

Rhino Husbandry Manual

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PREFACE

A rhinoceros husbandry manual is a dynamic document, representing our current understanding of the rhinoceros in managed settings, and presenting a diverse set of parameters and recommendations for managing this unique, iconic mammalian taxon in zoo collections. In 1996, the Association of Zoos and Aquariums Rhino Advisory Group (AZA RAG) and the International Rhino Foundation (IRF) collaborated to produce the first Rhinoceros Husbandry Resource Manual, published by the Fort Worth Zoo and edited by Michael Fouraker and Tarren Wagener. This excellent reference has weathered the times, and with great relevance to rhino husbandry in 2013, the historic document has formed the basis for this new edition.

Recognizing that the depth of our rhino management experience has improved, that our skills, tools and techniques have been refined, and that targeted research projects have shed new light on our base of knowledge, the RAG and IRF have worked to gather crucial new information and input to update the Rhinoceros Husbandry Manual. At the 2009 bi-annual working meeting of the AZA RAG, held at Fossil Rim Wildlife Center, the Steering Committee formed a working committee and developed the outline for the 2014 Rhinoceros Husbandry Manual. A second planning meeting was held at the San Diego Zoo Safari Park in 2010 to review progress and refine the production process.

Management of four rhinoceros species, white rhino, black rhino, greater one-horned rhino and Sumatran rhino, all established in zoological facilities in North America, is the focus of this manual. The life history and distribution of the Javan rhino is discussed in Part I and in Appendix A. This manual presents recommended guidelines for the successful maintenance of rhinos in the zoo setting given the scientific data currently available. These guidelines represent current optimal recommendations for participation in the AZA's Species Survival Plans (SSPs) and in no way reflect U.S. Department of Agriculture (USDA) minimum standards. Although necessary for participation in rhinoceros SSPs, the guidelines do not supersede USDA mandates for the exhibition of rhino species. Additional information concerning these recommendations may be gathered by contacting the respective SSP coordinators. It should also be emphasized that these recommendations are guidelines, and in all

cases common sense concerning enclosure design and routine zoo animal management should be used. Parameters exclusive to an individual institution also must be considered (e.g., climate, local and state laws, etc.). As a living document, the AZA RAG and IRF intend this information to be revised and updated on a regular basis. The electronic format provides opportunities for revision as new information comes forward and/or as new husbandry and management techniques are developed. While much data was compiled for this manual, many holes in the knowledge-base still exist. It is our intention that this manual be the catalyst for scientific inquiry into the management of rhinos in zoos and conservation centers. To that end, there have been updates made to this document over the years, and this DVD is the most up-to-date document available at this time. The goal is to be able to update the manual quickly and to keep the most relevant issues available to rhino managers and facilities that may decide to work with rhino species in the future. The format has been developed in anticipation of the inclusion of reports and projects developed through inter-national collaboration between SSPs, EEPs and TAGs in other zoo associations and regions. We hope you find this document to be an important resource for rhino management.

PART I CRISIS FOR RHINOS

In the middle of the last century, all five rhino species were widely distributed and most abundant throughout Asia and Africa. As of mid-2013 only about 29,000 rhinos of all kinds survive in the wild. Another 865 exist in captivity (Table 1.1). However, more than 80% of these rhinos, both in the wild and in captivity, are of a single species, the white rhino (*Ceratotherium simum*). The other four species combined comprise fewer than 8,500 individuals. Populations have been growing for the past several years for all but the Sumatran rhino (*Dicerorhinus sumatrensis*), which has rapidly decreased, and the Javan rhino (*Rhinoceros sondaicus*), which we believe has remained relatively stable (Fig. 1.1). Although there has long been a debate among conservationists as to whether subspecies are different enough that they should be conserved as separate units, in some cases, such as the Sumatran and Javan rhinos, subspecies issues are superseded by the species' severely limited numbers. This provides only a small number of management options—the least of which may be genetic in nature.

The Javan rhino is the rarest of the species, with a total population estimated at between 35 and 44 in the wild and none in managed breeding situations. The last individual of the Javan rhino subspecies *Rhinoceros sondaicus annamiticus* was declared extinct in Vietnam in 2010 by World Wildlife Fund and the International Rhino Foundation; now only one population remains in Indonesia's Ujung Kulon National Park (Brook et al., 2012). However, while the Javan rhino is fewer in number, the Sumatran rhino's rapid decline (roughly 75% over the last 20 yr) makes it the most critically endangered of all the rhino species and perhaps of any large mammal. The IUCN officially declared the northwestern black rhino (*Diceros bicornis longipes*) extinct in the wild in 2013, and the northern white rhino (*Ceratotherium simum cottoni*) became extinct in the wild in 2008.

There are, however, success stories in rhino conservation. With concerted government commitment and efforts by dedicated conservationists, including protection and consolidation of populations, three of the five rhinoceros species have slowly recovered from the brink of extinction. Southern white (*Ceratotherium simum simum*) and greater one-horned or Indian rhinos (*Rhinoceros unicornis*) have both come back from fewer than 100 animals in the early 1900s, now numbering more than 20,000 and 3,000 respectively. Black rhinos (*Diceros bicornis*) faced a serious poaching crisis in the early 1990s, which led to the loss of 97% of the population. Management measures, including consolidation of populations through targeted translocations, strategic dehorning, and active protection have helped the species recover to more than 5,000 animals, most living in fragmented populations. Significant black rhino populations now survive in only nine countries (South Africa, Namibia, Kenya, Zimbabwe, Tanzania, Zambia, Malawi, Swaziland and Botswana, in descending order of population size). Unfortunately, rhino poaching is now rampant again, with poaching losses threatening to overshadow previous conservation progress in population growth.

The Cause of the Crisis

Rhino species have faced many different challenges over the past few decades. As with many endangered species, fragmentation and loss of habitat is an important factor, but not the major cause of the rhino's decline. The greater global problem is overexploitation through poaching for rhino horn. Rhino horn has been used for centuries in traditional Chinese medicine as a fever reducer. China has been the primary consumer country until recently. Now, the burgeoning market is in Vietnam, where the economy has rapidly grown and purchasing power is increasing. In addition to traditional use, rhino horn also has been touted as a cancer cure and a purported hangover preventative in Vietnam. It also is given as a high-value gift item. In the Middle East, horn has been used to make dagger handles that confer social status, but this threat has paled in comparison to the growing consumption in Asia.

Africa

Rhino poaching is driven by crime syndicates that might have entered Africa as infrastructure (e.g., roads and building construction), and extractive industry (e.g., mining) contracts have been awarded to Asian companies operating in Africa. Poaching syndicates are highly systematic and strategic; poaching gangs are generally well-funded, well-equipped, and ruthless. From 2000-2007 there was a reduction in poaching in southern Africa, partly because of increased anti-poaching efforts. Since 2008, however, poaching has been on a steady increase. In South Africa alone, 333 rhinos were killed in known poaching events in 2010; by 2012, numbers had increased to 668 (about one rhino every 9 hr) and by the end of 2013, three rhinos were lost in South Africa to poaching each day (Fig. 1.2). The year 2013 may well prove to be the tipping point for African rhinos, with population growth unable to keep pace with poaching losses.

Asia

Nepal and India's greater one-horned or Indian rhino also is threatened by active and expanding poaching, but so far, to a lesser degree than African rhinos. In Malaysia, Sumatran rhinos have essentially been wiped out in the past ten years by poaching and habitat loss with recent information suggesting that only a handful of animals remain in one area in the state of Sabah.

Rapid decrease in numbers due primarily to poaching is the major, but not the only, problem encountered in the conservation of rhinos. Habitat loss and fragmentation is occurring in many areas, which leads to small isolated populations. Small and fragmented populations make it difficult for genetic exchange and adaptation to changing environmental conditions. This also may lead to long-term reproductive abnormalities as animals are less and less able to find each other to breed.

In Indonesia, rhinos are under greater threat from habitat fragmentation and loss to infrastructure development such as roads. Even with protection, with the exception of one national park (Way Kambas), Sumatran rhino numbers continue to slowly decline. Fortunately to-date, documented poaching has been rare in the last stronghold for Javan and Sumatran rhinos. If Indonesia's populations of rhino were to experience the poaching pressure seen in Africa, these two species would be wiped out within months.

Conservation of Rhinos

If rhinos are to survive long-term in the wild, they must be intensively managed and protected, with a spectrum of options to maximize options for the future need. These options represent a continuum with respect to intensive management required and range from management within protected areas or semi-free-ranging reserves to conservation centers to zoos.

Zoos and conservation centers may increasingly provide key portions to the available options within the conservation spectrum. Animals in these facilities can play a number of important roles, serving as: (1) ambassadors for their wild counterparts; (2) instruments for education for local communities and the general public-at-large, (3) research populations that allow scientists to learn as much as possible about the basic biology of species (which may be difficult to study in nature); (4) 'flagship species' to protect and call attention to other threatened wildlife that share their habitat; (5) an 'insurance' population that can be used to re-establish or revitalize wild populations that have been severely reduced or extirpated (provided that adequate protection measures can be put in place in former ranges); and (6) a means to attract attention and support, financial and otherwise. However, it must be emphasized that ex situ populations and programs are not a be-all and end-all in themselves; the prima-

ry purpose should be to support applied learning that can be used to assist the survival or recovery of the species in the wild.

As the rhino crisis intensifies, expertise in small population management may become more and more important. For some species, such as Sumatran, Javan and black rhinos, implementation of these principles may hold the only hope for future survival. Zoos and conservation centers are well-positioned to provide inputs using examples from highly-organized and scientific programs such as Species Survival Plans (SSPs). SSPs have traditionally been managed in the United States and Canada by Species Coordinators and Management Committees in cooperation with Taxon Advisory Groups (TAGs), which provide strategic perspectives and technical advice for SSPs and participating rhino-holding institutions.

Managed breeding, however, is not all genetics and demography. Basic husbandry, how to maintain healthy individuals and induce them to breed, is fundamental. There are major challenges for rhino husbandry in zoos and conservation centers, which may present some of the most formidable captive management challenges of any species. As a consequence, all taxa of rhinos maintained in zoos and conservation centers are in some degree of demographic difficulty. These demographic problems are causing genetic difficulties because some lineages are at risk of being lost as their representatives are not reproducing. Clearly, husbandry, demography and genetics interact; and all three are crucial to the conservation of rhinos, especially in managed breeding situations. Husbandry problems can impede intensive management of rhino species (Table 1.2). Specific problems include poor survivorship and high mortality, poor reproductive success and a fundamental lack of knowledge regarding basic rhino biology.

Species Status

Eastern black rhino

This species reproduces rather reliably in captivity, but management has not maximized the reproductive potential, and health/husbandry problems continue to negate the breeding success that has occurred. As a result, the species is in a demographic crisis; thus, it is imperative to increase reproduction through improved management and expanded capacity to grow the population.

Southern black rhino

Reproduction in this species has been moderate, with many of the initial births in captivity actually conceived in the wild. Captive reproduction is on the decline and mortality has been high (although much is probably due to toxin exposure in Africa). This species is now managed as a non-AZA population by the International Rhino Foundation, which is working with AZA facilities, private owners, and the native range countries.

Southern white rhino

Reproduction in this subspecies has been very uneven with only a few facilities, particularly those able to maintain larger social groups, propagating well. The majority of rhinos in institutions are not breeding at all; thus, the population is in demographic and genetic crisis. The age structure of the population is senescing, and not enough of the original wild-caught founders have reproduced. There have been numerous imports over the years, but many of those new imports continue to not breed. The demographics of the southern white rhino population are still in need of work, and hopefully some of the new imports will breed.

Northern white rhino

The program for this subspecies has been a failure to date. Only seven individuals survive, and reproduction in captivity has been limited (none in North America and none anywhere since 1989). (Corrected- female born in 2000.)

Intense efforts are in progress to induce reproduction, but the prospects are limited at best. Four of the last northern white rhinos in Dvur Kralove went to Ol Pejeta in Kenya and have been "released" with the southern white rhinos in the hope that even with hybridization, the northern white rhino genes may be maintained through offspring. All the wild northern white rhinos that had previously been in Garamba National Park, Demo-

cratic Republic of the Congo, were poached. There are no longer any wild northern white rhinos left in their former range.

(Corrected-There are now only 5 northern white rhino left on the planet. The only hope for this subspecies is assisted reproduction.)

Greater one-horned

This program has been relatively successful with the annual population growth rate about equal to what is occurring in the wild. However, much of the reproduction to date has been by a limited number of breeders; thus, the genetic diversity in the captive-born population is inadequate. Prospects do seem good for recruitment of more breeders from the existing captive population.

Sumatran rhino

This program has initially failed with numbers of individuals and founders low, no reproduction occurring and the death rate high (30% of those imported in the 1980's). However, in 2001, the Cincinnati Zoo was successful in breeding their pair of Sumatran rhinos and producing the first birth in captivity in 112 years. Since then, they have produced a total of three calves. One male was shipped back to Sumatra to join the managed breeding program at the Sumatran Rhino Sanctuary in Way Kambas National Park and has sired a calf there. Unfortunately, the adult female at Cincinnati has since died and the prospect of future zoo breeding in the U.S. is dependent on a sibling pairing at Cincinnati. (Corrected-only the male is left in Cincinnati.)

Poor Survivorship/High Mortality

The browsing rhinos, black and Sumatran, in particular have problems with poor survivor-ship/high mortality under intensive management. The black rhino has been afflicted with many health problems (e.g., hemolytic anemia, severe ulcers on skin and mucous membranes, liver dysfunction). Both species are affected by iron storage issues, which may lead to other complications.

Poor Reproductive Success

Reproduction in all four of the species that have been maintained in zoos and conservation centers is less than optimal. In general, greater one-horned, black and, to a lesser extent, white rhinos reproduce well in managed breeding situations if species-specific needs are met. Captive managers are still struggling to understand the spectrum of these needs. Although reproductive challenges have now been overcome for the Sumatran rhino, the learning curve was very steep before the species could be reliably maintained and bred. For no species of rhino in captivity is reproduction reliable or routine.

Poor Understanding of Basic Biology

Compared with many other groups of organisms under intensive management, aspects of the basic biology (e.g., nutritional, reproductive, behavioral) of rhinos is poorly known. Nutritional problems are suspected to be of particular significance to the health and perhaps the reproductive difficulties of rhinos, particularly the browsing species. Behavioral issues also may interfere with successful husbandry. Various physiological and psychological challenges are believed by some researchers and managers to be underlying causal factors for many of the specific disease syndromes in rhinos. In recognition of husbandry challenges, a major goal of SSPs and the TAGs that facilitate them is the production of husbandry manuals, which can lead to successful management and propagation of species in captivity.

The Future

In the coming decades, as rhino husbandry and small population management are refined in zoos and conservation centers, these techniques will undoubtedly have broader application to the intensive management of increasingly fragmented wild rhinoceros populations. Ex situ populations can contribute positively to the conservation of rhino species in nature, but only if we use these populations to gather as much information as possible that can be applied to proactive management in situ. Rhino-holding institutions also have the obligation to educate the public about the plight facing this magnificent taxonomic group, which grows more imperiled every day.

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Captive management or husbandry manuals are being developed for an increasing number of wild animals in captivity, predominantly species that are managed in formal conservation breeding programmes. Although these manuals are invaluable resources for those working in zoos and aquariums, they vary considerably in style, content and layout. [PDF] RHINO A rhinoceros husbandry manual is a dynamic document, representing our current understanding of the rhinoceros in managed settings, and presenting a diverse set of parameters and recommendations for managing this unique, iconic mammalian taxon in zoo collections. [PDF] Concept husbandry guidelines for the White Rhinoceros Summary The white rhinoceros (*Ceratotherium simum*) is stated as "near threatened" since 2002 by the IUCN. The EAZA rhino collection is not self-sustaining. The AZA Rhinoceros Husbandry Resource Manual (Fouraker et al. 1996) mentions 516 days as the longest known gestation period. Pregnancy in greater one-horned rhinos can be monitored using faecal steroid analyses (Schwarzenberger et al. *Mammal Review* 40:221-245. Metrione L, Eyres A (2014) Rhino Husbandry Manual, Fort Worth, TX, International Rhino Foundation, 327 pp. Miller RE (2003) Rhinocerotidae (Rhinoceroses). In: Fowler ME, Miller RE (eds) Fowler's zoo and wild animal medicine 5th edition. Husbandry guidelines: Rhinoceros iguana. *Cyclura cornuta cornuta*. Rhinoceros Iguanas *Cyclura cornuta cornuta* belong to the Iguanidae family consisting of as many as nine hundred species. Rhino Iguanas are the only member of the *Cyclura* genus to possess the horn after which they are named. Iguanas are unique as they are the only large primarily herbivorous group of lizards. The genus *Cyclura* is restricted to the islands of the Caribbean.