

# ENDANGERED SPECIES

## Technical Bulletin Reprint

Wildland Management Center  
School of Natural Resources  
The University of Michigan

### The Elimination of Inbreeding Depression in a Captive Herd of Speke's Gazelle

by Alan Templeton and Bruce Read

Inbred offspring result when biological relatives mate. Such inbreeding is a common occurrence in many zoo populations and is frequently accompanied by an inbreeding depression — a decrease in viability, birth weight, or other desirable traits as the level of inbreeding increases.

As a consequence, the primary goal of many zoo breeding programs is to avoid inbreeding. However, in many cases, such a goal is impractical. For example, although the St. Louis Zoo has many individuals of Speke's gazelle, and smaller herds exist at the Dallas, San Antonio, and Los Angeles zoos, all of these animals trace their ancestry to one male and three females acquired in the late 1960's. Moreover, collections from nature cannot be made because the natural habitat of this rare species is the border area between Ethiopia and Somalia — an area of prolonged guerrilla warfare.

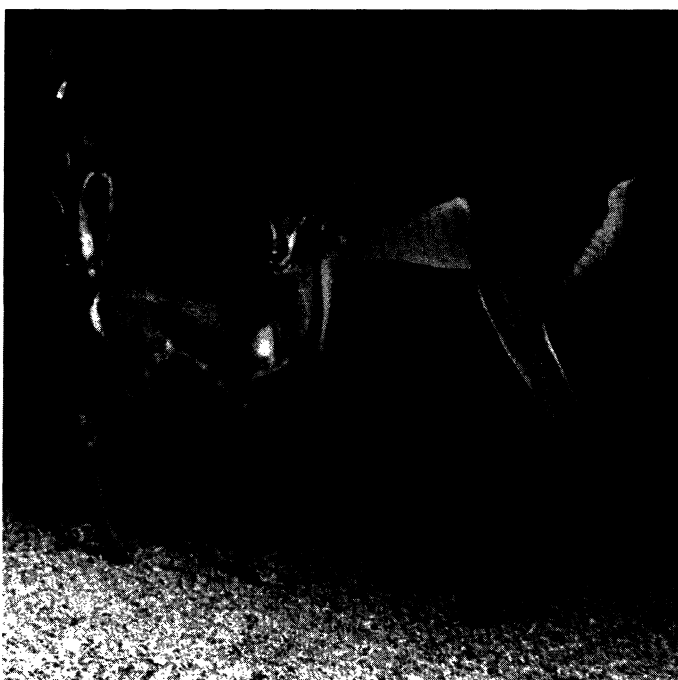
Because of the small founding population and the inability to collect new animals, high levels of inbreeding now exist in the St. Louis herd. Unfortunately, an extremely severe inbreeding depression occurred both for viability and birth weight. Given this inbreeding depression and the impossibility of avoiding inbreeding, the prospects for long-term maintenance of this species may seem poor. However, evolutionary theory and studies on natural and experimental populations indicate that animals can adapt to high levels of inbreeding and thereby eliminate inbreeding depressions.

At the St. Louis Zoo, we designed a breeding program using this theory with the goal of eliminating the inbreeding depression. There are two major components to the design. First, we favor as parents those individuals who were already inbred but of proven viability. This actively selects for genes (units of hereditary information) that do well under inbreeding. However, selection can only operate when there is genetic variability, so the second component of our design is to optimize conditions for selective response by maximizing genetic variability. This was accomplished at the herd level by equalizing the average genetic con-

tributions of the four ancestral animals to the herd's gene pool (the genes collectively shared by all the gazelle) and by allowing the herd size to expand during the selection procedure.

Cooperation between the zoos having Speke's gazelle aided the achievement of these goals by allowing a larger total herd size, by physically subdividing the herd (which protects against epidemics or other disasters destroying the entire herd), and by allowing breeding loans and exchanges to insure maximal genetic variability in the herds kept at each zoo.

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A carefully designed breeding program at the St. Louis Zoo helped the captive Speke's gazelle population avoid inbreeding depression.

## From the School of Natural Resources

# Conservation Biologists Form Society

Conservation biologists gathered at the University of Michigan this November to solidify the foundation of a new organization, the Society for Conservation Biology, the first formal group to represent the growing field of conservation biology. Under the direction of chief organizer Michael Soule, the attendees, including leading scientists and managers, discussed the nuts and bolts of the Society, examining everything from the by-laws to the production of the journal which is to be the centerpiece of the Society's activities.

In the applied tradition of conservation biology, the Society will seek to promote scientific research relevant to the needs of conservation managers throughout the world, or, in the words of Soule, "to provide the theoretical underpinnings for management."

According to Soule, since 1980

"there has been a community of academics and professionals that has consciously called itself conservation biologists." Despite this development, "there has been no real curricula or degree program" for students interested in becoming conservation biologists "and very little research money," he adds. Soule sees the Society for Conservation Biology playing an important role in raising the status of conservation biology in the academic community and in "communicating the principles of conservation biology to its own constituency."

One of the areas of rigorous discussion at the meetings centered on the goals of the Society. It was agreed upon in the end that the promotion of scientific study on topics in conservation biology should be the primary purpose, rather than the more general

commitment to conservation of biological diversity. "We are all conservationists — no question, Soule says, "but we are not another Sierra Club or Friends of the Earth. Our distinguishing feature is that we are a group of scientists and professionals dedicated to science."

The first issue of the journal is expected to make its appearance in late 1986 or early 1987. Membership is open to anyone. To those interested in becoming an early member of the Society for Conservation Biology, direct inquiries to:

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A forum for information  
exchange on  
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## Inbreeding continued

Evolutionary theory also indicates that the opportunity for selection to operate in small founder populations is greatly influenced by individual genetic variability as well as gene pool variability. Individual genetic variability was increased by favoring crosses yielding animals that received nearly equal amounts of their genetic material from all four ancestral animals.

The breeding program turned out to be extremely successful, with much, if not all, of the inbreeding depression eliminated in our selected animals. Consequently, severe inbreeding depressions do not necessarily imply that captive herds are doomed to extinction; rather, the inbreeding depression can be selectively eliminated, thereby making the long-term maintenance of the herd much more likely.



St. Louis Zoo

All of the captive populations of Speke's gazelle trace their ancestry to one male and three females.

## From the Brookfield Zoo

# Grant Awarded for Population Genetics Project

Chicago's Brookfield Zoo has received a \$22,775 Conservation Project Support grant from the Institute of Museum Services in Washington, D.C.

The funds are being awarded to the zoo's Conservation Biology department for a project on population genetics among a colony of 1000 deer mice. This project may result in the establishment, assessment, and modification of effective captive breeding plans for all zoological parks.

Population biologists and population geneticists, who examine the effects of population size on long-term demographic and genetic fates of populations, have not come to an agreement on minimal critical sizes for captive

populations. There is an urgent need to investigate the rate of loss of genetic variation. Mice can serve as models for species in need of conservation, and they can be studied in controlled breeding experiments on a large enough scale to permit statistical analysis of the data.

Dr. Robert C. Lacy, population geneticist at Brookfield Zoo, will be in charge of the research. Dr. Pamela Parker, chairman of the Conservation Biology department, and Bruce Brewer, assistant curator of mammals, also will participate in the data collection and analysis.

Brookfield Zoo has an extensive animal collection and an active pro-

gram of breeding endangered species. The Research department, which was established in the 1950s, recently has been enlarged, with a greater commitment to investigating many aspects of conservation biology. Now called the Conservation Biology department, it is actively involved in the proper genetic management of animals in zoological parks. The department hosted a workshop on the subject in May 1984.

In addition, the Conservation Biology staff at Brookfield Zoo has a cooperative base of mutual research endeavors with staffs of the Field Museum of Natural History and the University of Chicago.

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## Resources

### WWF/IUCN Wetlands Campaign

September, 1985 marked the launch of the WWF/IUCN Wetlands Campaign. Designed to raise funds for the Wetlands Conservation Program developed by IUCN, the Campaign will also seek to build public awareness of wetlands: their value, threats to them, and what is being done to conserve them. The world's marshes, mangroves, shallow coastal estuaries and lakes are breeding grounds for many fish species and support whole ecosystems. They are a prime source of food that does not need cultivation.

Unfortunately, wetlands are often considered to be wastelands that can be drained for conversion to "productive" purposes. Today wetlands are threatened by drainage, pollution and development.

It is difficult to assess the amount of wetlands worldwide, but in the United States, 5% of the lower 48 states is covered by wetlands. Nearly 200,000 hectares are being lost each year — over 50% of the wetland that existed during colonial times has vanished. Agricultural development involving drainage was responsible for 87% of the recent national wetland losses, and this is, in general, the major wetland threat throughout the developed world.

In Brazil, 400,000 km<sup>2</sup>, 6.3% of the land surface is assessed as wetland of international importance. Pollution, construction of dams, and siltation due to watershed deforestation are threats to wetland species diversity in the tropics.

The WWF/IUCN Wetlands Program will seek to achieve wetland conservation by:

- Promoting public awareness.
- Developing major projects in selected focal regions in Brazil, Central America, the Sahel, coastal West Africa, Central Africa, China and Indonesia.

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# Resources continued

- Providing start-up funds to smaller wetland conservation projects in other countries worldwide.
- Developing conservation programs for wetland species including dragonflies, fresh-water turtles, manatees, and crocodiles.
- Promoting the training of wetlands managers.
- Supporting the spread of information on wetlands conservation.
- Promoting consideration of wetlands by major decision makers.
- Preparing an organizational framework for wetlands conservation worldwide.

Of the 84 project activities listed in the Campaign, 65 require funding, totaling \$3.1 million. For more detailed information, a copy of the WWF/IUCN Wetlands Conservation Program is available from IUCN, Avenue du Mont-Blanc, CH-1196 Gland, Switzerland.

## The World's Tropical Forests

An international task force organized by the World Resources Institute has developed a 56-country plan for arresting and ultimately reversing the destruction of tropical forests. According to the 3-volume report, "Tropical Forests: A Call for Action" (issued by the World Resources Institute, the World Bank, and the United Nations

Development Program), 27 million acres of tropical forest are lost every year. If deforestation continues at the current rate, at least 556 million acres will be destroyed by the year 2000.

The task force recommends an investment of \$8 billion over the next 5 years, half from international lending institutions and the aid programs of developed countries, and half from private and Third World sources. Specific programs for the most critically affected countries are presented in the report, such as forestry and agricultural activities which, hopefully, will result in alleviating the devastating impact of tropical deforestation on people and the environment.

## Educational Materials

Two films have been produced by the WWF-US Primate Program during the past year. The first, entitled: "Monkey of the Clouds" is 18 minutes in length and deals with the Peruvian yellow-tailed woolly monkey and its Andean cloud forest habitat in northern Peru. The second, entitled "Amazonia: A Celebration of Life", focuses on the rich biological diversity of the lowland tropical forest of Peruvian Amazonia. This 20 minute production was filmed mainly in Peru's two largest protected areas, Manu National Park and Pacaya-Samiria Reserve. For further information on these films, contact Russ Mittermeier or Bill Konstant,

Dept. of Anatomical Sciences, Health Sciences Center, State University of New York, Stony Brook, N.Y. 11794.

TRAFFIC (U.S.A.) announces the availability of a slide show, entitled "The Impact of Illegal Trade on Wildlife", which highlights the role of the U.S. in international trade in live wildlife and wildlife products. It is composed of 57 slides and a prepared text and can be borrowed free of charge by contacting: TRAFFIC (U.S.A.), 1255 23rd Street N.W., Washington, D.C. 20037.

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Resource information provided by Jane Villa-Lobos, Smithsonian Institute.

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