ECOLOGY AND BEHAVIOUR OF THE ONE-HORNED RHINOCEROS

Progress Report Number 5

15 June 1975

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Introduction

After a month in the United Kingdom and six weeks in Assam, work was resumed in Chitawan on March 10th. A film crew from Anglia has been filming the project since April 16th and will continue for a further month. Ranald Laurie and Mr. Rai have both assisted with the work during the last six months.

Assam January 22nd to March 5th.

Four weeks were spent in Kaziranga and two weeks travelling round Assam. Sonai Rupai, Orang, Laokhawa and Pabha Wildlife Reserves were visited.

a. Sonai Rupai

Rhinos are restricted to a swampy area beside the Gabru Khola which is also used by herdsmen who pay grazing fees and live within the reserve with their large buffalo herds. Tracks and dung were seen only in this region -- twice in two days walking. There are probably only three to four rhino remaining in this area permanently. The large expanses of thick forest and grass land are frequented by elephant herds which pass back and forth into the hills of Arunachal Pradesh.

b. Orang

Orang Reserve is also a forest plantation. The trees are protected from fire by extensive firebreaks dividing the area into fireblocks. Most of the upper dry grassland area has been unburnt since 1972. As a result much of it is now covered by thick matted Saccharum stalks and leaves; mainly dead and unpalatable. Burnt areas with fresh regrowth were being grazed by rhinos and other species.

An enormous swampy area beside the Brahmaputra harbours the main rhino population in the dry season though it is flooded during the monsoon. Dung piles and tracks were common and nine rhinos, including two calves, were seen during two days walking and elephant riding. They were feeding mainly on Saccharum regrowth, Cynodon and Cyperus spp. and Eichhornia crassipes (water hyacinth).

As in all the wildlife reserves in Assam, including Kaziranga, the buffalo grazing rights are sold to Nepali herdsmen who live within the reserve and transform their surroundings into heavily grazed short grassland.

Reports of rhinos in the Singri Hills east of Orang and the tea estates north of the Brahmaputra opposite Kaziranga were investigated. No sign of rhinos was found at Singri though there are reports of occasional wanderers from Orang, especially during the monsoon. Similarly there was no sign further east opposite Kaziranga but local teaplanters report rhinos heading north towards the NEFA hills occasionally during the monsoon.

c. Pabha Reserve

There are no rhinos in Pabha. The whole area is surrounded by farmland, heavily encroached during the dry season, and totally flooded during the monsoon. Two rhinos spent February and March there three years ago but since then there have been no records.

d. Laokhawa Reserve

Laokhawa Reserve is situated on the south bank of the Brahmaputra fifty miles west of Kaziranga. It probably held the third largest population of rhinos in Assam until a few years ago, but is severely threatened by poaching, cultivation and stockgrazing.

People are allowed to live and cultivate in forest villages within the reserve in return for a certain amount of free labour for the Forest Department. Nepali herdsmen and Moslem fishermen pay the Forest Department for the grazing and fishing rights.

During one day in the reserve three rhinos were seen, including a cow and a two year old calf. There are large expanses of short grassland, rough Zizyphus and Tamarix scrubland and simul and koroi plantation areas with low sparse undergrowth. Several bheels with

Typha and Arundo reeds and palatable andropogonous grasses are frequented by rhinos and buffaloes but their numbers are low.

The Beat officer showed me records from last year of twenty-two rhinos killed by poachers within the reserve. Local Forest Department estimates for the population range from eighty to one hundred and fifty, but I would place it much lower and in severe danger at that rate of poaching.

e. Kaziranga

Most observations were made in the western end of the park. Fifty three adult males, twenty six adult females and three sub-adults were identified. Fourteen of the twenty six cows had accompanying calves: four first year, four second year and six third/fourth year. Although nocturnal observations showed a slightly higher ratio of females there is probably a higher percentage of adult males in the Kaziranga population than in Chitawan.

The Mikir Hills area inhabited by rhinos during the monsoon, is now only infrequently visited, and only one set of tracks was seen there. None of the rhinos identified there last August were relocated on this visit. Three rhinos identified in Kanchanjuri last August were resighted in the same area in February.

Fifty hours of behavioural observations were made in the Bagori and Kanchanjuri areas and data was also collected on distribution feeding habits and herd compositions of buffalo, elephant, swampdeer and hogdeer.

Chitawan March 10th to June 15th.

1. The Population

Seven births and six deaths have been recorded since December 1974. Table 1 shows the breakdown of causes of deaths from December 1972 to June 1975. Nearly twenty per cent of all rhino deaths can be attributed to intraspecific fights between adult males or between adult males and sub-adult males.

Sixty four per cent of all deaths are of males and one hundred per cent of all calf deaths are of male calves.

A further case of attempted poaching occurred at Khoria Mohan in June when an adult female died of bullet wounds received perhaps fifteen days previously. This is the first proven case within the park since March 1973, though two rhinos which died natural deaths had their horns stolen after death.

TABLE I

Causes of deaths of rhinos
December 1972 to June 1975

Cause of Death	Adult Male	Adult Female	Subadult Male	Subadult Unsexed	Calf Male	Calf Female	Total
Poaching	2	4			1		7
Tiger Predation					2		2
Old Age		3					3
Intraspecific Fighting	3		2				5
Abandonment by Mother (Incl. death of mother)					2		2
Accident in Attempted Capture					1		1
Unknown	2	2		1	1		6
TOTAL	7	9	2	1	7	0	26

2. Habitat and Feeding.

Further data has been collected on rhino distribution and seasonal movements related to burning, stockgrazing, flooding, silting and grasscutting. A few examples follow.

a. Thick layers of silt which initially prevented growth of grass on the river beds after the high floods last September have now produced more luxuriant growth than the previous two years. This led to an earlier return to the north of the river of rhinos which had gone south of the Rapti for the dry season.

b. In January, enormous influxes of people cutting grass for thatching, wattle and daubing and rope making caused considerable disturbance and affected the habitat in various ways. This year there was no control whatsoever over the location of the cutting or the materials removed from the forest.

Scattered cutting of Imperatum thatch grass in Saccharum areas prevents burning of Saccharum afterwards. Fires are lit in the S. munja stands to enable the canes to be cut for hut walls. S. spontaneum canes are cut prior to burning, thinning them in such a way that the area cannot later be burned. One area last year regularly grazed by twelve to fifteen rhinos every morning was almost devoid of rhinos this year because there was no burn and thus no regrowth. All the rhinos aggregated at a neighbouring area burnt earlier by villagers.

c. Browse species have been more fully collected and a number of effects noted. Colebrookia oppositifolia though not grazed or browsed in its normal state is heavily utilized if burned. Rhinos eat the thick charred woody stalks -- up to one inch in diameter.

Rhinos affect the growth pattern of some species of trees; notably Dalbergia sissoo and Butea frondosa. Rhinos pull the young trees over with their mouths or straddle them and walk over them until

they crack or bend permanently. After repeated browsing, the trees take up a horizontal or inclined growth attitude.

3. Behaviour

a. Adult Males

The following sequence of events involving seven adult males (A, B, C, D, E, F, S) two subadult males (X,G) and six adult females (Bm, By, Bx, Ax, Ay, Sp) sheds some light on the role and inter-relationships of the adult males in the population. All events took place within twelve square miles in the main study area which has been divided into sections (1, 2, 3, 4,) west to east along the Rapti for easy description of the location of the events.

A further six adult males are resident in the area though only rarely visit the central sections (2, 3). All thirteen males have been seen squirt urinating, though (B, C, D) do so less frequently.

Male rhinos are not defending an area when fighting. The defeated rhino may or may not vacate the area but can often be seen later grazing or wallowing with his opponent. Fights are not directly related to mating. On only one occasion were two males seen following an oestrus female (Kaziranga, March, 1975). On other occasions a breeding bull has grazed unconcernedly while another breeding bull courts a cow ten yards distant. (Table II, 9th of May).

Three of the adult males (A, F, E) have all been seen mating or courting in both sections (2, 3). Their associations with cows fall into a temporal sequence.

TABLE II

Sequence of events at Saurah
13 March to 12 May 1975.

Date	Section	Event.
13/3	2	A mates with Bm.
15/3	3	A wallows with/courts Bm.
17/3	2	A courts Bx.
24/3	4	F courts By.
26/3	2	A fights with/defeats D.
31/3	2	A, B, D, E wallow together within forty yards.
1/4	2	S fights/chases off E.
2/4	2	S challenges A then runs off.
2/4	2	S fights/defeats D.
2/4	2	S chases another rhino (Unidentified).
8/4	1	S back in home section.
8/4	1	X killed by tusk wounds (perhaps S8s).
8/4	4	F courts Ax.
26/4	3, 2	F courts Ay.
27/4	2	A fights/defeats S (S badly wounded in the neck).
2/5	4	F courts Ax.
3/5	2	A, E graze forty yards apart.
4/5	2	G leaves mother and becomes independent.
9/5	3	E courts Ay.
9/5	2	A, E wallow together ten yards apart.
9/5	2	E courts Sp A grazes ten yards away. No aggression. A shows no interest in Sp.
11/5	2	C fights/chases off G.
12/5	1	S dies of wounds received on 27/4.

TABLE III

Dates of Associations of Bulls (A, F, E) with Cows.

Males	13/3	15/3	17/3	24/3	8/4	26/4	2/5	9/5	9/5
A	X	X	X						
F				X	X	X	X		
E								X	X

The period of two months can be divided into four periods of 4, 15, 6 and 1 days during which (A, F, F, E) respectively are sexually active and court more than one cow each. This observation and the indifference of breeding males to courting males nearby supports the theory that the males come into periodic breeding condition.

The three breeding males (A, F, E) have overlapping home ranges and have never been seen to fight among themselves. Fights occur more frequently between males strange to each other. Thus (S), coming from section (1) was involved in at least fights in section (2) and eventually returned to section (1) to die. Similarly (G), was attacked by (C) on entering the population as an independent individual.

Males who know each other and live permanently in the same area fight less often. One can visualize the system as a number of communities. There has to be more than one breeding male within each community to ensure fertilization of all oestrus females because of the periodicity of the male's sexual activity. In encounters between males of the same community one has to give way to avoid a fight. Footdragging displays are the mark of the strongest males of the community.

The three breeding males at Saurah are the only ones known definitely to make drag marks over long distances in the central sections

(2) and (3). Other dragmarking individuals in sections (1) and (4) rarely venture into sections (2) or (3). Scarrump (S) did so and was killed.

b. Dispersal of Subadults

Subadult male (X) was killed in section (1) -- possibly by Scarrump (S) or Slitear, both squirt urinating, dragmarking bulls. Attacks on subadult by adult males are common and this leads to adoption of survival strategies of:

1. avoidance and a low flight threshold
2. or, aggregation with other subadults or cow/calf pairs
3. or, dispersal to other areas — often suboptimum habitat.

During the last month four new subadult males and one new subadult female have appeared in the Saurah study area. Of ten identifiable calves which have left their mothers in the Saurah area, six are females and four are males. Two males and four females are still present in the same area. One female stayed until two years after leaving her mother and has now moved elsewhere. Both females and males have been subject to attack by adult males. As reported in Progress Report Number 3, the females attach themselves more readily to cow-calf pairs than the males, who tend more to form temporary associations amongst themselves.

Because males are more subject to attack by adult males they stay longer with the cow. One male calf (G) finally left his mother on 4th May after more than four and one half years. A female calf left her mother between November and January after only two and one half years. The male calf is on his own and has been attacked at least once by adult male (C). The female calf temporarily attaches herself to a cow-calf pair and remains within their home range which overlaps that of her mother and new sister.

The change in reaction of a subadult male to the approach of rhino or man from immediate flight to curiosity and investigative behaviour

has been observed over the last six months. It has been accompanied by an increase in size of the regular range, but not yet by the squirt urinating or feet dragging display behaviour.

c. Cows leaving small calves unattended

The phenomenon of cows leaving small calves and going to feed alone has been more fully investigated. Five cows with calves aged six, four, four, three and two months respectively have been seen feeding alone up to 800 yards from their calves. On three occasions a cow was followed back to her calf. Once after being scared, she ran back 200 yards to where her three month old calf lay in the open beside a woodland path. On another occasion a cow was followed 800 yards back to her calf hidden in thick cover. She was absent for more than 90 minutes and fed almost the whole time. One cow, having lost her calf after pursuit by a male spent 90 minutes looking and calling for her calf, squeak panting 130 times during the 90 minutes as she searched back and forth over a small area. The calf must have been very near to her on several occasions but remained silent.

Intentional abandonment of the calf is odd behaviour; tigers can kill calves up to eight months old. Perhaps the calf simply needs the rest, while the cow continues to graze. The predation risk perhaps fails to counteract the selective advantage of longer feeding periods for the lactating cow. A cow who has abandoned her calf five times before it was three months old has not been seen away from her calf since then.

d. Dungpiles

Dungpiles occur most frequently at borders of woodland, grassland or pools or on regularly used paths and path junctions. Their frequency of use varies directly according to the number of rhinos using the area. All classes of rhinos use any dungpile. Finding of dung by a rhino stimulates defecation near or on top of it rather than

avoidance of the area. New dungpiles can start on single defecations but they are rare.

On a six kilometer circuit there were twenty five dungpiles or single defecations on the 19th March and fifty four on the 24th May. Between these dates the circuit was walked on thirty eight days, during which the original twenty five piles were defecated on 237 times and the twenty nine additional piles only thirty eight times. Only four of the additional twenty nine piles were used more than once. A cluster significance test for the data for three different periods of ten consecutive days shows that there was significent clustering of defecations in runs of consecutive days for twelve of the original twenty five dungpiles. ($p < 0.05$). Recently used dungpiles stimulated defecation more than dungpiles with old dung.

Dung moved from other areas and put in the Saurah area has not stimulated defecation. Orientation and marking of paths and feeding grounds in use are functions of dungpiles for rhinos within the community. Urine marking and possible defecation at dungpiles have sexual significance in detection of oestrus females.

Plans for Final Research Period

1. Completion of height measuring of Saurah population.
2. Further plant collection.
3. Sound recording and photography of wallow fights, made impossible last year by breakdown of equipment.
4. Translation and recording of records of Rhino Guard Headquarters for the last fifteen years.
5. Bibliographic research in Kathmandu.