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CONTENTS

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THE POPULATION:

1. NUMBERS AND DISTRIBUTION:

During the year at least 151 rhinos have been seen and the presence of a further 50 - 60 deduced from sightings and tracks in outlying regions and the rate at which new individuals appear in a small study area.

Table 1: POPULATION SIZE

Individuals classified in National Park, Janakpur, Kuchkuchia and Bodhrani.	151
Estimate from tracks and sightings frequency in Kuchkuchia, Jaghdari, Kandromoli and Liglig-lomar Area east of the National Park.	20
Estimate from tracks and sightings in Bandarjola, and Nawalpur.	20
Unidentified individuals in the park and Janakpur estimated from frequency of sightings of new individuals.	15
Report of rhinos resident north of Rapti in Rani Khola.	5
TOTAL	211

There are atleast 200 rhinos in Nawalpur and Chitawan. A six day trip east of the Park was made in November. During one morning seven rhinos were seen within four square miles of forest at Kuchkuchia eight miles east of the Park boundary. The presence of a further 20 between Janakpur and Liglig lomar was estimated and there are recent reports of rhinos from as far as forty miles east of Saurah. Two short visits have been made to Nawalpur and Bandarjola and plans are being made to survey these areas and the Rani Khola and Hetaura districts in detail. The Rou Valley south of Bankatta is now devoid of rhinos.

The main concentration of the population is in the Saurah Area in and around the north-east corners of the National Park. Here the population density is about nine rhinos per square mile of forest or grassland. The western area, around Surang, Tiger Tops and Khorla Mohan

2. POPULATION DYNAMICS:

151 different rhinos have been classified into age and sex groups. 14 have since died and 120 are recognizable again. The table below shows the classification of all 151.

Table 2: POPULATION COMPOSITION.

	MALE	FEMALE	UNSEXED	TOTAL
Adult	36	50	4	90
Sub-adult	10	7	5	22
Calves I(0-1yr)	3	3	5	11
CalvesII(1-2yr)	2	1	7	10
CalvesIII(2-?)	6	3	9	18
			Total	151

Animals are classed as sub-adult only after they have left their mothers. They are distinguished from adults by shorter horns, smaller size and a less aged appearance to the hide. Some mothers with calves are classified as adults though similar in size and appearance to sub-adults.

The population composition is 23.9% adult males, 33.0% adult females, 14.5% sub-adults and 26.6% calves accompanied by adult females.

Table 2: POPULATION STATISTICS COMPARING A SAMPLE OF 46 RHINOS FROM THE WEST WITH A SAMPLE OF 105 RHINOS FROM THE EAST

	WEST(46)	East(105)	Total(151)
Adult sex Ratio	100M:100F	100M:165F	100M:138F
Adults as a % of the Pop.	65.0	57.0	59.5
Subadults as a % of Pop.	15.2	14.3	59.5
Cows with calves as a % of the population	19.5	28.6	25.8
Cows with 1st year calves as a % of the population	6.5	7.6	7.3
% of adult females with 1st year calves	21.4	23.5	23.0
% of adult females with calves	69.0	86.0	81.0
No. of calves in each age class	1 3	8	11

There is a considerably higher ratio of identified adult females to males in the east and a higher percentage of the females are with calves. Class III probably includes calves from two to four years old and the indications are that calves are staying longer with their mothers in the east than in the west. The birth rate is also higher in the east whether expressed as a percentage of the population or a percentage of the adult cows. Possibly females leave rhino deaths were receorde.

Table 4: RHINO DEATHS

CAUSE:	ADULT MALES	ADULT FEMALES	CLASS II (M)
Poached	2	3	1
Killed by Tiger:			
Died of old age:			
Died of Tusk Wounds received: Fighting	2		
Drowned in Muddy Lake		1	
Cause Unknown		1	

No rhinos are known to have been poached between March and October. Some deaths could easily go undetected in the thick grass areas. The year's recruitment in the sample of 151 is 11 or 7.3% The death rate is 8% of which 4.0% were poached and 4.0% died naturally. Thus there is a near static population which will increase if poaching is reduced.

2. THE HABITAT

1. COVER:

From May onwards grasses shoot upto five to twenty feet high. Forest and scrub vegetation becomes lush and dense and covers for rhino is plentiful. Shelter from the sun and escape from man are the main reasons for seeking cover. Many rhinos use degraded scrub and forest areas adjoining the paddies to lie up in during the day and emerge at night to feed in the paddies. This happens to a lesser extent in the west probably because there

There is no shortage of unexposed drinking water after May, rhinos will even drink the ~~dirty~~ diluted urine solution which fills their wallos. A large number of temporary wallows appear in muddy depressions in the forest, scrub and grassland and these are used extensively by rhinos in addition to permanent wallows. For five months more than half my observations of rhinos were of wallowing ones.

Table 5: OR RHINO OBSERVATIONS WITH THE ANIMALS WERE WALLOWING ON FIRST ENCOUNTERS

June	55	Sept.	85
June	71	Oct.	62
Aug.	73	Nov.	13

During the monsoon there were often periods of upto four days without rain, or of upto a week with very little. These days were hot (upto 34^{0}C) and very humid (upto 90%) and rhinos invariably spent the heat of the day in wallows or thick cover. Heavy rain and drops in temperature, which usually lasted two to three days, always reduced the numbers of wallowing rhinos. By October the use of temporary wallows had decreased and by November most such wallows ~~dec~~ had ~~decreased and by November~~ dried up.

3. FOOD:

The following vegetation types exist in the rhino areas and are used seasonally to varying degrees.

(i) Forest

(A) Khair-Sissoo (Acacia catechu, Dalbergia sissoo) is the most dominant type on riverbanks and islands upstream from Saura on the Rapti and on the Narayani. It is associated with old wet riverbeds of Sacchurum species and a wide variety of shade shrubs and grasses. Rhinos eat sissoo leaves and twigs in both areas, the new growth in May and June being favourite.

(B) Sal (Shorea robusta) is the dominant forest type over the Churias and Someswar Ranges down to the Rapti Valley and it occures in patches northwards across the valley until it re-stats in the Mahabarat in thick stands. It is associated with trees such as Terminalia tomentosa

Dillenia pentagyna, Bauhinia malabatica, Dalbergia latifolia, Mallotus Philippensis, Mimosa rubricaulis and Ficus auriculata, all of which have been eaten by rhinos. Sal saplings themselves are also eaten and so are many shrubs and creepers; eg: Spatholobus roxburghii. Many are evergreen or shed their leaves throughout the year as new one grow so browse in the forest is an important part of the rhinos' diet.

3. Food:- (i) Forest cont.

(C) Belar (Trewia nudiflora) characterizes a forest type which extends along the Rapti Valley from Lothar to Saurah in areas where cultivation has been stopped. It is a riverine type and is superceded by the sal towards the hills to north and south. There is more from Sukibar west to Bhim-ligh Island. Simul (Sombax malabaricum) is a common component and the shrub Callicarpa macrophylla is common in the understory. Many reach eight to ten feet high in places, Phyllanthus emblica is another common shrub and both are eaten to a certain extent by rhinos. They eat the fruits of the belar tree during July, August and September and the seeds germinate in their dung after passing through the digestive tract. Simul leaves are eaten occasionally.

Shade grasses from the forest include Setaria pallidefusca paspalidium flavidum, Chrysopogon aciculatus and Digitaria setigera. These are eaten after the tall grasses have passed the green shoot stage. They flower during or just after the monsoon and are used on into the winter. Themeda caudata occurs in fifteen to twenty foot stands in clearings in the sal forest or as lower understory in the same forest.

ii) Grasslands:

(A) Saccharum munja, Saccharum spontaneum and Phragmites Karka occur as mixed fifteen to twenty foot hight thickets with the dominant varying in different areas. Themada caudata also occurs in these stands in some areas. They are grazed extensively as fresh growing shoots after burning inearly spring and are eaten on throughout the year to a lesser extent. Their main value is as green shoots with a high protein ratio. Areas which do do not burn become a mass

S.munja occurs on some sandy soils as a six to ten foot grass. S.

S.spontaneum is one of the first species to invade old damm

river beds and the sandy soils nearest the river.

B) Short grasses grow under the tall grass canopy and in open areas. The silt laden bed of the Sarti is covered with lush grass growth within eight days of a fall of the water level during the monsoon. Species used by rhino include Cynodon dactylon, Eragrostis japonica, Brachiaria ramosa and Andropogon spp. They grow swiftly after the start of the rains and flower during the monsoon. There is almost complete utilisation of this food component by rhino, deer and domestic stock.

C) In areas previously occuried by villages until evacuation in 1964 Imperata cylindrica grows interspersed with taller Saccharum munja and other Saccharum spp. I. cylindrica is hardly used by the rhino though they have been seen to feed on young roots occasionally. It is the main thatching grass cut by the villagers.

D) Arundo donax, Saccharum spp. and Typhus spp. grow around lakes and streams in thick stands and are eaten by rhino throughout the year. The subaqueous vegetation is also an important part of the rhino diet. Both components have a peak of productivity and hence utilization in April, May and June.

3.FOOD - (ii) Grasslands cont.

E) In areas heavily grazed by domestic stock and overexploited by wood cutters a variety of recolonising plants have taken hold. Lantana, Callotropis gigantea and Colebrookia oppositifolia are unpalatable, but rhinos are second only to goats in the variety of these plants which they will eat. Artemisia moorcroftiana, Callicarpa macrophylla, Ogosteamon lectanthroides and Solanum torvum are eaten by rhinos and goats, but not by cattle or buffaloes. The leaves of Zizyphus jujuba are unpalatable to most species, but the berries are eaten by almost every herbivore in such areas. The creeper Ipomea quamoclit also becomes common in such areas and is eaten by cattle and rhino alike.

F) The fields of the local farmers provide an almost year around source of food for the rhinos. They travel up to three or more miles from the forest edge at night to raid crops. A breakdown of the food available to them in the fields is given below:

Table 6: FOOD AVAILABLE TO RHINO IN FIELDS DURING THE YEAR

	MAIZE: JOWAR	GRAINS	PULSES	POTATOES	WHEAT
June	*				
July	*				
August	*	*			
September		*	*		
October		*	*	*	
November		*	*	*	
December			*	*	*
January			*	*	*
February				*	*
March					*
April					
May					

seeds which grow in the crops are also grazed. Although rhinos do not eat mustard plants they damage the crop while feeding on thistles and

Despite attempts by the Forest Department and the Villagers to keep them out the rhinos make nightly visits to the fields from June onwards and show very little fear of the villagers' shouts, drums and firebrands. The food consumed in the fields is highly nutritious and in some cases the major part of their daily intake. It makes a very important contribution to the total energy intake of the population. Even small babies less than four months old have been seen feeding on paddy.

4. BEHAVIOUR : (A) INDIVIDUAL

1) Activity Pattern : A lot more data has been collected, the general pattern during the monsoon was an early morning return from grazing grounds to wallow where there were often spectacular displays of aggression at a few wallows even though many others were available. Some individuals left the wallows early in the day and either moved to other wallows or spent the day in the forest lying down or feeding. Showers often fell at about 1400 and cooled the air down to 27° or 28°C. This would often bring rhinos out to graze earlier than the normal 1500 or 1600 start. The early evening was spent wallowing again or in further feeding and last sorties to the fileds took place after 2000.

4 BEHAVIOUR :(A) INDIVIDUAL - 1) Activity pattern cont:

A period of rest is usual during the night and can take place anywhere. Rhinos have been seen apparently dozing in the before sunrise. Rhinos were never seen sleeping in the fields. They always returned to the forest to rest.

Rain does not have any immediate effect on rhino behaviour. They continue doing what they were doing before the rain, but the sentiments accompanying drop in temperature may later encourage leaving a wallow or thick cover.

During winter, mist lies in the Rapti Valley until two or three hours after sunrise. As described in they may progress to rest feeding under these conditions often continues after dawn, even in the fields.

ii) Movements: Typically an individual or a cow-calf pair make a piece of forest, or a wallow, their base for sometime. Individuals vary in the length of time they remain resident in one place. Apart from nocturnal trips to the fields two adult cows with calves have remained within one square mile of grassland and forest for the whole year and six adult cows with calves remained within a two square mile area for six months. One cow and calf with an accompanying subadult spent from May to July in the Jaimungala Area and then moved to Baraxhari on the north of the Rapti where they were often seen during the day in one of the five wallows, until October. Since then they have not been seen together, but the subadult is now at Iterni two miles upstream from Jaurah.

A cow and a new born calf frequented a Jaimungala wallow for two weeks in August, moved to tall grassland a mile away in Kachwani in September and are now at Bagmara three miles away, north of the Rapti. Another cow left her calf on 12th July, at Jaimungala, and went to Janakpur five miles east where she gave birth and remained with the calf until the 12th December. She is now back at Jaimungala frequenting the same area she was seen in from December to July.

Nocturnal movements into the fields have been ecorded u to three and a half miles from the nearest forest. Males generally travel further than cows and calves. One male travelled at least nine milesin in the fields alons and a further two miles in the forest. Males cross the river more readily than the cows and calves though all can swim. They get carried down by the current a long way and puff and blow spray with only their noses and ears above the water.

Movements of bases to other areas is connected with the condition of the vegetation in the forest and the fields. The numbe of 'rhino days' (the sum of the number of days on which each individual was seen) recorded for the Jaimung-ala area dro ed from 167 in July to 45 in October. Twenty-three individuals we e seen on more than five days each in July as against six individuals in October.

4. BEHAVIOUR: (A) INDIVIDUAL- ii) Movements:

The biggest dro in numbe s came at the end of Jly July, when at least ten individuals left to live on the north of the ~~-a-ti.~~ Tji Torti. This movement coincided with the end of the maize crop at Jaimungala and the rhinos which moved began feeding on the growing rice near Bodhrani, Saurah, Harahhari and Dumkauli. Anothe five cows with calves have not been seen since July and may be furthe west in the long grass areas near Doomria.

The rhinos from the Surang Valley moved north during July and s ent the monsoon season in the Sukibar Area nea er the villages, The Sura ong Valley was deserted in August and Se tember, but is now reporu-lated. Similarly, the Jaimungala area is slo ly being ~~re~~ rep ulted though nocturnal tri s acrossthe rive er through the fence are still common.

(B) INTE SPECIFIC:

Recording of reactions to human small or auditory or visual stimulation continues. A lot de ends on the individual concerned. Sub-adults have a very lo flight thr-e shold. Some adults of both sexes are almost without fear of man, advancing head u , sniffing to ithin a fe fe t of an observe sitting in a tree and then returning to lie down in a wallow des ite shouts or even stones being thro n at them.

The more usual es onse is immediate flight o er loratory advances accompanied by snorts and followed by a fast trot away and honking.

Three people have been inju ed by rhino in the Saurah area since / September and one was killed on 12th December. All attacks have been with the tusks in the lower jaw. Three of the attacks, including the fatal one, were by co s with calves and one by an adult male. Another adult male attacked a man on a bicycle. Rhinos have been observed grazing with domestic stock in open areas with herdsmen close by. It is an almost daily occurrence in several laces. The herdsmen retreat to trees and the rhinos graze peacefully with the cattle and buffaloes.

An adult rhino was attacked by four tigers in the Chumka Area on 27th November. From the tracks it a peared that the rhino was brought down twice, but still managed to escape.

(C) INTRA SPECIFIC:

i) Communications: Twelve different vocalizations can now be recognized. A parabolic reflector, recently obtained will be used to help

Visual signals are few. The head low, mouth open threat posture adopted in disputes at waterholes is the most common. The ears are partly sweept back and the lower jaw tusks exposed. Visual recognition can be poor. One calf followed an adult male half way across a moonlit river before realising that he wasn't his mother and rushing back to the bank and 100 yards upstream where his mother waited.

(C) INTERSPECIFIC. i) communications cont:

After an encounter with another rhino or man a male rhino will normally urinate in one or more backward and downwardly directed squirts of strong smelling urine. Cows do not so the same, but on several occasions cows have defecated after an encounter with humans. The "flehmen" attitude is adopted by rhinos smelling other urine, but has never been seen while smelling dung. It is seen in males and females alike.

Daily inspection of twenty-five dung piles or dunging areas in the Jaimungala area for twenty days showed that they were typically used daily for a period and then left unused for periods varying from two days to two weeks or more. Dunging on a pile seems to be a reflex action to the smell of fresh dung. If there is no new dung on a pile one day the likelihood of dung appearing the next day is reduced. Several individuals have been seen using the same pile and a calf usually does so immediately after its mother.

ii) Associations: Very rarely can more than two rhinos been seen moving together as a group and remaining together for any length of time. Aggregations at wallows or feeding grounds occur, but each individual, pair or trio arrives, moves and leaves independently. Two subadults attached themselves to cow and calf pairs for periods of more than three months. One calf often tried to accompany its mother and young sibling, but was periodically driven off by the mother. Two groups of three subadults remained together for periods and reformed again.

iii) Interactions:

(a) Mother-calf: Physical contact between mothers and calves is frequent, but between others is hardly ever seen except in fightings or courtship. Naso-nasal greeting, nasal rubbing on flanks and simply lying in wallows in physical contact are the commonest with calves of over a year old. On several occasions prolonged licking session have been observed both by cows to calves and vice-versa. The licker stands behind or beside the other and licks a small area of skin very regularly for a long period (perhaps some secretion is obtained in this manner.

Younger calves seek much more physical contact. They climb onto the mother's backs, rest with forelegs up on her back, walk down her flanks rubbing them with their heads and flanks, rub heads on her head and horn, bite her ears and horn and rub her head with slightly opened lips. Calves often seek physical contact during inter-actions with other rhinos or encounters with man. A class II calf put her head on to her mothers rump while another adult female and calf walked by their wallow and then took it off again.

Calf and cow aggression has been observed between a cow and her old calf, both after the birth of a new calf up to four months before. If there are fewer class III calves in the next one would expect more cow-calf aggression there also. This is being checked.

(C) INTRA SPECIFIC- 111) Interactions cont:

(b) Aggressive: Adult males on meeting may either ignore each other OR or threaten each other. The talks may consist of a head on approach, loud snorts, squirt urination and the touching of horns, lo on the ground. One may turn and flee honking or a fight may deve in which the tusks are used considerably. Two males have have died during the year as a result of tusk wounds. During a fight in November one male lost half his horn and both were deeply gashed.

One of the animals returned from six miles to the south of the Earti the next night. He walked very slowly, dragging a back leg and fed for less than two hours during the seventeen he was followed for.

Most observations of aggressive behaviour have been made in wallows, where threats and OO fights were very common during the monsoon. Rhinos concentrated at few wallows though many were available, The wallows used varied from day to day. Most interactions involved cows and calves. The approach of another rhino to the wallow might trigger off an interaction or one might start after both parties had been lying peacefully in the same wallow.

Attacks normally take the form of a charge. The head is held low, mouth open, tusks bared and the charge is accompanied by a loud roar. In only 30 out of 41 occasions did an attack result in physical contact. Normally the rhinos stopped, facing each other at a distance of one to two feet. The charge is repeated or one of the animals turns and goes. In 75 out of 41 occasions an attack was preceded by a short fight, the aggressor.

The ~~end~~ end result is normally the diversion of the loser to another place in the wallow or away from the wallow altogether. Approaching rhinos sometimes turn and go on hearing the snorts. Others take no notice and walk straight in. Even between the same individuals in similar situations the results of encounters were different on different occasions. One cow and 7 calf always occupied the same position in a wallow whatever other rhinos were present. They never took part in any aggressive interaction.

Calves were often involved in the interactions. In one case a two month old calf attacked an adult female after she had chased off his mother. The cow chased him in the opposite direction, but he charged twice more. The cow stopped in front of him each time with tusks bared roaring loudly. Eventually, the calf's grunts were answered by soft squeaks blows from his mother who returned to fetch him.

Ten cows with calves, one single cow and one bull were the users of one particular wallow during July. As many as 24 assembled at the wallow during a single morning. The bull, though often wallowing with the cows took part in only one aggressive interaction. On that occasion he fled from the single cow who invariably fled from the other cows.

Detailed analysis of lying positions, direction in which individuals face in relation to other in the same wallow and the results of encounters is being carried out. So far no clear pattern has emerged.

(C) INDIAN BOIPIC- iii) Interactions Cont:

(b) Aggressive: cont.
Similar behaviour is recorded by Gee (1958) for Kaziranga rhinos though he never saw fighting between cows. In Chitawan such aggression is much more frequent in the eastern part of the population than in the western, Tiger Top's area.

Perhaps it is a response to higher population density. It seems that wallows are being used as an excuse to display aggression. Rhinos gather at one wallow to compete over it without obvious reason. This suggests that although the population has enough food the limited forest area is socially crowded.

(c) Sexual
The characteristic "grunt-squeak" issued by males in pursuit of females are issued at a lower intensity by females when pursuing males. They have been heard in every month of the year with highest frequency in March. The furrows which males make in the earth ground by dragging hind legs along on the toes while urinating have increased in ?? frequency during November and December and were common until April. They have been recorded in every month and their lower frequency during the monsoon may be due simply to bad conditions for track reservation. The function of these furrows is ?? unknown. They have been made by males after unsuccessful attempts to mate cows or after encounters with man. Similar furrows may be made by males while mounted on cows.

Evidence for a possible oestrus periodicity of between 34 and 44 days was obtained in July. A bull was seen grazing and moving with a cow and her two year calf from the 14th to 16th June. On the 15th June he mounted the cow and remained mounted for one hour stationary in long grass. The bull was not seen again with the cow and calf until 11th July when he attacked her and succeeded in turning her right over on her back by lifting from the side with his head between her front legs and from the side. The calf grunted from a distance in the tall grass. The cow urinated frequently while grazing beforehand and the bull "flehmened" repeatedly on smelling it.

The bull was not seen with the cow the next day nor until 27th July, when the cow started to follow the male around sniffing at his penis and his urine, urinating herself and uttering a soft "squeak blow".

Calf birth distribution since November 1972 has been as follows:

Table 1: CALF BIRTH DISTRIBUTION

BIRTH	No. OF [illegible]	BIRTH	No. OF [illegible] BORN
January	2	July	2
February	0	August	2
March	0	September	1
April	2	October	1
May	0	November	1
June	0	December	0= TOTALS

(c) Sexual cont:
There is a possible peak of births during July and August, which would tie in with a peak of mating activity in March and a 16[illegible] births

5. MANAGEMENT:

1) Burning: Burning is essenti l to vide lush high rotein fibre ratio gras shoots ithin the rk. It should be done as early as ossible to encourage the rhin to stop feeding in the field . N e t ucti n of o est by i e h s been seen but an earlie cooler burn ill reduce the likelihood o any forest destruction. uch of the gras land ill burn by late December. It the long gras areas are not u nt t e e is a very low roductivity for that area. The dried stems, mat ed and light excluding, revent regrowth and the area ecomes bar en until the monsoon rains slowly ot the te s. oth the sal f rest and the grassland have been bu nt for th usands of years and are themselves the result of years of burning.

2) Thatch grass utting: Cutting of thatch grass in itself has no ef ect on the rhino o ulati n. Im erata cylind ica is not used as a food to any great extent. It is ossible ho eve , that it is the annual cutting of the grass hich e etuates it. A long s ell ithout cutting might result in Saccharu s taking over. The eginnings of such a roces c n be een at Khoria Mohan, Doomria and Kachwani. Ex eriments need to be done on the differential effects of bu ning and cutting on the gras invol-ved. If I. cylindrica is not c t it burns, but cutting events fire in the more scattered accharum stands.

Even after the effects are kno , it must be decided hat is wanted from the oint of vie of the ark, its wildlife and its visitors. horter gras areas may be an im o tant a t of he habitat requirements of some animals s ecies and they rovide more o en reas for sho ing nimals to tou ists.

The resent ban on thatch grass cutting fte mid-Decembe and its restriction to t reas ithin the National ark is unnece-ssary and roving i ractical. Many villagers re busy ith the rice harvest until mid-December and do not normally think about thatch cutting until l te December. There are many vill ges more than miles by oad from the nea est e mi-tted thatch cutting area. In e reas east of the ark cam s are set u from hich villagers cut their grass, but there is a limited amount av il le nd it is usu lly finished u early. Padam ur villagers are no faced ith doing the same or t avell-ing t enty miles every day to Doomria and back, though there also the gras is nearly finished.

Restriction o gras cutting is es ential to revent distrubance ithin the Park, but it has o be easonable. Until the effects of cutting and burning re known, it see s unreason ble to allow all the thatch grass normally used by Padam ur villagers to be burnt. The cutting eriod sh uld be extended t least until the end of December and the K ch ani sh uld be o ened u for cutting within certain boundaries so th t the effects of cutting and burning can be watched side by side.

5. MANAGEMENT - cont.

3) Gra ing and fodde cutting: The cutting of gras and trees for domestic stock fodder should be sto ed for it is togethe ith gra ing of domestic stock the mostserious roblem threatening the habitat and wildlife of the National ark. In the short grass areas and rive side forests cattle and buffaloes a e in direct com etition ith the rhinos fo many of the grass, sh ub and tree

the ecological status unacceptable to cattle and buffaloes. The large number of rhinos living in degraded areas outside the Park are likely also feeding, to a large extent, on agricultural crops rather than on the native vegetation. If these animals were ever deprived of crops they would probably have difficulty in surviving in any numbers in these areas.

The most obvious effects of change in vegetation type due to stock grazing are seen in the strip of colonising shrubs south of the Karati at the extreme northeast corner of the Park, the extensive area between Kasra Dunbar and Jamili between the Karati and the sal forest and on Chimligh Island in the west.

Livestock grazing affects the wildlife in two ways. It is direct competition for a highly nutritious and much used food source and it also alters the habitat. Both effects are harmful to the rhino population and efforts should be continued to reduce the problem.

4) Fencing: The fence and ditch built around the Jaimungala salient discourages a few animals from wandering casually across, but there are many holes and rhino can also walk around the edge or straight across the Karati from Baranhari. Rhinos have been seen breaking past and live in the areas where the ditch caved in. Villagers on the north of the Karati are their own rhino ditches and fences and the south bank villagers have started to do the same again behind the National Park fence at Jaimungala protect the mustard crop from trampling. They would willing work to repair the fence if supplied with tools and wire.

Fences will only keep rhinos out of the fields if constructed of very strong materials, which will be very expensive. Surrounding of the forest areas or the agricultural areas will have to be complete, and herein lies a problem as so many rhino live outside the National Park. It is possible that the rhinos could live within the National Park.

5. MANAGEMENT - 4 Fencing Cont:

They are obviously using crops as a quick efficient source feeding within the Park on native vegetation is less efficient at certain times of year. However, feeding on crops has been part of the rhinos' way of life since early Tharu settlers arrived and it has grown in importance as the Karati Valley has deteriorated become agriculturally developed and the rhino habitat has been destroyed. The human population growth over the next few years will exacerbate the situation. Yet it is surprising how well the local farmers accept the rhinos' crop raiding and attacks on their people, but their attitudes will change eventually.

Evaluation of actual damage to crops by trampling and feeding and the importance of the crops in the energy intake of the rhinos is being done. Fencing, to be effective and to protect crops all over the rhino range will be prohibitively expensive. Infact fencing is not worth the money. Perhaps if the main rhino concentration areas at Sauraha and east to Jamuna was effectively fenced and domestic stock excluded, the rhinos would be able to feed themselves within the fence. Certainly, they cannot feed themselves within the degraded forest east of Sauraha if stock grazing

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well [illegible] access in c[illegible] tu[illegible]ing [illegible]oaches n[illegible] [illegible]ean s ectacular. Drastic measures such as removing h[illegible]ns f[illegible]m living [illegible]hin[illegible] [illegible]hould not be considered.