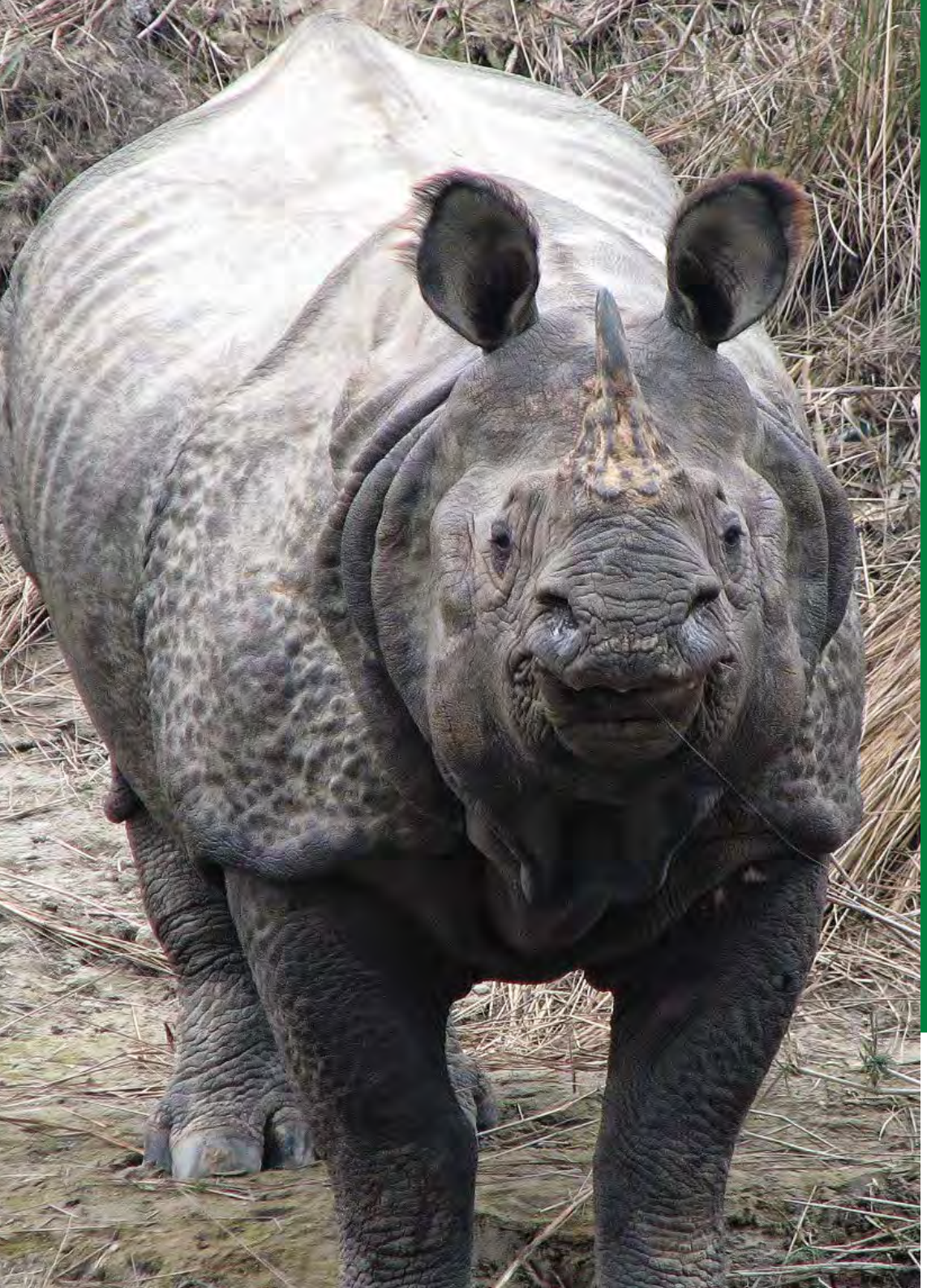

Profiles of the Greater One-horned Rhinoceros *(Rhinoceros unicornis)* of Bardia National Park and Shuklaphanta Wildlife Reserve, Nepal

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Profiles of the greater one-horned rhinoceros (*Rhinoceros unicornis*) of Bardia National Park and Shuklaphanta Wildlife Reserve, Nepal

Reviewed by
Ganga Jang Thapa (NTNC); Judy Oglethorpe (Hariyo Ban Program); Shant Raj Jnawali (Hariyo Ban Program/WWF); Maheshwar Dhakal (DNPWC)

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Foreword

Conserving large mammals like greater one-horned rhinoceros is a big challenge in human dominated landscapes. The population of greater one horned rhinoceros in Nepal has gone through ups and downs since 1950s. Political context is the major driver affecting rhino conservation in Nepal. During the period of political unrest, the country faced rampant poaching of rhinoceros. However, the population is recovering well after a decade long civil strife. At present, there are over 534 rhinos in Nepal distributed in Chitwan, Nawalparasi, Bardia and Kanchanpur districts. There have been tremendous efforts to conserve rhino in Nepal by the Government of Nepal and conservation partners together with local communities.

Nepal initiated ID based rhino monitoring system for small and vulnerable populations since 2009. This ID based rhino monitoring system creates a profile for each rhino and helps search for them during the monitoring and regular ground patrolling so that the state of each and every rhino in a given area is known. The information gained from the monitoring provides inputs to design strategy against any possible threats of poaching. The intensive and extensive patrolling and surveillance in the rhino habitats improves and strengthens rhino security. I am pleased to emphasize that after the integration of ID based rhino monitoring with the anti-poaching system there has been no poaching of rhinos in Bardia since 2009. I would like to thank all security personnel, Park staff and NTNC rhino monitoring team for their untiring efforts. The ID based monitoring throughout the year demands a lot of resources for mobility, equipment (cameras, binoculars, GPS, etc.) and database management. Conservation partners like NTNC, WWF Nepal, and Zoological Society of London have been instrumental in supporting this activity. In the recent years, USAID funded Hariyo Ban Program has been supporting us in this endeavor.

I am very happy that the National Trust for Nature Conservation has published this Profiles of the rhinos of Bardia National Park (BNP) and Shuklaphanta Wildlife Reserve (SWR), Nepal which is very informative and has been targeted to field staff and general readers to familiarize them with the need to monitor rhinos and improve their security. I believe that this profile will help the BNP, SWR and Department of the National Parks and Wildlife Conservation to understand the dynamics of rhino conservation and to incorporate the findings in planning. I am confident that such activities will strengthen and support the Government of Nepal and all conservation partners to continue to work together for the success of rhino conservation in Nepal.

Thank you.

Tikaram Adhikari
Director General
Department of National Parks and Wildlife Conservation (DNPWC)
Babarmahal, Kathmandu

Preface

Greater one-horned rhinoceros (*Rhinoceros unicornis*) is one of the most threatened large mammal species in the world, and conserving the rhino in Nepal is a major priority for many conservation partners. Collective rhino conservation efforts in the country – by community members, conservation NGOs, government line agencies, and the police and army – are now bearing fruit. The population is increasing again, and Nepal recently celebrated two years of zero rhino poaching – I am proud that the Hariyo Ban Program was able to contribute to this achievement.

The Hariyo Ban Program is named after the famous Nepali saying 'Hariyo Ban Nepal ko Dhan', or 'Green forests are the wealth of Nepal'. One of the major objectives of this program is to reduce threats to biodiversity in the Terai Arc Landscape (TAL) and Chitwan Annapurna Landscape (CHAL), including focal species such as the rhino. In order to better conserve Nepal's isolated rhino populations, recognition of individual rhinos is essential both for protection and for gaining better understanding of population dynamics and conservation needs. Hence the Program supported the National Trust for Nature Conservation (NTNC) to undertake intensive and rigorous identity (ID) based rhino monitoring in Chitwan National Park, Bardia National Park and Shuklaphanta Wildlife Reserve.

This publication results from that work. It aims to introduce and highlight the strategies of rhino conservation in Bardia National Park, which can be replicated in other protected areas of Nepal. Thanks to the individual ID profiles generated by the program, researchers and park management can now monitor individual rhinos using their unique features and conduct further research on rhino population dynamics, ecology, movement, and occupancy in and around Bardia National Park. The Hariyo Ban Program is pleased to be a part of these conservation efforts under the umbrella of the Government of Nepal.

The catalogue is a milestone for rhino conservation in the country. I would like to congratulate NTNC for the excellent initiative, and on behalf of all the Hariyo Ban consortium partners, thank the members of the rhino monitoring team who have worked diligently in the protected areas to bring us this important publication.

Judy Oglethorpe
Chief of Party
Hariyo Ban Program

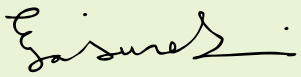
Acknowledgements

In Nepal, over 800 greater one-horned rhinoceros were believed to be living in the Chitwan valley until the 1950s. Rhino numbers dropped to less than 100 as early as mid-1960. To protect the remaining wild population, the Government of Nepal established the Chitwan National Park (CNP) in 1973 as the first National Park of the country. As a result, the rhino population increased and reached 612 individuals in 2000. The Government reintroduced a total of 87 rhinos to Bardia National Park (BNP) and Shuklaphanta Wildlife Reserve (SWR) between 1986 to 2003, where National Trust for Nature Conservation (NTNC) provided technical support in capturing, handling and transportation along with regular monitoring of the translocated populations. However, during a decade long armed conflict in Nepal, rhinos were heavily poached and Chitwan rhinos dropped to 372 in 2005 and the Bardia population to 31 in 2007. But since the peace process was initiated in Nepal, rhino numbers are increasing and reached 534 in 2011.

This catalogue is profile of each individual rhino of Bardia National Park (BNP) and Shuklaphanta Wildlife Reserve (SWR). Since the translocation of the first batch of rhinos to BNP in 1986, NTNC has been constantly monitoring the rhinos in BNP, SWR and in CNP. NTNC's Bardia Conservation Program (BCP) in Bardia and Shuklaphanta Conservation Program (SCP) in Kanchanpur in close collaboration with BNP and SWR, along with the other community relief programs are involved in research and monitoring of the flora and fauna in the area. Intensive ID based rhino monitoring is one of the Trust's important programs in Chitwan, Bardia and Shuklaphanta. Besides monitoring, NTNC is also involved in habitat management and the treatment, rescue and care of problem animals. ID based rhino monitoring was initiated in 2008 with the financial support of different donor agencies. In this system, each individual rhino is given a particular ID and name based in its distinct physical appearance. The Asian Rhino Specialist Group (AsRSG) provided training for 20 frontline staff of rhino bearing protected areas in 2008. Since 2012, the USAID funded Hariyo Ban Program has been providing financial support for the continuity of the program. This catalouge profile is also prepared under the same program.

I would like to extend our sincere gratitude to USAID funded Hariyo Ban Program for the financial support to conduct the ID based rhino monitoring and other wildlife research programs. I would also like to thank conservation partners and other donor agencies who have supported NTNC at different times. Thanks to Mr. Ganga Jang Thapa, Dr. Shant Raj Jnawali, Ms. Judy Oglethorpe and Dr. Maheshwar Dhakal for review and comments. Special thanks to Dr. Naresh Subedi and the team at the center and field offices in Bardia and Shuklaphanta, who have been involved in gathering the information and documentation. At this juncture, we welcome comments and feedback from all readers and our well-wishers regarding this publication.

Thank you.



Govinda Gajurel
Member Secretary
National Trust for Nature Conservation

Contents

Acronyms

AsRSG	:	Asian Rhino Specialist Group
BNP	:	Bardia National Park
BZUC	:	Buffer Zone Users Committee
CF	:	Community Forest
CITES	:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNP	:	Chitwan National Park
DNPWC	:	Department of National Parks and Wildlife Conservation
GIS	:	Geographic Information System
GPS	:	Global Positioning System
ID	:	Identity
IUCN	:	International Union for Conservation of Nature
Km	:	Kilometer
MCP	:	Minimum Convex Polygon
NP	:	National Park
NTNC	:	National Trust for Nature Conservation
SWR	:	Shukhlaphanta Wildlife Reserve
USAID	:	United States Agency for International Development
WWF	:	World Wildlife Fund

1. Background

1.1 Greater One-horned Rhinoceros (*Rhinoceros unicornis*)

The greater one-horned rhinoceros (*Rhinoceros unicornis*) is a highly threatened large mammal and is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The species was categorised under International Union for Conservation of Nature (IUCN) criteria as Endangered for a long period until the relative recovery of a single population in India (Kaziranga NP). With this recovery it has been down-listed to vulnerable in the IUCN Red List of Threatened Species (IUCN 2008).

Five species of rhinoceros survive in the world: three occur in Asia - greater one-horned rhinoceros, javan rhinoceros *Rhinoceros sondaicus* and sumatran rhinoceros *Dicerorhinus sumatrensis*, and two in Africa - black rhinoceros *Diceros bicornis* and white rhinoceros *Ceratotherium simum*.

Once believed to be widespread throughout the northern floodplains of the Ganges, Brahmaputra and Indus rivers and nearby foothills of the Indian sub-continent between Indo-Myanmar border in the east and Sindh River basin, Pakistan in the west, the greater one-horned rhinoceros (henceforth rhino) is currently restricted in few isolated protected areas in north-eastern India and lowland of Nepal (Figure 1). Kaziranga National Park holds the largest population of about 2200 individuals.

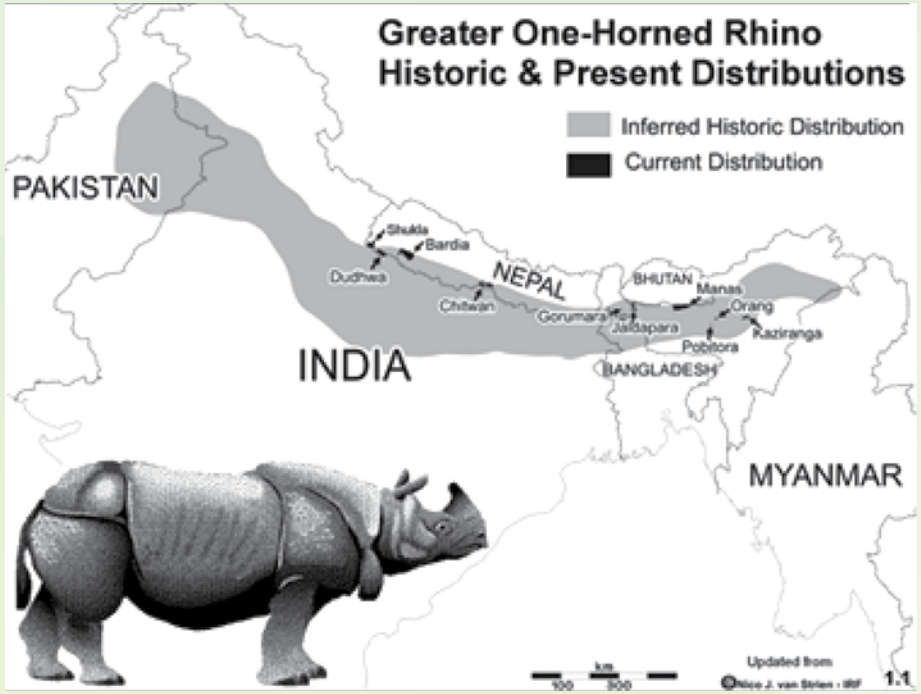


Figure 1. Historic and present distribution of the greater one-horned rhinoceros

1.2 Rhinoceros in Nepal

In Nepal, over 800 rhinos were believed to be living in the Chitwan valley until 1950s. Rhino numbers dropped to less than 100 as early as the mid-1960s because of poaching and habitat loss for agriculture. To protect the remaining wild population of rhinos, the Government of Nepal established Chitwan National Park (CNP) in 1973 as the first National Park of the country. People living in the prime habitats were moved out and an armed force was mobilized to control poaching. As a result, the rhino population increased gradually and reached 612 individuals in 2000. In order to spread the risk (due to poaching, flooding and other demographic and stochastic events) and to maximize population growth rate, the Government of Nepal between 1986 and 2003 translocated and reintroduced a total of 87 rhinos to Bardia National Park (83) and Shuklaphanta Wildlife Reserve (4) from CNP.

Table 1 : Rhino population status and structure in Nepal as estimated in 2011.

Protected area	Sex	Adult	Sub adult	Calf	Total
Chitwan National Park	Female	157	14	12	183
	Male	126	9	10	145
	Unidentified	49	37	89	175
	Total	**332**	**60**	**111**	**503**
Bardia National Park	Female	7	1	1	9
	Male	4		1	5
	Unidentified	4	3	3	10
	Total	**15**	**4**	**5**	**24**
Shuklaphanta Wildlife Reserve	Female	2	0	0	2
	Male	2	0	0	2
	Unidentified		2	1	3
	Total	**4**	**2**	**1**	**7**
Total population - Nepal		**351**	**66**	**117**	**534**

Source: Subedi et.al. 2013

However, during a decade long (1996 – 2006) armed conflict in Nepal, the rhino populations were heavily poached and Chitwan rhinos dropped to 372 in 2005 and Bardia population to 31 in 2007. But after the end of the insurgency, rhino number increased at 5.1% per annum (Subedi 2012) and the number had reached 534 in 2011 (Table 1).

1.3 Bardia National Park

Bardia National Park (BNP) covers an area of 968 km^2 and is the largest national park in the Terai. An area of 507 km^2 surrounding the park is designated as buffer zone where 19 buffer zone users committees (BZUCs) representing about 240,000 people engage in conservation and development activities in coordination and with active support of the park authorities and conservation partners.

BNP is home to globally significant wildlife species fauna such as the greater one-horned rhinoceros, Bengal tiger, Asian elephant, swamp deer, four horned antelope, and hispid hare. Other endangered species include gharial crocodile, Indian rock python and gangetic dolphin. Globally threatened birds such as lesser florican, sarus crane, white rumped vulture, red headed vulture, prinia, white stork and black stork are also found in the park. More than 53 species of mammals including 10 protected mammals of Nepal, over 460 species of birds including 6 protected birds of Nepal, 25 species of reptiles including all 3 protected reptiles of Nepal, and more than 121 species of fish have been recorded in park habitats including riverine forest, rivers, waterholes, mixed forest, Sal forest, grassland and bush.

1.4 Shuklaphanta Wildlife Reserve

Shuklaphanta Wildlife Reserve covers an area of 305 km^2 and is located in Kanchanpur district in the far-western Terai in Nepal. The reserve is connected with

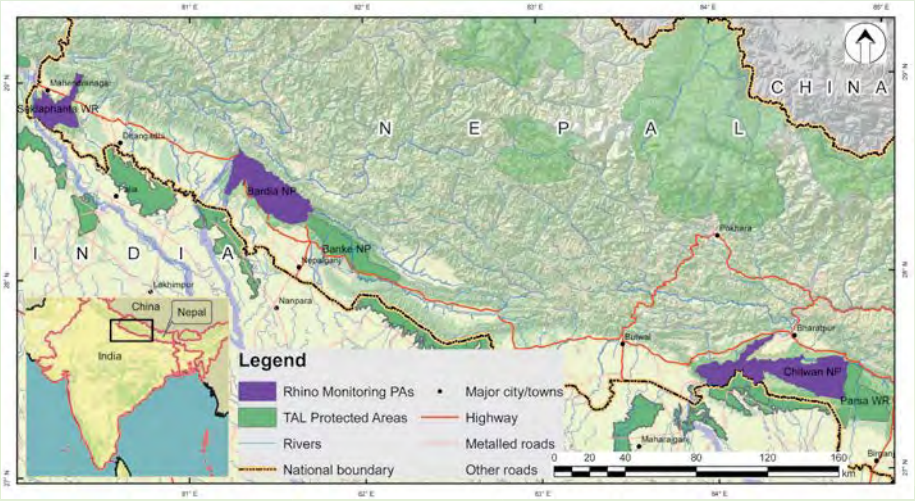


Figure 2. ID based rhino monitoring parks and reserves in lowlands of Nepal

two protected areas in India - Dudhwa National Park in the east through Laljhadi forest corridor and Pilibhit Tiger Reserve in the south through the Lagga-Bagga forest block of north Kheri forest division.

Although the area of the reserve is small, it supports a wide range of biodiversity which is nationally and globally important. The main vegetation types are Sal forest, mixed deciduous forest, riverine forest, grasslands and wetlands. 24 mammal species, 350 species of birds and 14 species of fish have been recorded in the Reserve. The Reserve supports Nepal's largest population of Bengal florican *Houbaropsis bengalensis* and swamp deer *Cervus duvauceli* with herd of ca. 2000. The rhinoceros were first reintroduced in 2003 with the translocation of 4 animals from Chitwan National Park. This small population of rhino is critical and needs to be enriched by further reintroductions.

2. Intensive ID Based Rhino Monitoring

Intensive ID based rhino monitoring is a simple monitoring system where each individual rhino is assigned a particular ID or name based on its distinct physical appearance and body features. This system is very effective in small populations where monitoring staff can manually track and monitor individual animals and keep records of their movements. After the heavy loss of rhinos due to poaching, intensive ID based monitoring of each individual rhino was initiated to enseure security of the remaining individuals in BNP and SWR in 2008.

ID based rhino monitoring is being carried out by NTNC in close coordination with BNP and SWR together with the Nepal Army which is deployed for park protection. Since 2012, the USAID funded Hariyo Ban Program has been providing financial support to continue and scale up ID based rhino monitoring in all rhino bearing protected areas of the country.

2.1 Methodology for ID Based Rhino Monitoring

In Bardia, all potential rhinio habitats have been divided into five different blocks in BNP (Figure 3) for ID based rhino monitoring.

Block 1: Bardia-Katerniaghat forest Corridor strentched along the Geruwa and Orai River; **Block 2:** Hattisar-Bagh Machan/Lamkighagar; **Block 3:** Bagh Machan/ Lamkighagar-Gainda Machan; **Block 4:** Gainda Machan-Laguna Machan; **Block 5:** Laguna Machan-Lalmati including Chhatiwan CF in Karnali river corridor.

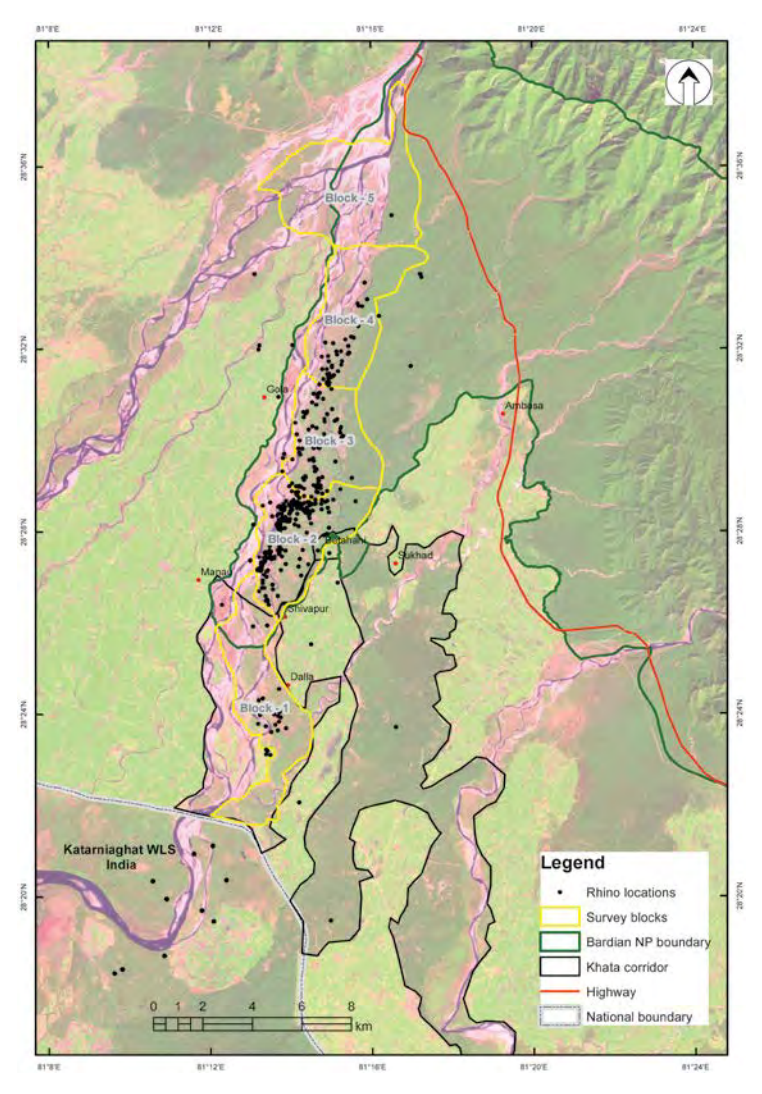


Figure 3. ID based rhino monitoring blocks in BNP

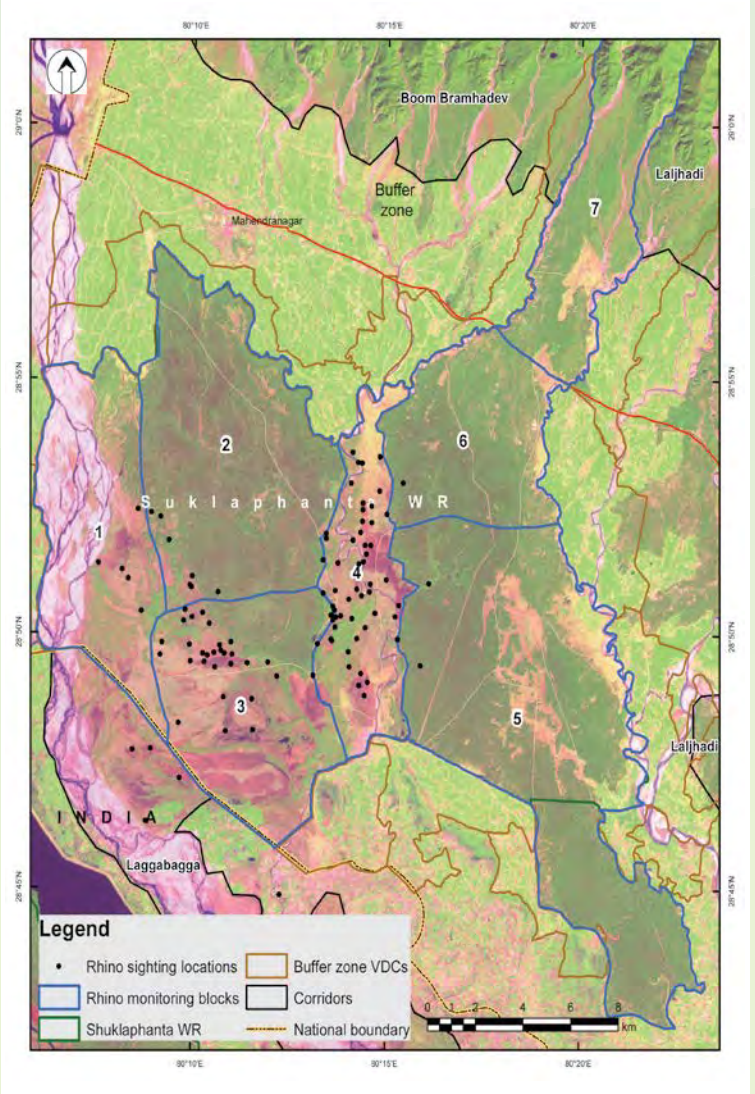


Figure 4. ID based rhino monitoring blocks in SWR

Similarly, potential rhino hanitats in SWR are divided into seven blocks (Figure 4).

Block 1: Piparia-Barkola; **Block 2:** Majhgaon; **Block 3:** Singhpur-Shuklaphanta; **Block 4:** Chaudhar-Suryaphanta; **Block 5:** Beldandi; **Block 6:** Arjuni-Badnikheda; **Block 7:** Arjuni

2.2 Rhino Monitoring Training

The Asian Rhino Specialist Group (AsRSG) has developed an IUCN accredited course manual on rhino monitoring (IUCN AsRSG 2009). Twenty frontline staff from rhino bearing protected areas of Nepal were intensively trained as rhino instructors in 2008. The trainers then trained other field staff using hands-on training in the field. The field staff were formally tested through different levels of exams. The field technicians deployed for ID based rhino monitoring are some of the best wildlife technicians in Nepal, trained through this accredited course. The basic equipment required for rhino monitoring comprises cameras, binoculars, GPS, maps and data forms.

2.3 Rhino Population Master ID Files

Based on the field data a master ID file for each rhino is prepared. These files are an invaluable tool for monitoring the rhino population. Rhino identification master files are used to control quality of rhino sighting data recorded in field sighting forms and to correctly classify the sightings. The files also help to capture and transfer the knowledge/skills of the highly experienced key observers which otherwise would be lost during transfers or retirements. The photographic sequences kept in the files enable changes in the animals to be tracked over time, and allow development of guidelines on horn and body size appearance with rhino age. It is therefore essential that the information in the files is accurate and kept up-to-date by the data controllers trained to maintain these files. The aim in small populations (or sub-populations) is for every individual rhino to be given a unique identifier (ID) for life to enable population performance data to be derived (e.g. inter-calving intervals for each cow) in addition to serving as an audit.

2.4 Recording Rhino Identification Features and Demographic Data

A rhino data recording booklet has been designed to standardize the accurate recording of rhino identification features and demographic data (Figures 6 & 7). The process of completing and validating field data recording forms ensures that the data are collected on an on-going basis and are of the best possible quality to be useful. The use of high resolution (8-10x optical zoom) digital cameras make it much easier for rhino monitors and other staff to reliably record sightings of rhinos. This information is then checked on a regular basis by experienced accredited observers and the sightings classified in accordance with the ID master files, which are continuously updated by the field officers.

It is important that field monitoring staff give equal importance to collect information on "clean" animals–usually subadult animals with no distinguishing features, and not just ID individuals. The validation of rhino sightings is an important part of this process to ensure all staff are correctly identifying animals with subtle ID features and not basing their decisions on unreliable features such as territory and behavior. If unreliable features are used, there is a risk of inflating the numbers with duplicate "clean" rhinos which have been given different names. On-going training, accurate filling of sighting forms and the use of up-to-date ID master files for validation is very important. Having clearly identifiable rhinos (e.g. through ear cuts) particularly in small populations (or sub-populations) make monitoring easier, more transparent, and in the long run will allow compilation of quality information for decision making.

NTNC's Wildlife technicians jointly with park gamescouts are following this procedure and has set up monitoring blocks across the rhino distribution habitat in both BNP and SWR and nearby corridors. Regular monitoring is being carried out and monthly updates are being provided to the park authorities. Based on the information obtained, park authorities develop a strategies and work plans to deploy security forces and park personnel. A total of about 100 km^2 of potential rhino habitats is being regularly surveyed to intensify ID based rhino monitoring in the Karnali floodplain of BNP. Till date, ID profile of all 32 rhinos of BNP has been prepared. Similarly, a total of 150 km^2 area is being regularly monitored in SWR. Profiles of all nine rhinos have been prepared in SWR.

2.5 Computerized GIS Database and Reporting

Once rhinos are individually monitored, individual details are maintained in population database (Figure 5). An AsRSG accredited customized GIS based wildlife monitoring database has been developed which enables key information on individual rhinos (date of births, calving records, details of ID features, mortalities, translocations, etc.) as well as all their sighting records plus information on patrol movements and record of sightings of illegal activities. The database program enables park authorities to enhance the security situation inside the park.

Monthly park progress reports on rhino security, monitoring and community engagement are also derived from database system. A template which includes a monthly rhino sighting chart and patrol, illegal activity and animal sighting intensity maps is being developed and is being used in BNP and SWR. This can be modified as required and BNP has considered this as a very effective tool for deploying monitoring patrols and anti-poaching activities. Most of the elements of the standard report can be generated automatically from the GIS wildlife database system.

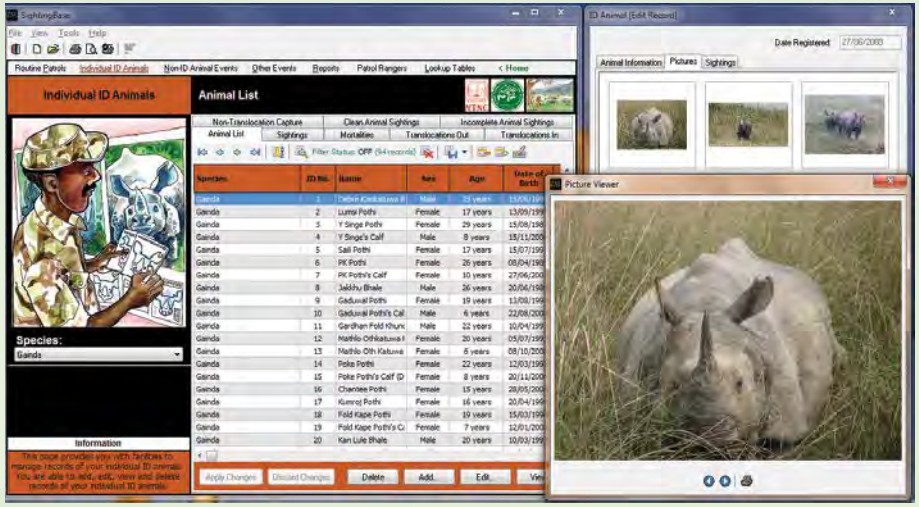
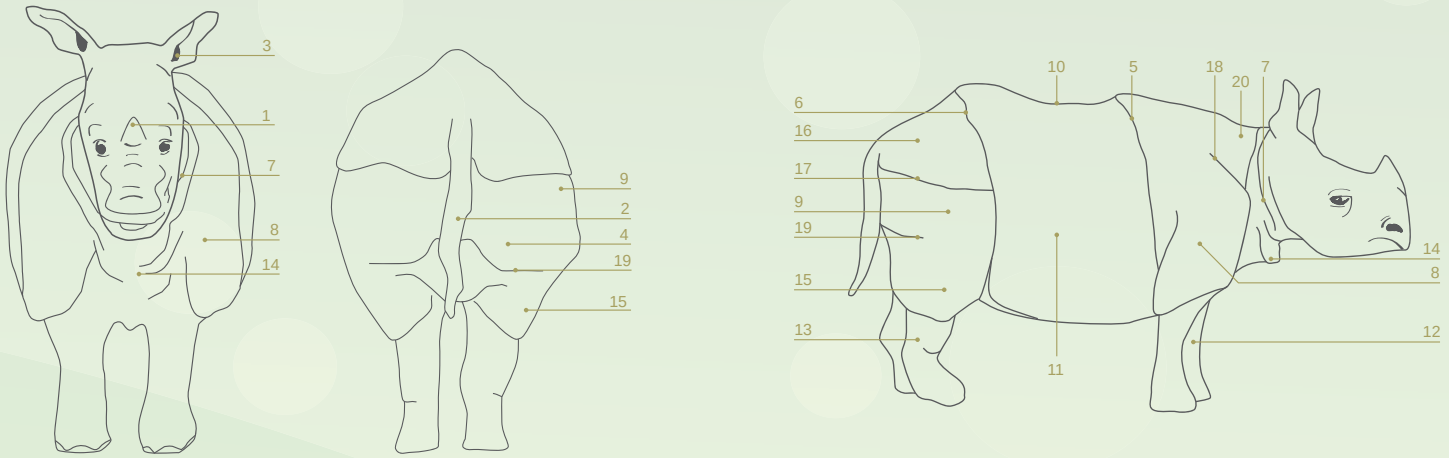


Figure 5. Rhino sighting based software for rhino database in Nepal

2.6 Equipment Used for ID Based Rhino Monitoring

For the effective ID monitoring of rhinos, all field monitoring units get equipped with the necessary monitoring equipment including communication system, GPS receiver, binocular, digital camera, data recording forms, maps (as required) and accessories such as spare batteries and pens. Patrol teams are also provided with necessary field transport and camping equipment to conduct effective patrol and surveillance. With the support from different conservation partners, NTNC has been providing all the necessary equipment to the field for monitoring.



(1) Horn (2) Tail (3) Ear (4) Anal plate (5) Front cross fold (6) Rear cross fold (7) Neck fold (8) Shoulder plate (9) Upper thigh plate (10) Prong (Spine) (11) Ribs (12) Front legs (13) Hind legs (14) Lower neck fold (15) Lower thigh plate (16) Back plate (17) Upper back corner fold (18) Shoulder cross fold (19) Lower back corner fold (20) Upper neck

Figure 6. Body parts of rhino

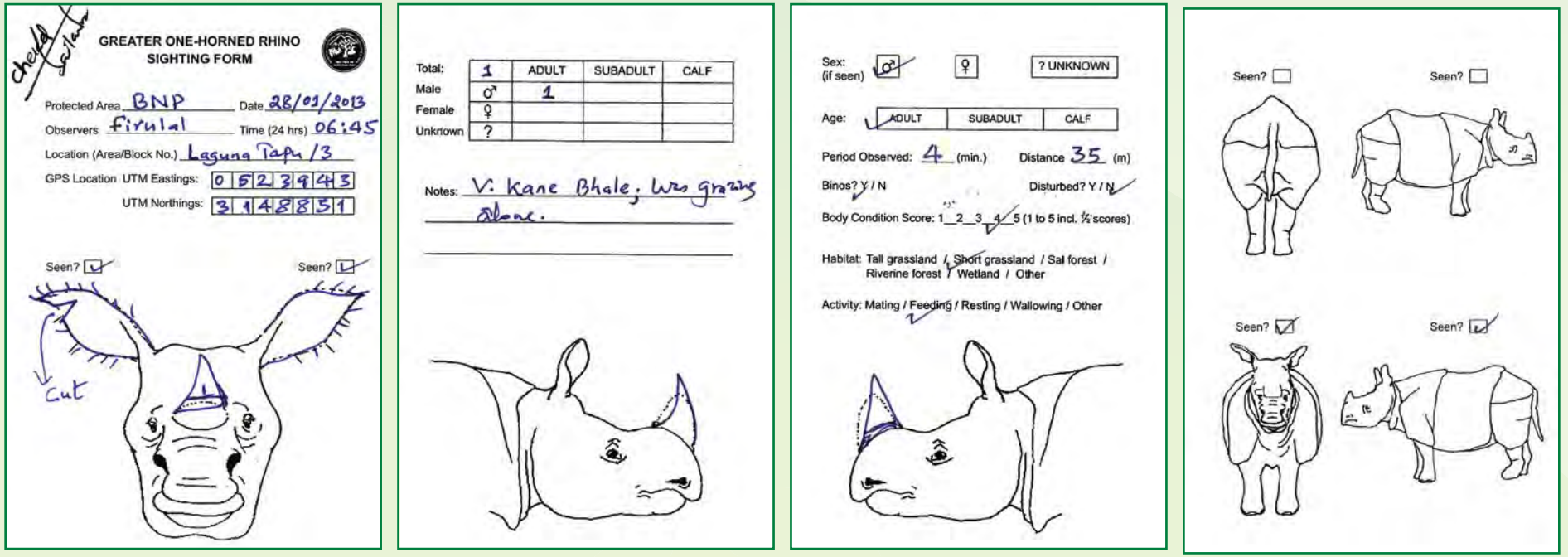


Figure 7. Standardized form used to record details of rhino sightings

3. Key Ecological Findings of ID Based Rhino Monitoring

The ID based rhino monitoring system helps to generate long-term ecological data on rhino, together with strengthening security. Some of the key findings from the data generated through the ID based monitoring system in BNP and SWR are summarized in the following sections.

3.1 Size of Home Ranges

Based on the data obtained from the ID based rhino monitoring system between 2009 and 2014 we estimated home ranges of some individual rhinos in Bardia National Park using the 95% Minimum Convex Polygon (MCP) method (Mohr, 1947). We used 460 locations from 8 rhinos (5 females and 3 males) to estimate the home ranges. Average home range size for males was 27.02 ± 5.17 km^2 and 17.99 ± 2.91 km^2 for female rhinos (Table 2).

Table 2. Home ranges of eight rhinos estimated by using 95% MCP method in Bardia National Park.

Rhino ID	Name of the Rhinos	95% MCP Home range (km^2)	No. of locations (n = 460)
ID 03	Thute Mau	28.22	63
Id 07	V-Kane Bhale	31.63	57
ID 09	Dalla Bhale	32.73	64
ID 14	Kankatwa Pothi	11.69	54
ID 15	Korea Bagar Pothi	13.12	67
ID 16	Gori Pothi	17.71	44
ID 19	Khagtutali Pothi	19.23	65
ID 20	Laguna Machan Bhale	16.70	46
Average female home range		17.99 ± 2.91	
Average male home range		27.02 ±5.17	

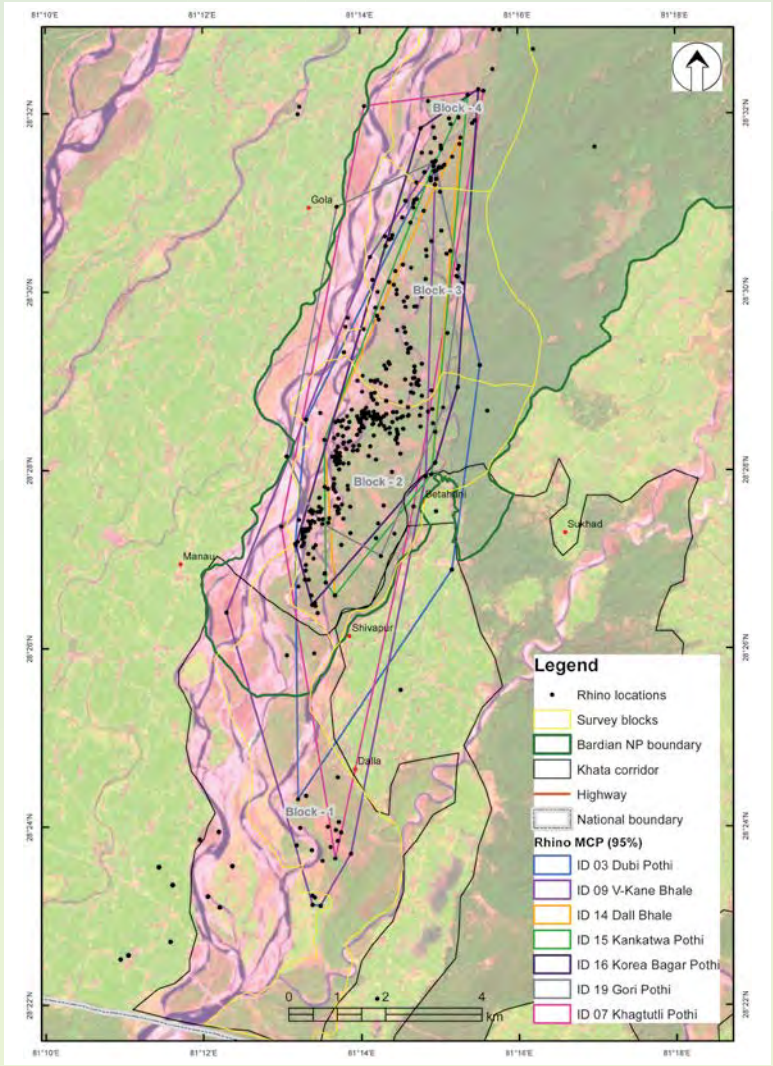


Figure 8. Rhino sighting locations and home ranges of some individual rhinos in Karnali floodplain of Bardia NP

We used 215 locations from the monitoring of five rhinos to estimate the home range size by using 95% MCP in SWR. The average home ranges for males (n = 2) was 34.7 ± 2.31 km^2 while the home range size was 24.51 ± 1.25 km^2 for the female rhinos (n = 3).

The home ranges of BNP and SWR rhinos were found to be bigger than those of Chitwan rhinos in this study. A previous study (Jnawali 1995) estimated home ranges of newly reintroduced rhinos in BNP through radio-collar study and found average home ranges of male rhinos to be 41.8 ± 4.4 km^2 and 25.1 ± 9.3 km^2 for the female rhinos. The current estimated home ranges of rhinos in BNP were smaller than those estimated by Jnawali (1995). The present finding suggests that the rhinos in BNP are now well settled in the reintroduced habitats and have stabilized their home ranges. Subedi (2012) has found home ranges of 19.27 ± 7.17 km^2 for males and 10.2 ± 0.64 km^2 for females in Chitwan National Park. In the case of SWR, the rhinos were reintroduced very recently and may have not settled well in their habitats at compared to BNP, resulting in bigger home ranges. Moreover, the small population size of rhinos in SWR may also have affected the size of home ranges. In general, it was observed that the quality of habitat and population density influenced the size of home ranges in rhinos.

Rhinos were found to extensively use Khata forest corridor that connects BNP with Katarniaghat Wildlife Sanctuary in India. Generally 3 to 5 rhinos were found using this corridor at any time of the year (Figure 8). The rhinos of BNP and Khata corridor were also found frequently visiting Katerniaghat Wildlife Sanctuary. Beacause of the international boundary our monitoring team was unable to track the rhinos in Indian territory. Therefore if a joint monitoring system can be established between India and Nepal, it will help longterm rhino conservation in transboarder areas.

3.2 Habitat Use

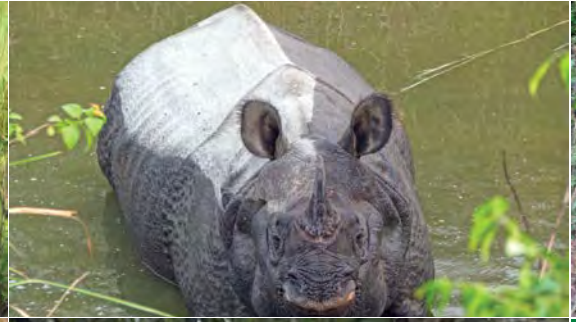
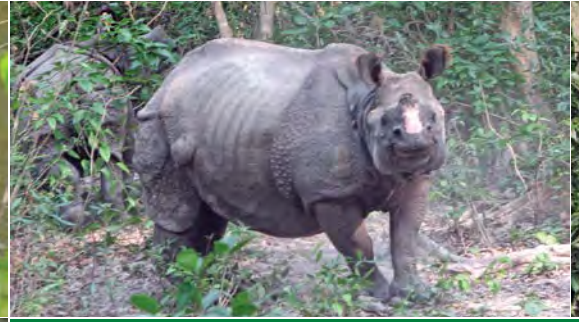
ID based rhino monitoring data revealed that rhinos in Bardia were mostly using riverine forests, wetlands and *Saccaharam spontenum* dominated grasslands while they rarely used Sal (*Shorea robusta*) dominated forests (Figure 9). Therefore, riverine forests and grasslands interspersed with wetlands are key habitats for rhino in Bardia. The management efforts that intend to maximize rhino conservation through habitat management need to focus on these habitats for management interventions.

The habitat use pattern by SWR rhinos was similar to that of BNP rhinos. Most frequently used habitats were riverine forests and floodplain tall grasslands along the Chaudhar and Mahakali rivers in SWR. The waterholes located in Sal forests were also used mostly during the monsoon season.

3.3 Inter-birth Interval

The average inter-birth interval for Bardia rhinos (n = 4) was found to be 52 ± 2 months which was longer than Chitwan rhinos where the average inter-calving interval was 44.82 ± 3.64 months (Subedi 2012). Long-term ID based rhino monitoring will reveal further findings and help to understand demographic parameters and population performance in rhino bearing protected areas of Nepal.

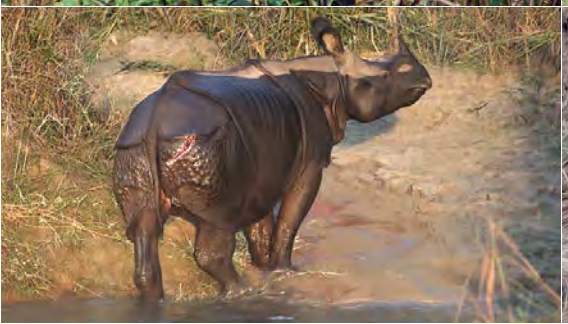
Figure 9. Percentage use of different habitat types by rhino in Bardia National Park. The error bars are standard errors



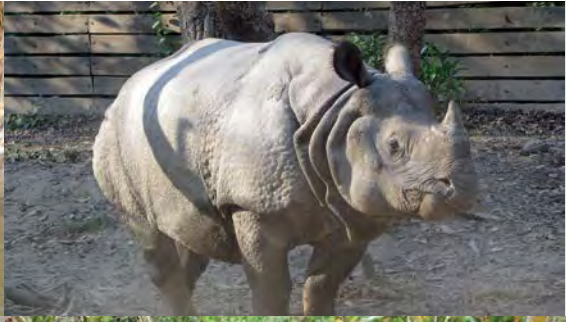







4. Individual Profiles of Rhinos in Bardia National Park



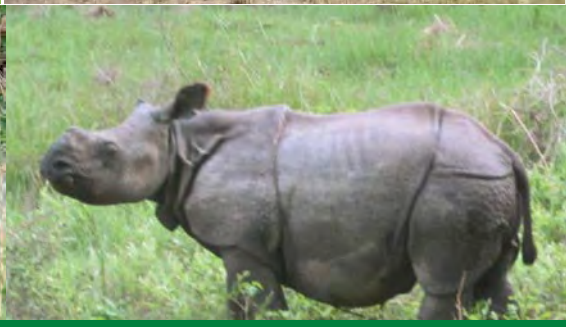











ID 1 : Terrible Thito
Sex : Male
Origin : BNP
Birth date : 1999 (±2 yrs.)
Mother : Thute Mau (ID 3)
Father : Unknown

Distinct Identification Features:

Horn is compact and broad at base. He was born in BNP (approximately 1999). He was seen around Terrible Island. The rhino is considered to be in a critical state as he has not been seen since 2007. He used to be seen sometimes with ID 3.

Photo in 2007

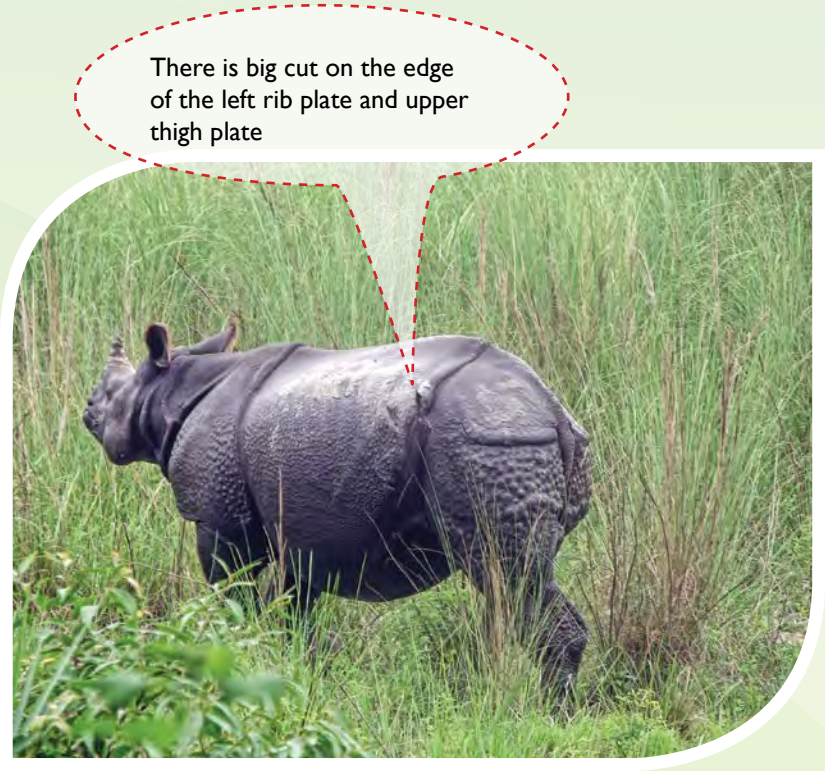


Photo in 2007

ID 2 : Linde Bhale
Sex : Male
Origin : CNP
Birth date : 1984 (± 3 yrs)
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He has a cut and a lump on the left rear next to the upper thigh plate. He was translocated from CNP in 1986. He is mostly seen around Terrible Island to Hatisar area. Generally he is seen alone, though sometimes with ID 5 in Dalla.

Photo in 2008

He had a long tail in 2007 but has a short tail since 2008.

Photo in 2010

Photo in 2008

He had a long horn but it was broken from the middle in March 2010 in a fight with another male.

ID 3 : Thute Mau
Sex : Female
Origin : CNP
Birth date : 1979 (± 5 yrs)
Mother : Unknown
Father : Unknown

Distinct Identification Features:

*She has a calf **(ID 4)** of about 6-8 years old. She allows people to come up close on elephants. She was translocated from CNP and had at least three births in BNP. She ranges from Hattisar to Kalaban. She is mainly seen with her calf **(ID 4)** but sometimes also with other mothers and calves. She has a big lump on the rear right flank.*

She has a big lump on the right ribs near the right lower thigh plate

Photo in 2010

Horn broken from base with pink-white spots on the nose

Photo in 2010

ID 4 :Thute's Calf
Sex : Male
Origin : BNP
Birth date : September 2007
Mother :Thute Mau (ID 3)
Father : Unknown

Distinct Identification Features:

He was born in BNP in September 2007. He is mostly seen from Hattisar to Kalaban with his mother ***(ID 3).***

Photo in 2011

Photo in 2012 with ID 3 (left)

Horn has a broad base and tapers up, with a indent in the front half way up.

ID 5 : Khagchiruwa Tikhe
Sex : Female
Origin : CNP
Birth date : 1983 (± 2 yrs)
Mother : Unknown
Father : Unknown

Distinct Identification Features:

*She was translocated from CNP. She ranges between Patkanuwa, Koreabagar, Saijanatappu, Kalaban and Dalla. Previously, she was seen with calf **(ID 6)** but now is seen in Dalla Buffer Zone Community Forest with another calf **(ID 24)**.*

She had a long horn earlier but was found with broken horn and calf (ID 24) in August 2013

Photo in 2013

Photo in 2013 with ID 24 (right)

There is a big lump on the rear right flank

Horn has vertical indent and goes in at base

Photo in 2007

ID 6 : Khagchiruwa Tikhe's Calf (Terrible pothi)
Sex : Female
Origin : BNP
Birth date : January 2005 (± 3 yrs)
Mother : Khagchiruwa Tikhe (ID 5)
Father : Unknown

Distinct Identification Features:

Horn has grown slowly but is not pointed. She has hairy ear tips. She roamed alone since 2011. She gave birth to ID 26 in September 2013.

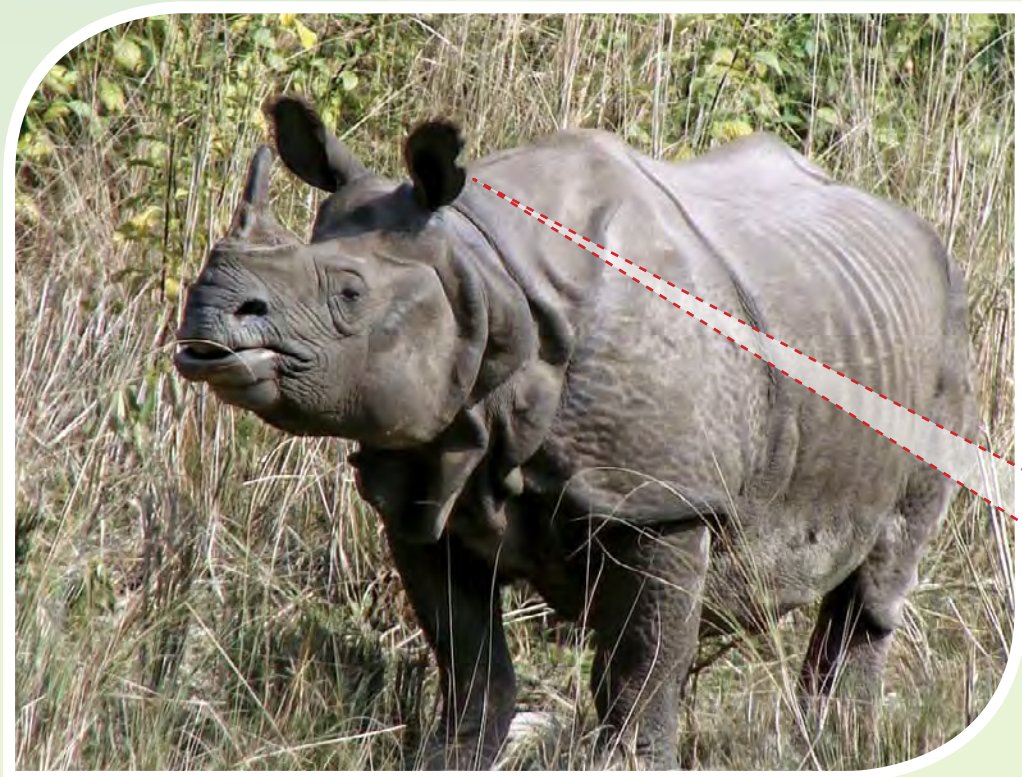
Photo in 2014 with ID 26 (right)

Photo in 2009

ID 7 : V Kane Bhale
Sex : Male
Origin : CNP
Birth date : 1979
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He has a white patch on his right front leg which was treated on 30 October 2009. He is seen alone at Patkanuwa, Korea Bagar, Sisiniya, Kalaban and Khaurahaphanta.



Lower part of left ear has a cut v-shaped cut so he is called V Kane

Photo in 2013

Photo in 2010 during treatment

ID 8 : Thikhe Mau
Sex : Female
Origin : BNP
Birth date : Unknown
Mother : Unknown
Father : Unknown

Distinct Identification Features:

She ranges between Patkanuwa, Hattisar and Sisaniya with her calf ID 9.

Photo in 2013

Photo in 2008

ID 9 : Thikhe Mau's Calf (Dalla Bhale)
Sex : Male
Origin : BNP
Birth date : March 2007
Mother : Thikhe Mau
Father : Unknown

Distinct Identification Features:

He has very clean body features, no distinct identification observed. He used to be seen with his mother (ID 8) but has been seen alone since 2012.

Photo in 2009 with ID 8 (back)

Photo in 2013 with ID 8 (right)

ID 10 : Raun Kane Pothi
Sex : Female
Origin : BNP
Birth date : 1994 (± 4 yrs)
Mother : Unknown
Father : Unknown

Photo in 2008 with ID 24 (right)

Photo in 2013 with 2nd calf

Distinct Identification Features:

She has small tail with hair coming up to lower back corner fold. She has been sighted with her calf in Patkanuwa, Khauraha and Terrible island. She gave birth to her second calf, ID 27, in july 2013.

Ear has very long hair on the top

Photo in 2007

Horn is small and very pointed with multiple rings

ID 11 : Ghaite Gainda
Sex : Unknown
Origin : BNP
Birth date : Approx 1995
Mother : Unknown
Father : Unknown

Distinct Identification Features:

Horn is medium with broad base. This ID 11 rhino is critical because it has not been seen since 2007.

Photo in 2007

Photo in 2007

ID 12 : Golaghat Bhale
Sex : Male
Origin : BNP
Birth date : 1990 (± 3 yrs)
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He has a small cut between the anal plate and back plate. The body is clean with lumps. He was previously sighted alone around Golaghat area but has not been seen February 2008 hence he is marked as critical.

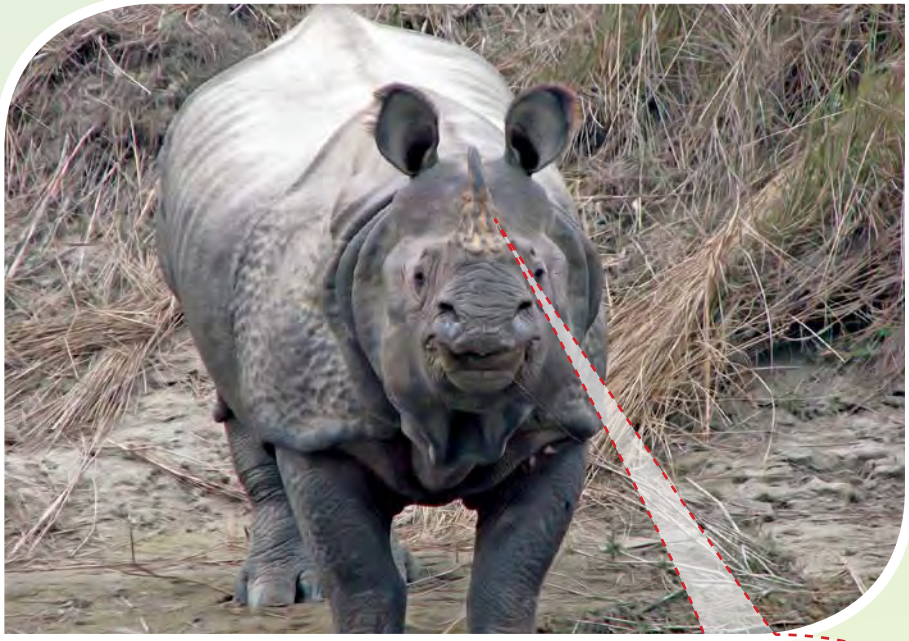


Photo in 2008

Horn has a broad lumpy base (not smooth) and thin pointy top

Photo in 2008

ID 13 : Raun Kane's 1st Calf (Mahagaura Bhale)
Sex : Male
Origin : BNP
Birth date : November 2007
Mother : Raun Kane Pothi (ID 10)
Father : Unknown

Distinct Identification Features:

Horn is very small. He has small ears with long hair. He has been sighted with his mother (ID 10) in Patkanuwa, Khauraha and Terrible island area but he has been independent since 2012.

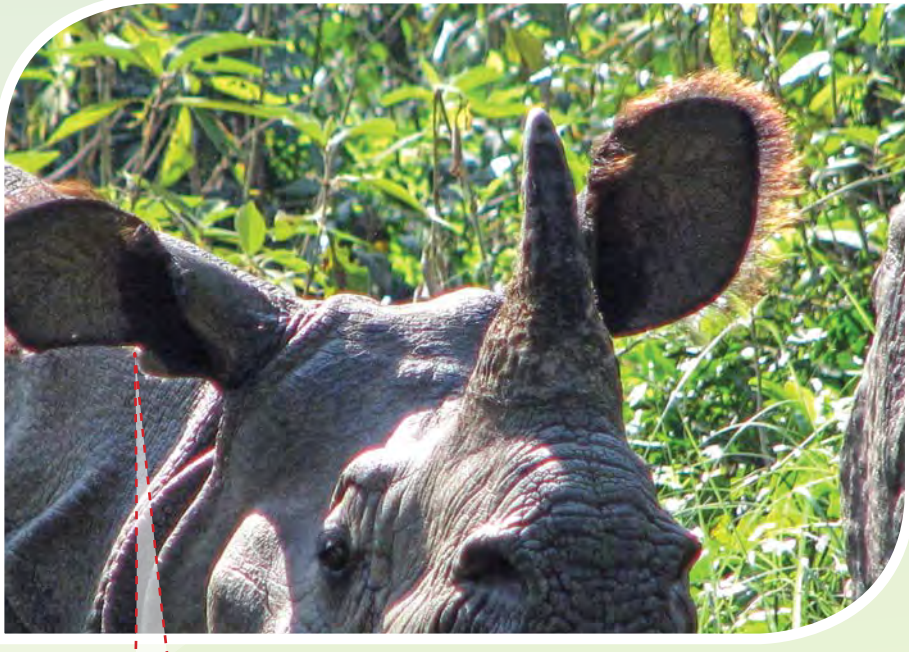
Photo in 2008 wtih ID 10 (left)

Photo in 2009 with ID 10 (left)

ID 14 : Kan Katuwa Pothi
Sex : Female
Origin : BNP
Birth date : 1993 (± 4 yrs)
Mother : Unknown
Father : Unknown

Distinct Identification Features:

There is an indent in the horn. She has a clean body. She had a fully grown calf (ID 15) which she left in December 2008. She is seen in Kalaban, Baghaura and Sisuniya.



She has a small cut in the lower part of her right ear

Photo in 2008

The tip of the horn is broken, this can only be seen from the side

Photo in 2009

Photo in 2008 with ID 15 (left)

ID 15 : Kan Katuwa's Calf (Korea Bagar pothi)
Sex : Female
Origin : BNP
Birth date : 2003 (± 1 yrs)
Mother : Kan Katuwa Pothi (ID 14)
Father : Unknown

Distinct Identification Features:

She gave birth to a new calf (ID 25) in July 2010. She is seen with her calf in Kalaban, Baghaura, Sisuniya and Laguna Tappu.

Photo in 2013 with ID 14 (left)

Photo in 2009

Horn has a broad base and is cropped in the mid portion

ID 16 : Gori Pothi
Sex : Female
Origin : BNP
Birth date : 1993
Mother : Unknown
Father : Unknown

There is a big lump on the left rear flank between the ribs and lower thigh plate

Photo in 2008 with 1st calf

Photo in 2014 with ID 28 (right)

Distinct Identification Features:

She has a small and broad based horn with rigged rings. She has clean and hairy ears. Identifying feature of this rhino is a big lump on the left rear flank. She gave birth to her second calf, ID 28, in september, 2013.

Photo in 2010

ID 17 : Gori Pothi's 1st Calf (Bagh Tappu Gainda)
Sex : Unknown
Origin : BNP
Birth date : September 2008
Mother : Gori Pothi (ID 16)
Father : Unknown

Distinct Identification Features:

This rhino has a small horn. No distinct identification features observed yet. It is observed with its mother (ID 16) around Terrible island, Khair Tappu and Sano Baghaura.

Photo in 2010

Photo in 2009 with ID 21 (right)

ID 18 : Nikunja Kane Bhale
Sex : Male
Origin : CNP
Birth date : 1990
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He is completely blind. He was translocated from CNP and is kept in an enclosure at the Headquarters of BNP.

Photo in 2009

Photo in 2009

ID 19 : Khag Tutali Pothi
Sex : Female
Origin : CNP
Birth date : Unknown
Mother : Unknown
Father : Unknown

Distinct Identification Features:

She is frequently seen with her calf (ID 21) around Bagh Machan and Kalaban. Distinct feature of this rhino is her broken horn.

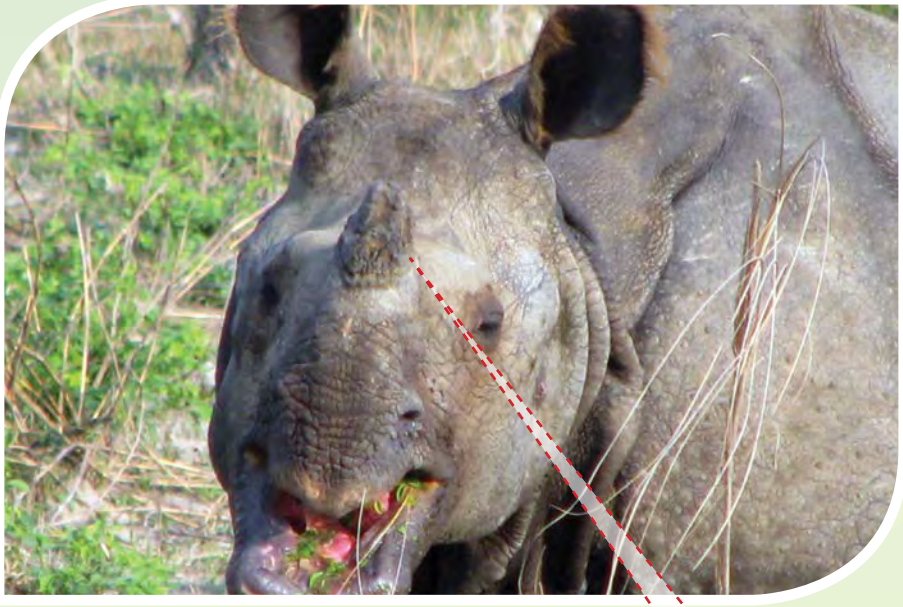


Photo in 2009

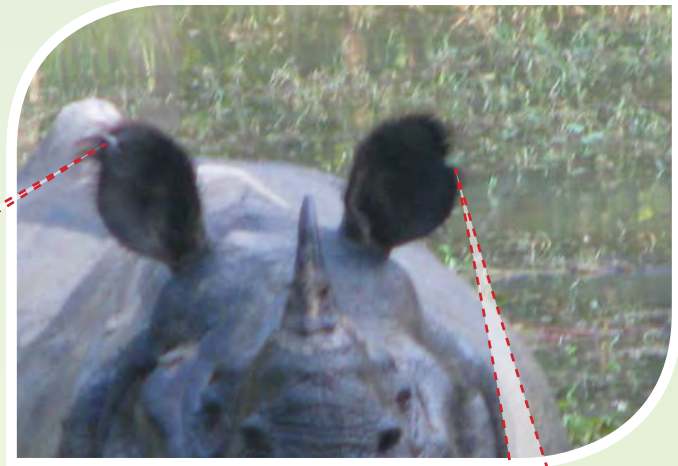
Photo in 2010

Photo in 2013

ID 20 : Laguna Machan Bhale (V Kane Bhale – B)
Sex : Male
Origin : BNP
Birth date : Unknown
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He is frequently seen alone around Laguna Machan and Bagh Tappu. His identifying features are a small cut on the upper part of his right ear and a broken horn.



He has a small cut one the upper part of his right ear

He has a small cut on the lower part of his left ear

Photo in 2009

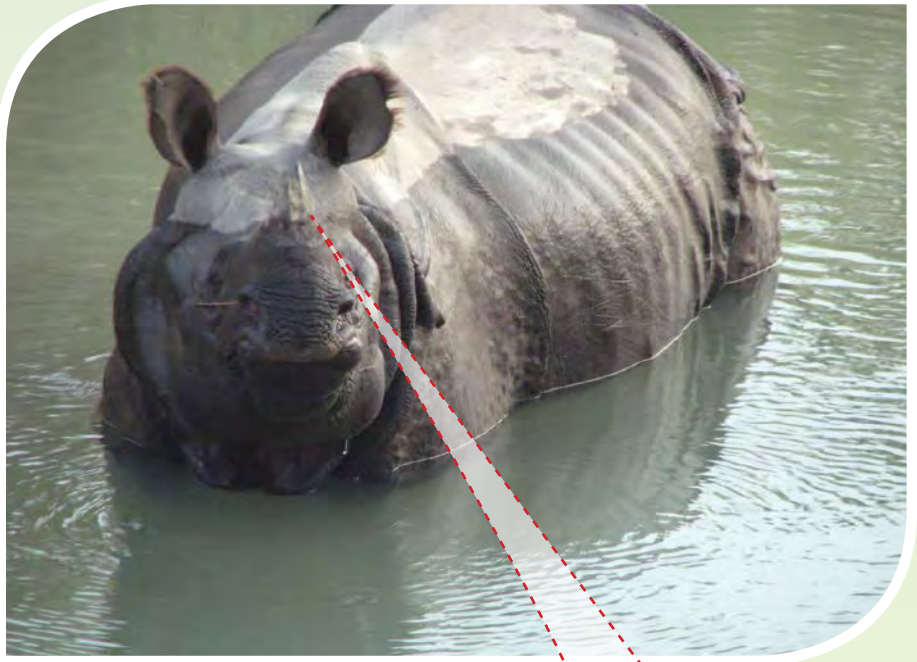


Photo in 2010

His horn has been broken from the middle in May 2010 in a fight with V Kane Bhale (ID 7)

ID 21 : Khag Tutali's Calf
Sex : Female
Origin : BNP
Birth date : October 2010
Mother : Khag Tutali Pothi (ID 19)
Father : Linde Bhale (ID 2)

Distinct Identification Features:

She is a clean animal and is frequently seen with her mother (ID 19) around Korea Bagar, Terrible Island, Bagh Machan and Kalaban.

Photo in 2012

Photo in 2013

ID 22 : Buduni Pothi
Sex : Female
Origin : BNP
Birth date : Unknown
Mother : Unknown
Father : Unknown

Distinct Identification Features:

She has clean body and medium size broad base horn with little ring.There is an indent in the horn with a slight backward lean. She is mostly found with her calf in Khauraha cross and Bagh Machan. She gave birth to ID 29 in April 2014.

Photo in 2014 with ID 29 (left)

Photo in 2013

ID 23 : Buduni Pothi's 1st Calf (June Calf)
Sex : Male
Origin : BNP
Birth date : 11 June 2010
Mother : Buduni Pothi (ID 22)
Father : Unknown

Distinct Identification Features:

No distinct features have been observed yet. It is mostly found with its mother (ID 22) in Khauraha cross and Bagh Machan.

Photo in 2013 with ID 22 (left)

Photo in 2013 with ID 22 (right)

ID 24 : Dalla Calf (2nd Calf of Khagchiruwa Tikhe ID 5)
Sex : Female
Origin : BNP
Birth date : January 2011
Mother : Khagchiruwa Tikhe (ID 5)
Father : Unknown

Distinct Identification Features:

No distinct identification features observed yet. It is mostly found with its mother (ID 5) in the Dalla.

Photo in 2013

Photo in 2013 with ID 5 (left)

ID 25 : Korea Bagar Calf
Sex : Female
Origin : BNP
Birth date : July 2010
Mother : Kankatuwa Pothi's Calf (ID 15)
Father : Unknown

Distinct Identification Features:

No distinct identification features observed yet. it is mostly found with its mother (ID 15) in Korea Bagar and Saijana Tappu.

Photo in 2013 with ID 15 (left)

Photo in 2013

ID 26 : Terrible's Calf
Sex : Female
Origin : BNP
Birth date : September 2013
Mother : Terrible Pothi (ID 6)
Father : Unknown

Distinct Identification Features:

This is the first calf of ID 6. No distinct features observed yet. It is mostly found with its mother (Terrible Pothi) around Bagh Machan, Terrible Island and Kala Ban.

Photo in 2013 with ID 6 (right)

Photo in 2014 with ID 6 (left)

ID 27 : Second Calf of Raun Kane Pothi (ID 10)
Sex : Unknown
Origin : BNP
Birth date : April 2013
Mother : Raun Kane Pothi (ID 10)
Father : Unknown

Photo in 2014 with ID 10 (left)

Distinct Identification Features:

It is the second calf of ID 10. No distinct features observed yet. It is mostly found with its mother (Raun Kane Pothi) around Korea bagar, Patkanuwa and Terrible Island.

Photo in 2014

Photo in 2014

ID 28 : Second Calf of Gori Pothi (ID 16)
Sex : Male
Origin : BNP
Birth date : June 2013
Mother : Gori Pothi (ID 16)
Father : Unknown

Distinct Identification Features:

It is the second calf of ID 16. No distinct features observed yet. It is mostly found with its mother (Gori Pothi) around Terrible Island, Sano Bandh, Khair tappu and Bagh Machan.

Photo in 2014 with ID 16 (left)

Photo in 2014 with ID 16 (left)

ID 29 : Second Calf of Buduni Pothi (ID 22)
Sex : Unknown
Origin : BNP
Birth date : April 2014
Mother : Buduni Pothi (ID 22)
Father : VKane Bhale (ID 7)

Distinct Identification Features:

It is the second calf of ID 22. No distinct features observed yet. It is mostly found with its mother (Buduni Pothi) around Hattimachan, Sano Bandh, Terrible Island and Bagh Machan.

Photo in 2014 with ID 22 (left)

Photo in 2014 with ID 22 (right)

ID 30 : Kan Chiruwa Calf (Second Calf of Tikhe Mau ID 8)
Sex : Male
Origin : BNP
Birth date : ± 6 months old in 2013
Mother : Tikhe Mau ID 8
Father : Unknown

Distinct Identification Features:

Left ear has a tear in lower part

Photo in 2014

Photo in 2014 with ID 8 (right)

ID 31 : Bagh Machan Calf (Second Calf of Khag Tutali Pothi ID 19)
Sex : Unknown
Origin : BNP
Birth date : July 2014
Mother : Khag Tutali Pothi ID 19
Father : Unknown

Distinct Identification Features:

No distinct features observed yet.

Photo in 2014 with ID 19 (left)

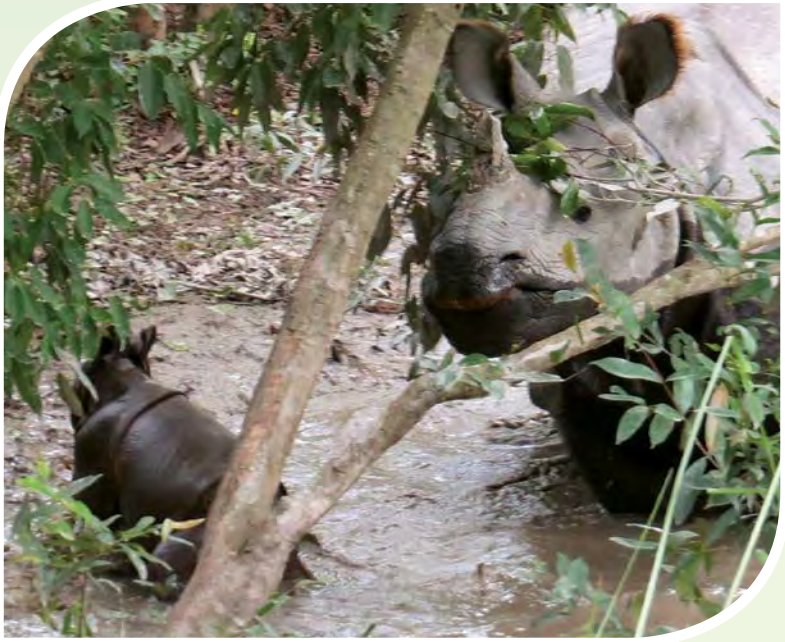


Photo in 2014 with ID 19 (right)

ID 32 : Third Calf of ID 5
Sex : Unknown
Origin : BNP
Birth date : August 2014
Mother : Khag Chiruwa Tikhe ID 54
Father : Unknown

Distinct Identification Features:

No distinct features observed yet.

Photo in 2014 with ID 5 (right)

Photo in 2014 with ID 5 (right)





5. Individual Profiles of Rhinos in Shuklaphanta Wildlife Reserve




ID 3001 : Chitwan Bhale
Sex : Male
Origin : CNP
Birth date : Translocated from Chitwan in 2000
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He was treated on December 9, 2009 because he was injured in a fight with another male. A small cut was observed on the age of right ear. He was translocated from CNP in 2000 and was the only adult male in SWR. He was usually seen in the Tatargunj area near the Nepal-India border and was found dead on January 10, 2014 in Tatargunj in India.

Photo in 2013

ID 3002 : Rani Pothi
Sex : Female
Origin : Unknown
Birth date : First time recorded from Ranital area in 1995
Mother : Unknown
Father : Unknown

Distinct Identification Features:

First recorded in Rani Tal area in 1995. Both ears are intact and the horn is slender with and inward curve. She gave birth to two calves.

Photo in 2014

Photo in 2014

ID 3003 : Solu Pothi
Sex : Female
Origin : SWR
Birth date : November 2001
Mother : Chitwan Pothi
Father : Unknown

Distinct Identification Features:

This female was born in November 2001. Her left ear is chopped. She was born in SWR. She gave birth to two calves : Bicchuwa (ID 3006) and Kartike (ID 3008).

Photo in 2014 with ID 3008 (right)

Photo in 2014 with ID 3008 (front)

ID 3004 : Chaudhar Bhale
Sex : Male
Origin : CNP
Birth date : Unknown
Mother : Unknown
Father : Unknown

Distinct Identification Features:

He has a hole in his right ear.The horn is pointed and has a fissure. He was translocated from CNP to SWR

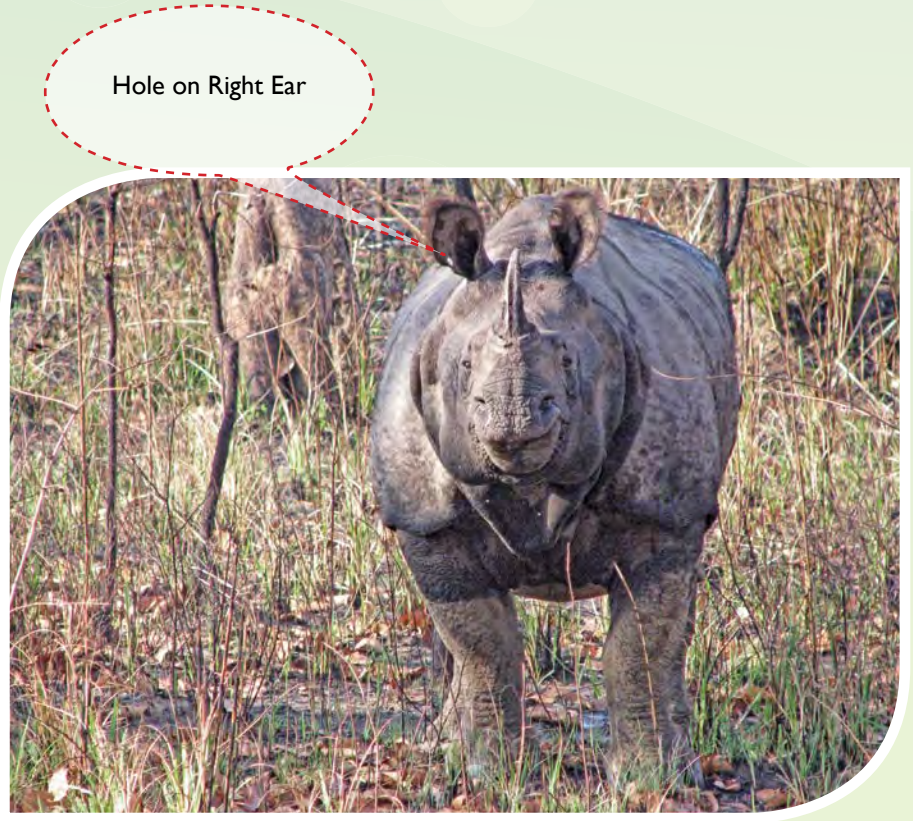


Photo in 2014

Photo in 2014

ID 3005 : Surya Pothi
Sex : Female
Origin : SWR
Birth date : November 2006
Mother : Chitwan Pothi
Father : Chitwan Bhale (ID 3001)

Distinct Identification Features:

Her horn is broken at the base.

Photo in 2014

ID 3006 : Bichuwa
Sex : Unknown
Origin : SWR
Birth date : October 2007
Mother : Solu Pothi (ID 3003)
Father : Unknown

Distinct Identification Features:

Bichuwa is the only adult rhino in SWR whose sex is unknown. Probably it is male. The base of the horn is broad. The mother is Solu Pothi and it was born in October 2007 in SWR.

Photo in 2013

ID 3007 : Bhadaure
Sex : Unknown
Origin : SWR
Birth date : October 2009
Mother : Rani Pothi (ID 3002)
Father : Unknown

Distinct Identification Features:

This rhino is always with Rani Pothi and the sex is unknown. The horn is medium sized and curves inward.

Photo in 2014 with ID 3002 (right)

ID 3008 : Kartike Baby
Sex : Unknown
Origin : SWR
Birth date : October 2012
Mother : Solu Pothi (ID 3003)
Father : Unknown

Distinct Identification Features:

This rhino of undetermined sex was born in October 2012 and always lives with its mother. It is younger than Bhadaure. The horn is just emerging.

Photo in 2014 with ID 3003 (back)

Photo in 2014

ID 3009 : New Baby
Sex : Unknown
Origin : SWR
Birth date : November 2011
Mother : Surya Pothi (ID 3005)
Father : Unknown

Distinct Identification Features:

This calf of SWR was born to Surya Pothi in November 2011 and is always seen with its mother.

Photo in 2014 with ID 3005 (left)

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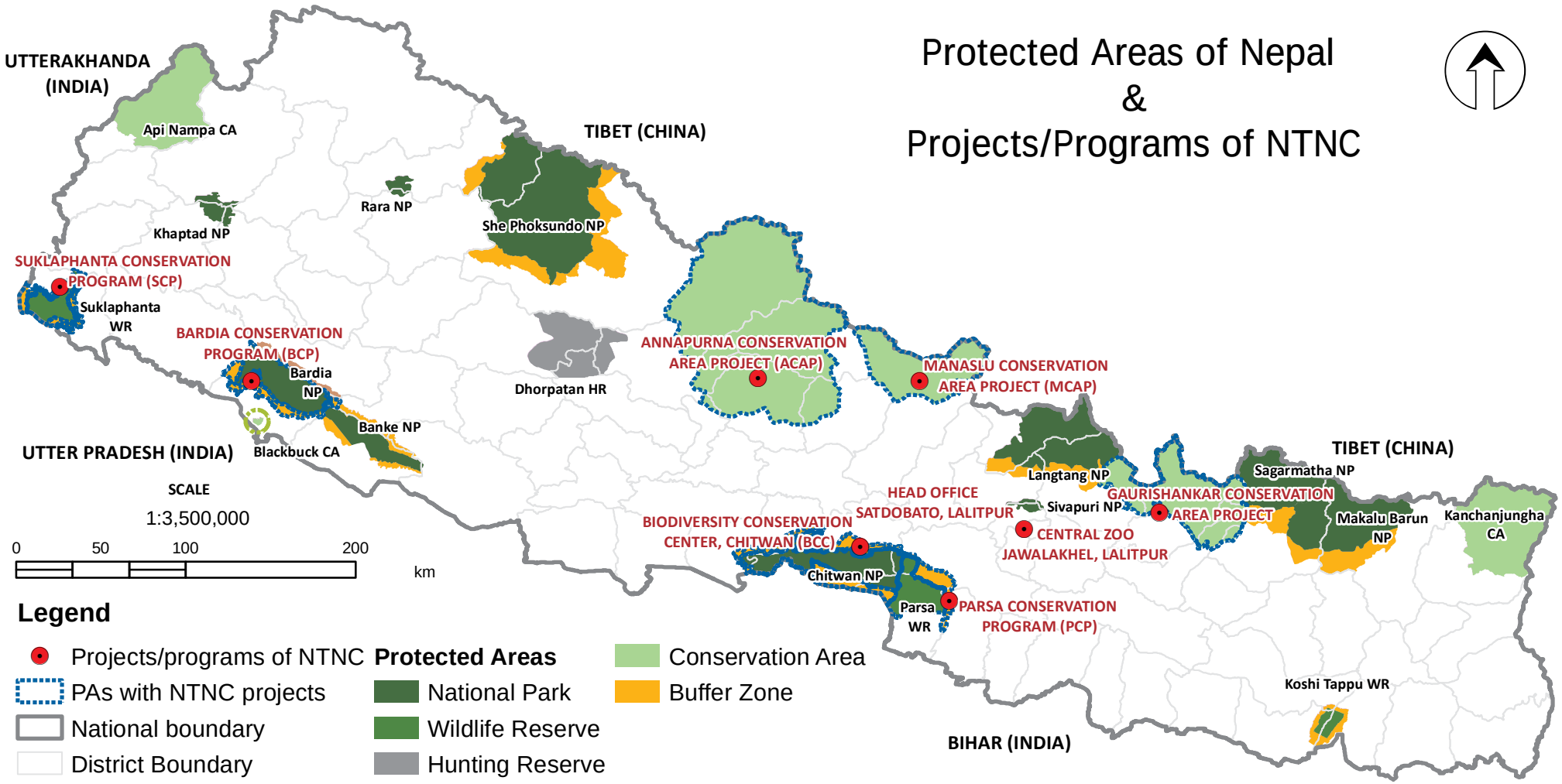
7. Field Glimpses of Rhino Monitoring

Protected Areas of Nepal
&
Projects/Programs of NTNC



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