

Table 1. Centipede abundance correlated with rainfall (January to December 1997)

No.	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	<i>Scolopendra amazonica</i> Bucherl.	—	—	—	—	—	3	5	3	2	2	6	3	24
2	<i>S. morsitans</i> Linn.	—	—	1	—	—	—	2	—	—	—	—	2	5
3	<i>S. hardwickei</i> Newport	—	—	1	—	—	2	1	1	—	1	2	1	9
4	<i>Asanada sukhensis</i> Jangi & Dass	—	—	2	—	—	2	1	5	4	3	—	1	18
5	<i>Otostigmus politus</i> Karsch.	1	—	—	2	—	3	—	3	4	3	2	6	24
6	<i>Otostigmus</i> sp.	—	2	2	—	—	—	1	2	2	2	—	—	11
7	<i>Rhysidua nuda subnuda</i> Jangi & Dass	—	2	—	—	—	1	1	2	7	4	3	2	22
Total number of Individuals		1	4	6	2	—	11	11	16	19	15	13	15	113
Rain fall (mm)		—	—	—	—	110	100	479	66	43	697	1052	409	

rainy season from June to December, 100 individuals were recorded. This amounts to 88.5 per cent of the total records which could be due to moist cooler climate and wet soil condition. Another reason could be the blockage in centipede burrows by rain water. However, low rainfall months (August and September) denote the highest number. The Robust centipede *Scolopendra morsitans* Linn, and the Tiger Centipede *S. hardwickei* Newport were found to be less common in the soil of Anaikatty Forest.

Only further studies can throw light on the exact trend in centipede population during different seasons. The practice of removal of topsoil to make brick by the industries in and around Anaikatty is a major threat to the survival of centipedes in this region.

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References

- Attems, C. (1930). Scolopendromorpha. *Das Tierreich* 54 (2): 1-308.
 Jangi, B.S. and C.M.S. Dass (1984). Scolopendridae of the Deccan. *J. Sci. and Ind. Res.* 43: 27-54.
 Yadav, B.E. (1993a). On a collection of centipedes (Myriapoda: Chilopoda) from Pune, Maharashtra. *Rec. Zool. Surv. India* 93(1-2): 165-174.
 Yadav, B.E. (1993b). Scolopendridae (Chilopoda) of Western Ghats with some first records. *Rec. Zool. Surv. India* 93(3-4): 321-328.
 Yadav, B.E. (1994). The Scolopendrid centipedes. *J. Sci. & Cult.* 60: 77-79.

NOTE

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MALE-MALE AGGRESSION IN *RHINOCEROS UNICORNIS* - AN OBSERVATION FROM NORTH BENGAL, INDIA

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In West Bengal the Great Indian One-horned Rhinoceros (*Rhinoceros unicornis*) is confined to Gorumara National Park (80 sq.km.) and Jaldapara Wildlife Sanctuary (216.5 sq.km.) in a mosaic of various vegetation types (Ghosh, 1991). There are only a few studies on various aspects of rhino ecology and management strategies in this part of the country (Ghosh, 1991; Pandit & Yadav, 1995; WII, 1997). Jaldapara Wildlife Sanctuary has a population of 40 rhinos and Gorumara National Park has 14 rhinos. The population figure shows an increasing trend over the last decade. However, question has been raised over the future of this species in such a small, isolated and fragmented patch of forests (Nandi, 1993; Bist, 1994; Raha & Yadav, 1996).

The present study analyses the aggressive behaviour in male rhinos of Jaldapara Wildlife Sanctuary and Gorumara National Park. Ghosh (1991) described in brief about male dominance relationship in Jaldapara Wildlife Sanctuary and Laurie (1978) studied this aspect in Royal Chitwan National Park in Nepal.

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Bist (1994) has reported certain incidents of male-male aggression in Jaldapara leading to death of the subordinate male.

Adult male-adult male confrontation

Adult male rhinos are solitary in nature and form temporary associations with females during sexual encounters. Home range of Indian Rhinos show much overlap between different individuals of each sex (Laurie, 1978) and concept of exclusive territory is absent in this species. The dominant adult male tries to establish his supremacy by show of strength with other adult males for mating with females in oestrus.

In Jaldapara Wildlife Sanctuary there are nine adult males and 18 adult females presently. During December, 1992 one adult male rhino with injury on the back of the rump with occasional bleeding was sighted in Jaldapara-5 and Torsa-1 compartments. The injury was caused by intraspecific fight with another adult male rhino. The movement of the rhino was tracked daily with the help of departmental elephants. In the last week of January 1993 this aged rhino, which had passed its prime was again attacked by the dominant adult male who had travelled almost 10 km. from Torsa-2 compartment and inflicted severe injuries with several attacks. The movement of the injured rhino became very slow and he appeared to be weak. It was observed that after injury the old rhino restricted his movements only to Jaldapara-5 compartment near Chirakhawa River and spent most of the time in wallowing in a muddy water pool or in Chirakhawa River and would not leave until disturbed.

Intra-species fight

Fighting between these two adult male rhinos was observed twice. Agonistic behaviour of rhinos are typical before and during the fight. The dominant male was observed to keep both its ears erect and forward and occasionally move its head upwards before approaching the old male rhino from a distance of nearly 100 m. As the dominant male approached nearer the old male, he squirted urine and rubbed his horn against a medium girth Sissoo tree. This display was followed by dragging of the hind legs making marks on the earth. Soon after, the dominant male ran towards the older male at full speed with lowered head making a typical guttural sound. The older male rhino was chased for a distance by the dominant male with mouth wide open and displayed tusks.

In another incident similar behaviour was observed with additional head to head confrontation. The dominant male rhino attacked the head of the weaker male with his horn and tusks. Attacks were also made from the side at the head region. However, due to the movement injuries were also received on the neck and the side of front folds. Both the male rhinos frequently performed squirt-urination during the fight. At the end of every fight the dominant male rhino totally overpowered the older and weaker rhino.

Injury and treatment

After the first encounter with dominant adult male, the old male rhino received injury on the left rump. The wound was one-and-half-feet long and approximately two-inch deep. Subsequently more injuries were inflicted during fight and the old male rhino sustained one-half-foot long wounds on both the hind legs below the fold. Bleeding was noticed from the wounds and part of it also indicated maggot infestation. At this time it was decided to treat the lacerated wounds. Firstly, for some days, long acting antibiotics mixed with turpentine oil was sprayed on the wounds from a distance on elephant back. This did not help much. On 5 February 1993, the injured rhino was darted with 1.6 ml. of immobilisation drug and was tranquilised. A team of veterinary doctors cleaned the wounds and treated with Himax ointment, Nebasulph ointment, Dexamethasone (30 ml.), Conciplex injection (30 ml.) and long acting penicillin (240 lacks). During the treatment an additional dose of Xylazine (150 mg.) was administered. After 47 minutes, an antidote Revivon (2 ml.) was administered intravenously and the rhino recovered its reflexes. The movement of the rhino was monitored regularly and he was reported to be healing.

The same rhino was again attacked by the dominant male rhino after three months and he was reported to have broken his horn on the top edge. There was not much severe injury. Again after 10 months in April 1994, the old male rhino was injured during horn clash and he sustained injury near the nasal opening and at the base of the broken horn. The injured rhino was given doses of long acting penicillin (200 lacks) in the months of April and August, 1994 using a dart gun.

In the last week of September 1994, the old rhino was severely injured in the head region and was bleeding from the nose. On 6 October 1994, the injured rhino was tranquillised at Jaldapara-5 compartment with 1.74 ml. of Immobilion. There were two wounds near the nasal portion and base of the horn. The wound was at the right maxillary position. The injury at the base of horn was 4 in. in diameter and extended towards the frontal sinus. The wound was putrified with maggot formation. The pus and dead tissue debris were removed. The wounds were treated as mentioned earlier and the animal was revived with the help of antidote Revivon (1.8 ml.). This was followed by spraying of medicine Himax, Betadine, Lignocaine 2% (30 ml.) and Nebasulf. Injection Penedidure LA (48 lacks) was administered five times with dart gun.

However, the condition of wounds deteriorated further because of another violent encounter with the dominant male in the first week of December 1994. The head region appeared to be swollen and continuous bleeding was noticed from the nasal openings and at the base of the horn. The injured rhino was unable to move properly and spent most of the time in the wallow pool to avoid maggot infestation. It was decided to tranquilize the injured

rhino and keep it in a temporary wooden stockade for intensive treatment and to prevent the chances of further fighting with the dominant male. On 23 December 1994, the injured rhino was tracked near the stockade in the grassland on Jaldapara-5 compartment and was tranquilised using 1.6 ml. of Immobilon (3.92 mg. Etorphine HCl plus 16 mg. Acepromazine). The veterinary surgeons examined the immobilised and injured rhino. They found that the left nasal passage was completely blocked by cancerous tissues with cauliflower-like growth. The sinus wound was from nasal passage to bottom of the horn due to maggot infestation. The wounds were cleaned and long acting penicillin was applied intramuscularly. The animal maintained stable pulse rate, breathing and body temperature. The immobilised rhino was carried on a wooden sledge to the stockade. The overall operation took less than 45 minutes and 1.6 ml. of Revivon was administered intravenously. However, the injured rhino did not respond and died.

Adult male-subadult male confrontation

Intraspecies fighting in rhinos was observed in Gorumara National Park involving one fully grown adult male rhino and a subadult rhino (5-7 years old). The stronger bull was the dominant male among the three male rhinos in this National Park. Calves generally remain with their mothers for three to four years and are protected by mothers. However, after weaning from mothers juvenile males are attacked frequently by stronger adult males. It was observed that this particular subadult male rhino was very timid and fled immediately on the approach of a stronger bull. This subadult male rhino was repeatedly chased by the stronger bull and forced to move out of prime rhino habitat. The subadult male changed its range use after confrontation with stronger adult male and shifted to central Diana Block after crossing the river Jaldaka in the last week of August 1995.

Central Diana Block is fragmented patch of forest surrounded by tea garden and human habitation and was not considered safe from protection point of view. It was decided to drive this subadult rhino towards Gorumara National Park using departmental elephants. However, every time he went up to the Jaldaka River he again ran back to a small Sissoo plantation patch on the bank of the river outside the forest area. Since all attempts to drive back the rhino failed, a team of staff along with one departmental elephant was stationed in that area to ensure safety of the animal, with the hope that the rhino may, on its own, enter Gorumara National Park. However, the rhino was reluctant to cross the river and confined its territory across Jaldhaka River near Zero Bundh. It was then decided to translocate this subadult rhino to Jaldapara Wildlife Sanctuary. The attempts for chemical capture failed in January 1996 and the operation was ultimately abandoned fearing that shock and trauma caused by chemically induced capture may be fatal.

In the night of 29 February 1996, the subadult rhino was at-

tacked by the dominant bull rhino which crossed the river. The staff camping nearby burst fire crackers and drove away the adult male rhino using a departmental elephant. The fight lasted for about half-an-hour. During this time the subadult rhino received severe injuries in the left and right thighs, under portion of the belly and on the left part of the face. It was evident from the injuries that the subadult male rhino was completely overpowered by the adult bull and had been felled on the ground. The dominant bull used its horn to attack and injure the weak rhino.

Again after a week the dominant bull crossed the river and entered the patch of forest where the subadult male rhino had taken shelter. It chased the subadult male rhino for around 4 km. towards Gorumara National Park and forced it to cross the Jaldhaka River. The chase continued up to the Gairati Camp where the adult bull overpowered the weaker one and again injured it in the right and left thighs. The injured rhino took shelter in a secluded area of Medla-3 compartment where rhinos generally do not visit. The movement of the rhino was tracked and it was observed that the wounds were quite severe. It was decided to protect the injured rhino within an electric fence to prevent further flight with adult bull and to give proper medication. Firstly, for some days long acting antibiotics mixed with turpentine oil was sprayed on the wounds from a distance. The movement of the injured subadult rhino was regularly monitored and was observed grazing, wallowing and drinking water. After three days the injured rhino was seen in the resting position when staff went to spray medicine; the rhino was able to move very slowly. The veterinary doctors administered intramuscular antibiotic and antipyretic injections including a life saving drug. The condition of the rhino deteriorated fast, was unable to move and he died on 12 March 1996. According to the veterinary doctors the injuries were quite severe and the rhino had become anaemic due to heavy blood loss.