

# **REPRODUCTIVE FAILURE IN SOUTHERN WHITE RHINOCEROS: TESTING HYPOTHESES WITH BEHAVIORAL AND HORMONAL DATA FROM CAPTIVITY AND THE FIELD**

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## **SUMMARY**

In the fall of 2000 the endocrinology and behavior departments joined forces to conduct the zoo's first long-term field study of a rhinoceros species in a study aimed at understanding the reproductive biology and behavior of the white rhinoceros. Our previous research efforts with the captive population generated a host of new questions that could only be adequately addressed by detailed studies of wild rhinos. Over the past four years we collected behavioral and hormonal data at the San Diego Wild Animal Park and other zoological institutions and found that the female reproductive cycle was highly variable. Sometimes these data pointed to an estrous cycle recurring about every 35 days, and sometimes about 70 days passed between cycles (Patton et al. 1999). In each case progesterone metabolites found in feces remained high between fertile periods, dropping to low levels at the same time that the female began to show behavioral signs of estrus and became the target of male courtship overtures. Some of the long cycles appeared to be associated with uterine pathology and/or premature termination of a pregnancy, suggesting that long cycles might be abnormal. However, researchers in Europe made similar findings, but suggested that the long cycle was typical for the species. Data from the field were too limited to provide an answer to this controversy. It is surprising that we do not yet fully understand this basic aspect of reproductive biology in the white rhino in the new millennium. Clearly, this issue must be resolved if we are to adopt an informed management strategy for dealing with cases of reproductive failure. What is normal for this species? Which female cycles should be considered pathological and merit remedial intervention? The answer lies waiting for discovery in a healthy, reproductively active wild population.

We found just such a population at the Umfolozi Game Reserve in Kwazulu-Natal, South Africa. Early in this century the white rhino population had been decimated by poaching, reducing their numbers to about 50 individuals, and it was only through the efforts of enlightened managers at Umfolozi that the species was saved from extinction. Under their protection the population grew rapidly, and subsequently were translocated to many other reserves. Today they number nearly 10,000. Umfolozi is comprised of bushveld habitat, characterized by open short and long grass grazing areas interspersed with dense acacia thickets. The reserve harbors one of the densest populations of game in all of Africa. Common species include black rhino, cape buffalo, giraffe, zebra, impala, nyala, cheetah, lion, and elephant. Behavioral ecologist Angela White was hired by CRES to radio-track white rhinos to collect both behavioral data and fecal samples to be analyzed

in the endocrinology lab at CRES. Small transmitters are implanted near the base of the horn, which will emit a signal for approximately two years. Tracking rhinos has proven difficult, as they are extremely wary of humans; one must always approach the rhino from downwind and, although rhinoceros vision is poor, take care not to be seen by the ever-present oxpeckers. These birds live in a mutualistic arrangement with rhinos, feeding on ectoparasites living on the rhino's skin and signaling alarm to the rhinos when they detect the approach of a human.

Although this project has been underway for only seven months, several females have already come into estrus, perhaps stimulated by the flush of fresh green growth that followed the beginning of the rainy season in September. Preliminary data from behavioral observations suggest that these wild females do indeed experience approximately 30-day cycles. Estrous females are easily recognized by the sustained presence of a dominant territorial male, which often accompanies the female for up to two weeks prior to mating. At this time observations are intensified to be sure that data are gathered during the brief 1-2 day fertile period. During the period leading up to peak estrus the female generally rebuffs the male's advances, keeping him at a distance by snorting, snarling, and lunging at the male. The male appeases the female by making a hiccing sound when he approaches her. Eventually, the female will allow the male to advance and rest his chin on her hindquarters, and mating follows soon thereafter. We hope to obtain detailed data on these behavioral processes that predict impending estrus, and determine how they relate to levels of reproductive hormones. In addition to providing conclusive data regarding the length of the estrous cycle, we hope to obtain a better understanding of reproductive strategies, competition, mate choice, and acoustic and olfactory communication in wild rhinos, and make comparisons with similar processes observed in captivity. Fecal metabolites of corticoid hormones, which can be an indicator of stress, will also be assayed to provide a basis for comparison with captive populations. These data may provide new insight into the potential role that stress may play in inhibiting reproduction in captive populations. Ultimately, we hope that this research will make meaningful contributions to the conservation of the species, both in the wild and in captivity.

## LITERATURE CITED

Patton, M., Swaisgood, R., Czekala, N., White, A., Fetter, G., Montagne, J., & Lance, V. 1999. Reproductive cycle length in southern white rhinoceros (*Ceratotherium simum simum*) as determined by fecal pregnane analysis and behavioral observations. *Zoo Biology*, 18, 111-127.