

on the morning of 16 August. The male responded to her by erecting the penis to its full length of about 75 cm and attempted to copulate with the female. As she was sitting down, the penis could not be inserted fully into the vagina. From then onwards whenever the female was in oestrus and approached the male, he would erect his penis and rub it over her genital area. Once again, on 8 September 1964 when the female was in oestrus, the male tried to copulate with her, but once again she was sitting down and the attempt was unsuccessful. On 26 April 1965 when the female was in oestrus the male copulated with her successfully for the first time. Copulation lasted for about 20 minutes. On 26 May a second successful copulation, also lasting for about 20 minutes, took place. After this the female did not come into oestrus again.

From then onwards both rhinos lived quietly together; the female particularly was much less aggressive and stopped chasing the male and remained aloof from him.

On 23 December 1965 it was noticed that the female's mammae, abdomen and genitalia were swollen and these were taken to be definite signs of pregnancy.

On 25 August 1966 it was noticed that the female had chosen the more secluded of the two dens where she was less disturbed by visitors. She tried to drive the male into the other den and became increasingly restless. She frequently moved to the partition to peep at the male and if he tried to enter her den, she drove him out with shrill, whistling noises. The door between the two

dens was therefore closed and the female shut off from the public. She then calmed down.

On 26 August milk was seen oozing from her two mammae. A viscous fluid was also discharged from the vagina. At about 1200 hours she lay down in a corner of the den and birth contractions started. The amniotic membrane was seen at 1345 hours. It burst at 1355 hours and the amniotic fluid was discharged onto the floor. The baby rhino's front legs were now visible. At 1415 hours the baby rhino was born, the mother lying on the floor. The gestation period, from the last day of the last observed oestrus to the day of the birth was 458 days.

The baby was immediately licked by the mother. It was fully developed and active. Its body was hairless, except for the lining of the ears and the end of the tail. There were two white patches on the nose: the growing sites of the horns. The front patch was slightly raised. At 1430 hours the calf started trying to struggle to its feet. It succeeded in standing at 1500 hours. At about 1520 hours the calf started looking for the mammae. At 1530 hours it was able to walk slowly. It suckled for five minutes for the first time at 1635 hours. It suckled again at 1700 hours, at 1720 hours and at 1800 hours. After the second feed it became increasingly active, following its mother.

The placenta, which had been hanging from the vulva, dropped away at 1800 hours.

On 27 August the calf was seen suckling at 1800 hours. From then onwards it suckled about every one or two hours. By 28 August this interval had increased to 2-2½ hours, by 29 August to 3 hours and by 30 August to 3-4 hours.

Notes on breeding Black rhinoceroses

Diceros bicornis

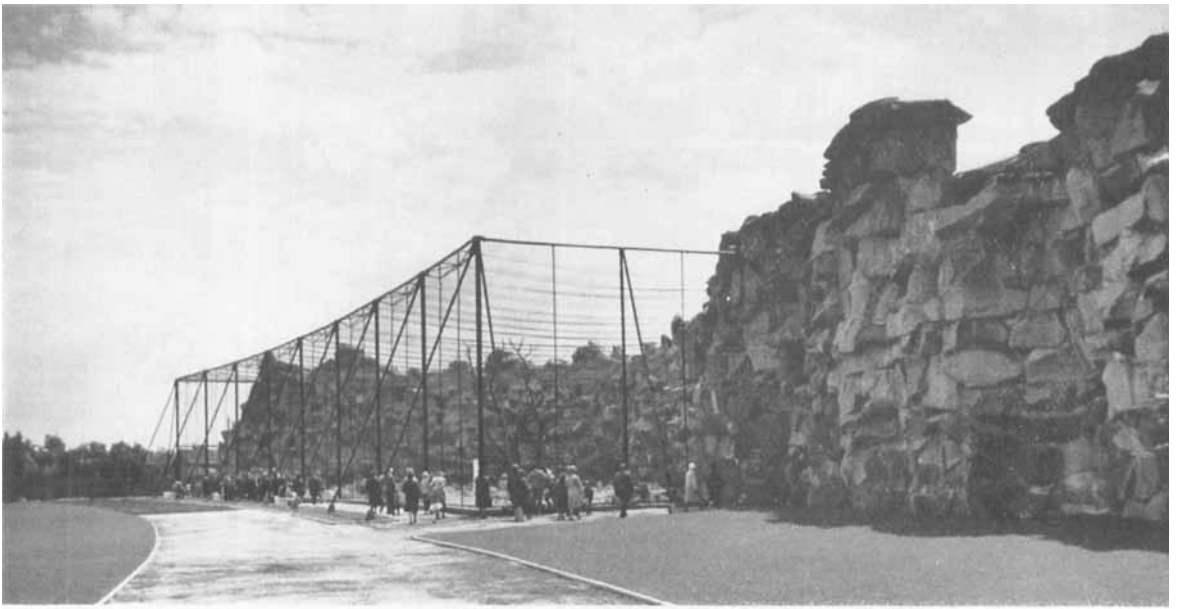
at Pittsburgh Zoo

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The pair of Black rhinoceroses *Diceros bicornis* at Pittsburgh Zoo were bought from Carl Hagenbeck on 23 May 1954. The male was estimated to be 2½ years old and the female three years old at the

time. Three years later in 1957 attempts at mating were observed. Two complete acts of copulation were seen in 1958 but the female did not become pregnant. In 1959 one complete act of copulation



53. *top.* View of the new birds of prey aviary at East Berlin Zoo. The aviary measures 60 m long, 8 to 27 m wide and 9 m high, covering a ground surface of about 1,200 sq. m (see pp. 69-70). All supports are outside the aviary, thus giving the birds maximum flying room. The aviary is backed with large grey blocks of Lausitz granite freestone and behind there are winter quarters for non-hardy birds of prey. It contains about 50 birds of prey belonging to 13 species.
Werner Engle E. Berlin

54. *below.* Interior of the birds of prey aviary at East Berlin Zoo. Nesting holes have been built in the rocks and within a year of being put in the aviary, five species had nested. Plumage and activity of birds that had been kept in small cages in the past have improved considerably since being in the aviary.
G. Budich E. Berlin





55. *above.* One of the large free-flight areas in the new building for tropical birds at Houston Zoo (see pp. 71-75). Visitors cross the bridge and go through the arch into another 'jungle' area.

F. Wilbur Seiders Houston



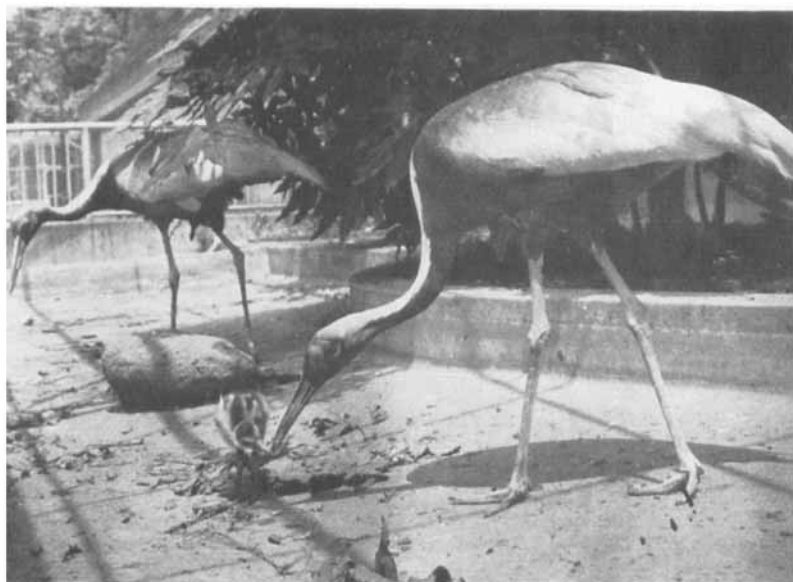
56. *right.* One of the bird exhibits in the bird, reptile and rain forest building at Dallas Zoo (see p. 75). The front of the exhibit is covered with thin, taut 'piano' wire.

City of Dallas Photo



57. At Ueno Zoo, Tokyo, a pair of the rare White-necked cranes *Grus vipio* has bred nine times between 1953 and 1965 in a covered aviary with a ground area of 34 sq. m (see pp. 177-178). In 1965 five clutches of eggs were laid in a nest of bamboo twigs. All were removed to an artificial incubator except one which was incubated by the parent birds.

58. The White-necked crane chick immediately after hatching on 16 June 1965.



59. The White-necked crane chick being fed by the parent birds, seven days after hatching.
Tokyo Zoological Park Society



60. *above.* Five-day-old tuatara *Sphenodon punctatus*, hatched at Auckland Zoo on 25 June 1965 (see pp. 178-179). This is the first recorded instance of the tuatara breeding in captivity. Altogether six tuataras hatched, of which four survived. They fed for the first time four days after hatching—on mealworms and woodlice.
Auckland Star



61. In order to explain to visitors why they are not allowed to feed animals in the zoo, the West Berlin Zoo has designed a special display board. It is placed near the seal pools and shows a variety of objects removed from the pools within a few weeks. It includes a photograph of the stomach of the elephant seal, 'Roland', a famous zoo 'star', who was killed as the result of swallowing a similar object.
Zoologischer Garten Berlin

occurred and was followed by another 50 days later, when the female became pregnant. Mating has taken place in May, September and November.

The only signs of oestrus appear to be enlargement of the vulva and receptivity to the male's advances. In every case, only one copulation occurred during each oestrus. Sexual union lasted for over an hour and the male was observed ejaculating about every 10 minutes during copulation. After mating the male ceased to be interested in the female.

The first calf, a male was born in October 1960 after a gestation period of 463 days, the second calf, a male, was born in April 1963 after a gestation period of 454 days, and the third calf, also a male, was born in October 1965 after a gestation period of 457 days. The gestation period was calculated from the day of mating to the day of birth. The estimated weights of the newborn calves were between 22 and 34 kg. The first calf was sent to Jacksonville Zoo in Florida, and the second male calf to Duluth Zoo in Minnesota.

Notes on breeding the Black rhinoceros

Diceros bicornis

at Sydney Zoo

SIR EDWARD HALLSTROM

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In July 1966 there were one male and six female Black rhinoceroses *Diceros bicornis*, at Sydney Zoo. Two and probably three of the females were pregnant at this time. In recent years six Black rhinos (one male and five females) have been bred at Sydney Zoo, including one second generation birth in captivity.

Oestrus seems to last several days, with an approximately 18-day oestrous cycle. When the female shows interest in the male she is put with him and remains with him until mating activity has ceased. When the female is in oestrus, the male calls to her, making sounds like a deep sigh. Preliminary play is very rough and very often they cut each other with their horns. However, despite this fighting they are in fact less aggressive than

when the female is not in oestrus. This may go on for hours before mating.

Copulation lasts 15 to 40 minutes, or more. Occasionally it is shorter than 15 minutes. After copulation the marks of the bull's front feet on the female's back can be clearly seen. They are much quieter after copulation.

During pregnancy some females sometimes become very aggressive with the male. In four cases the gestation period was just over 17 months. In one case it was 15 months, but the female may have already been pregnant when copulation was observed.

One female suckling a calf became pregnant three months after giving birth. Unfortunately she aborted three months later.