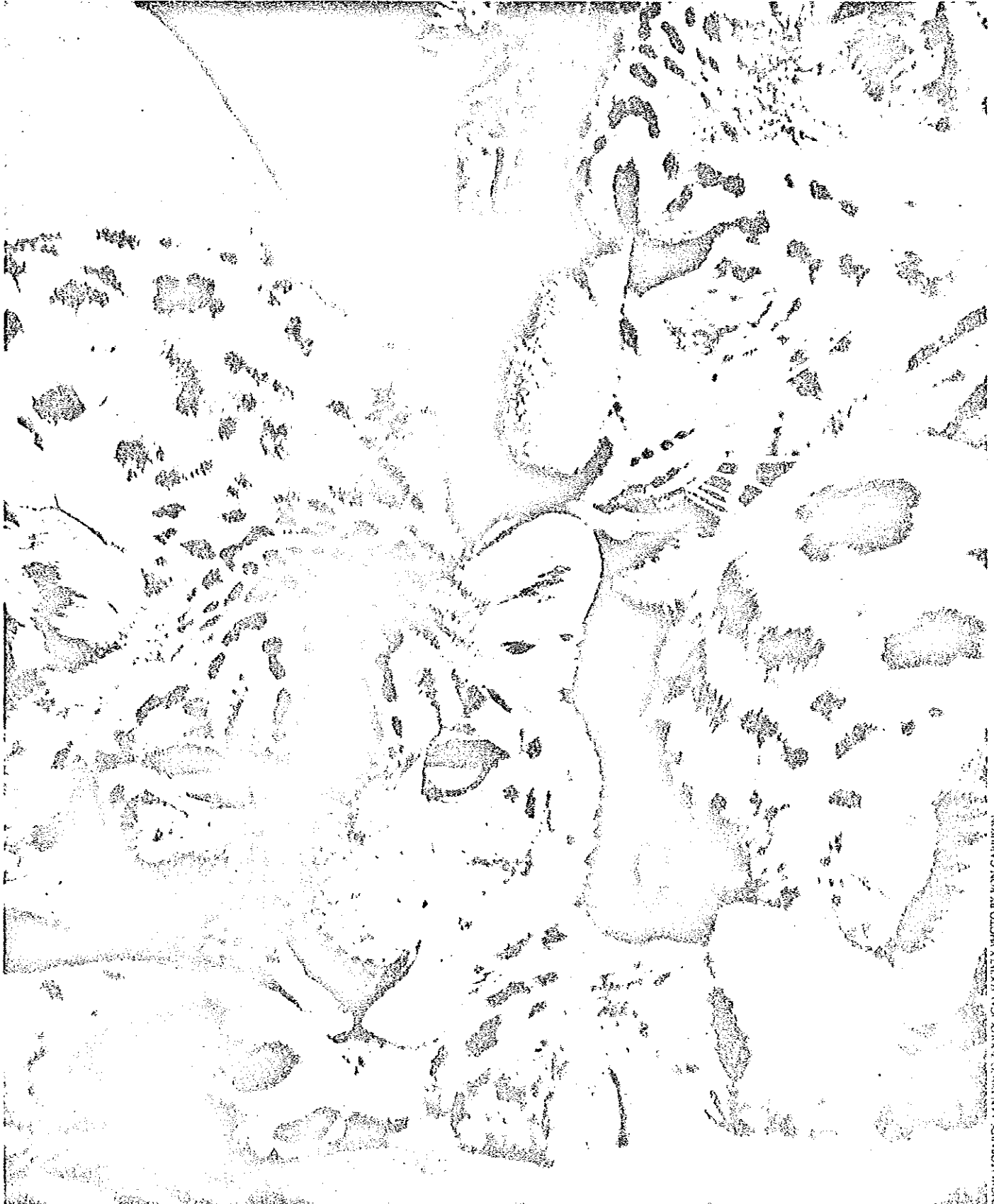


by JANET NEWLAN BOWER

For some endangered species, captive breeding programs are their ...



NEW YORK: AMERICAN MUSEUM OF NATURAL HISTORY PHOTO BY RON GARRIN

Last chance for life

HIGH IN REMOTE, wind-swept fasts of the Himalayas lives a near-mythic animal whose life history in the wild was never studied until the past few years. Peter Matthiessen's recent bestselling book, *The Snow Leopard*, describing his arduous journey with zoologist George Schaller in search of this majestic cat, has immortalized the snow leopard as a spiritual symbol of the intangible, of all that eludes man. Unfortunately, however, the snow leopard cannot elude the traps of the hill people who want the five to ten dollars apiece they can earn for the cats' pelts. In fact, the snow leopard has become one of the most endangered species in the world. The number of these animals surviving in the wild is unknown, but about a hundred live in captivity in zoos around the world. A number of these zoos are now cooperating in a study of snow leopard reproductive behavior in an effort to foster captive breeding programs. Although a zoo undoubtedly is no substitute for the mountain haunts of the snow leopard, captive breeding could help ensure the survival of this species and of many other endangered species around the world.

Such programs have met with mixed results. Perhaps the most publicized zoo courtship—or non-courtship—of all time is the ongoing saga of the pandas at the National Zoo in Washington. But many less-publicized programs are under way. For instance, the San Diego Zoo recently returned an eighty-year-old celibate Hood Island tortoise to his native Galapagos Islands. One of three remaining adult males of his kind in the world, the 200-pound tortoise ("No. 21") successfully mated with a female at the Charles Darwin Research Cen-

ter in the Galapagos. On the other hand, no mate has been found anywhere in the world for "Lonesome George," who thus may be the last survivor of another kind of Galapagos tortoise.

The ultimate goal of many captive breeding programs, of course, is to reintroduce species into the wild. A program to reestablish the peregrine falcon in the eastern United States has been particularly promising. DDT has caused this species' endangerment by leading to thinning of eggshells so that the eggs are crushed during incubation. Captive breeding programs have been absolutely necessary to ensure the continued existence of the species. During 1979 a peregrine laid eggs out of captivity for the first time in twenty years in the East. Bred in captivity at Cornell and released in Maryland, the bird made her way to the top of a thirty-third-floor ledge of a building in Baltimore. With only the stimulation of her own reflection in the window, the peregrine shocked scientists by laying three eggs—a feat that earned her the name of "Scarlet" because of her unmated status. Four fledglings were substituted for the infertile eggs in Scarlet's nest, and she dutifully adopted and reared the young birds. It is hoped that someday released captive-bred peregrines will mate successfully in the wild. Meanwhile, Scarlet, Lonesome George, No. 21, and the snow leopard are just a few examples of the problems, promises, and surprises scientists must contend with in attempting to carry out captive breeding programs.

A CONFERENCE to examine the problems and potential solutions of breeding endangered species in captivity drew delegates

from around the world to the World Conference III on Breeding Endangered Species in Captivity, held in San Diego in November 1979. Sponsored by the Zoological Society of San Diego and the Fauna Preservation Society, World Conference III was the first such conference in the western hemisphere.

Intent on saving as many endangered species as possible, delegates searched for answers to two questions: (1) What is entailed in maintaining a healthy and thriving population of captive species members and ensuring that health and fitness for more than a few generations? (2) How does a program work effectively to reintroduce that species into the wild, or semi-wild, so that the species may continue to live in natural freedom?

Without a doubt, the overriding threat to wildlife today is habitat destruction. Currently logging, farming, and population sprawl are contributing to the decimation of more than 175,000 acres of the world's wildlands per day. Even if the habitat is not totally destroyed, it is often so fragmented that a large population of a species cannot exist.

The problems in fostering small captive populations of a species often are the very problems found in such habitat fragments in the wild.

One of the major problems in captive breeding today is inbreeding depression. Because of space requirements and difficulty in procurement of animals, most populations of captive endangered species are small, so a great deal of inbreeding results. If inbreeding is allowed to continue on a grand scale, a species may die out in a few generations as a result of high mortality among inbred juveniles. Even if the young do reach sexual maturity, they may be unable to reproduce.

Other factors in maintaining the genetic viability of a small population are "the founder effect," "genetic drift," and selection.

"The founder effect" refers to the original group of animals from which a population has developed. For instance, only about fifteen Père David's deer started the present world population of nearly 900 animals. If the few animals in each species are of sound genetic stock, their offspring have a good chance of survival, providing a careful breeding program has been established. If not, problems will soon become apparent.

"Genetic drift" refers to changes in the frequency of certain genes because of random processes. Problems with selection occur when weak animals are bred to weak animals. Even if the population survives, there may be difficulty in reintroducing the animals to the wild

because of their reduced health and resilience.

Gene pools can be strengthened by introducing animals from the wild into the captive population. But in some cases no individuals of the species are left in the wild. Political circumstances like the wars in Southeast Asia or Zaire's refusal to permit exportation of okapis, for example, prevent access to other species. Among other difficulties is the danger that the stress of being transported out of their native habitat may kill some animals.

Similarly, ignorance of a species' natural history can cause problems. For example, several years ago some Japanese crested ibis were acquired for captive propagation. When they were fed whale meat, all died of poisoning. Ignorance of the birds' physiology may have destroyed this entire species. Today only six Japanese crested ibis are believed to ex-

ist in the wild—all on Sado Island, Japan. But the residents of Sado oppose the capture of these six birds. Even though scientists believe propagation in captivity may now be assured, the islanders prefer that the birds be allowed to die free rather than possibly be killed in captivity.

REINTRODUCTION of endangered species into their native habitat is still the objective of many breeding programs. For species such as the snow leopard, that may one day be possible, if the hill people learn that they can make more money from tourists who appreciate a wild area with live predators than from buyers of pelts. For other species, no natural habitat remains in which to reintroduce them.

Numerous bird reintroduction programs have been enacted, although the success of only a few programs, such as those involving the masked bobwhite and the peregrine falcon, is established. Fostering and cross-fostering with compatible species have been successful in the peregrine restoration program in the East. Often, wooden eggs are substituted for newly laid peregrine eggs, which can then be incubated and placed with foster parents if necessary.

One problem in the falcon reintroductions has been how to teach the young bird to hunt. Peregrine parents are known to teach necessary skills by allowing the young to chase them in the air. Later they provide food to the young by dropping the prey to them while in the air. They even drop live prey to their young in the air to allow practice in the chase. Other problems include the continued danger of DDT, natural predation (primarily owls), and shootings.

On the positive side, it is known that captive-reared adults will mate with wild peregrines when reintroduced. Although captive peregrines don't have the parental training, falconer's techniques are used to train them to fend for themselves.

The reintroduction of Arabian oryx into their native habitat has been most encouraging. It is believed the species has been extinct

Captive herds of Prezwalski's wild horse—the only surviving species of true wild horse, which is now thought to be extinct in the wild—are descended from just thirteen animals.



PREZWALSKI'S WILD HORSE, MARE AND FOAL SAN DIEGO ZOOLOGICAL SOCIETY PHOTO BY RON GARRISON

in the wild since 1972. Once wide-ranging, the Arabian oryx were machine-gunned out of existence by hunting parties in jeep caravans. In 1962, Operation Oryx found two males and one female in the wild. These three, plus six captive-born oryx, were the nucleus of a world herd now numbering more than a hundred. In 1978 four male Arabian oryx were sent from the San Diego Wild Animal Park to their homeland at the Shaumari Wildlife Reserve in Jordan. In August 1979 four females from the Wild Animal Park were sent to join the males.

Israel has been returning many species described in the Old Testament to their natural habitat. Numerous species inhabit two multi-thousand-acre reserves, now fenced and patrolled to prevent escapes. Among them are the ibex—the wild goat so often mentioned in the Bible—and the lyre-horned addax—believed to have been used by King Solomon as meat.

SCIENTIFIC ADVANCEMENT
 In genetics and reproductive physiology during the past few years has greatly improved prospects of overcoming problems such as inbreeding depression to ensure successful captive breeding. For instance, Kurt Benirschke, Research Director for the Zoological Society of San Diego and chairman of the conference, and Bill Lasley, endocrinologist at San Diego, are fore-runners in these new and promising fields. By studying the measurement of the circulating male hormone, testosterone, Benirschke was able to determine why the pair of Komodo dragons at San Diego had not reproduced—they were both female! Similarly, Lasley has established a procedure for sexing birds by studying the estrogen and testosterone in the bird's excreta. This technique enables breeders to sex species in which both sexes have identical markings, without subjecting the birds to the stress of being captured and examined.

Artificial insemination is another promising answer to difficulties faced in captive breeding. Through artificial insemination the fertility



Although severely threatened in the wild, the strikingly handsome, heavily furred Siberian tiger breeds so well in captivity that the species is making a comeback. Using demographic studies of the world's captive population of about 750, scientists can now estimate their future reproductive capability.

of whooping crane eggs has been increased from 20 percent to an average of about 80 percent at the U.S. Fish and Wildlife Service's Patuxent Wildlife Research Center in Maryland. And artificial insemination is being considered for the female giant panda at the National Zoo, perhaps this spring.

Establishment of breeding consortia and use of reserves and public parks in the exchange of captive and wild animals are other possibilities for boosting populations.

WILDLIFE CONSERVATION and propagation have become a waiting game of the most precarious kind. Charles Bieler, Executive Director of the Zoological Society of San Diego, expressed the consensus of the San Diego conference when he remarked, "The crucial question for the future may be what animal species should we save from extinction?" Consider that Global 2000, the White House report on life in the year 2000 AD, predicts that by that time there will be 2.5 billion additional people living on this planet, that agricultural land to feed us will have declined by 30 percent while world fish catches will probably already have

peaked, that tropical forests will be reduced by two-thirds, that the vast majority of the earth will be settled land, and that accordingly, by the year 2000, the number of species to have become extinct over recorded history will have reached about 600,000.

Consider also that more than half the extinctions since recorded history have taken place during the twentieth century. In fact, Sheldon Campbell, author of *Lifeboats to Ararat*, warns that "the number of animals now threatened with extinction—about 20 percent of living species—is so high that our extrapolation probably errs on the low side." The biological clock is at one minute to twelve. We hold the fate of endangered species within our grasp. We are holding back the hand of time—but for how long? □

A native of San Diego, California, Janet Newlan Bower "almost grew up" at the San Diego Zoo and Wild Animal Park, home of many captive breeding programs. Now a freelance writer whose main focus is on wildlife, Mrs. Bower still pays frequent visits to the zoo with her two children. Her article about Père David's deer appeared in our April 1979 issue.