Beyond Noah's Ark: What Do We Need to Know?

As populations of wild animals dwindle, biologists are trying to figure out how to save them, in the wild or in captivity

IN NOAH'S TIME, an ark was sufficient. Today's conservationists need to know the intricacies of reproductive physiology and nutrition, among other things, if they are to preserve endangered animals. That was the conclusion, in brief, of a group of experts assembled by the National Science Foundation in mid-November to examine research priorities in single species conservation biology.

The need is all too clear, said Ulysses S. Seal, chairman of the captive breeding specialist group of the International Union for the Conservation of Nature and Natural Resources. The African elephant population has dwindled to 700,000 and is expected to drop to 25,000 within 40 years. The black rhino declined from 70,000 to 3,000 over 16 years. "On some continents we have no more than 10 years left to study the natural populations of some species," said Seal. "Benign management is no longer enough. The entire planet is going to require active management."

In an intensive 3-day workshop, the 28 participants identified a host of research priorities, which can be seen as a "litany of our ignorance," said Seal, who along with David Wildt of the National Zoo chaired the meeting. They focused on four areas: natural populations and release biology, small population biology, reproductive biology, and the impact of stress and disease.

Natural populations and release biology. Ben Beck of the National Zoo outlined what needs to be learned to establish, maintain, and reintroduce populations into the wild. First comes an understanding of the population dynamics of target species, including a census of how many there are and their age, sex, mortality rate, distribution, and the overall population trend. Research is also needed on how species adapt to the resources available to them in their habitat. The role of humans in the equation is central: most habitat fragmentation stems from human deeds, and correcting these wrongs will involve modifying human behavior. Beck advocated sampling attitudes and studying such activities as poaching and fuel collection so that mitigation strategies can be based on scientific data rather than intuition.

Finally, reintroduction itself should be a target of study, said Beck. This would involve investigating how wild animals learn to find food and how they acquire information so that captive-born animals can be given the opportunity to acquire knowledge in the same way. Studies must also be done to determine how reintroduced animals fare. "We have to know what works, and what doesn't," said Seal, who notes that hundreds of animals have been released to the wild over the years with virtually no follow-up.

Small population biology. As habitat is fragmented and populations dwindle, conservation biologists are trying to ascertain the danger point: in essence, when does a population become too small to survive? In that regard, the study of naturally small populations—those that have evolved on islands or in other isolated habitats—can be instructive. The key question, said Bob Lacy of the Brookfield Zoo, is, what are the processes that determine why some species go extinct and others survive?

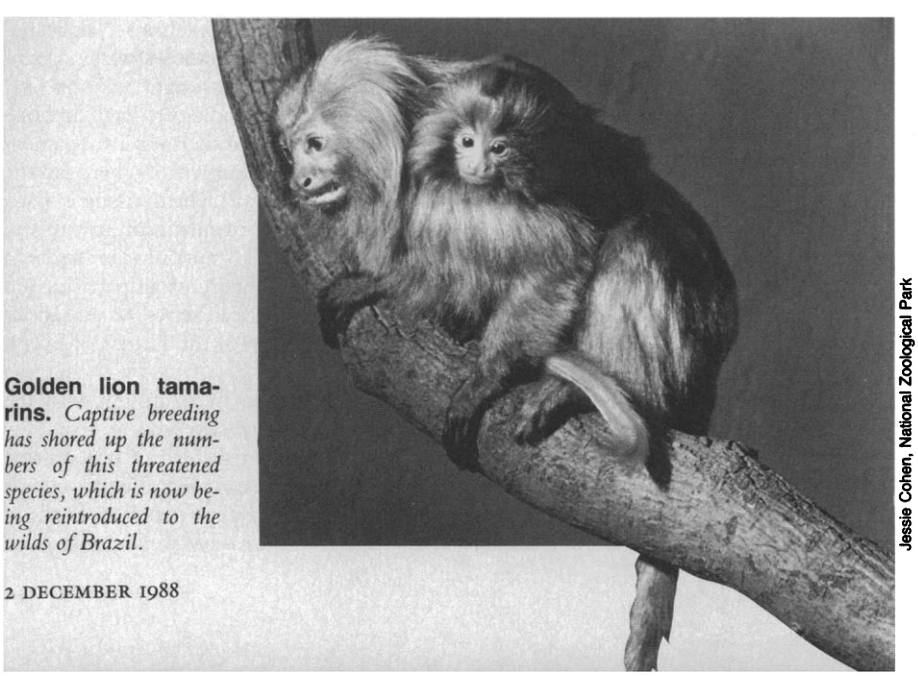
To answer it, work is needed on the basic demography of target populations—that is, birth and death rates, age at reproduction, and how these vary annually. Lacy called for studies of the genetic structure of a population, especially the distribution of genetic variation in a population and how it is transmitted from one generation to the next. Research is needed to understand the interactions of demographic and genetic processes in population extinctions, as well as the role of natural catastrophes, like last summer's drought and the fires in Yellowstone National Park.

Finally, the geographic pattern of the habitat and its effect on the population deserves study. In the old growth forests in the Northwest, said Lacy, the geographic pattern of what is left, not the total acreage, will probably determine if the spotted owl survives.

Reproductive biology. Captive breeding may be the only hope for some species; indeed, both the Arabian oryx and red wolf survive today only because of such efforts. For other species, intensive management in the wild may suffice. In either case, said Duane Kramer of Texas A&M University, research is needed on the normal reproductive processes of target species—when they breed, the number in a litter, and so on. Those studies should be accompanied by efforts to improve the efficiency of such technologies as in vitro fertilization and embryo transfer, which may be needed as a last-ditch effort.

Stress and disease. A recurrent theme in the study of wild and captive populations is the effect of stress—largely human disruption—on behavior, reproduction, and vulnerability to disease. When severe, stress can lead to lack of reproduction and well-being, and disease leading to death, said Suzanne Kennedy-Stostopf of Johns Hopkins University. The problem, despite the widespread interest, is that there is no reliable, agreed upon way to measure stress before pathology sets in. Devising such methods, the group concluded, is the central research priority.

■ LESLIE ROBERTS



Jessie Cohen, National Zoological Park

Golden lion tamarins. *Captive breeding has shored up the numbers of this threatened species, which is now being reintroduced to the wilds of Brazil.*