

POPULATION HISTORY OF GREAT INDIAN RHINOCEROS IN NORTH BENGAL AND MAJOR FACTORS INFLUENCING THE SAME

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1. Introduction

The Northern part of the State of West Bengal is the only region in India other than Assam (not considering the small number of Rhinos introduced in Dudhwa National Park in Uttar Pradesh) where the Great Indian Rhinoceros (*Rhinoceros unicornis*) still exists in the wild. Rhinos also existed in the Sunderbans¹² and the district of Malda¹¹ within West Bengal till the second half of the previous century. One more species of Rhino, viz. *Rhinoceros sondaicus*, used to exist in North Bengal, but it became extinct much earlier - the last recorded sighting made in the forests of Chilapata in 1900^{14,2}. But the Great Indian Rhinoceros has managed to survive, despite all odds. This paper seeks to trace the population history of rhinos in North Bengal during the last 100 years or so and examine the major factors which have influenced their numbers and distribution within the region.

2. Rhinos in North Bengal

There is ample evidence^{1,14} to indicate that at the turn of the nineteenth century, rhinos existed in three distinct and non overlapping populations in the flood plains of the following major rivers in the present districts of Jalpaiguri and Cooch Behar :

- I. Sankosh - Rydak
- II. Torsa
- III. Jaldhaka - Diana

Rhinos in the Sankosh - Rydak region moved freely across the Assam - Bengal border and contained two separate, though over-lapping sub-populations, viz. - the Buxa sub-population in Jalpaiguri district, occupying the forests of Bholka and Rydak reserves in the present Buxa Tiger Reserve, and the Garodhat sub-population in Cooch Behar district, occupying the forests and adjoining grass lands in Atiamochar and Nagurhat. Similarly, the rhinos of the Torsa region comprised of two over-lapping sub-populations, viz., the Jaldapara sub-population in Jalpaiguri district occupying the present Jaldapara sanctuary and Chhillapata reserves and moving upto Bhutri and other adjoining forests in Buxa and Cooch Behar Divisions, and the Patlakhawa sub-population in Cooch Behar district which occupied the Patlakhawa reserve and extended as far as upto Pundibari near Cooch-Behar.

The Jaldhaka-Diana population of rhinos occupied the forests of Upper Tondu, Lower Tondu and Diana in Jalpaiguri Division and moved upto Indo-Bhutan border in the north and Mynaguri on the east. The present Gorumara Sanctuary formed the nucleus of this population, which can, therefore, also be called Gorumara population.

3. Number of rhinos - 100 years ago

Rhinos were reported to be plentiful in North Bengal towards the end of the 19th century². According to the estimates of the Fawcus Committee³, there were about 200 rhinos in the Torsa region and a dozen or so in the other pockets in North Bengal

in the 1920s. The hunting records of Maharaja of Cooch Behar¹ indicate that about 201 rhinos were either killed or injured in North Bengal between 1871 and 1905, the figure for the period 1890-1905 being 42. Assuming a zero rate of growth during 1905 -1920 and a negative rate of growth equal to the number of rhinos hunted every year during the period 1890 - 1905, it can be concluded that at least 240 rhinos existed in North Bengal in 1890s, with a possible break up as follows :

Sankosh - Rydak - 120+
Torsa - 100+
Jaldhaka-Diana - 20+

4. Population Trend

4.1 Sankosh-Rydak Population

Garodhat : Garodhat happened to be the exclusive hunting reserve of the Maharaja of Cooch Behar. Between 1877 and 1897, as many as 104 rhinos were killed and 18 rhinos were injured in and around Garodhat reserve - the largest number of rhinos i.e., 18, having been killed in 1886. It appears that Garodhat had one of the largest concentration of rhinos in North Bengal. Ironically, it was also the first region in North Bengal where the rhino became extinct. Rhinos have been hunted in the region subsequent years also, but records of the same are not available. By 1930, rhinos were stated to be non-existent in the region². It is possible that the Rhinos, which could survive hunting, moved over to the forests of Buxa or Assam and left the area for good.

Buxa : According to the records of Maharaja of Cooch Behar¹, as many as 28 Rhinos were killed and 13 injured in the region between the rivers Rydak and Sankosh during the period from 1877 to 1904. Sighting of more than 14 Rhinos was also recorded. This suggests the presence of sizeable number of rhinos in the region towards the end of the last century. No information about the rhinos of this region is upto 1948. Rhinos were reportedly present in the wet forests of Panbari of Buxa Division in the thirties^{14,2} but it can not be said with surety that they formed a part of the Rydak-Sankosh population. Table - I gives an idea about the status of Rhinos in Rhinos in Buxa, particularly Bholka forests, in the subsequent years :-

Table - I (Rhino population in Buxa)

Year	Population Status	Reference
1948-49	A couple of Rhinos	14.8
1949-50	A couple of Rhinos	14.9
1952-53	In fair number	14.12
1953-54	Exist,	9 & 14.13
1954-55	-do-	14.14
1956-57	-do-	14.16
1957-58	-do-	14.17
1958	-do-	8
1958-59	10 (Approx.)	14.18
1966-67	Exist	14.20
1967-68	-do-	14.21

The Hydak Sankosh population of rhinos appears to have become extinct by 1970 and no rhino has ever been recorded in the forests of Buxa Division except those straying occasionally from Jaldapara sanctuary.

4.2 Torsa Population

Jaldapara : In his three hunting expeditions in 1892, 1893 and 1904, in or around the Chilapata forests, Maharaja of Cooch Behar¹ has recorded the killing of 1(one) rhino, injury of another rhino and sighting of more than 14 rhinos in the region. The Fawcus committee³ had estimated that there were about 200 rhinos in 1920s in the Torsa region, which included Jaldapara and Patlakhawa.

Table -2 gives an idea about the variation in population of rhinos in Jaldapara region over a period of time.

Table -2 (Rhino population in Jaldapara)

Year	Population Status	Reference
1920s	200(Approx.)-including Patlakhawa	3
Before 1930	80 (Approx.)	4
1932	40 - 50	3
1935-36	A Good number	14.1
1936-37	56(including Panbari)	14.2
1940-41	Increased in Number	14.6
1947-48	Increasing	14.7
1948	60(Approx.)	4
1948-49	Increasing	14.8
1949-50	-do-	14.9
1950-51	-do-	14.10
1951-52	-do-	14.11
195 30	5	
1952-53	Increasing	14.12
1953 54	30 56	14.13
1954	Not less than	50 9
1954-55	Promising	14.14
1957	50(Approx.)	7
1958-59	65(Approx.)	14.18
1964	72	13
1965-66	75	14.19
1966-67	76(including Patlakhawa)	14.20
1968 69	75	14.22
1973-74	21	14.26
1975	23	22
1978	19	22
1980	22	22
1986	14	20
1988	24	24
1989	27	24
1992	33	24

Patlakhawa:

Maharaja of Cooch Behar¹ has recorded the killing of 1 (One) rhino, injury of another rhino and sighting of 6 (Six) rhinos in 1895. Hunting of rhinos took place in this region in the subsequent years also, but the records are not available. However, there are many Shikaris and other persons still living in Cooch Behar who vouch for the presence of 'dozens' of rhinos in the region in the thirties and the forties. Table 3 has been compiled on the basis of the recorded information.

Table -3 (Rhino population in Patlakhawa)

Year	Population Status	Reference
1951-52	A few	14.11
1952	25	5
1952-53	Increasing	14.12
1954	Small number	6
1958-59	10 (Approx.)	14.18
1967-68	Increasing	14.21
1968-69	-do-	14.22
1969-70	-do-	14.23

Rhinos in Patlakhawa fell to the bullets of the poachers or moved over to Jaldapara in the early seventies and no rhino was reported there in the census operations held since 1973-74. Rhinos from Jaldapara have been known to be visiting Patlakhawa occasionally, but no such visit has been recorded since 1985²⁵.

4.3 Gorumara Population :

In the year 1885, Maharaja of Cooch Behar¹ has recorded having killed 5 rhinos, injured 2 and sighted another 5 rhinos in the region along Jaldhaka and Diana. Rhinos were reported to be common in the forests of Jalpaiguri Division in the past^{14,2} but their population has never exceeded 20 since 1920s as the Table -4 would indicate.

Table -4 (Rhino Population in Gorumara)

Year	Population Status	Reference
1920s	Less than 12	3
1936-37	4 or 5	14.2
1940	12 (Approx.)	8
1950-51	Appreciable increase	14.10
1951-52	-do-	14.11
1952-53	Frequently seen	14.12
1952	3	5
1954	Small number	6
1954-55	3 (Approx.)	14.14
1955-56	5 (Approx.)	14.15
1956-57	4 (Approx.)	14.16
1958	7 (Approx.)	15
1958-59	8 (Approx.)	14.18
1965	14	15
1965-66	10	14.19
1967-68	Exist	14.21
1968-69	12	14.22
1971-72	13	14.22
1972-73	7	14.25
1973-74	7	14.26
1978	8	22
1986	8	20
1989	12	23
1993	15	23

5. Population structure:

Sex-wise and Age-wise classification -- Information in the old records regarding the composition of rhino populations on the basis of sex and age is either absent or vague. However, the available information is presented in Tables 5, 6 and 7.

Table -5 (Jaldapara Sanctuary - Population Structure)

Year	Adult			Calves	Total	Reference
	Male	Female	Unsexed			
1968	-	-	70	5	75	14.22
1975	7	7	4	5	23	22
1978	5	7	4	3	19	22
1980	5	7	6	4	22	22
1988 (April)	9	11	-	4	24	24
1989	9	13	-	6	27	24
1992 (April)	8	12	-	13	33	24

Table -6 (Jaldapara Sanctuary - Age & Sex wise classification of Rhino Calves).

Class	Description	Sex	Number		Remarks
			Apr '92	Jan '93	
I. Sub-adult	Shoulder height 135-160cm. & moving without mother.	1.1 Male	1	1	One calf born in August, 1992 and one male sub-adult calf died in Dec. 92.
		1.2 Female	-	-	
		1.3 Unsexed	1	2	
II. Juvenile	Shoulder height 120-135 cm., having horns and moving with mother.	-	8	4	
III. Calf	Shoulder height below 120 cm., having practically no horn and moving with mother.	-	5	6	

Table -7 (Gorumara Sanctuary - Population structure)

Year	Adult			Calves	Total	Reference
	Male	Female	Unsexed			
1954-55	1	1	-	1	3	14.14
1965-66	-	-	8	2	10	14.19
1968-69	-	-	10	2	12	14.22
1978	1	3	3	1	8	22
1989 (Feb.)	4	7	-	1	12	23
1993 (Nov.)	4	7	-	4	15	23

6. Reproduction Trend:

Table - 8 gives details of the Rhinos Calves born or dead in Jaldapara and Gorumara Sanctuaries since 1988.

Table-8 (Birth & Death of Rhino calves)

Year	Jaldapara		Gorumara		Remarks
	Birth	Death	Birth	death	
1988	3	-	1	-	One pregnant cow-Rhino died in Gorumara in March, 1989
1989	2	-	-	-	
1990	2	-	1	-	
1991	3	-	1	-	
1992	2	1	1	-	
1993	3(?)	-	1	-	

7. Mortality among the Rhinos

Death among the rhinos may be caused by old age, disease, injuries, hunting, poaching, predation, accidents, natural calamities etc. Trend of mortality among the rhinos on the basis of the recorded cases of deaths in Jaldapara, Gorumara and North Bengal as a whole, will be clear from the tables 9, 10 and 11.

Table -9 (Mortality in Rhino-Jaldapara)

Year	Population Status	Reference
1930 and 1931	50 (Approx.)	4
1932	40-50	3
1935-36	1	14.1
1936-37	1	14.2
1940-41	2	14.6
1948-49	2	14.8
1949-50	4	14.9
1950-51	1	14.10
1954	3	14.14
1955-56	4	14.15
1957-58	2	14.17
1967-68	1	14.21
1968-72	30	14.24 and 22
1972-73	6	14.25
1973-80	9(2 in Paliakhawa)	14.26, 24, 25
1981	2	25
1982	3	24
1983	4	24
1984	6	24
1985	2	24
1987	1	24
1988	1	24
1991	1 (Chitrapata)	24
1992	2	24
1993	1	24

Table -10 (Mortality in Rhinos - Gorumara)

Year	Population Status	Reference
1950-51	3	14.10
1952	2	8 & 14.11
1954-55	1	14.14
1968-72	4	22
1981	1	23
1983	2	23
1984	1	24
1989	1 (Bangladesh)	23
1990	1	23
1992	1 (Apalchand)	24

Table - 11 (Mortality in Rhinos - North Bengal.)

Year	No. of deaths	Reference.
1951-52	2	14.11 & B
1952-53	2	14.12
1954-55	4	14.14
1955-56	4	14.15
1956-57	1	14.16
1957-58	2	14.17
1958-59	1	14.18
1967-68	4	14.21
1968-72	47	14.24 & 22
1972-73	6	14.25
1973-80	9	14.26, 24, 25
1981	3	24
1982	3	24
1983	6	24
1984	7	24
1985	2	24
1986	1	24
1987	1	24
1989	1	24
1990	1	24
1991	1	24
1992	3	24
1993	1	24

relating to the period 1980-93^{22,23,24,25} provide a classification of the cases of mortality on the basis of maturity and sex.

9. Range of Rhinos in North Bengal:

Bannerjee¹¹ has recorded in 1966 that the shrinkage of rhino zone in N. Bengal is pronounced and the area of its distribution has been restricted to even less than one eighth from what it was about 150 years back. Information available about the range of North Bengal rhinos is presented below.

9.1 Sankosh - Rydak Population :

In his hunting expeditions spread from 1871 to 1905, Maharaja of Cooch Behar¹ has recorded the hunting or sighting of Rhinos from almost all over the region between the Rivers Sankosh and Rydak which included the Forests of Rydak and Bholka (170 kms) in Jalpaiguri district, Garodhat Reserve (50 sq.km) in Cooch Behar district, and almost an equal area where no forests or grasslands exist today. The range of these rhinos extended within Assam - though its extent is not known. By 1930, Garodhat appears to have fallen out of favour with Rhinos². Rhinos have been recorded in the Panbari forests 33 sq.km. on the West of Rydak in the thirties^{14,2}. Information relating to the period 1941-63^{5,9,14,9,14,12,14,13,14,14,15,14,12,14,14} and 14.20 indicate that the Rhinos were seen mostly in the Bholka Rango (70 sq.km.) and they moved freely between Assam and West Bengal across the Sankosh. As stated earlier the Sankosh-Rydak population appears to have become extinct by 1970.

8. Mortality in Rhinos - Relationship with age and sex.

Table -12 and 13 compiled on the basis of the information

Table -12 (Mortality V/s Sex and Age - Jaldapara)

Year	Adult				Calf				Total		
	Male	Female	Unsexed	Total	Male	Female	Unsexed	Total	Male	Female	Unsexed
1981	-	-	1	1	-	-	1	1	-	-	2
1982	3	-	-	3	-	-	-	-	3	-	-
1983	2	2	-	4	-	-	-	-	-	-	-
1984	1	-	5	6	-	-	-	-	2	2	-
1985	-	2	-	2	-	-	-	-	1	-	5
1986	1	-	-	1	-	-	-	-	-	2	-
1987	-	-	-	-	-	1	-	-	1	-	-
1991	-	-	1	1	-	-	-	1	-	1	-
1992	-	1	-	1	1	-	-	-	-	-	1
1993	-	1	-	1	-	-	-	-	1	1	-
Total :	7	6	7	20	1	1	1	3	8	7	8

Table -13 (Mortality V/s Sex and Age - Gorumara)

Year	Adult				Calf				Total		
	Male	Female	Unsexed	Total	Male	Female	Unsexed	Total	Male	Female	Unsexed
1981	1	-	-	1	-	-	-	-	1	-	-
1983	-	-	1	1	1	-	-	-	1	-	-
1984	-	-	1	1	-	-	-	-	-	-	1
1989	-	1	-	1	-	-	-	-	-	1	-
1990	-	1	-	1	-	-	-	-	-	1	-
1991	-	1	-	1	-	-	-	-	-	1	-
Total :	1	3	2	6	1	-	-	1	2	3	2

Table - 14 (Range of Sankosh-Rydk population)

Year	Range (within North Bengal only)
1900	400-450 sqm
1930	300-350 sqm
1940	200-250 sqm
1950-1970	60-70 sqm

9.2 Torsa population :

Fawcus committee³ has recorded in 1943 that the main stronghold of rhinos consisted of a tract of high grass savannah along the Torsa river stretching from the foot hills of Bhutan, through the Duars, in to Cooch Behar - occupying perhaps 50-60 sq miles (130-160 sq km) but from the hunting records of Maharaja of Cooch Behar¹ and information given by the old shikaris in Cooch Behar, it appears that till at least 1930, the rhinos could be seen in Pallakhawa Reserve and its extension upto now non-existent grass land areas of Pundibari. Pallakhawa has been a regular habitat of rhinos till about 1970^{14,23}. Rhinos from Jaldapara have been known to visit Pallakhawa till as late as 1985(25). Information from the local people indicate that Rhinos from Jaldapara were frequent visitors to the forests of Nilpara Range (Bhutri, Godamdabri, Bharnabari, Rangamati) and Madarihat Range (Khairbari, Till and Dumchi) in the forties, and the fifties. Rhinos were regular visitors to the forests of Till and Jalgaon - though no such visit has been recorded since 1984²⁵. V. S. Rao⁹ has recorded the presence of rhinos in Khairbari, Bhutri, Salkumar, and Basti (Chilapata) and some private Jute forests near Moiradanga in January 1954. Forests of Chilapata (Banla, Barodabri, and Mendabari) have always been a natural for the rhinos from Jaldapara. Rhinos occasionally visited the nearby forests of Nimall range in Buxa but no such visit has been recorded since 1982²⁵. It has also been observed that rhinos do not utilise whole of the 216 sq.km. area of the present Jaldapara sanctuary. During the census held in April, 1992, the presence of rhinos (actual sighting or dung heaps) was recorded in an area of only 80 sq.km. comprising forest compartments of Malangi, Chilapata, Jaldapara, Torsa, Mundabari and Banla²⁴.

Table -15 (Range of Torsa population)

Year	Range (sq.Km.)
1900	450-500
1930	400-450
1950	350-400
1960	300-350
1970	250-300
1980	200-250
1985	100-150
1990	80-100

9.3 Gorumara Population :

Gorumara Sanctuary set up in 1949 occupies less than 9 Sq.Km. but the range of rhinos extends much beyond its boundaries. Maharaja of Cooch Bohar¹ has recorded the hunting or sighting of rhinos in 1884 around Ramshahat

(Lower Tondou) Dhupjhora (Upper Tondou) and Nagrakata (Diana). Rhinos existed in the flood plains of the rivers Jaldhaka and Diana and occupied the forests of Lower Tondou, Upper Tondou and Diana ranges and perhaps also the grasslands existing outside the reserved forests. Despite their small numbers, range of Gorumara rhinos has been large. Rhinos were reported in Hillajhora forests in 1940-50 and 1950-51^{14,9,14,10}. They were reported to be travelling up to Mynaguri, Chapramari, North Diana and South Diana till the late sixties¹⁵. However, movement of rhinos to Chapramari and Diana ranges (except Jaldhaka block) have become rare since 1980. Rhinos of Gorumara are known to wander far off. In March 1989, one female rhino wandered into Bangladesh and had to be physically brought back²⁴. Another female Rhino strayed into the forests of Apalchand range and moved as far West across the river Teesta as Golna in Mahananda sanctuary. It never returned to Gorumara till its death in Apalchand forests in August 1992²⁴. In the recent years, rhinos have known to be mostly confined over an area of about 80 sq.km. comprising forest blocks of Modla, Central, Sursuti, Gorumara, South Indong, Dhupjhora, Tondou and Jaldhaka.

Table.- 16 (Range of Gorumara Population)

Year	Range (Sq.Km.)
1900	300-350
1940	250-300
1960	200-250
1970	150-200
2980	100-150
1990	80-100

10. Factors influencing number and distribution of Rhinos in North Bengal.

10.1 Biotic pressure : There has been a large increase in the population of human beings and the cattle in the region creating tremendous pressure on the forest land (encroachment, trespass, fire) and forest resources (Grazing and collection of timber, firewood and fodder) and, as a consequence, creating adverse living conditions for all wild animals including rhinos. Tables - 17 and 18 give an indication about the increasing pressure on the region on account of human beings and the cattle.

Table - 17 (Density of human population)

Year	DENSITY (Per Sq.Km.)	
	Jalpalguri	Cooch Bohar
1881	52	178
1891	69	171
1901	87	165
1911	107	175
1921	110	174
1931	118	173
1941	129	188
1951	150	196
1961	218	305
1971	280	418
1981	356	523
1991	448	637

Table - 18 (Live stock population)

		No. of Cattle & Buffalo		
		No. of Heads	No. per Sq. Km	No. of Sq. Km of Forest
Jalpaiguri	1940	561569	90	308
	1984	730651	117	408
Cooch Behar	1984	811000	240	14228

10.2 Hunting:

Legal hunting of rhinos was permissible in Bengal till the passing of the Bengal Rhinoceros Preservation Act. in 1932. Maharaja of Cooch Behar, however, had exclusive rights to hunt rhinos within his jurisdiction. Hunting has been the major factor for decline in rhino population in North Bengal till the twenties before the poachers took over. Heavy hunting can be cited as the sole reason for the extinction of rhinos from Garodhat Reserve in Cooch Behar. Reliable records of hunting of rhinos are not available except those kept by the Maharaja of Cooch Behar¹ from 1871 to 1905. The Tables 19 and 20 have been compiled from the aforesaid source.

Table - 19 (Hunting of Rhinos in Sankosh-Rydk region)

Year	Garodhat (Cooch Behar)		Buxa		Total	
	Killed	Injured	Killed	Injured	Killed	Injured
1877	11	-	4	-	15	-
1879	11	-	-	-	11	-
1880	6	2	-	-	6	2
1881	8	2	-	-	8	2
1882	10	2	-	-	10	2
1883	7	4	-	-	7	4
1884	8	-	5	1	13	1
1885	10	2	1	-	11	2
1886	18	-	-	-	18	-
1887	4	1	-	-	4	1
1889	4	2	1	2	5	4
1890	1	-	3	-	4	-
1891	4	2	-	-	4	2
1892	-	-	3	1	3	1
1893	2	1	5	1	7	2
1895	-	-	2	4	2	4
1896	-	-	4	2	4	2
1897	1	-	-	-	1	-
1904	-	-	-	2	-	2
Total	104	18	28	13	132	31

Table - 20 (Hunting of Rhinos in other regions)

Year	Jaldapara		Patlakhawa		Gorumara	
	Killed	Injured	Killed	Injured	Killed	Injured
1884	-	-	-	-	5	2
1893	1	1	-	-	-	-
1905	-	-	1	1	-	-
Total:	1	1	1	1	5	2

10.3 Poaching :

Poaching has always been a problem in the protection of rhinos. Jaldapara, for example, has faced worst spells of poaching during the early thirties and then in the late sixties about 50% of its population of Rhinos was wiped out due to poaching. Poaching can be cited as the major reason of extinction of rhinos from Patlakhawa. Table 21, 22 and 23 present the available information about poaching of rhinos in North Bengal.

Table -21 (Poaching of Rhinos - Torsa region)

Year	Jaldapara	Patlakhawa	Reference
1932	40-50	-	3
1930&1931	50(Approx.)	-	4
1932-43	very few	-	3
1955-56	2	-	14.15
1956-57	-	1	14.16
1958-59	-	1	14.18
1968-72	28	-	22
1972-73	6	-	14.25
1973-74	-	1	14.26
1976-77	-	1	25
1978	1	-	25
1980	2	-	25
1981	1	-	25
1982	3	-	24
1983	1	-	24
1984	2	-	24
1985	2	-	24
1991	1	-	24
1992	1	-	24
1993	1	-	24

Table -22 (Poaching of Rhins - Gorumara)

Year	Number	Reference
1954-55	1	14.14
1968-72	4	22
1981	1	23
1983	1	23
1984	1	24
1990	1	23
1992	1(Apalchand)	24

Table-23 (Poaching of Rhinos - North Bengal)

Year	Number	Reference
1951-52	2	14.12
1954-55	1	14.14
1955-56	2	14.15
1956-57	1	14.16
1958-59	1	14.18
1967-68	4	14.21
1968-72	43	14.24 & 22
1972-73	6	14.25
1973-80	5	14.26&25
1981	2	23, 25
1982	3	24
1983	2	23,24
1984	3	24
1985	2	24
1990	1	23
1991	1	24
1992	2	24
1993	1	24

10.4 Loss of habitat:

Loss of rhino habitat has been due to many reasons, such as - extension of agriculture and tea gardens, encroachments, erosion, forestry practices etc.

(A) Agriculture and tea-industry

With the increase in population, many grassland and Jungle areas outside the reserved forests, which formed the habitat for rhino, have been reclaimed for the purpose of agriculture or setting up tea-gardens. There are 158 tea estates in Jalpaiguri occupying an area over 670 Sq.Km. Most of these tea estates were established during the period 1890-1920 and they alone account for the loss of about 200-250 Sq.Km. of rhino habitat. Loss of habitat on account of extension of agriculture took place mostly during the era of grow more food campaign and also the influx of refugees from Eastern Pakistan in the fifties. No reliable date is available to quantify the loss of habitat due to extension of agriculture, but a conservative estimate would put it in the range of 60-80 Sq.Km.

(B) Encroachments:

Substantial encroachments (20-30 Sq.Km.) exist in the Khashmahal as well as forest areas in the Patlakhawa and the Garodhat (Atiamochar) region. Most of the encroachments have taken place during the fifties and the seventies on account of influx of refugees from East Pakistan

(C) Erosion:

Recurrent floods in the rivers Sankosh, Rydak, Torsa, Diana, Jaldhaka and their tributaries have eroded a substantial party of rhino habitat. Loss of such habitat is pronounced at Patlakhawa, Atiamochar, Bhoika, Rydak, Bhutri, Hashimara, Titi, Chilapata, Barodabri, Diana and many other forest areas. At least 20-30 Sq.Km. of area has been rendered useless for rhino on account of erosion during 1950-90.

(D) Forestry Practices :

There has been a conscious attempt by the forest officers to bring savannahs and grass lands under the cover of valuable timber species - particularly in areas outside the sanctuaries. A good example of attempts made to 'stamp out' grass from Sankosh and Bhoika by planting Jarul, Teak and sal is provided by V. S. Rao⁹. Large scale plantations of Teak and other species in Bhutri, Godambari, Titi and Khairbari has been one of the reasons as to why these areas have fallen out of favour with the Jaldapara rhino. Strict fire control in the past, has also resulted in the invasion of woodland over grasslands - thus, reducing the area of the preferred habitat of the rhinos^{6 & 14,13}. Gorumara and its adjoining forests which supposed a vast grass land with scanty tree cover in the beginning of the century²², provide an example of the effect of strict fire control. Entire Patlakhawa beat (15 sq.Km.) as well as Atiamochar and Nagurhat beats which comprised Garodhat Reserve (18 sq.Km.) are now unsuitable for rhino. A comparison of the working plan maps of 1945-46 of Bhoika range and Rydak ranges¹⁶ with the current maps indicate a loss of 20-25 sq. of grassland. A rough habitat survey done in Jaldapara Sanctuary in 1989-90¹⁹, revealed that the pure and mixed grassland areas comprise about 38.5 sq.Km. as compared to 50-55 sq.Km in 1945-46 indicated by the working plan maps¹⁶.

Table -24 gives an idea about the loss of Rhino habitat in

different regions on account of forestry practices during 1900-90.

Table - 24 (Estimated Loss of Rhino habitat due to forestry practices during 1900 -90)

Population	Area (sq.km.)
I. Sankosh-Rydak	30-40 sq.km.
II. Torsa	70-90 sq.Km.
III. Jaldhaka-Diana	50-60 sq.Km.

10.5 Predation:

Predation by tigers on rhino cows and calves is believed to be an important factor in keeping down the population of rhinos in Gorumara⁹ and Jaldapara^{14,13}. Table - 25 gives a list of the recorded cases of predation of tigers on rhinos.

Table -25 (Killing of Rhinos by tigers)

Year	Jaldapara	Gorumara	Outside sanctuaries	Reference
1952	-	2 (mother-with calf)	-	8 & 14.11
1981	1(calf)	-	1(calf)	14.22 25

10.6 Intra-specific fights:

Bull rhinos have a tendency to fight others of their own species (probably rivals) and this is believed to be an important factor in depletion of its numbers^{14,13}. Table - 26 gives a list of the recorded cases of deaths or serious injuries sustained by rhinos due to infighting.

Table -26 (Cases of Intra-Specific fights among Rhinos)

Year	Jaldapara	Gorumara	Outside sanctuaries	Reference
1948-49	1	-	-	14.8
1950-51	1	-	-	14.10
1968-69	-	-	1	14.22
1983	1 dead & 1 injured	1(sub-adult)	-	23 & 24
1986	2 (injured)	-	-	24
1992	1 (injured)	-	-	24

10.7 Accidents :

Table - 27 (Recorded instances of accidental deaths of Rhinos)

Year	Jaldapara	Gorumara	Cause	Reference
1948-49	1	-	trapped in swamp	14.8
1984	1	-	trapped in swamp	24
1986	1	-	-do-	24
1989	-	1	strayed into Bangladesh and got injured.	23

Table - 28
(Major floods affecting Rhinos in North Bengal)

River	Year	Affected Rhino population	Effect	Ref.
Sankosh	1924-26	Sankosh-Rydak (Buxa)	Large areas of Forests in North and South Bhoika reduced to Savannah.	9 and 16
-do-	1934-35	-do-	Eroded part of Bhoika Forests	16
Rydak	1930	-do-	Shifted course, creating new grasslands	
Rydak	1934	Sankosh-Rydak (Buxa)	Eroded part of Central-Rydak.	16
do	1934	do	Washed out numerous areas of forests near Dhumparaghat.	9
Torsa	1932-33	Jaldapara	Eroded Hashimara, Joygaon and Dalsingpara blocks.	16
-do-	1937-38	-do-	Changed course resulting in increase in area of Jaldapara.	14,3
-do-	1948-49	-do-	Changed course and flooded Sissamara, Bengdaki and Dhaldhaighat, causing heavy damage to the vegetation.	14,8
-do-	1952	-do-	Damaged crop	18
do	1954	-do-	3 Rhinos died Shelter for Rhinos become somewhat thin in parts. Savannah patches became less dense. Sal Forests of Baria damaged.	14,14 9
-do-	1964	-do-	Damaged crop	18
-do-	1968	-do-	Changed course, composition of Jaldapara and Torsa blocks changed. Damaged forests of Chilapata.	18
-do-	1984	-do-	Damaged crop	24
Holling, Siltorsa, Malangi, Tili, Howri	1993	-do-	Eroded forests in Jaldapara Barodabri, Tili and Hashimara blocks.	24
Jaldhaka	1954	Gorumara	Vegetation was killed and & Moorti big openings were created Adversely affected the feeding grounds and the cover of wild animals.	14,14 9
Diana	1964	-do-	Damaged forests of Diana Range	23

10.8 Diseases :

Cases of infectious diseases among rhinos are not on record. However, there is one case of a Rhino dying of septicaemia in Jaldapara in 1967-68^{14,21}. One abandoned female rhino calf was also caught in Jaldapara Sanctuary in March 1986, which was found to be suffering from pneumonia and also corneal capacity in the right eye. The calf died in 1987 due to unknown reasons.

10.9 Natural Calamities :

(a) The only natural calamity known to have affected rhinos and their habitat is the floods in rivers, which is a common feature in North Bengal. But unlike Kaziranga in Assam, where many rhinos are washed away by the mighty Brahmaputra every year, there is only one case in North Bengal recorded in 1954 at Jaldapara sanctuary resulting in the burial of 3 (three) Rhinos in the floods of the Torsa^{14,14}.

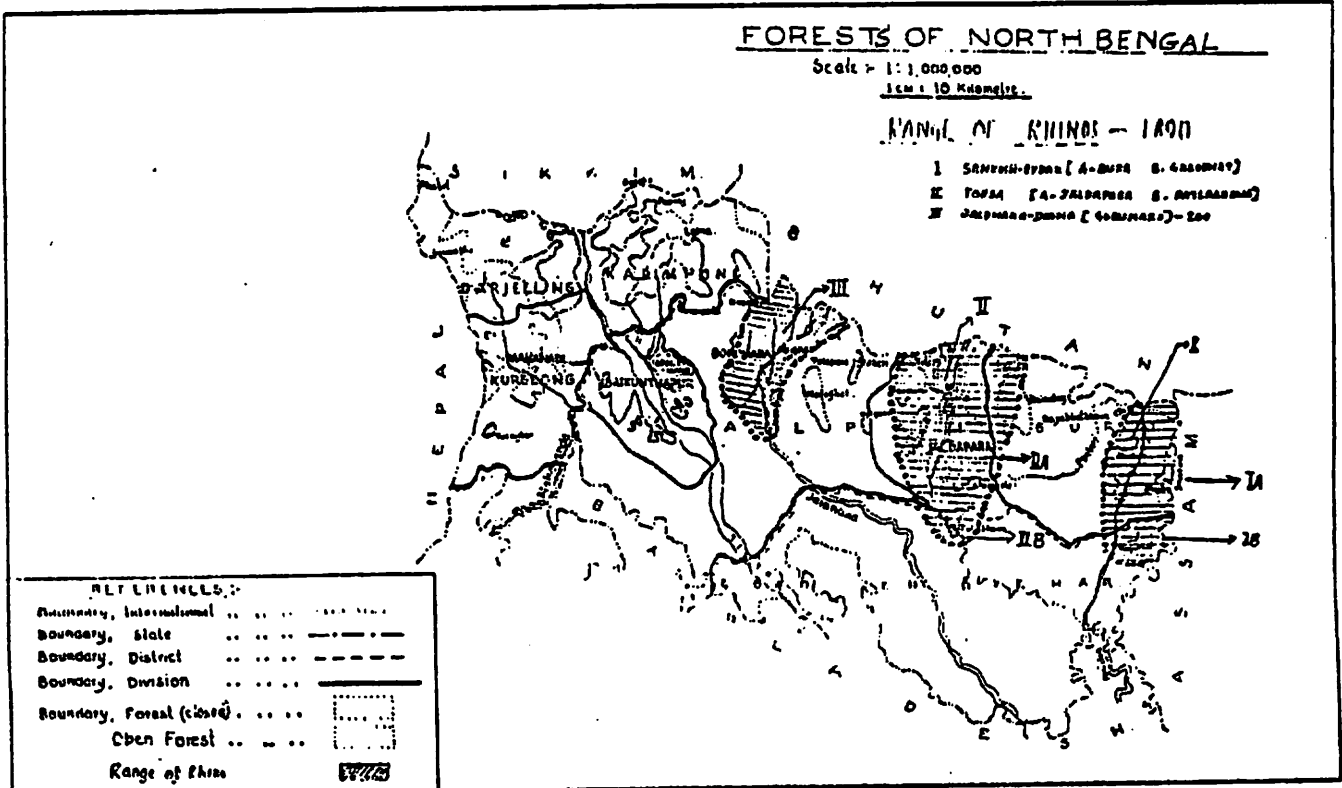
(b) In general, the impact of the floods on the rhino habitat can be negative (erosion of land) as well as positive (conservation of tree lands into grasslands). Table -28 gives a brief account of the major floods during the current century which have influenced the rhinos and their habitat in North Bengal.

11. Conclusion

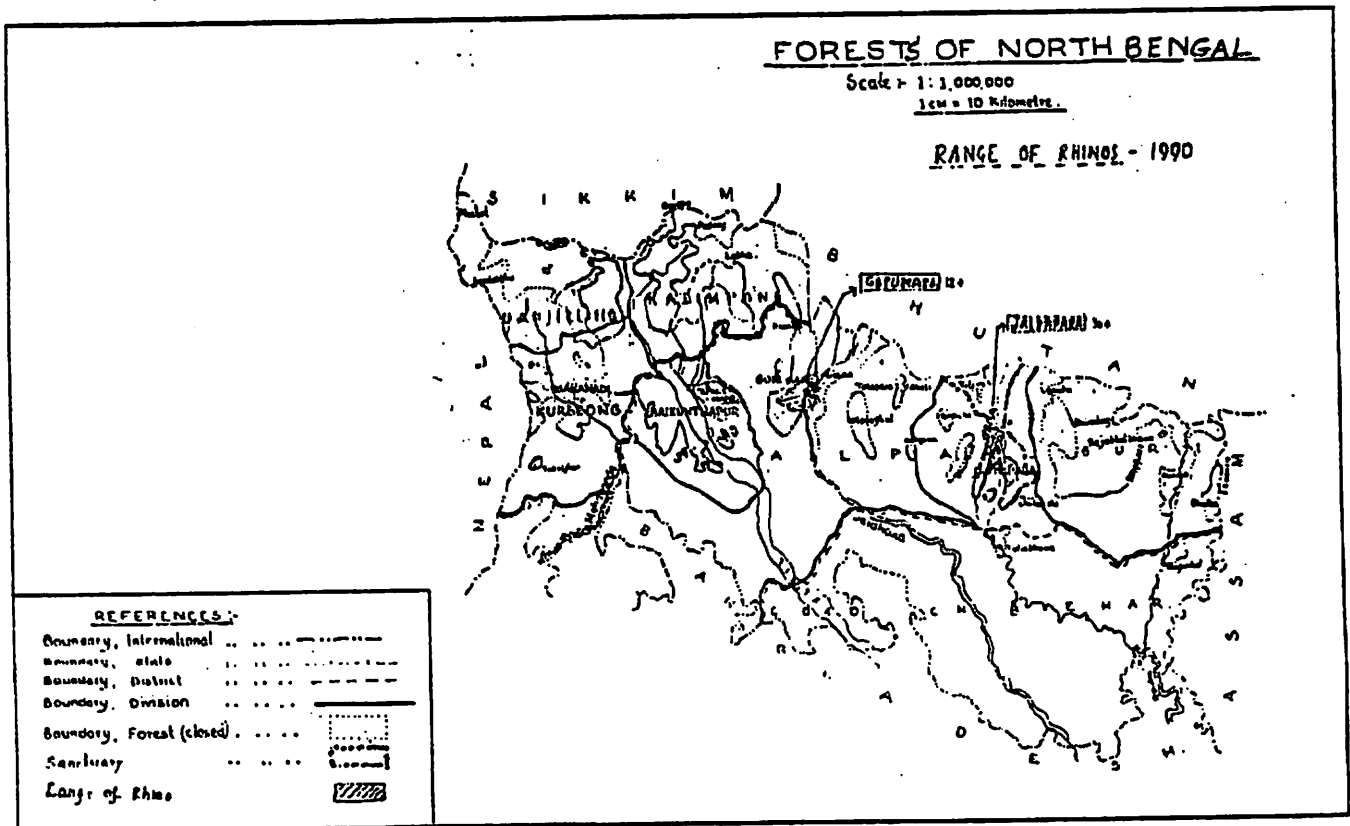
History of rhinos in North Bengal is very old. However, during the last one hundred years, they are engaged in a fierce struggle for existence against the human beings and the elements. The year 1900, witnessed the extinction of the lesser one-horned rhino (*Rhinoceros sondaicus*) from North Bengal and by 1930, the Great Indian Rhinoceros (*Rhinoceros unicornis*) also looked doomed for extinction. But thanks to the timely steps taken by the Forest Department and the other conservationists that rhinos are safely entering the twentieth century, though their present range has taken the shape of a mega-Zoo. Recent population trends in Jaldapara and Gorumara have indicated that given protection, the rhinos have the capacity to multiply and grow. With the now available tools of scientific management and the growing consciousness among the public and the decision makers towards conservation, there is every reason to believe that the rhinos in North Bengal will enter the twenty first century and also the centuries to follow.

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RANGE OF RHINOS IN THE LATE NINETEENTH CENTURY



PRESENT RANGE OF RHINO DISTRIBUTION