

# Challenges and opportunities of transboundary rhino conservation in India and Nepal

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## Abstract

Currently, the wild population of the greater one-horned rhinoceros (*Rhinoceros unicornis*) is found in India and Nepal. To manage this transboundary population along the Indo-Nepal border, their habitats and numbers need scientific monitoring. Regular data should be collected on their movement patterns and management, and the data shared across borders with concerned conservation and management agencies to monitor the rhino population and the corridors they use, especially in Suklaphanta–Lagga Bagga, Pilibhit Forest Division, Dudhwa, Katarniaghat and Bardia landscape. Rhinos moving around the Indo-Nepal border in Katarniaghat–Bardia and Lagga Bagga–Suklaphanta should be fixed with radio collars to generate vital information that will assist conservation and management of the greater one-horned rhino along the border, strengthen transboundary planning and conservation for the rhino, besides orienting the police and border security forces in both countries to contribute towards protection of this rhino population moving between the countries.

## Résumé

Actuellement, la population sauvage des grands rhinocéros unicornes (*Rhinoceros unicornis*) se trouve en Inde et au Népal. Pour gérer cette population transfrontalière de rhinocéros le long de la frontière indo-népalaise, leurs habitats et leur nombre doivent être suivis scientifiquement. Des données sur leurs habitudes de déplacement et de gestion doivent être recueillies régulièrement, et ces données partagées à travers les frontières avec les organismes de conservation et de gestion concernés afin de suivre la population de rhinocéros et les couloirs qu'ils utilisent, en particulier dans les paysages de Suklaphanta–Lagga Bagga, la forêt de Pilibhit, Dudhwa, Katarniaghat et Bardia. On doit mettre des colliers émetteurs sur les rhinocéros qui se déplacent près de la frontière indo-népalaise dans Katarniaghat–Bardia et Lagga Bagga–Suklaphanta pour générer des informations clés afin de faciliter la conservation et la gestion le long de la frontière, renforcer la planification et la conservation transfrontalière pour le grand rhinocéros unicolore, et aussi orienter les forces de police et de sécurité à la frontière des deux pays pour qu'elles contribuent à la protection de cette population de rhinocéros qui se déplace entre les pays.

## Introduction

Most protected areas are not big enough to sustain a viable rhino population, and a small population can be highly vulnerable to the environment and demographic factors. International conservation organizations are increasingly advocating large-scale wildlife conservation initiatives that override national political borders. Alternatively known as transfrontier

biosphere reserves (Fall 1999) or transboundary conservation areas (Westing 1998; Magome and Murombedzi 2003; Spenceley 2006; Ramutsindela 2007), these protected areas represent a compelling approach to wildlife conservation across borders. A landscape approach allows better ecosystem integrity and stability within a transboundary conservation initiative and could further pave the way for much-needed means to engage countries sharing borders

to conserve and save the remaining populations of threatened species that use transborder habitats (Sandwith et al. 2001; Busch 2007).

In 2008, the greater one-horned rhinoceros was downlisted in the IUCN Red List from *Endangered* to *Vulnerable* due to an overall increase in numbers in its distribution range within India and Nepal (Talukdar et al. 2008). India and Nepal, the last remaining strongholds of the species, share rhino habitats across the border, lending credence to the need for transboundary conservation planning to further enrich the gene pool in rhino conservation. The terai is one of the world's most spectacular landscapes, encompassing the tall grasslands and sal (*Shorea robusta*) forests of the southern slopes and foothill valleys of the eastern Himalayas. This biologically diverse landscape spans an area of approximately five million hectares from Nepal's Baghmata River in the east to India's Yamuna River in the west. The terai is home to endangered wildlife such as the tiger, greater one-horned rhino, Asian elephant, sloth bear, gaur and Gangetic River dolphin; it also contains vital migratory and breeding habitat for over 500 bird species.

The terai is one of the few places in the world where rhinos, elephants and tigers coexist. It needs urgent conservation initiatives to protect the animals in their natural habitat. This landscape contains the Asian Rhino and Elephant Action Strategy (AREAS) priority populations of the greater one-horned rhino and Asian elephant. The terai supports the second largest population in the world, after Brahmaputra flood plain alluvial grassland habitats, of the greater one-horned rhinoceros along with three reintroduced populations in Dudhwa National Park (NP) in India, and Bardia NP and Suklaphanta Wildlife Reserve in Nepal.

Most of the large mammals in the western terai are isolated, few in number and restricted to these protected areas due to degradation and fragmentation of the habitat outside them. A renewed approach to conserving and sharing key scientific data on rhinos and habitats in the Indo-Nepal transborder could open new opportunities to improve the long-term future of the greater one-horned rhinoceros along with rhino habitats in the Indo-Nepal transborder.

## Methods

We identified the main corridors the greater one-horned rhino uses in the Indo-Nepal border through field visits, direct sightings, indirect evidence such

as rhino dung and footprints, and also through interactions with local villagers, elephant mahouts and forest officials. We used geospatial technology and satellite imagery to draw these corridors to assess their current state and the challenges the rhinos and the habitat face.

## Results and discussion

Our field visits and interactions have helped us identify the key corridors the rhinos use in the Indo-Nepal transborder, which we highlight below.

### *Key corridors for rhino movement*

We identified two corridors along the Indo-Nepal border: the Suklaphanta–Lagga Bagga–Pilibhit Forest and Dudhwa Tiger Reserve (TR) corridor, and the Bardia–Katarniaghat–Dudhwa and Basanta Forest corridor. All corridors fall in Uttar Pradesh state. We also found movement of rhinos from Chitwan NP in Nepal to Valmiki TR in Bihar State of India (Figure 1). The corridor depicted in Figure 1 is based on the movement of rhinos tracked, and information available about habitat use in the Indo-Nepal transborder. In the past three years, four rhinos from Chitwan NP moved to Valmiki TR, and one female rhino aged about 10 years passing through Valmiki TR was killed by a speeding train in March 2013. Another female rhino was killed by poachers in May 2011 and two bullets were found in its carcass. At present, two rhinos are still inhabiting Valmiki TR.

From 1987 to 1991 and from 1999 to 2003, the second author, Dr Sinha, worked extensively on monitoring reintroduced rhinos in Dudhwa NP and assessing the corridor between Dudhwa NP and Katarniaghat Wildlife Sanctuary, which is now a satellite core of Dudhwa TR. During this period, the second author visited these areas and tracked stray rhinos and their signs, sometimes using a domestic elephant along with a mahout or going on foot or using a vehicle. Forest officials regularly track the rhinos in their respective areas to take stock of security needs. During regular meetings with forest officials of Nepal and India, information on movement of rhinos between the two countries is discussed. Regular tracking of rhinos is being carried out by the Forest Department of Uttar Pradesh, the Nepal Forest Department and NGOs such as the international WWF-India and the local Wildlife Trust India.

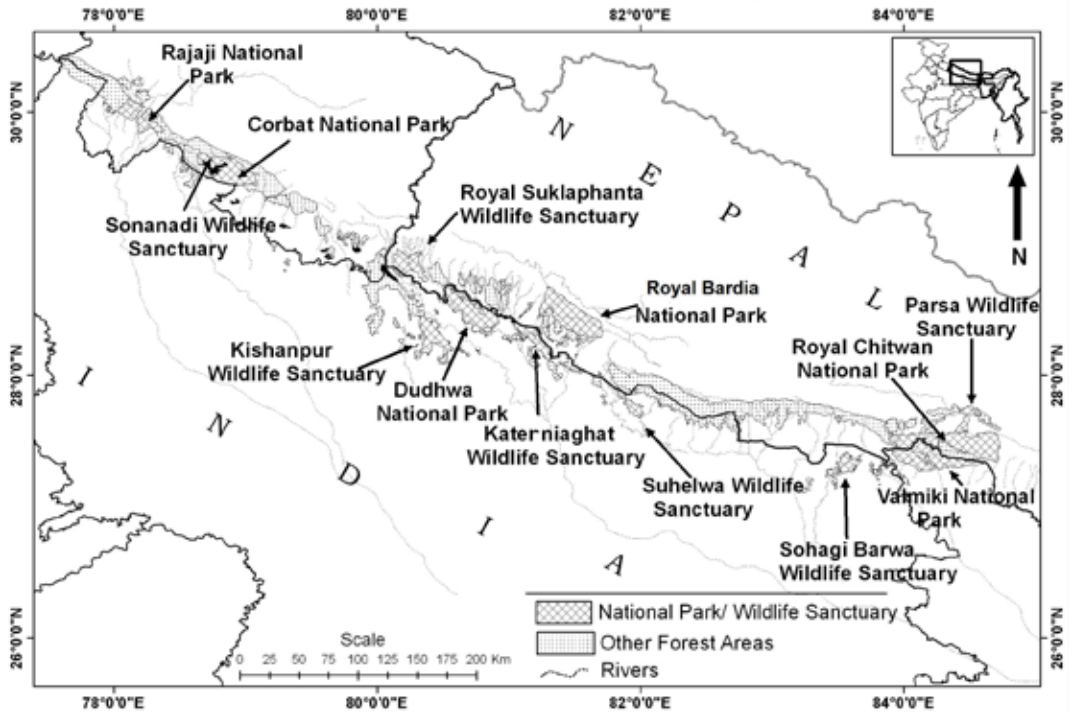


Figure 1. Corridors used by rhinos along the protected areas of the Indo-Nepal transborder.

### *Suklaphanta–Lagga Bagga–Pilibhit Forest–Dudhwa corridor*

According to the Jhala et al. (2011) report on the status of tigers and copredators, Pilibhit Forest in Uttar Pradesh state is connected to Corbett TR in the northwest by the Surai Range falls in Haldwani Forest Division, and to Suklaphanta in Nepal to the northeast through the forests of Lagga Bagga (Figure 2).

Lagga Bagga is located on the Indo-Nepal border adjoining the famous Suklaphanta Wildlife Sanctuary (WLS) to the northeast. To the south and southeast, the Sharda River flows in a loop around it. The forest and grasslands of Lagga Bagga form a continuous stretch with Suklaphanta WLS, except for a small trench demarcating the international border. The Suklaphanta WLS has a good population of Bengal florican *Houbaropsis bengalensis* (Inskipp and Inskipp 1985). It also holds large populations of the swamp deer *Cervus duvauceli*, the hog deer *Axis porcinus*, the spotted deer *Axis axis* and the tiger *Panthera tigris*. Large mammals regularly move between Lagga Bagga and Suklaphanta WLS (Rahmani et al. 1987; Rahmani 1989).

The Lagga Bagga area forms a continuous narrow corridor along the Sharda Canal that stretches southeast into Kishanpur WLS. This corridor is also used by tigers, which form a contiguous population from Surai Range in Uttarakhand to Pilibhit Forest and Kishanpur WLS. While carrying out the all-India tiger census, the Wildlife Institute of India and WWF-India installed a number of camera traps in the area and observed the regular movement of tigers. However, the narrow Pilibhit Forest corridor is a bottleneck as dense agriculture and human settlements line its borders. The Sharda River forms a minor corridor since it is lined by intensive agricultural activities; it is used by tigers and elephants and the recently reintroduced rhinos between Dudhwa–Kishanpur–Pilibhit Forest–Lagga Bagga and Suklaphanta WLS. Six rhinos from Suklaphanta WLS in Nepal recently moved to the Lagga Bagga area in Uttar Pradesh's Pilibhit Forest (Jhamak Bahadur Karki, pers. comm.). All rhinos had coloured tags with codes to identify them. Indian authorities always inform the Forest Department of Nepal whenever rhinos cross the boundary. During regular meetings, forest officials from both sides exchange information on rhino movements. Since

mid-2011, one male rhino from Suklaphanta WLS moved into Pilibhit TR. This relocation has been confirmed using the rhino track. Later, this male was sighted in Kishanpur WLS. He was also spotted in the Sathiana area of Dudhwa NP and has also been sighted in the Billaryan range and in neighbouring crop fields. He is regularly on the move, using the artificial corridor of sugarcane fields, which provides shelter in which to hide and also provides food.

#### *Bardia–Katarniaghat–Dudhwa and Basant Forest corridor*

Katarniaghat WLS is situated on the Indo-Nepal border in Bahraich District, Uttar Pradesh state. It represents the Terai-Bhabhar bio-geographic subdivision of the upper Gangetic plains (Rodgers and Panwar 1988). Owing to the great diversity of vegetation, the area is a mosaic of diverse habitats. The most interesting feature of the sanctuary is the presence of the greater one-horned rhinoceros. The second author found evidence of rhino presence in Katarniaghat between 1987 and 1992, and the first author saw the footprint of rhinos in Katarniaghat in 2012. Before this, forest staff had seen rhinos in the area because they regularly raided farmers' fields. The main corridor is the Khata corridor between Bardia and Katarniaghat along the Girwa River. Rhinos use only this route to enter Katarniaghat WLS, either near the Dhanora Tal area, slightly southeast of the Girwa, or near Ambia Bardia village. Rhinos also enter near the Maila Nala area on the north of the Girwa. Rhinos travelling through this route is evinced by the dung piles and feeding signs they leave behind. Elephant dung and tiger pug marks were also found on this route, indicating that even elephants and tigers use the same route while coming from the Royal Bardia NP of Nepal to the Katarniaghat WLS. Recently, three rhinos—a male, a female and a subadult—were

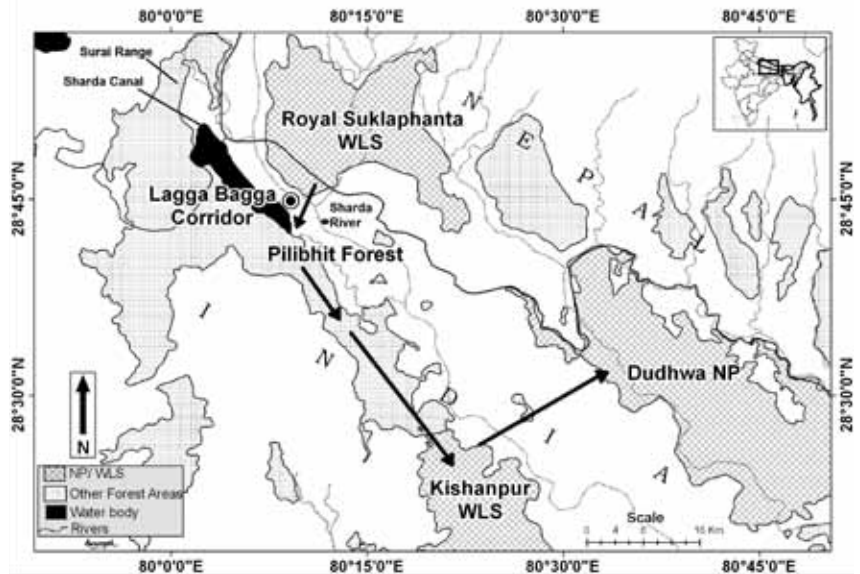


Figure 2. Suklaphanta–Lagga Bagga–Pilibhit Forest–Dudhwa corridor used by greater one-horned rhinos.

sighted in Katarniaghat WLS after they moved from Bardia NP through the Khata corridor.

The corridor between Dudhwa NP and Katarniaghat WLS (Figure 3) has been disrupted due to continuous biotic pressure caused by human settlements, cultivation, encroachment, the regular movement of people, and the use of natural resources. The situation of the corridor between Katarniaghat WLS and Royal Bardia NP is similar. In the past, corridors were safe passages for animals, allowing their movement from one place to another (Sinha and Singh 1999). While working on the corridor project (1999–2003) between Dudhwa NP and Katarniaghat WLS, the second author saw limited regular movements of tiger, elephant and rhino from Katarniaghat WLS to Dudhwa NP. Forest patches of the northern corridor of the North Nighasan forest range are close to Dudhwa NP and elephant, tiger, wild boar, chital (spotted deer), antelope or nilgai (*Boselaphus tragocamelus*), and hog deer were widely distributed in these areas. Animals move from Dudhwa NP to these areas and vice versa (Sinha et al. 2010). As the northern corridor lying along the Nepal side of the border also has forests, large animals move to either side. Elephants and rhinos move between Royal Bardia NP and Katarniaghat WLS, but they are restricted to certain areas. It is thus important to revive corridors to ensure the survival of these three isolated populations: rhinos, tigers and elephants.

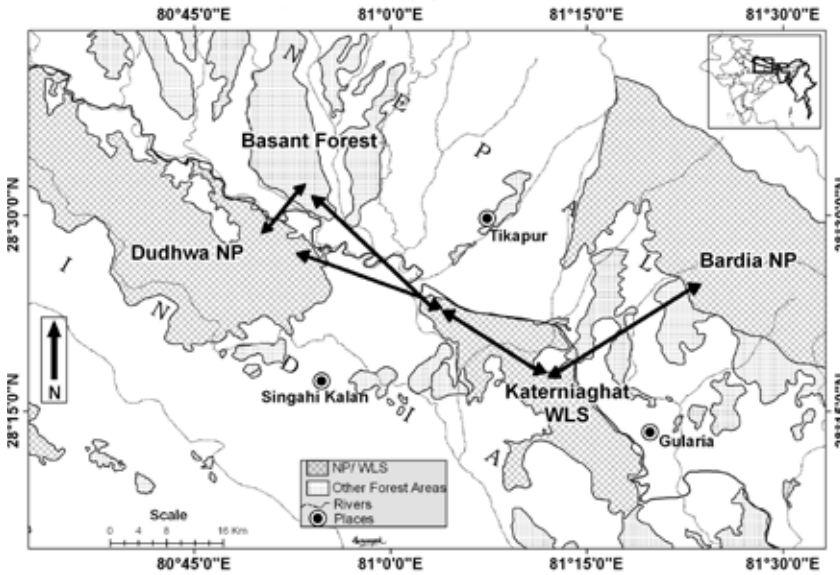


Figure 3. Corridor and forest patches between Dudhwa NP, Katerniaghat WLS and Bardia NP.

Another narrow corridor on other side of the river, which forms the international boundary between India and Nepal, developed due to afforestation. This corridor touches Dudhwa NP through the forest patches of Basanta Forest in Nepal and the Bela Persua area. In 1996, one adult female rhino from Bardia NP reached Dudhwa NP through Basanta Forest and was attacked and killed by a resident rhino inside the rhino holding area.

One subadult rhino from Nepal came to the Lakhimpur Kheri area and moved to the Sitapur area through a sugarcane field. It was captured and caged on 2 November 2004 by a combination of one veterinary official from West Bengal and forest officials and staff of Dudhwa NP near NH-24. But the cage was faulty and the animal's condition was worsening as indicated by its pulse rate and heartbeat. It was therefore immediately given an antidote and released because further delay would have been fatal. The same animal reached Moradabad on 2 January 2005 and was successfully darted by a team of experts and assisting forest staff. It again was caged and sent to Kanpur Zoo. This rhino had also travelled through the sugarcane field corridor. On both occasions the second author took part in the entire capturing operation.

### Small population issue

Currently Dudhwa NP in India and Bardia NP and Suklaphanta WR in Nepal have reintroduced rhino

populations. In Dudhwa NP, 30 rhinos are confined inside a fence in a restricted area measuring 27 km<sup>2</sup>, while the 24 rhinos in Bardia NP and the 7 rhinos in Suklaphanta WLS range freely. These reintroduced rhinos often cross the international border and explore the neighbouring cultivated areas for food and water.

The main issue is the size of the population and the safety of stray rhinos in the forest areas along the Indo-Nepal border. The population in Dudhwa NP has reached 30 rhinos including the founder population of one male and

four females (three from Chitwan NP, Nepal and one from Pobitora WLS, Assam). On 27 November 2011, a second-generation adult male rhino was found dead. The horn had been removed; it was later recovered in Dhangarhi, Nepal. The case is still under investigation to determine the cause of death.

### Current status of rhinos in Dudhwa NP

- When the total fenced area for rhinos is considered, the forage area is limited and other areas are degraded by floods from River Suheli. Palatable grasses that rhinos prefer are now becoming unpalatable because the area is submerged under floodwater. The habitat requires management and improvement.
- Dudhwa NP covers over 490 km<sup>2</sup> but the rhinos are confined within an electric fence in an area measuring 27 km<sup>2</sup>, restricting them to use only this space.
- One question we have for the Dudhwa authorities is for how long these rhino will be kept in the fenced area? We feel that some of the rhinos in the existing fenced areas of Dudhwa NP should be translocated to the proposed new rhino area in Bhadhi Taal, which is a good habitat with required food plants and wallowing sites available to give rhinos space and also allow for scientifically managed breeding in the wild, considering the family genetic tree of

the rhino population in Dudhwa NP. In 2005, the second author of this paper submitted a detailed project proposal to the Uttar Pradesh Forest Department and the Ministry of Forest and Environment, New Delhi, to create another fenced area for rhinos within Dudhwa NP.

- It is evident from field observations that a single male dominated breeding with almost all mature female rhinos and contributed to population growth. Therefore, we feel that a non-invasive DNA-based study using dung should be carried out soon to ascertain the genetic diversity of the Dudhwa rhino population.

### *Current status of rhinos in Suklaphanta WLS*

- Currently, Suklaphanta WLS in Nepal has a population of seven rhinos that usually move to Lagga Bagga in Pilibhit Forest Division, Uttar Pradesh state, India. One of the adult males was sighted near Haldwani Forest Division in India and had stayed in a sugarcane field for more than six months before going back.
- The habitat may not be suitable for rhinos when we consider the terrain and availability or lack of it of water and forage during all seasons. The area falls in the Terai-Bhabar zone and the soil's water-retaining capacity is low; therefore, the rhinos tend to stray out of Suklaphanta WR whenever water is scarce. Also, the soil consists of boulders and pebbles, and water seeps into the soil forming underground water channels commonly known as *choya*.
- Rhinos from Suklaphanta move into Lagga Bagga and further into the Pilibhit Forest Division and often feed on crop fields, to the annoyance of local villagers. This invasion of fields is bound to increase human–rhino conflict and is likely to result in animosity and killing of these stray rhinos.
- Long before rhinos were translocated from Bardia to Suklaphanta, one adult male rhino had been sighted in Suklaphanta but no-one knew where he came from. He must have reached Suklaphanta WR by coming from Bardia NP, but this is yet to be confirmed.
- It is imperative to have a joint research and monitoring team for the rhinos in the Indo-Nepal trans-border forest areas, where rhino movement has been recorded, to generate and maintain first-hand information on their movement pattern and cause of

seasonal movement in this landscape. This situation in turn would help management authorities in both India and Nepal make informed decisions based on sufficient scientific information and analyses to ensure the future of the rhinos.

- Rhinos coming to Lagga Bagga and Pilibhit Forest are susceptible to being injured or killed because of the large numbers of villagers surrounding the forest area. Local people chase and harass the rhinos to save their crop fields, rhinos attack in retaliation, and on many occasions people have been killed, especially if there is a female rhino with a calf.

### *Current status of rhinos in the Bardia–Katarniaghat complex*

The current rhino population in Bardia NP is 24. There were about 80 rhinos in Bardia before the political unrest in the country in the mid-2000s; over 75% of this population was wiped out by poachers taking advantage of the socio-political unrest. In 1991, three rhinos—a female with calf and a male—were sighted in Katarniaghat WLS. Currently, 4–5 rhinos have been reported in the area, which reflects that more rhinos from Bardia NP may have strayed out and come to Katarniaghat. After some time these rhinos moved back to Bardia and few stayed long outside the park. The need is urgent to monitor their movement patterns, habitat use and locations with the use of satellite radio collaring under a joint monitoring programme.

### *Conservation priorities*

- Considering its location and importance, Lagga Bagga should be declared a protected forest or wildlife sanctuary.
- More efforts are needed for better coordination and cooperation in transboundary issues. Regular meetings involving senior officers of paramilitary forces and customs departments of both sides would achieve better coordination, help share field-based information on rhinos and help in anti-poaching operations.
- A joint research project should be carried out to track the radio-collared rhinos on both sides of the border to identify the movement pattern and habitat conditions of particular areas to which rhinos move.
- If possible, all rhinos should be radio collared or tagged with ID marks.

The forest habitats of the Indo-Nepal transborder are capable of providing shelter to a number of threatened species, including rhinos. A well-coordinated conservation and protection plan is essential to ensure that these habitats continue to extend suitable refuge to rhinos and other threatened wild animals in this important landscape of the Himalayas.

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