

Study on Group Size and Group Composition of Great Indian one Horned Rhinoceros (*R. Unicornis*, Linn.) at Gorumara, Jaldapara and Kaziranga National Parks, India

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Abstract: Greater one horned rhinos are to some extent solitary in nature and they do not maintain any particular group size and age-sex composition in the groups. The group sizes are very much flexible, only excepting mother-calf association. Over all rhino groups consisting of five, six, seven and eight members were rarely seen in all the three study areas in comparison to single, dyads, triplets and quadruple groups. However, Kaziranga rhinos are comparatively a bit pseudo-social because of higher population density. Most probably they form superficial temporary associations during grazing or wallowing. Group size consisting of six, seven and eight members are totally absent at Gorumara and Jaldapara. The bulk of the group sizes observed at Gorumara and Jaldapara were single, dyads and triplets which attained almost 96% and 97% respectively. On the other hand, Kaziranga rhinos were seen in four, five, six, seven and eight groups comprising of more than 12% sighting records. The age-sex composition in larger groups were seen changing frequently. The all male groups sometimes formed temporary associations usually roamed at the periphery with a greater home range particularly at Gorumara and Jaldapara.

Keywords: Group size, Group composition, dyads, triplets, quadruples, social association. Social groupings

1. Introduction

Indian rhinoceros is generally solitary in nature. But they are seen forming a variety of social groupings which are not at all steady. Basically, adult females are solitary when they are not accompanied by their calves. Sometimes an adult female allows her older calf to give her accompaniment until a newborn takes birth. On the other hand, the adult males are generally solitary but they form dyad during mating or during showing agonistic attitude to their fellow individuals or make triplets, quadruples or more during wallowing or grazing. But they sometimes occur in temporary associations of up to nine rhinos of various sex and age classes. Groups of up to 10 rhinos have been reported sharing a wallowing pool composed of females with their calves encircling a dominant adult male but without any sub adult male (Dinerstein, 2003). The adult or sub adult males often feed or rest together but move independently of each other (Laurie et al., 1983). In one study in Chitwan, Nepal, only 15% of the sightings of Indian rhinos were groups other than cow-calf pairs. Only seven groups consisted of more than three individuals and the most common type of group was comprised of two or three sub adults, usually sub adult males, which had recently left their mothers. The largest group recorded in Chitwan was of six sub adults (Laurie et al. 1983).

Much works have been done on the population studies, demographic patterns and social associations of Indian rhinoceros (Ulrich, 1964; Lahan and Sonowal, 1973; Laurie, 1978; ; Bhattacharya, 1991; Foote et al., 1993; Bhattacharya, 1993; Jnawali, 1995; Mukherjee and SenGupta, 1999; Hazarika, 2007). Animals containing social groups have some advantages over the non-social animals

like rhinos in relation to the intra specific communication systems such as responses to any visual, auditory and other signals; interdependency on each other, alertness to danger with a prior estimation etc. All these may increase the fitness level for survival. As the rhinos have no strong bondage among the individuals they are somewhat reluctant about the dangers to come.

2. Study Areas

During the years 1981 to 1984 an extensive study was undertaken on different aspects of population and demographic study and social groupings along with other behavioural studies on Indian rhinoceros at Gorumara (26°40' N, 89°00' E) and Jaldapara (25°68' N, 89°55' E) National Parks (the then Wildlife Sanctuaries) and Kaziranga National Park (26°30' N, 93°30' E) under the foot hills of eastern sub- Himalayan region. It was a part of a broader field study on the ecology and behavioural study of this animal. Gorumara and Jaldapara (Plate 1a and 1b) are located in the northern part of the state West Bengal in the district Jalpaiguri (Jaldapara is now located in the district Alipurduar). Gorumara lies at the confluence of Murti and Jaldhaka rivers, occupies an area of about 80 km² on the other hand, Jaldapara is situated on the flood plain of river Torsa. Gorumara is supported by a good buffer zone, whereas, southern part of Jaldapara has got a shape like a trouser owing to the rapid encroachment by the villagers and outsiders (most of them are refugees, displaced from the erstwhile East Pakistan, latter from Bangladesh), resulting a very long boundary, leaving almost no buffer zone. Jaldapara embraces an area of 216 km² area. Apart from core zone Gorumara is predominated by sal (*Shorea robusta*) forest in the buffer zone. Most of the areas of

Jaldapara are occupied by mixed riverine forest consisting of sissoo (*Dalbergia sissoo*), sirish (*Albizia lebbek*), khoir (*Acacia catechu*) etc. intermingled by grassland meadows. Nearest Airport is Bagdogra for Gorumara and Coochbehar for Jaldapara. Nearest rail stations are Chalsa and Hasimara for Gorumara and Jaldapara respectively.

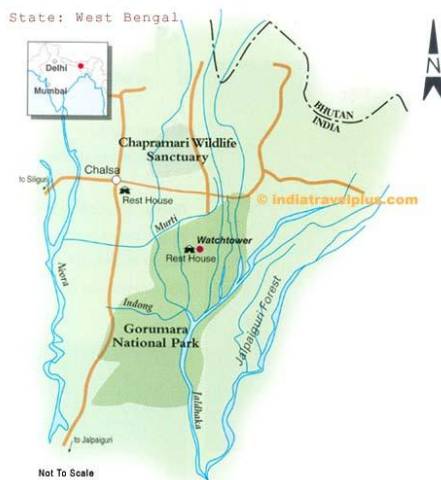


Plate 1(a): Gorumara National Park

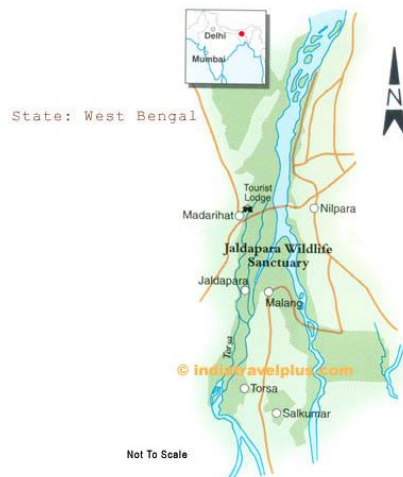


Plate 1(b): Jaldapara National Park

Kaziranga (Plate 2) is a well known and safest homeland of greater one horned rhinoceros. It enjoys a great natural boundary, the river Brahmaputra, along its north side which creates devastating flood during June to October every year. Numerous tributaries of the river Brahmaputra flow through the park, creating many logged permanent 'beels' or lakes. The soils are all alluvial deposits of the Brahmaputra and its branches. The vegetation is mixed grasslands and riverine woodlands, with grasslands predominating in the west. Tall grasses are common on higher grounds and short grasses grow on the lower grounds surrounding the lakes. The climate is monsoonal. The National parks extends in an east-west direction lengthwise and spreads over two neighbouring districts, Nawgong and Shibsagar. The entire National Park occupies an area of 430 km². The southern boundary is guarded by Assam Trunk Road where frequent patrolling is done by the Kaziranga Forest department. Nearest airport is Guahati.



Plate 2: Map of Kaziranga National Park

3. Materials and Methods

The wildlife researchers must identify individual rhinos in order to estimate their actual number, age-sex ratio, density of population etc. Firstly, we were to depend on their morphological appearances and their individual recognising features such as arrangement and irregularities in skin folds, horn length and shape, tail length, structural fold of bibs, body scars (if any), following the previous works done by W.A.Laurie in 1978. The records were noted down in a field diary. Photographs were taken, as many snaps we could take from different angles so as to be sure about slightest morphological differences. The chronological records of age-sex pattern of rhino populations helped us to evaluate whether the populations were stable or were increasing or in a depleting condition. When the population density in an area is good enough there is no chance of immediate extinction from that area, particularly it is true in case of Great Indian one horned rhinoceros at Kaziranga, in Royal Chitawan national park in Nepal (Laurie, 1978) and Pabitora Wildlife sanctuary in Assam (Hazarika and Saikia, 2010). The identified rhinos in some particular groups were of prime importance to view any bonding among the individuals. In this article, the study has been concentrated on the number and age of the individuals in the social groups, sex have been recorded in most of the cases. In many cases we took the help of the fresh foot impressions during our study, particularly at Gorumara and Jaldapara (Bhattacharya and Acharya, 1993).

4. Result and Discussion

Sightings in different parts of the day

Bulk of the sightings were recorded in the morning and afternoon session. Midday sightings were recorded in the close vicinity of wallowing sites (Pal and Bhattacharya, 1985). In many occasions we found the fresh foot prints and body impressions on the mud of the wallowing sites. However, midday sightings, all recorded in the three study areas, were comparatively low (Table 1). Sightings in the afternoon and evening sessions were slightly higher than the morning session at Gorumara, where as, at jaldapara and at kaziranga opposite pattern was noticed. But we do not consider this to be much conclusive since our searching hours were not always evenly distributed in the morning and afternoon sessions in all the study areas.

Table 1 depicts that starting from June 1980 to the end of May 1984, i.e., in four consecutive years' study, we encountered the rhinos in 879 occasions and sighted 1758 individuals in all the 879 sightings. Of the 879 sightings we recorded 356, 128 and 395 sightings in morning, midday and

afternoon sessions respectively including many brief glimpses. Besides this total 1758 individual sightings of rhinos, it was divided into 745, 188 and 825 individuals in those three sessions accordingly.

Considering the low population density and thick tall vegetations at Gorumara and Jaldapara, we think that above sighting records are good enough for further study regarding their general behaviour patterns. Of course, a fairly well analysis based on indirect observations proved to be an assisting factor.

Table 1: Chronological representation of no. of sightings and sighted no. of individual rhinos in different times of the day

Palce	Year	Sample	Morning	Noon	Evenning
Gorumara	1980-'81	140(262)	47(89)	8(14)	85(159)
Gorumara	1981-'82	94(171)	34(53)	7(19)	53 (99)
Jaldapara	1982-'83	156(260)	70(122)	25(45)	61 (93)
Kaziranga	1983-'84	489(1065)	205(481)	88(110)	196(474)
	1980-'84	879(1758)	356(745)	128(188)	395(825)

*Sample size includes no. of sightings and sighted no. of rhinos within parentheses.

Ratio between sightings and sighted individuals and group size

Table 1 reveals that in the three consecutive years at Gorumara and Jaldapara the average ratio between no. of sightings and no. of sighted individuals remains below 2. It does occur in those two places due to low population density. The ratio at Kaziranga only exceeds the level of 2. In the former cases the dyads consisted of mostly by the mother – calf association and the temporary breeding pairs. On the other hand, the Kaziranga dyads, apart from the above two combinations, found composed of various types of combinations such as, adult female + sub adult female, two sub adults, adult female + sub adult male (probably the older calf) etc.

At Kaziranga due to higher rhino density we found much accommodativeness among them and they were found using the same habitat irrespective of age and sex. A tendency of avoiding major agonistic interactions with other herbivores or with fellow individuals was noticed also. It might be due to the fact that they were habituated to live gregariously at least in superficial level. However, various combinations of dyads, triplets and quadruples increased the sighted number of rhinos per sighting. Table 2(a) and Fig. 1. shows the ratio between sighted individuals and sightings and 2(b) shows the group composition analysis in reference to the years and places

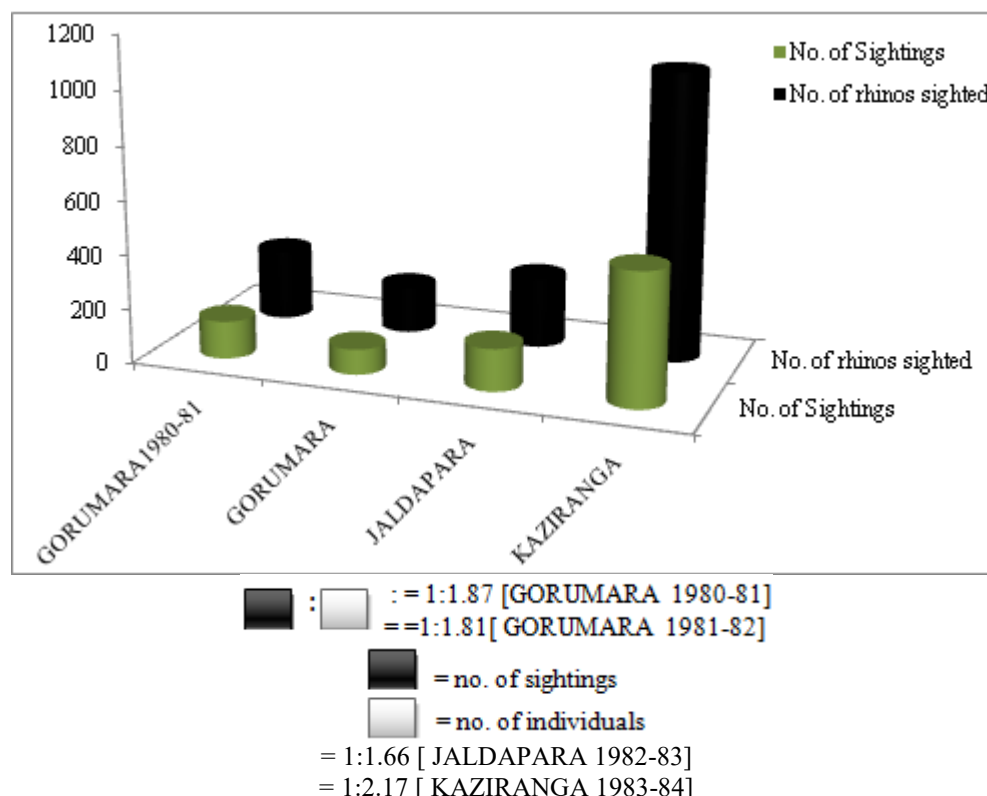


Figure 1: The figure shows striking difference in no. of sightings and rhinos sighted, Kaziranga lies far ahead than those of Gorumara and Jaldapara. The data below the figure shows the ratio between the above parameters in three study areas

Table 2: (a) Comparative study on the ratio between number of sightings and sighted rhinos in the three study areas

Place	Year	No. of sightings	No. of individuals	Ratio
Gorumara	1980-81	140	262	1.87
Gorumara	1981-82	94	171	1.81
Jaldapara	1982-83	156	260	1.66
Kaziranga	1983-84	489	1065	2.17
		879	1758	2.0 (Avg)

In the first year (1980-'81) the frequency of sighting of dyads exceeded the 2nd year's (1981-'82) sighted dyads. In the first year the dyads were mostly composed of a known breeding pair and a mother-calf association. But in the following year, observations on dyads were decreased due to two consecutive poaching incidences [Table 2 (b)]. Triplets usually formed by an adult female, one juvenile and another sub adult female. Sometimes an all male group comprising of three members were seen roaming at the periphery of the sanctuary having a greater home range. Formation of quadruples could not be inferred strictly as their social compositions but they might be congregated together for enjoying the best areas. Congregation and segregation usually did not happen systematically, but they used to come close together while searching for food and wallowing sites without disturbing each other.

A single case of observation of a penta-group (five rhinos together) was recorded in April, 1981 at Gorumara. Quadruple formations at Gorumara were seen to be variable; sometimes by two sub adult males combining with a mother-calf association, or sometimes by a mother-calf and two juveniles and so on.

In initial months at Jaldapara and Bardabri block (1982-83) we observed mostly the lone bulls and lone cows. One large bull and a smaller cow were frequent visitors in the vicinity of our camp particularly at night. Their presence were felt by the cracking sounds of chewing short and tall grasses. Northern Jaldapara blocks do not have good rhino habitats, so it was true in case of Bardabri block. But when we shifted our study centre at Moiradanga block (located in south western leg) we started viewing dyads and occasionally triplets. Our frequent visit at Sissamara block (eastern leg of the then Jaldapara Sanctuary) also appeared to be fruitful.

We observed 23 dyads over there at Sissamara, mostly comprising of a breeding pair, and a mother-calf unit. A couple of immature (non-sexed) in three occasions also came to our notice. Like Gorumara we observed a group consisting of five members at Moiradanga. We were confirmed that it was a chance occurrence by union of a lone cow, a mother – calf unit and a breeding pair since the same mother with her calf were found, roaming isolately, in our latter visits. The calf was known by its mother who could be instantly identified by a cut mark on her left ear.

The frequency of sighting records of dyads, triplets, quadruples and to some extent penta- groups were found to be much high at Kaziranga (1983-'84) due to its highest density of rhino population. Sighting records of dyads finished well ahead of the recorded sightings on lone individuals over there. But it was hard to believe that the

groups consisting of 5,6,7 and 8 members were all belonging to the specific groups rather those large groups might have the compositions of some smaller subgroups. It is known that rhinos are not gregarious animals rather they lead solitary lives, so a large group of 8 rhinos consisting of some singles or a few dyads or triplets used to come close together very often during grazing or wallowing because of high density. In the driest months from March to May they used to form larger groups in the best habitat zones, congregated knowingly or unknowingly for better food, water and above all for enjoying cooler muddy wallowing sites.

Percent observations of group size

The percent wise calculation of the group composition it is revealed that out of total 879 sighting records the lone individuals, dyads, triplets and quadruples comprise of 36.17%, 40.95%, 14.44% and 5.23% respectively totalling to 96.97%. The data observed for the groups of 5, 6, 7 or 8 members were negligible. The percentages of group compositions of dyads, triplets and quadruples achieved this representable shape due to higher sighting records of above said groups at Kaziranga. Of the total 489 sightings at Kaziranga, singles, dyads, triplets, quadruples and penta group comprised 30.26%, 40.23 %, 14.72%, 7.15% and 3.27%. But if we calculate the result in all the three

Table 2(b): The comparative group composition analysis of observed rhinos in reference to years and place

Place	Year	GROUP COMPOSITION							
		1	2	3	4	5	6	7	8
Gorumara	1980-81	53	59	22	5	1	-	-	-
Gorumara	1981-82	43	28	20	3	-	-	-	-
Jaldapara	1982-83	74	65	13	3	1	-	-	-
Kaziranga	1983-84	148	208	72	35	16	6	3	1
Total sightings		318	360	127	46	18	6	3	1
no of rhino		318	720	381	184	90	36	21	8

Total sightings = 879 and total no. of rhinos sighted = 1758 study areas, Kaziranga alone claims 57.77 %, 56.69%, 76.08% and 88.88% sighting records in single, dyads, triplets, quadruples and penta group respectively .

Are the Kaziranga rhinos a bit social than their West Bengal representative?

From the above percentage records it appears that the social bondage(?) to some extent is present in Kaziranga rhinos unlike Sumatran (Borner,1979) and Javan rhinos (Santiapillai et.al.1990) and Malayan tapirs (William and Petridges,1980). This does not mean that they have made themselves gregarious like wild buffaloes (Divekar et.al.,1982) and gaurs (Guin and Pal,1982). If they would be gregarious the existing total population at Gorumara and Jaldapara would not exceed one or two groups. But the fact was that the Kaziranga rhinos were compelled to make a superficial social habit under pressure due to high population density in some places and thereby shifted a little from their original solitary behaviour. While feeding on the succulent green grasses in the preferable pastures, or during sharing the large shallow water bodies for wallowing the rhinos of Kaziranga used to come close together forming

larger and larger groups. A peaceful coexistence without much aggression was noticed in their daily activities, most probably, due to a rich and spacious habitat.

The rhinos of Kaziranga have learnt to live with their conspecifics along with other large herbivores without involving much in agonistic interactions. Though we observed aggressions in a few occasions and, we were also reported about some aggressive interactions between themselves and, in two cases with elephants happened elsewhere at Kaziranga [Sharma, (R.O.), pers.com. and Pal, (B.O.), pers. Com.]. In case of African Black rhinoceros, who are known not to be much social, group size reached its maximum level up to six consisting of $A_{\sigma} - c + A_{\sigma} - c + A_{\sigma} + Im_{\sigma}$. Otherwise, maximum group size ranged from 1 to 4 members (Frame, 1980).

Table 3: Chronological percent observations of group size in three study areas

Place	Year	Group Composition							
		1	2	3	4	5	6	7	8
Gorumara	1980-81	53	59	22	5	1	-	-	-
Gorumara	1981-82	43	28	20	3	-	-	-	-
Jaldapara	1982-83	74	65	13	3	1	-	-	-
Kaziranga	1983-84	148	208	72	35	16	6	3	1
Total sightings		318	360	127	46	18	6	3	1
no of rhino		318	720	381	184	90	36	21	8

Table 3 depicts the percentage of total group size sightings in all the three study areas where it shows that Kaziranga lies much ahead in group size sighting records (55.61%). Group size consisting of 6, 7 and 8 members remained totally absent at Gorumara and Jaldapara.

So Rhinos of Jaldapara and Gorumara were not that much fortunate. Low population density led them to live a more or less solitary life. In addition to that, limited favourable green pastures and wallowing pools, made them a bit aggressive particularly in the driest months (Bhattacharya, unpubl.data).

5. Conclusion

From time immemorial solitary nature of rhinos (irrespective of African and Asian species) have made them less communicative and less responsive in comparison to the other large herbivores such as elephants, gaurs, wild buffalo, bison and smaller deer and antelopes. It has also made them vulnerable to predation (particularly on the calves), hunting and poaching. In Kaziranga and Pobitora (highest density of rhino population in the world) what has been found is due to overpopulation and that brought about a temporary superficial association in smaller habitat zones.

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