

## ABHANDLUNGEN

### The Breeding of White Rhinos in Captivity — A Comparative Survey<sup>1</sup>

By Colin Guy Champion Rawlins, London

With 1 Figure

On 5th August, 1970, 7 ♂♂ 13 ♀♀ White Rhinos arrived at the Zoological Society of London's Whipsnade Park from the Natal Game Parks. They went into a new 30-acre paddock where another pair of White Rhinos, received at Whipsnade 3 years earlier in 1967, were already installed.

On 17th February, 1971, 6 ♂♂ 14 ♀♀ White Rhinos arrived from Natal at the new San Diego Wild Animal Park of the San Diego Zoological Society. They were the first occupants of a 93-acre enclosure. 1 ♂ and 1 ♀ died shortly after arrival but another pair which had been at the San Diego Zoo since 1962 were moved in with the new herd at the Wild Animal Park in May and August, 1971, followed in November, 1972, by a young ♀ received at the San Diego Zoo on 18th September, 1971.

The acquisition of the 2 large herds of White Rhinos for Whipsnade and San Diego represented a big change from the previous practice of keeping White Rhinos in zoos only in pairs or in groups of 1 ♂ 2 ♀♀. It was hoped that both the number of animals and the size of the enclosures in which they were to be kept would provide the stimulus needed for successful breeding, which, up till then, had occurred only at the Pretoria Zoo.

Although subsequent births in the San Antonio and Copenhagen Zoos, where 3 animals only (1,2) were involved, confirmed the indication given by the earlier success at Pretoria that space rather than animal numbers was the crucial factor in White Rhino captive breeding, the Whipsnade and San Diego herds present the first examples of sustained captive breeding. This survey compares the breeding results in these 2 herds and examines the factors responsible for the differences in these results.

The Table attached shows the progress of all the ♀♀ in each group from the time of arrival at either Whipsnade or the San Diego W.A.P. until the end of 1976, including information on those animals which left either herd for another zoo before the end of the period. In the case of the Whipsnade animals, age was estimated on arrival and any period below 4 years is shown on the Table by a broken line. Similar information was not available for San Diego at the time of preparation of this survey.

4 years has been taken as the age at which a White Rhino may first conceive. Although there appears yet to be no precise evidence for this assumption, some reporters (Shortridge "Mammals of S.W. Africa", Walker) have estimated the age of breeding in White Rhinos at 4 to 5 years old, and there is evidence of a Black Rhino conception in the London Zoo at near or just below 4 years of age. Perhaps the best evidence, however, is in the Whipsnade herd itself, where Nos 7 and 8, estimated by Natal Parks

<sup>1</sup> Presented at 32nd meeting of International Union of Directors of Zoological Gardens Vienna, August 1977.

staff to be 18 months old when they arrived at Whipsnade, both conceived less than 3 years later.

The period of gestation used for the Table is 17 months. There are figures for White Rhinos varying from 16 months to 19 months, the difference probably being due to the difficulty in identifying, even in well-observed captive animals, the time at which conception takes place. For example casual observations at Whipsnade indicate a period between 17 and 18 months, while the more precisely observed matings at Copenhagen give periods of more than 19 months (April 27th, 1973, to December 4th, 1974, and mid-May, 1973, to December 14th, 1974, although, in the second case, matings "later in the summer" were observed).

The clearest evidence, however, comes from San Diego. In several cases, as the Table shows, the period between the dates of birth of 2 calves born to a particular cow is less than 18 months and if allowance is made for an average period of 1–3 weeks before the next oestrus, the gestation period in these cases comes to more or less 17 months. The most precise figure, however, can be obtained from the case of SAW 10, which produced the first calf in the San Diego herd on 11th October 1972. The sire of this calf, and indeed of all the calves in this herd up to the end of 1976, was the bull "*Mandhla*", SAN 1, which only arrived at the Wild Animal Park on 11th May, 1971. Assuming mating took place immediately after his arrival, the gestation period of SAW 10's calf would be exactly 17 months.

Some general comments on the results at Whipsnade and San Diego may now be made.

### Whipsnade

The herd arrived in Britain in the second half of summer. It included 4 mature cows, 1 of which was already pregnant and 1 adult bull, which had had the front horn removed before leaving Natal. There was also the resident Whipsnade bull, which, with its ♀ companion, immediately became part of the herd. Nevertheless it was not until nearly a year later, during the following summer of 1971, that the first successful matings took place and there were no further successful ones until 2 years after that, in the spring of 1973, by which time all the cows which were immature on arrival at Whipsnade had reached maturity. From then on a fairly clear two-year cycle has developed, with conception in the spring and early summer, birth in the autumn and early winter of the next year, followed by mating about 6 months later to complete the cycle.

There have been some exceptions to this pattern. Nos 8, 13 and 26 did not conceive in 1975, the year following the birth of a calf, but are thought to have done so in 1976. All 3 had their 1974-born calves at foot throughout 1975, whereas the other 1974 mothers, Nos 7, 12 and 19, all lost their calves within 24 hours of birth. Against this, No. 16 conceived her 1974-born calf 4 months after the birth of her first calf in January, 1973, a calf which was with her right up to the time of birth of her next one in October, 1974. But No. 18 had her first calf in March, 1973, and did not conceive again until May, 1975; her 1973 calf was at foot until early 1975 when it died. Cow No. 8 gave birth in October, 1974, to a calf which remained with her until early 1976. She did not conceive in 1975 but has probably done so in 1976 after the departure of her first calf. There is, therefore, no definite indication as to whether the presence of a calf inhibited mating at the next apparently favourable time, the following spring/summer, although all those animals which lost their calves early on did so mate.

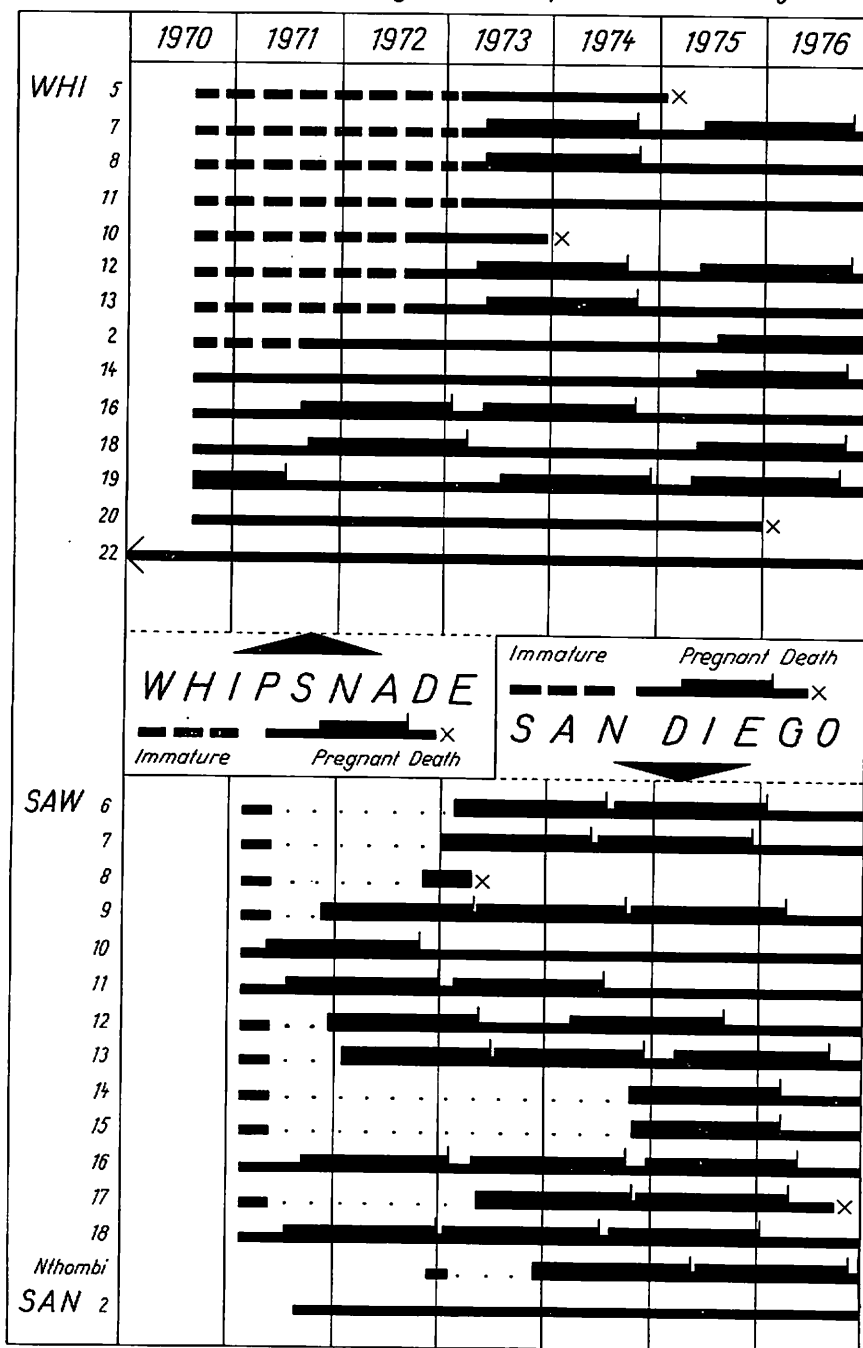
*White Rhino Breeding — A Comparative Survey*

Fig. 1

It should be noted that, at Whipsnade, where most births took place in the autumn and early winter, it is the practice to keep each mother and her calf separate from the others and inside the large rhino stable because of the possible danger to calves from the deteriorating winter weather or from being damaged by other animals in the stable at night. This process naturally removes any possibility of the new mother becoming pregnant again until she rejoins the herd the next spring. As already noted, however, even those cows which lost their calves soon after birth and were immediately put back with the rest of the herd, did not conceive anyhow until the following spring.

The other observation of note is that 5 of the 14 cows in the Whipsnade herd have never conceived. 3 of these died, one probably as a result of mating, but were found not to be pregnant on post-mortem. One, No. 11, left for Rotterdam in April, 1976, and, although at Whipsnade it was never seen to mate and was a lone and submissive animal, it could be pregnant with birth possible up to September, 1977. The last one is No. 22 which was in residence in the new enclosure with the bull No. 21 when the new animals arrived from Natal. No mating had been observed between these 2 prior to the arrival of the other animals but the bull then became the dominant one and has sired most of the calves so far born at Whipsnade. However, neither he nor any other bull was seen to have mated with No. 22.

As noted, the resident bull No. 21 was responsible for most of the births at Whipsnade although another one, No. 9, which was mature and physically very large on arrival in August, 1970, could have been the father of 3 of the calves and probably was of one of them. However, his front horn had been removed for the journey and it is unlikely that he was able to challenge No. 21 for at least the first 2 or 3 years. He died in January, 1975, probably in the mating incident which also killed the cow No. 5.

By 1975 the young bull No. 4 had grown into a very large adult and, with the demise of No. 9, began to challenge the dominant bull, No. 21. One calf is credited to No. 4 and the latest indications are that the mating is now being shared between Nos 4 and 21.

In summary, from August, 1970, to December, 1976, there have been 14 births to 14 cows resulting from conception at Whipsnade. 3 cows were thought to be pregnant at the end of 1976.

### San Diego

This herd arrived at the new Wild Animal Park at San Pasqual, 15 miles outside San Diego, on February 17th, 1971. This is the coldest and wettest time of the year. On 11th May, the resident adult bull at the San Diego Zoo was transferred to the Wild Animal Park and, as has already been noted, started mating immediately. Thereafter pregnancies occurred regularly and generally conception took place very soon after the birth of the previous calf, less than 2 weeks in one case. On cow SAW 10 did not breed again after the first calf.

In the San Diego herd, because of the favourable climatic conditions, and because of the much larger area available, it was not necessary to take the same kind of measures to protect mothers and calves as at Whipsnade and new mothers mated as soon as they came into oestrus after their last birth, in one case in less than 2 weeks. This means that the rate of breeding at San Diego has been quicker than at Whipsnade, with 4 animals having had 3 calves each during the six-year period.

Only one cow at San Diego failed to conceive during the survey period, that being SAN 2, the older ♀ resident at the San Diego Zoo before the arrival of the main herd at the Wild Animal Park and transferred to the Park in August, 1971. Even the cow SAW 8, which died in April, 1973, was pregnant at death.

The bull "*Mandhla*", SAN 1, resident at San Diego Zoo from 1962, was transferred to the Wild Animal Park on 11th May, 1971, 3 months after the arrival there of the new herd. As noted above, he must have mated within the first few days, since the first calf born in the Wild Animal Park, to the ♀ SAW 10, was born exactly 17 calendar months later. The information from San Diego is that all the calves born up to the end of 1976 were sired by SAN 1, the first challenge to this dominance not having shown itself until September, 1976. With reference to the position described at Whipsnade, however, it should be noted that one of the challengers to SAN 1, the younger "*Paghati*" or SAW 1, may have been unsuccessful because his horns were sawn off at the time when his challenge might have succeeded.

From February, 1971, to December, 1976, there have been 27 births to 15 cows at the San Diego Wild Animal Park.

The similarities and differences between the development of the 2 herds at Whipsnade and San Diego can now be reviewed. The principles behind the establishment of the 2 herds were the same and, if allowance is made for the negative effect of the British autumn and winter in the settling down period of the Whipsnade herd, the real development period for the 2 herds started at approximately the same time, the spring/summer of 1971. The number of animals and the make-up of ages in each herd was similar and both herds were increased by a resident pair of older animals.

The differences were in the climatic conditions and management systems. In Britain there is a long period of low temperatures and high humidity during the autumn, winter and most of the spring, with only 4–5 months of the year with relatively high temperatures. This contrasts with the relatively short dry winter of Natal and maximum humidity during the fairly long hot summer. It contrasts even more with the San Diego Wild Animal Park situation of a short winter, during which most of the low annual rainfall occurs, and a long dry period in spring, summer and autumn with high temperatures for several months of the year. Neither pattern fits the Natal situation exactly but the San Diego one is closer.

At Whipsnade it was necessary to provide permanent housing for the Rhinos because of the climatic conditions. At the San Diego Wild Animal Park no housing was necessary for the main herd. The management system at Whipsnade has therefore been to train the animals to return to shelter and food each evening except during the summer. This training and the inclement weather outside has encouraged the animals to want to stay in the house during the winter and for this reason it has been necessary to separate mothers and calves from the rest of the herd in order to protect them from injury, which, as already noted, may have contributed at least partly to the slower breeding rate at Whipsnade as compared with San Diego.

Indeed, the reproduction rate in each herd represents the main difference in their progress. Taking the period mid-1971 to end 1976, and ignoring possible deficiencies in the breeding potential of individual cows, it works out at 1.0 per cow at Whipsnade and 1.8 at San Diego. All births at Whipsnade have occurred in the autumn and winter

from a mating period in the months of April to July, while at San Diego the births and thus the mating dates are spread over the whole year.

Despite climatic and management differences there have also been similarities between events and progress in the two herds.

Most important perhaps is the role taken up in each herd by the adult pair of animals already in residence in each collection. In each case, the bull immediately became dominant and was responsible for all the breeding at San Diego and nearly all of it at Whipsnade. While at San Diego there was no real challenge to this bull, SAN 1, from the ♂♂ which came with the herd, probably for age reasons, at Whipsnade there was one fully adult ♂ with the new herd, but the removal of his front horn before leaving Africa may also have removed any threat from him to dominance by the resident bull, No. 21.

At both Whipsnade and San Diego, the resident cow, already adult and for several years in the company of the bull which was to sire all at San Diego, and most, at Whipsnade, of the calves born, has never conceived and probably never been mated.

There have been some common conclusions based on the experience at Whipsnade and the San Diego Wild Animal Park. The number of ♂♂ received with each herd, 7 at Whipsnade and 6 at San Diego, plus the one already in residence in each case, and not counting young ♂♂ subsequently born, has proved to be higher than necessary and several have been disposed of to other zoos, 5 of the 7 at Whipsnade and 4 of the 6 at San Diego.

The breeding success achieved has also led to the disposal of some of the ♀♀, 2 from Whipsnade and 4 from the San Diego Wild Animal Park, as well as the one in each Zoo already resident when the new herds arrived. To some extent both organizations were surprised by the breeding success and were not ready to deal with its consequences in terms of the extra cost of maintaining such large and expensive animals and the difficulty of disposing of surplus young animals, particularly ♂♂.

The way in which numbers in each herd have been built up and then kept in check by voluntary reductions as well as deaths is shown in the following Table:

New Herd	Add Residents	Births	Of which dead	Other deaths	Sent Elsewhere	Balance 31.12.1976
Whipsnade 7/13	1/1	*9/6	3/2	1/3	*10/3	3/12
San Diego 6/14	1/2	**14/13	1/3	1/3	**13/11	6/12

\*Includes one conceived in wild and one born in Edinburgh

\*\*Includes one born in Phoenix and one born in Columbus

### Zusammenfassung

Gegenwärtig leben — neben Einzelpaaren oder Triplets in einer Reihe von Zoos — 2 größere Herden Breitmaulnashörner in Tiergärten: in Whipsnade und San Diego. 7,13 kamen am 5. 8. 1970 aus Natal nach Whipsnade, 6,14 am 17. 2. 1971 gleichfalls aus Natal in den San Diego Wild Animal Park. Die Tabelle gibt die Entwicklung beider Herden (an den einzelnen ♀♀) wieder. Nach Erfahrungen in Whipsnade konzipierten 2 ♀♀ erstmals mit knapp 4½ Jahren. Die Tragzeit beträgt 16—19 Monate, wobei die Differenzen wahrscheinlich mit der Schwierigkeit eindeutiger Konzeptionsfeststellungen zusammenhängen. In San Diego konnten mit großer Sicherheit 17 Monate registriert werden. — Auf beide Herden wird dann im einzelnen eingegangen. In Whipsnade gab es von August 1970—Dezember 1976 14 Ge-

burten bei insgesamt 14 Kühen nach Gefangenschaftskonzeptionen, die meisten im Herbst und Frühwinter. Mutter und Kalb werden stets von der Herde separiert und zunächst im Innenstall gehalten. Damit wird zwar eine Wiederbefruchtung bis zum nächsten Frühjahr verhindert, doch zeigte sich, daß auch ♀♀, die ihr Kalb unmittelbar nach der Geburt verloren hatten und deshalb sofort zur Herde zurückkamen, nicht vor dem Frühjahr wieder aufnehmen. — In San Diego wurden von Februar 1971 — Dezember 1976 von 15 Kühen 27 Kälber geboren, wobei sich die Fortpflanzungsperioden über das volle Jahr erstrecken. Die günstigeren klimatischen Bedingungen gestatten das Beisammenlassen aller Tiere, auch jungführender ♀♀; in einem Fall fand eine erneute Begattung weniger als 2 Wochen post partum statt. Die Fortpflanzungsrate ist deshalb auch höher als in Whipsnade, z. B. hatten 4 ♀♀ in 6 Jahren je 3 Kälber. — Auf die klimatisch bedingten Unterschiede im Management-System für beide Herden wird abschließend eingegangen. In beiden Haltungen war der älteste Bulle (= jeweils das ♂ Tier des vor dem Herdenimport schon anwesenden Paares) Vater fast aller Kälber.

### Résumé

À l'heure actuelle, à côté de couples ou de trios isolés, se trouvant répartis dans quelques parcs zoologiques, 2 troupes importants de *Rhinoceros caninus* vivent dans les zoos de Whipsnade et de San Diego. 7—13 sont arrivés le 5. 8. 1970 à Whipsnade en provenance de Natal, 6—14 le 17. 2. 1971 au Wild animal Parc de San Diego, de la même provenance. Le tableau indique le développement des 2 troupes à partir de chaque ♀. D'après les expériences de Whipsnade, 2 ♀♀ ont eu une première fécondation à l'âge de 4 ans  $\frac{1}{2}$ . La durée de gestation est de 16 à 19 mois, les écarts étant probablement dus aux difficultés de l'observation des fécondations. San Diego a pu établir avec certitude une durée de 17 mois. Les 2 troupes sont alors analysés. A Whipsnade il y a eu entre août 1970 et décembre 1976, 14 mise-bas de 14 ♀♀ ayant été fécondées en captivité, la plupart en automne ou au début de l'hiver. La mère et son produit sont toujours isolés du troupeau et enfermés dans un box. Avec cette technique la fécondation est retardée jusqu'au printemps suivant. Cependant on a pu observer que des ♀♀ ayant perdu leur produit et remises donc immédiatement dans le troupeau n'ont pas été fécondées avant le printemps suivant.

A San Diego entre février 1971 et décembre 1976, 15 ♀♀ ont donné 27 produits, la période de reproduction s'étalant sur toute l'année. Les conditions climatiques plus favorables permettent la présence permanente de tous les animaux dans le troupeau, également des ♀♀ suitées. Dans un cas une fécondation a été observée, moins de 2 semaines post-partum. Le pourcentage de reproduction est donc plus important qu'à Whipsnade, c'est ainsi que 4 ♀♀ ont produit chacune 3 veaux en 6 ans. Les différences du système de management dues aux conditions climatiques différentes sont alors analysées pour chaque troupeau. Dans les 2 troupes le ♂ le plus vieux (= chaque fois le ♂ du couple déjà présent avant l'importation du troupeau) était le père de presque tous les veaux.

Dir. Colin Guy Champion Rawlins, The Zoological Society of London, Regent's Park, London NW1 4 RY (England)