ANALYSIS OF CERTAIN STRATEGIES OF CONSERVATION AND PROPAGATION OF *Rhinoceros unicornis* (L)

by Umesh C. Goswami

INTRODUCTION

In the process of man's exploitation of the earth's natural resources for his expanding population, and the indiscriminate killing of the voiceless denizens for sport and for immediate profit, the world has witnessed the extinction of many reptiles, birds, mammals and other rare and magnificent animals from the surface of the earth. The great Indian rhinoceros *(Rhinoceros unicornis)* also would have met the same fate, had not strict protection been extended to the few surviving species since the turn of this century, when it was recorded that barely a dozen rhinos existed in Kaziranga National Park.

There is no doubt that *R. unicornis* existed in large numbers in earlier centuries, where it ranged from the Indo-Gangetic valley, extending up to the Brahmaputra valley. The indiscriminate killing or hunting by earlier kings, empirers or other high influential persons of those times, as well as the superstitions about the use of the rhino horn, led to the decrease of the population of the animal. There was also a change in the climatic and other environmental conditions of the Indus and Ganges valleys with a dry climate which led to the loss of the original habitat. This compelled the present rhinoceroses to retreat to certain restricted pockets of northeast India, where Kaziranga may be considered as being part of its original range, along with Jaldapara (West Bengal), Nepal. The species also migrated from its original home to certain other nearby wildlife sanctuaries (Manas, Orang, Pabitora, Laokhowa and Sonai-Rupai) of Assam.

Certain conservation and propagation policies for the species could be suggested after determining the various causes of the reduction of present rhino numbers, as well as future strategies to conserve and propagate this rare mammal in its natural habitat. It is clearly evident that the position of *R. unicornis* in Assam, northeast India, has been redeemed and it is a satisfying example of how the hitherto destructive hand of man can do a lot for their protection and survival, especially if we consider their earlier numbers, which was not more than a dozen in 1908. The figure rose to 250 after 50 years and to about 400 in 1966 (Patar, 1977; 1980). This was brought about by the gradually intensified protective measures taken up by the Government. The number rose satisfactorily in 1972, but the rate of increase began to decline from 1978 onwards. Within the last decade the population growth rate has steadily decreased from the 9% which was obtained during 1972 from the population recorded in 1966, to 6.18% in 1978, 1.98% in 1984 and 1.77% in 1990. On the other hand, the population density per sq. km. showed an increase from 0.93 in 1966 to 1.56 in 1972, 2.23 in 1978, 2.51 in 1984 and 2.62 in 1990 within the 430 sq.km. area of the Park. Thus, present observations show a deplorable situation where the number of rhinos is gradually decreasing with the increase of population density per sq.km., which requires serious attention for its future conservation and a search for some new rhino-land.

The following discussion examines the causes of the decrease in the rhino population in Kaziranga National Park and the policies to be adopted for the protection, conservation and propagation of the species.

CAUSE OF DIMINUTION OF *R. unicornis* POPULATION

Human Interference in the Habitat of *R. unicornis*

The hunting and killing of rhinos by hunters and poachers is the major problem relating to the reduction of the rhino population. Various stories, lores or beliefs which can be expressed as superstitions, together with credence in the medicinal value of rhino urine, flesh, horn, skin, etc., are prevalent among the people. These superstitions have prevailed from time immemorial and it is unlikely that they will end. Poachers are using this opportunity and kill the animals mercilessly, either by

(con't on p. 17)

(con't from p. 16)

shooting them, digging pits to trap them in, or electrocuting them.

Encroachment in Natural Habitat of *R. unicornis*

It has been found that there are some illegal occupants who have establishments near the National Park. Some huts have been constructed along the side of the National Highway (No. 37) adjacent to the boundary of the Park. This leads to various problems relating to the safe movement of the animal and other aspects of the topography of Kaziranga National Park. The general problems created by these factors may be summarised as follows:

(a) *Conversion of the land of the National Park to cultivable land:*

It has been observed that human settlement has resulted in the grabbing of nearby lands which are thus converted into cultivable land for various crops.

(b) *Change of soil topography:*

The conversion into cultivable land leads to a change in soil topography, by construction of drains, pruning of highlands and removal of original vegetation in order to develop their settlement. Further, the soil characteristics will also be greatly affected by the change in topography.

(c) *Introduction of domesticated animals into Kaziranga National Park:*

Cattle, goats and even domesticated pigs have started entering the boundaries of the National Park. From Buhrapahar onwards up to the Bokakhat region along the National Highway, a large number of such domesticated animals enter daily and graze or roam within the Park. Several parasites of domesticated animals have been found during the present investigation. It is an alarming situation regarding the spreading of certain epizootic diseases in the *R. unicornis* population. The occurrence of anthrax is a serious threat (Choudhary, 1964; Pathak, 1978) in the *R. unicornis* population.

Urbanization

The tendency towards urbanization and establishment of townships along the area of the rhino habitats, particularly along the side of the National Highway of Kaziranga and Bokakhat, is noteworthy. Although they do not pose any hazards at present, such trends could disturb the rhino habitat. There is every possibility of the spread of urban areas towards the boundary of the Park. Certain other developments along with urbanization have created alarming problems such as the construction of highways, roads and railways.

The construction of the present National Highway and roads between the Karbi plateau hills and the National Park have created a demarcation between the park and the hill areas. During floods, the rhino population usually crosses the highway which runs from the Buhrapahar hill range of Karbi plateau up to Bokakhat, and extending up to Dibrugarh. It has been observed that the highway has created problems for the rhinos crossing the road owing to the presence of a large number of vehicles and also the human habitations. Several records of rhinos being hit by vehicles or the subsequent death of rhinos caused by these accidents on the highway have been reported earlier. Further, the construction of other roads or subways leading to the different tea estates also causes problems.

Moreover, there is a proposal for the construction of a railway line alongside the highway, but it is hoped that such a scheme will be abandoned or diverted towards the other side for the safety of the habitat of *R. unicornis*.

National Calamities and Environmental Problems

Floods

The occurrence of floods every year is also one of the major causes of diminution of the rhino population. In 1988, several rhino calves, subadult and adult rhinos died owing to the havoc caused by the floods. The floods sometimes occur more than four times a year (as in 1988). As the Brahmaputra river is the immediate boundary of the Park, during the floods the excess water submerges the area, covering 75–80% of the total land mass. The magnitude of the damage is unimaginable as the flood waters sometimes remain for more than 10–20 days.

During the floods the animals congregate and take shelter on the roads, in the highlands and on the Karbi plateau. A large number of animals migrate from the Park to the nearby Karbi hills, crossing the National Highway. When the Park is submerged by flood waters the animals are deprived of fodder and shelter and forced to seek refuge outside.

After the recession of the flood waters, it requires another spell of rain to wash away the debris that usually adheres to the leaves and grass, which makes them unpalatable to the animals. Rhinos that remain in the Park during the floods face starvation, eating only the leaves of trees (which are not in great quantity). The food habit of the species is, therefore, seriously affected by the floods.

Soil erosion

Soil erosion is a constant problem in Kaziranga National Park during summer, after the floods. Every year large chunks of land from the northern boundary of the park are washed away by the Brahmaputra river. New river islands are also formed near the Park, but owing to legal complications such islands cannot be included within the area of the Park. New areas formed by silt deposition adjoining the Park take time to become stabilised and support vegetation. The seriousness of the damages done by erosion can be gauged from the fact that the present area of the Park is 37,822.43 hectares against the original 42,496 hectares. In addition, the areas of severe erosion are subject to further change in size and position according to changes in the course of the Brahmaputra river. In fact, the lower reaches of the Brahmaputra near the Kawaimari area are severely affected.

Drought

If there is a drought from the end of February to April this will reduce the growth of new grass seedlings (particularly at the burning sites). As the burning of the forest is usually practiced from December to March, the further growth or development of grass seedlings will be adversely affected if there is no rainfall at the end of February or in March. This condition of drought affects the food plant consumption of rhinos. Although there were no directly observable effects of such a drought, it would certainly affect the growth and nutrition of calves and sub-adults.

Emergence of Exotic Plants

Certain exotic plants such as *Eichhornia crassipes* (water hyacinth), *Mikenia*, etc. are proliferating so greatly that 90% of the entire aquatic vegetation consists of water hyacinth. The rhino does occasionally consume this plant as a food item, but only during wallowing. The water hyacinth has invaded almost all the rivers, swamps and beels in the Park. The rapid growth and excessive spreading capacity of this weed has covered up the aquatic space.

Mikenia is a climber that has spread to many areas of the Park, retarding the further growth of other plants. This weed is developing a tendency to grow rapidly and it will be a problem which will hinder the growth of food plants of *R. unicornis*.

POLICIES TO BE FOLLOWED FOR THE CONSERVATION AND PROPAGATION OF *R. unicornis*.

Eradication of Human Interference

The hunting and killing of rhinos must be completely stopped and law enforcement authorities will need to keep extreme vigil over poachers. Such systems should be more intensified and a river patrol service and an electronic communication centre should be employed along the riverside boundary and within the Kaziranga National Park. This will stop the illegal entrance of poachers as well as further crossing or migration of *R. unicornis* through the river side of the Park.

The encroachment of human habitations in the Park area and further eradication of the associated problems through the banning of any cultivation, irrigation or domestication of other animals along the border or within the boundary of the park should be strongly dealt with. This will create a complete rhino-land buffer zone.

There should be no further extensions of highways, subways or even the proposed railway line (Choudhary, 1987) along the boundary of the Park. In addition, movement of vehicles and the use of horns/ bells, etc. could be monitored and a noise reduction system could be instituted by the regulation of vehicular traffic. Alteration of the side of the highway behind the Mikir hill ranges would be significant in creating a complete and continuous zone connecting the Karbi plateau, which will solve a number of problems during

the floods. A proper plan in this regard with a new design could increase Kaziranga National Park by a vast area (more than 100 sq. km.).

Control of Natural and Environmental Parameters

Floods and erosion

Floods are annual occurrences, sometimes up to 3–4 times (or even more) in a year, along with erosion along the boundary line adjacent to the Brahmaputra river. Flood control measures such as building embankments to regulate water entry and discharge, and the creation of highlands or so–called platforms are of the utmost importance. Although the Forest Department of the Government of Assam has built some platforms inside the Park, more are needed to help a larger number of animals during floods. Proper planning and design of mechanisms to regulate flood water entry through the Brahmaputra river is needed. In this connection, the Central Government agencies of India, and international organizations such as the World Wildlife Fund, United Nations, World Bank, etc. should share a common platform to survey the problem and find a solution. The large scale migration of animals from the Park to the adjacent areas and mortality, in particular of *R. unicornis*, could be thus minimised.

Spurs or dykes should be erected along the banks of the Brahmaputra river to control both erosion and floods. If any new islands or small land masses are formed owing to heavy silt depositions, steps should be taken to have control of them handed over to the Park authorities.

Control of growth of plants

The growth of exotic plants such as water hyacinth and *Mykenia* should be controlled by manual or mechanical devices, since 90% of the water bodies in the Park are now covered by these plants.

It has been observed that certain areas of the park are devoid of the common food plants used by *R. unicornis*. Species such as *Andropogon, Chrysopogon, Cynodon, Saccharam, Imperata, Erianthus, Arundo*, etc. may be replanted in those areas which are devoid of such plants. This replantation scheme of such grasses in the places where there is no such growth would bring about a change in the ecology of the species.

Soil and Water Analysis of the Area Adjacent to the Tea Estates

The frequent use of organic compounds such as pesticides, weedicides and other chemicals in the tea estates, which are almost adjacent to the National Park, should be constantly monitored so that any contamination by such injurious agents may be minimized. The possible effects of eating or grazing on the infected grass, as well as water and soil containing those chemicals, might have a drastic effect on the physiology of the animals.

The expansion of the tea estates near the boundary of Kaziranga National Park should be limited and proper legal information should be extended in order to curtail their expansion. The drainage system emerging from the tea estates should not face in the direction of Kaziranga National Park.

Health Monitoring Programmes for Wildlife

Health monitoring programmes for the wildlife of Kaziranga National Park should be developed. Routine examination of faecal samples and general health conditions, along with treatment of injuries could be carried out by means of a mobile unit in the Park. Present examinations have revealed several parasitic species in the faecal samples of rhino. There is every possibility of the occurrence of epizootic diseases that are prevalent in domestic animals. Hence, a constant vigil should be enforced not to allow the entry of domesticated animals into the Park area.

Furthermore, diseased animals whose conditions are critical should be removed from the Park and given proper treatment away from the other animals.

The domestic animals found within the vicinity of the natural habitat should be regularly vaccinated to prevent any epidemics or serious diseases being transmitted to the wild animals.

Creation of New Rhino Land

There are certain areas which could be converted into rhino lands by declaring them as sanctuaries. From the present investigation, the belt from the Mayong Reserve up to the Chandrapur/Panikhaiti area is a suitable area where a small number of rhinos occasionally

roam or graze. The habitat is almost similar to that of Kaziranga National Park. The area is about 120–150 sq. km., adjoining the river Brahmaputra. There are several streams and swamps along with the Kapili river and other small tributaries. This may be considered as suitable rhinoceros habitat with about 150 sq. km. of pure forest areas. The north bank of the Brahmaputra river, starting from Kurua up to Orang, is also another site where rhinos roam almost throughout the year.

Additional new habitats should also be found for the reintroduction of rhinos from Kaziranga National Park. Dudhwa Wildlife Sanctuary in Uttar Pradesh was recently selected for introduction of rhinos, but a thorough survey is still required to determine the ecology of the habitat of *R. unicornis*. New rhino land would be needed for the survival and continuity of the species and if necessary, the creation of such an ecology should be given top priority for the process of conservation and propagation of the species.

Expansion of Kaziranga National Park

Although programmes have been drafted to expand certain areas along the side of the Brahmaputra river and in certain parts of the Karbi hills, these have not yet been implemented owing to administrative and other reasons. However, enlarging Kaziranga National Park could be accomplished by acquiring adjacent tea estate areas. Tea planting would be abandoned and food plants of *R. unicornis* could be introduced. This area would also serve as a refuge for the animals during the floods. The adjoining reserve forests of Kukrakata Bagser, Panbari and the northern slope of the Karbi plateau (500 sq. km.) should also be added to the Park so that they could be used for temporary rehabitation of flood affected rhinoceroses.

The Movement of Elephants

The movement of elephant herds should be regulated in Kaziranga National Park as there is a sizeable number of elephants reported in the census reports. Also, a large population always visits the Park during September, October and November and may remain up to May–June. During floods the elephants return to the Karbi hills. A certain number of elephants should be captured or sold (Lahon and Sonowal, 1973) to obtain revenue as well as to balance the animal population. It may be mentioned that the elephant also uses almost the same food plants as the rhinoceros.

Rhino Capturing

A certain number of rhinos should be captured and despatched to foreign countries which are interested in obtaining rhinos for their zoological parks. This may be a significant issue for obtaining foreign exchange as well as maintaining a good relationship with India. Thus, the population density could be easily balanced.

Environmental Education and Awareness Programme

To create an awareness about this great animal which is on the verge of extinction and has a limited distribution only in northeast India and Nepal, awareness programmes should be carried out. Environmental studies should be incorporated in the school curriculums from the level of primary education and also in the newly introduced adult education programme in India. The use of mass media like newspapers, television, radio and even posters could change the entire idea of hunting such a rare animal. This awareness programme is of the utmost significance as it will have a direct effect on the conservation strategies of the flora and fauna of our land.

Voluntary organisations or clubs for young persons with the determination to preserve nature will uplift the entire awareness programme. The organization of meetings, symposia, audio visual programmes, demonstrations, etc. may help to implement such ideas. There should be a collaborative programme for implementation of the objectives of conservation and propagation between those voluntary organizations and the Government departments.

Creation of a Clear Boundary

Although one side of the National Park has the natural boundary of the Brahmaputra river, the other side has no such clear cut demarcation to indicate a visible buffer zone which will help to prevent the further spread of human inhabitation.

Captive Breeding Programme

It is essential that captive breeding programmes be taken up for *R. unicornis* in selected zoological gardens of India. This will help us to understand the

reproductive behaviour and physiology in detail and aid in further rehabitation programmes in newly created ecosystems or rhino-land.

Proposed Oil Refinery at Numaligarh

The decision to establish an oil refinery at Numaligarh (less than 25 km away from Kaziranga National Park) might cause various problems in maintaining the ecology and further propagation of *R. unicornis*. The proposed refinery must strictly follow the code of the norms of pollution control, especially in waste treatment, so that the oil scum and other harmful material is destroyed before being discharged in the waste deposition dumps or in the Dhansiri river. The proper treatment of waste matter is of the utmost importance so that the Dhansiri river will not carry any such harmful material to the Brahmaputra river. It is clear that the Brahmaputra river, during the monsoon floods, discharges a huge amount of flood water into the Kaziranga National Park. This might carry the pollutants/oil scum through the main stream of Dhansiri or Mara-Dhansiri (the small tributary which is merged into the Dhansiri) into the Park.

The construction of very tall chimneys and the selection of a suitable site within the refinery premises might help in releasing the gaseous particles in a controlled direction. The development of regulating devices in releasing these gases or smoke towards the opposite side of Kaziranga National Park might help in controlling air pollution. A thorough and constant monitoring device of the refinery waste/smoke or gases both, at the site of release and within the Park, should be installed.

Research, Monitoring and Long Term Observation

A thorough research programme and long term observation of the behavioural ecology of the rhino concerning its propagation and reintroduction in a new rhino–land is essential in order to conserve this rare animal. Hence, forest institutes, other academic institutions, government agencies and the United Nations should work out a common strategy for its research and monitoring for long term observation. This is one of the major weaknesses of our wildlife conservation programmes. The action plan aims to develop this particular aspect with the inclusion of a national data bank on wildlife ecosystems, and *R. unicornis* in particular.

Nature has endowed India with an abundant and varied flora and fauna, particularly in northeast India where the ecosystem has distinct and unique features. The habitat of *R. unicornis* in Kaziranga National Park and its distribution or occurrence in other wildlife sanctuaries requires a specific ecosystem pertaining to its survival and propagation. The two decades covering the 1950s and 1960s saw an attitude of total neglect and irresponsibility leading to massive and unprecedented destruction of wildlife, in particular the rhinoceros and its habitat, a process that has not been totally arrested yet. Fortunately, the 1970s onwards have witnessed a change of approach and a new sense of awareness is being created regarding the environment and wildlife such as *R. unicornis*.

In the present study, with regard to the concept of conservation and propagation of *R. unicornis* with reference to the habitat of Kaziranga National Park, certain ideas and suggestions have been forwarded. There is no doubt that the objectives and management principles of Kaziranga National Park are mainly oriented towards the conservation of rhinos, although it is also the habitat of a large number of other precious mammals, birds, reptiles, fish and other invertebrate fauna along with various flourishing vegetation types. The different analyses and their suggested causes for the decreased rate of growth of the rhino population from 1972 onwards are alarming and whatever the rate of population growth, it is necessary either to increase the area or buffer zone of rhinos in Kaziranga, or to reintroduce rhinos in the neighbouring natural habitats. Several suggestions have been made with regard to increasing the area of Kaziranga national park by expansions through the neighbouring tea estate land or changing the present position of the highway, which will not only create highlands, but also support a new habitat within a vast area. Otherwise, serious implemention measures will have to be considered for:

i) creating new rhino-land in natural habitats with proper afforestation to enable the rhinoceroses to feed, breed and maintain sound health for flourishing and future continuity;

ii) encouraging the increase of the present rhino stock in the existing sanctuaries (viz. Manas, Orang, Pabitora, Sonai-Rupai, etc.), through well planned habitat management programmes.

Thus, it may be concluded that in order to propagate the rhino population, the area of Kaziranga National Park should be increased and it should be suitably

managed for this purpose. Otherwise, after a few years, it will jeopardise the propagation of the population as well as the general biology of *R. unicornis* because of the deteriorating conditions in the ecobiology of Kaziranga National Park.

REFERENCES

Bhattacharyya, B.K. and U.C. Goswami. 1987. **Some observation on the process of parturition, neonate and maternal behaviour in great Indian one horned rhinoceros *(Rhinoceros unicornis)*** . *J. Zoo. Outreach Org. Zoo. Print.*, 11(8) : 6–8.

Choudhur, A. 1987. **A railway threat to Kaziranga.** *Oryx.* 21(3): 160–163.

Choudhury, B. 1964. **Incidence of anthrax in rhinoceros.** *Indian Vet. J.*, 42: 75–77.

Gee, E.P. 1964. **The wild life of India.** Collins, London.

Lahon, R. and R.N. Sonowal. 1973. **Kaziranga Wild Life Sanctuaries, Assam.** *J. Bombay Nat. Hist. Soc.* 70(2) : 245–278.

Pathak, B.N. 1978. **Kaziranga National Park, and 1978 Census Report, Govt. of Assam, Department of Forest.** 1–46.

Patar, K.C. 1980. **Life history and economic value of the one horned Indian rhinoceros *(Rhinoceros unicornis)* in Kaziranga National Park, Assam, India.** *M.Sc. Thesis of Michigan State University, East Lansing.*

Patar, K.C. 1980. **Life history and economic value of the one horned Indian rhinoceros *(Rhinoceros unicornis)*** in Kaziranga National Park, Assam, India. *Trop. Ecol. Dev.* 329–332.

The author is: Reader and Project Director of the Research Scheme "Biology and conservation of Rhinoceros unicornis" : Department of Zoology, Gauhati University, Guwahati 781 014. Assam. India.

Acknowledgement

The author wishes to acknowledge Dr. Andrew Laurie, Department of Applied Biology, University of Cambridge, England; Mr. S. Debroy, Conservator of Forest, Ministry of Forest and Environment, Government of India; Dr. P. Sharma, Ex-Director of Post-Graduate Studies Veterinary College, Khanapara, Assam Agricultural University and Dr. B. K. Bhattacharyya, the Research Associate of the present research project for their suggestions and discussions while pursuing the present investigation.

Great Indian Rhino, Kaziranga N.P. (Kuper)