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under our wing

INNOVATIVE CARE IN SOUTH FLORIDA

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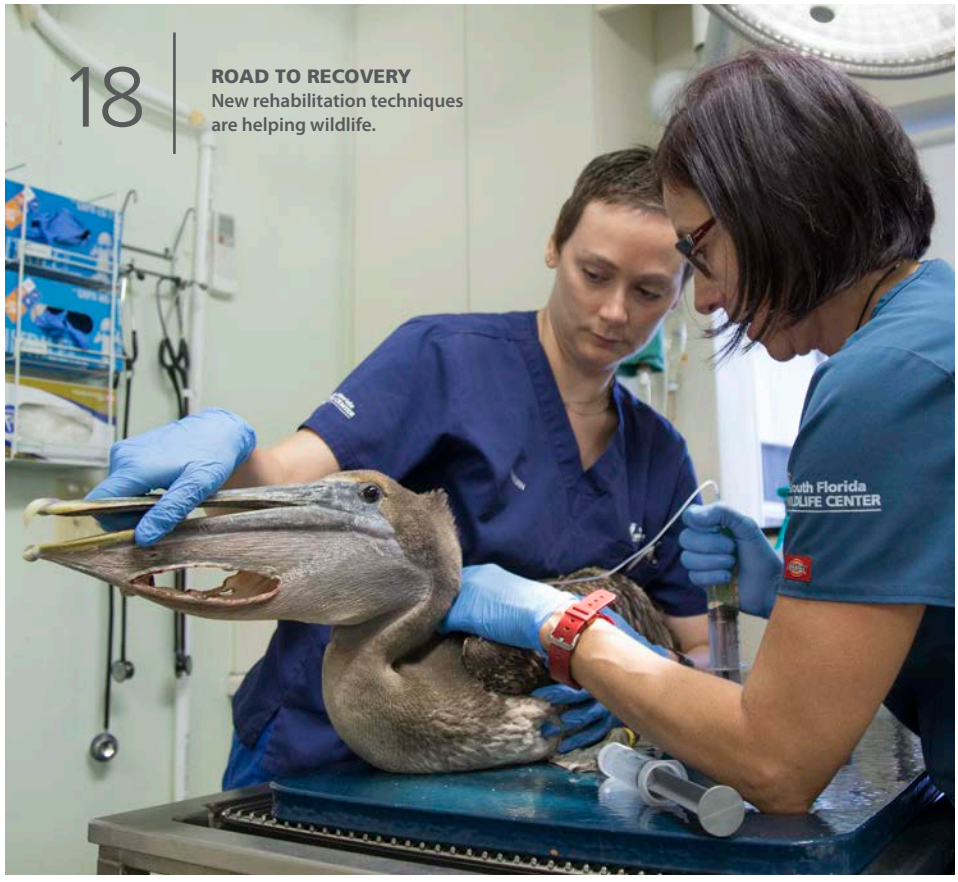
ON THE COVER
This barn owl is just one of thousands of patients treated at the South Florida Wildlife Center. Photo by Aaron Ansarov.

FROM TOP: JESUS ARANGUREN/AP IMAGES FOR THE HSUS; MEREDITH LEE/THE HSUS



the heart of HEALING

HOW OUR SOUTH FLORIDA WILDLIFE CENTER USES NEW TECHNIQUES TO SAVE ANIMAL LIVES

BY KAREN E. LANGE

IN A TINY PARCEL OF GREEN amidst the sprawl of highways and houses and hotels that is Fort Lauderdale, three young opossums wait in a carrier, poised to slip into a sliver of remaining wild. They are old enough to fend for themselves: Their mouths, sealed shut during the early days in their mother's pouch, open in wide "smiles" that reveal rows of small sharp teeth. At the same time, they are not so eager to venture into the unknown.

As a release specialist from the HSUS-affiliated South Florida Wildlife Center raises the door, the orphans press themselves against the opposite end of the carrier, peering big-eyed into the jungle of bushes and vines. Finally, one by one, they nervously claim their freedom, skittering off onto the tract of undeveloped land. Instantly, they disappear into undergrowth rich in their favorite foods: fruits and rodents and snakes and ticks.

It's a quick, easy release. But the return of these orphans to their natural habitat was made possible by decades of research into the needs of the youngest, most vulnerable opossums, the ones rescued from dead mothers' pouches.

Opossums are common inhabitants of the densely populated coast that stretches from Fort Lauderdale to Miami, and yet mysterious enough in their marsupial anatomy that South Florida Wildlife Center vets and volunteers have been collaborating with researchers and other HSUS staff and rehabilitators for 30 years to understand exactly how to feed the sightless, furless, near-embryonic babies regularly brought in.

"Everybody thinks, 'It's just an opossum,' but there's the utter joy when you realize what a unique group of animals these are," says Dr. Lynn Miller, the center's director of wildlife education, who has made a career of applying science to the process of rehabilitation. "It's revolutionizing the way we look at opossums."

New knowledge and methods are allowing rehabilitators at the wildlife center and elsewhere to successfully return an increasing number of creatures to the wild. It's a unique challenge. Keeping the animals alive is not enough. For releases to work, the animals must develop fully and be able to find food and avoid being eaten in unforgiving environments. They must be set free in places removed from human disturbances or predators. Otherwise, release will mean only suffering and death.

"You can't get away from the fact that there are these biological milestones that they must meet," says Miller. "If they are not getting what they need, they are not going to develop. We are standing in for their parents."

EACH MORNING, orphaned and injured animals—the sick, the saved, the separated and the strayed—arrive at a South Florida Wildlife Center building marked "hospital." The center receives about 13,000 animals each year. There are the fledgling birds people mistakenly "rescue" from the ground, not realizing that they are learning how to fly. The baby squirrels similarly abducted by well-meaning folks. The pelicans who rip their pouches when they are snared by hooks cast by fishermen who cut their lines. A whiteboard in the lobby keeps track. One May

From left: Raring to go, a 4-month-old nursery-raised opossum "smiles" as Mariangelique Diaz, a South Florida Wildlife Center rehabilitation specialist, readies him for release. In a flash, it's over, as the opossum launches himself into an urban jungle.

morning, the tally reads: 33 animals admitted yesterday, 68 in the hospital, 165 in the nursery, 649 total in care.

Baby opossums come to the center in a steady stream, usually taken from the pouches of mothers struck by vehicles. Raising baby opossums is not as simple as giving them formula. In the wild, opossums spend their first 90 days in their mother's pouch, attached to her teats, which extend down their throats to deliver milk with a very different composition from the milk of non-marsupial, or placental, mammals. Also, during their first weeks, opossums grow more slowly than other mammals—their hearts, lungs, kidneys, livers and digestive systems are all still developing.

Because opossums are the only marsupials in the United States, when South Florida Wildlife Center staff and volunteers first tried to figure out how to care for the smallest of the animals, they got little information or interest from American academics. But they persisted. Peggy DiMauro, a former volunteer at the center, spent 10 years working on the problem. "It started out as a dream of helping a very unpopular species," she says. "We treated them like mammals. We just didn't know how to do it."

Eventually, DiMauro, working with Miller and others at the South Florida Wildlife Center, contacted researchers in Australia (home to the majority of the world's marsupials) and was met with an enthusiasm that matched her own. With their help, center staff and volunteers pored over scientific papers that detailed the complexities of newborn opossum development. It used to be that baby opossums who weighed less than 40 grams (as much as a golf ball) when brought to rehabilitation centers did not survive. Today, caregivers are pushing the boundaries of what is possible with these animals, and new orphans taken from their mother's pouch regularly make it. Last spring, Miller, who holds a doctorate in environmental toxicology, presented some of the new methods at a national conference. Immediately, requests for more information came in from wildlife rehabilitators in Texas, Missouri and California.

In the past, rescued baby opossums were fed on a quick-growth schedule with regular formula. The first day they did fine. The second too. The third as well. Then they developed diarrhea. Often they became dehydrated. They were prone to infections. Frequently, they died.

For years, rehabilitators had been adjusting baby opossums' diets, trying to keep them healthy. Some succeeded by giving them less formula. Research revealed why: In the wild, opossum milk contains no lactose, a complex sugar that they lack the enzyme (lactase) to digest. Standard formulas used by rehabilitators are based on mammal milk and contain less water and far more milk solids, including the impossible-to-digest lactose. Standard formulas also lack important protective components baby opossums receive from their mothers. Born with undeveloped immune systems, they get immune boosts from their mother's milk, as well as antimicrobials from her pouch

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secretions and from the saliva that comes off her tongue when she licks their fur.

Over time, the center fine-tuned a system of diluting the standard formula with water, so the baby opossums' digestive systems could better handle the lactose it contains. Rehabilitators also began giving them injections of saline to keep them hydrated—staff and volunteers watch for opossum-specific signs of dehydration, such as slanted eyes, clenched fists and rings around their tails. Because of the high risk of infection, caregivers started administering preventative doses of antibiotics and giving babies who had fleas or came from the pouches of dead mothers an iron supplement to boost their blood counts.

Using these methods, center caregivers today routinely keep baby opossums alive. In the home where she now lives on Cape Cod, DiMauro successfully fosters babies as small as 17 grams with the help of an "Opossum Posse" of skilled volunteers who provide care 24 hours a day, seven days a week. Meanwhile, South Florida Wildlife Center staff and volunteers, DiMauro and other rehabilitators continue to explore more effective strategies.

"It's a constant evolving process based on trial and error, staying up to date, attending conferences," says Dr. Renata Schneider, the center's director of wildlife rehabilitation. "Every year we take a look at the previous year—what worked and what did not."

Opossums aren't the only species helped by this approach. Center staff are also using new science to refine the diets of baby armadillos so they develop bony coverings hard enough to protect them from predators and encounters with rocky dirt while burrowing.

A baby armadillo has a soft covering that will harden only if he gets enough calcium. To ensure that, center staff feed him concentrated formula.

Armadillos, who jump in the air when alarmed, often hit the bottoms of vehicles as they cross streets and are frequently seen dead along Florida's roads. Yet until recently, their needs remained obscure. No published articles described the nutritional makeup of their milk. Then, researchers at the University of the Ozarks sent milk from mother armadillos to the Smithsonian National Zoo's Conservation Ecology Center nutrition laboratory. Tests revealed a much higher percentage of calcium than is found in the milk of other mammals, which makes sense: Armadillo babies are born with soft protective plates that ossify, or turn to bone, as they age. The tests also showed a larger amount of protein.

Using information that Frank Knight, a professor at the University of the Ozarks, and Michael Power, an animal nutrition scientist at the Smithsonian lab, expect to publish this winter, South Florida Wildlife Center staff decreased the degree by which they were diluting formula for baby armadillos, increasing the relative amounts of calcium and protein. They saw immediate results. Babies fed the more concentrated formula grew leaner and developed harder shells.

Each species seen at the center is a puzzle to be solved: How can staff mimic what animals would receive from their natural mothers? Wanting to give baby yellow-crowned night herons the best possible diet, Miller researched what the birds eat in the wild, which turns out to be almost entirely crabs. Then she switched the diet of the young birds at the center to the closest possible approximation. Caregivers now use whole crabs, donated by a local restaurant, to create a smoothie, rich in calcium, potassium, magnesium and manganese.

Looking for the reason some birds at the center fail to thrive, vets focused on parasites. Perhaps some birds have higher than normal numbers of parasites when they arrive at the center, or are carrying parasites their species do not normally suffer from and are not adapted to. In order to check

Hope for baby opossums

Research is helping wildlife rehabilitators keep baby opossums alive. Compared to other mammal babies, the youngest opossums require fewer nutrients from their milk and more water. Fed standard formula, orphans taken from the pouches of dead mothers develop diarrhea, become dehydrated and die. Fed diluted formula and given extra fluid, they survive.

Birth (11-13 days after conception): Less than a fifth of a gram, babies have mouths that open just enough to attach to a nipple, which extends down their throat. Their organs are still developing and they lack immune systems.

50-60 days old: Babies detach from the nipple, start to move around and begin to gain weight. At 17-25 grams, they can be kept alive with 24/7 care, using new methods.

70 days: Babies' eyes open. Their immune systems are partially developed.

85 days: Weight gain accelerates and babies' lips separate. They are fully furred and poke their heads out of the pouch for the first time. Their immune systems are finally equivalent to those of newborn mammals.

91 days: Babies emerge from the pouch and are able to digest lactose.

these possibilities, vets draw small amounts of blood to discover what numbers and types of parasites different kinds of birds usually have.

To better care for sea birds, staff give them daily injections of extra fluid—a technique endorsed by Miller. Without such injections, the birds might not receive enough moisture in their early days at the center. These birds evolved not to absorb the huge amount of ocean water they swallow or take in through food. Instead, they send the salt to a gland around their eyes and then out through their nostrils. Salt that would otherwise overwhelm their bodies is excreted, but water is lost too. Extra fluid injections make up for this loss.

BEYOND DIET and hydration, center staff confront the limits of healing. A gopher tortoise who cannot dig, a turkey vulture who cannot fully extend her wing for normal flight, a raccoon who cannot use one of her front paws—none of these animals can be returned to the wild. Giving them back what they lost is a matter of life and death. Keeping many of these species in captivity would be cruel—and there are not enough sanctuaries for the animals who could adapt to life there. If they cannot be released or placed, animals must be euthanized. Fortunately, technologies recently introduced in human medicine are now being applied at the center to treat challenging wildlife injuries.

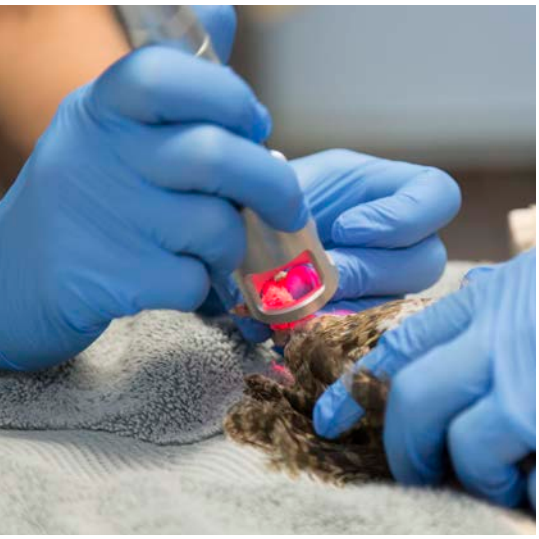
In April, a gopher tortoise came in with a cracked shell and back legs that didn't move—she was dragging herself forward. Found on a road, she was probably struck and flipped by a car. X-rays revealed no broken bones, but they did show seven eggs she would have difficulty laying if she couldn't use her rear legs to dig. Center veterinarians assumed the turtle was suffering from nerve and tissue damage and contacted Dr. Carolina Medina, a volunteer veterinarian from Coral Springs. She started coming to the center once a week to treat the tortoise's rear legs with electro acupuncture, a science-based procedure that electrically stimulates nerves.

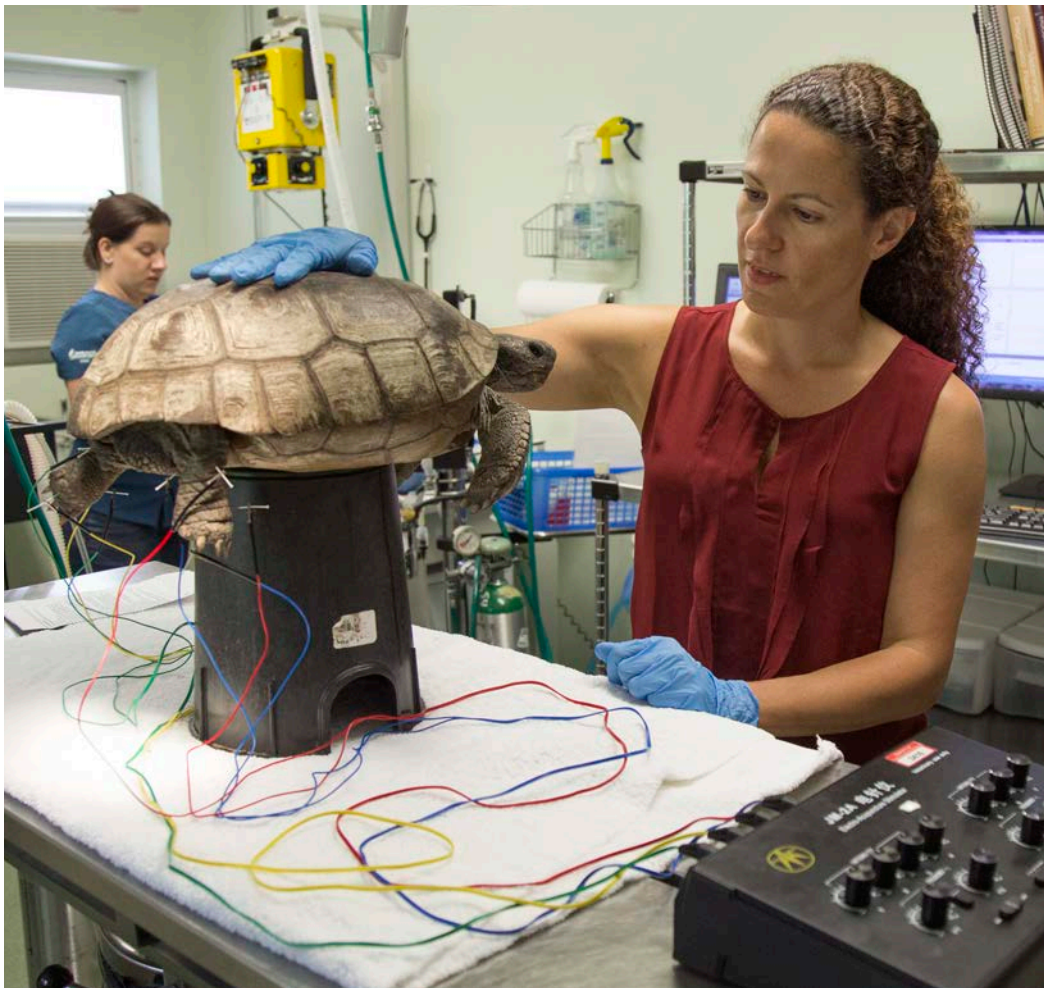
In May, several weeks into treatment, the tortoise can move her hind legs well enough to excavate a little. She has laid two eggs. But she is not quite back to normal. Placed on the floor, she pushes forward with her back legs but cannot lift her body off the ground. Medina says the tortoise clearly needs more help healing. "We really don't know what happened to her, how much damage she has to her spine."

Medina perches the tortoise on a little platform that supports her shell, then connects electrodes to her weak legs. When the vet turns on the machine, the tortoise withdraws her rear legs because of the still-strange sensation of mild electrical current and paddles her front legs to get away. After a few minutes, she relaxes, slowly letting her back legs extend down from her shell. Following 20 minutes of stimulation, the tortoise has improved. She moves across the floor just a bit better and digs more effectively into the sandy soil of an outdoor pen.

Very slowly, with treatment, the tortoise is regaining the full use of her back legs. Medina hopes for a full recovery.

The center has seen similar healing in the wings of a peregrine falcon, a pelican and a turkey vulture. Medina treated them





High tech: At right, colored wires carry a mild electrical current to the injured rear legs of a gopher tortoise during electro acupuncture treatment, delivered by center volunteer Dr. Carolina Medina. Above, a laser focused on an owl's damaged wing encourages healing.

with a portable ultrasound machine. This therapy delivers sound waves to contracted tendons and stiff joints, breaking up scar tissue and reducing inflammation and pain.

Another new approach: laser therapy. On the same afternoon the tortoise gets electro acupuncture, a raccoon who walked around for a day with one of her front legs in a trap is anesthetize so a laser wand can be directed at her badly damaged paw. The trap cut off the blood supply for hours. When it was removed, fluid that poured in as the blood returned caused the paw to swell and turn red. The fluid contained cytokines—proteins produced in response to injuries by the immune system that sometimes prolong inflammation and pain. The laser wavelengths penetrating the tissue can reduce these, says Dr. Antonia Gardner, medical director at the center.

With continued treatment, the raccoon's paw heals. Several weeks later, she is released.

A yellow-crowned night heron in a makeshift "nest" drinks a smoothie made from whole crabs. Their shells and meat provide the minerals he needs to grow.

EVEN WHEN ANIMALS have been expertly mothered and returned to peak health, there is one final obstacle: finding a place to release them where they can survive. That demands research and innovation of a different sort.

In the city of Tamarac, northwest of Fort Lauderdale, between a road and a drainage canal, lies a long, narrow park. The rare stretch of open space is overshadowed by power lines and bounded on the north and south by paved trails. In the park's center stands a playground. In the middle of the playground, as dawn breaks on a May morning, a burrowing owl sits at the entrance to her home. Burrowing owls are listed as threatened in South Florida because there is so little left of their required habitat: undeveloped dry land with soil soft enough for digging. That's what has driven this owl here, between a picnic pavilion and a teeter-totter, where construction left the ground easier to excavate (the surrounding park is built on cement-like fill).

Worried that people might harm the owl and her colony, a local conservation group, South Florida Audubon Society's Project Perch, put a rectangle of rope around the burrow and a sign that reads, "Please don't disturb or feed this threatened species … back up if they bob or hiss." The sign gives the South Florida Wildlife Center number as an emergency contact. A couple of weeks earlier, Schneider got a call. A vandal had stuffed a piece of blue plastic in the burrow entrance. When a Project Perch volunteer owl guardian removed it, she found a dead male owl. An autopsy revealed damage to the lungs of the otherwise healthy bird. Staff suspect an unknown substance caused him to suffocate.

The volunteer found three survivors—the female owl and two babies. The babies, thin and weak, acting lethargic, were brought to the center for care until they were old enough to fly. The female, the male's mate and babies' mother, was left behind in the hope she would remain at her burrow and, unburdened by caring for the babies, be able to find enough food for herself—males are usually a colony's main hunters. If the babies had been left in the burrow, the mother owl would have been hard-pressed to find enough food both for herself and them.

Burrowing owl babies

A week later, the mother waits, near motionless, as a light breeze blows across the playground. Her yellow eyes stare across the human-changed landscape. Occasionally, she moves her head to track insects. Unbeknownst to the mother, her babies have just been transferred to an outdoor enclosure at the South Florida Wildlife Center, where they can fly short distances and work on landings. Project Perch is building an artificial burrow nearby, so that once the babies are returned, they and their mom can move to a safer place. It's part of a campaign in close collaboration with the center to stabilize the burrowing owl population, which fell 25 percent in the Fort Lauderdale-Tamarac area during the most recent 10-year census.

The sun rises. Runners pass, plugged into smartphones or chatting in pairs. The mother owl sits, faithful to her burrow, enduring the loss of everything else.

In woods to the south, the just-freed opossums root through undergrowth. At the center, the gopher tortoise pushes her way toward eventual release. And here, in just a few more days, the mother owl and her babies will be reunited.

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