

Table 4: Precent frequency of an animal for various activities

Activity	PT	AP	IP
Passive	22.9	17.6	17.0
Movement	34.1	43.6	44.1
Feed	25.5	30.9	29.8
Self-directed	4.7	2.1	2.3
Social Behavior	12.8	5.8	6.8
Grooming	35.1	31.1	24.5
Agression	12.2	20.0	10.0
Play	46.8	40.1	49.8
Sexual	5.9	8.8	15.7

Table 5: Percent frequency of an animal feeding on various food items

Food Item	PT	AP	IP
Drink	0.7	0.1	0.2
Crop	0.8	0	0
Leaf	0.3	2.0	0.4
Insect	17.9	18.0	15.3
Fruit	64.1	59.4	77.9
Others	16.2	20.5	6.2

OBSERVATIONS ON FEEDING AND TERRITORIAL BEHAVIOUR OF INDIAN RHINO (*Rhinoceros unicornis*) IN KAZIRANGA NATIONAL PARK, ASSAM, INDIA

by P.O. Mary, G.S. Solanki, D. Limboo and K. Upadhaya

Introduction

The great one-horned rhinoceros (*Rhinoceros unicornis*) is the only surviving species belonging to the Family Rhinocerotidae, Order Perrisodactyla. The animal was once well distributed in the

Gangetic plain, but at present it is restricted to Nepal, West Bengal and Assam (Rajesh Gopal, 1993). Kaziranga National Park in Assam has the largest population of the Indian one-horned rhinoceros with 70% of the total world population (Sawarkar, 1995). Apart from poaching, outbreaks of epidemics due to the

mixing of domestic buffalo and the loss of habitat due to the spread of exotic plants in the viable habitat are responsible for the decline of the rhino population. Various conservation measures and management plans have been initiated since Kaziranga sanctuary was given the status of national park in 1974 (Negi, 1993). The park is bounded by the Brahmaputra River and is frequently inundated when the river is in flood. Parts of the park are covered with silt deposited by the river water. Because of this regular and cyclic phenomenon, the habitat structure and floral composition are affected. Under the existing situation, the rhinoceros has had to adjust and change its feeding behavior and selectivity of plant species. Knowledge about the feeding and selection of preferred plant species is important strategic information that should be incorporated into the conservation and management plan for the endangered one-horned rhinoceros. The present study gives vital information to strengthen the available data and to supplement the gaps in conservation and management plans for this animal.

Materials and Methods

Assam's Kaziranga National Park is located in the flood plains of the Brahmaputra River. The park occupies an area of 430 km², which is constantly being changed due to erosion caused by the mighty river Brahmaputra. The park is full of swampy areas, beels and nallahs, etc. The soil is the alluvium type deposited by the river. The whole area is flat with an easy gradient from east to west. A number of rivulets pass through the park area, merging into the Brahmaputra river. The presence of small lakes, called 'beds', are a characteristic feature of the park and contributes to the ecology of the wildlife. These beds are gradually being converted in the swamps due to siltation. The eastern and southern boundaries of the park are flanked by cultivated land, including tea gardens and tribal inhabitants. The western boundary is demarcated by another river, the Mori-Dipholu.

Climate

The climate in the Assam valley shows three distinct seasons, viz. summer, winter and monsoon. The dry summer runs from mid-February to May, with average maximum and minimum temperatures of 37°C and 7°C. The winter extends from November to mid-February with average maximum and minimum temperatures of 25°C and 5°C. This period remains free from rains except for occasional winter showers. The monsoon season extends from May to September with an average annual rainfall of 2,220 mm. More than 75% of the rainfall occurs only during the monsoon.

Vegetation

The vegetation in the park can be broadly classified as follows:

- a. aquatic plants in and around water holes;
- b. tall grasses;
- c. forest trees.

Water bodies, covering 6% of the park area, are dominated by *Eichhornia crassipes*; different species of *Andropogon*, *Ipomoea reptans*, *Enhydra fluctuans*, *Pistia stratiotes*, *Nymphaea lotus*, and *Nelumbium speciosum* comprise the rest of the aquatic flora.

Grasslands cover nearly 66% of the park area. Among the dominant tall grass species are *Saccharum procerum*, *S. spontaneum*, and *Imperata cylindrica*. The most common and widely distributed species in the park area are *Erianthus ravennae*, *Saccharum elephantanum*, *Phragmites karka* and *Arundo donax*, found in low-lying areas. Around the edges of the beds and in marshy areas, short succulent grasses like *Cynodon dactylon*, *Chrysopogon aciculatus*, *Andropogon* sp., and *Eragrostis* sp. occur abundantly. *Microstegium ciliatum* is found under the tree canopy in comparatively higher grounds.

Woodlands occupy about 28% of the area of the national park. Tall trees are found on higher ground along the central and eastern parts. The low-lying marshy land present in slightly higher reaches are dominated by *Salmalia malabarica*, *Albizia procera*, *A. lebbeck*, *A. stipulata*, *A. odoratissima*, *A. lucida*, *Premna latifolia*, *Lagerstroemia parviflora*, *L. flos-reginae*, *Dillenia pentagyna*, *Zizyphus jujuba*, *Barringtonia acutangula* and *Crataeva religiosa*. At the higher reaches, patches of evergreen forest species are present. Dominating tall trees are *Albizia* sp., *Trewia nudiflora*, *Tetrameles nudiflora*, *Alstonia scholaris*, *Chikrassia tabularis*, *Spondias mangifera*, *Bischofia javanica*, *Dillenia indica*, *Cedrela toona*, *Terminalia bellerica*, *Salix tetrasperma*, *Artocarpus chaplasha*, *Schima wallichii*, *Gmelina arborea*, and *Erythrina arborescens*.

Ecological Factors Operating in National Park

Two important external factors -- burning and the annual floods -- influence the flora and fauna of the national park.

Burning

A large part of the savannah grasslands are subjected to annual controlled burning during the winter months. Such burning helps to promote vegetative reproduction in rhizomatus grasses (Kucera, 1981; Kushwaha *et al.*, 1983) and in arresting vegetational succession (Kushwaha and Unni, 1986) of grassland. Thus, the quality of an ideal habitat for the terrestrial fauna is retained, particularly for the larger mammals. Vegetative regrowth being phenomenally fast under the prevailing conditions, no serious deteriorating effect on the habitat occurs and the status quo of the grasslands is maintained. The emerging shoots attract the herbivores immediately after burning. The effect of burning is better dispersal for the animals, and it also reduces pressure on the heavily grazed locations.

Annual floods

The annual submergence of large areas of the park due to high flood levels of the Brahmaputra, coupled with spells of heavy showers in the southern Mikir hills, is a regular feature. The flood plays an important role in maintaining the ecological status of grassland formations and flushes out the water hyacinth. The submergence is not uniform throughout the park; the earliest to be flooded are the southern and western parts, and the last to be affected is the central part. Formerly, there were escape routes for the animals in the form of inter-connecting corridors of vegetation leading to the southern high hills, but these days, with more and more areas becoming inhabited and cultivated adjacent to the southern part of the park, both in the plains and hills, such escape routes have vanished.

Floods cause some casualties among the animals; nevertheless, there has not been any decline in the total population. The loss due to floods probably indirectly helps in maintaining a healthy population stock. There appears to be some changes in the behavior of animals, particularly in the breeding pattern, due to the annual floods.

Observations and Discussions

Feeding behavior

The rhino is a well-known sight feeding on grasses and twigs growing along the bank and surrounding the 'beels' which remain under water during the monsoon and dry up in winter. It is mainly a grazer, but also browses over tall grasses. While browsing, it holds the grasses with its mouth and pushes them inside the buccal cavity with the help of finger-like projections on the upper lip for mastication. It mainly feeds on young sprouts of tall grasses that appear after burning, bamboo shoots, and water hyacinths from the swamps. The rhino was observed feeding on 47 species in the park area. Grasses comprised 75% of the total plant species eaten. The

highly preferred grass species were *Cynodon dactylon*, *Eragrostis* sp., *Chrysopogon* sp., *Imperata cylindrica*, *I. indica*, *Aciculatus* sp., *Phragmites karka*, *Andropogon* sp., *Saccharum elephanatum*, *Saccharum* sp., *Pennisetum* sp., *Typha elephantina*, *Pollinia ciliata*, *Arundo donax*, and *Tamarix* sp.

Among the marshy vegetation, the rhino preferred *Eichhornia crassipes* (water hyacinth), *Andropogon* sp., *Ipomoea reptans*, *Nelumbo speciosum* and *Nymphaea lotus* the most.

Vegetation, water bodies and availability of rhino

The kinds of vegetation and water bodies present in the park area affect the distribution of the animals. Water bodies occupy 6% of the total area of Kaziranga National Park. The rhinos are mostly seen grazing on the boundaries of water bodies. During the summer and hot period, wallowing in the water is common and grazing while wallowing is a usual phenomenon observed. However, the savannahs with tall grasses are the regular grazing and shelter grounds during the night, and even during the warmer parts of the day as well. Areas with tall trees are normally avoided, unlike other herbivores that usually prefer to rest in areas where tall trees are present.

Territorial behavior

The territorial concept is more often seen in rhinos. They mark the territory by defecating at particular places. When the faecal deposits become large masses, they kick out these deposits and spread them over a large area. That area becomes the private territory which is guarded. There are also some common paths and places which are shared for grazing, wallowing and herding activity. These places are not defended.

References

- Kucera, C.L. 1981. **Grasslands and Fire**. In: *Fire regimes and Ecosystem properties* (Eds. Mooney, H.A., Bonnicksen, T.M., Christensen, N.L., Lotan, J.E. and W.A. Reiners). General Technical Report WO 26, Honolulu, Hawaii.
- Kushwaha, S.P.S., Ramakrishnan, P.S. and R.S. Tripathi. 1983. **Population dynamics of Imperata cylindrica (L.) Beauv. Var. major related to slash and burn agriculture (Jhum) in North Eastern India**. Proc. Indian Acad. Sci. (Pl.Sci.), 92(4):313-321.
- Kushwaha, S.P.S. and N.V. Madhav Unni. 1986. **Application of remote sensing techniques in forest cover monitoring and habitat evaluation -- A case study at Kaziranga National Park, Assam**. (Eds. Kamat, D.S. and H.S. Panwar). A seminar-cum-workshop on Habitat Evaluation Using Remote Sensing Techniques. Dehradun. pp.265.
- Negi, S.S. 1993. **Manual for wildlife management in India**. International Book Distributors publication, Dehradun. pp.299.
- Rajesh, Gopal. 1993. **Fundamentals of wildlife management**. Justice Home Publications, Allahabad. pp.668.
- Sawarkar, V.B. 1995. **A manual for planning wildlife management in protected areas and managed forest**. Wildlife Institute of India publication. pp.262.
- Authors' address: Department of Applied Science, North Eastern Regional Institute of Science and Technology, Nirjuli-791 109, Itanagar, Arunachal Pradesh, India.*