

EXECUTIVE SUMMARY OF THE GREAT INDIAN RHINO P.H.V.A.

The Population and Habitat Viability Analysis Workshop for the Great Indian Rhino was conducted for three days in Jaldapara Wildlife Sanctuary and for a day in the Gorumara Wildlife Sanctuary, along with concurrent sessions of the Asian Rhino Specialist Group. Some of the members of the AsRSG participated in Working Groups for the PHVA. Parallel Working group sessions were held alternately with plenary, or reporting sessions. Written reports were prepared by all of the Working Groups which form this Draft Report.

The Working Groups include the following subjects:

1. Population and Habitat Dynamics
2. Management Strategies
3. Threats (three groups for Trade, Human Impact and Public Awareness)
4. Funding requirements
5. Translocation and Reintroduction
6. Captive Breeding and Disease Management
7. Modelling

The Habitat and Population Group attempted to quantify and assess population parameters using data on population structure, number and density obtained from the forest department and habitat requirements using information on the behavioural and biological characteristics of the Indian rhino.

The present populations in the six protected areas vary from 30% to 65% of the estimated carrying capacity. In all the protected areas the growth rate of the population is relatively less compared to the rate of mortality mostly due to the high rate of poaching. Analysis of adverse factors indicate that flooding and grazing were the most frequently occurring.

The Working Group for Management Strategies focused on the preservation of the existing biodiversity with emphasis on maintenance or attainment of ecologically viable populations of Indian rhino. Recommendations were made to provide genetic continuity through expansion of existing protected area and building of corridors and to protect the existing populations by reinforcing the organisational structure to orchestrate, coordinate and intensify anti-poaching measures; vegetation and water management for all areas. Special management measures were suggested for medium and small population, such as the identification and inclusion of additional habitat and improvement of existing habitat. For small populations it was suggested additionally that they be maintained as genetic resource to facilitate research on reproduction biology of small populations and translocation of compatible breeding stock from one area to another. Other strategies for all rhino bearing areas were economic recovery of fringe human population, wildlife tourism, training, monitoring and veterinary care.

The Threats Working Group divided into three focused on Trade, Human Impact and Public Awareness.

The Trade Working Group focused on the rhino horn, including legal structures at the international and national levels, recommending measures for enhancing enforcement and dealing with poaching techniques, poaching pressures, market trends, trade routes. Substitutes for rhino horn usage were suggested.

The Human Impact Working Group focused on communities in proximity to the protected areas for the rhino, including demographic changes, patterns of dependency, attitudinal changes, socio-economics, and political/civil unrest.

The Public Awareness Working Group, including peoples' participation and NGO involvement; motivation of service personnel, education, extension and interpretation programmes; and eco-tourism.

The Funding Requirements Working Group did a costing of the requirements for all five areas for submission to international aid agencies under broad categories, e.g. Reinforcement of infrastructure for anti-poaching measures, Habitat management, Veterinary and rescue of marooned animals, Security Staff support, Eco-development, Compensation Payment, Translocation/Reintroduction of animals, Wildlife Tourism and Awareness, Training, Research and Monitoring.

The Translocation and Reintroduction Working Group discussed the means of 1. strengthening non-viable populations and 2. establishing new populations by reintroduction. The following factors were stressed: areas which have recently lost rhinos should be "preferred" but only where the original cause of extermination extension have been removed or in the process of being removed and where habitat requirements of the species have been satisfied; extent of recipient areas must have adequate rhino habitat for minimum of 100 individuals; area should have the strictest possible legal protection status with good implementation of enforcement measures; area should have a management plan and adequate overall infrastructure. Monitoring should be carried out on released animals.

The Captive Breeding and Disease Management Working Group looked at the history of rhino management in India and made recommendations on the basis of their past performance and present facilities including holdings of animals. It was felt that zoos that have had breeding successes should be given priority when pairing animals and that all efforts must be taken to assure maximum breeding potential. Specific recommendations were made in this regard. It was also felt that Guwahati zoo should not be used as an orphanage as this arrangement affects the management of the existing captive population there. It was felt that surplus males could be used for reintroduction research. In respect of health and disease the working group felt that more information and research was essential on neonatal mortality, infectious disease survey and post-mortem results of rhinos in captivity.



POPULATION AND HABITAT DYNAMICS WORKING GROUP

Members: P. Lahan, D. K. Ghosh, K. Surendra Varman, B. S. Bonal, S. S. Bist

1. Introduction:

Previous distribution of the great Indian one-horned rhinoceros (*Rhinoceros unicornis*) used to extend over a continuous belt along the lower foothills of the Indian and Nepal Himalayas. Various factors culminating towards disintegration of this continuous habitat have finally resulted in the rhino habitat being confined to a few pockets. Most of these pockets are small and isolated, providing little scope for animal migration.

Of these, the primary pockets of rhino habitat in India are on the Brahmaputra basin having rainfall ranging between 1800 to 3000 mm per year with a more or less uniform coefficient moistening of 0.7 to 0.9 for 4 to 6 months and 0.4 to 0.6 for the balance period. The alluvial and sandy porous soil has developed a typical vegetation consisting primarily of grasslands of different nature as follows:

- 1, Low alluvial savannah woodland,
- 2, Moist sal savannah and
- 3, Eastern alluvial grasslands.

Within these broad vegetation types the rhinos are now confined in the following pockets which have been subjected to study and observation.

Assam:

1. Kaziranga National Park,
2. Manas Tiger Reserve,
3. Orang Wildlife Sanctuary,
4. Pobitora Wildlife Sanctuary.

West Bengal

1. Jaldapara Wildlife Sanctuary,
2. Gorumara Wildlife Sanctuary.

1.1 Habitat Assessment,

The Indian rhino of *perrisodactyla* with the capacity of extensive lower tract fermentation and with its typical setting of teeth pattern, mouth anatomy and volume of intake, is cate-

gorised under bulk and roughage feeder. With additional rumen/reticulum volume of 53 % and 22 % than other ruminants, it requires a microbial synthesis of food intake for almost 20 hours and a ceacum digestion for around 3 hours. Reciprocal to this is a very fixed energy output enabling the animal to make limited movement in its foraging efforts and requiring a major time slot for assimilation of food. Based on this pattern the Indian rhino is basically grazer, the short grasslands being its prominent food habitat. But the adverse shrinkage in habitat due to either density independent or density independent factors, it is forced to take a considerable amount of browse material in its foraging strategy. Keeping all this in mind an effort was made to quantify and assess the population parameters and grass, browse available for rhino population in existing rhino areas.

The data on population number, structure and density was obtained from forest department census reports. The habitat type, food availability and other related data were obtained from the reports available on these areas. The population parameter such as growth rate, death rate, male-female ratio, female calf ratio and other related informations were arrived at from the census reports, natural and poaching (death) records. A previous study on rhino in Jaldapara by Dr.D.K.Ghosh, was utilised to obtain a food and feeding behaviour of rhino.

Tables 1 - 5 (next page) summarize the results. The tables summarize the following parameters:

- 1, Correlations between area available and the density of rhino in different habitat type.
- 2, Potential carrying capacity of the areas, taking into consideration of substantial development in the existing habitat in correlation to food and shelter patterns.
- 3, Habitat type and population number,
- 4, Mortality and growth rate and
- 5, Adverse factors in rhino habitat.

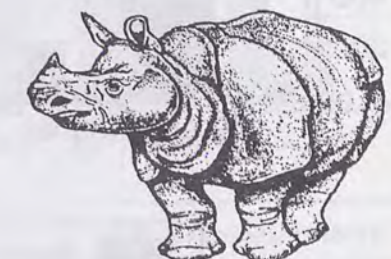


Chart # 1. Correlations between area available and the density of rhino in different habitat type.

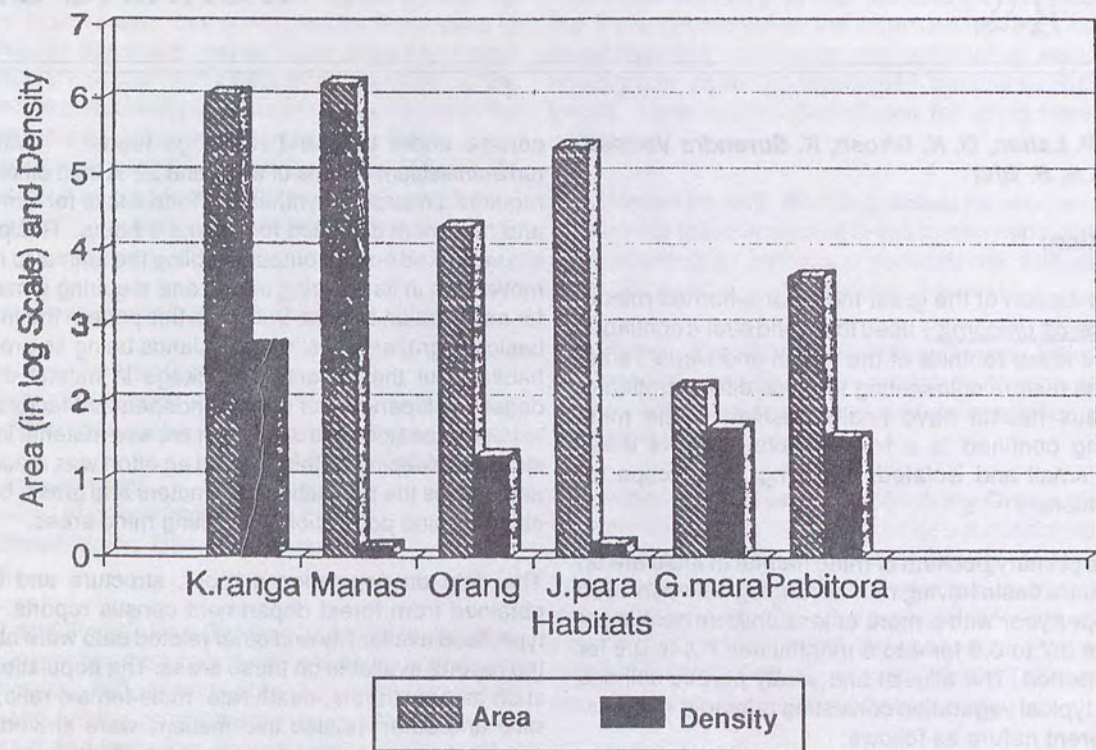


Chart # 2. Potential carrying capacity of the areas, taking into consideration of substantial development in the existing habitat in correlation to food and shelter patterns.

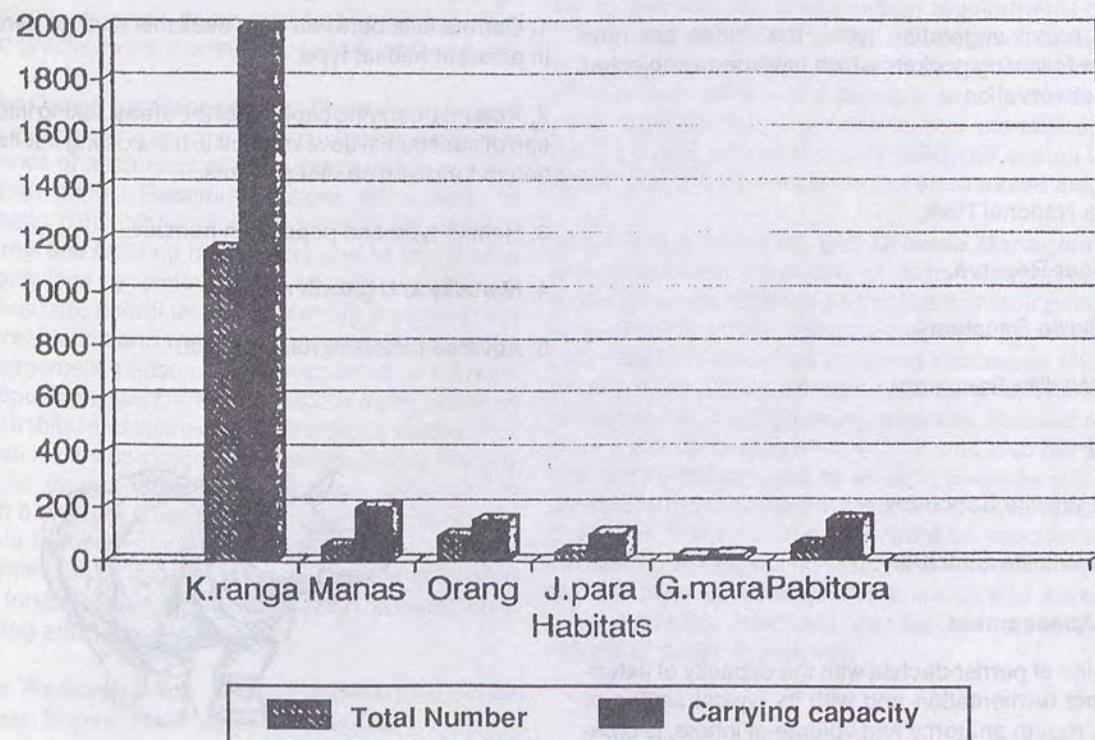


Chart # 3. Habitat type and population number.

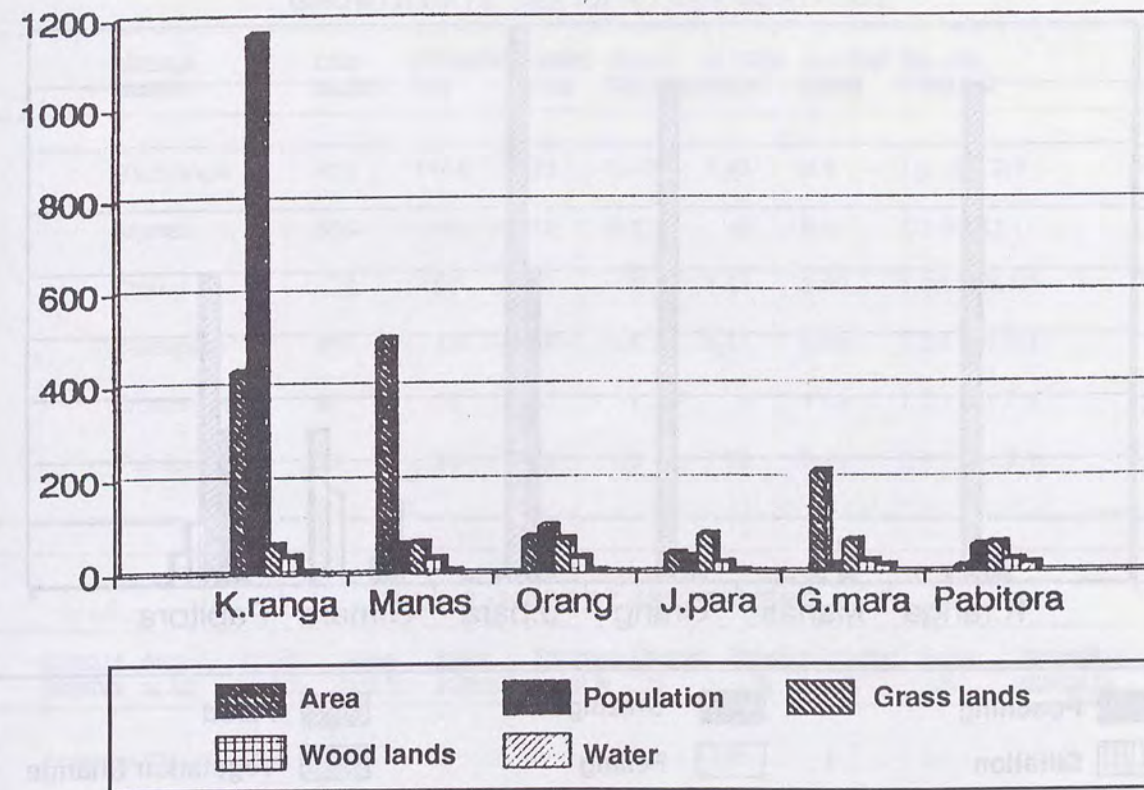


Chart # 4. Mortality and growth rate

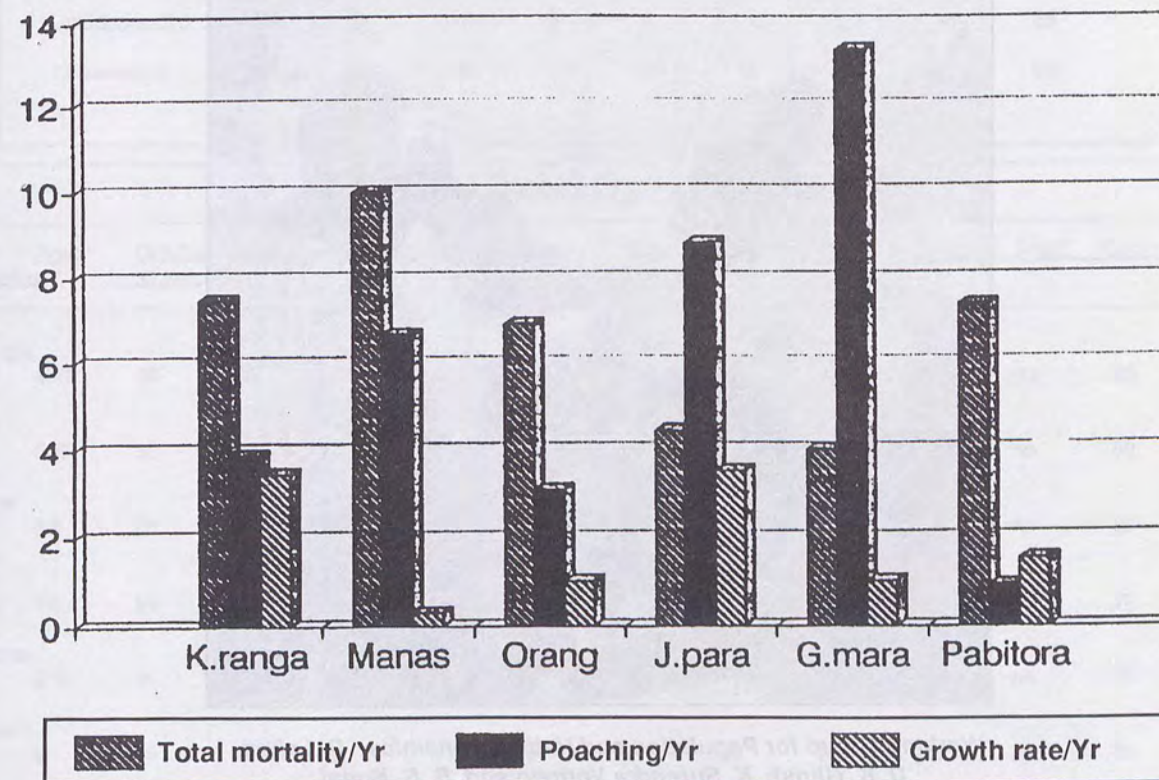
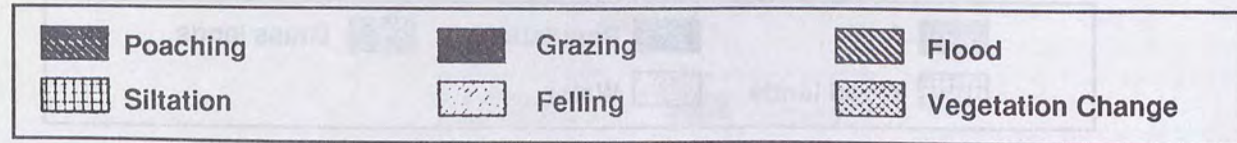
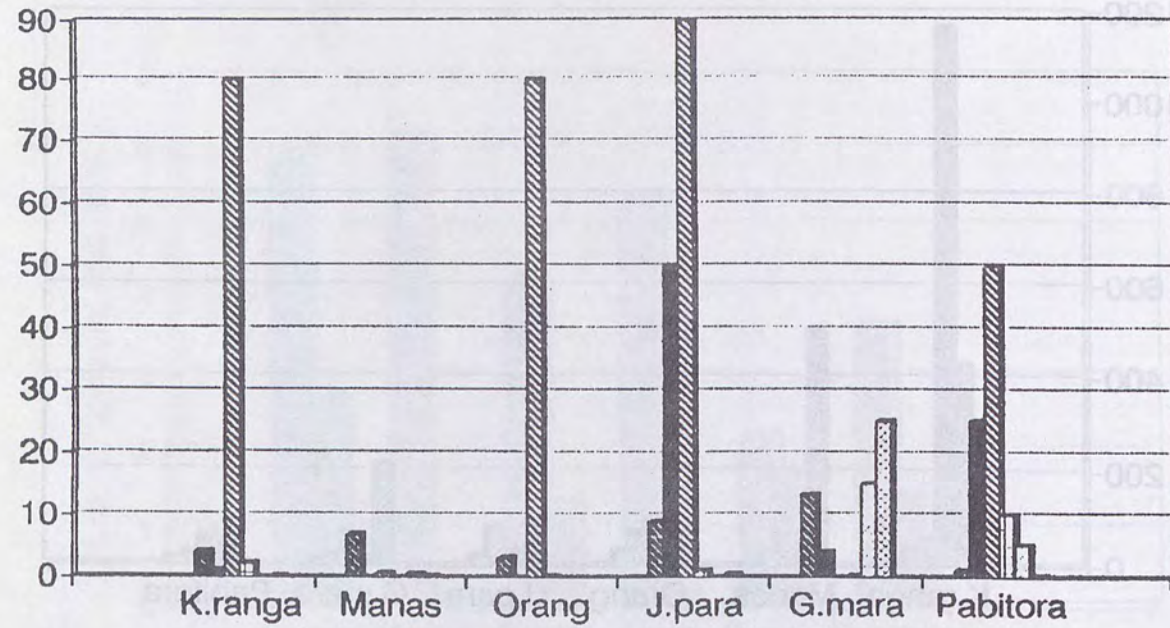


Chart 5. Adverse factors in rhino habitat



Working Group for Population and Habitat Dynamics: P. Lahan, D. K. Ghosh, K. Surendra Varman and B. S. Bonal.

Table 1: RHINO POPULATION DENSITY, GROWTH RATE, SEX RATIO AND MORTALITY

Name of reserve	Area sq. km.	Population size	Density/ Sq.km.	Growth rate/year	Mortality rate/yr	Poaching rate/yr	Sex ratio F:M & F:C
Kaziranga	430	1164	2.71	3.45	7.47	3.8	1:1 & 2.2:1
Manas	500	60	0.12	0.3	10	6.6	1:1 & 7:1
Orang	74	97	1.31	1	6.91	3.09	1.4:1 & 5.1:1
Jaldapara	216	43	0.16	3.5	4.41	8.82	1.3:1 & 1.2:1
Gorumara	9	15	1.67	1	4	13.3	1.7:1 & 1.7:1
Pabitora	39	56	1.56	1.5	7.39	0.89	2.1:1 & 4.2:1

Table 2 : HABITAT ASSESSMENT

Name of Reserve	Area sq km	Wood land %	Grass land %	Water bodies %	Encroach-ment %	Grazing %	Flooding %	Siltation %	Felling %	Vegetation change %
Kaziranga	430	28	66	8	0	1	80	2	0	0.2
Manas	500	30	65	5	0	0	0.5	0	0.3	0.2
Orang	74	29	70	1	0	0	80	0.2	0	0
Pabitora	39	19	80	1	0	50	90	1	0	0.3
Jaldapara	216	20	68	12	0	4	0	0.1	15	25
Guramara	9	25	60	15	0	25	50	10	5	0.2

Table 3 : FOOD TYPE AND COVER

Name of Reserve	Area sq.km.	Grazing	Mdg.	Browsing	Water	Sis	Bom	Tall	Other	Sufficient	Insuff.	Cover	Hiding
Kaziranga	430	45	30	0	5	0	0	10	10	yes	no	25	15
Manas	500	50	25	0	1	1	0	20	3	yes	no	30	20
Pabitora	39	50	25	0	1	1	0	20	3	yes	no	30	20
Orang	74	50	25	0	1	1	0	20	3	yes	no	30	20
Jaldapara	216	40	10	2	0	2	2	15	29	yes	no	35	25
Gorumara	9	35	15	2	0	2	0	20	26	yes	no	45	30



MANAGEMENT STRATEGIES FOR INDIAN RHINO IN PROTECTED AREAS

Members: M.K. Nandi, S.K. Sen, V.K. Yadav, P. Vyas, H. Sajudin, Nina Sengupta, Philip Wells

MANAGEMENT OBJECTIVE:

Preservation of the existing biodiversity and interspersion of habitat with emphasis on maintainance and attainment of ecologically viable population of Indian rhino and secure the existence of sympatric herbivores.

MANAGEMENT STRATEGIES FOR RHINO POPULATIONS IN KAZIRANGA, MANAS, ORANG

1. Provision of genetic continuity among rhino bearing areas like Kaziranga, Orang and Laokhowa through expansion of existing protected area and building of corridors to facilitate natural migration of individuals from one protected area to the other.

2. Rationalising and reinforcing the existing organisational structure for orchestrated and co-ordinated anti-poaching drive.

3. Intensification of anti-poaching drive:

a. Strengthening of radio-transmission network through establishment of adequate fixed and mobile station in all protected areas.

b. Provision of adequate mobile squads for land and waterways.

c. Building up adequate numbers of surveillance towers to be manned by properly equipped armed personnel at vulnerable points for prevention of entry of organised poachers in the park.

d. Strengthening of intelligence network for collection and transmission of information and introducing a formal mechanism for rewarding informers and staff for good work in prevention and detection of poaching

e. Provision of social facilities to park personnel:

- through building up of infrastructure for accomodation, education, recreation and family welfare

- providing adequate financial compensation to staff in the form of ration allowance, field allowance and proper uniform

Creation of a special legal cell for prosecution of offenders apprehended in connection with poaching of Indian rhinos and depredation of its habitat

Creation of international awareness to bring-in pressure on rhino horn consuming countries to stop illegal trade in rhino horn and other body parts.

4. To build-up escape routes for a substantial part of population to meet the contingencies of high flood

a. Raising and widening of the existing central (east-west) roads to facilitate intrapark traffic

b. Raising some more artificial high-grounds for providing shelter to flood affected rhinos and other animals.

5. Habitat-management

a. Extension of the existing Kaziranga National Park by inclusion of 490 sq.km. in the north and south.

b. Identification of areas for building up corridors if necessary through re-settlement of small enclave human habitation.

c. Eradication of weeds from grasslands and arresting colonisation by woodland.

d. Maintainance of adequate waterbodies to cater to the needs of foraging during pinch period through desiltation of Beels and eradication of undesirable aquatic vegetation.

MANAGEMENT STRATEGIES FOR RHINO POPULATIONS IN JALDAPARA AND PABITORA

1. Rationalising and reinforcing the existing organisational structure for orchestrated and co-ordinated management and anti-poaching drive (Jaldapara and Pabitora)

2. Intensification of anti-poaching drive: as in case of mega population.

3. Habitat-management

a. Identification and inclusion of additional rhino habitat to make room for growing members

b. Eradication of weeds from grasslands and arresting colonisation by woodland.

c. Judicious use of fire in a prescribed burning regime in restricted areas for production of nutritive fodder.

d. Amelioration of degraded habitat by raising fodder plantations

e. Elimination of grazing by domestic cattle from prime rhino habitat in a phased manner for improvement of the habitat and prevention of outbreak of cattle-borne diseases (Pabitora & Jaldapara)

f. Diversion of controlled discharge of water from the existing channel of the Sil Torsa into its old course- Char Torsha for rejuvenation of grasslands in Jaldapara block.

4. Translocation of compatible breeding stock from one area to another to increase the genetic variability and to raise the recovery rate of the population.

MANAGEMENT STRATEGIES FOR RHINO POPULATION - GORUMARA

1. Extension of the existing protected area to include a variety of ecotypes suitable for holding Indian rhino and other ungulates

2. Intensification of anti-poaching measures: same as other population

3. Habitat management:

a. Development of meadow in erstwhile Khunia forest village through cultivation of fodder grass and rigging water-holes.

b. Canopy manipulation in man-made plantations and grasslands colonised by woodland

c. Judicious use of fire in a prescribed burning regime in restricted areas for production of nutritive fodder.

4. Research needs:

Objective: maintainance of this small population as a gene-pool to facilitate research.

Strategy:

Study of reproductive biology of this small rhino population through registration of individuals and monitoring the population with reference to reproduction and population dynamics

REINTRODUCED POPULATION & POTENTIAL AREAS FOR REINTRODUCTION

Objective:

1. To reintroduce Indian rhino in the potential areas of Assam state viz: Laokhowa WLS.; Burachapori R.F.; Kochmara R.F.; Kuruwa R.F.; Disangmukh area and some areas of Uttar Pradesh and West Bengal in its erstwhile ranges.

a. Evaluation of habitat suitability index for reintroduction

b. Capture and translocation of breeding stocks from Kaziranga N.P.

c. Monitoring and assessment of reintroduced population and its habitat

DUDHWA:

Objective: Attainment of an ecologically viable population within a reasonable time-span

Management Strategies:

a. To strengthen the existing breeding stock by inducting additional breeding stock (2 males + 4 females)

b. Expansion of the power fenced area in phased manner to

about 40 sq.km. to ensure survival of growing population

c. Removal of the power fence on attainment of founder population of 50 individuals.

COMMON OBJECTIVES AND STRATEGIES FOR RHINO BEARING AREAS

Objectives:

1. Economic rehabilitation of fringe population through provision of adequate inputs on beneficiary oriented and community development items identified in consultation with local people.

Strategy:

a. Face to face communication with target groups and local leadership

b. Formation of ecodevelopment committees involving existing rural institutions including Panchayats

c. Preparation of micro-plans for formulation of site-specific eco-development plans

d. Organisation of awareness campaigns and integrating the message of conservation through the local cultural ethos.

2. Wildlife-tourism

Objective: Judicious promotion and regulation of tourism in protected areas

Strategy:

a. Development of appropriate site specific interpretation facilities.

b. Lifting of existing restrictions for visit by foreigners in rhino bearing areas to raise additional resources.

c. Evolving a mechanism for ploughing back of tourism revenues in conservation areas and sharing of such revenues with people in the fringe areas.

3. Training:

Objective: To impart training to park personnel on issues relevant to management so as to achieve the management goals.

Training topics:

a. Grassland ecology and managing such grasslands for the rhino population.

b. Tranquilisation, rescue and veterinary care

c. Management of the captive elephants

d. Census techniques of rhinos and its associated species.

e. Erection and maintainance of energised fences

f. Interpretation and extension

g. Arms training to park personnel

4. Monitoring:

Objective: To monitor the habitat and population in rhino-bearing areas on a two-year basis.

Strategy:

a. Using satellite imageries of rhino-bearing areas for

assessment of extent of habitat suitable for Indian rhino.

b. Undertaking census of rhino-population at regular intervals to classify them into age-sex classes.

5. Veterinary care

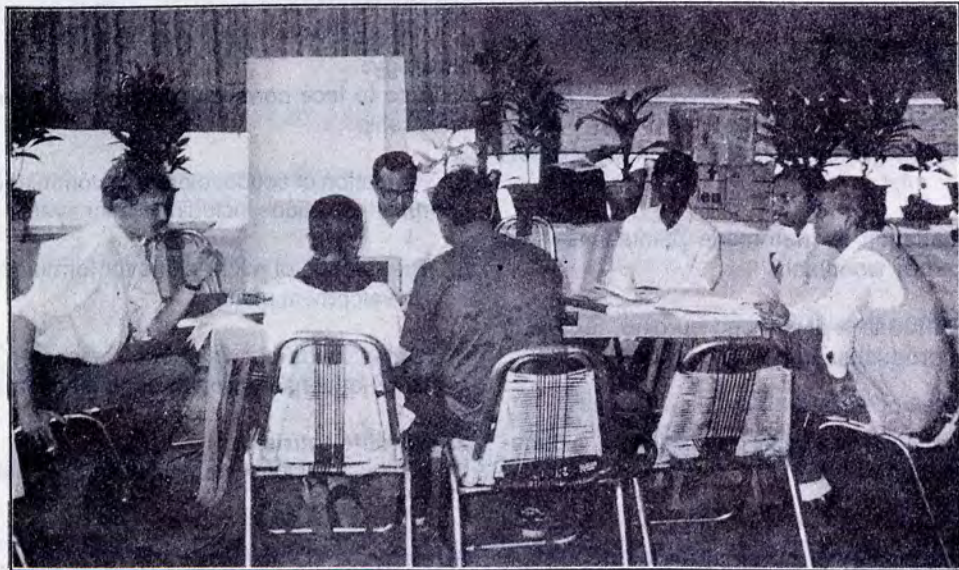
Objective: To ensure a healthy wild population of rhino and other associated species.

Strategy:

a. Establishment of suitable veterinary units in all protected areas.

b. Immunisation of domestic cattle in fringe areas to prevent outbreak of communicable diseases like anthrax, foot & mouth, rinderpest etc.

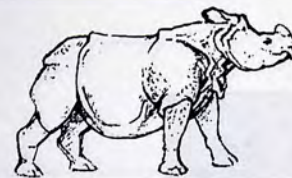
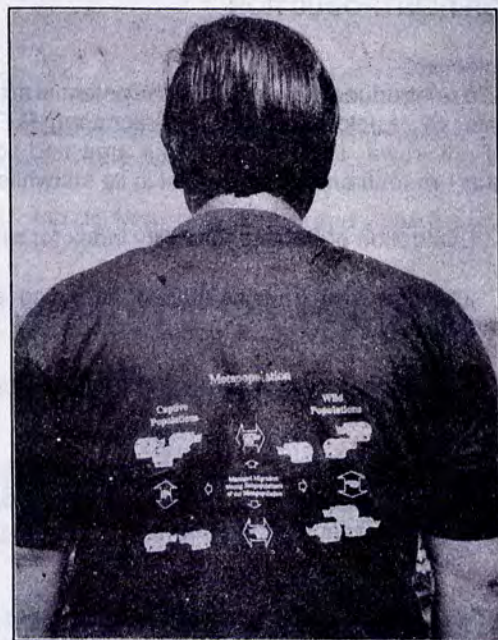
c. Monitoring the health of wild population.



Management Strategies working group at Jaldapara Wildlife Sanctuary



Dressing for meta-population management at Gorumara Wildlife Sanctuary



TRANSLOCATION AND REINTRODUCTION

Members: R. N. Hazarika (Facilitator), J. D. Sale, N. van Strien, Mohd. Khan, S. Bajimaya, D.N.S. Suman, A. Bhat-tacharya (Secretary)

1. Objectives of Translocation

1.1 To strengthen non-viable populations in areas which have adequate potential for becoming permanent self-perpetuating populations.

1.2 To establish new populations by reintroduction in suitable areas (habitat and security) where it was indigenous before its extermination within the species historic range, preference being given to areas which have recently lost rhinos. Only where the original cause of extermination extension have been removed or in the process of being removed where habitat requirements of the species have been satisfied. Here namely Laokhowa W.L.S. of Assam may be regarded as an example.

1.3 To maintain high heterozygosity in the population

1.4 To distribute populations over a large geographic range area in order to prevent loss of the species owing to mass catastrophe.

2. Identification of the recipient areas: Characteristics (Basic criteria).

2.1 The extent of recipient areas must have adequate rhino habitat for minimum of 100 individuals.

2.2 Legal status: Area should have the strictest possible legal protection status, e.g. national park and W.L.sanctuaries which is the best one in India

2.3 Actual law enforcement on the ground must also be of high quality, e.g. no significant poaching case in recent years.

2.4 Area should have a management plan and full implementation there of including adequate infrastructure with adequate elements of proper management of the translocated / reintroduced population.

2.5 All the above characteristics should be the subject of detailed studies of the proposed area.

Following expertise should be represented in the study.

- Wildlife Ecologist
- Vegetation Ecologist /Botanist
- Management/ Law enforcement
- Sociologist

3. Funding

3.1 Detailed budget must be prepared and funding should be assured before the commencement of the project.

4. Preparatory Phase

4.1 Composition and quality of introduced group :
It is recommended that in the case of a location which currently has no rhinos an initial (in the first instance) reintroduction should be minimum of 10 animals consisting of 3 males and 7 females. It is important that animals selected should be young, healthy individuals. The optimum age group being young adults at the beginning of their reproductive life. Such animals are better able to withstand the stresses of translocation and are also ready to contribute reproduction in the new area. Old adults should be rigorously avoided. After breeding of the initial group has been successfully established supplementation by further translocation programme should be undertaken.

4.2 Identification of donor area:
In the first instance suitable animals for translocation should be sought from pocketed or isolated groups (doomed animals) whose future existence is in danger. First priority will be given to pocketed animals in areas which have no legal protection status. For example, animals which have permanently strayed from protected areas. The next priority would be to examine the possibility of surplus animals being available in protected areas, bearing in mind that high density of rhinos does not in itself necessarily imply that carrying capacity is exceeded.

5. Released Phase

5.1 Methodology of capturing and translocation:
Preferred method of capture should be drug/chemical immobilisation and subsequent transquillisation (sedation) during transportation and transit. If feasible, it is recommended that captured animals be immediately despatched to the recipient areas where they should be held for an in situ acclimatization period in stockade with appropriate measure such as electric fencing must be implemented to prevent interaction. Depending on food availability released animals should be initially restricted to an area totalling 2 to 3 km per animal.

6. Follow up phase:

6.1 Monitoring of released animals
It is extremely important that the released animals are systematically monitored including their effect on the habitat and till such time as they have established equilibrium with the new surroundings and are breeding successfully. It may be considered whether radio collaring of a small number of individuals should be undertaken as an aid to monitoring their movements.

In cases where new animals are being introduced into an existing population great care should be taken to avoid adverse interaction between existing animals and the newly introduced ones. Adult males should be especially monitored in this regard.



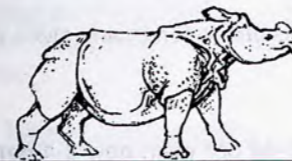


Mr. S. Bhattacharya leafing through one of the many CBSG, SSG, IUCN publications that were on display during the PHVA at Jaldapara



Members of the Trade, human impact and public awareness working group - E.B. Martin, J. Williams, J.T. Mathews, V. Menon and M. Aggarwal.

* The Modelling Working Group has been working on the data supplied by other groups and the result will be published in the second draft of this report



TRADE, HUMAN IMPACT, AND PUBLIC AWARENESS WORKING GROUP

Members: Vivek Menon, Facilitator; J.T. Mathew, Secretary; Mohit Aggarwal, Asst Facilitator - Trade; Suprava Patnaik, Asst. Facilitator - Human Impact; Esmond B. Martin, E.A. Sumardja, S.K. Das, B.R. Sharma, John Williams

Introduction

The group decided to focus primarily upon a ten year horizon, though for selected areas of discussion, a longer term view was discussed. The discussion was broken into three broad areas, dealing with the relationship of the rhinoceros to people living beyond the boundaries of the park. These were:

Trade Issues, focusing on the rhino horn. Discussions included legal structures at the international and national levels, enforcement, poaching techniques, poaching pressures, market trends, trade routes, and substitutes for rhino horn usage.

Human Impacts (other than poaching), and focusing to considerable extent on the communities in proximity to the protected areas for the rhino. The discussions encompassed demographic changes, patterns of dependency, attitudinal changes, socio-economics, and political/civil unrest.

Public Awareness, including peoples' participation and NGO involvement; motivation of service personnel, education, extension and interpretation programmes; and eco-tourism.

I. Trade

1. Legislation - International, National

1.1 International -- What is the impact of the international legal structure on pricing?

A major assumption is that the legal international trade in rhino horn will not reopen, and that this is positive with regard to the Indian Rhino. [If the African Rhino horn trade reopens, this would reopen the market, that would have a negative effect on the Asian populations. The probability of the existing CITES ban being lifted is estimated to be less than 5 percent, because 80 countries (two-thirds of the Conference of Parties) would have to approve it.

Based on increasing stockpiles, there will be continuing pressure from Southern African countries to reopen the trade, but the chances are still slim that the trade will reopen. Note: the destruction of existing known stockpiles of rhino horn would very much decrease the possibility of reopening the trade, as suggested by Resolution 6.10 (CITES) which is technically voluntary.

1.2 National

Are effective national legislations in place in range and consumer countries?

1.21 Range Countries

Both India and Nepal have legislation protecting the rhinos, in effect for many years.

1.22 Consumer countries

The penalties in the consumer countries (China, Yemen, and Taiwan) are so low for dealing in rhino horn, and so little enforced that effort should be made to increase the penalties in those countries. This would deter smuggling efforts. (Note that the response of Taiwan and China to the US Pelly Amendment has been to ban the internal trade in rhino horn.)

In Taiwan, there are 3-5 tons of horn stockpiled [300 kilos are used annually]. China had 8 1/2 tons stockpiled, [650 kg used per year]. With rhino horn prices decreasing, and in our opinion continuing to decrease, stockpilers now have a risky investment.

During the next decade, existing stockpiles can more than meet the projected demand, and it is unlikely that the price will go up. The long term outlook beyond a decade depends primarily upon the continued use of rhino products in the production of medicines. If such use is discontinued, a continuing decline in price would be expected.

Note: there is domestic trade within Nepal for Rhino products other than horn, such as urine, blood, and nails, but existing legislation should discourage poaching just for these products.

2 Enforcement

What is the state of Enforcement in India and Nepal?

Potential poachers perceive the enforcement in Nepal to be strong. However, the perception may be stronger than the fact. In India there are 10 or 12 departments concerned with enforcement concerning rhino poaching and related trade. Coordination between these departments needs to be strengthened.

Intelligence and Informers

In parts of Africa (particularly Namibia), there are large payments to informers which results in significant successes in catching poachers/traders. In India and Nepal, intelligence is a low priority. There needs to be established well-publicized reward schemes within intelligence networks which will provide significant payments for good information.

Intelligence is the aspect of enforcement that would bring the greatest success for the least investment. The present strategy on poaching needs to be closely examined. While more money is required for patrolling, firearms, etc., a higher priority is required for intelligence networks. One study in Zambia showed that investment in information gathering from informers is 30 times more effective than other strategies.

Other agencies than wildlife need to be involved after the rhino

is poached. The gold and narcotics section of the police agencies in Namibia are the enforcers. Other agencies (i.e. police, revenue intelligence) with existing enforcement capability, should develop information units specific to rhino horn.

In Assam, it would be most desirable to have an Elite group of forest people trained in combatting poaching. Intelligence support from outside would be most welcome.

3. Poaching Techniques

In Nepal, poisoning as a poaching technique has recently been introduced.

In India, pit poaching and shooting were the traditional techniques. But more recently, electrocution and poisoning have been added to the poachers' arsenal. The traditional pit trapping has declined greatly. More traditional techniques have been used in West Bengal, while new techniques are coming into Assam.

In general, more powerful weapons and techniques are available which makes it easier to kill the rhinos. Since more effective tools are available for poaching, this leads to a potential increase over time in the kill, in the absence of changes in other factors.

4. Poaching Pressure

The following section describes for each protected area the present population, recent poaching activity, and projected rate of poaching over the next decade.

Nepal

Area: Royal Chitwan
Population: 375 - 400 rhinos
Recent poaching: None for many years, but has restarted again. Now it is having minor fluctuations but an upward trend per year. 1% per year in recent past
Projected pressure: 1-3% per year projected for next decade

Area: Royal Bardia
Population: 43 rhinos
Recent Poaching: Almost similar enforcement measures as in Chitwan, but because of proximity to the Indian border, there are increase probabilities of poaching. Three rhinos were poached from Bardia in 1993 (7.5 percent).
Recent poaching: 5 percent per year

India

It is noted that a number of animals, as many as 25, exist in pockets outside of reserves in Assam and West Bengal, and are vulnerable. Poaching pressure on this population is unpredictable.

Assam

Area: Manas
Population: 60 rhinos
Recent Poaching. Lost 22 Rhinos in one year (1993), but average of 5-6% per year in recent years
Projected poaching 5-6 %

The chance of a 20 percent kill is one in ten in any given year.

Area: Kaziranga
Population: 1164 rhinos
Recent poaching: Now losing 30-40 per year, now 3-4 percent per year.
Projected poaching: projection is 4 percent annually
Because this area now has the largest number of animals poached, it is a high priority area for action.

Area: Orang
Population: 97 rhinos
Recent poaching: 1 poached in three years
Projected poaching: 1-3 percent annually

Area: Pabitora
Population: 56 rhinos
Recent poaching: 3 out of 56 poached last year.
Projected poaching: 6% poaching annually projected for next decade
Over the decade this could (20 percent chance) increase to 10 percent.

West Bengal

Area: Jaldapara
Population: 34
Recent Poaching: 3%
Projected Poaching: 2-3 percent

Area: Gorumara
Population: 13 rhinos
Recent poaching: 1-2 percent
Projected poaching: 1-2 percent

U.P.

Area: 1. Dudhwa
Population: 11
Recent poaching: Not a single case so far, rhino are now kept behind an electric fence. When the population exceeds approximately 25, a release outside the fence is planned, Projected poaching: 5-10 percent

5. Trade Routes

The information on trade routes for rhino products out of India and Nepal is sparse, but a few routes have been documented: (1) from Assam and West Bengal through Bhutan to SE and East Asia; (2) from Assam and West Bengal through Nepal into SE and East Asia; (3) from Assam to Myanmar and on to SE Asia; and (4) from Assam and West Bengal to Calcutta (apparently now little used).

Porous borders such as the ones shared by India with Bhutan, Nepal, and Myanmar, encourage poaching. Such borders only more clearly indicate the need for intelligence networks.

6. Substitutes

1. Discouraging the use of Rhino horn in medicines. The government in Japan discouraged the use of horn for medicinal, and there is no evidence of illegal movement into Japan since 1980. If the use of horn in medications is sufficiently discouraged, it would lower demand and presumably, price.

2. Dagger horn in Yemen. The Substitution of buffalo horn and other substitutes for rhino horn needs to be further encouraged.

II. Human Impacts

1. Population

Information was obtained on population for a number of villages adjoining the Jaldapara reserve. No data was collected for Assam or Nepal, and such studies would be useful in planning eco-development for communities in all locations near the protected areas for the rhino. The data for a cluster of three villages adjacent to Jaldapara are shown in figure 1.

The following points are made:

1. Fertility has shown modest declines over the period, from a Total Fertility Rate of 4.8 in 1971 to an estimated 3.7 percent in 1991. There was some variation in the fertility rate in the villages. Family planning is practised almost not at all. Family planning support is available, but there is no extension work, materials are expensive for the villagers, and health facilities for these villages are limited. Village women mostly go to the hospital for birth. Changes in fertility do not greatly affect the short term growth of population, due to population momentum. However, the maintenance of high fertility over the next three decades would result in continued population growth in the following 25 years.

2. Mortality showed improvement from 1971 until 1990. However, there has been an alarming increase in mortality including child mortality since 1990, due to an increase in cerebral malaria. Malaria generally is not treated in the villages.

3. There has been substantial in-migration from Bangladesh over the period. This was heaviest in the 1970's and during the most recent five years. There is a possibility that there will be net out-migration from the villages to urban centers starting in the near future. Over the next three decades, the out-migration of small numbers of people from these villages has a highly significant impact on reducing population growth. In the short term, migration has more impact on size of population than changes in fertility.

4. From 1971 to 1991, the number of people and the number of households has approximately doubled in number. A substantial part of this increase is attributed to in-migration of households from Bangladesh.

5. The number of households that will be in these villages after 20 years (2011) is not much affected by fertility patterns or population program. Hence, barring major catastrophe or social dislocation, the number of households that will be here in 2011 may be estimated with reasonable accuracy. These households increase in number.

6. The population change has had dramatic impacts on landuse patterns of the local population. In 1971, the village was relatively egalitarian, and most of the households had between 2.5 and 6.5 acres. Very few were landless. But by 1991, 35 percent of the households had less than .5 acres, and a considerable majority of the households had less than 2.5 acres and could not produce the majority of the food they consumed.

7. The entire increase in the number of households over the next 20 years will consist of households that are extremely landpoor, or almost landless. These households have far more dependency on the reserve, not only for firewood, wood, food, and grass for their own consumption, but as a source of resources for sale. Data have been collected on the present patterns of collection by the landpoor households.

8. The level of fertility will have a relatively great affect on the size of the population 30 or 40 years in the future. If the level of fertility is lowered in the near future, based upon the experience of the villages visited, a near stationary population could be achieved by the year 2015 with a population around Jaldapara as an example that would be not more than double the present population. This would require major investments in a health infrastructure providing maternal child health care and family planning services, plus participatory population outreach, which could be part of other participatory work with the villages.

2. Patterns of Dependency

All households in villages are dependent upon forest for fuel wood. Landpoor households have additional dependencies on the forest. 75 percent of the landless people get 30-50 percent of their income on the forest (fuelwood collection for sale, and collection of non-timber products, such as grass, food, etc.)

Households with cattle depend on areas of the reserve for the grazing of their cattle. This grazing poses dangers for the rhino and degradation of some grasslands.

In the short term, the human dependency on wooded areas does not directly affect the rhino habitat, but it could affect it indirectly through overall changes to the ecosystem.

3. Changes in Attitudes

3.1 Attitudes to the Rhino

Jaldapara

Field work in villages around this reserve indicated generally positive attitudes toward the rhino. If rhino were more numerous (100 animals is the projected carrying capacity, three times the current number), the rhinos would go out of the reserve more frequently and negative feelings could increase.

Kaziranga

There is extensive crop damage by the rhinos, more than one lakh. If local people support the poachers, it is due to the socioeconomic conditions of a small percent of the population. Local people need compensation for the damage occasioned by living adjacent to these animals. They need massive ecodevelopment programmes in the villages surrounding Kaziranga.

Nepal

There is considerable animosity by the local people to the rhinos, because of the number of animals that come out of the park into their fields.

3.2. Attitudes toward the reserve

Asking the local people to stop the use of the reserve meets with local opposition. There is some grazing and cutting of grass allowed in some areas. Imposing too much protection without giving an alternate strategy does create ill-will towards the reserve.

This antagonism will be greater where there is extensive property damage or threat to personal injury. These damages and dangers do not come primarily from the rhino, but from other wild mammals, such as wild boar, elephant, and leopard. These damages coming from the reserve require compensation.

Chitwan

The local people like to put their cattle into the park, and they are chased out; cattle are sometimes confiscated, creating a lot of ill feeling

Kaziranga

There are 130 villages (20,000 population) on the southern boundary. There are also villages across the river on the north. The park creates some economic opportunities for these villages. Park personnel hire villagers (only) for work: grass cutting, road construction, and other jobs. The park has constructed high school and other facilities for the local people.

4. Political and Civil Unrest

Assam

Civil disturbance has affected rhinos in Manas and Laokhwa. Militants have killed some rhinos; even if the militants do not directly hurt the rhinos, opportunists may take advantage of the breakdown of law and order. In West Bengal, no problems have been seen.

III. Public Awareness

1. People's participation and NGO involvement :

People's participation in the management and use of protected areas is dependent on the legislative structure which allows or prohibits such use. In Nepal, the legislation allows for some collection. The legislation in India currently prohibits the use of forest products by the local communities in the reserves. The development of participatory approaches is essential in areas where use of protected area resources must be made compatible with conservation objectives.

With regard to the rhino areas, only in West Bengal have first steps been taken toward the establishment of participatory mechanism. In Jaldapara, the West Bengal Forest Department has established eco-development committees with both reserve officials and elected community members. The committees have served to greatly improve the quality of the dialogue between the reserve staff and local people. The committee structure is further used for channelling eco-development funds. The response by the community members has been very positive. West Bengal has been playing an important role in developing this sort of participatory models bringing the cooperation of local villagers in conservation management.

In Assam, a structured eco-development programme is on the drawing board but has not been funded. The parks and reserves hire local people for daily wage labor and recruit staff from the villages. A few other benefits have been provided to local communities.

In Nepal (Chitwan) local villagers are allowed in the park for 15 days per year by permit. The cost of the permit is extremely low, and the villagers may take out as much thatch as they can by non-mechanical means.

2. Motivation of Service Personnel

- Training

To ensure optimum protection of protected areas, the needs of the forest personnel must be satisfied. In addition, specialized training is required in (1) wildlife; (2) interacting with local communities; (3) arms training.

Most of the forest guards are trained for commercial forestry, but not for wildlife. There is some training for divisional forest officers and range officers, but no training of forest guards exists in West Bengal or Assam.

There is great need for training the protected area personnel in community relations. Building rapport with the local communities is essential in gaining and maintaining their cooperation, and minimizing negative impacts (poaching, habitat degradation etc).

- Incentives

Motivation is also associated with incentives. There is a need for hazard allowance for forest guards, who are often in the forest camps while their families are living in distant villages. There is an official policy in India for giving rewards for outstanding work or special accomplishments, but the rewards are small, when given.

- Education, Extension, and Interpretation Programmes

In India, most people surrounding the rhino reserves have never been to school, and illiteracy among adults is high. (In the rural parts of Jalpaiguri district, 70 percent of the population is illiterate). Improved education of the local people is essential for the long term health of the conservation areas. The forest department needs to become a special advocate to improve the education in the communities that border the reserve. Such education is a prerequisite to many eco-development projects, and is viewed as a pre-requisite to reducing population growth. Interpretation facilities made available to the people surrounding the reserve should be greatly expanded and improved.

- Eco-Tourism

Wildlife tourism exists for most rhino preserves in both India and Nepal, with the present exception of Manas. Economic benefits of tourism should be channelled to local communities whenever possible, and can serve to increase local incomes. Ecotourism involves (1) the experience of wildlife; (2) minimal impacts on species and habitat; (3) minimal negative impacts on local communities.

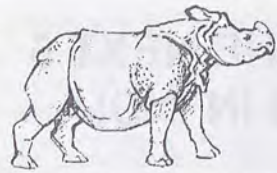


FUNDING/EQUIPMENT REQUIRED FOR THE NEXT 5 YEARS FOR MANAGEMENT OF RHINOS IN INDIA

Working Group : S. S. BIST (Facilitator), V. P. Singh, S. Pal Choudhury, R. P. Saini, R. S. Prasad

After discussion with the Management Working Group, funding proposals have been assembled as per broad heading mentioned below, keeping in mind the management requirements of the rhino populations of different sizes in India. Proposed amounts have been figured in Millions of US dollars for submission to international aid agencies.

Items	W. Bengal	Assam	U. P.	Total
1. Re-inforcement of the existing protective infrastructural facilities& antipoaching measures.				
a) Communication network	0.17	16.70	0.015	16.885
b) Wireless network	0.14	0.20	0.005	0.345
c) Arms & Ammunition	0.03	0.035	0.005	0.070
d) Watch tower, Night vision devices/Binoculars etc.	0.07	0.325	0.015	0.410
e) Intelligence network	0.035	0.17	0.015	0.220
f) Mobile Squad (land & water ways)	0.05	0.085	0.005	0.14
g) Construction of Boundary wall, energised fences, etc.	0.65	0.00	0.035	0.685
2. Habitat Management				
a) Removal of water hyacinth & desiltation/diversion water channels	0.17	0.17	0.00	0.34
b) Habitat manipulation	0.105	0.10	0.35	0.555
c) Relocation of enclave villages	1.000	0.35	0.00	1.350
3. Veterinary Care & Rescue of marooned animals				
a) Establishment of Veterinary Units	0.065	0.165	0.015	0.245
b) Cattle Immunisation programme	0.05	0.055	0.015	0.12
c) Rescue operationCentres	0.005	0.025	0.065	0.095
d) Captive breeding Centres	0.00	0.035	0.00	0.035
4. Support for security to Staff	0.05	0.115	0.015	0.18
5. Eco-development	1.000	7.000	0.35	8.35
6. Compensation Payment	0.00	0.400	0.00	0.400
7. Translocation of Rhinos for re-introduction in viable populations	0.335	0.335	0.330	1.000
8. Wildlife tourism and Nature Awareness programme	0.150	0.680	0.085	0.915
9. Training of staff	0.025	0.035	0.015	0.075
10. Research, Monitoring & Evaluation	0.07	0.165	0.075	0.31
11. Contingencies	<u>0.330</u>	<u>2.855</u>	<u>0.15</u>	<u>3.335</u>
Total	4.5	30.00	1.560	36.060



CAPTIVE BREEDING AND DISEASE MANAGEMENT WORKING GROUP

S. C. Sharma* (Facilitator), S. Battacharya (Co-facilitator), N. C. Bahuguna, M. Dee, V. Kumar Pillai, T. Chakraborty, M. Adi, B.S. Bonal

CAPTIVE BREEDING PLAN FOR INDIAN RHINOS IN INDIA -- The members of the above mentioned group after discussing among themselves at length, are furnishing the following recommendations for Indian Zoos having Greater One Horned Rhinoceros:

1. The zoos that have successfully bred Indian Rhinos in India are Mysore, Guwahati, Calcutta, Delhi, Hyderabad, Patna, Chandigarh and Kanpur. Of these, Delhi, Calcutta, Guwahati and Patna have breeding pairs.

In addition to the above zoos, Nandankanan Biological Park, Orissa also has a pair, but to date no breeding has been achieved since their arrival in 1974 & 1976. At the present time, it is unknown as to why these animals have not bred.

Recommendation: The zoos that have had breeding successes should be given priority when pairing animals.

The current situation at Nandankanan should be investigated as to why no breeding has occurred. Estrus cycle in the female should be determined. If she proves to be sound, she should have access to the male that she is paired with. If no breeding occurs, then another male of breeding age should be made available to her, either by transfer of the male from Chandigarh or transfer of the female to Chandigarh if facilities are available.

2. The following zoos having single animals and also have experience in breeding Rhinos:

Zoo	Sex of animal	Age of animal
a. Kanpur Zoo	Female	20 years
b. Hyderabad Zoo	Male	12 years
c. Chandigarh Zoo	Male	17 years
d. Mysore Zoo	Male	18 years

Recommendation: All efforts must be taken to ensure maximum breeding potential. A breeding age female must be made available to the proven breeder in Chandigarh. Breeding age females should also be made available to Mysore and Hyderabad, as they have previous breeding experience with this species. A breeding age male should be placed at Kanpur with the proven breeding female. Moreover, Kanpur Zoo has four male rhinos born from this adult female. One of the zoo-bred male rhinos of Kanpur should be exchanged with the breeding age male at Bombay so as to add more genetic heterozygosity.

3. The Bombay Zoo and Trivandrum Zoo have males, but have had no breeding experience:

Recommendation: In the future, as more zoo bred females become available, these two zoos should receive priority.

4. Guwahati Zoo at present is being used as an orphanage for rhinos and a breeding center. At present it has a number of excessive males.

Recommendation: Guwahati zoo should not be used as an orphanage as it is now. This arrangement has affected the management of the rhinos that are currently there. The orphanage should be attached with the Kaziranga National Park or other rhino rearing area where facilities could be established to rear young animals. After rearing, these young and sub-adult animals, should be reintroduced into the National Park. If more females could be available from the orphanage, these animals may be put in the *ex situ* breeding programme. Excessive males could be used for reintroduction research.

5. In some zoos like Calcutta, no breeding has occurred since 1984 though the present pair has bred once before. It is now reported that this pair has been showing signs of reproductive behaviour but little information is available on the efforts made so far in detecting the etiology of this fact.

Recommendations: After discussion with the participant representing Calcutta Zoo, it is proposed that the moat should be modified to slope gradually on the animal side. This will allow more room for the animals to move. More visual barriers should also be provided to give a better opportunity for courtship behaviours and to avoid injuries during these behaviours.

The following information will be helpful when attempting to breed this species:

a. Signs of heat — Restlessness, frequent urine squirting, lack of appetite, whistling, vulva flashing, and the vulva becomes swollen and pinkish in colour. The female and the male will seek each other's company.

b. The oestrus cycle should be observed closely. In general the estrus cycle is approximately 30 - 45 days. From our present knowledge of the Indian rhinoceros in regard to reproductive biology, it appears that males in captivity can breed up to 39 years while in the case of females it is up to 31 years. An observation has been made that if the male whistles during courtship behaviour, the chances of breeding are higher.

c. The female remains in heat for 18 - 20 hours. So the male should be allowed close proximity to the female for the first few hours after the onset of heat and should be allowed to enter in

the enclosure of the female between five - six hours when the peak period is approaching.

d. As far as breeding behaviour is concerned, all zoo animal care staff should observe points a, b, and c mentioned above so as to maximise breeding potential.

e. Animal care staff - all personnel working with rhinos should be given proper training on reproductive biology and physiology of the species (see a, b, and c).

General recommendations

1. Though at this stage, we are not in a position to reintroduce captive born rhinos into the wild, in the future if the breeding programme goes well, we should think over the probabilities of reintroducing those captive born individuals. The group recommends a feasibility study to determine if indeed reintroduction of captive born rhinos into the wild is a possibility, and if so what captive management activities should be undertaken to insure a successful project. Consultation with the Reintroduction Specialist Group of the IUCN is highly recommended.

2. All the data related with each individual, namely date of birth, date of any acquisition, transfer, date of death and cause of death should be made available to the Kanpur Zoo, being the National Studbook Keeper, Species Coordinator, and Central Zoo Authority.

The National Studbook Keeper should take all the responsibility to send all the data to the International Studbook Keeper.

3. All the zoos that maintain the species should have educational materials available to the visitors and they can be in the form of signage, brochures, or pamphlets in the light of conserving the species.

HEALTH AND DISEASE

1. In respect of health and disease, there is little information available about neonatal mortality, infectious disease survey and post-mortem results of rhinos in captivity. There are also no authentic records available on the etiology of mortalities in

the wild which could be helpful to combat health hazards in captivity.

Recommendation: Every zoo that maintains this species will perform postmortem for each and every animal and the results should be made available to the Regional Studbook Keeper, Species Coordinator and Central Zoo Authority. The postmortem results may be maintained in accordance with the format as already laid down in the guideline by the Central Zoo Authority.

Additional required information may be added to the existing format of C.Z.A.

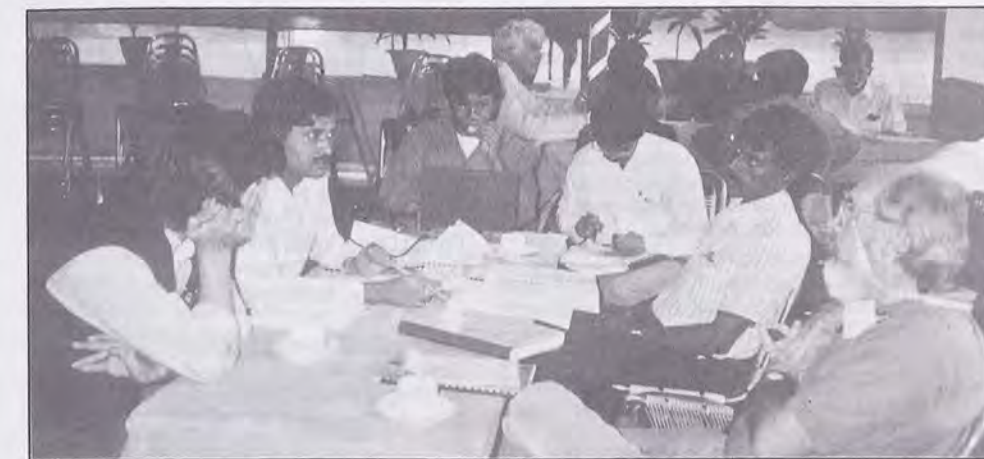
2. Infectious diseases have been found to cause a good percentage of mortality. Some viral infections were reported from Hyderabad Zoo and bacterial infection from Guwahati Zoo. The causative agents appear to be viral and bacteriological.

Recommendation: The disease which can be prevented by periodical testing and vaccination like rinderpest, haemorrhagic septicaemia, tuberculosis should be taken into consideration for routine prophylactic measures. The treatment records should be kept properly.

3. Fecal sample examinations should be done on a regular basis for the detection of parasites and the treatment should be followed accordingly. A heavy parasitic load may be an important factor in infertility.

4. Although we are not involved with the wild population we would recommend that post-mortem examination should be done by the group of veterinarians so as to have an idea about the disease pattern in the wild. This will be useful in planning future interactive management strategy. The results from the wildlife department be made available to the studbook keepers, species coordinator and the C.Z.A.

5. Artificial insemination. At this point, the technology is not available for AI. We need more information on the reproductive biology of this species. Perhaps, this technology will be available in the next 3 - 5 years. At that time AI could be revisited. We do not recommend hormonal manipulation at this point.

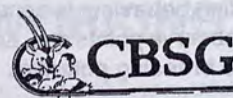


B.S. Bonal, S. Battacharya, M. Adi, T. Chakraborty, U.K. Pillai & M. Dee in the Captive Breeding & Disease Management working group

* Mr. Sharma could not be present for the full meeting and Mr. S. Battacharya acted as the group facilitator.



IUCN SSC ASIAN RHINO SPECIALIST GROUP



FULL AsRSG MEETING & P.H.V.A. WORKSHOP

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