HANDBOOK OF THE MAMMALS OF SOUTH ASIA

WITH SPECIAL EMPHASIS ON INDIA, BHUTAN AND BANGLADESH

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and
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NATRAJ PUBLISHERS
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FOREWORD

Bears and leopards are quite common in the hill areas of Uttarakhand. In the area I hail from, it was carefully fostered in the minds of the children that one should be careful of the wild animals, especially carnivores. A famous dictum amongst our village elders was: "Run uphill when a snake is after you and run downhill when a bear is in pursuit." Their logic was that the snake finds it difficult to climb up while the mane of the bear obstructs its view when the beast is moving downwards. Naturally, I was scared of both these animals. Most of these stories were passed on from one person to another, always with a touch of exaggeration. No doubt, leopards sometimes, became man-eaters but such cases were rare. Once, in the seventies, I lived within the range of a suspected man-eater near Lansdowne in Uttarakhand. Daily I would be treated to a barrage of wild and unbelievable stories. Each day would usher in a new twist to a tale that steadily grew more bizarre. The most outlandish version that I recall was the one about how the leopard turned into a ghost by evening. After a few days, things became normal and the rumours too died down. I could not, however, get a confirmation whether there was really a man-eater in the area. Of course, man-eaters have been killed and captured there from time to time. I even saw one brought to the Lucknow Zoo.

Around that time, I also heard an incident in which a hunter killed a leopard illegally on a tip from some villagers that the said cat had started lifting domestic cattle. The matter was immediately reported to the Forest Department. The concern was certainly not for the law or the death of the leopard. The main cause of the complaint was the grievance that the hunter did not take a few important people into confidence. I do not know what action was taken on that complaint. But almost all the local people were happy to get rid of a wild carnivore that was causing damage to their domestic animals. A long time ago when I was a child, a pheasant was spotted by my friends and I. We threw stones to hunt the bird. It flew away and took shelter in some other spot. All the people in the locality began to help us in our hunt. They guided us towards the bird, which ulimately escaped. The local people showered sympathy on us but not on the pheasant.

Similarly, in another incident, I heard a story about how a bear was killed by some local people. The main theme of the story was about the courage of the person who had faced the bear and striken it with his axe. By the time I grew up, however, the concern for wildlife had started percolating down to the mind of the public. But despite this, the public attitude towards wild animals remained homicidal by and large. I began to ponder over the right of animals to lead a peaceful life. But this sympathy was still restricted to prey animals. I realised the importance of protecting wild animals only after coming into the forest service. During the initial years of my service, my relatives and friends introduced me as 'the lord of the jungle'. The message to their children was that I could arrange venison for them. Initially, it was quite difficult for me to change their impression and attitude. I know that to avoid embarrassment, a few foresters even promised to fulfill their desire.

Another embarrassment I faced while on duty was when wild animals strayed outside the forest and people demanded that the beast be shot. Any action contrary to the demand would invite their wrath. Even some foresters were not convinced about the protection of wild animals. Such questions from foresters were more difficult to answer because they were knowledgeable. For example, one member of my staff emphasised that conservation was a western theory. "Those people have already killed all their dangerous animals and are preserving only harmless creatures like deer, birds etc. On the other hand, India is full of dangerous animals. We should also kill our tigers, leopards, elephants and all the dangerous creatures. Only then, we should pursue conservation."

All this made me realise that the only way to enlighten people was to record our glorious assets. I found that most foresters do not have sufficient knowledge of wild animals. There are good books, but these books do not highlight what we have lost due to human need and greed. In the field, a forester comes across a variety of animals. Whenever a new animal is sighted, there is no handy literature for identification. During my posting as Conservator of Forests, Wildlife Circle in the year 1999, Subrata Pal Chowdhury, a renowned wildlifer, requested me to write a book on the animals of the State. During this interaction, he introduced me to Jayanta Mallick for help. Initially, I thought of writing a book for departmental use. I asked Jayantada to provide the necessary matter in proper format. What he accumulated turned out to be quite substantial. In the meantime, I wrote a book on the seized butterflies of Darjeeling. Although appreciated, the book could not be dispatched to proper places after I was transferred out of that Circle. Therefore, I discarded the idea of a departmental publication. It was found that the matter already gathered was insufficient for a voluminous work, I began to consult more and more literature. I started gathering whatever information was available and from every possible sources. Jayantada ably supported me in this work. So instead of producing an elementary book, we switched over to a compilation of a voluminous and informative tone, covering India and adjoining areas.

The objective of this book is to present a thorough account of the heritage of mammal diversity in India and its adjoining areas. The main emphasis is on the past and present distribution of animals in the region. Commonly known animals have been described in more detail to inculcate interest amongst readers. At the same time, lesser known animals have also been covered

to some extent, so that those interested in wild mammals can distinguish and identify them in the field. The details of the extinct species confer a pattern and are testimony to the extent of extinction. Information on the basis of our experiences have been combined to present all the hitherto scattered and unknown facts for the more inquisitive readers.

N.C.Bahuguna

When I first joined the Wildlife Wing just after completing my post-graduate studies, I did not have much knowledge about wildlife conservation. But my direct attachment to all the Chief Wildlife Wardens of the State, three years after the promulgation of the Wildlife (Protection) Act, 1972, has opened up a vast knowledge-base before me. It became a custom of mine to meticulously preserve all the information that came my way. The prime store-house was the age-old Central Library of the Forest Directorate. Though my basic objective to haunt this favourite treasure-house and others was to prepare my dissertation, facts pertinent to wildlife also enriched my collection. Field visits to all the protected areas of the state, as and when the opportunity arose, also enhanced my experience. I have so far been involved in the efforts of departmental publications. But when Mr. N.C. Bahuguna contacted me to be a co-author, I handed over the relevant documents to him for editing with the cherished hope that these would ultimately be useful for posterity.

Jayanta Kr. Mallick

manner (Harrer, 2005). Sportsmen considered this animal a nuisance because of its curiosity and noisy galloping, which scared off the game they wanted to shoot. In summer, it loves swimming across the river. Once there was a fight between two kiangs, probably for females. They did not observe the onlookers. Chunks of turf flew and the earth shook under their hooves. The sensuous mares, danced around. A thick cloud of dust often hid the area (Harrer, 2005).

Sub-adults create their own herds of up to 10 members in winter. By summer, those approaching adulthood try to attract females. Males begin to follow the female herds in July. Infighting for the possession of females is observed through August. During mid-August, they begin herding the females into harems, defending them from rival males. Sexual maturity is attained in 2-3 years in females; a little later in males. The mating season ends by the end of summer. Its gestation period is almost a year. Females give birth during the next summer. Small groups of 2-5 females split away from the main herd, retreating to rocky places to give birth. Generally one foal, weighing about 30 kg and with a shoulder-height of about 90 cm is born. The young ones walk within a few hours after birth and become independent in about a year. Thus the female is again ready for mating. A group of pregnant females choose a rocky area for giving birth. The mother and young ones again join the herd after a few weeks. The lifespan of this mammal is more than 18– 25 years (Dover, 1932).

PAs: JDNPBh (Jackson, 1981; IUCN, 1993).

Status: VU (Molur *et al.* 1998). Sharma & Lachungpa (2002) mention it as rare in Sikkim. Within Sikkim it is found in Chho Lanho plateau, Gyamtsona, Chulung Valley, Yumcho, Kerang, Chulung La, Bamchho La, Sesse LA Oloten, Gurugongmar, Donkyala (Anon, 2004a). Approximately 2000 or more kiangs are expected spreading over large territories. Ali (1981) reports of Kiang in groups of ten and seven in north of Donkya La near Bomchho La and in Chho Lamhu respectively.

RHINOCEROTIDAE

Rhinoceroses

The word 'rhinoceros' is derived from the Greek word meaning 'nose-horned'. African rhinos are found in Africa, south of the Sahara. Asian rhinos are found in Asia, extending eastwards from India. In the past, Asian rhinos existed across the entire northern part of the Indian subcontinent from Afghanistan to south-east Asia. The presence of Rhinoceros seals, with extremely lifelike representations, indicates its presence in northwest India in the past. Babur in his memoirs often mentioned the presence of the rhino in Northern India. The rhino was hunted in the Indus Valley in 1519 (Schaller, 1998). In the beginning of twentieth century, the rhinoceros existed in UP also. *Indricotheriam*, the largest ever land animal, was 5.4 m tall and weighed 30 tonnes.

Rhinos are massively built animals with broad chests and stumpy limbs. The females are smaller than the males. Their colour varies from greyish to brownish black. They have a three-

toed foot, unlike the elephant, which has four toes. The hooves are separate from the digits. Their eyes are small. Their skin is very thick and folded; appearing like riveted armour plates. Not many hairs are present on the skin. There are stiff bristles on the tail. The braincase is small. Rhinos have one or two well-developed, solid and formidable nasal horns; which is a cemented mass of hair, separated from the skull resting on a bony base. It is rudimentary in some; broader in males while longer and sharper in females. This nasal horn has a high concentration of keratin- a protein found in hair.

Rhinos inhabit savannahs, shrubby regions and dense forests where plenty of water is available for wallowing. They are more active in the evening, through the night and in the early morning, spending the daytime resting in a heavy cover. They penetrate dense thickets by shear force, often leaving behind a trail that other animals use later. The African species usually live in more open areas. They are grazers, more aggressive and fight with their horns while the Asian rhinos are browsers and fight with their bottom teeth (Ballenger & Myers, 1999). When stumbled upon suddenly, rhinos scuttle off at a great pace, crashing through the undergrowth, and taking to the hillside almost as rapidly as the level ground. Rhinos prefer a diet of succulent plants. They sleep in standing as well as in a recumbent position. They walk awkwardly attaining a maximum speed of about 45kmph for short distances while running in a canter. Thought to be generally timid, they are very ferocious at times. Rhinos mark their territories with urine or dung in well-defined piles that can reach up to one metre in height. This dung-heap is furrowed around to make it more conspicuous. Rhinos have a symbiotic relationship with birds, which feed on the ticks infesting the animal. Their senses of smell and hearing are acute, but sight is very poor.

Rhinos are solitary creatures and tend to avoid one another, coming together only for breeding (Anon. 2007). I do not agree with this observation and I have often seen many wallowing together but as separate individuals and not as herds (Bahuguna). Females do not move too far from their place of stay. They have partially overlapping home ranges. The males are slightly more nomadic. The large ranges of males overlap extensively, but there appear to be small, exclusive core areas. Both sexes mark their territories with faeces, urine and soil scrapes.There may be long-term pairing of a male and a female. Females generally give birth to a single baby at 2-3 years interval. The gestation period is generally 420 to 570 days (Ballenger & Myers, 1999). The young baby remains with the mother for about two years. Sexual maturity is attained in 4-6 years in females and 7-10 years in males. Their lifespan is up to 50 years.

In addition to various superstitions, rhino horn is used as an aphrodisiac. A shield made of rhino hide is considered impregnable in battle. Shebbeare and Roy (1948) have noted that blood, urine, skin and meat of the rhino were saleable. Some Hindus believe that every part of its body is sacred and valuable.

THE SUMATRAN OR ASIATIC TWO-HORNED RHINOCEROS

Dicerorhinus (*Didermoceros*) *sumatrensis* G. Fisher, 1814

Plate 19

Subspecies: *lasiotis*

Range/distribution: Jalpaiguri (Mitra, 1951, Inglis *et al.*, 1919). Past distribution in Bengal, Assam, Tripura and northeast India till the end of the 19th century. Blanford (1888-91) mentions them in the Bhutan *duars*. Bhutan (Choudhury, 1997). Its range extends in Bangladesh (Wilson & Reeder, 1993), Indo-China and up to Sumatra and Borneo but not Java.

Short description: It is the smallest and most primitive of all the rhinos. Its appearance is rather plump and roundish. The male is 1.2- 1.4 m high at the shoulder. The HBL is about 2.5 m. The tail seems to be rather variable in length. It weighs 800-900 kgs or more. It possesses a single pair of lower front teeth instead of two pairs. Rowland Ward's the rhino record of the horn is $32^{1}/_{8}$ inches (Dollman & Burlace, 1928). Around the lips, inside of the ears and the legs, under the throat and the belly, in the groin, and in the skin fold, the colour shades vary from flesh and dirty flesh or pink.

> Sanyal (1892) describes one born in Kolkata zoo in 1889: At birth, its body was covered with soft woolly hair. The skin was soft and a pinkish brown colour, which gradually became darker as the animal grew but still retaining its pinkish suffusion. Hairy fringes of the ears and the body were lost with age. There were two distinctive skin folds one circling the trunk just behind the forelegs and another over the belly and flanks up to the hind legs and not going over the back. Besides, there were less distinctive folds on the neck and upper parts of fore- and hind-legs. Compared to *sondaicus* and *unicornis*, the skin folds were far less marked. The skin was smooth, granular or sometimes very rough and often hairy. The skin cracked in small polygonal scales. The skin was rather soft and thin (maximum thickness 16 mm) compared to other Asiatic rhinos.

The greater part of the body is covered with stiff black bristles or hair varying from red brown to black in colour. The extent and density of hair-cover is largest in young animals. The face and skin inside folds are hairless. Hairs are especially numerous inside the ears, on the middle line of its back, belly, lower side of the flanks and on the outside of its legs. At the tail-tip, there is a tuft of longer hair. The ears are fringed with distinctive lines of hairs of variable lengths; leading to description of *Rhinoceros lasiotis* or 'Hairy-eared Rhinoceros'.

> Sterndale (1982) describes Ear-fringed or hairy-eared rhinoceros (*Rhinoceros lasiotis*). One was caught near Chittagong of present Bangladesh in 1868. Sanyal (1892) also mentions housing of this species in captivity. In additions to drooping hairs on the ear-fringe, he describes a few more details. Finn (1929) describes the two animals as one species. Now they are not considered as separate species. The *lasiotus* that lived for more than 30 years in London Zoo did not show its original hairy coat at the time of its death. The same holds for animals living in other zoos.

The upper lip has strong bristles, set widely apart; eyelashes present on the upper and under lid of the eye. There are two horns. The front or anterior horn on the tip of the muzzle is larger. The posterior horn is situated above the eyes. Often it is not more than a lump or a small knob. Blyth (1862) quotes the possibility of the presence of a third rudimentary horn as some native's belief. The horns of the females are smaller and less rugged than those of the males. The horns are of the same colour as the body: dark gray or even black; it is darker on the stem than at the base. One pair of incisors are present in each jaw. The lower incisors are modified as large sharp forward-pointing tusks. The incisors in the upper jaw have a large flattened crown. In the young animal, these teeth are absent. The lower tusks (incisors) are sometimes lost in the old animals.

The colour of the nails is blackish. Its hindfeet are narrower than its forefeet. The toe-nails are generally a little larger. The skin under the foot is rather soft and elastic. Hence the width of the print varies considerably, depending on soil conditions. The penis points backwards. So, when the male urinates, it does so backwards. The udder, two inguinal mammae, has two fairly large teats.

Although, it possesses two horns, *Dicerorhinus sumatrensis* is more related to the Asiatic rhinoceros than to its African cousins. This rhino is largely sympatric with the *Rhinoceros sondaicus* and is not always distinguishable in the field.

Habits and habitat: This species prefers forested hill tracts, sufficient shade and a good supply of water. Mud smears on trees or saplings along the path of the animal indicate its presence. For such a clumsy looking animal, it is an extremely active beast and a wonderful hill-climber. It wanders not only through calm and gravel-bottomed rivers, but also through extremely swift ones, up to 1.5 m deep, with slippery rounded rocks at the bottom where it speedily swims in an unbelievably short time. It is as quick as lightning. It can stop and turn in a fraction of a second but a fast walk cannot be sustained for a long.

It rolls in its wallowing pool. It burrows its way through dense tangle. It inhabits grassy and marshy areas. Night and early morning are spent in wandering about and feeding. Hot hours of the day are spent in rest in some cool and shaded spot. When testing the wind, it curls up its pointed upper lip. Like most herbivores, it visits salt lick regularly.

It obtains most of its food by breaking down small trees and pushing against bigger trees with its forehead or chest until the tree is sufficiently bent over to enable it to walk over it by pressing the tree under its belly. Sometimes, when a tree is fairly large, it puts its forefeet on it to bring more weight into play. It even holds a tree down by standing on it with its forefeet. Marks of its toenails are seen on broken-down trees. Having defeated the tree, the rhino proceeds to eat twigs and small branches; moving round and round the end of the tree, continually altering its position during the process of demolishing leaves and end of the branches. It prefers young saplings. The rhino is particularly fond of wild mangos, bamboo and figs, and obtains essential minerals from salt-licks. Individuals prefer to travel and feed at dawn or dusk or during the

night, when it is cooler. Days are usually spent resting and wallowing in mud to keep the skin cool and insects at bay.

Its droppings consist of round balls. Collection of dung can be found in particular places. In case of the male, ordure and urine will usually be found on the ground at least a foot or two apart whereas in case of female it will be found more or less together scattered over bushes in the immediate vicinity at heights of three to four feet. The male and the female both have the habit of squirting urine backwards.

When feeding and quite undisturbed, it continually squeaks making some of the noises through its mouth and some through its nose. Noises can be heard up to some distance. It makes a peculiar subdued kind of humming, rumbling or buzzing sound when submerged in a wallow. The noise is very similar to that made by a species of the large horn-bill when soaring through the air or like the sound made by a vulture's wing when swooping down the sky. In addition, during wallowing the rhino sometimes vents a complete series of snorts, grunts and blowings. It is probably due to its efforts to get the mud out of its nose and eyes. When alarmed, it snorts violently. If thoroughly alarmed, it sometimes makes a noise between the bark of a dog and the quack of a duck. It also utters a succession of loud whistling and braying sounds in different keys, not unlike the braying of a donkey or a terrific snort. It also makes a dull growling sound which changes into a fresh snort and sneeze and then ends in a short jolting and barking sound. When about to expire after being fatally shot, it utters a piercing long drawn out scream, not unlike the screaming of the sambhur under similar circumstances.

When hungry and food was not forthcoming, the animal in the Kolkata zoo called with a monotonous wailing whine. For the animal size, its voice is quite weak (Sanyal, 1892). A captive female's voice was a high, shrieking whistle, which one would more easily ascribe to a kind of crow than a rhinoceros.

It prefers to take a bath in streams with rocky beds and also feeder streams and it often visits gullies. Animals in the Kolkata zoo were very active in digging and loosening the earth with their anterior horns, scraping and throwing it back with their forefeet, sometimes beating the lumps down to convert it into a soft ooze, which these animals enjoyed so much(Sanyal, 1892). It may be found lying asleep during the day either in a mud wallow or at the foot of some shady tree or bamboo clump in a fairly open jungle on top of some ridge, or hill, to catch any blowing breeze. While resting, it may lie on the side or half on its belly and half on its side. It is a very light sleeper and awakes in a trice. As a rule, it wanders about singly.

When a lot of the bark of a tree is taken off, the ground around the tree much pawed up and the surrounding shrubs sprinkled with urine, the doer will be male. Female rhinos rub horns against a tree in a similar fashion but it never seems to be accompanied by pawing. The more twisted the creepers, bamboo and branches appear, the better are the chances of coming upon a male with a good anterior horn. But this is generally not agreed upon by every one.

Blyth (1862) mentions the 'fire-eating Rhinoceros' in Myanmar attacking night-fires of travellers. In one such case, one such animal got injured and it was found to be a Sumatran rhino. Dr Heifer mentions it as the wildest rhino (Blyth, 1862).

> In 1889, a calf was born in the Kolkata zoo. An evening before, the mother refused to eat and was restless. Early next morning, she was in acute labour pain and very restless. After intense suffering for nearly an hour, she suddenly got up and a young one was born. The mother took no more notice of the young. After about an hour and a half, and not until several ineffective attempts to get up, the young animal at last got up and began to look for nourishment, but evidently it did not know where to find it. It was weak and very unsteady in its movements. It could not walk even three yards without tumbling. During the course of the night the calf began suckling the mother. The milk is thin and watery of bluish colour with a very pronounced saline taste but no markedly distinct odour. The calf equalled the mother in size and bulk after two years and seven months (Sanyal, 1892).

Sexual maturity is reached at 6-8 years of age. August is the middle of its rutting season. The common signs of oestrus are an increase in frequency of urine spraying, tail raising or swinging, anogenital and other contacts. The gestation period is estimated to be around 510-550 days. During pregnancy, females may make more frequent trips to the saltlicks. It is a slow breeder and has only a single calf at a time.

The young offspring remains with its mother till a fairly advanced age. When the youngster reaches about three-quarters of its adult size, it leaves the mother (van Strien, 1985). Inter-calving period is 3-4 years. The sub-adults then gradually extend their home range for a number of years with the older ones travelling widely into new areas, probably to find a gap between the existing adult ranges. It takes several years before a Sumatran rhino becomes an adult and has established a permanent home range. The lifespan of this rhino is recorded up to thrity years (Dover, 1932).

Status: Extinct in West Bengal. Extinct in Bangladesh (Nabi, 2004; Khan, 1982b). CR (Molur *et al.* 1998). The last one was sighted in the Mizo hills in 1935.

It was found in the erstwhile Buxa Division by the side of the Sankosh River (Mitra, 1957). D. H. E. Sunder's Settlement Report of 1895 mentions the *Sheng Shengi gera* as the *Rhinoceros Malayan* in the Jalpaiguri district (Mitra, 1951). It was small and ill tempered. The mention of a third rhino leads to this species (Bahuguna). One was shot in the Dalgaon forests of the Jalpaiguri district (Inglis *et al.* 1919). It was not clear whether it was a Sumatran rhinoceros. In 1864, one was shot at the Sankosh River, Jalpaiguri (eastern border) (*ibid*). Blanford (1888-91) mentions one rhino recorded on the Sankosh River in Assam and another shot 20 miles south of Comillah in Tipperah in 1876. Blyth (1862) mentions all the three species as ordinary Rhinoceroses in Indo-China. He mentions the range not extending to India proper, which comprises Bengal but not Burma.

De (1990) mentions, "Sunderbans including Bangladesh" as quoted in the Imperial Gazetteer (1909). "Its habitat was in the depth of the forest near the seacoast as quoted in The Calcutta Review (July, 1889)." Sclater (1872) mentions one female captured 100 km south of Chittagong

in 1868. It was brought to the menagerie of the Zoological Society, London in February 1872. It lived there until August 1900. One male was killed south of Commilla in 1876; its head which was preserved in London was destroyed during World War II (Rookmaaker, 2003). Again, one was shot in 1875 near the Sankosh River, in the gorge where the river issues from the Bhutan Range (Sclater, 1875). Hobley (1932) reports a few still surviving till a short time back (1930) in Myanmar, Lushai (Mizoram), Tripura hills, and Chittagong Hill tracts in Bengal. Talbot (1960) also reports of some possibility of isolated survivors in the Chittagong hill tracts, partially in the Indian Lushai and partially in Bangladesh. Rookmaaker (2002) mentions that all rhinos captured or killed in Chittagong were two horned animals.

Earlier, it was distributed from Comilla (Flower, 1878) to Teknaf in the evergreen forest wetlands of Chittagong Hill districts (Khan, 1982), Kassalong RF during the 19th and early 20th century (Anon, 2005b) and the Cossyah hills south of Charyolah (Anderson, 1872). It was last sighted in 1868 (Mahmud, undated). One rhino was killed in 1967 near Cox's Bazar in Bangladesh (Choudhury, 1997). Local people sighted one in 1967 in Assam, in the 1970s and in the 1990s in Manipur, and in 1967-68 and 1994 in Nagaland (Choudhury, 1997). Many local forest officers rule out its existence in Manipur due to the absense of habitat there (Bahuguna).

Bird (1909) mentions it as fairly common in Burma. Blyth (1862) mentions that although it is quite common in Indo-china, it is difficult to procure fine horns of this animal; as Chinese use the horn not only for medicinal purposes but also for carving. A horn was worth about Rs 50/- or $ 5/- (*ibid*). Its global population estimate is less than 400 these days.

THE JAVAN OR SMALLER ONE-HORNED RHINOCEROS

Rhinoceros sondaicus Desmarest, 1822

Plate 19

Subspecies: *inermis*

Range/distribution: Sunderbans- both in India and Bangladesh (Mukherjee, 1980; Gupta 1966; Dey, 1987). Jalpaiguri (Annual report, 1936-37; Mitra, 1951). Bengal *duars* (Banerjee, 1966b). Possibly Sikkim & Bhutan (Rookmaaker, 1980; Groves, 2003). A small population is surviving in the Jung Kulon Reserve (Western Java). Past distribution, occured in southern side of river Brahmaputra in Sumatra, West Malaysia, Thailand, Indo-China and southwestern China.

Short description: It is smaller than the *R. unicornis* but is still very bulky. Its HBL is about 3-3.20 m. The tail is 70 cm long. It weighs 1500-2300 kgs. Old bulls are about 1.4-1.7 m high at the shoulder. The length of the horn, a single nasal one, is about 30 cm. Rowland Ward recorded it at 10¾" long (Dollman & Burlace, 1928). The skin is thick and hairless with three folds across the back; others around the neck and legs. The fold of the skin before the shoulder is carried right across the back. The hide is marked all over with a curious mosaic-like pattern. Its upper lip is pointed, prehensile and hangs over the lower lip when at rest. Tusks are present in both sexes

in the lower jaw. The horn is not developed in females or if developed, it is only a low boss. Its spoor is a trefoil, similar to that of the R. *unicornis* but smaller.

Habits and habitat: In the Sunderbans, there is a stream still called Gandamara Khal, indicating Gandar (rhino) which was once seen on its banks (Ahmad, 1981). The Calcutta Review (July, 1889) mentions its habitat in deep forests near the seacoast (De, 1990). It is more of an inhabitant of the tree forest than of the grassland. A browser, it indulges less in grazing. Its teeth are short-crowned for grinding. It feeds on shoots, twigs, young foliage and fallen fruit, although it can also graze on various species of grass. Its diet is supplemented with salt, usually from salt-licks, but rhinos have been known to drink seawater as well when available. It feeds mainly in the evening or morning. Like other rhinos, it wallows in mud and water. Its sight is poor but senses of hearing and scent are good.

It travels very fast. It is quite at home moving either uphill or downhill. It generally avoids attacks on enemy and seeks to escape, yet it may charge when it is wounded or with a calf. It is very fond of the *Dillenia indica*, resulting in blood-like urine. It is not as dangerous as the R. *unicornis*, trusting generally to flight. A female, deprived of her young, is the most dangerous and will charge at anything that comes near her.

When it comes across a fallen tree, it always goes round it, being unable to raise its feet very much. Like the R. *unicornis*, it favours trees to sharpen and clean its horn. It is tolerant to disturbances in the forest. It is mentioned as the mildest rhino; easily domesticated according to Dr Helfer (Blyth, 1862). It spends most of its time wallowing in pools of mud to keep cool. It is a largely solitary animal with loosely defined territories, although a few sometimes congregate at wallows and salt-licks.

Females become sexually mature at about 3-4 years and the males mature slightly later. The gestation period is 16 months. One calf is born at a time. The time between births is probably at least 3 years. Birth takes place between the end of February and the end of April. The calf stays with its mother for about 2 years. The life span of this species is presumed to be about 50 years.

PAs: PWLSBD (Anon, 2005b). SWLSBD (Jackson, 1981).

Status: Extinct in India (Ghosh, 1997). One of the world's rarest mammals. Old official records show that the last Javan rhino was killed in the Sunderbans around 1888 (De, 1990), though Baker (1886) mentions the presence of these rhinos in abundance in Sunderbans. Baker killed three Javan rhinos in 1881. Dey (1987) mentions "...Javan Rhinoceros was also found in the Sunderbans in the late nineteenth century and perhaps even up to very early part of the present (twentieth) century." Imperial Gazetteer of India while describing the fauna of the Sunderbans in 1909 states "the wild animals include tigers..., rhino (now nearly extinct), buffalo,...etc." (De, 1990).

It was once well-known throughout the Sunderbans. It is also said to have occurred as far south as the Mahanadi delta in Orissa. Rookmaaker (2002a) mentions that this rhino was the only

species in Sunderbans up to the vicinity of Kolkata till 1925. A specimen collected in 1870 is displayed in the Zoological Galleries of the Indian Museum. Blyth (1862) thought a broader type of *sondaicus* prevailed in Bengal and the narrower far southward. He narrated a broad type of skull from the Sunderbans. DHE Sunder's Settlement Report of 1895 mentions *Kuku gera* as *Rhinoceros Malayan* with a rough and tuberculated body in Jalpaiguri (Mitra, 1951). It had a very bad temper. The mention of a third rhino indicates the presence of the Javan rhinoceros in Jalpaiguri. Gee (1948) speculated that a few isolated Javan Rhinos were present in the Himalayan foothills in Assam. The Annual report of 1936-37 mentions it as rare in Jalpaiguri and recommended no measure, as it was extinct there and also extinct in Chittagong. The last recorded sighting of this species was by Mr. Grieve in 1900 in the Chilapata forests of North Bengal (Annual Report, 1936-37). Prasad (2002) statement that it was last shot in Jalpaiguri about 40 years ago seems mere imagination and cannot be relied upon (Bahuguna).

Blanford (1888-91) mentions the shooting of this species in the Sikkim *terai* by Kinloch. Rookmaaker (2002) thinks that it was based on distorted rumour. He feels that Kinloch himself wrote about the shooting in 1878 and 1886 but of *unicornis* only. However, he agrees that Kinloch mentioned that a *sondaicus* was shot by his friend in later life. Rookmaaker (2002) also quotes the shooting of a young female *sondaicus* by J.A. Moller from Denmark in Moraghat Range of Jalpaiguri on 24 February 1881. He also quotes Sheabbeare, who mentioned one killed by Grieve in the Buxa division. He expresses doubts about these records because the Maharaja of Cooch Behar never hunted this rhino although he mentioned shooting 135 *unicornis* and injuring 34 of them between 1871 and 1904. Rookmaaker mentions that only this rhino was found in the Sunderbans and seen within a few miles of Kolkata around 1860.

According to Rookmaaker (1997a), 11 specimens were sent from the Sunderbans to museums of Calcutta, Berlin and London. He mentions the following records of the presence of the Javan rhino with reference:

1630: Island Xavaspur (Manrique, 1927),

1664: River Jillisar (Schoutens, 1676),

1670: Sunderbans (Bowrey, 1905)

1828: Eastern Sunderbans, Bangladesh, one adult female and its calf of 4 months shot by Francois Victor Lamarepicquot (Berlin Museum,) (Lamarepicquot, 1835; Peters, 1877),

1832: One shot at Sagar (Saugor) Island, Middleton Point, on the mouth of the Hooghly river, Western Sunderbans, West Bengal (Shekarea, 1832),

1834: One nearly full-grown female killed at Baugundee, Jessore district, Bangladesh (Indian Museum, Calcutta, presented by J.H. Barlow) (Pearson, 1840; Sclater, 1891)

1850: Stuffed skin of one young male, Sunderbans (Indian Museum, Calcutta, presented by C. Huffnagle) [*Journal of the Asiatic Society of Bengal* 10:88 (1851) –quoted in Roomaaker (1997) and Blyth, 1862].

c.1850: One huge wounded bull escaped hunting at the bank of the Pealee river near Baruipur, 22°30¢N, 88°0¢E, south of Calcutta (Baker, 1887)

do: Edward B. Baker shot 2 adult males and one adult female (mud-bathing) rhinos in the eastern part of Sunderbans, Bangladesh (Baker, 1887)

1859: skull, Sunderbans (London Museum, presented by A. Grote in 1882) (Flower and Garson, 1884)

1860: 6 rhinos sighted, one wounded and another shot by Frank B. Simson at Isla Foolzurree S. of Backergunge (Bakarganj), south of Barisal, Eastern Sunderbans, Bangladesh (Simson, 1886)

1867: skull, Sunderbans (Indian Museum, Calcutta, presented by W.W. Shepperd) (Sclater, 1891)

1872: one juvenile female, Sunderbans (Indian Museum, Calcutta, presented by J.E. Barckley) (Sclater, 1891)

1874: one female, Sunderbans (Indian Museum, Calcutta, presented by O.L. Fraser and J.F. Barckley, (Sclater, 1891; Fraser, 1875)

1875: one adult female, Matabangah river, Barisal dist., Eastern Sunderbans, Bangladesh (Indian Museum, Calcutta) (Sclater, 1891)

1876: One captured by William Jamrach at the Ray Mangal (Raimangal) river, Western Sunderbans, West Bengal, border between Indian and Bangladesh, which later died (Sclater, 1876)

1876: One captured at an unknown place at Sunderbans by William Jamrach, which lived for six months (London Museum) (Pocock, 1946)

1877: Western Sunderbans (Garrod, 1877)

1879: One female, Chillichang/Chillipangpi creek (Indian Museum, Calcutta, presented by Capt. Charling) (Sclater, 1891; Groves, 1967)

1888: Western Sunderbans, West Bengal (one killed) (De, 1990)

1892: R. Pizon Khalee, S. Issuripore saw one out of about 6 living ones at five islands, viz. nos. used by him 165, 169, 170, 171, 172, some 15 miles south of Issuripore (probably the present Iswaripur , 22°19¢N, 89°07¢E, Eastern Sunderbans, Bangladesh (Poncins, 1935)

1900: Sunderbans (one seen) (Shebbeare, 1953)

1908: Sunderbans (Present), Western Sunderbans, Bangladesh (Hussain, 1985)

Regarding the Javan rhino in Bangladesh, Jalil (2000) gives the following account: "Alexander Hamilton's statement of 1727 that there were many rhinos in Sunderbans. During the late 1880s, skeletons were discovered from Harinagar (1 number) and Srifalkati (1 number) villages under Shyamnagar Thana, Dhumghat (number not known), Iswaripur (6 numbers.). In the early 19th century the villagers sighted rhinos in the forests of Srifalkati and Khagraghat; Gandarkhal forests of Satkhira (Bangladesh); mid-19th century near the mouth of the Malancha and Raimangal

rivers. Raisaheb Nalini Bhushan, brother of Acharya P.C. Roy, reported the sighting of the last rhino in Sunderbans in 1885." Reza *et al.* (2000) mentions this animal in the swamps that existed in Sunderbans in the north.

> The book of the Maharaja of Cooch Behar is confined to the records of animals hunted or injured by him. His records do not throw any light on the condition of the forest and wildlife of that period. The Javan rhino was rare at that time also and therefore the Maharaja might not have got the opportunity of hunting this animal. He has also not mentioned the clouded leopard or black leopard, which are still recorded in these parts. There is a similar situation in case of red panda. No records exist in literature about its presence in the Darjeeling forests, which have been frequented by hunters and even biologists.
>
> – *Bahuguna*

Since it was around in Sunderbans and Myanmar, it might have existed in Chittagong, which is a link between these two populations (Rookmaaker, 2002). He also mentions that one was shot in Sylhet.

THE GREAT INDIAN ONE-HORNED RHINOCEROS

Rhinoceros unicornis Linnaeus, 1758

Plate 19

Local name: *Gandar*, *Hati gera* (Mitra, 1951). *Gainda* (Nepali).

Range/distribution: Jalpaiguri (Gruning, 1911; Hunter, 1876). Past distribution within the state in Darjeeling (Hunter, 1876), Cooch Behar (Campbell, 1907; Bhaduri, 1966; Hunter, 1876), Malda (Sengupta, 1969; Hunter, 1876), Murshidabad (Agrawal *et al.*, 1992) and also Sunderbans. Very rare in Malda (Sengupta, 1969). Bhutan (Lahan, 1986; Anon, 2005o). It is also found in Assam in India and Nepal. Historically, it was found from Northeastern India to the Indus River in west, around the Ganges in the south and the Himalayan foothills in the north. Rookmaaker (2002a) describes its presence in Rajmahal and Patna in Bihar, Mirzapur, Kora Jahanabad, Sambhal, Aligarh and Pilibhit in UP, Kotdwara in Uttarakhand (actual sighting in 1789), Peshawar, Khyber Pass and the lower Indus valley in Pakistan. Mughuls hunted the rhino in the Indus valley as late as 1519 (Schaller, 1998). The mention of bowels like those of the horse makes Blyth (1862) think that it could be other than Indian rhino.

Short description: This rhino is a stout-bodied ponderous creature and a heavily armoured tank of the mammal world. Next to the elephant it is the second largest terrestrial animal. Its length is 300-315 cm and its height is 1.2-1.5 m. It weighs 1600-2000 kg. In 1886, the Maharaja of Cooch Behar shot a bull rhino with body length 11 feet between sticks. The body skin is divided into large shields by horny folds before and behind its shoulders, in front of its thighs and on its buttock. The folds behind its shoulders and in the front of its thighs are continuous across the back while those in front of its shoulders do not continue right across the back. The skin is studded with convex tubercles on the shoulders, thighs and buttocks.

Its colour is blackish grey throughout. Both the sexes have a single well-developed, solid and formidable nasal horn. The horn is 40 cm on an average and weighs 400-900 gms. According to Rowland Ward, the record length is 24 inches and the record weight of another horn is 4lbs 9oz (Dollman & Burlace, 1928). Generally, a good horn weighs 60 ounces (Shebbeare & Roy, 1948). The horn of the Indian rhino is slightly smaller than that of the African white rhino. Growth of horn from the top of nose is noticeable only at about six months. The protuberance becomes marked in one year. In two years, it becomes a blunt conical stump. The horn takes on a pointed shape at about three years of age. The circumference at the base of the horn increases to 10-25 cm; the height going up to 10-15 cm. At this stage, the calf leaves its mother to lead an independent life. By ten years, the horn matures and reaches its final shape and size. Thereafter, not much increase in height or girth is noticed. In JWLS; the breakage of the horn of a mature male is seen due to fighting with other males. In the process, half of the horn breaks away. Fresh growth (regeneration) is observed from the broken end after six months. The horn ultimately reaches its previous status both in shape and size (Ghosh, 1991). Further studies are needed to confirm this observation (Bahuguna). The presence of a velvety deposit on the horn of mature middle-aged males and shearing away of the same by rubbing against a tree trunk was seen in Jaldapara (*ibid*). The horn is slightly loose. Poachers reveal that if the flesh is cut, the horn can even be knocked off the skull with a sharp blow of a stone or dagger handle (Menon, 1997).

Habits and habitat: The rhino is a terrestrial animal. It is solitary though sometimes it is seen wallowing in groups. I saw 6 rhinos in a small swamp on a couple of occasions (Bahuguna). Its sense of hearing and scent is good. It is a grazing animal but becomes a semi-browser during the rainy season. It inhabits two types of forests, (i) dense moist forests and the low hill slopes of *terai* and *duars* and (ii) tall grass land and mixed forests. It is occasionally seen outside the forest area raiding crop fields in fringe villages at night.

It regularly visits salt licks to supplement its mineral requirements. The home-range of the females is about 10 km^2. This area is temporarily enlarged if there is a scarcity of food and water. The ashes of burnt jungles are eaten for saline matter. The tiger seems to avoid the rhino. However, there are periodic instances of a rhino calf killed by a tiger-1974, 1991, 1995 in Jaldapara (pers. comm. S.Roy). Deer and buffalo appreciate this fact and often graze in the company of the rhino, apparently for protection (Gee, 1948).

> In 1986, Mr Sahoo and I, the then ACF, took positions to photograph a rhino. We hid ourselves on one side of a forest road. The rhino was heading straight towards us from the opposite side. Sahoo continued taking photographs. Before we could think of our safety, the animal was in front of us and about to step on the road. Sensing danger, we got up. Only the 10 feet wide road, nearly one foot high from the forest floor, separated us from the rhino. Suddenly noticing us in front, the rhino was astounded. Neither the animal nor we knew what to do. For a few seconds we all stood still. Thinking that the animal may charge, I looked behind in search of a shelter. Probably, my neck movement made the animal nervous as it swiftly turned back and fled away.
>
> — *Bahuguna*

Generally, the rhino is quiet and inoffensive. On being attacked or provoked, it becomes furious and dangerous; subjected to paroxysms of fury, which nothing can assuage. It gets nervous at strange sounds. It suffers from inertia. It cannot get going, nor turn nor stop as early as a smaller animal can nor does it hide. Its charge is 'blind'. It is quite difficult to escape a rhino attack. It is quite agile.

Dr Heifer mentions that this rhino is very shy, more than others (Blyth, 1862). Occasionally, it tosses its head from side to side. Sometimes, it make attack a mock. Normally it does not charge except when the female is with her calf. It is also dangerous to be in the vicinity of a mating pair or fighting rhinos. A staff member was killed in Jaldapara in 1999 when a mating pair was disturbed. Mallick once had such an experience in JWLS while two adult bulls were fighting. The horn is not used as the weapon of defence or offence or for digging as is commonly believed. Its weapons of offence are its razor sharp tusks like teeth, at the side of its lower jaw. For this, the upper lip is turned up and the lower lip is lowered down, exposing all the teeth. The mouth is also opened at the same time. It inflicts terrible gashes, as evidenced by the scars on an old bull's hide. A dominant male often attacks weak males. The fights among rhinos are sometimes fatal. Although, it is not afraid of elephants it does not like them to approach too near. Yet usually, it allows visitors on elephant backs to approach within a range of 10 m. I have often approached the animal at a short distance on elephant back in Jaldapara. The rhino never allowed such proximity in Gorumara. Of course, I did not make many visits on elephant-back in Gorumara to make such a comparison (Bahuguna).

> I have seen this rhino outside the forests on a few occasions, more at night time. Jaldapara rhinos used to visit the villages around the Buri Torsa River in the western fringe during the paddy season (winter) and to the forests of Chilapata Range almost throughout the year. Sometimes the movement was up to the Titi forests in the north. Such movement is still recorded. After 1982, only recently a rhino was recorded in Nimati (within BTR). Migration of the Jaldapara rhinos to the Patlakhawa forests of the Cooch Behar division, which was quite frequent in the past, has ceased to take place since the mid-seventies. P Vyas, an IFS officer told me that in 1988, a rhino reached as far as Bangladesh from Gorumara. The increase of the male population in an area often causes such straying but the rhinos from Jaldapara and Gorumara never stray into Bhutan.
>
> – *Bahuguna*

It is mostly inactive during the day. It spends the major portion of its time in wallowing and resting, particularly during the hot hours. Its acivity gradually increases after dusk. Nighttime is spent mostly in feeding. It moves considerably at early dawn and late dusk periods. Wallowing increases in the afternoon. In a day, it spends 45% of its time the eating (less than the elephant) and 30% in resting. The percentage of time spent on feeding and resting are higher in the cool season. Wallowing is highest in the hot and lowest in the cool season, and appears to be directly related to temperature.

Bhattacharya and Pal (1983) describe the behaviour pattern of the rhino in Jaldapara-Gorumara as follows: feeding, wallowing, resting, moving, alert positions, interaction with conspecifics and other mammals and investigation. Moving includes walking, strolling, running and galloping, while its alert posture involves raising the head and ears, and orienting towards any stimulus and lastly investigation means standing motionless orienting towards the direction of movement in a raised head posture. More than 10 distinct vocalizations, including a honk, bleat, trumpet, and roar, have been recorded. (Anon. 2007a).

On leaving the wallows, it is covered with mud, which cakes after drying and becomes impervious to the bites of mosquitoes and other biting flies. When pursued, it often plunges into wallows to get cooled and then goes on; making the tracking easier since wet mud adheres to reeds and grasses brushed through. It lacks sweat glands and hence it needs water to cool its body. A myna sitting on the back of a rhino is a common sight. The bird not only eats insects, but also acts as an alarm system, flying at sudden disturbance. The rhino defecates only at a particular spot, approaching backwards. The mounds accumulated are levelled with its horn.

If it gets into a quicksand, the rhino often cannot get out and needs assistance. Similarly if it falls into a shallow pit it becomes helpless. This is how poachers used to trap it for its horn. It moves faster than the elephant over shorter distances and also in water. In full gallop it runs like a horse with a speed of about 15 miles per hour. When chased, it spins round every now and then, facing the pursuer and then dashes off again. In going through swampy and ponky ground, the rhino has no rival. The wedge-shaped head helps it get through heavy jungle. Its thick hide protects it from thorns and pointed stumps.

Females attain sexual maturity in 4 years; males in 7 years. Mating is generally observed between February and April. The peak signs of heat are marked by chasing and mock fighting during the pre-mating period. Fight between males for a female sometimes turns very violent (Yadav, 2000b). Its reproduction rate is very poor. The cows give birth to one calf every three years; it may be only once in five years. The gestation period is 12-19 months. Generally, a single calf is born around October. Mating was observed in at Delhi Zoo in October while the birth took place in January after a gestation period of 484 days. The baby was pink in colour at the time of birth. After about two hours, the baby stood on its own feet. After one month, the calf began to consume green fodder (Bhatia & Desai, 1971). The body length of the calf is about 105 cm and it weighs about 60 kg. The calf is deserted by its mother before she gives birth to the next offspring. It is said that during ancient times, the Assamese had domesticated it and used it for ploughing (Stracey, 1951). Its lifespan is about 70 years. Dover (1932) records a survival of 47 years for this species. It is moderately difficult to breed in captivity.

PAs: CWLS, JWLS and GNP (RMP). JWLS, GNP and CWLS (Agrawal *et al.*, 1992). PWLSBD (Anon, 2005b). RMNPBh (Lahan, 1986).

Census: Census figures in West Bengal: 1964- 72, 1975- 23, 1978- 19, 1980- 32, 1985- 22, 1989- 39, 1992- 44, 1996- 57, 1998-75, 2002 –106 and 2004- 121.

Status: Endangered (Molur *et al.* 1998; Agrawal *et al.*, 1992). The population of the rhino has greatly decreased due to hunting and poaching. During the 1890s, the North Bengal population was estimated to be 240 (Bist, 1994). The Maharaja of Cooch Behar (1908) killed more than 207 rhinos between 1871 and 1907 in the Cooch Behar and Buxa forests. There were about 200 rhinos in the Torsa region and a dozen or so in other pockets in North Bengal in 1920 as per the Fawcus Committee Report (Bist, 1994). In later part of the nineteenth century, a sportsman in the Bengal Doors (a Planter) fired about 100 shots at the rhinos in one day, killing five and wounding more than 25 (Dey, 1987). Shebbeare & Roy (1948) report about eighty rhinos prior to 1930, but poachers killed about 50 rhinos. Avari (1957) reports its population being reduced to less than a dozen due to poaching in the thirties. In 1933, T. V. Dent collected about 50 skulls. Roy was made Honorary Game Warden of Jaldapara and he scarcely ever saw a rhinoceros until 1936. There were about 25 rhinos in Hasimara (JWLS) in 1942 (Ahmad, 1981). The Annual report of 1936-37 mentions that although it was common in Jalpaiguri, the species showed tendency to extinction up to 1932 due to heavy poaching and since 1933 the population began to increase in Buxa. Its population had swelled to about 60 by the end of the forties.

Ahmad (1941) reports about 60 to 70 rhinos in the State. Pollock found the animal extremely plentiful and shot 44 in seven years (Stracey, 1951). Gee (1952) mentions the presence of 25 rhinos in Cooch Behar. Anon. (1954) mentions some rhinos in the Sankosh region and a few scattered in the Cooch Behar forests. Rao, in his inspection report, mentions the rhino in Bhutri and Khairbari in 1954. The Annual report of 1953-54 mentions 56 or more rhinos in Jaldapara. The Annual Report of 1954-55 shows its presence in the Barobisha and Balapara areas along the Gholani River and the presence of probably only 3 of them (a male, a female and a calf) in Gorumara. But the population of this rhino was 5 according to the Report of 1955-56 and 4 according to the Report of 1956-57. The rhino population in the State swelled up to 76 in 1966-67. Bist (1997) reports the presence of rhinos in Buxa (Panbari and South Bholka blocks) before 1968. The Annual Report of Wildlife Preservation in West Bengal for 1967-68 shows this species in Buxa Division. It is highly unlikely – as there was none in 1964 (S Roy, the then DFO). The Report mentions an increase in the Patlakhawa (Cooch Behar) population.

In 1986, the population in Jaldapara was reduced to just 14. S Roy single handedly, with a little support from P Shukla and I, planned and executed the Rhino census in Jaldapara (Bahuguna).

- According to S Roy, then DFO Cooch Behar, the last rhino of Patlakhawa was lost in 1974 due to poaching.
- Its presence in the Nathua forests was reported 1981. I, then under training, was sent for the observation and for keeping control on the movement of the rhino, who had strayed from Gorumara. In July, during rains, this animal had crossed the floodded the Jaldhaka River.
- The last rhino in Patlakhawa was killed in 1985. The rhino had strayed from Jaldapara and even came out of Patlakhawa forest. As usual, the animal was teased by the local people. One boy tried to poke its eyes with a stick when it was stranded in a mud-pool and was

finding it difficult to come out due to the presence of a crowd all around. It, somehow, emerged and attacked the boy. The local people killed the animal in retaliation. I, then DFO of Cooch Behar Division, visited the hospital and found the teenager badly mauled.

– *Bahuguna*

According to Hunter, in the 1876 big games in the Malda district included rhinos, although its presence was very rare due to deforestation (Banerjee, 1966b). The Revenue Surveyor in his report of 1857 recorded that he had found, among other wild animals, rhinoceroses on the floodplains of the Ganges river system (Bardhan Roy, 1966). It was considered an extinct species in the Sunderbans (Ghosh, 1997). Blyth (1862) mentions it as quite common in the eastern Sunderbans and also in the Rajmahal hills of Bengal (now in Jharkhand). In 1984, a large bone of a rhino was collected at Bakkhali area of the Sunderbans. ZSI has cast doubts that this was the remains of the *R. unicornis*. The remains of recent fossils of this species have also been collected from Mollakhali, P.S. Gosaba, of Sundarbans, in April, 2000. The skeletal remains at Mollakhali were found only at 2.7 m below the surface by the side of the island (*Management Plan of Sundarban Tiger Reserve).*

The bio-ecological regions inhabited by the *R. unicornis* in Bangladesh were Tidal forests of the Sundarbans within the Bio-ecological zone 7a, Tropical wet evergreen and semi-evergreen forests of the Sylhet depression in the Garo Hills, Valleys of Sylhet within the bio-ecological zone 9b and wetlands of Tropical moist deciduous forests in Mymensingh within the bio-ecological zone 5 (IUCN, BD 2003). It was common in the Bangladesh Sunderbans till 1908 (Khan, 1982b; Hussain, 1985). Reza *et al.* (2000) mention this animal in the swamps that existed in the Sunderbans (Bangladesh) in the north. According to the Bengal District Gazeteer the rhino had become rare by 1908. There is an unconfirmed report of this species from the Sangpu (Sangu?) area of the Chittagong Hill Tract, located at the south-eastern corner of the country, at the trans-boundary with (western) Myanmar (Mitra, 1957). The presence of rhinoceros throughout north India was reported up to the 16th century (Rookmaaker, 2002a). The animal is 'Endangered' in Bhutan (Lahan, 1986), where it is found only on the Assam side. Doubtful in Royal Manas NP (Pradhan, 2001).

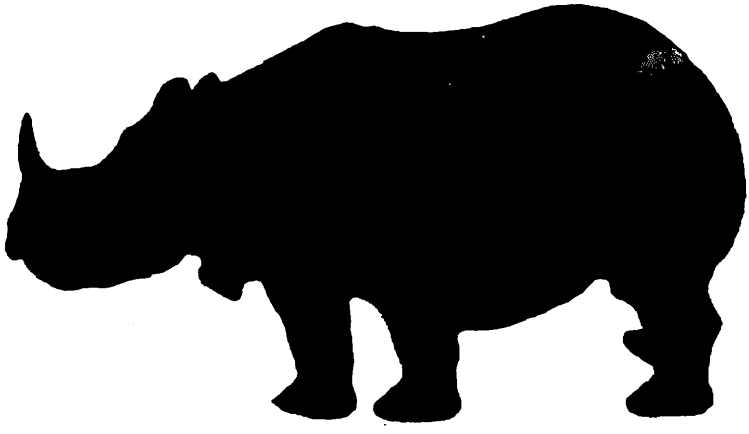
The ecological role of the rhinoceros is great. By grazing and trampling they open up small areas of ground for new seedlings, further increasing diversity and also access for other associate herbivorous species. By continuously browsing shrubs and small trees, they keep them short and accessible to a whole range of smaller leaf-eaters. Particularly in the flood-plains where tree species diversity is low, they influence forest structure and crop/canopy composition by inhibiting vertical growth of saplings that are frequently browsed and trampled. The common examples are the *Litsea monopetala, Mallotus philippinensis, Dalbergia sisso,* etc. Browsing and trampling stimulate production of new leaves and stems below 2 m. As grazers, they help transform the grassland structure. By the act of bulk grazing, it removes some plants at the expense of others. The tall grass cover is replaced by short-grass species to form the 'productive lawn', supporting not only the rhinoceros, but also many other associate species. It consumes fruits of the *Artocarpus rigidus, Careya arborea, Phyllanthus macrocarpa, Dillenia pulcherrima, Melocanna*

bambusoides, Mezzettia leptopoda, Parkia insignis, Payena costata, Pouteria maingayi, Sandoricum indicum, Mangifera lagenifera, etc., the seeds of which take 3-7 days to pass through their gut. As their dung enriches soil nutrition and structure, these seeds can naturally germinate on their own, sometimes kilometres away from the parent plant. The rhinoceros community latrines, called 'middens', in the floodplain grasslands provide crucial recruitment sites for the shade-intolerant trees like the *Trewia nudiflora,* locally called 'rhino apple'. Birds also consume these seeds from the rhino dung piles and defecate elsewhere, thus planting the seeds in a new location. The faeces of the rhinoceros provide a concentrated supply of nutrients and food, and support a large community of insects and other invertebrates thereby the nutrients are released back into the soil. Some other animals also either eat their dung or feed on the invertebrates that are attracted to the middens. The wallows dug and used by the rhinos themselves are also used by other species and become the breeding pool for frogs, insects and other invertebrates. Similarly, by excavating minerals from the ground using their horn and feet, they serve other species which are unable to open up the earth for themselves.

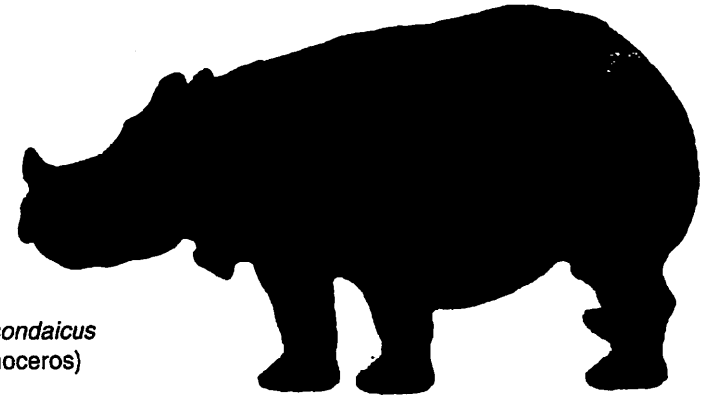
– *Mallick (2006)*

The Asian Rhino horn is sold for two to three hundred thousand rupees and can sell upwards of US$13,000 per pound in the US (Hanfee, 1998). The Asian rhino horn or 'Fire horn' costs 5-10 times more than the African horn or 'Water horn' in Taiwan and China (*ibid*). In 1954-55, the rhino skins and horns fetched the Government of West Bengal about Rs 300/- and Rs 2300/- respectively. During 1974-1997, 1 skin, 20 horns and 6 hooves were seized in West Bengal (Anon. 1997). Departmental records show that one horn was seized in 1998-99 and two in 1999-2000. Informers told me that rhino horns from Assam were often routed through Bengal. Even the arrested poachers accepted this fact (Bahuguna).

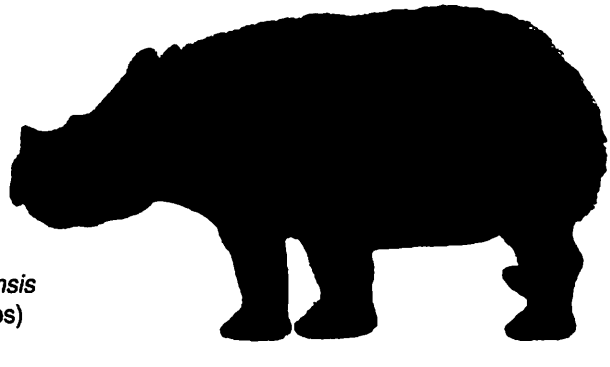
For genetic improvement, two rhinos were procured from the Guwahati Zoo and one each was released in the Gorumara and the Jaldapara forests in a fenced area.



Rhinoceros unicornis
(Indian Rhinoceros)



Rhinoceros sondaicus
(Javan Rhinoceros)



Dicerorhinus sumatrensis
(Sumatran Rhinoceros)