Extracts

College of Public Health and Health Professions

Device May Help Parkinson's Patients Swallow Easier

A hand-held device that strengthens the muscles involved in swallowing can address a serious symptom of Parkinson's disease, according to a new University of Florida study.

In what researchers believe is the largest randomized trial of a behavioral swallowing treatment in patients with Parkinson's disease, scientists found that about one-third of the volunteers who used the device improved their ability to swallow. The findings appeared in November in *Neurology*, the medical journal of the American Academy of Neurology.

Nearly 1 million Americans have Parkinson's disease, according to the Parkinson's Disease Foundation. Finding solutions to their swallowing problems is important because their most common cause of death is pneumonia caused by inhaling foreign material, such as food, during swallowing.

"The many muscles involved in swallowing progressively weaken in patients with Parkinson's disease and become uncoordinated in the same way that patients lose coordination and strength in their arms and legs," said Michelle Troche, a clinical lecturer in UF's Department of Speech, Language, and Hearing Sciences.

It also becomes more difficult for patients to sense material in their airways and cough hard enough to expel it, she said.

For the study, researchers trained participants with Parkinson's disease to exhale into an Expiratory Muscle Strength Training, or EMST, device. In previous studies, EMST has improved swallowing and cough function in patients with multiple sclerosis and in elderly, sedentary adults.

"EMST uses the basic exercise theory behind any strength training program," said co-investigator Christine Sapienza, chair of the Department of Speech, Language, and Hearing Sciences. "This small device capitalizes on that concept of overload with a calibrated pressure release valve that won't open until you generate a great enough lung pressure. The patient or clinician can vary how much pressure is needed to open the valve on the device. The greater the pressure you need, the stronger the muscles have to be. It acts much like a pin on a weight machine and uses the same concept to strengthen the muscles involved in swallowing and breathing."

"Their efforts are pioneering, and it is likely that this study will stand the test of time as a landmark in Parkinson's disease swallowing research," said Dr. Michael Okuna, co-director of UF's Movement Disorders Center.

Participants in the Parkinson's disease study were divided into two groups of 30. In one group participants used the EMST device with proper calibration. The other participants used a

Florida Museum of Natural History

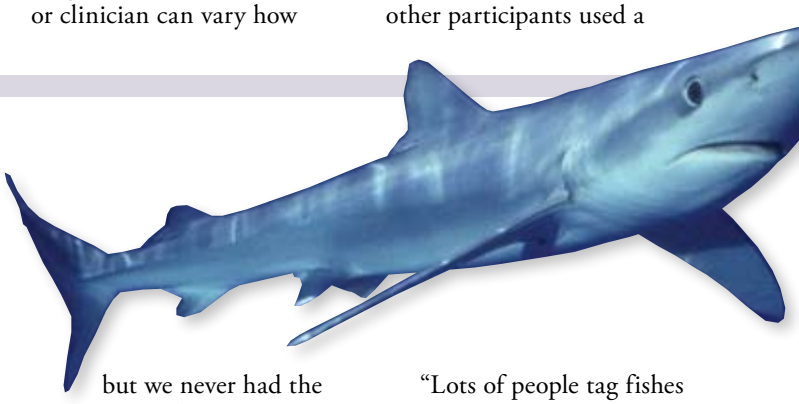
Ocean-Crossing Blue Sharks Need International Protection

Blue sharks are strong enough to cross the Southern Atlantic Ocean but need human protection at their destinations and points of departure, a University of Florida collaborative international tagging project finds.

The discovery of the shark's wide ranging ways shows that the species, which is subjected to heavy fishing pressure, needs multinational regulations to manage them on both sides of the Southern Atlantic, said George Burgess, director of the Florida Program for Shark Research at UF's Florida Museum of Natural History.

"This is the first evidence of the transatlantic migration of a blue shark from the southwestern Atlantic Ocean to the southeastern Atlantic Ocean," said Felipe Carvalho, a UF graduate student majoring in fisheries and aquatic sciences. He worked on a Universidade Federal Rural de Pernambuco (Brazil)/UF project that tagged a blue shark off the coast of Brazil and detected the fish off Africa 87 days later.

"We thought this migration might be happening,



but we never had the data before to prove it," Carvalho said.

The suggestion that the same stock of blue shark lives on both sides of the southern Atlantic Ocean allows management agencies to consider fishing regulations that would cover both geographical areas, said Burgess, who is co-supervising Carvalho's research.

Considered to act as one entity, fishes within the same stock have the same biological characteristics and movement patterns, which allow them to be managed together, he said.

"Lots of people tag fishes and sharks, and sometimes when they make a movement from one place to another, there are lots of 'oohs' and 'aahs' because it wasn't known they could do that or go there," Burgess said. "But this is a key piece of information that will have applicability toward fishery management."

The most frequently caught shark species in the South Atlantic Ocean, the blue shark must be carefully managed because it is frequently captured in the nets of fishermen seeking tuna

Jesse S. Jones

Speech pathologist Christine Sapienza helps patient Lou DeLaney use an Expiratory Muscle Strength Training device that new UF research shows can improve swallowing function in patients with Parkinson's disease.

device that looked exactly the same, but did not work to strengthen the muscles. Neither the participants nor the study therapists knew who had the real device and who had the placebo device. Participants used the devices in their homes for 20 minutes a day, five days a week for four weeks. Therapists visited once a week to make sure participants used the device correctly. Following the study period, participants in the sham group received the EMST treatment.

The researchers measured participants' swallowing function before and after treatment with a standardized swallow safety scale, the Penetration-Aspiration scale, developed in part by John Rosenbek, also with the Department of Speech, Language, and Hearing Sciences. Researchers used videofluoroscopy to obtain motion X-ray images of the participants' swallowing muscles as they swallowed liquid.

One-third of participants who used the device with calibration had significantly improved swallow safety scores compared to 14 percent of the participants in the sham group. The researchers also found that for patients in the treatment group, there was greater movement in the muscles that lift the voice box out of the way during swallowing. Quality-of-life measures related to swallowing improved in both the treatment and sham groups.

Christine Sapienza, sapienza@ufl.edu

Jill Pease

and swordfish, Burgess said. Some fishermen remove the fins and toss the sharks back into the water, dead or alive, he said.

"Sharks are of real concern to biologists because they are taken in such huge numbers all over the world," Burgess said. Yet they are understudied because they don't generate the economic revenue that tuna and swordfish do, he said.

Adding to sharks' troubles are certain biological characteristics that lower their reproductive potential, Burgess said. Sharks may take 10 years or more to reach sexual maturity — compared with two to five years for many bony fishes. Pregnancies are long, typically a year or more and are followed by a resting period. As live-bearers, the number of young they can carry at one time is limited, he said.

"There are other animals that have what we call 'life in the slow lane,'" he said. "Skates, rays, whales and sea turtles follow this same pattern of being slow growing and long lived with limited reproductive potential."

Sharks caught and killed, especially when young, are cut off from the lengthy period of time required over a lifetime to reproduce the number of offspring needed to sustain a population, Burgess said.

Working with a Brazilian research team, Carvalho and his co-workers have so far attached tags to 10 sharks off the coast of Brazil and plan to tag 10 additional sharks. These satellite tags provide the location as latitude and longitude, and the temperature and depth, of the water where the shark is swimming.

"These tags are like minicomputers," Burgess said. "If the antenna breaks the water surface, it can send up a signal to a satellite, which then bounces a signal back to us telling where it is."

Although blue sharks have been documented to move across the Atlantic or Pacific Ocean in northern latitudes, this is the first time evidence has shown such migration to take place in the South Atlantic Ocean, Carvalho said.

"The next step of our study will look at whether this was just one individual who got happy feet and decided to boogie all the way across the ocean or if this is part of a larger pattern," Burgess said.

George Burgess, gburgess@flmnh.ufl.edu

Cathy Keen

Extracts

Institute of Food and Agricultural Sciences

Collaboration Will Share Food Security Techniques

The University of Florida has secured a four-year, $7.9 million award to lead a unique new collaboration among experts in the U.S. and Brazil to improve agriculture and food security in the African nation of Mozambique.

The program model, known as trilateral cooperation, involves collaboration between two donor countries to help one beneficiary country, said Walter Bowen, international programs director for UF's Institute of Food and Agricultural Sciences.

Bowen will lead a team of scientists from UF and Michigan State University on the award, funded by the U.S. Agency for International Development.

The project's primary goals are to reduce hunger and poverty in Mozambique by increasing agricultural productivity, creating economic opportunities and enhancing human nutrition. Partners based in Brazil and Mozambique will include institutes of higher learning and agricultural research agencies. Project activities in Mozambique will commence this spring.

Located on the southeast coast of the African continent, Mozambique is a country of about 28 million people. Though its economy has grown in recent years, it remains one of the world's poorest nations and malnutrition is a widespread problem. Major food crops there include cassava, corn, sugarcane, coconuts and sorghum.

Trilateral cooperation was a logical choice because Brazil and the United States bring complementary strengths to the project, said Bowen, who spearheaded the effort to secure the award.

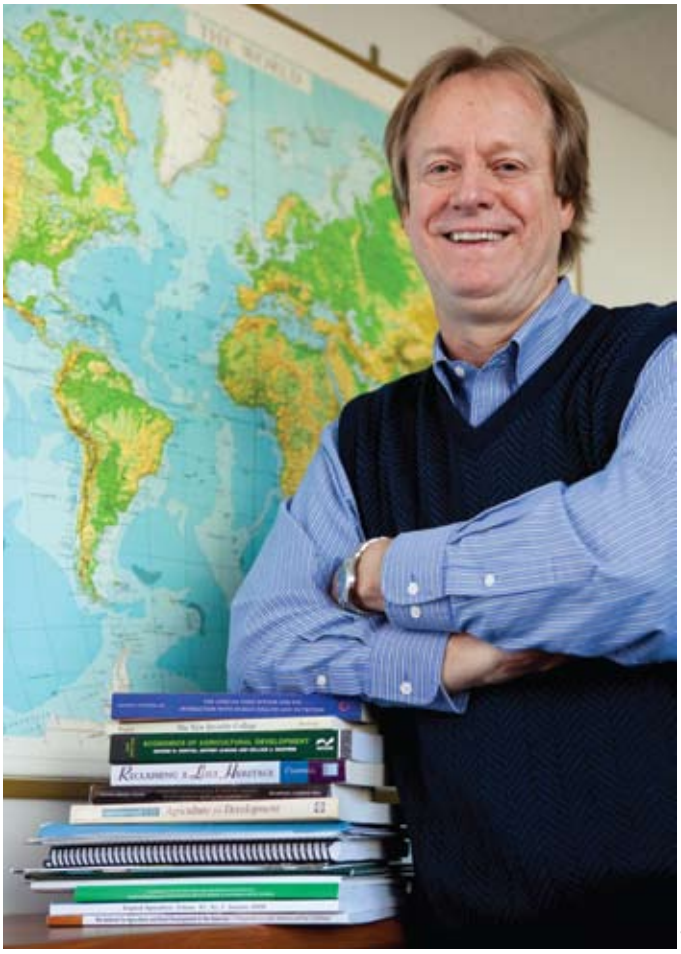
> "The university has a long history of collaborating with colleagues in Latin America. With this project we are taking that experience and leveraging it for the benefit of a third country. This is a model that has great potential as world economies become more interconnected."
>
> — Win Phillips

"We know we can do a more effective job if we combine the best expertise in the U.S. with the best expertise in Brazil," Bowen said.

Brazil has a rapidly developing agricultural economy with climate and soil conditions similar to those in Mozambique, he said. Portuguese is the official language of both countries.

The U.S. has extensive experience funding and administering international development programs, Bowen said. Also, UF has long been involved in research and outreach programs in Brazil.

Win Phillips, UF vice president for research, said the award is significant not only because it will enable faculty members to help a developing nation but also because the trilateral cooperation model may be a good fit for future UF partnerships.



Tyler Jones

Walter Bowen

"The university has a long history of collaborating with colleagues in Latin America," Phillips said. "With this project we are taking that experience and leveraging it for the benefit of a third country. This is a model that has great potential as world economies become more interconnected."

Besides providing humanitarian aid, the project will help UF scientists develop more effective strategies for improving agricultural systems and outreach, said Jack Payne, UF senior vice president for agriculture and natural resources.

"International cooperation is one of our key themes at IFAS," Payne said. "The efforts we make in other parts of the world can lead to new farming approaches, new crops, new markets and many, many other innovations that ultimately benefit Florida residents and producers."

Walter Bowen, wbowen@ufl.edu

Tom Nordlie

Ibis Mating Habits Altered By Mercury

When University of Florida researchers began studying the effects of mercury consumption on white ibises, they had a hunch the contaminant might affect the birds' ability to produce chicks.

And while their suspicions of poor breeding were confirmed, they didn't expect this: altered courtship behavior in males and high percentages of male birds mating with other males.

"We knew that mercury can disrupt hormones — what is most disturbing about this study is the low levels of mercury at which we saw effects on hormones and mating behavior," said Peter Frederick, a UF wildlife ecology and conservation professor who led the five-year study. "This suggests that wildlife may be commonly affected."

The study marks the first time that mercury's effects on birds' sexual preference and courtship behavior have been documented, and provides a critical link between low levels of mercury contamination and impaired reproduction. The results suggest that even low levels of mercury — which is widespread in the U.S. and global environment — can result in major impairment for wild bird populations.

The study was published in the December Proceedings of the Royal Society B.

In the late 1980s and early 1990s, Everglades researchers began to notice high levels of mercury in many wildlife species, such as panthers, birds and fish, Frederick said. By the late 1990s, mercury levels in the Everglades had dropped dramatically, and suddenly the ibises were nesting like crazy.

Researchers believed that better hydrological conditions probably caused much of the birds' renewed nesting enthusiasm, but something else also seemed to be at work, Frederick said — and that's what prompted him and then-doctoral student Nilmini Jayasena to begin looking at mercury. The contaminant found its way into the Everglades via municipal and medical waste incineration. But during the 1990s, medical waste became more closely regulated and flashlight batteries that didn't contain mercury replaced those that did.

The UF scientists built a 13,000-square-foot, net-covered aviary, and brought in 160 young ibises, which were divided into four groups made up of equal numbers of males and females.

Three groups ate a diet that included low, medium or high levels of mercury; a fourth control group ate a mercury-free diet.

The scientists took great care to ensure that even the birds in the high-mercury group weren't consuming more than they would have in the wild, Frederick said.

Among the findings: in 2006, about 55 percent of the high-mercury-diet males were nesting with other males. The degree of homosexual pairing for all three dosed groups increased as did their mercury exposure, he said.

"Many years ago, I spent thousands of hours in the field documenting pairing behavior in ibises in a place that did not have mercury contamination — and I never once saw males pairing with males," he said.

High-mercury males were far less likely to be approached by females during courtship and all of the males given mercury showed lower rates of performing the ritual head bobs and bows of bird courtship than those in the control group.

Overall, high-mercury females produced 35 percent fewer fledglings than females in the control group.

After the study, which lasted three breeding seasons, some 260 birds were released back into the Everglades, but only after spending several months on a cleansing, mercury-free diet.

Peter Frederick, pfred@ufl.edu

Mickie Anderson

A pair of white ibis with a chick at the Wetlands Ecological Research Aviary in Gainesville. UF research has found that mercury consumption can affect ibis mating habits, causing some males to pair off, and reducing the number of chicks produced by females.

Extracts

Florida Museum of Natural History, College of Liberal Arts and Sciences

Genetics Research Provides Insights About Flowering Plants

Flowering plants have evolved at explosive rates throughout history, yet scientists since Charles Darwin have been faced with the great biological mystery of how they originated.

A new University of Florida study published in December in the *Proceedings of the National Academy of Sciences* presents the deepest insight to the genes that made up the first flower, the common ancestor of all flowering plants, and how those genes have changed over time.

"Our survival depends on products we get from the flower — grains, fruits and many other materials," said Doug Soltis, UF distinguished professor of biology and project co-investigator. "Crop improvement is so important, but you don't understand how a flower is put together unless you have a reference point — you can't modify what you can't understand."

After nearly 10 years of research funded by the National Science Foundation, scientists from the Florida Museum of Natural History, the UF Department of Biology and the UF Genetics Institute are bringing the study to a close.

"There are 350,000 species of flowering plants (or angiosperms), and they serve as the foundation of nearly all of Earth's ecosystems, yet we don't know how the flower originated," said Pam Soltis, UF distinguished professor, Florida Museum of Natural History curator and project co-investigator. "We now know the origin of many of the genes responsible for making a flower and how those genes

Jeff Gage

College of Medicine

Protein May Explain Role Of Diet In Aging

Restricting calories extends life and slows a range of age-related disorders in mice, rats and other organisms. But even after eight decades of research on the subject, scientists are still unclear just how caloric restriction exerts its age-battling influence.

Now, for the first time in mammals, researchers at the University of Florida and the University of Wisconsin-Madison have sleuthed out the role of a key player in the process, using age-related hearing loss as an example. The protein in question, called Sirt3, could provide a new target for anti-aging drug therapies. The findings were reported in the journal *Cell* in November.

The researchers found that when Sirt3 is absent, caloric restriction loses its anti-aging powers. They uncovered details of how the protein, an enzyme found primarily in mitochondria — the energy-producing centers of cells — wards off cell death by maintaining an environment that combats destructive chemicals.

"Knocking it out seems to be very negative for mitochondrial function and allows the accumulation of oxidative stress and damage to neurons and other cells," said Christiaan Leeuwenburgh, chief of UF's Biology of Aging division. "That's an important clue about the role that Sirt3 plays in protecting cells from age-related damage."

Age-related hearing loss is the most common sensory disorder among the elderly, affecting more than 40 percent of people older than 65 and projected to affect 28 million Americans by 2030, according to the Department of Health and Human Services.

The disorder is marked by the death of sensory hair and nerve cells in the inner ear. While those cells are long-lived, they do not regenerate, so their demise means permanent loss of hearing. But all is not lost, since the environment in which those cells reside can be remodeled over time as damaged organelles such as mitochondria get replaced. Caloric restriction helps to rescue those damaged cells by reducing oxidative damage.

Having previously shown that restricting the diet induces expression of the protein Sirt3 in the inner ear, the researchers now

"Our survival depends on products we get from the flower — grains, fruits and many other materials. Crop improvement is so important, but you don't understand how a flower is put together unless you have a reference point — you can't modify what you can't understand."
— Doug Soltis

have changed during the history of angiosperms."

A 2009 UF study traced the origin of flowers using genetic data for the avocado (a representative of one of the early lineages of flowering plants) and a well-known plant in genetics research, *Arabidopsis thaliana*. The new study includes additional comparisons with a water lily, California poppy and cycad (a gymnosperm or non-flowering seed plant) and shows how the first flowers evolved from pre-existing genetic programs in gymnosperm cones.

"We have a much better understanding of the flower than we did 10 years ago and it's a huge improvement," Doug Soltis said. "We don't know every pathway, but we have a much better handle on what makes those parts tick."

Typical angiosperms have flowers with four organs: sepals (typically green), petals (typically colorful), stamens (male organs, which produce pollen) and carpels (female organs, which produce eggs). But in the earliest flowers, the distinct borders between their floral organs fade to a blur. The flowers of early angiosperms have organs that merge into each other — for example, a stamen of a water lily produces pollen but it may also be petal-like and colorful.

"Our study found that the floral organs of basal angiosperms merge not only in appearance but also in their underlying genetic pathways," Pam Soltis said. "During evolution, the timing and location of where these genes act have become restricted, ultimately producing flowers with separate and distinguishable flower parts."

"These missing links are incredibly important," Doug Soltis said. "They are our key to the past."

The study was a collaboration of researchers at UF, Penn State, the University of Georgia and the University at Buffalo. The first author on the paper is Andre Chanderbali, a postdoctoral student at the Florida Museum and the UF Department Of Biology.

Pam Soltis, psoltis@flmnh.ufl.edu

Danielle Torrent

show that Sirt3 aids caloric restriction by combating some of the chemical changes that play a major role in the process of aging.

The enzyme belongs to a class of compounds called sirtuins that are known to have anti-aging effects in lower organisms including yeast and flies. Until now, however, there wasn't clear evidence that the effect extends to mammals.

"This is a major step in terms of understanding aging retardation by dietary restriction — it doesn't work without Sirt3," said Shinichi Someya, of the University of Wisconsin-Madison.

In normal mice, lowering calorie intake to 75 percent of a regular diet reduced hearing loss, but in Sirt3-deficient mice, dietary restriction had no such effect. Further, after caloric restriction, mice lacking Sirt3 lost more cellular structures vital for hearing — sensory hair and nerve cells in the ear — than did normal mice on a similarly restricted diet.

Corresponding with that observation, the researchers found that while caloric restriction reduced oxidative damage to DNA in inner ear cells in normal mice, it did not have that effect in mice that lacked Sirt3.

Effects seen in the ear were also observed in brain and liver tissue, suggesting that Sirt3 might have a role well beyond age-related hearing loss, and a potential benefit in cardiovascular and neurological diseases.

Christiaan Leeuwenburgh, cleeuwen@aging.ufl.edu

Czerne M. Reid

Florida Panther Population Rebounding

In 1995, conservation managers made a desperate bid to save the Florida panther from extinction by releasing eight female pumas imported from Texas in hopes they'd breed with native males.

Fifteen years later, the Florida panther population has increased threefold, and while the species remains in peril, the big cats now have a better chance for survival.

Two research papers — in the journals *Science* and *Biological Conservation* — document the breeding program's success and outline an unusually long, collaborative effort among agencies. The Florida Fish and Wildlife Conservation Commission, National Park Service and the National Cancer Institute's Laboratory of Genomic Diversity have been conducting field and lab work on panthers since the 1980s.

University of Florida scientists joined the effort in 2005, analyzing data and conducting population modeling studies.

"What we found was that the panthers that had a mix of Texas and Florida genes were more genetically diverse, had fewer defects and were, in general, surviving better," said Jeff Hostetler, a doctoral student with UF's Institute of Food and Agricultural Sciences.

There were about 25 panthers left in the state when the eight Texas pumas were brought to Florida. There are now more than 100, concentrated mostly between Miami and Naples.

"The big picture is that things have improved from a genetic standpoint for the population, coinciding with an increase in population," said Dave Onorato, a panther expert with the state Fish and Wildlife Conservation Commission's Florida Panther Project. "The evidence is pretty clear that there has been a positive impact on the population."

Listed as an endangered species since 1967, the Florida panther was designated the official state animal in 1982. Despite its popularity, the species was in dire straits by the early 1990s and the cats suffered from numerous inbreeding-related problems: poor sperm quality, heart defects, parasites and infectious diseases.

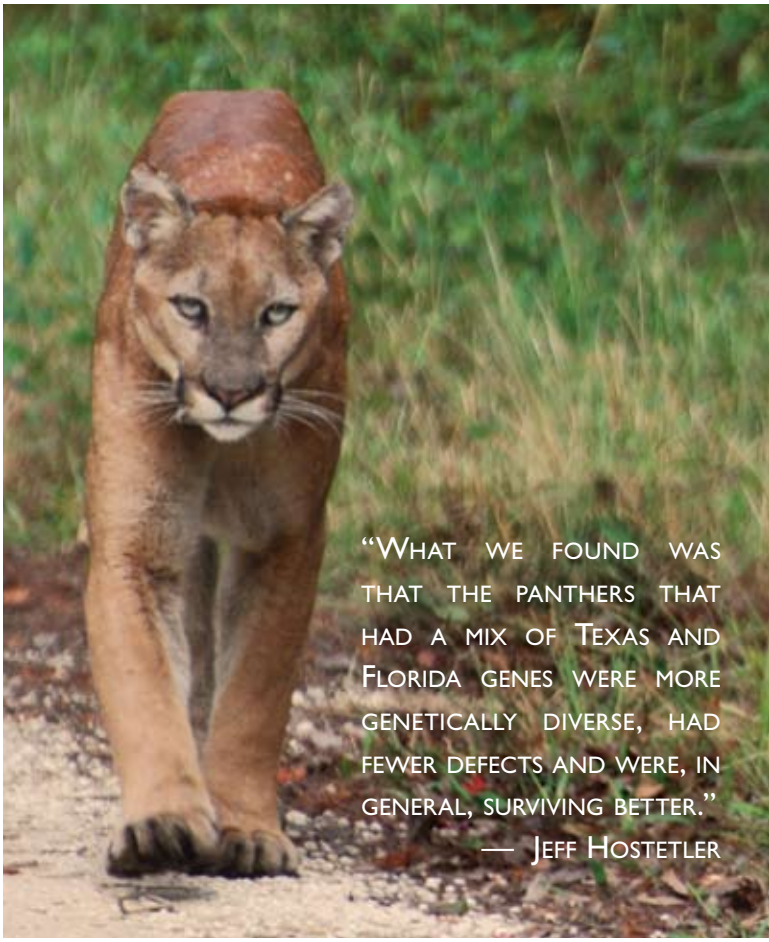
The first generation of kittens born to the Texas females was a much more robust group, but future litters may eventually display problems linked to inbreeding.

"The population does need to get larger so that it's not as dependent on periodic supplementations of new genetic material," Onorato said.

Another major issue is that the cats require so much space, especially males, which are more territorial than females, said Warren Johnson, a geneticist with the National Cancer Institute.

Close proximity to humans could pose problems, although Johnson pointed out that people in the western U.S. often live close to pumas.

While time-consuming and expensive, the research has been invaluable, Johnson said. The lessons scientists have learned from panthers, especially in terms of infectious diseases and inherited disorders, are applicable to humans, he said.



"What we found was that the panthers that had a mix of Texas and Florida genes were more genetically diverse, had fewer defects and were, in general, surviving better."
— Jeff Hostetler

"In essence, in-depth studies of wild populations can teach us a lot," he said.

Madan Oli, a population ecology professor who led the UF team, said because scientists have studied panthers so consistently for so long, the amount and variety of data collected from the carnivores were stunning and valuable.

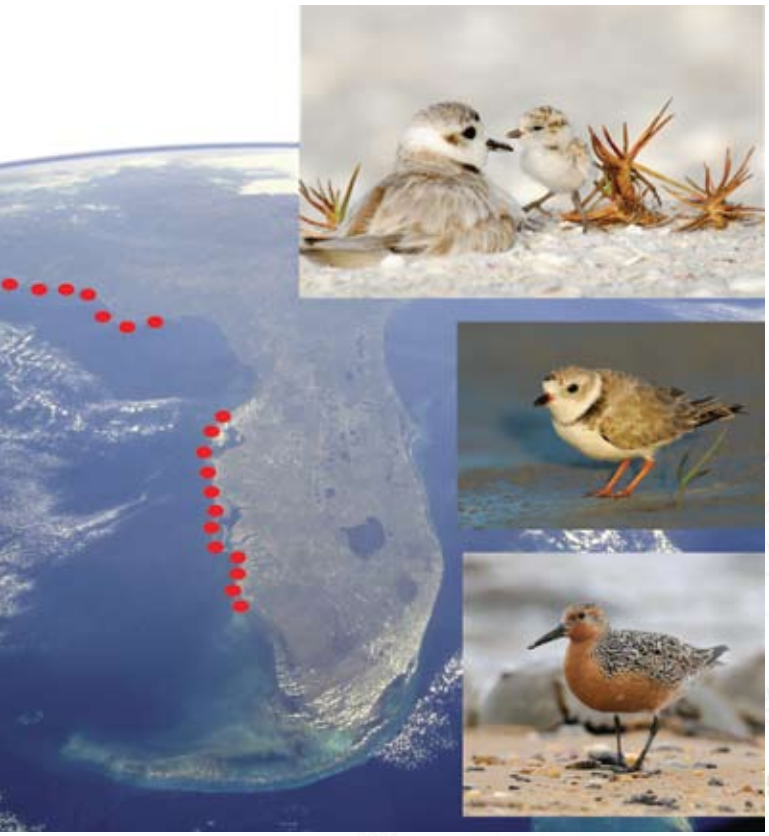
Researchers used radio-transmitter collars on larger cats and outfitted kittens with something akin to the microchips used for cats and dogs. The microchips let them identify individual panthers, and the collars gave them precise information about where the adult cats roamed.

Oli echoed other research team members' assessment of the findings: A population of 100 panthers is much better than 25, but there's still a long way to go.

"As far as persistence of the species … the outlook remains tenuous, but it's definitely a whole lot better than it was," he said.

Jeff Hostetler, hostetle@ufl.edu

Mickie Anderson



NASA and USFWS

Red dots illustrate Florida nesting areas of the snowy plover (top), a small shorebird. UF and FSU researchers have found that birds like the snowy plover, the piping plover (middle) and the red knot (bottom) actually prefer to nest in coastal regions in the year after tropical cyclones have impacted the shore, beach and dunes where the birds nest.

Institute of Food and Agricultural Sciences

Tiny Shorebirds Benefit From Big Storms

Tiny threatened shorebirds on Florida's west coast not only survive hurricanes, they seem to benefit from the storms' after effects, according to new research findings that contradict conventional wisdom.

The findings could have implications for beach nourishment efforts throughout the world and how they affect wildlife.

A paper published in January by the online biology journal *PLoS ONE* outlines the University of Florida and Florida State University scientists' findings that in the year following "tropical cyclones" — a term that covers hurricanes, tropical storms and tropical depressions — snowy plovers were seven times as likely to nest in affected coastal areas.

Matteo Convertino, a research associate in agricultural and biological engineering, said the U.S. Department of Defense funded the study as part of an overall effort to track its environmental impact on Florida Gulf Coast military installations and Eglin Air Force base, in particular.

The snowy plover, a white-chested bird with brown and black markings, is considered a threatened species, according to the Florida Fish and Wildlife Conservation Commission. In Florida, the birds are found along the state's Gulf coast.

The scientists believe plovers benefit from the storms because wind and wave actions create changes to the shore, beach and dunes that the birds prefer when they look for nesting sites, said Convertino of UF's Institute of Food and Agricultural Sciences.

Convertino said he was examining bird-count data from 2002 through 2010 for three regions along Florida's west coast when he noticed an apparent increase in the birds' abundance in years following tropical cyclones.

"The thought we had (earlier) was completely wrong. Hurricanes influence the shorebirds, but in a very positive way. And this goes against many other studies that just assumed a catastrophic event for the species," he said.

James Elsner, an FSU geography professor and a co-author of the study, said the findings may help decision-makers understand how expensive beach nourishment programs actually affect threatened species, such as plovers.

"I think it's a first step … but we have to understand what it is about hurricanes that refreshes the sand, because there is obviously some kind of renourishment (from storms) that doesn't seem to occur when using the dredging methods," he said.

Elsner, who studies hurricanes in a changing climate, said the shorebirds study demonstrates why he finds the subject so compelling.

"I think it's interesting that there are a lot of potential impacts from climate change and that some of those impacts may surprise us — and this is one of them," he said.

But the scientists say future climate change scenarios may not bode well for the birds or humans, as they predict fewer, but more powerful, storm events.

Matteo Convertino,
mconvertino@ufl.edu

Mickie Anderson