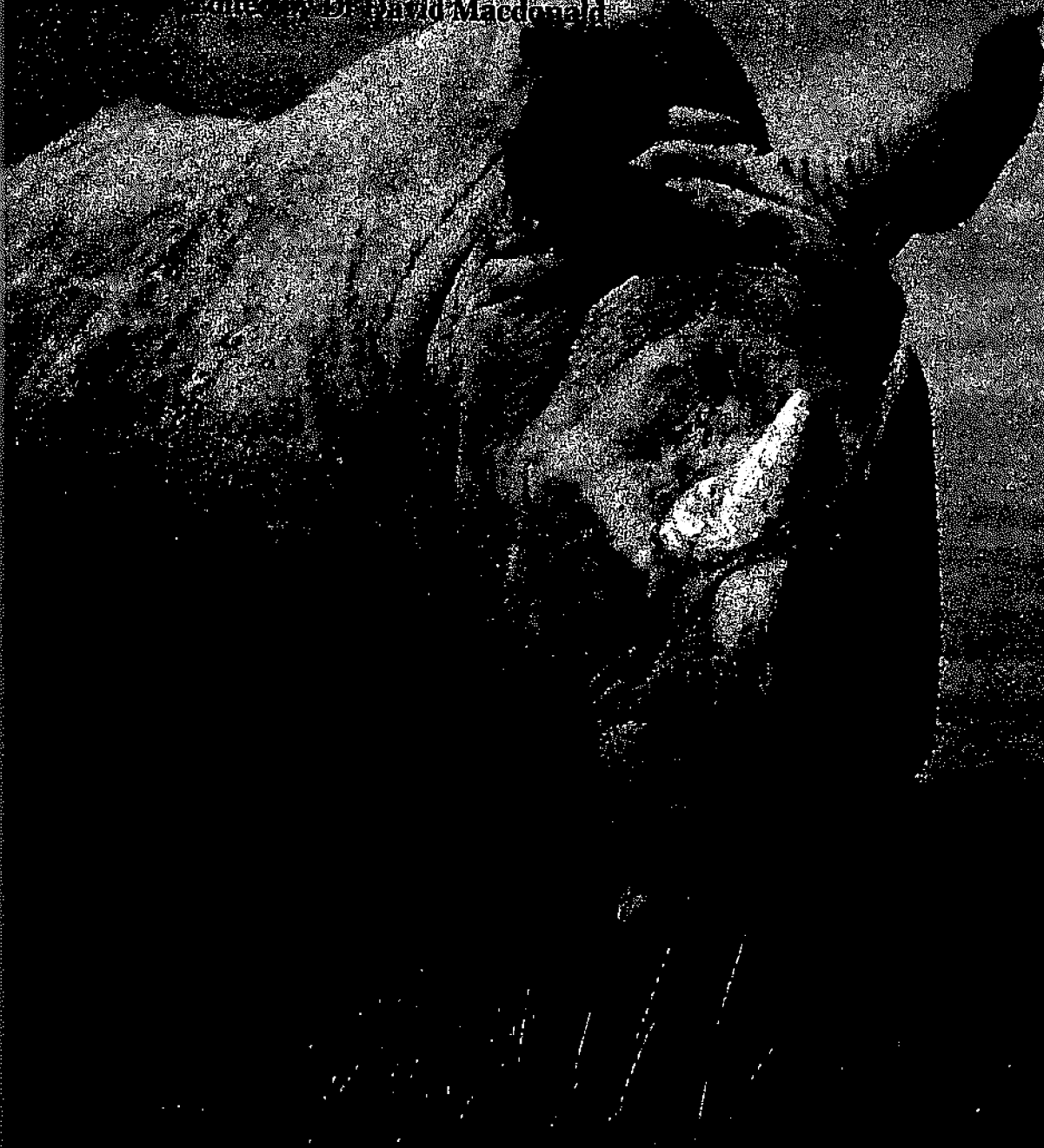


OWEN SMITH 1984

in D. Macdonald

ENCYCLOPAEDIA OF MAMMALS: 2

Edited by Dr David Macdonald



RHINOCEROSSES

1987 London, George Allen & Unwin

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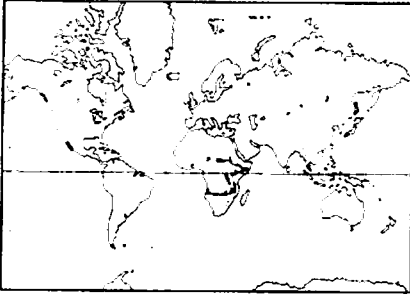
Owen-Smith

Family: Rhinocerotidae □

Five species in 4 genera.

Order: Perissodactyla.

Distribution: Africa and tropical Asia.



Size: head-body length from 250-315cm (98-124in) in the Sumatran rhino to 370-400cm (146-158in) in the White rhino. Weight from 800kg (1,765lb) in the Sumatran rhino to 2,300kg in the White rhino.

□ CREES listed.

To many people, rhinoceroses with their massive size, bare skin and grotesque appearance are reminiscent of the reptilian dinosaurs which were the dominant large animals of the world between 250 million and 100 million years ago. Though rhinos are certainly not reptiles, it is true that they are relicts from the past. Rhinos of various forms were far more abundant and diverse during the Tertiary era (40-2 million years ago), but in Europe the Woolly rhinoceros survived until the last Ice Age (about 15,000 years ago).

While the extinct rhinos varied in their possession of horns and in the arrangement of these horns, they were generally large. Together with the elephants and hippopotamuses, they represent a life-form which was much more abundant and diverse in the past: that of the giant plant-feeding animals, or "megaherbivores". Of the surviving species, two are on the brink of extinction, while the other three are becoming increasingly threatened.

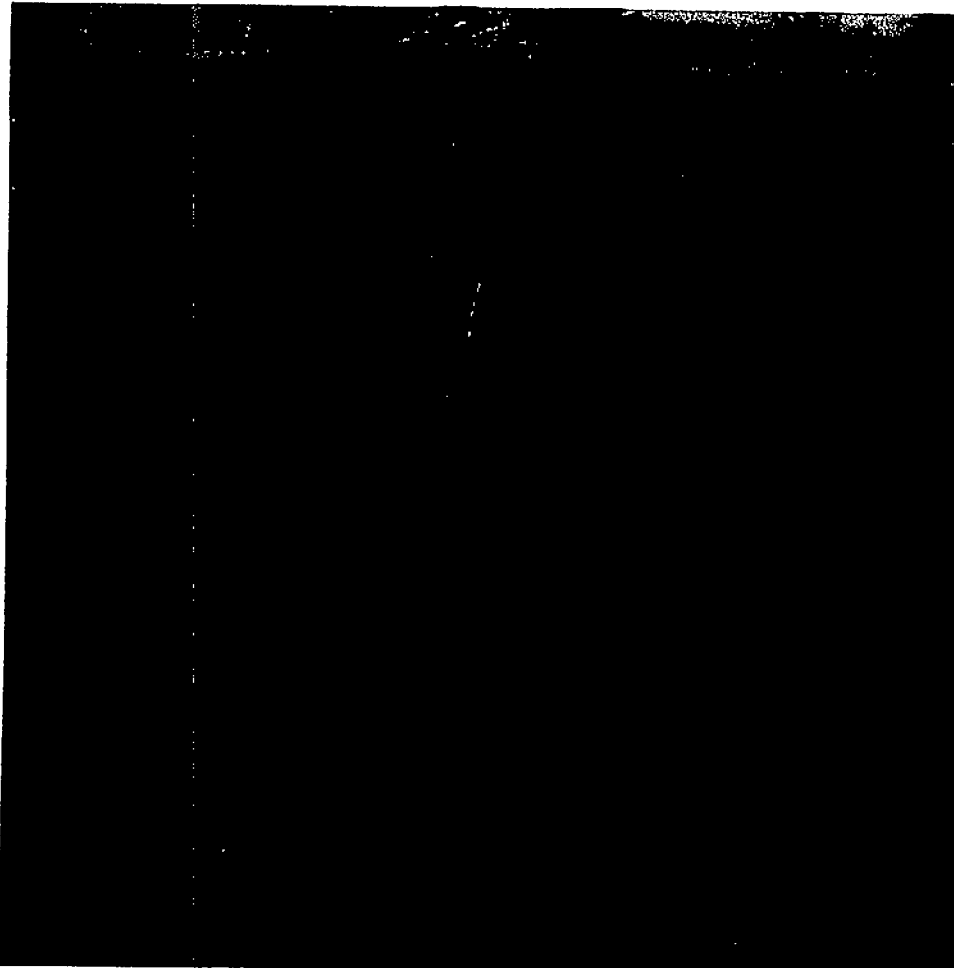
The name "rhinoceros" derives from the distinctive horns on the snout. Unlike those of cattle, sheep and antelopes, rhino horns

have no bony core: they consist merely of an aggregation of keratin fibers perched on a roughened area on the skull. Both African species and the Sumatran rhinoceros have two horns in tandem, with the front one generally the largest, while the Indian and Javan rhinos have only a single horn on the end of the nose. Rhinos have short stout limbs to support their massive weight. The three toes on each foot give their tracks a characteristic "ace-of-clubs" appearance. The Indian rhino has an armor-plated look, produced by the prominent folds on its skin and its lumpy surface. The White rhino has a prominent hump on the back of its neck, containing the ligament supporting the weight of its massive head. In both the White rhino and the Indian rhino, adult males are notably larger than females, while in the other rhino species both sexes are of similar size. The Black rhino has a prehensile upper lip for grasping the branch ends of woody plants, while the White rhino has a lengthened skull and broad lips for grazing the short grasses that it favors. In color, the two species are not notably different, and the popular names most probably arose from the local soil color tinting the first specimens seen.

Rhinos have poor vision, and are unable to detect a motionless person at a distance of more than 30m (100ft). The eyes are placed on either side of the head, so that to see straight in front the animals peer first with one eye, then with the other. Their hearing is good, their tubular ears swiveling to pick up the quietest sounds. However, it is their sense of smell upon which they mostly rely for knowledge of their surroundings: the volume of the olfactory passages in the snout exceeds that of the brain! When undisturbed, rhinos can sometimes be noisy animals: a variety of snorts, puffing sounds, roars, squeals, shrieks and honks have been described for various species.

A further peculiarity of rhinos is that, as in elephants, the testes do not descend into a scrotum. The penis, when retracted, points backwards so that the urine is directed to the rear by both sexes. Females possess two teats located between the hindlegs.

The five surviving species of rhinos fall into three distinct subfamilies which are only distantly related to one another. The Sumatran rhino is the only surviving member of the Dicerorhinae, which also included the extinct Woolly rhino and other Eurasian species. The Sumatran rhino itself is little different from forms which existed 40 million years ago. The Asian one-horned rhinos (Rhinocerotinae) have an evolutionary



history extending back to Oligocene deposits in India; the Javan rhino is more primitive than the Indian rhino, having changed little over the past 10 million years. The African two-horned rhinos evolved independently in Africa. The White rhino is an offshoot of the same stock as the Black rhino, having diverged during the course of the Pliocene (about 3 million years ago).

All rhinoceroses are herbivores dependent on plant foliage, and they need a large daily intake of food to support their great bulk. Because of their large size and hindgut fermentation, they can tolerate relatively high contents of fiber in their diet, but they prefer more nutritious leafy material when available. Both African species of rhino have lost their front teeth entirely; although Asian species retain incisor teeth and the Sumatran rhino canines too, these are modified for fighting rather than for food gathering. The broad lips of White rhinos give them a large area of bite, enabling them to obtain an adequate rate of intake from the short grass areas that they favor for much of the year. Black rhinos use their prehensile upper lips to increase the amount of food they gather per bite from woody plants. Indian rhinos use a prehensile upper lip to gather tall grasses and shrubs, but can fold the tip away when feeding on short grasses; woody browse comprises about 20 percent of their diet during the winter period. Both the Javan and Sumatran rhinos are entirely browsers, often breaking down saplings to feed on leaves and shoot ends. They also include certain fruits in their diet, as also do African Black rhinos and, to a lesser extent, Indian rhinos.

All rhinos are basically dependent upon water, drinking almost daily at small pools or rivers when these are readily available. But under arid conditions, both African species can survive for periods of 4–5 days between waterhole visits. Rhinos are also dependent on waterholes for wallowing. Indian rhinos in particular spend long periods lying in water, while the African species more commonly roll over to acquire a mud coat. While the water may provide some cooling, the mud coating probably serves mainly to give protection against biting flies (despite the thick hide, blood vessels lie just under the thin outer layer).

For large, long-lived mammals like rhinos, life-history processes tend to be protracted. Female White rhinos and Indian rhinos undergo their first sexual cycles at about 5 years of age and bear their first calves at 6–8 years. In the smaller Black rhino, females breed about a year younger

than these ages. A single birth is the rule. Intervals between successive offspring can be as short as 22 months, but more usually vary between 2 and 4 years in natural populations of these three species. The babies are relatively small at birth, weighing only about 4 percent of the mother's weight—about 65kg (143lb) in the case of the White rhino and Indian rhino and 40kg (88lb) in the Black rhino. Females seek seclusion from other rhinos around the time of the birth. White rhino calves can follow the mother about three days after birth. Indian rhino mothers sometimes move away for up to 800m (2,600ft), leaving calves lying alone. Calves of both Indian and White rhinos tend to run in front of the mother, while those of Black rhinos usually run behind. White rhino mothers stand protectively over their offspring should danger threaten.

Males first become sexually potent at about 7–8 years of age in the wild; but they are prevented from breeding by social factors until they can claim their first territories or dominant status at an age of about 10 years.

Births may take place in any month of the year. In the African rhinos, conceptions tend to peak during the rains so that a birth peak occurs from the end of the rainy season through to the middle of the dry season.

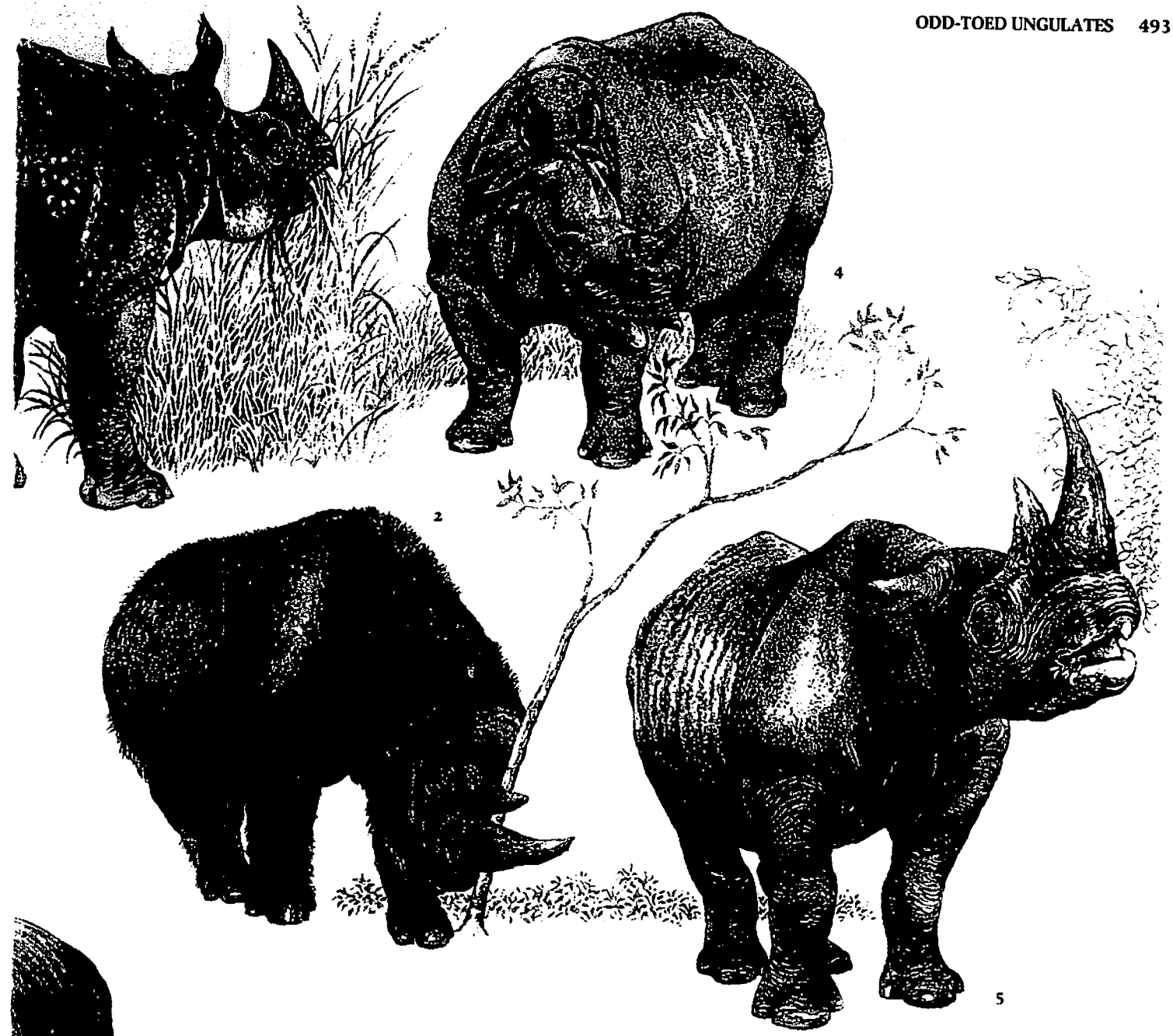
Rhino are basically solitary, except for the association between a mother and her most recent offspring, which usually ends shortly before the birth of the next offspring. In White rhinos, and to a lesser extent in Indian rhinos, immature animals pair up or occasionally form larger groups. The White rhino is the most sociable of the five species, and females lacking calves sometimes join up, while such females also accept the company of one or more immature animals. In this way, persistent groups numbering up to seven individuals may be formed. Larger temporary aggregations may be found around resting areas or favored feeding areas. Adult males of all species remain solitary, apart from temporary associations with females in heat (see pp496–497).

In White rhinos and Indian rhinos, females move over home ranges covering 9–15sq km (3.5–5.8sq mi), with temporary extensions when food and water supplies run out. The home ranges of Black rhino females vary from about 3sq km (1.2sq mi) in forest patches to nearly 90sq km (35sq mi) in arid regions. Female home ranges in all species overlap extensively and there is no indication of territoriality among females. White rhino females commonly



► Species of rhinoceros. (1) Indian rhinoceros (*Rhinoceros unicornis*). (2) Sumatran rhinoceros (*Dicerorhinus sumatrensis*). (3) White rhinoceros (*Ceratotherium simum*). (4) Javan rhinoceros (*Rhinoceros sondaicus*). (5) Black rhinoceros (*Diceros bicornis*).





Abbreviations: HBL = head-body length. HT = height. TL = tail length. AH = anterior horn. PH = posterior horn. WT = weight.
 Approximate nonmetric equivalents: 2.5cm = 1in; 1kg = 2.2lb. [E] Endangered. [V] Vulnerable.

Black rhinoceros [V]
Diceros bicornis
 Black or Hooked-lipped rhinoceros.
 Africa from the Cape to Somalia. From montane rain forest to arid scrublands; browser; more nocturnal than diurnal. HBL 286–305cm; HT 143–160cm; TL 60cm; AH 42–135cm; PH 20–50cm; WT 950–1,300kg. Coat: gray to brownish gray (varying with soil color); hairless. Gestation: 15 months. Longevity: 40 years.

White rhinoceros
Ceratotherium simum
 White or Square-lipped rhinoceros.
 S and NE Africa. Drier savannas; grazer; both diurnal and nocturnal. Male HBL 370–400cm;

HT 170–186cm; TL 70cm;
 AH 40–120cm; PH 16–40cm; WT up to 2,300kg. Female HBL 340–365cm; HT 160–177cm; AH 50–166cm; PH 16–40cm; WT up to 1,700kg. Coat: neutral gray, varying with soil color; almost hairless. Gestation: 16 months. Longevity: 45 years.

Indian rhinoceros [E]
Rhinoceros unicornis
 Indian or Greater one-horned rhinoceros.
 Floodplain grasslands; mainly a grazer; diurnal and nocturnal. Male HBL 368–380cm; HT 170–186cm; TL 70–80cm; horn 45cm; WT 2,200kg. Female HBL 310–340cm; HT 148–173cm; TL and horn as for males; WT 1,600kg. Coat: gray; hairless. Gestation: 16 months. Longevity: 45 years.

Javan rhinoceros [E]
Rhinoceros sondaicus
 Javan or Lesser one-horned rhinoceros.
 Southeast Asia. Lowland rain forests; browser; diurnal and nocturnal. HT up to 170cm; WT up to 1,400kg. Coat: gray, hairless.

Sumatran rhinoceros [E]
Dicerorhinus sumatrensis
 Sumatran or Asian two-horned rhinoceros.
 Southeast Asia. Montane rain forests; browser; diurnal and nocturnal. HBL 250–315cm; HT up to 138cm; AH up to 38cm; WT up to 800kg. Coat: gray, sparsely covered with long hair. Gestation: 7–8 months. Longevity: 32 years.

engage in friendly nose-to-nose meetings, but Indian rhino females generally respond aggressively to any close approach. However, subadults of both species approach adult females, calves and other immature animals for nose-to-nose meetings and sometimes playful wrestling matches.

Males of all species sometimes fight viciously, inflicting gaping wounds. Both African species fight by jabbing one another with upward blows of their front horns. In contrast, the Asian species attack by jabbing open-mouthed with their lower incisor tusks, or, in the case of the Sumatran rhino, with the lower canines.

Black rhinos have a reputation for unprovoked aggression, but very often their charges are merely blind rushes designed to get rid of the intruder. However, if a human or a vehicle should fail to get out of their way, they can inflict much damage with their horns. Indian rhinos also frequently respond with aggressive rushes when disturbed, and may occasionally attack the elephants used as observation platforms in some of the sanctuaries where they occur. However, rhinos invariably come off second best in any fight with an elephant.

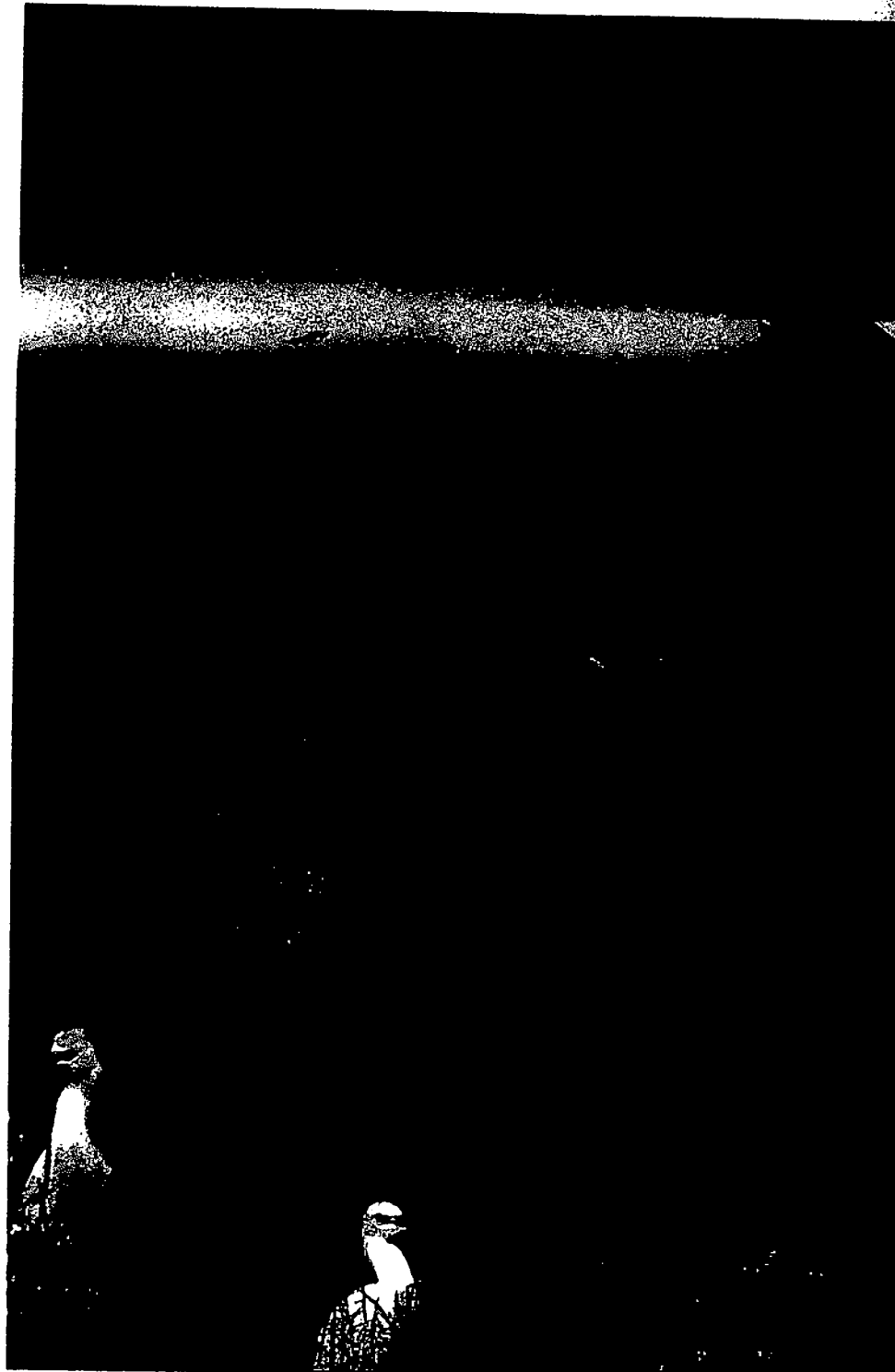
In contrast, the White rhino is mild and inoffensive by nature, and despite its large size is easily frightened off. Very often, a group of White rhinos will stand in a defensive formation with their rumps pressed together, facing outwards in different directions. While this formation may be successful against carnivores such as lions and hyenas, it is useless against a human armed with a gun.

Rhinos have been under threat from man for a long time. The three Asian species suffered a great reduction in numbers and considerable contraction of their ranges during the last century because of the local demand for their products. Following the advent of guns in Africa, the southern White rhino was reduced to the brink of extinction before the end of the 19th century. There is little local use in Africa, and products were generally exported. The Black rhino was exterminated in the Cape soon after the arrival of white settlers, but elsewhere in Africa remained widespread and fairly abundant until recently. However, with escalating trade between African countries and Asia, Black rhino numbers declined precipitously in East, Central and West Africa during the 1970s.

The reason behind the recent declines is the rapid increase in the value of rhino horn. While ground rhino horn is used as an aphrodisiac in parts of North India, its main

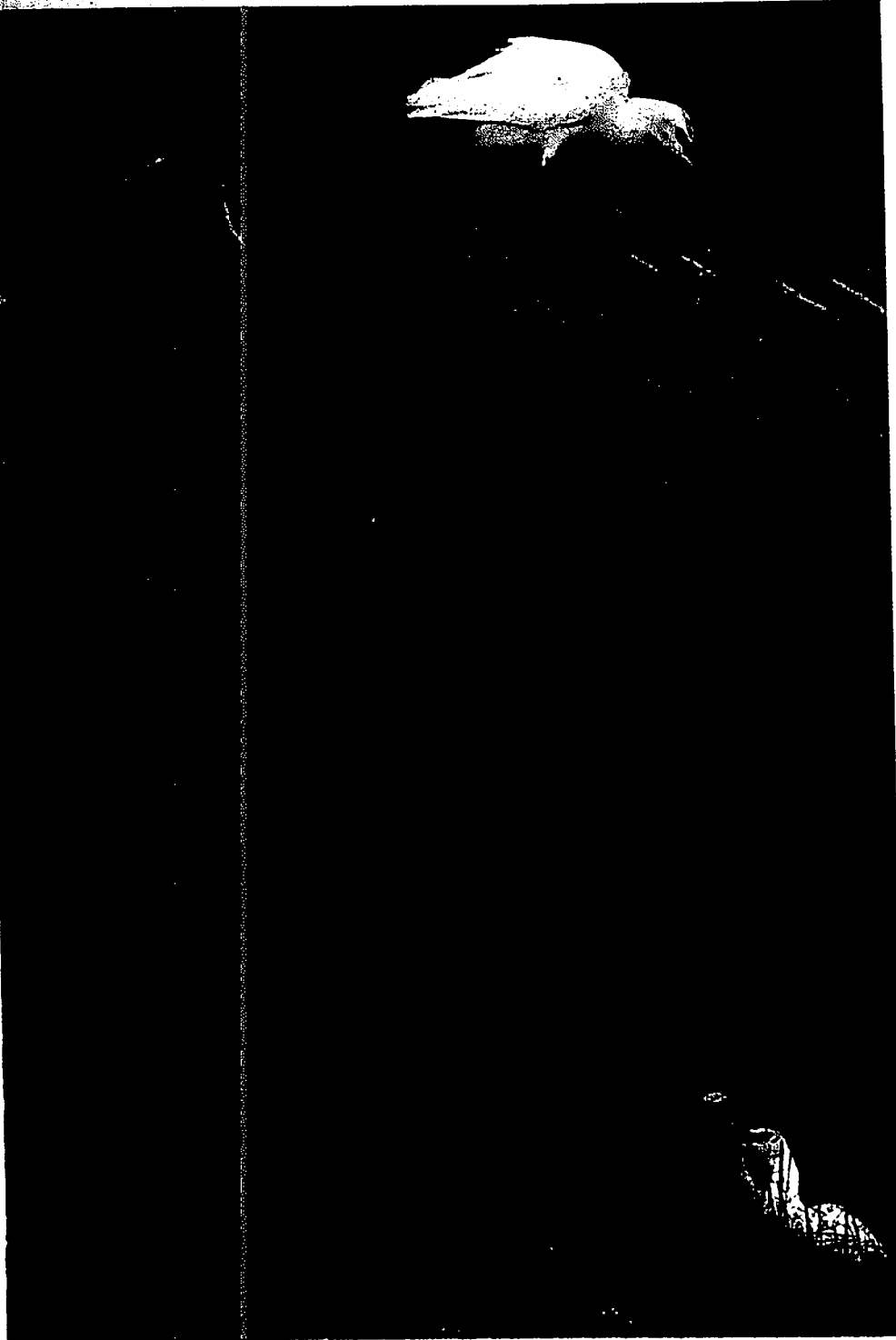
use in China and neighboring countries of the Far East is as a fever reducing agent. It is also used for headaches, heart and liver trouble, and for skin diseases. Many other rhino products, including the hooves, blood and urine, have reputed medicinal value in the East (but not in Africa). Chemically, rhino horn is composed of keratin, the same protein which forms the basis of hooves, fingernails and the outer horny covering of cattle and antelope horns, and there is no pharmacological basis for these uses; whatever success is achieved is, probably psychological.

However, it is the use of rhino horns to



▲ **Rhino companions.** Rhinos are rarely without a few oxpeckers (here, on the nose of the right-hand rhino) and Cattle egrets in attendance.

► **Rhino horns** at Tsavo National Park, Kenya. The rhinos' most distinctive feature could also prove to be their downfall, as demand continues for their use as aphrodisiacs, as other medicinal agents and as dagger handles.

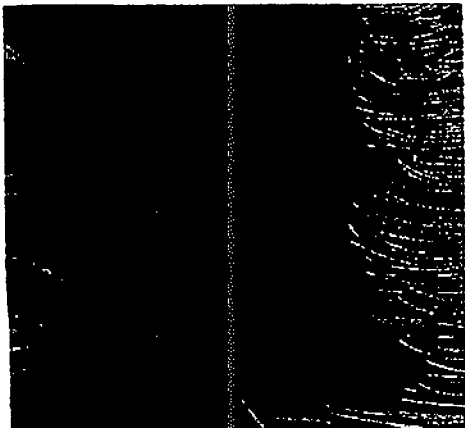


about 15,000 animals. The Sumatran rhino is now restricted to perhaps 150 individuals scattered throughout Sumatra, Malaya, Thailand and Burma. The Javan rhino, formerly widely distributed from India and China southwards through Indonesia, is now confined to a remnant of 50 in the Udjong Kulon Reserve in western Java. The Indian rhino is restricted to a few reserves in Assam, west Bengal, and Nepal, with a total population of about 1,500.

The situation of the White rhino is very different. The White rhino had a strange distribution, occurring in southern Africa south of the Zambezi River, and then again in northeastern Africa west of the Nile. The northern race has suffered severely from poaching in recent years, and has declined to perhaps a few hundred individuals in Zaire and the Sudan. The southern population was almost exterminated during the last century, but effective protection after 1920 resulted in a steady increase in the sole surviving population in the Umfolozi Game Reserve. By the mid 1960s their numbers had risen from perhaps 200 to nearly 2,000. As a result, the famous "Operation Rhino" was initiated by the Natal Parks Board to capture White rhinos alive for restocking other parts of their former range. This proved so successful that the species could be removed from the endangered list. By 1982, 1,200 White rhinos still remained in the Hluhluwe-Umfolozi Reserve in South Africa, and an equal number in other conservation areas in southern Africa. In fact, the main threat is posed by habitat deterioration due to the high densities attained by the species in the Umfolozi Game Reserve. To help provide outlets for the surplus animals which still need to be removed annually, some old males are sold to safari operators to be shot later by licensed hunters.

This contrasting situation is the source of an embarrassing conflict in conservation circles. While international cooperation is being sought to stop illegal hunting of rhinos through much of Africa, White rhinos, once the most endangered species, can be hunted legally in South Africa for legitimate reasons. While conservationists debate the most effective action, the situation is rapidly becoming desperate for rhinos in most regions of their occurrence. These hulking but simple-minded creatures are ill-adapted to cope with modern man armed with sophisticated weapons, and unless illegal hunting is controlled, rhinos may no longer be around by the turn of the century.

NO-5



make handles for the "jambia" daggers traditionally worn by men in North Yemen as a sign of status that is mainly responsible for the recent rise in prices. Between 1969 and 1977 horns representing the deaths of nearly 8,000 rhinos were imported into North Yemen alone. The increase in the demand for rhino horn can be attributed to the fivefold increase in per capita income in Yemen as a result of oil wealth in the region.

The bulk of the pressure from the trade in rhino horns falls on the Black rhino in Africa and the Sumatran rhino in Asia. The Black rhino is still the most abundant and widespread species, but has been reduced to

Morison
Owens - Sum. 12

Horn to Horn

Territoriality, dominance and breeding in rhinos

Two male White rhinos approach each other to stare silently, horn to horn, then back away to wipe their horns on the ground. This ritual confrontation is repeated many times for perhaps up to an hour, before the males move apart to return to the hearts of their domains. For the point at which this ceremony takes place is the common boundary between their respective territories.

Territory holders also exhibit specialized techniques of defecation and urination, which may serve to scent mark the territories. The droppings are deposited at fixed dungheaps or middens, and are scattered by backwardly directed kicking movements. Especially large dungheaps, with prominent hollows developed by the kicking action, are located in border regions. The urine is ejected in a powerful aerosol spray, and urination is commonly preceded by wiping the horn on the ground then scraping over the site with the legs. Territory holders spray-urinate particularly frequently while patrolling boundary regions.

In White rhinos, access by males to receptive females is controlled by the strict territorial system. Prime breeding males occupy mutually exclusive areas covering 80-260ha (200-650 acres). These males form consort attachments to any females coming into heat that they encounter, and endeavor to confine such females within the territory for 1-2 weeks, until the latter are ready for mating. However, if the female should happen to cross into a neighboring territory, the male does not follow and the next-door male joins her.

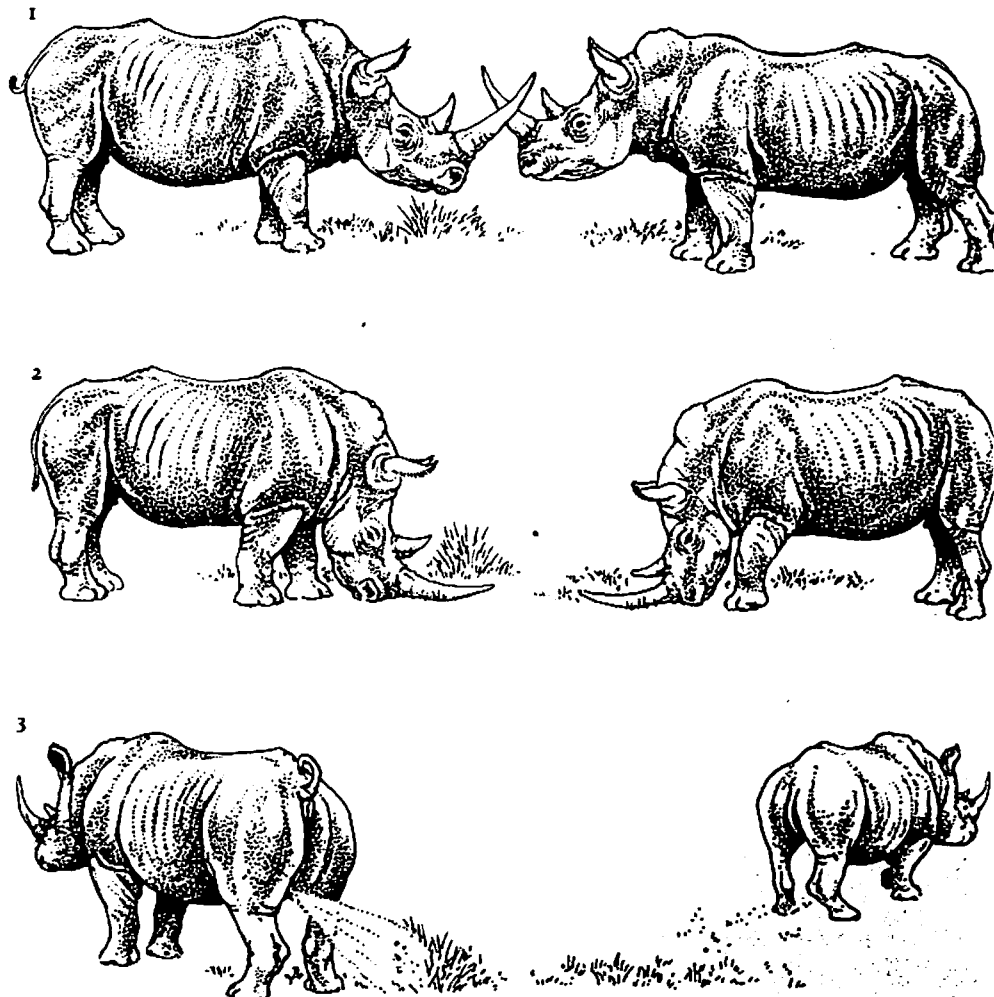
Within territories, one or more subordinate males may be resident. Subordinate males do not spray their urine or scatter their dung, and they do not consort with females. When confronted by the territory holder, a subordinate male stands defensively uttering loud roars and shrieks. Females use similar roars to warn off males that approach too near. Generally, confrontations are brief, but if the subordinate male is an intruder from another territory a more prolonged and tense confrontation ensues, which may develop into a fight.

A defeated territory holder ceases spray-urination and dung scattering and takes on the status of subordinate male. Territory holders outside their own territories, on their way to and from water, also do not spray-urinate until they regain their own territories. If a territory holder is confronted by another male on a distant territory, he adopts the submissive stance and roars of a

subordinate male. However, on a neighboring territory he maintains a dominant posture, but backs away steadily towards his own territory.

These behavior patterns signify a relationship whereby each territory holder is supremely dominant within the spatial confines of his own territory. This dominance gives him the opportunity to court and mate with any receptive female encountered there without interference from other males. Males nearing maturity, and deposed territory holders, choose to settle within a particular territory where the owner eventually becomes habituated to the presence of the additional male, providing that he displays subordinacy whenever challenged. While thus temporarily foregoing mating opportunities, subordinate males may gain strength to enable them at a later stage to challenge successfully for the status of territory holder in a nearby territory.

In a relatively high density population in the Hluhluwe Reserve, Black rhino breeding males occupy mutually exclusive home



▲ **Rhino confrontation.** A dominant White rhino confronts two subordinate rhinos on his territory. Subordinate males are tolerated by the dominant male provided they behave in a suitably submissive fashion.

◀ **Mating in rhinos** can be a prolonged business, with several hours of foreplay, and copulations often lasting for one hour.

◀ **Rhino ritual.** In their confrontations, rhinos repeat the same gestures over and over before one concedes: (1) horns forced against each other; (2) wiping the horns on the ground. (3) A dominant male proclaims his mastery by spray-urinating, while the subordinate male retreats. Only dominant males spray-urinate.

areas which are shared by non-breeding males. These areas cover 4sq km (1.5sq mi), and meetings between neighboring males are rarely witnessed. In other Black rhino populations, the home ranges of males overlap and no clear evidence for territoriality has been found. Some males emit their urine in the form of a backwardly directed spray, but both males and females scatter their dung. When a female is in heat, several males sometimes displace one another in succession, before one succeeds in mating. Horn jousting matches between male and female sometimes occur during courtship.

In Indian rhinos, males can be classified as "strong" or "weak," but rather than being discrete categories there seems to be a continuum between them. Strong males urinate in a powerful backwards jet, associate frequently with females, and only they copulate. Such males move over home ranges covering up to 6sq km (2.3sq mi), but these overlap with those of other strong males, and are also shared by weak males. However, neighboring strong males rarely fight one another, while strange males entering from elsewhere are viciously attacked. Fights between male and female, and prolonged and noisy chases covering distances of several kilometers, are features of courtship.

These differences in social system can be related to differences in the density and distribution of food resources. As short grass grazers, White rhinos build up local densities in excess of 5 animals per sq km (12.5 per sq mi), while the location of favorable feeding areas at particular seasons is relatively predictable. Indian rhinos achieve local densities nearly as high, but because they are dependent upon flood plain habitats the location of favorable feeding areas changes in an unpredictable way. This does not favor spatial localization by males. In addition, the vegetation is dense, so that males may be screened from sensory contact with one another even when quite close by. For browsers the density of accessible food is much lower than is the case for grazers, and Black rhinos rarely exceed local densities of 1 per sq km (2.5 per sq mi). As a result, individuals occupy fairly large ranges and seldom come into contact, so that there is less pressure for males to avoid potentially risky contacts with other powerful males. Thus the control of mating rights seems to be more fluid, with stronger males claiming females from weaker ones when they come into contact. It is possible that in low density populations of White rhinos the territorial system would be far less strongly expressed.