Captive Propagation: Will it Succeed?

A federal program to breed endangered species and release offspring to the wild has its critics. But scientists at the Patuxent Wildlife Research Center are certain that their plan will work.

BY LAURA TANGLEY

There were few signs of spring that cold, rainy morning in March. Yet there was one sure one — "Number five looks dumpy in the rear today!" Scott Derrickson, a research behaviorist, shouted to co-workers passing by in a pick-up. Springtime nesting season had arrived for one of the most famous of all U.S. endangered species, the whooping crane *(Grus americana)* — at least for the captive flock in residence at Patuxent Wildlife Research Center in Laurel, Md.

It was more than a month before the species' wild counterparts, still at wintering grounds in the Aransas National Wildlife Refuge in Texas, would produce any eggs. About March 15 those birds begin their 2,600-mile migration to nesting sites in northern Canada. At Patuxent, artificial lights start some of the whoopers nesting in March "because we have fewer disease and parasite problems early in the season," explains James Carpenter, who heads the propagation section of the U.S. Fish and Wildlife Service facility. "We also can keep the birds breeding longer this way and produce more eggs," he adds.

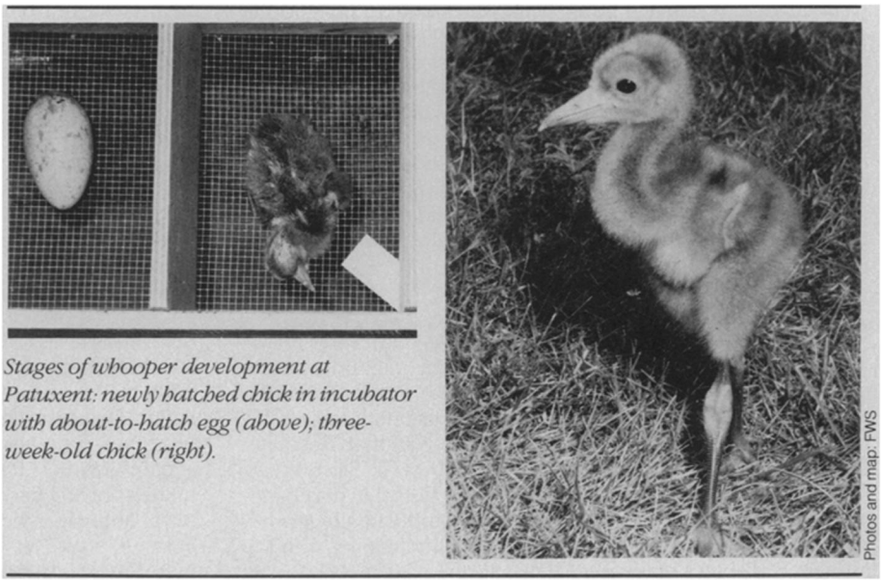
Increasing production from endangered species is what the propagation program at Patuxent is all about. Other than the lights, related strategies include artificial insemination of birds that don't breed well in captivity, inter-species foster parenting and "egg-pulling," removing eggs as soon as they are laid (for incubation elsewhere), inducing parents to renest. Results of these techniques have been impressive. "We get whooping cranes to lay as many as 11 eggs per season," says Carpenter, a research veterinarian. "In the wild they only produce two." And, possibly because food resources are limited, most wild crane couples only manage to raise one of the two chicks produced.

This characteristic of whooper reproduction played an important role in creation of a federal endangered species breeding program in the 1960s. Biologists who had been watching dwindling crane populations with dismay suggested taking "extra" eggs produced at Wood Buffalo National Park in Canada and starting a captive flock. Captive breeding of rare animals was not a new idea — zoos had been doing it since the early 1900s. But taking endangered animals from nature for an undertaking as risky as raising them for reintroduction to the wild has not been so quickly accepted.

Arguments against the plan stretched from one extreme — species that don't make it on their own don't deserve to make it at all — to the other — no endangered animal should ever be removed from the wild. There are also concerns that it won't work because of changes in behavior that take place in captivity and due to the effects of inbreeding. Moreover, even if it does work, opponents say captive breeding is not the best use of scarce endangered species funding.

In the early 1960s, advocates used the idea of the spare egg to convince Interior Department officials that a captive flock could be built with no impact on wild stocks. In addition, the crane — a graceful white bird that at 1.5 meters is taller than any other in the U.S. — had won public support as an important endangered species that could and should be saved.

In 1964 an agreement was signed between the Canadian Wildlife Service and the U.S. Bureau of Sport Fisheries (now the FWS), and in 1967 biologists began removing eggs from wild nests. In 1965 the Endangered Wildlife Research Program at Patuxent, the largest wildlife research center in the world, opened and began to



Stages of whooper development at Patuxent: newly hatched chick in incubator with about-to-hatch egg (above); three-week-old chick (right).

Photos and map: FWS

study and breed cranes, as well as other endangered species.

The program's first director, Ray Erickson, began a personal campaign for the facility as early as the 1950s. "He was the real driving force behind its establishment," says Carpenter. When Erickson began his job, he envisioned tremendous growth for the program. "Within 10 years, it is expected that more than 50 species, threatened and otherwise, will be under study at Patuxent," he wrote in 1968.

Today, however, biologists are breeding only six endangered species at Patuxent — all birds. There were twice as many ten years ago. "This is partially because our philosophy has changed," explains Carpenter. "We decided it was better to focus on getting good results on a few species rather than doing less intensive work on many." It's also a reflection of funding limitations, he admits.

In addition to the six endangered birds, several "surrogate" species are studied at Patuxent. A concept developed by Erickson, a surrogate is a species closely related to an endangered one with which scientists can perfect breeding and release techniques before they are tried on endangered animals. Two subspecies of the more common sandhill crane *(Grus canadensis)* — the greater sandhill and the Florida sandhill — serve as surrogates for the whooper.

When a group of visitors approached a pair of Florida sandhills — slightly smaller than whoopers, with solid gray plumage and a bright red head — the two stopped foraging and broke into a "unison call" — one long note by the male followed very quickly by two short notes by the female. "It shows that there's a bond between them and, in this case, it's also a sign of unity aimed at intruders," said Derrickson, who has worked with cranes for five years. A curious thing happened next. The male bird, normally the more aggressive of the two sexes, ran away as the group approached. But the female, neck extended and bill pointed straight down, began a slow stiff-legged walk back and forth along the fence. "That's a threat walk," explained Derrickson. "Because this bird was hand-raised, she thinks that we're cranes coming into the breeding territory. The male, on the other hand, raised by cranes, sees us as people, and is retreating — the more appropriate response."

This illustrates one of the problems with hand-raising birds with complex learned behaviors. Another is that they don't breed. While hand-raised cranes show all the normal pre- and post-copulatory behaviors, they won't actually copulate. "We have to artificially inseminate hand-raised cranes," says Derrickson. "And fertility is very low."

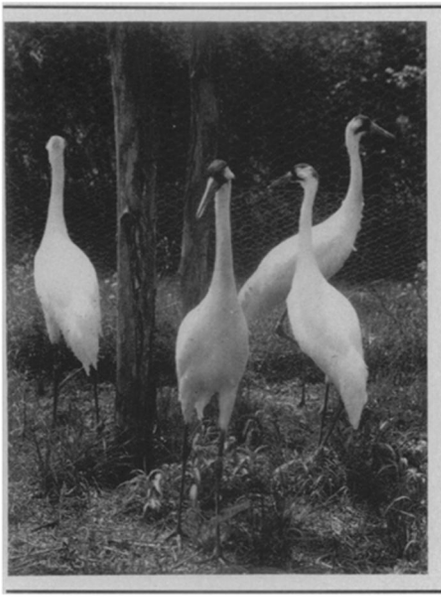
This forms the basis for one of the major criticisms of captive rearing — that it ultimately won't work for animals as complex as cranes because, unless they are raised by wild parents in a natural environment, they will not learn what is necessary to survive. "I have misgivings about captive propagation of birds," says Jay Sheppard, staff ornithologist with the FWS Office of Endangered Species. "They're not like fish. Birds and mammals learn a lot from their parents and the environment." A related concern is that once a bird adjusts to an artificial environment it cannot readjust to the different climate and photoperiods of its native habitat.

"We've proven that to be untrue," argues Carpenter. "A good example is the Andean condor. No place could be as different from Laurel, Maryland as a desert in Peru. Yet seven out of eleven birds we released there over a year ago are still alive — the same as natural mortality." To help them acclimate, condors were released slowly, left in pens and fed their captive-type diet for one to four months. But they were allowed to see and interact with other wildlife during this period so that biologists could check for normal reactions. This method, called a "soft" release, is used for most species. The condors, monitored with radio telemetry, still seem to be behaving normally. Much bird behavior is innate, stresses Derrickson.

But learned behavior, no matter how small a part of the total, still worries some. Cranes stay with their parents for one full year in the wild. "The amount of time a chick spends with its parents is an indication of the amount of learned behavior," says Sheppard. "There are hundreds of things taught that we can't understand, never mind replicate in captivity."

Patuxent researchers may have found a solution to this problem. Now they are parent-rearing all cranes and a number of other birds as well — not necessarily with parents of the same species, however. Many more eggs are produced each year than whooping crane parents could possibly care for. Some of the eggs are sent to Gray's Lake National Wildlife Refuge in Idaho where they have been put into nests of greater sandhill cranes since 1975, in hopes of establishing a second population migrating along the sandhills' route. Eggs that stay at Patuxent are reared by "foster parents" — either Florida or greater sandhill cranes.

Cross fostering has worked well with one other Patuxent species — the masked bobwhite quail, reared by closely related Texas bobwhite parents. The chicks have learned appropriate survival and breeding behaviors from their relatives and are now



Group of 2-year-old adult whooping cranes (left). Offspring of the Andean condor (center) and masked bobwhites (above) are two Patuxent species that have been successfully reintroduced to their native habitat. Released bobwhites have already produced young in the wild.

doing fine in the wild. Yet cranes are far more complex than bobwhites. Are Florida and greater sandhills closely enough related to whoopers to teach them everything they need to know? "Cranes seem to have a complicated language including not only calls and displays, but subtle eye-blinkings and bill clackings," says Sheppard. Each crane species probably has its own unique language. "Even if 99 percent of the language and behavior is innate, that one percent could be an important link that, if lost, could destroy an entire chain of behavior."

Breeding, in particular, is controlled by a series of actions that must be followed by appropriate responses in sequence in order to succeed. Whoopers raised by greater sandhills at Gray's Lake have begun to exhibit characteristic whooping crane displays rather than those of the sandhills. "But until whoopers actually mate with whoopers, this is all experimental," says Jack Woody, Acting Assistant Director of the FWS southwest region where the crane eggs are sent.

Another concern critics of captive propagation have is that genetic variability is lost when many offspring are produced by a small pool of parents. "There is little question that if animals inbreed — at least most species — we will lose them," says William Conway, General Director of the New York Zoological Society, which has a history of significant achievement in captive breeding zoo animals (SN: 11/28/81, p. 347). "But today there are many techniques to avoid inbreeding in captivity," he adds. At Patuxent, selected pairings (to prevent close relatives from mating), artificial insemination (to add variety to offspring of birds that mate with one individual for life) and frozen preserved semen all contribute to maintaining the maximum genetic variability possible — perhaps more variation than in depleted wild populations, Conway suggests.

Still, inbreeding remains a concern. "Most conservationists that found captive propagation controversial ten to fifteen years ago have come to accept it," says Eugene Knoder, Director of Wildlife Affairs for the National Audubon Society, and who also worked with sandhill surrogates for the FWS before the Patuxent program began. "But I have one criticism — why do they wait until the coefficient of inbreeding is already so large before starting?" Carpenter, too, would like to see his captive populations taken from larger natural populations. Propagation techniques are so sophisticated now that they can be used as more than a "last resort," he says. The problem is that money has not been available for captive breeding until a species is seen as being on the brink of extinction. There are some exceptions for animals that are very popular with the public, like the bald eagle, which is also bred at Patuxent.

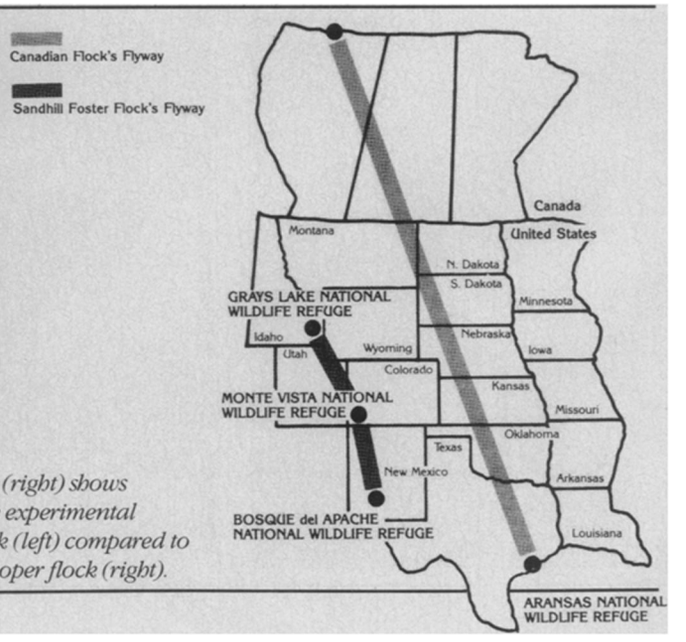
Perhaps the most fundamental question about captive breeding is — regardless of whether or not it will work — should it be done at all? Is it worth the money? Or does it take limited funding away from more important endangered species activities? Paul Ehrlich, a well-known writer and environmentalist, is critical of captive propagation for this reason. In their most recent book, *Extinction* (Random House, 1981), he and his wife Anne call it a "question of the allocation of scarce resources.... There is danger that too much emphasis on saving prominent individual species may distract attention from absolutely crucial but less 'sexy' tasks..." like protective regulations, law enforcement, public education and habitat preservation. "Captive breeding is a very expensive undertaking," agrees Woody, who has run FWS endangered species programs for more than ten years. "It can be a real PR thing too — it looks good but can contribute to overlooking real problems."

His major concern is wildlife habitat. "It's useless to produce truckloads of birds if there's nowhere to release them." For example, the future of the masked bobwhite, though it is one of Patuxent's greatest success stories, is still uncertain due to vulnerability of its habitat in the United States — entirely privately owned ranch lands in southern Arizona. Current owners are sympathetic to the quail, but "if land ownership changes, they could all be wiped out," says Woody.

Patuxent scientists have emphasized from the beginning, however, that captive breeding should complement, not replace, traditional endangered species conservation measures. The cost is low compared to some of the other approaches, says Carpenter. And in addition to producing animals for reintroduction, captive propagation provides benefits such as:

- animals with which to conduct biological research too risky for depleted wild stocks,
- animals for public education,
- preservation of genetic variability in case it is lost in the wild and
- a final stronghold for species that could be wiped out in a single natural or man-made disaster.

Carpenter agrees that habitat protection is the key to saving endangered species. Since the goal of Patuxent's breeding program is reintroduction, he says that "it will do little good to have a successful program here if there's no habitat to return the animals to." □



Young whooping crane with greater sandhill foster flock at Bosque del Apache National Wildlife Refuge (above). Biologists hope that adult birds will mate with their own species here. Map (right) shows migration route of the experimental whooper-sandhill flock (left) compared to the remnant wild whooper flock (right).