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Birth of Two White Rhinoceroses (*Ceratotherium simum simum*) at the Copenhagen Zoo

By Erik Eriksen, Charlottenlund

With 8 Figures

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The table below, which is based on information from the International Zoo Yearbook 1975, shows that the White Rhinoceros is the Rhinoceros species represented in largest numbers in captivity, but at the same time the one which has borne the fewest young. One of the reasons for the moderate breeding results is probably that this species has only been kept in captivity for at relatively few number of years.

Species	Number	Number born	Number collections
Great Indian Rhinoceros (*Rhinoceros unicornis*)	31,26	15,12	29
Black Rhinoceros (*Diceros bicornis*)	67,78	19,19	69
Southern White Rhinoceros (*Ceratotherium simum simum*)	155,196	11,7	82
Northern White Rhinoceros (*Ceratotherium simum cottoni*)	3,5	0	5

Number of Rhinos, and number of Rhino calves born in captivity (including only calves conceived in captivity). The ♂♂ are listed at the left, the ♀♀ at the right of the dot. The column at the far right indicates the number of collections among which the animals are distributed.

In 1946, Pretoria Zoo in South Africa was the first Zoo in the world to exhibit a White Rhinoceros, having successfully reared a newborn ♀ White Rhinoceros found in the Umfolosi Game Reserve (Bigalke 1947, 1975; Bigalke et al. 1950). Later in 1949, the same zoological garden succeeded in obtaining a ♂ and, in 1952, one more ♀, but until 1960 there were only a total of 13 specimens in captivity. Of these the 3 in Pretoria Zoo were Southern White Rhinoceroses (*Ceratotherium simum simum*) while the rest were Northern White Rhinoceroses (*Ceratotherium simum cottoni*) (Reynolds 1960).

The first captive birth occurred on 8th June, 1967 in Pretoria Zoo. However, the Rhinoceros which gave birth was already pregnant when captured 476 days prior to the delivery (Smith 1968). Foster states the gestation period to be approx. 18 months (Grzimek 1968). 3 more captive births also took place in Pretoria Zoo in 1969, 1970 and 1971, and in all 3 cases the ♀♀ had conceived in the zoo (I.Z.Yb. 1971, 1972, 1973).

The first births outside Africa occurred in 1971 in Hannover (Dittrich 1972), and Whipsnade Zoos respectially (I.Z.Yb. 1973). In both cases the ♀♀ were pregnant before they were captured.

The first calves conceived in captivity outside Africa were born in 1972 in the U.S.A. when 1 calf was born in San Antonio Zoo and 3 calves were born in San Diego Zoo (I.Z. Yb. 1974).

Whipsnade Zoo was the first place in Europe to breed the White Rhinoceros. The birth took place on 23rd June, 1971. At the end of 1974 a total of 9 (7,2) live calves had been born in Whipsnade (Manton 1975).

There exist rather detailed descriptions of matings and births in the Great Indian Rhinoceros (Lang 1961; Gowda 1969; Hagenbeck 1969) as well as in the Black Rhinoceros (Faust 1958; Dittrich 1967; Gowda 1962; Greed 1967; Hallström 1967; Hays 1967; Yamamoto 1967). However, as far as the White Rhinoceros is concerned such information is very scarce (Smith 1968; Schaurte 1969; Dittrich 1972; Lyster 1974). The following is an account of some observations made on the birth of two White Rhinoceroses in Copenhagen Zoo in December, 1974.

On 31st August, 1971, 1,2 White Rhinoceroses arrived in the Copenhagen Zoological Garden from South Africa. The age of the ♀♀ was estimated to be approx. 6 years. The ♂ was somewhat smaller, about three fourths of the size of the ♀♀. His age was estimated to be approx. 4 years.

All 3 animals were together in the daytime in the outdoor enclosure, but the ♂ could not really cope with the ♀♀, who were much stronger, and no mating took place. The ♂ seemed somewhat afraid of the ♀♀, who occasionally chased him. At night the 3 animals were kept separated, each in its own pen.

Later it appeared that this ♂ had been delivered by mistake, and it was send to Whipsnade Zoo in exchange for a full-grown ♂.

On 23rd June, 1972, the new ♂ arrived. He was a little bigger than the ♀♀, and his age was estimated to be approx. 8 years. Shortly after his arrival, he was let out into the outdoor enclosure with both ♀♀ .The 3 animals were together in the outdoor enclosure all day, and at night they were separated in 3 pens.

On September 3rd and 24th, 1972, mating attempts were observed, with both ♀♀ but the mating was not completed.

On March 3rd and April 27th, 1973, mounting of ♀ no. 1 was observed for the first time.

♀ no. 2 was mounted approx. 14—21 days later than ♀ no. 1. During this period several mounts took place, and matings were also observed later on in the summer.

After the end of July, 1973 both ♀♀ rejected the ♂ and further mounts were not observed, although the 3 animals were kept together in the daytime in the outdoor enclosure.

The courtship behaviour was, in general, rather placid and undramatic. The copulation usually lasted half an hour or more.

In the spring of 1974 ♀ no. 1 showed unmistakable signs of pregnancy. Her abdomen had grown considerably, and the keeper observed presumable foetal movements in the flanks of the animal. As birth was expected to be near, the animal was separated from the 2 other Rhinoceroses in June, 1974 when she was moved to an enclosure next to the main one.

♀ no. 2 showed much fainter signs of pregnancy, but during the summer we realized, that she too was pregnant. Because of the less pronounced signs it was assumed, however, that she would give birth at a much later date than no. 1.

On August 20th, 1974, the animal keeper succeeded in measuring the abdominal circumference of both ♀♀. The measuring was made around the middle of the body, and both ♀♀ measured 343 cm. When they were measured again on November 20th, 1974, both ♀♀ measured exactly the same as on August 20th.

Fig. 1. Mating in the outdoor enclosure. All the photographs were taken by Erik Parbst

All through the summer the animals were fed on grass according to appetite, but after August 20th feeding with hay instead of grass was instituted.

This change might be the reason why the size of the abdomen did not increase during the period between the 2 measurings as expected.

Parturition

♀ no. 1

In the beginning of November, 1974 the size of the vulva, udder and teats increased. This was particularly distinct in the period from November 22nd till December 2 nd.

The vulva gradually grew to 2—3 times its normal size, and the labia swelled up strongly. Udder and teats also grew steadily during this period, and the teats nearly reached the level of the hocks.

On December 3rd the teats were very swollen, and the skin on them was shiny and wrinkled. At morning inspection December 4th it was observed that the oedema in the labia and the size of the vulva had further increased during the night, and the region around the base of the tail seemed somewhat loose and sagging.

The animal was let out into the outdoor enclosure. She was rather restless all morning, and as the restlessness increased she was let back into the stable at about 2.30 p.m.

During the following 2—3 hours the restlessness further increased. She alternately laid down and got up, or walked around the pen, occasionally rummaging about in the litter, with frequent discharge of faeces and urine. The behaviour resembled a moderate case of colic in a horse.

From 5—6 p.m. a few antepartum contractions occurred.

At 6.02 p.m. large quantities of allantoic fluid were discharged, and the animal calmed somewhat down. The colour of the fluid was yellowish brown.

Fig. 2. Amnion appears in vulva (6.50 p.m.)

At 6.15 p.m. a good deal of allantoic fluid of the same colour was again discharged, after which the animal laid down calmly and relaxed.

At 6.25 p.m. she was lying half-way on her side and bore down a few times.

At 6.26 p.m. she got up, walked around the stable, bent the tail upwards, and bore down.

At 6.32 p.m. she lay down again and bore down violently; thereafter deep and groaning respiration was noticed (respiration frequency 36 per minute).

Fig. 3. The calf is born surrounded by the foetal membranes (6.59 p.m.). Note the big teats of the mother!

At 6.35 p.m. she got up, but about half a minute later she lay down again. The respiration was now normal.

Between 6.36 and 6.40 p.m. she got up and lay down approx. every half minute.

At 6.40 p.m. she walked around the stable, took a few mouthfuls of hay and started eating.

At 6.45 p.m. she drank a little water, lay down, but raised immediately and walked around restlessly.

At 6.49 p.m. she lay down and bore down violently, and at 6.50 the amniotic membrane appeared in vulva (Fig. 2). Immediately after the animal got up and walked around a little. The labour pains increased, and gradually the foetus with its head first was pressed further forward through vulva.

At 7 p.m. the calf was born. The mother gave birth in a standing position, and the foetal membrane did not burst until the calf fell to the ground. The mother was calm and immediately looked after the calf which was carefully cleaned.

The first signs of life from the calf were blinking with the eyes and fluttering of the ears.

The new-born calf was characterized by a peculiar greyish blue colour. The ears were very long and hairy along the edge and the tip (fig. 6). The feet were unusually big, and the teats very well-developed (fig. 5).

At approx. 7.30 p.m. the calf was able to rise to its feet, and it was noted that it was a ♀. Her weight was estimated to be approx. 50 kg.

At approx. 9.30 p.m. the placenta was discharged. The mother was not particularly interested in eating it.

Fig. 4. Immediately after delivery (7.00 p.m.). The calf is still connected with the mother via the umbillical cord

It had previously been planned to film the birth, and photolamps had accordingly been placed in the pen and lit daily for 2 months in order that the animal could get accustomed to the glare. During the birth the animal neither reacted to the light from the photolamps nor to the photographer's flashlight, but when the film cameras started buzzing she jumped up and ran snorting around the pen a few times, after which she lay down again, apparantly accepting the strange sound.

The mother and the calf were observed until midnight. When everything seemed to be normal and both animals appeared to feel well, they were left alone for the rest of the night. The next morning at approx. 8 a.m. the calf was observed suckling (fig. 7).

After having given birth the ♀ was in heat again on December 4th and January 14th, but was not admitted to the ♂.

Fig. 5. The new born calf. Note the big feets and nails!

♀ no. 2

♀no. 2 was mated approx. 2—3 weeks after ♀no. 1 and accordingly delivery was expected to take place during the coming month. The animal, however, showed only slight symptoms of a close delivery.

Because of lack of space she shared the outdoor enclosure with the ♂ in the daytime, while at night they were kept in separate pens.

When on December 14th, 1974, the keeper arrived at the stable at approx. 8 a.m. ♀ no. 2 had given birth. The calf was still wet and could not stand up, and it was therefore assumed that the delivery had taken place within the preceding half hour.

At approx. 8.30 a.m. the calf was able to stand up, and it soon became so steady on its legs, that it started walking around the stable, trying to find the teats. The placenta had not yet been born and the mother being rather restless, refused the calf, who did not get a chance to suckle.

At approx. 12 noon the placenta was discharged, and the mother immediately calmed down, and permitted the calf to suckle for the first time. The calf was a ♂ somewhat smaller than the first calf.

Both ♀♀ suckled their calves in a standing position. The calves throve and grew remarkably fast. When they were about 2 months old, 4 front teeth appeared in the upper as well as in the lower jaw.

When they were about 2—3 weeks old, the calves started nibbling a little hay. Often they also ate from their mother's droppings. Later on they got into the habit of eating gravel from the outdoor enclosure. This caused some concern, particularly in the case of the ♂ calf, because his droppings at times contained rather large quantities of gravel. The geophagy was probably caused by salt hunger because it stopped when they were given free access to a mineral mixture containing sodium chloride.

Fig. 6. The calf on its feets (about 7.30 p.m.). Note that the ears are long and hairy along the edge and the tip

The mineral mixture consisted of the following minerals:

40.000% Di-calcium phosphate
42.717% Calcium carbonate
15.000% Sodium chloride
0.800% Manganese sulphate
0.900% Iron sulphate
0.500% Copper sulphate
0.083% Zinc oxide

Because of the cold weather season the animals were kept stabled until February 8th, 1975, when the ♀♀ with their calves, one after another, were let out into the outdoor enclosure. Immediately after being let out ♀ no. 1 and her calf both became very nervous and excited. They snorted and galloped around very fast, and the calf running against the bar a number of times got several minor abrasions. Therefore the animals had to be confined to the pen again.

In order to prevent serious injuries the bar was padded with bales of straw before the animals were let out again. ♀ no. 2 and her calf, when admitted separately walked around calmly and took no notice of the visitors. After a few days the 2 other animals calmed down as well.

Fig. 7. The calf is suckling, it is now approxemately 13 hours old

On March 5th, both ♀♀ and their calves were let out together in the outdoor enclosure. All 4 animals got along well, and spent hereafter most of the day hours together. On July 1st, the ♂ was let out into the enclosure to join them. This passed without problems, and since then all 5 animals have been together in the daytime in the outdoor enclosure. The ♂ has neither been aggressive towards the calves nor towards the ♀♀, and has often been watched playing with the calves.

On July 25th, 1975 ♀ no. 1 mated again, and ♀ no. 2 mated on August 25th, 1975. The matings took place in the outdoor enclosure, in which the 5 animals were together, and everything passed off in a placid way.

Fig. 8. Mother and child 13 hours after delivery

Discussion

Potter maintained that White Rhinoceroses would only breed if they had access to mud baths (Bigalke 1960). It has also been a widespread opinion that these animals would only breed if they were kept in a very large enclosure. For instance the size of enclosure for White Rhinoceroses in Pretoria Zoo is 12 acres which equals 48.560 square metres (Smith 1968), while Whispnade Zoo has 2 enclosures measuring 30 and 20 acres respectively for 22 (8.14) White Rhinoceroses. Klös and Frädrich (1970) claim that a main reason for the poor breeding results in *Diceros bicornis* is that in captivity they are continuously kept in pairs, which is biologically wrong, since as they state animals, who are solitary in the wild, seem to become 'blunt' if they have to live together for years in small areas.

In the cases here described none of the above conditions were present. The Copenhagen Zoo stable for Rhinoceroses is an old wood building formerly used for oxen. The only change is that the doorways were made wider and provided with doors of steel, when the Rhinoceroses were admitted.

In the building there are 2 pens each measuring 18 square metres (6 m × 3 m) and one pen measuring 14 square metres (4 m × 3.5 m).

The outdoor enclosure, in which the matings took place and in which the animals usually spend the daytime, measures approx. 540 square metres. The table below shows their feeding:

Feeding plan for White Rhinoceroses
Daily quantity per animal:

Food	Morning	Afternoon	Totally
Concentrates [1] see below	1 kg	0	1 kg
Hay	20 kg	20 kg	40 kg
Carrots[2] beets and sometimes fruit	10 kg	10 kg	20 kg

[1] Concentrates for horses containing: 10 per cent digestible pure protein and 80 Scandinavian feed units per 100 kgs, plus vitamin and mineral supplements.
[2] vegetables (chopped)

During the summer the root vegetables and approx. half of the hay are replaced by grass.

During the suckling period the ♀♀ get 1.5 kg concentrates per day.

The breeding results in Copenhagen Zoo indicate that White Rhinoceroses will breed under very modest and primitive stable and space conditions. A successful breeding result seems to depend more on harmony among the animals than on the facilities offered to them.

P.S.: International Pedigree for the White Rhinoceros.

Adult ♂		Studbook No.: 93
Adult ♀	No. 1	Studbook No.: 140
Adult ♀	No. 2	Studbook No.: 141
Yong ♀		Studbook No.: 231
Yong ♂		Studbook No.: 232

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Das Verhalten von Ungulaten an Gehegegräben

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Mit 6 Abbildungen

Der Begrenzung einer Tieranlage, einer Huftieranlage etwa, auf die wir uns hier beschränken wollen, widmet man meist im Stadium der Planung des Geheges besondere Aufmerksamkeit. Die Funktionstüchtigkeit der Absperrung, also die Sicherheit für Mensch und Tier, architektonische und finanzielle Überlegungen spielen die entscheidende Rolle. In der Regel wird man bei der Wahl der Dimensionen und der Details auf einschlägige Erfahrungen zurückgreifen.

Zäune aus Maschendraht oder Gittern sind eine herkömmliche, aber auch noch heute sehr gebräuchliche Methode der Umgrenzung von Huftiergehegen. Auf Überlieferung und Erfahrung beruhend, haben sich, mit Ausnahme von Giraffenanlagen, in unseren Tiergärten Zaunhöhen zwischen 1,80 m und 2,20 m eingebürgert und gelten als sichere Begrenzung der Gehege für Huftiere aller Art, wobei gelegentlich für die besonders springgewandten Ziegen und deren Verwandten nach innen ragende, draht- oder maschengitterbespannte Kragarme als zusätzlicher Abweiser unmittelbar am Zaun hochspringender Tiere angebracht werden.

Obwohl sich derartige Gehegezäune in der Regel durchaus bewähren, heißt das aber nicht, daß die meisten Huftiere Zäune dieser Höhe nicht überspringen könnten. Im Laufe der Jahre sammeln sich im Notizbuch eines Tiergärtners Fälle, in denen, meist in Situationen, die bei den Tieren panisches Verhalten bewirken, was bei Huftieren stets Flucht um jeden Preis bedeutet, die verschiedensten Arten, teils sogar aus dem Stand, offenbar mühelos hohe Zäune überwanden, rinderschwere und elandgroße Huftiere wie die kleinsten Duckerantilopen oder Muntjakhirsche. Konsequent formuliert muß man also sagen, daß 1,80 m bis 2,20 m hohe Gehegezäune Huftiere unter Normalbedingungen am Weglaufen hindern, nicht aber in Ausnahmesituationen oder anders gesagt, daß Huftiere hinter solchen Zäunen bleiben, liegt in ihrem eigenen Verhalten begründet. Man muß davon ausgehen, daß sie normalerweise nicht daran interessiert sind, ihr vertrautes Gehege zu verlassen. Vom Standpunkt der Sicherheit bilden bis zu 2,20 m hohe Zäune für Huftiere jedenfalls kein absolutes Hindernis.

Grundsätzlich die gleiche Situation besteht dann, wenn statt des Zaunes ein Wasser- oder Trockengraben das Huftiergehege begrenzt. Mehrere Ausführungsarten und recht unterschiedliche Weiten haben sich in unseren Tiergärten eingebürgert und werden in Baubeschreibungen und Aufsätzen, teilweise auch in dieser Zeitschrift erörtert. Überlegungen zu ihrer Funktionstüchtigkeit im Hinblick auf die Sicherheit spielen eine besonders große Rolle, vor allem wohl, weil Menschen und vielleicht auch viele Tiere sich hinter einer senkrechten Barriere eines Zaunes sicherer dünken als hinter einem Graben, selbst wenn beide gleichermaßen keinen absoluten Schutz bieten.

Nach langjähriger Erfahrung mit Huftieren im Zoo und einigen Beobachtungen in freier Wildbahn wage ich zu behaupten, daß alle mir bekannten Grabenprofile und -breiten zwischen 2 m und 4 m für die dahinter gehaltenen Huftiere jederzeit überwindbar