

**Reintroduction of a captive born White rhinoceros
(*Ceratotherium simum simum*) to the Etosha National Park.
Part I: Selection, transfer, and adaption**

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With 3 Figures

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Introduction

Breeding and management of wild animal species under intensive and extensive conditions has been the subject of the authors for several years. Reintroduction individuals into their formerly inhabited ecosystem has been performed with more than 100 vertebrate species, with a high percentage of those species adapting well after transfer e. g. *Addax nasomaculatus* (DITTRICH et al. 1989) and *Lynx lynx* (BÖER et al. 1994, 1995). The management of endangered species, e. g. *Diceros bicornis minor*, with optimal conservation success, is daily work for two of us (C. B. & K. V.) in a National Park ecosystem. Having both backgrounds in mind, we decided to incorporate an ex situ born white rhino into a reintroduction project for this species in Etosha National Park.

Materials and Methods

On September 22, 1996 a five year old white rhino bull named "Kai" (Fig. 1), born as an F-1 individual at the Serengeti Safaripark Hodenhagen, was transferred in a crate from Hodenhagen to Etosha National Park in Namibia, where he arrived three days later. The tour involved a transfer to Luxembourg airport by truck, a flight to Johannesburg airport by a 747-400 air cargo carrier, and a final truck transfer from there to a rhino boma in Etosha for adaptation before release.

Its parents were shipped to Europe some 25 years ago, probably captured from the Umfolozi or the Caprivi strip area. Official permits for CITES- and veterinary import-, transit- and export-documents were signed by the Namibian Ministries of Environment Tourism and Agriculture in June 1996.

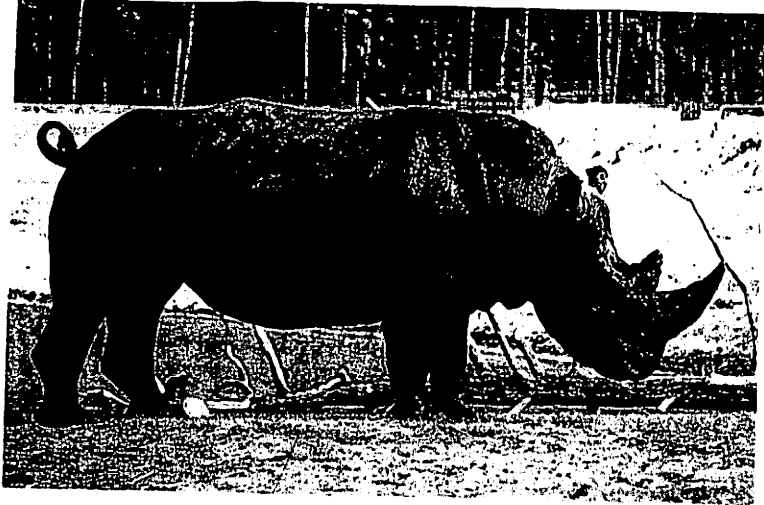


Fig. 1. Five years old white rhinoceros "Kai" one day before the transfer

Before transfer the rhino was immobilized with 1.2 ml large animal immobilon, tested for tuberculosis and leptospirosis and vaccinated against anthrax.

The transport crate had been constructed by Berlin Zoo recently and build according to the latest experience in long distance transfer of rhinos. The crate was equipped with a lower and upper door on the front and the back, the lower doors being extremely helpful during feeding and drinking. Information about the rhino's reactions during transport could be collected by an infrared-camera, which had been adapted to the front crate door prior to transport. Both rhino and crate were insured for travel.

September was chosen as a moderate time of the year to perform the climatic change between the hemispheres: In the end of the northern summer with temperatures between 10 and 20°C and low gras biomass the rhino still can adopt to high summer temperatures within a few days. The climate then is similar to late Namibian winter time, which also is characterized by low biomass and slightly higher temperatures.

For in situ adaptation before release, the rhino was kept in a boma with 6 open air 7×7 m boxes connected with each other and with a large 2000 sqm boma enclosure (Fig. 2), providing shade and water. The boma is situated in the southeast of the park (Fig. 3). There is a tent camp providing overnight opportunities for rangers and students involved in the project.

As soon as adaptation to local environment has been achieved, the rhino will be fitted with a transmitter and radiotracked daily after release from the boma site. Capture of one of the females already ranging free in the park is planned in order to provide the bull with a companion leading him outside after opening the fence. Behavioural aspects including 24 h activity rhythm, foraging, social interactions with conspecifics and other species as well as territorial patterns of the bull will be monitored permanently by one of us (T.C.) as part of a PH. D. thesis.



Fig. 2. View of larger boma enclosure with wooden boxes in the back. Notice an artificial water hole behind the front fence. Photo: Dr. MICHAEL BÖER



Fig. 3. Suitable habitat of grass and bush "veld" north of the reintroduction site. Photo: Dr. MICHAEL BÖER

Situations in situ and ex situ before transfer

The Etosha National Park in Namibia is one of the oldest and largest protected nature reserves in the world. It is inhabited today by the world's largest population of southern or desert black rhinoceros. A healthy population is reproducing steadily, with an estimated interbirth interval of about 24–30 months. During the last 6 years only one case of poaching has been officially registered. Until the end of the last

century the area around and in Etosha Nationalpark had been inhabited by both African rhino species, when the white rhino became exterminated by hunting. One hundred years later, reintroduction of this species is under way using wild captured individuals from Kruger National Park/R. S. A., animals from game ranches and also zoobred individuals.

The Serengeti Safaripark Hodenhagen/Germany breeds white rhinos regularly (BÖER & HAMZA 1996). Up to now (January 1997) 21 calves have been born. The rhinos live in a 9.5 ha large enclosure and are kept semi-extensively, the maintenance system as well as rhino activities deviating from most other rhino enclosures and behaviour known from other zoological institutions (CANTZLER 1996). During the past 6 months the five year old bull "Kai" became more and more aggressive towards his father, the dominant breeding bull of the herd, showing expansive rank tendency with territorial scent marking activities. "Kai" spent most of the daily activity time far away from its mother and the other siblings showing increasing interest in the second adult reproducing cow. This cow however had a pairbond with the breeding adult male. Although circumstances leading to a change in social status from being a subordinate male to becoming a dominant territorial bull are not yet clear for the white rhino (PIENAAR 1994), the social situation within the group at Hodenhagen indicated the right time for transfer of this young male into new territory in order to reduce aggression in the group by management.

Transfer procedure

The young bull became accustomed to a more restricted situation by being allowed to freely accompany the other rhinos in the outside enclosure only every third day, the territorial male staying in the inside barn then. This procedure started about 4 weeks prior to transport. "Kai" settled down to his inside box without any problems. The day before transport he was allowed to be in the outside enclosure together with the other five conspecifics except his father from 9 a.m. to 1 p.m.. Outside he fed on grass and drank water ad libitum before going back to his inside box. The crate had been prepared with his mother's dung in order to provide him with olfactoric familiarity on the unknown way from his box to the transport crate. The 15 m pathway to the crate was opened at 3 p.m. and the bull moved into the crate within 15 minutes without any keeper force. In the crate the bull started to feed on hay, carrots and straw immediately. The crate was lifted by crane onto the truck one hour later.

The transfer started next morning, September 22, 1996, at 8 a.m. after the bull had spent the night in the crate and fed in the morning without any stress. During transfer to the airport, we stopped every two hours to serve some water, which he refused until next day 4 p.m. at Johannesburg, where he drank 25 l.

Reloading from the truck, transfer to the aircraft and moving the crate to fly position lasted for 2.5 hours. The rhino showed no signs of stress during these events despite the considerable noise especially on Luxembourg airport.

At 10.40 p.m., about 3 minutes after take off, the rhino stood on all fours in the middle of the crate, well balancing his weight during the climb. At 11.15 p.m., the rhino had laid down comfortably, began to sleep and was laying in the same position

the next morning at 8 a.m. Balancing on all fours could be seen again during flight descent.

The rhino laid down for rest at 9.30 a.m. shortly after landing and rested in this position completely relaxed during loading from the aircraft, onto the truck and transfer through Johannesburg, where we stopped for 4 hours. He then drank - described above - and fed on alfalfa.

On the transfer to Etosha over a distance of 2.500 km we stopped every 4-6 hours for a few minutes. During the whole land transfer of about 50 hours he drank some 85 l of water and ate about 60 kg of alfalfa. Resting and standing periods changed regularly every 4-6 h.

The rhino became slightly nervous when the crate was pushed into an adjusting position at the entrance to the boma corral on September 25, but finally left the opened crate at 21 p.m., after 104 h of travel.

The way from the crate to one of the boma corrals had been prepared with his dung, which was taken from the crate through the lower back door, the bull being present still inside.

Severe distress was not observed during the whole transfer. The rhino never had to be sedated before, during or after transfer. The Berlin Zoo crate prove to be technically ideal meeting all transport eventualities with simple but perfect handable equipment.

Weather conditions during transport were excellent, starting to be sunny and dry with 15°C during the day on the way from Hodenhagen to Luxemburg, 18°C in the aircraft, sunny and dry with 20°C in R. S. A. and southern Namibia and finally 25°C sunny and dry in the afternoon of September 25 at the boma, cooling down to 15°C during the first night there.

Behaviour of the rhino during the 72 h after transfer

From the beginning the rhino was fed local alfalfa and hay, which it consumed already in the first night after release in the boma. Temperatures during the day rose from 25°C to 39°C within 72 h. During midday heat, the rhino stood or lay in the shadow of the wooden boma walls. No signs of heat stress could be observed. Breathing frequency accelerated slightly from 14 to 17/min. In order to cool down it also used the water hole which was discovered early the next morning after release into the large boma. The rhino vocalized several times during the first night. Contact frequency by the rhino to known persons decreased remarkably during the next days.

Direct body contact to one of us (M. B.) which had been tolerated by the rhino in Hodenhagen and during the whole transfer, was refused in the morning of September 28, indicated by frontal body position and lowered head toward the approacher, although there had been no stressful situation in this aspect before.

During the same day he scratched himself on one of the thorned acacia trees in the large boma. At several places on neck, dorsal shoulder area and the front part of the back, the 3-4 mm thick stratum corneum had been torn off the skin leaving several long lesions. Within a few hours these were typically covered with agglutinated plasma.

Behaviour of the rhino during the first six weeks after transfer

After the first week feeding times were changed slowly from the early morning hours to evening.

This was accepted without any problems. After two weeks "Kai" was given local grass cut from the surroundings of the boma. It was mixed up with hay and alfalfa. The rhino consumed this diet without any problems.

The waterpool inside the large enclosure had only been used for bathing during the first ten days after arrival. Later on the pool was visited up to three times a day just for water intake. Wallowing or lying in the pool were not seen any more. Lying on muddy places in the shadow of trees was observed rarely.

Hot times of the day as well as long periods in the nights were spent in a lying position. The onset of Namibian springtime with leaves growing on the mopane trees provided more shadow for the rhino by the end of October.

Activity phases consisted mainly of drinking and feeding in the early morning and late afternoon hours shortly before sunrise and sunset. After six weeks long times of feeding in the night – up to three hours continuously – were noticed.

Heat stress was observed from the mid of the first week after transport. Snorting, puffing as well as breathing frequency increased with rising temperatures. Loss of mucus fluid from the nasal holes was characteristic in the first three weeks after transfer, but normalized with advanced adaptation.

Scent marking territory developed by establishing two dung piles, spray urination was rarely observed. Rubbing posts like trees and the fence were used frequently. Searching for weak points in the fence and "working" activities at the fence could be regularly observed.

Interspecific behaviour by means of curious approaches toward greater kudus which entered the enclosure for drinking at the pool was noticed. No reactions were seen toward bigger birds like the helmeted guineafowl or the yellowbilled egret. Both species were accepted feeding next to the rhino. Noises or scents from outside the enclosure always called up an attentive standing still with orientation of ears while turning body and head toward the source.

Attempts to approach the rhino in the large enclosure four weeks after transfer, performed by one of us (H. H.) whom he had always reacted to very friendly and familiar at Hodenhagen, were stopped by the bull lowering his head, showing the horn and follow or pace the approacher well known to him.

Discussion

Today an intercontinental transfer of even a very big mammal doesn't feature any severe logistical problems or risks for an individual if transportation is carefully planned. The project shows that modern wildlife management is able to transfer specimens all over the world.

The family situation as well as age and constitution of the bull selected for the project simulates a similar situation of rhino sociology in the wild yet to be proven relevant for a wild bull shortly before establishing new territory. Individual fitness to stand attacks of potential predators can be looked upon as being optimal in this spe-

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cimen. Interspecific interactions with other ungulate species and future interactions with tourist cars in Etosha are events well known to the bull due to his semi-extensive maintenance at Hodenhagen.

Anthrax live vaccine for active immunization of hoofstock is not freely available on the European market since anthrax has become very rare in Europe and handling of live vaccines requires special caution. Official import permits are necessary even among EC states before buying the vaccine. Etosha is an anthrax endemic area and anthrax is annually responsible for a small proportion of mortalities. Game is not routinely vaccinated against anthrax but vaccination trials in elephant and zebra have indicated a booster vaccination to be necessary to build up and maintain measurable antibody. Vaccination is however required by veterinary regulation for animal imports into Namibia but exactly what sort of protection this may impact on rhinos is unknown. In black rhino in Etosha there have been three recorded deaths from anthrax in the last 15 years.

There are numerous potential threats facing an animal being reintroduced into a foreign environment and this is particularly true for a captive born animal entering a game park such as Etosha. Threats include predation, interactions with elephants, getting stuck in mud holes to mention but a few. For this reason the rhino will be closely monitored after release from the boma.

Skin lesions by contacts with acacia thorns can only happen in pachyderms that are accustomed to moderate cool climate and therefore have developed only a very thin stratum corneum. From the hypothetic point of view tropical semiarid climate with intense ultraviolet immission may induce an adaptive change of the pachyderms' epidermis in terms of higher mitosis frequency leading to a thicker stratum corneum. Further alterations of the rhino's epidermis will be carefully monitored before release.

Summary

A 5 years old captive born white rhino male showed territorial behaviour and expansive tendencies in his family group at Serengeti Safaripark Hodenhagen. Therefore the animal was transferred to Etosha National Park for adaptation as part of a reintroduction project for this species. The transfer procedure is described. Factors causing distress were minimized. Generally the rhino's behavioural patterns during transport could be characterized as being relaxed. During the first days and weeks after transfer the rhino began to adapt to its new environment. Factors influencing the rhino's adaptability and hence the probability of reintroduction success are discussed.

Zusammenfassung

Ein 5 Jahre altes männliches Breitmaulnashorn zeigte territoriales und zunehmend sozial expansives Verhalten in seiner Familiengruppe im Serengeti Safaripark Hodenhagen. Daher wurde der Bulle in den Etosha Nationalpark zwecks Adaptation im Rahmen eines Wiederansiedlungsprojektes für seine Art transferiert. Der Transport wird beschrieben. Einen Distress auslösende Transportfaktoren wurden weitestgehend vermieden. Im allgemeinen war das Verhalten des Nashorns auf dem Transport als entspannt zu bezeichnen. Während der

ersten Tage und Wochen nach erfolgtem Transport waren bereits Anpassungsvorgänge an die neue Umwelt erkennbar. Diskutiert werden die Faktoren, die die Anpassungsfähigkeit des Nashorns und damit auch die Wahrscheinlichkeit des Wiederansiedlungserfolges zu beeinflussen vermögen.

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