ZIMBABWEAN CONNECTION

(continued from page 1)

Zimbabwe in the development of captive propagation and field conservation efforts in that country. In partial fulfillment of that commitment, Tom Foose, Tony Starfield and I travelled to Africa last July to participate in a government-sponsored workshop in Harare, Zimbabwe. The purpose of the workshop was to develop a national strategy for rhino conservation and to acquaint the game department and scientific staff with recent developments in captive and small population management. While in Harare we also had the pleasure of meeting with Mrs. Victoria Chitepo, Minister of Natural Resources and Tourism, Dr. William Nduku, Director of National Parks and Wildlife Management (DNPWM), and Dr. Rowan Martin, Deputy Director for Research for DNPWN.

Home to one-half of the world's remaining 3,800 wild black rhinos, the small country of Zimbabwe is working hard to preserve this valuable national resource. Today, the Zambezi Valley region of Zimbabwe is the only area of the world where the wild black rhino population exceeds 500 animals.

We visited two camps in the Zambezi Valley, Chekwenya and Manapools, but were not lucky enough to spot any rhinos. In a meeting with Manapools game warden Mark Brighton, we learned the sobering fact that, despite the intensive anti-poaching patrols in that area, they are losing one rhino per day to poachers. Although there is some local poaching, they believe the vast majority of the poachers come in from Zambia. With assistance from Ingrid Schroeder and Babette Aliferi of SAVE, Zimbabwe is trying hard to raise $25 million to beef up their anti-poaching patrols and protect the remaining rhinos.

We went on to visit two of the large privately owned ranches in the midlands of Zimbabwe. The government has relocated a substantial number of rhinos to the 60,000+ composite acres which comprise these private ranches where the animals are contained by solar-powered electric fences and vigorously protected by the ranch owners, many of whom are members of Game Coin. It was on the ranch of Eleanore Lowe where I finally saw my first black rhino of the trip.

I went on to the Hluhwue Reserve in Natal, which has the distinction of being the only place in the world where the wild population of black rhino is actually increasing - 7-10% per year. There I met Keith Mikeljohn who is in charge of their successful and well-run game-catching operation. Hluhlwue catches over 7,600 species of live game every year, and sells them to ranchers. I had a chance to go out with some beaters and witness some game netting first-hand.

Hluhlwue is the point of origination of seven rhino that have come to the U.S. over the last decade. While there, I also met with Director of Parks, Dr. George Hughes, and Rodney and Barbara Henwood, and we laid the groundwork for further increasing the number of founders for our North American southern subspecies black rhino program.

VIABLE POPULATIONS FOR RHINOS

By Thomas J. Foose

The five extant species of rhinoceros provide spectacular examples of the rapid and accelerating disappearance of wildlife on the planet. Fewer than 10,000 total rhinos survive in the wild today.

The immediate causes of the endangerment and extinction of wildlife are habitat destruction and unsustainable exploitation. In the case of the rhinos, the second cause, in the form of decimation by poachers, is the primary problem. Rhinos, like so many of the megavertebrates, actually vanish well before their habitat disappears. To preserve species of rhino, it is obviously necessary to protect them from poacher activity and habitat destruction.

However, while such protection is necessary, it is not sufficient. Surviving rhino populations must also be managed if they are to survive over the long-term. The reason is yet a third threat to survival of the five rhino species: the problems of small populations.

Small populations, even if well protected, are vulnerable to a number of environmental, demographic and genetic problems that can imperil their survival, especially over the longer term, i.e., the next several centuries. These problems are random or stochastic in nature. Hence, they are impossible to predict with any certainty. However, there are remedial measures possible through management. These problems of small populations apply to species in both the wild and in captivity, although much of the management methodology is being developed in zoos.

Genetically, small populations lose genetic diversity at a rapid rate. All species appear to possess some amount of genetic diversity, known as their gene pool. Genetic diversity is important for species at both the population level and the individual level. At the population level, genetic diversity is vital to permit species to adapt to continually changing environments (e.g., the appearance of a new disease). At the individual level, genetic diversity is necessary to maintain fitness or vigor, i.e., the ability to survive and reproduce adequately under existing environmental conditions. When populations are reduced to very low numbers (a few tens or hundreds), their gene pools are converted into gene puddles! Sooner or later, there is scientific reason to expect that this loss of genetic diversity can and will jeopardize the survival of the species.

There are also problems of demographic and environmental uncertainty. Demographically, small populations are at risk because of such factors as random failures in birth or survival rates, distorted sex ratios, or unstable age structures. As an example, consider sex ratios. In larger populations and over long periods of time in the wild, sex ratios at birth will frequently be even (i.e., equal numbers of males and females) or at least will represent some average that has evolved as adaptive for the species. However, in very small populations, these averages may not be realized and sex ratios can become

RHINO ROUNDUP

Species	Captive North American SSP #	Captive World #	Wild #
Black	80	160	3500
White	138	450	3500
Indian	32	93	2000
Sumatran	3	17	900
Javan	0	0	50
	253	720	9950

disasterously biased, i.e. ,predominantly or exclusively all males or females to the point where reproduction is seriously, often lethally disrupted.

Environmentally, small populations are especially susceptible to extinction because of natural disasters, climatic cataclysms and epidemic disease. The reality of such catastrophes is well exemplified by the two epidemics that recently decimated the last known wild population of black-footed ferrets and the hurricane that has decimated the sole surviving population of Puerto Rican parrots. A recent epidemic has already afflicted the last definitely known population of Javan rhino in Indonesia.

All of these problems are a function of population size. The smaller the population, the greater the problems and the more likely extinction becomes. As a consequence, conservation strategies for species like the rhinos which are reduced in number, and which probably will remain that way for a long time, must be based on maintaining viable populations, i.e. ,large enough to survive despite the genetic, demographic and environmental problems.

There is no single magic number that constitutes a viable population size for all species, or for any one species all of the time. Viable population size depends on:

(1) the genetic and demographic objectives of the conservation program;

(2) the biological characteristics of the species; and

(3) the kinds and intensity of stochasticity operating in the environment.

It is possible to perform population viability analyses to prescribe how large a population might be required for any species under any particular circumstances.

One generalization seems possible. Species like the rhinos will almost certainly need effective population sizes of several hundreds or perhaps thousands to be viable. Indeed, there has already been some attempt to perform population viability analyses for rhino species in both Asia (for the Sumatran and the Javan) and in Africa (for the black rhino, especially the populations in Zimbabwe). A preliminary recommendation is that each distinct kind of rhino may need an effective population size on the order of 500.

However, the effective size of a population is not the same as the actual number of animals. Instead, the (genetically) effective size is a measure of how the members of the population reproduce with one another to transmit their genes to future generations. Normally, the effective population size, denoted by N_e, is much smaller than the total number of animals. Such normal occurences as failure of some/many animals to reproduce, disparities in lifetime production of offspring (lifetime family sizes) or biases in the sex ratio of breeding animals will depress N_e well below the census number. For example, N_e may be as low as 10 to 25% of the total population number. Thus, a recommended N_e of 500 to provide genetic and demographic viability for each distinct kind of rhino may require that a population of at least two or more thousand actually be maintained. It is also important to realize that these analyses often recommend a minimum that seems necessary for long-term survival under the best information available. More is always better and safer.

A survey of the estimated numbers surviving in the wild for each of the five species of rhino suggests that none are probably at acceptable viable population levels. The situation is even worse if it is the case that within these species there are subspecies that are different enough to justify preservation as separate entities. For example, there has been reason to recognize at least four different geographical varieties (i.e., "subspecies") of black rhino that should be preserved separately. (There actually have been seven subspecies described.) Extending the logic developed earlier, i.e. ,that an N_e of 500 may be required and that 2000 rhinos may actually be needed to achieve this genetically effective size, it is simple arithmetic to calculate that 8000 black rhino may be necessary to preserve viable populations of all four geographic varieties. This number of 8000 is over twice the estimated number that survive on the entire continent of Africa. The conclusion is that a viable strategy for conservation of the black rhino will entail not only arresting the decline in number but also providing for expanding populations to at least twice their present levels as soon as possible.

It will be difficult or impossible for any of the rhino species to maintain single, contiguous populations of 2000 or more. However, it is possible for smaller populations and sanctuaries ("subpopulations") to be viable if they are managed in such a way to constitute what is known as a metapopulation, whose collective numbers are equivalent to the desired viable population size. This kind of management will entail periodic movement of rhinos from one separate subpopulation to another to correct genetic or demographic problems.

Viability analyses can provide guidelines on the number, size and interaction of the separate populations that are being managed collectively and interactively to constitute the metapopulation. For example, the conservation strategies, based on preliminary population viability analyses, in the IUCN SSC Asian Rhino Action Plan for each of the three species of Asian rhinos recommends:

(1) An effective population size (N_e) > 500
(2) A total metapopulation size > 2000
(3) The number of subpopulations > 10
(4) The size of each subpopulation > 100

(continued on page 4)

VIABLE POPULATIONS FOR RHINOS

(Continued from page 3)

One result of note from these preliminary analyses is that a viable number for each separate subpopulation of rhino should perhaps be at least 100 animals. However, this recommendation does not necessarily refer to the actual number of rhinos existing in some defined area, e.g., a sanctuary, of the natural range of the species now. Instead, this guideline for viable size of a subpopulation represents a minimum number that the area or sanctuary must be able to sustain if the rhinos can be protected and hence permitted to grow to the carrying capacity of the habitat.

It must be reiterated that the numbers for viable rhino populations are preliminary and should not be interpreted as definitive prescriptions. Much more population viability analysis is needed to provide the foundation and framework for rhino conservation strategies. However, it seems unlikely that the numbers suggested above for viability will be any lower after further analyses.

It is also worthwhile to observe that sustaining viable population sizes for rhino in the wild also implies maintaining minimum critical areas of natural habitat that can and will accomodate many other species. Megavertebrates like the rhino are both flagship and umbrella species for conservation of many other kinds of wildlife. This function should ameliorate, in part, the concern that investing so much money for the preservation of a few megavertebrates like the rhinos is unjustified while the greater number, and perhaps more important but less charismatic, species may be neglected.

[Editor's Note: In the next issue of Around the Horn, Dr. Foose discusses a conservation strategy involving intensive management of wild populations and the inevitable role of captive propagation.]

ARMSTRONG AID

Over the past two years, 31 white rhinos in North America have been translocated to other SSP participating institutions in accordance with the White Rhino SSP Masterplan. The moves were recommended in order to enhance the breeding of these potential founders.

A special note of thanks goes to the Armstrong Tire and Rubber Company for awarding to the White Rhino SSP a grant of $50,000 which paid for nearly all of the transportation costs incurred in moving these animals.

The first success of this translocation program occurred with the birth of a female calf at Knoxville on February 2, 1990. The calf's sire had never bred successfully until moved to Knoxville in May, 1988.

RHINOCERESEARCH

By Robert W. Godfrey

When a newsletter for rhinos was first proposed, my initial reaction was one of confusion, since everyone knows that rhinos cannot read. As I thought about it, I realized that the intent was to benefit rhinos, but was aimed at people. It appears that humans are responsible for the current status of rhinos as endangered species. Granted, extinction may be a part of natural selection and evolution, but it usually occurs much slower than what is happening with rhinos. The decrease in rhino populations is definitely a manmade situation. Efforts have been successful in stabilizing the wild population of southern white rhinos, but the remaining species do not appear to be so fortunate. The prospect of maintaining any sizeable wild population looks bleak, so efforts are being made to establish stable captive populations.

In order to establish a viable and productive population in captivity, much more knowledge of the rhino needs to be gained. The best way to acquire this knowledge is through the efforts of researchers and the zoo community. By designating specific areas of research and identifying the major problems to be solved, it will be possible to establish a comprehensive data set on rhnos. Currently there are several areas being investigated by researchers around the country. Projects completed in the past have yielded valuable information about rhinos, and future projects should add to the information already available.

Granted, one of the fastest ways to increase the captive population is by enhancing reproduction. Techniques for increasing the reproductive capability of rhinos are being investigated and will continue to be evaluated in the future. No less important are the areas of nutrition, animal health and genetics. Focusing all of the research efforts on just one of the areas would be inefficient and counterproductive. There are many aspects of these research areas that are inter-related and this needs to be taken into consideration when designing and conducting projects.

As the Rhinoceros Research Coordinator, it will be my responsibility to coordinate all of the research efforts involving rhinos. There needs to be a high level of collaboration and cooperation between the researchers involved and the zoos holding rhinos. Anyone who is interested in conducting research or has a specific project proposal involving rhinos is encouraged to participate in the program. The initial step involves either contacting myself or one of the four SSP species coordinators for rhinos. After the details of a project are worked out, there should be no difficulty in beginning the data collection. I feel confident, based on past results, that future research will provide meaningful information which will be useful in saving the rhino from extinction.