



# EARLY BIRDS

26, 'SURUJMUUKHI'  
P.O. : SILPUKHURI, GUWAHATI - 781 003  
Regd. No. : 3140 of 1991-92

Handwritten initials 'JW' in blue ink.

website <http://www.propoor.org/ngo/2095>  
E-mail : BARUAHM@IOCL.CO.IN.

Patron :  
Smt. Shanta Sharma

Advisers :  
Dr. P. C. Bhattacharjee  
Sri Dinesh Baishya  
Sri H. P. Phukan  
Sri Dipak Sagar Das

President :  
Sri Moley Baruah  
☎ 546353 (R)

Vice-President :  
Dr. S. N. Choudhury  
☎ 540563 (R)  
Sri Manal Das

General Secretary :  
Sri Zakir Ahmed  
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Asst. Gen. Secretary :  
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Treasurer :  
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Executive Members :  
Gautam Chowdhury  
Mridu Pallav Sarma  
Mrs. Achala Goswami  
Saratika Sekhar Dutta

## EARLY BIRDS' COMPLETED 50<sup>th</sup> VETERINARY CAMP IN ASSAM WILD-LIFE

Guwahati, May 1 :-

The Early Birds', an NGO working in the wild-life Protected Areas of Assam for the last ten years recently completed its 50<sup>th</sup> free Veterinary Treatment -cum-Vaccination Camp in the periphery areas of the newly declared Nameri National Park. The camp was organized with the support from the Western Assam Wild-life Division and was the second camp within a fortnight. The Early Birds' team had vaccinated a total nos. of 1,400 cattles which also includes two hundred buffaloes from 27<sup>th</sup> to 29<sup>th</sup> of April, in Bardikrai, Maherbasti and Gargaon areas, which incidentally was the highest ever number achieved in all its 50 (fifty) veterinary camps in Assam Wild-life, conducted so far. Early Birds' have been working in ten Protected Areas of Assam viz. Kaziranga, Manas, Nameri, Orang, Burachapori, Pobitora, Garampani (Nambar), Chakrashilla, Laokhowa and Deepar Beel Wild-life Sanctuary; in order to sustain and create an immune belt around it, so that contagious diseases from domesticated bovine stock does not spreads to the wild ungulates. Though Nameri was declared a Tiger Reserve in March '2000, with an increase of an area of 64 sq.km., no fund have been made available nor provided to this effect, which resulted in a considerable delay in the initiation of a Tiger Project.

(Moley Baruah)  
President

Donations to Early Birds are exempted under 80G of I.T.ACT.



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☎ 546353 (R)

Vice-President :  
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Sri Pradyut Rajkhowa

Treasurer :  
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Executive Members :  
Gautam Chowdhury  
Mridu Pallav Sarma  
Mrs. Achala Goswami  
Sasanka Sekhar Dutta

(Moley Baruah)  
President

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# EARLY BIRDS

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26, 'SURUJMUUKHI'  
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## Elephant Treatment camp at Nameri National Park

Advisers :  
Guwahati, January 28, 2002 :

Dr. P.C. Bhattacharjee  
Sri Dinesh Baishya  
Sri H.P. Phukan  
Sri Dipak Saha

The Early Birds' which was formed in 1991 with the sole intention of providing protection to the forest and wild-life of the north-Eastern states had recently successfully completed an elephant treatment camp at Nameri National Park, which lasted for a three day duration w.e.f. 19<sup>th</sup> of January'02. Besides general health check-up, fecal examination were carried out and vaccination against FMD were also administered. It is worth mentioning that after 8(eight) consecutive & continuous service in the twelve Protected Areas of Assam, out of the seventeen, the Early Birds' was recently awarded a grant from the USA Govt. Deptt. (U.S. Fish and Wildlife Services) to maintain elephant health, of five PA's for one year. Besides giving adequate doses for de-worming, two minor operations were also performed on two elephants of which, one had an injury in the coccygeal vertebrae region resulting out of leopard biting and the other one had an injury during capture.

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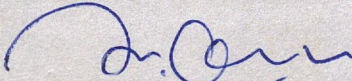
Nameri, which was declared a National Park in 1998 had only 39 permanent staff and 25 casuals to guard a vast track of over 200 sq.km. area. On the other hand, the sudden transfer of the dynamic Range Forest Officer by the present Govt. of Assam, (on politically motivated grounds) who is known for his effectiveness may also cause further trouble in the near future to this Tiger Reserve / National Park. Famous for Masheer and the endemic White-Winged Wood Duck, Nameri harbors 26 tigers and to protect this species, it is urgent that tree-felling / logging, poaching and encroachment like problems around Nameri and its' adjoining Reserve Forest Areas like Barpara and Chariduar must be stopped with firm hands. Early Birds' also demands to the Govt. to make all initial priority postings in the Deptt. for its' Wild-life wing, so that one can give one's idealistic young age services, to the wild-life. People in the vicinity, living around Bordikrai and Ranghejan Chapori who are still making sporadic attempts to encroach upon Nameri's territory, a detestable act that must be nipped in the bud. District administration must offer its helping hand to tackle this problem to the sparse forest officials entrusted to protect this area. It is equally surprising that, even though two years have lapsed, no fund under Tiger Reserve have been granted nor remitted to this park yet.

General Secretary :  
Sri Zakir Ahamed  
Ph : 521427 (R)

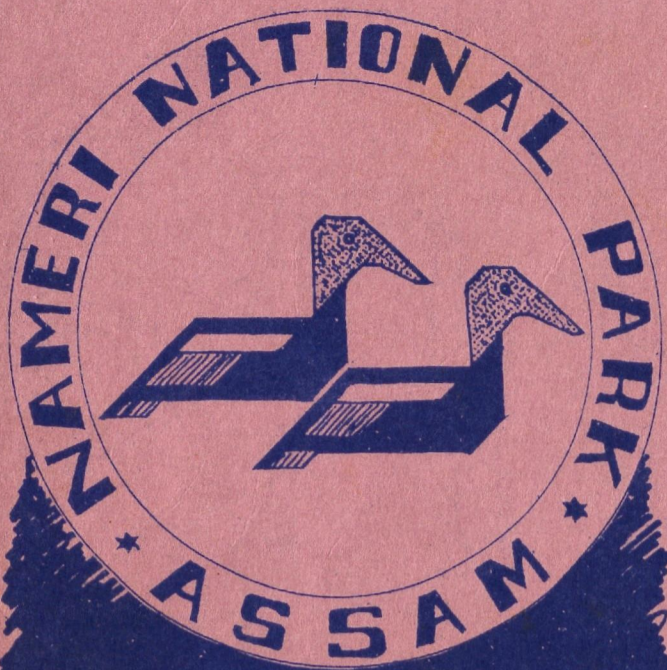
Asstt. Gen. Secretary :  
Sri Gautam Choudhury  
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Gautamchoudhury@isaparcasyl.net.

The Early Birds' team consisted of Shri Moley Baruah, President and three Veterinary Doctors Rishiraj Borah, Hamen Bharali and Bhaskar Choudhury.

Treasurer :  
Sri Mukul Talukdar  
Ph : 633451 (R)

  
(Moley Baruah)  
President (Early Birds')

Executive Members :  
Mridu Pallav Sarma  
Mrs. Achala Goswami  
Dr. Parimal Roy Chaudhury  
Gittartha Dutta.



## NAMERI NATIONAL PARK

Situated in the Civil District of Sonitpur, Nameri is the third National Park of Assam. The Pakhui Sanctuary of Arunachal Pradesh adjoins the Park on its North-Eastern point. The area is criss-crossed by the river Jia-Bhoroli and its tributaries namely Diji, Dinai, Doigurung, Nameri, Dikorai, Khari etc. Each tributary undergoes bifurcation / trifurcation at many points into streams or nalas to such an extent that it is virtually impossible to keep track of the stream. A few beels (during the rainy season) also dot the area. The Jia Bhoroli river and the tributaries display devilish look when the incessant rains in the upper reaches during the rainy season make it swell.

Nameri is fit to be a Tiger Reserve with 29 no counted in 1997. The in-accessibility and contiguity with neighbouring forest areas helped the wildlives of Nameri to flourish. There is a strong prey-base for Tiger - Sambar, Barking Deer, Hog Deer, Wild Boar, Bison etc. About 800 domestic cattle (to be rehabilitated soon) also form a formidable prey base for the Tigers and Leopards.

Nameri and the adjoining forest areas which are declared reserved for a considerable time for departmental operations, qualifies to be re-named as Elephant Reserves. The elephant population counted in Nameri in 1997 is 225.

Reserved Forest declared on 17-10-1878.

Nameri Sanctuary (137 sq.km.) on 18-09-1985.

Provisional Notification of National Park (212 sq.km.) on 27-02-1997.

Final Notification of National Park (200 sq.km.) on 09-09-1998 in Assam Gazette.

The habitat of Nameri is made up of tropical evergreen, semi- evergreen, moist deciduous forests with cane and bamboo brakes and narrow strips of open grassland along rivers. Grassland comprise of less than 10% of the total area of the Park while the semi-evergreen and moist deciduous species dominate the area. Some notable species are Gamari, Titachopa, Amari, Bogipoma, Ajar, Urium, Poma, Bhelou, Agaru, Rudraksha, Bonjolokia, Hatipoila, Khakan, Hollock, Nahor, Siya Nahar, Simul, Bonsum etc. Orchids include Dendrobium, Cymbidium, Ladies sleeper etc. Tree Fern, lians, creepers are some of the specialities of these forests.

1. Tiger - art by Abdal Munnaf.

2. Elephant - art by Dr. A. H. Chaudhury.

3. Sambar - Courtesy - Book of Indian Animals by Prater





The most prized and most significant finding is the White Winged Wood Duck (in Assamese - Deoanh) which has a flourishing population in Nameri - confirmed officially in 1995. Till now 310 avian species are recorded in the Park. Few notable among them are :

- |                        |                          |                              |                             |
|------------------------|--------------------------|------------------------------|-----------------------------|
| Large Cormorant        | Phalacrocorax carbo      | Small Indian Pratincole      | Glareola lactea             |
| Grey Heron             | Ardea cinerea            | Longbilled Ringed Plover     | Charadrius placidus         |
| Chestnut Bittern       | Ixobrychus sinensis      | Pintailed Green Pigeon       | Treron apicauda             |
| Black Stork            | Ciconia nigra            | Emerald Cuckoo               | Chalcites maculatus         |
| Large Whistling Teal   | Dendrocygna javanica     | Himalayan Pied Kingfisher    | Ceryle lugubris             |
| Common Shelduck        | Tadorna tadorna          | Three toed Kingfisher        | C. erithacus                |
| Common Merganser       | Mergus merganser         | Bluebeared Bee eater         | Nyctornis atheroni          |
| Black crested Baza     | Aviceda leuphotes        | Wreathed Hornbill            | Rhyticeros undulatus        |
| Pallas's fishing Eagle | Haliaetus leucoryphus    | Indian Pied Hornbill         | Anthracoseros malabaricus   |
| Whitetailed Eagle      | Haliaetus albicilla      | Great Pied Hornbill          | Bucaris bicornis            |
| King Vulture           | Sarcogyps calvus         | Maroon Oriole                | Oriolus traillii            |
| Kaleej Pheasant        | Lophura leucomelana      | Greater Racket tailed Drongo | Dicrurus paradicus          |
| Ibisbill               | Ibidorhyncha struthersii | Hill Myna                    | Gracula religiosa           |
| Stone Curlew           | Burhinus oedicephalus    | Orange Billed jungle Myna    | Acridotheres javanicus      |
|                        |                          | Himalayan Treepie            | Dendrocitta formosae        |
|                        |                          | Longtailed Minivet           | Pericrocotus ethologus      |
|                        |                          | Fairy Bluebird               | Irena purella               |
|                        |                          | White Throated Bulbul        | Cringer flaveolus           |
|                        |                          | Black Bulbul                 | Hypsipetes madagascariensis |
|                        |                          | Chestnut backed Sibia        | Heterophasia annectens      |
|                        |                          | River chat                   | Chaimarrornis leucocephalus |



1. Capped Langur: Prasanta N. Bhowmik, 2. Indian Pied Hornbill: © Dr. M. Choudhury, 3. Large Racket Tailed Drongo: 4. Chestnut Headed Bee Eater: 5. Python: © Abdul Mannaf, 6. Black Bear: © Gyimesi's Animal Life Encyclopedia, 7. North Bear: © Gyimesi's Animal Life Encyclopedia, 8. Indian Porcupine: © Abdul Mannaf, 9. Otter: 10. Black Stork: © Abdul Mannaf



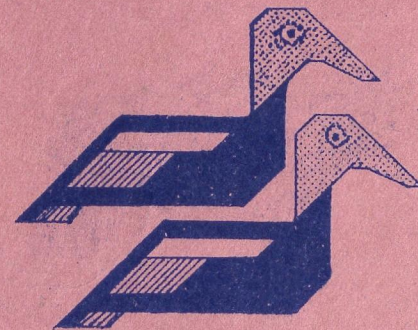
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### WHITE WINGED WOOD DUCK (*Cairina scutulata*)

#### Introduction

The white winged wood duck is one of the most endangered duck species in the world and is in the Red - Data book of IUCN. The WWWD is a shy and elusive bird and is an inhabitant of Tropical Wet Evergreen forests, Semi Evergreen forests and Moist Deciduous forests. The bird assumes the size in between a domestic duck and a geese. The male (drake) is slightly bigger and darker than the female (duck) and both have prominent white patches on the wings seen while sitting and flying from behind as well as from beneath. The head and the neck is white with black speckles which is more in the female. The black eye is surrounded by an orange red marking. The beak is yellowish in front. The female is chestnut brown in comparison and the downy ducklings are dark chocolate brown and yellow. The identifying characteristic of the WWWD ducklings are the eye strip divider which none of the duck species possess.

#### Measurement of the body

On 17-03-96, an injured drake was rescued by the staff of Nameri National Park. The drake was treated with antibiotic and vitamin and was released. The weight and measurement recorded was as follows:

- I. Weight-2.7 kg.
- II. Length of the Beak-6 cms.
- III. Length from base of beak to neck (where the speckles end)-18 cms.
- IV. Total body length from tip of beak to end of tail feather (upper side)-76 cms.
- V. Girth (Over the wings)- 52 cms.

#### Present Distribution and Population Size

The WWWD is presently confined only in the following South - East Asian Countries: Indonesia (Sumatra and Java), India, Bangladesh, Union of Myanmar (Burma), Thailand, Laos P.D.R. and Vietnam. But the World population is less than 800.

#### Wetland Types

The WWWD prefers relatively small, shallow, sluggish, stagnant wetland in forest areas. They widely use streams, pools, small lakes and river marshes and sometimes flooded rice fields. In Nameri National Park they frequent relatively bigger rivers (tributories of Jia Bhoroli) but with less water current and clear water. The WWWD is also observed swimming in a depth of 3 1/2 ft. water.

#### Ecology and Behaviour

The dial rhythm of WWWD has a strong crepuscular peak. Varied observations suggest that they adjust their dial rhythm opportunistically according to timing of food availability, habitat disturbance or breeding cycle/activity.

#### Breeding Biology

The breeding season starts from end of March in Nameri to July in Eastern countries. The clutch and brood size was observed upto 15 in Upper Assam while 12 was sighted in Nameri. The tree cavities above 6 to 7 mtrs. from ground level are preferred as nests. The tree species are Switonia floribunda, Artocarpus lakocha, A. chaplasha; Bischofia javanica, Hollock, Hollong, Nahor, Bher, Ficus etc.

The female incubates the eggs, while in captivity it may be a brood hen. The drake was observed roosting in a tree 180-270 mtrs. away. The pair leaves the nest site around dawn and dusk. The male attends the female closely during incubation and escorts the female while leading to the hole and flies around the nesting tree till the female settles down. As soon as the chicks leave the nest, they move to water in ditches, creeks and streams partially guarded by both the parents.

#### Vocalisation

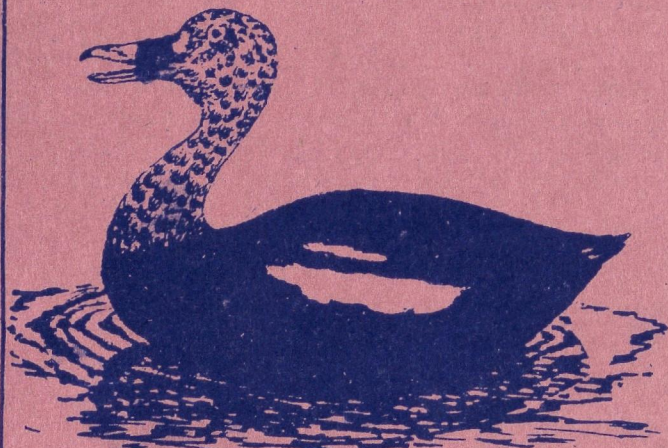
The honking calls of the female was recorded during flight in Nameri and alarm calls when flushed. But also observed remaining silent when flushed. The vocalisation is not a ghostly wail as thought earlier for which it was termed in Assamese as 'Deohanh'.

#### Feeding

The WWWD is an omnivorous bird and the diet varies with feeding site and seasonal availability. The analysis of faecal matters revealed presence of molusc shell. They are also observed taking aquatic snails (*Vibira* spp.), *Ampullaria* and fresh water mussel in addition to taking plants like *Hydrilla*, *Utricularia* spp. They also feed on shrimp, small fish (*Puthee*), aquatic spider, annelids, frogs, dragon fly, grass hopper etc. in captive condition.

#### Conservation Problem

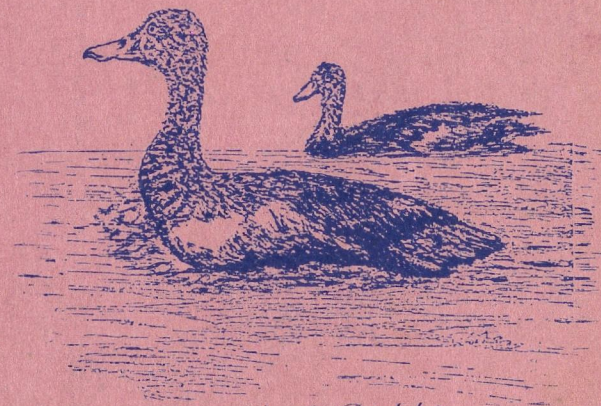
The destruction of habitat has been rated as the highest threat and cause of decline of WWWD population. Departmental logging and illegal felling has removed many nesting trees as well as the forest cover. Moreover, most of the prime habitats have been converted to agriculture and tea plantation in the past. Encroachment, shifting cultivation and mono-silviculture also attributed to habitat destruction. Development activities such as township, construction of roads and installation of oil rigs inside forests also reduced the habitat of WWWD.



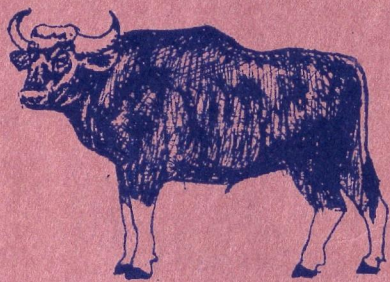
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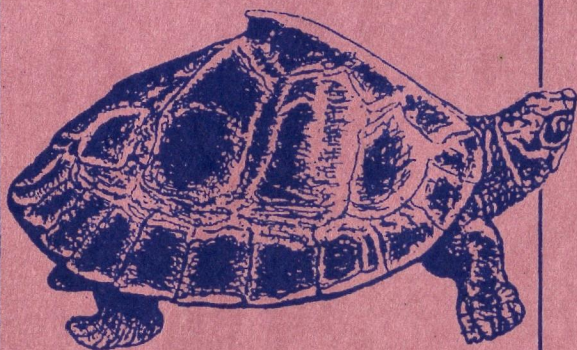
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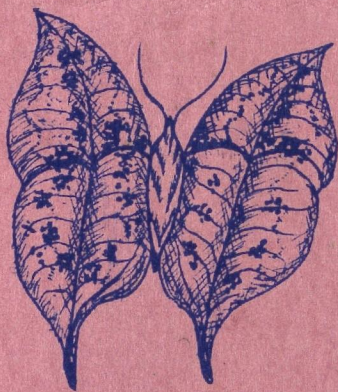
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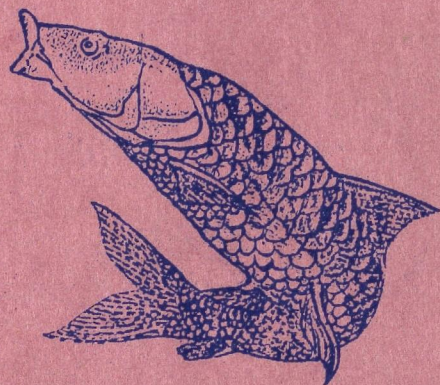
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## THE GAUR OR INDIAN BISON

(*Bos gaurus*)

The Bison is known in Assamese as Methun, is a very impressive mammal. The bull stands up to 6ft. 4in. at the shoulder - while the cows are smaller in built. With its huge head, deep massive body and sturdy limbs the Gaur is the embodiment of vigour and strength. Very striking in the Gaur is the muscular ridge upon its shoulders which slopes down to the middle of the back where it ends in an abrupt dip.

Forests are essential to the existence of Gaur. They come out to graze early in the morning or in the late afternoon. During the hot hours of the day Gaur retire to the shelter and seclusion of the forest. Their food is chiefly grass, they also browse on leaves and eat the bark of certain trees.

Gaurs are by nature shy and timid animals. Their defence is their massive size and an acute sense of smell.

## TURTLES

In India all soft shelled Turtles (belongs to order Trionychidae) and few hard shell turtles are protected by Wild life(Protection) Act, hence can not be trapped or killed. In Nameri, the following are the turtles recorded so far: (1) *Kachuga sylhetensis* or Assam Roof Turtle. (2) *Cuora ambionensis* or Malayan Box Turtle. (3) *Pyxidea mouhotii* or Keeled Box turtle. (4) *Cyclemys dentata* or Asian leaf Turtle. (5) *Chitra indica* or Narrow headed soft-shelled Turtle. (6) *Aspideretes gangeticus* or Indian soft-shelled Turtle.

Habitat preference

1. Forest floor and waterbodies of evergreen forests : Assam Roof Turtle, Keeled box turtle, Asian leaf turtle. (2) Marshy grassland : Malayan Box Turtle. (3) Rivers : Narrow headed softshelled turtles, Indian soft-shelled Turtle.

Ecologically, turtles are important, being Scavengers that help release nutrients locked up in dead animal tissue. They also help control water weeds, pests including mosquito larvae and snails and some being predators of fish help in removing the sick or otherwise less healthy individual.

The diversity of turtles is greatest in the North-East and the Himalayas(19 and 15 sps. respectively). The centre of Origin of Asian Pond Turtles (Bataguridae) is possibly the North-East India.

## THE DHOLE OR INDIAN WILD DOG

(*Cuon alpinus*)

Much like a domestic dog in general appearance, with the long, lank body of the Wolf but relatively shorter in leg and muzzle. The tail is quite bushy. Very distinctive is the red coat which varies in tone with season and locality.

Within the limit of India, three races are recognised, a Trans Himalayan, a Himalayan and a Peninsular form. Otherwise they are well distributed over central and eastern Asia from the Attai mountain and Manchuria southward through the forests regions of India and the Malay countries.

Wild dogs are social animals, going about in packs. In Nameri they form smaller packs unlike in other parts of India. The pack is a family, or a union of two or more, sometimes of several families. Such union increases the chances of killing larger prey. Usually they hunt by day. Their prey is trailed by scent. Food varies with locality. Wild pigs are favourite prey.

The breeding season is Nov-Dec; pups normally 4 to 6, are born in Jan-Feb in a cave or under a rock. Several females may breed in a colony.

## BUTTERFLIES

Nameri is a Paradise for the Entomologists. Some notable Butterflies are :

| Family      | Species                               | Family                             | Species                           |
|-------------|---------------------------------------|------------------------------------|-----------------------------------|
| Lycaenidae  | <i>Anthene emolus</i> Godart          | Donaidae                           | <i>Euploea core</i> Cramer        |
|             | <i>Celastrina argiolus</i> (Linnaeus) |                                    | <i>Danais genutia</i> Cramer      |
|             | <i>Jamides alecto</i> Felder          | Satyridae                          | <i>Melanitis leda</i> (Cramer)    |
|             | <i>Arhopala pseudocentaurus</i>       |                                    | <i>Ypthima lisandra</i> (Cramer)  |
|             | <i>Loyura atymnus</i> (Cramer)        |                                    | Pieridae                          |
| Riodinidae  | <i>Zemerus flegyas</i> (Cramer)       | <i>Catopsilia pomona</i> Fabricius |                                   |
| Nymphalidae | <i>Junonia hierta</i> Fabricius       | Papilionidae                       | <i>Pieris brassicae</i> Linnaeus  |
|             | <i>J. almana</i> Linnaeus             |                                    | <i>Cepora nerissa</i> Fabricius   |
|             | <i>Cirrochroa aoris</i> Doubleday     |                                    | <i>Papilio demoleus</i> Linnaeus  |
|             | <i>Neptis hylas</i> Linnaeus          |                                    | <i>P. polytes</i> Linnaeus        |
|             | <i>Kallima</i> sp.                    |                                    | <i>Troides geaus</i> C&R Felder   |
|             |                                       |                                    | <i>Thelena</i> Linnaeus           |
|             |                                       |                                    | <i>Graphium sarpedon</i> Linnaeus |

The Atlas Moth with a world record of 10 inches wing span was also recorded in the Nameri National Park.

## MAHSEER - THE KING OF RIVER

The river Jia Bhoroli within the Nameri National Park is famous for the mighty 'Mahseer' right from the period of British. The upper stretch of Bhoroli river (known as Kameng that fall in Arunachal Pradesh) and the Nameri River is the breeding ground of the Mahseers. The following species are recorded so far :

(1) Golden Mahseer or *Tor tor*. (2) Short gill Mahseer or *Tor putitora* (3) *Tor progenius* (4) *Neolissochilus hexagenolepis*.

The fishes migrate up the rivers during breeding season.

The record of Mahseer in Jia Bhoroli is as bellow :

| Year    | Weight | Year    | Weight   | Year    | Weight    | Year    | Weight    |
|---------|--------|---------|----------|---------|-----------|---------|-----------|
| 1963-64 | 28 lb. | 1975-76 | 33 lb.   | 1983-84 | 12.75 kg. | 1991-92 | 24.50 kg. |
| 1964-65 | 34 lb. | 1976-77 | 35.2 lb. | 1984-85 | 7.75 kg.  | 1992-93 | 14.25 kg. |
| 1966-67 | 42 lb. | 1977-78 | 25 lb.   | 1985-86 | 6.50 kg.  | 1993-94 | 18.00 kg. |
| 1970-71 | 29 lb. | 1978-79 | 30 lb.   | 1987-88 | 16.00 kg. | 1996    | 28.00 kg. |
| 1972-73 | 20 lb. | 1980-81 | 24.2 lb. | 1988-89 | 20.00 kg. |         | 21.00 kg. |
| 1973-74 | 31 lb. | 1982-82 | 7.25 kg. | 1990-91 | 16.50 kg. |         |           |

In Nameri River

## Nameri - the future Tiger Reserve

It is worth mentioning that Nameri and Sonai-Rupai are only Protected Areas in the North Bank of Brahmaputra in the Civil District of Sonitpur, Lakhimpur and Dhemaji.

There are as many as 25 Reserved Forests in these three districts where departmental logging is allowed. Habitat shrinkage due to encroachment has put immense pressure on tiger population to move and seek a safer place. Nameri being a Sanctum-sanctorum area becomes the choice of tiger to take shelter. Hence there are local reports that the tiger concentration in Nameri has increased in the Past few years. As a result of increase of tiger population, Nameri is in need of a better conservation and protection measures.

### Other notable wildlives

Bhalukpong is known for the Bhaluk-the Bear. The Himalayan Black Bear and the Sloth Bear is recorded so far.

The Dhole or Indian Wild Dog has been listed as another carnivorous mammal next to the tiger and leopard.

Nameri is proud to secure the existence of another endangered small mammal - the hispid hare.

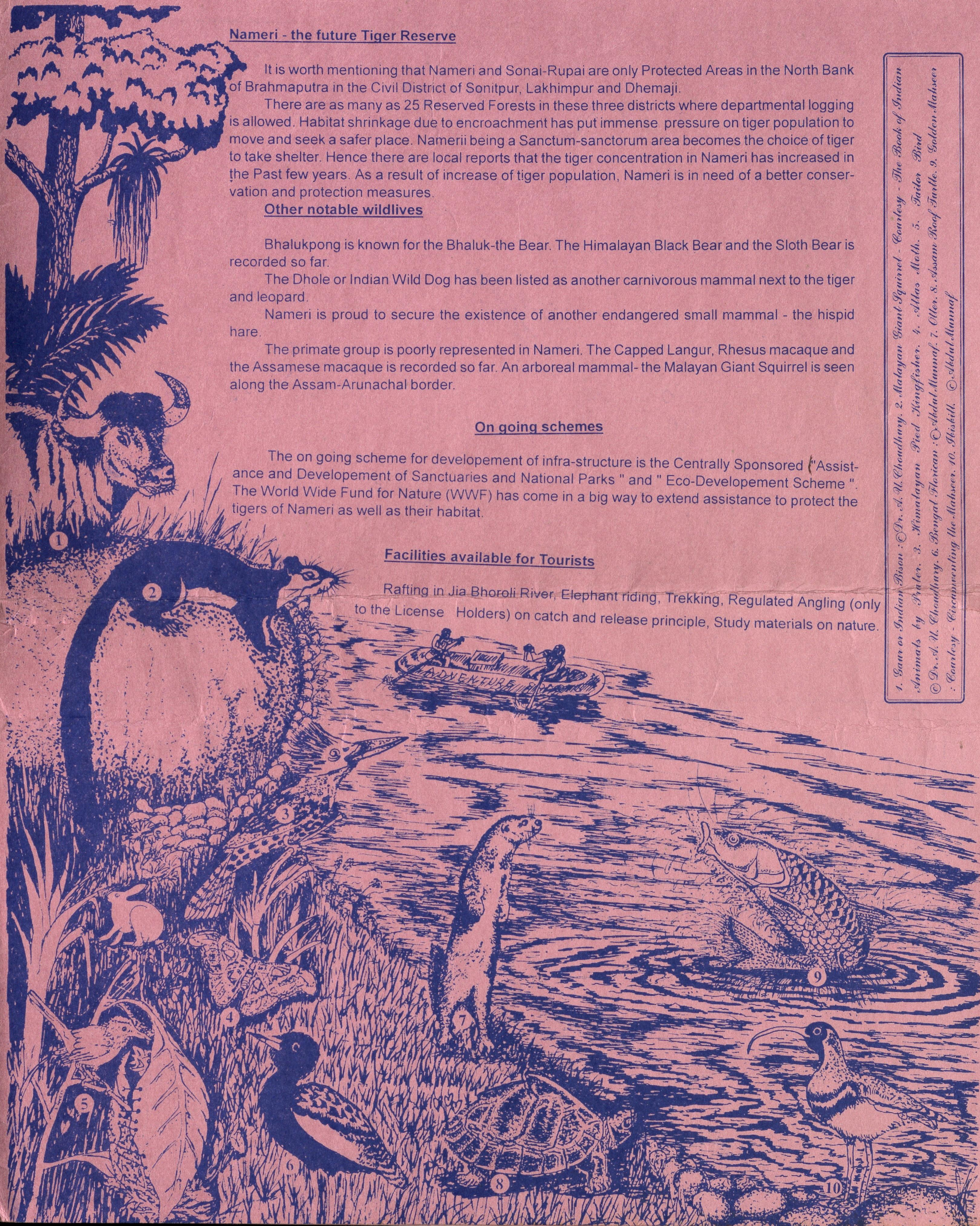
The primate group is poorly represented in Nameri. The Capped Langur, Rhesus macaque and the Assamese macaque is recorded so far. An arboreal mammal- the Malayan Giant Squirrel is seen along the Assam-Arunachal border.

### On going schemes

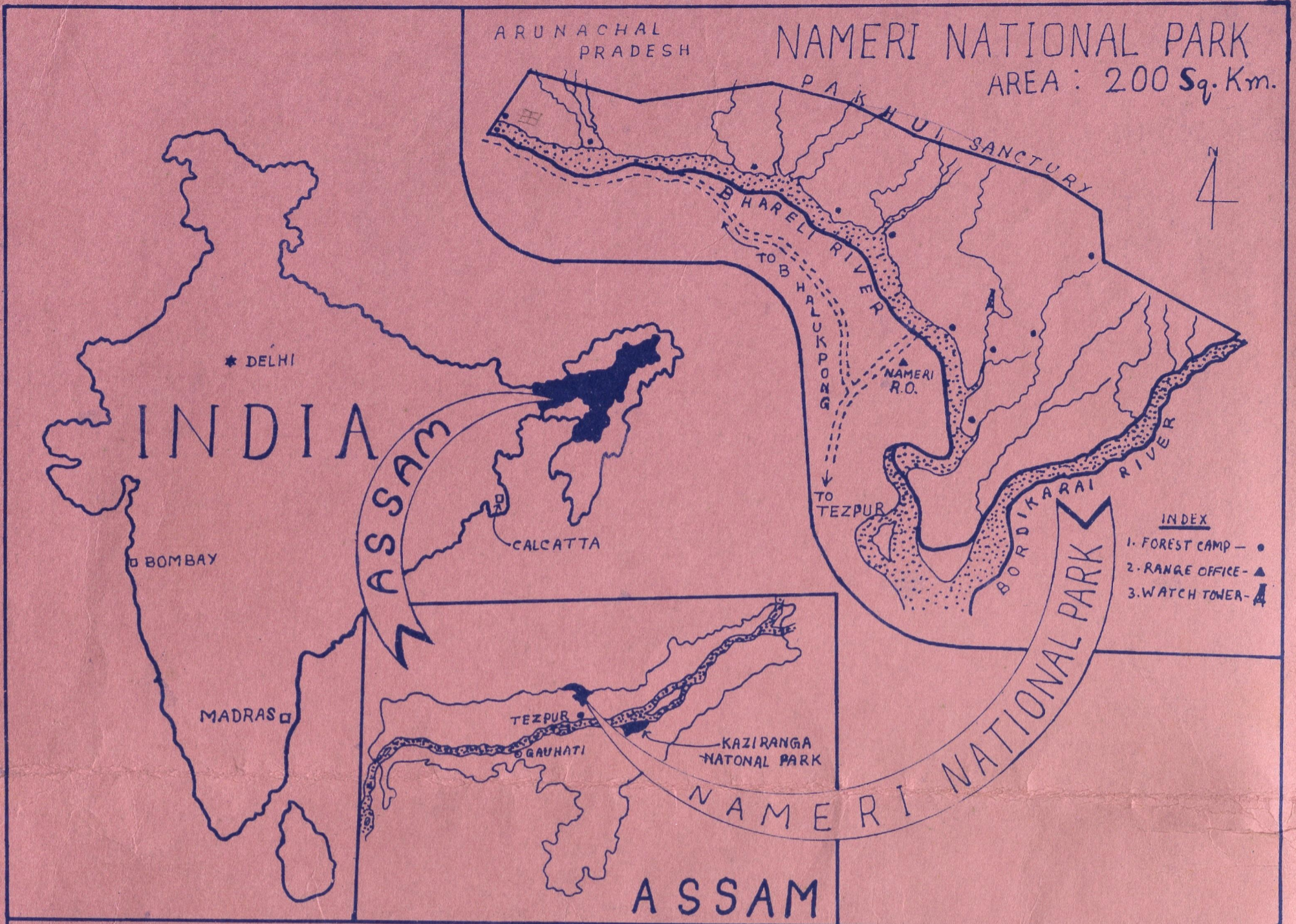
The on going scheme for development of infra-structure is the Centrally Sponsored "Assistance and Development of Sanctuaries and National Parks " and " Eco-Development Scheme ". The World Wide Fund for Nature (WWF) has come in a big way to extend assistance to protect the tigers of Nameri as well as their habitat.

### Facilities available for Tourists

Rafting in Jia Bhoroli River, Elephant riding, Trekking, Regulated Angling (only to the License Holders) on catch and release principle, Study materials on nature.



1. Gaur or Indian Bison : © Dr. A. M. Choudhury. 2. Malayan Giant Squirrel - Courtesy - The Book of Indian Animals by Prater. 3. Himalayan Pied Kingfisher. 4. Atlas Moleh. 5. Tailor Bird © Dr. A. M. Choudhury. 6. Bengal Florican : © Akhbar Munnaf. 7. Otter. 8. Assam Roof Turtle. 9. Golden Mahseer : Courtesy - Circumnavigating the Mahseer. 10. Skinkill. © Akhbar Munnaf



**GENERAL INFORMATION**

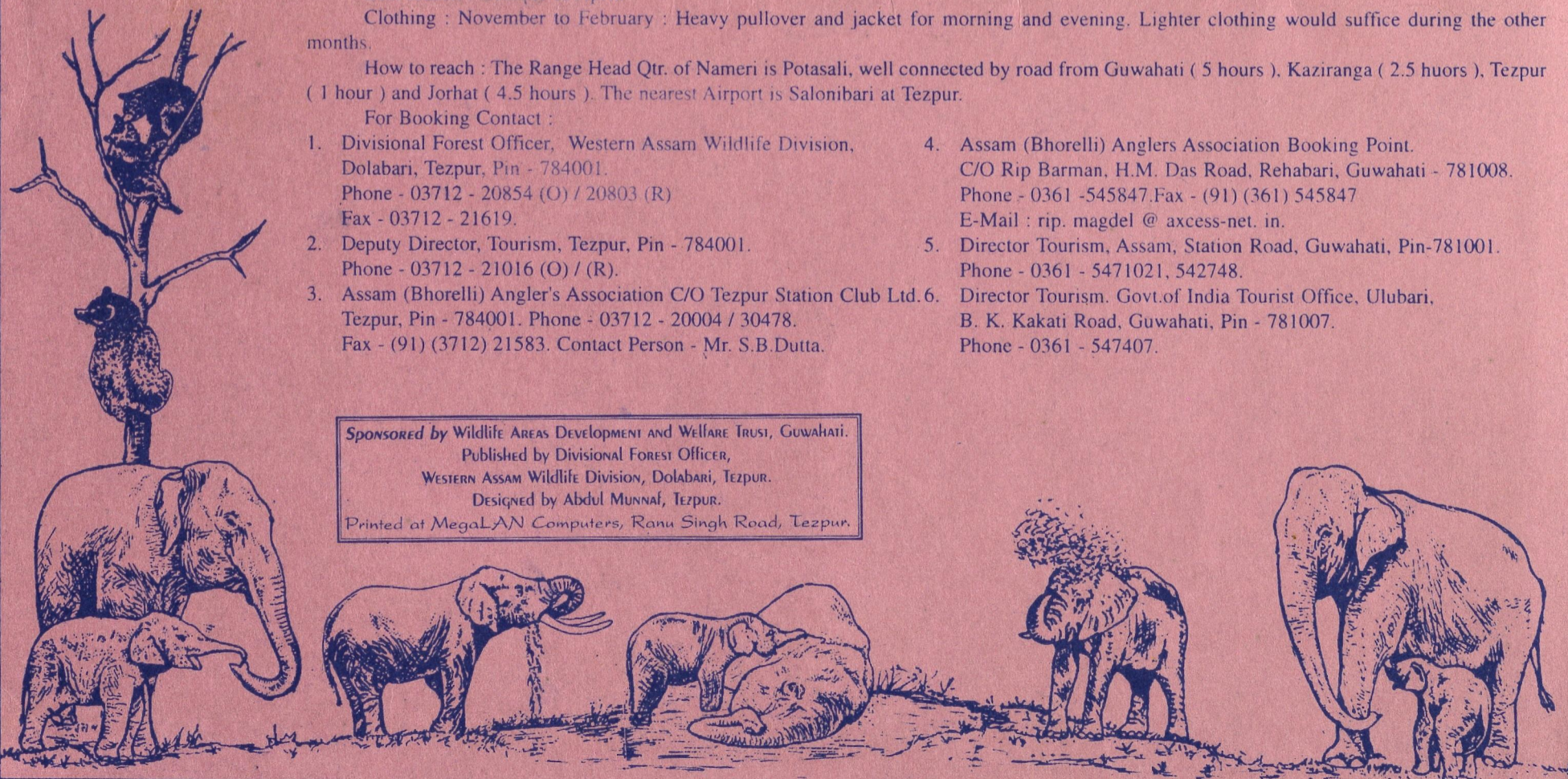
Best season : October to April.  
 Clothing : November to February : Heavy pullover and jacket for morning and evening. Lighter clothing would suffice during the other months.

How to reach : The Range Head Qtr. of Nameri is Potalasi, well connected by road from Guwahati ( 5 hours ), Kaziranga ( 2.5 hours ), Tezpur ( 1 hour ) and Jorhat ( 4.5 hours ). The nearest Airport is Salonibari at Tezpur.

For Booking Contact :

- |                                                                                                                                                                                              |                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Divisional Forest Officer, Western Assam Wildlife Division, Dolabari, Tezpur, Pin - 784001.<br>Phone - 03712 - 20854 (O) / 20803 (R)<br>Fax - 03712 - 21619.                              | 4. Assam (Bhorelli) Anglers Association Booking Point.<br>C/O Rip Barman, H.M. Das Road, Rehabari, Guwahati - 781008.<br>Phone - 0361 - 545847. Fax - (91) (361) 545847<br>E-Mail : rip. magdel @ access-net. in. |
| 2. Deputy Director, Tourism, Tezpur, Pin - 784001.<br>Phone - 03712 - 21016 (O) / (R).                                                                                                       | 5. Director Tourism, Assam, Station Road, Guwahati, Pin-781001.<br>Phone - 0361 - 5471021, 542748.                                                                                                                |
| 3. Assam (Bhorelli) Angler's Association C/O Tezpur Station Club Ltd. 6.<br>Tezpur, Pin - 784001. Phone - 03712 - 20004 / 30478.<br>Fax - (91) (3712) 21583. Contact Person - Mr. S.B.Dutta. | 6. Director Tourism, Govt. of India Tourist Office, Ulubari,<br>B. K. Kakati Road, Guwahati, Pin - 781007.<br>Phone - 0361 - 547407.                                                                              |

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PA 034/77

## Seven elephants die, poisoning suspected

**SAMUDRA GUPTA KASHYAP**

GUWAHATI, OCT 15

AS MANY as seven wild elephants, including a tusker, were found dead in a paddy field just outside the northern Assam cantonment town of Tezpur on Monday morning. Forest officials feel poisoning could be the cause.

The carcasses were reportedly found at different spots in a large paddy field at village Haleswar within five kms from the Tezpur police station. With this, the toll in Sonitpur district has gone up to 23 in three months. In August, 15 wild elephants were found dead in and around the Nameri national park situated north of Tezpur town.

In the earlier instance, veterinary experts had concluded that wild elephants were poisoned to death by

villagers who were being constantly disturbed by the animals straying out of the national park. Forest officials cited the same could be the reason for today's deaths as well. They said the first report of an elephant being found dead was reported around seven am today, but they found more bodies, scattered at different locations in the large field where the villagers collectively cultivate paddy.

Veterinarians and police are investigating the deaths and no arrests have been made so far. Quoting some villagers, sources said a herd of elephants from the Nameri national park and the Charduar reserved forest was creating havoc in the outskirts of the town for over a week and that might have prompted the villagers to poison them to death.

The authorities are in the dark, wonder whether anthrax, liver fluke or a pesticide could have caused the deaths

# Elephant deaths in Assam park spell trouble for authorities

SAMUDRA GUPTA KASHYAP  
AUG 20

THE deaths of as many as 18 elephants in the Nameri National Park in Assam and the adjacent Pakhui reserved forest in Arunachal Pradesh within the span of seven weeks have caused alarm in the region, more so because the authorities have been unable to ascertain the cause.

With the first death being reported on July 3, wildlife enthusiasts have now urged the authorities to call in experts.

Initially, the authorities suspected the outbreak of anthrax, a killer disease that

had, way back in 1914-15, wiped out about 150 elephants here. The entire population of spotted deer was also wiped out from Assam during that epidemic.

Nameri park in-charge, DFO (Wildlife) H.P. Phukan said they also suspected liver fluke to be responsible for the deaths. But liver fluke could be confirmed in case of only two deaths, he said.

The authorities have now engaged experts from the Veterinary College, Guwahati, to carry out a detailed study, Phukan said. However, he did not rule out the pos-

sibility of encroachers poisoning the elephants. He said large tracts of forest area in the adjoining Charduar reserved forest had already disappeared, with encroachers setting up houses and taking to cultivation there.

"The elephants that earlier went to these areas looking for food still continue to go there. This has disturbed the encroachers," he said.

He said that pesticide diathene used in tea estates could have been used to kill the elephants. In the past also, bottle-gourds injected with diathene had been found in-

side forests meant to target elephants, he added. "We have found some clues of encroachers living in forest land close to the park. Such reports are yet to be confirmed," the DFO said.

Wildlife activist Bibhab Talukdar agrees with Phukan. On an average, depredation by wild elephants leads to the death of some 30-40 people every year in the Sonitpur and Darrang districts. These districts comprise the fringe area of the National Park and adjoining reserved forests which are home to over 700 elephants, Talukdar said.

There have also been reports — attributed to the ULFA — that the deaths were

caused by a gang of international poachers who worked hand-in-glove with some forest officials. "There is no basis for saying that 100 elephants have died in the park. I have personally scanned the entire park during the past week and have come across only eight carcasses. But no part of the carcasses has been removed," Phukan said.

He also said that all the eight elephants were either juvenile or semi-adult, i.e below eight years of age. Two veterinary doctors from Guwahati who made a preliminary study of the deaths too have indicated that it could be a case of poisoning. The Forest Department has contacted the Wildlife Trust of India for a team of experts.

## DATELINE GUWAHATI

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23 June ✓

# 18 tuskers 'poisoned' in Assam

PH 237

UNITED NEWS OF INDIA

GUWAHATI, Aug. 19. — At least 18 wild elephants of the Nameri National Park were suspected to have been poisoned to death by irate villagers, harassed by the herd for long.

The Nameri Range officer, Mr Pankaj Sharma, said so far nine carcass had been recovered from the range. "Initially we thought it was the foot and mouth disease but now we suspect poisoning as more carcass were found in the areas where the elephant depredation was high," he said.

A senior veterinary doctor from the Assam Veterinary College, Mr Kushal Sharma, said: "We don't think it is the foot and mouth disease as in that case it would have affected all the herbivorous animals in the park.

But we had found the carcasses of elephants only."

He along with his colleague, Mr Apurbo Chakravarty, would reach Nameri today to collect blood samples of the domesticated pachyderms of the forest department.

Mr Talukdar of Aarynak Nature Club, who was doing research work on the most endangered white winged wood duck of Nameri, said he had seen the first carcass on 3 June.

Carcasses of the elephants had been found since 3 July in the

Nameri and Pakoi reserve forest.

"I suspect they are poisoned to death by the villagers frustrated with the authorities for not getting compensation even as the herd continued to destroy their paddy field and houses," he said.

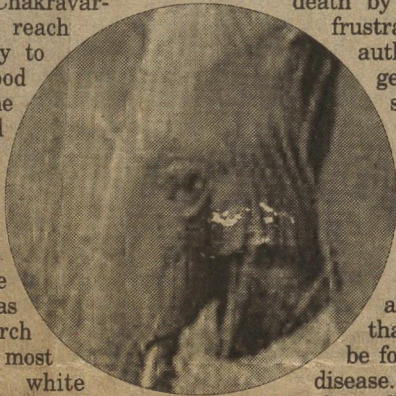
Mr Talukdar also agreed that it might not be foot and mouth disease. "If that is the case then all the herbivorous animals are under threat. We should not forget that more than 150 elephants have died in 1942 because of the disease. In

fact, the spotted deer vanished from Assam for the same reason," he said.

Nameri, situated at the foothill of the Himalayas in the northern bank of the Brahmaputra has a floating population of 225 elephants as per the 1997 census. But these elephants roam around in a massive area, including the foothills of the Himalayas in Arunachal Pradesh.

The elephant depredation has been a major problem in the northern bank of the Brahmaputra and, in fact, has affected the operation of the Salonibari air base of the Indian Air Force at Tezpur.

Divisional Forest Office H P Phukan, had also rushed to the park from Tezpur to investigate the mysterious death of the animals.



TOI

AUG 20

RAV33

### 18 elephants believed poisoned in Assam

GUWAHATI: Forest guards have found 18 dead elephants in a sanctuary in Assam in the past month and officials said angry villagers were suspected of poisoning them. Forestry department official Pankaj Sharma said villagers, harassed by raids on their farms by wild elephants looking for food, were believed to have killed the animals in Nameri National Park. "We have recovered 18 dead elephants in Nameri and suspect they have been poisoned by villagers," Sharma said on Monday.

Herds of wild elephants regularly venture out of Assam's forests and trample rice fields and destroy granaries and houses in their search for food. Forestry officials say the raids on villagers' fields are a result of a growing elephant population and the destruction of their natural habitat.

Veterinarians were investigating the deaths in the park, which is about 200 km from Guwahati, the main city in the region.

"Initially, we thought the elephants had died of some disease infecting their liver," Sharma said. "But any such epidemic should have also affected other herbivorous animals in the area, why only elephants?" The North-East is home to about half of the country's elephant population of 30,000.

Elephant expert Dinesh Choudhary said that state government protection of elephants over the last 20 years, including a ban on their capture, had led to an increase in the population in Assam state to about 5,000.

G

PAV33

TOI

AUG 21

**Man-animal conflict claims 12 tuskers**

SHANKHADEEP CHOUDHURY & MITA GOSWAMI

**GUWAHATI/TEZPUR:** Foresters have attributed the recent death of 12 elephants in northern Assam to suspected poisoning by Bodo villagers.

Describing the incident at the Nameri National Park as "a clear-cut case of man-animal conflict" JP Phukan, divisional forest officer of the northern Assam wildlife division, said: "We suspect that some of the crops and vegetables that the rampaging elephants were in the habit of consuming were poisoned by local Bodos. It appears that the poison was not strong enough to kill full-grown elephants. That's why the victims were all sub-adults or calves."

The first elephant carcass was sighted on June 3 by wildlife activist Bibhab Talukdar, who was engaged in research work on the endangered white-winged wood duck at the Nameri National Park.

Since July 3, carcasses have been found inside both Nameri and Pakoi Reserve Forest in neighbouring Arunachal Pradesh, taking the death toll to 12.

Phukan, however, did not blame the jumbos, saying their natural habitat had been encroached upon by people. "Nameri was thickly forested even five years ago. Now, sections like Charduar and Balipara have been almost completely encroached upon," he said.

The poison theory, Phukan said, holds ground all the more because neither the cattle population nor deer or any other animal had been affected. "The vets have not been able to detect any virus and they are now deep inside the jungles, looking for more clues. Ten carcasses have been found in Assam territory, while two were found in Arunachal Pradesh," he said.

While forest authorities have stepped up vigil and were on the lookout for more carcasses, the Sonitpur police have promised to take "severe action" against the culprits once the forest authorities lodged a formal complaint. "Under the Preservation of Wildlife Act, severe action can be taken. However, that can be possible once the forest department lodged a complaint, pointing out their suspicions along with some technical reports," additional superintendent of police P.R. Kar said over phone.

Wildlife activists, while condemning the incident, have alleged that sufficient efforts were not being taken to build up awareness among the people. "It is not enough to build up infrastructure under elephant conservation projects like the one sponsored by the US Fish and Wildlife Service. Those areas, where awareness is urgently required, are completely ignored," regretted Soumyadeep Dutta, director of Nature's Beacon. He warned: "Unless awareness is built up, such incidents will recur."

PAV33

## Elephants died of poisoning: <sup>To 1</sup> forest officials

Times News Network <sup>22/8/2001</sup>

**GUWAHATI/TEZPUR:** Forest officials have attributed the recent deaths of 12 elephants in northern Assam to poisoning by Bodo villagers. They have described the incident at the Nameri National Park as "a clear-cut case of man-animal conflict."

"We suspect that the local Bodos had probably poisoned some of the crops and vegetables that the rampaging elephants were in the habit of consuming. It seems that the villagers did not have enough poison to kill full-grown elephants, that was why victims were all calves", J.P. Phukan, the divisional forest officer of the northern Assam wildlife division said.

The first elephant carcass was sighted on June 3 by wildlife activist Bibhab Talukdar, engaged in research work on the endangered white-winged wood duck at the Nameri national park. Since July 3, carcasses have been found inside both Nameri and Pakoi Reserve Forest in the neighbouring Arunachal Pradesh, taking the death toll to 12.

Mr Phukan, however, did not blame the jumbos for the depredation, saying that their natural habitat had been encroached by men. "Nameri was thickly forested even five years back — now, sections like Charduar and Balipara have been almost completely encroached", he said.

The poison theory, Mr Phukan said, holds ground all the more because neither the cattle population nor the deer or any other animal have been affected. "The vets have not been able to detect any virus as they are now deep inside the jungles, looking for more clues. Ten of the carcasses have been found in the Assam territory, while two were found in Arunachal Pradesh", he explained.

While forest authorities have stepped up vigil and were also on the lookout for more carcasses, the Sonitpur police on Tuesday promised to take "severe action" against the villagers once the forest authorities lodged a formal complaint. "Under the Preservation of Wildlife Act, severe action can be taken. However, that can be possible once the forest department lodged a complaint, pointing out their suspicions along with some technical reports", additional superintendent of police, P.R. Kar, said over telephone.

Wildlife activists, while condemning the incident, have alleged that sufficient efforts were not being undertaken to build up awareness amongst the people. "It is not enough to build up infrastructure under elephant conservation projects like the one sponsored by the US Fish and Wildlife Service. Those areas, where awareness was urgently required, were completely ignored", regretted Soumyadeep Dutta, director of Nature's Beacon. He warned, "unless awareness is built up, such incidents will recur."

FROM: ADMINISTRATION, GR SECRETARIN@IOCI.CO.IN  
To: <kwiksh@vsnl.com>  
Subject: X-Files on Elephant deaths in Nameri N.P., Assam  
Date: Thursday, August 30, 2001 1:41 PM

PMV 33

Dear Mr. Shekhsaria,

Since the beginning of this month, till now 18 (eighteen) semi-adult female elephant carcasses were found in the vicinity of NAMERI NATIONAL PARK, Assam, along the Jia-Bhorali river. The symptoms are typical of Anthrax, which may have been transmitted by an infected herd, from the Arunachal Pradesh's PAKUI Wild life Sanctuary. The Veterinary Departmental statement, released to the press, is given as Liver Fluke, even though the symptoms are typical of Anthrax, with blood, pus and body fluids coming out from all the pores of the body, viz mouth, ears, trunk, anus etc.

An expert team to determine the cause of the unnatural deaths of a significant numbers of elephants, within a limited area is desired. (i.e. whether it is due to Anthrax or Liver Fluke or any other diseases or especially poisoning by pesticides from the Arunachal Pradesh side, by locals), is the need to arrive at a conclusion and the action plan to be adopted on a war footing to stop further such deaths.

This incident in the recent wake of the poaching in CORBET NATIONAL PARK, causes a lot of concern.

DIBYA J. BORA, Ganesh Mandir Lane, New Guwahati, P.O. - Noonmati, Guwahati - 781 020 (Assam)

PAU 35

Wildlife experts are flabbergasted by a malaise that has claimed at least 18 wild elephants in the northeast Indian states of Assam and Arunachal Pradesh. Thirteen more elephants-most of them domesticated-in the 200 sq km Nameri National Park in northern Assam are battling against this fatal disease believed to be caused by the liver fluke worm. This disease threatens the existence of some 3,500 pachyderms along the 800 km elephant belt of northern Assam boasting of the highest concentration of Asian elephants.

Most of the elephants killed by this disease were calves and semi-adults aged between 3 and 7 years. The carcasses of eight elephants were found in Nameri while seven were located in three neighbouring reserve forests. Three others were recovered around the Pakhoi Wildlife Sanctuary in the adjoining state of Arunachal Pradesh.

The first elephant death in Nameri National Park was reported on July 3, but forest officials passed it off as a "normal natural death of a calf".

They pressed the panic button last week after elephant carcasses began popping up all over the place. According to divisional forest officer Mr HP Phukan, autopsy on a carcass located on Tuesday revealed that the elephants died due to the attack of the deadly liver fluke worm.

"This is very serious," said chief conservator of forests (wildlife) Mr Sonadhar Doley. "Our main concern is to prevent the disease from spreading and felling other elephants." This, conservationists felt, is easier said than done. Until wildlife habitats are kept at a safe distance from human population and their domesticated animals. The liver fluke worm is water-borne usually found in the livers of sheep and pigs. Elephants in Northeast India had seldom been attacked by this worm, though there have been reports of anthrax deaths. And vast wetlands and rivers flowing past several villages into the protected forests are adding to the problems.

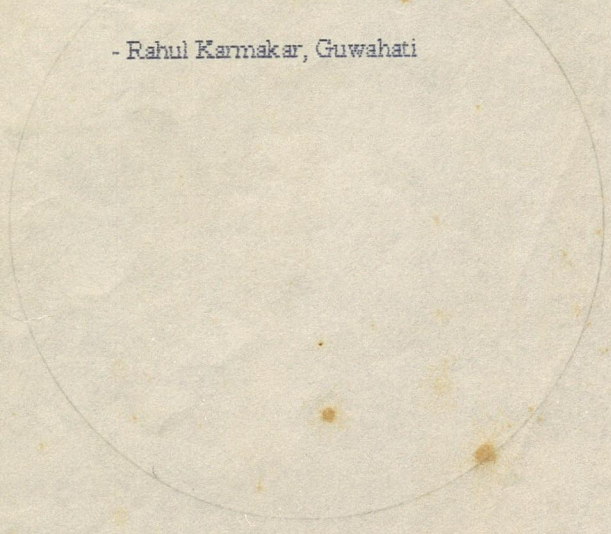
"Most forest reserves in Assam and elsewhere in India are perilously close to human habitations. Elephants in India have suffered most due to habitat shrinkage, and it is not surprising that undesirable contact between domesticated and wild animals are taking a toll of the latter," said Zoology professor and wildlife activist, Mr PC Bhattacharjee.

He recalled the havoc caused by the rinderpest virus at the Kaziranga National Park and neighbouring forests, to prove his point. Rinderpest-cattle are carriers of this virus-had almost wiped out the rhino and wild buffalo population in eastern Assam more than a decade ago.

Over the past couple of years, elephants in Assam have also been in focus for trampling at least 45 people to death besides destroying crop and property. Most of these deaths were in low-lying areas, known to be elephant corridors but encroached upon by immigrants.

The jumbos have also often disrupted services in at least three airports in the region, including a prime Indian Air Force base sited close to wooded areas.

- Rahul Karnakar, Guwahati



Handwritten notes and calculations on the right side of the page, including the word 'MUM' and various mathematical expressions like  $V \sim 9 \times 10^3$  and  $W = 175M$ .

## 4 NATIONAL NETWORK

# Minister brushes off elephant deaths

EXPRESS NEWS SERVICE

GUWAHATI, NOVEMBER 17

ENVIRONMENT and Forest Minister TR Baalu has spent over six hours with forest ministers and senior officers of the eight north-east states since yesterday.

But Thursday's elephant deaths in Digboi hardly found a mention at Baalu's two meetings. "The recent deaths are the results of man-animal conflict," he said at a press conference here. "Wild elephants have been extensively hurting human lives and damaging property, forcing people to react by poisoning."

Seven elephants, including two calves, were mowed down by a speeding passenger train, when a herd of about 100 elephants were crossing the railway track near the oil town of Digboi in Assam on Thursday evening. The Northwest Frontier Railways officials say that the driver of the speeding train could not stop the train in time to prevent the mishap.

The incident took place around 6 pm evening close to the Lakhpathar reserve forest, when the herd of elephants sud-

denly came out of the forest and started crossing the railway track, just before the train ran into them.

The panic-stricken driver tried to apply the brakes, but that derailed the engine, causing panic among both elephants as well as the passengers. While the passengers ran away in panic and later travelled



**Train mows down seven elephants including two calves in Assam. "It's just man-animal conflict," says the Environment and Forest Minister.**

to Dibrugarh by buses, the enraged elephants tried to push down the coaches.

"The elephants stayed near the spot till daybreak next day, and later left for the forests, while forest officials cremated the dead elephants beside the railway track later in the afternoon," a district official said.

Though the deaths of over 50 elephants over two months at the hands of humans have provoked resentment, Baalu has just one answer — increase compensation to depredation victims.

"The compensation has been raised from Rs 10,000 to Rs 1 lakh. People are angry with the elephants because the ani-

victims of elephant depredation."

He was unsure who should be held accountable for the rampant deaths of wild elephants. "Forests belong to the states. The Centre can advise," he said.

In North Assam's Sonitpur district, 40 wild elephants have been poisoned to death since August.

Non-Government Organisations and wildlife workers have for long accused the state of failing to protect elephants by driving out people who have taken over reserved forests, especially those north of river Brahmaputra.

Baaluu, however, asserted that the north-east had lost 255 sq km forest cover between 1997 and 1999. Mizoram, he said, lost the most at 437 sq km. Assam was second by losing 136 sq km forest cover during the same period and Nagaland lost 57 sq km. The loss occurred though the Supreme Court had banned tree-felling and forest exploitation in December 1996.

Arunachal Pradesh and Tripura, however, brought more area under forest cover during the same period. Arunachal's forest cover increased to 245 sq km, and Tripura's 199 sq km.

4.12

1E 12/11/01

The Assam Tribune  
dated: 15th August, 2001.

### 7 tuskers die in Nameri

From Our Staff Correspondent

NAMERI, Aug 14 — At least seven wild elephants including two calves were found dead near Jiaborali river inside the Nameri national park, the third national park of Assam while 13 other tamed tuskers of the State Forest Department are suffering from various diseases and are undergoing treatment at the veterinary hospital at Chariduar in Sonitpur district for the last three days. Talking to this Correspondent, Mahendra Saikia of the national park said that at least seven wild elephants, including two infant tuskers (about four years of age), were found dead without any injury mark near Mahmora camp inside the national park at the bank of river Bhorali, a tributary of river Brahmaputra, in mysterious circumstances during the last 72 hours. Besides, the body of two male tuskers were detected at Pakhoi under Khari forest beat office of the national park. The Sonitpur district veterinary department suspect that the unnatural deaths of the wild tuskers might be due to the disease Anthrax, which spread in an epidemic form in the nearby forests of Arunchal Pradesh. Expressing resentment against the forest department, various NGOs who are camping there alleged that the State Forest Department is not taking adequate measures to combat the diseases, and added that even under this circumstances the range officer of the park has gone on leave.

Dr. Rathin Barman Vice President, Aaranyak Samanwoy Path (Survey) P.O. Beltola Guwahati 781 028  
Assam, INDIA. Phone: 0091-361-636768 (home) TeleFax: 0091-361-266087 e-mail: rathinbarman@saryam.net.in  
rathinbarman@yahoo.com

NAMERI

Done

From: narmal ghosh <tigerfire@yahoo.com>

To: Natural History of South Asia - General discussion and research <naturalhistory-india@groups.yahoo.com>

H 20/5/01

## 18 elephants feared poisoned in national park

PAV35

**GUWAHATI, AUG. 19.** At least 18 wild elephants of the Nameri National Park are suspected to have been poisoned to death by irate villagers harassed by the herd for long.

The Nameri Range Officer, Mr. Pankaj Sharma, said so far nine carcasses had been recovered from his range.

"Initially, we thought it was the foot and mouth disease but now we suspect poisoning as more carcasses were found in the areas where the elephant depredation was high," he said.

Senior veterinary doctors from the Assam Veterinary College, Mr. Apurbo Chakravarty and Mr. Kushal Sharma, would reach Nameri today to collect blood samples of the pachyderms of the forest department.

"We do not think it is the foot and mouth disease as in that case it would have affected all the herbivorous animals in the park. We had found the carcasses of elephants only," Mr. Sharma said.

Nameri, situated at the foothills of the Himalayas in the northern bank of the Brahmaputra has a floating population of 225 elephants as per the 1997 census.

But these elephants roam in a massive area extending to Arunachal Pradesh. — UNI

**Pesticide poisoning responsible for pachyderm deaths at Nameri**

By Surajit Khaund in the ASSAM TRIBUNE published from Guwahati (dated 15<sup>th</sup> September)

GUWAHATI, Sept 14 - The doctors of the State Veterinary College investigating the mysterious death of elephants in the Nameri National Park and the Pakhoi Game Sanctuary, have confirmed the deaths due to pesticides poisoning. They have confirmed it after receiving the forensic report in which 'organophosphorous' pesticide (Demecron) has been detected in a sample of an elephant carcass. In view of frequent death of pachyderms during the last month, the State Forest Department had asked the Veterinary College to conduct a detail investigation. Having completed the clinical analysis, the doctors had sent a sample of a carcass to the Forensic Science Laboratory for detection of chemical compounds. The forensic test report which was placed yesterday confirmed the presence of 'organophosphorous' pesticide (Demecron) in the sample.

Dr Apurba Chakraborty, one of the members of the investigating team told The Assam Tribune that organophosphorous is a highly toxic for animals due to its residual affect. "Nowadays the use of this pesticide has been banned due to toxicity as informed by some agriculture scientists," he said. Asked how the elephants came into contact with the pesticide, he said "elephants have a strong affinity for liquor and taking advantage of it, they were given country-made liquor mixed with the pesticide by some unscrupulous elements." He however, said that this is an assumption as the authorities are yet to establish the involvement of miscreants. Worried over the death of the pachyderms, he along with the three doctors of the investigating team - Dr PN Mahanta, Dr K Sarma and Dr KK Sarma suggested initiating stern steps for preservation of elephants. "Elephants depredation is a major problem in the bordering areas of the State due to depletion of forest coverage and hence a pragmatic step is a must," Dr Chakraborty said.

Meanwhile, the Forest Department has recovered another carcass of an elephant at upper Dikrai in the Nameri National Park leading to the death toll to 10. The intestinal part of the carcass has been sent to the Forensic Science Laboratory for detection of chemical compounds. Highly-placed Forest Department sources who did not wish to be named said that considering the gravity of the problem, all Divisional Forest Officials (DFOs) have been asked to remain vigilant on their respective areas to prevent such incident. "We have undertaken a scheme of erection of fencing in the Sonitpur district in view of growing elephant depredation," they said.

✓  
33 done

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Bishab - phone?  
Soyngdey email  
Parash Korb - Phone?  
Claude Akhau - Sakra?  
Manish Vaidya - Email?  
H S Siphak - Sakra?  
Babu Man - Phone?  
Anand Niyde - for Email?  
Ashok Kumar  
Cheryl with phone  
N N Dammadada  
FD Bandangmah  
Sujay Mahant?  
BEE  
Sunder Kumar

V  
D  
37  
PAV 33

Subject: More on Ganesha -THE ELEPHANT GOD / Date: Tuesday, August 21, 2001 6:35 AM  
ELEPHANTS BEAT HUMAN HURDLES Midnapore, Aug 16: TELEGRAPH of Calcutta

Elephants have succeeded in outwitting human beings. Convinced that the elephants - like every year - would not descend on West Bengal's plains in Midnapore, Bankura and Purulia from their homes in Jharkhand's hills before September, forest officials were planning elaborate arrangements to tackle them. The elephants, however, have pre-empted the officials' plans. Twenty-nine grown-up pachyderms, along with their cubs, entered the Kankrajhor forest and fanned out in the Ramgarh and Lalgah areas even as officials were splitting hairs on how to translate their plans into action, district forest officer (Rupnarayanpur Range) Kajal Kumar Hazra said. A meeting between chief conservator of forests (western range) A.K. Raha, conservator of forests Siddhartha Barari and all district forest officers and forest rangers has been called tomorrow in Garbeta to decide on immediate measures to prevent the situation from worsening. Senior state forest department officials met minister Jogesh Barman last week at the Mandalpuskarini Bungalow to draw up a plan to prevent wild elephants from entering human habitats in this part of the state. They decided to take some new measures, including setting up electric fencing near Lalgah over the Kansabati river to prevent the pachyderms from entering the fields of Midnapore, Bankura and Purulia. The herds, however, entered the area much before officials could erect the electric fence. The officials had also decided to bring Kunki elephants (trained females) from Assam to lure the male leaders of the herd and thus lead the entire herd in a safe direction and trap some elephants for training to transport tourists. "But these Kunkis arrived only today," Hazra said. The early entrance of so many wild elephants posed a problem for the forest department, officials said. The department would probably apply "shock therapy" - targeting them with tranquillisers - to send them back to Dalma again, they added. More than 20 people were trampled to death by these wild pachyderms last year. More than 1,000 acres of crop were lost and hundreds of forest guards and rangers were either beaten up or gheraced by angry villagers who felt that the forest department could not protect them or their property from elephants. Lakhs of rupees had to be spent on compensation to affected villagers in south Bengal. Elephant menace in south Bengal is a new development. Earlier, it was restricted to north Bengal. Elephant deaths in National Park spell jumbo confusion

SAMUDRA GUPTA KASHYAP in the Indian Express (20th August)

GUWAHATI, AUGUST 19: THE deaths of as many as 18 elephants in the Nameri National Park in Assam and the adjacent Pakhui reserved forest in Arunachal Pradesh within the span of seven weeks have caused alarm in the region, more so because the authorities have been unable to ascertain the cause. With the first death being reported on July 3, wildlife enthusiasts have now urged the authorities to call in experts. Initially, the authorities suspected the outbreak of anthrax, a killer disease that had, way back in 1914-15, wiped out about 150 elephants here. The entire population of spotted deer was also wiped out from Assam during that epidemic. Nameri park in-charge, DFO (Wildlife) H.P. Phukan said they also suspected liver fluke to be responsible for the deaths. But liver fluke could be confirmed in case of only two deaths, he said. The authorities have now engaged experts from the Veterinary College, Guwahati, to carry out a detailed study, Phukan said. However, he did not rule out the possibility of encroachers poisoning the elephants. He said large tracts of forest area in the adjoining Charduar reserved forest had already disappeared, with encroachers setting up houses and taking to cultivation there. "The elephants that earlier went to these areas looking for food still continue to go there. This has disturbed the encroachers," he said. He said that pesticide diathene used in tea estates could have been used to kill the elephants. In the past also, bottle-gourds injected with diathene had been found inside forests meant to target elephants, he added. "We have found some clues of encroachers living in forest land close to the park. Such reports are yet to be confirmed," the DFO said. Wildlife activist Bibhab Talukdar agrees with Phukan. On an average, depredation by wild elephants leads to the death of some 30-40 people every year in the Sonitpur and Darrang districts. These districts comprise the fringe area of the National Park and adjoining reserved forests which are home to over 700 elephants, Talukdar said. There have also been reports - attributed to the ULFA - that the deaths were caused by a gang of international poachers who worked hand-in-glove with some forest officials. "There is no basis for saying that 100 elephants have died in the park. I have personally scanned the entire park during the past week and have come across only eight carcasses. But no part of the carcasses has been removed," Phukan said. He also said that all the eight elephants were below eight years of age. Two veterinary doctors from Guwahati who made a preliminary study of the deaths

too have indicated that it could be a case of poisoning. The Forest Department has contacted the Wildlife Trust of India for a team of experts. Meanwhile, the head of Zoology department, Gauhati University, Dr P.C. Bhattacharjee, said the possibility of outbreak of some new epidemic should not be ruled out immediately.

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N. SHIVA KUMAR / A-1, SECTOR-1, NOIDA-201 301





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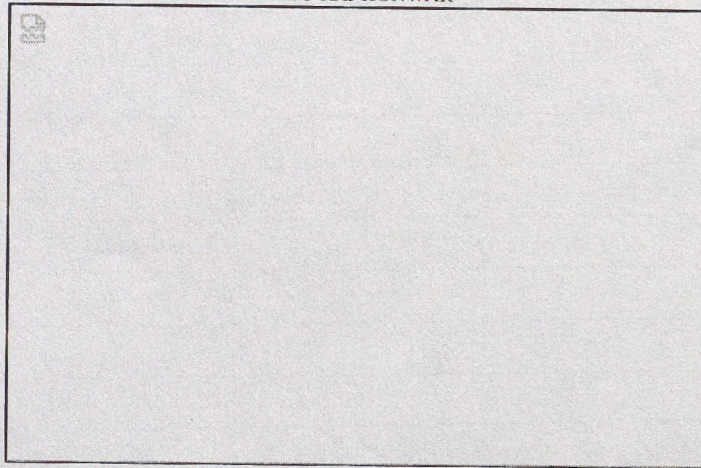


COVER STORY

**Two cheers**

**The forest rights legislation has been welcomed by tribal people and rights activists, but with reservations.**

RITU RAJ KONWAR



**ILLEGALLY CONSTRUCTED HOUSES inside a reserve forest near Guwhati being destroyed by the Assam Forest Department with the help of elephants.**

**Doubts on efficacy**

*Sushanta Talukdar in Guwahati*

ROHIT BASUMATARY, a Bodo settler of the Jiabari area on a degraded portion of the Sonai Rupai Wildlife Sanctuary in Assam's Sonitpur district, and thousands of other traditional settlers like him in other parts of the State may not face eviction by the Forest Department now, unlike in 2002, with the Lok Sabha passing the Bill giving rights to forest-dwelling communities.

However, the tribal bodies are doubtful about the efficacy of the new Act in protecting fully the interests of the tribal people as successive governments in Dispur have failed in the past to protect the tribal belt and blocks, leading to the alienation of the tribal people from their ancestral land. Secondly, they fear that non-traditional forest dwellers, such as immigrant settlers, might take advantage of the ambiguity in the

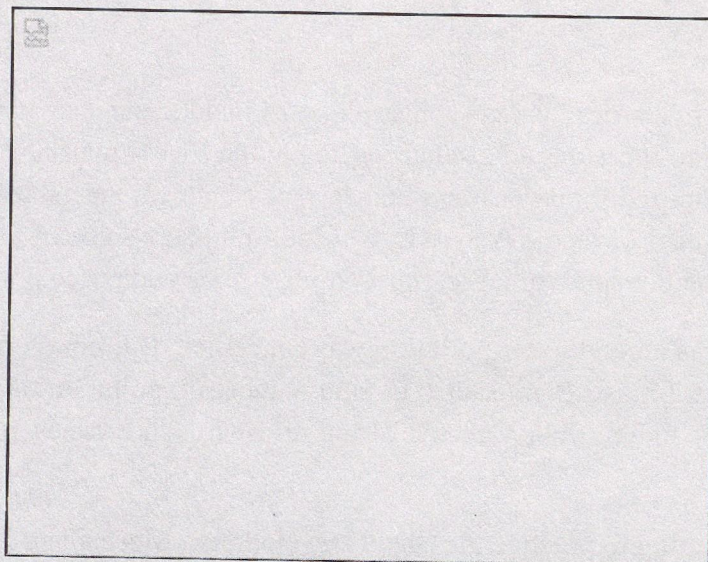
nomenclature "other forest dwellers" in the new Act to claim occupancy rights. Thirdly, they say that the new Act has not taken into account tribal customary laws, which are essential to protect both forest and tribal rights.

The tribal leaders also say that settlement of tribal people in reserved forest areas cannot be seen in isolation as it is linked with the protection of tribal belts and blocks. Aditya Khaklari, general secretary of the All Assam Tribal Sangha, an apex body of tribal organisations, pointed out that successive governments had failed to implement Chapter X of the Assam Land and Revenue Regulation, 1886. In contravention of the provisions of Chapter X, revenue officials granted mutation to non-tribal and other non-notified classes of people and allowed registration of sale deeds sought by non-tribal people.

"Because of this administrative failure to protect tribal belts and blocks, vast tracts of land belonging to tribal people were illegally transferred to various non-tribal and immigrant settlers, leading to displacement of tribal people to forest as well as non-forest areas. We must keep in mind that alienation of the tribal people from their land was one of the root causes of the various tribal upsurges in Assam," Khaklari said. The Tribal Sangha has been demanding a White Paper on the status of the tribal belt and blocks and enactment of a new land law to protect the interests of the tribal people.

Forty-seven tribal belts and blocks comprising 85,80,842 bighas (7.5 bigha = 1 hectare) were created. Chapter X was specially incorporated into the Assam Land and Revenue Regulation to prevent alienation of tribal land and to check plains tribal people from retreating farther into the forests. The government initially notified (vide notification No. RD. 69/46/19 dated Shillong, December 5, 1947) plain tribal, hill tribal and tea garden tribal people, Santhals, Scheduled Castes and Nepali cultivator-graziers as classes entitled to protection under Sub-Section (2) of the Section 160 of the Assam Land and Revenue Regulation, 1886. However, Nepalis were excluded from the list of these protected classes through a notification (No RSD/26/64/PT/15 dated Shillong June 27, 1969). In 1985 and 1990, Koch Rajbongshis of Dhubri, Kokrajhar, Goalpara and Bongaigaon were also included in the list of protected classes.

RITU RAJ KONWAR



**A VIEW OF a newly encroached reserve forest area outside Guwahati.**

Urkhao Gwra Brahma, Bodo leader and Rajya Sabha member, said that in view of the government's failure to protect the tribal belt and blocks, the tribal people in the State doubted whether the government would initiate proper steps under the new Act to protect their interests. The ambiguity in the nomenclature "other forest dwellers" would have the potential to complicate the problem of loss of tribal land in Assam, he said. Brahma pointed out that a large number of Bodo people and other S.Ts were displaced from their ancestral land to far-flung areas of Assam-Nagaland and Assam-Arunachal Pradesh borders as the government had stopped creating new forest villages after 1980. The forest land on which the tribal people settled had already been degraded and destroyed by the unholy nexus of timber mafia and corrupt forest officials. Brahma pointed out that surveys conducted in 1980 revealed alienation of 79,594 bighas in the tribal belts and blocks. A fresh survey of the 45 tribal belts and blocks may reveal a far greater figure. The monthly progress reports on implementation of Chapter X, available at the Directorate of Land Records in Guwahati, also reveal that large areas of the tribal belts and blocks are under encroachment by non-notified classes of people.

Environment protection groups, on the other hand, fear that if the rights enshrined in the new Act are granted without responsibility, they will prove to be detrimental to the existence of the forest cover and result in increasing human pressure on the remaining forest land. They point out that encroachment of forest land in many areas of the State received political patronage, and express the apprehension that some politicians may now take advantage of the provisions of the new Act to encourage more organised encroachment. "The tribal organisations should come forward to shoulder the responsibility to ensure that the rights provided in the new Act are not misused to degrade forest land," said Dr. Bibhab Kumar Talukdar, secretary-general of Aranyak, a leading organisation in the field of biodiversity conservation in northeastern India.

As of 2005, of the 1,399,264 ha of reserved forest land in Assam, 342,650 ha has been encroached, of which 205,770 ha was encroached before 1980.

Similarly, of the 1,594,065 ha of land under the 10 national parks and wildlife sanctuaries in the State, 355,980 ha has been encroached. He said tribal leaders should realise that when the forest cover vanishes, it will pose greater livelihood risks for the tribal people.

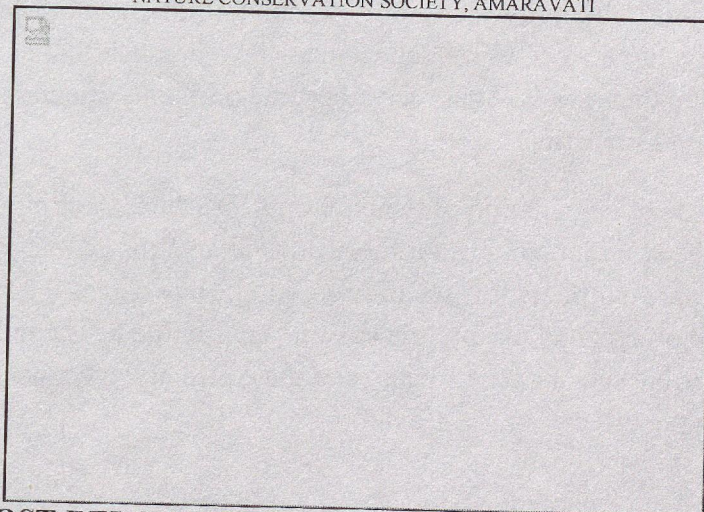
A front-ranking tribal leader and former chief executive member of Karbi-Anglong Autonomous Council, Dr. Jayanta Rongpi, is of the opinion that tribal rights can be ensured by reinforcing the customary laws of various tribes. These laws ensured the protection of both forests and the tribal people and scientific management of the forests, he said. Instead of reinforcing these laws and vesting the authority to customary bodies, the new Act has vested the power to government officials, leaving room for its misuse, he said.

Padma Maibongsha, a leader of the Dimasa tribe in Karbi-Anglong, feels that landless tribal villagers who have been cultivating inside degraded forests should be given settlement rights and their villages should be recognised as forest villages. Simultaneously, if these villagers are educated on the need to protect the forests then it would serve the twin purposes of protecting tribal people from further alienation from their land and protecting forest land. He, however, feels that the ambiguity in the nomenclature "other forest-dwellers" should be removed so that non-traditional forest-dwellers cannot take advantage of the new Act. The tribal bodies in Assam feel that the State needs comprehensive and well-defined land laws to address the problem of loss of tribal land and forests.

### **R&R success**

*Lyla Bavadam in Mumbai*

NATURE CONSERVATION SOCIETY, AMARAVATI



**THE POST-RELOCATION meeting of administrative officials and**

### **activists with residents of Bori village.**

FIVE years ago, in the tribal village of Bori located in the heart of the Melghat Tiger Reserve in Amravati district, only seven of its 22 families owned land. After they were relocated outside the reserve, all 22 families were given arable land with full rights. Giving land to the landless and providing them livelihood options is just a part of the success story of sanctuary-related relief and rehabilitation in Maharashtra. Also, the tribal people suddenly had access to clean water, education and medical facilities, metalled roads, power supply, transportation and grazing lands. They were given top priority whenever any government scheme was implemented in the district.

Bori, Koha and Kund are the first of the 58 villages in the reserve to be resettled successfully. The R&R plan, conceived in coordination with the tribal people, had a firm starting point; there would be no forcible eviction. The villagers would be shown a variety of sites and allowed to choose the one that suited their needs. Open dialogue has been the key to the progress in R&R here; the effort has left both sides satisfied. The majority of the tribal population in the reserve are Korkus. The other tribes include Gonds, Balais and Gawalis. The Korkus came to live in the reserve a century ago, brought in as forest labour by the British. They were given land *pattas* and encouraged to grow their own food. The Gawalis were primarily herders but also practised agriculture.

Kishor Rithe of the Nature Conservation Society, Amravati, which was actively involved in the resettlement plan, says, "Given the geographical characteristics of the area, the British chose flat lands and meadows near rivers to settle these villages. These were also ideal herbivore habitats, frequented by gaur, chital, sambar. Over the years, the human and cattle populations of the villages increased. More agricultural and grazing land was required to sustain the growing populations. The situation led to cases of illegal encroachments on forest land and illegal grazing in the reserve. As a result, the tribal populations and the tiger reserve authorities frequently came into conflict. The increasing biotic pressure on the wildlife reserve led to an increase in crop degradation incidents as well, with some villages suffering heavy losses when wildlife entered their fields. The residents also started demanding black-topped roads, power supply, hospitals and schools in their village. However, it was not possible to create new rights in the sanctuary area and conduct developmental works." He says the cattle population (approximately 1,15,575) is 15 times the wild ungulates population (7,874) in Melghat.

Conservationists began to think of alternatives. In October 1999, forest and district administration officials held a meeting with the residents of Bori. The objective was simple: resettle villages that were within the sanctuary to a nearby area where there was enough agricultural and grazing land for every family as well as the potential to create necessary infrastructure. The first step in this process was to ask the villagers whether they were amenable to being relocated. The answer was an

unwavering 'yes'. Bori villagers chose a site about 15 km from their village. A total of 188 hectares of land was available at the new place, of which Bori required 35 ha to 40 ha. As 95 ha of the total land selected was forest land, the Forest Department prepared a proposal under the Forest Conservation Act, 1980, to get permission to clear the land. The Centre cleared the proposal within three months. A district resettlement committee comprising villagers and administrators was set up to ensure that the R&R process was smooth.

The financial allocation came in July 2000. For the implementation of the R&R package, the Tiger Project Directorate demanded Rs.92 lakhs (one lakh/ family as per the Centrally sponsored scheme of tribal villages) from the Centre for the 92 families of the three villages. An additional Rs.93.64 lakhs came from the State fund for R&R.

While the Forest Department cleared the new land, the villagers started work on the actual construction.

Meanwhile, the school and the primary health care centre were staffed. The zilla parishad brought in earthmovers to the new site to prepare the fields for the next season for which the Agriculture Department had distributed seeds. On March 26, 2001, the actual shifting of Bori began. By July the resettlement was complete, and Bori villagers started their agricultural practices in their new home.

#### ROADBLOCK

Despite this success, sanctuary-related R&R has hit a roadblock in Maharashtra. Initially the State government supported all moves made by non-governmental organisations (NGOs) and the local administration. In fact, the Maharashtra Project-Affected Persons (PAP) Rehabilitation Act, 1986, was the first to be amended in order to categorise parks and sanctuaries as projects so that the affected people would get the same benefits as other PAPs. Unfortunately, the follow-up by the State government has been sluggish.

From the point of view of the tribal families, the R&R has been smooth, but the move has not entirely benefited the sanctuary because grazing areas are yet to be created, and cattle graze in the sanctuary area.

Considering that the entire R&R was perfect, it is not clear why it failed on the crucial aspect of grazing lands. This nagging point resulted in an evaluation of the process, which threw up some answers and some valuable lessons for future R&R.

The Department of Environment and Forest had framed a scheme in 1989-90 called "Centrally sponsored beneficiary-oriented scheme for tribal villages of Project Tiger areas, National Parks and wildlife sanctuaries". The State government gets a financial assistance of Rs.1 lakh a family from the Centre under the R&R scheme, of which

Rs.36,000 is towards the development of 2 ha of agricultural land. Naturally, that means the Centre expects an allotment of a minimum of 2 ha for the landless. The Maharashtra government policy mentions only 1 ha of non-irrigated or 1 acre (1 acre = 0.4 ha) of irrigated land to a landless person. This needs to be rectified. Similarly, 50 ha of land for grazing or wood lots and fuel wood reserve must be allocated to every village under the same scheme, for which the State government receives money from the Centre at the rate of Rs.8,000 a family. The State receives a similar sum for pasture and fodder plantation. And yet, no such land has been allotted to the villages of Bori, Koha and Kund, which has resulted in cattle-grazing within the reserve.

It is crucial to start the actual rehabilitation work before the onset of the monsoon season so that villagers can start agricultural practices in their new land. Misjudging this had delayed the resettlement of Koha and Kund by a year.

Understanding the sociology of the people and the need to involve experts in every aspect is crucial for any R&R project. Bureaucrats avoid this because they feel that it will show them up as incompetent.

While allocating land at the new site, the Revenue Department should first complete the land demarcation work for housing and cultivation. It is only after this is done that the Forest Department should cut trees and that too, only on the agricultural land. This will protect trees in the vicinity of the village, the grazing area, and along the boundary of agricultural fields. This was not followed in the case of Bori, Koha and Kund.

Every year vast funds are earmarked under "rural development". Linking R&R with rural development funds is perhaps the best livelihood option given to the tribal people. Because of this Bori, Koha and Kund received more economic benefits than predicted.

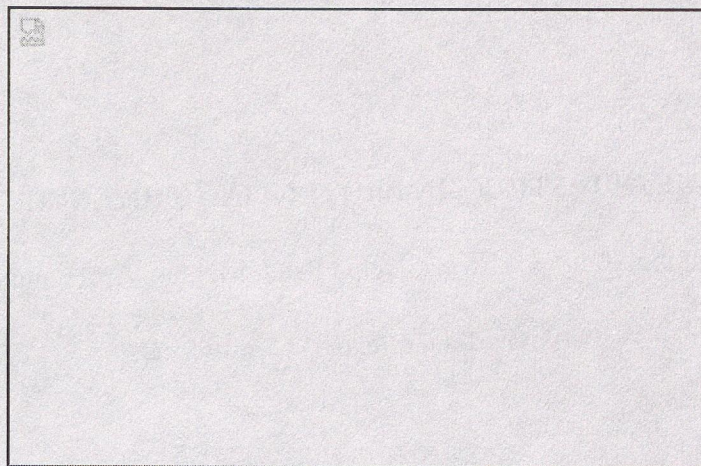
### **Nature vs people**

*T.K. Rajalakshmi in Sariska*

FOR Radha and Kailash Gujjar, inhabitants of Karath hamlet in Kankwari village located in the area designated as Core I in the Sariska Tiger Reserve, the passage of the new Bill recognising their forest rights means little. Ever since the disappearance of the tiger population from Sariska, almost all the forest-dwelling Gujjar families have come under pressure to move out of the forest. Radha, who is in her forties, says she has never seen a tiger in the reserve all her life.

Eleven villages in the reserve area will be relocated in order to restore the tiger habitat. There are 28 villages within Sariska's 881-square-kilometre area and nearly 200 more in the general vicinity of the reserve.

SANDEEP SAXENA



**THE GUJJARS OF Kankwari village are under pressure to move out of the core zone of the Sariska Tiger Reserve.**

There are plans to reintroduce tigers from the Ranthambore National Park within a year. These and other details are not known to the Gujjars. Other tribal communities such as the Meenas, the Bawarias and the Bhils live in the buffer zone of the reserve. The Gujjar villages cannot be shifted to the buffer zone as it is already heavily populated.

There is a growing consensus in favour of removing the Gujjars out of the core areas. The land to relocate the 11 villages has been identified. In the first phase, some 125 families of Kankwari and Bhagani villages are to be relocated in Behror-Rund, followed by those living in Kiraska and Umri. Forest officials and "well-wishers" of wildlife conservation have been trying to persuade the Gujjars to accept the relocation package. The Gujjars do not want to move out, though they feared to say that in front of the forest guard who accompanied the *Frontline* team.

The pastoral community has lived in the reserve for generations, content with its frugal lifestyle. The Gujjars are now being accused of indiscriminate felling of trees and depletion of forest land, and of indulging in commercial activity by selling milk and milk products outside the reserve. Radha denies her people are making money by selling thickened milk or *maava* to the townspeople. "If that was the case, why would I live in this mud house?" she asks.

"They cut trees, and do it in such a way that the trees do not regenerate. The tiger has gone and that is why they are happy - their livestock can graze freely without any fear. The cattle return home on their own," says forest guard R.P. Sharma. According to him, "they have made a fortune out of selling *maava*. The Gujjars have 'big houses' outside the reserve and yet continue to stay inside the forest area as they get everything free, including fodder for their livestock." Sunda, who drives a government vehicle inside the reserve, calls the Gujjars enemies of the jungle.

In another hamlet of Kankwari, Jabbur Gujjar bristles at these allegations. "If we give ghee and *maava* to these forest officials, then there is no problem with us staying on." A heated argument ensues

between Jabbur and R.P. Sharma over this statement. "May be Sharma has not taken ghee from us, but others have," Jabbur asserted.

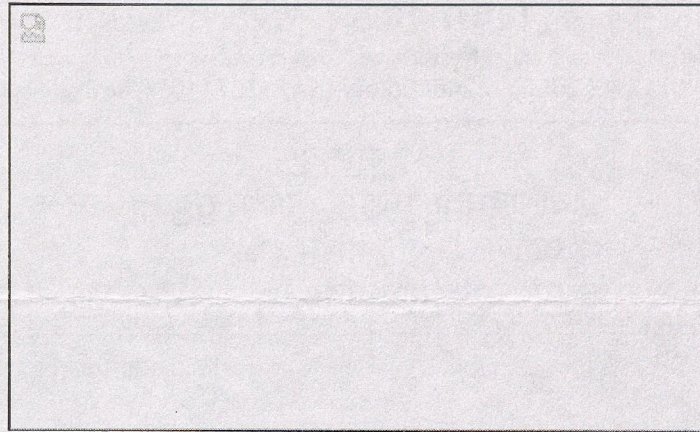
Radhakrishan Gujjar, in a less confrontational mode, said the Van Suraksha Samitis, which involved local inhabitants along with forest officials in protecting the forest, ceased to exist, resulting in open conflict and the breakdown of trust between the Gujjars and the government machinery. He denied that the Gujjars resorted to wanton destruction of trees. "Why should we do that? We are not fools. We know that if a tree is destroyed, it cannot be regenerated. Only the dried-up trees are used as firewood. We do occasionally chop dried branches. If we are not allowed even that, how do you think our children will survive?"

If the Gujjars have benefited from tiger poaching, as is insinuated, there is no evidence of the resulting prosperity in their homes. A vegetarian community, they do not hunt. Two successive drought years wreaked havoc on the ecology of the reserve. Much of the Gujjar livestock perished in that period. Contrary to reports that each family has a hundred buffaloes, not more than three or four buffaloes per family was visible.

Some forest officials and wildlife experts argue that the relocation package for the Gujjars is reasonable. The package includes six bighas (2.4 acres or .96 hectares) of unirrigated land or three bighas of irrigated land, the cost of shifting from the reserve, and Rs.40,000 for the construction of a homestead on the land. For the purpose of identifying family units, the government decided that each male member in a family over the age of 21, with 2003 as the cut-off year, would be considered a family unit and be entitled to the package. The Gujjars feel the package is not sufficient as they would have no access to grazing land and their entire lifestyle would change. Jabbur Gujjar asked: "There are some 22 families where the boys will turn 21 this year, what of them?" The Gujjars want permanent habitation rights within the reserve and some education and health facilities.

Radhakrishan said the compensation amount should be raised to Rs.2 lakhs. "In Delhi also people raise buffaloes but it is not the same here. In the new location, we will not be able to keep more than two or three animals. We can reduce the size of the house but there will not be enough land for grazing. If they make it difficult for us to live here, then we will have to go. But it is not right. We had nothing to do with the disappearance of the tiger. Our people have lived with the tiger for centuries," Jabbur said.

SANDEEP SAXENA



**KANKWARI VILLAGE, which is to be relocated.**

Rajesh Gupta, Deputy Conservator of Forests and Deputy Field Director of Project Tiger, said the reserve received more attention than necessary following the disappearance of the tiger. As per the recommendations of the 206-page report of the National Task Force on Tigers, "Joining the Dots", and the State Empowered Committee, relocation of the villages from the core area was the top priority. "If you ask me for a vision statement, I would say that the core area should serve as a core natal area, as a breeding ground for tigers and other predator species. Owing to the biotic disturbance, the breeding grounds have been affected," he said.

Kankwari, situated 22 km from the entry point to Sariska, is a potential habitat for the tiger, says Rajesh Gupta. In addition to being a watershed area, the village has a perennial lake.

The forester said he was hopeful that one village would serve as a model for the other 10. He said the Central government had sanctioned Rs.1 lakh in cash compensation apart from the six bighas. He felt the compensation was not sufficient. The Gujjars, he said, were attached to the land but they needed to realise that they were under great hardship, their children were malnourished and they were deprived of education facilities. The Wildlife Act of India did not permit the construction of *pucca* houses or buildings in the vicinity of the forest. The Gujjars have not availed themselves of electricity supplies too as their homesteads are in the core area. "Under the Act, they have no rights in the core areas," Rajesh Gupta said.

Echoing a regional aphorism, Sanjiv Kharadwal of Jungle Watch, an Alwar-based wildlife protection group that emerged after the disappearance of the tiger from Sariska, says the Gujjars as a community can spread destruction up to 12 miles. According to Jungle Watch, the solutions lie in relocating the Gujjar villages from the core area and the Bhil and Bawaria villages far from the buffer area.

The five-member Tiger Task Force, which submitted its report to the Prime Minister in August 2005, observed that a particular problem that dogged Project Tiger was the manner in which relocation of persons in the core and buffer areas was done. Secondly, the failure of the

eco-development programme in the 1990s pitted the people living in the reserves against the protectors of the parks. The report said that the rights of these people, an estimated four million, living in enclaved villages all over the country, were never settled. Relocation occurred sporadically and they lived an illegal existence. The Task Force report noted that the 11 villages in the core area were denied any form of development. The rehabilitation of one village in the 1970s was done so shoddily that the residents returned to their original village in the sanctuary. The report recommended that conservation efforts must share the benefits with local communities if the tiger had to be safeguarded.

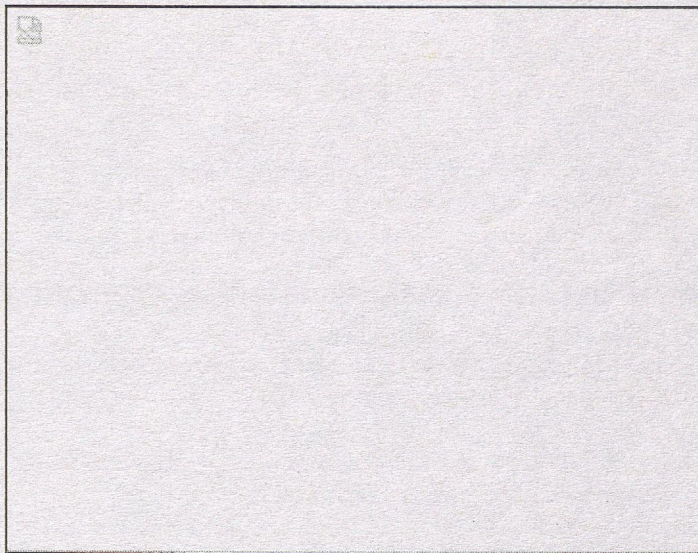
### **Livelihood woes**

*Prafulla Das in Bhubaneswar*

THE new Act seeking to recognise forest rights, with December 2005 instead of 1980 as the cut-off date, has eased feelings of insecurity among the tribal people of Orissa, who constitute 23 per cent of the State's population. But the declining forest cover and the priority given to industrial development could endanger the livelihood options available to them.

The allotment of large tracts of land to set up steel plants, alumina refineries and thermal power stations and increasing mining activity have been adding to the woes of forest dwellers. It has been estimated that Orissa will hand over 1.40 lakh acres of land to make space for industrial projects. A vast portion of this land will be inside the forests or in their vicinity. Thousands of acres of additional forest land will be required for mining in the coming years. Nearly 2.5 lakh acres of mineral-bearing land has already been leased out.

The size of the mining zones is set to expand, with the government preparing to recommend to the Centre the proposals of various corporate houses. The companies that are waiting for grant of mining leases include POSCO-India and Mittal Steel. Over 60 memoranda of understanding have been signed for steel mills, power generation units, alumina refineries and cement plants.



**WOMEN BELONGING TO the Dongaria Kondh tribe with forest produce collected from the Niyamgiri Hills in Orissa.**

The two districts of Keonjhar and Sundargarh have been witnessing mindless mining for several decades. The Rourkela Steel Plant in Sundargarh produces less than two million tonnes of steel a year. There is no other big industry in the district. Keonjhar has 80 mines covering 50,000-odd acres, most of which are located in forest belts.

Mining activity has not provided employment to even 1 per cent of the district's people, the majority of whom live below the poverty line. The region's ecology has been disturbed with increasing human-elephant conflicts. The district, which helps the State earn huge revenues by way of mining cess, has got very little in return. Faster degradation of forests has not only hit the traditional livelihood sources of the tribal people but also resulted in the spread of diseases such as malaria.

The worst is about to happen. In its latest report, the Orissa State Pollution Control Board has said that the situation in five of the 10 mining zones is alarming. The natural drainage system and groundwater table in these zones are disturbed, affecting people living near by, it said.

Although the new Act promises that tribal people will not be forcibly evicted from the 9,000 sq km of sanctuary area, one is not sure about their rights over forest resources.

The tribal people of Orissa are the worst victims of displacement caused by development projects. In the initial stage of project construction, they are employed as daily wage workers; they are not considered for further employment under these projects because of lack of education.

The tribal people have also experienced multiple displacements. Koraput district abounds with such instances. On many occasions, their consent is not taken before they are asked to vacate their dwelling units. They ultimately land up in urban slums to begin a fresh round of struggle for survival.

Official records show that people displaced from their land decades ago have still not been provided relief and rehabilitation.

Most forest-dwellers are not covered by welfare schemes as they do not figure in revenue records. It is two years since the government announced that forest-dwellers would have the right to collect 68 different kinds of non-timber forest produce (NTFP), but there is no proper mechanism in place to help them get the right price for the produce. One-fourth of the State's population is dependent on forest produce to eke out a living for four to six months in a year.

The present arrangement only facilitates the sale of kendu and sal leaves. For the sale of other forest produce, the tribal people are at the mercy of traders.

"Whenever there is a crop failure, the government declares it a drought period, but when NTFP crops fail no effort is made to redress our problems. The primary gatherers should be compensated to overcome the crisis period," said Rekha Panigrahi, a researcher.

"The new Act is no doubt a good step towards recognising the rights of the tribal people and other traditional forest-dwellers over forest land and resources, but for it to be beneficial the State government should take pro-active steps to have the rules implemented. Livelihoods of forest-dwellers should be accorded priority," she said.

Tribal people engaged in *jhum*, or shifting cultivation, in forest regions are a worried lot. Hounded by revenue and forest officials for encroachment of revenue or forest land, they have never been able to connect themselves to the land they till. Cases of minor forest offences, involving materials worth even Rs.2, take decades to be settled. "Forest rights may remain a dream for the tribal people until the government implements the existing laws and the new Act. Their suffering will never end until they are given the record of rights over the land they have been living on or cultivating for generations," social activist Vidya Das said.

Another major problem relates to the State government's data on forest-dwellers of the pre-1980 period, which indicated that only 5,113 families lived in forest villages. According to the data, the tribal-dominated backward Malkangiri district did not have a single family living in reserved forest areas in the enumerated period. Only a detailed survey will save the tribal people and other traditional forest-dwellers from displacement.

### **Conflicts feared**

*K. Venkateshwarlu in Hyderabad*

THE Forest Rights Bill may not mean much for Andhra Pradesh, a State that already has strong pro-tribal laws, such as the Andhra Pradesh Scheduled Area Land Transfer Regulation Act, 1959, in place.

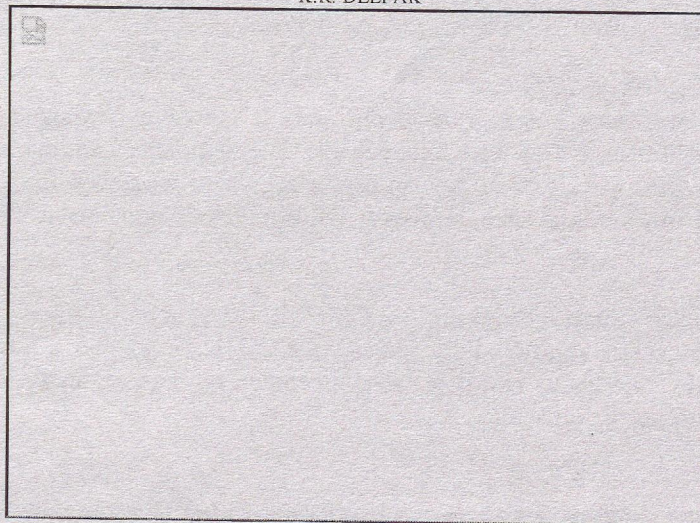
Home to some of the most colourful and primitive tribal groups in the country, the State has the usual tribal-non-tribal, tribal-wildlife conflicts and more, the additional dimension being the way tribal people are often caught in the crossfire between the Maoists and the police.

"Andhra Pradesh has been a pioneer in bringing about stringent laws to protect tribal rights that have been upheld by the Supreme Court and included in the Ninth Schedule of the Constitution, but their implementation has not been up to the mark. So another law may not make much of a difference to the State. The new Bill may help States where there is virtually no law in place," said Sivaramakrishna of Sakti, an NGO that was in the forefront of the struggle to restore to the tribal people their land rights snatched away by non-tribal plains people in West Godavari and Khammam districts.

The tribal-non-tribal conflicts often reach a flashpoint in the tribal-dominated Agency areas of West Godavari, East Godavari and Visakhapatnam districts. With no clear-cut demarcation of the Scheduled areas, an elaborate survey having been shelved midway, large tracts of tribal land are in the possession of non-tribal people, and most of it is locked in litigation. Civil society groups fighting for tribal rights estimate that about 50 per cent of tribal land could be under illegal occupation by non-tribal people. In all such disputes, the Revenue Department and the police invariably take the side of the non-tribal people.

Revolts and long struggles by tribal people, dating back to the British era, ensured that sound protective laws were in place. The Andhra Pradesh Scheduled Area Land Transfer Regulation Act of 1959, amended in 1970, prohibits the transfer of land in Scheduled areas to non-tribal people. Statistics available until 2003 showed that the government had booked 69,119 cases relating to this law, covering 3,40,491 acres. Of the 59,849 cases that were disposed of, 27,461 went in favour of the Scheduled Tribes, restoring to them 94,823 acres.

K.R. DEEPAK



**TRIBAL WOMEN RETURNING** from the forest with the day's

**collection, near Araku in Visakhapatnam district.**

In Khammam, Sakti's efforts resulted in the Forest Department giving away over 3,000 acres to Koya tribal people for raising cashew plantations. "We have a long way to go and unless the government takes pro-active steps, tribal people will continue to be exploited," said Sivaramakrishna. Large-scale violations of the land transfer regulation came to light recently in the tribal-dominated revenue division of Utnoor in Adilabad district. Of the 154 beneficiaries of a housing scheme in Chanduri village, 100 were non-tribal people. They bought the land, 600-square-foot plots, from tribal people for getting a house sanctioned under the "Indiramma" programme and a possession certificate by claiming that the land was with them for the period specified in the regulation. In another village, 800 of the 1,000 beneficiaries were non-tribal people.

Sceptical of the new law, tribal rights activists argue that there is a distinct possibility of a similar situation emerging after the new law comes into force, with the provision "other traditional forest-dwellers" coming in handy. They fear it could lead to unequal competition between advanced and primitive tribal groups on the one hand and tribal people and the "other traditional forest-dwellers" on the other.

"Far from correcting a historic injustice, it could lead to further marginalisation of the primitive tribal groups, as the better-placed, advanced tribal people and other forest-dwellers could take advantage of the law. It could fuel and add to the existing conflicts as non-tribal people now occupying tribal land could claim rights in the garb of other forest-dwellers," said Ravi Rebbapragada of Samata, the NGO whose fight for tribal rights led to the "Samata judgment". The Supreme Court passed the historic judgment in 1997, declaring null and void the leasing of land in Scheduled areas to private mining companies. Samata filed the case against the State government's decision to lease out tribal land to private companies. Citing the 73rd Amendment to the Constitution, the apex court held that the gram sabha would be competent to safeguard and conserve community resources. Minerals would be exploited by the tribal people, either individually or through cooperative societies, with financial assistance from the State, it said. It took Samata a 12-year-long legal battle to restore land holdings to tribal people in 10 villages of the Borra caves area in Anantagiri mandal of Visakhapatnam district.

Ravi cited the example of how people of the Lambada tribe cornered most of the benefits doled out in Integrated Tribal Development Agency areas, leaving in the lurch some primitive tribal groups such as the Chenchus inhabiting the Nallamala hill ranges. Every time the Greyhounds, the anti-naxalite police squad, go on combing operations in the Nallamala forests, the Chenchus, who live by collecting minor forest produce and whose population now stands at about 40,000, are thrown out, for months together at times.

"The law hardly makes a difference in such situations. They may have rights, but their lifeline is cut by throwing them out lock, stock and barrel, sometimes permanently," said M. Sambasiva Rao of the Banjara Development Society, which works among the Chenchus.

For the same reason, activists express doubts over the efficacy of the new Bill in situations where there is large-scale displacement of tribal people. It is estimated that nearly two lakh tribal people will be displaced by the construction of the Polavaram multipurpose project, thousands by the proposed bauxite-mining project in Visakhapatnam and hundreds by the uranium extraction plant near Nagarjuna Sagar. "Time and again even the toughest pro-tribal land laws have been flouted with impunity for the sake of projects that hardly benefit tribal people. They will be left with rights but no land," said Ravi. "Building dams and alumina plants form part of an economic agenda to achieve a 10 per cent growth rate by pushing up the Gross Displacement Product of the tribal people."

Instead of the new Bill, amendments to the Forest Conservation Act of 1980 would have served the purpose, according to Sivaramakrishna. It would have put to an end the harassment by Forest Department officials, who brand the tribal people encroachers. Merely ensuring land rights would not be enough. These rights would have to be tempered with sound land-management practices relevant to *podu* (shifting) or slope cultivation.

When it comes to wildlife, Forest Department officials and enthusiasts see the Bill as sounding the death-knell for sanctuaries and national parks, especially tiger reserves. Their refrain is that if rights are bestowed on tribal people over large stretches of reserve forests, legalising encroachers, nothing will be left for wildlife. The immediate threat would be to the Rajiv Gandhi Tiger Sanctuary in Srisailam. Much of the forest cover could be lost.

"In its present shape, the Bill helps neither tribal people nor wildlife. Both would get a raw deal. With other traditional forest-dwellers too getting land rights, forests could become anyman's land for encroaching and plundering," said Farida Tampal, director, State Office of World Wide Fund for Nature-India.

Other wildlife enthusiasts felt that by throwing open the forests to all, the Centre was playing to the gallery. Wildlife could be harmed as anyone in the guise of tribal people or 'other forest-dwellers' could get free access. The Forest Conservation Act of 1980, the Wildlife Protection Act of 1972 and the National Forest Policy of 1988, which suggested that one-third of the geographical area of the country be under forest and tree cover, would lose their meaning, they felt. But tribal rights activists counter the argument and point to the successful models of involving tribal people in the protection of wildlife.

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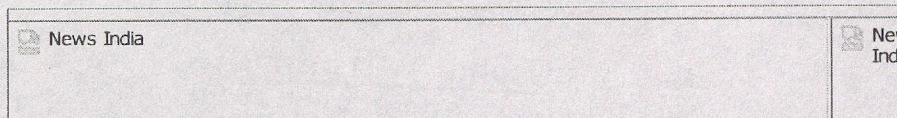
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## Timber mafia threatens Sonai Rupai sanctuary

[Print this page](#)

Bano Haralu

### Watch story

Saturday, September 2, 2006 (Sonai Rupai):

Fresh large-scale felling in the 100 sq km Sonai Rupai wildlife sanctuary in Assam's Sonitpur district is sounding its death knell.

This last remaining patch of lowland tropical rainforest on the northern bank of the Brahmaputra river with its irreplaceable gene pool is fast going the same way as an estimated 9,000 square km of reserve forests in the north bank.

In Assam's Sonitpur district, forest officials have simply watched as this destruction by the timber mafia has gone on.

Recently, 1,500 men entered the sanctuary chopping down 500 trees.

The eastern section of this sanctuary has been reduced to a pale shadow of what it was a few decades back. Once the trees are cleared, the land is illegally taken over.

### Organised nexus

It's increasingly clear that this is the work of organised groups and the marketplace in Golai is just another example of the encroachment going on here.

The forest department, however, does not seem too keen on cracking down on encroachments.

"I'm not singling out that I'll carry out eviction only in Golai or in Sonai Rupai. I'll have to start it from somewhere, but I'll obviously start from the place where the situation is quite critical," said M C Malakar, CCF Wildlife.

Members of the Eco Task Force, a group that has been resisting this attack on the tropical rainforests, have been threatened.

"They came in a large group of 10-15 men and overpowered our member and then entered the forest. They then began to demarcate the area they said they would clear. They were armed with weapons and without any weapons, we are no match," said Marak, an Eco Task Force member.

The continuing destruction of valuable timber inside a wildlife sanctuary gives very little hope for conservation.

It also brings into focus the larger role of the forest department and where it's failing to save these protected sites.

Photofeatures

### Timeline

**Sep 2, 2006:**  
Timber mafia threatens Sonai Rupai sanctuary


**Dec 13, 2005:** Concern and celebration: Manas Park marks anniversary


**Nov 17, 2005:** Rajaji National Park opens to visitors


**Mar 3, 2005:** Dearth of tourists at Bharatpur Sanctuary

[...Complete timeline](#)
[<< Back](#)

# The Assam Tribune

Guwahati, Tuesday, January 02, 2007

## EDITORIAL

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### MESSAGE FOR TODAY

Come forth into the light of things Let nature be your teacher.

— WILLIAM WORDSWORTH

### Protecting reserve forests

**U**nabated destruction of reserve forests in the State has resulted in drastic reduction of dense forest cover and its inevitable consequences. Among these most disturbing fallouts has been the worsening man-elephant conflict that has taken a heavy toll of both human and elephant lives. Reserve forests, which constitute over 75 per cent of the State's total classified forest cover, have received very little protection over the years, even though their well-being is critical to the survival of a healthy forest system. Till date the State Government does not have a definite policy as far as according protection to reserve forests is concerned. As a result, a plethora of ills - widespread encroachment, settlement of rights of people, especially the tribals living for ages in forests, etc., — continue to plague the reserve forests. Apart from the heavy biotic pressure on reserve forests from an exploding population, what has compounded the situation is aggressive, organised encroachment backed by political powers and rampant felling of tress for smuggling purpose. Then there are factors like inter-State boundary disputes and rehabilitation of flood-affected people in forestland that have had an adverse effect on forests. Asom has nagging boundary disputes with almost all its neighbours like Nagaland, Arunachal Pradesh, Meghalaya and Mizoram, and a sizeable forestland bordering these States are under heavy encroachment.

To say that the magnitude of the problem of encroachment and tree-felling inside reserve forests has been alarming would be an understatement. Things have come to such a pass that many of the reserve forests exist only in name. In Sonitpur district, which has been the centre of the man-elephant conflict, vast tracts of reserve forests of Gogpur, Naduar, Chariduar, Balipara, etc., have been completely wiped out. This is the situation in a number of districts of the State. Reserve forests not just act as an ideal habitat for a wide range of animal and bird species, but are also crucial for maintaining the contiguity of the forests and corridors for movement of animals, especially the elephant. The State of Forest Report 2003 puts the loss of dense forest cover in Asom at a staggering 2,788 sq km between 2001 and 2003. It is the reserve forests that have borne the brunt of this colossal deforestation.

It is apparent that the reserve forests will not be able survive the onslaught of different types of biotic pressures unless the State Government adopts a pragmatic policy to deal with the issue. It would be naive to expect the Forest Department to save the reserve forests at a time when it is finding itself constrained to protect the national parks and wildlife sanctuaries. The required manpower and infrastructure are simply not there to protect reserve forests. The biggest impediment in the path of according protection to reserve forests, however, is the lack of political will. Driven by its narrow, vote bank politics, the

political class has always been oblivious to the importance of these forests. While the State Government can declare some of the more important reserve forests as wildlife sanctuaries as an immediate measure, the other task, which is even more important and will determine the long-term survival prospects of the forests, is to work out an action plan for permanent demarcation and consolidation of reserve forest boundaries and to involve the local communities in fringe areas in the conservation process. The tribals living inside the forests for ages should be motivated to become a part of the protection mechanism as economic stakeholders. The Assam Forest Policy, too, takes cognizance of this fact and stresses the need for creating people's protected areas (PPAs) inside forests where settlers create community assets of forests together with the services required for their livelihood. A cut-off date should be fixed for evicting all encroachers and stringent measures should be taken to ensure that there is no further encroachment on reserve forests. Forests are our priceless heritage, not to speak of their role as natural resources that provide sustenance to millions. Without the forests, our very existence will be at peril.

# The Assam Tribune

Guwahati, Sunday, January 07, 2007

## Clearing encroachment can solve problem

From Sanjay Hazarika

KAZIRANGA, Jan 6 – The ongoing mass encroachment in the forests of the State must be resisted to reduce the man-elephant conflict. According to the latest data, the habitat area for the elephants are decreasing day by day and hence, the man-elephant conflict is on the rise. This was stated by MC Malakar, State Chief Conservator of Forest (Wildlife) at the national-level seminar held at Kaziranga Convention Centre today.

The seminar, held under the aegis of People's & Science and JDSG College in connection with the Fifth Kaziranga Elephant Festival on "Conservation of Environment, Tea Tourism and Man-elephant co-existence" was formally inaugurated by SS Baghel, VC, AAU, Jorhat and conducted by Amiya Gogoi of AAU, Jorhat. A total of 259 participants took part in the seminar.

Besides Malakar, elephant documentary filmmaker Gautam Saikia, ex-CCF Phatik Ch Gogoi took part as the guests of honour. MC Malakar and Parbati Baruah highlighting the different issues of man-elephant conflict. In the seminar, Dr Jogesh Bora, Pabitra Mahanta, Debashish Baruah, Manash Pratim Sarmah and Maan Baruah presented papers on the subject.

Meanwhile, the behaviour of some of the wild elephants in the national park has changed to a large extent. A total of five departmental elephants have been injured by wild elephants in the last five days. Experts said that this behavioural change might have been caused by the heavy inflow of humans into the park areas during the Elephant Festival.

The festival has been witnessed by 23 foreign tourists coming from Germany, England, Netherlands, France, Finland who are staying in the park.

The SHG fair has been attended by 86 different traders' teams.

# The Assam Tribune

Guwahati, Saturday, September 16, 2006

## Illegal encroachment on 18,640 hectares

By Prabal Kr Das

GUWAHATI, Sept 15 – The scale of encroachment in the Protected Areas of Asom is becoming a matter of serious concern for the State Forest Department and conservationists alike. However, no sustained action has been taken to remove illegal settlers from inside the areas.

Documents made available to *The Assam Tribune* reveal that 18,640 ha of area lie encroached in ten National Parks and Wildlife Sanctuaries. Among these, Manas National Park has 1,700 ha encroached by illegal settlers. Nameri National Park has encroached territory extending to 2,100 ha.

Additions to that, the Kaziranga National Park significantly have a total area of 7,790 ha under encroachment. Closer to Guwahati, Pabitora Wildlife Sanctuary has 200 ha under illegal occupation.

Among the worst affected areas, Burhachapori has 2,850 ha under encroachment. In Sonai Rupai, 1,900 ha has been taken over by settlers.

These figures, however, are maintained by the Forest Department, and some conservationists feel that independent assessments would come up with more worrying figures.

Encroachment has contributed to the damage of flora and fauna in and around several protected areas. Recently scores of trees were felled in the Sonai Rupai Wildlife Sanctuary. The Burhachapori-Laokhowa complex has also witnessed large-scale destruction of forests.

Well-placed sources in the Forest Department state that even though the dangers issuing out of encroachment are known, there have been no intervention sustained over a long time. Lack of such initiatives has seen the continuing destruction of forests leading to the depletion of even vulnerable and endangered species.

At times eviction drives have been stopped because of political compulsions as in the case of some areas in Sonitpur district. In other cases, encroachment has taken place in a random manner, which have not even been reported or documented.

An official speaking on condition of anonymity said the response from the Forest Department to the issue of encroachment could only be described as knee-jerk. For instance the senior most officials have never feel it necessary to camp in vulnerable areas, which would have sent a strong message to encroachers. The standard response is to visit an area some time after trees have been felled and settlements have taken root.

Some Forest officials are of the view that the Government must have a clear policy regarding the status and future of various forest villages, which have expanded close to Protected Areas. Their continuing growth would create additional problems both for people and wildlife.

The status of Reserve Forests in the State vis-à-vis encroachment and Government intervention is no less serious. Conservationists often face a dead end when they seek data on encroachment in various reserve forests. The reason being many officials when asked to submit data by their superiors merely put up records from previous years. The result shows that no major encroachment has taken place, while the reality is otherwise.

Some Protected Areas and territory under encroachment

| Name of PA   | Total Area of PA(ha) | Area under encroachment(ha) |
|--------------|----------------------|-----------------------------|
| Burhachapori | 4406                 | 2850                        |
| Laokhowa     | 7013                 | 400                         |
| Sonai Rupai  | 22000                | 1900                        |

|                        |       |      |
|------------------------|-------|------|
| Nameri                 | 21000 | 2100 |
| Additions to Kaziranga | 42900 | 7790 |
| Manas                  | 50000 | 1700 |
| Barnadi                | 2622  | 600  |
| Dibru Saikhowa         | 34000 | 300  |
| Orang                  | 7881  | 800  |
| Pabitora               | 3880  | 200  |

0.81

## Another report from Assam Tribune is below.

SD

### Armed police to guard Sonai Rupai sanctuary

By Prabal Kr Das

GUWAHATI, Dec 3 – Faced with the twin threats of illegal encroachment and felling of trees, Sonai Rupai Wildlife Sanctuary would soon have camps manned by armed police personnel. This is the outcome of high-level deliberations involving the Forest Department, Sonitpur district administration and police. Facing criticism for failing to stop large-scale encroachment, the Forest Department is keen to put the process on a fast track.

An action plan by the Forest Department detailing the number of armed personnel to be stationed in four camps inside the 135 sq kilometre wildlife sanctuary is on the anvil. The plan would also contain particulars related to fund and logistical requirements.

Recently, a team comprising Sonitpur DC, SP, and the local DFO had made an on the spot assessment of the sanctuary and noted illegal felling at several parts and detected illegal settlers, some of which were removed the same day.

Well-placed sources told *The Assam Tribune* that during the daylong visit they witnessed degradation and fragmentation of the forest, which was recent in origin. Some of the habitat destroyed by encroachers used to be prime elephant habitat. Among the felled trees were some valuable species.

The assessment was a step the district administration and the Forest Department had to take following media reports on large-scale destruction of forest inside the wildlife sanctuary. As a result of illegal encroachment the habitat of wildlife had shrunk substantially.

An official who was part of the recent visit revealed Sonai Rupai used to have a resident population of about 150 wild elephants. Herds from that population, due to pressure on their habitat, now enter nearby settlements and create panic.

It is likely that the State Government now would adopt a stronger stance against illegal encroachers because it now realizes the implications of the damage caused to Sonai Rupai.

In the past, there were four camps to monitor and protect the sanctuary, some of which were destroyed by encroachers. Besides reactivating the camps, plans are afoot to station armed police inside the sanctuary on a permanent basis.

"The intent is clear, no further damage could be allowed to take place. Large tracts of forests have been removed. What remains have to be protected not just for the elephants, but for the food and water security of neighboring settlements," the official said.

Anupam Sharma, coordinator, North Bank Landscape, WWF India said conservation of Sonai Rupai wildlife sanctuary is important not just for protecting its resident flora and fauna, but for maintaining a crucial corridor for the movement of the major elephant population of the north bank.

"If the sanctuary degrades or disappears, the fate of not less than a 1,000 wild elephants is sealed. Bereft of the strategically located space the East-West movement of wild elephants hits a dead end," Sarma said.

In such a situation, pressure on the elephants to divert into human settlements would be even greater and consequently human-elephant conflict would increase manifold.

Moreover, the rampant removal of forest cover in Sonai Rupai is destroying soil and water quality. Water scarcity and soil degradation have been witnessed in the degraded Barnadi Wildlife Sanctuary close by. The same phenomenon would occur in the adjoining areas of Sonai Rupai, unless corrective steps are taken immediately. Sarma added.

Here is an news item published in the Assam Tribune for your kind interest. The act needs to be resisted by the conservationists. You may wish to write letters to the editor in the matter by sending your views to [info@assamtribune.com](mailto:info@assamtribune.com)

Brajesh

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Guwahati, Thursday, March 30, 2006

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Cong encouraging forest encroachers

By A Staff Reporter

GUWAHATI, March 29 – While the Congress manifesto has been described as populist by its detractors, a part of it has invited scorn from another quarter. Those working in the area of conservation and natural resource management have condemned the party for its promise that "land pattas will be issued to people residing in the Doyang, Tengani and Gohpur Forest Reserve areas and similar other places."

What "similar other places" would denote is anybody's guess. Critics of the Congress manifesto suspect that it would mean those areas occupied by illegal settlers, who act as the party's vote bank.

Not just conservationists and forest officials, even a section of political leaders have called it a move that reveals how desperate the party is to pull in votes, even from encroachers and illegal settlers.

Talking to The Assam Tribune, Ashokanand Singhal, the BJP candidate from West Guwahati said that the Congress Party's promise was another step to appease illegal migrants, many of which have settled in land without any pattas.

A senior forest official called it a game plan to hoodwink the people residing in encroached areas. Giving land pattas inside reserved forest areas is not easy, and the present Government has not been able to do so till now.

According to him the better deal would be to relocate the people in other areas, and not inside reserved forests.

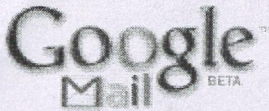
Commenting on the issue, Dr Bibhab Talukdar of Aaranyak, a conservation group, said that it was a dangerous and irresponsible utterance from the Congress party. Through this the party has given its nod to an illegal act. In this context, he wanted other political parties to clarify their stance.

He agreed that the people residing in forest areas should be relocated in areas, which do not fall inside reserved forests. Pointing to the existing conditions, he mentioned that about 342,650.144 ha of reserved forestland were already encroached, and the Congress party's promise will only add to the problem.

In his view, it is appalling that while the party has committed itself to giving away forestland, it has not expressed any wish to increase the area under forest cover. "Losing vital forestland could be disastrous for the agricultural community of Asom!" he asserted.

Others like Dr Talukdar question the Congress party's commitment to the conservation of forests, which significantly also ensures food and water security of a large number of people. It now appears that the Government, which held the Kaziranga and the Manas centenary are now willing to renege on their promises just for the sake of capturing votes.

The area of reserved forestland occupied by encroachers has soared during the last few years. About 85,550.000 ha stand encroached in the Golaghat Division alone. In Dhemaji Division 32,751.000 ha has been lost to illegal settlers, while the land lost to encroachment in Sonitpur East and West divisions amount to more than 50,3634.440 ha.



Arshiya Urveeja Bose &lt;arshiyabose.research@googlemail.com&gt;

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**Fwd: cutting down Sonairupai WLS**

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Neeraj Vagholikar &lt;nvagho@gmail.com&gt;

Thu, Jan 15, 2009 at 6:41 PM

To: Arshiya Urveeja Bose &lt;arshiyabose.research@googlemail.com&gt;

----- Forwarded message -----

From: **vidya athreya** <phatrosie@gmail.com>

Date: Tue, Feb 13, 2007 at 11:37 AM

Subject: Re: cutting down Sonairupai WLS

To: [nathistory-india@princeton.edu](mailto:nathistory-india@princeton.edu)

I know - incidentally the Bodos are also going into Arunachal Pradesh to take trees out of an old plantation there - the local Arunachalis are too scared to say anything because it is a small village - I also heard that the local Assamese politician is actually selling the RF land and land is available if you wish to buy it!!

An evil looking electric fence runs for kms by the side of the road between the clear felled RF's and the Sonitpur WLS on the other side. The elephants have gone into Eagle nest wildlife sanctuary - unto 1200 m now and go onto 2300 in the summer because that is where the only habitat and food is.

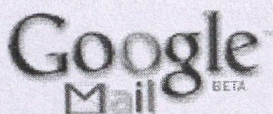
Obviously politicians do not want to mess up with their vote banks - but who will stop this when it starts happening to all the other protected areas? Yesterday the RF, today the WLS and tomorrow Kaziranga NP (which is anyway happening due to encroachments)?

On 13/02/07, **Pritam Baruah** <[doublebulb@yahoo.com](mailto:doublebulb@yahoo.com)> wrote:

I drove by in December and noticed the devastation too. The number of illegal encroachers in Chariduar and Sonairupai is reportedly more than 10,000 and the entire effort is highly organized. New bodo settlers from Khokrajhar and Dhemaji districts are coming in even today. Violent resistance groups have been formed in those areas and only an armed eviction effort can get rid of them. The government is in no mood to do that. There is money being made out of this. The forest dept is a mute spectator and corruption is pandemic.

More than 500 people enter the main area of Sonairupai WLS everyday to cut trees with assured impunity. With this precedent, people close to Nameri NP now fear that Nameri will be the next target. Before the last elections, there was an attempt to evict settlers from Naduar RF (95% encroached - no viable habitat left) but it was called off just minutes before the final go-ahead signal. It is said that the CM personally intervened to call it off.

There are no large trees left in Balipara RF. Even young Sal trees near the highway are being cut down in broad daylight. The hutments in the northern area of Balipara RF (which has been blanket felled) are increasing and I did not notice any serious agriculture. Otoh, I did notice lot of people on bicycles carrying illegally felled wood. Mekahi ghat (right under the noses of the range office at



Arshiya Urveeja Bose &lt;arshiyabose.research@googlemail.com&gt;

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## Fwd: Habitat pressures for Primates -NE India

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Neeraj Vagholikar &lt;nvagho@gmail.com&gt;

Thu, Jan 15, 2009 at 6:44 PM

To: Arshiya Urveeja Bose &lt;arshiyabose.research@googlemail.com&gt;

----- Forwarded message -----

From: &lt;NALINM@aol.com&gt;

Date: Thu, Jun 15, 2006 at 7:38 AM

Subject: Habitat pressures for Primates -NE India

To: [nathistory-india@princeton.edu](mailto:nathistory-india@princeton.edu)

FWD - ZEE NEWS

### North East primates faced with uncertain future

Habitat destruction, encroachment, shifting cultivation, and monoculture forest plantation is a major threat to the survival of primates in North East which has the richest primate diversity in the country.

The forest cover in North East has disappeared at an alarming rate in the last two decades and as most of the primates are forest-dwellers, their survival depends upon continued existence of the forest, says noted environmentalist and an expert on primates, Anwaruddin Choudhury.

Encroachment is a major problem in reserved forests and in the Balipara reserve forest of Sonitpur district in Assam, which is a good area for the Capped Langur, more than 100 out of 188 sq km is under encroachment and forest villages while about a third of Golden Langur habitat was lost due to felling and encroachment.

Almost the entire population of primates--Slow Loris, pig-tailed Macaque, Rhesus Macaque, stump-tailed Macaque, Capped Langur and Hoolock Gibbon have vanished from the 900 sq km rainforest tract comprising Nambor in Diphu and Rengma reserve forests in Golaghat district of Assam, he said.

The cause of their disappearance has been attributed to Assam's border problem with Nagaland and subsequent felling, poaching and encroachment, Choudhury added.

Choudhury points out that in the hilly areas throughout the North East, 'Jhum' or shifting cultivation, is an important factor for forest destruction.

In Manipur, with a total area of 22,327 sq km, Jhum currently covers more than 8.2 per cent and even in hilly areas of Assam, the area under shifting cultivation is more than 2,600 sq km.

"The destruction of forest is not only reducing the habitat and number of primates but also results in fragmentation and species like slow Loris and Hoolock Gibbon suffer the most", he said.

Killing of primates for their meat is a serious threat in Assam, mainly in north Cachar Hills, parts of Cachar, Assam-Nagaland and Assam-Mizoram border areas, central and eastern Arunachal Pradesh, parts of Meghalaya and Tripura, hill districts of Manipur and entire Nagaland and Mizoram.

Choudhury says unscientific harvesting of bamboo for large paper mills at Jagiroad, Panchgram and Jogighopa in Assam and Tuli in Nagaland are also posing a threat to them.

Oil mining and exploration in eastern Assam and adjacent areas of Arunachal Pradesh and open-cast coal mining in eastern Assam and parts of Meghalaya are some of the other conservation problems which are not only destroying the habitat but also causing pollution and disturbance, he added.

Choudhury points out that habitat destruction has also led to depredation in the crop fields, vegetable gardens and orchards by the Rhesus Macaque and has emerged as a serious problem in parts of Assam.

Although most species are protected under the Wildlife (Protection) Act, 1971 which prohibits their killing or capture dead or alive, enforcement in the field is virtually nonexistent except in some of the protected areas, he claimed.

Fifty-five notified protected areas in the region have primate populations with the diversity ranging from a single species in Orang National Park in Assam to eight species of Dampa sanctuary in Mizoram.

The cover of the protected area network is very insignificant accounting for only six per cent of the total geographical area of the region, he added.

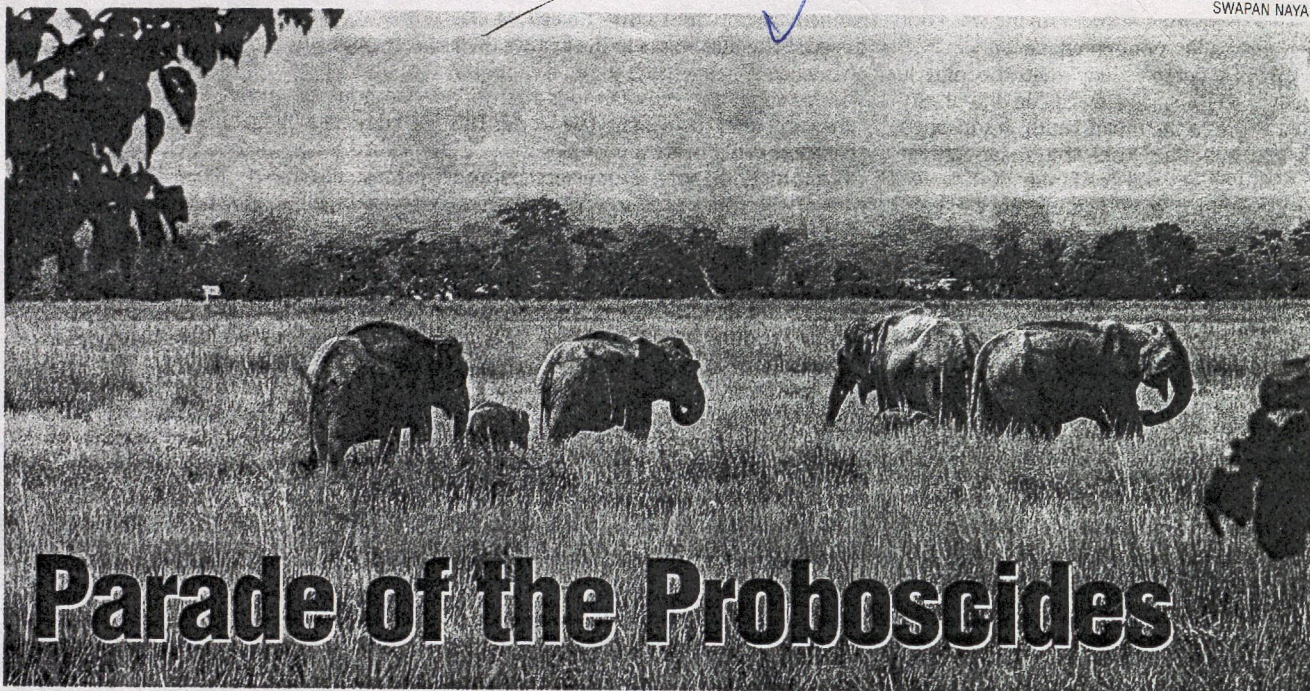
The ban on logging imposed by the supreme court of India has greatly checked deforestation in the region but once it is allowed on the basis of working plans, it will be disastrous as implementation of the plan in remote areas will be virtually impossible.

Although most tribals hunt primates for food, there are some local taboos, which have helped in conservation of some species. For example, the Mishimis do not hunt the Hoolock Gibbon, while many of the tribes do not like to take the meat of the Slow Loris.

Bureau Report

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Neeraj Vagholikar  
Kalpavriksh  
Apartment No. 5, Shree Dutta Krupa,



## Parade of the Proboscides

### Elephant deaths in Assam reopen the man-beast conflict issue

**T**HE death of at least 18 elephants in northern Assam's Nameri national park since early July this year has sent forest and wildlife authorities of the north-east on a wild-goose chase. The reason: nobody knows what or who killed these pachyderms. The first death was reported as early as July 3, but it was not before park rangers and wildlife enthusiasts stumbled upon several carcasses a month later in the 200-sq km park that the enormity of the entire issue became evident.

The many theories doing the rounds about the cause of the deaths have only added to the confusion. Initially, park officials blamed the deaths on an outbreak of anthrax, a killer disease which claimed at least 150 elephants in the area between 1914 and '15. Then, H.P. Phukan, the Nameri park in-charge, announced that two of the elephants died of liver fluke—caused by a parasite which affects all grazing animals. But he wasn't sure why the rest of the beasts perished. Experts from Guwahati's Veterinary College have now been engaged to reach a conclusion. The state has even sent an sos to the Centre to depute experts to help them work out a solution.

Park authorities haven't even ruled out the possibility of encroachers poisoning the elephants with diathene, a pesticide used in the adjoining tea gardens. In fact, increasing encroachments into natural elephant habitats in the northeast in the past decade has resulted in a rising conflict between man and animal. Encroachers have cleared large tracts of forests in Sonitpur district in northern Assam to set up houses

and cultivate land. The upshot: wild elephants have claimed around 400 human lives in Assam in the last five years.

According to the 1997 census, Assam has over 5,500 wild elephants spread over 2,437 sq km of wildlife protected areas including reserve forests, sanctuaries and national parks. "This," says a senior forest official, "is not enough for such a large population of elephants." Adds a retired chief conservator of forests: "Fragmentation of traditional migration corridors due to large-scale deforestation and human encroachment has resulted in the elephants being denied their rightful place. As a result, there is increasing conflict between man and the beast." Official statistics of the forest department point to the thinning forest cover in Assam—409 sq km of forest cover was lost in the state between 1985 and 1991 alone.

The forest authorities' problems have been compounded by the ban on capture of wild elephants since 1977 after elephants were upgraded to Schedule I of the Indian Wildlife Act, 1972—animals coming under this group are designated as endangered species and hence are not allowed to be captured. The rules are so strict that the Centre's permission is needed even to kill or capture a rogue elephant. Forest officials in Assam have repeatedly requested the Centre to allow limited capture of

### Elephants in the Nameri park: ambushed

elephants so that they can be used in tourism and other forest department work. The authorities are still waiting for a response from New Delhi.

Before the ban, almost 300 to 400 elephants, mainly calves, used to be captured in Assam every year by a traditional method called *mela shikar*. Since 1977, however, the ban has led to increasing depredations by wild elephants throughout Assam. In fact, two major airports—Guwahati's Lokapriya

Gopinath Bordoloi international airport and the Tezpur Air Force Station—routinely grapple with the elephant menace. Officials cite a number of instances when herds of wild elephants in search of food have strayed into the airbase area. Tea gardens in Sonitpur district in northern Assam and upper Assam's Jorhat district have recorded increasing elephant attacks in recent years.

Afforestation and greater awareness among the villagers, say wildlife experts, could help solve the problem. Says a former chief conservator of forests: "People have to be made aware that encroachment on traditional migration corridors has to be stopped and simultaneously deforestation has to be arrested." Until that is done, the conflict between man and animal will continue—and more elephants will die. ■

Nitin A. Gokhale

**Fragmentation of traditional migration corridors due to encroachment has denied the elephants their rightful place.**

## Poisoned again

The death of 18 elephants in Assam revives the debate over human-animal conflict once more



SHIBANI CHAUDHARY

A shrinking habitat is leading to the conflict

CONFLICTS with human beings have recently taken toll on 18 elephants in Nameri National Park, Assam, the state which houses half of India's elephant population. What was first believed to be a disease killing, later turned out to be a case of poisoning. The crisis, which is also said to have spread to the adjacent Pakhoi Wildlife Sanctuary in Arunachal Pradesh, is perhaps one of the many instances of human-animal conflict.

The forest authorities of Assam, however, put the number of deaths to ten. According to a senior forest department official in Guwahati, nine elephants died in July-August and the 10th elephant died on September 10. With the death of the first few elephants, there was a lot of speculation that the elephants might have died due to anthrax. Later the theory of liver fluke was also propped up.

However, when the college of veterinary sciences in Guwahati conducted tests on the animals, they found traces of a pesticide called Dimecron in all nine elephants. This is now believed to be the cause of the deaths although investigations are still on. According to experts, this is a clear case of deliberate poisoning of the pachyderms by the villagers around the park in retaliation against the destruction of their crops and property, and sometimes lives, by

the elephants.

"There is a large human population around the park and it is possible that these elephants were poisoned by the villagers," says a forest official. One interesting aspect is that most of the carcasses were found near the waterbodies. According to Bibhab Talukdar, conservationist and secretary of Aranyak, a Guwahati-based non-governmental organisation, the disease factor can be further refuted by the fact that after the carcasses were found and people became alert, there seem to be no further deaths. He adds that some villagers near the park admitted to have poisoned a rivulet for fishing purposes. No arrests, however, have been made.

Experts are of the opinion that this kind of an incident was inevitable given the conditions of the elephant habitat not only in Nameri, but all over the country. "The habitat is shrinking and people encroaching from all sides. This increases the conflicts and the compensations are also not very much," says Talukdar.

The compensation for death or permanent incapacitation is Rs 20,000 and there are no compensations for destruction of crop or property. Given such conditions, it is not surprising that irate villagers would like to live with as few elephants as they could, say experts. ■

## Talking green

Participants at an international conference on forest management discuss ways to curb logging

PARTICIPANTS from over 20 countries gathered in Bali, Indonesia, from September 11-13, 2001, to strategise on how to battle the myriad of problems of forest management, including illegal logging on a national and international scale. Officially known as the Forest Law Enforcement and Governance (FLEG) East Asia Ministerial conference, the meeting was the result of a series of meetings in east Asia on combating the threat of illegal logging and trade, wildlife poaching and corruption.

Though FLEG's focus was law enforcement, its agenda seemed to cover almost every topic related to forest management. Presentations ranged from governance in forest law enforcement, to the role of non-governmental organisations and local communities in forest law enforcement.

Participants commonly identified the problems of illegal logging and illegal trade as being rooted in social, economic and political structures of different countries, and therefore stated that discussions should not be only limited to the forestry sector. David Kaimowitz of the Indonesia-based Centre for International Forest Research, for example, stated that forest law enforcement must form part of a broader strategy that includes economic incentives, public infrastructure investment, and research and technical assistance.

The outcome of the conference was an ambitious ministerial declaration, which duly emphasised the urgent need for cooperation among governments to address these various problems at the national and international levels. ■

FRESH ENCROACHMENTS:

D. KAWAL WLS: 1,000 teak trees

## Basic Data Sheet

District Sonitpur (11), Assam (18)

( Source: Census of India 2001)

### Population:

|                                |           |                                    |         |
|--------------------------------|-----------|------------------------------------|---------|
| Persons                        | 1,681,513 | Number of households               | 315,116 |
| Males                          | 871,568   | Household size (per household)     | 5       |
| Females                        | 809,945   |                                    |         |
| Growth (1991 - 2001)           | 17.80     | Sex ratio (females per 1000 males) | 929     |
| Rural                          | 1,505,719 | Sex ratio (0-6 years)              | 973     |
| Urban                          | 175,794   |                                    |         |
| Scheduled Caste population     | 87,900    | Scheduled Tribe population         | 195,083 |
| Percentage to total population | 5.23      | Percentage to total population     | 11.60   |

### Literacy and Educational level

#### Literates

|         |         |
|---------|---------|
| Persons | 830,579 |
| Males   | 494,965 |
| Females | 335,614 |

#### Literacy rate

|         |       |
|---------|-------|
| Persons | 59.00 |
| Males   | 67.54 |
| Females | 49.73 |

#### Educational Level attained

|                                 |         |
|---------------------------------|---------|
| Total                           | 830,579 |
| Without level                   | 18,082  |
| Below primary                   | 255,139 |
| Primary                         | 204,000 |
| Middle                          | 144,886 |
| Matric/Higher Secondary/Diploma | 172,379 |
| Graduate and above              | 36,083  |

### Workers

|                  |           |
|------------------|-----------|
| Total workers    | 634,723   |
| Main workers     | 465,283   |
| Marginal workers | 169,440   |
| Non-workers      | 1,046,790 |

### Age groups

|                                   |         |
|-----------------------------------|---------|
| 0 - 4 years                       | 185,036 |
| 5 - 14 years                      | 433,724 |
| 15 - 59 years                     | 967,533 |
| 60 years and above (Incl. A.N.S.) | 95,220  |

### Scheduled Castes (Largest three)

|                  |        |
|------------------|--------|
| 1.Kaibartta etc. | 42,049 |
| 2.Namasudra      | 19,249 |
| 3.Jhalo etc.     | 9,689  |

### Scheduled Tribes (Largest three)

|             |         |
|-------------|---------|
| 1.Boro etc. | 140,293 |
| 2.Miri      | 44,092  |
| 3.Rabha     | 4,256   |

### Religions (Largest three)

|              |           |
|--------------|-----------|
| 1.Hindus     | 1,287,646 |
| 2.Muslims    | 268,078   |
| 3.Christians | 115,623   |

### Amenities and infrastructural facilities

**Total inhabited villages** 1,784

#### Amenities available in villages

|                                        | No. of villages |
|----------------------------------------|-----------------|
| Drinking water facilities              | 1,784           |
| Safe Drinking water                    | 1,772           |
| Electricity (Power Supply)             | 1,331           |
| Electricity (domestic)                 | 1,209           |
| Electricity (Agriculture)              | 74              |
| Primary school                         | 1,372           |
| Middle schools                         | 405             |
| Secondary/Sr Secondary schools         | 172             |
| College                                | 13              |
| Medical facility                       | 235             |
| Primary Health Centre                  | 40              |
| Primary Health Sub-Centre              | 88              |
| Post, telegraph and telephone facility | 422             |
| Bus services                           | 539             |
| Paved approach road                    | 1,067           |
| Mud approach road                      | 1,692           |

### Important Towns (Largest three)

|                   | Population |
|-------------------|------------|
| 1.Tezipur (MB)    | 80,575     |
| 2.Dhekiajuli (MB) | 25,349     |
| 3.Rangapara (TC)  | 18,824     |

### House Type

|                                           |      |
|-------------------------------------------|------|
| Type of house (% of households occupying) |      |
| Permanent                                 | 23.4 |
| Semi-permanent                            | 23.9 |
| Temporary                                 | 52.7 |

# Forests as safety nets in Sonitpur district of Assam in India

Guide: Dr. Bhaskar Majumder, Reader in Economics, Gobind Ballabh Pant Social Science Institute, Allahabad  
 Author: Renuka Mishra, ICSSR fellow  
 Gobind Ballabh Pant Social Science Institute, Allahabad

## Introduction

Development in the North-East of India has posed a serious challenge to the nation-building process in the country. Out of the seven states that comprise the Northeast of the country, Assam has special significance because it is the gateway to all other states of the region. The land area of Assam constitutes about 2.4% of the total land area of India and shelters about 3% of the country's population and 75.4% of the population of the northeastern region. Assam shares 30.8% of the Northeastern region's geographical area. By virtue of geographical location, Assam occupies a strategic position in the country as entire Northeastern region is connected with the main body of the country by a narrow corridor of 32 kms width.

## Statement of the problem

Under development is clearly perceived in terms of per capita income and sectoral growth rates as shown below:

Per capita income in Assam was Rs7,335 as against Rs12,782 in the country in the year 1999-98. Agriculture, the main occupation of the people registered a growth rate of 1.2%. Manufacturing sector never contributes more than 5% to 7% of the state national product. Paradoxically, the backdrop of this phenomenon is rich and a fairly diversified resource base that comprises among others, a third of the country's hydro potential, the largest inland source of petroleum and extensive forest resources.

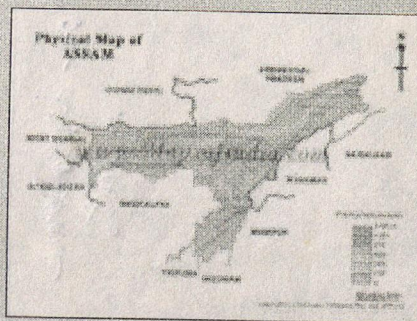
## Resource Base of Assam

**Forest Resources:** Generally evergreen forests are found in the undivided districts of Cachar, Goalpara, Nagaon, Kamrup, Lakhimpur, Dibrugarh, Darrang and the hill districts of the state. Most of the forests in the state are evergreen in character. In 1992-93, 355 number of reserved forests in the state occupied twenty-two percent of the total area of the state. Forests account for 39.11% of the total geographical area of the state. The highest concentration of forest occurs in the districts of Karbi-Anglong and North-Cachar hills, with 40.2% of the total area under forests of the state.

The share of forestry and logging to Net state domestic product in 1980-81 was 3.70% which declined to 2.03% in the year 1996-97.

## Objectives of study

- To study the existing resource base, its availability with specific reference to forestry resources.
- To examine the type of utilization of forestry at present.
- To examine the infrastructure, both physical and human, that exists at present for sustainable utilization of forestry.
- To suggest strategies for sustainable development as may be derived from objectives (1) and (2).



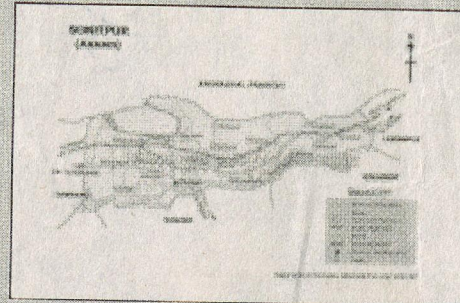
## Hypothesis Testing

During the research work, the following hypothesis have been tested:

- Development strategies in Assam followed so far overlooked the question of sustainability of resource-base.
- A dynamic inter-active link between the local communities and the state government of Assam for rational utilization and protection of forestry will ensure sustainable development for the state.

## Methodology

- Twelve forest villages have been selected, six each from Sonitpur East and West division. Ten percent of the households in each village were taken as the sample.
- Questionnaires for the common people were specially designed with the parameters of sustainable development in mind.
- Forest Department officers were also asked to fill up questionnaires specially designed for them.
- Local level Non-Governmental Organizations were also interviewed.



Remote sensing map of Sonitpur district in 1994



Remote sensing map of Sonitpur district in 1999



Remote sensing map of Sonitpur district in 2001



Deforestation in Mekahi Hill in Charduar reserved forest area



## Findings

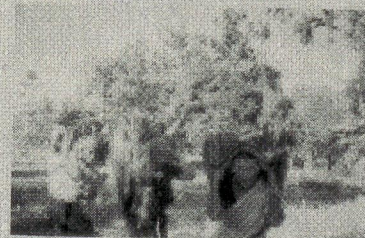
Forest land in Garo Miri Gaon has also been used as an orchard for growing oranges. Villagers have closely felt that the rapid deforestation in the region is going to ruin their prospects as forest villagers. The fertility of the arable land is gradually falling. Rainfall has become irregular and the amount has been declining. Temperatures have been increasing in the region.

A study done by AGROMET center located in North East Institute of Land and Water Management, Tezpur in Sonitpur district has shown records, which is confirming what the villagers have said.

## Sample structure

Sample population-795  
 Males-261,  
 Females-239,  
 Children-295  
 Literate-219

## Forests are essential for life



Of the 111 households surveyed, 92.85% of the households use conventional mud-bulk stoves or chullas to cook their food.

## Linkage between Deforestation and Population

| Family size  | Households |
|--------------|------------|
| Between 1-3  | 6          |
| Between 4-6  | 47         |
| Between 7-10 | 44         |
| Above 11     | 14         |
| Total        | 111        |

94.59% of the population in this sample has family size above 4.

52.25% of the households have family size above 7.

In the last two decades, only 8 households in 111 households migrated to forest villages. During this period rapid deforestation can be attributed to rapid increase in population of the existing families in the region.

## Basic features of the economy of forest villages

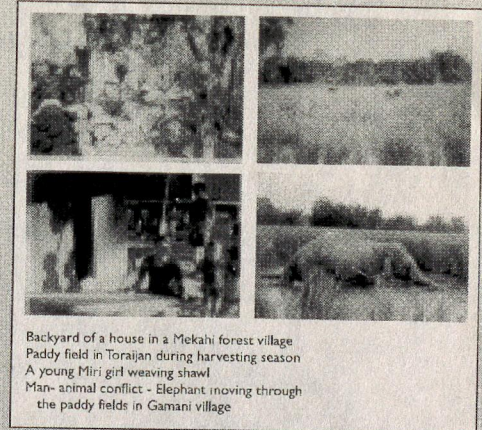
**Subsistence Agriculture-** All the households had Agriculture as the main occupation. Main crops grown are rice, mustard, potatoes and vegetables. Bari-Households with above 10 big ha of land also maintained a bari or kitchen garden. In this garden they grow betel-nut, pan, elephant apple, Kamarenga and other trees which yield fruits.

**Weaving-** Handloom weaving is an integral part of both tribals and Assamese community residing in these villages. They prepare their own gamocha, mekhala, Chaddar and Dhakona, shawls and mufflers.

## Consequences of deforestation

In July and August 2001, about 20 elephants were poisoned in and around Nameri National Park. Forest villagers interviewed in Gamani, Choploga, Toraijan and Sotai near Nameri national park complained that the elephants often visited their paddy fields and destroyed the crops. Humans are destroying the elephant's home for agriculture. The destruction of crops is an obvious result of the human destruction of forests.

Presence of forests in the form of old habitats protect mankind and act as safety nets against elephant's destructive activities in the paddy fields.



Backyard of a house in a Mekahi forest village  
 Paddy field in Toraijan during harvesting season  
 A young Miri girl weaving shawl  
 Man-animal conflict - Elephant moving through the paddy fields in Gamani village

## Strategic intervention by the Government

Supreme court ordered a complete ban on tree felling except under government working plans. In December 1996 the apex court further directed nine states including Assam, to stop encroachments on reserved forest lands. There has been eviction drives by forest department in both east and west Sonitpur division this year. Joint Forest Management programmes have been introduced in Dharikati and Sakaikati in 2002. Villages in Gohpur Reserved Forest are waiting arrival of funds.

## Suggestions for a strategy of sustainable development

- A. Management and protection of forest resources:**
- Well-defined property rights in terms of forests as common property resource.
  - Forest villagers are presently deprived of development programmes which easily reach a civil village. Deforestation is encouraged so that the village no longer remains a forest village and becomes eligible for the status of a civil village. Village Headmen and his team of village management body needs to be empowered.
  - Forest protection committees should be formed.
- B. To improve the quality of life:**
- Power supply should be provided.
  - Hospital and health care centres should be established. Family planning incentives are also required.
  - Education Centres with the vision of creation of alternative job opportunities inside and outside the forest villages should be set up.

## C. Consumption Pattern

- Fuel-wood consumption can be reduced if bio-gas projects are encouraged. Agricultural wastes and cattle dung can also be used for preparation of fuel cakes.
- Timber products should be highly taxed to discourage illegal felling of trees for the same.

## Conclusion:

Considering the rapid rate of deforestation in Sonitpur district, if forests disappear or are not available people will lose vital safety nets in the form of forests. They are mostly dependent on forest land for food, fuel and fodder. They do not have alternative source of income. Neither do they have any alternative risk management system. The state government has only recently become aware of the problem and the draft on State Forest Policy 2002 was submitted to the Chief-Minister Tarun Gogoi on 25th April, 2003. The committee for the policy preparation on forests is headed by Anil Goswami and a team of experts including Bibhab Taluqdar of WWF, Bagdora. The policy is aimed at encouraging sustainable development in the state through people's participation.

No Living Space? Shrinking Habitat and Human Elephant Conflict in Assam, India

Final Report

Submitted to :

The  
**Rufford**  
Small Grants Foundation  
[www.ruffordsmallgrants.org](http://www.ruffordsmallgrants.org)



## No Living Space? Shrinking Habitat and Human Elephant Conflict in Assam, India

Anup Saikia  
Rubul Hazarika  
Dhrubajyoti Sahariah  
Eva Barman  
Sunil Pio

Habitat destruction is a universal conservation problem brought about by a variety of factors. While the reasons underlying HEC in Assam are fairly easy to identify - the prime agent being habitat loss- quantifying the amount of habitat destruction that has occurred is less easy and was thus one of the main objectives of the RSG project. Using satellite data during 1994-2007 substantiated by extensive ground truth verification the habitat loss has been quantified.

Although the project had initially stated that the focus would be on the western and northern portion of the Sonitpur district of Assam, the entire district covering an area of 5324 kilometres was assessed in terms of habitat losses, since leaving the eastern portions of the district would provide an incomplete picture. However there was a focus on the western and northern portions during ground truth verification. GPS readings of using a handheld PDA-GPS were used during most of the field surveys.

Habitat characteristics were necessary to be understood on two counts:

- (a) to quantify losses and identifying those in need of immediate protection
- (b) to identify alternative habitats if any within the area

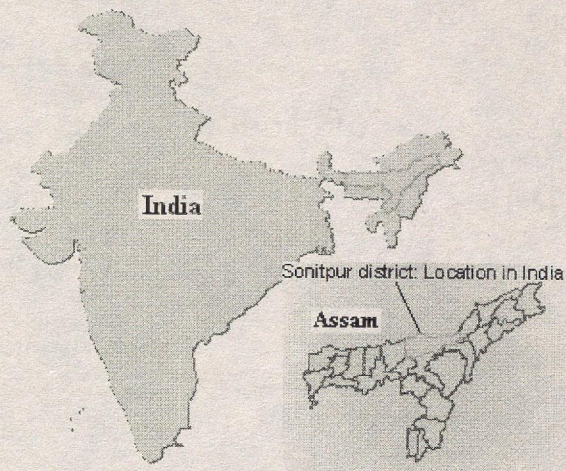
During the ground truth verification process encroacher settlements were identified, particularly those in close proximity to forested sites.

The extent of habitat loss goes much beyond classification, ground truth verification and accuracy assessments since attributes of the habitat such as the number of patches, distance between patches, the degree of fragmentation of the habitat are equally important landscape characteristics. Using the widely used Fragstats software that allows such an understanding we took a closer look at the habitat characteristics.

To assess the magnitude of the problem, and the trials and tribulations of the villagers a survey of 28 select villages using a semi-structured questionnaire was conducted. The questionnaire was largely based on that developed by the AESG, with certain modifications.

### The Study Area

Sonitpur lies between 26° 30'N to 27° 01'N latitude and 92° 16'E to 93° 43'E longitude. Spread across an area of 5324 square kilometers. The district is sandwiched by the Brahmaputra River to the south and the Himalayan foothills of Arunachal Pradesh to its north. The area is characterized by lowlands with elevation varying between 10-80 meters, 80-100 and 100-200 meters. A small strip of low hills on its northern limits with elevation ranging between 200-500 meter exists on its north western margin. Several rivers flowing parallel to one another in a north-south trend dissect the district as they flow down the foothills to the Brahmaputra river. Rainfall is quite high at 1384 mm (GoA,2004).



### Forest Divisions

As per Government of Assam records the area under Reserved Forest in Sonitpur West Forest Division ~ the focus of this RSG project~ was 46164.690 hectares and that in Sonitpur East was 52674.770 hectares (GoA,2004).

### Population and Encroacher Settlements

Since the early 1990s the forest cover has been at the receiving end and studies (Srivastava et. al. 2002) have observed trends of rapid loss of forest cover. The prime agent was a shift of population that was engineered by certain communities with a view to gaining political control in the area. While the trend of new settlement in an organised manner does not seem to be operating, the aftermath of encroachers settling in cleared forest land ~ in several instances within protected areas (PAs) themselves~ continues. In such settlements human elephant conflicts occur. Elsewhere in fairly old settled and established villages, HEC occurs due to a different set of reasons, but closely linked to the activities of these forest encroachers (that cause forest/habitat loss and force elephants to seek food outside of their habitat and into human settlement areas).

### HEC

The dimensions of HEC in western Sonitpur particularly the area are as follows:  
Death of humans:

| Year    | No. of Deaths |
|---------|---------------|
| 2002-03 | 11            |
| 2003-04 | 11            |
| 2004-05 | 8             |
| 2005-06 | 7             |
| 2006-07 | 10            |

Injuries to people:

| Year    | No. of injuries |
|---------|-----------------|
| 2002-03 | 2               |
| 2003-04 | 7               |
| 2004-05 | 1               |
| 2005-06 | 4               |
| 2006-07 | 4               |

Elephant deaths:

| Year    | No. of Deaths |
|---------|---------------|
| 2002-03 | 13            |
| 2003-04 | 12            |
| 2004-05 | 10            |
| 2005-06 | 6             |
| 2006-07 | 5             |

Source: Forest Department (Sadar Range), Tezpur.



Crop damage was assessed at 640 hectares during 2005-06 affecting 1121 small farmers/landholders; during 2006-07, 355 hectares belonging to 530 landholders were damaged by elephants as per Forest Department (Sadar Range) data. Additionally damage to 285 and 221 houses was caused by elephants during the years 2005-06 and 2006-07 respectively.

#### **Land use and land cover change**

Available land use data for the Sonitpur district pertain to 1999-2000 (provisional) and relevant to this project, the data for forest area is placed at 29% of the total geographical area (GoA,2004); it would seem that these statistics are not very accurate, and also not sufficiently disaggregated. To generate an accurate assessment of forest as well as overall land use/ land cover conditions the following datasets were used:

#### **Satellite imagery used:**

- i) Landsat Thematic Mapper and
- ii) Landsat Enhanced Thematic Mapper+

Resolution: 30 m

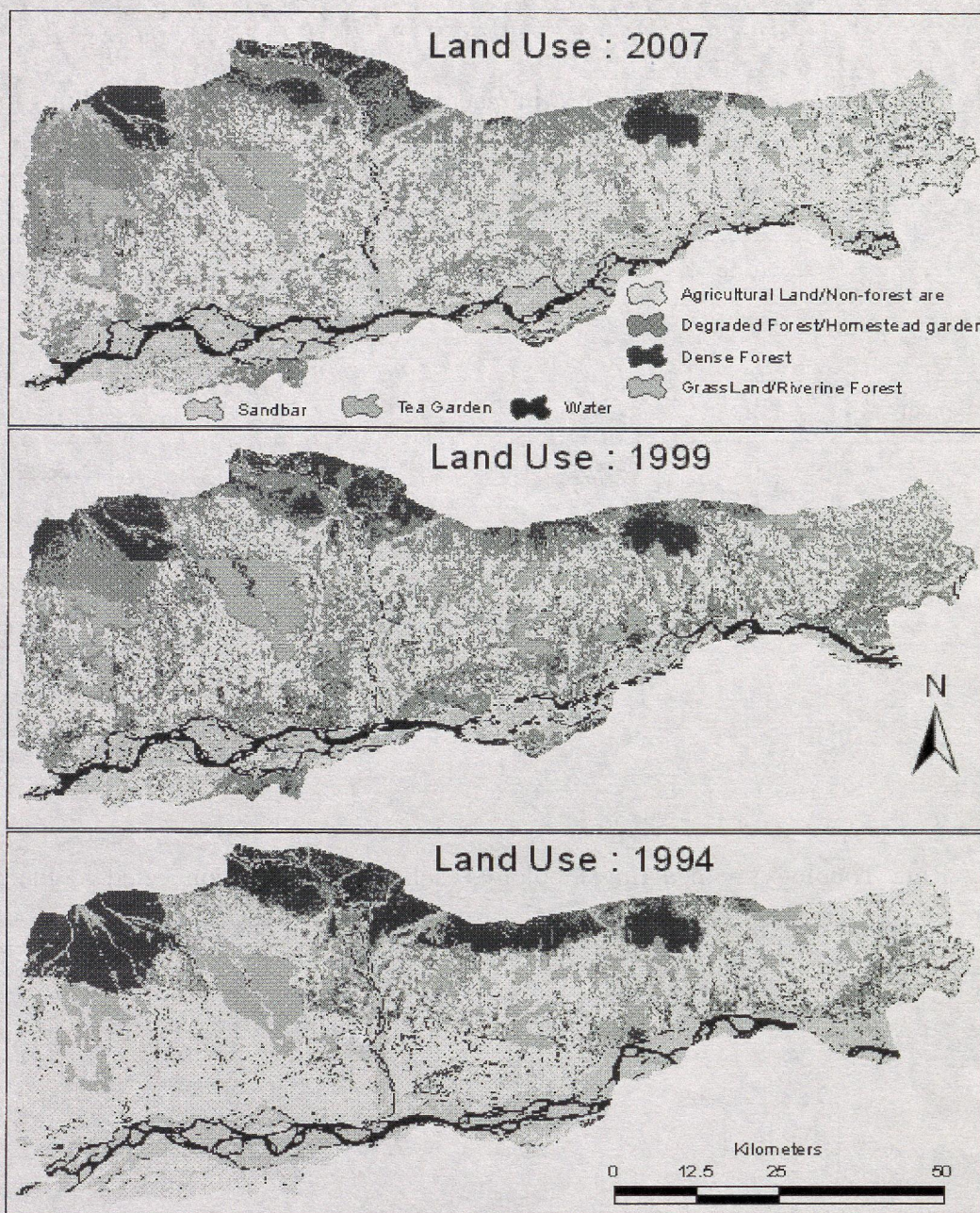
| Data Type    | Path-Row | Acquired on      |
|--------------|----------|------------------|
| Landsat TM   | 136- 41  | 25 January, 1994 |
| Landsat TM   | 136- 42  | 25 January, 1994 |
| Landsat TM   | 136- 41  | 27 January, 1999 |
| Landsat TM   | 136- 42  | 27 January, 1999 |
| Landsat ETM+ | 136- 41  | 23 January, 2007 |
| Landsat ETM+ | 136- 42  | 23 January, 2007 |

Based on these datasets substantiated by extensive ground truthing in which more than 300 GPS points were taken over a 2 month period, the following land use categories were delineated with standard accuracy assessments above 80%.

| Land use Category                  | Area ( in hectares) |            |            |
|------------------------------------|---------------------|------------|------------|
|                                    | 1994                | 1999       | 2007       |
| Tea Garden                         | 38,693.66           | 38486.11   | 38565.81   |
| • Dense Forest                     | 75,457.98           | 44061.39   | 32241.24   |
| GrassLand/Riverine Forest          | 36,725.12           | 3680.14    | 13380.93   |
| Agricultural Land/Non-forest area  | 231,897.41          | 189454.22  | 215,154.63 |
| • Degraded Forest/Homestead garden | 44,395.21           | 190240.71  | 144147.33  |
| Water                              | 26,156.78           | 26308.53   | 23230.53   |
| Sandbar                            | 75,019.79           | 36132.21   | 61663.68   |
| Total area                         | 528,345.95          | 528,363.31 | 528,384.15 |

**Two results are apparent:**

1. Sharp declines in the dense forest category have occurred
2. Degraded forest/homestead gardens have increased substantially.



Land use change 1994-2007 : The following changes were identified

| Land use Category                 | Change 94-99<br>(Hectares) | Change 99-2007<br>(Hectares) | Overall Change 94-07<br>(Hectares) |
|-----------------------------------|----------------------------|------------------------------|------------------------------------|
| Tea Garden                        | -207.55                    | -79.70                       | -127.85                            |
| Dense Forest                      | -31396.59                  | -11820.15                    | -43216.74                          |
| GrassLand/Riverine Forest         | -33044.98                  | -9700.79                     | -23344.19                          |
| Agricultural Land/Non-forest area | -42443.19                  | -25700.41                    | -16742.78                          |
| Degraded Forest/Homestead garden  | +145845.50                 | -46093.38                    | +99752.12                          |
| Water                             | -151.75                    | -3078.00                     | -2926.25                           |
| Sandbar                           | -38887.58                  | +25531.47                    | -13356.11                          |

The dense forest category of recorded a loss of 43216.74 hectares. This has an adverse effect on elephant habitat and other changes in land use (viz. increases in spatial extents of degraded forests / or the near static position of tea estate areas) are much less important to the HEC equations in western and northern Sonitpur.

| Land-use category                 | PLAND |       |
|-----------------------------------|-------|-------|
|                                   | 1994  | 2007  |
| Degraded Forest/ homestead garden | 8.40  | 27.28 |
| Dense Forest                      | 14.28 | 6.10  |
| Grassland/Riverine forest         | 6.95  | 2.53  |
| Agricultural land/non-forest area | 43.89 | 40.71 |
| Sandbar                           | 14.20 | 11.67 |
| Water                             | 4.95  | 4.40  |
| Tea garden                        | 7.32  | 7.30  |

PLAND= percentage of landscape measures the proportion of the landscape occupied by that patch type, or that class.

PLAND data for 1994 and 2007, in the dense forest category ~ the ideal elephant habitat~ dropped from 14 to 6% ; in terms of spatial extent this loss amounted to a staggering 43216 hectares. This loss in dense forest is the underlying cause of HEC in Sonitpur.

### Decline in quality of the dense forest

Along with forest loss in areal terms the quality of the dense forest has declined, as quantified below, using the Fragstats landscape characterization program:

| 2007                  |          |      |          |                 |                    |
|-----------------------|----------|------|----------|-----------------|--------------------|
| patch size (hectares) | area     | NP   | MPS      | % to total area | % to total patches |
| 0-5                   | 3624.03  | 6147 | 0.589561 | 11.25           | 95.54              |
| 5-10                  | 1059.48  | 159  | 6.663396 | 3.29            | 2.47               |
| 10-20                 | 946.17   | 67   | 14.12194 | 2.94            | 1.04               |
| 20-50                 | 877.05   | 30   | 29.235   | 2.72            | 0.47               |
| 50-100                | 576.09   | 8    | 72.01125 | 1.79            | 0.12               |
| 100-200               | 2134     | 14   | 152.4286 | 6.63            | 0.22               |
| 200-500               | 566      | 2    | 283      | 1.76            | 0.03               |
| 500+                  | 22417    | 7    | 3202.429 | 69.62           | 0.11               |
|                       | 32199.82 | 6434 | 5.004635 |                 |                    |
| 1994                  |          |      |          |                 |                    |
| patch size (hectares) | area     | NP   | MPS      | % to total area | % to total patches |
| 0-5                   | 5087.541 | 7489 | 0.679335 | 6.89            | 92.15              |
| 5-10                  | 2280.346 | 330  | 6.91014  | 3.09            | 4.06               |
| 10-20                 | 2311.511 | 166  | 13.92477 | 3.13            | 2.04               |
| 20-50                 | 2772.709 | 92   | 30.13814 | 3.76            | 1.13               |
| 50-100                | 1759.077 | 26   | 67.65681 | 2.38            | 0.32               |
| 100-200               | 1180.685 | 9    | 131.1872 | 1.60            | 0.11               |
| 200-500               | 2657.8   | 8    | 332.225  | 3.60            | 0.10               |
| 500+                  | 55776.2  | 7    | 7968.029 | 75.55           | 0.09               |
|                       | 73825.87 | 8127 | 9.084025 |                 |                    |

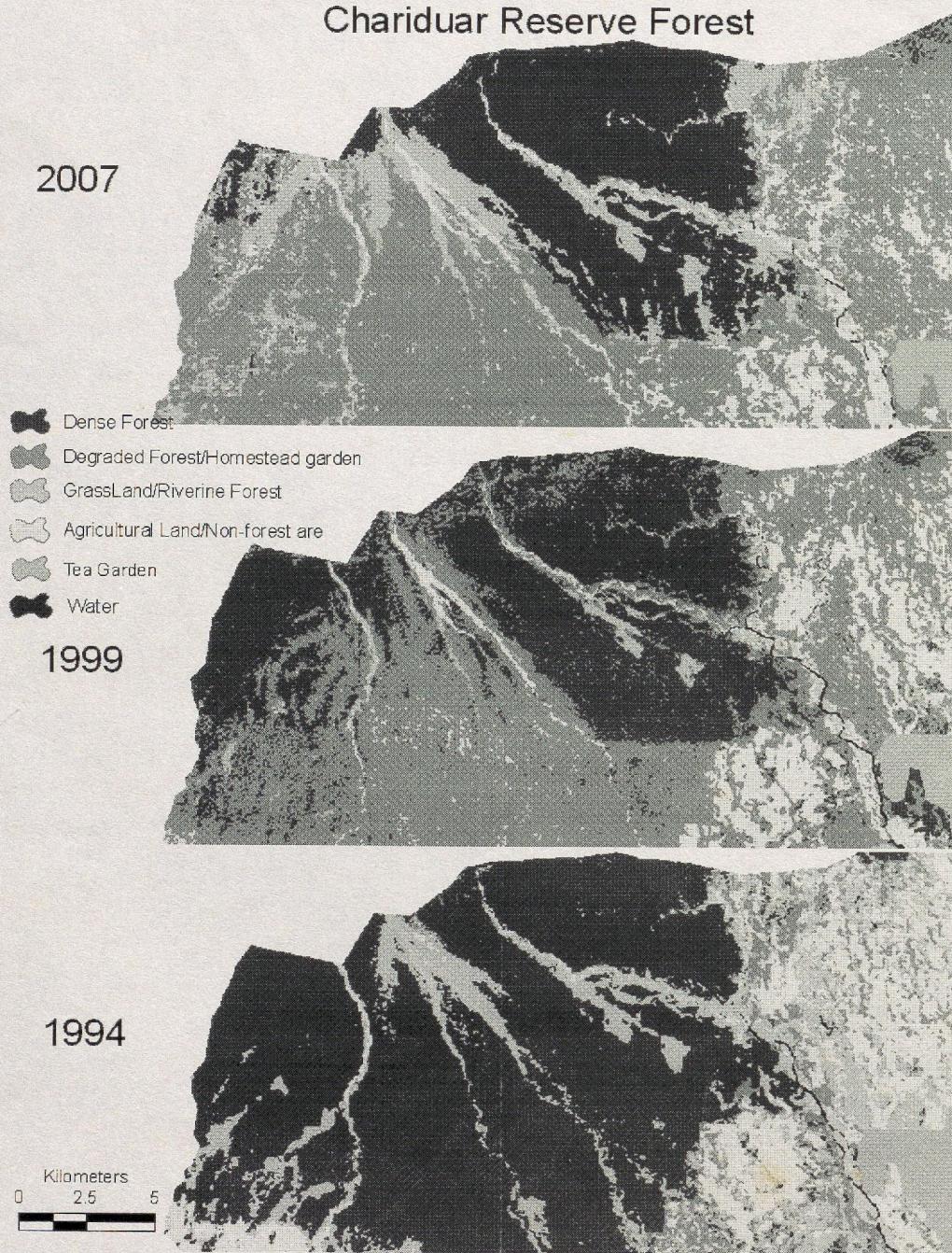
Where, NP= number of patches and MPS= mean patch size (in hectares)

The losses in MPS, NP and the increase in the proportion of smaller size patches within the dense forest category (and conversely the losses in larger patch size classes) indicates a reduction in the quality of the elephant habitat during 1994-2007.

### Forest loss in critical areas:

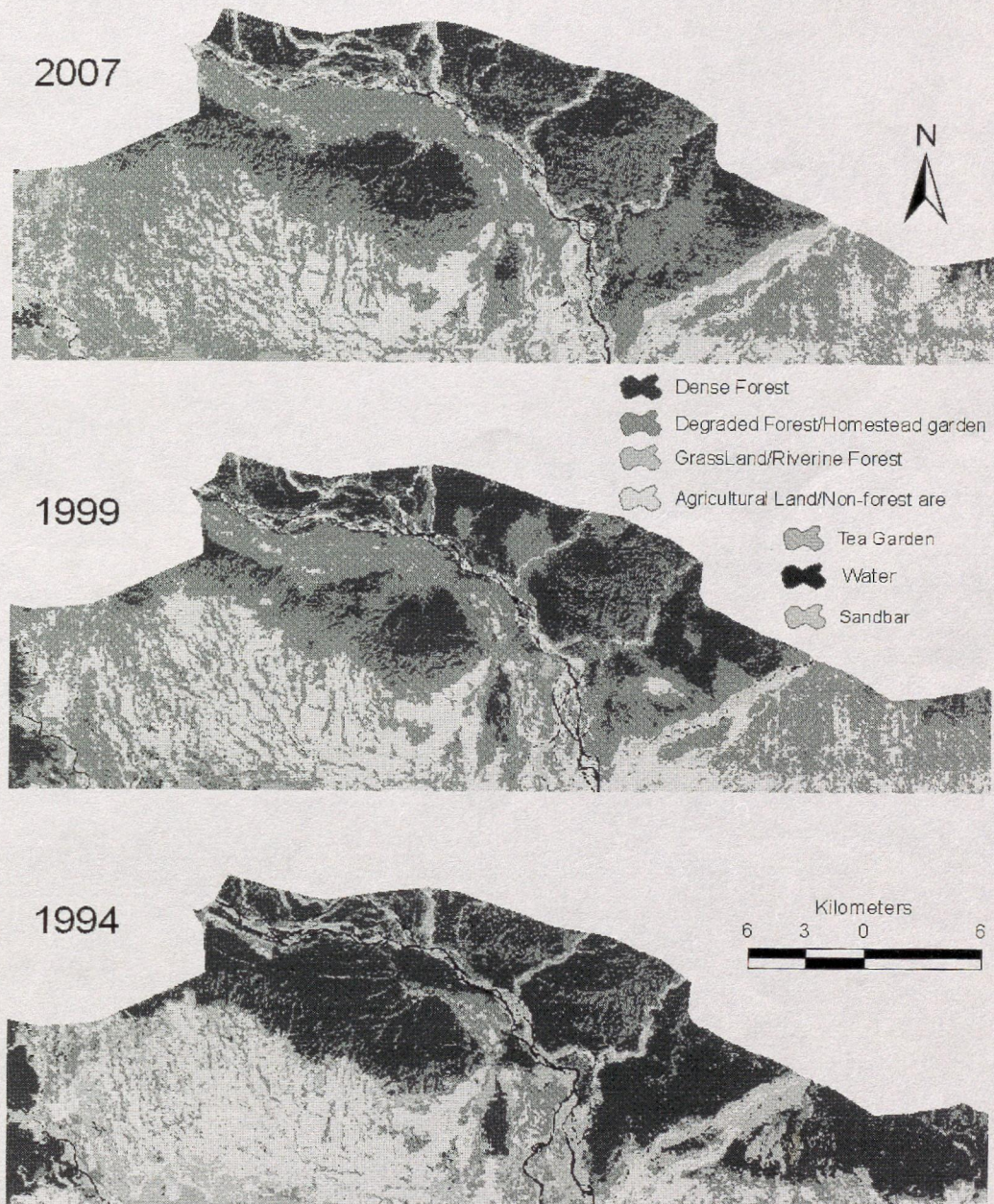
The area under forest has registered a sharp change, and this is particularly disturbing when we consider forest loss specific to the important reserve forest (protected forest) areas. The losses under dense forest of Chariduar over 1994-2007 are as shown below:

### Chariduar Reserve Forest



Chariduar, once the 2<sup>nd</sup> largest reserve forest in Asia, has experienced substantial forest loss and encroachment within its official boundaries is rampant. Forest loss, encroachment and resultant fragmentation of forests has adverse consequences on elephant habitat. Forest loss in Chariduar is indicative of the pattern of land use change across the entire western and northern areas of the district: encroachment, clearing of forest patches for cultivation and expanding homesteads. Human elephant conflict (HEC) naturally follows in its stead. As observed elsewhere, HEC occurs in the fringes of forest/ protected areas “ where natural vegetation gives way to increasing human density and cultivation” (Sitati and Walpole,2006).

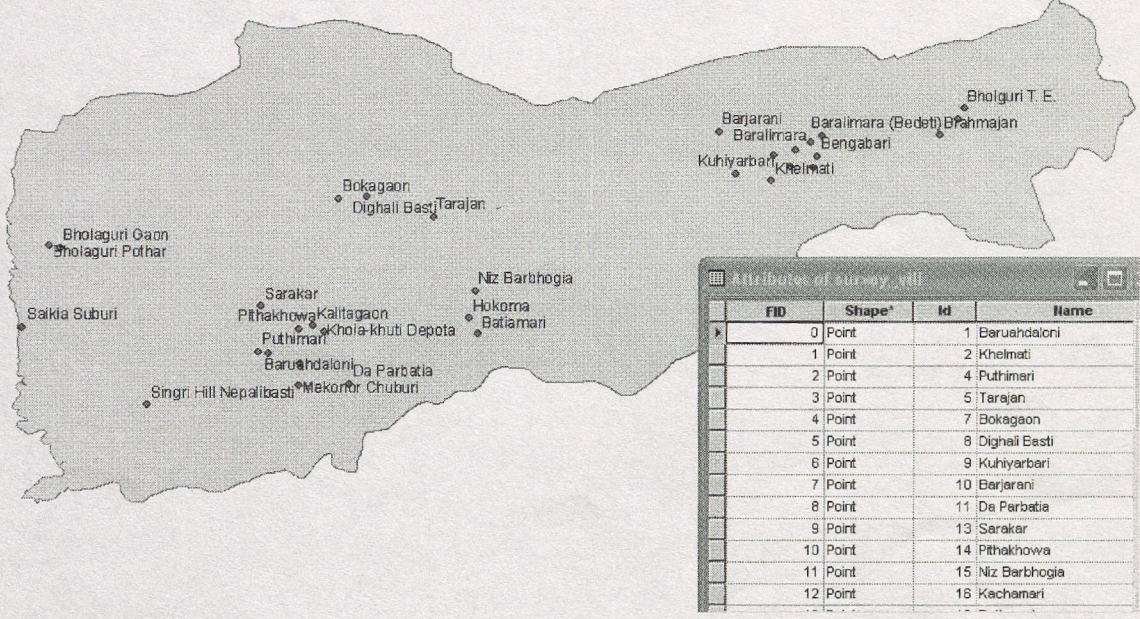
### Nameri National Park / Balipara Reserve Forest



As with Chariduar, the loss in dense forest area in the Nameri/ Balipara protected areas is quite stark. In the maps above, the Bhareli river separates the Balipara Reserve Forest (to its left) from the Nameri National Park (to the river's immediate right).

**Primary survey to gauge local perceptions of villagers affected by HEC**

A primary survey was carried out in 28 sample villages to gauge perceptions of villagers regarding/affected by HEC. A questionnaire along the lines of that used by the IUCN's African Elephant Speciality Group, with certain modifications was used.



Excel tables were linked with the GIS

| Village Name           | Location (Dist from Tezipur/nearest town in KM) | HEC since when | Duration of Crop raiding (in months) | Peak Period | Number of raiding days per month |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |
|------------------------|-------------------------------------------------|----------------|--------------------------------------|-------------|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|---|----|--|--|----|---|
|                        |                                                 |                |                                      |             | Jan                              | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |  |  |   |    |  |  |    |   |
| Bholaguri T. E.        | 8                                               | 2              | 2                                    | Dec-Jan     |                                  |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |
| Bedeti (2 No Baralima) | 32                                              | 8              | 3                                    | Oct-Jan     | 15                               |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |
| Bholaguri gaon         | 4km Chanduar                                    | 7              | 3                                    | Nov-Dec-Jan |                                  |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |
| Khelmati               | 25                                              | 8              | 3                                    | Oct-Dec     |                                  |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  | 15 | 1 |
| Brehmajan (Jalukbari)  | 13                                              | 5              | 3                                    | Nov-Dec     |                                  |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  | 3  | 2 |
| Baralimara 1 No.       | 33                                              | 10             | 3                                    | Sept-Feb    |                                  |     |     |     |     |     |     |     |     |     |  |  |   | 14 |  |  | 20 | 2 |
| Behali (Da Hasti)      | 22                                              | 5              | 3                                    | Oct-Dec     |                                  |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  | 10 | 1 |
| Barjarani (Monobani)   | 27                                              | 10             | 2                                    | Nov-Dec     |                                  |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |
| Bengabari              | 32                                              | 10             | 3                                    | Oct-Dec     | 15                               |     |     |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |
| Kuhiyarbari (Lalpari)  | 25                                              | 10             | 3                                    | Dec-Jan     |                                  |     |     |     |     | 1   |     |     |     |     |  |  | 1 |    |  |  |    | 1 |
| Kachamari              | 5                                               | 8              | 3                                    | Nov-Jan     | 5                                | 1   | 1   |     |     |     |     |     |     |     |  |  |   |    |  |  |    |   |

**Findings from the survey of the villages indicate the following:**

Crop raiding is spatial as well as seasonal. Generally this coincides with the time of harvest and most raids occur during the winter months. Duration of raiding by elephants varied between 2 to 3 months across the villages.

Traditional methods of elephant deterrence were in use. However there was eagerness to adopt alternative deterrence strategies (most of the surveyed villages evinced interest in the chilli-grease fence and chilli-dung brick burning methods discussed; most villages had not heard of these methods). When told that they would need to probably bear the cost of methods by themselves some reluctance was encountered. There is a problem of marketing constraints in the area as well as pointed out members of an NGO, the *Bihaguri Anchalik Banariya Hati Upadrap Surakhya Samity* (an NGO in the Bihaguri area formed for the protection against wild elephants) ; if a mechanism of buy back of their chilli crop could be explored, at reasonable sale rates, the adoption of chilli deterrence would perhaps be more widespread. Discussions were initiated between farmers with an NGO / Trust the Balipara Foundation (BF) if a buy back option could be worked out and whether a particular variety of chilli could be grown by farmers if competitive prices (slightly higher than or at par with the prevailing market rates) could be agreed upon by the farmers and the BF. While the BF would provide the agricultural inputs and know-how, M/s Agriquest Plantations Pvt. Ltd would deal with the marketing and buy-back aspects. The farmers could then use a portion of the chilli produce towards elephant deterrence and sell the rest on a reasonably profitable basis. The chilli growing was positioned as part of a larger package in which development of fisheries and sale of paddy along with some training was envisaged.

Various deterrent methods were in vogue ranging from chasing elephants with fire-lit poles, crackers, use of search lights to arrows. There was mention of the use of country made pipe-guns by 'other villages'. In some villages 'anti-depredation squads' had been formed by the WWF.

Crop raiding seemed to be linked to rainfall patterns. On years when rainfall was below normal as in 2006 elephant sightings were higher than usual and during 2007 when a normal monsoon was experienced across Assam including western Sonitpur, sightings were fewer. Over 36% of villages reported this trend.

Elephant depredation affected cultivation practices in a few villages, where farmers left 30-40 percent of fields fallow, stating that it was useless to cultivate such fields as they were bound to be damaged by elephants and its was futile cultivating such fields. However those fields that were nearby and could be cropped and harvested safe from depredation were cultivated.

During late 2007 crop raids were mostly confined to the foothill areas and elephants had not made an appearance in the villages at the time of writing this report, though they were 'expected' during December-January.

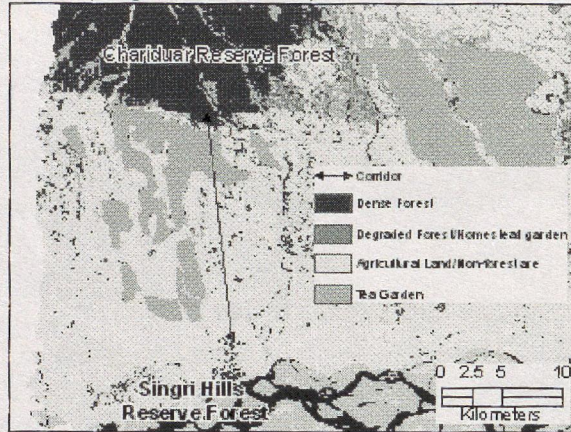
Tuskers ( male elephants are called 'datals') were more difficult to deter and chase from fields than family herds. There was complete unanimity among all the villages surveyed on this count.

Compensation cases were reasonably good in terms of speed of delivery, but the record was a mixed bag. In one case compensation had been received the very next day; while there were instances of no compensation being received at all. Certain villages were unaware that no compensation was liable to settlers that simply encroached/set up villages based on illegal clearing of forest lands.

The main grouse of the villagers seemed to be that elephants were of little use and that methods such as electric fences should be erected to fence them in: the redundance and impracticability of such methods were lost on such opinion holders. Such perceptions are quite normal and have to be seen in the context of difficulties, impatience with slow results forthcoming from human wildlife conflict research in general (Treves, et.al. 2006). [At the same time there was general agreement that loss of forest areas and encroachment/settlements was the major causes of HEC.]

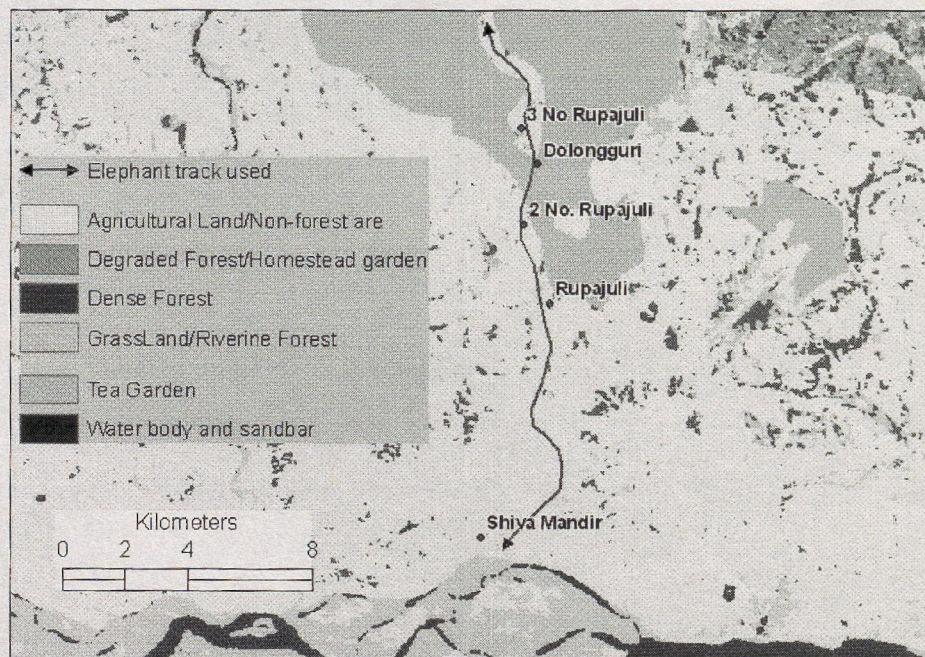
### Elephant Corridors:

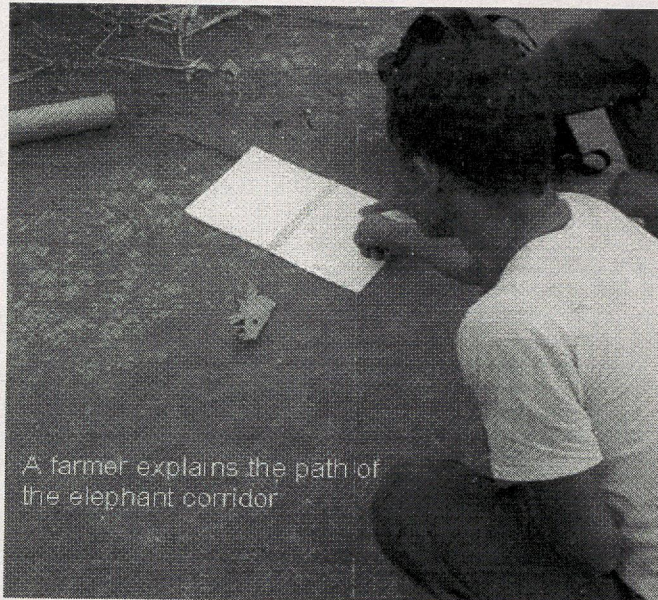
Certain corridors have almost disappeared with the forest cover. A previous study (Tiwari et al. 2005) by a premier institute, the Wildlife Trust of India, pointed out the importance of the Chariduar-Singri Hills corridor (Map shown below).



An earlier corridor (After Tiwari et al., 2005)

Today this corridor has vanished and elephants no longer use the route since the Singri Hills Reserve Forest has all but disappeared and the distance between forest patch has become so fragmentary, with a prohibitive patch distance between them that the elephants simply cannot use it as a corridor. The indication is that a shift of about 10-12 kilometers east of the Singri Hills, centering around Bihaguri (Kalitagaon-Dipota area) en route to the water source at Arimora Sapori has become occurred to become the new corridor, via the Rupajuli-Dolongguri stretch.





A farmer explains the path of the elephant corridor



Taking GPS readings, where a protected forest once existed.



Elephants tracks, pass by the villager (left) and render the land unfit by impacting of the soil.



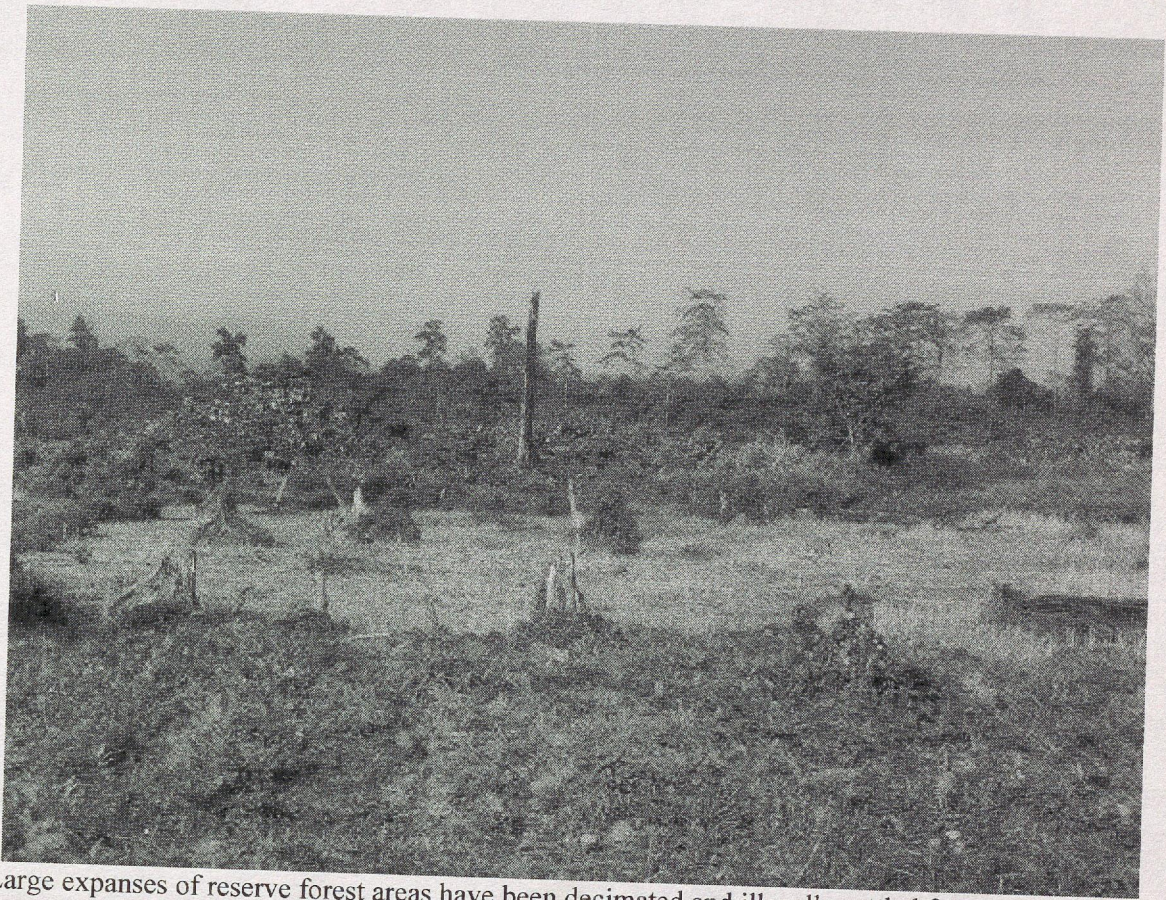
Tree stumps in the Balipara Reserve Forest.



An elephant corridor, from Chariduar Reserve Forest to a sapor (lowland/river bank) that ends at a water source, where cattle during the day and elephants at night share the water.



Sale of firewood (in the fringe of a reserve forest) is easy money and the forest and habitat suffer as humans encroach.



Large expanses of reserve forest areas have been decimated and illegally settled for agriculture.



With residents of a village that has lies in the edge of the corridor. Chilli farming would be acceptable, but at some places, they fear the land is too low-lying for chilli cultivation (stagnant water is injurious to the chilli plant). However most villages would like to cultivate chilli, particularly if some marketing assistance/buy back scheme could be worked out.



This farmer is perched on a tree top at night to protect his crops. Like others, he is unaware that chilli-dung bricks and chilli-grease fences are used profitably as elephant deterrent elsewhere.



Chilli-dung bricks along chilli-grease fences with are an option that needs to be promoted using awareness campaigns. However, experience in other parts of the world shows that farmers need to grow their own chilli for this to be a low-cost option.



Paddy, banana, maize, potatoes and vegetables are damaged in village farms.



### Summing up:

- In India where the density of humans and settlements is high, the point of no return for effective land use planning may have been reached (Riddle, 2007) and while there is no doubt that at the heart of HEC in Assam land-use/land cover change is the chief protagonist the fact remains that this cannot be undone. This is particularly true since political compulsions in evicting encroachers exist and degradation of forest by encroachers is not something that is likely to be easily reverted. However there is an urgent need to maintain status quo in terms of land use-land cover and ensure further losses in forest cover do not result.
- This loss in dense forest to the tune of 43216 hectares (1994-2007) is the underlying cause of HEC in Sonitpur. Dense forest declined from 14% in 1994 to 6% by 2007. Measures to arrest this trend are most urgent.
- Elephant habitat has deteriorated over 1994-2007 in both qualitative and quantitative aspects. Attributes such as mean patch size, number of patches and the increase in the proportion of smaller size patches within dense forest landscape indicates a reduction in the quality of the elephant habitat during 1994-2007. Spatial decline from 14 % to 6% in terms of dense forest completes the quantitative decline.
- Additional encroachments in forest areas must be prevented, since these are the only elephant habitat areas that remain. Stretches in the immediate vicinity of elephant corridors and the foothills areas ~ along with the important reserve forest areas such as the Chariduar and Balipara Reserve Forests ~ need urgent attention.
- Alternative deterrent methods such as chilli fences and burning of chilli-dung bricks as profitably employed in Zambia and Kenya must be used to supplement elephant deterrence. Since the area is home to the world's hottest chilli, the '*bhut-jolokia*' (ghost pepper) the adoption of such deterrence methods needs to be promoted. Hopefully this will reduce methods such as the use of arrows and country made pipe-guns: methods that do more harm than deter elephants.

-o-o-o-

### Acknowledgements:

Noah Sitati, Matt Walpole, Rachael McRobb for various suggestions and Palash Hazarika (Bihaguri Anchalik Banariya Hati Upadrap Surakhya Samity) for sparing considerable time with us during fieldwork. The Forest Department (Sadar Range), Tezpur for providing access to official data. Loki Osborn for sending one of his papers on chilli based deterrents and Dr.S.U.Ahmed for various suggestions.

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**Planned work:**

The data on habitat loss and fragmentation forms the basis of a scientific publication being finalised. It was felt a peer-reviewed publication provided to the Forest Department, Government of Assam this would serve as being more authentic than write-ups in a local daily ~ several such write-ups have appeared in the local press but have had little effect on state policy on HEC and its major driver, i.e. habitat loss.

One of the team members has registered for a Ph.D. on the theme of human elephant conflict in the study area covered by this project and has received a fellowship from the Indian Council for Social Science Research (ICSSR), New Delhi. This will enable him to continue fieldwork in additional villages for a more detailed understanding of the problem and thus the project started by the RSG will continue. A possibility of acquiring additional satellite data from the European Space Agency is also being explored.

Discussions initiated between village representatives and an NGO/Trust to encourage chilli farming (with assured post harvest sale prices & chilli crop buy back options with the assistance of the latter) to facilitate chilli-based deterrent methods will be followed up.

AN ANALYSIS OF THE CHANGING  
PATTERN OF LANDCOVER IN  
SONAI RUPAI WILDLIFE SANCTUARY  
IN SONITPUR DISTRICT,  
NORTH BANK LANDSCAPE

Technical Report



**ASIAN RHINO AND ELEPHANT ACTION  
STRATEGY (AREAS) PROGRAM**

Project Executed by-  
WWF India



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- *Discussion and Suggestion*
- *References*



## The NBL Team

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*In fond memory of our dedicated team member –*

**Pankaj Sarma**

*report prepared by –*

**Amit Sharma**



## ACKNOWLEDGEMENT

We take this opportunity to express our sincere gratitude to all the organizations and individuals without whose support and advice the present progress could not have been achieved in North Bank Landscape.

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## The Study Area

The North Bank Landscape (NBL) lies in North East India (Fig.1), north of the river Brahmaputra in Assam and Arunachal Pradesh and extends up to the northern most limit of elephant distribution. It covers a geographical area of more than thirty-five thousand square kilometers, which is recorded to be one of the richest in the World (WWF) is constituted of nineteen districts in total of which ten are in Arunachal Pradesh and rest are in Assam (considering the old pattern of district structuring).

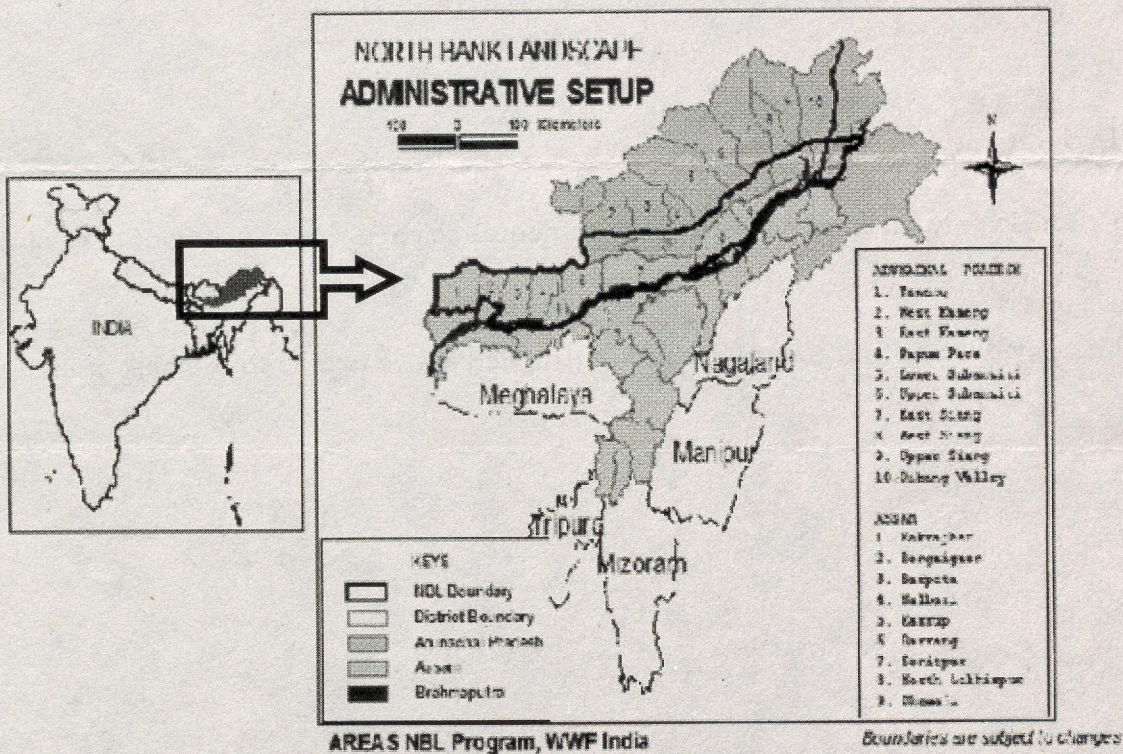


Fig.1: Locational Reference of the Landscape

The present area of interest Sonai Rupai wildlife sanctuary is located in the north-western part of Sonitpur district in Assam adjoining Arunachal Pradesh (Fig.2). The area was declared as a wildlife sanctuary in 1998 with 220sq.kms.; it extends from about longitude  $92^{\circ}20'24''E$  to  $92^{\circ}34'48''E$  and from  $26^{\circ}51'36''N$  to  $26^{\circ}57'36''N$  latitudes. The area is bounded by river Pachnoi to the west and Jia Gabharu to the east, Doimara RF to the north in Arunachal Pradesh and revenue village and Charduar RF of Sonitpur to the south. The sanctuary historically had a very rich biodiversity and is a home to species like the Asian Elephant, Indian Tiger and the White Winged Wood Duck to name a few.

The continuous degradation of the natural environment of this area due rapid growth of

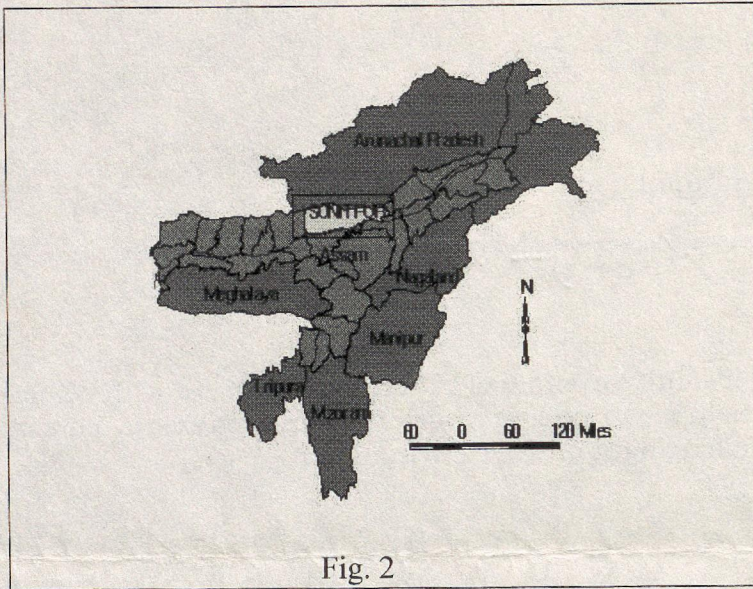


Fig. 2

population and their increasing needs and other developmental activities has led to the need for an accurate, fast and cost-effective measure and environmental management system. Therefore, in the present era of information technology, GIS and Remote Sensing is the best tool for proper and prompt management and monitoring of the degrading natural environment of the North bank Landscape (NBL) and also to protect

and conserve the natural habitat of the Asian elephant, Indian Tiger and the One horned rhinoceros.

## Objective

GPS, GIS and Remote Sensing tools were very effectively put to use the present analysis for the following broad activities –

1. generate geo-database.
2. understand the present Landcover / Landuse status.
3. study the historical pattern of Landcover / Landuse status.
4. analyse and study the pattern of change in Landcover / Landuse status.
5. creation of Thematic outputs.

## Data Used

In NBL multi source data has been used and integrated to a single GIS platform after rectification and processing of the same. Geo-databases of different layers of information has been generated after generating the base maps from existing and reliable sources. Toposheet information of RF 1:250,000 and RF 1:50000 forms the backbone of the spatial data bases. The false color composite (FCC) in the form of geo-coded data have been used to generate broad land use / land cover information for the area. Attribute database has been generated mainly from Ground Surveys and also from reliable Government sources. Data primarily used are -

1. Single season multi-date LANDSAT TM data for the year 1990 (scene corresponding to path –row 136-41).



2. Single season multi-date LANDSAT ETM data for the year 2001 (scene corresponding to path –row 136-41).
3. Single season IRS LISS III data for the year 2005 (scenes corresponding to path-row 111-52 & 111-53).
4. Topographic maps covering the area.
5. Forest boundary maps covering the area.
6. GPS surveys.
7. Primary data generated through field activities.

## **Data Preparation & Methodology**

### **a. Creation of geo-database (Vector)**

The vector layer involving the theme of interest, the notified forest boundary has been generated from base maps prepared from information generated from toposheets and maps from the forest department. The base maps prepared after checking reliability were scanned for creation of the digital database in most of the cases, only for limited cases tablet digitizing method was employed. Raster to Vector conversion processes were carried out after the process of geo-registration i.e.- real world coordinates were assigned. The data was generated using the software R2V and ArcInfo.

### **b. Creation of geo-database (Satellite Data Interpretation)**

The 2001 LANDSAT ETM data has been obtained in geo-referenced and projected format based on WGS 84 datum in six scenes covering the area. The 1991 LANDSAT TM data has been processed using the parameters of the 2001 images as the base. The 2005 IRS LISS III data was also processed similarly. The image processing works has been done using Erdas Imagine and ArcView Image Analyst software to obtain the landcover status for the area.

The standard processes for the analyses of satellite data such as extraction, rectification, enhancement and classification were applied for the study. A normal false Color Composite (FCC) was created by applying appropriate band combinations Band 4 (near-infrared), 3(red) and 2(green) for the data. Subset imagery of above-mentioned area using the respective AOI layers was prepared for further analysis. Unsupervised classification in the different subset imageries for each of the landcover classes was performed.

Ground verification of the classified map was done through field surveys covering the whole length and breadth of the area. The field based information was generated mainly using GPS surveying techniques. Garmin XL12, Etrex and Legend models were used for the field surveys. Based on the results of the groundtruthing the classification was modified to obtain the present output.

### **d. Creation of attribute-database**



The attribute database from multiple sources are maintained and integrated into the GIS data engine using standard standard RDBMS software like Visual FoxPro and MS Access.

The analysis and mapping is done mainly using the ArcView Platform and relevant extensions.

## Data Analysis & Outputs

### Landcover Status & Change

The satellite data for the winter season of 2005, 2001 and 1990 has been analysed and mapped to understand the pattern of Landcover in the area. Two main types are identified for the present analysis, area under forest (green/canopy cover) and non-forest areas. The rivers are also identified. A temporal study for the same sets of data was done to detect changes in the pattern of Landcover in the area and also understand the trends. This will help formulate intervention strategies for planning conservation measures in the area.

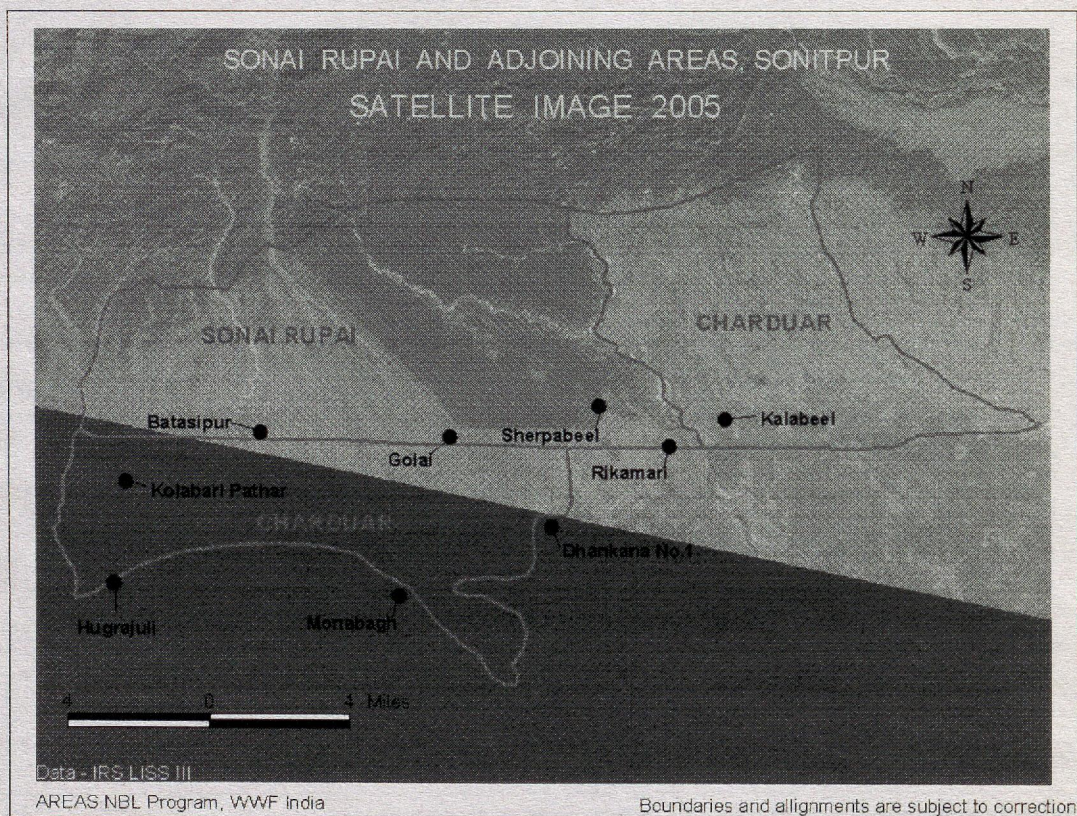


Fig. 3

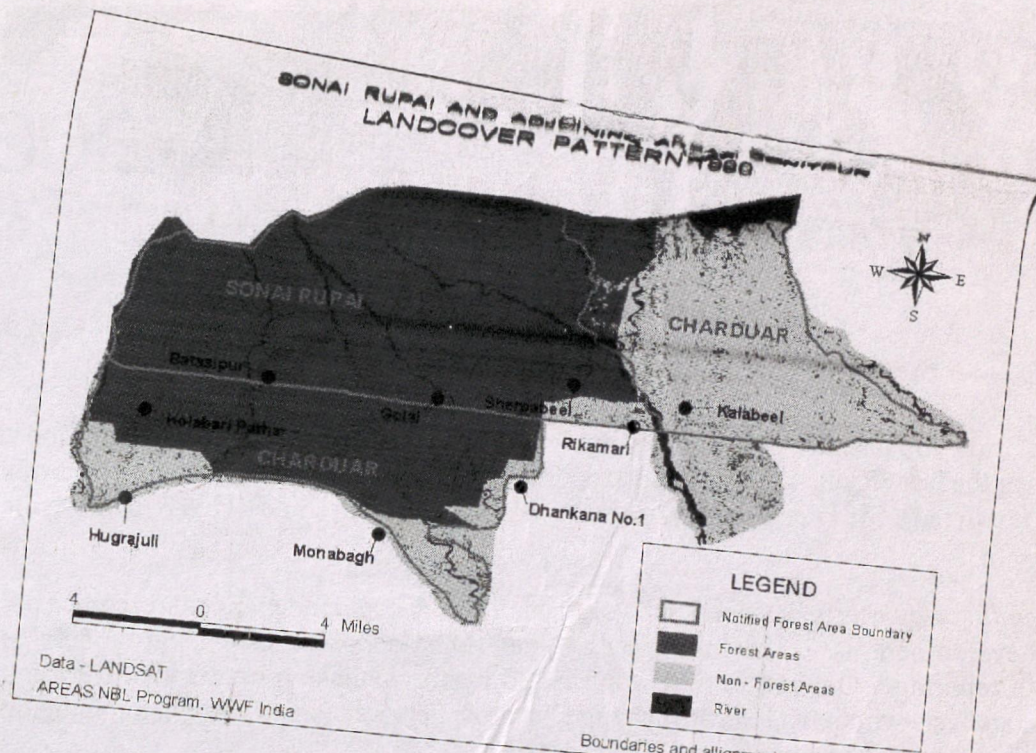


Fig. 4

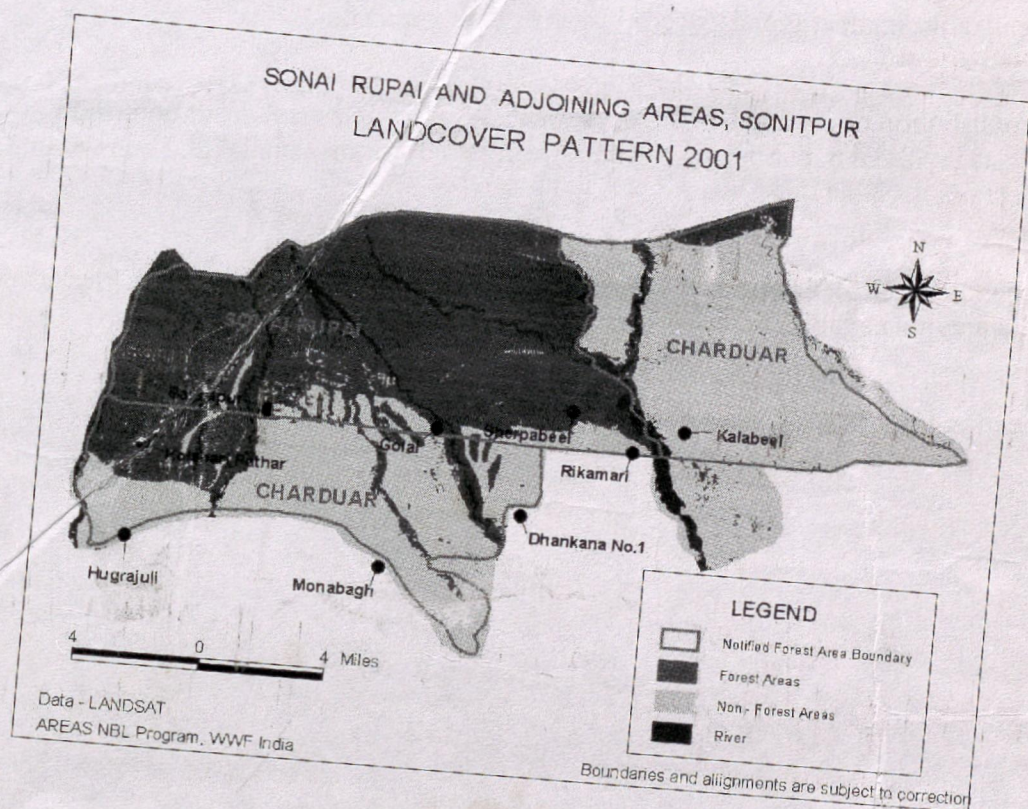


Fig. 5

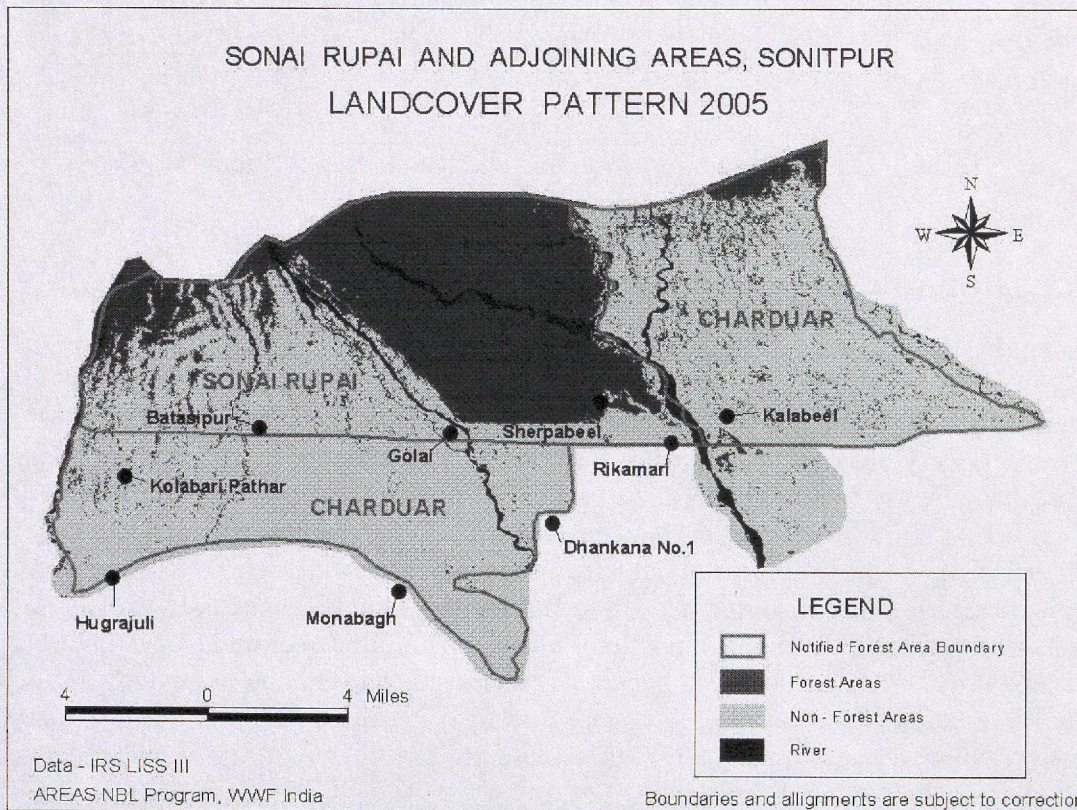


Fig. 6

In 1990(Fig.4), it is seen that the area analysed had a good forest cover and the coverage inside the sanctuary was very high at 97% (Table1). Most of the areas to the east under Charduar RF was already under the influence of human activities and the forest cover was quite low. To the south, which also comes under Charduar RF the status of forest was relatively healthy.

In 2001(Fig.5), the human pressure in the southern portions under Chanrduar RF have become very prominent. Human activities is also seen to have its impact on the sanctuary specially in the central portions (Batasipur and Golai areas). This can be stated to be the starting period of change of landcover within the sanctuary. To the east the forests have further gone down with the influence up to the eastern boundary of the sanctuary along the river. Still the sanctuary had a good forest cover of about 93% (Table1), and the change that had occurred was only about 4%.

In 2005(Fig.6), vast changes are observed even within the sanctuary. A change of about 35% in forest cover is observed during the period of 2001 and 2005 (Table1). It is seen that the forest cover in the central portions as well as the western portions up to the northern boundary is almost gone. Some changes in forest cover are also observed in the Sherpabeel area in the south east portion adjoining the river.

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## Assessment of large-scale deforestation in Sonitpur district of Assam

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The study highlights the deforestation and encroachment in the moist deciduous and other forest areas in Sonitpur District of Assam. The time series analysis of satellite imagery was carried out. Satellite images of 1994, 1999 and 2001 and intensive ground truthing were used for forest type mapping and change detection. Alarming rate of conversion of well-stocked forests into cultivable land was noticed. The spatial distribution of forests showed progressive decline from 1994 to 2001 through 1999. The loss of forest cover was more pronounced between 1999 and 2001 than between 1994 and 1999. This coincides with increased levels of insurgency in lower Assam. An overall loss of 232.19 km<sup>2</sup> of forests was noticed in the Sonitpur District between 1994 and 2001. The study demonstrates unique potential of remote sensing and geographical information system for forest cover assessment and monitoring.

TROPICAL regions around the world are currently experiencing rapid, wide ranging changes in the land cover. The changes in the land cover, in particular the tropical deforestation, have attracted worldwide attention because of their potential effects on soil erosion, run-off and carbon dioxide level<sup>1</sup>. Large-scale deforestation has been reported in India in the past<sup>2</sup>. Forest cover in India has more or less stabilized after 1980 due to ban on clear felling. However, forest degradation and small-scale deforestation still continue. The loss of forest cover in India for the period between 1990 and 2000 is 380.89 km<sup>2</sup>, annually as reported by FAO<sup>3</sup> and 1889 km<sup>2</sup> between 1991 and 1999 as reported by Forest Survey of India<sup>4</sup>.

The state of Assam falls in the tropical climate belt in the northeastern region of India. The state is well known for its rich flora and fauna. Out of 15,000 flowering plants reported from India, 5000 grow in this region. The forest areas form a network of habitat patches in the primarily agricultural landscape of Assam. These forests fall in one of the two mega biodiversity hot spots identified in India, viz. the Western Ghats and the Eastern Himalayas. Recorded forest area is 3.07 million ha, which constitutes 39.15% of the geographical area of the state. According to the legal classification, reserved forests constitute 59%, protected forests 13% and unclassified forests 28% (ref. 4). Agriculture occupies a significant place in the economy of the state and forms the major occupation of the people. The average density of population per

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km<sup>2</sup> in Assam (286/km<sup>2</sup>) is slightly higher than that of the whole country (273/km<sup>2</sup>)<sup>5</sup>. The state of Assam is facing insurgency for quite sometime. Taking advantage of the disturbance, local people have clear-felled large areas of forests in lower Assam.

Monitoring of deforestation in the state using ground-based methods has become a difficult proposition due to insurgency. Satellite remote sensing is a better option under such situations. Temporal images allow detection of land cover changes over a period of time. Beginning in 1972, when the first Earth Resource Technology Satellite (ERTS) was launched by USA, satellite remote sensing has established its use in assessment and monitoring of the forest resources<sup>6</sup>. Its capability to provide real-time data with synoptic and repetitive coverage gives significant advantages over traditional methods. Remote sensing has played an important role in generation of valuable information on the forest cover, vegetation type and land use changes<sup>7-11</sup>. Remote sensing data coupled with geographical information system (GIS), offer good opportunities to monitor regional ecosystem processes in tropical environments that are undergoing rapid change<sup>12</sup>. A large number of studies have been carried out using visual interpretation techniques. Howarth and Wickware<sup>13</sup> have discussed the procedures for environmental change detection. Nelson and Holben<sup>14</sup> delineated the extent of deforestation in Rondonia, Brazil from MSS, LAC, GAC and GOES in order to identify appropriate satellite data for monitoring deforestation on continental scale. Temporal Landsat MSS data have been used to detect changes in forest cover due to shifting cultivation by Miller *et al.*<sup>15</sup> and Eden<sup>16</sup>. Singh<sup>17,18</sup> has evaluated automated methods

for forest change detection. Leucas *et al.*<sup>19</sup> suggested a post-classification change detection technique based on time series analysis of Landsat data. Forest to agriculture conversion and extent of shifting cultivation were investigated earlier<sup>20-22</sup>. These studies relied on visual interpretation technique. In general, visual interpretation technique has been more successful than digital techniques in mapping tropical vegetation<sup>12</sup>. Sader *et al.*<sup>23</sup> have concluded that vegetation diversity and interspersed of land cover are high in humid tropics and spectral reflectance characteristics of mixed vegetation are often not distinct, causing problems in digital classification. The present study was undertaken mainly to highlight the ongoing large-scale deforestation in Sonitpur District of Assam in north-eastern India.

The entire district of Sonitpur, Assam (Figure 1), which falls in 9A and 9B biogeographic zones, i.e. north-east Brahmaputra valley and northeast-northeast hills<sup>24</sup> was covered in this study. The geographical area of Sonitpur is 5103 km<sup>2</sup>. It is located on the right bank of river Brahmaputra within 26°24' and 26°59'N latitude and 92°18' and 93°48'E longitude. Land use in the district is divided primarily among tropical semi-evergreen, moist deciduous, riverain forest, grassland, agricultural land and tea garden. According to Champion and Seth<sup>25</sup>, Sonitpur has east Himalayan moist deciduous forest (I/3/3c/3cb), Assam valley semi-evergreen forest (I/2/2B/C1), eastern alluvial semi-evergreen forest (I/2/2B/2S2) and riverain forest. Moist deciduous forests dominate the forest cover in the district. The temperature ranges from 7°C in January to as high as 38°C in May. The annual rainfall in the district is 2393 mm (ref. 26). Both south-

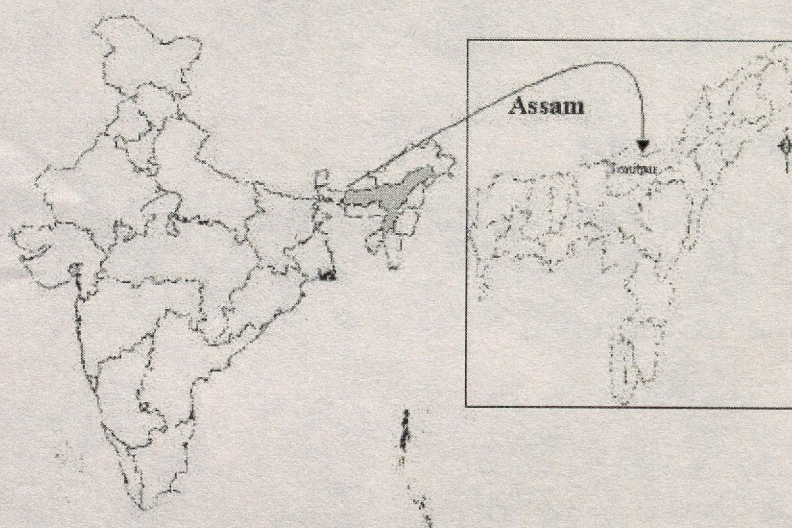
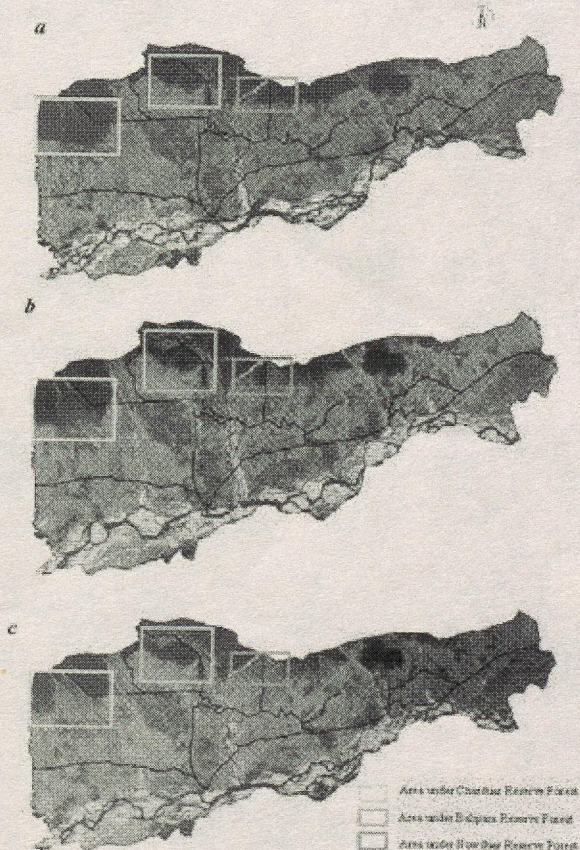


Figure 1. Location of the study area.

**Table 1.** Satellite data used for the study

| Data type       | Path/row  | Date of acquisition |
|-----------------|-----------|---------------------|
| Landsat-TM      | 136-41,42 | 25 January 1994     |
| Landsat-TM      | 136-41    | 27 January 1999     |
| IRS-1C LISS-III | 111-52    | 4 March 2001        |

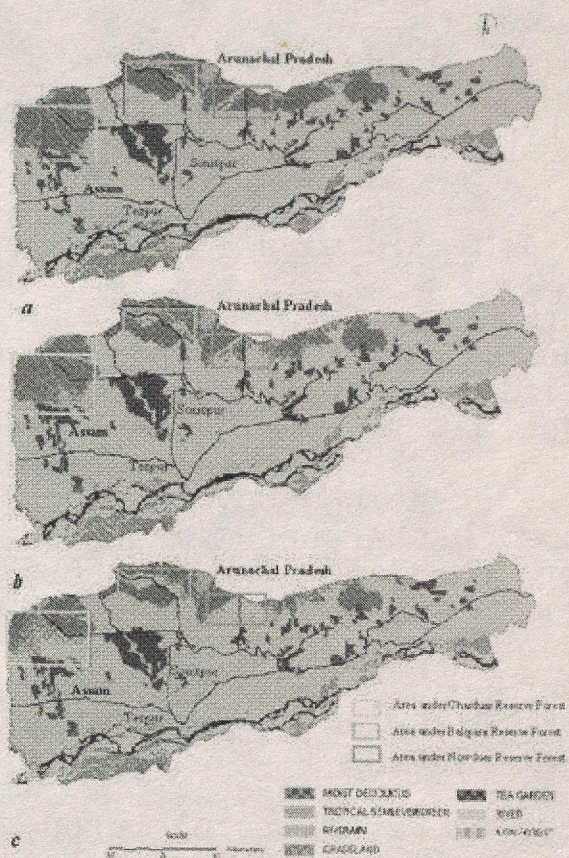


**Figure 2.** False colour images of Sonitpur pertaining to periods *a*, Landsat-TM (136-41/42), 25 January 1994; *b*, Landsat-TM(136-41) 27 January 1999; *c*, IRS-1C LISS-III (111-52) 4 March 2001.

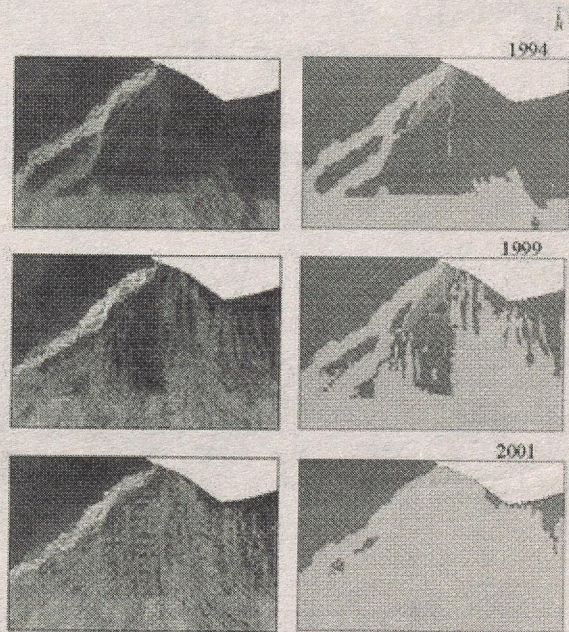
west and northeast monsoons bring rain to this region. Relative humidity ranges from 67% (in March) to 87% (in July)<sup>27</sup>.

Landsat Thematic Mapper and IRS 1C LISS-III digital data pertaining to 1994, 1999 and 2001 were used to monitor the forest cover changes. Details of the data are given in Table 1. Survey of India (SOI) toposheets and Forest Survey of India (FSI) report for Assam were also consulted and used as collateral data.

Ground truthing was done in December 1999 and May 2001. Landsat-TM scene and IRS LISS-III were radiometrically corrected using dark pixel subtraction techni-



**Figure 3.** Forest and other land cover categories in Sonitpur.



**Figure 4.** Subset of area around Nowdara Reserve Forest showing deforestation.

## RESEARCH COMMUNICATIONS

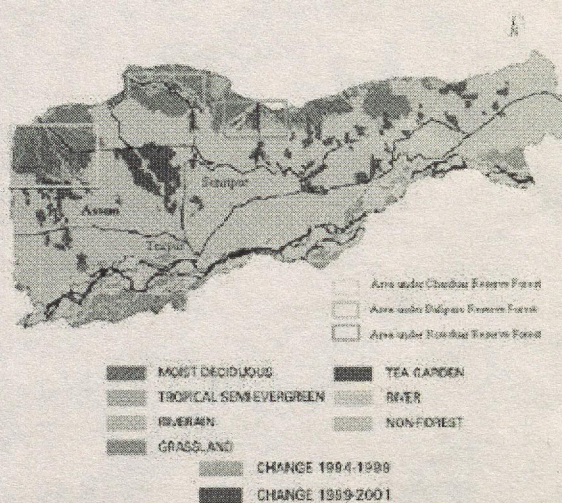
**Table 2.** Area (km<sup>2</sup>) and species composition under different forest and non-forest categories in Sonitpur

| Category                | 1994    | 1999    | 2001    | Net change | Species composition                                                                                                                                                                       |
|-------------------------|---------|---------|---------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Moist deciduous         | 743     | 656.76  | 513.36  | (-) 64     | <i>Terminalia myriocarpa</i> , <i>Duabanga grandiflora</i> , <i>Pterospermum acerifolium</i> , <i>Ailanthus grandis</i> , <i>Bombax ceiba</i> , etc.                                      |
| Tropical semi-evergreen | 59.70   | 59.19   | 57.15   | (-) 2.55   | <i>Artocarpus chaplasha</i> , <i>Dipterocarpus turbinatus</i> , <i>Tetrameles nudiflora</i> , <i>Castanopsis hystrix</i> , <i>Vatica lancaefolia</i> , <i>Terminalia bellerica</i> , etc. |
| Riverain                | 7.65    | 7.65    | 7.65    | Nil        | <i>Bombax ceiba</i> , <i>Terminalia arjuna</i> , <i>Albizia lebbeck</i> , <i>Dalbergia sissoo</i> , <i>Lagerstroemia speciosa</i> , etc.                                                  |
| Grassland               | 249.03  | 251.07  | 250.56  | (+) 1.53   | <i>Saccharum</i> sp., <i>Arundinaria</i> sp., <i>Erianthus</i> sp., <i>Phragmites</i> sp., etc.                                                                                           |
| Tea garden              | 383.24  | 385.28  | 384.77  | (+) 1.53   | —                                                                                                                                                                                         |
| River                   | 658.80  | 658.80  | 658.80  | Nil        | —                                                                                                                                                                                         |
| Non-forest              | 3001.58 | 3084.25 | 3230.71 | (+) 229.13 | —                                                                                                                                                                                         |
| Total                   | 5103    | 5103    | 5103    | —          | —                                                                                                                                                                                         |



**Figure 5.** Forested land converted to agriculture in Nowduar Reserve Forest.

que. They were then co-registered with SOI toposheets using Lambert Conformal Conical projection. Well-identified ground control points (GCP) were taken to rectify the satellite images. Sub-pixel image to map registration accuracy was achieved through repeated attempts. Histogram matching was done to correct the radiometric difference prevailing in the mosaic of the year 2001. The district image was extracted by superimposing the Sonitpur District boundary (Figure 2). The three period images were then visually interpreted on-screen. A classification scheme was developed and the overall number of classes in each case was kept constant. The visually interpreted images were superimposed to detect changes from one period to the other. All operations were carried out using ERDAS IMAGINE software. Phytosociological analysis and Shannon-Weiner index of



**Figure 6.** Map showing deforestation in Sonitpur District from 1994 to 2001 through 1999.

plant diversity were calculated in the respective forest types to assess the loss of phytodiversity due to deforestation.

Figure 2 shows the loss of forest cover with the passage of time. As evident from Figure 3, three types of forest, viz. tropical moist deciduous, tropical semi-evergreen and riverain forest could be identified and mapped from three data sets of different time periods. Three most affected reserve forests in the district are Charduar Reserve Forest, Balipara Reserve Forest and Nowduar Reserve Forest. Figure 4 shows deforestation in Nowduar Reserve Forest. Figure 5 shows a view of actual

**Table 3.** Biodiversity status in different forest/vegetation types of Assam

| Forest/vegetation type | No of samples (N) | Species diversity (H) | Total species | Economically important species | Medicinally important species | Endemic species |
|------------------------|-------------------|-----------------------|---------------|--------------------------------|-------------------------------|-----------------|
| Semi-evergreen         | 25                | 5.45                  | 250           | 105                            | 62                            | 21              |
| Moist deciduous        | 127               | 6.49                  | 640           | 257                            | 179                           | 37              |
| Grassland              | 16                | 2.00                  | 90            | 24                             | 25                            | 01              |

deforestation on ground in Nowduar Reserve Forest. Figure 6 shows change in the reserve forests from 1994 to 2001 through 1999. The results indicate that moist deciduous forests occupy the maximum area in Sonitpur followed by tropical semi-evergreen and riverain forests (Table 2).

The following species composition was noted in different forests:

**Tropical moist deciduous forest:** These forests were found along Arunachal Pradesh border. This type corresponds to east Himalayan moist deciduous forest (I/3/3c/3cb) type of Champion and Seth<sup>25</sup>. The important species in these forests are *Terminalia myriocarpa*, *Duabanga grandiflora*, *Pterospermum acerifolium*, *Ailanthus grandis*, *Bombax ceiba*, *Chukrasia tabularis*, *Albizia odoratissima*, etc.

**Tropical semi-evergreen forests:** These forests were found in the hilly areas of the district towards the north. This type corresponds to Assam valley semi-evergreen forest (I/2/2B/C1) and eastern alluvial semi-evergreen forest (I/2/2B/2S2) of Champion and Seth<sup>25</sup>. The forests are of mixed type, with deciduous upper canopy trees. The major tree species are *Artocarpus chaplasha*, *Dipterocarpus turbinatus*, *Tetrameles nudiflora*, *Terminalia myriocarpa*, *Castanopsis hystrix*, *Vatica lancaefolia*, *Albizia lucida*, *Terminalia belerica*, etc.

**Riverain forest:** This type of forest is confined along the banks of large rivers. The species composition of this forest is *Bombax ceiba*, *Terminalia belerica*, *Albizia lebeck*, *Dalbergia sissoo*, *Terminalia arjuna*, *Lagerstroemia speciosa*, *Zizyphus* sp. etc.

Maximum loss (229.64 km<sup>2</sup>) was noticed in the case of moist deciduous forests and the decline was more pronounced between 1999 and 2001 (143.40 km<sup>2</sup>) than between 1994 and 1999 (86.24 km<sup>2</sup>). An area of 2.55 km<sup>2</sup> under semi-evergreen forest was lost, while riverain forests did not suffer any loss. Nearly all the deforested area (232.19 km<sup>2</sup>) has been converted to cultivable land. The rate of deforestation in the district worked out to be 10.7% from 1994 to 1999 and 20.1% from 1999 to 2001. The overall rate of the forest decline was estimated to be 28.65% between 1994 and 2001, which may be the highest rate of deforestation anywhere in the country. Table 3 indicates these forests are storehouses of rich biodiversity

with high Shannon-Weiner index value, and large number of species of medicinal (27.14%) and economic importance (39.39%). Many of them are also endemic (6.0%). Moist deciduous forest was found to possess highest biodiversity, with a high Shannon-Weiner index (6.49) as well as the maximum number of species (640).

The spatial distribution of different forest types from 1994 to 2001 shows that forest cover in Sonitpur is undergoing massive reduction with time. The district may be devoid of its forest cover in another 10 to 15 years if such a high rate of deforestation goes unchecked. This will of course lead to immense biodiversity loss. The increasing insurgency problem and constant increase in human and cattle population are to be blamed for this. Incidentally, the Supreme Court of India has banned all kinds of clear-felling in the northeastern region from 1996 onwards, with a view to protect the remnant forests. Unfortunately, illegal felling like the one in Sonitpur, still continues. The study shows high reliability and excellent potential of remotely sensed data for mapping and change detection, especially in problematic areas. This correlates well with earlier works on change detection.

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## Pattern of yolk internalization by hatchlings is related to breeding timing in the garden lizard, *Calotes versicolor*

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Pattern of yolk internalization by hatchlings born in early (May–June), mid (July–August) and late (September–October) breeding season in relation to maternal, egg and hatchling sizes was studied in *Calotes versicolor*. The maternal snout-vent length (SVL), body mass, clutch size, clutch mass and egg mass were recorded. Eggs from five clutches each, from early, mid and late breeding periods were incubated at ambient room temperature until hatching. At hatching, SVL and body mass of the hatchlings, and amount of yolk internalized by hatchlings were recorded. The internalized yolk mass of hatchlings was not related to maternal SVL, body mass, clutch mass and hatchling SVL. Internalized yolk mass was positively correlated with egg mass and hatchling body mass. Significantly greater amount of yolk was internalized by hatchlings born in the later part of the breeding season. Production of heavier hatchlings with greater amount of internalized yolk appears to be an important strategy to enhance the fitness of hatchlings of later clutches that have to compete for food with conspecific hatchlings of earlier clutches.

HIGHER vertebrates expedite the growth of their offspring by providing post-natal parental care, especially by feeding the young. Parental care is uncommon among reptiles<sup>1</sup>. However, reptiles aid their offspring's post-natal nutritional state by deposition of extra yolk than actually

required by the developing embryos. The portion of yolk that remains unutilized at the time of hatching (often referred to as 'residual yolk') is drawn into the body of the hatchling before it emerges from the egg<sup>2,3</sup>. The residual yolk represents reserve energy to offspring during their early post-hatching activities<sup>2,4–6</sup>. In turtles, residual yolk serves as reserve energy during their dispersal from nest to water<sup>2,6</sup>.

Inter-clutch variation in the amount of residual yolk is reported in a single species of lizard, *Iguana iguana*<sup>5</sup>. In this lizard, the inter-clutch variation in the internalized yolk is attributed to the difference in the availability of nutrients to the mother. All the previous studies on reptiles concerned with yolk internalization are on species that lay eggs in a single clutch or those have not been examined for the influence of maternal body size, clutch size and mass, and egg size, if any, on the pattern of yolk internalization between clutches oviposited at different times of the breeding season. Hence, the actual consequences of breeding time on yolk internalization are poorly understood in reptiles.

*Calotes versicolor* is a multiclutched lizard and has an extended breeding season (May–October)<sup>7,8</sup>. Therefore, it serves as a good model to study the pattern of yolk internalization by hatchlings from eggs laid at different times of the breeding season. The present study was undertaken to know whether maternal size, clutch and egg size, and breeding timing have any influence on residual yolk mass of hatchlings in *C. versicolor*.

The eggs from gravid *C. versicolor* were obtained during the breeding period (May–October 1999) from surrounding areas of Dharwad city (15°17'N and 75°3'E). The maternal snout-vent length (SVL; cm) and mass of body (g), clutch (g) and eggs (mg), and total number of eggs (clutch size) were recorded for these lizards. The clutches were categorized as early (May–June), mid (July–August) and late (September–October) depending upon the capture of gravid lizards following the procedure described previously by Shanbhag *et al.*<sup>8</sup>. For each

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total elimination of sucrose, accompanied with 1% CO<sub>2</sub> enrichment in the nutrient medium and bright light were detrimental to growth. This clearly shows the inevitability of sucrose in the medium for hairy root cultures of *S. khasianum*. Sugars are involved in the differentiation of xylem and phloem elements in cultured cells<sup>3</sup>. We have observed that growth and solasodine production improved at 3% sucrose, 1% CO<sub>2</sub> and bright light (Figures 5 b and 6). Concentrations higher than 1% CO<sub>2</sub> were seen to inhibit growth (Figure 5). Other research groups have reported similar decrease in secondary metabolite production in cell cultures as a result of high CO<sub>2</sub> concentration<sup>28</sup>. Therefore, by manipulating environmental and nutritional conditions, optimum growth and solasodine production could be achieved in hairy root cultures of *S. khasianum*. This requires a light intensity of 2000 lux at 14 h photoperiod (14 h of light and 10 h of dark), 25°C, 3% sucrose and 1% CO<sub>2</sub> as seen from our results. These conditions can be used to achieve a scale up of solasodine and hairy root cultures in suitable bioreactors.

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## Assessment of habitat loss in Kameng and Sonitpur Elephant Reserves

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**The Kameng and Sonitpur Elephant Reserves in north-eastern India are comprised of trans-border subtropical evergreen to tropical moist deciduous forests of Arunachal Pradesh and Assam. The reserves are facing deforestation and habitat loss in recent years. The present study attempts to investigate the loss of habitat in these reserves using temporal satellite imagery of periods 1994, 1999 and 2002. The on-screen visual interpretation of the three-period imagery revealed alarming and continuous habitat loss from 1994 to 2002. The overall habitat loss was found to be 344 km<sup>2</sup> between 1994 and 2002. The average annual rate of deforestation worked out to be 1.38%, which is much higher than the national average. The rate of deforestation was highest between 1999 and 2002. The study indicated that at this rate much of the forests in the study area would be depleted within the next few years. It also showed that moist deciduous forests, which possess highest biodiversity in Assam, are facing maximum deforestation. High deforestation has resulted in high man–elephant conflicts. The study suggests rehabilitation of affected forests in the larger interest of elephants and biodiversity.**

THE long-term sustenance of wildlife depends on the sustenance of wildlife habitats. Hence, habitat protection and conservation is vital to any meaningful wildlife conservation

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strategy. As human and cattle populations have demographically expanded, their demand for space and resources has increased. There are vast expansions of human habitations, agriculture and the industry at the expense of wilderness areas, especially in developing countries. The encroachment of the natural habitats is one of the most critical issues in wildlife conservation today. The consequences of an ever-increasing pressure of human development are depletion, degradation and fragmentation of habitats, loss of corridors and an increased human-animal conflict to name a few. The Government of India has taken serious note of the situation and embarked upon ambitious conservation-oriented wildlife projects such as Project Tiger, Project Crocodile, Project Hangul, etc. Project Elephant was started on similar lines in 1992, with an aim to provide the much-needed impetus to conservation of Asian elephant (*Elephas maximus*) in the country. Eleven elephant ranges with sizeable elephant populations have been identified for this purpose. They are: (i) Eastern India (9694 km<sup>2</sup>), (ii) North Brahmaputra (4300 km<sup>2</sup>), (iii) South Brahmaputra (4400 km<sup>2</sup>), (iv) Kaziranga (4900 km<sup>2</sup>), (v) Eastern Dooars (3800 km<sup>2</sup>), (vi) Garo Hills (3500 km<sup>2</sup>), (vii) Nilgiri-Eastern Ghats (13,000 km<sup>2</sup>), (viii) South Nilgiri (2400 km<sup>2</sup>), (ix) the Western Ghats (5700 km<sup>2</sup>), (x) Periyar (3300 km<sup>2</sup>) and (xi) Northern India (3000 km<sup>2</sup>)<sup>1</sup>.

There are about 35,000 to 50,000 elephants in Asia, which is one-tenth of the estimated population of African elephants<sup>2</sup>. The elephant is the largest terrestrial mammal in India. There is enough evidence to suggest that the elephant had wide distribution in India in the past. Today its distribution is limited to four widely separated geographical zones, viz. southern India (14,800 elephants), central India (2400 elephants), northern India (1600 elephants) and northeastern India (9200 elephants). The present estimated population of elephants in India is about 28,000, which also includes more than 3000 elephants in captivity in different parts of the country<sup>1</sup>. Elephant reserves seldom contain the full range of natural resources necessary for the survival of a large elephant population and therefore migration across such reserves occurs. An elephant's daily need for fodder is about 250–350 kg. Large animals like elephants are particularly vulnerable to habitat degradation and corridor loss as they migrate over long distances; as much as 50 km, as in West Bengal and north-eastern India or as little as 10–20 km, as in parts of Sri Lanka<sup>3</sup>. Some elephant populations even visit adjoining non-forest areas such as agriculture or human habitations, despite risk of life.

The expanding geospatial technologies, viz. remote sensing, geographic information system (GIS) and global positioning system (GPS) provide the capabilities to acquire, analyse and interpret wildlife habitat information on various scales, time- and cost-effectively<sup>4</sup>. According to the American Society of Foresters, satellite imagery and related technology is one of the top ten advances in forestry in the past one hundred years. Many studies have used remote sensing and GIS for wildlife habitat analysis during the past three

decades<sup>5–11</sup>. A Chinese study in Xishuangbanna clearly demonstrated the potential of integrating remote sensing, GIS and field information for habitat assessment<sup>12</sup>. In Thailand, satellite imagery and GIS have been used to find out the habitat suitability for Asian elephants<sup>13</sup>. IRS 1C LISS-III data were used to study the elephant habitats and corridors in Orissa and adjoining parts of Bihar<sup>14</sup>. The ecological status of elephant corridors in Rajaji–Corbett area in Uttaranchal was evaluated using a combination of remote sensing, GIS and field investigations<sup>15</sup>.

This study covers large parts of the Kameng and Sonitpur Elephant Reserves (KSER), spread in West Kameng, East Kameng and Papum Pare districts, Arunachal Pradesh and Sonitpur and Darrang districts, Assam and aims to present a comprehensive picture of elephant habitat loss and degradation using remotely sensed data of periods 1994, 1999 and 2002. An effort was also made to relate the changes in the habitat to the man–elephant deaths reported from the region. Our earlier study<sup>16</sup> focused on Sonitpur district only and reported an overall habitat loss of 232 km<sup>2</sup> between 1994 and 2001.

The North Brahmaputra Elephant Range covers 4300 km<sup>2</sup> hill forests of Arunachal Pradesh and dooar forests of Assam on the northern side of river Brahmaputra. The KSER boundaries encompass Pakke Tiger Reserve (including Pakhui Wildlife Sanctuary), Eagle Nest Wildlife Sanctuary, Sessa Orchid Sanctuary and reserve forests of Khellong Forest Division in Arunachal Pradesh and Sonai–Rupai Wildlife Sanctuary, Nameri Tiger Reserve (including Nameri National Park), Charduar, Balipara, Nowduar, Biswanath and Behali Reserve Forests in Assam. Parts of KSER falling in Arunachal Pradesh and Assam (26°27'00"–27°07'00"N and 92°01'30"–93°27'00"E) were selected for this study (Figure 1). According to Champion and Seth<sup>17</sup>, the forests in the study area are comprised primarily of sub-tropical evergreen, tropical semi-evergreen, tropical moist deciduous and riverain forest/grasslands. The East and West Kameng districts have 88.56% of their area under forests, while forest area in Papum Pare is 94.74%. Darrang and Sonitpur districts have 13.56 and 19.80% area respectively, under forest<sup>18</sup>.

*Shorea assamica* (sal), *Terminalia myriocarpa* (hollock), *Artocarpus chaplasha* (sam), *Cinnamomum cecicodaphnea* (gonsorai), *Amoora wallichii* (amari), *Canarium strictum* (dhuna), *Terminalia citrina* (hilika), *Dysoxylum procerum* (poma), *Duabanga grandiflora* (khokan), *Mesua ferrea* (nahar), *Castanopsis indica* (hingori), *Endospermum chinense* (phul gamari), *Syzygium cumini* (jamun), *Sapium baccatum* (sellang), *Baccaurea sapida* (morhal), *Vatica lanceaefolia* (moroli), *Morus roxburghii*, *Sterculia hamiltonii*, *Pseudostachyum polymorphum* (baja bamboo) and *Dendrocalamus hamiltonii* (kako bamboo) are some of the species found in the KSER. Elephant, tiger, leopard, clouded leopard, red panda, musk deer, sambar, hog deer, Himalayan black bear, wild dog, fishing cat, jungle cat, slow loris, Indian bison, fox, jackal, Malayan giant squirrel, civet cat,

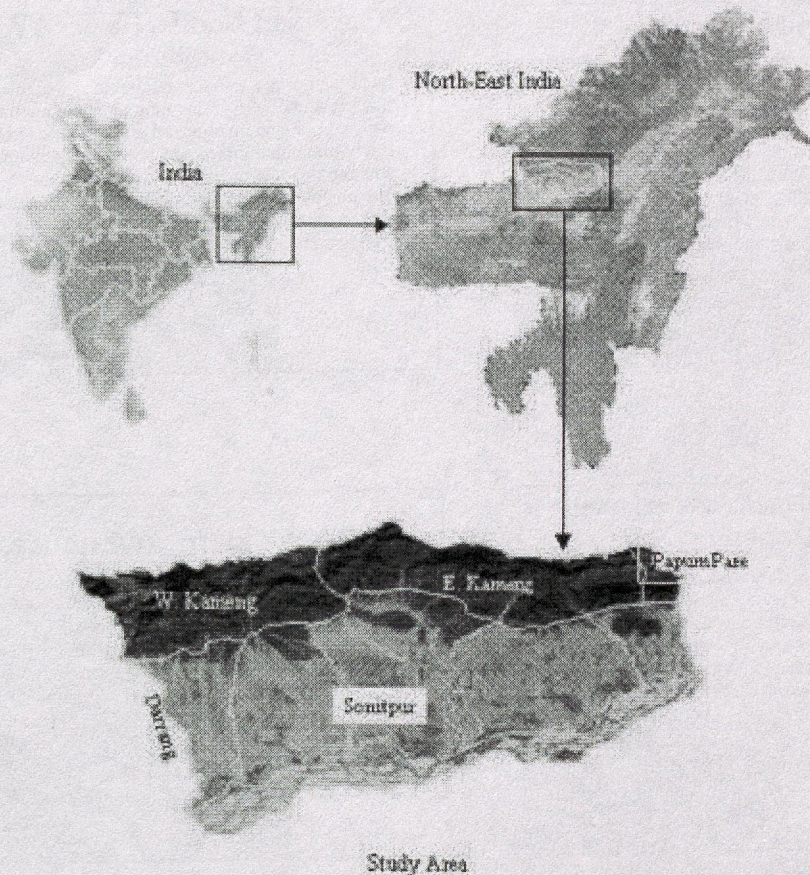


Figure 1. Location of study area in India.

hare, yellow-throated martin, rhesus macaque, capped langur, about 250 varieties of butterflies, 300 species of birds and four species of hornbills have been reported from the study area.

The dooars or foothills in Assam adjacent to Arunachal Pradesh border provide plenty of browse material for large herbivores like elephants. This favourable habitat has been seized and deforested during the past one decade due to a peculiar socio-political problem. The area is dominated by the Bodo tribe, which has been demanding for a separate ethnic Bodo province since long. Since their demand was not met, they resorted to several movements and widespread insurgency in Bodo-dominated districts of Kokrajhar, Darrang and Sonitpur in Assam. One of the consequences of this insurgency is large-scale deforestation and encroachment in forested tracts encompassing reserve forests of Sonai-Rupai, Charduar, Balipara, Nowduar, Biswanath and Behali. Bisht<sup>1</sup> has expressed doubts about the viability of KSER in the light of large-scale deforestation in the area.

Paddy is the major crop cultivated by the present-day occupants of the land. Paddy crop attracts elephants, which in turn devastate farmers' annual food source and

supplementary income. This leads to man–elephant confrontation, resulting in loss of elephant and human lives. About 60% of the elephants in Sonitpur district, Assam and adjoining East and West Kameng districts have been wiped out in the last five years; the most common method of killing is by poisoning. Ninety three persons were killed by wild elephants during 1991–2003 in Kameng–Sonitpur area. During the same period elephant deaths were 52, among which 23 were due to poisoning. In general, more humans and elephants died during 2000–03 (Table 1). Crop and property damage by elephants is worth 2.5 million rupees (US\$ 55,000) per year (Talukdar, pers. commun.). Crop depredation has become a serious problem in the KSER. Presently, elephants are compressed into smaller home ranges and left with little choice for traditional seasonal migration. The resultant increase in elephant densities in the remaining parts of the KSER has led to serious resource competition and habitat destruction. [The Supreme Court of India has imposed a blanket ban on clear felling from 1996 onwards in North East India. However, felling in troubled districts like Sonitpur continues unabated.]

**IMPORTANT!**

## RESEARCH COMMUNICATIONS

The Landsat-TM imagery (for 1994 and 1999) and IRS 1D LISS-III imagery (for 2002) were used (Figure 2). The two images had to be mosaiced to cover the entire study area in case of 1994 and 2002 data. Histogram matching was done to correct the radiometric differences before mosaicing. All imagery were rendered to atmospheric correction using dark pixel subtraction method<sup>19</sup>. Then they were geo-referenced to topomaps and to each other to have high geometric fidelity. The preliminary on-screen visual interpretation of the three-period imagery was carried out to delineate different forest (also referred as habitat here) and non-forest types using ERDAS IMAGINE and ArcGIS. A field visit was made for twenty days to correlate the image characteristics with forest and non-forest categories. A GPS set was used to facilitate ground truthing. Modifications in the interpretation were made after field visit and maps were finalized. The visually interpreted maps were converted to shape files for change detection in GIS environment. Intersect operation was used to generate change maps for the three periods. Information on deaths due to man–elephant conflict was collected from Aranyak, a non-governmental organization at Guwahati, Assam. Information on biodiversity was taken from our earlier work on biodiversity characterization at landscape level in northeastern India<sup>20</sup>.

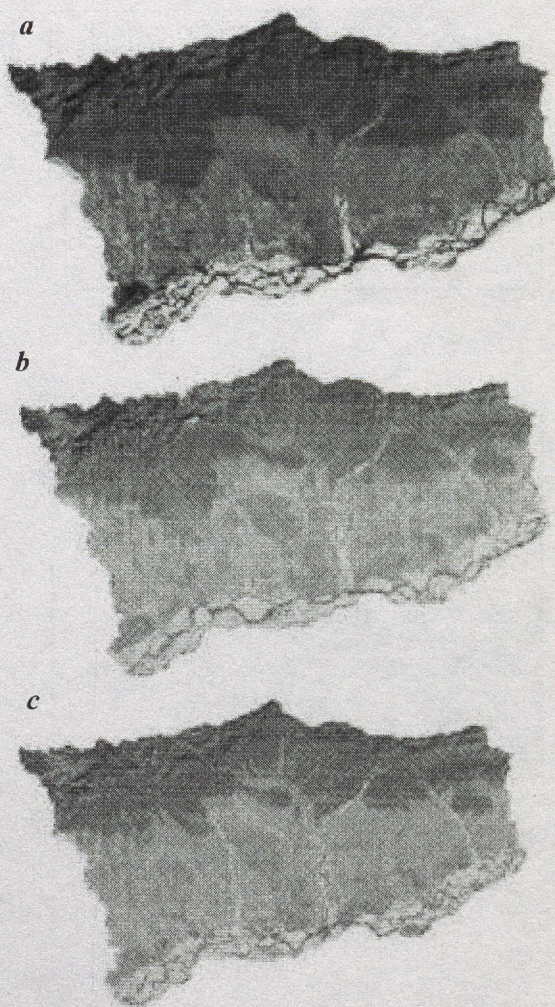
Four types of elephant habitats were identified and mapped from satellite imagery: (i) subtropical evergreen forest, (ii) tropical semi-evergreen forest, tropical moist deciduous forest and (iv) grasslands, distributed from hills (up to 1000 m elevation) to plains (Figure 3). The species composition of these forest types could be found in an earlier study on Sonitpur<sup>16</sup>. The moist deciduous forest is located mostly in the plains. The semi-evergreen forest represents the ecotonal zone between moist deciduous and evergreen forests. The moist deciduous forest was noticed to have suffered maximum loss from 1994 to 2002 through 1999. The loss, however, was more pronounced between 1994 and 1999 (226.76 km<sup>2</sup>) than between 1999 and 2002 (118.32 km<sup>2</sup>).

**Table 1.** Human and elephant deaths between 1991 and 2003

| Year    | Persons killed by wild elephants | Natural death of wild elephants | Elephant death by poisoning |
|---------|----------------------------------|---------------------------------|-----------------------------|
| 1991–92 | –                                | –                               | –                           |
| 1992–93 | 11                               | –                               | –                           |
| 1993–94 | 12                               | 2                               | –                           |
| 1994–95 | 4                                | 1                               | –                           |
| 1995–96 | 6                                | 1                               | –                           |
| 1996–97 | 4                                | 3                               | –                           |
| 1997–98 | 5                                | 2                               | –                           |
| 1998–99 | 3                                | 8                               | –                           |
| 1999–00 | 4                                | 3                               | –                           |
| 2000–01 | 10                               | 7                               | 1                           |
| 2001–02 | 15                               | 2                               | 17                          |
| 2002–03 | 19                               | –                               | 5                           |
| Total   | 93                               | 29                              | 23                          |

The total loss of this category of forest worked out to be 345.08 km<sup>2</sup> (or 45.38%) between 1994 and 2002. The semi-evergreen forest too suffered a loss of 20.44 km<sup>2</sup> between 1994 and 1999. No worthwhile loss was recorded between 1999 and 2002. There was no loss of subtropical evergreen forests, except that 5.55 km<sup>2</sup> got converted into open/degraded forest category.

The results indicate that forest areas in the immediate vicinity of human habitations suffered the most compared to those located away. Nearly all deforestation took place towards the Assam side of the inter-State boundary. The change of 5.55 km<sup>2</sup> dense forest into open forest inside Arunachal Pradesh could be attributed to shifting cultivation and not due to the Bodo problem. The degraded semi-evergreen forest decreased by about 12 km<sup>2</sup> between 1994 and 1999. Degraded deciduous forest increased considerably due to conversion of dense forest—61.23 km<sup>2</sup> between 1994 and 1999 and 20.50 km<sup>2</sup> between 1999 and



**Figure 2.** Satellite imagery (FCC) of (a) 1994, (b) 1999 and (c) 2002.

maybe Balipara, etc. were already gone by then } Does any land sat data exist for loss of forest cover before 1994?

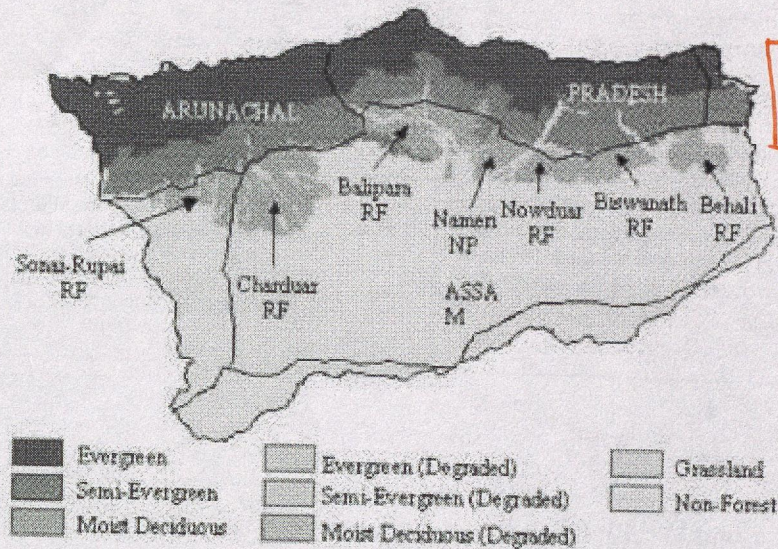


Figure 3. Forest types in the study area.

Table 2. Habitat changes in KSER

| Forest type              | Area (km <sup>2</sup> ) |         |         | Habitat loss/gain (km <sup>2</sup> ) |           |           |
|--------------------------|-------------------------|---------|---------|--------------------------------------|-----------|-----------|
|                          | 1994                    | 1999    | 2002    | 1994-99                              | 1999-2002 | 1994-2002 |
| Subtropical evergreen    |                         |         |         |                                      |           |           |
| Dense                    | 1319.78                 | 1314.23 | 1314.23 | -5.55                                | 0.00      | -5.55     |
| Open/degraded            | 17.69                   | 23.24   | 23.24   | 5.55                                 | 0.00      | 5.55      |
| Tropical semi-evergreen  |                         |         |         |                                      |           |           |
| Dense                    | 977.67                  | 957.23  | 957.00  | -20.44                               | -0.23     | -20.67    |
| Open/degraded            | 22.85                   | 10.62   | 10.22   | -12.23                               | -0.40     | -12.63    |
| Tropical moist deciduous |                         |         |         |                                      |           |           |
| Dense                    | 760.48                  | 533.72  | 415.40  | -226.76                              | -118.32   | -345.08   |
| Open/degraded            | 17.83                   | 79.06   | 58.56   | 61.23                                | -20.50    | 40.73     |
| Grasslands               | 6.23                    | 0.00    | 0.00    | -6.23                                | 0.00      | -6.23     |
| Non-forest               | 4120.16                 | 4324.59 | 4464.06 | 204.43                               | 139.45    | 343.88    |

2002 – thus showing an overall increase of 40.73 km<sup>2</sup> from 1994 to 2002. The 6.23 km<sup>2</sup> grasslands area was altogether lost between 1994 and 1999. The reserve forest-wise loss of habitat was found to be maximum (90%) in Nowduar RF followed by Biswanath RF (70%), Charduar RF (60%), Balipara RF (40%), Sonai-Rupai RF (30%) and Behali RF (10%) in that order (Figure 4). An analysis of the overall depletion and degradation of forests showed alarming trends. While about 344 km<sup>2</sup> area under different forest types was lost between 1994 and 2002, the decrease was much higher in case of moist deciduous forests. Being interface forests, deciduous forests suffered continuous depletion with the passage of time (Table 2). The results reveal an average annual deforestation rate of 1.38%, which is rather too high. The annual rate of deforestation worked out to be higher

between 1999 and 2002 (1.59%) than between 1994 and 1999 (1.31%). The above results indicate that forests are under massive destruction with time and the elephant habitat is decreasing day by day.

The KSER forests historically represent the relatively undisturbed dense climatic climax forests and are located in the East Himalaya biodiversity hotspot of the country. Our study on biodiversity estimated high plant species diversity in evergreen, semi-evergreen and moist deciduous forests of Assam. Highest number of species, genera, families and Shannon-Weaver index of diversity<sup>21</sup> was reported in moist deciduous forests, followed by evergreen and semi-evergreen forests in that order. The degraded forests also showed high species diversity, which indicates that disturbance level till then was not high. The grasslands

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had least diversity. A total of 640 species from moist deciduous, 300 from evergreen and 250 from semi-evergreen forests were recorded (Figure 5). It is unfortunate that the

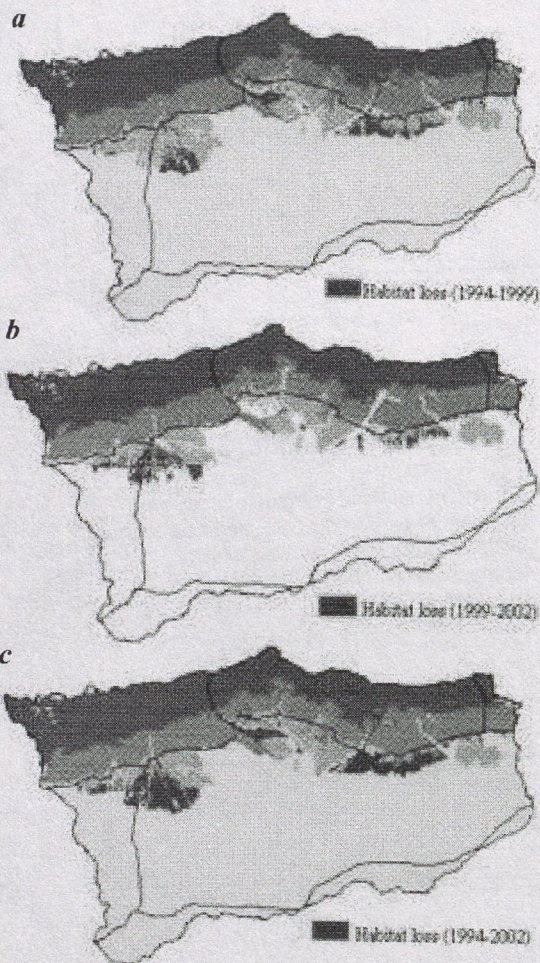


Figure 4. Habitat loss during (a) 1994–99, (b) 1999–2002 and (c) 1994–2002.

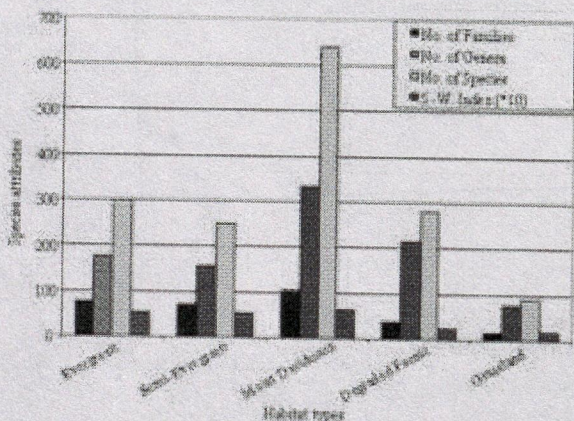


Figure 5. Species richness in the area.

forest having highest diversity is being lost with the highest rate.

The once vast home ranges of the elephant are now being depleted, degraded and fragmented into smaller habitat islands due to intense pressure on such ranges in many wildlife habitats of India, and elephant habitats are no exception. A wide-ranging animal like elephant requires vast areas for fodder and healthy survival. The compression and fragmentation of the habitat leads to lesser availability of fodder, increased risk of poaching and inbreeding among various elephant groups. Some elephant reserves like KSER are shrinking so fast that elephants may not even get sufficient time to get used to it. Elephant groups have been noticed roaming in the area, especially during night, even after the habitat is deforested. A possible reason for their continued use of the habitat even after deforestation could be their liking for paddy crop growing in their habitat. Elephants are also attracted by the country wine prepared from rice by local people. Either way they risk their lives and often get killed. As clear from Table 1, a correlation was noticed between deforestation and the number of human and elephant killings. The number of people killed during 2000–03 has constantly increased. The number of elephants killed rose sharply during 2001–02, which coincides with the maximum deforestation phase. More humans were killed by elephants than vice-versa.

Restoration of the habitat seems to be the only solution for any effective elephant conservation and human–wildlife conflict mitigation. This should be possible through rehabilitation of forests. Any further deforestation and encroachment in the KSER should be effectively resisted. The two reserves should be regularly monitored in future using remote sensing to detect the loss of the habitat due to human activities or natural calamities. The study demonstrates high potential of remote sensing and GIS technologies for wildlife habitat monitoring.

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## Ca and Sr dynamics in the Indo-Gangetic plains: Different sources and mobilization processes in northwestern India

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**The leachable fraction of the sediments from the Thar Desert fringe and the adjacent Ganges alluvial plains, has been studied to determine the sources and the processes responsible for the mobilization of Ca and Sr using Sr isotopes and Ca/Sr ratios. In the desert the leachable fraction of the soil/sediments is probably derived from mixing of old marine carbonates, microfossils with the sea-spray of the Arabian Sea and rainwater. Aeolian reworking of soil carbonates of this mixed origin could have provided the carbonate found at the desert fringe. The sub-humid zone of the Gangetic plains, just outside the desert fringe, has relatively higher <sup>87</sup>Sr/<sup>86</sup>Sr ratios with lower Ca/Sr ratios, indicating silicate weathering as the major contributor of leachable fraction. The spatial geochemical differences could also be related to the ineffectiveness of dust transport and accumulation processes in the humid Ganga plain. The <sup>87</sup>Sr/<sup>86</sup>Sr ratio of the present-day dust leachate from the polluted city of Delhi indicates that its Sr source is petroleum burnt residues.**

WE studied the sediments of the Thar Desert and Ganga plains for their sources and found that the Himalayas have been playing a dominant role in supplying sediments for these two geomorphic entities<sup>1</sup>. During the course of the Sr and Nd isotopic studies of the sediments, we leached our samples with dilute hydrochloric acid to separate carbonates and other authigenic phases from the samples<sup>2,3</sup>. Besides studying silicate chemistry, we also analysed the leachates for their <sup>87</sup>Sr/<sup>86</sup>Sr isotopic composition. Because Sr replaces Ca in mineral structure, it can be used as a tracer for the source of Ca<sup>4</sup>. When we combine this information with Ca/Sr ratios of the leachates, we find that we have a powerful tracer pair to distinguish between different sources for the leachates. Such a geochemical approach can provide important information on the sources of calcium in various surface and ecosystem studies as shown by various investigations<sup>5–7</sup>.

The main sources which may supply Ca to the ecosystem could be weathering products of silicates and carbonates, sea spray and rainwater<sup>7–9</sup>. Besides the local sources, dust derived from a long distance could also provide Ca to the

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