

Grzimek's Animal Life Encyclopedia

Second Edition



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In association with the American Zoo and Aquarium Association



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Rhinoceroses

(*Rhinocerotidae*)

Class Mammalia
Order Perissodactyla
Family Rhinocerotidae

Thumbnail description

Large, heavily built ungulates with three toes on each limb, one or two horns on the snout, and skin mostly devoid of hairs

Size

Shoulder height: 54–73 in (135–185 cm); head and body length: 100–150 in (250–380 cm); body mass: 1,750–5,000 lb (800–2,300 kg)

Number of genera, species

4 genera; 5 species

Habitat

From rainforest through savanna to semidesert

Conservation status

Critically Endangered: 3 species; Endangered: 1 species; Lower Risk/Near Threatened: 1 species



Distribution

Africa and tropical Asia; formerly also Eurasia

Evolution and systematics

The rhinoceros lineage split from the tapirs and equids in the late Eocene. The family was far more abundant and species-rich during the later Tertiary period than today. Among the Oligocene rhinoceroses, *Indricotherium asiaticum*, standing 16.4 ft (5 m) tall at the shoulder, was the largest land mammal ever. *Teleoceros* was a squat North American form with a single small horn on the end of the nose, while the *Diceratheres* had two horns side by side on the snout. *Elasmotherium sibiricum* was a Pleistocene giant with a huge single horn in the frontal region. The five extant species of rhinoceros fall into three distinct subfamilies. The Asian two-horned rhinos, or Dicerorhinae, may be traced back 40 million years to *Dicerorhinus tagicus*, an animal the size of a small tapir. One of its descendants was the woolly rhinoceros, *Coelodonta antiquitatis*, which was widespread through northern Eurasia during the Pleistocene ice ages. This species was primarily a grazer, as attested by its lengthened head, lack of incisors and canine teeth, and high-crowned cheek teeth. Two other rhinos from this subfamily occurred in Europe during the Pleistocene: the steppe rhinoceros, *Dicerorhinus hemitoechus*, and Merck's rhinoceros, *Dicerorhinus kirchbergensis*, which was more a forest inhabitant. The sole surviving species, the Sumatran rhinoceros, *Dicerorhinus sumatrensis*, has changed little from the Oligocene form.

The Asian one-horned rhinoceroses in the subfamily Rhinocerotinae can be traced back to *Gaiotherium browni* from mid-Miocene deposits in India. Of the two surviving species, the Javan rhinoceros, *Rhinoceros sondaicus*, is the more

ancient, having changed little during the late Pleistocene in the last two million years.

The two African rhinoceroses represent the subfamily Dicerotinae. The earliest form was *Paradicerus mukiri*, which was found in Miocene deposits at Fort Ternan in Kenya and Beni Mellal in Algeria, dated to 12 million years ago. Rhinoceroses from this subfamily were found from Spain to Turkey and Iran during the late Miocene. The genus *Ceratotherium* first appears in late Pliocene deposits at Langebaanweg in the Cape and elsewhere. The modern species



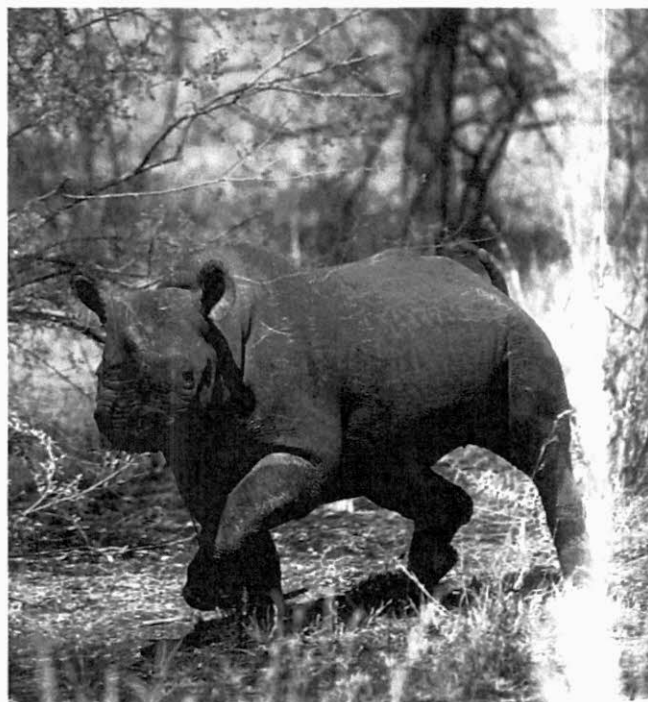
White rhinoceros (*Ceratotherium simum*) mother and calf. (Photo by Harald Schütz. Reproduced by permission.)



A newborn Sumatran rhinoceros (*Dicerorhinus sumatrensis*) rests in its pen at the Cincinnati Zoo Thursday, Sept. 13, 2001. The rhino is the first Sumatran rhinoceros to be born in captivity in 112 years. Officials at the Cincinnati Zoo and Botanical Garden hailed the birth from the only breeding pair in the United States as a historic event that could help save a species. (Photo by AP Photo/Cincinnati Zoo. Reproduced by permission.)



A black rhinoceros (*Diceros bicornis*) mother chasing away a lion. (Photo by K. & K. Ammann. Bruce Coleman, Inc. Reproduced by permission.)



A black rhinoceros (*Diceros bicornis*) charging. (Photo by Tom Brakefield. Bruce Coleman, Inc. Reproduced by permission.)



Indian rhinoceros (*Rhinoceros unicornis*) checking for enemies. (Photo by Tom & Pat Leeson/Photo Researchers, Inc. Reproduced by permission.)

Ceratotherium simum is especially numerous in Pleistocene deposits at Olduvai Gorge in Tanzania. Some workers regard the distinctions between *Ceratotherium* and *Diceros* as insufficient to warrant the generic distinction.

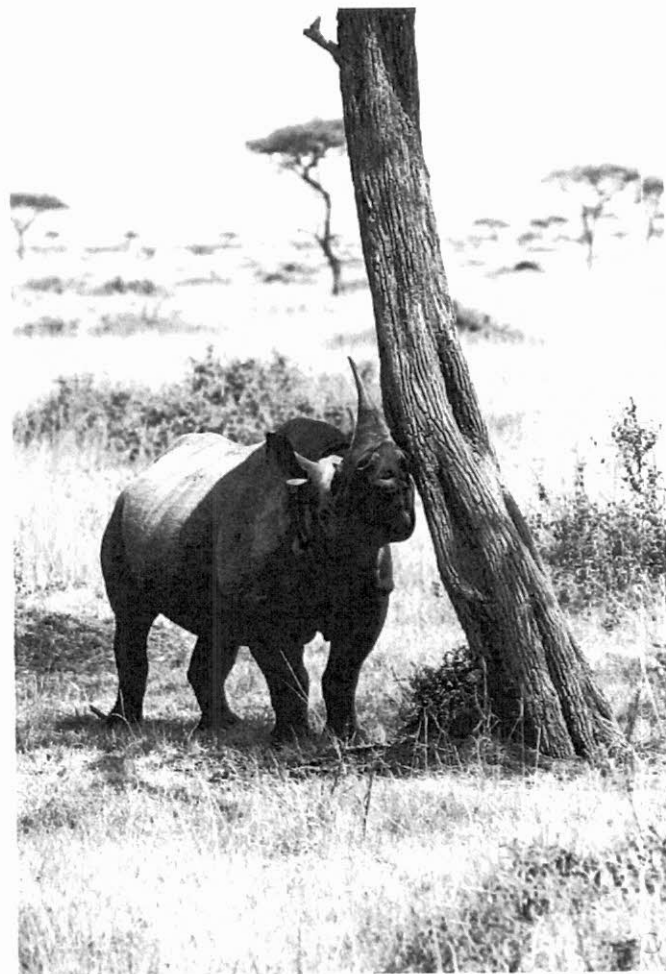
Physical characteristics

Together with the elephants and the hippopotamus, rhinoceroses constitute the "megaherbivores," those species weighing over 2,200 lb (1,000 kg) as adults. Rhinos are large, graviportal animals with relatively short limbs and barrel-shaped bodies. The three toes on each foot leave a track resembling the ace-of-clubs. The skull includes enlarged nasal bones and an extended occipital crest, with the eyes perched strangely on the sides of the head. The cavity occupied by the nasal sinuses exceeds that of the brain. The chewing teeth comprise three molar-like premolars and three true molars in each half-jaw. In grazers like the white rhino and Indian rhino (*Rhinoceros unicornis*), these are high crowned with complex grinding surfaces, while in browsers the teeth are lower crowned with prominent cusps. The African species completely lack in-

visor and canine teeth, while the Indian and Javan rhinos retain a pair of tusk-like incisors in the lower jaw, and the Sumatran rhino (*Dicerorhinus sumatrensis*) has tusk-like lower canines as well as upper incisors. The skeleton is massively constructed to support the heavy body weight, with the vertebral spines greatly extended in the shoulder region and in the posterior thoracic region. The neck is short, as is the tail.

Rhino horns lack the bony core that is typical of the horns of cattle, goats, and antelope, but consist of the same proteinaceous substance, keratin, that forms the outer material of such horns, as well as the material of hooves, fingernails, and hairs. They are made up of tubular filamentous rods, resembling a mass of adherent hairs. Rather than being part of the skull, the horns adhere to roughened areas of bone. If knocked off during fighting, or through some other accident, the horns re-grow. Indeed, they continue growing throughout the life of a rhino, with increase in length counteracted by wear from the tip.

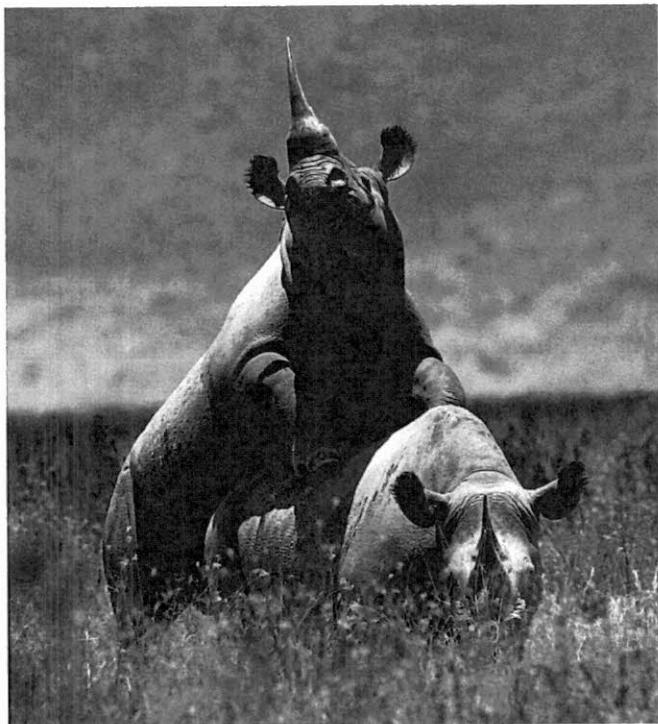
The skin thickness varies between 0.5 and 1.8 in (13–45 mm) over different regions of the body, and among species.



Black rhinoceros (*Diceros bicornis*) with raised upper lip demonstrating scented of a tree in Masai Mara, Kenya. (Photo by Mary Beth Angelo/Photo Researchers, Inc. Reproduced by permission.)



White rhinoceros (*Ceratotherium simum*) male, female, and calf in Zululand, South Africa. (Photo by Nigel J. Dennis/Photo Researchers, Inc. Reproduced by permission.)



Black rhinoceroses (*Diceros bicornis*) mating in Ngorongoro Crater, Tanzania. (Photo by Joe McDonald. Bruce Coleman, Inc. Reproduced by permission.)

However, the outer epidermis is quite thin (about 0.04 in, or 1 mm), and well supplied with blood vessels, so that biting flies have only to penetrate this distance to draw blood. Instead of the usual type of sweat gland, rhinos have exceptionally large apocrine glands scattered over the skin, well designed for rapid and copious discharge of fluid.

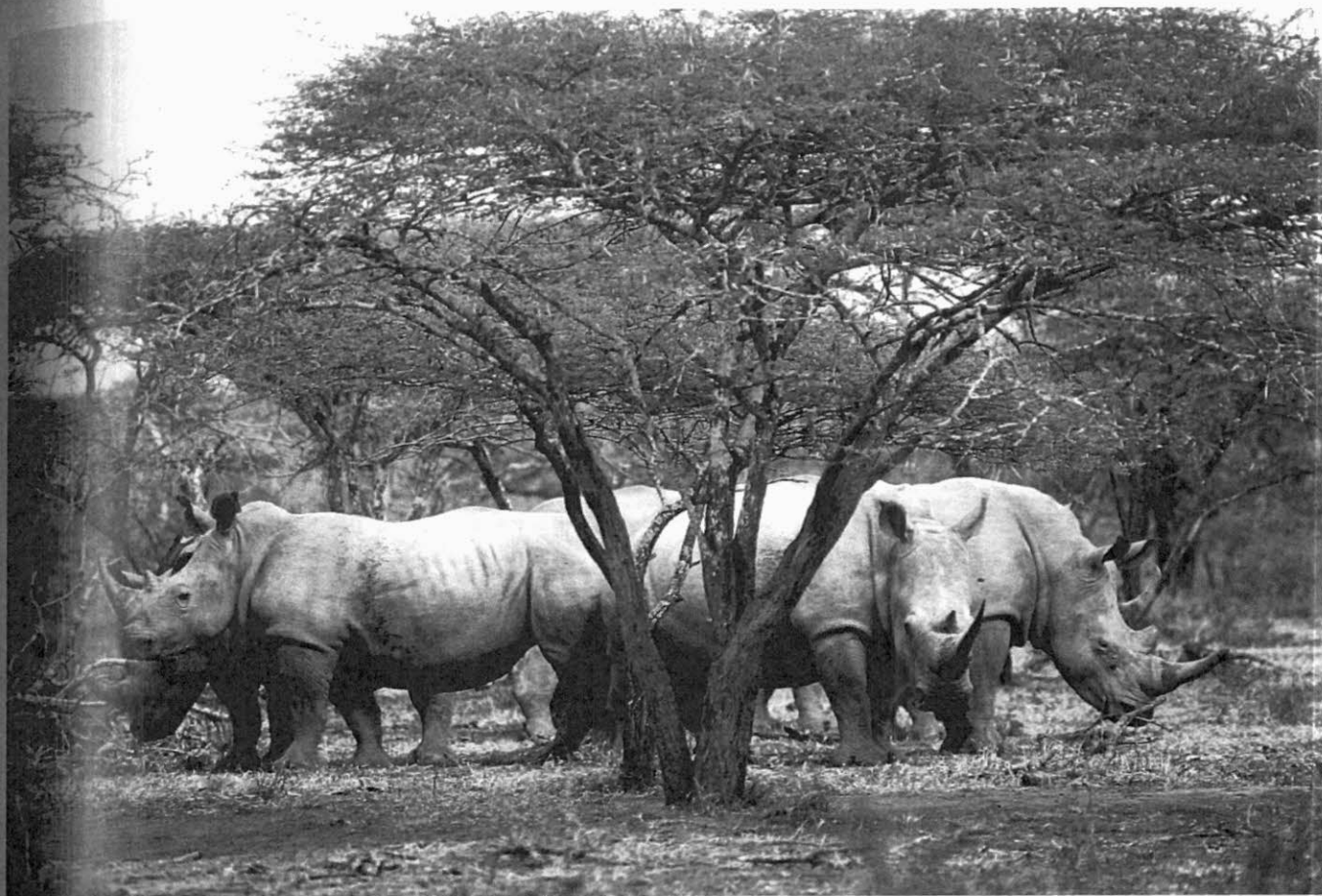
The penis is muscular as in equids, and backwards pointing when retracted. There are laterally projecting lobes associated with extensions of the corpus cavernosum, and the tip terminates in an enlarged flattened flange. The testes are located close to the skin between the prepuce and the attenuated nipples, and there is no scrotum. Females possess two teats located between the hindlegs. Pedal glands are present in the genus *Rhinoceros*, but lacking in the African species. Preputial glands are present in the white rhinoceros only.

Distribution

Two species occur in Africa, and three species in Southeast Asia. All five species are much more restricted in their distribution today than they were in the past because of human impacts.

Habitat

Modern rhinoceroses occupy a diversity of habitats: dense rainforests for the Sumatran and Javan rhinos, swamplands



White rhinoceroses (*Ceratotherium simum*) form a defensive circle when a potential enemy threatens. (Photo by M. Reardon/Photo Researchers, Inc. Reproduced by permission.)

and adjoining meadows for the Indian rhino, grassy savannas for the white rhino, and dry bushland or semi-desert for the black rhino (*Diceros bicornis*).

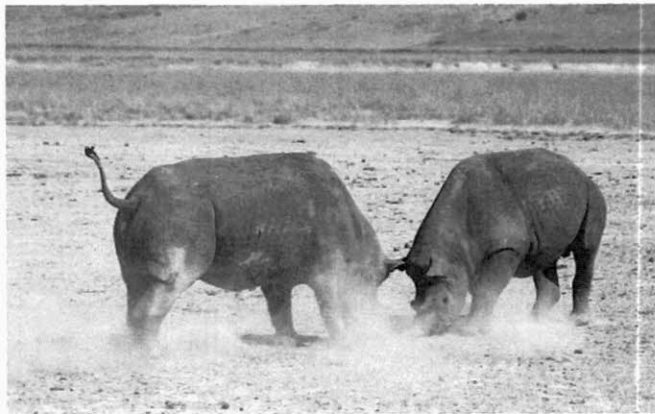
Behavior

Rhinos are largely solitary animals, apart from the mother-offspring association, but the white rhino is more social and forms small groups. They have poor vision, and seem unable to recognize a stationary human observer at distances exceeding about 100 ft (30 m). Their hearing is good, with the ear pinnae moved independently to scan for sounds from different directions. Their sense of smell is acute, and rhinos can detect traces of human scent, and also follow the tracks of other rhinos, after many hours have passed. They can be frightening animals to encounter, because they often charge human intruders, or their vehicles, but when not threatened can be quite docile, and become very tame in captivity.

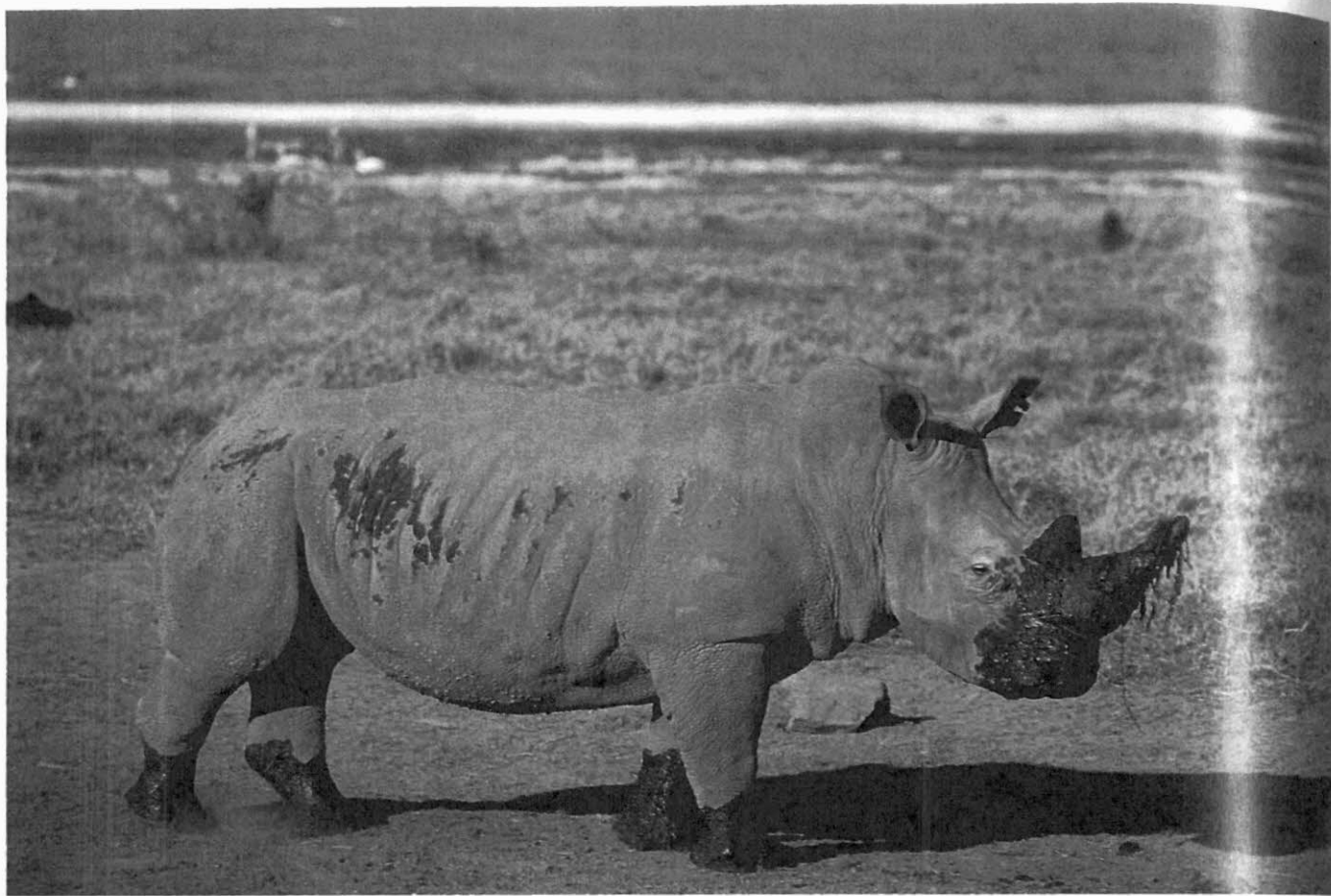
Feeding ecology and diet

The stomach is simple, and the capacious cecum and colon (or large intestine) in the hind-gut serve as the main sites of fermentation of plant food, with the help of bacteria. Large

body size prolongs the period of retention, facilitating efficient digestion. Grass-feeders such as the white rhino and Indian rhino have a relatively longer colon than the other three rhino species, which are primarily browsers on the leaves and stems of woody plants.



Black rhinoceroses (*Diceros bicornis*) fighting. (Photo by Len Rue, Jr. Bruce Coleman, Inc. Reproduced by permission.)



A white rhinoceros (*Ceratotherium simum*) with muddy face and horns after digging for water during drought in Nakuru National Park, Kenya. Lake Nakuru (in background) is a soda lake. (Photo by Gregory G. Dimijian/Photo Researchers, Inc. Reproduced by permission.)

Reproductive biology

The gestation period is 15–16 months for all rhinoceros species, even the small Sumatran rhino, and the inter-birth interval is correspondingly between two and four years. Nursing generally continues for over a year, and the older calf is driven away by the mother around the time of birth of the next offspring. Estrous cycling begins while the mother is still nursing, and there is no narrow birth season. Rhinos are renowned for the extended duration of copulations, which last between 20 minutes and an hour or longer, with multiple ejaculations. They have proved surprisingly difficult to breed in zoos, with many strange features of their reproductive biology being revealed. For example, white rhinos show no reproductive activity if housed in pairs, and the presence of more than one male, or at least an exchange of males, seems necessary for females to show overt estrous behavior. For the Sumatran rhino, mating induces ovulation. Courtship behavior can be surprisingly aggressive and frequently results in injuries. Rhinos are polygynous, and generally males and females do not associate with each other outside of mating.

Conservation status

Both the Javan rhino and Sumatran rhino are Critically Endangered, with low numbers of animals persisting in just

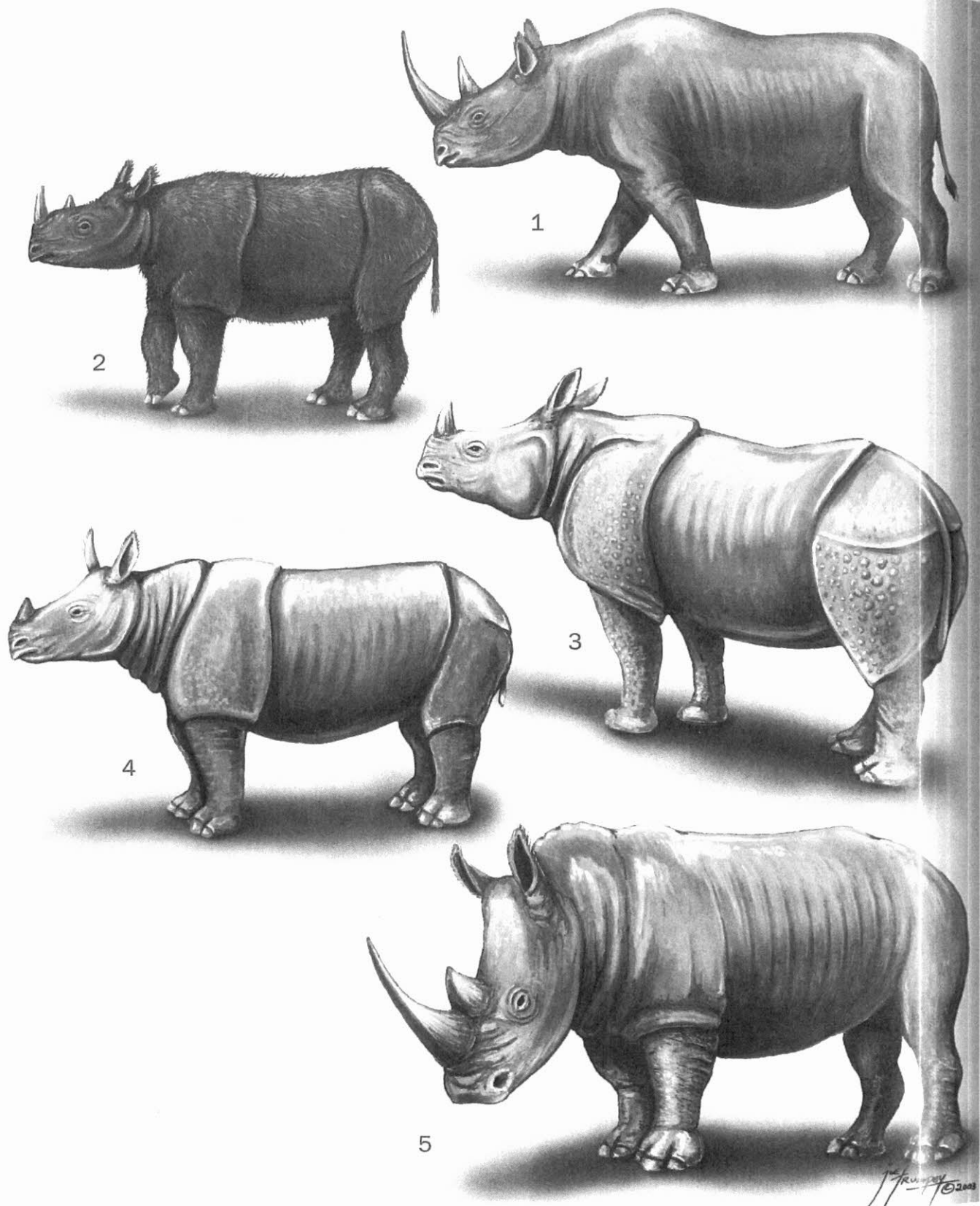
a few sanctuaries in Southeast Asia. Although more numerous, the black rhino is also classed as Critically Endangered, because no area harbors a large population and because it remains extremely vulnerable to poaching. The Indian rhino is marginally less insecure in numbers, and thus classed as merely Endangered. Only the white rhino is no longer seriously in danger, having recovered amazingly from its critically low numbers at the beginning of the twentieth century in southern Africa. Nevertheless, the distinct northern subspecies persists as just a relict of 30 animals in one park in northeast Congo. The threat to all of these species comes from illegal hunting driven by the high market value and legendary powers of their horns.

Significance to humans

Rhinoceroses have fascinated humans from early times, as is shown in cave art from the Early Stone Age in Europe, depicting the extinct woolly rhino, and in rock paintings and engravings spread across Africa, from the Cape to Algeria. The engraving of an Indian rhino by Durer in 1515, received as a gift to the Portuguese king from an Indian sultan (actually intended for the Pope), brought these animals to the attention of Europeans. However, Marco Polo described the Sumatran rhinos that he had seen during his

travels through the Far East early in the fourteenth century, and the early Romans had imported some rhinos of unknown affinities. Rhinoceroses have become especially valued for their horns, used for the making of prestigious dagger handles in Yemen and adjoining parts of the Middle East, and in powdered form as a fever-reducing drug in China and aphrodisiac potion in India. The horns were also carved into cups, used by Indian and Far Eastern potentates

to test whether beverages contained poison. The claimed medicinal power is without pharmaceutical foundation, since the substance of the horn is no different from that of hooves or fingernails. The legends about aphrodisiac properties seem to derive from the prolonged copulations typical of the family, perhaps supported by the phallic appearance of the anterior horn.



1. Black rhinoceros (*Diceros bicornis*); 2. Sumatran rhinoceros (*Dicerorhinus sumatrensis*); 3. Indian rhinoceros (*Rhinoceros unicornis*); 4. Javan rhinoceros (*Rhinoceros sondaicus*); 5. White rhinoceros (*Ceratotherium simum*). (Illustration by Joseph E. Trumpey)

Species accounts

Sumatran rhinoceros

Dicerorhinus sumatrensis

SUBFAMILY
Dicerorhinae

TAXONOMY

Dicerorhinus sumatrensis (Fischer, 1814), Sumatra.

OTHER COMMON NAMES

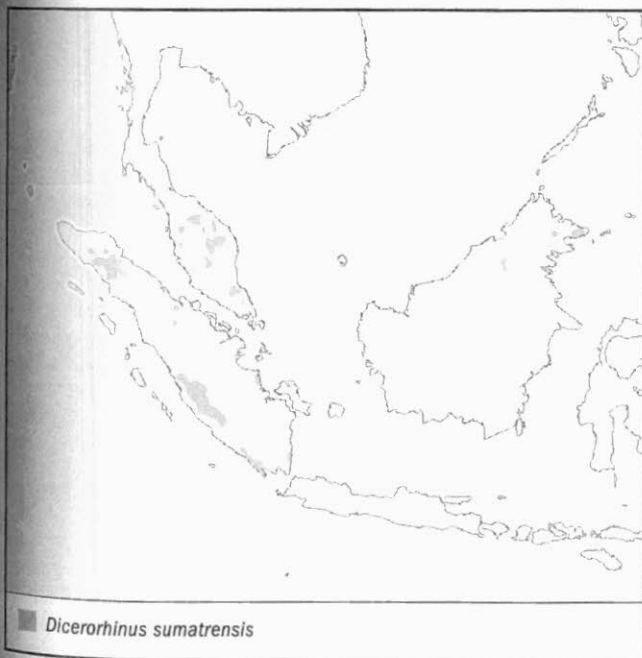
English: Asian two-horned rhinoceros; French: Rhinoceros de Sumatra; German: Sumatra-Nashorn; Spanish: Rinoceronte de Sumatra.

PHYSICAL CHARACTERISTICS

The smallest living rhinoceros, body mass to 1,750 lb (800 kg); shoulder height of 48–58 in (120–150 cm); and head and body length, 100–125 in (250–315 cm). Unusual among rhinos in having the body covered with short, stiff hairs. The hide is dark red-brown in color, the dark-colored hair quite dense in young animals, but thinning out in older animals. The ears are fringed with prominent hairs. The anterior horn length is up to 20 in (50 cm), but usually much less; the posterior one is maximally 6 in (15 cm), though commonly little more than a hump. Males have larger horns with a greater basal diameter than females, but otherwise there is little sexual dimorphism. The hide forms a thick horny cover over the front of the snout, and is also thickened around the eyes.

DISTRIBUTION

Formerly widely distributed from Assam and Burma (Myanmar) through Thailand into Indochina, and southwards through the Malay Peninsula to the islands of Sumatra and Borneo. Today thinly scattered through the southern Malay



Peninsula, parts of Sumatra and Sarawak in north Borneo, plus possibly a few animals in Myanmar.

HABITAT

Occurs in regions of broken mountainous forest, but in the past may have occupied lowland forest as well.

BEHAVIOR

Generally solitary, apart from calves accompanying mothers. Animals use a network of trails through the forest, and wallow frequently in muddy pools. The hair coat helps anchor a thick armor of mud to the body, which provides protection against biting insects, and also thorns. Salt licks are also visited frequently in the Gunung-Leuser Park in Sumatra. Females occupy home ranges covering 4–6 mi² (10–15 km²), while adult males move over much larger areas up to 20 mi² (50 km²). Male ranges have core areas, which may represent territories. Both sexes urinate in a spray, commonly over a bush, and leave scrape-marks, dung piles, and urine deposits along trails; mature males seem more active in placing such marks. Sharp dagger-like canines in the lower jaw are used as weapons in fights.

FEEDING ECOLOGY AND DIET

Feeds largely on the twigs and leaves of small trees or shrubs growing in the forest understory, and at times also on some fruits, herbs, and lianas of a wide variety of species. The preferred feeding habitat is dense undergrowth along streams and lower slopes, with the protected snout and eyes and mud-covered hide helping animals penetrate such vegetation. To reach higher shoots, animals bend or break saplings by walking over the plant and pressing down on the trunk with the body.

REPRODUCTIVE BIOLOGY

The species is an induced ovulator, and courtship is quite aggressive. Gestation period is 475 days, and birth weight 14 lb (33 kg). Females confine their movements to a small region close to a saltlick while nursing the calf. Calves separate from their mothers around 16–17 months of age, whereupon the mother returns to her non-breeding range, while the calf remains close to the saltlick. The usual birth interval seems to be close to four years, with a period of a year between weaning and the next pregnancy.

CONSERVATION STATUS

An estimated 300 animals still remained in the wild in 2002, but widely scattered among a number of parks in the Malay Peninsula, Sumatra, and north Borneo, with another 40 animals being managed in a captive breeding program. The first birth occurred in September 2001 in the Cincinnati Zoo in the United States. Poaching as well as encroachment by cultivators remain serious threats despite the formal establishment of several protected areas. Listed by the IUCN as Critically Endangered.

SIGNIFICANCE TO HUMANS

Perhaps the strangest of all the rhinoceros species, a living relict from far distant times. ♦

Javan rhinoceros*Rhinoceros sondaicus***SUBFAMILY**

Rhinocerotinae

TAXONOMY*Rhinoceros sondaicus* Desmarest, 1822, Java.**OTHER COMMON NAMES**

French: Rhinoceros de al Sonde; German: Java-Nashorn;

Spanish: Rinoceronte de Java.

PHYSICAL CHARACTERISTICS

A small version of the Indian rhinoceros, distinguished by minor differences in the folds of the skin, and by its browsing dentition. Body mass to 3,300 lb (1,500 kg); shoulder height 47–70 in (120–178 cm); horn length to 15 in (38 cm).

DISTRIBUTION

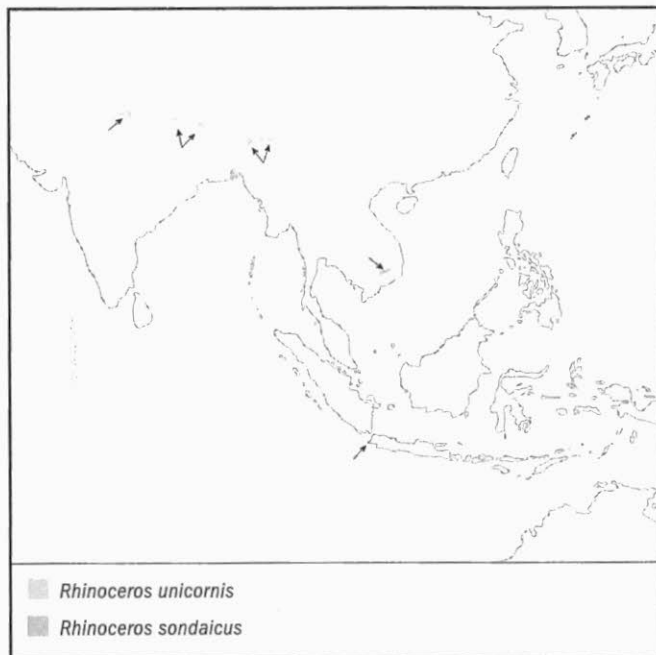
Formerly from Assam and Bangladesh through to Indochina and the islands of Sumatra and Java. Now restricted to the western tip of Java, plus a few animals in Vietnam.

HABITAT

Lowland rainforest, favoring transitional habitat between low secondary vegetation and the primal forest.

BEHAVIOR

Mostly solitary, although groupings of two to four animals are occasionally observed. Cows without calves move through overlapping ranges covering about 4 mi² (10 km²), those with calves use a smaller area of about 1 mi² (2–3 km²), while bulls traverse a larger area of 8 mi² (20 km²). Animals often rest lying in ponds or mud wallows. The red-orange urine of male Javan rhinos is squirted alongside trails and in wallows. Dung deposits are widely spread and not broken up by the feet. A far-reaching whistling call may serve as a contact signal.

**FEEDING ECOLOGY AND DIET**

Feeds on the twigs and branches of saplings, shrubs, and lianas, using the finger-like upper lip to draw food towards the mouth. Small trees may be bent or broken to bring the upper foliage within reach.

REPRODUCTIVE BIOLOGY

Very little is known.

CONSERVATION STATUS

Among the rarest of mammal species, with a mere 50–60 animals surviving in the Ujung Kulon Reserve in Java, and an unknown, but very small, number in the Cat Loc Park in southern Vietnam. Although animals in Ujung Kulon are well protected, and there have been no cases of poaching, the population is not increasing. Listed as Critically Endangered by the IUCN.

SIGNIFICANCE TO HUMANS

The least known of the rhino species. ♦

Indian rhinoceros*Rhinoceros unicornis***SUBFAMILY**

Rhinocerotinae

TAXONOMY*Rhinoceros unicornis* Linnaeus, 1758, Assam Terai, India.**OTHER COMMON NAMES**

English: Greater one-horned rhinoceros; French: Rhinoceros unicomne de l'Inde; German: Panzernashorn; Spanish: Rinoceronte unicornio indico.

PHYSICAL CHARACTERISTICS

Characterized by the armor-like plates formed by folds of skin on its sides and neck, and by the single horn perched on the snout. Males weigh to 4,600 lb (2,100 kg), females about 3,500 lb (1,600 kg); shoulder height in males to 71 in (180 cm), females 63 in (160 cm); head and body length in males 150 in (380 cm), females 135 in (340 cm). Maximum horn length is 18 in (45 cm) in both sexes. The hairless skin is gray in color, and shows flat bumps resembling rivets on a ship's hull. The two lower incisors are modified as short tusks used in fighting, up to 20 cm long, and thicker in males than in females. There are prominent glands on the edge of the sole of each foot.

DISTRIBUTION

Formerly from Indus through northern India and adjacent parts of Nepal and Bhutan into northern Burma. Now restricted to mostly isolated reserves in Nepal, Assam, and neighboring Bhutan.

HABITAT

Occupies floodplain and swampland habitats with tall cane-like grasses reaching heights of 13–20 ft (4–6 m), plus adjoining woodlands on drier ground.

BEHAVIOR

At Chitwan in Nepal, females occupy long, narrow home ranges bordering the river, covering up to 8 mi² (20 km²), although most time is spent within a core area of about 1 mi² (2–4 km²). Male core ranges are typically 1.1–1.5 mi² (3–4 km²) in extent, and overlap without territorial exclusion. Indian rhinos are basically solitary, apart from associations being between mothers and their most recent offspring, and temporary associ-

ations among subadults. However, congregations of several animals may develop around wallows and bathing pools, and in feeding areas. Dominant males have a large head-on profile, plus prominent bibs formed by folds of skin, and perform squirt-urination and foot-dragging displays. Males respond aggressively when they meet strange intruding males, and violent fights can develop with fatal results. Submissive males may share the home ranges of dominant males, do not squirt-urinate, and run away when challenged. Dung deposits develop alongside trails and bordering feeding areas, and are used by animals of both sexes. They seem to serve as orientation points. Indian rhinos are highly vocal, and make a variety of sounds, from squeaks and grunts to loud roars. About 50–65% of their time is spent feeding, and the rest mainly lying down. Indian rhinos drink daily, and ingest mineral-rich soil when it is available.

FEEDING ECOLOGY AND DIET

Feeding is aided by the finger-like upper lip, used to grip grass stems and bushes. The lip is folded back when animals graze on short grasses. Tall cane-like grasses form the principal food source year-round, in particular species of *Saccharum*. Short grasses and herbs are favored during the monsoon period, and also aquatic plants. Woody browse becomes important during winter. Fruits of many species are also eaten, especially the hard green fruits of *Trewia nudiflora*, which fall to the ground in large numbers during the monsoon season. When feeding on tall grasses or shoots, animals often step over the plants, pulling the stems down between their legs and body so as to bite off the tips. The feeding activities of Indian rhinos have quite a large impact on their habitat, by trampling and breaking plants, and also by dispersing seeds in their dung. *Trewia* trees seem to be especially dependent on rhinos, with their hard seeds benefiting from passage through rhino gut, which increases their germination rate.

REPRODUCTIVE BIOLOGY

At Chitwan, there is a weak peak in the number of females in heat during late winter and the pre-monsoon period, with most births thus occurring during the monsoon period. A female in heat sprays urine, and makes rhythmical whistling sounds. Spectacular chases over 0.62–1.2 mi (1–2 km) are a feature of courtship, with the female making loud honking noises, and the male squeaky panting sounds. These chases attract the attention of other males, thus ensuring that the female mates with the strongest sire in the region. When the bull catches up with the cow, initial horn fighting may develop into biting, and gaping wounds can be inflicted. Several mounting attempts may be made before intromission is achieved. Copulation lasts around 60 minutes, with a maximum of 83 minutes recorded. There were as many as 56 ejaculations were recorded in one instance. Females may come on heat about 36–58 days later if conception fails.

The gestation period is 16 months. Mothers seek seclusion in thick grassland or forest to give birth, and are aggressive towards other rhinos while the calf is small. Calves weigh 140–150 lb (65–70 kg) at birth. Calves under two months of age may be left lying alone for periods of up to an hour while the mother forages several hundred feet (meters) away. Nursing continues until the offspring is about two years old. The offspring is driven away by the mother a week or two before the birth of the next calf. Young males tend to join up with other young males, and young females occasionally attach themselves to adult females, although such associations endure only a few days at most. Young females may remain within the maternal home range, while young males tend to disperse away from high-density areas.

Young males form shifting groups of from two to as many as 10 animals until over eight years of age, and may not achieve breeding status until 15 years of age. In the wild, females first give birth between six and eight years of age. In zoos, females can attain sexual maturity as early as three years of age, while males become sexually potent at seven years. The median inter-calving interval is 3.5–4 years in the wild. The shortest recorded calving interval is 18 months, which occurred after the newborn infant had been killed by a tiger. Birth intervals may lengthen in older animals. About 25% of all deaths of rhinos were as a result of fights, affecting especially young as well as adult males. Predation by tigers is an important cause of death among calves under eight months old. In zoos, a record longevity of 47 years has been recorded, but the oldest animal in the wild was estimated to be 30 years old, from counts of cementum lines in her teeth, when she died.

CONSERVATION STATUS

Listed as Endangered by the IUCN. As of 2002, the surviving population totaled about 2,400 free-ranging animals, including 1,550 rhinos in India's Kaziranga National Park, and 500 rhinos in the Royal Chitwan National Park in Nepal. Elsewhere in the Assam region, numbers have been declining because of social instability and associated poaching, as well as encroachment by agriculture and cattle grazing. Rhinos are vulnerable when they move out of parks to higher ground following flooding and when they raid the crops of surrounding villages. However, the situation seems to be improving, and animals have been translocated to establish populations in new parks in Nepal and India. A large stretch of the Brahmaputra River has been added to the Kaziranga National Park, which will allow the rhino access to fertile grazing on the islands in the river once cattle are excluded. This could also allow rhinos to move between Kaziranga and other nearby wildlife reserves.

SIGNIFICANCE TO HUMANS

Viewing Indian rhinos from the backs of elephants in sanctuaries like Kaziranga and Chitwan constitutes a considerable attraction to tourists. However, rhinos are costly to surrounding village people when they move out to feed on crop plants, including maize, rice, wheat, and potatoes in surrounding fields, generally at night. Fatal attacks on humans sometimes occur, with injuries inflicted by the lower incisor tusks. ♦

Black rhinoceros

Diceros bicornis

SUBFAMILY

Dicerotinae

TAXONOMY

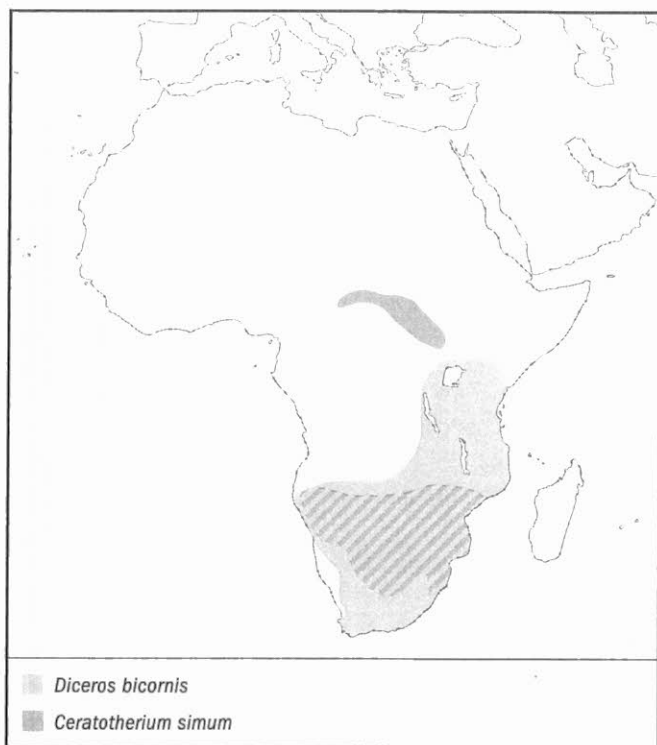
Diceros bicornis (Linnaeus, 1758), South Africa. Four subspecies: *D. b. bicornis* in Namibia, re-introduced into former range in northern Cape; *D. b. minor* from eastern South Africa to southern Tanzania; *D. b. michaeli* from northern Tanzania through Kenya; and *D. b. longipes* from Cameroon and adjoining regions.

OTHER COMMON NAMES

English: Hook-lipped rhinoceros; French: Rhinoceros noir; German: Spitzmaul-Nashorn; Spanish: Rinoceronte negro.

PHYSICAL CHARACTERISTICS

Black rhinos attain a weight of 2,100–2,900 lb (950–1,300 kg); shoulder height of 56–63 in (143–160 cm); and head and body



length of 112–120 in (286–305 cm). Male and female are of closely similar size. Despite name, the skin is gray to brownish gray in color, and devoid of hairs. The prehensile upper lip, used to grasp food, gives rise to alternate name. Anterior horn is 16.5–54 in (42–138 cm) in length, the posterior one 8–20 in (20–50 cm). Have a saddle-backed appearance, rounded ears, and tend to hold the head high, except when feeding on low vegetation.

DISTRIBUTION

Originally almost throughout Africa, from southwest Cape to Somaliland, and in the west to the border region between Cameroon and Ivory Coast, but absent from evergreen rain-forest. Currently persists in fragmented remnants in parts of this range.

HABITAT

From various forms of savanna vegetation to arid shrub steppe.

BEHAVIOR

Home ranges vary enormously in size, from 1 mi² (2.5 km²) in Ngorongoro Crater to 200 mi² (500 km²) in the Namib Desert fringe in Namibia. Home ranges of males tend to be smaller than those of females, and in some populations may represent defended territories. May travel to water only at intervals of four to five days in dry areas, but drink more frequently when water is plentiful. Journeys to water usually take place during the late afternoon or early part of the night. Animals commonly lie in mud, and sometimes also in dust hollows. Saltlicks are also frequently visited. Somewhat more active at night than during the day.

Largely solitary, although groups of three to five animals may occasionally form. A cow and her calf comprise the basic social unit, and adult males are solitary, except when courting a female. Sub-adults join other rhinos more frequently, but still are more commonly alone than in groups. When adult males

meet, a complex bull ceremony may take place, involving stiff-legged scraping, imposing postures, and short charges sometimes accompanied by screaming groans. Males mark the environment with long drag marks made by the legs, spray urine over bushes or other objects, and deposit feces on dung-heaps. Females use the same dung-heaps, or “middens,” and animals of both sexes scatter their droppings with backwardly directed kicks.

Lions occasionally tackle black rhino calves, but can pay with their lives when the mother attacks back. Spotted hyenas are responsible for some mortality among small calves, which seem to be vulnerable to hyenas because of their habit of running behind the mother.

FEEDING ECOLOGY AND DIET

Predominantly low-level browsers, feeding on small saplings and shrubs under 5 ft (1.5 m) in height as well as a variety of herbs, and occasionally small amounts of grass. *Acacia* spp. are especially favored, as are various species of Euphorbiaceae, including succulent forms with milky sap reputed to be poisonous. The prehensile upper lip is used to pull twigs into the mouth, which are then bitten off with the cheek teeth. They crop branch tips up to 0.4 in (10 mm) in thickness and 4–9.8 in (100–250 mm) in length. The horns may be used to bend or break stems to reach higher branches. Bark may also be stripped from certain trees.

REPRODUCTIVE BIOLOGY

Matings and births can take place throughout the year; in South Africa, most matings take place during the early summer or wet season, with births subsequently peaking from late summer into the dry winter season. Males attach themselves to a female six to seven days prior to mating, and the courtship period may include attacks by the female on the male. Copulations last 20–40 minutes, and may be preceded by several mounting attempts before intromission is achieved. Females come on heat again after 35 days if the mating is not successful. Gestation lasts 15 months, and the birth weight is 9–11 lb (20–25 kg). The newborn infant may be left hidden for the first week after birth. When separated the mother calls with breathing pants, while the calf makes mewing squeals. Nursing continues until the calf is about 1.5 years old. Inter-birth intervals can vary widely, from as short as 2–2.5 years under favorable conditions, to four years in less favorable circumstances. Calves separate from their mothers around the time of birth of the next offspring, generally when aged 2.2–3.3 years. After leaving their mothers, sub-adults may join other sub-adults temporarily, but remain mostly solitary. Females first mate at 4.5 years of age, and give birth around six years of age, but in high-density populations the age at first parturition may be delayed until eight to 12 years. Males reach reproductive maturity around eight to nine years of age in the wild, but one captive male sired an offspring at the age of 3.5 years. The maximum longevity recorded in a zoo is 49 years, while the life span in the wild would probably not much exceed 35 years.

CONSERVATION STATUS

Listed as Critically Endangered by the IUCN. From being a common and widespread species, numbers plummeted to only 2,700 animals remaining in the wild in 2000. The largest segments are in the Kruger National Park (estimated 400), Hluhluwe-Umfolozi (about 350), and northern Namibia (around 700). Only about 400 remain in Kenya, once a major stronghold of the species. The West African subspecies, *D. b. longipes*, is Critically Endangered with only an estimated 10 animals persisting in Cameroon.

SIGNIFICANCE TO HUMANS

Renowned for their propensity to charge humans or their vehicles; many charges are merely curious advances. However, actual attacks may also result, leading to severe and sometimes fatal wounds, or damage to vehicles. ♦

White rhinoceros*Ceratotherium simum***SUBFAMILY**
Dicerotinae**TAXONOMY**

Ceratotherium simum (Burchell, 1817), Cape Province, South Africa. Two subspecies: *C. s. simum* in southern Africa and *C. s. cottoni* in northeast Africa.

OTHER COMMON NAMES

English: Square-lipped rhinoceros; French: Rhinoceros blanc; German: Breitmaul-Nashorn.

PHYSICAL CHARACTERISTICS

The largest rhinoceros, with males weighing to 5,000 lb (2,300 kg), females to 3,800 lb (1,700 kg); shoulder height for males 65–73 in (165–185 cm), females 61–70 in (155–177 cm); head and body length for males 140–150 in (360–380 cm), females 118–143 in (300–363 cm); anterior horn length males 20–47 in (50–120 cm), females 20–62 in (50–158 cm); posterior horn length 6.6–15 in (16–40 cm) in both sexes. The skin is battle-ship gray, with very sparse hairs on the body in the southern form, and none in the northern form, apart from fringes to the ears and the tip of the tail. The head is lengthened, and the lips broad, as adaptations for grazing. The ligament supporting the enormous weight of the head, and associated tissues, causes a hump on the back of the neck to form. The northern subspecies is slightly smaller, appears somewhat longer legged, and has the dorsal profile of the skull slightly less concave than the southern form.

DISTRIBUTION

Historically distributed in two discrete areas, separated by a gap of more than 1,240 mi (2,000 km). In southern Africa, they occurred south of the Zambezi to northern KwaZulu-Natal in the east, and westwards through Botswana and Northern Cape into the northern part of Namibia. The northern subspecies was distributed west of the Nile River, from northern Uganda into southern Sudan, and westwards through northeast Congo and the Central African Republic as far as the southern edge of Chad. However, teeth and rock art indicate that it formerly occurred through much of East Africa until quite recently, and extended as far north as Algeria. Hunting eliminated the southern subspecies over its entire range, except in the Hluhluwe-Umfolozi region, but subsequently animals have been reintroduced to parts of the former range. In northeast Africa, the species persists only in the Garamba National Park in the Democratic Republic of Congo.

HABITAT

Associated drier forms of savanna in southern Africa, but in the northern range occupies moist savanna, with tall grass prevalent except around termite mounds.

BEHAVIOR

Female home ranges extend over 8–16 mi² (10–20 km²), including a smaller core area, in Hluhluwe-Umfolozi, but en-

compass 20 mi² (50 km²) or more in low-density populations, or where habitat conditions are less favorable. Northern white rhinos cover 20–40 mi² (50–100 km²) in Uganda and 80–200 mi² (200–500 km²) in Garamba. Adult males restrict their movements to somewhat smaller areas, which constitute breeding territories. Active for about 50% of the time, both day and night, with most of this time taken up with feeding. There is generally a midday slumbering period, for which animals commonly resort to shady areas on ridge-crests. Wallowing in muddy hollows is a favorite activity, and they emerge coated with mud, which helps remove ticks and reduces the number of biting flies, and may also serve a cooling function. They sometimes lie in pools of water.

The typical group is a mother-offspring pair, but larger groups, including several subadults as well as one or more adult females, are also formed. Subadults almost invariably team up with one or more subadults of similar age, of the same or opposite sex, or with an adult female lacking a calf. Adult males are solitary, except when accompanying females.

Dominant males occupy clearly defined territories from which they exclude other dominant males, but share these with one or more subordinate adult males as well as with cubs and sub-adults. These territories cover only 0.4–1 mi² (0.8–2.5 km²) in the dense Hluhluwe-Umfolozi population, but may expand hugely when there is less pressure, with territories of 20–40 mi² (50–100 km²) being patrolled in some sparsely populated localities. Males are dominant only within the boundaries of their own territory. Adult males manifest their subordinate status by uttering loud roars and shrieks when confronted by a territory holder, with curled tails indicating their nervousness. Adult females also use loud roars or snorts to deter a bull from a close approach. Occasional fights among males may lead to a change in territorial dominance. Interestingly, the defeated male may remain on in his former territory, provided he behaves submissively when challenged, and foregoes scent marking.

They largely ignore lions, even when a calf is present, although there are occasional records of lions preying on young white rhinos. Hyenas seem less a threat to calves than in the case of the black rhino, perhaps because white rhino calves run ahead of the mother and thus seem to be better protected. The longer but more slender horns of females seem designed to ward off predators.

FEEDING ECOLOGY AND DIET

The southern form is strictly a grazer, with herbs generally constituting no more than 1% of the diet, and only occasional records of munching on woody browse. Short grasses are the favored food source for most of the year. The grass can be cropped as short as 1 in (25 mm) above soil level. During the later dry season, animals turn to taller grasses, including buffalo grass (*Panicum maximum*) and red oats grass (*Themeda triandra*). The northern subspecies favors areas of short grass on termite mounds and after fires, but includes a range of medium-tall grass species in its diet.

REPRODUCTIVE BIOLOGY

Calves can be born throughout the year, but in Hluhluwe-Umfolozi there is a peak in the number of cows on heat following the first rains in early summer, and a corresponding peak in the number of calves born during the late summer/early winter period. Copulation lasts 15–30 minutes, with multiple ejaculations. The cow comes into heat again after about 30 days if the mating was not successful. Almost all matings are by territory holders. Cows seek seclusion before giving birth, either in dense bush or up on hillsides where few

other rhinos travel. The gestation period is 16 months, and the newborn infant weighs about 145 lb (65 kg). The older calf is driven away shortly before the birth. Weaning is completed by 15–24 months, and cows come on heat again while the calf is still being suckled. The mean inter-birth interval is 2.5 years for Hluhluwe-Umfolozi (range 1.9–3.5 years), although somewhat longer in some introduced populations. Subadults are itinerants, living in one area for a period, later shifting somewhere else. Females begin estrous cycling around four years of age, and the sub-adult period terminates with the birth of their first calf around 6.5–7.5 years of age. Young males start showing solitary tendencies around eight years of age, and reach the stage when they can challenge successfully for a territory around 10–12 years of age. The maximum life span for a white rhino is about 40 years.

CONSERVATION STATUS

By 2000, more than 10,000 white rhinos existed in the wild, including 1,700 in Hluhluwe-Umfolozi, over 3,000 in the Kruger National Park, and about 2,300 on private land in southern Africa. However, the ease with which animals can be tracked down, coupled with the high value of their horns, has led to the elimination of some reintroduced populations. Some hunting of the species is now allowed under strictly controlled

conditions, as well as a limited trade in live white rhinos, but not in their horns. A strange new threat in some protected areas is the killing of white rhinos by young male elephants that have reached sexual maturity at an early stage in the absence of older bulls. The future of the northern subspecies is especially precarious, with a total population of only 30 animals in the wild, all in Garamba Park. The species is listed as Near Threatened by the IUCN.

SIGNIFICANCE TO HUMANS

A whiff of human scent, even at ranges of up to 2,625 ft (800 m), sends rhinos running away. The terror that humans inspire in these animals is a clear indication of the past hunting pressure that almost wiped out the species, not only during the era of guns but much earlier in East Africa. White rhino meat was highly regarded by early European hunters, and other body parts had many uses. Once guns became widely available across southern Africa, white rhinos changed from an abundant and widespread species to the brink of extinction within a few decades. The subsequent recovery of the southern subspecies, from a few score animals to the stage when populations could be reestablished in many parts of their former range, and even in East Africa, is one of the great success stories of conservation. ♦

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