CONSERVATION UPDATE

SAN DIEGO ZOO INSTITUTE FOR CONSERVATION RESEARCH

THE HEART AND SCIENCE OF SAVING WILDLIFE™

Simon Madill

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SLOW BUT STEADY: Desert Tortoise Recovery

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It's my first trip to a parched land where the scenery is hot and prickly to the touch. I've driven to the Mojave Desert to discover more about the rocky road to recovery facing the threatened Mojave desert tortoise. Getting out of the car, the heat instantly feels unforgiving, and through the settling dust of the dirt road, a cascade of questions spring to my mind. Where did I pack my sunscreen? What is happening to the Mojave population of the desert tortoise? Has the threat of disease been satisfactorily abated? Has loss of habitat been slowed and degraded lands restored to improve animal health and productivity? Are reintroductions of tortoises monitored and improved upon to advance the recovery process? I've arrived at the Desert Tortoise Conservation Center, Las Vegas, and I have a hunch the San Diego Zoo Global team will help me find my answers. And my sunscreen.

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WORKING TOGETHER TO PROMOTE RHINO REPRODUCTION

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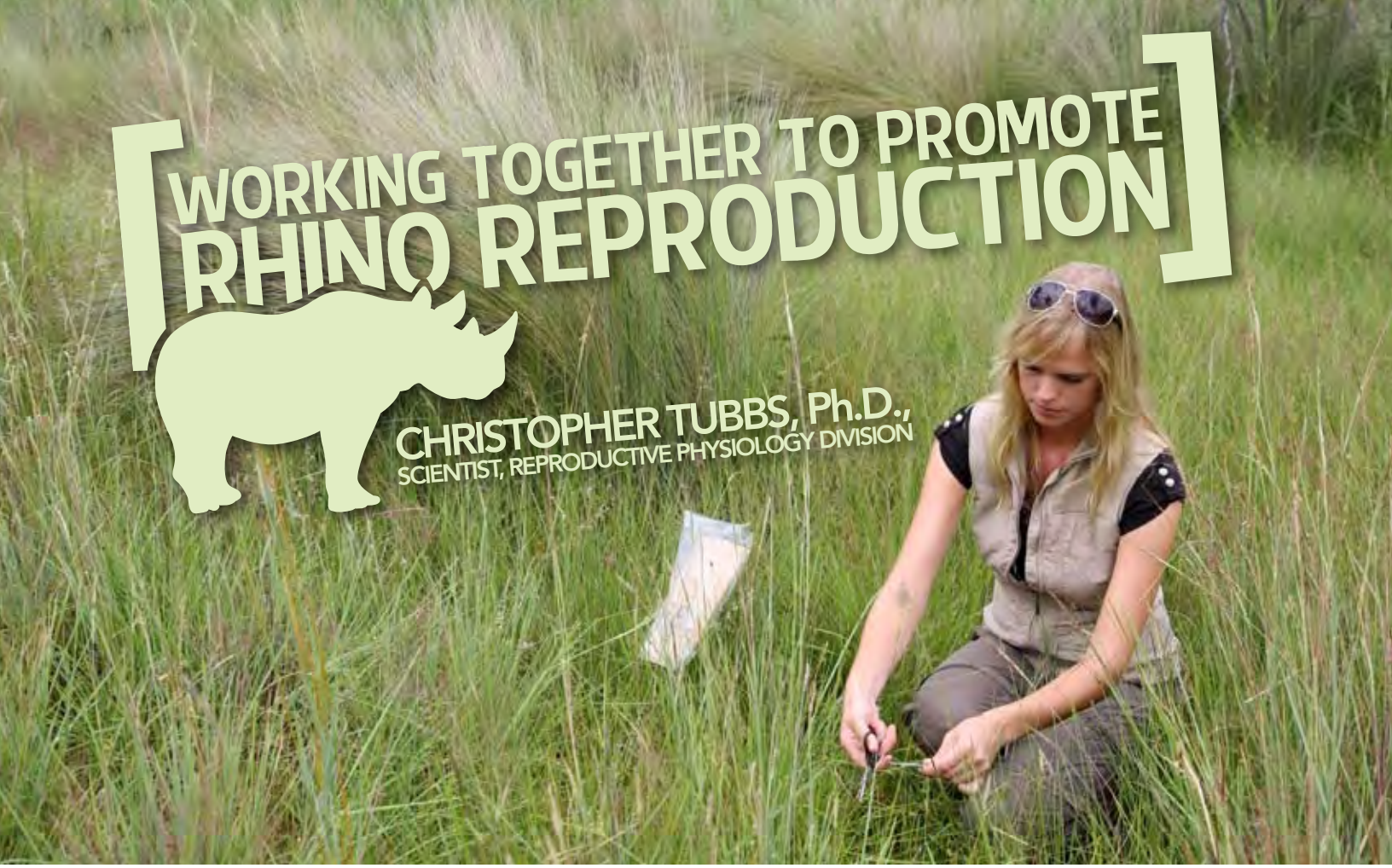

One step closer to solving a rhino reproductive mystery: Dr. Annemieke van der Goot collects samples of spear grass from South Africa's Lapalala Wilderness Reserve. These samples will be sent back to the Institute's Reproductive Physiology lab to be analyzed for phytoestrogen content.

TWO years ago, in the Spring 2010 issue of *Conservation Update*, I shared the Reproductive Physiology Division's research on a long-standing conservation problem: Why do zoo-born female southern white rhinoceros fail to reproduce? This work is now coming to fruition, with the help of some terrific collaborators around the world.

We have focused on compounds called phytoestrogens that are produced by plants such as soy and alfalfa, commonly fed to rhinos in zoos. Phytoestrogens get their name (*phyto* = plant) because an animal's body "sees" phytoestrogens as the natural hormone estrogen. This is because phytoestrogens activate the receptors that regulate estrogen function. Normal estrogen function is precisely controlled. However, inappropriate estrogen—such as signaling by foreign chemicals like phytoestrogens—can cause permanent reproductive damage in some species.

Our research started in the lab, measuring how strongly phytoestrogens activate white rhinoceros estrogen receptors. We performed the same experiments using greater one-horned rhinoceros estrogen receptors. Both the African and Asian rhino species receive similar diets in zoos, but unlike white rhinos, greater one-horned rhinos reproduce well in a zoo setting. We suspected there might be species differences in receptor activation by phytoestrogens to go along with differences in reproductive success. Nearly four years later, we had a major breakthrough: we found that white rhinoceros estrogen receptors are activated more by phytoestrogens than greater one-horned rhinoceros receptors! This is exciting news, but it doesn't mean phytoestrogens cause white rhino reproductive problems. To prove that, we have teamed with a group of eager collaborators, merging field and laboratory expertise to tackle the problem.

Because we know which phytoestrogens most strongly activate white rhino estrogen receptors, we are now determining if they are present in rhino diets in zoos. We do this by collecting food items and testing the ability of food extracts to activate rhino estrogen receptors. This takes a great deal of effort, because captive rhino diets are surprisingly diverse. Some rhinos graze on pasture grass, some eat hay, some eat alfalfa,

and many eat food pellets made from soy and/or alfalfa. Some rhinos live in exhibits with other species that receive different diets, but few if any of those species defend their food from a hungry rhino, so rhinos eat whatever they want! In the lab, we are testing as many of these food items as we can, collected by rhino keepers across the country. In collaboration with our Applied Animal Ecology Division, our data is combined with the results of a survey of white rhino diets and births from zoos around the world. Our findings will, we hope, give us a better idea of the role that phytoestrogens may play in reproductive failure. In partnership with researchers from the Institute for Breeding Rare and Endangered African Mammals, we now have the exciting opportunity to evaluate phytoestrogen levels of diets from white rhinos that are reproducing well. Veterinarian Annemieke van der Goot of the University of Western Australia is collecting samples of the white rhino's favorite grasses from the Lapalala Wilderness Reserve in South Africa. They will be sent to our lab for analysis in our receptor activation experiments. If phytoestrogen content in wild diets is low compared to zoo diets, we will have one more interesting piece to add to our research puzzle.

Zoo diets for southern white rhinos may activate their estrogen receptors, so Dr. Christopher Tubbs analyzes food extracts to compare them against wild diets.

Because the biology of a 5,000-pound rhino can never be completely recreated in a test tube, our next step will be to establish white rhino feeding trials that measure phytoestrogen levels after they eat diets lower in phytoestrogens compared to typical zoo diets. This project is shaping up as a tremendous collaboration between keepers, animal care managers, veterinarians, and scientists that should provide the final piece of information needed to solve a conservation problem that has plagued us for decades.