CHAPTER IV

HABITAT OF THE UNICORNIS

AN interplay of various biotic and environmental factors goes to make up the habitat of a particular animal and ensure that it thrives and flourishes within it. Food, of course, is a primary requirement, but other considerations such as availability of water, nature of soil, presence of mineral nutrients etc. play their part. Climatic factors, such as the range of temperature, amount of rainfall, degree of humidity are vital to the animal's existence. The animal must be endowed by nature to make full use of the nourishment and other advantages offered by its habitat. The presence of other animals within that environment, including man, and the animal's interaction with them, also contribute to ensuring its survival.

Each of the various eco-systems of the world has faunal presence peculiar to it. The fauna is dependent on that eco-system and, conversely, the eco-system is dependent upon the fauna. Eco-systems are complex entities in which multiple factors operate, and despite the progress of human knowledge about the working of Nature, our understanding of them is still at a rudimentary stage. Thus, while talking about the habitat of any particular animal we can only talk in simplistic terms, because our comprehension of that habitat in its totality is inadequate and incomplete.

The Indian rhino is an adherent of wallowing to lower its body temperature and obtain relief from ectoparasites.

In the case of the Great Indian One-Horned Rhinoceros, two factors basically define the eco-system to which it is fixed. First, the Indian rhino is essentially a grazer or grass eater. Second, it is an adherent of wallowing (remaining immersed in mud or stagnant water) during the hotter part of day to lower its body temperature, and also at other times to obtain relief from ectoparasites.

Thus, putting it simply, a wetland eco-system around alluvial plains of mega rivers, of savanna or grassland, with swampy or marshy areas dotted with shallow water bodies fit for wallowing, is the suitable habitat for the Great Indian One-Horned Rhinoceros. If sufficiency of grass and a marshy terrain with an adequacy of water bodies exist, the Indian rhino can also survive in hilly terrains, or forest areas. The African White rhino is also a grazer and requires grassland. But although it might wallow if water is available, it is not addicted to this habit as the Indian rhino is. Despite the intense heat that prevails, in the African plains, the African White uses the shade of trees for rest and to control its body temperature, and surface water for drinking. Thus dry savanna grassland suits it. This is a clear case of adaptation, for the eco-system to which it is fixed does not have sufficiency of water holes for year-round wallowing.

... a wetland eco-system around alluvial plains of mega rivers, with swampy or marshy areas is a suitable habitat for the Indian rhino.

The African Black and the Asiatic Sumatran rhinos are browsers (i.e., consumers of twigs and leaves), and therefore more adapted to live in woodlands. Forested tracts with bushes and palatable shrubs are ideal habitats for them. Though the Javan rhino is a species of coastal plains, being a browser it is more an inhabitant of forest than grassland and, if needed, can survive in mountainous regions. The African Black has a wide range of habitats, frequenting open plains, savannas and forests as well as mountainous territory. Grass plays a very small role in its food habit and, because it lives in dry areas, succulent plants provide succour when water is not available. The two-horned Sumatran is also addicted to wallowing and in the absence of marshy areas often enters streams to cool off. During the winter months the Sumatran comes down to lower regions in search of food. Both the Javan and the Sumatran are known to feed on twigs and shrubs and exhibit a preference for fruits such as citrus and figs.

Suitable habitats and feeding habits have greatly influenced the distribution of the species in the past and their status in the present. The White rhino, being a grazer had a less wide range than the Black rhino in the past, and today has been more affected by the encroachment of human settlements into its habitat. The African Black is therefore, even today, numerically superior to the African White. Similarly, the Sumatran and Javan, which are browsers, had a wider distribution in the past than the Indian. While the Sumatran's range at one time extended to cover both the Occident and the Orient, the Javan's spread out from Eastern India to cover a greater part of the South East. Because the Sumatran primarily inhabits mountainous forests of higher elevation, which are not subject to encroachment and logging, it has survived better in its native habitat than the Javan, which is a species of the coastal plains and mountains of lower elevation.

On the other hand the Indian rhino, being a species restricted to the alluvial plains of mega rivers such as the Indus, Ganges, Yamuna and Brahmaputra, remained confined to the northern half of the Indian sub-continent, and its range did not extend beyond the North East India to South East Asia. It was, of course, also found in plain, marshy, riverine terrain at a higher elevation such as Chitawan in Nepal, and Bhabar tracts on the foothills of the Eastern Himalayas such as Jaldapara and Manas. The Nepal terai is grassland and forest combined, possessing a marshy characteristic suitable for rhino, and watered by numerous *nullahs* and streams. Jaldapara too is plain grassland on the foothills of Bhutan and is watered by the Teesta river.

Indian Rhinos are also present in savanna areas like Manas located at comparatively higher alluvial terraces of the coarser deposits of Bramaputra's tributaries. But the wide fluctuation in the level of water tables (owing to the extremely porous nature of the substratum) particularly in the Bhabar zone, leading to acute scarcity of water over extensive areas during the winter months, is a limiting factor. In fact in

Manas Wildlife Sanctuary the forest department has had to undertake manipulation of the habitat by building artificial ponds (with concrete floors so that water collected in the rainy season is retained) for rhinos to wallow. Manas has natural water holes only during monsoons and is not like Kaziranga, where there are permanent wallows.

However, although the Great Indian One-Horned Rhinoceros is holding its own in Chitawan, Jaldapara and Manas, these are not optimum habitats for the animal. The primary productivity of the environment is not as high as in Kaziranga and the rate of increase in the rhino population is not as spectacular. Despite three decades of protection the present population of Chitawan is around 400 only, while that of Jaldapara has shown a decline. In Manas the rhino is treated as an associate animal and numbers around 100. In contrast a small sanctuary like Pabitora (16sq km of reserved forest), far smaller in size than Manas, but with a wetland eco-system similar to Kaziranga, contains around 60 rhinos.

The ideal habitat for supporting a large population of the Great Indian One-Horned Rhinoceros is the undisturbed alluvial flood plains of a mega river like the Brahmaputra, and Kaziranga as well as other smaller

Annual flooding is essential to maintain the wetland character of the habitat.

sanctuaries in Assam (except Manas) are good examples of this. Such flood plains are subject to annual inundation with consequent reduction in accumulation of organic matter and seasonal replenishment of mineral nutrients. This in effect means that there is assured recycling of nutrients each year and little danger of range degradation. These flood plains are also subject to the dynamic processes of nature to maintain the essential diversity of habitat through cutback erosion, accretions, deposition of sand and silt, colonisation of pioneer species of grass etc. The annual inundation replenishes the fertility of soil, ensuring a very high primary productivity in terms of rate of growth of invading plants, particularly grasses that provide food and cover for the animals. This high productivity of nourishment in turn enables the area to support a large population of primary consumers such as the rhino.

Situated in the flood plains of the Brahmaputra the Kaziranga National Park in Assam is the finest example of the right habitat for the Rhinoceros Unicornis. The total area of the park, encompassing 429.96 sq km (42,496 hectares), had been formed by the deep alluvial deposits of the Brahmaputra river. The terrain is flat with an east-to-west slope. Apart from the Brahmaputra flowing across the northern boundary, the

Water bodies, regions of short palatable grass and taller grasses for cover make Kaziranga an ideal habitat.

area is criss-crossed by a number of streams and *nullahs* such as the Mora Diflu, Diflu, Bhengra, Borjuri, Diring, Kohora, Deopani etc. The sanctuary is also dotted with numerous *beels*. All in all the water area is 5.5 per cent of the total area, although recent satellite mapping indicates that this area may be more. Erosion and shifting of the Brahmaputra induces a constant change in the total area.

Floods are an annual phenomenon. During the rainy season the rivers within the park overflow their banks and submerge almost the entire sanctuary. During high floods the waters of the Brahmaputra also enter and animals take shelter in natural and man-made high grounds. It is true that for a short period when vast areas are flooded the animals suffer due to lack of fodder and shelter. Also some animals leave the sanctuary and migrate to the Mikir Hills, returning when the flood waters recede. Many

Kaziranga during high floods.

animals are washed away during high floods. Also animals leaving the protected confines of the park are open prey to poachers. But such drawbacks are of a temporary nature and the gains from the annual floods far offset the loss.

The flood waters recede slowly and low-lying areas take a long time to dry, maintaining the swampy nature of the eco-system and helping to arrest species succession. The flood waters replenish the soil with fresh alluvial deposits, thereby ensuring luxuriant growth of green grass throughout the year. The flood waters also arrest the growth of unwanted invading plants. The water hyacinth, for instance, which provides negligible nutrients to the animals, invaded Kaziranga a long time back. This nuisance grows in thick, impenetrable masses covering the *beels*, *nullahs* and streams, depriving aquatic avi-fauna of foraging ground. While receding, the flood waters wash away the water hyacinth, thus clearing the water areas from their insidious presence.

Despite the loss of animal lives during floods, this annual phenomenon is essential to maintain the wetland character of the region. That is why the Assam Forest Department vetoed a proposal to construct embankments along the Brahmaputra to control floods in Kaziranga.

Each year from December to February the forest staff of Kaziranga burn the grasses in specific areas. Accidental fires are also common. With the onset of winter showers new grasses sprout up in the burnt areas. Burning of the taller grasses also facilitates patrolling. This practice seems to be essential in maintaining the natural vegetational growth, for burning arrests the growth of fire hardy tree species which attempt to colonise the grassland through profuse regeneration. Burning is also a factor in better

Rhinos taking shelter on highland during floodtime.

dispersal of rhinos and other animals in Kaziranga.

Fire and flood are the two factors that help in maintaining the essential character of the grassland, which contains grass species that provide the animals with food as well as cover. The tall grasses that provide cover and some fodder are locally known as *ikorani*. The *ikorani* mainly consists of *Erianthus ravanae *(Ikora reeds)*, Saccharum elephantinus *(Borota kher)*, Imperata cylindrica *(Ulnkher)*, and Pollinia ciliata *(Hankher)*. In swampy areas are found grass species such as Phragmites karka *(Khagori)*, Saccharum arundinaceum *(Meghela)* and Arundo donax *(Nal)*.

The open grazing grounds around *beels* have a profusion of short grasses that are the favourite fodder of the herbivores in the sanctuary. These grasses included Cydodon dactylon (*Dubari*), Hemarthia compressa (*locosa*), Chrysopogon aciculatus, and Cenchrus ciliaris. In and around the swampy fringes of the *beels* are found floating and creeping species of grass such as Andropogon spp.(*Dal* and *Erali*), Ipomoea reptans (*Kalmou*), Enhydra fluctuans (*Helonchi*), Pistia strafiotes (*Borpuni*), Lemna pancicostata (*Harupuni*), Eichhornia spp. (*Meteka*), etc.

The open grazing grounds around beels have a profusion of grasses that are the favourite fodder of herbivores.

*Local names within brackets wherever possible.

The vegetation of the habitat is thus tailor-made for an animal like the rhino. In the morning and evening the rhino grazes in the grassy meadows. A safari into Kaziranga therefore is conducted early morning and late afternoon, when a large number of animals can be viewed placidly grazing near the *beels*. But as the sun climbs higher in the sky, the animals disappear from sight. This is an unfailing and unique phenomenon that most visitors see at first hand. There is, of course, no magic to the vanishing act. The animals merely retreat into the *ikorani* to rest in the shade when the temperature rises. There are also a number of wallows within the cover which rhinos and buffaloes can use. In winter when it grows quite cold too many animals cannot be seen because they retreat to the safety of the tall grass in order to shelter from the breeze.

Climatic factors also operate in keeping the wetland eco-system as an ideal habitat for the Indian rhino. Assam is an area of heavy rainfall which helps in maintaining the swampy nature of the rhino habitat. The high humidity helps to control the body temperature of the massive, thick skinned creature. The fluctuations in temperature are not very great, the mercury neither climbs above 35° Celsius in summer, nor falls below 10° Celsius in winter. Moderate temperature and high humidity due to abundant rainfall are ideal climatic conditions for the Indian rhino.

The richness in vegetation, especially short grasses, ensures that the rhino does not have to compete with other animal species for food, except during stress conditions such as floods. Prohibition of forest exploitation and domestic cattle grazing keeps the biotic conditions intact. In a place like Kaziranga the Indian rhino lives in idyllic conditions, in absolute harmony and peaceful co-existence with fellow

In and around the swampy fringes of the beels are found floating and creeping species of grass.

creatures of the wilds. The only blot in its animate environment are, of course, men, especially those that sneak in carrying guns etc.

That the flood plains of the Brahmaputra, one of the last bastions of the Indian rhino, are its ideal habitat is also borne out by the high rate of population growth of this animal in a place like Kaziranga. Comparison of successive figures of rhino population in different census operations will bear this out.

Year	*1966*	*1972*	*1978*	*1984*
No. of rhinos	366	658	939	1080±

The increase in rhino population averages almost 40 per year, despite deaths due to natural causes and at the hands of poachers. Such a high rate of growth in population is not witnessed in other types of Indian rhino habitats. Different single valued indices have been formulated for assessing primary productivity of different areas by different authors. One such, based on climato-isophytes by Patterson, found the index for Kaziranga to be as high as between 2,000-3,000.

In short, equitable temperature and abundant rainfall; high relative humidity of tropics/subtropics in proximity of a large body of water

The richness in vegetation ensures a high rate of population growth in a habitat like Kaziranga.

(e.g., the Brahmaputra river); edaphic arrested seral stage of grasslands of primary succession; a miscellany of tall reeds or grass for cover and shelter, and short grass regions of palatable species; ample water for wallowing; absence of extremely cold conditions like occurrence of frost and snow; all go to make an ideal habitat for the Great Indian One-Horned Rhinoceros.

In the historic past such habitats existed around flood plains of rivers such as Indus and Ganges, and the Indian rhino was found therein. But gradually all such areas have been converted into human settlements and cultivation thus ensuring that the animal became extinct in the Indian mainland. The ideal habitats for the Indian rhino have gradually vanished from everywhere leaving a few pockets in the Brahmaputra valley as its optimum habitat.

CHAPTER V

A LONER IN THE WILDERNESS

"EAT, sleep and wallow — that's all they do." These were the terse, matter-of-fact, comments of old-timer Thuleswar Hira, who had seen 29 years of active forest service, when I asked him about the behaviour of the Indian rhino. Hira, of course, was absolutely right. The Rhinoceros Unicornis, especially the male, spends a lifetime eating, sleeping and wallowing. He might have added 'mating' to his list of the rhino's activities, but perhaps refrained because the animal uses a very short and insignificant part of its relatively long lifespan in sexual indulgence!

The bull Indian rhino is the most carefree of all animals, unburdened by any social responsibility in the world. A truly solitary animal, it roams the wilds of Kaziranga, Chitawan and other habitats in regal splendour, unafraid of any animal, giving ground to none. Such is its headstrong nature, the power in its low slung, armoured body, and its tendency to meet all dangers headlong, that even the tiger and elephant are afraid of it. Cow rhinos too are solitary, but at least they have the responsibility of bearing and bringing up their offspring. The bull rhino is saddled with no such burden. The only piece of occasional 'work' it does, (an illustrative example of mixing business with pleasure), is when it services a female in season and thus contributes its bit for the propagation of the species. Otherwise it is all eating, sleeping and wallowing in the mud!

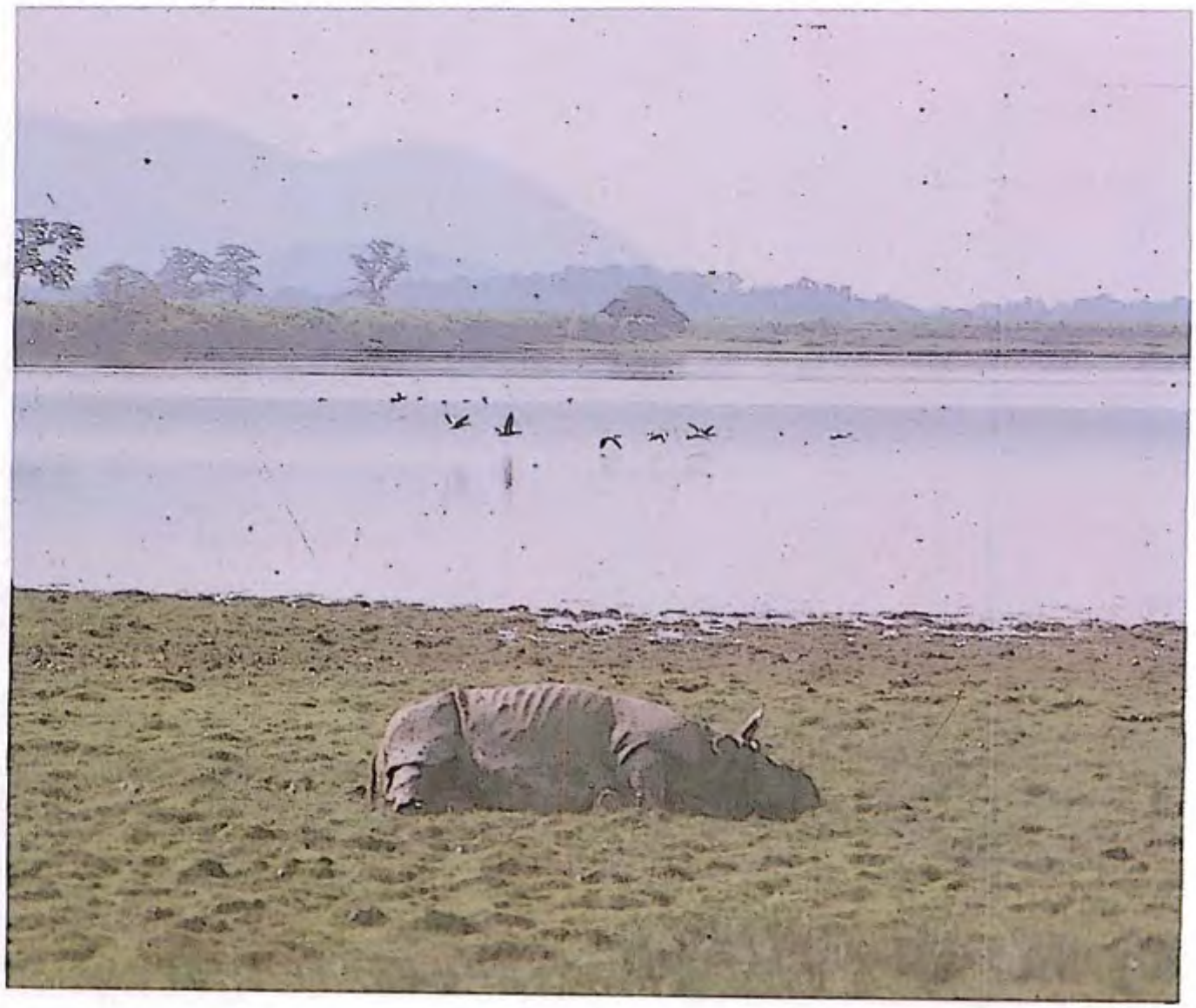
A casual visitor to any of the rhino habitats is sure to see rhinos eating and wallowing. But when and where do they sleep, you might well ask? Well, wallows for instance are ideal places for catching up on lost sleep! The Indian rhino which spends a greater part of the night in grazing, is at its most relaxed in wallows. Sonowal has a striking phrase for rhinos

Such is its headstrong nature, the power in its low slung, armoured body, that even tigers and elephants are afraid of it.

asleep in wallows. "They sleep like Kumbhakarna", he says alluding to Ravana's brother, who, legend has it, slept for six months of the year. The creatures also snore quite audibly when they sleep. If the wind is right and the approach silent, one can go quite close to wallowing rhinos. Now poachers have come to know that wallows are the best place to butcher rhinos and there have been a number of such killings.

Sonowal and others have also seen rhinos asleep in the small hours of the night, and during the warmer period of the day in the cover. The posture it adopts while sleeping on ground, with its forelegs tucked underneath its chest, is similar to that of cattle. The nasal sound that it makes while sleeping is always heard and is often quite loud. A wag once remarked that this precisely was the reason why rhinos are solitary animals!

A rare and unusual photograph of a rhino sleeping on open ground.



The swampy nature of the terrain in most rhino habitats enables the Indian rhino to indulge in its favourite form of recreation —wallowing! Mud wallowing or water wallowing is not essential to all rhino types, but the Indian rhino just cannot do without it. In summer especially a lot of heat is generated by the animal and wallowing helps it to keep body temperature low.

Wallowing also effectively destroys external parasites which nestle among the plates of thick skin and flies which try to lay their eggs there. In a wallow, the parasites, deprived of air, either perish or are forced to drop off. So wallowing, apart from providing obvious satisfaction to the animal, also serves physiological functions. If necessary a rhino can create its own wallow by digging the land.

None of the forest personnel I met had ever seen night wallowing, but quite a few, including Debroy, had seen early morning wallowing. Early mornings, of course, are the coolest part of the day, so such wallowing cannot be due to the need to control temperature, but to remove parasites. Again, while wallowing, the rhino, if the mud is sufficient, goes right down so that the entire body is covered, and only the horned snout and the ears stay above the surface. But ectoparasites have a nasty habit of lodging in the ears of the rhino too, and these cannot be removed by wallowing. The job of ridding such parasites falls on certain birds who act as parasite eliminators. Thus invariably one can see cattle-egret, drongo or jungle myena riding piggy-back on the animal, peeping every now and again into the ears or folds of the skin, and extracting parasites with their beaks. It is a highly entertaining sight to see the huge monster grazing in regal nonchalance as the birds, appropriately titled "valets of the animal kingdom" by Seshadri, do a cleaning job on it.

The Indian rhino spends a great deal of its time in wallows, luxuriating in the water or mud almost just as humans do in a bathtub or swimming pool. According to Sonowal, in summer, they wallow three or four times, spending one to two hours at a stretch in them. In winter there is less wallowing than summer. Wallowing is always done in mud or static water bodies, never in running water of streams or in rivers. Debroy, who had spent many years building up the Manas Tiger Reserve, says that he had never seen a rhino wallow in running water, even if in the dry season all the water holes in Manas dry up. Once he did see a rhino wallowing, not exactly in the Manas river, but among shallow backwaters. Elephants go constantly to bathe in the river with objectives similar to the rhino. But why the Indian rhino refrains from entering running water to bathe or clean itself is not known. The Sumatran rhino, on the other hand, has been observed to enter running water to cool off.

The Indian rhino's habit of early morning and winter wallowing shows that parasite removal is as important as temperature control. The rhino, however, is not as heavily infested with ectoparasites as may be imagined, despite the fact that they live in swampy conditions where ectoparasites may be assumed to be numerous. Heavy infestation of

ectoparasites is seen mostly in the cse of animals with hair, where the parasites can lay eggs and keep themselves secure. The Indian rhino is almost free of hair, so it does not suffer from the same degree of infestation as other animals such as elephants. Their Achilles' heel in this case, of course, is the ear and skin folds. It is interesting to note that African rhinos which do not have skin divided into deep folds are not particularly addicted to wallowing. For surface parasites these animals make do with rolling in the dust or cleaning by their avian companions.

The Indian rhino, like the African Black, Javan and Sumatran, is a solitary animal. But to misquote Donne, "No animal is an island, sufficient unto itself." An animal, however, solitary, cannot remain unconscious of its own kind, or unmindful of other animals around it. It has to compete with others in the relentless struggle for survival, and cannot ignore them. When we say that an animal is solitary, what we mean is that it does not directly associate for long with another of its own kind. Being solitary, however, does not imply that the animal desists from communicating through sound, smell, facial gestures etc. with other animals and displays absolute indifference to these. And, at some point or the other in their lives, even the solitary animals do have contact or companionship with others of their own kind, although it is always a one-to-one correspondence, and may be quite brief.

This is social instinct at the most basic level. A male rhino will temporarily associate with a female during mating time, and after intercourse with her, will go his separate way. Similarly, at a very young and formative stage of its life, a rhino calf will receive the companionship

Mud wallowing or water wallowing is not essential to all rhino types, but the Indian rhino cannot do without it.

of its mother. The Indian rhino calf stays with its mother for at least three to four years, while the calf of African Black is known to keep its mother's company for atleast two years. The offspring of the other Asiatic species also stay with their mothers till the birth of new calves.

Debroy gives another example of such one-to-one association in the case of the Indian rhino. Sometimes a 4-5 year old male calf, just after it has been forced to leave its mother's protective ambience, may associate

The Indian rhino spends a great deal of time in wallows, luxuriating in the water as humans do in the bath tub.

Enjoying itself . . . a roll in the mud.

itself with another mature male. The male-male relationship, according to Debroy, might continue for quite some time. Such an association is common among elephants, (which, however, live in herds) though not equally so among the Indian rhino. The reason for such behaviour in what are essentially solitary animals is clear. The period of dispersal (i.e., when the calf separates from the mother) is the most crucial one of its life. Though the calf is no longer under the watchful protection of its mother, it is still at a fledgling stage and might seek the reassuring company of another male till it gains in experience and self-confidence.

Among the five species of rhino, only the African White displays some kind of an organised social structure in its lifestyle. The males of this species exhibit a tendency to dominate territories averaging about 200 hectares per male. Within its own territory the dominant bull may tolerate sub-adults or aged bulls which have a subordinate status. Mature cows with calves may roam with the offspring from one territory to another, but mature bulls are not tolerated. The presence of a number of animals within one territory controlled by a dominant bull may give the appearance of a herd living together. However, the African Black as well as the three Asiatic species do not exhibit even such simple social structures.

Social instinct at the most basic level — a calf with its mother.

A solitary nature with occasional brief associations with females for procreative purposes is displayed by many rodents and carnivores. But herbivores in general, and ungulates in particular, usually display herd instincts for practical reasons. No doubt there are exceptions. The Hog deer, for example, leads basically a solitary existence although the presence of many animals together on a grazing ground may make it look as if they are living in a herd. It would be interesting to speculate why the rhino, a herbivore, is a loner in the wilderness, and displays no instinct for herd formation.

The need to live in an organised society arises when the members of the society are individually weak, but as a society they are strong. Man, for instance, is individually one of the weakest animals in nature, but socially the strongest. Herbivores, the natural prey of carnivores, seek to gain in strength by living in a herd. The herd is essential from the security point of view, where individual animals are capable of alerting the entire group of approaching dangers.

But the rhino is free from predation, for not even the most desperate carnivore would like to tangle with a full grown specimen of the beast. In rare cases, when it may be attacked, it can defend itself without the aid of others. Thus the strength and security acquired by living in a society is not required by the animal. Strength, however, is not merely a matter of physical prowess — it is a kind of self-assurance. In the wilds the rhino is a picture of confident self-sufficiency. It may be pointed out that elephants, which are physically bigger and stronger than the rhino, live in herds. But though elephants may be physically strong, they have a very timid psychology. They lack the self-assured independence of the rhino,

Exchanging gossip . . .

and need the strength and confidence that the herd provides. In fact, the elephant is not aware of its own strength; that is why it can be so easily tamed.

Division of labour is another reason for society formation. The family, (in a loose sense with animals), is the nucleus of any society, and each member of the herd is saddled with the responsibility of rearing the young. But the strong maternal and protective instinct displayed by cow rhinos towards their calves makes the presence of the bull redundant. In fact the female rhino after delivery does not allow any other rhino (including the sire) to approach the calf. Any animal coming too close is chased away by an irate mother. Thus, in the absence of rudimentary family instincts, complex herd formation becomes impossible for the rhino.

Moreover, as far as the Asiatic species and the African Black are concerned, their habitats are not vast, open spaces, which make possible herd formation. Thus, in the course of evolution, for the survival of the species, they have developed individualistic natures. On the other hand the African White, which inhabits the vast savannas of Africa, does live within rudimentary societies.

How far levels of intelligence influence social instincts has not been fully investigated; therefore it is impossible to say whether the low intelligence level of an animal like the rhino contributed to its solitary nature. However, it is certain that a rhino does not have a keen memory, a faculty that is of essence in social animals for establishing family ties, identifying other members etc. Officials in zoos have often observed a surprising aspect of the animal which shows how poor its memory is.

The Indian rhino is a solitary creature, although this picture might not suggest it.

When a male-female pair, which has been living together for a number of years in the same enclosure are separated for a brief period, and then paired again, they forget their old ties, and display initial hostility towards each other!

In most herbivores that live in groups, and are ground feeders, we find the legs slim and hooves small. But Indian rhinos, which are also ground feeders, are ponderous beasts with heavy bodies and wide feet. If they had lived in herds, a vast amount of grazing area may have been destroyed by their feet. Thus perhaps, in the course of evolution, in order to utilise the available food resources more efficiently, the Indian rhino may have developed individualistic instincts. No doubt elephants are bulkier, still they live in herds. But their height and the use of the trunk enables elephants to reach food far above the ground. Even then an elephant herd destroys more food than it consumes.

Such possibilities, however, are purely speculative, and need deeper scientific probing. Greater research is also required to establish the nature of the home range of the Great Indian One-Horned Rhinoceros. The area which an animal normally occupies during the course of grazing, mating and rearing young ones is called its home range. The sizes of such areas are not only different in case of different species of animals, but may also vary in the same species. A male may travel further in search of a mate when sexually aroused, while a cow with a calf, for practical reasons, (the new-born calf, for example, may not be able to travel far), may temporarily occupy a very small home range till the young one grows up.

The size of home ranges also depends upon the size of the available habitat, the nature of vegetational distribution, the number of animals in a particular area, etc. In order to definitely state the average size of the home range of the Indian rhino, one will have to monitor the movements of a number of animals for a number of years in different habitats. Such monitoring has been done in Africa and Nepal but not in India. Studies on the African White rhino have concluded that the home range of a bull normally encompasses an area of around 200 hectares. Adult Black rhinos occupy areas that may vary from as little as 200 to more than 1,000 hectares.

Observations by experienced forest personnel, however, have established that while in former times the home range of the Indian rhino may have been large, today, because of the limitation imposed by habitat, rhinos are quite sedentary. They do not wander over large areas, but stay localised for a long time in a particular area. This area, according to Lahan, is around 10 hectares or so, and the rhino, for reasons of feeding, keeps shifting to different spots in that particular area. Field personnel in Kaziranga have also observed that rhinos from Bagori range normally do not go to the Kohora range and vice versa. Females without calves seem to wander far more in Kaziranga. Ordinarily with animals, males have a wider home range, but the Indian rhino seems to be an exception.

Only during floods large scale change of habitats takes place, when vast areas are submerged. Many animals migrate to the Mikir Hills, while others seek the safety of high land. Once the floods recede the animals return unfailingly, but whether they occupy the same home ranges as before is not known. Data is also not available on the home ranges of rhinos in habitats not subject to annual flooding. Moreover some rhinos have been observed which for seemingly no particular reason, wander far away from their usual home range. At such times the animal seems to move aimlessly, its head high in the air as if sniffing the breeze, totally unconcerned as to what is going on around it. Field staff ascribe this to *chong holua* (changing its home range), but the animal in question might be a male in search of a mate, or a wandering female whose territory is not rigidly fixed.

Das gives a startling instance of such disoriented movement of a male rhino in 1984 in Assam. The animal in question probably strayed from Kuruwa area and, after travelling through Nalbari area, turned up in riverine islands near a place called Palasbari. It started moving through populated areas—villages, cultivations, household backyards; it continued to travel westward, resting occasionally in the courtyards and vegetable patches of villagers. On a few occasions it mauled curious onlookers when they approached too close. Ultimately it reached a forested location near Goalpara town—travelling more than 200 km in its wanderings and, at that rate, would have crossed into Bangladesh, had it not been tranquillised, captured and brought to the Guwahati zoo! It was an old bull—the poor creature later died in its cage during an attempt to translocate it to Dudhwa in U.P.

During floods a number of rhinos, male, female and calves, are seen to congregate on highland, in a startling herd-like formation.

Males in many animals seek to dominate the home range they occupy, and the presence of others of the species is subject to the tolerance of the dominant bull. In the case of the Indian rhino, forest personnel I have talked to have observed no such instinct towards territory domination. Neog, however, does not deny the existence of some kind of a pecking order among animals that stay in the same locality for a long time. This phenomenon, he believes, is temporary, and is caused more by the natural respect a weaker animal displays towards one which is stronger, rather than any tendency to dominate on the part of the latter.

The Indian rhino seems to be a votary of 'peaceful co-existence' and the 'live and let live' philosophy. The home ranges of many bulls in one area overlap each other. If in the past territory dominating instincts did exist, spatial circumstances may have erased them now, for with so many animals in small areas, absolute rigidity is impossible. Often quite a few rhinos may be seen grazing together in a small area giving the appearance of a herd, although each is a solitary individual. During floods a number of rhinos, male, female and calf, are seen to congregate on tiny patches of highland, in a startling herd-like formation. There is no hassle, no infighting, as the animals patiently wait for the flood waters to recede. With the floods over, each animal will again depart to its solitary existence.

In wallows the animals huddle in the mud very close to each other, the snout of one touching the flank of another.

While grazing on the same patch the bulls, however, do maintain their distance from each other, although females are under no such restrictions. One bull does not object to another bull in his home range; he might even tolerate it feeding on the same grounds as him. But what he objects to is close proximity. If another bull in the course of its grazing approaches too close, the rhino responds challengingly. It snorts belligerently and moves two paces towards the intruder. Sometimes the intruder may not give ground and a brief fight might ensue. But normally the intruder respects the other's right to graze, and turns and moves away. When the challenger sees the other beast leaving, it does not pursue it, but returns to graze. Such behaviour is not due to territory commanding instincts, but because the animal feels threatened by the approach of another bull, and its retaliatory instincts come into play. Lahan puts this distance at around 30 metres. Outside this radius the animal does not seem to mind; but the presence of a bull within it arouses its defence mechanism.

Though a bull rhino may not tolerate another bull in close proximity under normal conditions, in particular instances, say wallowing, it is a different story altogether. Many rhinos often share the same *ghulee* (local term for wallow), so a number of *dandis* lead away from each *ghulee*. All forest staff at Kaziranga have observed many rhinos wallowing together. Sonowal reported having seen 32 rhinos wallowing in a small pond like water body at Barekati in Kaziranga. Sharing wallows by many animals is specially seen in winter, when the smaller *beels* tend to dry up. While sharing a wallow the animals huddle in the mud very close to each other, the snout of one almost touching the flank of another. A peculiar

During winter months when beels become smaller animals huddle in mud very close to each other

characteristic of wallowing rhinos is that they always face the bank, and never turn their backs to it. This is, of course, a defensive device, a means of being able to spot unwelcome intruders on the bank, and to make a quick getaway if needed. Despite the bath-tub crowd there is no pushing and jostling—a little bit of adjustment perhaps when a newcomer joins the company, but otherwise they lie with absolute placidity and an unbounded sense of contentment. But when one of them decides that he has had enough of wallowing and makes a move to depart, there is a kind of minor stampede, a lot of thrashing and spraying of mud, and suddenly all the rhinos scamper out of the wallow and leave. Even if one rhino had joined the gang an hour later than the others, he too would leave.

The rhinos, no matter how many of them, approach the wallow by their own *dandis* and each departs over his own *dandi* in different directions. So although tolerating each other's presence even in close proximity, they retain their solitary character. Commenting on this E.P. Gee observes: "Although the rhino is a solitary creature, I have seen as many as 7 together in one wallow; but these came from different directions and departed from the wallow, when disturbed, in 7 different directions."

Despite their unique sense of tolerance, fights do occur amongst individual rhinos. Some fights may be due to spatial reasons, but these are usually ritualistic and the weaker adversary invariably backs out. Fighting amongst males before mating, however, are often life and death struggles, and might end in death or serious injury to one of the combatants. Debroy has observed another unusual feature in rhinos. Ordinarily among herbivores females do not fight. But he has seen quite a

The wallowing rhinos always face the bank.

Wallowing is the only occasion when bull rhinos allow close approach.

few cases of a female rhino engaged in combat with another female. He is not certain why this is so, and whether the incidents witnessed by him were isolated cases or formed a common pattern.

Another unique phenomenon among rhinos is that old animals sometimes come to live close to forest camps within the sanctuary, as if sensing that they will be protected. Forest personnel provide such animals with salt and look after some of their other requirements. E.P. Gee also records a similar phenomenon with a slight variation — "A curious thing about Indian rhino is that old animals, mostly bulls, on reaching a stage at the end of their life when they can no longer defend themselves against stronger ones, often retire to the edge of the sanctuary. They then sometimes live for years close to where villagers provide a certain amount of protection for them, because younger rhino will not venture outside the sanctuary in such a manner. These old rhinos usually carry the ugly gashes of conflict when they first come; and later on become welcome tourist attraction . . ." The most famous such rhinos in Kaziranga were the *Boora Goonda* (Old Rogue) and *Kan Katta* (Cut Ear).

When departing from the wallow, each animal will leave by his individual dandi *in different directions.*

The same 'live and let live' philosophy shown by the Indian rhino to its

own kind extends to other animals too. Except during stress conditions such as floods, when there is a great competition for fodder, the rhino lives in absolute harmony with other denizens of the wild. All field staff confirm that they have seen rhinos peacefully grazing among herds of buffalo, deer, wild pig and other animals. While wallowing, another animal addicted to this habit, the wild buffalo, keeps company in close proximity, and the rhino does not mind. A tiger does not worry a rhino unduly—it simply watches warily as the tiger passes, unless, of course, it happens to be a mother rhino with her calf, in which case the tiger is chased away. Hussain tells of an occasion when he saw a rhino and a tiger standing side by side, and Sonowal once saw a spectacular chase when a female rhino sent a Royal Bengal tiger packing with its tail between its legs.

The peace-loving rhino lives in absolute harmony with other animals . . . . Here a bull is seen with wild buffaloes.

Like the tiger, the elephant too is terrified of the rhino, because of the injury the powerful tushes of the animal can inflict on its delicate trunk. Forest personnel have seen rhinos grazing along with wild elephants. Upto a certain limit the rhino tolerates the presence of wild elephants, but will not permit them to approach too close. Lahan has seen rhinos snort and make challenging movements at wild elephants, which invariably retreat when thus challenged.

It is, of course, possible that the tolerance of rhino towards its own kind and other animals is because of the lack of competition for food in a habitat like Kaziranga, where there is a profusion of edible grasses growing throughout the year. In times of distress the pattern of behaviour might be different. In 1989, for example, after floods, rhinos in Kaziranga killed a number of domestic cows and buffaloes close to the sanctuary. The big shortage of fodder which floods bring in their wake may have caused such behaviour. But domestic cattle also carry the scent of man, which may have provoked the killings. Such behaviour is an aberration, for otherwise cases of rhinos in the wilds having actually killed a species of another kind are rare.

In the Guwahati zoo there was one case when a bull rhino killed a few chital deer kept in the same enclosure. Phukan, who witnessed one such

The rhino is a votary of the live and let live philosophy.

killing, says that it was a deliberate act. Since all the killings were at feeding time, such abnormal behaviour may have been due to competition for food. On the other hand, confinement does induce at times aberrant behaviour not normally displayed in the wilds.

What a red rag is to a bull, human smell is to the rhino. Centuries of persecution by this hated two-legged creature may have imprinted instinctive danger alarms on the brain of the animal; alarms that peal loud and clear as soon as it catches the smell of human beings. If the rhino will not allow a tame elephant to approach close and often charges at it without provocation, it is not because the animal represents a threat, but because of the human smell associated with it. The attack is on man, not the beast, though the consequences are invariably borne by the elephant.

A charging Indian rhino is a terrifying sight—not one for the weak or faint-hearted. It hurtles along at a tremendous speed, head bent, snout almost touching the ground and eyes half shut, its feet thundering a fearsome tatoo on the sun baked earth! However, experienced foresters assert that if they are on elephant back, and the elephant is made to stand its ground, the rhino will not press home its charge. At the last minute it will move around, with an agility remarkable in so huge a creature, and head for the safety of cover. Such attacks have been experienced several times by all forest personnel and occasionally, (if they are fortunate), by tourists as well.

As early as the 16th century, Emperor Babur got a taste of the rhino's charge. "I had often wondered," he wrote in his memoirs, "how a rhinoceros and an elephant would behave if brought face to face. In this hunt the mahouts brought forward the elephants. One of the rhinos

Mother and calf graze placidly among a deer herd.

charged out where the elephants were. When a mahout brought one of the elephants forward, the rhino would not stay but charged off another way."

If an elephant stands its ground the rhino will unfailingly yield; but whenever the elephant panics, turns around and bolts, the rhino will maintain its charge and often, it it catches up, inflict deep wounds on the flank of the beast. To call it a mock charge would therefore not be correct. Modern foresters have nowadays found a substitute for the elephant while patrolling jungle tracts—the all-purpose jeep. The very fact that rhinos sometimes charge at a moving jeep shows that its target is not the vehicle, but those sitting inside it. Confronted with a bellicose rhino while travelling in a jeep, the trick (as Debroy, Lahan, Sonowal and others avow) is to countercharge, with the jeep in full throttle and horns blaring. Faced with such a noisy 'elephant' the rhino will abruptly wheel away and flee, a few shots fired into the air serving to spur it on!

Neog relates one of his own experiences to illustrate the fact that a rhino will press home its charge, often chasing for long distances, if its adversary turns tail, and bolts. Once at Pabitora sanctuary he and his party on an elephant encountered an irate rhino. Their mount, being a newly trained one, turned and fled. The rhino pursued the beast for almost a kilometre before giving up the chase. The next morning the elephant was taken to the same spot so that its self-confidence would not shatter and it would learn to face a rhino. As soon as they reached the spot the elephant began to show signs of jittery nerves and kept trying to turn back, but the mahout resolutely pressed it on. Sure enough the rhino was there and charged again. This time the mahout made the mount stand its ground and the rhino swerved and disappeared into the elephant grass.

But the greatest danger from a belligerent rhino is faced by a man on foot. In a number of cases a man trying to escape by running had been killed or injured by a rhino. Forest guards, while patrolling on foot, use the tunnel like trails made by the rhino because they are easier to traverse than cutting their way through the *ikorani*. Also poachers dig their pits on such *dandis*, and these must be periodically inspected. The rhino is a most obdurate beast and if it encounters men on its *dandi*, will never contemplate retreat, but charge. While attacking the Indian rhino does not use its horn as a weapon. Instead it uses its tushes (large cutting teeth) in its upper and lower jaw, and bites with an upward thrust of its head. The wounds inflicted this way can be terrible. Sometimes, more by accident than by design, the horn of the animal might inflict minor lacerations. The sharp incision of the lower tushes made on rhino victims have often been mistaken to be injuries inflicted by the horn.

It is also not true that a rhino will not attack a fallen man. Rather, it will use its forefeet to stamp upon the victim, as many injured foresters will testify. The best way to escape from a pursuing beast, so foresters say, is to head for the nearest tree and scamper up it with record breaking

speed. But if a tree is not located nearby, instead of attempting to outpace the animal, a feat impossible for a human being, the man must attempt to get away from the animal's line of vision, and hide. The animal being short-sighted, if the conditions are right, may not be able to spot its quarry.

The wayward behaviour of Indian rhinoceroses, their so called 'unpredictability', is legendary. When men on elephants approach a rhino, it may simply raise its head for a quick look and then again get down to grazing. Another might permit a very close approach with contemptuous indifference, while a third might, for no apparent reason, start a thundering charge from far off. But we regard such differences in behaviour as unpredictability only because a particular animal's temperament and its state of mind at that precise moment is unknown to us. A rhino which has just been beaten by another in a fight to choose a female in season might be irascible and potentially dangerous, just as a rejected suitor among human beings might well be. Similarly an animal which is under stress cannot be expected to be chummily disposed, especially towards its arch enemy—man. But an animal which has fed well and enjoyed a roll in the mud is quite likely to ignore such minor irritants as some human beings approaching too close.

The 'rogue rhino' alluded to in books of animals is nothing but a rhino in conditions of stress. Frank Finn, in his *Mammalia of India* alludes to such a creature—"Elephants, we know, are very nervous, but if any wild animal were inclined to attack them it would be a rogue rhinoceros, if such existed or still exist, since they are the most obvious rivals." No less an authority as P.D. Stracey uses this term when he says—"Should it be necessary to destroy a rogue rhinoceros any powerful rifle with a steel nose bullet may be used, and the brain shot taken."

In reality, however, a 'rogue' rhinoceros (in the sense of a rogue elephant) does not exist, but a beast under tremendous fear and alarm might behave in ways that might brand it as 'rogue'. Lahan recalls an experience with one such unfortunate animal which had strayed into a tea garden near Bokakhat. The tea pluckers were afraid to enter that section of the garden, so Lahan as the D.F.O. was requested to get rid of the beast. He tried to drive it away through blank fire, but the beast turned on his parked jeep, tore the spare wheel to shreds and, with a toss of the head, overturned and damaged the vehicle. That rhino created such a terror in the region that it had finally to be shot dead.

Such fierce behaviour is an aberration of the normal temperament displayed by the Indian rhino. That the animal was in an unfamiliar and hostile environment and in a state of panic explains the 'ferocity' it displayed. The rhino, by nature, is not a ferocious animal; the myth of its ferocity has been created by past hunters who needed a peg on which to hang their own bravery in confronting it. It is a peace-loving animal which exists in perfect harmony with other creatures of the wilds.

If the Indian rhino does display some amount of ferocity when

confronting man, it is because it knows man to be a deadly enemy. Call it stupidity, foolhardiness or courage, it is one animal that does not slink away when man approaches. Most animals instinctively run away from danger, but the rhino chooses to meet it literally headlong. In doing so it has earned some notoriety as an aggressive, bellicose animal—descriptions which do it less than justice.

Stories about it being tamed and used in the past for warfare, ploughing etc. may not be old wives' tales. Not only does the Indian rhino exist amicably with other animals, if exposed for some time to human presence, and convinced that it will not be harmed, loses its aggressive instincts and becomes quite docile. This has been observed not only in zoos, but in natural habitats like Kaziranga too. The rhinos in Kohora, as they are much exposed to tourists, have become relatively docile and allow close approach by domestic elephants. But in Bagori, where only forest personnel enter, the animals are wary of human approach, and retain their hostility towards man.

When kept in confinement in zoos, the Indian rhino loses whatever aggressive instincts it possesses. The alertness which animals display disappears in confinement; only a newly brought calf retains this alertness for a time but gradually it becomes less alert as it grows habituated to human proximity. Zoo rhinos display no tendency to attempt to break out, nor aggressiveness towards the keepers and cleaners.

A mother with a calf in the zoo may show aggression towards her male partner, but not towards her keeper. A most interesting case is recorded in Guwahati zoo where a mother rhino allowed her keeper not only to touch her calf, but also to milk her. This enabled the zoo officials to collect milk samples of a rhino and analyse it. Such behaviour clearly indicates the possible truth in the assertion that rhinos were tamed and put to domestic use in the past.

Once Sonowal was confronted by a rhino as he was driving his jeep through the Kaziranga sanctuary. Since the animal displayed no aggressive reaction, Sonowal switched off the engine and sat absolutely silent and immobile in his seat. The rhino came right upto the vehicle and took a sniff at the crouching figure. Then the rhino gave a snort (of contempt, perhaps) and ambled away slowly into the thicket!

When much exposed to tourists, the Indian rhino loses its fear of man and allows domestic elephants to approach closely.

CHAPTER VI

LOVE AMONG THE UNICORNIS

THROUGHOUT its life in the wilderness the bull Indian rhino cuts a solitary path. But at certain points it momentarily deviates from its reclusive existence to join a female in an all too brief bond of companionship. The urges that drive it on are primordial ones that impel all living things to contribute to the propagation and perpetuation of the species. In the case of the Great Indian One-Horned Rhinoceros, mating is the only activity that brings the male and female together.

Observations in zoos as well as the wilderness reveal that there is no fixed season for rhino mating. It can take place at any time of the year, though in Kaziranga, during the summer when there is prolonged flooding, observation is impossible. In most mammals breeding takes place throughout life. Definite information on cessation of breeding ability is to be had only on human beings. As far as is known, the female rhino retains her breeding ability throughout her lifespan.

Also, as in most other mammals, the female rhino attains sexual maturity earlier than the male. The average age of sexual maturity of the Indian rhino has been fixed at between 8-9 years for females and 9-10 years for male. This has been borne out by the limited data available at Guwahati zoo. Of three female ages recorded, Padmini came to estrus at 9 years, 8 months 6 days, Gita at 8 years and 25 days and Gini at 8 years, 11 months 8 days. No recorded data was available in the case of males.

Two factors govern mating between mammals—the receptivity of the female and the sexual preparedness of the male. The period in which the female is sexually active is called estrus, the colloquial term for which are heat, rut or season. Some mammals are monestrous, meaning they have only one heat period in a year and some polyestrous, having several in a year.

This bull had its ear torn in a fight.

Observations made on the female Indian rhino show that it is polyestrous, coming into season a number of times each year, with an estrus cycle of 46-48 days, until mating takes place and conception occurs. The regulation of this period of heat, which remains for 2-3 days, is controlled by several hormones that prepare the female for reception of the male sperm. During anestrus, the sexually quiescent period before coming into heat, the female is not interested in mating. Pregnant adult females and those with very young calves will not go into heat and will not accept the services of a male. Similarly a female rhino that is not in heat is generally ignored by the males.

While the requirement for female receptivity for mating has been established, some controversy surrounds sexual preparedness in male Indian rhinos. The general belief is that the male also comes into heat, and the seasons of a male and a female must coincide before mating can take place. Prater states that: "From observation of animals in zoos it would appear that the male undergoes a period of heat, as does the female and these periods must coincide before mating can take place." This is echoed by E.P. Gee when he says: "Bull rhinos are also believed to have periods when they are 'in rut' and the seasons of both cow and bull must coincide before mating can take place." Lahan and Sonowal in their treatise on Kaziranga make a similar statement: "For successful mating both animals' heat periods must coincide."

Males of many mammals come into rut or heat, and it is quite possible that this is the case with the Indian rhino too. A reproductive cycle in a male mammal is initiated by the release of Testosterone hormones which trigger off sperm formation and cause general sexual stimulation. Finally, when pituitary secretion is inhibited, a decline takes place in the sexual excitement of the male until the cycle starts before the next breeding season.

But a contradictory opinion is advocated by others, who point out that males in most animal species of the world are sexually active throughout their adult life. Their volume of sexuality might diminish as also their semen potential; the sexual desire also may not be intense all the time; but it will nevertheless be there. Sexual arousal may come through external stimuli. The male Indian rhino, according to them, remains sexually active throughout the year. The urine of a female in heat contains a chemical called Feromen, which can be detected only by a male of the same species, and acts as a sexual stimulant.

When a female rhino comes to estrus she urinates frequently. From the smell of the urine male rhinos come to know that a female in heat is around and this arouses their dormant sexuality. The female also behaves peculiarly when she is in heat. She runs to and fro and shows an air of restlessness; her intake of food is also less, and she seeks out male company. Such symptoms, avers this school of thought, as well as the scent of Feromen in her urine, kindle sexual excitement in males and they come to mate with her.

Both these lines of opinion seem equally plausible and without further scientific research, it would be well nigh impossible to resolve the controversy. A similar difference of opinion exists among the forest personnel I have met regarding foreplay among male and female rhino prior to mating. The Indian rhino, as well as the other rhino species, go through an elaborate courtship, perhaps because the male and female are total strangers. The courtship activity in mammals is essential because it prepares the animals psychologically and physiologically for the most important activity of mating, which can be initiated by the male or the female. In the case of the Indian rhino, opinions vary as to which sex precisely initiates courtship.

While most authorities opine that it is the male who seeks out the female, some field personnel believe that the initiative is taken by the latter. E.P. Gee also speaks about "a cow 'in season' running after a 'reluctant' bull". Mahanta asserts that it is the female who begins the courtship by chasing a male and arousing him. To illustrate his point he speaks about an occasion while he was escorting a BBC team in Kaziranga, and the entire group was witness to a male being chased by a female, a little later followed by a sudden reversal of position and culminating in mating. Deuri claims to have seen a female rhino in heat tease a male so that it would get roused and chase her. Hussain and Rahman have seen females in the zoo, in sexual frenzy, mount reluctant males. Talukdar talks about seeing Padmini, a comparatively young female, mount the aged Sivaji, who being quite old, was perhaps not adequately equipped to satisfy Padmini's ardour!

Here again proper scientific scrutiny is required to determine whether such instances are aberrations, or a part of generic behaviour. But

A jagged scar on the side of this animal shows that fights for mates is more than just a ritual.

An aged bull, the veteran of many fights for mates as the scars on its body show.

whosoever may initiate proceedings, the pattern of foreplay has been established, and always ends in a male chasing the female in season. Before the courtship can commence there is invariably a fight between males, for a particular female in heat may have many suitors. Fights for mating are serious and can culminate in the death of a male. Even after a male has established his suzerainty over a female and begins to woo her, another male might intrude and a fight occur. Debroy and others report seeing many such fights and a particularly spectacular one which concluded with the death of a combatant.

Courtship and mating in the Rhinoceros unicornis is between one male and one female and not between many males and one female, a bull having eliminated all competition beforehand. In Kaziranga the natural ratio appears to be one male to one female, so there is hardly any problem on this score! Having established his superior prowess among fellow suitors, the dominant bull then approaches the female in season, but she plays hard to get, running away just as domestic cows do, and not allowing a close approach. When he runs, she will run, when he stops, she will stop. The male, however, continues to keep company, and is sometimes allowed to approach by the female, and both urinate at such moments. Then the female runs away once more, and the male resumes the chase. Chasing, pausing, approaching, urinating and again chasing—a pattern of courtship is thus established.

The chase *(kheda-khedi* in local parlance) is spectacular and continues for a great distance and a long time. In the heat of their excitement they do not care what is in front of them and trample upon everything that comes in their way. There is a great deal of sound as these giants of the

'Kheda-khedi' — A male chasing a female before mating.

wilderness thunder over the ground, tear through the *ikorani* and splash through water. Whenever the sound of *kheda-khedi* is heard, foresters on foot patrol head for the nearest tree, for they do not know from which direction the animals might emerge from the cover. Neog got a taste of this once when he and others on an elephant chanced upon a courting pair of rhinos. The bull, perhaps under the impression that the elephant wanted to take over from him, temporarily set aside his amorous preoccupations, and gave chase to Neog's elephant. It returned to the female only when convinced that the elephant was safely out of the way!

Usually during the courtship chase, although the distance covered is great, the two keep to a wide, circular path so that they stay in the same area and are not separated. They maintain contact with each other through smell (frequent urination) and sound. The male makes a ght-ght-ght sound,(Sonowal says it sounds like machine-gun fire),and the female a peculiar oo-oo, whistling sound, so that they can keep track of each other in the thick cover. And, finally, when the courtship threatens to become so exhausting that there is definite danger of amorous instincts evaporating, the male makes a whistling sound, and the chase comes to an end.

In many instances the female may not submit even though it is in heat, because somehow the male suitor does not measure upto her standards! Animals after all, like human beings, can be cantankerous and temperamental, with likes and dislikes, compatibility and incompatibility. Also in the wilds there is natural and instinctive selection, where the best and the fittest male must mate with the female if the progeny is to be strong. So if, for instance, a relatively immature bull gets a chance, the

Sometimes the female allows the male to approach her and both urinate at such moments.

female may not permit copulation. Sex starvation may also make some animal press its amorous intentions on an unwilling female. After the floods, for instance, a male might wander off to the hills, and when he returns, might be sexually hyperactive. But the female rhino is uncompromising in defending itself against an unwanted male, (just like female elephants), and will never allow a male to mate with her unless it is her choice, no matter how ardently the suitor might press his case!

A female injured while warding off an ardent suitor.

If the female is unreceptive, it might attempt to escape from the male's clutches, or might choose to fight. Lahan and Sonowal, as well as field staff in Kaziranga, have witnessed male-female fights. Injury to female rhinos in the wilds occur due to such tussles, for a sexually aroused male is very aggressive, and can kill if thwarted. Sonowal gives two instances when a reluctant cow died trying to escape. There was a case at Naromara *beel* where a female rhino, attempting escape, got stuck in the deep mud and died of starvation. Another female fell into a man-made *nullah,* broke her leg and died soon afterwards. Sonowal also mentions two recorded cases when the calves accompanying their mothers had been killed by the males because they came in the way of mating.

Hussain gives a particularly pathetic example of a female being bitten to death by a thwarted male in the Orang sanctuary. She was a rhino heifer which had just attained puberty; forest personnel had observed her being chased by a bull, and in all probability she had resisted its advances. She was very badly mauled and her vaginal parts had been slit open.

However, when the female is willing, she finally stops and allows the male to mount her. Copulation in rhino, like most mammals, takes place

dorso-ventrally, with the male mounted over the back of the female. At first there might be unsuccessful attempts at mounting, and the male might keep falling off his perch. But the female continues to allow the male to make his attempts and when he finally does succeed, the two stay in that coital position for quite some time, much longer than most animals. From five matings observed in the Guwahati zoo (there in the morning, two in the evening), the longest was of 110 minutes and the shortest of 50 minutes, for an average of around 75 minutes. Lahan has seen couplings of more than 40 minutes, Sonowal of 32 minutes (though the pair had been at it before he timed them), Hira, Momin, Borang and others ranging from 15 minutes to 90 minutes. As for the place of mating, there seems to be no obvious preference, for they have been sighted at most odd places, in the middle of forest roads, for instance. In many cases matings have also taken place in water. But unlike the Hippopotamus, copulation in water seems to be an exception rather than a rule with the Indian rhino.

Once the coital position has been attained, it is the female who becomes the guiding partner. While the male stays mounted, (only making a few movements in the beginning and after a while becoming completely docile), the female controls the action by moving forward and backwards occasionally. As the female moves forward the male does not walk, but is virtually dragged along. Although he might occasionally bite the back of his mate for a better grip, so finely is he balanced on the female's back that even when he is dragged along he does not topple. Whenever foresters see such a dragtrail they know that a rhino mating has taken place.

Mating of the giants — Two extremely rare photographs of Indian rhinos mating in the wilderness.

The copulating pair displays total indifference to what is going on in the surroundings. The male, which till prior to mating had been aggressive, becomes docile and disinterested when mounted. "During mating they remain so absorbed that their normal protective instincts are dulled", says Lahan. "I have gone extremely close to mating couples without getting any response from them. They show absolute unconcern and lethargy, do not dismount, run away or display aggression." Mahanta speaks of going quite close to take photographs without any visible reaction from a mating pair. Sonowal tells of the time his elephant inadvertently disturbed two mating rhinos and caused the male to dismount. He was afraid that the beast would charge, but the animal showed total indifference, and mounted once more when the elephant retreated.

When the time comes to discharge the semen, it will be ejaculated towards the end of the mounting in four-five thrusts made in quick succession. That ejaculation is at the end of mating has been recorded in the zoo and there should not be any biological difference in the wilds.

All the people I spoke to were unanimous in asserting that the male departs from the female the very moment mating comes to an end. The female grunts to indicate that the service of the bull is no longer required, her mate takes the hint and moves swiftly away without tarrying for post-coital dalliance! The female is totally disinterested in the male now and grazes on placidly as if nothing of moment had occurred, not even favouring him with a backward glance as he leaves! Lahan and Debroy, however, speak of the possibility that there might be further matings between the two particular male and female during the 2-3 days in which she remains in estrus, something like that which takes place in elephants, and conception need not occur at a single mounting. But Sonowal says that he has observed nothing of this nature to confirm it. Doctors in the zoo also state that there is no multiple mating between a pair, and conception occurs during one mounting. If conception does not occur, then there will be further mating in the next estrus period. In the zoo doctors have recorded copulation 360 times during a single heat period between lions; with the Indian rhino and hippopotamus only single mountings have been recorded.

A female which has conceived after mating does not display any extraordinary temperament that might mark her out from non-pregnant females. It is also almost impossible to identify a pregnant female till at least 6 months after conception, when there is a swelling of her underbelly. Before delivery her stomach almost touches the ground whereby the mahouts and others come to know that birth is going to take place soon. In zoos, however, because the recurrence of estrus can be observed, a pregnant rhino can be identified from the time of conception. Females in zoos which have conceived do not allow the male to come near and become especially aggressive as delivery approaches.

The larger the animal, the longer the gestation period. In elephants it is

almost two years. Animals that give birth to precocial (well developed) young also have longer gestation periods than those delivering altrical (poorly developed) young. The gestation period, (as in elephants), for male calves also seem to be longer than females in animals that produce only one offspring at a time. Multiple deliveries are a characteristic of rodents and carnivores, and herbivorous ungulates generally produce only one offspring at a time.

All these characteristics fit the Indian rhino. Its gestation period is long, although different authorities give different figures. Of the number of calves born in the Guwahati zoo, the maximum gestation period recorded was 506 days and the minimum 461 days, making an average of about 475 days, or just about 16 months. From comparisons with figures offered by other authorities (E.P.Gee, for instance, puts it at 16½ months, Lahan at 16 months), the gestation period should range between 16-18 months for the Indian rhino. Like most aspects of the Indian rhino, this also requires more data and greater investigation. Single births are the rule and female calves seem to have a shorter gestation period than male.

The behaviour of a female during actual delivery has not been observed in the wilds, although Mahanta tells of the time he saw a rhino give birth while she was wallowing. In confinement the female selects a site for delivery within the enclosure and sits at that spot. If she sees the male coming in her direction, even if he is at a distance away, she gets up and gives chase. She chases for a long time and then returns to the spot exhausted. After the delivery, however, it is the male which attacks and attempts to injure the baby. Zoo authorities keep men ready nearby to

A mother with a recently delivered calf.

drive the male away and ensure that the calf is not harmed. The moment the calf is delivered it is separated from the mother by the men. This drives her frantic and she keeps searching and grunting for the calf. The calf is returned to the mother only after the male had been separated and put in another enclosure. Even after such precautions there was one case in Guwahati zoo when a new-born calf was injured by the male.

The delivery is very quick and comparatively without fuss. Within 45-60 minutes of the onset of labour pains birth takes place. The presentation is anterior, which means the baby emerges head and forelegs first. Because of natural selection, malformed babies are very rare, for the offspring must be fit to survive in an intensely competitive environment, and unlike in humans, Nature does not permit abortions or deformed offsprings in wild animals.

Precocial new-borns are characteristic of most hoofed animals which live in open country and do not have dens. They are born almost fully developed with their eyes open and can get up and move soon after birth. The newborn of the Indian rhino too gets up and begins to walk 30-45 minutes after birth. The new-born calf is completely red in colour, whatever foetal excreta remaining on its body being cleaned by the mother by licking. The reddish colour remains for about three weeks to a month by the end of which the baby gets its natural greyish black colour.

The size and weight of new-born calves vary, there being no difference between males and females. The following record can be had at the Guwahati zoo.

Name of calf	*Date of birth*	*Length*	*Height*	*Girth*	*Weight*
Krishna	12.9.71	92 cm	46 cm	—	—
Bishnu	23.5.74	86 cm	61 cm	92 cm	40 kg
Moharrar	11.5.87	105 cm	45 cm	93 cm	48 kg
Chilarai	30.3.89	105 cm	66 cm	97 cm	55 kg

The minimum intercalving period recorded at the Guwahati zoo was 1 year 10 months and 19 days, while the maximum was 4 years 5 months. In the case of the former the intercalving period was minimised after separation of the calf at 158 days, when the mother came to estrus and the calf was bottlefed. The Indian rhino is popularly believed to give birth to a calf every 3-4 years, and estrus after parturition to occur not earlier than one year. But Neog believes that in sexually active females in the wilds estrus can come as early as 3 to 4 months after parturition and intercalving periods can be less than 3 years, for otherwise it would be difficult to explain how the rhino population in Kaziranga has increased so rapidly. It must be remembered that even if we assume a 50 : 50 male-female ratio, only half the total population is female and even among these some might be sub-adults and some already in conception. Taking the average mortality into account due to poaching, natural causes and predation, Neog believes that unless the intercalving period is less than that believed, the Kaziranga population cannot grow so rapidly. Here again precise scientific investigation is required to get accurate estimates.

The mother rhino in the wilds, after delivery of her baby, will stay at the same spot for at least a day, and only then move away slowly, so that the baby can keep up with her. A similar lying-out period has been observed in the case of the African Black rhino.

Only those animals with several pairs of teats along the milk line such as dogs, cats and pigs suckle their young lying down. Animals with localised teats, like the Indian rhino, suckle their young standing. The calf may suckle from both sides, but the usual habit is to suckle from the back, with its head between the hind legs. The mother keeps still while suckling. The caesin content of rhino milk is low, so the suckling frequency of calves is more and they have been observed suckling every half hour or so. This factor has to be kept in mind when bottlefeeding orphaned calves in zoos, where powdered milk with a higher caesin content is used. The intervals for milk feeding therefore have to be longer.

Suckling continues till the mother conceives again. The calf begins to nibble at grasses in about 8-9 months, while continuing to suckle till milk is available. So at one period it partakes of both milk and grass. Most calves are weaned in less than 2 years, although some might suckle for 3 years or more. As stated before, a calf in the zoo was weaned at around 5 months in Guwahati zoo. But under normal circumstances at least upto a year the calf is dependent upon its mother for sustenance, and if the mother is killed during this period, it is liable to perish unless it falls into the hands of forest staff.

Boro mentions one such calf which received wide media coverage. He and his companions found the week-old, stranded calf during the floods. The mother and calf had strayed into a tea garden and the former, while

Mother suckling her calf.

chasing away a villager, lost her way and got separated from her calf. This baby was milkfed by the then Prime Minister of India, Rajiv Gandhi, on a visit to Kaziranga, which was flashed in the national media.

The mother rhino's attachment towards her calf, and her fierce protective instinct, is legendary. She is the epitome of the true mother and is ready to confront everything under the sun, even unto death, in order to protect her baby. Sonowal relates a particularly touching incident to illustrate this. During the floods he observed a number of rhinos taking shelter in a small patch of high ground. The males and females without calves would swim out every now and again to nibble at the grass tops showing above the surface of the swirling waters. But the females with calves remained where they were because they instinctively knew that if they were to go into the waters, their calves would follow them, and might drown. They chose to go without food rather than put their babies to peril. By the time the floods receded these females had grown so emaciated that their ribs showed.

The rhino mother will always keep the calf close to her, within her sphere of protection. While sleeping she maintains physical contact with the infant. At the initial stage the baby too remains closely attached to its mother. Gradually, as it grows to about three-four months, it becomes more playful and adventurous, and tends to stray a little. The mother while allowing the baby to romp and gambol, will follow it constantly, always keeping a watchful eye. She also attempts to restrain the calf by nudging. The mother has also been observed to mock charge the baby and teach it the act of attack and defence by playing with it.

While the mother grazes, the calf may stay at her side or even at her

The mother rhino keeps the calf in front of her while travelling across a dandi, so that she can keep a watchful eye on it.

back, but always in close proximity. However, the mother rhino generally keeps the baby in front of her when travelling across the *dandi*, so that she can keep a watchful eye on it. Earlier this had posed problems for the forest staff when they had to use the pit method to trap rhino. There were quite a few cases when the baby preceding its mother had fallen into the trap first, and the mother came heavily down on it, killing it instantly. The staff therefore had to be careful that there were no mother and calf pairs in the vicinity while digging pits. Poachers, however, display no such considerations and often a baby is butchered along with its mother.

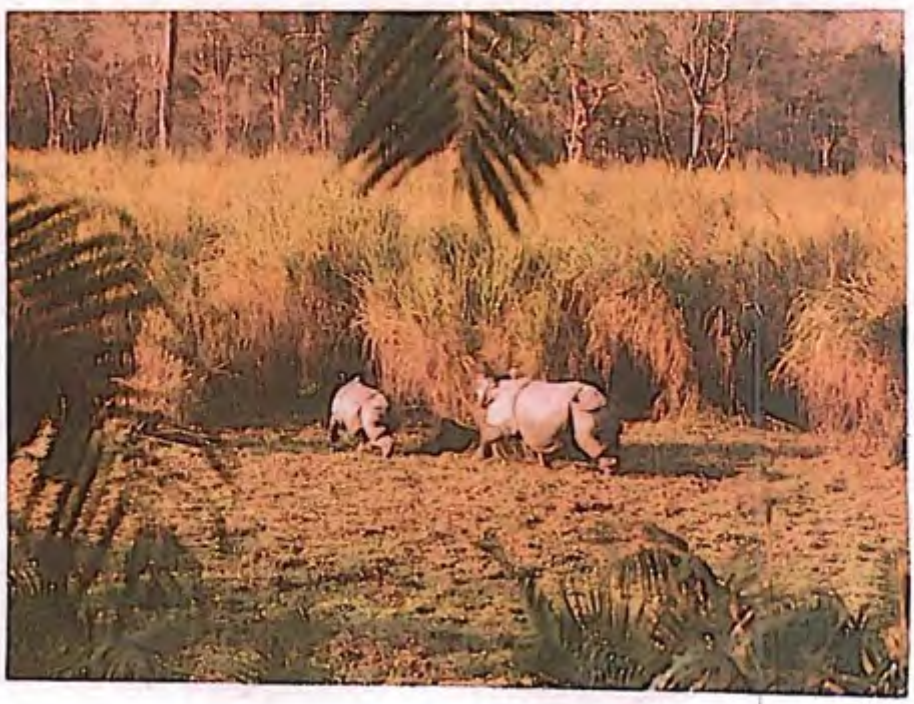
A mother rhino with a calf is a dangerous creature and all animals give her a wide berth. She is liable to charge at the least provocation. Forest staff are particularly cautious about this. While patrolling on foot or on elephant back they become extra careful when they encounter a mother with calf. The trouble with such pairs is that since the playful, frisky and curious calf is in front, there is no telling when it might change direction and head towards them. If the baby comes towards the men on foot or the elephant, there is grave danger that the mother would charge. Harish Gogoi tells of an occasion when he and his companions entered the jungle along with a pet dog. On encountering a rhino with her calf, the dog ran forward and started barking and the rhino charged. The dog fled, leaving Gogoi and his companions in the lurch, but they managed to save themselves by climbing a tree. From that day onwards Gogoi vowed never to take a dog into the sanctuary again!

All forest personnel have similar anecdotes regarding their encounters with mother rhinos. They also tell of seeing mother rhinos fight their

Wherever the calf goes, mother will follow.

main enemy, the tiger. Tigers seem to have a special taste for the flesh of the baby rhino, for they brave the wrath of the mother and the fearful bite of her teeth to snatch it. Two tigers, a male and a female, usually stalk a rhino-calf. While one tiger draws the mother away, its partner snatches the baby. Also when it is very young, the calf is loath to get in to wallow, and the mother often leaves it on the banks for a short while. Tigers take

A mother with a calf is a dangerous creature and all animals give her a wide berth.



Entering the tunnel like dandi *inside the cover, the calf still preceding the mother.*

such opportunities to attack the baby. Sometimes the mother is able to drive the tigers away, but if the baby had been injured in the meanwhile, its wounds might get infected. Sometimes, rather than see her badly infected baby die under her eyes, the mother abandons it. Many such severely mauled babies have been rescued by the forest department.

A mother which has lost her baby is particularly dangerous, and for at least a week or two, is apt to attack without reason. She keeps searching for the baby and makes a long drawn sound calling for it. There was one such case in Kaziranga which was seen by many visitors. A mother had lost her calf and for almost a week if a guide emitted a oooh-oooh sound, the mother would respond by emerging from the cover, mistaking it to be her baby's call. The rhino not being equipped with a long memory, mothers who lose their calves however soon forget about them.

Separation of mother and calf occurs when the latter becomes absolutely self-sufficient and independent. It no longer needs milk and has fully developed its self-protective instincts. The process of separation begins after another calf is born to its mother, when the older one moves away either of its own accord, or is chased away by the mother. But even then separation is gradual, and the older calf will not go away at once, but

A calf which had been mauled by a tiger and rescued by the mother.

She is the epitome of a true mother—the mother keeps guard while the calf drinks.

remain in the vicinity, though slightly apart from the other two. It continues to follow the mother and the younger calf for quite some time; the mother not allowing it to come close for fear of injury to the newborn. So for some time both the calves keep the mother company. Total separation comes about at around 4 years of age. The first 3 years of a calf's life are the ones in which the maximum growth takes place, after which there is a slowing down of the growing process. So, by the time it reaches four years, it has attained relative physical maturity and can take care of itself.

Separation brings to an end the animal's brief span of companionship. From now on it will wend its solitary way across the jungle, a true loner of the wilderness.

Sub-adult rhino which has separated from its mother.

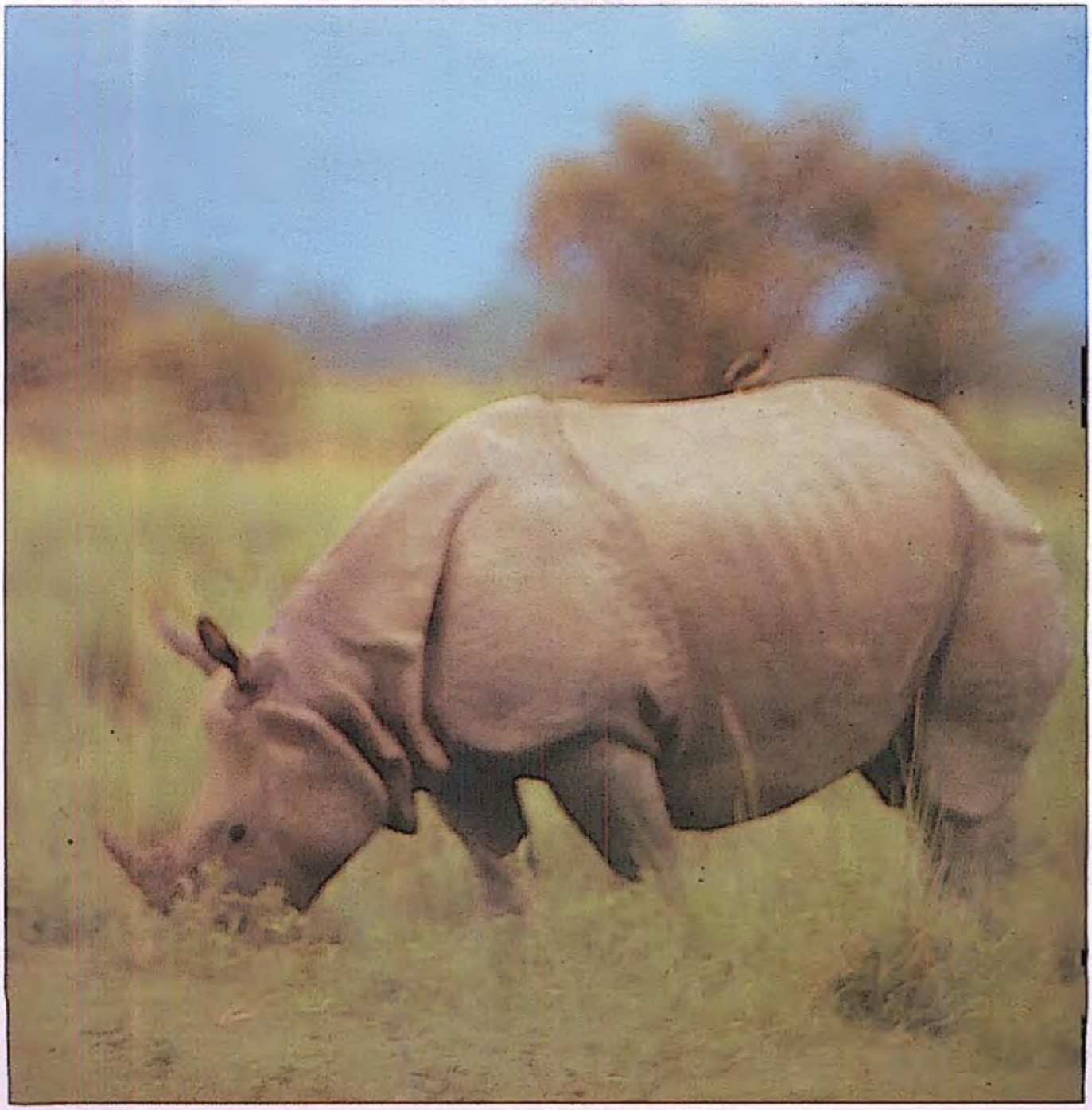
CHAPTER VII

FOOD OF THE UNICORNIS

BEING primarily a grazer, grass plays a major role in the food requirements of the Great Indian One-Horned Rhinoceros. To maintain its over two ton body, the animal needs an average of one and a half quintal fodder per day. It is no easy task eating such a vast quantity of food. Little wonder that a greater part of its life is spent in grazing!

The Indian rhino grazes early morning, late afternoon and throughout

Being primarily a grazer, grass plays a major role in the food requirement of the Indian rhino.



the night. In the morning it grazes till 8-9 a.m., retires to cover or wallow, emerges around 3 in the afternoon, and grazes till late at night. Both male and female consume equal amounts. Its food preferences are seasonal. In the dry season, for instance, when its favourite grasses are available in plenty, it is not tempted into eating vegetation such as water hyacinth, a plant that is alien to its palate, and causes loose motions in the bargain! But during scarcity conditions such as floods it eats water hyacinth, though with apparent reluctance. It eats only the tender sprouts of this plant, and would rather starve than eat it when it is mature and tasteless. Similarly when taller grasses such as Erianthus ravanae (*Ikora*), Phragmites karka (*Khagori*) and Arundo donax (*Nal*) become mature, and their leaves grow coarse and go beyond reach, it does not eat them. But all such grasses are eaten when at a sprouting stage.

Given an unlimited supply, the Indian rhino would prefer to confine its diet to grasses growing around the numerous *beels* in a habitat like Kaziranga. In fact, in the dry season 90 per cent of its intake is from 3-4 species of grass such as Hemarthia compressa (*Locosa*), Arundo donax (*Nal*), Phragmites karka (*Khagori*), Cerex-rubro-brumee etc. Other low grasses such as Cynodon dactylon (*Dubari*), Andropogon spp. (*Dal* and

During scarcity conditions the Indian rhino eats water hyacinth, though with reluctance.

Erali), Cenchrus ciliaris (*Hahkota bon*), Chrysopogon aciculatus, and tender shoots of Schelristechya fuesche, Saccharum sportandon etc. are consumed to a limited extent.

Some floating and creeping specimens of vegetation found in marshy areas, such as Ipomoea reptans (*Kalmou*), Enhydra fluctuans (*Helonchi*), Pistia strafiotes (*Borpuni*), Lemna pancicostate (*Harupuni*), Echhornia spp. (*Meteka*) etc. are also eaten by the Indian rhino. Food habits also differ from location to location. For instance, rhinos in Kaziranga eat the apical parts of a Verbanacious shrub—Lippie gemineta, but not the rhinos of Orang Sanctuary.

Although grass is its favourite fodder, the Indian rhino is not averse to eating such occasional delicacies like brinjal, capsicum and tomato, though they avoid legumes like peas. During the season of plenty, bushy type of vegetation is not touched, even when the saplings are invitingly young and tender leaved. In the camps where foresters have to stay for long periods the men throw away seeds after eating vegetables such as gourd, pumpkin etc. The new plants which naturally grow up from such seeds near camps seem to be relished by rhino, who gobble them up, vegetable, vine et al. Deuri complains that once he threw some gourd seeds at a rhino dung heap near the camp and they came up beautifully. But the day before the one he had set for plucking a rhino came and ate them all up!

For a short period during the monsoons, when vast areas are flooded, conditions of food scarcity prevail. The rhinos take shelter on higher grounds which do not have the same type of vegetation as the lowlands, and do not contain short grasses. During this period of scarcity

During periods of scarcity the rhino turns a semi-browser—a calf browsing on twigs.

circumstances force the animal to temporarily change its food habits, and turn into a semi-browser. It has been observed eating leaves of shrubs, cane, bark of trees etc. It nibbles at leaves of species of vegetation such as Flemingia and Albizzia. It has also been observed swimming out to eat grass tops sticking out of the water. The tops of these tall grasses and reeds are not soft and it would not have eaten them under normal conditions. But during conditions of scarcity they have to eat whatever vegetation is available. Their health deteriorates dramatically during this period.

Rhinos which migrate to the nearby Mikir hills in flood time turn semi-browsers too. Originally these low hills were not inhabited and rhinos used them as a habitat. In fact his was one of the reasons why the Indian rhino which had been wiped out from other grasslands had survived in Kaziranga. But the hills by themselves cannot sustain a rhino population on a permanent basis, so it is only during floods that they go there. Some grass grows on the hills to provide them with sustenance during the distress period. But these are not sufficient for their voracious appetites, and they have been known to eat bamboo leaves and shoots as well as twigs and leaves of shrubs in the hills.

The large grazing areas around beels provide the Indian rhino's favourite fodder.

During periods of floods animals such as the rhino and water buffalo have developed a fascinating technique to dip under water and eat the submerged grasses. They are capable of cropping with head submerged for long periods on underwater vegetation. If the level of water is not very high, and they can stand at least so that their upper body is clear, they dip their heads and search under water for grasses such as *Erali, Dal* and other water plants. They bite off mouthfuls and resurface, the water trickling out of the sides of their mouths. The grass is chewed and swallowed above the water level. A rhino can continue its underwater search for 2-3 minutes before the need for air overtakes it. Some field personnel claim that if the level of water is very high, a rhino will even dive into the water till its feet touch the bottom, crop the grass, and come up again. On such occasions the rhino is not visible for the duration it is under water. During floods the forest staff patrol the park in country boats and sometimes, so they claim, they pass clear over a submerged rhino without seeing it. Roy tells of an incident when the boat he was patrolling in rammed into a rhino which had suddenly popped up for air!

The days following the receding of floods are equally desperate for the faunal population of Kaziranga. The low lying grassy areas are the last to dry out. Having been submerged for 1-1½ months, the grass in such areas rot; nothing green remains and the area turns into a vast carpet of brown. This is the period of greatest scarcity for the herbivores. At such times rhinos have been observed eating even tuber roots of water lilies. But with the next shower new grasses sprout, and the rhinos and other herbivores get a fresh lease of life.

Sometimes sheer hunger drives rhinos into paddy cultivations around the sanctuary. Such intrusions, of course, can occur under other circumstances too. For example, during a fight, a rhino may have been chased to the outer perimeter of the park, and is afraid to return to its original home range. Sometimes a rhino might lose its way during a mating chase and stray outside the park. Incursions into village paddy fields or other crop and vegetable patches is always under abnormal circumstances, for ordinarily a rhino does not need to leave the sanctuary for food. Rhinos also raid village crops mostly at night, as if they instinctively know that it is the safest time for such forays.

A night-raiding rhino will not, however, eat rice plants when they are in the sapling stage, nor when mature and laden with grain. It eats rice plants when they are about to sprout. The animal is also known to eat pulses, mustard plants, potatoes, gourds and other vegetables. Villagers around rhino habitats build makeshift tree houses (*tungighar*) in their fields to guard against animal incursions. Noise, crackers, blank fire, flares etc. are used to drive intruders away. The rhino, however, does not cause as much damage to crops as elephants, and are not as great a menace to cultivation.

While cropping, the rhino grasps the grass with its prehensile upper lip, which curls around the tuft, pulls it out and draws it into the mouth to be

chopped off by the cutting teeth. The upper lip is highly sensitive and acts as a sensor to investigate the quality of the food before it is consumed. The rhino therefore avoids grasses with sharp edges, and thorny or spiky vegetation for fear of injuring the lip. That is why while elephants are a menace to sugarcane crops, the rhino rarely enters sugarcane patches. Another peculiar cropping characteristic distinguishes it from the elephant. An elephant lifts grass tufts with its trunk, shakes them to dislodge the soil, and puts them into its mouth, roots and all. But the rhino chops off the base of the tufts, eating only the grass and discarding the roots.

From December to February each year the forest staff burn large patches of grass in Kaziranga. The day after an area is burnt, animals in great numbers, rhinos as well as deer, buffalo, wildpigs etc. are seen to congregate there to eat the ash. There might be succulent grassy stretches nearby, but the animals will ignore them to flock to the burnt area. They also love to eat the half burnt stalks of reeds such as *Ikora, Nal* and *Khagori.* Just as human beings sometimes roast stalks of sugarcane to get a special taste out of them, the animals seem to derive special pleasure from the roasted stalks. Some field personnel have told me that it is for the stalks and not the ash that animals gather in burnt areas. But *ikoranis* not only contain reeds, but also grasses without thick stalks. *Kher*, for instance, does not have thick stalks and is completely burnt to ash. After a *Kheroni* is burnt, animals go there too. So it is true that animals such as rhinos also eat the ash. The ash has medicinal value for the animals, providing them with supplementary alkali and salts.

Salts and minerals are also provided by natural salt licks. Manas

The day after an area is burnt, rhinos flock to that spot to eat ash and half burnt reed stalks.

sanctuary, for instance, has a number of natural salt licks. Artificial salt licks are not provided at places such as Kaziranga, Orang, Pabitora etc. for these are needed only at places where viewing animals is difficult, and a concentration of animals is required to satisfy tourists. Rhino habitats such as Kaziranga offer enough viewing to tourists and also have natural salt licks.

There is a peculiar spot in Kaziranga, almost a kilometre away from the river Brahmaputra, called *Gare-mati-khoa* (translated, meaning rhino-earth-eating). This appears to be a natural salt lick, although so far the composition of soil has not been analysed. It is a unique spot in the park where throughout the year large numbers of animals congregate to 'eat earth'. Deer, buffalo, bison and rhino are to be seen in great numbers. Decades of use by animals, who constantly lick the earth at that spot, has created a large crater. Field personnel say that animals go there more often during the dry season, but that is most probably because the spot is water-logged during the monsoons. They also claim that 'earth-eating' at night is more common during the full moon, but this again is probably not true—only animals are more visible when the moon is full. There is some amount of water seepage there, which might be instrumental in replenishing the salt content of the soil, for even after so many years of use, animals have not deserted the spot. The soil at *Gare-mati-khoa* might also contain other mineral nutrients and needs to be chemically analysed.

Apart from aiding digestion, salt-licking or 'earth eating' also acts as a purgative. Because of the wet and marshy terrain, liver fluke (tapeworm infestation) is common among Kaziranga animals. In the case of

The rich vegetation of a habitat like Kaziranga can sustain a large number of primary consumers.

domestic elephants engaged in the sanctuary, they are given three days off each week and administered purgative to rid them of worms. The natural medication for wild animals is eating earth, which acts as a purgative, and gets rid of the worms as well as cysts. Even in artificial salt licks some amount of earth is consumed along with the salt. A spot like *Gare-mati-khoa*, however, poses problems to the park authorities, because the large concentration of animals makes it an ideal site for poaching.

The type of food given in zoos to the Indian rhino also shows the animal's ability to adapt its palate to fodder not available in the natural state. Zoo animals, because of lack of physical activity, tend to become dangerously overweight, so a balanced diet is essential for their health. In zoos rhinos too are given a balanced diet in fixed food scales according to their age, size and weight. There are three food scales for adults, sub-adults and calves. Two types of food are given—(1) concentrates (for energy) and (2) natural intake. Concentrates for adults include 2 kg of gram, 1 kg of wheat bran, 1 kg of mung pulse, 500 gm (per month) of black salt and 40 gm (daily) of common salt. Natural fodder in the form of 1½ quintal of green grasses are given every day. Sub-adults are supplied with the same food as adults, but these are scaled to half of that given to adults.

In the later part of winter, when grass is scarce, it is substituted by leaves of trees, and these are accepted. Green bamboo leaves have also been tried without rejection. Preserved green grasses (hay) in the preflowering stage have been given and accepted. Occasionally vegetables like carrots have been given. What is even more interesting, the Indian rhino in confinement accepts bananas, something beyond their reach in the wilds. Bananas are given not only for their nutritive value, but also as an instrument of future deception. Afterwards, if a rhino falls sick, medicine can be inserted into banana peels and administered to the animal. Zoo doctors tell me that all such food, even bananas, are consumed with gusto by the animal.

Thus it is clear that the Indian rhino is capable of adapting itself to prevailing circumstances as far as food is concerned. During periods of scarcity it can take to browsing, and consume food to which it is not habituated. But in normal circumstances it prefers grass to any other variety of fodder and retains its basic characteristic—that of a grazer.

CHAPTER VIII

COMMUNITY LATRINES

THE defecating habits of the Great Indian One-Horned Rhinoceros are very peculiar, and except for certain animals such as the tapir and some species of antelope, do not bear comparison with most herbivores. However, questions that naturally arise from such habits—whether their dung heaps denote territory, whether they use their olfactory mechanisms to mark home range and their urine to scent-mark trails etc., have not received sufficient scientific scrutiny to be convincingly answered.

Previously it was believed that each individual rhino defecates in its own personal dung heap, going back to it whenever the urge came. In fact, once the Assam forest department had even contemplated carrying out a census of the animal by counting the number of dung heaps in a particular area. But when these dung heaps were kept under observation it was discovered that far from being individual toilets the dung heaps were more in the nature of community latrines, many rhinos approaching a heap from different directions and depositing dung on it. So it was decided that such a 'dung heap census' would be an exercise in futility!

In any Indian habitat, whether in Chitawan, Jaldapara, Manas or Kaziranga, can be seen numerous dung heaps made by the animals, some small, some very high and wide. The heaps are found usually by the side of rhino *dandis*, but sometimes in the most unusual places, such as the middle of a jungle road. One feature common to most dung heaps is that they are located in higher areas, thus proving that the Indian rhino does select a site to answer the call of nature. However, isolated nodules of rhino dung are occasionally seen, equally irrefutable evidence that sometimes, if the summons is too urgent for it to tarry, a rhino might give up the idea of heading for the nearest public lavatory, and seek relief wherever it may be at that moment!

Selection of a defecation site on a higher terrain is a lesson in instinctive hygiene—in a region subjected to inundation and water logging, a dung heap in a lower area will be washed away. Excreta, as we are all aware, (and so it seems is the rhino!), if spread that way can help to propagate waterborne diseases. Such a danger is minimised if the dung heaps are located in higher areas where the water normally does not reach. This also explains the mystery behind location of dung heaps in the middle of the road. Such roads are built higher than the surrounding terrain so that they are not submerged during ordinary floods and, from the rhino's point of view, make an excellent location for depositing their dung.

Dung heaps are normally located, for similar reasons of cleanliness away from grazing areas, on grassless stretches, woody, elevated areas, high banks on the sides of *beels* etc. Dung heaps are found inside the thick *ikorani* cover, where shorter grasses used for food do not grow, mostly at points wherever the tunnel like *dandis* of the animals cross. Usually dung heaps are located near water bodies. In Nepal the heaps are found near the streams and rivers that flow through the terai.

A rhino dung heap is not the handiwork of a single animal—it is, so to say, a community effort. However, such an edifice must have a genesis; a 'pioneer' rhino must select a site and lay the foundation to which his fellow compatriots can contribute their bit. Debroy, Lahan and others have seen how a fresh rhino heap starts, and give a vivid account of the sequence of action. A rhino with an urge to defecate will first search for an existing dung heap. Only if there is none nearby, will he contemplate starting a new one and seek a suitable spot for it. Having sought out a likely site, the animal comes sniffing to the spot, as if it is searching for something. If the site is acceptable, it paws the ground a few times, turns around, and defecates. The act itself is a quick and clean one, taking just a few seconds or so. Having relieved itself it will go forward a step or two, paw the ground again like dogs do, and move away. There is urination too, but not the kind of dung scattering that the African species indulge in.

A 'pioneer' rhino selects a site and lays the foundation to which his compatriots can contribute.

This pioneering animal having set the ball rolling, that particular spot soon becomes public property. Other rhinos passing by, getting a whiff of the aroma emanating from the pile of dung, will make a beeline for it, and defecate precisely at the same spot. No one can explain why this is so, or what causes this quirk in the animals' behaviour. Even if it does not have the inclination, whenever it passes a dung heap, on getting the scent, a rhino will invariably defecate on that heap, though it might be as little as ½ kg. It is clear that this urge is triggered off by smell, and a rhino during the course of a day, might relieve itself as many number of times as the number of dung heaps it encounters. Since its power of smell is acute, a dung heap quite a distance away can attract it like a magnet.

The rhino dung heap is not the handiwork of a single animal—it is a community effort.

The 'original' rhino, the one who started it all, will use his creation as many times he passes by it, and if it happens to be by his *dandi*, quite a few times in a day. But he never wilfully returns to a dung heap. Thus the Indian rhino does not go to a particular place to defecate whenever it feels the urge, but it does get the urge whenever it smells a dung heap. On moving to another area, the 'original' animal will search out a dung heap in that area whenever it feels like defecating. But others will continue to use its creation and if that dung heap is located in an area where many rhinos pass by, the heap can become very high and wide. Since many animals approach a heap from many directions, it assumes a circular symmetry. Also a rhino, approaching a dung heap, will suddenty turn around a few feet away from it, and make its final approach backwards. Poachers find this an ideal habit, and dig their pits close to dung heaps.

A dung heap continues to be used by the animals as long as it remains. High floods, which inundate the habitat almost totally, sound the death knell of many a heap. Burning is also responsible for the destruction of dung heaps. If neither flood nor fire touches a dung heap it can be used for many years. Lahan, however, has observed that year old heaps do not have deposits of fresh dung on them, and therefore concludes that a dung heap is used for one dry season after which it is discarded.

The Indian rhino retains its defecating habit in the confinement of the zoo. A pair in an enclosure will use the same spot, so there is a well defined latrine. However far they may be from the spot, whenever the urge overtakes them, they head straight towards that latrine. Also, while moving around the enclosure, if they stray near the heap, they will invariably deposit some dung before moving away. Young calves, however, deposit dung here and everywhere, and pick up the habit only

Solanum Khassianum growing profusely on a dung heap.

after some time.

But in the zoos, while pawing and dung scattering after defecation has been observed in the African rhino, the same has not been seen in the Indian. The habit of backing the last few feet has, however, been observed. Dung heaps are regularly cleaned in the zoo, but afterwards the animals continue to use the same spot.

The rhino, being a nonruminant, does not have the complex digestive system of ruminants, so the excreta is not as fine as that of cattle. The fibre content, like that of elephants, is quite high, and there is a large amount of undigested matter, such as reed stalks, in the excreta. But elephant dung is more dry and compact. Rhino dung, which has a moist quality about it, cracks up sooner than elephant dung enabling foresters to distinguish between the two.

The dung heap and the area immediately around it is mostly devoid of vegetation; whatever grass is present has a sickly, jaundiced look about it. This is probably because of the urination that accompany defecation. Some fungal growths are seen on and around old dung heaps. The excreta is a rich source of organic matter and supports a number of detritivores and a large population of microbiota which reduce the material to a suitable state for intake by plants. Thus, though in a fresh state the dung may not possess a fertility value as high as that of ruminants, in a decomposed state it is an excellent soil nutrient. Kaziranga, where fresh alluvial deposits enrich the soil each year, is not, of course, very dependent on animal excreta for maintaining soil fertility, but in other habitats this may be a contributing factor.

Although a dung heap may possess a barren look, some vegetation does grow on it. One specific plant that grows profusely on and near dung heaps is Solanum Khassianum. Some researchers on the food habits of the rhino seeing the profusion of this plant near dung heaps, came to the conclusion that the animal eats the plant and aids in seed dispersal. But Debroy, Lahan and others, after observing the food habits of the rhino discovered that the animal does not eat this plant at all and therefore cannot be a seed carrier. Perhaps birds which come to forage in dung heaps for parasites may be responsible for the dispersal of this plant.

Authorities on Indian rhino such as E.P. Gee believe that the peculiar habit of the rhino of dropping its dung in fixed places does not indicate territory marking. They point out that quite a few herbivores such as *nilgai* and other antelopes drop their dung at particular spots, without necessarily demarcating territory. Among the African species excretory products do play an important role in territory demarcation and fixing home ranges. The dung heap of the dominant bull of the African White is always an individual one, located within its territory. After depositing dung it kicks the material to scatter it and also urinates in a specialised manner, literally leaving its personal stamp on the heap, so that other animals may not use it. However, the subordinate members of the herd use communal dung heaps and do not scatter the dung. The Black rhino

also scatters dung, but this behaviour is shown by all members of the species, and not by a bull alone.

The defecating habits of the other two Asiatic species are similar to that of the Indian rhino, and they do not scatter dung. Since territory dominating instincts are absent in these species too, dung heaps are neither used to demarcate territory, nor to fix home range. These animals are truly solitary, displaying no herd mentality whatsoever, while the African White lives in some kind of a society where a dominant bull must use such a device to assert his suzerainty.

One peculiarity of the Indian rhino is its strange habit of sudden urinating and simultaneous defecating when surprised or frightened. This is particularly noticeable in areas where human intrusion is infrequent, such as Bagori range in Kaziranga. When, on misty mornings an elephant with forest staff on it suddenly disturbs a grazing rhino, the startled animal invariably urinates or defecates.

The Indian rhino is not known to urinate in order to fix direction or scent-mark trail. Smell does direct it sometimes—e.g., in finding dung heaps or during mating, but not in general direction-fixing in the way a dog marks its trail. Although the Indian rhino does keep to its own *dandi* while moving from grazing to cover, it depends upon its sense of hearing, sight etc. to fix the trail. However, like all other aspects of the Indian rhino, its peculiar defecating habit too must be the subject of greater research. Who knows, the key to many of the secrets of the Rhinoceros unicornis might lie in an innocuous looking heap of dung!

CHAPTER IX

DISEASES

THE Great Indian One-Horned Rhinoceros is one of the hardiest of animals, and seldom falls prey to diseases that afflict other herbivores, domestic or wild. It is this phenomenal resistance to diseases that has contributed to the creation of a mystique of invulnerability around the creature, and the superstitions surrounding its flesh, blood and other organs. The extraordinary capacity to recover displayed by orphaned or injured calves has to be seen to be believed. There are cases in which calves which had been heavily infected due to severe mauling by tigers have survived after treatment. Mortality due to injury or disease is rare in calves brought to the zoos.

This is the primary reason why Kaziranga and other habitats are relatively free from serious epidemics amongst Indian rhino. In 1944 and 1947 there were casualties among the rhino population of Kaziranga due to suspected anthrax and another unidentified disease, and a number of animals perished. P.D. Stracey also records that "the carcasses of no less than 13 rhinoceroses which had died through one of these diseases (anthrax and haemorrhagic septicaemia) were found in the Kaziranga Sanctuary of Assam." In 1973 too haemorrhagic septicaemia was detected in Kaziranga in 9 or 10 cases.

But despite the proximity of rhino sanctuaries to villages (except, of course, in Chitawan), where domestic cattle occasionally stray in and mingle with the wild denizens, there have been no epidemics of cattle diseases such as rinderpest among rhinos in any of the habitats. Some years back a rinderpest epidemic raged throughout Assam, killing a great number of domestic cattle. While the epidemic affected wild animals in Kaziranga resulting in mortality to a number of wild buffaloes, rhinos remained totally free of the disease. Whether they are immune to cattle diseases such as rinderpest has not, however, been conclusively proved. The forest authorities carry out systematic prophylactic inoculation and vaccination of domestic cattle of adjacent villages as a preventive measure against epidemics amongst wild animals.

While talking about diseases among rhinos, we can look at it from two angles: (1) the ones they are susceptible to and (2) diseases that have actually been encountered in the wilderness or in confinement.

The Indian rhino may be susceptible to bacterial, viral, fungal and protozoal diseases as well as Helminth parasitic (worms etc.) infestation. Among bacterial diseases anthrax is the most common in most animals including the rhino. It is caused by the bacteria Bacillus anthrasis and is highly contagious and fatal. As previously stated, there have been cases of this disease in the wilderness and one of the rhinos in the Guwahati zoo, Padmini, died in 1968 of it. Rhinos are also susceptible to haemorrhagic septicaemia, an infectious disease transmitted by a micro-organism called Pasteurella boviseptica. Cases of this disease too have been detected in the wilds and the Guwahati zoo records the death of a male rhino in 1984 of it.

Tuberculosis is common in most animals, in the wilds as well as in

zoos, and the rhino is also susceptible to it. In the wilds it is very difficult to detect an animal with TB because of the absence of external symptoms but the affliction in newly captured animals brought to the zoo confirms that in general all wild animals are susceptible to TB. This disease is of three types—human, bovine and avian. In cases of TB detected among animals in zoos, it is invariably of the human type, and obviously comes from human sources—zoo workers and visitors. The place where the zoo is located may have had human habitation previously, and TB germs may also be active in the soil from latrines, urinals etc.

A zoo study on TB among animals has revealed that although the rhino and hippo are susceptible to TB, their degree of susceptibility is less than that of deer, antelopes, giraffes and monkeys. In certain zoos deer are kept in enclosures along with the rhinos and the disease might be transmitted from the former to the latter. In the Guwahati zoo preventive anti-TB treatment is given to rhinos.

Many zoos have recorded rhino mortality due to Escherachia coli infection, and this disease is also present in the wilderness. In 1989 a 2½-month old male rhino calf brought to the Guwahati zoo was seen to be infected with heavy E. coli infection and succumbed to it. The other bacterial diseases the Indian rhino is susceptible to are Salmonellasis, tetanus and staphyloccal infection, which is an associate disease with E. coli, Salmonellasis etc.

Among the viral diseases to which rhino might be susceptible are viral entritis and rabies, though no record of any affliction exists in the wilderness or zoos.

Rhinos are also susceptible to fungal and myotic infection. The Guwahati zoo records one such case where pathological analysis of the dung revealed fungal infection in a calf. Due treatment was given and the calf recovered. Protozoal diseases from blood parasites, such as Trypanosomiasis are also on record. Liver Fluke or tapeworm infestation is also seen in rhinos, more in the wilderness than in confinement. Postmortems done among animals in the wilds show that at least 60 per cent of those examined have parasitic infestation. But such non-pathogenic parasitic infestation rarely leads to mortality.

Apart from the above, rhinos might occasionally suffer from grass poisoning, despite the inherent instinct in animals to distinguish edible plants from non-edible ones. Other causes of mortality recorded in Guwahati zoo include one in 1970 of acute bloat, two cases in 1984 and 1987 of dehydration due to senility, a newly brought calf's death in 1988 of injuries and the stress of journey and a 15-day old orphaned calf's death due to aspiratory pneumonia.

While fungal or parasitic infection of the horn has not been observed in the wilds, there have been one or two cases in zoos. African rhinos do sharpen their horns by rubbing against trees while the Indian rhino does not. Yet sometimes in zoos an Indian rhino too may be seen to rub its horn, and this might be misinterpreted as a habit. Actually parasitic

infection of the horn might induce an animal to rub its horn to obtain relief from itching. One such case was treated in the Guwahati zoo by gentian-violet and cured.

In the natural state ectoparasites are found in the folds of the rhino's skin and ears, and are removed by wallowing and avian companions. But in a well managed zoo ectoparasitic infestation is almost absent in most animals including the rhino because they are regularly cleaned and cleansing agents such as bleaching powder and other chemical disinfectants are regularly used. This has enabled zoo officials in Guwahati to experiment on rhinos by depriving them of water for wallowing. The objective of such an experiment is to determine whether the animal can lead a relatively 'dry' life and survive without wallowing. Stagnant water is an ideal medium for multiplication of germs and if the rhino can do without wallows, its chances of catching waterborne diseases could be eliminated.

Two rhinos have been kept in an enclosure without facilities for wallowing for over two years now. It has been seen that they not only survive without wallowing, but their health has become far better than what it was when they were first brought to the zoo. Regular showers and shade is sufficient to keep their body temperature under control. It must, of course, be remembered that zoo animals are relatively sedentary and do not have to run and move about like animals in the wilds.

The absence of major epidemics among rhinos in their habitats is ample testimony to their hardiness and inbuilt capacity to resist diseases. Unfortunately, the Indian rhino has no defence against the wiles and armaments of poachers. If this animal does vanish from the face of this earth, it would be due to the disease of cupidity and savagery infecting human hearts, and not anthrax or haemorrhagic septicaemia.

CHAPTER X

QUO VADIS, UNICORNIS?

IN today's world, with an ever-increasing human population and growing consumerism, there is a constant conflict between the needs of man and the needs of wild animals. This is a global phenomenon, not confined to any particular region of the earth. A rapidly increasing human population means more mouths to feed, which in turn requires increasing food production, for which more land for cultivation is needed.

An expanding population also requires land to build houses, to set up villages, townships, cities and megapolises. Huge dams must be erected to irrigate agricultural fields and provide electricity. Forests must be mowed down to make paper and other items of human consumption. Man must delve deep into the bowels of the earth in search of fuel; build mammoth refineries that spit out noxious venom. Giant industries must be constructed to produce goods. Land and more land must be reclaimed and colonised by the spawning hordes of ever hungry humanity.

In this intensifying conflict wild animals inevitably emerge as losers. They have been slaughtered by the million and their habitats destroyed. It is a fact that from the point of transition from the Mesozoic to the Cenozoic era, when the genera of mammals became distinct from the reptiles, more than two-thirds of mammals have become extinct. But these died out in the evolutionary process through natural selection, and have been replaced by new species better equipped to survive in the ruthless struggle for existence. In the prehistoric period human responsibility for species extinction was insignificant. But in the last two thousand years man has committed unpardonable atrocities on wild animals, and has caused the unnatural extinction of dozens of species.

Fortunately, slowly but inexorably, mankind is waking up to the consequences of its own folly. The stark reality, that the obliteration of any single species is but another nail driven into its own coffin, is gradually penetrating the egocentric, unreceptive consciousness of mankind. Yet even today a vast majority of people, when told that a species like the Great Indian One-Horned Rhinoceros must be protected and its habitat maintained, will automatically ask—"Why on earth should we protect an animal that does nothing else but eat, sleep and wallow?"

I have put this question to a number of people and the answers, despite their diversity, had one thing in common—all of them dwelt on the usefulness or the uselessness of the animal to the needs of man. Only one villager came out with a different answer. "God made this animal," he said simply. "We have no right to destroy something that God has made."

He had, of course, touched the heart of the matter. But in an increasingly utilitarian world, such a simplistic answer will not satisfy man. In a milieu in which land has become a precious item, not many will support setting aside vast tracts of that commodity for the exclusive use of an animal solely on grounds of morality. Any conservationist argument advocating rhino protection, therefore, has to be utilitarian if it

is to convince the lay person.

This is particularly difficult with the Rhinoceros unicornis because the animal's position in the scheme of Nature has not been deeply studied and, any way, is too abstract for most people to comprehend. What I have observed, however, is that illiterate villagers, perhaps because they are closer to Nature, have a deeper awareness of the unity in diversity, the harmony among seemingly disparate entities, that exist in Nature. They possess an instinctive awareness that nothing is insignificant or superfluous in creation, an awareness that is lacking in the so-called educated, urban elite. Unfortunately it is the urban elite which frames the laws, sanctions finances for conservation, dereserves reserved forests, resettles refugees in wild life habitats etc. Convincing such people is an extremely difficult task.

In Nature everything is inter-related; the kind of delicate equilibrium that Nature maintains can be disrupted if any one of the inter-related factors is violently removed, with consequences which may not be immediately visible, but may have a far reaching impact. Nature does not have any place for superfluity; it cannot be said that this animal plays a more significant role and this a less significant one. All things, great and small, have an equally important, preordained role in the great natural scheme; if a certain species has outlived its usefulness Nature will ensure that it will vanish of its own accord. But if a species is forcibly removed through human interference, the hiatus created might have a disastrous effect on the whole. To put it simply, if the conditions are created today in which the Great Indian One-Horned Rhinoceros is forced into extinction, conditions might be created tomorrow in which human

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beings too would be forced into extinction.

In the dynamic, natural cycle of production—consumption—growth—decay—death—decomposition that sustains solar powered eco-systems, the rhino occupies a trophic level just above the producers, i.e., autotrophs/green plants. Its role in the cycle is that of a primary consumer. Each life form, whether plant, insect or animal, represents a link in this cyclic chain. Each form is dependent on a number of other forms for sustenance and survival, and each in turn supports a number of other life forms. Each link is essential for the continuance of life as we know it on this earth.

As a primary consumer the rhino has a special part to play in converting plant energy into other energy forms, and thereby maintaining the uninterrupted flow of the cyclic process. While depending on a number of plant species for sustenance, the rhino in turn supports other life forms. It acts as an agent of seed dispersal. During its lifetime its excreta supports a number of detritivores, saprotrophs etc. In death it provides food for a large variety of carnivores, scavengers, saprotrophs and microbiota.

Its removal from the eco-system will result in an increase in plant energy, loss of prey to carnivores and scavengers, and a defect in grazing succession. In Kaziranga, for instance, we have four types of deer, buffalo, rhino and elephants among other herbivores. As the taller species of grass grow in height, they successively go beyond the reach of each of these species, but continue to be consumed by the others higher up in the grazing order. The barking deer, being the smallest, feeds only when the grasses are at a sprouting stage. As the tall grasses continue to grow they successively go beyond the reach of the hog deer, swamp deer, sambar, buffalo, rhino till finally only the elephant can feed upon them. The presence of each animal is thus required to control the increase in plant energy and convert it into other forms of energy. A defect in grazing succession can bring about an irreparable break in the delicate cycle.

It may, however, be argued that other herbivores may perform the same function and role in Nature, and the loss of one species will not have a deleterious impact on the entire cyclic process. But a variety of forms performing similar functions, also called genetic diversity, is a unique characteristic of natural eco-systems. This multiplicity of forms provide numerous alternate pathways to the same end, and serve as a self-regulating mechanism to safeguard against entropy developing at any stage of the cyclic process of energy transformation. The process itself is infinitely complex and has not been fully understood by man so far. Therefore, man-induced loss of any life form may prove to be a disaster in the long run. The loss of genetic diversity will also weaken the resilience of the natural eco-system as a whole. The importance of the Indian rhino from the above viewpoint cannot be over-emphasised. The environment would be poorer if the Indian rhino becomes extinct.

The Indian rhino, like the other species of the family, is one animal which has been evolving for millions of years and as such is of immense

cognitive value to scientists. A number of animal species have become extinct through natural causes to be replaced by other similar forms. So even through extinction these gradually contributed to the process of evolution. For us losing the Indian rhino will not only entail the loss to the genetic pool resource of the world, but also the loss of a valuable species that might add to our knowledge of the evolutionary process. Scientific study of the species and the long evolutionary path it has traversed will enable us to learn more about the evolutionary process, and thereby give us a deeper insight into Nature herself.

Moreover, the Indian rhino is an indicator species of the wetland eco-system, one of the richest and most productive eco-systems of the world. By studying this eco-system, we can learn a lot about the Indian rhino. Conversely, by studying the rhino we can learn a lot about the wetland eco-system. The Indian rhino and its life process has a very strong link with the large river systems and the peculiar micro-climate surrounding them. The rhino requires all the ingredients of its habitat to sustain itself. Once we start probing into what is required for the rhino, we will be able to understand what the habitat provides. The wetland eco-system is a highly complicated one with hundreds of factors operating to produce it, and our understanding of these factors in their totality is incomplete. An understanding of the Indian rhino might enable us to fathom the mystery as to what sustains such a rich eco-system.

The Indian rhino is an indicator species of the wetland eco-system.

These, in brief, are some of the ways by which the Indian rhino can benefit us, though perhaps not everyone will be convinced by such arguments. It is an integral and indispensable part of Nature and its extinction would be an irreplaceable loss. Despite its long evolutionary

history it is not a prehistoric animal in the sense that it may become naturally extinct. One has only to see its enormous procreating vitality in optimum habitats such as Kaziranga to be convinced that it will not become extinct unless man is involved in its extermination. But arguments regarding the indispensability of this animal to the continuation of the life process on our earth will cut no ice with those who slaughter it for its horn. With the drying up of legal channels for procuring the horn, poachers will grow more desperate in their endeavour to finish off the remaining members of this species.

The future of the Great Indian One-Horned Rhinoceros, as that of most species of wild animals, is not rosy. So far in major habitats such as Kaziranga or Chitawan the animal has shown an upward trend. But the Indian rhino is not, in a literal as well as a figurative sense, out of the woods yet. Its numbers are not large enough for it to have crossed the threshold towards safety. Civil unrest in the areas where it has survived, an unforeseen epidemic or two, might yet spur it towards total annihilation. If this unique animal is to attain a population level that can be considered safe, where all threats of possible extinction are eliminated, a conservation strategy has to be framed. The priorities of such a strategy should be:

(1) Effective propaganda against the use of the rhino horn by exposing the futility of such usage.

(2) Improvement in the existing infrastructure, strengthening protective and management measures and enactment of more stringent punitive laws against illegal trafficking in the horn.

(3) A determined effort, sustained over a number of years, for research on this animal.

(4) Identification of other suitable habitats; giving legal status to such habitats (park or sanctuary) and setting them apart exclusively for the rhino and other wild life; translocation of the Indian rhino to these.

(5) Full protection to, if possible, and extension of existing habitats to remove their island like character.

As long as the demand for the rhino horn exists, the animals will not be safe no matter what measures are adopted to protect them. A concerted propaganda effort at an international level is required to educate the people on the foolishness of using a commodity that does not have the properties ascribed to it. Legislation in countries like China forbidding the use of this ingredient in medicines will go a long way to curb demand and give this creature a fresh lease of life.

If the surviving population of the Indian rhino is to be effectively safeguarded from poachers, improvements in measures to protect this animal in its various habitats are imperative. An elitist rhino protection force, trained to deal with poachers and extremists, is the need of the hour. Equally important, stronger deterrents are required against poaching and illegal trafficking in animal products, and suitable legislation must be enacted to mete out harsher punishments to those who butcher

wild animals for profit. The forest and police authorities must also ensure proper follow up so that poachers are not only arrested, but also convicted for their crimes.

Our ability to protect an animal is inextricably linked to our knowledge of that animal. Thus research on the Indian rhino, sustained over many years, is a *sine qua non* if we are to succeed in conserving this species. A small beginning can be made by collecting greater data through the field staff themselves. For example, each Beat Officer in any sanctuary can be entrusted with the responsibility of observing and monitoring a single animal for a long period of time, tracing its movements, behaviour patterns etc., and recording them. If the animal wanders away to another area, the records can be passed on to the Beat Officer of that area. If an officer is transferred his successor can continue to maintain records. Data collected in such inexpensive ways may prove to be of invaluable help to scientists and research scholars.

In the course of centuries the Indian rhino's habitats that once ranged over the entire Indo-Gangetic plains have now been reduced to isolated pockets in India and Nepal. The dimensions of existing habitats are, naturally, finite. It is imperative that new habitats for this unique animal be identified and given legal status before they are occupied by encroachers. In Assam itself there are other areas to which rhinos can be translocated, provided legal status as well as security can be provided to these. As contained in the *Planning A Wildlife Protected Area Network in India* (2 Volumes), a body of experts have already identified additional potential rhino habitats and recommended their conversion into Wildlife Parks or Game Sanctuaries. Unfortunately, hardly any follow up action

If due to continued persecution the Indian rhino passes into oblivion, the loss would be that of mankind.

on the recommendations has so far been taken in Assam.

However, translocation of an animal species from one habitat to another is fraught with grave danger, and must be done after careful and thorough study of the species and its habitat. Translocations effected in haste without adequate preparation may harm rather than serve the cause of the animal sought to be conserved. It must be ensured that the new area to which it is translocated has the necessary environmental and biotic factors which will enable the species not only to survive but also to thrive and prosper. For genetic viability proper natural nutrition, suitable climatic and micro-climatic conditions are essential and these must be taken into account before translocation is attempted. Otherwise the animal might survive in the new area for one or two generations, but from the third generation onwards there might be a crisis.

And finally, the existing habitats must be strictly maintained and, wherever possible, extended. This, however, is easier said than done, for the optimum habitat of the Indian rhino is also ideal for agriculture. This is why all rhino habitats except perhaps Chitawan are under tremendous pressure, and have gradually shrunk in the course of the years. In Kaziranga erosion by the Brahmaputra has also contributed to shrinkage in the total area of the park.

A flock of ducks take to the air while a mother and calf take a dip.

But if these habitats are not to assume the character of open air museums where endangered species are kept under rigorous protection, these have to be extended and provided with more corridor type outlets so that animals can migrate to different areas. A study of the Kaziranga National Park, for instance, has shown that by bringing in the river islands of the Brahmaputra under the forest department's authority as well as opening out protected passages to the Karbi Anglong hills, the present area of the park can be almost doubled. Such possibilities exist also in the case of Jaldapara and Manas Sanctuaries.

The Rhinoceros unicornis is one of the world's most magnificent animals, and a source of wonder and awe to all who see it in its natural state. It is a harmless creature that has been brought to the edge of extinction due to the rapacity and thoughtlessness of man. If due to continued persecution it passes into the realm of oblivion, the loss would not only be to Nature, but to mankind as well.

GLOSSARY

dandi: local term for an animal track.
beel: a small body of water.
ikora: a species of reed, botanical term Erianthus ravanae.
bahon: a vehicle—in the context an animal used for riding.
kharam: wooden clogs worn in ancient India.
vanovas: living in the wilderness.
tapasya: deep meditation
vrata: fasting
pinda: a Hindu, post-cremation ritual.
gaonbura: village headman
satras: Vaishnavite religio-cultural centres of Assam.
linga: male sexual organ.
shradh: after-death rituals.
argha: a spoon like receptacle used in sacred ceremonies.
keratin: a fibrous protein, the chief constituent of hair.
placental: mammals which feed their babies inside the body through a special organ called the placenta.
genera: Group of animals with common structural characteristics, singular—genus.
Ungulates: hoofed animals.
Artiodactyla: ungulates with even number of toes.
Perissodactyla: ungulates with odd number of toes.
pachyderms: hoofed nonruminants.
epidermally: attached to the skin, not fused to the bone.
caecum: the first part of the large intestine.
mucous membrane: fluid secreting skin lining.
habitat: the particular set of physical environmental factors that immediately surround a faunal community.
prehensile: capable of grasping.
ectoparasites: parasites that live outside the body of their hosts.
savanna: tropical grassland.
primary productivity: the amount of green food produced by the environment for the primary consumers, mainly herbivores.
range degradation: deterioration of a particular habitat due to over-population or other causes.
dispersal: the process by which species of flora and fauna increase the range of their habitat.
home range: the area over which an animal normally roams while getting food, mating and raising young.
chong holua: local term denoting the shifting of an animal from the home range it normally occupies.
peck order: the order of dominance of one animal over another when living in the same community.
ghulee: local term for a wallow.
estrus: heat period in female, when she is sexually active.
gestation period: the time taken from a successful mating to the delivery of the baby.
detritivores: plants and micro-organisms which break down animal waste into soil nutrients.
protozoa: unicellular, microscopic parasites.

non-pathogenic: not causing disease.
saprotrophs: vegetable organisms subsisting on decayed organic matter.
indicator species: a species the presence of which indicates the nature of the ecosystem.
translocation: the artificial transfer of an animal from one habitat to another.

SELECT BIBLIOGRAPHY

A.K. Mukherjee, *Endangered Animals of India*, Zoological Survey of India.

Andrew Laurie, *The Ecology and Behaviour of the Greater One-Horned Rhinoceros.*

Balakrishna Seshadri, *The Twilight of India's Wildlife*, 1967.

Brahmachari, Rakshit and Mallik, Further Attempts to Determine the Food Habits of the Indian Rhino at Kaziranga, Bombay Natural History Society.

Champion and Seth, Revised Reviews of Forest Types of India.

E.B. Martin, *Run, Rhino, Run.*

E.P. Gee, *Management of Indian Wildlife Sanctuaries and National Parks*, Bombay Natural History Society.

E.P. Gee, *The Wildlife of India*, Collins, 1964.

Frank Finn, *Mammalia of India*, Thacker, Spink & Co., 1929.

Hamdi Bey, A Profile of Kaziranga, *Cheetal*, 10 (1-2), 1967.

H.P. Phukan and F. Rahman, *A Study on the Nature and Reproduction in the Great One-Horned Indian Rhinoceros*, Assam State Zoo.

K.C. Pator, *Thesis on Food Habits of Rhino during Dry Season Period in Kaziranga.*

Our Magnificent Wildlife, How to Enjoy and Preserve It, *Reader's Digest* Pub.

P.D. Stracey, *Wildlife in India, Its Conservation and Control*, Government of India, 1963.

Pocock, *Fauna of British India, Mammalia.*

P. Lahan and R.N. Sonowal, Kaziranga, Wildlife Sanctuary of Assam, *Journal of Bombay Natural History Society*, August 1973.

Ramesh and Rajesh Bedi, *Indian Wildlife*, Brijbasi Printers.

Richard G. Van Gelder, *Biology of Mammals*, George Allen & Unwin Ltd., 1969.

Richard Walker, The GIOR with Special Reference to Kaziranga, *Cheetal*, 15 (1-4).

S.H. Prater, *The Book of Indian Animals*, Bombay Natural History Society.

W.T. Blandford, *Distribution of Vertebrate Animals in India*, Ceylon and Burma, 1901.

Yuri Dmitriyev, *Man and Animals*, Raduga Publishers, 1984.

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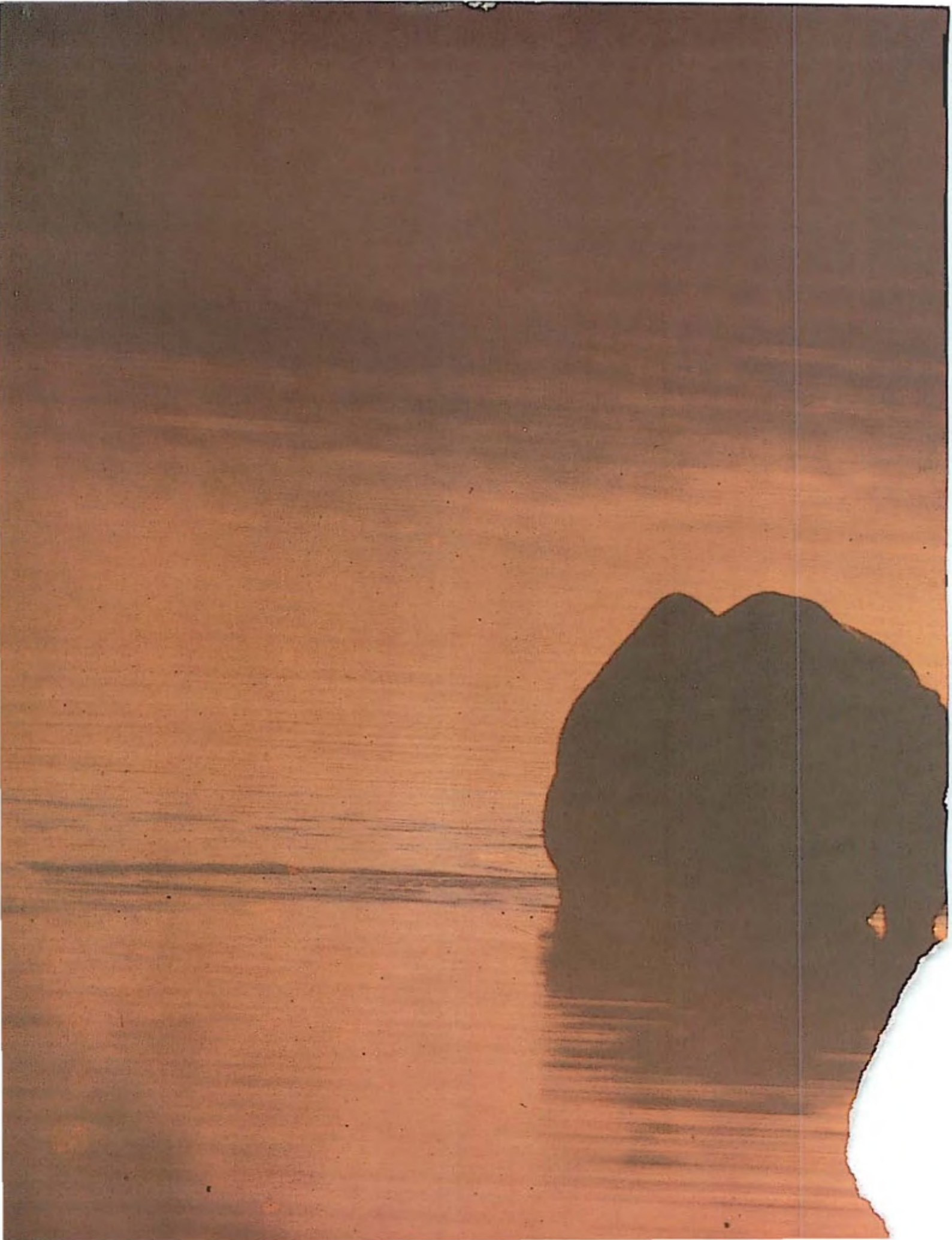
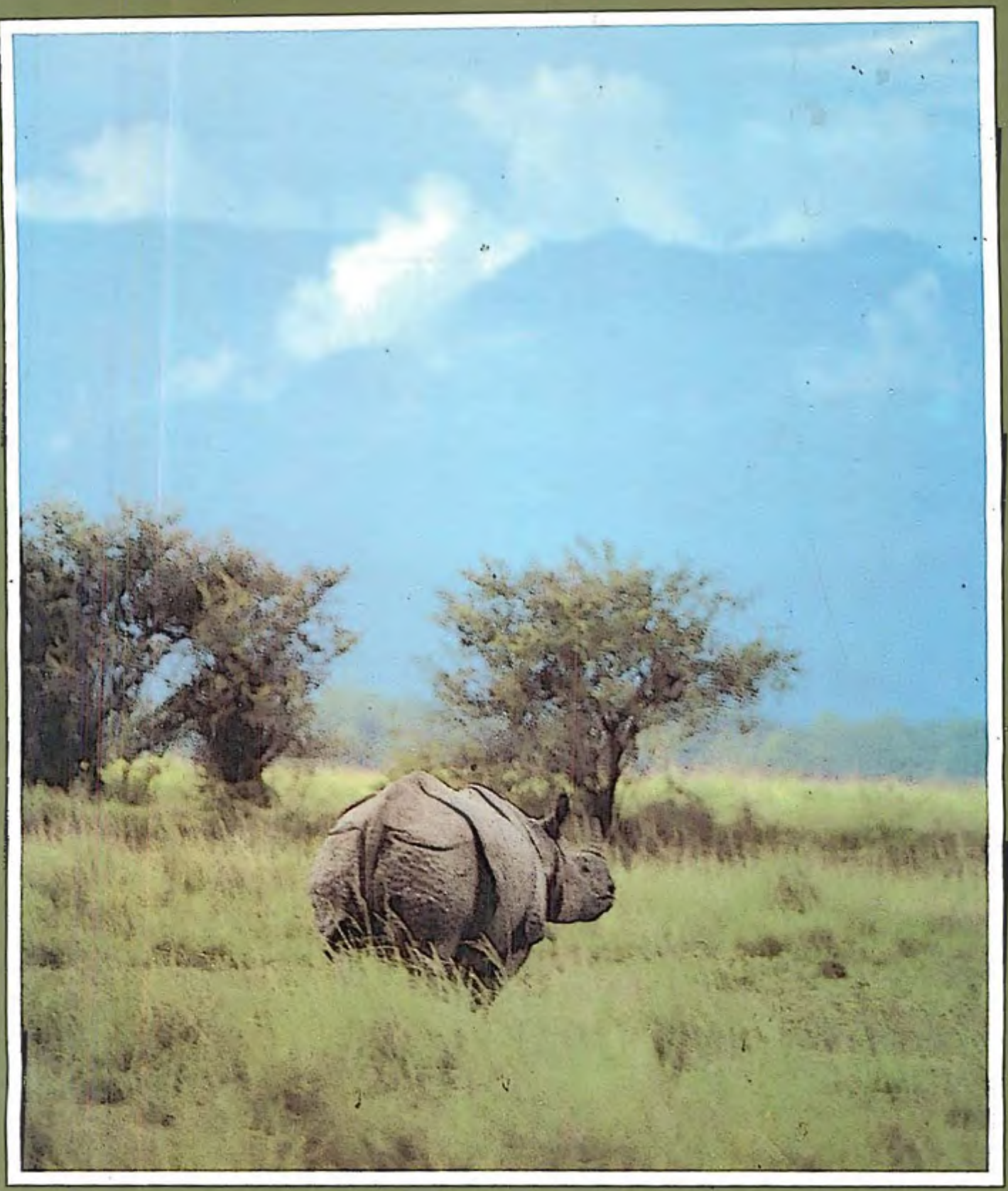


The Great Indian One-Horned Rhinoceros (Rhinoceros unicornis, Linnaeus), which once roamed across the alluvial plains of mega-rivers such as the Indus, the Ganges and the Brahmaputra, now survives precariously in a few small pockets in Assam, West Bengal and Nepal. One of the oldest extant land mammals, the Indian Rhino has become a casualty of the miraculous properties associated by man with its horn, flesh and other organs.

As long as the myth of the aphrodisiac and medicinal value of the rhino horn persists, the animal will never be safe from poaching, which has become a lucrative business. A concerted effort is thus required to educate people regarding the stupidity of using a commodity that does not have any of the values attributed to it and thus save the animal from extinction. This, basically, is the *raison d'etre* of this book, and forms its thematic core.

Unicornis is a comprehensive account of the Great Indian One-Horned Rhinoceros, its past history and present status, generic characteristics, temperament, behaviour and habits as well as its position in the scheme of nature. Written with the objective of familiarising the lay reader with this unique animal, the book will also prove to be a source of information for zoologists and naturalists.

Jacket (front) shows a portrait of a Rhino.
Jacket (back) shows the idyllic conditions of the Indian Rhino in a place like Kaziranga.
End paper shows a Rhino couple quenching thirst.



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