सत्यमेव जयते

RHINO CONSERVATION PLAN FOR MANAS NATIONAL PARK (2014-2019)

A WORLD HERITAGE SITE (N 338)

UNDER CRITERIA (vii), (ix), (x)

Submitted by

Field Directorate, Manas Tiger Project
GOVERNMENT OF ASSAM

Contents

ACKNOWLEDGEMENTS

The constant guidance and leadership of Honble' Minister Environment and Forest Department, Govt of Assam, Shri Rockybul Hussain and Honble' Deputy Chief of BTC and E.M.Forests, Shri Kampa Borgayary are gratefully acknowledged for carrying out Rhino conservation works at Manas.

PCCF & Hoff, Shri V.K.Vishnoi, IFS and PCCF cum Chief Wildlife Warden Shri R,P.Agarwalla, IFS, Council Head of Forests, Shri A.Swargiary, IFS are thanked for their motivation and guidance.

Seniors in the forest department, Shri S.S.Rao, IFS, Shri Hirdesh Mishra, IFS, Secretary Forests, BTC Shri .P.K.Hazoary,ACS, and Field Director, Manas Tiger Project Shri A.C. Das are gratefully acknowledged for their constant support and guidance.

Shri H.K.Chodhury, IFS (retd.) and Chairman, Wildlife areas Welfare and Development Trust is especially thanked for his funding support (through USFWS and WADWT projects) to Conservation volunteers and Rhino monitoring at Manas. His enthusiasm and optimism has been a major guiding force for implementation of some of the law-enforcement mechanisms.

Dr Bhaskar Choudhury, Dr Christy Williams, Dr Bibhab Talukdar and Mr. Amit Sharma are gratefully acknowledged for their valuable comments that have been incorporated into this Plan.

Mr D.D.Boro, ACF, and Dr Prabhat Basumatay are also thanked for their continuing support for Rhino conservation in the field.

The Rhino monitoring teams at Bansbari, Bhuyanpara ranges along with Shri Bipul and Shri Sande, Shri Kiran Basumatary, Shri Girin Barman-Fr1 and the respective camp staffs are thanked for their support and active participation that led to successful implementation of SMART patrolling during the monsoon season.

(DRAFTING TEAM)
Dr. Sonali Ghosh,IFS
Deputy Director, Manas Tiger Reserve
AND
Shri Deba Kumar Dutta
Senior Project Officer, WWF-India

Suggested Citation: Ghosh, S and Dutta, D.K. (2014) Rhino Conservation Plan for Manas National Park-(November 2014) Published by: Field Directorate, Manas Tiger Project.

CHAPTER ONE

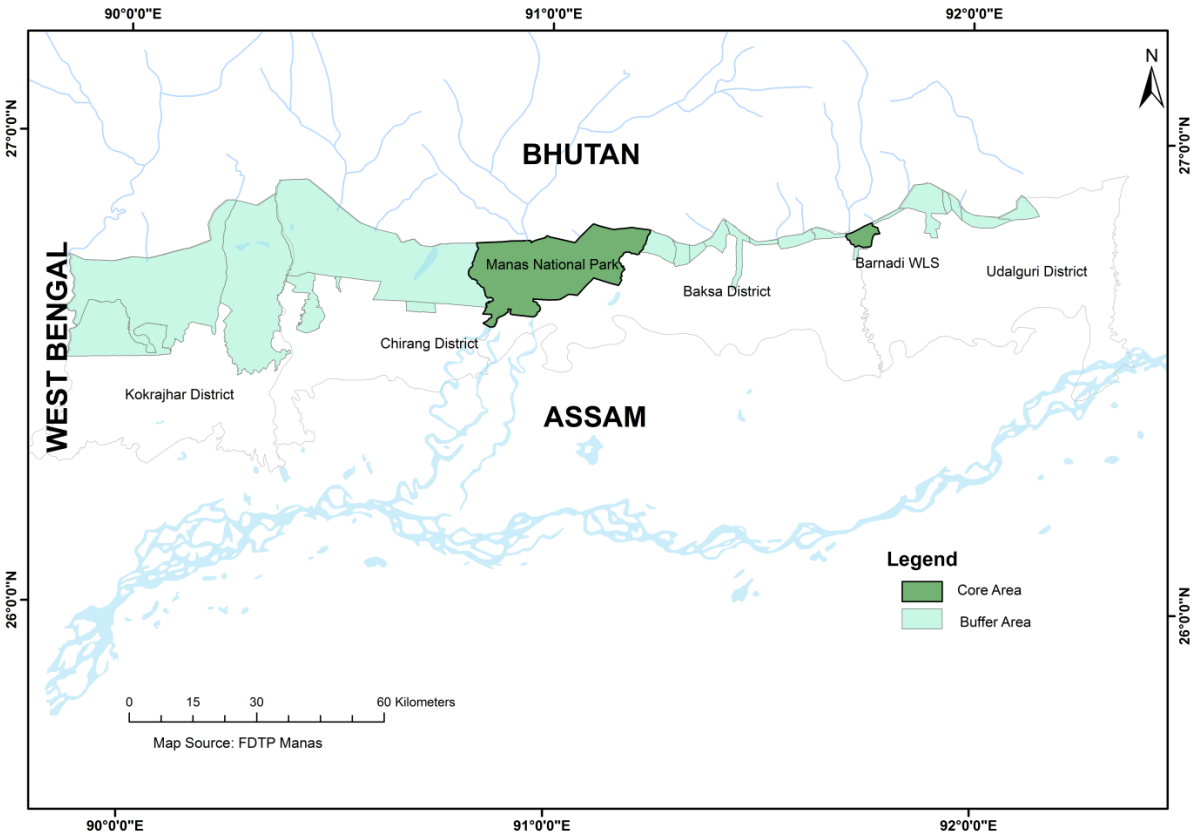
OVERVIEW OF RHINO CONSERVATION IN MANAS NATIONAL PARK

1.1 Background:

Manas National Park with an area of 500 sq km forms the core of Manas Tiger Reserve. Manas Tiger Reserve (MTR) Reserve spans across the districts of Kokrajhar, Chirang, Buxa and Udalguri in north-west Assam. To the North, it is separated from the Royal Manas National Park of Bhutan by the River Manas and its tributaries- Beki and Hakua; while to the west, it is separated from the Buxa Tiger Reserve of West Bengal by the River Sankosh (Fig 1 and 2).

Manas, with its spectacular landscape is one among most stunning pristine wildlife habitats in the world. The area has a unique distinction of being a Natural World Heritage Site, a Tiger Reserve, an Elephant Reserve, Biosphere Reserve and Important Bird Area. Evolutionarily, it is the entry point of tigers into India and combined with Buxa-Nameri-Pakke-Namdapha TRs and Protected areas in Bhutan and Myanmar; forms the single largest tiger conservation landscape for Bengal tigers (*Panthera tigris tigris*) in the world.

Fig.1.1 Location map of Manas Tiger Reserve (core and buffer area) in Assam, India

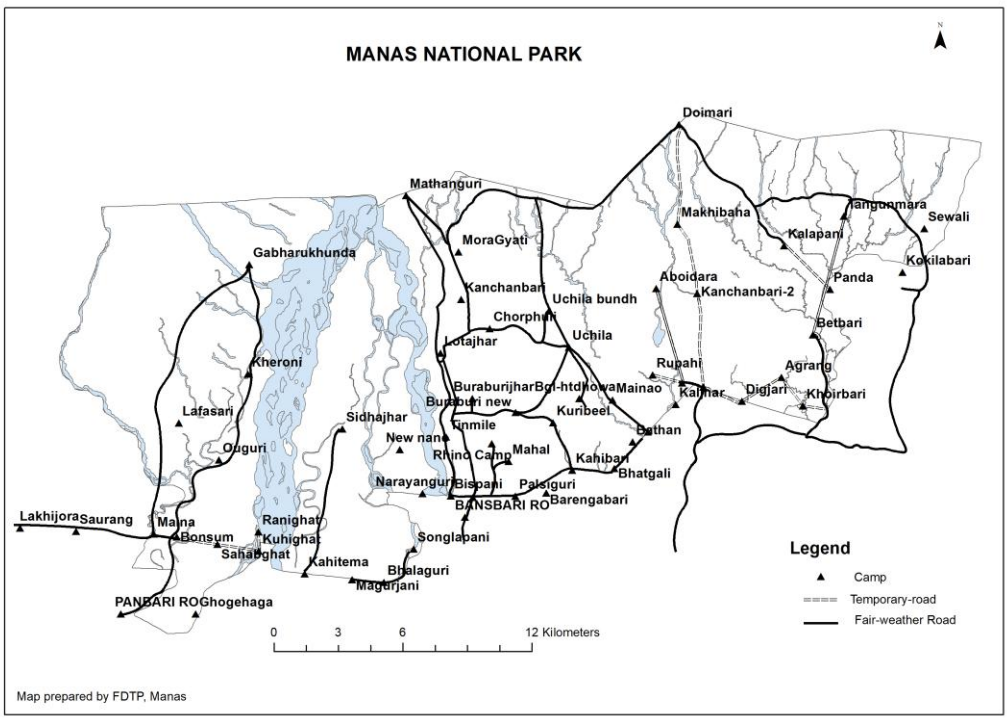


Although it has a long history of wildlife preservation dating back to 1905; key animal species such as one-horned rhinoceros and other large herbivores were extirpated during the insurgency period that lasted from 1989 to 2003. The formation of a democratically elected local government (BTAD; Bodoland Territorial Areas District) in 2005; restoration of law and park infrastructure resulted in revival of key species and their habitat. The Park regained its UNESCO Heritage Site status in 2011 in recognition to all it efforts in scientific management of the Park.

Manas National Park harbours 61 species of mammals, 450 species of birds, 42 species of reptiles, 9 species of amphibians, 79 species of fishes and more than 200 species of butterfly and 100 species of invertebrates. Manas NP supports (IUCN listed) one critically endangered, seven endangered, ten vulnerable mammals; five critically endangered, two endangered, eighteen vulnerable birds and four endangered and nine vulnerable reptiles. The avifaunal diversity of Manas is very rich as there is a confluence of wide range of habitats. Over 450 bird species has been recorded so far in this (IBA) Important Bird Site (Fig 2).

The rich assemblage is due to its unique bio-geographical location which is at the confluence of Indo-Malayan, Indo-Chinese and Australasian pathways making it an important refuge for several endemic and charismatic wildlife species. It also provides an ideal habitat ranging from high altitude Himalayan dense canopied forests to the sub-tropical woodlands and alluvial floodplain grassland and riverine ecosystems in the lower elevations.

Fig 1.2: Map of Manas National Park showing anti-poaching camps and road network



1.2. Past History of Rhinos in Manas (Pre-2005)

The Great One horned Rhinoceros (*Rhinoceros unicornis*) had been historically found in the flood plain grasslands on the north-Bank of Brahmaputra, including areas within Manas National Park. Prior to 1989, about 100 rhinos had been estimated in the Park. Published information was rather scarce while sourcing for past history of rhino occurrence in Manas National Park. It is well known that Manas was declared reserved forests where 'Game' could be hunted for a price way back in 1905. A compilation of published literature is therefore limited to a report by Menon (1996) for WWF-TRAFFIC-India.

According to this report, the IUCN /SSC Asian Rhino Specialist Group (AsRSG) proclaimed that in 1989, there only remained three of the seven refuges for Rhino in India (Kaziranga, Manas and Orang) that were known to have a viable population of the species. Unfortunately, by 2001 it was confirmed that most of the 100 rhinos in Manas had been poached (Menon, 1996).

Table 1.1: Population and poaching of native Rhinos is Manas National Park (upto 2001; source Vigne and Martin, 1994; Menon, 1996 and FDTP, Manas)

Year	Population	Poaching	Remarks
1962		1	
1963		1	
1965		1	
1966	15	0	Population estimation by E.P.Gee (Spillet, 1966)
1971		1	
1976	40	4	Population estimation by Laurie, 1978
1977	75	0	Population estimation by Deb Roy.
1978		1	
1981		2	
1982		1	
1983		3	
1984		4	
1985		1	
1986	75-80	1	Population estimation by Forest department
1987		7	
1988		1	
1989	85	6	Population estimation by Forest department

1990	85-100	2	Population estimation by Forest department
1991		3	
1992	80	11	Population estimation by Forest department
1993	60/30	22	Population estimation by Forest department
1995	30/120		Population estimation by Forest department
2001	?	1	Poaching as reported by Forest Department

1.3. Present Rhino Conservation status (Post-2005)

At the Centenary celebration of Kaziranga and Manas National Park in 2005, it was decided to reintroduce Rhinos to areas where it had been exterminated as per a multi-stakeholder plan which is popularly known as IRV 2020 (India Rhino Vision-2020). The process of reintroduction began on 20th January 2014 with the translocation of a rehabilitated rhinos named "Mainao" in *Gahori pam* area Basbari range of Manas.

The Indian Rhino Vision 2020 as conceived is a joint conservation initiative of the Assam Forest Department, WWF India and International Rhino Foundation, supported by the Bodoland Territorial Council, United States Fish and Wildlife Service, Wildlife Areas Welfare and Development Trust and other partner organizations. Under this programme, wild-to-wild translocation of rhinos to Manas from two other rhino bearing protected areas in Assam was initiated in 2008 with 2 rhinos. As of 2012, this had increased to a cumulative total of 18 rhinos. In parallel, 9 rescued rhinos hand raised at Center For Wildlife rehabilitation and Conservation (CWRC) from Kaziranga National park were also rehabilitated in Manas (Table 2).

Table 1.2: Population Status of Rhino Translocation in Manas National Park

Wild-to-Wild Translocation		Rescue-and-Rehabilitation	
Year	No. of Rhinos	Year	No. of Rhinos
2008	2	2006	3
2010	2	2012	2
2011	4	2013	1
2012	10	2014	3
Total	18	Total	9

Unfortunately, a number of rhino poaching incidents occurred during the last two years in the region as a whole. Both the World Heritage Sites namely, Kaziranga National Park and Manas National Park were affected by the sudden spurt in poaching. In Manas, a

total of 8 rhinos have succumbed to poaching till date (as on 30.11.2014). On the other hand, the translocated rhinos also gave birth to 11 rhino calves in the new habitat (Table 3). Currently there are 31 Rhinos in the Park (Table 4).

Table 1.3: Mortality and Birth of Translocated Rhinos in Manas National Park

Year	No. of Rhino Deaths	No. of Rhino Births
2011	1	
2012	1	1
2013	5	10
Till 30th Nov 2014	1	
Total	8	11

Table 1.4: Current distribution of Rhino population in Manas National Park

Rhino distribution status as on 23.10.2014						
sno	Name	Sex	age	reintroduction type	collar	Ranging area
1	Rhino-3	Female	Adult	wild		Bansbari
2	Rhino-6	Female	Adult	wild		Bansbari
3	Rhino-9	Female	Adult	wild		Bansbari
4	Rhino-11	Female	Adult	wild	Working	Bansbari
5	Rhino-13	Female	Adult	wild	Working	Bansbari
6	Rhino-15	Female	Adult	wild	Working	Bhuyanpara
7	Ganga	Female	Adult	Rehabilitated		Bansbari
8	Jamuna	Female	Adult	Rehabilitated		Bansbari
9	Mainao	Female	Adult	Rehabilitated		Bansbari/Bhuyanpara
10	Rhino-4	Female	Adult	wild		Bansbari
11	Rhino 7	Male	Adult	wild		Bansbari
12	Rhino-18	Male	Adult	wild		Bansbari
13	Rhino-19 (Raja)	Male	Adult	Rehabilitated	working	Bansbari
14	Rhino-20 (Maju)	Male	Adult	Rehabilitated		Bansbari
15	Rhino-6-calf	unsexed	SA	wild		Bansbari

16	Rhino-21	Male	SA	Rehabilitated	Boma	Bansbari
17	Rhino-22	Male	SA	Rehabilitated	Boma	Bansbari
18	Rhino-23	Male	SA	Rehabilitated	Boma	Bansbari
19	Rhino3-calf	unsexed	calf	wild		Bansbari
20	Rhino8-calf	unsexed	calf	wild		Bansbari
21	Rhino9-calf	unsexed	calf	wild		Bansbari
22	Rhino10-calf	male	calf	wild		Bhuyanpara
23	rhino13calf	unsexed	calf	wild		Bansbari
24	rhino15calf	unsexed	calf	wild		Bansbari
25	Ganga-calf	Female	calf	wild		Bansbari
26	Jamuna calf	Female	calf	wild		Bansbari
27	Mainao-calf	Female	calf	wild		Bansbari
28	Rhino-14	Male	calf	wild		Bansbari
29	Dwimalu	Male	calf	Under rehabilitation	Boma	Bansbari
30	Purabi	Female	calf	Under rehabilitation	Boma	Bansbari

1.4 Plan Objectives

The main objective of this plan is to maintain a viable population of Rhinos in Manas landscape by maintaining a harmonious relation with indigenous people without causing any damage to the PA resources. They can be broadly described as follows:

- **To conserve Great one horned Rhino as the flagship species in Manas by managing habitat and other ecological attributes for the propagation of prey species in a balanced ecosystem.**
- **To strengthen anti-poaching strategies and capacity building for forest frontline staff and developing an intelligence network.**
- **To assess and summarise the conservation activities including research and monitoring aspects, community engagement etc since rhino reintroduction in Manas in 2008, and provide a road map for the next ten years.**

CHAPTER TWO

SPECIES AND HABITAT MANAGEMENT STRATEGIES

2.1. Vegetation and Forest type:

The vegetation and forest types of Manas National Park can broadly be classified as follows:

1. **Tropical semi-evergreen forests:** *Aphanomixix polystachya, Anthocephalus chinensis, Syzygium cumini, S. formosus, S. oblatum, Bauhinia purpurea, Mallotus philippensis, M. roxburghianus, Cinamomum spp., Actinodaphne obovata,* etc. The under growth in these forests comprises mainly of *Leea aequata, Coffea benghalensis, Phlogocanthus thyrsiflorus, Clerodendrum viscosum, Holmskioldia sanguinea, Piper diffusum, Desmodium spp., Derris spp.,* grasses and members of Zingiberaceae.

2. **Tropical moist and dry deciduous forests:** This is commonest vegetation type in the park and it is invading to the grassland. The common trees of this type are *Bombax ceiba, Sterculia villosa, Dillenia indica, Dillenia pentagyna, Careya arborea, Lagerstroemia parviflora, L. speciosa, Terminelia bellerica, T. chebula, Trewia nodiflora, Gmelina arborea, Albizia procera, Vitex glabrata, Bridelia spp.* Common undergrowth of this forest type are *Desmodium spp., Leea spp.,* and grasses.

3. **Alluvial grassland**: Extensive patches of grasslands are found towards Southern boundary of the park. The common grass species are *Apluda mutica, Brachiaria distachya, Capilipedium assimile, Cynodon dactylon, Cyrtococcum accrescens, Digitaria ciliaris, D. longiflora, Echinochloa colonum, Eleusine indica, Erianthus longisetosus, Imperata cylindrica, I. cylindrica var. major, Neyraudia reynaudiana, Pogonotherum rufobarbatum, Polytoca digitata, Rottboellia exaltata, Saccharum procerum, S. spontaneum, Phragmites karka, Themeda villosa, Eragrostris tenella, Panicum spp. Paspalum spp.,* etc. Several trees and shrubs have invaded the grasslands, these are *Dillenia pentagyna, Emblica officinalis, Bombax ceiba, Lagerstroemia parviflora, Careya arborea, Glochidion assamicum and species of Clerodendrum, Leea, Grewia, Premna, Mussaenda, etc.*

In terrai region wetland hydrophytes are – *Alpinia nigra, Cyperus brevifolius, Lasia spinosa* and some grasses are common. Other hydrophytes found are- *Ceratophyllum demersum, Limnophylla sessiliflora, L. heterophylla, Ottelia alismoides, Vallisneria spiralis, etc.*

2.2 History of rhino presence: According to locally available information, rhinos were known to graze in the grassland areas that included the current encroached areas of Betbari and also the leased out Kokilabari Seed Farm. The last rhino was allegedly poached at Krishi pukhuri area under Bhuyanpara Range in the year 2001.

2.3: Habitat quality

a) Food: Rhino are graziers and therefore eat a variety of grasses and forbs. Past observation (under IRV2020 annual monitoring) indicate that Bansbari and Bhuyanpara ranges of Manas NP bear sufficient fodder plant species generally eaten by the rhinos in all the habitats. The common fodder species available and generally grazed and browsed by the rhinos are *Paspalam orbiculare, Paspalam conjugatum, Pogonotherum crinitum, Echinochola colonum, Panicum spp., Leersia hexendra, Dol, Cynodon dectylon, Limnophylla sessileflora, Hydrophylla zeylanica, Vallisneria spiralis, Azolla pinnata, Monochoria hastata, Eichornia crassipes, Cyperus spp., Themeda villosa, Arundinecia sp., Saccharum spontaneum, Phragmates karka, Alpinia nigra, Lasia spinosa* and several species of undergrowths etc. Rhino also generally grazed new shoots sprouted of tall grasses after burning. However, the grazing pressure by livestock is medium to very high, especially along the Southern boundary of the Park. Rhinos were also found to feed on algae species, *Bihalangani* (*Amphineuronopulentum*), Dhekia (*Diplaziumescullentum*) and other varieties of ferns, herbs, shrubs and creepers specially during the late or retreating monsoon (August –September). The Rhinos were also seen to eat the seeds of Oxy (*Dillenia pentagyna)* during July – August and also on the young and new leaves during March – April.

Table 2.1: list of fodder plants for reintroduced Rhinos in Manas National Park (Ref: IRV2020 Rhino monitoring Report 11-12)

Sl No	Scientific name	Family	Season of feeding
1	*Casia tora*	Caesalpiniaceae	Summer
2	*Amaranthus spinosus*	Amaranthaceae	Spring, Summer, & Autum
3	*Amaranthus viridis*	Amaranthaceae	All round the year
4	*Cida equata*	Malvaceae	Winter
5	*Centrella asiatica*	Apiaceae	Winter and Spring
6	*Hydrocotyle sibthropioides*	Apiaceae	Winter and Spring
7	*Solanum torvam*	Solanaceae	Winter
8	*Oxalis corniculata*	Oxalidaceae	All round the year
9	*Spilanthes paniculata*	Asteraceae	Summer
10	*Dectyloctenium aegyptieum*	Poaceae	Summer
11	*Cyperus compressus*	Poaceae	All round the year
12	*Cyperus digitaus*	Poaceae	All round the year
13	*Astraceae sps*	Astraceae	All round the year
14	*Eurana lobata*	Malvaceae	All round the year
15	*Astraceae sps*	Astraceae	All round the year
16	*Digilaria sps*	Poaceae	All round the year
17	*Eragrostis sps*	Poaceae	All round the year
18	*Eleusine indica*	Poaceae	All round the year
19	*Axonopus compressus*	Poaceae	All round the year
20	*Commelina sps*	Commelinaceae	Winter

21	*Malastoma malabaricum*	Malastomaceae	Summer
22	*Malastoma sps*	Malastomaceae	Summer
23	*Rubiaceae sps*	Rubiaceae	Summer
24	*Comelina longifolia*	Comelinaceae	Summer
25	*Papilionaceae sps*	Papilionaceae	All round the year
26	*Paederia foetida*	Rubiaceae	All round the year
27	*Paederia husota*	Rubiaceae	All round the year
28	*Scrophulariaceae sps*	Scrophulariaceae	All round the year
29	*Pouzolzia sps.*	Urticaceae	All round the year
30	*Vallisneria*	Hydrocharitaceae	All round the year
31	*Premna herbaceae*	Verbenaceae	Spring and early part of
32	*Morus sps*	Moraceae	Winter and Spring
33	*Macaramga denticulata*	Euphoraiaceae	All round the year
34	*Carex sps*	Cyparaceae	Spring and early part of
35	*Sateria palmifolia*	Poaceae	Summer
36	*Fimbristylis aestivalis*	Cyparaceae	All round the year
37	*Sterculia villosa*	Sterculaceae	All round the year
38	*Mariscus compactus*	Poaceae	All round the year
39	*Cyperu rotondus*	Poaceae	All round the year
40	*Cynodon dectylon*	Poaceae	All round the year
41	*Bombax cieba*	Bombacaceae	Spring and early part of
42	*Dillenia pentagyna*	Dilaneaceae	Spring and early part of

b) Extent of Invasive species

The prime grassland habitat in Manas is currently facing the onslaught of alien invasive species (weeds) that have increased in extent due to several anthropogenic factors such as increase in livestock grazing, human movement and dispersal, uncontrolled fires etc (Fig 3). Invasive species have been observed where ever disturbances like grazing and creation of opening in grassland for roads, camps, boma etc (Lahkar et.al, 2011). It has been observed that *Chromolaena odorata* invasion is greater in a stretch of 2–4 km along the southern boundary of the Park. Invasive weeds have spread to the southern boundary, replacing in situ vegetation that has been destroyed due to biotic pressures including livestock grazing. *Chromolaena odorata* is spreading very fast in the grasslands of Manas, where the authorities face enormous challenges to eradicate it. In addition to *Chromolaena*, the spread of *Mikania* in Manas NP grasslands is alarming. The *Mikania* invasion is observed more in riverine grassland patches and on the edge of forest patches. Invasive species have been changing the structure and function of grasslands in Manas NP. This may reduce the amount of habitat suitable for the reintroduction of rhinos, as outlined in IRV 2020.

Some of the species have been described as below

1) *Chromolaena odorata* is a perennial shrub species native to neotropical America stretching from southern Florida to the upper drainage basin of the Amazon in Southern Bolivia.

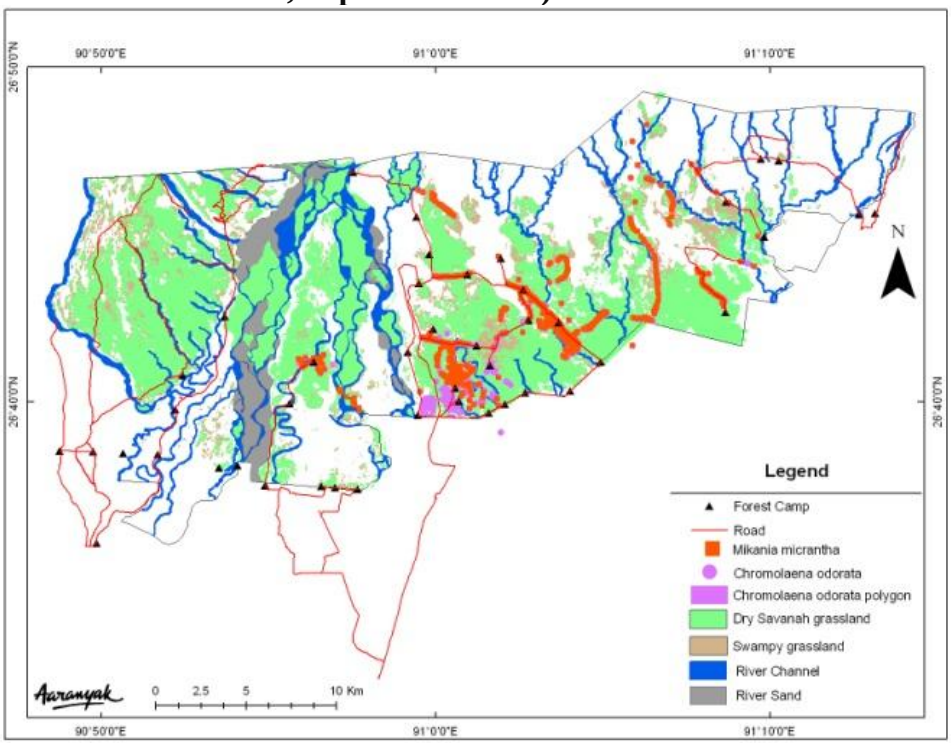
IUCN's Invasive Species Specialist Group has identified *Chromolaena* as one of the hundred worst invaders. Until recently, it was taxonomically classified as Eupatorium. The genus *Chromolaena* belongs to the family Asteraceae, one of the largest and most evolved of plant families.

2) *Mikania micrantha* is a perennial creeping climber known for its vigorous and rampant growth. It grows best where fertility, organic matter, soil moisture and humidity are high. It damages or kills other plants by cutting out the light and smothering them and competing for water and nutrients. A native of Central and South America, *Mikania micrantha* was introduced to India after World War II to camouflage airfields. Once established, *Mikania micrantha* spreads at an alarming rate, readily climbing and twining on any vertical support, including crops, bushes, trees, walls and fences. Significantly, it is believed that the plant releases substances that inhibit the growth of other plants (IUCN/ISSG database).

3) *Ipomoea carnea,* the Pink Morning Glory, is of American origin. This flowering plant has heart shaped leaves that are a rich green and 6–9 inches long. It can be easily grown from seeds which aretoxic and it can be hazardous to herbivores (USDA database).

4) *Lantana camara* is a low erect or subscandent, vigorous shrub with stout recurved prickles and a strong odour of black currents. It grows to 1.2–2.4 metres or more. The diverse and broad geographic distribution of lantana is a reflection of its wide ecological tolerances. It occurs in diverse habitats.

Fig 2.1: Distribution of key invasive species in Manas National Park in 2014 (Ref: Dr Bibhuti Lahkar et.al., unpublished data)

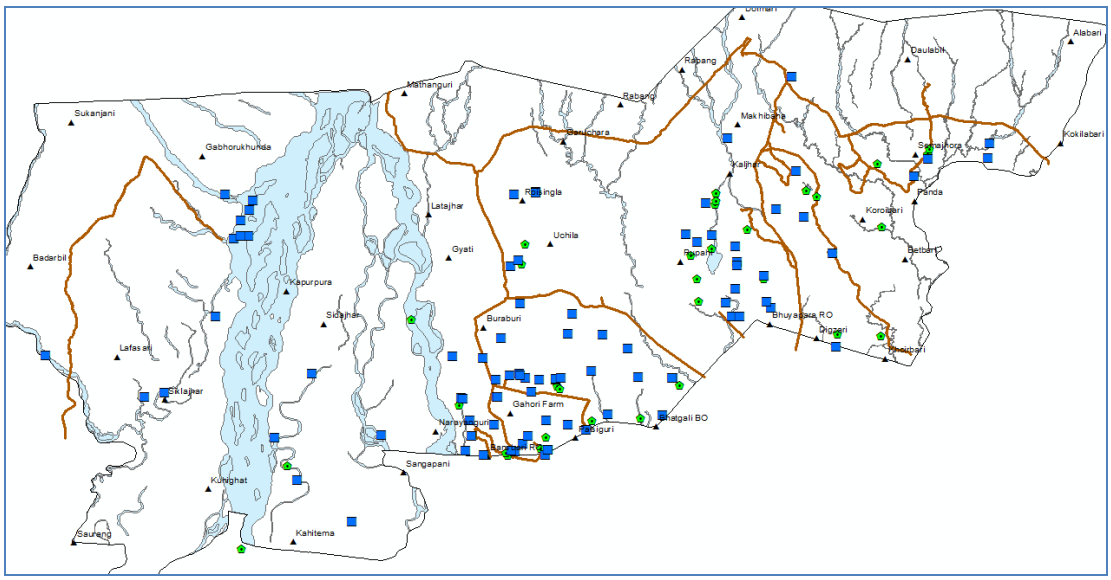


The main strategy to eradicate invasive should be to set up a surveillance system to monitor new invasive species in the park and also to monitor spread of existing species. Priority wise, invaded area should be restored by removing invasive species. Few experiments plots should be established to find out best practices. Livestock grazing should also be completely stopped, as it is a major driver of spreading invasives.

b) Water bodies: Rhino needs water bodies both for drinking and wallowing. They preferred muddy water body for wallowing to protect themselves from ecto-parasites and for rapid healing of their body injuries.

Large stagnant water bodies are absent in Manas but there are some small perennial water bodies here and there towards northern sides locally called as pukhuri and beel where according to field forest staff rhinos wallowed earlier. In the Terai region towards southern boundary there are muddy areas and perennial streams where rhinos wallow. According to the field staff during flood period rhinos moved to the northern highland and during winter and summer they stayed at southern Terai region (Fig 3). During flood period at the high land of Northern side short grasses and forbs eaten by the rhino covers the forest floor and they preferred to stay there due to availability food and water bodies. A good numbers of river system works throughout the Park. All the rivers, streams, nallas forming the drainage of the valley confluence with the river Brahmaputra flowing at the south. Rivers and streams flow from north to south. In the bhabar areas most of the rivers, streams, nalla excepting perennial ones, Manas, Hakuwa, Beki, Paglladia dried up during winter and dry seasons. But, these same rivers filled up with water in the north and regular flow in the terrain region.

Fig 2.2 Location of Rhino Dung(blue) and waterhole (green) locations in Manas National Park (Data source: Deba Dutta pers observ.)



2.4 Rhino Ranging Pattern- An analysis

a) Release of rhinos at Manas NP

The wild to wild rhino translocation began in 2008 and during this period (2008-14), a total of 18 wild rhinos have been translocated to Manas National from Pobitora WLS and Kaziranga National Park. The first phase of rhino translocation has been well documented and a video documentary has been prepared including entire process of translocation (footage available on websites http://www.wwfindia.org/; http://www.rhinos.org). The still photographs were also distributed to all relevant persons in the form of a presentation and is also available at the Assam Forest Department official website under the section Indian Rhino Vision:2020 (www.assamforest.in) along with a report on both the rounds.

b) Post release monitoring at Manas National Park using radio telemetry

It had been strongly recommended that intensive post-release monitoring be undertaken immediately after release and during the settling in phase. The basis for any rhino monitoring approach should be that it provides the quality of information needed to meet the objectives of the monitoring programme. A successful monitoring approach must form a match between required data quality and available resources.

Rhinos were deployed with VHF radio collars and were tracked on a 24x7 basis. Monitoring was carried out by using radio-telemetry system directional antennae either on foot, elephant back, motorcycles and 4WD vehicles depending on the area where the rhinos were present. Homing using the VHF signal was done to locate the individual visually from a safe distance and a handheld GPS (Garmin Inc.) was used to record spatial information. The radio collars have an average life span of one year and most of them have therefore dropped off/removed and also dysfunctional at present. Currently six rhinos have active radio collars (as on 30.11.2014). The monitoring of other rhinos is therefore carried out based on rhino ID (specific identification Mark) on body and ear notch,.

c) Habitat Preferences and Ranging Pattern of Rhinos

Habitat preferences and ranging was studied by comparing frequencies of animal distribution on particular habitat type on the basis of direct focal observation. Initially, Rhinos were ranging throughout the grassland areas under Bansbari and Bhuyanpara Ranges (Fig 4, 5, Table 6) of the Park. Infact the rhinos were moving very large distances (Table 6) initially perhaps to establish their individual territory in the best possible habitat. Gradually, some of the rhinos dispersed and stayed at certain specific locations.

Table 2.2 Ranging pattern of the reintroduced rhinos in Manas National Park (ref: IRV Rhino Monitoring Report 11-12)

Sl.No.	Details	Area (Sq. kms.)	Remarks (Apr11-Mar12)
1	Rhino1	188	MCP irrespective of park boundary
2	Rhino2	74	MCP irrespective of park boundary
3	Rhino3	133	MCP irrespective of park boundary
4	Rhino4	13	MCP irrespective of park boundary
5	Rhino5	174	MCP irrespective of park boundary
6	Rhino6	72	MCP irrespective of park boundary
7	Rhino7	81	MCP irrespective of park boundary
8	Rhino8	116	MCP irrespective of park boundary
9	Rhino9	53	MCP irrespective of park boundary
10	Rhino10	214	MCP irrespective of park boundary
11	Rhino11	42	MCP irrespective of park boundary
12	Rhino12	146	MCP irrespective of park boundary
13	Rhino13	138	MCP irrespective of park boundary
14	Rhino14	94	MCP irrespective of park boundary
15	Rhino15	45	MCP irrespective of park boundary
16	Rhino16	17	MCP irrespective of park boundary
17	Rhino17	150	MCP irrespective of park boundary
18	Rhino18	53	MCP irrespective of park boundary

Some general observations based on ranging pattern on reintroduced rhinos have been described in the following pages.

- Rhino-1 (R1) used both the Bansbari and Bhuyanpara ranges and also used some part of eastern buffer of Manas National Park. But R1 never crossed the Beki River.
- Rhino2 (R2) was found to use River Beki as a western and Digjhari river as the eastern boundary of its ranging area. Usually Rhino2 liked to utilize areas near to southern boundary in the summer and central and northern part of Bansbari and Bhuyanpara during the winter season.
- Rhino 3, 8, 13 and 14 specifically used central part of Bansbari Range.
- Rhino 4, 9, 11, 17 and 18 ranged into Kahitama beat areas as well as the central part of Bansbari range. Rhino 4 and Rhino 17 were also known to range upto Kheroni grassland area under Panbari range on few occasions.
- Rhino 6, 7, 8 frequently crossed between Bansbari and Bhuyanpara range. While adult rhino 5, 10, 12, 15 and 16 preferred to use eastern and western part of Bhuyanpara range.

Fig 2.3 Habitat use by reintroduced rhinos in Manas National Park (as recorded between April 2008-March 2010)

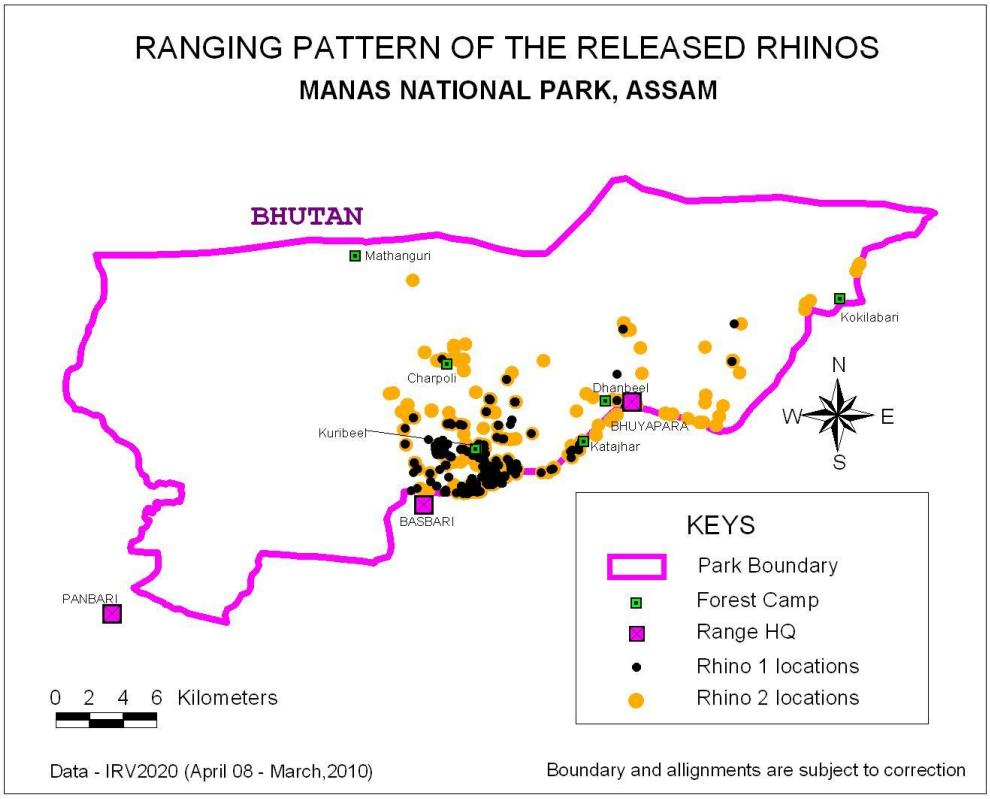
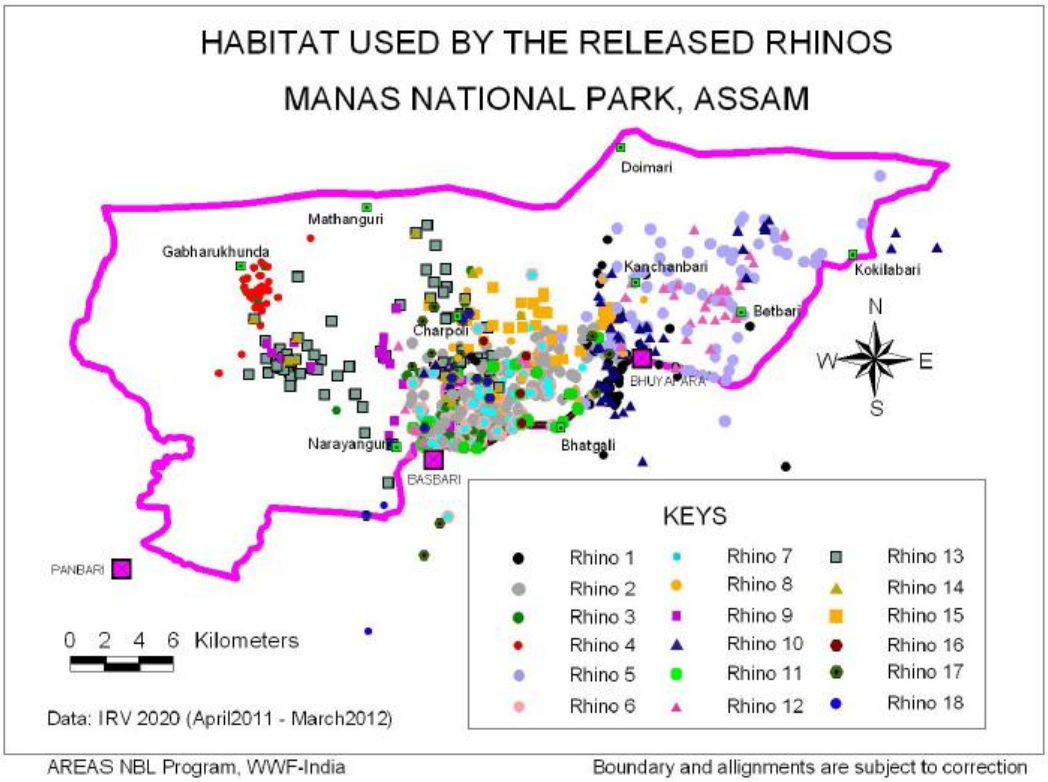


Fig2.4 Habitat use by reintroduced rhinos in Manas National Park (as recorded between April 2011-March 2012)



d) Rhino Behavior

Rhino's behavior as per focal observations (Deba Dutta pers. obs) indicated a seasonal variation in diurnal and nocturnal activities. In summer, diurnal activity was very less as compared to winter season. Since the beginning of their reintroduction in 2008, Rhinos in Manas were showing a medium level response in social interactions. Cow-calf pairs were very common. Rhino 6 &7, 13 &14 usually moved together in the Bansbari Range, although Rhino 7 (calf of Rhino 6) was beginning to stay away from his mother. Sub adult female Rhino-4 and male R 18 were also observed to form a group. In contrast, Rhino-9 and Rhino-4 were behaving in a solitary manner and using large tracts of habitat under Panbari and Bansbari by crossing the river Beki. This indicates that small rhino calves are good swimmers and also able to fast flowing river like Beki. Adult rhinos association was also found between Rhino-3 and Rhino-8 for a few months. However adult male Rhino 5 was usually found with Rhino-10 and its new born calf. Subsequent to poaching of Rhino-10 in October 2013, the orphaned calf was found to move with male Rhino-5.

A note on male Rhino Behaviour inside Boma after release

In 2006, four rescued rhinos were rehabilitated in the Manas National Park within a 0.136 sq km solar electric fence enclosure (Boma). Orphaned rhinos were rescued in Kaziranga National Park (KNP) when they were about one to five months old during the flood season. The calves were hand reared and nursed at the Centre for Wild Life Rehabilitation and Conservation (CWRC) with the aim of releasing them to natural habitat. At the age of about three years the calves were translocated to Manas National Park and rehabilitated (Barman et al 2014). The first rhino, a three and a half-year old female christened Mainao by Honbl'e Deputy Chief of BTC, Shri Kampa Borgayary was moved to the Boma on 21 February 2006. Mainao thus got the distinction of being the first rhino to reach Manas post-2005. On 28 January 2007; two more female rhinos Ganga and Jamuna were relocated to Manas from CWRC Kaziranga. On 23 February 2008 a female rhino calf was also relocated to Manas National Park.

In a peculiar incident, On 10th June 2008, the adult male rhino 1 (code rhino 7000) broke open the fence and managed to enter the rehabilitation *boma.* Three adult females (within the age group of 4-6 years of age) were also present during the period. Social interactions in the form of facial touches with short snorts were observed during the period. Pre-mating or mating behavior with characteristic vocalization was not recorded during the observation period. The adult male continued to stay with the *boma premises* until 3rd May 2009 for a total of 323 days.

Interestingly, another adult male rhino (rhino no 2) who strayed out of the PA premises was captured and relocated on 23rd Sept 2008 and was released inside the boma. Agonistic behavior with loud snorting was observed when the two males and the three females were together inside the *Boma*. The male rhino 2 broke fence and came out of the *boma* on 25th Nov 2009 after spending a period of almost 400 days inside the boma. Water was provided by pumping inside from the nearest streams during November till March. Adult male were always found agonistic to each other and sometime violent fighting occurred in between Rhino-1 and 2 & Rhino-2 and 5. Aggression was very common when any one of them entered their occupied areas. At present no adult male rhino is present in Manas NP so no infighting has been observed.

Several different types of vocalization have been noted (Deba Dutta pers. obs.) for communication between rhinos. A loud snort was very common and mainly used by the rhinos as initial contact with each other. Sudden confrontation, including aggression displays between male rhinos and other wild animals like elephant and buffalos resulted in snorts. Snort was also observed during courtship behavior (locally, the call made by female rhinos to attract adult males is termed s*uhuri*).

Mother with new born calf is always agonistic to other adult male and patrolling staffs. They are furious and chase away animals by making fuzzy sound. Young calves are also known to softly 'whistle' to their mother to remain in their vicinity as they have poor eyesight.

Rhinos usually defecate at one place (latrine sites) in areas that are used regularly by them. Defecation is along their travelling paths (Dundies) as a way of marking their territory. Rhinos are not found to defecate near waterholes or wallowing sites (locally called as Leti) . Frequently used areas have more dung pile than less used areas.

It was observed that Kuribeel, Rhino camp. Charpuli, Tin-mile, Palsiguri areas had more dung piles than other places of Bansbari. In Bhuyanpara Rupahi, Sikagonda , Kanchanbari and Chengmarijhar had more dung piles and in Kahitama, Sidhajhar area was the major dung pile site. In Panbari, Kheroni area had vast tract of grassland but the number of dung piles were fewer, as only one rhino was using the area. Rhinos are mainly found to prefer short grasses and herbs close to the ground. But occasionally they found to feed tall grasses, shrubs, bushes and trees. According to analyzed data 40% of observations are found on feeding. Plants are often uprooted, the foliage bitten off and usually roots dropped. But some occasions they eat everything. In monsoon and retreat monsoon seasons they are more found to feed aquatic plants by duckling the head beneath the water. In the winter season

they are found to devote maximum time on foraging activity including browsing and walking. They are found to lick or eat soils near to Bhuyanpara. Sometime some rhinos visit regularly some anti-poaching camps to lick kitchen discharge contain with salts and other food material.

Detailed studies based on focal animal sampling in the initial years of release led to valuable insights into rhino behaviour in their new habitat (Dutta et.al., 2012). Overall, among the major land cover classes categorized in the study area, the authors observed that the marshy/swampy and grassland areas were more preferred than the woodlands. Among the grasslands the rhinos preferred to occupy the areas dominated by *Cynodon dactylon, Andropogon sps., Leersia hexandra, Cyperus rotendus, Cyperusiria, Phragmites karka, Saccharum ravennae, Saccharum narenga, Imperata cylindrica, etc.* It is known that the tall grass land and riverine forests are the critical habitats for the greater one horned rhinoceros as in case of translocated Rhinos in Nepal (*Dinerstein,* 1991). In case of Manas, it was also observed that short and open grass land was more preferred compared to the tall grasslands.

Tall grass land was found highly preferred by both male and female during the monsoon. It was also observed that the rhinos were using grass land near to southern part of the National Park close to the boundary which is adjoined to the agricultural fields. Rhinos were found to raid crops during summer season when fringe villagers started paddy cultivation.

Even though water bodies are much used areas by rhinos for wallowing, in Manas, rhinos spent only 20 -30% of their time wallowing. The main purpose of wallowing was to maintain heat regulation and also keep the flies and ecto-parasites at bay. Wallowing time was even less during month of January to March (Dry period) but very high in summer season. In case of Manas, it has been observed that permanent flood-plain grasslands (swampy areas) are much lesser as compared to in Kaziranga and Pabitora. Therefore even smaller waterholes with water during the wet season were being used. During the dry season, the grassland areas gets very dry and almost all the shallow water pools dry up. During this time, perennial water sources, small rivulets and springs (Bhumuk) become critical and get highly frequented by the wandering rhinos.

Besides wallowing, rhinos usually rested for the day during the hot summer season. During winter, rhinos were also known to move towards the woodland areas for warmer temperatures. The resting period is therefore accounted for about 7-8% of the total activity budget. (Some time rhinos were approached from very close distances but due to hindrance

of tall and dense grass land, it was not possible to record the rhino behavior. Therefore, we included another category as unknown behavior(~25%) in the total activity pattern

Rhinos were also observed to exhibit natural 'commensalism' with common mynas and cattle egrets, the birds fed on the ecto-parasites and possibly alerted the animal in case of any approaching predators. Rhinos were also observed to be feeding along with hog deer, wild pig, elephants, gaur and domestic livestock.

e) Ranging patterns of hand-reared Rhinos

In case of hand-reared rhinos, initially they tend to remain in the vicinity of the Rhino Camp where they had been soft-released (inside Boma). For example, GPS fixes of Raja (Rhino 19), indicate that the animal tends to use the area round the Rhino boma, rhino camp and Madlijora swamp area of Basbari range of the park. The effective area of its foraging, resting and wallow remained same since January till July 2014. The animal has visited the rhino camp area on 30 occasions of the month, typically ranging from 2:30 pm till 10 pm. It spends overnight in the vicinity of the camp, primarily foraging and resting in between. The area of its foraging also overlaps with the younger rehabilitated sub-adult male Maju (Rhino 20) and the two adult rehabilitated female Rhino Ganga and Jamuna.

The only exception to this has been Mainao with her calf. She has shown instances of straying outside the Park and in Bhuyanpara. Similarly, Rhino has also been observed to stray outside in the fringe tea gardens. The three sub-adult male rhinos (Rhino 21, 22, 23) released from their Boma on 3rd Nov 2014 have since then showed a characteristic behaviour of residing together, in the vicinity of the camp .

f) Rhino calves under rehabilitation inside Boma

Both *Dwimalu* (calf of Rhino 17; 1.3 years) and *Purabi* (orphaned calf from Kaziranga; 2 years) are currently being hand-reared inside Boma. Both the rhinos have gained weight and imprived body condition after several bouts of diarrhea and pcestode infestation. Concentrate food is introduced to their diet without reducing their milk formula (DM). Supportive therapy is being continued in the form of herbal liver stimulant and macro and micro minerals. The rhinos will be weaned off milk at the age of 24-30 months with gradual withdrawal of artificial formula. The rhinos can be shifted to a larger enclosure with some provisional food and can be held till the age of 36-42 months; after which they can be released in the wild and to be monitored for survival and ranging pattern.

2.5. Radio collar status

As part of the IRV2020 protocol, most of the reintroduced rhinos have been fitted with radio collars. It is mandatory to observe radio-collar belt of rhino at a regular interval. The collars are designed to adjust according to the animal's neck size and also 'drop-off' after a certain period. However, in case of 20 collars used on rhinos reintroduced in Manas, most of the collars have remained even after the validity period. In case it is observed that the collar is in any way a hindrance or has 'tightened' then it becomes essential to physically remove the collar so that it doesn't become a life risk to for the animal.

As per decision taken by 2nd May, 2014 Translocation Core Committee Meeting, PCCF(WL) at present has given permission to remove of six (Rhino-3,7.9.11,13 &15) rhinos radio collars that shall be undertaken in the coming winter season.

Table 2.3 : Status of radio collars of Rhinos at Manas National Park (as on 31.11.2014)

	Rhino code/Name	Radio Collar Frequency	Sex	Date of Collaring	Duration of radio collar functioning	Remark
1	**Rhino-1***	149.7000	A-M	11/4/2008	12 month	Radio collar was removed 21st June,2011
2	**Rhino-2***	149.3202	A-M	25/4/2011	12 month	Dropped 8th November and recovered 11th November 12
3	**Rhino-3**	148.7800	A-F	27/12/2010	11 month	Stopped (dtd.30/11/2011) collar belt tightened
4	**Rhino-5***	148.3200	SA-M	18/01/2011	9 months	Stopped (dtd 3/11/2011), removed 22/1/2013 by capturing the rhino
5	**Rhino-6**	148.7200	A-F	18/01/2011	6 months	Dropped (dtd.8/8/2011) due to courtship with Male rhino
6	**Rhino-7**	148.3200	SA-M	18/01/2011	22 months	Stopped (dtd.13/10/2012) Collar belt around the neck it is tightened
7	**Rhino-8***	149.3830	SA-F	18/01/2011	36 months	Working till rhino killed by poacher on 31/12/2013
8	**Rhino-9**	148.8510	A-F	8/1/2012	11months	Stopped(Recent Status Unknown)
9	**Rhino-10***	149.2720	A-F	8/1/2012	21months	Working till rhino killed by poacher on 29/10/2013
10	**Rhino-11**	148.2590	SA-F	19/2/2012	23 month	Working (collar tightened)
11	**Rhino-12***	150.51	A-F	19/2/2012	4months	Rhino was killed with active radio collar on 23/5/2013
12	**Rhino-13**	150.250	A-F	19/2/2012	22 months	Working
13	**Rhino-14**	148.3900	A-M	19/2/2012	13 months	Dropped(dtd.21/03/2012) pull out by adult male Rhino-2
14	**Rhino-15**	150-070	A-F	11/3/2012	20 months	Working(Not getting signal

						27th June,2014
15	**Rhino-16***	149.2410	SA-M	11/3/2012	4 months	Dropped(dtd.2/6/2012) pull out by adult male Rhino-2
16	**Rhino-17***	150.110	A-F	11/3/2012	13 months	Working till poached on 2/4/2013.
17	**Rhino-18**	150.290	SA-M	23/11/2012	13 months	Dropped
18	**Rhino-19 (Ramu)**	151.700	SA-M	27.12.2013	11 months	Working
19	**Rhino-21**	151.880	SA-M	3.11.2014	1 month	Working
20	**Rhino-22**	151.051	SA-M	3.11.2014	1 month	working

A-M= Adult Male, , A-F= Adult Female, SA-M- sub-adult Male, SA-F= sub-adult female, *= poached
Average radio collar age -14.7 months

2.6 Birth of New Rhino Calves

Since 2006, 8 trans-located (wild to wild) females and 3 rehabilitated (hand reared) females have given birth to 11 calves. These births indicate that the trans-located rhinos are breeding successfully and have adapted well to the new environment. It is now important to ensure the safety of these newborn calves and their mothers as well as the other rhinos in Manas so that the vision of establishing a viable rhino population is achieved over the long term. The new mother rhinos are very protective and always remain in teh vicinity of the young one. While running, the young calf tends to run in front of their mother so it is very difficult to observe rhino calves for the first 2-3 months. Sometimes mother 'hid' her calf for 1-2 hours in grassland area and moved in the vicinity of 100-200m radius. In case of any approaching danger, the calf would make a low pitched snorting sound that alerted its mother. It was also observed that rhino calf footprint circumference were on an average around 12.2cm in a muddy place. The footprints grew (increased) in size up to 1 cm per month, thereby indicating the rapid growth in body size in the first six months (Deba Dutta pers observ).

2.7 Master ID preparation

Rhino ID based monitoring is one of the most essential system of monitoring rhinos for a newly established rhino population of Manas NP. Master ID of all translocated rhinos has also recently been completed on the basis of Greater One horned Rhinoceros Monitoring Training Manual based on IUCN SSC AsRSG Rhino Monitoring Course (**ANNEXURE 6).**

The Rhino ID Master file contains details of potential identification features such as horn shape, ear notch. Ear tears, skin folds deformities, body scars or tail shape. So each member of ground field staff should understand better way to collect unbiased data of rhinos. Regular monitoring and correct identification function will help to deter other illegal activity.

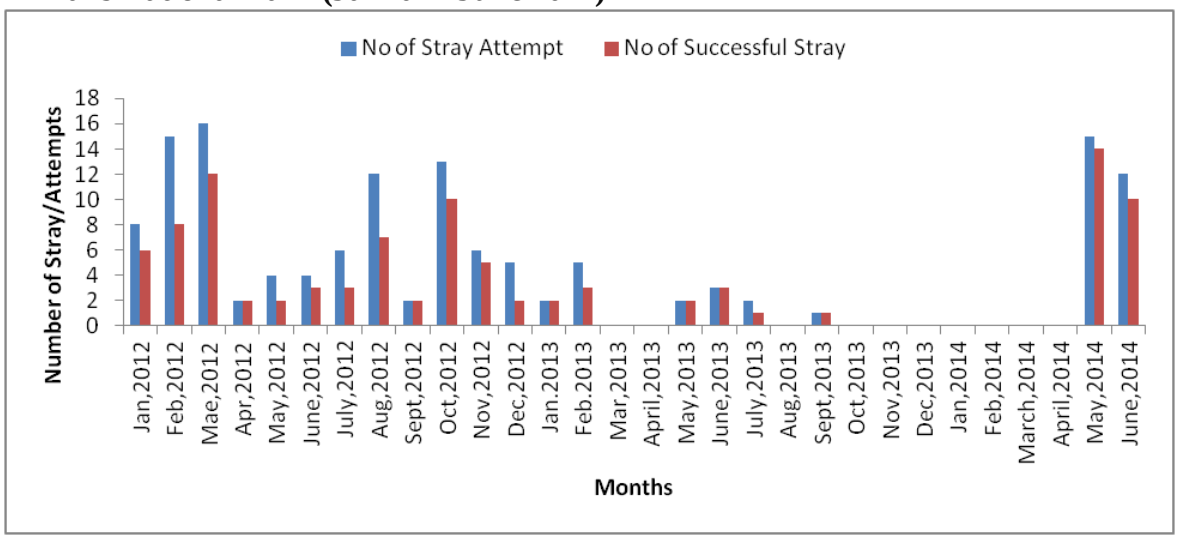
It will also help to develop all round development of park. Poachers killed 7 translocated rhinos of Manas. So presence of monitoring team on patrol on a daily basis plus knowledge of rhino behaviour, IDs may help to deter all illegal activity. These processes also helps to keep all rhino using areas under close demographic surveillance, so that any illegal threat may be detected.

2.8 Stray and Man-animal conflict management:

In case of wild-to-wild reintroduced Rhinos, there were several instances of straying outside the Park in the initial years. This was possibly due to the fact that adult rhinos were trying to establish their territory in the new area. Few individuals strayed outside into adjacent paddy fields as well as cultivable lands and depredated crops. During January-April, 2012 there were 3 major stray incidents wherein one person was killed when he got himself very close to rhino in spite of forest personal warning him against it. Rhino stray incidences gradually came down by the year 2013, although as a precautionary measure, one crate with accessories and limited quantity of tranquilizing drugs are kept under the supervision of the Forest Veterinary Officer (FVO) for any emergency use.

Usually rhino stray attempts are just near to boundary 10-20m. If rhino overcomes this distance from the patrolling and monitoring staff then they can moved upto 1-2 km and more for raiding crops or exploring new areas. This has been termed as a 'sucessful stray' and the number of such instances recorded (Fig 1.6). As evident the straying usually coincides with the paddy growing season in May-June and also during the drier months.

Fig-2.5. Monthly Rhino Stray Attempt and Successful Straying (crop raiding) by rhinos in Mans National Park (Jan2012-June 2014)



During this period two distinct pattern of rhino straying was observed, one by the rhinos released in the park earlier straying out for crop raiding and the other by the newly released rhinos post-release as a part of their exploration and adaptation to the new habitat. The stray took place only along the stretches which was not protected by electric fencing. Of the earlier released group, Rhino1 was most prone to stray and Rhino5 also demonstrated a very limited trend. Among the new batch, Rhino10, 17 & 18 strayed out of the park soon after getting release probably as they were trying to explore the new area. Rhino10 strayed over to small distances of about 1 to 2 km close to Kaljhar and Kokilabari and returned back. Rhino17 and 18 strayed out along the Beki River through the Kahitema area and strayed over a larger distance as they had to experience a large human pressure leading to a lot of problems and chaos. This was the first experience of a post release stray in Manas.

2.8.1. Human-animal Conflict

Certain Rhinos along with elephants also reported to stray and raid crops in the fringe areas. As evident from Fig7 and Fig 8, the Rhino-Human conflict is highest along the southern boundary in Bansbari and Bhuyanpara Ranges. Erection of solar fencing, community watchtowers and driving rhinos inside are some of the mitigation measures that may be tested.

Fig 2.6 Human-animal conflict in Manas National Park (2011)

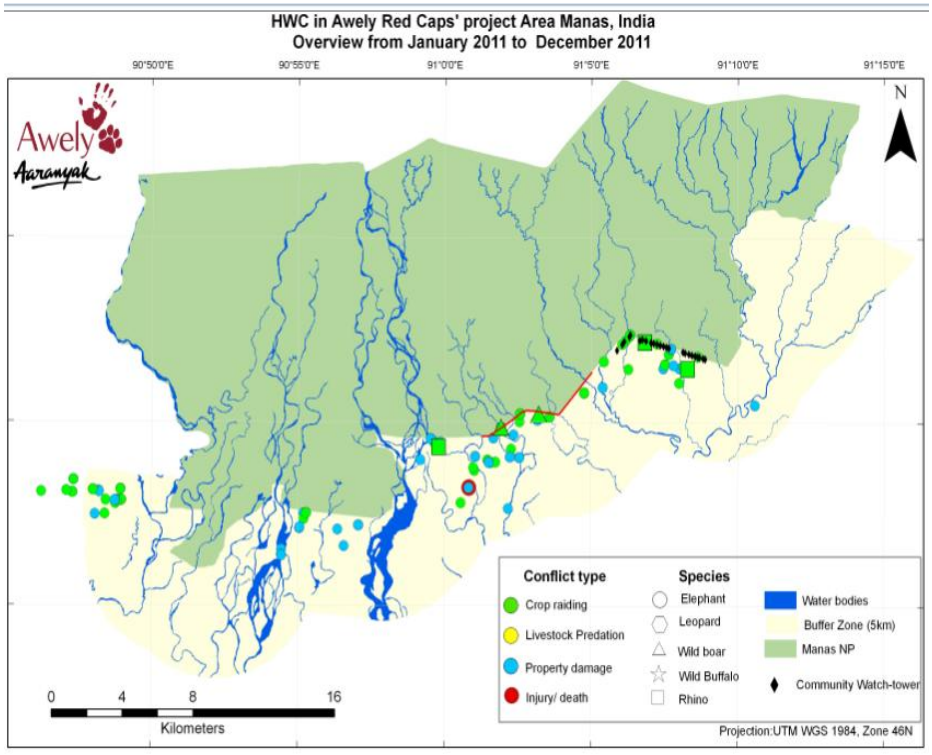
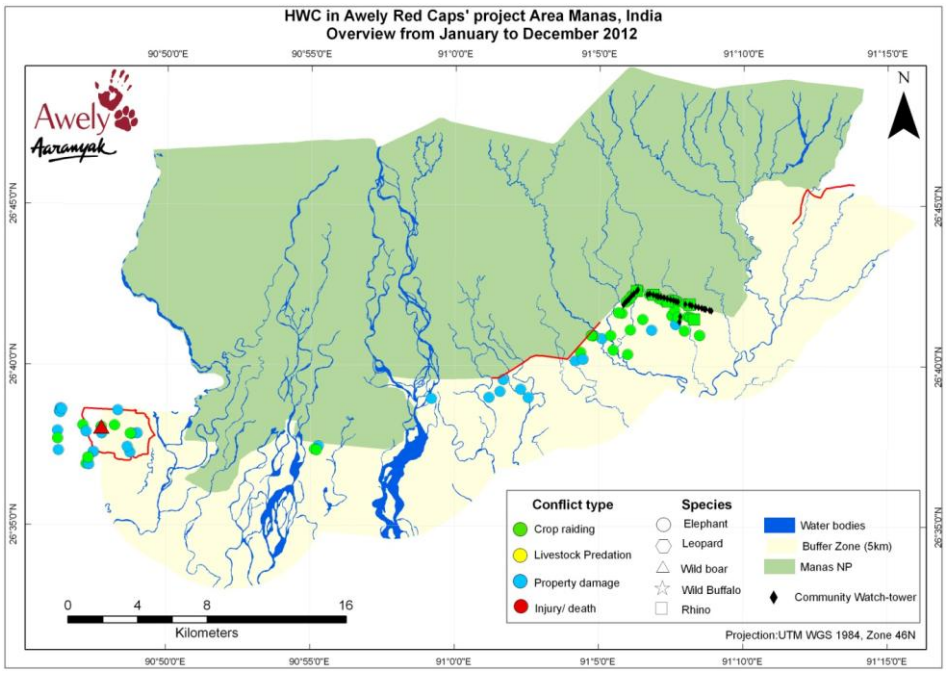


Fig 2.7 Human-animal conflict in Manas National Park (2012)



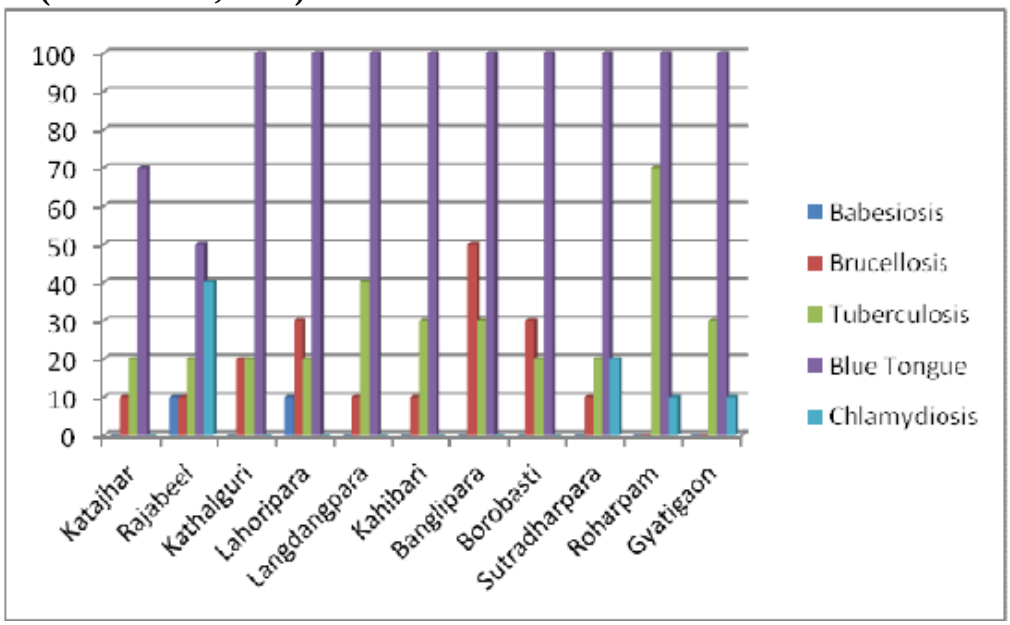
2.9 Disease monitoring:

Disease ecology is a fast emerging discipline in wildlife conservation. There is particular interest for mega herbivore-livestock interface issues. Diseases also play a role in structuring the demography and viability of the wild population, and this could be addressed by quantitative knowledge on the emergence, spread, persistence and evolution of infectious diseases. Re-introduced wild populations mimic the small population which are vulnerable to stochastic events and disease impacts.

A masters dissertation study in 2013 (Phukon, 2013) focused on re-introduced population of Greater One-horned Rhinoceros (*Rhinoceros unicornis*) and their sharing of habitat with livestock in Bansbari Range of Manas National Park. It was hypothesised that the interaction of rhinos with livestock has potential to contract diseases from the livestock population, and therefore the diversity and magnitude of disease prevalence in livestock is likely to pose serious threat to the rhinos. The study quantified disease distribution pattern and commonality between livestock and rhino population and map disease gradient in MNP during the period (Jan-April, 2013).

The study established wide prevalence of disease in the livestock (Fig 2.7). Given that the Zone of Influence of livestock in MNP includes home range of rhinos, it indicated that the rhino population is likely to be under disease risk and conservation efforts needs to incorporate disease perspective for recovery efforts and long-term viability of rhinos in MNP.

Fig 2.8: Percentage of infectious diseases in fringe villages of Bansbari Range,Manas NP(ref: Phukon, 2013).



The major intervention required includes a well planned disease surveillance and management programme, ensuring proper scientific management of livestock and restricting movement of livestock inside the park through proper checks at entry points. Efforts should be focused on villages showing high Index of threat, viz. Katajhar and Rajabeel, while executing any management interventions including veterinary care.

2.10 Conclusion and specific recommendations

1. There are 30 Rhinos at present in Manas (28.11.2014) and majority has established a set pattern in their ranging and behaviour. The ranging is comparatively much larger as compared to Rhinos in other areas (such as Kaziranga, Pabitora and Orang) and straying behaviors has also been associated with a few individuals.
2. Habitat management interventions especially for systematic removal of invasive species and control of livestock grazing is most urgently required in key rhino habitat areas.
3. Provisioning of artificial water holes for wallowing is also critical during the dry winter season. Existing natural water bodies (especially small rivulets) need to be protected and devoid of any biotic interference.
4. Straying, including crop-raiding by certain individual rhinos can be controlled by adopting a proactive ‘driving in’ strategy by patrolling staff along the southern boundary.

5. Provisioning of (solar fencing and its regular maintenance and upkeep) has been beneficial towards controlling straying of wild (and domestic) animals.
6. The existing monitoring of rhinos using radio telemetry should be gradually phased out and identification of individual Rhinos based on external physical features and behaviour as prepared under the Master-ID file (Annexure 6) by field staff must be encouraged. The monitoring based on identification key has already shown signs of success with frontline staff and must serve as a key protocol for small Reintroduced rhino populations in other areas under IRV2020.

CHAPTER THREE

SECURITY ASSESSMENT AND STAFF CAPACITY BUILDING

3.1 Challenges in managing Manas National Park

Within Manas National Park, new challenges such as grassland habitat management, expanding peri-urban infrastructure along the southern boundary, trans-boundary vehicular traffic, poaching, instances of insurgency and illegal wildlife trade remain to be completely addressed. Holistically, MTR landscape needs to be managed as a trans-boundary entity with international cooperation with the Government of Bhutan.

Some of the good practices that have been initiated and need mainstreaming and institutional continuity in managing Manas National Park have been the involvement of local communities, especially unemployed youth for joint protection of forests and eco-tourism initiatives. Similarly, rebuilding park infrastructure, multi-stakeholder partnership towards scientific management of tiger populations and rhino reintroduction since 2008, has contributed significantly towards rapid revival of the Park.

The need to have a unified command for the core and buffer combined with proposed up-gradation of certain good quality (> 40% canopy cover) forest areas such as Ripu-Chirang and Manas RF (part) into wildlife sanctuaries will be necessary for the increasing wildlife population from the core (in Manas National Park and Barnadi wildlife sanctuary) in the long run. Rapid expansion of agriculture and settlement areas along the southern boundary, increasing human-animal conflict and expansion of border towns have also contributed to forest fragmentation and disruption of animal corridors have been some of the challenges in the buffer areas of MTR.

3.2 SWOT analysis of Manas National Park for Rhino conservation

STRENGTHS	WEAKNESS
• Sense of pride for rhino in the people of BTC • Largest and viable rhino habitat (past and current year data) • Staff dedication • Ngo and civil society willingness for partnership in rhino conservation. • Rhino based tourism • Multiple conservation value and tags	• Inadequate and untimely funding from state govt. • Inadequate man power (number and quality). • Inadequate infrastructure. • Porous southern boundary. • Insufficient intelligence gathering. • Appropriate and insufficient number of modern fire arms.

in rhino bearing area • WHS values. • Funding support from NTCA. • State amendment of WPA for better investigation and conviction with legal support.	• Inadequate community development. • Low rate of conviction in wildlife offences.
OPPORTUNITIES • Preparation of a comprehensive Rhino conservation Plan, • Public and political goodwill. • Scope for research. • National and international support. • Use of modern technology for monitoring and protection.	THREATS • Rise in global demand of illegally traded rhino horns. • Law and order situation. • Habitat degradation (invasive, woodland encroachment in grasslands). • Easy availability of fire arms including country-weapons. • Encroachment.

3.3 Poaching

Rhino conservation initiatives at Manas NP under IRV-2020 gave major setback when 7 adult rhinos and 1 sub adult male rhino were poached within the period of the three year (2011 to 2014). Adult male (Rhino 1) was poached in the October, 2011.Adult female (Rhino12) was poached 23 May 2012, adult male (Rhino2) was poached in the month of January, 2013 and Adult Female (Rhino-17) was poached on 3rd April, 2013. Sub adult male Rhino-16 was poached on 16 August, 2013. Adult female Rhino-10 was poached at Chengmarijhar area of Bhuyanpara range on 29th October, 2013. On 31st December, 2013 another adult female Rhino-8 was poached at Charfuli areas of Bansbari range. In the year 2013 altogether 7 rhinos were killed by poachers. During this year one adult male Rhino-5 was poached in the month of November. Among the 7 poached rhinos 3 adult females have gave birth calves at Manas.

Table 3.1 : Summary of poaching of Reintroduced rhinos in Manas National Park

	Name	likely cause/arm used/remarks	Sex	Approx Age	Date of Poaching/Detection	Location	Range
1	Rhino-1	Probably bullet injury, carcass badly decayed,	M	10	1.10.2011	Sikagonda	Bhuyanpara
2	Rhino-12	Gun shots wounds about 0.5cm diameter over right eye, right forearm, right shoulder, left shoulder and lower mandible, horn, nail and meat removed.	F	10	22.05.2012	Chengmarijhar	Bhuyanpara
3	Rhino-2	Gun shots wounds about 0.5cm diameter over neck left arm, left shoulder and forehead noticed, horn meat and nail removed	M	7	13.01.2013	Daokabaha (Bhatghali)	Bansbari
4	Rhino-17	Gun shots wounds about 0.5cm diameter size over right chest region just behind the shoulder joints, horn, nail, tail removed	F	12	02.04. 2013	Sidhajhar	Kahitema
5	Rhino-16	Single bullet above chest, 0.315 bullet suspected; meat etc recovered from suspected poacher	M	8	06.08.2013	Kuchiabeel (Bhatgali)	Bansbari
6	Rhino-10	Three bullets 0.303, Gajimara. Bullet and weapon recovered. One suspected poacher killed.	F	12	29.10.2013	Kochubari (Betbari)	Bhuyanpara
7	Rhino-8	Bullets from AK47 suspected	F	9	31.12.2013	Chorpuli	Bansbari
8	Rhino-5	Bullets from AK47 suspected	M	12	01.11.2014	Dawjeng (Kanchanbari)	Bhuyanpara

3.4. Inadequate Manpower and Infrastructure

With the increase in the number of camps and the complexity of protection it is felt that the current number of manpower is highly inadequate, especially at the frontline level. (Table 9). An analysis of age and the length of service put into Manas are also very revealing (Fig 8) and there are several instances when the person has served for more than twenty years at the same location and at the same post. The average age of frontline staff in all categories is above 40 years. This is a severe impeding factor towards conducting physically challenging duties such as foot patrolling and nigh vigil.

Additional support has been provided in terms of support from local NGO conservation volunteers, armed Home Guards and Assam Forest Battalion (Table 10). however due to their low wages (as in case of casual workers and conservation volunteers) and diminished levels of motivation (due to prolonged stay at the same place and temporary position for a number of years) , nature of leave etc, it is suggested that a serious review and strategy be undertaken for bringing in 'change' in the existing man power.

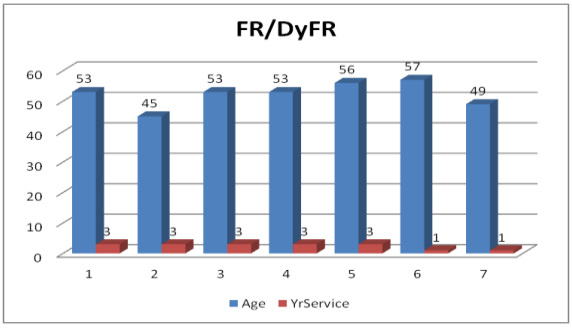
Table 3.2: Existing Sanctioned and proposed Field Staff increase in Manas National Park (as on 30.11.2014)

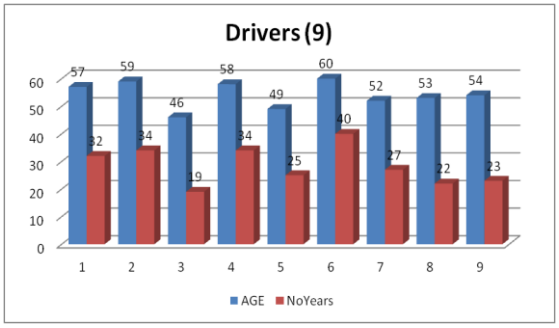
Sl.No.	Name of Post	Total Strength	Man in position	Vacancy	With Proposed Increase (Total)
1	Field Director	1	1		1
2	Dy. Director	1	1		2
3	ACF	1	0		4
4	Forest Ranger	4	4		6
5	Deputy Ranger	5	4	1	8
6	Forester-I	33	24	9	50
7	Forester-II	18	23	(+5)	18
8	Forest Guard	180	157	23	250
9	Driver	8	8		10
10	Handiman	3	2	1	8
11	Mahut	22	19	3	40
12	Grass Cutter	23	19	4	30
13	Boatmen	10	8	2	20
14	Game Watcher	44	37	6	50
	Total	353	307	49	497

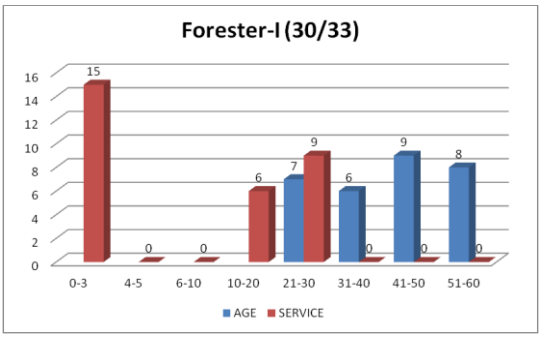
Table 3.3: Categories of Manpower available in Manas NP

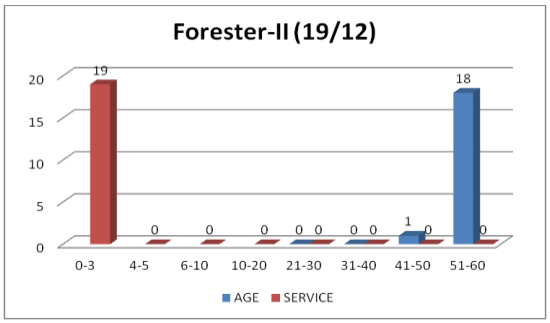
Sl. No.	Category of Manpower	Availability
1	Casual Frontline Staff	70
2	Conservation Workers (BTC supported)	100
3	Conservation Workers (IRV supported)	35
4	Armed Home Guards (IRV supported) Armed Home Guards (NTCA supported)	20 50
5	Assam Forest Protection Force (AFPF)	11
	TOTAL =	275

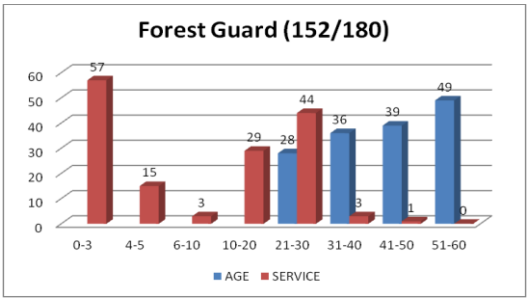
Fig 3.1 Age (Blue) and years in service (Red) as rendered by various staff of Manas National Park. The number in parentheses is the actual number present/total staff strength(as on 30.11.2014).

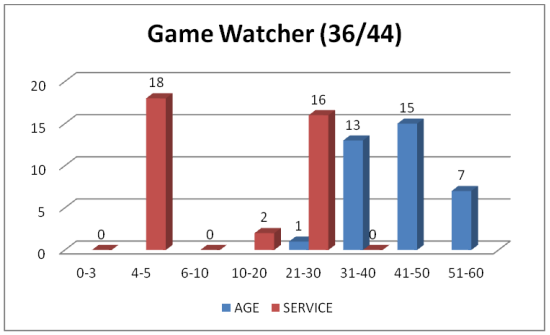


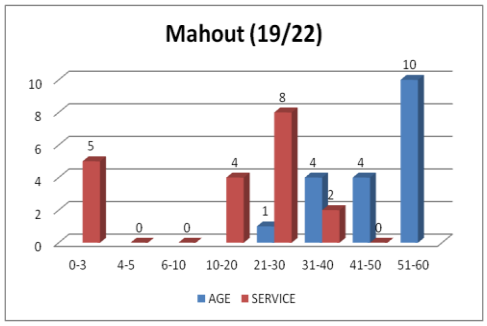


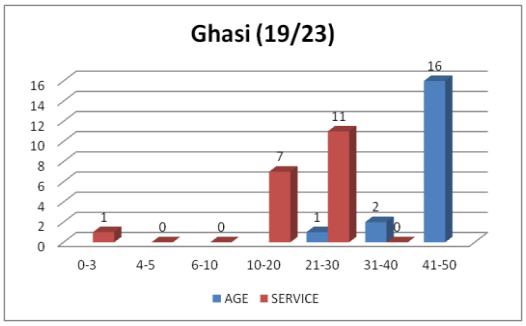


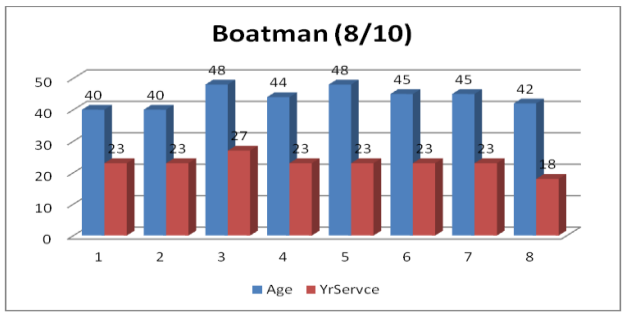












3.4.1. Camps and Infrastructure

Currently, there are about 60 numbers of anti-poaching camps distributed all over the Park. However the camps are not uniformly distributed and there are several gaps in patrolling especially along the northern and northwestern part of the Park (Fig 9) .More camps are required as the terrain is difficult and inaccessible because of which monitoring and protection have not been possible uniformly (Fig 10).

Similarly, the number of vehicles, patrolling infrastructure such as boats, wireless sets, patrolling paths and infrastructure remain inadequate and depend on fund position to compensate for the gaps. Detailed analysis of the same has already been made in Swargowary et.al., 2012.

Fig 3.2: A geospatial analysis of gap areas for camp network in Manas National Park (ref: Swargowary et.al., 2012)

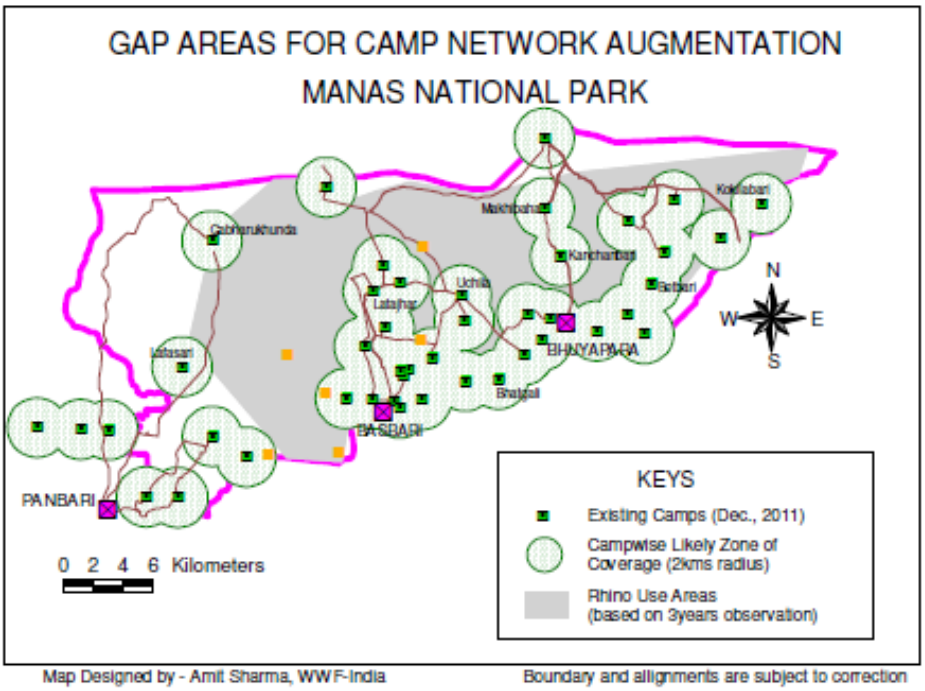
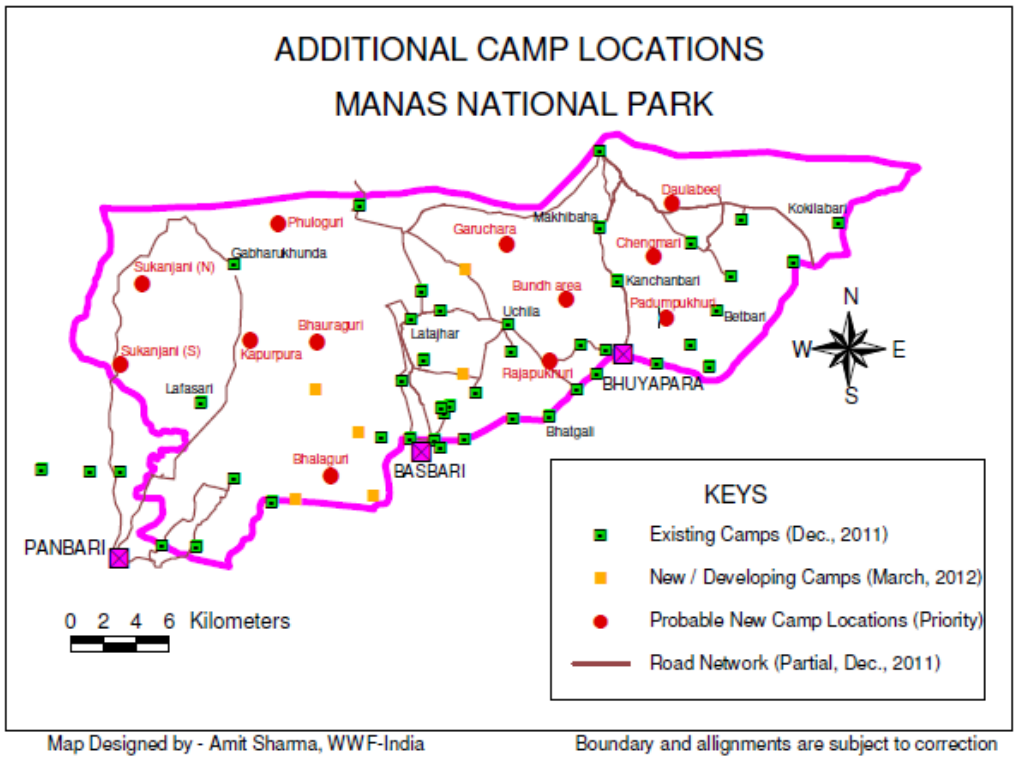
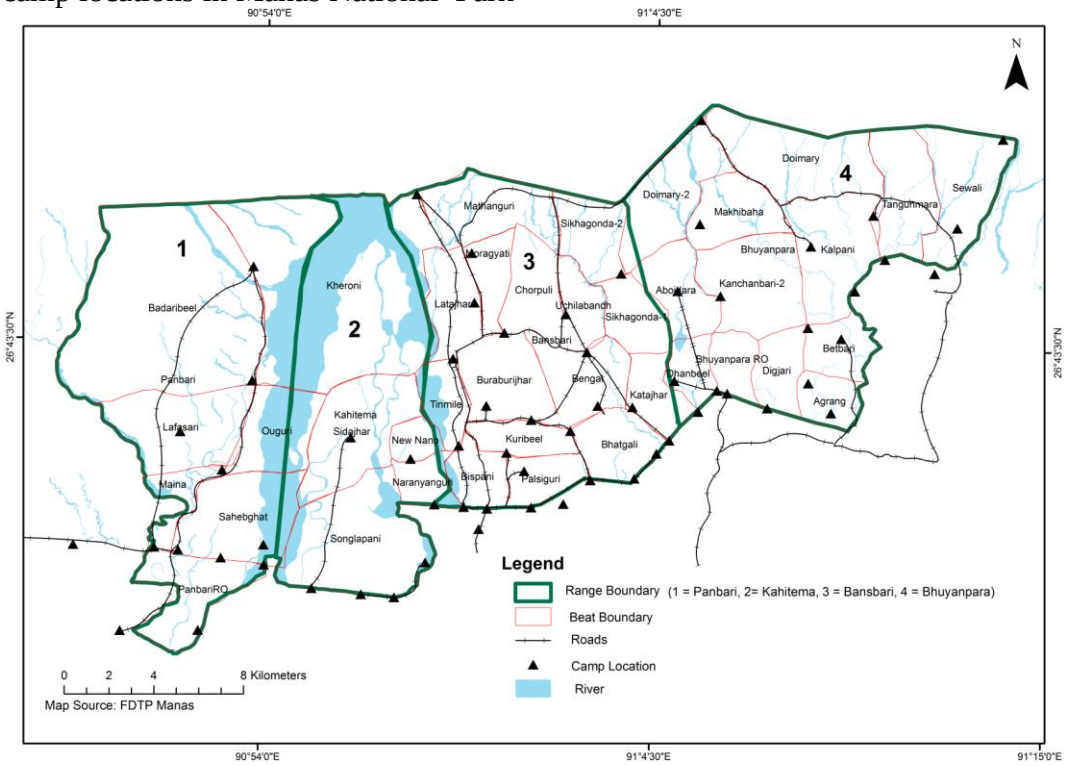


Fig 3.3: A geospatial analysis of probable areas for camp construction in Manas National Park (ref: Swargowary et.al., 2012)



3.4.2 Establishment of Ranges and Beat boundaries

Fig 3.4 Map depicting proposed new Range(Kahitema) and beat boundaries along existing camp locations in Manas National Park



As it is evident from the Fig 3.4. above, new range and beat boundaries (based on natural features, roads and past maps) have been proposed under the Tiger Conservation Plan for Manas (2014-2024). The beat boundaries must be demarcated on the ground and the staff encouraged to carry out regular field patrolling based on their area of jurisdiction.

3.5 Rhino protection Strategies

The last security assessment had been undertaken for the Park by the IRV2020 Security assessment team in June 2012 (Swargowary et.al., 2012) and there is a need to conduct this again in the light of new poaching and encroachment threats to prime Rhino Habitat. Severeal High-level security committees have also been formed by the State government (Annexure) and it is important that a consolidated anti-poaching strategy be adopted for the Park. Details of the integrative strategy and the road map for the next ten years have also been discussed in Chapter Four.

While, several emergency measures have been rolled out by the authorities to deal with the serious poaching issue and a series of high-level security meetings were held to ensure greater coordination between the Forest Department, the Civil Administration and the Police Establishment. Seven suspected people have also been arrested for alleged

involvement in the criminal offence and one intruder in the National Park was also killed in an encounter with forest guards.

Significant steps by the Manas National Park authorities with the goal of improving the protection mechanism include establishment and improvement of infrastructure (anti-poaching camps, road bridges, communication equipment), intensified patrolling using SMART techniques, engagement of additional personnel for enforcement, filling-up of vacant positions, capacity building of frontline forest staff and local community engagement through eco-development and eco-tourism activities. The details of the same have been described in the following pages. .

3.6 Strategic planning and enforcement of Law Enforcement Mechanism (LEMs)-SMART

3.6.1 Introduction and background:

The Spatial Monitoring and Reporting Tool (SMART) is designed to improve anti-poaching efforts and overall law enforcement effectiveness in established conservation areas. SMART makes it possible to collect, store and evaluate data on patrol efforts (e.g. time spent on patrols, areas visited and distances covered), patrol results (e.g. snares removed, arrests made) and threat-levels. When effectively used to create and sustain information flows between frontline staff , analysts and conservation managers, the SMART approach can help to substantially improve protection of wildlife and their habitats. The SMART approach can be introduced to any conservation area that relies on patrol teams to protect wildlife and the natural ecosystems they depend upon. This approach has already demonstrated its effectiveness in improving law enforcement effort, improving morale of enforcement teams, and reducing poaching levels in multiple sites across the world. Already SMART has been implemented in 120 conservation areas in 27 countries worldwide and fast becoming a global standard for law enforcement monitoring and management.

Manas National Park was the first choice under the program Indian Rhino Vision 2020 program for the range expansion of the rhinos in Assam and to build a new population through wild to wild translocations. As a part of the program 18 rhinos were successfully translocated to the park during 2008 to 2012 and all the rhinos seemed to have adapted well to their new habitat. Before the release of the rhinos in the park necessary rebuilding was done for the security of the rhinos to be released and poaching was not an issue in the park till October 2011. In the year 2013, five translocated rhinos total 7 rhinos (last 3 years) killed by

poachers. This was not a healthy sign at all for a newly established population through a lot of efforts and financial inputs. As per discussions in the Rhino Task Force meeting held on 30th January 2013 a decision was taken that to improve the patrolling, SMART systems are to be adopted and tried on a trial basis in Manas.

Following that decision a training program on SMART was organized for the park staff during the month of March,2013. After some gap period, Forest Department of Assam, Manas National Park authority planned to implement SMART with support of WWDT and WWF from the month of March, 2014. SMART has been implementing as pilot basis some selected vulnerable locations of Manas to improve the security scenario through improved patrolling and monitoring. 12 GPS and 12 digital cameras have been used for SMART patrolling in some vulnerable locations.

The patrolling was done by using elephants for combing the patrolling area and attempt was made to locate rhino and other wild life as far as possible. Later, all the spatial information was analyzed with SMART software for better output.

3.6.2 Orientation on SMART software

A special SMART software orientation program was arranged in the month of June, 2014. Principal objective of this program was to orient SMART software to core computer cell groups of Field Director Office of Manas Tiger Reserve. To do a preliminary analysis of duty GPS data on SMART tool for basic idea about outcome of SMART effort.

3.6.3. A Brief Progress of LEM implementation at Manas

Field implementation and experiment was carried out in the month of March , April and May in a very limited areas. In the month of July there were no such effort undertaken due to change of park administration.

A proper patrolling plan has been prepared on 8th August, 2014 at Bansbari range with frontline staff of Manas National Park. Later on all patrolling elephants were deployed at different anti-poaching camps. There are 12 patrolling teams containing 3-4 elephants and 5-8 frontline staffs for patrolling all vulnerable locations of Central Part of Bansbari and Bhuyanpara Range . Patrolling effort led to a positive atmosphere among frontline staff. They have improved their data collection capacity. All team members of Bansbari are now able to handle GPS, binoculars and cameras. They are also developing their patience to identify rhinos at wild stage on the basis of rhino unique ID.

As a result, patrolling team located Rhino-4 at Bansbari range after 400 days of uncertainty. Regular outcome of SMART report and discussion with patrolling staffs helped them to improve their work quality. Deployment of elephant in some strategic location

helped them to patrol regularly in some difficult areas. As a result of patrol on 16th August,2014 one patrolling team recovered huge amount of ammunition and hunting accessories and fortunately saving rhino from poaching. So there is a big challenge in front of Manas Park Authority to cover entire Manas NP under LEM patrol on coming days.

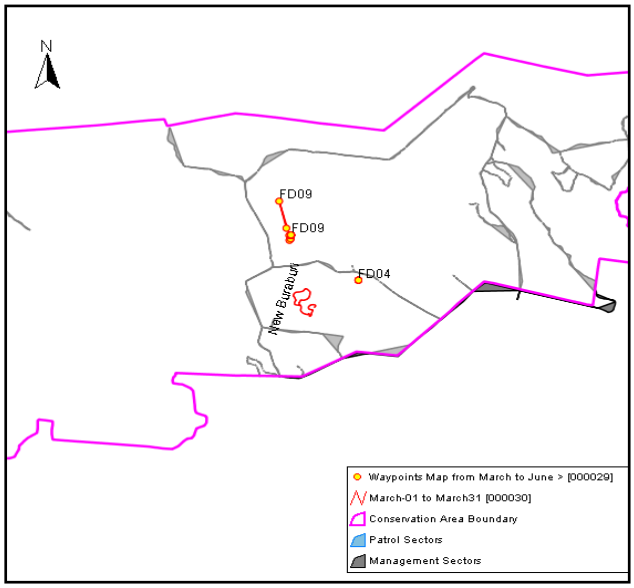
3.6.4. Summary of field data and Maps

a) Month of March Data Analysis- During the month of March, only New Buraburi, FD09, FD04 GPSs used on patrolling duty.

Table-1- Summary of duty GPS used in for the month of March, 2014

Code name of Duty GPS	Distance Covered (km)
New Buraburi	6.68
Buraburi	0
FD09	4.5
FD04	0.4
Rupahi	0
DD2	0

Map Showing GPS use areas of Manas National Park in March, 2014

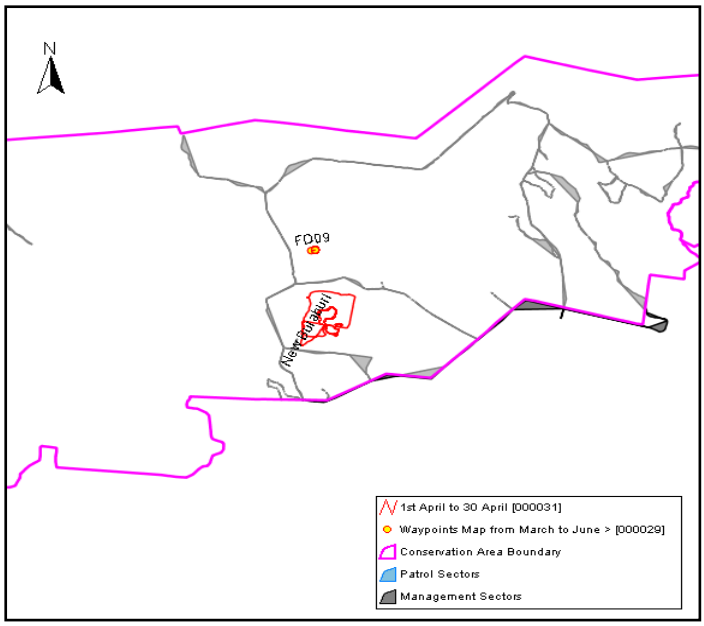


b) Month of April,2014 Data Analysis- In the month of April, New Buraburi GPS was in use on patrolling duty while FD09 GPS had limited use. Other four GPS has not recorded any data.

Table- Summary of duty GPS used in the month of April, 2014.

Code name of Duty GPS	Distance Covered (km)
New Buraburi	31.36
Buraburi	0
FD09	0.25
FD04	0
Rupahi	0
DD2	0

Map Showing GPS use areas of Manas National Park in April, 2014

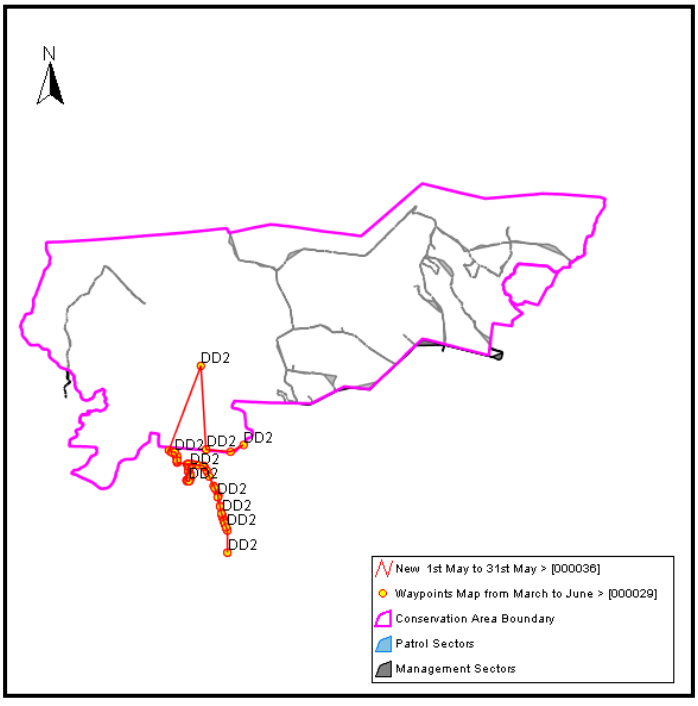


c) Month of May,2014 Data Analysis- In the month of May, only DD2 GPS was found to be used for patrolling duty. Major part of the patrolling was done outside the park boundary.

Table- Summary of duty GPS used in the month of May,2014.

Code name of Duty GPS	Distance Covered (km)
New Buraburi	0
Buraburi	0
FD09	0
FD04	0
Rupahi	0
DD2	30.91

Map--GPS use areas of Manas National Park on the month of May,2014

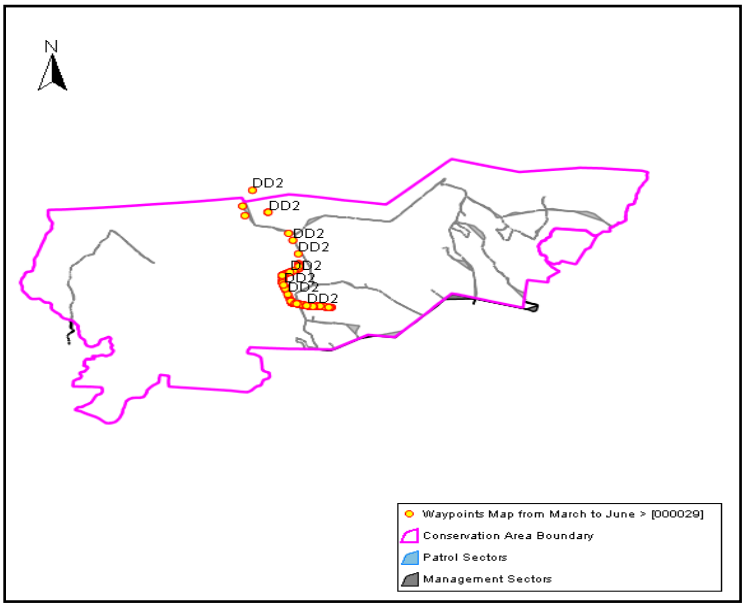


d) Month of June ,2014 Data Analysis- In the month of June, only DD2 GPS was found to use for patrolling duty. Other GPS were not in any use.

Table-3- Summary of duty used GPS in the month of June.

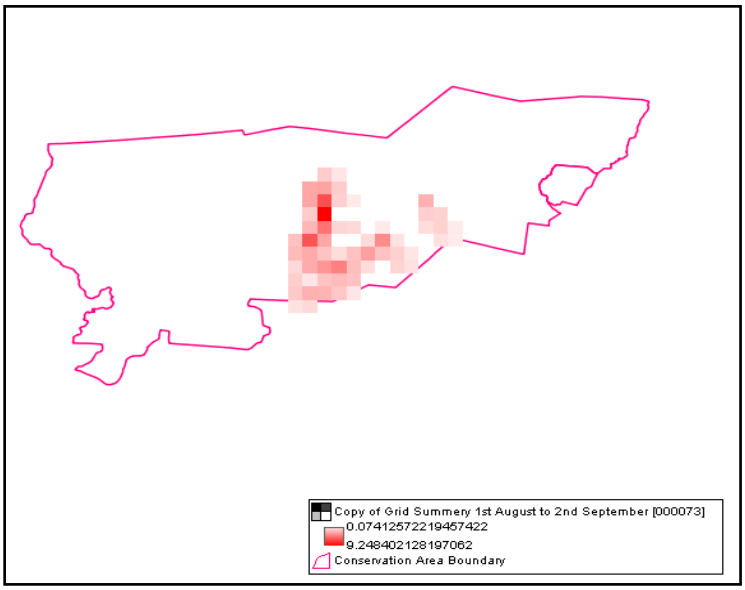
Code name of Duty GPS	Distance Covered (km)
New Buraburi	0
Buraburi	0
FD09	0
FD04	0
Rupahi	0
DD2	29.14

Map-4-GPS use areas of Manas National Park on the month of June.



e) Field data analysis for the month of August and September,2014

Map showing Patrolling intensity areas 1st August-2nd September,2014



3.6.5. Patrolling Effort

Patrolling effort is improving. Each team is giving hard effort to patrol as much as possible. Following are brief analysis of each team effort.

a) Patrolling effort from 1st - 15th August,14

Serial No	Name of Team	Distance (km)	Total Hours of Duty
1	FD04	7.4	4.2
2	DD2	5.27	3
3	FD06	12.64	5.6
4	FD07	12.53	4.8
5	FD08	10.31	4.4
6	FD09	0	0
8	FD10	16.73	9.1
9	GPS1	0	0
10	Bhuyanpara RO	0	0
11	Charfuli	0	0
12	FD11	0	0

b) Patrolling effort from 16th August - 2nd September, 2014

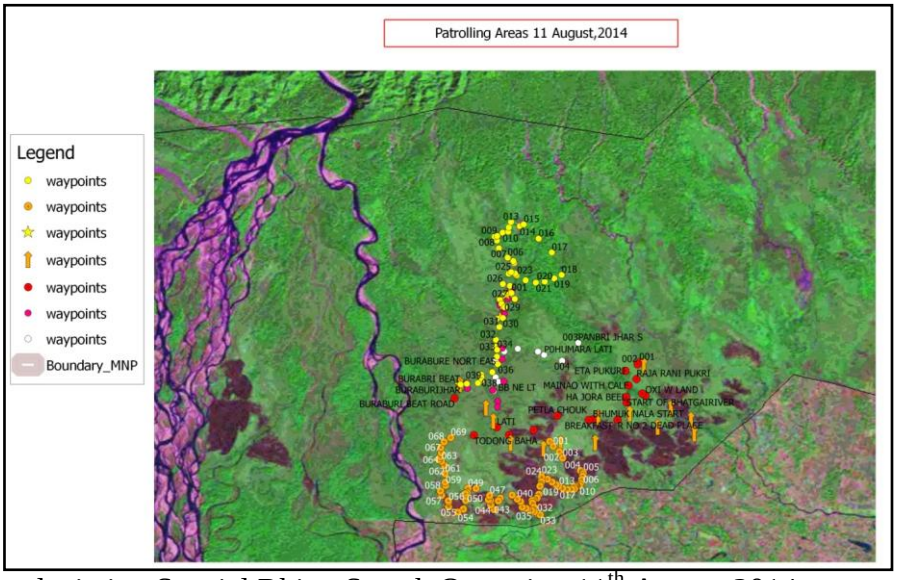
Serial No	Name of Team	Distance (km)	Total Hours of Duty
1	FD04	0	0
2	DD2	13.03	4.7
3	FD06	10.36	6.2
4	FD07	10.43	4.6
5	FD08	0	0
6	FD09	0	0
8	FD10	12.13	5.43
9	GPS1	0	0
10	Bhuyanpara RO	7.5	5.9
11	Charfuli	0.37	10
12	FD11	15.33	6.39

c) Patrolling effort from 1st August to 2nd September, 2014

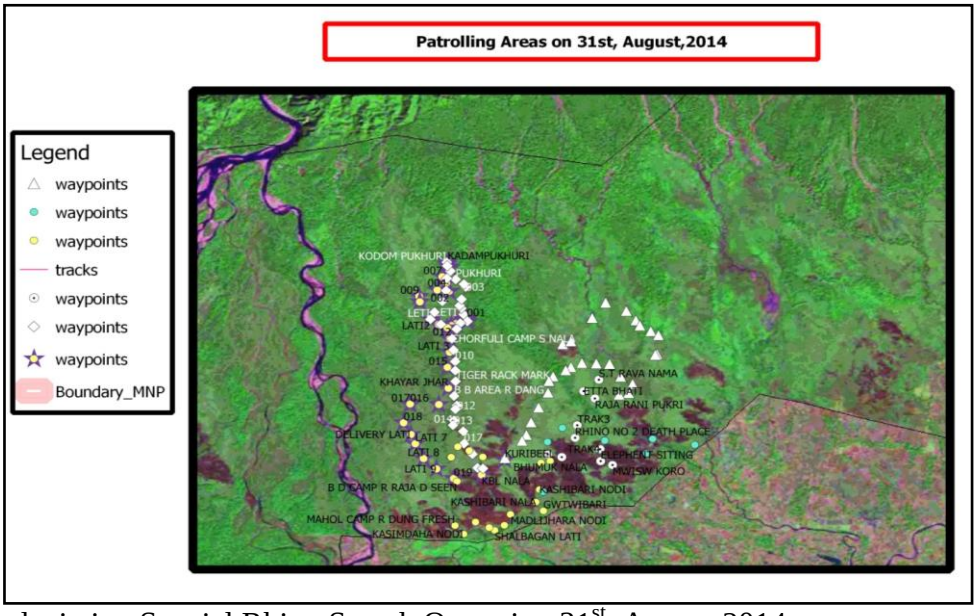
Serial No	Name of Team	Distance (km)	Total Hours of Duty
1	FD04	7.5	4.56
2	DD2	18.3	7.72
3	FD06	23.0	11.86
4	FD07	22.96	9.57
5	FD08	10.4	4.48
6	FD09	10.4	4.56
7	FD10	28.8	14.62
8	GPS1	0	0
9	Bhuyanpara RO	7.5	5.9
10	Charfuli	0.37	10
11	FD11	15.33	6.39

3.6. 6. Special Rhino Search Operation

There were two special rhino search operation undertaken at Bansbari and Bhuyanpara on 11th and 31st August. In this operation, mainly rhino ranging areas were covered. As a result of search operation 18 rhinos were located on different part of Bansbari and Bhuyanpara Range.



Map depicting Special Rhino Search Operation 11th August,2014



Map depicting Special Rhino Search Operation 31st August,2014

3.6.7. Other Wild Life Observation

On most of the occasions each team members dedicatedly devoted their patrolling effort to locate rhino with support of specific Rhino-ID. Moreover, other wild life as well as wild life signs were also recorded during their patrolling.

3.6.8. Future Plan

A detail security assessment was made on entire Park byIRV2020 security assessment team in the year 2013, considering all kind of threat for management of park. As per the security analysis it was recommended to increase SMART patrol to entire areas of Manas NP. Therefore park authority has immediately planned to implement SMART patrolling system entire areas of Park. Significantly, park authority has been trying to improve infrastructure (anti-poaching camps, road bridges, communication equipment), engagement of additional manpower, filling-up of vacant positions, capacity building of frontline forest staff etc. In this context park authority need additional resources (including 100 IRV2020 local volunteers and 100 arm home guard salaries apx .$10 million) in place to operate patrol on regular basis at least for coming 3 years. Besides park authority need financial resources regular training, procurement of necessary equipments and improving infrastructure.

3.6.9 Evaluating the SMART Approach

When SMART patrol monitoring and the adaptive patrol management cycle are operating entire park areas, regular patrol reports (usually monthly or quarterly) will be produced to evaluate patrol performance and provide feedback to frontline staff. Less frequent (e.g. annually) more in-depth data analyses, with an evaluation of various trends in patrol performance and threat-levels, as well as an evaluation of the entire patrol management system will be reflected in that report

3.7 Combating encroachment in Rhino-bearing areas (Bhuyanpara)

The Manas NP has two identified encroachments viz. – Panbari (south) and Betbari under Bhuyanpara Ranges. These encroachments have not happened overnight and trace their origin to the insurgency period in 1990s.

In case of Bhuyanpara, it is stated that while there have been new clearings in the grassland area of the (Agrang-Betbari) area of Bhuyanpara Range, but these are not of permanent nature and there is no human settlement inside the clearing areas. This illegal cultivation encroachment is not a new issue and has been a feature for over a decade. The

easternmost boundary next to Betbari camp is adjacent to the Kokilabari Agricultural Farm (approx 9 sq km) with only a small rivulet separating the two. The seed farm was until recently on a 30 years lease from the forest department. At the end of 2005-06, the seed farm was formally handed over to the Agriculture department, Govt of BTC. This farm supports people from at least 57 villages who take a small portion of the land on lease from the department every year. At the same time, certain miscreants take advantage of the heterogeneity of the community and also indulge in illegal cultivation on the disputed side. The park authorities remain vigilant and use vigilant and use both conservation volunteers and armed guards to monitor and control this menace.

To keep the sanctity of the National Park and a world heritage site, the entire park area should be cleared from the existing encroachers and enforcement should be in place to prevent any further encroachment. The total encroachment area estimated within the above mentioned locations of the national park is about 15 km^2. Sporadic illegal activities are also at times reported from different parts of the park and the area with the highest problem is the Kahitema area in between the rivers Beki and Manas. This is mainly because of inaccessibility of the area. It is essential to stop all forms of illegalities affecting the park.

The Government of Assam and Bodoland Territorial Council should come ahead to solve this key issue to maintain the sanctum of the World Heritage Site (Annexure 1 & 2).

3.8. Conclusion and specific recommendations

1. Poaching of Rhino has emerged as the biggest threat that must be controlled at any cost. A detailed security assessment is therefore recommended every six months.

2. The manpower, especially in forest frontline staff is currently highly inadequate and skewed towards an older age-group of above 45 years. The length of service rendered by forest frontline staff at the same location is also more than 3 years in most cases. A detailed evaluation of motivation levels, health and fitness etc needs to be undertaken for the permanent staff.

3. Gap areas in construction of camps at strategic locations must be urgently addressed in the coming one year. Temporary camping at critical locations needs to be reinitiated with patrolling being carried out by using departmental elephants in these areas. Regular patrolling based on ‘Beat Area’ system needs to be augmented.

4. In case of non-permanent staff including conservation volunteers, there is an urgent need to mainstream their involvement into Park protection (by enhanced wages and a job security).

5. SMART-based patrolling has been initiated but must be carried out at the Beat level on a regular interval. The main objective of such a patrol should be to monitor Rhinos, detect and combat any perceived threats that may result in poaching The frontline staff have shown tremendous improvement towards handling of GPS and camera, however the current logistical constraints at the Range-level require that the data is collected and analyzed at a central location . A SMART-Cell at Field Directorate office has been established and a stand-alone monitoring schedule can be worked out in coordination under the leadership of the Deputy Director. For greater transparency and coordination, analysis of field data can be coordinated with support from researchers who are familiar with rhino ranging behaviour at Manas.

6. A consolidated approach towards planning and assessment needs to be envisaged. Currently there are several committees that have been nominated by the Assam State and BTAD governments (Annexure 1-6). A joint effort by involving policy makers from both the governments must be urgently carried out to re-interpret/smooth out the differences that may be a hindrance towards active governance in the field. The committee meetings review and recommendations must be time-bound. Recommendations from each of the committees must be implemented on the ground with a feedback mechanism to feed into the assessments.

CHAPTER FOUR

RHINO CONSERVATION - THE ROAD MAP AHEAD

4.1 Aiming for Zero Poaching

The current demographic profile of Rhino population at Manas suggests that there may exist a breeding gap for the next 2-3 years as all the adult breeding males have been removed from the population. The last adult male Rhino 5 was poached on Nov 1, 2014. There is some speculation whether Ganga, who was observed with characteristic 'courtship injuries' in the first week of October 2014 had already mated with Rhino 5 then she may have the next calf in another one and half years. The need to supplement the existing population with adult breeding male Rhinos for population stabilization and aiming for zero poaching is therefore the immediate action point suggested for the next two years.

4.2 Combating encroachment in Bhuyanpara (Short-term Plan)

The encroachment in Bhuyanpara is currently on a standstill and since there are no permanent settlements a massive eviction drive with support from the District Administration in most urgently needed. The following timeline of action are therfeore proposed:

- Dec 2014: serving of eviction notice and eviction operation with support and coordinated action with Forest department, Baksa District administration, Police and Army.
- Dec 2014-Jan2015 : area domination will be required with support of additional manpower (with arms) support for atleast 50 staff to camp in the area. the camps at Khoirbari, Agrang, Panda, Betbari, Maozi and Tangunmara can accordingly be strengthened with the additional forces for the winter season.
- Jan-Feb 2015 : A trench along with a solar fence and boundary pillars can be erected at the disputed site so as to permanently repossess the area. The support of three local NGOs (Manas Bhuyanpara eco-tourism Society, Manas Agrang Society and Manas Maozegendri Ecotourism Society) along with the concerned village headmen will be crucial for the success of the eviction operation.

4.3 Combating encroachment in Bhuyanpara (Long-term Plan)

It has been observed that the encroachment at Bhuyanpara is a recurring problem that has been impacting the park since the declaration of the National Park in 1990. The disputed territories in Agrang Forest village and adjoining areas have been a bone of contention, especially since it is an area for prime grasslands /agricultural area. the socio-political

situation including the presence of militant outfits in the vicinity of the Park, unauthorized and illegal possession of weapons by civilians and the prevalence of country-made fire arms have also been some of the factors that have led to 'land mafia-backed' encroachment inside the Park. As already stated, the current encroachment is not of a permanent nature and the people from ateast 30 villages from nearby areas participate in clearing and cultivating small portions of forest land. Such encroachment is often backed and controlled by armed miscreants who have been indentified and the information shared with intelligence authorities. A reconciliatory attempt to talk to the encroachers and come up with an amicable solution was also attempted by the Park authorities in 2011 with support of the local NGOs. Boundary pillars had been erected and the area of actual demarcation was also agreed upon. Similarly, in April 2014, eviction notices were served and conservation volunteers from Panbari. Bansbari and Kahitema area were deployed in greater numbers to prevent any further encroachment.

All the actions as mentioned above indicate that a multi-pronged comprehensive long-term strategy (atleast five years) is required for targeting the encroachers. The tentative timeline is proposed below:

- Jan-Feb2015: eviction of encroachers, after the paddy cultivation season is over and to ensure that no further clearing in the grassland/forest is made. All access to forest, including grazing of livestock, collection of firewood and minor forest produce, fishing and hunting to be strictly banned and the law enforced through strictest of measures. Bringing in new forest staff and rotation of existing staff to other areas will be helpful. Any added incentive such as provisioning for rations, vehicle and elephants for patrolling, wireless sets for communication and provisioning of winter gear will most certainly boost the morale of the existing staff.
- Feb 2015: Deployment of Eco-Task Force (Two Companies) currently based out of Kokrajhar, BTC for systematic area domination and undertaking plantation in the adjoining Daodhara and Batabari RF areas. Daodhara RF is part of the Critical Tiger Habitat and also an important elephant corridor for migratory elephant. Currently, Daodhara and Batabari RF are also facing an onslaught of clearing and illegal removal of trees. There is a tremendous potential to create large-scale plantations through the Eco-Task Force in both these RF areas. The advantage of bringing in the ETF is that they are trained army personnel and that their large numbers (two companies) will ensure area domination against the armed miscreants that support

encroachers. Grassland improvement including maintenance of forest roads and creation of artificial waterholes etc are some of the additional tasks that can be handed over the Eco-task Force in the National Park. The Task force can be based out of Kokilabari and Agrang Camps so that no further encroachment occurs in the area. The modalities for providing housing to the Eco-Task Force, the salaries, nurseries for plantation etc must be worked out in coordination with the District and Territorial Division.

- March 2015 – Aug- 2020 : a systematic plan for creating nursery and plantations in the RF areas and complete closure of the National park to any anthropogenci pressures will ensure complete revival of the habitat and therefore the return of the Rhinos and mega herbivores.

4.4 Community engagement and public awareness

A total of 64 forest fringe villages have been identified that are in the immediate vicinity of the Park. Manas Forest Development agency has been registered and Eco-development activities need to be initiated that instill a sense of pride and ownership among the local communities. The local NGOs, fringe communities and the youth bodies around the national park are supportive towards conservation and this has helped the park to revive. For a better understanding of the community linkage discussion was held with members from the local NGOs like Manas Maozigendri Ecotourism Society, Agrang Society, Bhuyapara Society, Manas Ever Welfare Society and Panbari Society. It has been observed that almost every local NGO have a large number of members and a lot of them are engaged in supporting the park staff, this is healthy if used with care, however it has been learnt that the NGOs cannot sustain their large membership and often some of the guys leave the organization for other works and are not monitored. This leads to a risk of exposure of vital park information leading to complications in the anti-poaching measures. A large number of youths from the fringe villages of Manas are engaged as conservation volunteers and this is aiding building relationship and ensuring community goodwill to some extent. Some of these youths also understand that IRV-2020 is offering them a livelihood and this is helping to spread a good message.

It is also learnt that a regular community reach-out program has been organized since 2008 under the IRV-2020 program by the WWF team and almost all the villages and schools in the fringe of Basbari has been covered. It is also learnt that limited livelihood support program for the fringe community has also been extended under IRV-2020, the Government

biodiversity program as well as through some other programs run by NGOs like ATREE, Aaranyak and WTI. It is very important that the community out-reach programs are continued and areas under Bhuyapara and Panbari are also extensively covered to spread the message of conservation. Further it is necessary that livelihood support programs are initiated and systematically implemented to sustain the goodwill and support of the fringe community for long term conservation success in the park.

4.5 Enhanced Intelligence Network and LEMs

The support from the local community and help from the ex-poachers has built up the possibility of setting up an intelligence network in and around Manas National Park. A functional and effective intelligence network is very essential to minimize wildlife crime in any protected area which has wildlife like rhinos, tigers and elephants. At present it is not clear if any proper intelligent network exist in the park but efforts should be made to immediately form a working network that support the park authorities that can help in enhancing the protection for the rhinos and other wildlife.

The GPS-based SMART patrol that has been initiated in Manas NP this year needs to be continued and expanded in the coming years. The main objective of this patrol had been to undertake monsoon-patrol using elephants and also bring innovation in Rhino-monitoring. The current method (of combined patrol at an interval of 10-15 days) has yielded results, although several lacunae exists. For the coming dry season, it is necessary that the individual camps/beats are provided GPS and Camera and trained and motivated to undertake SMART patrol in their designated area. The following immediate actions points are suggested for SMART patrol for the winter season

- Distribution of GPS/Camera sets to target camps and locations (currently 20 each and targeted in rhino-bearing areas), including clearing of beat boundaries in the field shall be coordinated by Deputy Director and respective Range officers by 10th December, 2014.
- SMART-cell already established in FFDTP office comprising of Girin Barman, Kiran Basumatary, Mamoni Boro, Lalita Das and Farida Begum shall be solely responsible for managing and record keeping of the data generated.
- SMART re-orientation and training for the camps shall be organized by Deputy Director with support from WWF and Aaranyak by 15.12.2014.

- A dedicated SMART patrol shall be executed at least once in a week, over and above the patrolling duties assigned to the camp staff. Aaranyak has agreed to strengthen this with dedicated team member for managing the logistics and data on the ground.
- The daily/ weekly patrol shall be coordinated by Deputy Director in consultation with concerned Range officers and executed as per schedule. Data compilation and analysis shall be undertaken by SMART cell with support from Deba Dutta and Deputy Director.
- A lumpsum for conducting the field exercise and contingencies shall be requested from WADWT and made available to Deputy Director for execution of the SMART exercise.
- Gap areas, including locations especially in southern boundary, DaodharaRF, Manas RF shall be filled up by coordinators as appointed by Aaranyak.

4. 6. Habitat management

It is now widely accepted that the control of alien invasive species is not a short-term or isolated effort. It requires the long-term application of efforts aided by constant monitoring and investigation. Concerted effort is needed to control invasive species and a better understanding of the causes of their spread can help to implement pre-emptive measures. Recognizing the seriousness of the problem, the 31st session of the World Heritage Committee held in Christchurch in 2007 suggested that the Forest Department of Assam develop an independent management plan to control invasive species.

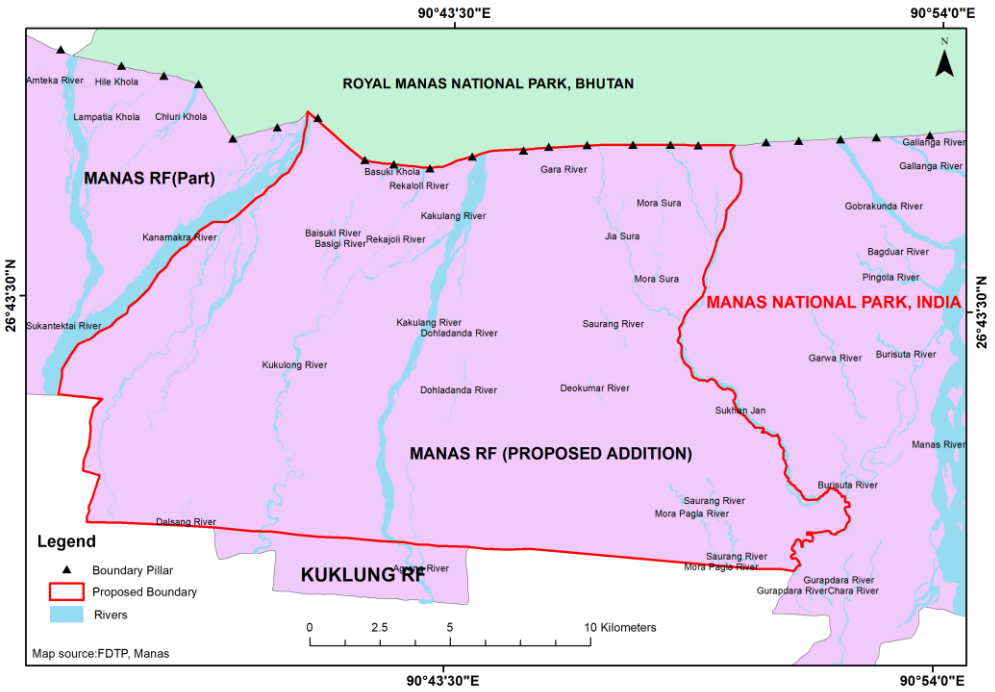
The potential of these invasive alien plants to destroy prime rhino habitat is enormous and should be investigated properly and immediately. The cost and difficulty of eradication increase exponentially with each season of delay. It cannot be over-emphasized; experience elsewhere has shown that if left too long the problem will become so immense that infestations cannot be practically or economically dealt with. Thus important habitats for the rhino would be destroyed. Government agencies, institutions and individuals in rhino bearing areas lack adequate knowledge of the ecological and environmental consequences caused by invasive alien species and how to address it. Hence emphasis should be given to apprise policy makers, managers, conservationists, media and the academic community about this genuine threat to Asian rhinos. Alien species in rhino habitats *Mimosa diplotricha* is a fast growing, abundantly thorny, biennial or perennial shrub with angular branching stems that become woody with age. Its leaves are alternate, bipinnate and compound. Once established, *Mimosa* spp. is difficult to control. Mimosa seeds are typically dispersed in two ways: carried

downstream during floods or transported by animals or machinery. Moreover, it is reported to be poisonous to herbivores and considered to be one of the most serious alien invasive species (IUCN/ISSG database).

4.7 Transboundary habitat

The proposed first addition to Manas NP extends from the Indo-Bhutan boundary on the north to the Manas road on the south. The eastern side is bounded by the river Sukanjan which is the western boundary of Manas NP and extends to the Sukanteklai river on the west. Beyond the western boundary there lies the remaining part of the Manas (Pt.) RF which stretches to the Chirang RF, Ripu RF and then to Buxa Tiger Reserve of West Bengal. Excluding the southern side of the proposed NP, the other three sides have contiguous forest areas both in Bhutan and India. The total area of the Proposed NP is 350 sq km.

Fig 4.1: Map of Manas RF(addition) proposed National Park



Current status: The National Park proposal has already been endorsed by the BTAD and also the State Board of Wildlife in their meeting held on 20.10.2014.

Justification for declaration as a National Park and as a potential Rhino habitat

- Manas RF is a protected forest for more than 80 years (declared as RF in 1927). It also has a unique location of 'forests' on all three sides of its boundary.

- Manas RF is already part of the critical tiger habitat that has already been declared by the Assam Govt in 2007 for Manas Tiger Reserve. This, along with Daodhara RF and Barnadi wildlife sanctuary roughly covers an area of 840 sq km which is as per the needs of supporting 25 breeding tigers in the future. Expansion of the landscape is the next logical step towards attaining this.
- UNESCO as per its periodic reporting format has been enquiring time and again about the three-stage extension of the world heritage site (Manas wildlife sanctuary) property (*WHC-11/35.COM/20, p. 22).* As per this three stage extension, Manas needs to be expanded to cover the entire Manas National Park, addition to Manas National park (Manas RF part) and the Royal Manas in Bhutan. The next reporting is due in Feb 2015.
- The human settlement remains only on the south of Manas road of the proposed NP. There is no Forest Villages inside the proposed NP area. There is no encroachment on the land
- The areas is home to the critically endangered White Bellied Heron (*Ardea insignis*) which is now being protected through local community based (United Forest Conservation Network of BTAD) conservation measures.
- Due to its Reserved Forest status, the area has witnessed an onslaught of forest degradation during the insurgency period, collection of forest produce and extraction of sand and boulders in the past. The current staff strength (about 38 persons for 350 sq km) is highly inadequate for forest protection. The staff strength needs to be increased and a wildlife conservation orientation is required. The 'upgradation' of status from Reserved Forest to National Park will help in garnering state and central support (and funds) to do that.

4.8 Conclusion and Key Recommendations

1. The key recommendation of this plan is to aim for zero poaching for the next three years using all possible means of strengthening the current anti-poaching strategies. Special efforts, manpower and funds may be required to achieve this and all agencies currently involved in implementing the Rhino conservation programme at Manas must come forward and join hands with the Park authorities.
2. A systematic time-bound short term and long-term plan as stated in the Chapter must be implemented to tackle the encroachment problem at Bhuyanpara. Since the encroachment and the intrusion of unauthorised persons into the park is linked to the poaching of rhinos, the same must be give TOP priority by the Government.
3. Community engagement and public support has been initiated through formation of Eco-development committees in the key rhino-bearing area under Bansbari in the first phase. The model needs to be expanded to other ranges and awareness and alternative livelihood support activities be initiated through proper micro-planning.
4. Expansion and securing potential Rhino habitat in Manas RF area shall be beneficial to all mega herbivores in the long run. Transboundary linkages to Bhutan may also be explored for further extending safety net and territory.
5. The Rhino Conservation Plan (RCP) and the provisions therein must find legal support and therefore key recommendations from the RCP have been also incorporated into the Manas Tiger Conservation Plan (2014-2024) as envisaged under the Wildlife (Protection) Act, 1972 (2006 amendment) for all Tiger Reserves. The overlapping / stand-alone action points therein including budgetary provisions etc must therefore emanate from a single Plan which in case of Manas has been accepted as the Tiger Conservation Plan. The Plan recommendations must be evaluated in a time-bound manner with a feedback mechanism to improve the document on a yearly basis.

References and further Reading

Altmann Jeanne, (1974), Observational study of behavior sampling method , Allee Laboratory of Animals Behavior University, Chikago, Illinoris, USA .

Bonal B. S, Sharma A, Dutta D. K, Swargowari A and Bhobora. C. R : An account of the released rhinos in Manas - National Park , Assam (April - September 2008).

Bonal B. S, Sharma A, Dutta D. K, Swargowari A and Bhobora. C. R : An account of the released rhinos in Manas - National Park , Assam (October2008 - March 2009).

Bonal B. S, Talukdar B.K. and Sharma A : Translocation of Rhino in Assam, *Tiger Paper*; Vol. 36, No. 1, Jan-March, 2009.

Dutta,D.K., Sharma,A., Swargowari,A, Bhobora, C.R., Bonal,B.S., Ghose, D., and Christy Williams, A. (2012) How many locations do we need per day to reliably describe the habitat use of translocated rhinos in Manas NP? Journal of Natural Sciences Research www.iiste.org ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online) Vol.2, No.3, 2012.

Emsile H Richards, Amin Rajan & Kock Richards (2009), Guidelines for the insitu re-introduction and Translocation of African and Asian Rhinoceros.

Lahkar, B.P., Talukdar, B, and Sarma, P. (2011) Invasive species in grassland habitat: an ecological threat to the greater one-horned rhino (Rhinoceros unicornis) *Pachyderm* No. 49 January–June 2011.

Menon, V.(1996), Under Siege: poaching and protection of Greater One-horned Rhinoceros. WWF-India.

Phukon, D. (2013). Assessment of Livestock diseases as an indicator of risk to Greater One Horned Rhinoceros (*Rhinoceros unicornis*) in Manas National Park, Assam. MSC. Dissertation submitted to Saurashtra University. Wildlife Institute of India.

Singh D.M. Sharma A, Dutta D. K, Swargowari A. and Bhobora. C. R : The Released Rhinos In Manas National park Assam-The Second Year (April-2009 to March-2010)**..**

Singh D.M., Sharma A. and Talukdar B.K. (January 2011) : Translocation of Rhinos within Assam : A successful first round of the second phase under Indian Rhino Vision (IRV) 2020, Translocation Core Committee Assam.

Singh D.M., Sharma A. and Talukdar B.K. (March 2011) : Translocation of Rhinos within Assam : A successful second round of the second phase under Indian Rhino Vision (IRV) 2020, Translocation Core Committee Assam.

Singh D.M., Sharma A., Dutta D.K., Swargowari A., Bhobora C.R. and Bonal B.S., The Released Rhinos in Manas National Park, Assam -The Second Year (April2009 - March2010), May 2010, IRV2020, Translocation Core Committee, Assam.

Singh S.P., Sharma A., Dutta D.K., Swargowari A., Bhobora C.R. and Singh D.M., : An Account of the Released Rhinos in Manas NP - TheThird Year (April2010 - March2011), May 2011, IRV2020, Translocation Core Committee, Assam.

Swargowary, A. Talukdar, B.K., Sharma,A., and Barman, R. (2012) Manas security reassessment report 2011-12 in the context of IRV 2020. Security Assessment Group IRV 2020 1st June 2012.

Annexure 1

GOVERNMENT OF ASSAM
ENVIRONMENT AND FORESTS DEPARTMENT
DISPUR, GUWAHATI-6

ORDERS BY THE GOVERNOR
NOTIFICATION

Dated Dispur, the 9th July, 2013

No.FRW.25/2008/pt/69 : The Governor of Assam is pleased to constitute a coordination committee for the protection of Wildlife and control of Wildlife Crime in and around the Manas Tiger Reserve consisting of the following Officers.

1. Additional PCCF & Council Head of Forest Department, BTC, Kokrajhar.	Chairman
2. CCF & Field Director, Manas Tiger Reserve, Barpeta Road	Member-Secretary
3. Inspector General of Police, Kokrajhar	Member
4. Superintendent of Police, Kokrajhar	Member
5. Superintendent of Police, Baksa	Member
6. Deputy Director Manas Tiger Reserve, Barpeta Road	Member
7. DFO, Chirang Division	Member
8. DFO, Baksa Division	Member
9. DFO, North Kamrup Division, Rangia	Member
10. Commandant, SSB, Howly	Member
11. Commandant, SSB, Bongaigaon	Member
12. All Range Officers under Field Director, Manas Tiger Reserve	Member
13. Officer-in-Charge, Salbari, P.S.	Member
14. Officer-in-Charge, Gobardhan, P.S.	Member
15. Officer-in-Charge, Bijni, P.S.	Member

The Committee will have following functions :-

1) Hold meeting every 3 months to share intelligence and other vital information for safety of the Manas Tiger Reserve. The minutes of the meeting will be sent to Principal Secretary, Department of Environment and Forests and Principal Chief Conservator of Forests, Assam and Principal Chief Conservator of Forests (WL) Assam within 7 days of the meeting by Member Secretary of the Committee.
2) Draw up action plan for protection of Manas Tiger Reserve during the next 3 months which will also be communicated.

Sd/- Kumar Sanjay Krishna, IAS,
Principal Secretary to the Government of Assam,
Environment and Forests Department

Memo. No.FRW.25/2008/pt/69-A, Dated Dispur, the 9th July, 2013

Copy to:-

1. The Principal Chief Conservator of Forests, Assam, Rehabari, Guwahati-8
2. The Principal Chief Conservator of Forests (WL) Assam, Basistha, Guwahat-29
3. The Director General of Police, Ulubari, Guwahati-7
4. The Principal Secretary, BTC, Kokrajhar
5. The Chief Conservator of Forests & Field Director, Manas Tiger Reserve, Barpeta Road
6. All Members of the Committee.

By order etc.,

Joint Secretary to the Government of Assam,
Environment and Forests Department

Annexure 2

GOVERNMENT OF ASSAM
ENVIRONMENT AND FORESTS DEPARTMENT
DISPUR, GUWAHATI-5

ORDERS BY THE GOVERNOR
NOTIFICATION

Dated Dispur, the 17th May, 2014

No.FRW.48/2010/127: In pursuance of D.O. letter No.CMO.4/2014/121, dated 22/01/2014 received from the Office of the Hon'ble Chief Minister, Assam and as proposed in the meeting held on 4/2/2014 vide Principal Chief Conservator of Forests, Wildlife, Assam's leter No.WL/FG/Rhino Poaching/MNP/2014, dated 13/2/2014, a high level task force with the following composition is hereby constituted with immediate effect to ensure overall improvement of Manas World Heritage Site & checking all illegal activities in Manas National Park.

1. Executive Member, incharge Forests, Bodoland Territorial Counicl, Kokrajhar -Chairman
2. Council Head of Department, Bodoland Territorial Counicl, Kokrajhar -Member
3. Inspector General of Police, Bodoland Territorial Counicl, Kokrajhar -Member
4. Deputy Inspector General of Police, Western Range, Bongaigaon -Member
5. Secretary General & CEO, WWF- India -Member
6. Representative of International Rhino Foundation -Member
7. Conservator of Forests, Wildlife, Office of the Principal Chief Conservator of Forests (WL) Assam -Member
8. Field Director, Manas -Member Secretary

Sd/- Davinder Kumar, IAS
Principal Secretary to the Government of Assam,
Environment and Forests Department
Dispur , Guwahati-6

Memo No.FRW.48/2010/127-A, Dated Dispur, the 17th May, 2014

Copy for information to:-

1. The Principal Chief Conservator of Forests, Assam, Rehabari, Guwahati-8
2. The Principal Chief Conservator of Forests, (WL) Assam, Basistha, Guwahati-29
3. The Executive Member, in-charge Forest, Bodoland Territorial Counicl, Kokrajhar
4. The Council Head of Department, Bodoland Territorial Counicl, Kokrajhar
5. The Inspector General of Police, Bodoland Territorial Counicl, Kokrajhar
6. The Deputy Inspector General of Police, Western Range, Bongaigaon
7. The Secretary General & CEO, WWF-India, 172-B, Lodhi Estate, New Delhi-11
8. Representative of International Rhino Foundation, C/o- Dr. Bibhab Talukdar, Evergreen, 50 Samannay Path, Aaranyak, Survey, Guwahati-28
9. The Conservator of Forests, Office of the Principal Chief Conservator of Forests, (WL) Assam, Basistha, Guwahati-29
10. The Field Director, Manas National Park, Barpeta Road, Assam.

By order etc.,

Under Secretary to the Government of Assam,
Environment and Forests Department,

Annexure 3

BODOLAND TERRITORIAL COUNCIL SECRETARIAT::BODOFA NWGWR, KOKRAJHAR
Department of Forest & Wildlife

Dated Kokrajhar, the 21st June,2012

N O T I F I C A T I O N

No.BTC/Forest-1/2003/122: In pursuance to the minutes of the review meeting on Manas National Park held on 29th May,2012 at Banshbari Range and in the interest of public service, the Bodoland Territorial Council is pleased to constitute a committee to suggest and to improve the existing security arrangement to be carried out by the Forest Department of BTC in Manas National Park consisting of following members:

01.	Chief Conservator of Forest & CHD Forest, BTC	-	Chairman
02.	Superintendent of Police, Baksa	-	Member
03.	Dr. Bibhuti Lahkar, Programme Secy. Aranyak	-	Member
04.	Sri Amit Sharma, WWF-Coordinator	-	Member
05.	Sri Phwjwngshar Narzary, MMES	-	Member
06.	The Field Director, Manas National Park	-	Member Secretary

The Field Director, Manas National Park & Member Secretary will take necessary steps to convene meeting and recommend the suggestions put forward by the Committee to the BTC.

This will come into force with immediate effect.

Sd/-
Secretary,
Bodoland Territorial Council,
Kokrajhar.

Memo No.BTC/Forest-1/2004/122 (A), Dated Kokrajhar, the 21st June,2012

Copy to:-

1) PS to Chief of BTC, Kokrajhar
2) PS to Deputy Chief of BTC, Kokrajhar
3) PS to Principal Secretary, BTC, Kokrajhar
4) The Chief Conservator of Forest, BTC, Kokrajhar
5) The Field Director, Manas Tiger Project, Barpeta Road.
6) The Superintendent of Police, Baksa.
7) Dr. Bibhuti Lahkar, Programme Secy. Aranyak
8) Sri Amit Sharma, WWF-Coordinator
9) Sri Phwjwngshar Narzary, MMES

Secretary,
Bodoland Territorial Council,
Kokrajhar

Annesure 4

By -Email

GOVERNMENT OF ASSAM
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS, WILDLIFE, ASSAM,
BASISTHA, GUWAHATI-29

No. WL/FG.41/ Rhino Translocation/ 2005 Dated Guwahati, the 25th November, 2014

A Security Assessment Team under IRV2020 is constituted as follows for preparing a report after assessing the current security status in Manas NP and suggest corrective measures accordingly –

1. CF Wildlife, o/o PCCF(WL), Assam - Leader
2. Deputy Director Manas TP - Member
3. Sri. A. Baig, DFO o/o PCCF(WL), Assam - Member
4. Sri. Anupam Sarmah, WWF-India - Member

Terms of Reference :

1. The team will be responsible for carrying out Security Assessments in the field and as required for suggesting measures for ensuring the security of the rhinos in Manas NP.
2. The team will analyze the gaps in the implementation of the suggestions in the previous security assessment and meetings conducted in relation to the security in Manas NP and suggest there-off.
3. The team will work in co-ordination with the Field Director, Manas TP and he is requested to provide all necessary information and extend support to carry out the assessments.
4. The team may also take the help of individuals to accomplish necessary activities.
5. The team will be supported from the IRV2020 program for their operation.
6. The team will submit detailed reports to the undersigned within a stipulated timeframe of 30 days and will also have to present the findings as and when requested.

[Rajendra P. Agarwalla, IFS]
Principal Chief Conservator of Forests (Wildlife)
and Chief Wildlife Warden, Assam
and Chairman, Task Force for Translocation of Rhinos within Assam

Copy to,

1. The PCCF & HOFF, Assam, Rehabari, Guwahati for his kind information.
2. The Field Director Manas TP, Barpeta Road for his information and action.
3. The CHD Forest, BTC, Kokrajhar for his kind information.
4. Sri Amit Sharma, WWF-India for information and facilitation.
5. All members.

[Rajendra P. Agarwalla, IFS]
Principal Chief Conservator of Forests (Wildlife)
and Chief Wildlife Warden, Assam
and Chairman, Task Force for Translocation of Rhinos within Assam
Basistha, Guwahati - 29

Annexure 5

By + Ema

GOVERNMENT OF ASSAM
OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS, WILDLIFE, ASSAM,
BASISTHA, GUWAHATI-29

No. WL/FG.41/ Rhino Translocation/ 2005 Dated Guwahati, the 25th November, 2014

A Co-ordination Team for SMART (LEM) under IRV2020 is constituted as follows for effective implementation in Manas NP and Kaziranga NP –

1. CF Wildlife, o/o PCCF(WL), Assam - Leader
2. Deputy Director Manas TP - Member
3. DFO EAWL Division - Member
4. Sri. A. Baig, DFO o/o PCCF(WL), Assam - Member
5. Sri. Deba Dutta, WWF-India - Member

Terms of Reference :

1. The team will be responsible for ensuring effective implementation of SMART (Spatial Monitoring and Record Tool) which was decided to be implemented in Manas NP and Kaziranga NP by the Rhino Task Force in its meeting dated 30th January 2013 for ensuring better patrolling and security.
2. SMART has been in implementation in both Manas NP and Kaziranga NP and the team will analyze the gaps in the implementation and come up with suggestions to address the gaps.
3. The team will work in co-ordination with the FDTP Manas TP, Director Kaziranga NP, Chairman WADWT and Co-ordinator Rhino Conservation, WWF-India.
4. The Deputy Director, Manas NP and DFO EAWL will be the Nodal persons for their respective parks for implementation of SMART and WWF is requested to provide all necessary technical support. They will also generate regular reports on SMART implementation and submit to the office of the undersigned every quarter.
5. Chairman WADWT will facilitate the operation of this team and WADWT will be the Nodal Agency for providing support for the effective implementation of SMART in Manas NP and Kaziranga NP.
6. The team will co-ordinate to ensure effective implementation of SMART and regular reporting for an initial period of two year.

25/11/2014

[Rajendra P. Agarwalla, IFS]
Principal Chief Conservator of Forests (Wildlife)
and Chief Wildlife Warden, Assam
and Chairman, Task Force for Translocation of Rhinos within Assam

Copy to,

1. The PCCF & HOFF, Assam, Rehabari, Guwahati for his kind information.
2. The Field Director Manas TP and Director Kaziranga NP for their information and support.
3. The Chairman, WAADWT for his kind information and request for facilitation.
4. Sri Amit Sharma, Co-ordinator Rhino Conservation WWF-India for information.
5. All members.

25/11/2014

[Rajendra P. Agarwalla, IFS]
Principal Chief Conservator of Forests (Wildlife)
and Chief Wildlife Warden, Assam
and Chairman, Task Force for Translocation of Rhinos within Assam
Basistha, Guwahati - 29

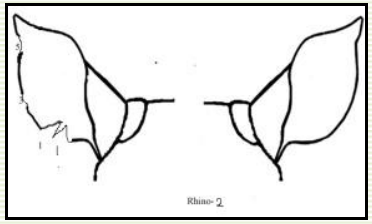
Annexure 6

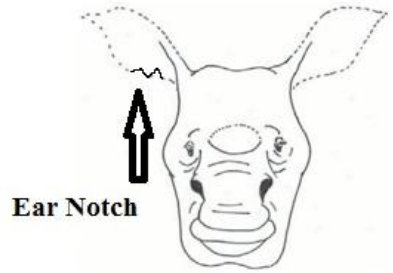
A MASTER-ID KEY TO RHINO IDENTIFICATION IN MANAS NATIONAL PARK

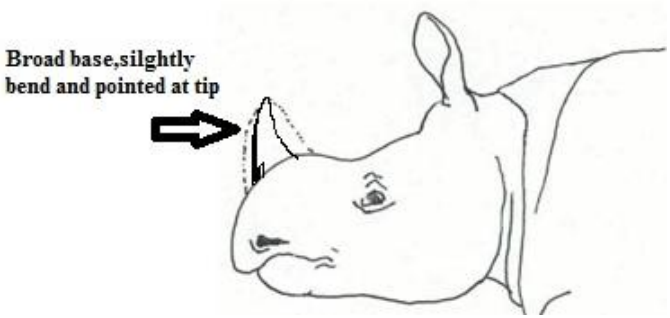
Prepared by : Shri Deba Kr. Dutta

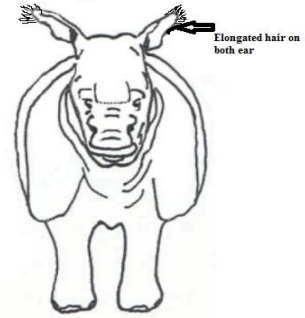
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

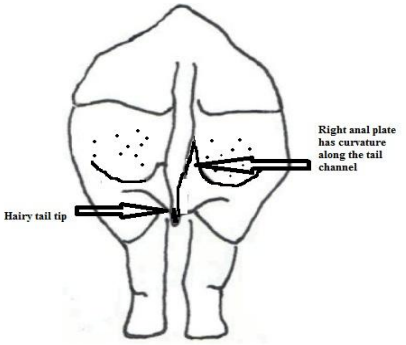
Name: Iragdwa
Sex: Adult Male
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino 2
Age: 12 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 2
Radio Collaring Date-12/04/2008
Radio Collar Stopped Functioning
Radio-collaring Date-25/4/2011
Radio Collar Dropped Date-11/11/2012

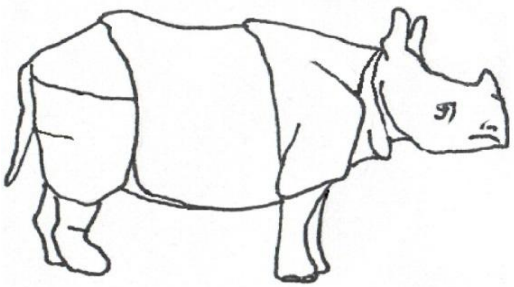


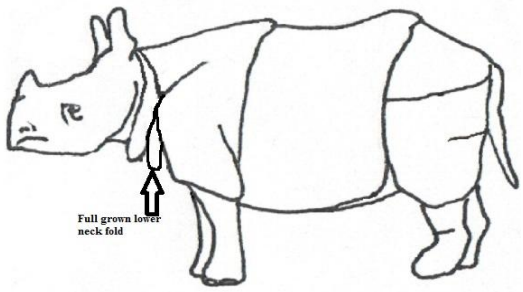




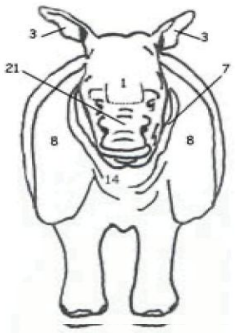


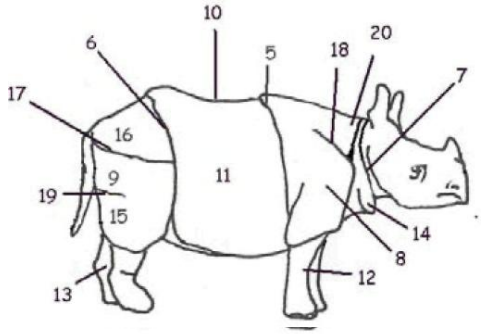


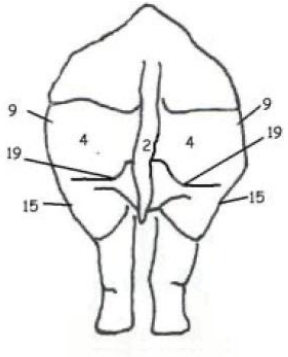




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK







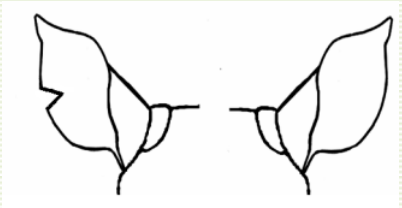
Specific Body Characteristics :
1. Horn: Broad base, Slightly curved and pointed
3. Ear: Elongated hair on both outer line of ears
4 . Anal plate: Right anal plate has curvature at the tail length
7. Neck fold: Stout and full grown and V-Shaped
14. Lower neck fold: Full grown lower neck fold

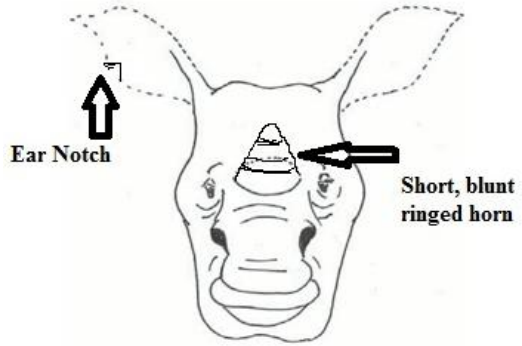
Rhino History, Ranging, Association
Rhino History: Rhino-2 was captured and translocated from Pobitora Wild Life Sanctuary to Manas National Park on 11th April, 2008 and released at wee hours in Buraburijhar under Bansbari range. This is only dominant male among female rhinos at Manas. It was rescued back again to Manas NP from the 100km park boundary after 15 days continuous hard effort. This killed by poachers in 13th January,2013.
Range: East bank of river Beki to Betbari camp of Bhuyanpara range of Manas.
Group Composition: Rhino-2 like to associate with Rhino-6 and 7,Mainao, Ganga ,Jamuna, R9, R 10,13 and 15.

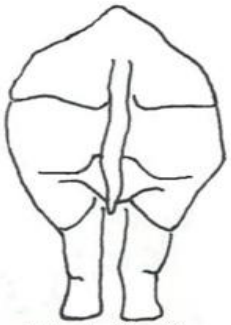
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

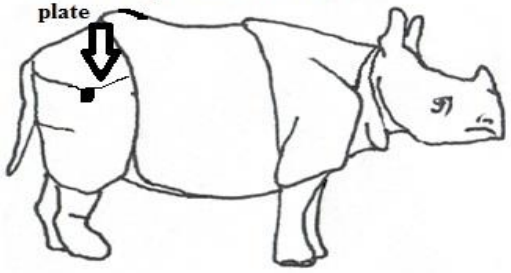
Name: Laisiri
Sex: Adult Female
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino 3
Age: 13 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 3
Radio-collar status-
Radio collaring date-
27/12/2010
Radio Collar Stopped Function-
30/11/2012
Radio Collar Dropped
22/11/2014



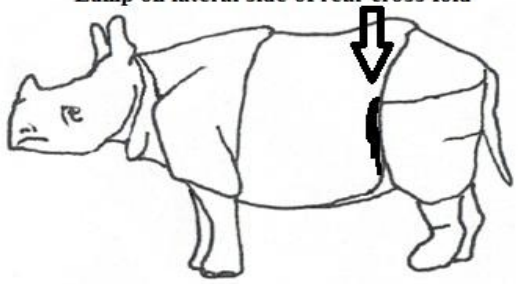




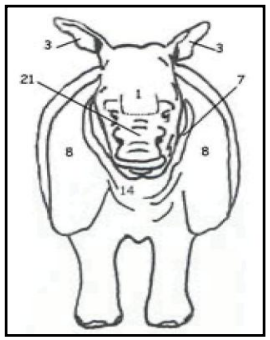
Mole on right side of the anal plate

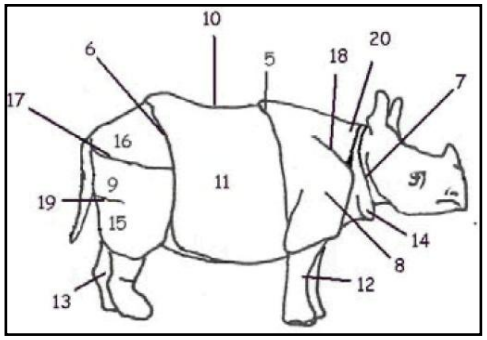


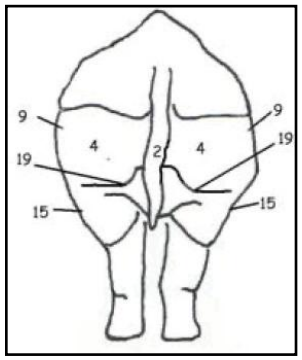
Lump on lateral side of rear cross fold



GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK







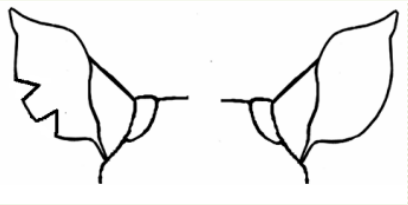
Specific Body Characteristics
1. Horn: Broad base, small and ringed
3. Ear: With elongated hair
4. Anal plate: Mole on right side of the anal plate
17. Upper back corner: Lump along the right lateral side

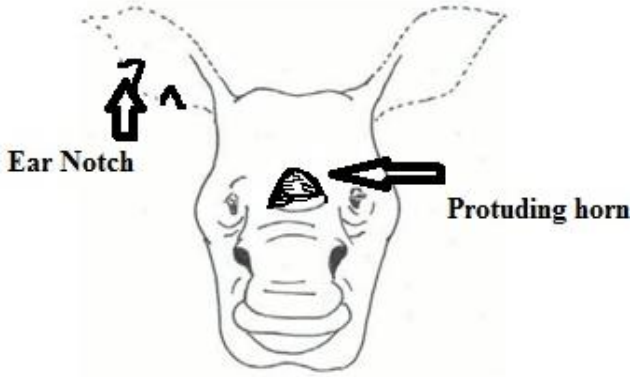
Rhino Histroy, Ranging , Association
History: This is adult female captured and translocated from Pobitora wild Life Sanctuary on 27/12/2010. Mother and calf were dissociated just after two month of release at Manas. Usually she moved alone in short and swamp areas of Bansbari range .
Claves: She has one female calf translocated and released at Manas as Rhino-4 and on 27/9/2013 Rhino-3 gave birth another calf at Charphuli areas of Manas National Park.
Range: She is using Charpuli, Kuribeel, Palsiguri , Secondgate and Langpati areas of Bansbari range
Group composition: Sometime she is located in association with adult female Rhino 8.

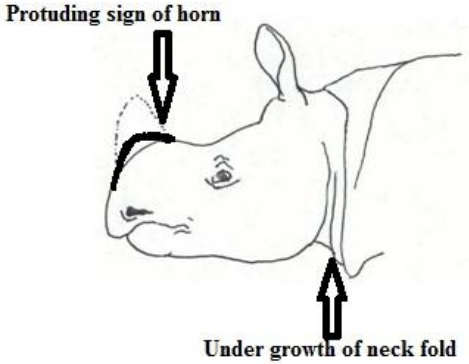
Photographs of Rhino-3

All photographs Taken in the year 2010 (March) and 2012 (May)

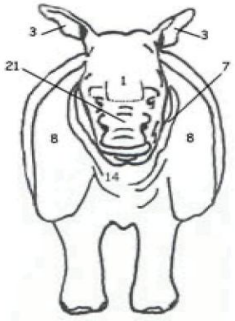
Name: Anida
Sex: Sub adult female
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino 4
Age: 5 years
Father: Unknown
Mother: Rhino-3
Date of Birth: Unknown
Ear Notch ID: 4
Radio Collar- Nil

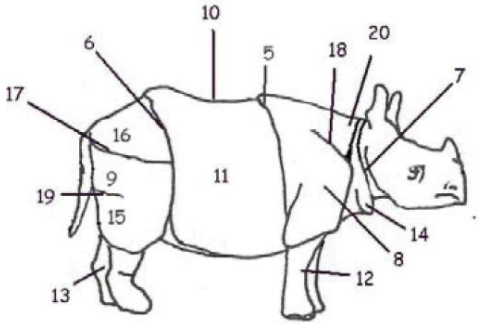


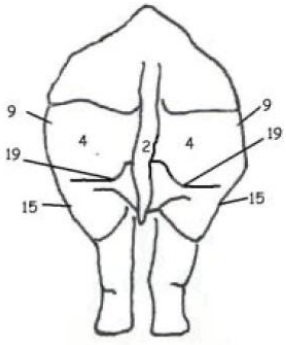




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

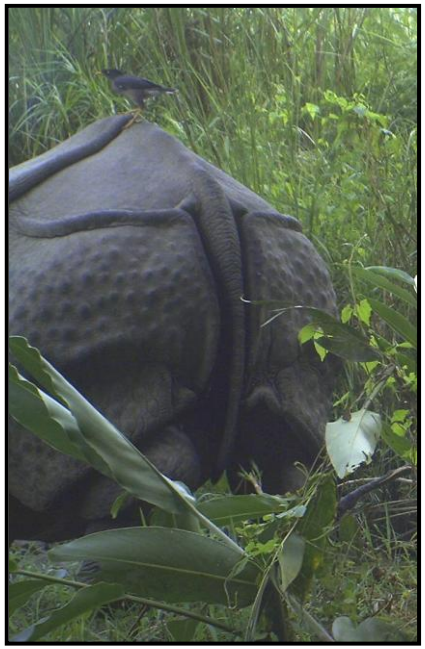






Specific Body Characteristics
1. Horn: Sign of protruding horn
3. Ear: Ear ID-Mark on the right ear.
14. Lower neck fold: Under growth.

Rhino History, Ranging and Association
History: This is sub adult female captured and translocated from Pobitora wild Life Sanctuary on 27/12/2010 along with her mother (Rhino 3) Mother and calf were dissociated just after two month of release at Manas. Sub adult female crossed river Beki and reached Panbari range. She was first translocated rhino to reach Panbari range . She has been using vast Gabharukhunda areas along with other herbivores such as Buffalo , gaur and elephants .
Claves:
Range: She is using vast Bhabar tract of Gabharukhunda area of Panbari range and since April,2013 she was using Bansbari.
Group composition: Male Sub adult Rhino-18 and Rhino-4 commonly observed along the Panbari and Bansbari area.

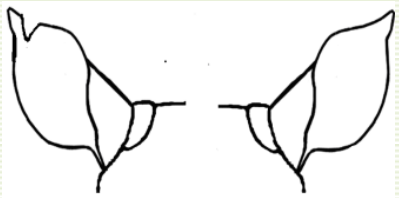


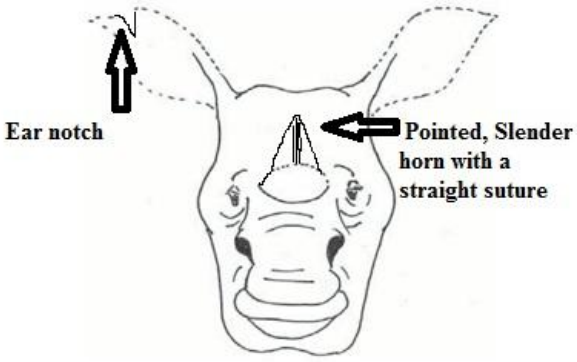
Photographs of Rhino-4

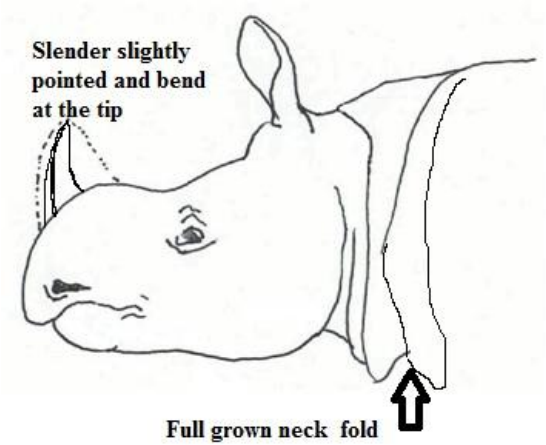
All photographs Taken in the year 2010 and 2011

GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

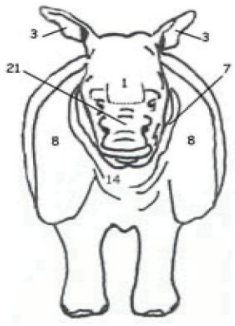
Name: **Manas**
Sex: Adult Male
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino 5
Age: 12 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 5
Radio Collaring Date- 18/01/2011
Radio Collar Stopped Functioning- 3/11/2011
Radio Collar Removing Date- 22/1/2013

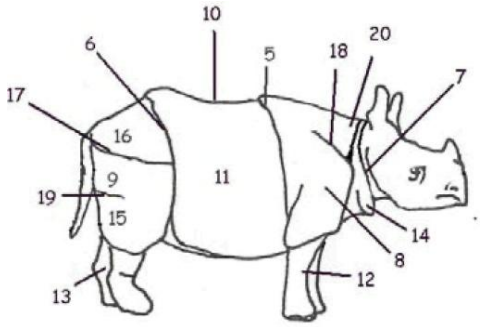


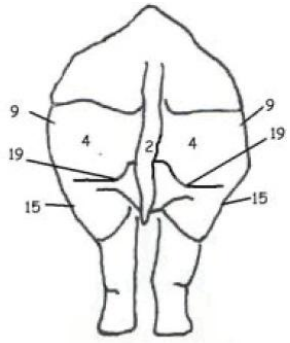




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK





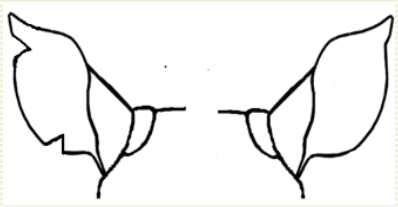


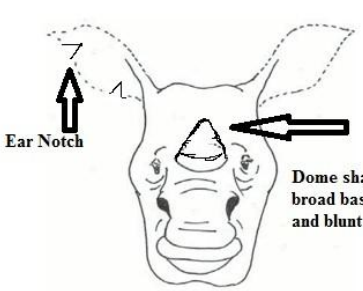
Specific Body Characterirstics
1.Horn: Slender, slightly pointed at the tip and suture through the front side of the horn
3. Ear: Unique ID cut mark upper right side of the ear
7. Neck fold: Full grown neck fold

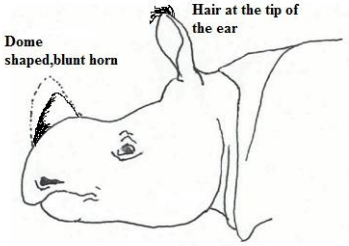
Rhino History, Ranging and Association
History: This is second potential male of Manas National Park. It was captured at Pobitora Wild Life Sanctuary on 17/1/2011 and released at Buraburijhar about 9-30pm on 18/1/2011.
Range: Rhino 5 used eastern part of the Bhuyanpara range since released at Manas National Park.
Group composition: Rhino 5 was associated with R3, R10,R10A R13, Ganga Jamuna Mainao .

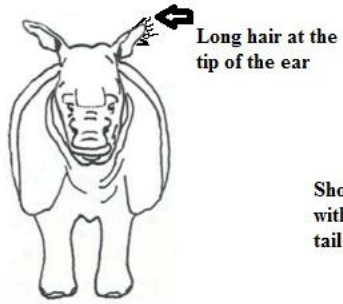
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

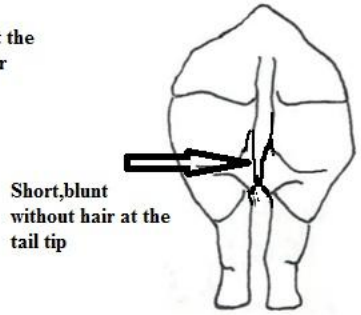
Name: Xavira
Sex: Adult Female
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino-6
Age: 15
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 6
Radio Collaring Date-18/01/2011
Radio Collar Dropped Date-8/8/2011

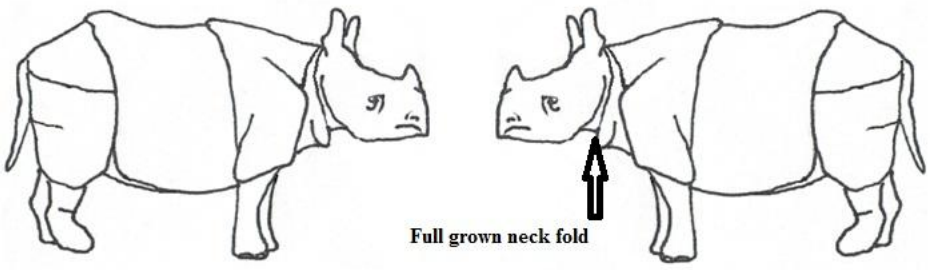




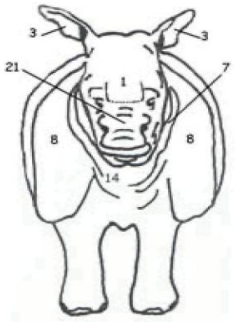


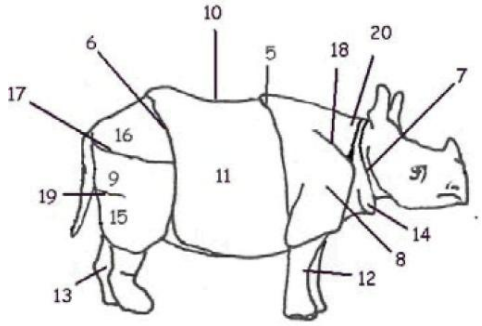


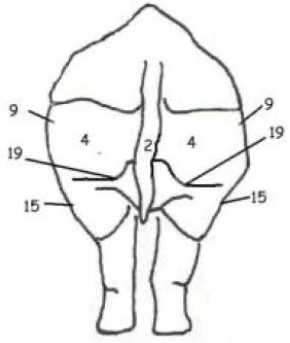




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

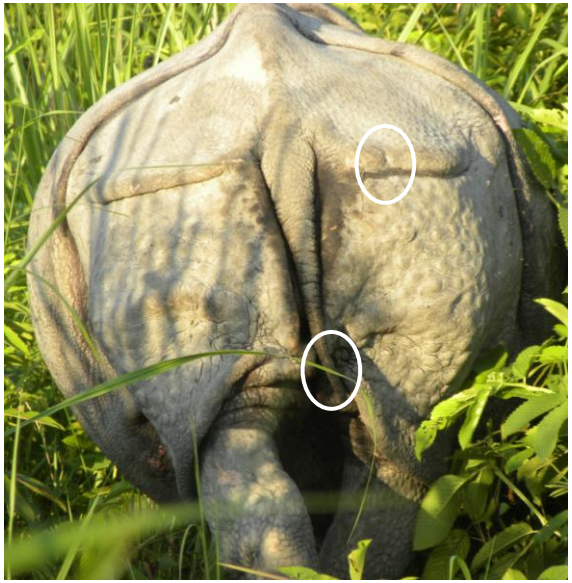






Specific Body Characteristics:
1. Horn: Dome shaped, broad base, short and blunt
2. Tail: Short tail without hair at the tip of the point
3. Ear: Unique ID cut mark upper right side of the ear and long hair on the both ear
7. Neck fold: Full grown neck fold

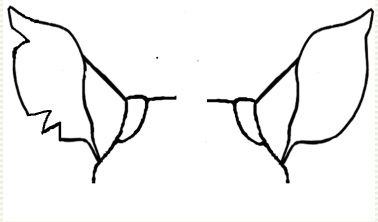
Rhino Histroy, Ranging , Association
History: This is adult female captured and translocated from Pobitora wild Life Sanctuary on 18/01/2011. Mother and calf were dissociated just after two month of release at Manas. Usually she moved alone in short and swamp areas of Bansbari range as well as Rupahi area of Bhuyanpara
Claves: She has one male calf translocated and released at Manas as Rhino-7 and on same day. Rhino-6 gave birth another calf at Kuribel areas of Manas National Park on 14/5/2013.
Range: She is using Charpuli, Kuribeel, Palsiguri , Secondgate and Langpati areas of Bansbari range and Rupahi area of Bhuyanpara range.
Group composition: Sometime she is located in association with adult female Rhino 2, Rhino 13 and 14 .

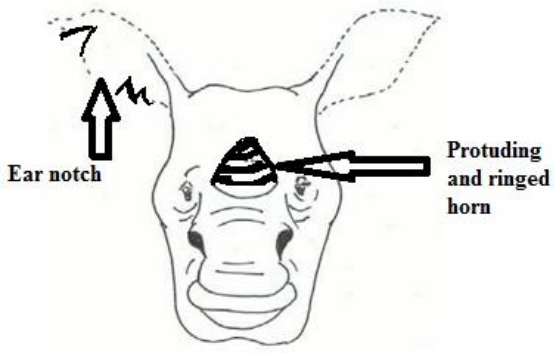


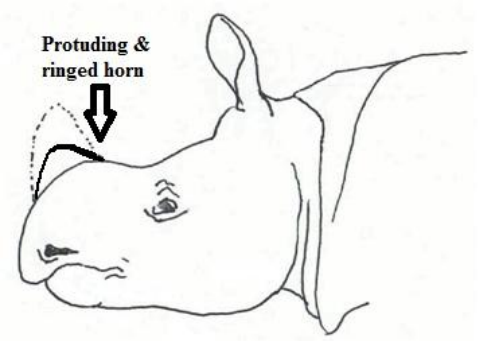
Photographs of Rhino-6

All photographs taken July,2012

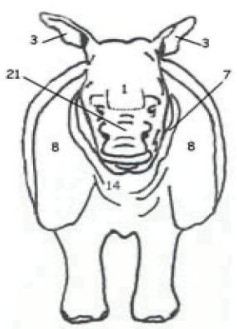
Name: Syria
Sex: Sub Adult Male
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino-7
Age: 6 years
Father: Unknown
Mother: Rhino-6
Date of Birth: Unknown
Ear Notch ID: 6
Radio Collar Date-18/01/2011
Radio collar stopped- 13/10/2012

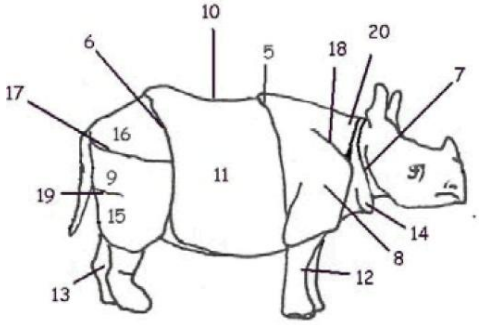


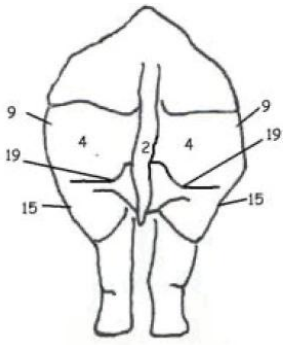




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



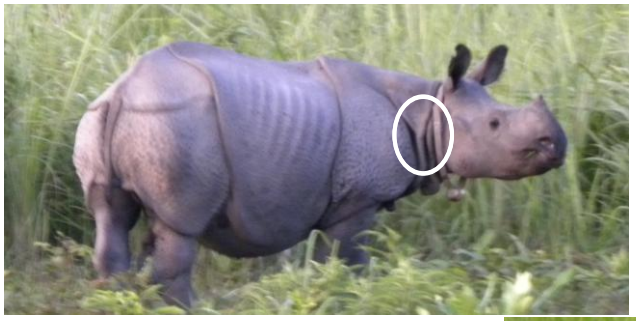




Characteristics:
1.Horn: Bulging and ringed slightly pointed
3. Ear: Unique ID cut mark upper right side of the ear and long hair on the both ear
5. Neck fold: Under growth

History: This is a sub adult male calf rhino captured and translocated on 17/1/2011 and released at Manas National Park Buraburijhar at 8-45am on 18/1/2012 simultaneously with his mother (Rhino-6).
Range: Charphuli, Timile, Kahibari, Kuribeel and Rupahi areas.
Group composition: Rhino-7 associated with another sub adult male Rhino-14

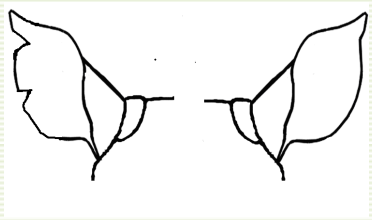
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

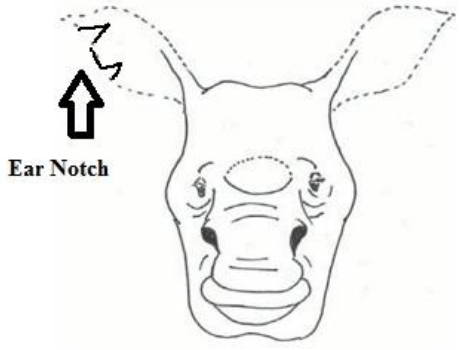


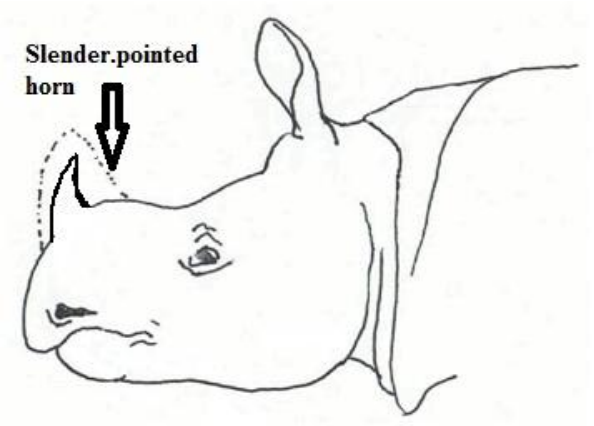
Photographs of Rhino-7 and Mother and calf

First two photographs August, 2012 Mother and calf May, 2011.

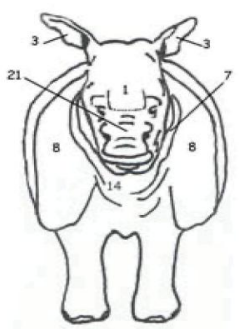
Name: Giribala
Sex: Adult Female
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino-8
Age: 10 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 8
Radio-Collaring Date-8/01/2011

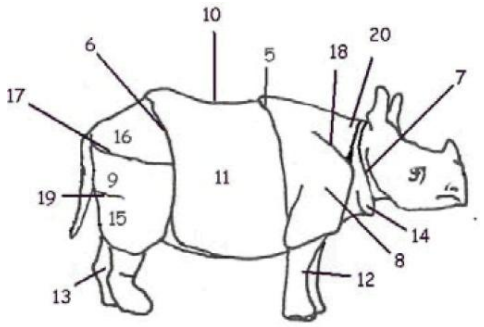


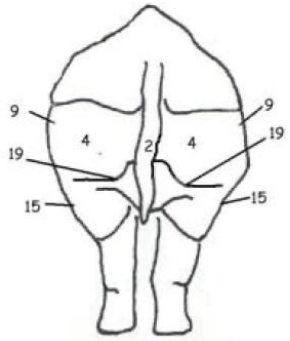




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK







Specific Body Characteristics
1. Horn: **Slender, slightly inward curve at the tipand medium height.**
3. Ear: **Unique ID cut mark upper right side of the ear and long hair on the both ear**

Rhino History, Ranging Pattern , Association
History: This is an adult female. She was captured at Pobitora Wild Life Sanctuary and Translocated to Manas National Park on 17/1/2011 and released at rhino *enclosure (Rhino boma)* around 10.00am on 18/1/2011. Usually she likes to use central part of Bansbari and western part of Bhuyanpara range. She was killed on 31/12/2013 at Charphuli area of Basnabri.
Claves: Rhino-8 gave birth calf on 23/3/2013 at Charphuli area
Range: Usually uses central part of the Bansbari, eastern bank of river Beki and Rupahi areas of Bhuyanpara range.
Group composition: Rhino-8 like to associate with another adult female Rhino-3.

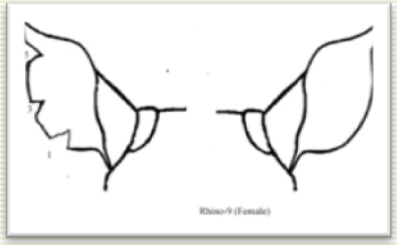
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

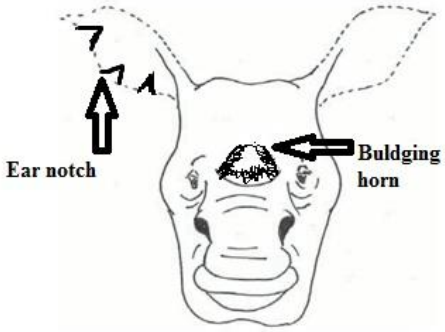
Photographs of Rhino-8

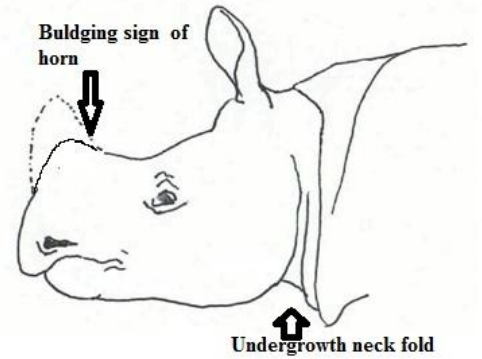
First two photograph May-2012 , Third on February,2011

Name: Pabitra

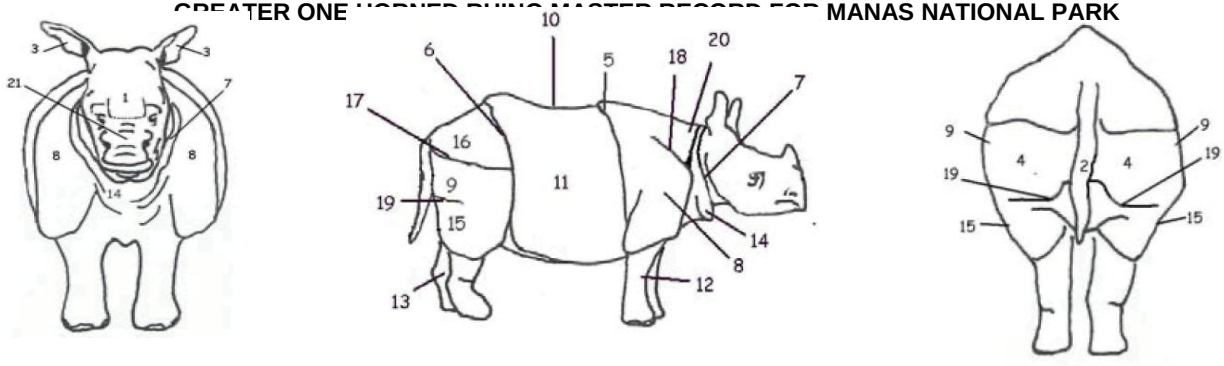
Sex: Sub adult Female
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino-9
Age: 8 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 9
Radio-Collaring date-8/1/2012
Radio Collar Stopped Functioning November,2012







GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



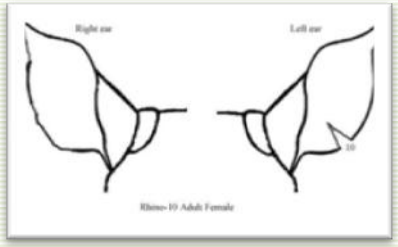
Specific Body Characteristics
1. Horn: **Bulging horn.**
3. Ear: **Unique ID cut mark right side of the ear**
7. Neck fold: **Under growth neck fold**

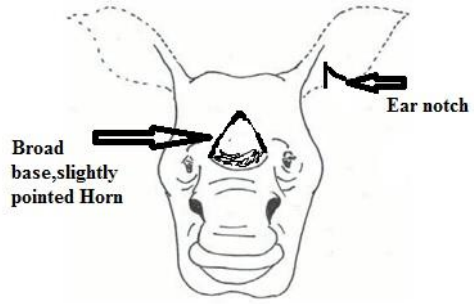
History: This sub adult female rhino was captured at Pobitora Wild Life Sanctuary and Translocated on 8/1/2012 and released at Buraburjhar Manas NP release site around 9-00am.
Claves: Gave birth calf 4/3/2014
Range: Kahitama, Tinmile Charphuli, Uchila, Rupahi and Katajhar area
Group composition: Usually stay alone with her calf.

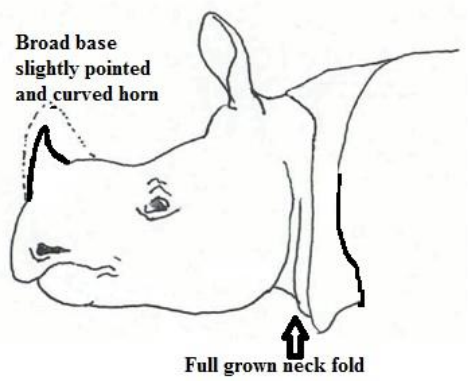
Photographs of Rhino-9

First photo taken-9/1/2012 , Second 21/3/2012

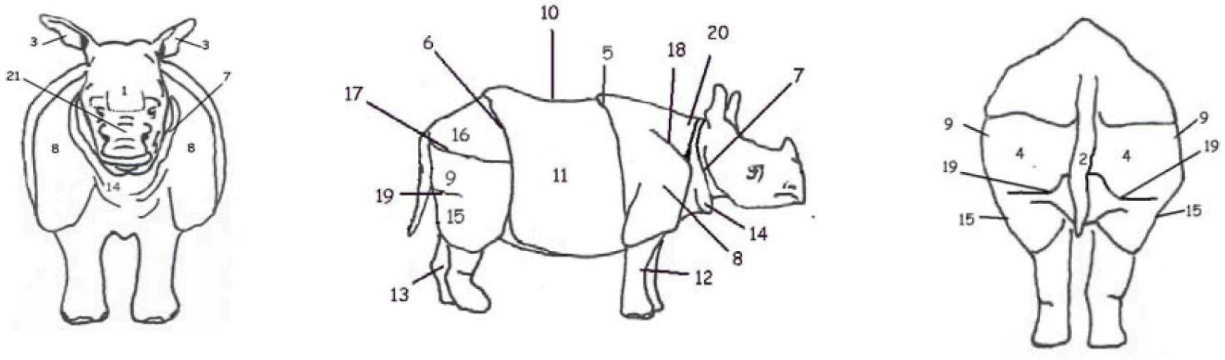
Name: Odangshi
Sex: Adult Female
Origin: Pobitora Wild Life Sanctuary
Rhino ID: Rhino-10
Age: 10 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 10
Radio Collar Date-8/1/2012
Radio Collar Stopped
29/10/2013







GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



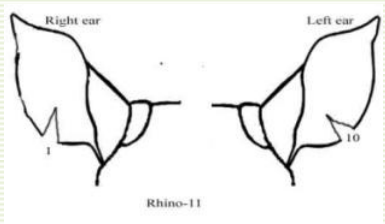
Characteristics:
1. Horn: **Broad base, rough outer side, slightly pointed** .
2. Tail: **Elongated and Hair on the tip**
3. Ear: **Prominent ID mark at the left side of the ear**
6. Neck fold: **Full grown neck fold**

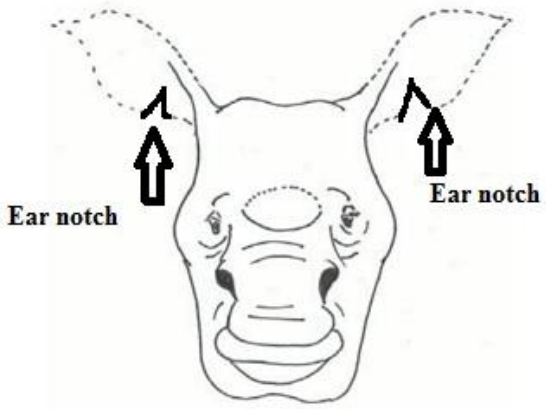
History: This adult female rhino was captured at Pobitora Wild Life Sanctuary and translocated to Manas National Park on 8/1/2012. She was released at 8-30am Buaraburijhar ,rhino release site Manas National Park on 9/1/2012.
Claves: She gave birth at male calf on 26/9/2012 at Chengmarijhar, Bhuyanpara range.
Range: She is mainly using Central part of Bhuyanpara range of Manas national park
Group composition: Usually Rhino-5 and Rhino-10 found together.

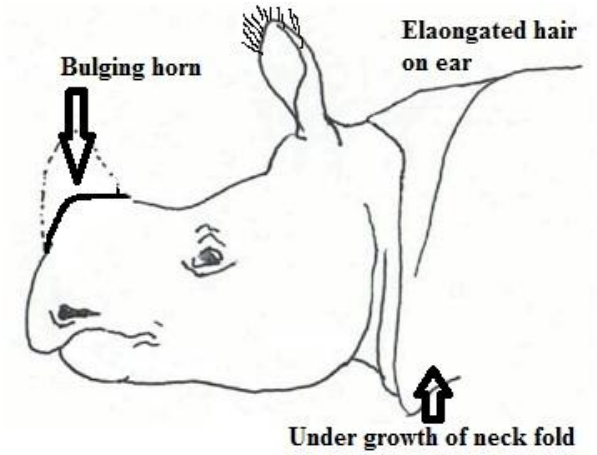
Photographs of Rhino-10

First photo taken-9/1/2012 , Second 3/3/2012

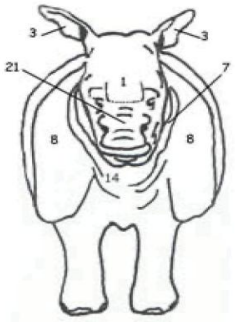
Name: Maidangsri
Sex: Sub adult female
Origin: Kaziranga National Park
Rhino ID: Rhino-11
Age:
Father: Unknown
Mother: Rhino-12
Date of Birth: Unknown
Ear Notch ID: 11
Radio Collaring date-19/2/2012
Radio collar Functioning till (Nov,2014)

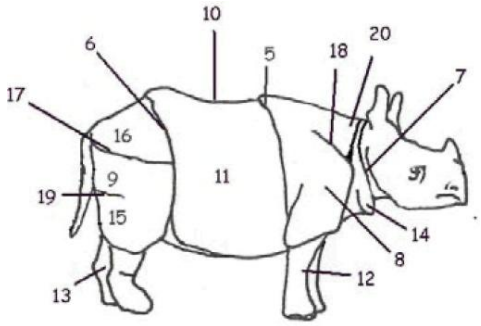


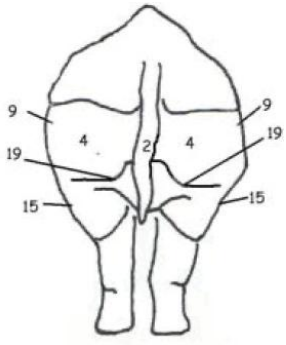




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK







Specific Body Characteristics:
1. Horn: **Bulging sign of horn**.
2. Tail: **Elongated and Hair on the tip**
3. Ear: **Prominent ID mark at the left and right side of the ears, ears have elongated hair.**
6. Neck fold: **Under growth**

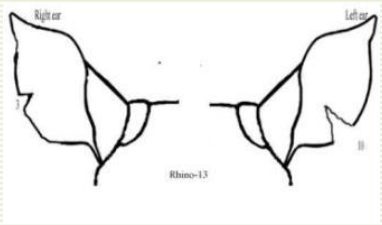
Rhino History, Ranging, Association
History: This is a sub adult female calf captured at Bagori Range of Kaziranga National Park and Translocated to Manas National park on 19/2/2012 along with her mother Rhino-12. They were released simultaneously at Buraburijhar release site around 8-15am on 20/2/2012.
Claves:
Range: she had used Bhatghali areas of Banbari range till 19th August,2012 and thereafter she crossed river Beki and like to stay at Chaonglapani area of Bansbari range of Manas National Park since April 2013 R11 spent central part of Bansbari
Group composition: R11 associated with R6,9, 13. At Bansbari range

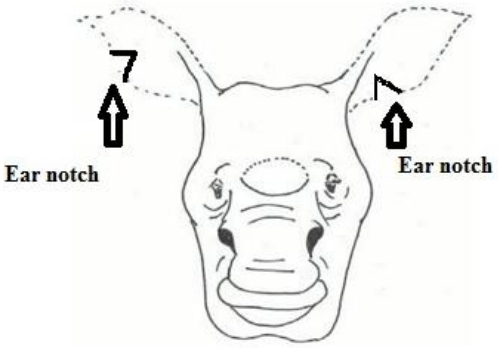
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

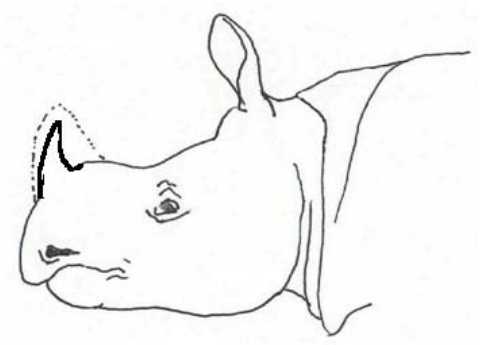
Photographs of Rhino-11

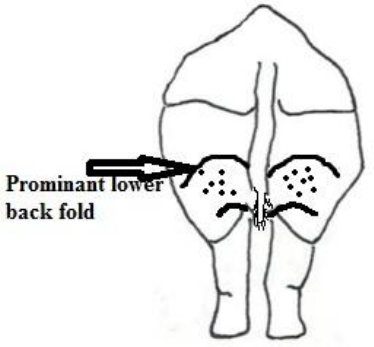
Photograph Date- 13/8/2012

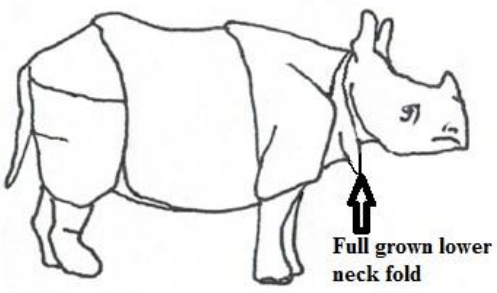
Name: Swamli
Sex: Adult Female
Origin: Kaziranga National Park
Rhino ID: Rhino-13
Age: 12 years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 13
Radio Collaring date-19/02/2012
Radio collar removed-19/11/2014

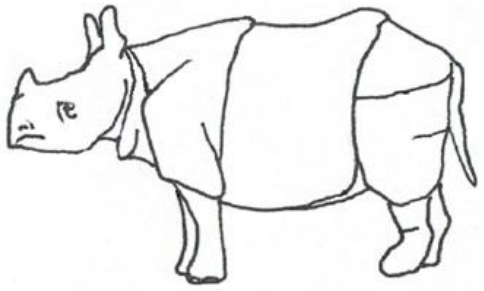




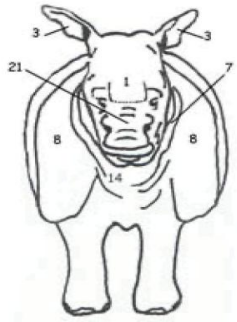


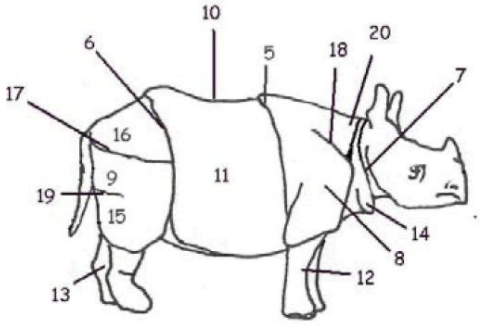


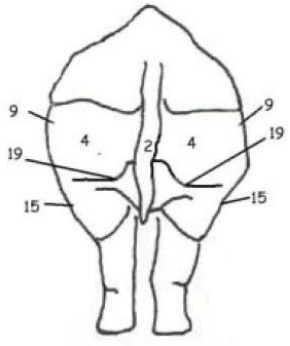




GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

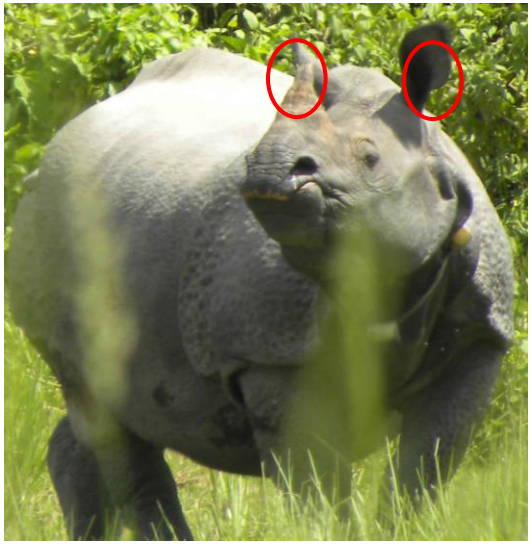






Specific Body Characteristics:
1. Horn: **Broad base, curved & pointed**
3. Ear: **ID cut mark on both left and right side of the ears**
14. Lower neck fold: **Full growth of lower neck fold**
19. Lower back corner: **Bow shaped and prominent**

Rhino History, Ranging and Association
History: This is adult female rhino captured at Bagori Range of Kaziranga National Park and Translocated to Manas National park on 19/2/2012 along with her male calf Rhino-14. They were released simultaneously at Buraburijhar release site around 9-30am on 20/2/2012.
Claves: She gave birth calf 27/9/2013 at Second gate
Range: Both mother and calf moved together Bansbari and Bhuyanpara range of Manas NP. After release certain period of time they were used Kahitama area of Bansbari.
Group composition: She share space with R3 ,R6,R9,R11

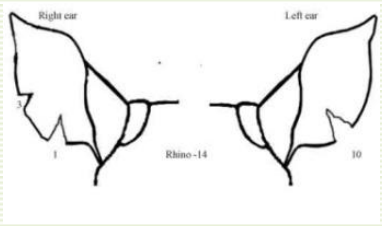


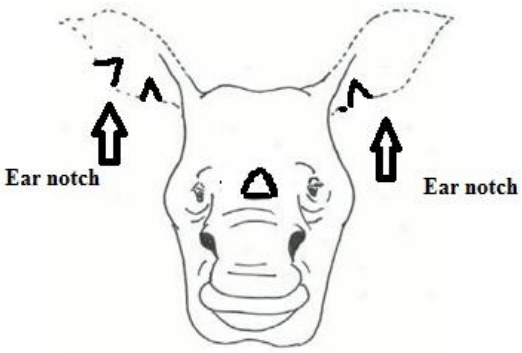
Photographs of Rhino-13

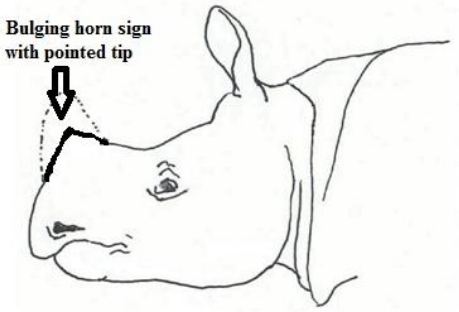
Photographs date- 14/8/2012

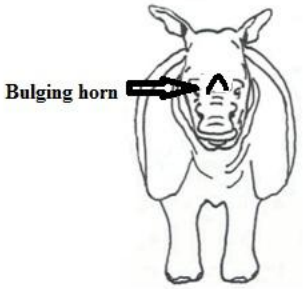
Name: **Daodai**

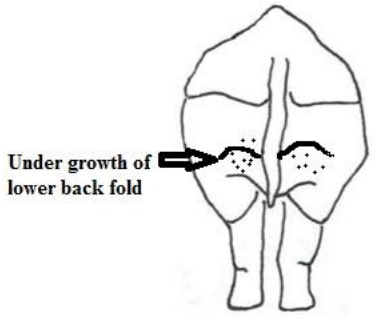
Sex: Male calf
Origin: Kaziranga National Park
Rhino ID: Rhino-14
Age:
Father: Unknown
Mother: Rhino-13
Date of Birth: Unknown
Ear Notch ID:
Radio collaring Date-19/02/2012
Radio Collar Dropped Date-21/03/2012

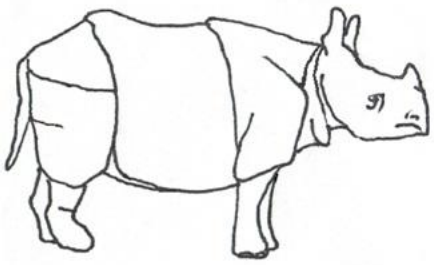


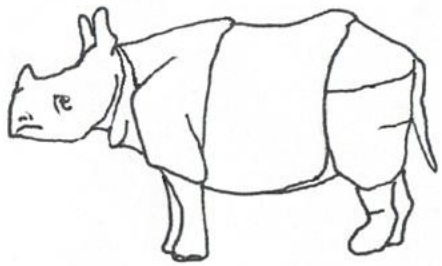




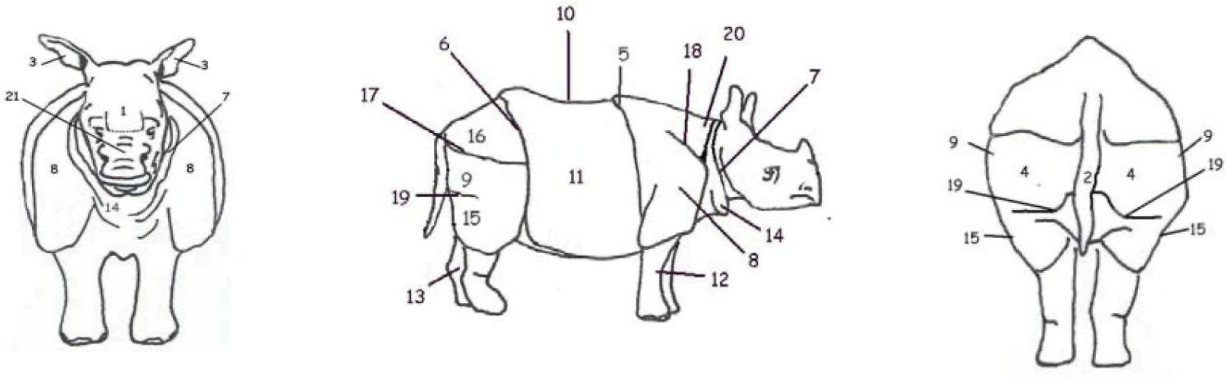






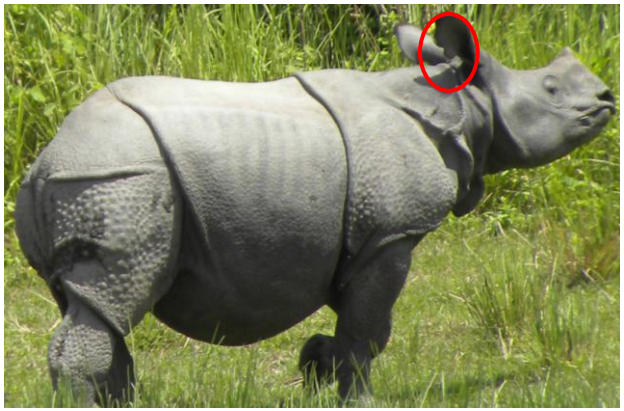


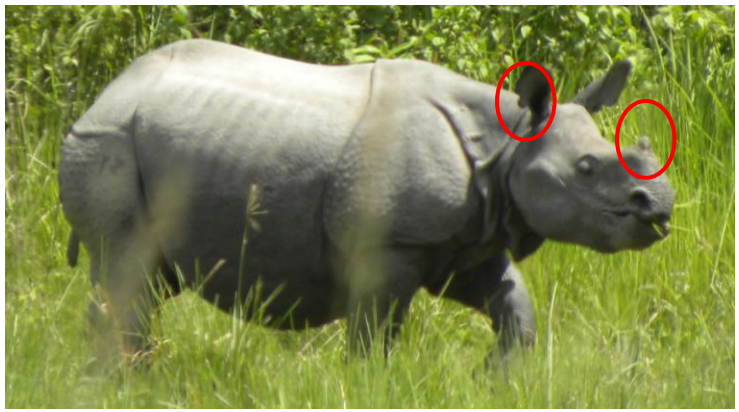
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



Specific Body Characteristics:
1. Horn: **Bulging and pointed at the horn site**
3. Ear: **ID cut mark on both left and right side of the ears**
6. Neck fold: **Neck folds are not well growth**
14. Lower neck fold: **Under growth of lower neck fold**
19 Lower back corner: **Back corner undergrowth and visible**

Rhino History, Ranging and Association
History: This is sub adult male rhino captured at Bagori Range of Kaziranga National Park and Translocated to Manas National park on 19/2/2012 along with his mother c Rhino-13. They were released simultaneously at Buraburijhar release site around 9-30am on 20/2/2012.
Range: Both mother and calf moved together Bansbari and Bhuyanpara range of Manas NP. After release certain period of time they were used Kahitama area of Bansbari.
Group composition: R7 and R8A



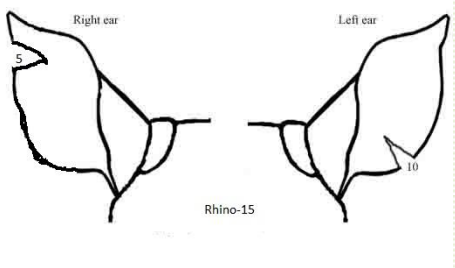


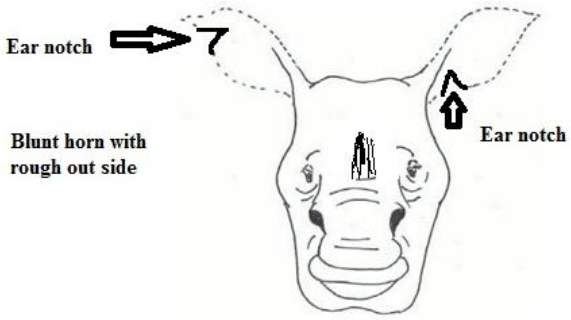
Photographs of Rhino-14

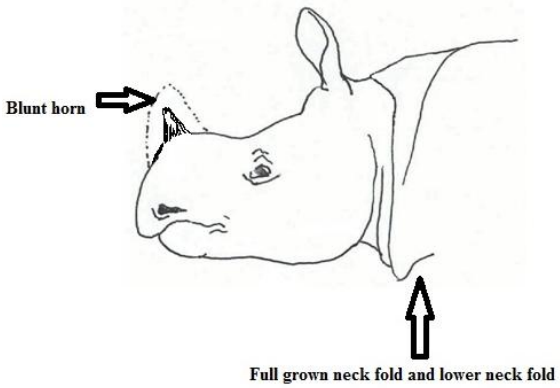
Photographs date- First two Photo-13/8/2012, Third one-20/6/2012

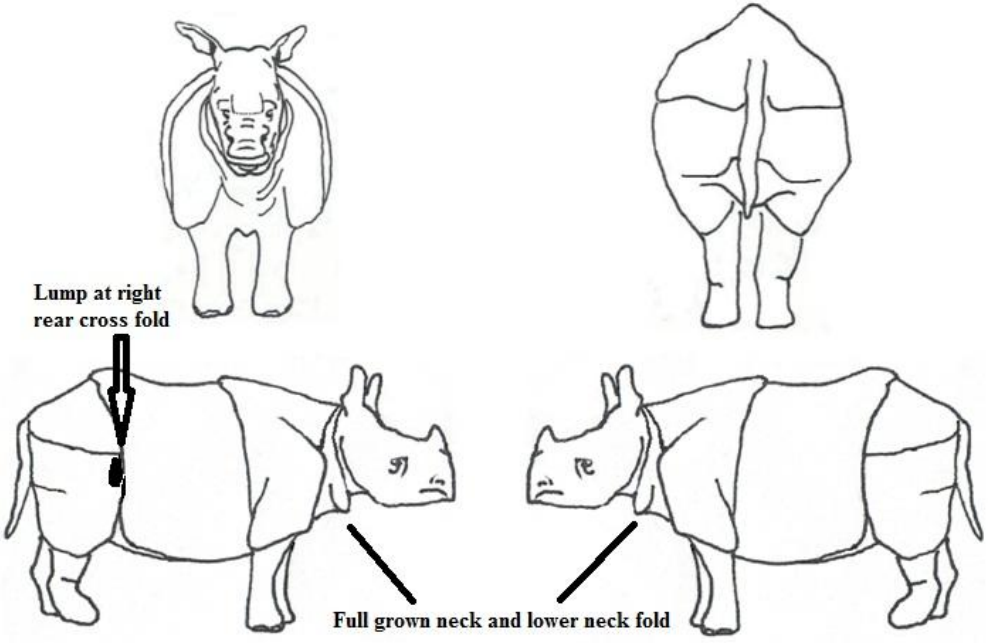
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

Name: Malati
Sex: Adult female
Origin: Kaziranga National Park
Rhino ID: Rhino-15
Age: 15 Year
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 15
Rhino Radio Collaring Date-11/03/2014
Radio Collar working (Nov,2014)

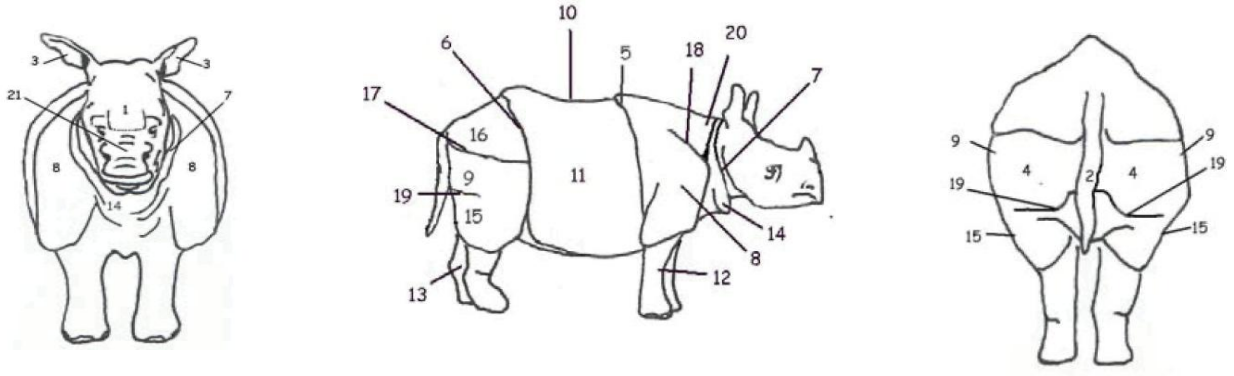








GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



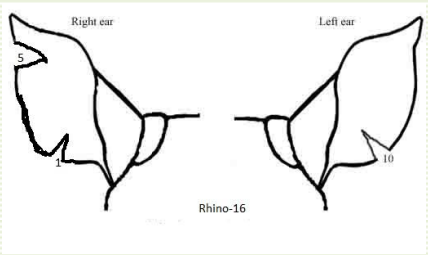
Specific Body Characteristics:
1. Horn: **Rough, blunt medium , broad base size horn**
3. Ear: **ID cut mark on both left and right side of the ears**
6.. Rear Cross Fold: **Right rear cross fold has visible lump**
7. Neck fold: **Full grown neck fold**
14. Lower neck fold: **Full grown lower neck fold**
19. Lower back corner: **Back corner undergrowth and visible**

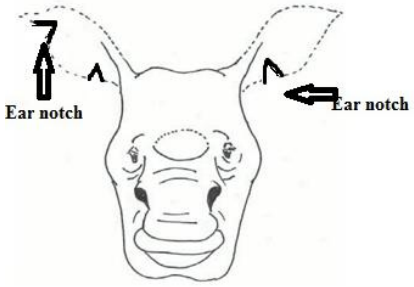
History, Ranging, Association
History: This adult female rhino was captured at Bagori range of Kaziranga National Park and translocated to Manas national park on 11/3/2012 and released at Buraburijhar release site at Bansbari range of Manas NP on 12/3/2012 at the 9-00am with her male calf (R 16)
Claves: She gave birth one male calf 2/11/2013
Range: Both mother and calf moved together at Bhuyanpara range of Manas NP. They mainly prefer to use central part of the Bhuyanpara range.
Group composition: R5, R6, Mainao.

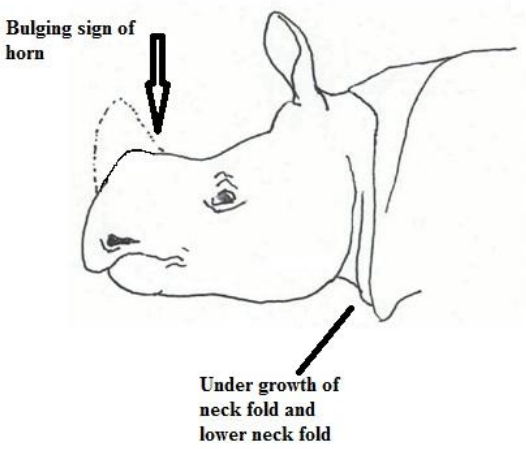
Photographs of Rhino-15

Photographs date- 26/7/2012

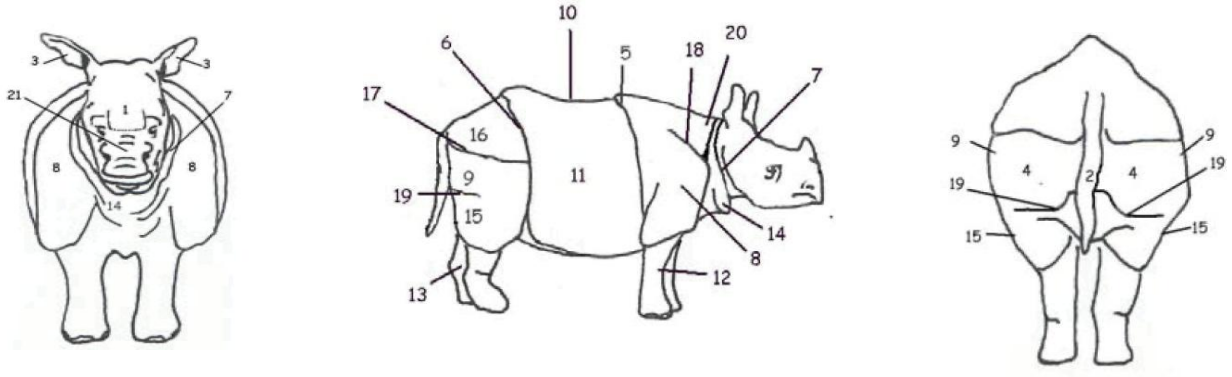
Name: Mann
Sex: Male calf
Origin: Kaziranga National Park
Rhino ID: Rhino-16
Age: 4 years
Father: Unknown
Mother: Rhino-15
Date of Birth: Unknown
Ear Notch ID: 16
Radio Collaring Date-11/03/2012
Radio-Collar Dropped-2/6/2012





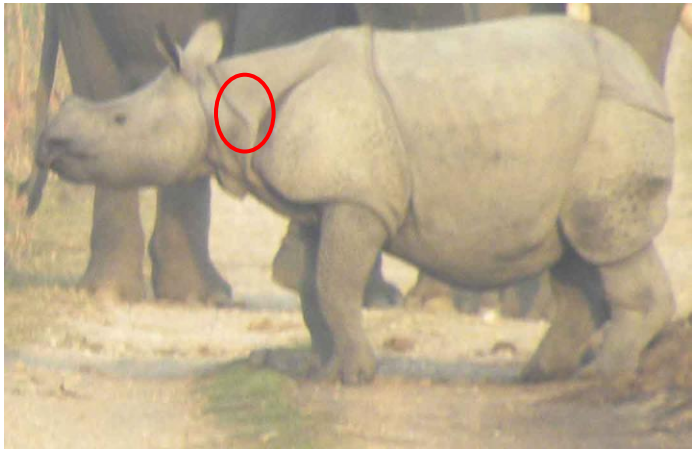


GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



Specific Body Characteristics
1. Horn: **Only bulging sign of horn site**
3. Ear: **ID cut mark on both left and right side of the ears**
7. Neck fold: **Under growth of neck fold**
14. 14. Lower neck fold: **Under growth of lower neck fold**
19. Lower back corner: **undergrowth and visible**
20. Rear Cross Fold:

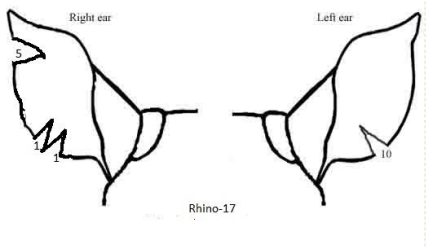
History: This is male rhino calf was captured at Bagori range of Kaziranga National Park and translocated to Manas national park on 11/3/2012 and released at Buraburijhar release site at Bansbari range of Manas NP on 12/3/2012 at the 9-00am with his mother (Rhino-15). **Rhino was killed 6/8/2013**
Range: Both mother and calf moved together at Bhuyanpara range of Manas NP. They mainly prefer to use central part of the Bhuyanpara range.
Group composition:

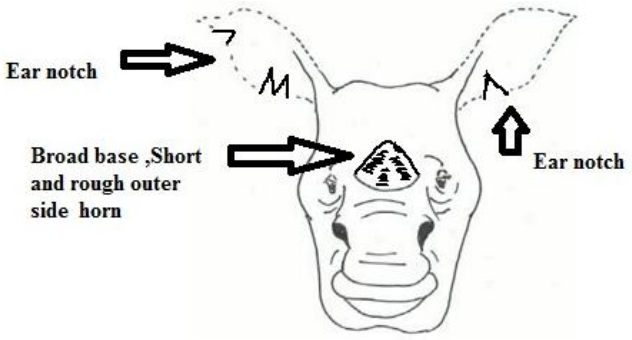


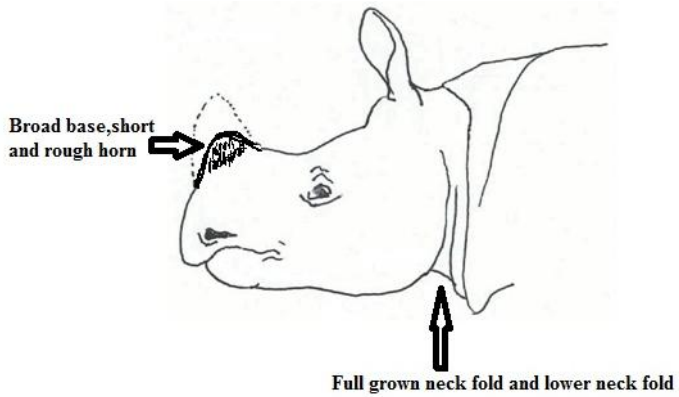
Photographs of Rhino-16

Photographs date- 11/3/2012

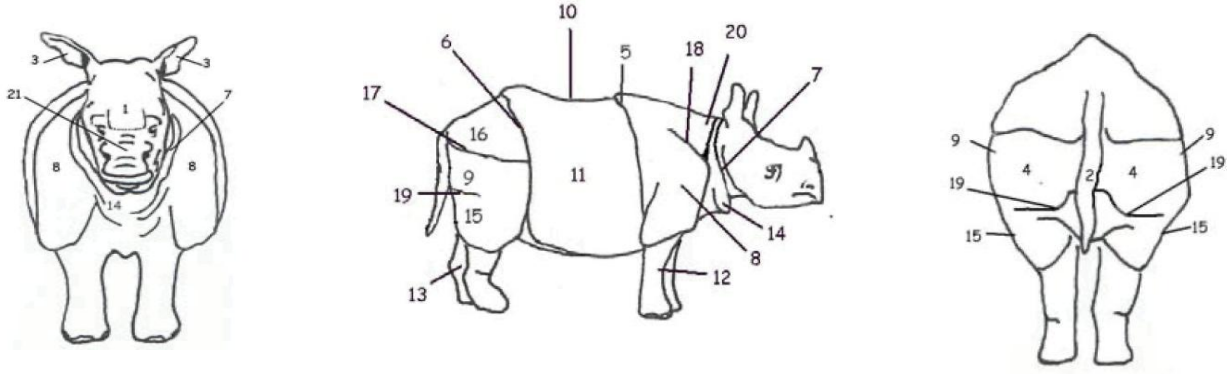
Name: Hainari
Sex: Adult female
Origin: Kaziranga National Park
Rhino ID: Rhino-17
Age:
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID: 17
Radio collaring date-
11/03/2014
Radio Collar Stopped functioning
2/4/2013







GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



Specific Body Characteristics:
1. Horn: Board base, short, rough outside horn
3. Ear: ID cut mark on both left and right side of the ears
7. Neck fold: Full grown neck fold
14. Lower neck fold: Full grown lower neck fold

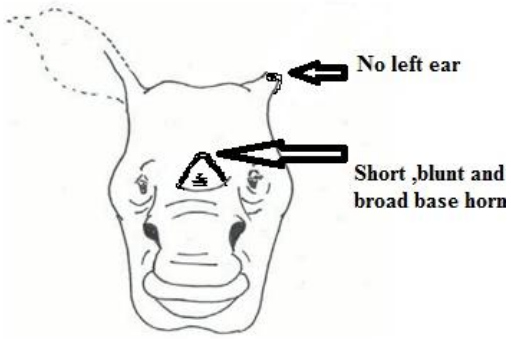
Rhino History, Ranging, Association
History: This is adult female rhino. She was captured at Bagori range of Kaziranga National Park and translocated to Manas National Park on 11/3/2012 and released at Buraburijhar rhino release site on 12/3/2012 at 10-00am. Rhino was killed on 2/4/2014
Claves: She gave birth one male calf on 20/3/2013
Range: Rhino-17 and 18 like to use western part of Bansbari (Kahitama area) and eastern part of Panbari range (Kunhighat area)
Group composition:

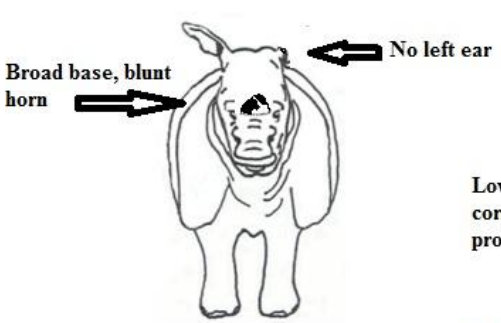
Photographs of Rhino-17

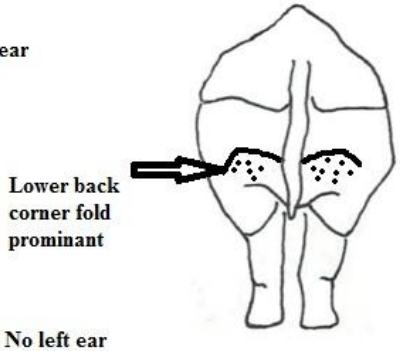
Photographs date- 27/3/2012 & 18/4/2012

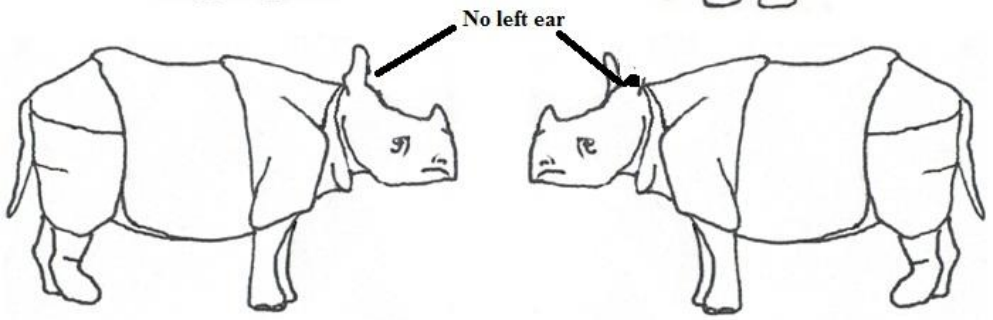
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

Name: Khwamajinai
Sex: Sub adult male
Origin: Kaziranga National Park
Rhino ID: Rhino-18
Age: 5 years
Father: Unknown
Mother: Rhino-18
Date of Birth: Unknown
Ear Notch ID: No ear notch
Radio Collaring Date
11/03/2012
Radio Collar Stopped functioning
March,2013

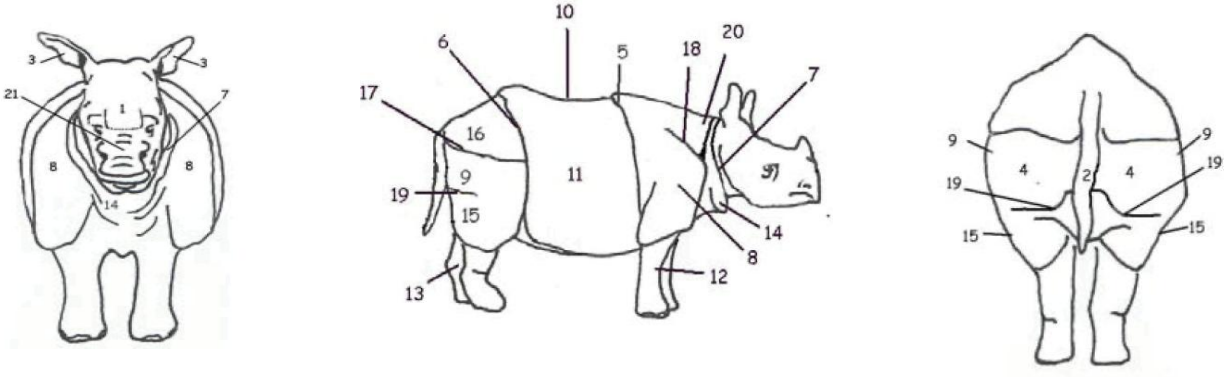








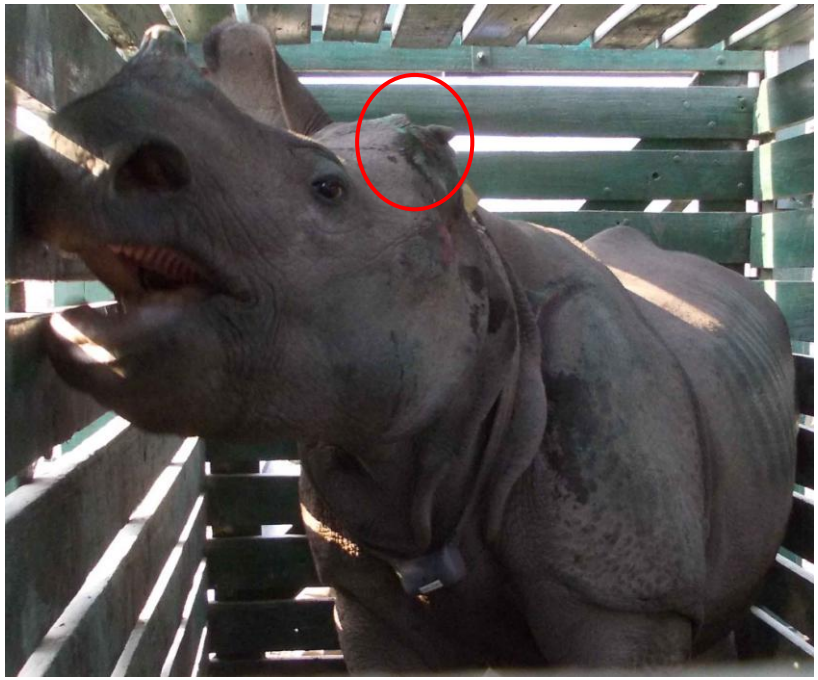
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



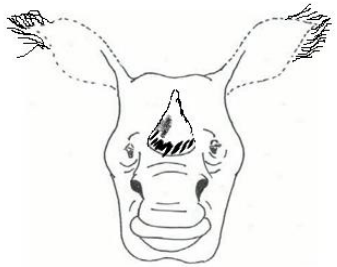
Characteristics:
1. Horn: Board base, short, rough outside
3. Ear: No left ear
7. Neck fold: Full grown neck fold
14. Lower neck fold: Full grown lower neck fold

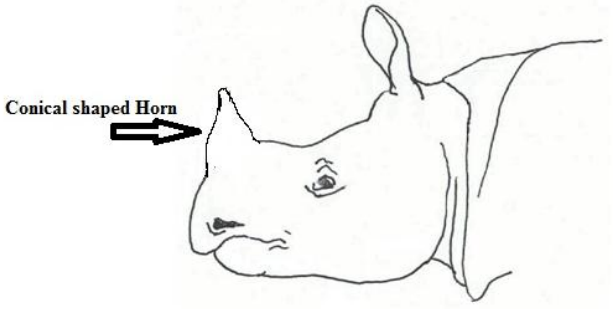
History: This is a sub adult male rhino. Rhino was captured at Bagori range of Kaziranga National Park and translocated to Manas National Park on 11/3/2012 and released at Buraburijhar rhino release site on 12/3/2012 at 10-00am.
Range: Rhino- 18 like to use western part of Bansbari (Kahitama area) eastern part of Panbari range (Kunhighat area), Charphuli and Tinmile area of Bansbari.
Group composition: Rhino 4 and Rhino 7 and 14

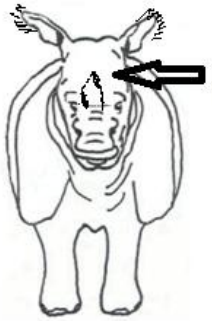
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

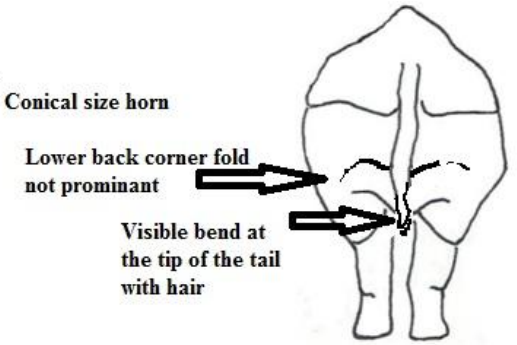


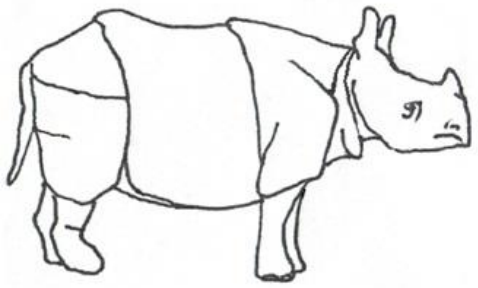
Name: Mainao
Sex: Adult Female
Origin: CWRC, Kaziranga NP
Age: 11 Years
Father: Unknown
Mother: Unknown
Date of Birth: Unknown
Ear Notch ID:

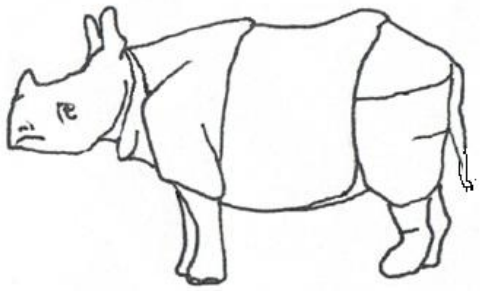




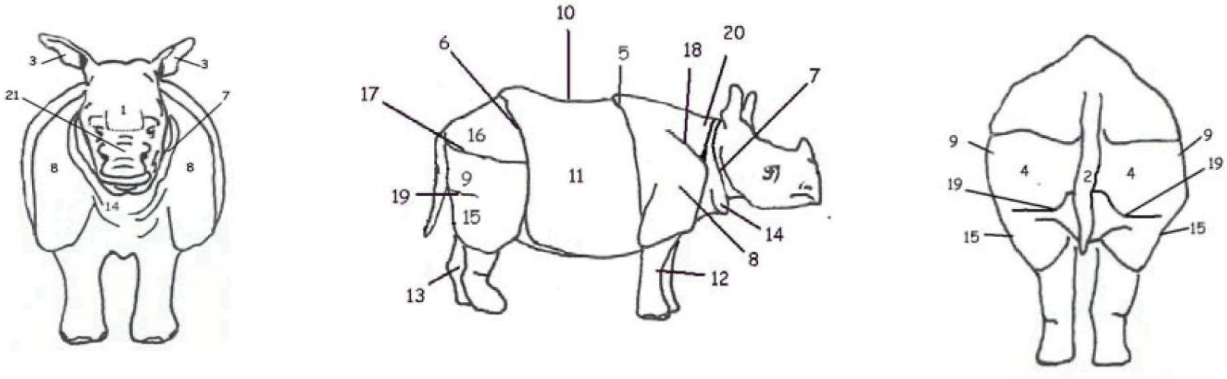








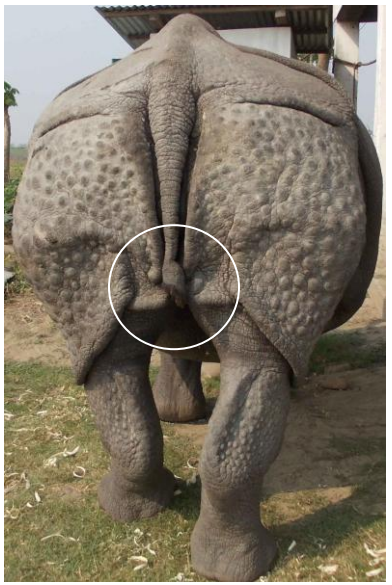
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



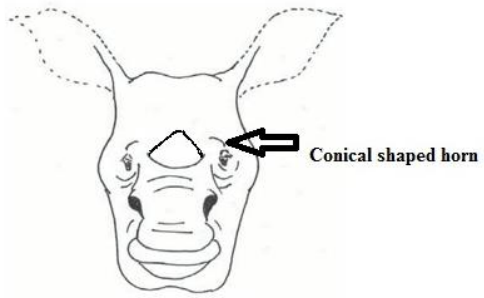
Specific Body Characteristics:
1. Horn: ***Broad base, Slightly curved and pointed***
2. Tail:
3. Ear: ***Visible bend at the tip of the tail and hair only at the tip of the tail.***
4. Anal plate:
5. Front cross fold:
6. Rear Cross Fold:
7. Neck fold: ***Stout and full grown***

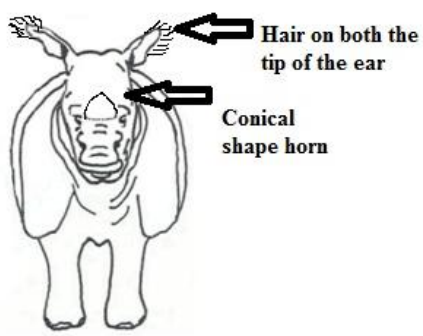
History, Ranging and Association
History: Mainao was translocated to Manas National Park on 21st February,2006.Mainao thus got the distinction of being the first rhino to reach Manas after the resident population of rhinos had been wiped out during the decade of political instability in the region.
Calves: Mainao gave birth a calf on 2/6/2013 Ranging : Bansbari and Bhuynapara range Grouping: R3, R6, R15, R13, R15, Ganga, Jamuan

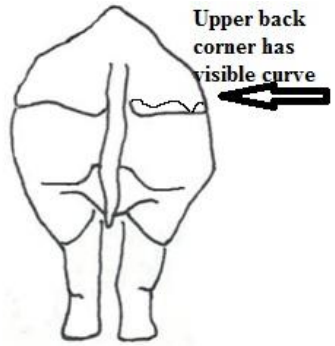
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK

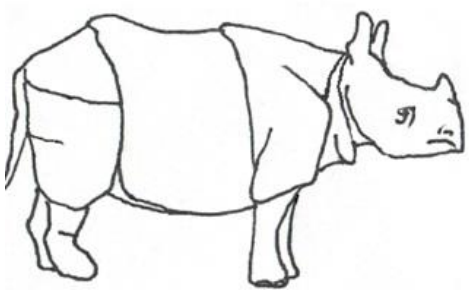


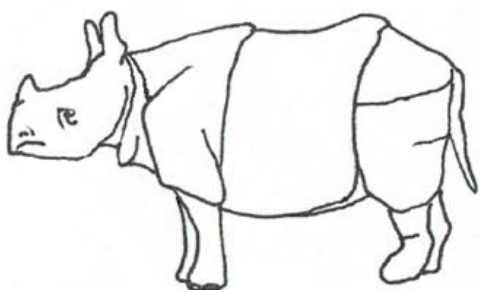
Name: Ganga
Sex: Adult Female
Origin: Wild Life Rescue Centre, Kaziranga NP
Rhino ID:
Age: 10 (apx)
Father:
Mother: Unknown
Date of Birth:



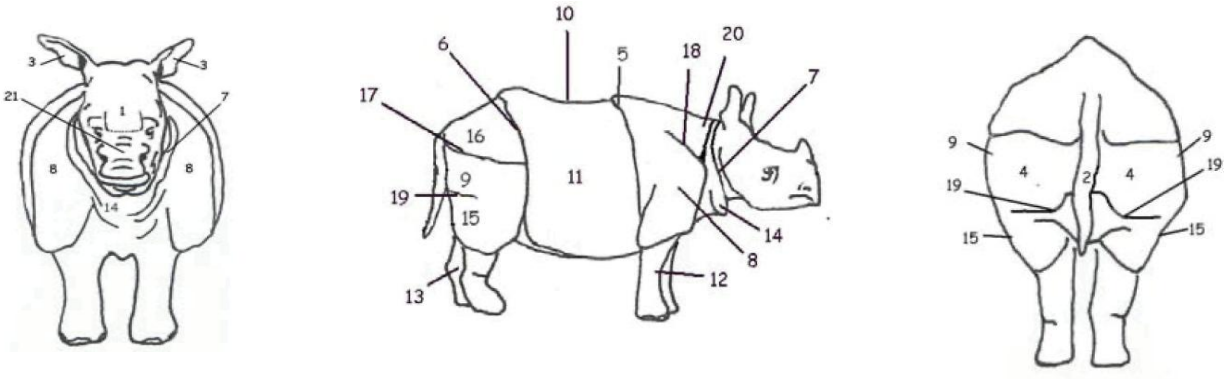








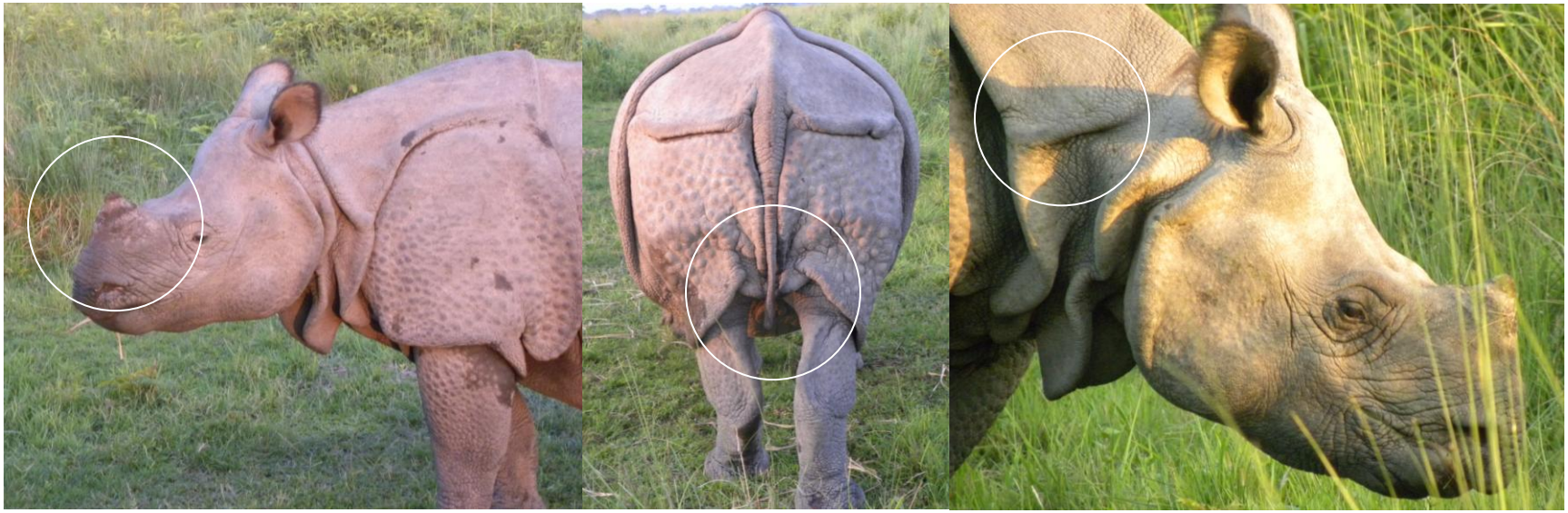
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



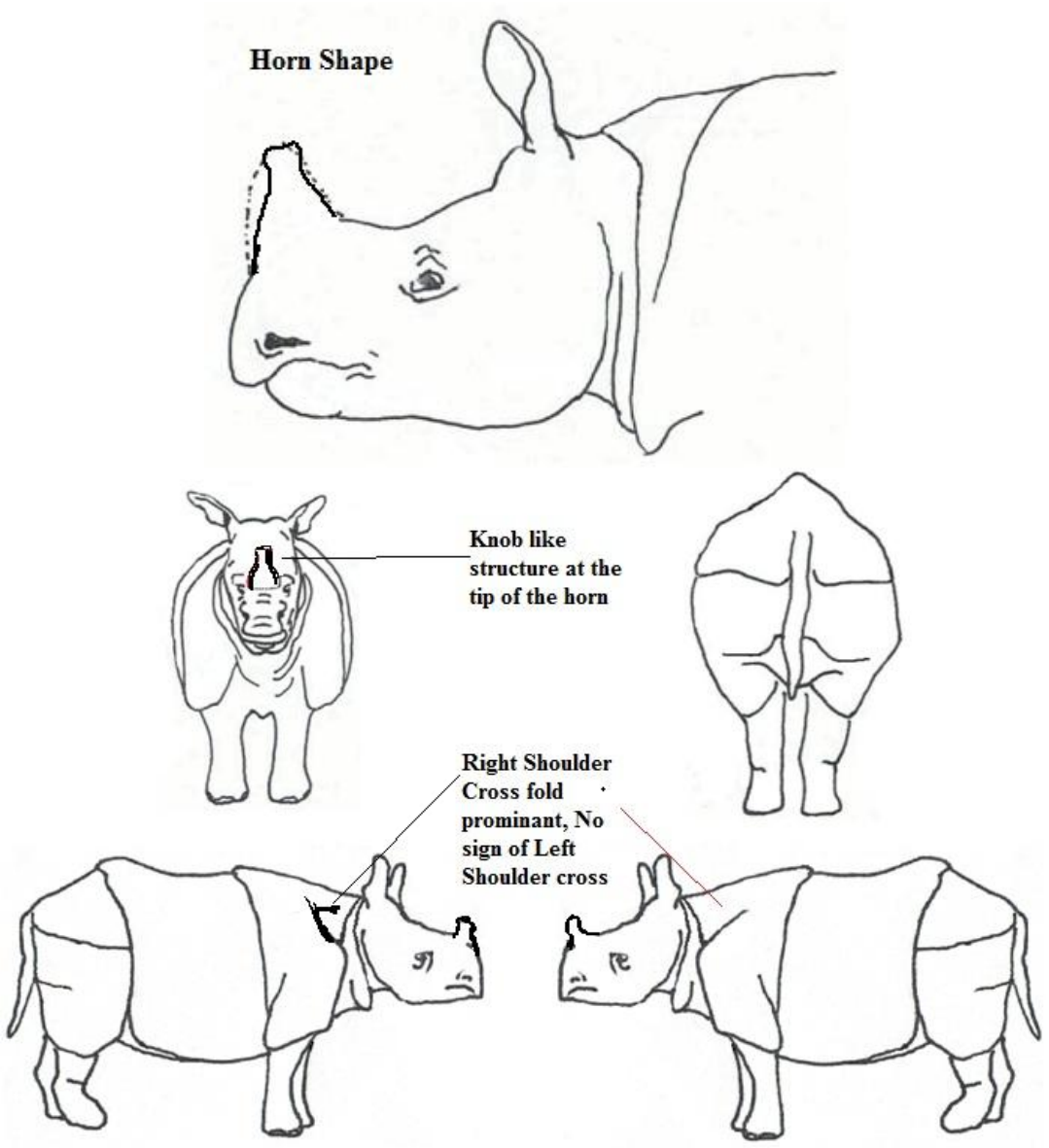
Specific Body Characteristics:
1. Horn: ***Conical shaped horn***
2. Tail: ***Elongated tail***
14. Lower neck fold: ***Full grown lower neck fold***
17. Anal plate: Upper back corner: ***Right upper back corner has visible fold***

History, Ranging and Association
History: Ganga was translocated to Manas National Park on 28th January,2007 .
Calves: Ganag gave birth a calf on 5/4/2013 at Rhino camp area Ranging : Bansbari range only Grouping: R3, R6, R15, R13, R15,Mainao, Jamuan

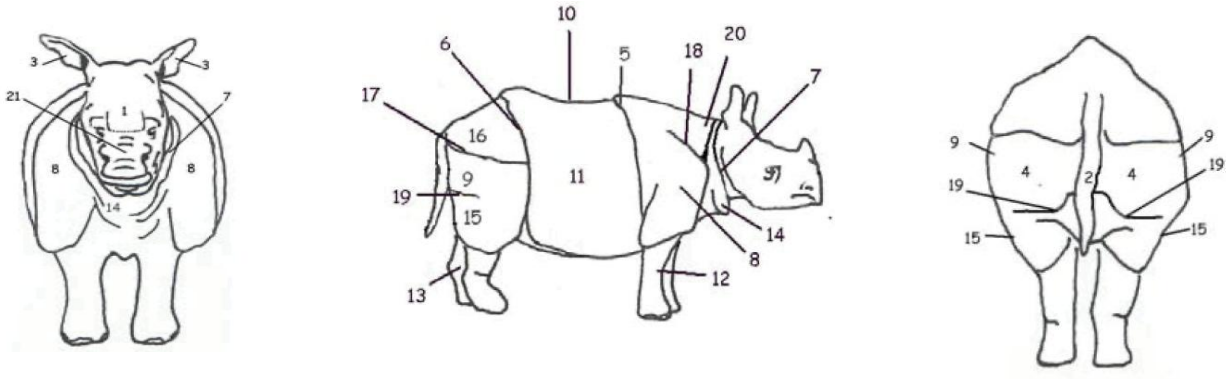
GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



Name: Jamuna
Sex: Sub Adult Female
Origin: CWRC, Kaziranga NP
Rhino ID:
Age: 10 years(Apx)
Father:
Mother:
Date of Birth:
Ear Notch ID:



GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK



Specific Body Characteristics:
1. Horn: **Knob like structure at the tip of the horn**
2. Tail: **Medium length tail**
3. Ear: **Hair on both ears.**
14. Lower neck fold: ***Full grown lower neck fold***
17. Shoulder cross fold: ***Right shoulder cross folder is visible but left side has no any sign of growth.***

History, Ranging and Association
History: Jamuna was translocated to Manas National Park on 28th January,2007 .
Calves: Jamuna gave birth a calf on 4/7/2013 at Rhino camp area Ranging : Bansbari range only Grouping: R3, R6, R15, R13, R15,Mainao, Ganga

GREATER ONE HORNED RHINO MASTER RECORD FOR MANAS NATIONAL PARK