

plants. The animals are solitary; the young become independent at a relatively early age. In order to study the behavior of individual animals, which are hardly ever seen in the dense jungle, Schenkel measured their footprints. In adult animals, these are 27-39 cm wide in the front, and 25-27 cm in the rear. In the young who were on their own, Schenkel measured 21.5-22 cm for the front feet and 20-20.5 cm for the hind feet. Presumably, the females, with or without young, remain in a rather fixed home range but they take long trips from there daily. This roaming is even more pronounced in the males. The paths of the Javan rhinoceros are found predominantly on passes which cross mountain ranges and parallel to them, but the paths are most distinct near wallows. These wallows and bathing places, as well as the resting places, are different depending on the season. During the rainy season, the rhinos wallow in creeks, and less frequently in wet places in the brush. However, during the dry season most of these wallows dry out. The Javan rhinoceros also bathes where larger creeks flow into the ocean and occasionally even in the ocean itself.

The bulls spray their urine backwards and upwards at bushes. The fresh urine, which is orange to red in color, smells like horse urine. Until now these red splashes were thought to be nasal secretions. The Javan rhinoceros defecate either in creeks or on regularly visited "manure fields" of five to ten meters in diameter. Often they may leave droppings on their way. Rudolf Schenkel thinks that defecation in Javan rhinoceros is of no special significance in intraspecific communication.

The only species of rhinoceros of which there still is a good population in the wild is the AFRICAN BLACK RHINOCEROS (♁ *Diceros bicornis*; Color plate, p. 37 and pp. 38-40). HRL 300-375 cm, TL approximately 70 cm, BH (shoulder) 150-160 cm. The weight is up to two tons. There are two horns, of which the anterior one is longer (usually about 50 cm, sometimes up to 138 cm). Occasionally there is even a disposition for a third horn. The body is hairless, except for the tips of the tail and ears. Rib-like folds are on the sides of the rump. The upper lip is extended and the tip is suitable for grasping. There are no incisors or canine teeth; there are seven premolars and molars on each side of the jaw. The gestation period is fifteen to sixteen months.

A person on foot who encounters a black rhinoceros really feels rather small and insignificant. One immediately recalls the angry attacks and even fatal accidents one has read about in books on Africa. After all, the black rhinoceros is one of the largest terrestrial mammals, next to the elephant and the square-lipped rhinoceros. The most impressive attributes are the two nose horns. A visitor to a zoo, seeing the animal for the first time, may already imagine them between his ribs. But then zoo rhinos almost never have the remarkable length of horns as do rhinos in the wild. The world record probably is held by

The African black rhinoceros by Bernhard Grzimek





Fig. 2-5.
Former and present distribution of the black rhinoceros (*Diceros bicornis*). This is the only species of rhinoceros which still occurs quite frequently (black triangles) in some areas.

Gertie, one of the two adult female rhinoceros of the Amboseli Game Reserve; her front horn is bent in an unusual way forward horizontally and upward to a length of 138 cm. For many years she was the most photographed wild game animal on earth. The adult female Gladys, who lives in the same area, had a similarly monstrous horn formation. In 1965 she broke 45 cm off of it. With photos, one was able to show that the frontal horns of these animals had grown 45 cm in six to seven years.

In some areas of Africa, where the rhinoceros are now extinct, there have allegedly been groups in which the two nose horns were of the same length. The three-horned rhinoceros were found frequently in Northern Rhodesia (in the vicinity of Lake Young). There are reports even about a five-horned rhinoceros and of others with horns growing out of their bodies. The great Indian rhinoceros on the famous drawing by Albrecht Dürer, which has a small horn on the shoulder, may well have had a living model. Occasionally, rhinos without ears are born. Gertie of the Amboseli Game Reserve of Kenya, who has perfectly shaped ears herself, in 1953 gave birth to Prixie, who did not have ears. I received the impression that Prixie, whom I have observed and filmed from a very close distance, may, in spite of this defect, decrease or even close the openings of the auditory canal.

In contrast to the square-lipped rhinoceros—the “white rhinoceros” of the literature on Africa—the “black rhinoceros” is not really black, just as the white rhino is not white. Depending on the soil of the habitat where the rhino likes to roll in the mud and the dust, the originally slate-colored skin may be covered with substances that may make it look white or reddish, or, in areas with lava, black. Since it is hairless and without sweat glands, it has a special liking for mud baths. Hence, in rare cases it may happen that a rhino becomes trapped in the mud without being able to get out; then it may be attacked by hyenas.

Black rhinoceros are remarkably nearsighted. Apparently they cannot distinguish between a man and a tree at a distance of only 40 or even 20 meters. This nearsightedness explains some of their behavior, for example, their alleged “aggressiveness.” Their sense of hearing is much better; their cone-shaped ears react quickly to unusual noises. The best developed of their senses is the sense of smell, which is probably comparable to the quality of a dog’s. They follow conspecifics by the scent of their tracks. When mother and young have lost one another, they may be within range of clear sight. However, they do not move towards each other but rather they sniff at the ground until they encounter the other’s track, which they then follow.

Animals with poor eyesight may well approach people or other objects slowly and curiously until they catch their scent. Once a rhino approached Cherry Kearton, an explorer of Africa and animal photographer, who was filming it. The animal circled closer and closer

until, at a distance of 10 meters, it finally ran off. The black rhinoceros have another habit which can become fatal for them; they will attack an object which they cannot identify, approach it snorting furiously, and then veer off or just pass within a few meters. A camera man, Martin Johnson, together with his wife, jumped down a deep cliff from attacking rhinos, but then they saw that the animals had stopped five meters from the place where the two of them had just stood. In two other instances, when the Johnsons could not flee, the rhinos also turned off shortly before reaching them.

However, in most cases, travellers in Africa do not have the nerve to wait and see whether it is the exploring approach of the nearsighted animals or actually an attack. Therefore, in most cases, the hunters will shoot the rhinoceros before they know for sure. Rhinoceros sometimes attack tree trunks or termite heaps in the same manner and then simply walk on. John Owen, the director of the Tanzania National Parks, had an especially exciting experience. One day when he was climbing up hill in the Ngurdoto Crater with a woman who was a famous horsewoman, the two suddenly saw a rhino coming towards them. Owen quickly escaped into the bushes; the lady pulled herself up on a branch. The branch broke and the woman landed on the rhino's back. Both mount and rider were terrified; the lady fell off and the rhino hastily ran away.

Of course, one cannot always rely on the harmlessness of rhinoceros. This the Swiss zoologist Rudolf Schenkel learned when he observed rhinoceros and lions in the Tsavo National Park in Kenya while on foot. Many of his encounters with black rhinos indeed were harmless—but one evening a bull attacked him when he moved along at a distance of about 50 meters, silhouetted against the horizon. Schenkel ran towards the bull, roaring in order to drive him away. Since the bull was approaching at full speed, Schenkel had to dash aside in order to avoid him. He ran towards a small tree whose top half was broken off and was hanging down. There was no time left to climb into the intact part of the tree top. So he just ran around the trunk and over its broken part, while the rhino had to run around the part with the dead top. But soon the bull changed his method. While Schenkel remained on the side of the tree with the broken part of the trunk, the bull waited on the other side in order to suddenly dash forward. Schenkel tried to get into the remaining part of the tree top, but the bull caught him and threw him into the air. He came down at first on the animal's shoulder and then to the ground where he immediately crawled under the broken tree top. The bull pushed aside the broken trunk and top part of the tree. Schenkel decided to remain motionless, lifting one foot to the level of the rhino's mouth so he could push himself off in case the worst happened. At first the bull was puzzled; then he came closer until his nose touched the naked foot—the

Is the African black rhinoceros dangerous?

shoe had fallen off. When the bull no longer saw the moving object, he responded to the human scent. He suddenly turned around and trotted away with his tail erect.

So we can see that the behavior of black rhinoceros may differ substantially; it depends on the behavior of the people who share their habitat. The Wakamba in Kenya pursue these animals with poisoned arrows or sling traps for the legs. The poor rhinos may drag around such a sling of wire with a heavy piece of wood attached to it for days and weeks, while all the time the wire cuts deeper into muscles and bone. Therefore, the rhinoceros in the Wakamba territory are said to be aggressive and mean. However, in the territory of the Masai who do not hunt and leave the rhinos in peace, they are known to be rather peaceful.

Sometimes it turns out that rhinoceros who suddenly attack have been wounded before. Once in Tanzania, Oscar Koenig had shot the hindquarters of a rhino which was blocking his way. During the following nights this animal turned over three limousines and two trucks and finally had to be shot. Kearton reported that a woman hunter, who had shot at a rhino which was generally known to be peaceful with too small a caliber bullet, was killed by the animal. The following day a farmer and his wife from the area came along the road with their car. The rhino immediately attacked when he saw the car. The man quickly pulled his wife out of the car and helped her to climb a tree; he could not reach it himself in time and was killed. In 1964, a game warden in the Hluhluwe Game Reserve in Natal was thrown into the air twice by a black rhinoceros; he was seriously injured in the thighs and buttocks. When the rhino started the third attack, the game warden grasped the frontal horn and desperately clung to it. The rhino shook his head vigorously from one side to the other, trying to dislodge the man. He finally succeeded with an extremely vehement jerk. When the man flew into the bush, the rhino departed.

Rhino attacks on
cars

I have experienced several attacks on cars, all of which I had provoked myself. In most cases the animals stopped just short of the car without touching it; only in one case did I get a dent in the metal. One day when I wanted to take a closer look at the ear openings of the earless Prixie, the game warden's son drove me close to the sleeping animal. Prixie suddenly jumped up on all four legs and attacked immediately, making a dent in the side of the open car right next to my buttocks. In Amboseli, too, in 1965 a rhinoceros pierced his horn through the open window of a fully occupied limousine into the metal of the roof, and then made dents all over the car. It injured the passengers with the shaft of a spear which was still stuck in his throat—so again this aggressive rhino actually was a wounded animal. Often rhinoceros work over a passing car just out of mere curiosity, sticking their heads under the fender and shaking the vehicle. A game

warden of the Hluhluwe Reserve, on one such occasion, bravely got out of his car and hit the animal over the head with his belt. On the railroad from Moshi to Same a rhino once chased off all the workers and damaged their lorries.

I do not know of anyone who has even seen a black rhinoceros cross a lake or a river by swimming, although these animals love to wallow or go into shallow water to graze on the reeds. However, they are able to swim. During the damming up of the artificial Lake Kariba in Sambia, attempts were made to save the game animals from the slowly disappearing islands. It happened that a rhinoceros, while attacking the boat, went into surprisingly deep waters where it could no longer stand. However, it did not disappear completely in the floods—just the nose, ears, and eyes were slightly above the water. A few waves would have been sufficient to eventually drown the animal.

In spite of their apparent awkwardness, black rhinoceros climb rather high up into the mountains. In East Africa, they were found at elevations from 900 to 2700 meters. They live in dense bush, in scattered forest, on open grass plains, and even in semi-desert. They do not like hot and humid areas; therefore, they have never penetrated the rain forest of the Congo Basin or the woodlands of West Africa. Thus, even in earlier times, they were never found throughout Africa. From the time the Europeans first entered Africa, the rhinos have become exterminated in wide areas of their habitat. In South Africa, south of the Zambesi River, only a few are left in protected areas. In Rhodesia and Malawi, too, they have become rare; they are somewhat more numerous in Zambia, especially in the area of the Luangwa River. The estimate for the Portuguese area of Mozambique is approximately five hundred head; for Angola it is one hundred and fifty; and for Southwest Africa, two hundred and eighty. In the French colonies of Africa, they were nearly extinct by 1930. Only then were strict laws for their protection introduced, saving some. The few rhinoceros in the Southern Sudan may have disappeared in the last years due to the civil wars going on there and the ready availability of firearms. If it had not been for the National Parks, especially in East Africa, and other protected areas, the black rhinoceros would probably be extinct by now. The total number now (as of 1967) of black rhinoceros left are only 11,000 to 13,500, three to four thousand of them in Tanzania.

The white hunters especially have wreaked havoc among the black rhinoceros. No less than 800 rhinoceros horns were exported from the sultanate of Fort Archambault in the area of Lake Chad in 1927. The professional big game hunter Cannon has killed about 350 rhinoceros in less than four years. He and a butcher by the name of Tiran "worked" mainly in the Cameroons, in Ubangi, and Chad. At times they switched from ivory hunting to rhinoceros because killing the rhinos was easier and their horns had increased in price. These people

They are poor swimmers

How many black rhinoceros are left?

What white big game hunters did

supplied modern firearms to the natives who eagerly participated in the shooting. The British big game hunter John A. Hunter brags about having killed more than one thousand and six hundred rhinoceros and more than one thousand elephants, partly of his own volition but also by order of the government who wished to prepare the land, for example the Wakamba, for settlements. In 1947 he killed three hundred rhinoceros there and, in the following year, another five hundred. Later it was found that this area was hardly suitable for settlements. The most difficult to understand are the so-called "sport-hunters" who, just for the fun of it, without any economic gain, have travelled in Africa and killed as many of these unsuspecting animals as possible. There are reports about a Dr. Kolb who has killed one hundred and fifty rhinoceros in East Africa.

It might be of special interest for psychologists to analyse the mentality of such wholesale killers from their letters and reports. These "Big Game Hunters" obviously are an entirely different type of man from those hunters in Europe who care for the game and spend large sums in order to preserve or to improve the game population. Since traditionally big game hunting in Africa has been described as something worthy of heroes, one may presume that a personal feeling of inferiority, destructive tendencies, and a certain addiction for fame have led to such slaughter. However, the rhinoceros hunt especially has never been a dangerous, heroic deed. During the many years he lived in Africa, the English explorer Frederick Selous (1851-1917) had not heard of a single instance where a European rhinoceros hunter had been killed by a rhino.

Unlike the roaming elephants, rhinoceros rarely return to areas where they once were exterminated. There is only one way to reintroduce them: They must be caught in other places, transported in boxes, and set free in that area. This was done in the 1950's in the Garamba National Park in Rwanda. During the last few years, we have caught sixteen rhinoceros, many of them seriously wounded, in the hunting areas of Tansania and brought them to the island of Rubondo in Lake Victoria. Meanwhile, they have reproduced there. Following habit and instinct, rhinoceros will stay in their home range after it becomes settled by man and disturbances increase.

Since we now obtain our information on these gray giants no longer from big game hunters but from patient scientists and game wardens, we have learned more about their life. Studies on their behavior really began only in 1960. In contrast to many other species of animals, black rhinoceros do not have territories from which they chase conspecifics. However, at certain times of the year as well as the day, one may find the same animal in the same place engaged in the same activity. Once a day a rhino takes a specific, well-trodden, wide path to get a drink. The distance between the pasture and the waterhole may be eight to

Ethological studies
in national parks

ten kilometers. Usually the rhino begins to graze only in the afternoon, spending the rest of the day in the shadow of a tree or in a wallow. At night at the waterhole, the animals may play, chasing each other, hissing and snorting. Where they are not pursued by man, as for example in the Ngorongoro Crater or in Amboseli, they are in the open all day long.

From the more intensive observations in the Ngorongoro Crater, we learned that individual black rhinoceros do exclusively remain in a specific home range, as was originally thought. This open protected area in Tanzania measures two hundred and sixty square kilometers; it is possible to count from an airplane how many rhinoceros are there at a given time. In January, 1958, my son and I counted nineteen rhinoceros there. Molly's count in March, 1959, revealed forty-two animals. Hans Klingel, between June, 1963 and May, 1965, found a population of sixty-one rhinoceros in the Ngorongoro area; thirty four of which seemed to be more or less permanent residents of the bottom land crater. J. Goddard, a biologist who lived in the Crater for three years until 1966, knew each animal individually, and regularly took photographs of them. During this period, he saw one hundred and nine rhinoceros in the crater. These varying figures are due to the fact, as Goddard presumes, that the great majority of the rhinoceros live the whole year round in the area above the rim of the Crater. Most of the permanent residents, especially the bulls, were found regularly in distinct areas, according to Klingel; but it may also happen that single animals of both sexes lose their home range, moving permanently to another area.

Black rhinoceros like especially to eat branches, which they grip with their upper lip as with a finger of a hand. When grazing on a pasture, in many cases, they pull out tiny little bushes only. According to the observations of Fraser-Darling, a rhinoceros daily pulled out two hundred and fifty little whistling acacias. In Natal (South Africa), two black rhinoceros were seen breaking off a rather large Mtomboti tree (*Spirostachya africanus*). One of the animals held the trunk of the tree between the two horns and then pushed, slowly shifting the weight of his body with a circling movement. When the tree broke off and lay on the ground, the two animals ate the shoots from the tops of the branches. Rhinoceros also eat the very prickly branches of thornbush and do not mind the sticky white juice of the Euphorbias. Klingel repeatedly observed a group of four animals who ate Wildebeest droppings. There they did not consume any plants at all but went straight from one pile to the next. They probably satisfied a need for minerals and trace elements.

In some areas these gray giants dig up the mineral soil with their horns. It is said that they tear up their own dung heaps in the same manner. The usual method is just to use their hind legs such as when

The diet of the African black rhinoceros

Behavior while defecating

a dog covers his fresh feces by scratching soil over them. In contrast to elephants, rhinoceros do not urinate and defecate at the same time. However, different individuals, bulls as well as females, may defecate on the same heap. Only in rare cases do they pause briefly to deposit their droppings right on their paths. The dung heaps probably do not mark a specific area as an individual's territory. Rudolf Schenkel, while doing research on the black rhinoceros in the Tsavo National Park in Kenya in 1964 and 1965, thought that the animals in an area maintain olfactory contact with each other. For similar reasons, the female rhinoceros may spray urine on their paths when walking. Bulls sometimes attack bushes first with their horns and then with their feet until they finally spray urine over them.

How rhinoceros
sleep

Herbert Gebbing studied the sleeping habits of rhinoceros in 1957 at the Frankfurt Zoo. Usually, the animals lie on their bellies, slightly to one side, with the front legs pulled in an angle under the body and the hind legs stretched out forward. The head rests forward on the ground. Only in rare cases does the animal lie completely on one side, stretching out all four legs. The rhinoceros seem to rest in this position in especially deep sleep. Their sleep lasts quite long, an average of eight to nine hours a night. Usually they rest without interruption for two, three, or even five hours, and they are not disturbed by familiar noises. Two or three times during the night they get up to defecate. According to Gerda Schütt, the rhinoceros of the Hanover Zoo slept for nine and a half hours; within this period they were up for almost three hours in which they ate almost without interruption. As soon as one of them got up, the other one usually would wake up too. If it did not, the first rhino would push the other with its head until it too stood up.

Rhinoceros among
themselves

Except in wallows, one will find black rhinoceros always singly or in small groups of up to five animals at most. If there are two of them, in most cases, it will be a mother with her more or less grown up young or a bull and a female; rarely will two bulls be together. Rhinoceros who stand together may caress each other with their lips or rub their chin on the other animal. In 1958, game warden Ellis saw a group of adult rhinoceros females one evening in the Nairobi National Park coming out of the woods; three of the animals walked side by side, while the fourth walked behind them. The animal in the middle was obviously in labor. When the animals became aware of being observed, they stopped, but one of the females kept rubbing the flank of the mother-to-be with the side of her head and horn. Finally, they retreated into the bushes. Three days later, a newborn calf was seen there.

When rhinoceros encounter each other, the meeting sometimes may seem antagonistic, but, in most cases, it is peaceful. For example, there may be a mother standing with her child. Suddenly a big bull appears

from behind a bush. All heads go up, the female snorts, and the bull snorts too; both of these huge creatures raise their tails straight up. The bull paws the ground several times with the hind legs and snorts. Then, almost simultaneously, both animals lower their heads and dash towards each other. One is prepared to hear the terrible clash of two heavyweights crashing into each other. Then, suddenly, at a distance of six meters, both stand still and look at each other with their heads erect. The ears are turned towards the other. Then the bull turns aside and walks to the water, and shortly after that, the female, too, turns around. However, a short while later all three stand together.

Elephants clearly are recognized as superior by rhinoceros, although the two species hardly ever have reason to fight. One day in Uganda, on a narrow path, an elephant and a rhinoceros were slowly walking towards each other. They did not become aware of the other's presence until they were fifteen meters apart. The elephant spread his ears widely and walked straight towards the rhinoceros, who stopped and lifted his head. When the elephant attacked, the rhino moved backwards, shaking his head from one side to the other, and snorting loudly. The next short forward movement of the elephant drove away the rhinoceros, which disappeared in a gallop in the direction from which it had come. Later, the two animals were seen grazing not far from each other without seeming to notice the other's presence. Mrs. Trappe once found a rhinoceros in the area of the Ngurdoto National Park which had apparently been pierced by elephant tusks, since the surrounding ground was covered with elephant footprints. There are several reports of similar cases. In 1960, game warden Koos observed a bitter fight between a rhinoceros bull and an elephant in the Kruger National Park. Obviously, the elephant was unwilling to let the rhinoceros drink water, but the rhino insisted. During the following fight, both animals fell three meters down the steep slope of the river bank and continued fighting in the water. Large pools of blood led to the place where the rhinoceros finally lay dead. He had four holes made by the elephant's tusks in his body as well as other injuries. It has been observed repeatedly that elephants covered rhinoceros, which they had killed, completely with branches and twigs.

The relationships between rhinoceros and other large animals are not at all as clear. A game warden in the Murchison Falls National Park once saw a black rhinoceros chase a group of twelve waterbucks over a distance of about one hundred meters. This was all the antelopes would put up with. Turning around, they attacked the grey giant who retreated quickly into the brush and did not show up any more. On another occasion, a rhinoceros attacked a herd of about three hundred and fifty Cape buffalo, who were grazing in a line about four hundred meters wide. The rhinoceros ran almost playfully along the line of the unsuspecting buffalos, chasing them in all directions, and then he

Behavior towards
other animals

walked on. In the Nairobi National Park, Guggisberg also saw a group of zebras playfully attacking a rhinoceros who finally retreated. However, mutual toleration is far more frequent, sometimes even leading to a kind of friendship between rhinoceros and other species of animals. A. Ritchie reports on two rhinoceros who were seen over a long period together with a large herd of Cape buffalo. They even slept regularly in the midst of the buffalo in a clearing in the forest, lying right next to them.

In other cases, animals of a different species may help the rhinoceros to rid itself of parasites. In Natal, a female rhinoceros was rolling in a creek and two turtles were seen tugging hard at her fissured skin. This was obviously painful for the rhino because she repeatedly jumped to her feet. However, she made no attempt to attack the turtles. On another occasion, again in Natal, at least six turtles approached a rhinoceros who lay in a puddle and started to pull the ticks out of his skin. They would rise up to seventeen centimeters above the water level in order to reach the parasites. In order to pull off the ticks, the turtles would push their forefeet against the rhino's body, take the ticks in their mouths, and then pull until the parasites came out. When the turtles worked in the more sensitive parts of the rhino's skin, he quivered several times, but the turtles did not pay any attention to this.

It is also said that the cattle egret picks the parasites from rhinoceros. Indeed, the cattle egrets follow the rhinos all day long, even sitting on their backs. But they seem only interested in catching the insects stirred up by the large animals. They do not pick ticks from the rhinos; this was confirmed by an analysis of their stomach contents.

Occasionally, rhinoceros calves are killed by lions. In 1966, in the Manyara National Park (Tanzania), several lions attacked a rhinoceros mother with her calf and drove them towards the entrance gate of the park. About fifty meters from the administration building, they caught the calf while the mother called loudly as if for help. Two passing cars were chased back by the rhinoceros mother, but the furious animal was driven off by shouts and rocks. The lions left the remains of the calf and walked off. In the Ngorongoro Crater a subadult rhinoceros was found killed by lions; he had severe injuries at the throat. Since there were no signs of a fight, one may presume that the lions broke the animal's neck. Although the lions stayed for one day with the dead rhinoceros, they made no attempt to eat it. The next day they moved on.

Usually, however, rhinoceros do not pay any attention to lions, even if the large cats walk closely past them. Once in a while, especially at waterholes, they are killed by other large animals. Guggisberg once watched a rhinoceros about to drink from a clear spring-fed pond in the Tsavo National Park. There a hippopotamus surfaced, grabbed the rhino's right front leg, pulled him down, and tore him to pieces with

his huge tusks. Selous even photographed an adult female rhinoceros that was pulled under water by a crocodile and drowned.

When two black rhinoceros fight with each other, which occurs rarely enough, it is quite a spectacular sight. As a rule, the two opponents are not—as is the case with deer and horned ungulates—two males that are jealous or may be fighting for a territory, but two quarreling females or a female fighting a bull. Sometimes, however, what appears to be a “fight” is actually just play. Our pair of black rhinoceros in the Frankfurt Zoo would often play for hours with horns pressed together. More often the calf will play in this manner with its mother or father. But even in serious fights rhinoceros rarely injure each other. The many wounds at their shoulders and flanks have other causes. There are many hypotheses, and for a while it was believed that they had been caused or enlarged by the pecks from the beaks of the ox peckers.

This is a distinct possibility. Because the rhinoceros are plagued by many parasites which are pulled out by these birds, such crescent-shaped wounds may easily result. J. G. Schillings found extremely thin worms in these wounds which are transferred by a mosquito. The black rhinoceros are also plagued by several other animal parasites. In their stomachs live the larvae of a species of fly which attach themselves by their mandibles to the stomach walls and live off the tissue fluids and blood. As soon as they have metamorphosed, they pass through the anus and pupate in the soil. The large-headed flies which result do not take any food, but stay close to the rhinoceros and deposit their eggs usually near their heads and horns. It is unknown how the larva get from there into the stomach. Besides these parasites, twenty-six different species of ticks were found on the black and square-lipped rhinoceros, in addition to one species of leech and several species of tapeworms. All these rhinoceros parasites are not dangerous to man or domesticated animals. Rhinos in a zoo are usually free of these parasites because there are no intermediate hosts to transfer the parasites in the new environment.

In recent times, procedures were developed that permit the immobilization of large mammals by shooting them with darts containing narcotic or paralyzing drugs (see p. 69). Since that time it has become much easier to capture rhinoceros, to move them to other areas, or to treat injured ones in the wild. Thanks to this method, it was possible in the Amboseli National Park in 1962 to remove the badly injured eye of the famous “Gertie.” She recovered tolerably after twenty-four hours.

When a female rhino is in heat, the bull stands opposite to her. The animals sniff at each other’s mouths, frequently making gargling sounds. Almost regularly, the female then attacks the bull and butts hard into his flank. The bull tolerates this, even though the butts are



Fig. 2-6.

The fights of rhinoceros are fair duels which are performed according to specific rules. Serious injuries rarely occur, and often these fights are mere play. (Black rhinoceros, *Diceros bicornis*.)

The mating behavior of the African black rhinoceros

sometimes so hard that he has to burp. If a second bull appears, he may dance around her in a circle. But in spite of this, the two males do not fight; the female chooses her favorite. During this part of the courtship, the animals snort, sniff, grunt, or occasionally squeak. I have never heard a loud, penetrating whistle in the wild, such as I heard from our bull in the zoo. Perhaps it expresses surprise. It is possible to attract rhinoceros by imitating the snorting and sniffing.

Black rhinoceros mate throughout the year and can have offspring at all times of the year. Martin Johnson once watched the courtship of a rhinoceros pair from his car at a very close distance. Both animals circled each other with short, stiff-legged steps. After half an hour, the bull smelled the car, snorted with surprise, and stormed into the bushes with his tail erect.

"Of course, we expected the female to do the same," Johnson's report continues. "But this did not happen. It almost seemed as if she had not even seen her mate disappear. Apparently she was quite surprised that his amorous efforts had suddenly ceased. But then she became aware of us and she started her mating behavior all over again, obviously treating our car like a rhinoceros. That a car may suddenly become the object of a rhinoceros female's admiration was quite an unusual experience for us. This new amorous adventure was not restricted to a moment only. The creature tried for fifteen minutes or so to attract the attention of our silent, motionless car. Then she retreated virtuously, and when nothing happened, she stopped, and pranced clumsily. She seductively took a tuft of grass and threw it into the air. She gracefully approached us in a stilted walk, and came even closer than before. Then she smelled our scent. With an angry snort, the animal stopped her flirting. Down came her head, up came her tail, and she headed straight for us; in the next moment she dashed against our fender. Because the clatter of the metal and our yelling were new sounds to the rhino's ears, she snorted once more angrily and then took off in the direction of the salt lick."

The actual copulation we have repeatedly observed here in the Frankfurt Zoo. This event has rarely been observed in the wild. Frank Poppleton describes a bull who stood with the soles of his front feet on the female's back and remained in this position for thirty-five minutes. The animals held their heads parallel and moved slowly forward in a circle. When the bull had dismounted, the female turned to him and the two looked at each other for some minutes. My associate, Dr. Scherpner, observed in Tsavo Park a copulation which lasted 21 to 22 minutes. In 1964 and 1965, John Goddard observed copulating rhinoceros six times in the Ngorongoro Crater. In one instance, the male and the female stayed together for four months after the mating. Two other pairs split up soon after mating, but they were observed courting one month later, and again separated after that.

Mervyn Cowie, the former director of the Kenya National parks, was present when a bull mounted two females in succession within a short time. In the time between he was attacked—as is usual in rhinoceros—by the first female.

The first successful breeding in a zoo

Since 1941 the black rhinoceros have reproduced in zoological gardens. It took place for the first time at the Brookfield Zoo in Chicago. The second "black" zoo-rhinoceros was born in Rio de Janeiro. The first one in Europe was born in 1950 in the Frankfurt Zoo. At the Frankfurt birth, 17 liters of amniotic fluid came out first. Our female rhinoceros, "Katharina the Great," was so tame that she could be milked before giving birth. The first distinct signs of labor appeared only one and a half hours before the actual birth. The cow permitted the veterinarian to pull out the baby, which weighed twenty-five kilos. After a few seconds, the ears of the newborn moved. Two minutes later the mother belatedly attacked the assistants present in her stall. Then she smelled at the baby, but she did not lick it.

The development of young

The newborn rose to its feet ten minutes later; one hour after birth it was walking around in a lively manner. After four hours, it found the mother's udder and drank. Not until nine and a half hours later did it lay down for one hour. At birth the frontal horn of the young was only a stump one centimeter thick, and the second one was just a white spot. Rhinoceros born in other zoological gardens weighed only twenty kilograms at birth, but one in Hannover was thirty-eight kilograms. So far, twin births have never been observed in rhinos. To the best of my knowledge, until now all black rhinoceros born in zoological gardens could be raised. So far we raised two at the Frankfurt Zoo. In Rio, as well as in Frankfurt, the females were mounted regularly during the gestation period, since they were always kept together with the bulls. Eight days after the birth, our rhinoceros female was again completely tame with the keeper and all persons with whom she was familiar. We could go into her stall, ride on her back, and play with the young.

As early as 1911, the Hungarian explorer Kalman Kittenberger mistakenly killed a furious black rhinoceros which was in the process of giving birth. He opened the dead animal's abdomen and managed to get the young out alive, although it died after eight days. It was only in 1963 that game wardens Malinda and Edy of the Manyara National Park observed the birth of a black rhinoceros in the wild for the first time. They found a female rhinoceros lying on the ground. Taking it for dead, they started to throw rocks at her. When they came closer, they saw the soil around the animal was soaking wet. Within the next few minutes, the rhinoceros suddenly arose; the baby emerged, apparently without causing any difficulty to the mother. After another ten minutes, the calf dropped to the ground. The mother turned around and began to remove the foetal membranes with her lips. Ten minutes later, the baby stood on its feet and shook its ears.

The young nurse for about two years at the mother's two nipples and usually remain with her for three and a half years. If one captures a nursing young rhinoceros, it will become as tame as a domestic animal. In most cases, eight to ten months will pass until the female becomes pregnant again. In Amboseli Park, the first calf stayed with its mother for two and three quarters of a year, the following one three years, and after five years she gave birth to the third one. Black rhinoceros are sexually mature at the age of approximately seven years.

Previously, when a zoological garden kept rhinoceros, they were mostly great Indian rhinoceros. Unfortunately, the great Indian rhinos are now almost extinct, and only a very few may be given to qualified zoos. The first black rhinoceros came to Germany in 1903 to the Berlin Zoo. Now black rhinoceros are the most frequently kept species of rhinoceros in zoos. In 1966, thirty-two of them were kept in zoos in the United States.

The animals usually become very tame in captivity; it is even possible to ride on some adult females' backs. They like being caressed with the palm of the hand over their closed eyes. Probably due to a lack of anything to do, they often rub their horns against concrete walls and iron fences, which reduces them to short stubs. Therefore, a trunk of soft pine wood should be placed in a rhinoceros pen where the animals may rub and polish their horns. They cannot cross a ditch of 1.75 meters in diameter at the upper rim and 1.20 meters of height at the outer wall, even though the inner wall of the ditch is inclined upwards towards the animals. How long they live we only know from zoological gardens. In Brookfield Zoo of Chicago, the breeding pair which came there on May 19, 1935, is still alive (1967). The two animals, who must be by now approximately thirty-three or thirty-four years old, do not show any symptoms of old age. Presumably, rhinoceros may reach an age of about fifty years.

A most impressive animal, which today is found only in a few savannah regions in Africa, is the SQUARE-LIPPED RHINOCEROS (*Ceratotherium simum*; Color plate, p. 37). It is the largest species of rhinoceros. The HRL is 3.6-4 m, the BH (shoulder) is 1.6-2 m, and the weight is approximately 3 tons (in one case approx. 5 t.). There are two horns. A strong shoulder lump, which consists of muscles and epidermal tissues, is not supported by the skeleton. It has wide, almost square-shaped lips that characterize it as a herbivore. Incisors are present only in the embryonic stage; later there are only high crowned premolars and molars: $\frac{(1) \cdot 0 \cdot 3 \cdot 3}{(1) \cdot 0 \cdot 3 \cdot 3}$. The gestation period is seventeen to eighteen months; one young is born. There are two subspecies: 1. SOUTHERN SQUARE-LIPPED RHINOCEROS (*Ceratotherium simum simum*). 2. NORTHERN SQUARE-LIPPED RHINOCEROS (\diamond *Ceratotherium simum cottoni*).

In place of the lacking incisors, the square-lipped rhinoceros has a

The square-lipped
rhinoceros
by H. G. Klös

