MANAGEMENT OF THE REINTRODUCED GREATER ONE-HORNED RHINOCEROS (*RHINOCEROS UNICORNIS*) IN DUDWA NATIONAL PARK UTTAR PRADESH, INDIA[2]

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1. INTRODUCTION

The five species of Rhinoceros which still exist in the parts of Africa and Asia are subjected to serious threat as result of excessive poaching for its horn, illegal trade and habitat destruction. Twenty years ago the world population of Rhinoceros which was about 70,000 has dropped down to around 11,000 in recent time.

In Asia 3 species of Rhinoceros found are, the Great Indian one-horned Rhinoceros (*Rhinoceros unicornis*) found in India, Bhutan and Nepal. The smaller one-horned or Javan Rhinoceros (*Rhinoceros sondaicus*) found in Indonesia and Vietnam, and the Asiatic Two-horned Rhinoceros (*Dicerorhinus sumatrensis*) found in the parts of Indonesia and Malaysia in the wild.

The Great Indian one-horned Rhinoceros (*Rhinoceros unicornis*) which was once widely distributed from the foot hills of the Hindukush Mountain Range (Pakistan) to Myanamar and also all along the flood plain of Ganges River. In the last 200 years due to over hunting, fragmentation of habitat by clearing forest for cultivation, disparate land use for agriculture, extension of tea gardens, reclamation of grasslands and swamps for fulfilling the basic needs of expanding human and livestock population and uncontrolled fires were the major causes of elimination of Indian Rhinoceros from most of its former range of distribution. The last rhino in Uttar Pradesh (UP) was shot in the Pilibhit district adjacent to the Dudwa National Park (N.P.) in 1878 [1].

At present the Indian rhino population of around 1900 rhino are restricted to protected areas (PA) in Assam, West Bengal and Nepal. The Kaziranga NP in Assam has 1164 rhinos and the Royal Chitwan N.P.in Nepal 400 [2]. The remaining rhino populations with the exception of Manas, India, are surviving in small and insecure habitat patches with insecure future of survival (Table 1).

Table 1: Indian Rhino Population in India and Nepal (1993).

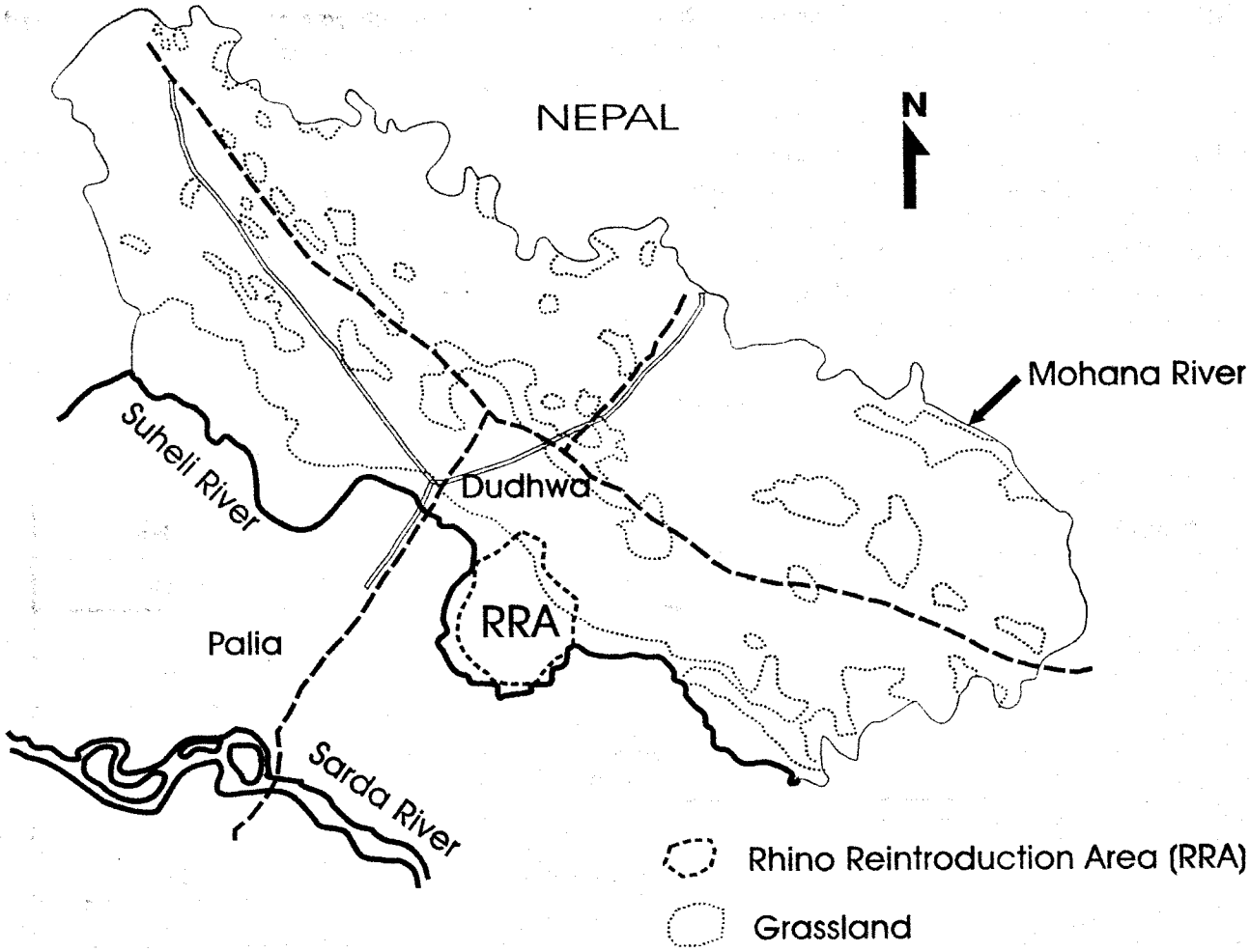
Country	State	PA	Number
INDIA	Assam	Kaziranga NP	1164
		Manas WLS*	60
		Orang WLS	97
		Pobitara WLS	39
		Other Areas	40
	West Bengal	Jaldapara WLS	35
		Gorumara WLS	12
NEPAL		Royal Chitwan and Bardia NP	400

* Present Status Uncertain

[2] *Paper presented in the International Conference on the Rhinoceros Ecology and Management, San Diego, California, USA, 9-11 May, 1991*

Despite the protective measures and dedication of field managers and forest staff to protect, the persecution of this animal continues due to rising price of Indian rhino horn in the International Market. In the Kaziranga NP between 1983-89, a total of 235 rhinos were killed by the poachers for horns [3]. The state of the clandestine rhino horn trade by [4] and new means of poaching in Kaziranga NP and mass poaching of rhinos in Manas NP is documented [5]. These examples are illustrative of the present threats to the rhinos and problems faced by the field forest staff and in number of cases field guards are killed by the poachers.

By considering the current highly restricted distribution with poaching pressure, habitat specificity and in consideration to the scattered small population, it becomes imperative to reintroduce the species in suitable habitats in its former range of distribution as one of the measures to be adopted for the long-term survival of this species. IUCN Rhino Specialist Group and the Rhino Sub-Committee of the Indian Board of Wildlife (IBWL) recommended the establishment of an additional rhino population in India [6]. The Dudwa N.P. fulfilled all the criteria required for the reintroduction among the various sites surveyed in India by a panel of experts [7]. Thus, Dudwa become the first and currently the only site of reintroduction of rhino in India during 1984-85. Another reintroduced rhino population exists in the Bardia N.P. Nepal.



Map 1

2. THE DUDWA NATIONAL PARK

The Dudwa National Park declared as Dudwa Tiger Reserve under Project Tiger in 1987 is in the Kheri district of Uttar Pradesh (UP) and lies between 28°18'N and 28°42'N latitudes and 80°28'E and 80°57'E

longitudes, approximately 30 km south of the Nepal Himalayas. It is 490 sq km in extent. With buffer zone of 124 sq km under the Park administration (Map. 1).

The park is a compact block of approximately 50 km in length by 10 km in width. The Mohana and Suheli Rivers constituted respectively the northern and the southem- boundaries. An area of 25 sq km within Kakhraha block surrounded by a power fence constitutes the Rhino Reintroduction Area (RRA). A section of the fence perimeter has a parallel stretch of trench. The RRA habitat is a mix of tall wet grassland, woodland complex with ten perennial swamps (Table 2). South of the RRA flows the river Suheli.

Table 2: Vegetation Types within RRA

No.	Vegetation Type	Area in hectares
1	Tall Grassland	343
2	Short Grassland	807
3	Marshy Grassland	563
4	Water Bodies (Aquatic vegetation)	107
5	Fringes & Riparian	107
6	Woodland	584

The vegetation consists of some of the best forests of Sal (*Shorea robusta*) in India, mixed moist forest, riparian communities, tall wet grasslands with patches of short grasses. Interspersed within the grasslands are a number of swamps within the park, grasslands cover 20% of the total area. So far, 75 species of trees, 21 species of shrubs, 17 species of climbers, 77 species of grass and grassland plants, 179 species of aquatic plants have been listed.

The list of larger vertebrates includes: tiger (*Panthera tigris*). Leopard (*Panthera pardus*) ,sloth bear (*Melursus ursinus),* jackal (*Canis aureus*), elephant (*Elephas maximus),* rhino (*Rhinoceros unicornis*), swamp deer *(Cervus duvauceli).* hog deer (*Cervus porcinus*),chital/spotted deer (*Cervus axis*), barking deer *(Muntiacus muntjac)* , nilgai (*Boselaphys tragocamelus*) , wild pig (*Sus scroffa*) and non-human primates includes common langur (*Presbytis entellus*) and rhesus monkey (*Rhesus mulata*).

Overall faunal documentation lists 40 species of mammals, 292 species of birds, 25 species of reptiles, 3 species of amphibians and 20 species of fish. Of these, I I species of mammals, 6 species of birds and 5 species of reptiles are listed as endangered under Wildlife Protection Act of India 1972 updated to 1991. North of the National Park, and within India, lie patches of reserved forests, villages and agricultural fields of local tribals called *tharu.* Across the international boundary the forested areas are cut over, degraded and covered by human settlements. Along west, south and east are forested areas with interspersed sugarcane cultivation and villages.

3. RHINO REINTRODUCTION IN DUDWA N.P.

The reintroduction of rhino in Dudwa took place in two phases. The first phase in 1984, in which five rhinos comprising 2 males and 3 females were captured, and translocated to Dudwa from Pobitora WLS, Assam [6]. These animals were released in the Rhino Reintroduction Area (RRA) in a specially constructed stockades for health care and for experiencing electric fence before final release into the main fenced area of RRA.

4. MONITORING REHABILITATION OF THE REINTRODUCED RHINOS

In 1987, the Wildlife Institute of India in collaboration of the forest department, Uttar Pradesh, launched a project to study the rehabilitation process of the reintroduced rhinos. It was designed to focus on the ranging and habitat utilization patterns, the inter and intra specific behaviour and monitoring the general state of health. Apart from the investigations, the project handled all aspects of Managements of the RRA and also give training to the forest staff deputed to this project.

4.1 Monitoring Rhinos

Every day, four riding elephants were used to locate all the rhinos, seldom were all rhinos sighted everyday due to poor sighting in the tall grasslands condition. Except for a short period after the burning of grassland when most of the rhinos were located. Rhinos were also sighted on foot, using a motorcycle and from machan tops (observation platforms). Each location of rhino was recorded on a grided map of RRA indicating vegetation classification. Each grid cell on the ground was l00xl00 meters.

4.2 Identification of individual Rhinos

All the adult rhinos were identified Individually by recording different physical traits, such as: arrangement of the neck folds, tubercles, folds, length of tail, length of horn and shape, wound mark on body and shape of white pigmentation patch between horn and upper lip. [8]. Each rhino bears a name derived from either a river or a mountain.

5. STUDY RESULTS

5.1 General

The study reveal that in RRA, the rhinos used 55 different plants species belongs to 25 families as food in different seasons. These include grasses and herbs species (25) which is the major part of food, aquatic plants (9), tree species (12), climber (5), shrubs(5) and fern.

During winters, grass species accounted for 45% of the diet of rhinos, aquatic plants, 18% and the rest of the diet consisted of woody plants, climbers, shrubs and tree species.

Towards the end of winter, most of the grass species attain full maturity and start drying. Water levels in most of the water bodies starts receding. During this period the aquatic plants become more accessible. During winter, rhinos seek thermal cover in woodland and do not emerge from the woodland till the late morning hours.

The prescribed burning of grasslands within the RRA is accomplished between February or, latest, by March each year. During the period, rhinos feed on *Teliacora acuminata* a climber and leaves and twigs of a medium-sized tree *Malloutus phillippinensis*. Around tals (water bodies), rhino feed mainly on *Cynodon dactylon*, *Hygrorhyza cristata*, *Trappa* and *Vallesnaria*. Within 2-3 days following the grassland burning, rhinos start feeding on burned swards of tall grasses and lick the ash on the ground.

By adopting the [9] statistical technique, habitat preference of rhinos in terms of percentage area of a particular habitat used in relation to the total habitat types available in the RRA was estimated. Table 3 summarises the observations for the different season. Aquatic habitats were used by rhinos throughout the year but in summer they were used significantly more than in the other seasons. Marshy grasslands exhibited similar trends of use. Tall grassland was equally significant in monsoon and winter. Thirty two percent of the RRA is occupied by short grassland which is comparatively little used by the rhinos. Main reasons attributed is the absence of water bodies in short grassland area.

Table 3: Habitat use in relation to the area available and degree of preference

Habitat Type	% area Available	Summer	Monsoon	Winter
Aquatic	4.3	28.0	22.2	21.1
Fringes/Riparian	4.3	5.6	5.5	3.4
Marshy Grassland	22.4	30.0	11.1	15.3
Short Grassland	32.1	8.2	8.6	14.2
Tall Grassland	13.7	13.2	24.2	22.5
Woodland	23.3	15.4	29.2	24.2

5.2 Spatial Use Pattern

By using Harmonic Mean Transformation Polygon (HMT), areas of maximum use at 50-90% level were calculated separately for different seasons. It was found that during summer 40.76% of the RRA was used by cows and calves. During the monsoon and winter, percentage area of RRA used was respectively 35.64% and 29.0%. There was variation between 10.19-4.16 km^2 in summer, in monsoon between 6.41-2.08 km^2 and in winter between 7.25 sq.km-1.95 km^2. In case of the lone male the percentage of area used in different seasons varied from 36.25 km^2-47.8%. Area used in different seasons varied between 2.50-11.95 km^2.

5.3 Monitoring Health Condition

Every day, rhinos located were thoroughly scrutinized for wounds or scars. If any fresh wounds were noticed, usually, prescribed medicines were sprayed with the help of a modified pump. Dung samples were collected in all seasons to estimate parasitic load. During the period of study, the parasitic load was not considered to be a problem. Professional veterinarians were consulted as and when necessary.

6. MAINTENANCE OF POWER FENCE

The original 1.5m high, 3 strand power fence was, in 1988, raised to the height of 2.8 meters, with 7 strands alternately energised by two energizers sharing the total fence perimeter. The alteration in the fence was carried out to prevent entry of tigers having overlapping home ranges within the RRA to preclude the threat of rhino calf predation. The fence was closed after ascertaining that no tigers were present within the RRA. The fence was unsuccessful in context of preventing entry of tigers. So far the tigers have not posed any real threat.

The main problem had been the repairs of imported energizers for lack of spares and expertise. Some indigenously manufactured energizers were found to be better in the long run. These have to be run on heavy duty 12 volt batteries for lack of mains source of power. In the remote forest area it is difficult to maintain the schedule for charging batteries and battery replacement as batteries must be transported to a distance of at least 20 km for the purpose.

It is especially problematic in rains when the area is flooded. While rhinos respect the fence, power or not, wild elephants periodically passing through Kakraha during their stay in the park have broken through the temporarily non functional strands of fence whenever the batteries were down. Floods cause sections of the fence to collapse. Sections of wire can get rusty and need replacement. A regular checking of the entire fence is scheduled on everyday basis.

Following the birth of a rhino calf, the mother and calf were temporarily sequestered in a 3 sq.km, power fence enclosed area within the RRA not so much to keep the tigers at bay but to keep the

animals conveniently under observation to preclude any threat to the calf during the critical early period of growth. Two observation posts were located nearby. Availability of essential habitat components was ensured within the fenced area.

7. THREATS

7.1 Small Population

The small population of rhinos as it currently exists attracts all well documented threats generally applicable to small populations in the wild [10]. It is quite clear that no debate is necessary to conclude that random natural events have the potential of severely limiting the future survival of the current reintroduced rhino population, possibly even on the short term basis as the events in the last twelve years of project.

In the last couple of years, it has been observed that alone bull made a habit of attacking other rhinos specially the male members. During this, two bulls were attacked and one bull died and another introduced from a zoo was badly injured. Similarly, one adult pregnant cow and her male calf were killed by this lone bull.

7.2 Operation of the Power Fence

This has been discussed earlier and the problems in maintaining the fence are critical, at least for some years till the population can build up to the level recommended by the IBWL, i.e., thirty rhinos with expansion of the RRA over portions of the estimated potential habitat of approx 90 sq.km. in the park through a combination of more translocation and in-situ breeding. This cannot be achieved easily as further translocation are proving very difficult for various reasons.

7.3 Poaching

Currently the dedicated managerial effort has ensured the desired security. However, poaching possibilities can never be discounted. The park infrastructure will need appropriate strengthening as indeed is being planned.

7.4 Translocation of a Fresh Batch of Rhinos and Development of Another Rhino Area Inside the Dudwa NP.

Considering the behaviour aspect of a lone bull, introduction of a fresh batch of rhinos in RRA can be fatal. To break the bonding between individual rhinos in RRA, another potential rhino Area-Bhadhital could be an option to shift 2 females from RRA and translocate a fresh batch of 2 female rhinos in RRA and one mature bull with 3 females in Bhadhital Area. Initially, Bhadhital Area should be electrically fenced to stop rhinos straying outside the park area. In future with the increase in rhino population two areas can be joined together by extending the electric fence.

8. CONCLUSIONS

Though the current population of the reintroduced rhinos is small, it is well adapted to its new home. The animals are in good health condition and are breeding well.

The available potential rhino habitat needs intensive management as that extended to the RRA with an eye on the future. Habitat management approach is documented [11, 12,13].

Park communication, basic staff amenities, equipment and other infrastructural support need to be realistically developed, especially in context of the eastern half of the park. There is no functional buffer.

The management actions required on several critical issues are implicit in context of the expressed threats in the earlier section and do not bear repetition.

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