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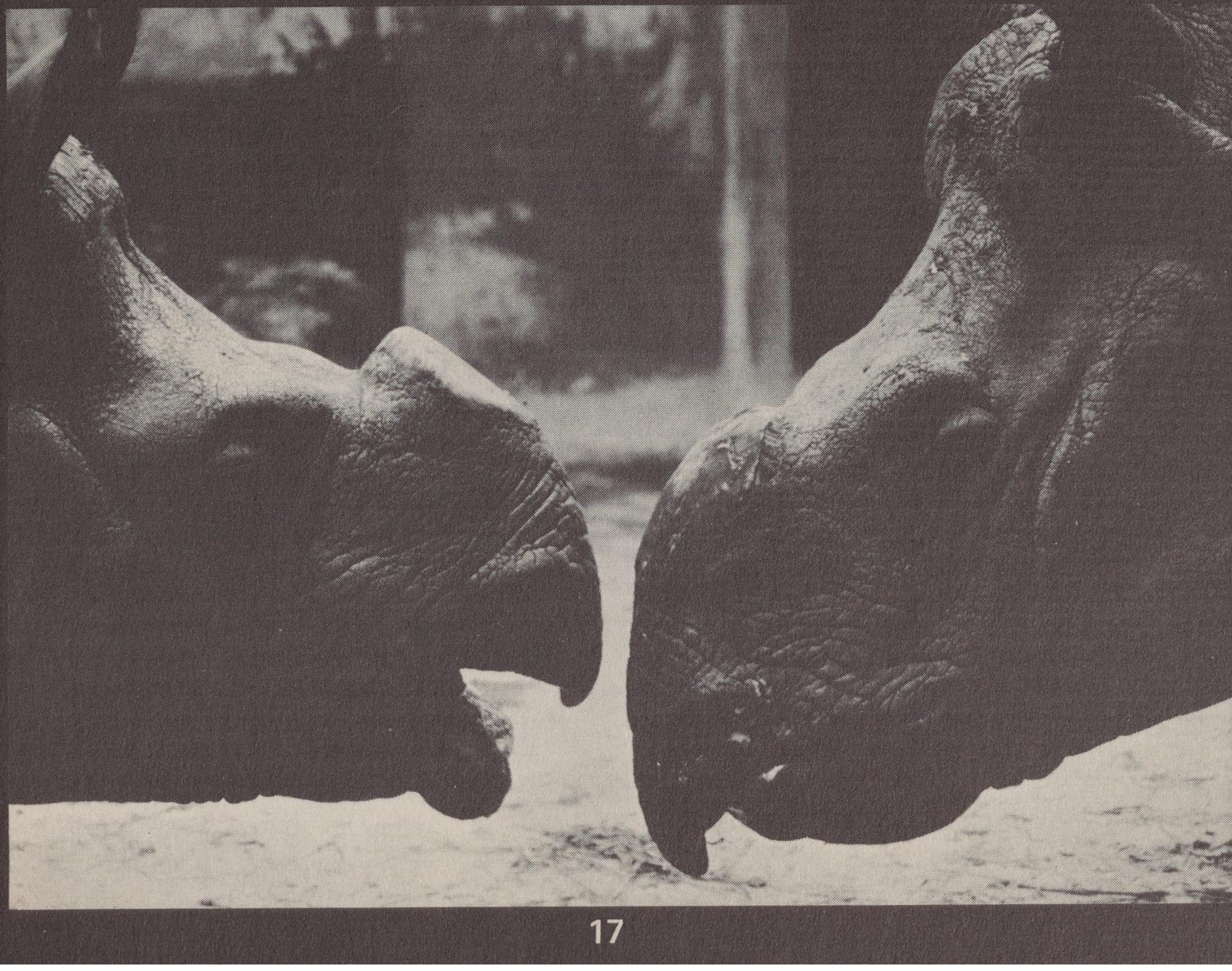
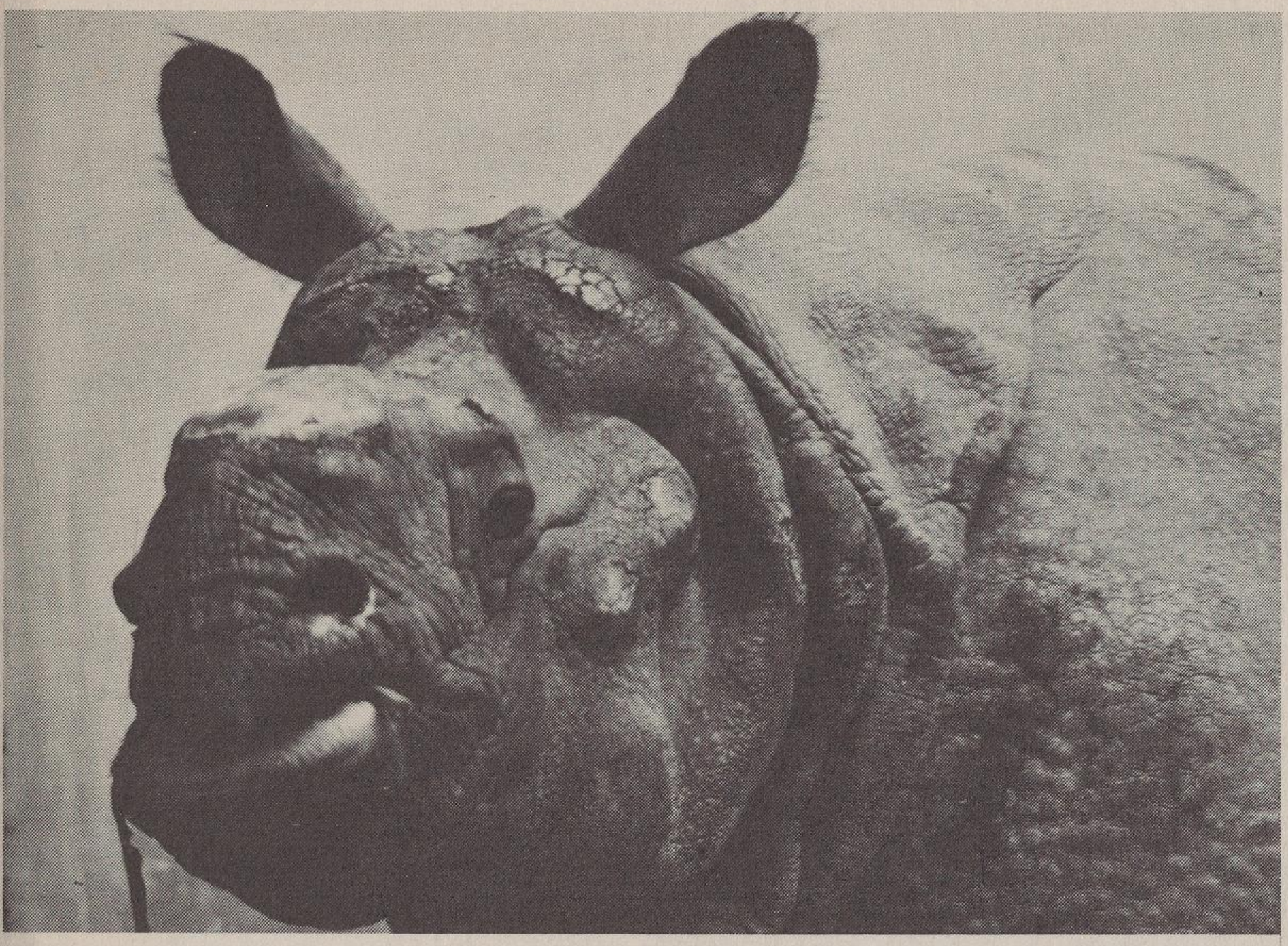
The Great Indian Rhinoceros



The great Indian one-horned rhinoceros *(Rhinoceros unicornis)* is one of the rarest of all large mammals. There are perhaps as few as 250 members of this species still existing in the wild in India and Nepal, and there are only about 50 of them in the world's zoos. The National Zoo is fortunate to have an adult pair; and it is with great pleasure that the Zoo is able to report that its Indian rhinos appear to have bred successfully this past September. In accordance with the Indian rhino's phenomenally long gestation period, a birth is expected in late January 1974.

As recently as the Middle Ages, the Indian rhinoceros was found in much of the northern half of the Indian subcontinent and as far east as Indochina. Gradually it was exterminated in most of this range as a result of two factors. One was increased human settlement and cultivation of the alluvial plains that seem to have been the Indian rhino's preferred habitat. In addition, the rhinos have been persecuted for centuries because of the role played by various parts of their bodies — particularly the horn — in magic and folk medicine. The latter pressure increased markedly with the arrival of firearms in the last century and gave rise to a fantastically lucrative commerce in rhinoceros products that, in spite of protective measures, continues to this day.

The world's four other rhinoceros species have suffered diminution for similar reasons, and none of them can be considered entirely free from danger. The African black rhinoceros *(Diceros bicornis)* has fared best, with some 12,000 individuals surviving in well-protected parks. One of two races of the African white or square-lipped rhinoceros *(Ceratotherium simum)* is adequately protected, while the other is still in a precarious position. The trade in rhino horn has always centered in the Far East, and thus it is to be expected that it has had a more devastating effect on the Asiatic species. It is probably too late to save the Javan rhinoceros *(Rhinoceros sondiacus)*, the closest living relative of the Indian rhinoceros. This species was once found throughout Indochina, Sumatra, and Java; but now only about two dozen survive in the Udjung-Kulon Reserve in Java. The Sumatran rhinoceros *(Didermoceros sumatrensis)* once shared the Javan rhino's range and was also found in Borneo. Unique in that it is the only present-day rhinoceros whose body is covered with hair, it remains in only a few isolated pockets in Sumatra, Malaysia, Burma, and Thailand; but it is



unclear exactly how many animals there are or what their chances are for survival.

It was during the Eocene epoch, between 55 and 35 million years ago that the first known member of the rhinoceros family appeared. Although it was hornless, this odd-toed ungulate had in other respects the typical rhinoceros body form. Later, a great variety of rhinoceros species evolved, including the woolly rhinoceros of northern Eurasia, which was portrayed in human cave paintings but had died out before the end of the last Ice Age. The genus to which the Indian rhinoceros belongs can be traced back to the Miocene epoch between 25 and 10 million years ago. But the antiquity of the rhinoceros family and the fact that a great many species died out before the end of the Ice Ages do not mean that the rhinoceros as a group would have faced extinction today without human interference. On the contrary, there is every indication that the five species that have survived into our own geological epoch would have continued to prosper indefinitely were it not for needless destruction of their habitat and needless persecution for superstitious reasons.

In appearance, the Indian rhinoceros probably represents to most people more of an echo of the antiquity of the rhinoceros line than any other rhinoceros species. Its skin, divided into section by large folds, has the look of armor-plating; there are even flat circular lumps in the skin that might be taken either for rivet-heads or for chain-mail. Moreover, the impression that this is a creature from the distant past is greatly augmented by the fact that, whereas photographs of the African rhinoceros species on their natural habitat are relatively common, few people have seen or photographed the Indian rhinoceros or any of the other Asiatic rhinoceroses in their native habitat.

There are apparently only two substantial populations of the Indian rhinoceros remaining in existence, one in the Indian state of Assam and one in Nepal. The larger of the two is that located at the Kazaringa Wildlife Reserve in the Indian state of Assam, which in 1966 was estimated at 400 animals but which has apparently declined since then. Intense effort is being made to protect the rhinos in this reserve, but poaching has still not been entirely eliminated. The second largest population is the one found at the Chitawan Rhino Sanctuary in Nepal; in 1966, this was estimated to contain 165 animals. However, the most recent investigator, in 1970, estimated that both these populations taken together totaled no more than 250 animals.

Several scientists have visited Kazaringa in recent years and have gathered valuable notes on the ecology and behavior of the Indian rhinoceroses there. Its habitat in this reserve is marshland to a large extent, as it apparently is in the few other areas where the species is still found. Although, given its fondness for baths and its well-attested ability as a swimmer, the Indian rhinoceros is evidently more dependent on water than either of the two African species and was probably always found close to rivers, its restriction to marshland is believed to be relatively recent.

It has most likely retreated to the marshlands because they are the only acceptable habitat for Indian rhinos that has not been taken over by human settlement. All rhinoceroses are animals neither of open grassland nor of really dense forests and are most commonly found in areas that combine grassland with some trees and bushes and it is probable that the Indian rhinoceros was originally found in a variety of such habitats alongside water-courses.

Actually, the Indian rhino's habitat in the Kazaringa offers a balance between permanent swampland and a certain amount of steppe and forest. The more characteristic vegetation is the six- to fifteen-foot-high elephant grass, on which the rhinos rely for cover in time of danger and which also constitutes a large percentage of their diet. Alternating with the elephant grass are more open pasturelands, where shorter grasses and various marsh plants grow. The rhinos feed on this vegetation also to a certain extent. Finally, there are scattered bits of forest in the reserve, where rhinos can also occasionally be found. The life of the Indian rhinoceros in the Kazaringa is further complicated by seasonal floods that inundate much of the area, forcing the rhinos to migrate to the foot of the Mikir Hills to the south of the reserve. That is a region where rice and tea are cultivated, and there the rhinos unfortunately sometimes come into conflict with human settlers.

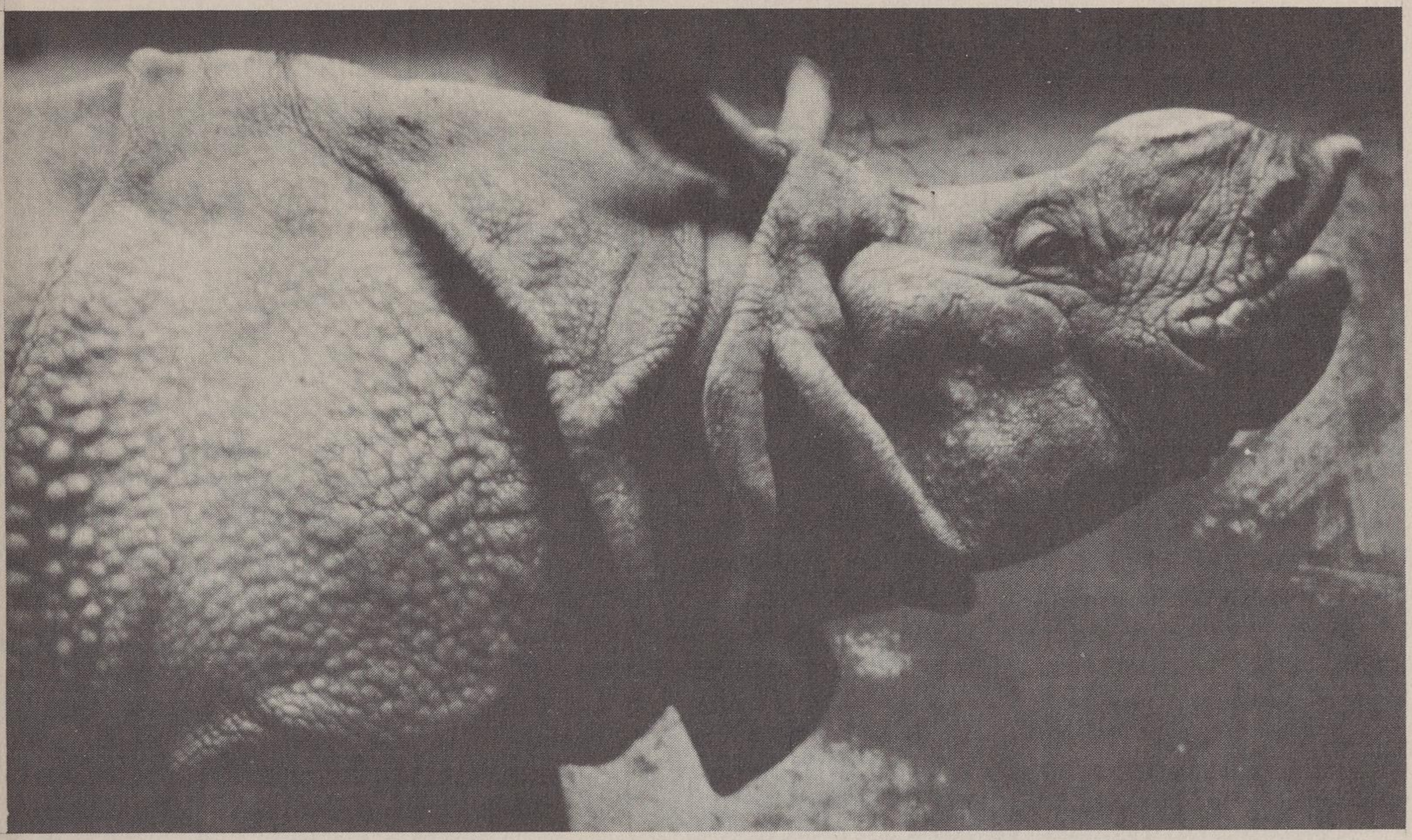
Except for flood-times, the Kazaringa rhinos lead a remarkably regular life. They sleep from midnight till early morning, usually concealed in the elephant grass. Then they move by well-trodden trails to grazing areas, where they feed for about two hours more. Wallowing in mud, a habit the Zoo's Indian rhinoceroses share, doubtless provides a protective coating against external parasites. Around mid-day, the rhinos return to their resting places, where they sleep at least three hours. On waking they againfind suitable feeding grounds and remain there until midnight.

In general, members of all rhinoceros species are not very sociable animals. Adults, especially adult males, are frequently solitary. The only really strong social grouping that is ever found is a small matriarchal grouping – numbering up to seven individuals in the Indian rhinoceros – consisting of an adult female and other rhinoceroses to which she has given birth in the past. If these are males, they are probably less than nine years old –

These two photographs illustrate "Flehmen" – the exaggerated lip-curl shown by a male Indian rhinoceros when he sniffs an estrus female's urine.

the age at which the male reaches sexual maturity. If they are females, they may have young of their own, which are also members of the group. When the matriarch is near giving birth, she drives away her previous offspring, which is then between one-and-three-quarters and three years old. But when her new calf is about one-half grown, the mother may be rejoined by several of her previous offspring.

Two or more matriarchal groups will sometimes come together temporarily in grazing areas, at bathing sites, or at mud wallows and share the area in peace; these temporary aggregations may number up to 20 animals. The only other type of social bond that is seen in this species is the temporary bond that exists between a male and female that are mating. Fully adult males are rarely seen together, and two adult males that meet will usually show aggressive signals, such as violent snorting, until one of the two flees.



Each solitary bull Indian rhinoceros defends a private grazing territory about an acre in area and also defends a private sleeping place. Some authorities believe that solitary adult females defend similar territories; whether or not matriarchal groups also do so is unclear. On the other hand, bathing places and wallows are never private property, and rhinos intermingle there. When territorial male rhinos meet at these places, they snort at each other but soon settle down to bathe or wallow together peacefully. Most of the paths through the elephant grass are public and open to all rhinos, but the paths that branch off these public paths and lead to the private sleeping and feeding territories are private and are defended against intruders.

Each group and each solitary individual tends by and large to keep out of the way of other groups and individuals; they are able to do so primarily by means of olfactory communication. Large dung piles on the well-worn public rhino trails are used by each individual as it passes; thus it keeps other rhinos that come along the same trail later informed about who has passed that way. Such a dung pile — which may be as high as three feet in the center and may extend outwards to a radius of four or five feet — apparently offers an irresistible stimulus to every passing rhino; and it has been reported that even when pursued by hunters an Indian rhinoceros would stop at every dung pile it encountered during its flight. Solitary bulls also sometimes leave olfactory signals in the form of urine, which they spray horizontally backwards onto grasses and other plants. In addition, adult females mark by spraying urine horizontally when they are in estrus, at which time the marking doubtless serves to alert males to their location and their condition of breeding readiness. The estrus female also signals her condition by means of a high-pitched whistle which can carry for a considerable distance. Moreover, in the wild the estrus female Indian rhinoceros wanders away from her usual home range in search of a mate.

There is a breeding season in the female Indian rhinoceros during which she comes into estrus approximately every 46 to 48 days although the interval may occasionally be as short as 38 days or as long as 58 days. Each of these estrus periods lasts about 24 hours. One observer believed that the breeding season generally occurs in the spring in the Kazaringa Reserve; captive females have come into season at a variety of other times of the year in a variety of zoos. In the Basel Zoo in Switzerland the female has also come into breeding condition in the spring. In both the Delhi Zoo and our own National Zoo, females have come into breeding condition during late summer and early autumn. The male comes into breeding condition in response to the presence of a female in estrus.

The breeding behavior of the Indian rhino-

ceros has been little observed in the wild; but a considerable amount of data is available from zoos – including, now, the National Zoo. At most zoos, adult pairs of Indian rhinoceroses are kept separate except when the female's behavior indicates a possibility of mating. When admitted to an estrus female's enclosure, the male reacts with several characteristic forms of behavior. One of these is vigorous chasing or "driving" of the female; females evidently also chase males at times. Another is a facial expression usually referred to by the German word "Flehmen." Flehmen, which appears in courting males of a great many mammalian species, consists of sniffing the estrus female's urine and curling the lip in a distinctive exaggerated fashion. The lip-curl apparently makes it possible for the scent of the female's urine to reach Jacobson's organ, a cavity lined with olfactory mucus membranes and connected with both the nasal cavity and the oral cavity, that is presumably sensitive to the chemical composition of the estrus female's urine.

The National Zoo's male Indian rhinoceros ("Tarun") is 14 years old and has been here since May of 1960; the female ("Rajkumari") is nine years old and was received in December, 1963. Female rhinoceroses first enter breeding condition at the age of about five years; and the Zoo's female was first placed with the male at that age on July 1st, 1968. The male drove the female but made no attempt to mate. The first clear breeding behavior was observed in August, 1970, when the male mounted the female briefly on two occasions but without successful copulation. A year later considerable breeding activity was observed, including one mounting that lasted ten minutes, during which partial intromission and external ejaculation were observed.

Consequently, as the time of year during which these attempts had taken placed approached again in 1972, it was hoped that at last a successful breeding might occur. On July 11, 1972, the pair were placed together for the first time since December, 1971; and, in subsequent days, they were kept together for most of the day but separated at night. On July 13, the male chased the female around the enclosure, but the female did not develop full estrus that month. On August 11, when it was again believed that the female was coming into estrus, the rhinos were put together at night; and arrangements were made for Friends of the National Zoo volunteers to observe their nocturnal behavior and summon the scientist in charge of the Indian rhinoceros breeding program, in the event of any breeding activity.

At 6:50 p.m. on August 12th, the first breeding attempt of the season took place; and during the next 20 hours, the male mounted the female some 30 times. The male failed to achieve full intromission, however, and none of the mountings lasted longer than ten minutes. Many observers have commented on the difficulty the male Indian rhinoceros often has in achieving intromission once he is mounted. Because of his great bulk and because of the fact that the erect penis is over three feet long and curved forward at the tip, considerable rather awkward maneuvering is often required before successful copulatory position is achieved.

On September 23rd, 41 days after this period of unsuccessful but intense breeding activity, the female first showed signs of the onset of a new estrus. She was active throughout the night, pacing continuously for long periods along the wall or the bars of the cage. The following morning she had a very high temperature over her entire body, probably as a result of the exercise. For three days she continued her nightly activity, wandering between her indoor and outdoor enclosures and bathing frequently in her outdoor pool. By the third day, her temperature had returned to normal. Evidently this period of great restlessness corresponded to the reported wandering of the female Indian rhinoceros at the time of estrus in the wild.

Many of the signs that indicate that a female Indian rhinoceros is in estrus have been observed in zoos. Among these are urinating horizontally backwards, whistling, opening and closing or "flashing" the vulva, backing into the male, and placing the head between the male's hind legs. During Rajkumari's period of nighly restlessness, however, she showed none of these signs. The only clear indication of an estrus condition was a dark amber-colored urine the morning after her first night of activity. Then, on the morning of September 29, she flashed her vulva briefly after urinating normally; and she twice raised her tail over her back as a female Indian rhinoceros is reported to do when urinating horizontally. At 5:30 a.m. on September 30, she backed into the male, pressing him against the wall of the cage. At 6:35 a.m., both rhinoceroses went outside quite suddenly, and mounting began. The male

easily achieved intromission and remained mounted from 6:40 to 7:50 a.m., during which time there were numerous ejaculations, as indicated by strong pelvic movements. In another captive pair of Indian rhinoceroses, 56 ejaculations were counted in a 60-minute-long mounting; and many have pointed out that this breeding pattern is the likely reason for what is probably the most widespread, persistent, and destructive of folk beliefs about rhinoceroses – namely, that rhinoceros horn is of value as an aphrodisiac.

After the male dismounted, the female returned to her indoor enclosure and made some vocalizations, including a high-pitched squeak. This sound was believed to be related to the female Indian rhino's well-known whistle, but the Zoo's female never produced a really distinct whistle. No further mounting occurred, and the animals rested the better part of the next 24 hours. They were active, however, for brief periods and frequently in physical contact with each other both while resting and while active. In November, a watch was begun again in order to determine whether or not the female would again come into estrus. There were no signs of estrus – a good indication that the September breeding had indeed been successful and that she was pregnant. If there is a birth without complications, it will be the first viable birth to have taken place in any Zoo in North America.

The first Indian rhinoceros birth in captivity took place on September 14, 1956, at the Basel Zoo. Since then, eleven more have been born in Basel and eight in other zoos. The gestation period has been measured at between 462 and 489 days. The calf, born while the mother is standing and in a time of only 15 to 30 minutes, is pink in color at birth. Its skin has the folds and protuberances of the adult's; but the horn is not present yet, and there is a smooth oval plate where it will appear later. The calf is able to stand on its feet and follow its mother after about the first hour-and-a-half of life.

The great Indian rhinoceros is one of relatively few endangered animal species which have a clear chance of being saved from extinction by breeding in zoos. Successes over the past fifteen years indicate that breeding this species in captivity should soon become a routine matter. Then, when a large number of captive-born animals are being produced, it should be possible to re-introduce some of them to the wild in protected reserves in parts of this species once-extensive range. The National Zoo is proud to be involved in the effort to save these unique and spectacular animals; and some of the Indian rhinoceroses that, with luck, will be born here in future years will hopefully contribute to re-established populations of this species in the wild.

The Zoo's two Indian rhinoceroses are located at the Elephant House *(number 11 on map)*.