

CONDITIONING OF BLACK RHINOCEROS FOR REPRODUCTIVE MANIPULATION

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Introduction

The black rhinoceros (*Diceros bicornis*) is critically threatened with extinction. The African population has declined from a total of about 65,000 in 1970 (Kock *et al.*, 1991) to around 2,350 at the present time (Reece and Foose, 1995), a decline largely due to poaching. There are approximately 208 black rhinoceroses in zoos around the world (Reece and Foose, 1995), but they tend to breed poorly in captivity and, as wild populations decline, it becomes increasingly important to improve the fecundity of the species in captivity.

Methods of determining and enhancing reproductive status are imperative to assist the management of this population. Remote determination may include collection and endocrine analysis of urine or faecal matter. However, tactile contact with the animal allows for more accurate determination through the collection of blood for endocrine analysis or the performance of trans-rectal ultrasonography of the reproductive tract of females. This procedure allows imaging of ovarian activity and characterisation of oestrous cycles, early pregnancy detection, and also imaging of the reproductive tract to facilitate the development and application of methods of artificial insemination (AI) and embryo transfer (ET). The use of AI will allow a more widespread utilisation of males, whereas ET will increase the amount of genetic influence provided by females in the captive population (Godfrey *et al.*, 1991).

For these procedures to be utilised the subjects need to be cooperative, tractable animals. The occurrence of black rhinoceroses of this disposition is rare and is usually achieved by conditioning the animal to a point where it is comfortable with a particular situation. The following is a description of general conditioning procedures used with this species at Western Plains Zoo (WPZ) and the results which have been achieved to date.

Background

WPZ currently holds 4.7 black rhinoceroses. Six of the females are wild-caught animals from Chete National Park, Zimbabwe, and arrived at the zoo in February 1993, while the other female was born in Taronga Zoo, Sydney, in 1958 and arrived at WPZ in October 1991. The four males are from Fossil Rim Wildlife Center, Texas, Milwaukee County Zoo, Wisconsin, San Diego Zoo and San Diego Wild Animal Park, and all arrived at

WPZ in November 1994. The animal from Fossil Rim was wild-caught in Chete National Park, while the other three were captive-born. The animals are housed in a complex comprising an exhibit area and a breeding or holding section. Each animal is housed individually and has its own night yard and larger day yard. Every day they are moved from night yard to day yard around 8.30 a.m., and back again at about 4.00 p.m. These routine movements provide the main opportunity for conditioning and familiarisation, as they are events with which the animals have become comfortable.

Method

The type of restraint chute through which the rhinoceroses are moved is shown in Figure 1. The main feature of these chutes is that they are semi-permanent – they are set up only when animals are to be moved between yards, by swinging the two gates across to form the sides of the chute and at the same time close off the main service raceway that runs down the centre of the complex.

The aim of the type of conditioning used is to encourage voluntary entry into and standing in the chutes at any desired time, and subsequent submission to various procedures while locked in the chute. The general techniques involved in the conditioning process have been described by Edmonds (1993) and Michel and Illig (1995).

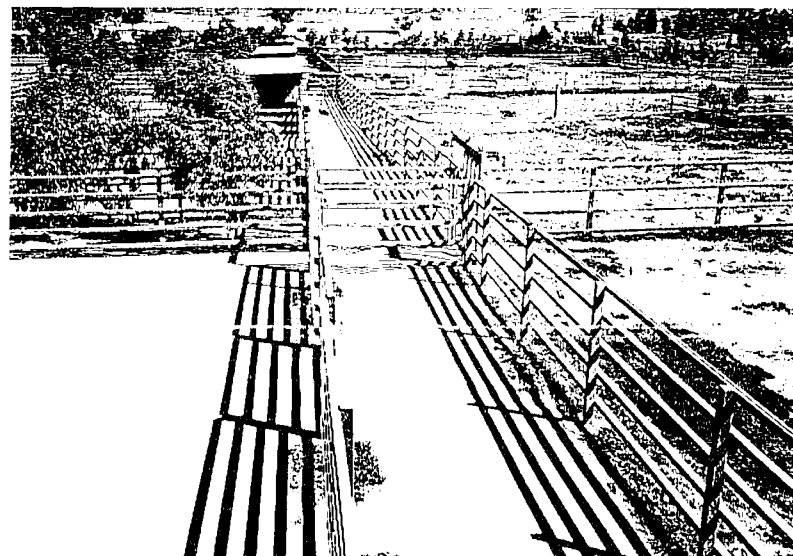


Figure 1: Restraint chute between night and day yards. (Photo: Andrew Thorne)

The first stage of this process involves making the animals comfortable with remaining in the chutes for a length of time rather than just passing through when moving between yards. This is achieved by using positive

reinforcement in the form of offering a favourite food as an incentive. Best results to date have been achieved with sweet potato (*Ipomoea batatas*), bread, and kurrajong (*Brachychiton populneus*) or she-oak (*Casuarina stricta*) browse. The animal is coaxed into the chute and hand-fed the reward, but allowed to leave in a forward direction when it desires; the keeper or trainer has the animal come to them when its name is called, and the keeper is then the 'target'. After a period of time the animal will come to the trainer when it hears the sound of gates closing as the chute is set up. This is persisted with until both front and rear gates can be closed and the rhinoceros locked in without becoming agitated. Depending on the disposition of the individual animal this may be achieved in as little as two weeks, but it can take over six months of daily training. One person can achieve this by leaving food in the desired spot, moving to the rear gate and closing it behind the animal, and then closing the front gate. This encourages exit from the chute in a forward direction only.

Two people can reach this level of conditioning more efficiently by allowing one to be the primary trainer, gaining the animal's trust using positive reinforcement, while the second closes the rear and front gates. This allows the primary keeper to remain constantly in the animal's field of vision, giving it an extra sense of security, while the other keeper moves behind the animal to the 'vulnerable' region. Having two people present from the beginning also means that the rhinoceros is less likely to react adversely when extra staff such as veterinarians are introduced in the latter part of the conditioning process.

Once the animal is accustomed to being locked in the chute at random times, it is then desensitised to various procedures and equipment required for collection of samples or performance of trans-rectal ultrasound. The gradual introduction of blood collection equipment and continuous manipulation of the ears has allowed venipuncture of the ear veins. Trans-rectal ultrasound is preceded by regular rectal palpation while the actual ultrasound equipment is brought in on the tray of a small service vehicle to which the animals have been constantly exposed during conditioning. During these procedures the vehicle is positioned close by and is in view by the animal in the chute.

Results

The practice of this type of conditioning of black rhinoceros at Western Plains Zoo began in April 1994, when it was decided to try and take regular weights of one of the females, Utahwedande, who was in a yard adjoining the main 'crush' area at one end of the breeding complex (Figure 2). The crush incorporates a set of electronic scales. From late April to late October 1994 this animal came into the crush voluntarily 85 times, about once every second day. On each occasion she was weighed and in the latter stages vaginal swabs were taken to help characterise her oestrous cycle, which subsequently assisted in timing of introductions to the male for mating. By the end of this six-month period she was becoming quite comfortable with being locked in, and blood collection was to be the next step. However, the animal had to be moved from her yard for management reasons, so intensive conditioning was postponed.

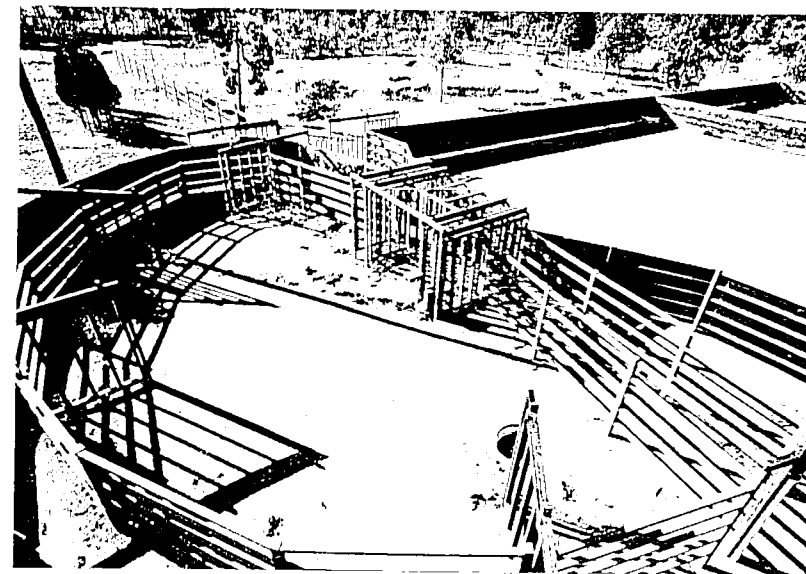


Figure 2: Main 'crush' area of complex. (Photo: Kevin Brumby)

Two of the four males are at the level of conditioning where they will enter a chute to be weighed regularly, and one will remain there to be locked in and even submit tentatively to blood collection from the radial vein in the foreleg. Both of these animals are less than three years of age and appeared to respond more quickly to the training, perhaps due to their youth and the fact that both are captive-born animals. An adult male is currently being conditioned to enter a chute with the aim of semen and blood collection. Prior to arrival at WPZ this animal had never been locked in any type of restraint facility, yet as at January 1996, after two months of conditioning, he now stands willingly in the chute as long as required (Figure 3), even with a large group of onlookers present. The next stage will be to perform rectal massage and engage the use of a purpose-built artificial vagina for semen collection.

The most significant progress to date has been attained with one of the females, Dongajuma. Conditioning of this animal began in earnest in August 1994, when a health condition referred to as hepatopathy syndrome meant she needed regular veterinary attention. Fortunately she recovered fully from this condition, partially due to the fact that regular treatment could be administered without the animal being immobilised (Blyde *et al.*, 1995). In addition Dongajuma has been conditioned to the extent where she will submit voluntarily to regular blood collection from the ear vein, rectal palpation, vaginal swabs, weighing and trans-rectal ultrasound. All of these procedures have aided in characterisation of this animal's oestrous cycle and pregnancy status after mating. The early assessment of pregnancy status allows management decisions to be made much earlier and with more confidence. This animal will submit to all of the above-mentioned procedures with almost total cooperation and

even with a large group of onlookers present. As at January 1996, Dongajuma's pregnancy status is unknown following matings in December 1995 and early January 1996. Now that her oestrous cycle has been characterised, she will be removed from the male to allow another unmated female to be introduced, and returned to him when due back in oestrus should ultrasound examination indicate no pregnancy.



Figure 3. Male Mwaniki in chute. (Photo: Andrew Thorne)

Discussion

A number of positive aspects have arisen from the ongoing conditioning of black rhinoceros at WPZ. There have been obvious benefits to management and husbandry in terms of the ability to perform detailed observations of the animals at close range, as opposed to viewing them from a distance in a large, open yard, allowing for early detection of any obvious physical problems. The increased tractability of conditioned animals also aids management, by facilitating easier movement of animals between yards on a routine basis, as well as transfer to new yards.

Apart from detailed physical observations, chute conditioning has afforded benefits in the area of health care, including administration of treatment and collection of blood samples for analysis. Without the benefit of conditioning these procedures are possible only after the animal is anaesthetised, which itself can be risky and counter-productive. The ability to take regular body weights and morphological measurements is another positive aspect of conditioning seen at WPZ, and provides obvious advantages for monitoring changes in body condition as well as growth rates, particularly in young animals.

The accurate characterisation of oestrous cycles and pregnancy status via ultrasound and blood collection for endocrine analysis have been

among the most promising outcomes of behavioural conditioning at WPZ. This is particularly so considering the otherwise difficult nature of determining the onset of oestrus in black rhinoceros and the advantages of being able to do so in terms of reproductive management of the group.

As would be expected with this type of conditioning, the amount of time and training required to achieve results will vary between animals. This has been particularly obvious with the black rhinoceros group at WPZ as a result of the variation in age and background of the animals. Three of the four males in the group are captive-born and have been subjected to various levels of conditioning since arriving at WPZ in November 1994. The youngest male (two years of age) entered the crush (Figure 2) voluntarily after having access to this area for a few hours each day for approximately one week. After 15 conditioning sessions he will enter the area cautiously when his name is called and remain there while being hand-fed, but still becomes a little agitated when attempts are made to close the gates. The second male, who is three years of age, entered the same crush area the first time he was given access, and was comfortable with being locked in this area after only six conditioning sessions. He is now an exhibit animal and will stand calmly while being locked in a chute adjoining his night yard. A third, adult male is currently being conditioned to enter a chute, and after seven conditioning sessions was comfortable with being locked in the chute. The fourth male is a wild-caught animal and has not yet been subjected to any conditioning apart from attempts to gain his trust by having him approach the perimeter of his yard to be fed. When he first arrived at WPZ, this animal would become very agitated even at the sight of a person.

As mentioned above, a number of the females, six of whom were wild-caught, have been the subjects of conditioning programs. One of these was able to be locked in a chute after only two attempts, and now submits to a full range of veterinary procedures. This animal was still quite young when conditioning began, and has always been generally placid. Another female of similar age took approximately six months to become comfortable with being locked in a crush. At the other end of the spectrum, one of the older wild-caught females is very reluctant even to enter the chute between her night and day yards while a keeper is nearby. The remaining females are at varying levels of conditioning between these two extremes.

The next stage in the conditioning program for this group of animals is to familiarise as many of the females as possible with the restraint chutes, to facilitate accurate determination of oestrous cycles for optimum breeding management, as well as for the application of assisted breeding techniques. This should be achievable in the foreseeable future with at least four of the females. The collection of blood and semen from the adult male is the immediate goal of his conditioning, while the two younger males will be trained with the aim of determining the age at which viable sperm is first produced, as well as for storage of collected semen for subsequent AI procedures.

With the goals and achievements mentioned here, the benefits of having tractable animals are quite apparent, and are partly due to the design and layout of the facility in which the animals are housed. When considering the acquisition of new species and the subsequent design of new facilities, zoos and other captive institutions should bear in mind

these advantages, and incorporate chutes and restraint and handling areas into facilities where they are likely to be encountered by animals as part of regular routines, thus enabling conditioning to be an integral part of husbandry programs.

Conclusion

The progress of these animals gives encouragement that the same is possible with most of the group of eleven at Western Plains Zoo, as well as with other animals elsewhere. With this progress in mind, the overall goal of enhancing reproduction through the techniques mentioned earlier appears to be very much an achievable one.

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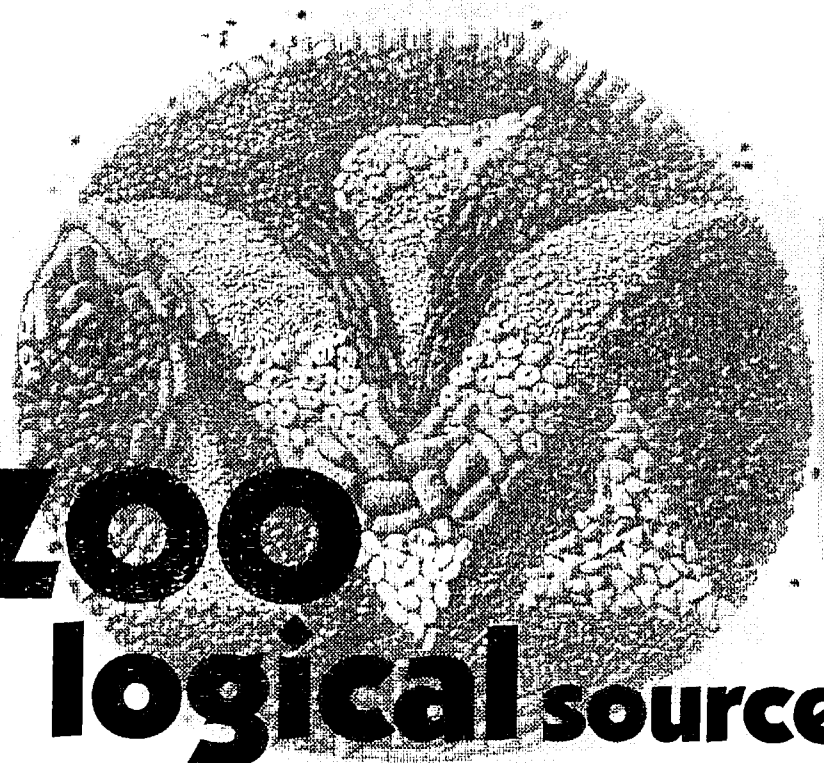
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Hornbills in Europe

The second issue of the *EPP Hornbill TAG Newsletter* is twice the size of the first, with 44 pages of long and short items on both *in situ* and *ex situ* hornbill topics. (Some of the longer ones are listed in our Recent Articles section below.) The editors would particularly appreciate articles or notes on hornbill nutrition/diets, causes of death, longevity and nestbox design, for inclusion in the next issue later this year.

A European conference on hornbill management and conservation is being planned, to take place in Ecoparque, Malaga, Spain, in March 1997: full details will be announced shortly.



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