Progress Report

2007

ONE HORNED RHINOCEROS CONSERVATION IN MANAS TIGER RESERVE

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Preface

With the initiative of Assam forest department, International Rhino Foundation and WWF, a mega rhino conservation programme was started in July 2005 in Assam globally known as Indian Rhino Vision-2020. The programme aims to increase the rhino population from 2000 to 3000 numbers at the end of 2020 by translocation and increasing security scenerio to the species. Initiative was taken to involve all the stakeholders working for rhinoceros conservation under one umbrella. As the programme selected Manas as first choice of translocation site, different types of short term and long term strategies are needed. Being a partner of Indian Rhino Vision-2020 and our involvement as a researcher and conservation worker in Manas tiger reserve since 2000 we also involved in campaign to raise fund for the work. It is nice to see that Peoples Trust for Endangered Species came forward to support our programme through International Rhino Foundation. Several sad incidents like death of Dr. Thomas Foose of IRF and other conservationists involved in Indian Rhino Vision-2020 and constrains in preparation of rhino translocation delayed the programme. Although we started our works in 2006, due to non availability fund the work was suffered. We received the PTES fund on March 2007 from Dr. Nico Van Strein of IRF which helped to continue the project work smoothly.

Acknowledgement

I would like to thank Peoples' Trust for Endangered Species of UK for the financial support of the project. I also express my sincere gratitude to former Director Late Dr. Thomas Foose of International Rhino Foundation (IRF) for his personal initiative in transferring the PTES grant which was later personally handed over by Dr. Nico Van Strein of IRF to Grasshopper in Guwahati, India. I also would like to thank the forest authority for the necessary permission and infrastructural facilities. Special thanks go to our partners Maozigendri, local Bodo leaders, students union, and teachers of the area.

Habitat information

Based on our earlier research findings, base map and recent satellite image, ground survey was conducted in three ranges of core area of Manas tiger reserve in different seasons. The core area of the tiger reserve is of 519.20 sq. km. and lies in between 90°48′00″E-91°15′00″E longitude and 26°36′00″N-26°49′00″ latitude. The climate of the tiger reserve is found to be subtropical in nature, with temperature lies in between 6º-37º celsious. The coolest period is from late December to early January while hottest season is recorded in the month of May. The average annual rainfall lies in between 3000 mm-4000 mm, attaining peak during the month of July and August that often causes flash flood for brief period. The driest period of the season is in between late February to early March. The topography of the Manas tiger reserve is a flat plain with gently slopes towards southern areas in core zone while some undulating hilly areas at the Indo-Bhutan border led to different kinds of ecosystem formation. There is a well-marked bhabor tract of rocky soil towards the northern boundary that contains sandstone, limestone and shale having very little moisture retaining capacity. The bhabor tract generally remains dry and is characterized by maximum relief, dissection and drainage density amongst all the major streams in this area and is deeply entrenched within it. The flood plains abut against the dissected mountain front of the sub Himalayas. The streams and rivers that become turbulent in the rainy season frequently flood riparian areas. Apart from bifurcating Manas river in Indo-Bhutan border, the core area also comprised of streams like Sukhanjan in west border, Burisuti, Gabharukhonda, Jongrong-Songrong Gyati, Pahumara, Garusora, Rabang, Suti Rabang Doimari, Teklai, Tangunmara, Jia simbu, Mora simbu, Kalpani, Sikari, Madulijora, Sarphuli and Pota at the eastern boundary. These streams and rivers are running through the reserve, carry enormous amount of silt and rock from the foothills resulting in the development of alluvial terraces comprising of thick deposits of mineral particles and detritus overlain with sand and soil of varying depth with shifting river channels and swamps. Highly porous bhabor formation in the northern part as well as terai tract and fine alluvial deposits with underlying pans in the southern parts is typical of the reserve. Except for a few perennial rivers/streams most of the other smaller and shallow water bodies or streams become dry during winter months. This bhabor-terai zone shows characters of dryness of most of the streams even in monsoon period and formation of natural springs in the southern side of the reserve. Of course during rains there are flow of high

speed water though these natural drainage for short period. Besides there are number of standing water bodies, locally known as 'beels' which act as reservoirs for extensive rainy water during monsoon. Most of the water bodies were created by the changing of the river and streams and blockade of the channels. Besides, several small ponds were created by the management authority in different parts of the reserve.

The remote sensing based map generated from the study has indicated the presence of all types of plant community namely evergreen forest, semievergreen forest, mixed moist and dry deciduous forest, tall and short grassland, water bodies in the form of rivers, streams, pond, puddles and small beel or wetland. The investigation indicated that more than 3% area are under encroachment. The core of Manas tiger reserve is mostly covered by mixed moist and dry deciduous forest (52.3%) while less than 1% forest cover is of semievergreen and evergreen nature. Grassland including low lying swamps covers an area of 38%. The study identified ten grassland assemblage or associations namely *Imperata cylindrica, Imperata cylindrica-Saccharum narenga, Saccharum narenga, Saccharum spontaneum, Phragmites karka–Themeda villosa-Saccharum ravennae, Arundo donox, Saccharum ravennae, Phragmites karka – Saccharum spontaneum-Saccharum ravennae, Phragmites karka* and non grass assemblage *Alpinia allughas.* The investigation showed that the grassland assemblages were distributed in diverse altitude generally ranging from 57 meters in southern boundary to 280 meters in northern upland. Well developed upland grassland are covered by *Imperata* and *Narenga* based associations where as preferred rhino habitats in the low lying grassland are comprised of associations dominated by *Phragmites karka, Themeda villosa, Saccharum ravennae, Arundo donox and Alpinia allughas* type species. Riparian grassland is mainly covered by *Saccharum spontaneum.*

The former rhino habitats are distributed mainly in the eastern part i.e Bhuyanpara range of the core area mainly dominated by low-lying tall grassland assemblage having a height of 3-4.5 meters comprised of *Phragmites karka, Phragmites-Themeda villosa-Saccharum ravennae, Phragmites-Themeda villosa-Alpinia allughas* and *Saccharum spontaneum* including pure *Alpinia* patch. Preferred swamps and wetlands are also identified. Several perennial stagnant water bodies generally adjacent to streams were characterized by complex hydropseral stages even in small areas. These habitats were comprised of free floating hydrophytes, suspended

submerged hydrophytes, anchored submerged hydrophytes, anchored hydrophytes with floating leaves, anchored hydrophytes with floating shoots, emergent amphibian hydrophytes and wetland species. The common aquatic plants in the former rhino habitat are *Vallisnaria spiralis, Ottelia dismoides, Eichornia crassipes, Trapa nutans, Pistia stratiodes, Ceratophyllum demersum, Limnophylla sessiliflora, Vallisnaria spiralis, Nymphoides cristatum, Nelumbo nucifera.* With increase of terrace height, several emergent amphibian hydrophytes like *Polygonum posumbu, Typha elephantine, Monocharia hastata, Hygroryza aristata, Leersia hexandra, Ipomoea aquatica* spreaded in the area. Besides several wetland short sedges/grass like *Cyperus brevifolius, C. digitatus, C. killingia, C. iria, Scirpus juncoides, Scripus grossus, Panicum paludosum, Paspalum conjugatum, Carax spiculata,* young *Phragmites karka, Arundo donox,* and non grass species *Lasia spinosa, Polygonum hydropiper, P. barbatum, Alpinia allughas* are distributed in the system. The wet tall grass *Phragmites karka* and *Arundo donox* along with non grass hydrophytes are highly competitive in the aquatic ecosystem present in the grassland areas. They even invaded on the dead remains of the different hydroseral stages. *Arundo donox* even found with submerged and free floating hydrophytes. The distribution of aquatic species is based on the depth of the water as well as microhabitat condition. The hydro-seral stages of the aquatic body could be related to the formation of wet grass community and swampy forest as a result of very long term temporal change. While presence of swampy forest was indicated by presence of wetland species like *Alpinia* and *Calumus* as undergrowth, dominant tall wet grassland formation was confirmed by presence key grass species cover adjacent to aquatic community as well within it.

Food Plants

Based on the field observation in Orang national park having a rhino population of 78 numbers and earlier information several plant species were identified as potential food plants of Indian rhinoceros. It may be mentioned that Orang national park is very much similar with Pabitora wildlife sanctuary and Kaziranga national park in terms of habitat i.e floodplain of Brahmaputra river. The important food plants are namely *Arundo donox, Phragmites karka, Sacchrum ravennae, Cynadon dactylon, Imperata cylindrica, Hymenachne assamica Saccharum spontaneum, Alpinia allughas.* Besides they select young shoots of various trees like

Dalbergia sisso, Ziziphus jujuba, creeper like *Mikania micrantha,* fruit of trees like *Trewia nodiflora.*

Micro habitat status of in the rhino enclosure area in Manas.

About 2 sq. km. of the Bansbari range of Manas was specially surveyed. We found two major grassland associations namely *Saccharum narenga* (*2.5* meter tall) and *Imperata cylindrica* in uplands. It also included perennial stream - Kasimdoha known to be a former rhino breeding site in Manas. It is near to a forest camp (Gahari farm) having two plots (250m long &150m wide, the connecting side of each plot has a wideness of 70 m, GPS point --26•40′43"N, 91•00′37"E & 26•40′31"N& 91•00′48"E) connected by a small corridor. It was prepared to keep three rhinos of the rescue center near Kaziranga NP. The grassland in the plot as well as surrounding areas is dominated by *Saccharum narenga* while *Themada villosa, Alpinia allughas* are also scattered in aquatic environment. A small seasonal branch (26•40′32"N 91•00′51"E) of another stream (approximate 5 m wide, 260m long inside the plot and 1 meter deep of water in December) Gyati is passing through the first plot. One rhino was translocated on 2006 followed by another two numbers on 2007.

Undergrowth vegetation in the Forest

Although one horned rhinoceros prefer wet tallgrass community, it also used forest patch in different occasion. Considering these we also surveyed the undergrowth vegetation. The undergrowth forest community of Manas is mainly comprised of sciophytic species like *Phlogocanthus thyrsiflorus, Litsea salicifolia, Adhotoda vasica, Piper mullesua, Mimosa himalayana, Murraya koenigii Clerodendron viscosum, Glycosmis arborea, Costus speciosa, Blacknum orientale, Piper diffusum, Zingiber zerumbet, Setaria pallida* in the moist forest. The forest floor of the dry deciduous and disturbed forest was covered by mainly heliophytes like *Chromaelaena odorata, Leea asiatica, Ageratum conyzoide,s Tephrosia candida, Crotolaria sissilifera etc.* The forest floor with high moisture content was quickly covered by fern *Dryopteris palaecea* having moderate logging pressure. On the other hand, the swampy forest floor is mainly covered by cane like *Calamus floribundus* as well as wetland non grass *Alpinia allughas.* The presence of grass *Paspalum conjugatum* indicated bhabor zone having moderate moisture and shade condition in the forest floor. The riparian bed was naturally covered by *Saccharum spontaneum, Leea asiatica, Chromalaena odorata, Tephrosia candida,*

Dryopteris palaecea, Crotalaria sp., along with tree sapling like *Bombax ceiba, Lagerstroemia parviflora, Dillenia pentagyna, Callicarpa arborea* and *Dalbergia sissoo.*

Present Management Constrains

Grassland Burning Perspective

Annual burning pattern has been playing a major role in the temporal dynamics of the grassland community. The investigation indicated that intensity of the burning percentage of grassland was depended on the soil moisture of the area. The soil moisture in the upland areas reached significantly low level in dry season causing higher to severe burning (65-100% of the respective patches) of *Saccharum narenga* and *Imperata cylindrica* dominated assemblages whereas grassland assemblages of the low lying and swampy habitat showed low percentage of burning (10-40%) or remained unburned. The riparian assemblage of riparian areas showed moderate burning (45-55%) due to diverse water holding capacity of the sand bars. The presence of control burning is very limited. Due to diversity in moisture content and presence of streams including natural water bodies some control of illegal burning was noticed. In the year 2007, grassland in Panbari range was severely burned as we always observed since 2000. There is improvement to keep the burning percentage low in central zone that is Bansbari range but areas adjacent to southern boundary could not be saved of anthropogenic burning (shown in the map) while the low lying Bhuyanpara range naturally observed very low percentage burning due to high moisture content of the biomass.

Grassland Invasion

High intensity of invasion by non grass tree *Bombax ceiba* was observed in *Imperata cylindrica*, *Saccharum narenga*, *Imperata cylindrica-Saccharum narenga*, *Saccharum spontaneum* assemblages in response to various disturbance situations like burn, burn-cut and burn-cut-external grazing while in disturbance free condition there was slow growth of the already existing saplings of the invasive species. Highest increase of the invasive species was noticed in *Saccharum narenga, Saccharum narenga-Imperata cylindrica, Saccharum spontaneum* assemblages in large gap areas created by cumulative disturbances. Maximum increase of other non grass species like undershrubs *Leea asiatica* and *Chromolaena odorata* were noticed in the gap areas created by different disturbed conditions in the grassland of the Manas tiger reserve. The *Leea asiatica* is generally known to spreads through underground

propagules and locally fills up the gap areas formed each year by continued disturbances, while Bombax have advantage of seeds attached to cotton ball that spreads through high speed wind. The preferred rhino areas i. e Bhuyanpara range mainly dominated by *Phragmites karka, Themeda villosa, Alpinia allughas* type species was also gradually invaded by *Chromolaena odorata, Leea asiatiaca* and *Bombax ceiba* in adjacent boundary areas due to excess external biotic pressure. There are some buffalo bathan and almost most of villagers have domestic cattle that graze on the grassland of the tiger reserve. The *Alpinia allughas* also has been decreased due to overexploitation and subsequent invasion by weed species *Chromolaena odorata*.

Status of Infrastructure

The southern boundary needs to be restored immediately by construction of bridges and restoration of degraded roads. There is also need to develop all camps and beats with all facilities before the actual rhino translocation. It may be mentioned that despite well designed security system eight rhinos was poached this year only in Kaziranga national park

Man Animal Conflict

The man animal conflict in the form of crop raids, household and property damage and injury and death by Asian elephant in the southern fringe village is a continued threat. There is no buffer cover on the southern side of the Manas tiger reserve.

Man power

There is shortage of 150 men/forest staffs besides lack of well trained young officials in Manas. Although presently volunteers of Maozigendri have been extending support to the authority in patrolling the reserve, the shortage of well trained permanent forest guards must be fulfilled before the actual translocation programme.

Medical facility

Malaria is the main disease in the foot hills of Indo-Bhutan border. Each year, both forest staffs and villagers suffered badly in monsoon period due to malaria. In 2006, a few cases of death were also reported from the fringe villages. There is no good hospital in the region and people have extra burden of expenditure for better treatment in outside. Last year we lost one of our colleagues Mr. Pankaj Sarma, project officer of WWF-India.

Tourist Pressure

Considering the improvement of law and order situation, excessive tourist flow in the park was observed in 2005-2006. At least 450 plus vehicles entered on 1st January, 2006. Average 50-100 numbers of vehicle entered for successive 2 weeks. Tourists are not aware of the rule & regulation of the national park although forest guards tried their best to maintain the law inside the park. A better management of tourist was observed on 2007.

Logging pressure

There is still logging pressure in Panbari range, while river Beki-Manas has been used for smuggling timber and fuel wood. The smuggler even collected timber from Royal Manas national park, Bhutan. Poachers are still active in some pockets although the security of the park is better in comparison to 1989-2002 periods.

Confidential Information

We got information from one local informer about roaming of two rhinos in the Indo-Bhutan border areas in the February, 2006. Information also revealed that one active poacher tried to get a suitable gun. I already informed the matter to the field director and deputy field director of Manas TR. Meanwhile, on eastern buffer in a site near Disima river stream one boy claimed to have seen a rhino on 2006. The pug mark was photographed by the authority. These incidents indicated that small population of rhinos still exists in Bhutan. There is a need of joint effort of authorities of India and Bhutan for surveying the existing rhino population in Bhutan for future management of the species.

Present Design of Conservation

Our partner Maozigendri-a local NGO succeeded in minimizing logging pressure and poaching in eastern range since 2004. Villagers of fifteen villages in Kokilabari area have actively extended cooperation in these activities. However they have to face tough situations in eastern and western fringe villages in different periods. On western side of Kokilabari local villagers near Satrapa camp destroyed one forest camp on 13th April, 2007 with the encouragement of an owner of Baffalo bathan. The situation was later controlled by the forest authority and local administration. There is also tendency of new encroachment in the Bhuyanpara range (shown in the map) in these areas. Similarly in eastern buffer area the

members of Maozigendri faced threat from local villagers due to restriction of timber felling. A well designed conservation activities are necessary in these areas.

Presently Maozigendri have eighty numbers of volunteers engaged in patrolling with the forest staffs in the eastern side of the core and adjacent buffer zone. They are staying in 10 antipoaching camps of the reserve.

Conservation Initiative

School bags with necessary accessories were distributed to the children of 18 poachers residing in the fringe areas of Bhuyanpara range, Manas tiger reserve. It was distributed during the Sahitya Sabha (a large gathering to discuss various aspect of Language and Literature) of the Bodo community. The children are from eight villages and from six schools having age ranging from 3-10 years. The aim and objectives of Indian Rhino Vision 2020 was focused during the distribution of the school bags. The mega rhino programme was also discussed by us in the opening and closing ceremonies of Manas Centenary Celebration. Besides small awareness campaigns in different villages (seven numbers of meetings) were organized in different periods which found to more effective to spread message of conservation.

We are preparing a conservation material on rhinoceros based on the information on current rhino research in Assam and available literature. It will be modified to simple language and later will be translated to Assamese and Bodo. The material will be distributed in targeted areas in this winter season for rhino conservation awareness and capacity building of local workers.

Resource generation

Training on Plantation crop management was provided to 19 numbers of female and 3 numbers of male participants in Kokilabari area. Each trainee was belongs to either one family of ex poacher or forest dependents. This design was followed as per the discussion with Maozigendri. In kind support like rhizomes of Zinger (Zingeber officinalis), seeds of Pigeon pea (Cajanas cajan) was provided to two self help groups (female) having members 24 numbers and 10 numbers respectively. In this summer, saplings of *Areca catechu* will be also freely distributed amongst the members. The most encouraging thing is that the

participants have come forward for joint effort and working for the resource generation. Each member deposited a small amount to raise a common fund which was used for preparation of soil, bio-fencing and other related cost. One group even gets allotment (one year lease in Kokilabari farm) of land for one year for rice cultivation. These activities although very simple but a new start by forest dependents/families of ex-poachers will significantly encourage the other dependents. Observing the changing of their behavior we with Maozigendri are planning to involve all eighty families of expoachers in different alternative livelihood programmes in phase by phase. For these activities, we are trying to raise additional fund and facilities from other sources.

Other Activities

We supported Maozigendri in writing project proposals for their different programmes.

We attended the meeting of Asian Rhino Specialist Group which was held in Kaziranga National Park in March, 07. In the task force meeting (habitat section) of the group we pointed out an important issue (dropped in the rapid habitat assessment report) the silent threats of invasion of *Leea asiatica* and *Chromolarena odorata* in rhino habitat of Manas as well as their low cost management strategies.

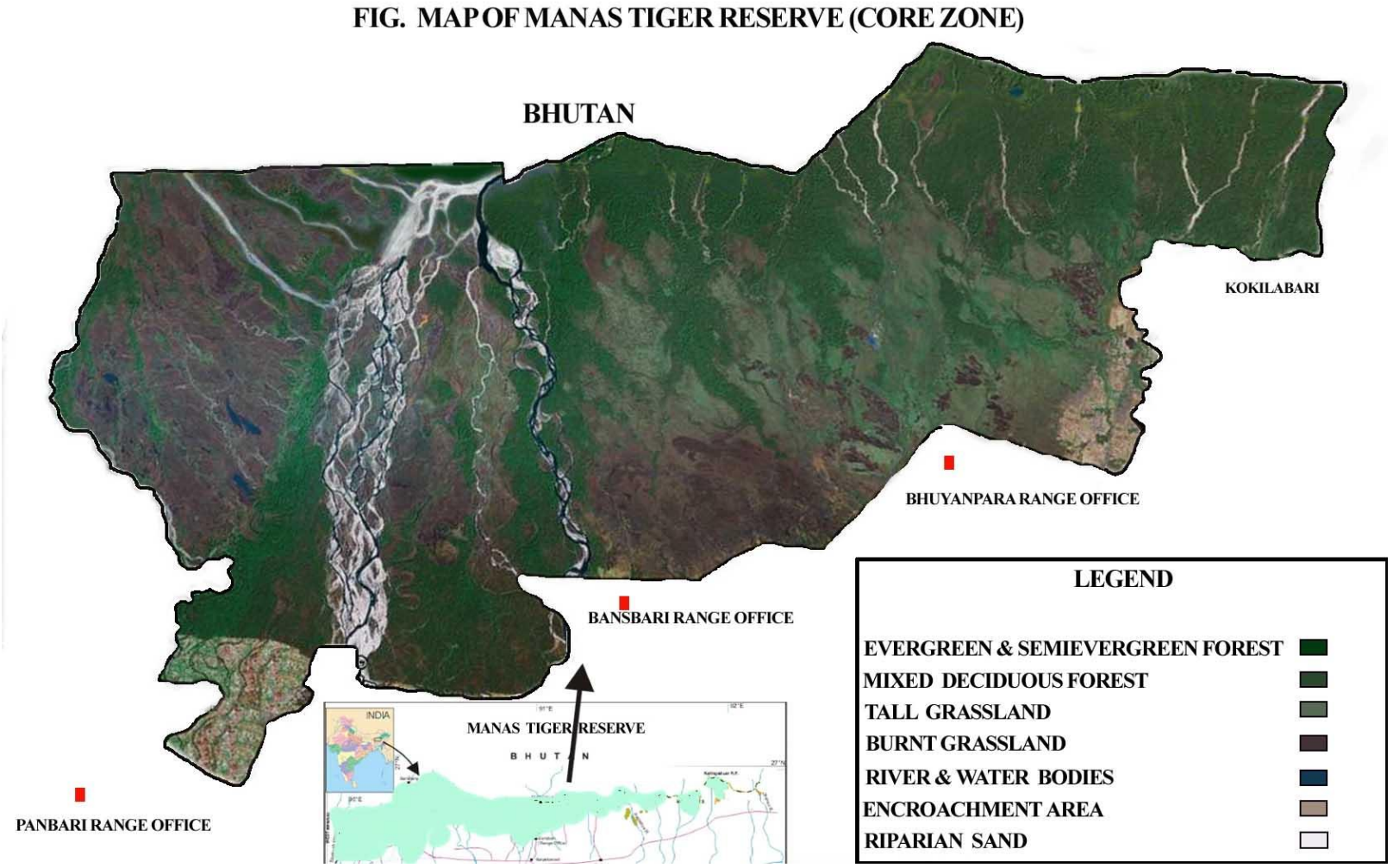

Fig. 1 Map of Manas Tiger Reserve (based on 2007 Satellite Data and rapid ground visit on 2006-2007)

Map credit: PRANJAL BEZBARUA

Fig. 2. Rhino habitat in northern side of Bansbari range, Manas TR

Fig 3. Former rhino habitat & poaching area known as Daulabil under Bhuyapara range of Manas TR

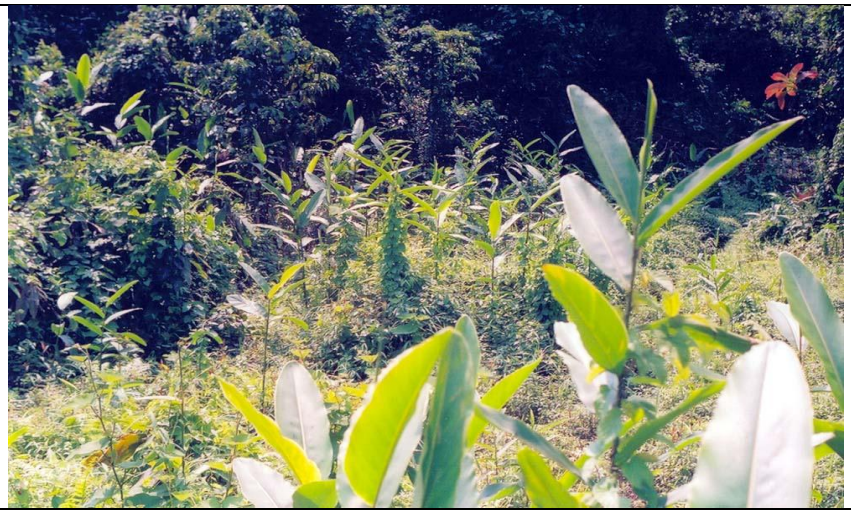

Fig 4. Swampy forest also known as former rhino habitat

Fig. 5. Rhino habitat dominated by *Saccharum spontaneum* in Kuribeel area- proposed as suitable translocation area

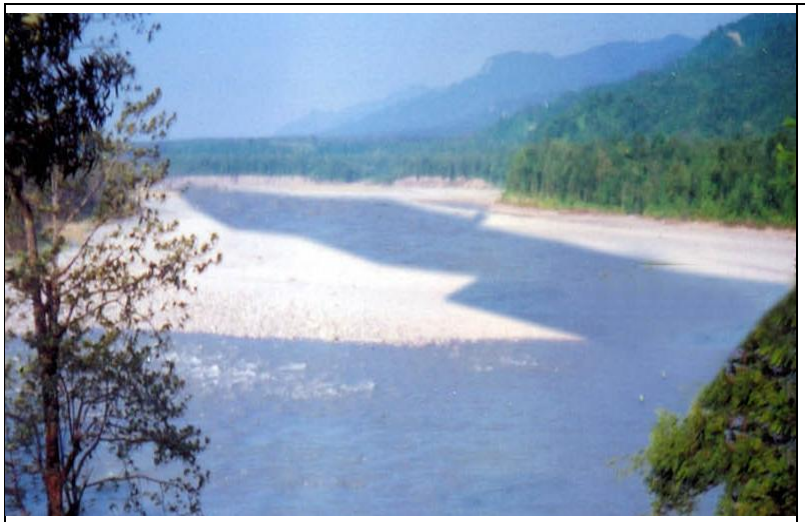

Fig. 6. Scenic beauty of Manas TR in Indo-Bhutan border

Fig. 7. Fuel wood of Manas TR in nearby market of Panbari range

Fig. 8. Uncontrolled grassland fire in Manas TR

Fig. 9. External overgrazing favouring invasion of *Leea asiatca & Bombax ceiba*

Fig.10. *Bombax ceiba* in the grassland of Manas TR

Fig. 11. *Chromolaena odorata* in boundary area of Manas TR

Fig12. Encroachment area in Panbari range (western side) of Manas TR

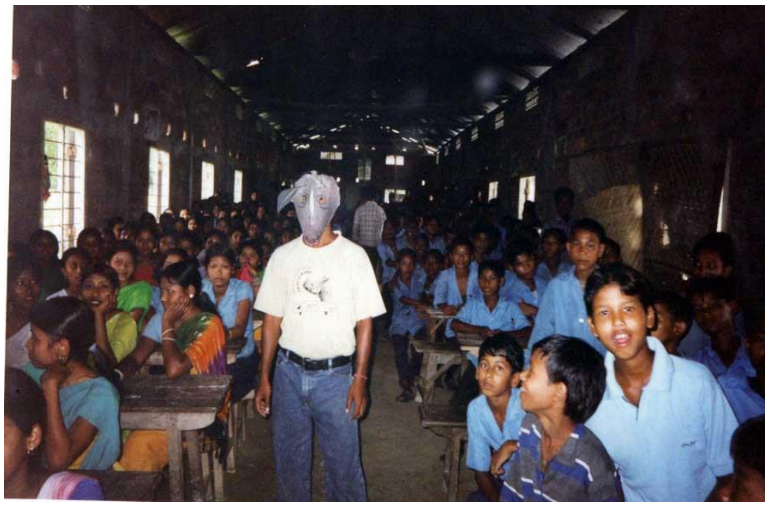

Fig. 13. A conservation worker wearing rhino mask made of paper in a conservation meeting in eastern buffer of Manas TR

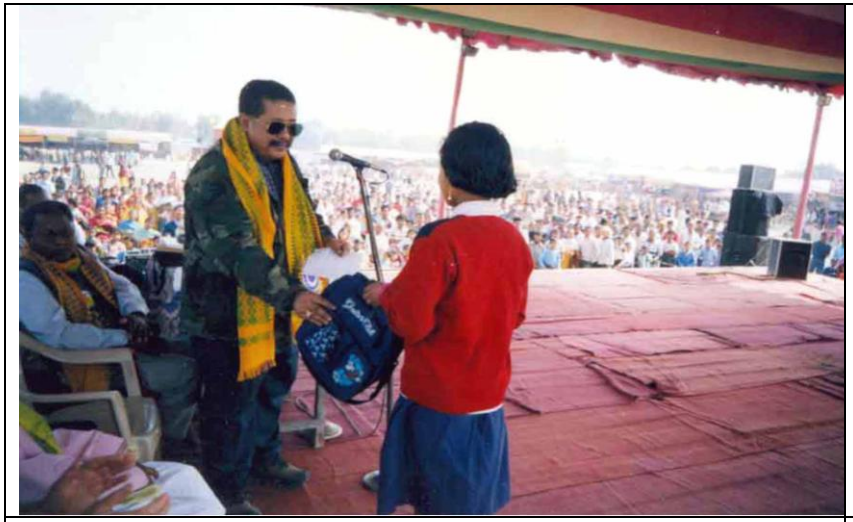

Fig. 14. Field director A. Rabha distributed school bag to a girl child of an ex poacher.

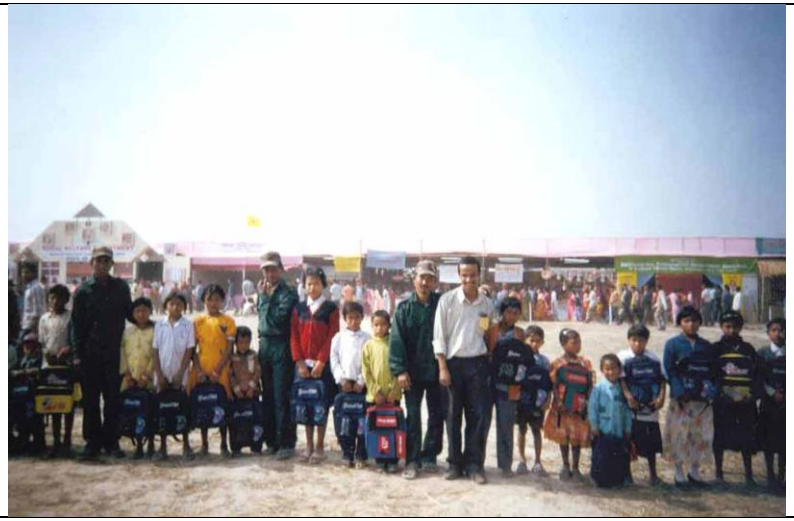

Fig. 15 The P.I with children of ex-poachers and volunteers of Maozigendri after school bag distribution ceremony

Fig. 16. The P.I. gave a lecture on Indian Rhino Vision 2020

Fig. 17 The P.I. gave a lecture on conservation of wildlife in a school near Manas TR

Fig. 18. Participants of the Training programme

Fig. 19. Topic of Training Programme

Fig.20. Agricultural resource person examined the prepared soil of one self help group

Fig.21. The new shoots of Zinger

Photo credit: PRANJAL BEZBARUA