

The Florida Panther Verges on Extinction

A breeding program that raises scientific questions and animal rightists' tempers may be the only way to save this cougar

TWO WEEKS AGO BIOLOGISTS FROM THE Florida Game and Fresh Water Fish Commission captured a Florida panther kitten and displayed it briefly to the press before whisking it away to White Oak Plantation near Yulee. There, the 6-month-old male will become the first animal in a breeding program intended to save the Florida panther, which is one of the most critically endangered mammals in the world. Only 30 to 50 Florida panthers are left in the shrinking wild areas south of Lake Okeechobee, and advocates of the captive breeding program say this could be the last chance to save this cougar subspecies from extinction.

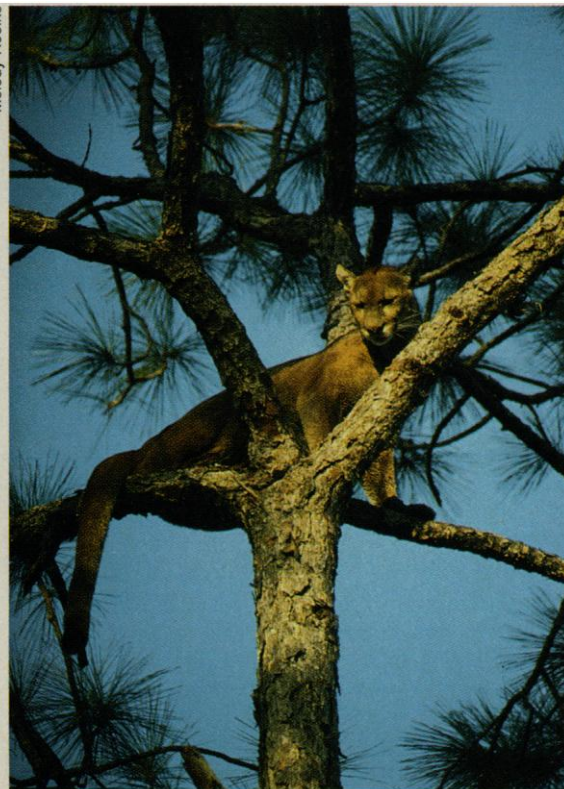
You'd think environmentalists and animal enthusiasts would be ecstatic. But, in fact, some of the strongest opposition to the program has come from animal rights proponents who say there are too many unknowns in the breeding program. More effort, they say, should be given to improving the panther's dwindling habitat—and possibly even to boosting the population by adding a separate subspecies of cougar from outside Florida.

According to D. J. Schubert, director of investigations for the Fund for Animals, a New York-based group with 200,000 members, the captive breeding program is "not a recovery plan but a recovery gamble." The government agencies involved don't know "whether the captures will irreparably harm the existing wild population [or] whether captive breeding can succeed." Indeed, the fund so adamantly opposed the breeding program that it sued the U.S. Fish and Wildlife Service to stop it—a challenge that was recently resolved by a settlement, allowing the program to move ahead.

Yet the legal tangle is not the only complication in efforts to save the Florida panther—there are also stubborn scientific questions. Most programs to save endangered plants and animals, including the panther breeding project, are carried out under the federal Endangered Species Act. The act applies only to recognized species and subspecies, and although the last 50 Florida panthers would certainly seem to fit that category, in scientific

terms the issue isn't crystal clear (see Perspective by O'Brien and Mayr on page 1187).

Last year, Stephen O'Brien, a molecular geneticist at the National Cancer Institute and Melody Roelke of the Florida game



Treed. *Felis concolor coryi*, the Florida panther, once roamed freely from Florida to South Carolina. Now 30 to 50 survivors are confined to south Florida.

commission tested DNA from Florida panthers and showed that some panthers carry genes from Central or South American cougars—probably inherited from imported forebears released in the wild two or three decades ago. But if the panthers aren't genetically "pure," do they deserve the protection of the Endangered Species Act?

That question isn't just theory. Last year the Fish and Wildlife Service turned down a petition by state farm bureaus in Idaho, Montana, and Wyoming to remove the gray wolf from the Endangered Species List because DNA studies had shown that some Midwest wolves carry coyote genes. David Flemming, chief of the division of endangered species in the Wildlife Service's south-

east region, says that "the service is now in the process of developing a policy as to what is and what is not a hybrid. We may end up considering cases on a species-by-species basis." And if the Florida panther is removed from the list of endangered species, efforts to save the last wild cougar in the eastern United States will likely fail.

Adapted to the hot, damp, thickly vegetated South, *Felis concolor coryi* is darker, has longer legs and smaller feet, and is lighter in weight than the other seven cougar subspecies of North America. Although it once ranged from Arkansas to South Carolina to Florida, it is now confined to 5000 square miles centered on Everglades National Park, Big Cypress National Preserve, and the newly created Florida Panther National Wildlife Refuge. The cat also ranges north into extensive tracts of private land that are probably the best habitat in its range—but these lands may soon become a poor home for wild species since they are increasingly subject to development.

As the panther's range and population have contracted, inbreeding has become so severe that most animals have one or more abnormal traits: deformed tail vertebrae causing a 90-degree kink near the tip of the tail; a "cowlick" whorl of fur on the back; and, in males, cryptorchism (a condition in which one testicle fails to descend into the scrotum) and more than 90% defective sperm. Researchers suspect there are other dangerous consequences of inbreeding that aren't so easily documented: reduced fecundity, birth defects, higher mortality among newborns, slower growth, perhaps even a homogenous immune system that could leave the entire panther population vulnerable to a single pathogenic strain.

But even those threats pale before the fate many thought had already befallen the Florida panther by the late 1960s—extinction. Indeed, until a panther was treed and anesthetized in 1973, it was widely assumed that *Felis concolor coryi* was no more. The discovery that there were survivors kindled interest among biologists and environmentalists, and in 1981 the Florida game commission began anesthetizing cats and fastening radio collars to them to track their movements.

The start of the program wasn't without problems. In 1983 a panther died in reaction to anesthesia, and soon afterward veterinarian Melody Roelke was hired by the commission to set up a protocol for tranquilizing and handling the cougars. Now the program has become safer and more sophisticated: attend-

ing each capture is a mobile medical unit with IVs, drugs, bottled oxygen, endotracheal tubes, and balloon splints for broken limbs. At the moment some 20 animals are radio-monitored by the Florida Game Commission and National Park Service biologists. Each cat is periodically treed by hounds, anesthetized, dosed with vitamins, and immunized against various diseases. Simultaneously, Roelke collects hair and skin samples, feces, blood, saliva, and semen, which are used to check the panthers' health and genetic status.

Caring for individual panthers, laudable as it is, clearly wasn't enough. In view of the tiny population, it was also necessary to think about the future of the subspecies as a whole. In 1989 the U.S. Fish and Wildlife Service contracted with the International Union for the Conservation of Nature and Natural Resources to help decide what action should be taken. Ulysses Seal and Robert Lacy, experts in captive breeding, held workshops in Naples and Gainesville, Florida, bringing together state and federal officials with specialists in genetics, reproductive physiology, population biology, and wildlife biology.

The researchers plugged data on the panther into a computer program designed by Lacy called VORTEX, which is intended to forecast the future of a species. VORTEX spat out an ominous answer. Without captive breeding, there was an 85% probability that the cat would die out in 25 years. The mean time to extinction, the program said, was 20 years. According to the program, chance events such as disease outbreaks, fluctuation in the sex ratio of offspring, and random gene transmission would feed back on each other to create a "vortex" in which the population would grow ever smaller, adults would have increasing trouble finding mates, inbreeding would intensify, and more genetic diversity would be lost—a cycle intensifying until the species faced extinction. Even worse than a gradual fading away, a disaster or disease could wipe out the tiny, vulnerable panther population overnight.

To short-circuit this vortex, the second workshop came up with a Species Survival Plan for the panther. The goal is to have 130 breeding animals in a combination of wild and captive environments by the year 2000 and 500 by 2010. According to VORTEX, meeting those goals assures a 95% probability that the cat will survive in the wild for 100 years, retaining 90% of its current genetic diversity.

The practical details of how to meet those

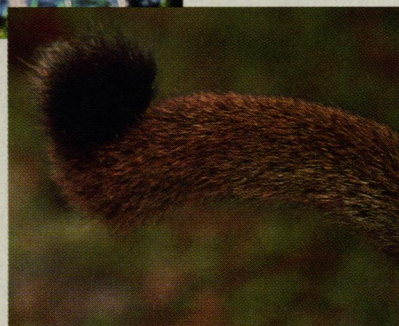
goals were laid down in an Environmental Assessment prepared by Dennis Jordan, a Fish and Wildlife Service biologist who serves as panther recovery coordinator. Scientists will collect and cryopreserve semen from free-ranging males. In addition, over the next 3 to 6 years, up to 50 panthers will be captured and placed in breeding facilities run by zoos.

But before those efforts could begin, the program had to run the gamut of public criticism. In June 1990 the Fish and Wildlife Service issued its draft Environmental Assessment, which was debated at hearings in



Special handling.

Florida Game Commission tracks 20 panthers, occasionally anesthetizing and treating them. Many panthers have inbred genetic defects such as kink in tail (right).



Washington and in three Florida cities, followed by a 60-day comment period. Sentiment at the hearings was mixed. Several groups—including the Wilderness Society, the Defenders of Wildlife, the National Audubon Society, and the Sierra Club—supported the recapture program. But at least five animal rights groups opposed captive breeding or called for a more comprehensive Environmental Impact Statement: the Animal Protection Institute of America, the Animal Rights Foundation of Florida, In Defense of Animals, the Humane Society of the United States, and the Fund for Animals.

Much of the criticism of the captive breeding program seems to be based on a concern that removing animals will interfere with the reproduction of the remaining wild population, a concern Dennis Jordan says is misplaced. "People don't understand that we're not planning to go in and take all the cats. Mainly we will remove kittens. If we took a whole litter, the mother would quickly recycle—go into estrous and breed again. Or we might take one or two kittens from a litter. Since we're seeing a 50% mortality in the kittens, this wouldn't hurt the population. And the kittens remaining in the litter would have a better chance of surviving."

Such arguments were persuasive to James W. Pulliam, director of the Wildlife Service's southeast region. On 12 December Pulliam signed a "Finding of No Significant Impact" on the environment, clearing the way for the recapture program to begin—without the Environmental Impact Statement program opponents had desired. In January Pulliam issued Endangered Species permits, allowing Florida game commission biologists to capture up to six kittens and four nonreproducing adults in 1991 and an additional six kittens and two adults annually for another 5 years.

It was then that the Fund for Animals filed suit, hoping to block the capture and force the Fish and Wildlife Service to file an Environmental Impact Statement before the program could proceed. Apparently fearing a court showdown that could delay the captures for a protracted period, early in February the Fish and Wildlife Service agreed to a settlement. Under the terms of the settle-

ment, the service will capture only kittens this year—no adults. It will also prepare a supplemental Environmental Assessment, giving attention to areas that the Fund for Animals argued were in need of more thought.

Following the compromise, federal and state wildlife agencies moved quickly. On 20 February biologists captured the 6-month-old male; since then they've taken three more. "We're very happy with the four panthers taken so far," Roelke told *Science*. "The father of two of the panthers was considered a genetic founder: a cat that had no other living relatives or offspring. After he sired his last offspring he was killed by a car; so these two kittens are carrying his irreplaceable genes."

As Roelke's remarks suggest, a key question for officials is going to be: Which animals should be captured? That question has been made more difficult to answer by Roelke and

Melody Roelke

Helen Longest-Slaughter

O'Brien's findings. Their analysis of nuclear and mitochondrial DNA, published last fall in *National Geographic Research*, indicates that a group of seven panthers in Everglades National Park is descended in part from Central or South American cougar bloodlines. The foreign genes, which O'Brien calls "heretical," have also reached the other, larger pocket of panthers: more than 20 animals in the Big Cypress Swamp region 50 miles to the northwest.

Using restriction fragment length polymorphism analysis, O'Brien and Roelke surveyed 43 loci in nuclear DNA from the Florida panther and its seven western cougar cousins. The Florida cats possessed only about half the genetic diversity of the western animals. In addition, tests turned up an unusual form of the enzyme adenosine phosphoribosyl transferase, or APRT, which is involved in recycling nucleotides. All except two Big Cypress panthers had the common western cougar form of the gene. The seven Everglades animals, on the other hand, all had the variant, which has cropped up in samples from Chilean and Brazilian wild cougars but not in any North American animals outside Florida.

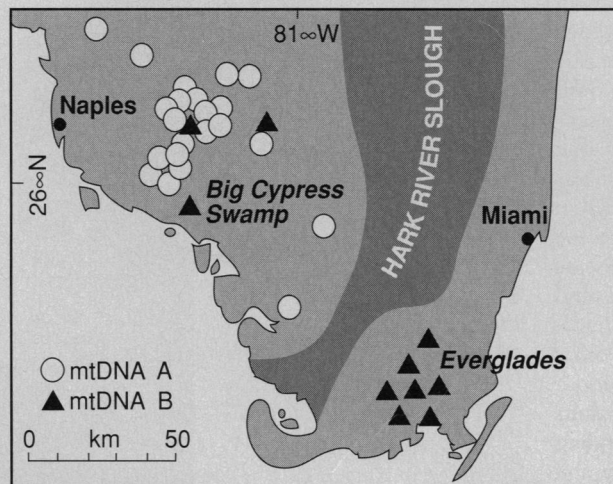
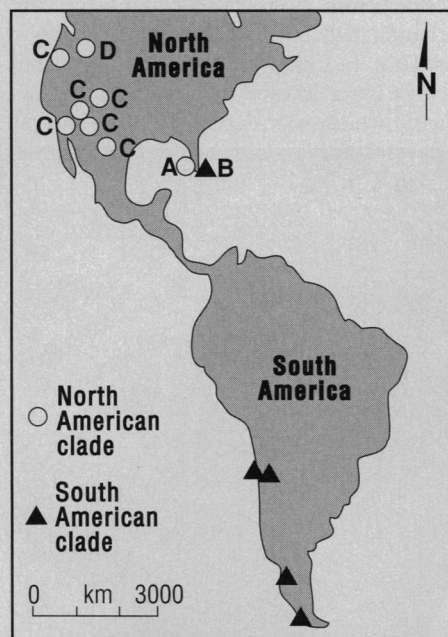
"We suspected we were looking at outside genetic material," says Roelke, "and not only in the Everglades stock, but in two of the Big Cypress animals as well. Either the two populations were isolated and this was a rare allele occurring naturally in Florida, or it had recently been introduced to the Everglades and was now emigrating west."

The suspicion that these were foreign genes was converted to a harder conclusion when O'Brien and Roelke extended their analysis using mitochondrial DNA from the eight North American cougar subspecies and three South American counterparts. Mitochondrial DNA from the Everglades cats was more closely related to the South American specimens than it was to the typical mitochondrial genes from Big Cypress or the other seven North American subspecies. Of the Big Cypress animals, 22 had the classic North American DNA, while three had South American mitochondrial DNA, confirming the movement of the foreign genes into the main Florida panther population.

Roelke and O'Brien assumed their gels weren't fibbing, but to confirm that the story the gels told was true it was necessary to show that at some time in the not too distant past, South American cats had been let loose in the Everglades. And, indeed, archives of the Everglades park revealed that a local menagerie had released captive cougars in the late 1950s and 1960s, with the permission of the Park Service, under the

impression that they were all Florida panthers.

"We don't have a good paper trail for what happened," Roelke told *Science*, "but apparently a tame female from the east coast of Florida had been brought into the menagerie in 1958. No one knows her genetic background. It's believed she was bred to



Genetic invasion. Mitochondrial genes typical of South American cougars have been found in Florida panthers, calling into question whether they are a distinct subspecies.

captive pure Florida panthers. Perhaps her offspring—carrying the mother's mitochondrial DNA and some portion of her chromosomes—were among the cats released into the wild." Late last fall O'Brien carried the analysis to a further degree of precision, using cat-specific DNA fingerprinting probes. Those results (not yet published) implicate eight of 19 Florida panthers as having some South American genes.

Some conservationists who favor the recapture program fear that the presence of heretical genes may offer an opening to

those who would like to develop the private lands on which the endangered feline now dwells. The U.S. Endangered Species Act gives the Fish and Wildlife Service the authority to protect species, subspecies, and distinct population segments (the bald eagle in the lower 48 states is an example) as well as their habitats. The act does not address genetic hybrids. Conservationists say corporations or special interest groups could attempt to have the panther removed from the endangered species list as a hybrid, clearing the way for development of its final stronghold.

But if the presence of genes from the south is a bureaucratic headache and possibly an additional threat to the Florida panther's homeland, it could also be a boon to the animal itself. Says O'Brien: "In the pure *coryi*...the males are all cryptorchid and have abnormal sperm. The panthers which have received the South American genetic material may be in better shape. There's no simple answer to this problem from a management standpoint, but from a genetic standpoint, the best strategy would be to simply consider the entire population a threatened subspecies."

And that seems to be the tack that proponents of the breeding program are now

taking. "The genetic introgression happened before the Florida panther was listed as an endangered species in 1967," says David Wesley, supervisor of endangered species activity at the Fish and Wildlife Service's Jacksonville field office. "What we listed then was what we have today."

Wesley's surety doesn't mean there won't be further challenges. Nor does it resolve all the questions that remain in relation to choosing which panthers to capture and breed and how to preserve what remains of their habitat. But those questions pale in the face of

the continued attrition of the animal itself—something that, for the moment, only the recapture program seems to hold the answer to. "Since January 1990," Roelke said recently, "we've lost eight animals, seven of which were genetic founders; they had no known siblings, offspring, or living parents. These panthers—their sperm, their eggs, and their unique genes—are lost to us forever."

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