

When Plan A becomes Plan Z: The challenges of shifting a resistant pair of Black Rhinoceros (*Diceros bicornis*) to a new exhibit through positive reinforcement and PATIENCE

By

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Introduction

Recognized as one of "Africa's Big Five" is the black rhinoceros or "hook-lipped" rhinoceros (*Diceros bicornis*). They are included in the Species Survival Plan (SSP), International Union for Conservation of Nature and Natural Resources (IUCN)-Red Date Book, Appendix I under the Convention of Trade in Endangered Species (CITES) and are categorized as a critically endangered species by the United States Fish and Wildlife Service (USFWS) (AZA, 1994). The captive population included approximately two hundred and ten individuals, encompassing all four subspecies of black rhinoceros (Fouraker and Wagener 1996). These mega-herbivores have a reputation of being elusive and unpredictable (in general, a rhino with attitude). They are crepuscular, non-ruminant browsers that populate open-range lands, tropical bush lands, savannas and forest margins. Zimbabwe, Kenya, Namibia, Cameroon and South Africa are the countries they continue to inhabit. The black rhino has acute auditory and olfactory senses, however their vision is poor. They cannot see a person or object 30 meters (m). Snorting, roaring and squealing are some vocalizations observed when rhinos encounter perceived threats or are excited. Often their charges are blind rushes designed to intimidate perceived threats (MacDonald, 1984). With this knowledge the St. Louis zoo keepers and staff were cognizant that shifting our rhinos to a new exhibit would be a significant endeavor. Both Toto our twenty-nine year old male and Betsy our thirty year old female had resided in a previous barn and exhibit for about twenty years. In this facility they routinely shifted. The last two years, before the new facility was completed, found them both sharing adjacent quarters in the Elephant Management Facility (EMF). In the EMF they resisted shifting outside the barn to an off-display yard. In addition, Betsy's left eye had been removed due to an earlier injury. Electrical barriers were going to be another new concept the rhinos were introduced to. Their previous exhibit did not incorporate electric fencing.

The existing state of knowledge about black rhinos' territorial behavior is central to their social organization (Toon and Toon 2003). Because our rhinos had been displaced from a barn and routine they were accustomed to, their behavior indicated a temporary disorientation and over cautiousness. We hoped we could eliminate these behaviors through consistent acclimation, positive reinforcement and persistence once they were transferred to their new facilities. Consistency of routine is vital in daily interaction with rhinos (Fouraker and Wagener 1996). The previously mentioned challenges were all taken into consideration in formulating a plan to shift our reticent rhinos.

The literature on black rhino behavior in captivity and in a wild setting is well documented. Even though each animal has independent characteristics, the observations and research published to date was very helpful in our acclimation process. The outcome we were striving for was that both the rhinos shift from the barn to the exhibit on cue. We aspired to achieve consistency in shifting straight to the exhibit with minimal delay on a daily basis.

Methods I

The first step in preparing to shift the rhinos to their new exhibit involved a blueprint formulated to specifically cater to each individual's idiosyncrasies. It was understood that their myopic view of their new surroundings would be one of the major factors in their behavior as well as their inexperience with electrified

barriers. The runway cables were not activated; however the electric fencing was activated on exhibit. By creative placement of favored foods and strategically placed middens or dung piles we provided rhino "road signs" leading to the locations we wanted them to ultimately shift. Keepers stationed themselves along this path as well, verbally encouraging them to move towards the exhibit and providing additional reinforcers when they did make progress. Through this, we hoped that the rhinos acute auditory and olfactory senses would aid them in their movements, the placement of these familiar objects putting them at ease with the new area. Olfactory communications are important as rhinos demonstrate through communal dung heaps (Kingdon, 1979), along with other forms of similar communications such as urine spraying and vocalizations. An abundance of urine spraying, and a variety of vocalizations were exhibited by both rhinos throughout the entire acclimation process.

Informal approximations and acclimations were also incorporated in the process, tailored to the rhinos' independent behaviors and specific reactions to the introduction of new areas. The application of acclimation training and the introduction process recommended by the Rhinoceros Husbandry Resource Manual was helpful in aiding us in our preliminary planning stages (Fouraker and Wagener 1996). However, custom made steps had to be utilized for our finicky and suspicious rhinos. The steps taken to move the rhinos towards their destinations were sometimes taken inch- by- inch, applying small reinforcers when progress was small. Occasionally, giant strides were taken, in which case "jackpot" rewards were given. Verbal cues, reinforcers and a mechanical bridge, (in this case a whistle), were employed. The bridge was used in a minimal was as a conditioned reinforcer. We were vigilant in trying to capture the rhinos' smallest intent on shifting towards the exhibit. Each acclimation and/or training period was ended on as positive a note as possible. As quoted by Karen Pryor in Don't Shoot the Dog. "End each session on a high note, if possible, but in any case quit while you are ahead"(Pryor 1999). This was a motto we tried to adhere to.

Methods II

The rhino facility is located in the Rivers' Edge section of the zoo. An immersion exhibit located on the south side of the zoo grounds. The rhinos share the facility with 0.2 Hippopotamus (*Hippopotamus amphibius*). Shifting of the rhinos began from the ~5.2 x 5.8 m barn stall, with each stall having two to three electronically controlled shift doors plus one manual door. The outside barn doors leading to the exhibit are located on the north side of the barn, with ~6.1 x 4.0 m gangways joining the barn to the exhibit. Off the main gangway leading to the exhibit is a ~2.0 x 16.5 m runway, which is on a slight incline. The gangway is enclosed on two sides by standard 7.5 centimeter (cm) metal bars, with the remaining two sides bordered by the barn and/or a heavy gauge, electrified cable. The substrate in the gangway and runway is a mulch/screening rock mix and screening rock respectively. The exhibit is about .40 hectares (ha). It includes all natural grasses, several old growth trees, and a waterfall that flows into an upper and then lower stream. There are electrified hot grasses, vines and traditional high-tension wire around key trees and along the lower gunnite walls of the exhibit. The exhibit also included a high-tension wire that closed off a small section in front of a service gate. There are three separate viewing windows for zoo visitors to observe the rhinos. The off-display yard is about .20 ha. It includes two old growth trees and is removed from public view.

Early planning stages for acclimation began in January 2002. Weather was a factor that dictated when we could commence with the outside acclimation. When the weather cooperated the outer barn doors were opened. This began the rhinos' desensitization to doors being opened and was the start of their acclimation to all the new sights, sounds and smells from outside the barn. Once the rhinos could start going outside, Plan A was initiated. This plan involved Toto being the first rhino acclimated/trained to go outside the barn. This period lasted from 1 March-6 May 2002. Our female rhino, Betsy started her "hall training", in mid-March 2002. This included her shifting from the south side of the barn, crossing a hall and then on to the north side of the barn. Throughout April 2002, our male rhino, Toto was acclimated/conditioned to the gangway and runway, followed by being closed out of the barn. During the preliminary steps he had access to the barn as a refuge if he chose to use it. At this time the exhibits' electrified barriers were activated, however the off-display and runway cables were not activated. On 6 May 2002, Toto ventured out to the exhibit for the first

time. Once he was on exhibit, he was closed in for about twenty minutes. He had an unfavorable experience by coming in contact with the electrified fencing, at the time the fencing was heavily flagged with orange tape. This experience was first and accident, then on purpose. He was given access to the barn immediately after his experience and he remained there for twenty-four hours. Toto's experience allowed us to re-evaluate the use of the electrified fencing in the exhibit during these preliminary introductions to the exhibit. It was determined that the keepers would de-activate the electricity until the rhinos were further along in the acclimation.

We then moved to Plan B, which involved Betsy. Her "gangway/runway training" began on 7 May 2002. We gave her access to stall one, the hallway, stall eight, the gangway, and the runway every night. We hoped this would provide her the opportunity to make her own choice to venture outside the barn undisturbed while having the barn as a refuge anytime she needed it. This method proved to be successful. She could be found in the mornings occasionally sleeping outside the barn in the gangway; most nights all her feces could be found there as well. To encourage her and increase her comfort level, we began leaving her feces out in the gangway and along the runway leading to the exhibit. In the wild middens or dung heaps are located like "sign-posts" along rhino paths, and territorial boundaries (Estes, 1993). The boundaries of the land of the respective rhinos is marked by a rough line of middens. Rhinos navigate by using the olfactory communications of the boundaries (Wexo, 1991). We hoped by utilizing the feces in this manner, we could make Betsy and Toto more comfortable with their surroundings. By 9 June 2002, we closed Betsy out of the barn, which encouraged her to investigate closer to the exhibit. On 14 June 2002, the runway door was closed behind her and she began spending more time eating and resting on exhibit. Finally, on 15 June 2002, she was secure on exhibit. In early August 2002, we began acclimation to the off-display yard in preparation for reintroduction with Toto. Each step that was taken involved not only middens, but strategic locations and presentations of her diet. Each meal-time the pile of food would be moved closer to the off-display yard. Being food-motivated, this method was most successful for her. Betsy did experience a seven-day regression; however once this passed, she resumed her consistent pattern of shifting.

In the meantime, while Betsy was secured on exhibit, training had not ceased for Toto. He continued on going outside the barn. He would be trained for two hours in the mornings. Betsy would be shifted out for the remainder of the day. Due to his deleterious experience earlier in the process we altered our procedure with Toto (aka "Plan C"). He would be acclimated to the off-display yard, which began on 30 July 2002. The off-display yard is to the immediate right of the runway and is accessible from a second electronically controlled door off the gangway. Once he became comfortable with this routine he would be reunited with Betsy. He was closed out of the barn on 31 July 2002. During his early morning conditioning he had access to the gangway, off-display yard and exhibit. He ate his diet from the exhibit for the first time on 10 August 2002. He also had access to the gangway off his stall every night. Like Betsy, Toto is also food motivated, so his food was moved daily, inch-by-inch towards the off-display yard, in the off-display yard, then finally to the exhibit. He also was provided middens and an abundance of keeper presence to encourage him to go to each new destination, along with varied food reinforcers. We used both the male and females feces to create the middens. They were placed in the gangway, runway, off-display yard and exhibit. We not only use the established diets but we reinforced favorable behaviors with foods such as; Whole Wheat Wonder Bread®, bananas, honeydew melons and Mazuri® primate biscuits. Finally Plan Z was instituted. The pair of rhinos were reintroduced on 29 August 2002. It was an uneventful reunion. Due to Toto's previous behavior we hoped he would follow Betsy's lead, which he did. Historically, Betsy had been dominant over Toto. He followed her onto exhibit regularly after the reintroduction. By 5 September 2002, both rhinos were shifting to the exhibit, taking the same or alternate routes on a more routine basis.

Results

Positive reinforcement and stability of routine were critical in the success of shifting our black rhinos to their new exhibit. Allowing for flexibility in the approximations involved in the acclimation process proved to be invaluable. Once the rhinos began their movements towards shifting to the exhibit, we were able to alter

husbandry routines accordingly. Alterations in this instance included variations of food presentations, creating middens along their travel path, changing time patterns concerning specific locations and the constant presence of keepers to apply reinforcers when applicable. The rhinos responded favorable to these methods in a sense dictating their own progress and moving at their own pace.

Toto's first acclimation/training process spanned 4 April-13 April 2002. Due to his experience once on exhibit, he was given time to mentally and physically recuperate and restart his training. His shifting plan was altered and continued within smaller time frames and in conjunction with a plan initiated with the female. He ultimately shifted to the exhibit traveling through the off-display yard as opposed to the runway. Through the months of May-August 2002, Toto shifted with more confidence in the new areas. By mid-August he ate his first meal from the exhibit. This success lead to the reintroduction with Betsy and finally the two rhinos were both secured on exhibit by 5 September 2002. Concurrently, Betsy's training process encompassed 7 May-15 July 2002. She appeared to take a more cautious, slow approach to shifting to the exhibit. This most certainly was a factor in her uneventful success. The key factor of valuable time was given to keepers and staff to allow the rhinos to shift at their own pace. The acclimation/training process highly benefited from this gift of time. The entire summer of 2002 was efficiently utilized for the rhinos shifting program.

Discussion

The primary goal of this program was to shift a pair of reluctant rhino to a new exhibit. In the past two years they had resisted shifting from their temporary barn to outside quarters. An adaptive management program by keeper staff for consistent shifting to exhibitory is always being fine-tuned (Kock, 1991). In hindsight, because of Toto's experience with the electrified barriers a protocol to de-activate the electricity for future introductions to new exhibits could be adopted. It should be stated that the rhinos' previous inexperience with the electric fencing could have contributed to Toto's unfortunate experience with it. As with Betsy's access to the exhibit, the electricity was de-activated. Otherwise, positive reinforcement, favored food items, verbal cues and flexible approximations were the primary aids in meeting the goal of the process. The advanced age of both rhinos was not considered in the implementation of this process. The age of the animal does not seem to influence its adaptability (Rogers, 1990).

Unlike the female rhino, the male was the more energetic and zealous regarding his keepers and surroundings. Although he did shift to the exhibit in a shorter period of time, his excitability created an unpleasant first experience. Toto has an exploratory nature that sometimes creates unforeseen challenges (for himself and his keepers). This caused an experience that could possibly have been minimized. Black rhino are inherently nervous and will charge at a moments notice. "They automatically interpret any motion as a predator, or a threat" (Sanford and Green 1987). Toto's original approximations were re-evaluated and altered to allow for a more comfortable shifting process to match his personality. His goal was attained using the alternative method. The female rhino, Betsy was cautious and more deliberate with her reactions to the new environments. This calmer approach while taking a longer chunk of time, allowed for a more efficient and progressive shifting process for her. The successive approximations, positive reinforcement, flexibility and established routines were all integral to the success of this program.

Having succeeded in our goals of consistently shifting the rhinos to their new exhibit, other challenges can now be addressed. One is the gradual acclimating of the rhinos to the presence of activated electrical barriers which is a future goal. A method to meet this goal could be to introduce the concept section by section, which the keepers at the St. Louis zoo have initiated. Another challenge involves the high percentage of time our rhinos are not visible to the public. Creating a more stimulating exhibit through the use of enrichment and/or more advanced operant conditioning could address this issue, along with securing them in the exhibit overnight to provide them with longer opportunities of "quiet" exploration. The rhinos have now made the new barn and exhibit "home" for over a year. The summer of 2003 proved to the keepers and staff that the labors of the previous summer paid off. Once the 2003 season began, it only took the rhinos about four weeks

for them to re-adopt the shifting routine. They both shifted to the exhibit by 0900 every day. This showed that their sense of normalcy in routine was established.

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