



CRES

CONSERVATION AND RESEARCH FOR ENDANGERED SPECIES

Scientific Detective Work in Practice:

Trying to Solve the Mystery of Poor Captive-born White Rhinoceros Reproduction

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At the Hluhluwe-iMfolozi Park, wild white rhinos breed like fleas. When brought into captivity, they still breed well, but their captive-born offspring do not.

In this day and age when there seems to be a high-tech solution available to solve any of society's ills, one would think that it would be a rather simple matter to get animals "to do what comes naturally." Indeed, the San Diego Zoo and the San Diego Zoo's Wild Animal Park have remarkable track records for establishing successful captive-breeding programs for animal species of all sorts. And the Arnold and Mabel Beckman Center for Conservation Research at the Park has played an integral role in these programs for "problem" species, seeking answers in studies on the behavior, genetics, physiology, and health of the species. But what would you say if I were to tell you that we have a breeding problem with rhinos? A prominent symbol of the Wild Animal Park, anyone touring the park on the monorail will hear about the many successes we have had: more than 50 Indian rhinos and nearly 100 southern white rhinos born at the Park alone. Despite this remarkable success, the white rhinos are heading for a population crash—at the Wild Animal Park and captive facilities worldwide—if we don't solve a major problem soon.

With so many births, what problem could there be? Neither the European nor North American captive white rhinoceros population is self-sustaining. Many of the founding population, given appropriate husbandry and management, reproduced well, but reproduction in captive-born females has been extremely sluggish. Most of

gest that the short ones are normal. In captivity, the long cycles are associated with chronic uterine infections, which may interfere with conception or pregnancy. Although we found some anomalies in the reproductive cycle, they are no more common in captive-born than in wild-caught females, and

the wild-caught females that formerly drove population growth have died or reached reproductive senescence in the past decade. Why don't these captive-born females reproduce? This represents one of the great unsolved mysteries of animal reproduction in zoological institutions, a problem which has remained intractable despite considerable scientific effort.

Significant headway has been made in trying to determine what factors cause reproductive failure in captive-born white rhino females, with much of the work done here at CRES. For example, working with CRES endocrinologists, I have investigated the pattern of reproductive behavior and hormones across the reproductive cycle. Some females have long cycles and some have short ones.

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REPORT

SUMMER 2006

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Marvin Jones Remembered

*Celebrating the life of our
legendary zoo registrar.
See page 4.*



Annual Cans for Critters Jamboree!

*Students and teachers work
hard to raise dollars for
endangered species.
See page 5.*

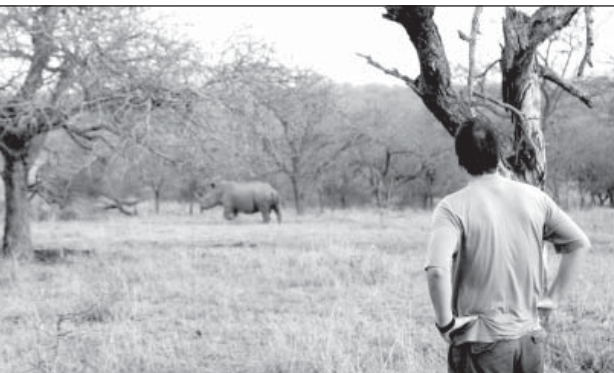


Save the Date for Celebration!

*The San Diego Zoo is
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"wildest" food and
beverage party!
See back cover.*

Scientific Detective Work in Practice

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Author Ron Swaisgood collects behavioral data on wild white rhinos at Hluhluwe-iMfolozi Park in South Africa.

so do not explain why more captive-born females fail to reproduce. We also circulated a questionnaire worldwide, interviewing rhino keepers about their rhinos. Both data from Wild Animal Park and the questionnaire indicate that captive-born females show normal signs of behavioral estrus and reproductive behavior, comparable to wild-caught females, indicating that the problem arises after the animals have copulated. Thus, the problem must occur during conception or pregnancy, taking us one step closer to understanding the problem.

But even if we know where in the chain of events the weak link occurs, this does not mean that we understand why captive-born females have this problem and wild-caught females don't. We were also able to rule out some of these "why" hypotheses. A widely accepted hypothesis was that the mothers—or other older wild-caught females—were dominant and suppressing reproduction in the younger captive-born females (a phenomenon that usually occurs in species more social than rhinos). In fact, reproduction was significantly higher when captive-born females were housed with their mothers.

Another key finding from these studies is that the problem must have its roots in the development of rhinos in captivity. In our studies, captive-born and wild-caught females were kept at the same institutions and exposed to the same social, environmental, and management circumstances, yet the birth rate for captive-born females was significantly less than that observed in wild-caught females. Since all factors were held constant at the time of our studies, our results point strongly toward a negative impact of captivity during the development

of captive-born females; that is, the circumstances of these rhinos differed only during their early years, with some females developing in the wild and some in captivity. Thus, the question that needs answering is, "Why is captivity having a different effect on captive-born and wild-caught females?"

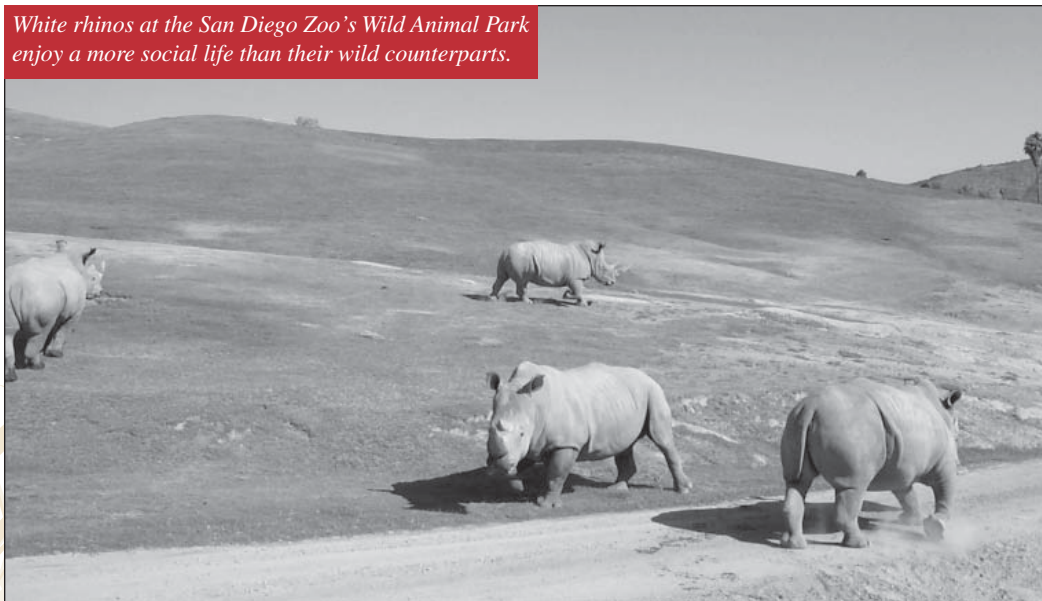
Our next step was to move our studies to the wild, where we could learn more about what takes place in a natural rhinoceros community: reproductive behavior and hormones, courtship and social interaction, and all aspects of development. We spent three years radiotracking wild rhinos at the Hluhluwe-iMfolozi Park in South Africa, literally the cradle of all southern white rhinos alive on the planet today. Among other important findings, these data helped us to articulate new hypotheses for why white rhino females fail to reproduce in captivity.

Step by step we get closer to an answer. At times frustrating, at times fascinating, this is the way that conservation science often moves forward. We are tantalizingly close but still can't quite identify the critical factor(s). After chatting with colleagues, I've come up with a number of new hypotheses. Some of these involve the more intense social environment in captivity compared to the wild. In captivity, males can shadow females—even young ones—and harass them, whereas in the wild, a male has to cover more territory

and can only afford to court females that are likely to be fertile soon. Captive white rhino females also appear to copulate for the first time at an earlier age than their wild counterparts. Do these precocious copulations damage the reproductive tract and cause many of the chronic uterine infections that are common in these females in captivity? Or maybe it has something to do with differences in nutrition or infectious agents?

In the next—and hopefully final—phase of this work there is a new plan of attack, focusing on development and where reproduction starts to break down on the captive-wild continuum. Clearly, with the reproduction crisis looming as the aging reproductive females die off, we do not have the time to conduct a longitudinal study of development. Only retrospective analysis can accomplish this goal in a timely manner, so a new and improved questionnaire is in order. With funds from the International Rhino Foundation, I have hired two assistants, Shannon Chapman and Dale Airtion (both experienced rhino researchers involved in our previous studies), to spend the year interviewing managers of small private game reserves in South Africa. There are hundreds of these reserves and they are sitting on a goldmine of information. These reserves vary from rather zoo-like to almost wild, making them the perfect place to address our question. First, we contact them by phone to ensure that they have all records available, and then we schedule an in-person interview lasting an

White rhinos at the San Diego Zoo's Wild Animal Park enjoy a more social life than their wild counterparts.



hour or more. We are using a systematic questionnaire format to get information on social, nutritional, ecological, and reproductive histories, during development and as adults. It is designed so that we can test specific hypotheses, which can be supported or ruled out by the data. We are finding that these managers really enjoy talking about their experiences with rhinos on their properties. We are also tackling these same issues by re-surveying the worldwide zoo rhino populations, using the new questionnaire focused on developmental questions. Dr. Lisa Nordstrom, funded by donations from the Heller Foundation of San Diego, will join our team to perform this aspect of the research, using her stellar knowledge of biostatistics.

In a year's time, I hope to report a more definitive answer and that our new data will pinpoint those factors in captivity responsible for the captive-born white rhino reproduction crisis. More importantly, I hope to begin to *apply* these findings by making recommendations on how to change white rhino management to address this problem. If this crisis can be averted, we will be able to continue to enjoy our white rhinos at the SDZWAP and elsewhere for the foreseeable future. The captive rhino populations, of course, are here for more than our enjoyment. These populations are also important to safeguard against their extinction should their situation in the wild take a turn for the worse.

INSIDE
CRES

Conservation Education Specialist Joins CRES

In responding to the growing need to engage the community in conservation science, we are pleased to announce that Maggie Reinbold has joined our team as the first CRES Conservation Education Specialist. Maggie has a B.S. in Zoology from San Diego State University and has just completed her Masters in Evolutionary Biology, which focused on the conservation genetics of desert aquatic insects. She has taught science in kindergarten through university classrooms and has engaged teachers and students with science outreach throughout San Diego County, Baja California, and the Arctic. Maggie came to CRES in the summer of 2005 as a research fellow with the Applied Animal Ecology and Genetics divisions and then stayed on part time in Genetics to work on endangered primates. She brings an amazing set of skills to her position with experience in field biology, laboratory procedures and techniques, and hands-on classroom instruction. Her position kicked off with the development and implementation of a summer institute in conservation biology for high school life science teachers, focusing on various aspects of the biology of the California condor. Additionally, Maggie has begun designing and equipping our Conservation Learning Lab, a high-tech research laboratory that will provide teachers and students with access to a wide range of equipment and techniques for conservation science activities involving reproduction, behavior, endocrinology, pathology, and the genetics of endangered species. Maggie will serve as the interpretive link between CRES researchers and the community as she focuses her efforts on creation of online inquiry-based classroom lessons, new content for guided tours, and further professional development opportunities for teachers and students at CRES.



Maggie Reinbold, Donald and Marie Van Ness Fund Fellow at the San Diego Foundation

CRES Grants

Conservation and Research for Endangered Species (CRES) is grateful to the following for their support of imperiled wildlife:

The **Butcher Fund** gave a grant that will provide the Panda Conservation Team with a laptop and software for behavioral observation studies and will allow the purchase of a staining system for the CRES Pathology division. The **California Department of Parks and Recreation** approved an additional payment for the Arnold and Mabel Beckman Center for Conservation Research. The **International Rhino Foundation** gave a grant to make possible a rhino reproduction study. The

J. W. and Ida Jameson Foundation and the **Maurice Masserini Trust, Wells Fargo-Trustee** gave grants which will be directed toward the purchase of a photovoltaic array for the Botanical Conservation Center through the Applied Conservation Division. The **Llagas Foundation** gave a grant that will be used to purchase slides for the Pathology Division. The **Mission Valley Community Foundation** and the **Donald and Marie Van Ness Fund at the San Diego Foundation** gave grants to provide CRES with summer interns for 2006. The **Mission Valley Community Foundation** grant is in memory of Dr. Werner Heuschele. The **Money/Arenz Foundation** gave a grant which was

directed to the yellow-legged frog recovery project. **Polar Bears International** gave a grant for a polar bear audio study. The **Foundation for Sustainability and Innovation** gave a grant for the purchase of a seed separator for the Botanical Conservation Center for seed banking. The **Takahashi Family Fund at the San Diego Foundation** and the **Walton Family Foundation** gave grants that were directed toward the purchase of equipment needed to establish a teaching laboratory at CRES. The **Walton Family Foundation** also gave to the CRES Endowment Fund. The **Steven and Carole Weinberg Foundation** gave a grant to provide the Pathology Division with a serum bank.