Illinois Wesleyan University Magazine, 2002-2017

Volume 22
Issue 1 *Spring 2013*

Article 1

Spring 2013

A Precarious Path to Discovery

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A Precarious Path to Discovery

IWU biologist Edgar Lehr explores the world's most remote habitats in search of new species of frogs and lizards that may be on the verge of vanishing.

Story by KATE ARTHUR
Photos by EDGAR LEHR and Rudolf von May

In a village just outside the Pui Pui Protected Forest, residents watch as Lehr examines specimens he collected. Many attended a workshop where Lehr explained his mission and the importance of conservation.

Edgar Lehr hikes rocky trails reaching 14,000 feet in the Peruvian Andes, where breathing is difficult and pilots decline to fly. His motivation: to help catalog the world's amphibian population and to find out why its numbers are so rapidly declining.

Collaborating with colleagues in expeditions spanning two decades, Lehr has discovered 72 new species of amphibians and nine new reptile species. But what concerns him most are the ones he'll never see. "They are disappearing without us knowing them," he says.

Habitat loss and global climate change have decimated dozens of amphibian species. Another even deadlier threat has emerged in the past 30 years. A fungal skin disease called chytridiomycosis has been linked to the catastrophic decline or extinction of at least 200 species of frogs, even in unspoiled and remote habitats.

Rudolf von May of the University of California, Berkeley, joined Lehr on his latest expedition. Their mission was to identify as many amphibians and reptiles as possible and to check amphibians for signs of chytridiomycosis. Their fieldwork focused on protected areas in central Peru where no biodiversity fieldwork had been conducted before.

"We figured out very quickly why," says Lehr. "Nobody went inside because it's so difficult."

The Pui Pui Protected Forest (PPPF) proved especially challenging. Peru declared it a protected area in 1985, but almost nothing was known about the mountainous area. There were few established trails to follow as Lehr's team climbed steep paths into jungle valleys and ravines crisscrossed by streams and torrents. Guides recruited from surrounding villages cut paths through the dense vegetation, and the only sounds often heard were the crunch of boots and the ping of swinging machetes.

“It was very slippery. There were some paths … I would say were life-threatening,” Lehr remarked in an interview aired on *National Geographic Weekend*, broadcast on National Public Radio and SiriusXM Radio. An accompanying video of the expedition was viewed 15,000 times in just 10 days.

Lehr was among the first scientists to receive a grant from National Geographic’s new Global Exploration Fund, allowing the German-born professor to travel to Peru during his 2012 spring-semester sabbatical.

No turning back

Lehr originally planned for his team to access PPPF via helicopter. But when he asked the Peruvian police, military and anti-drug force for help, each declined, citing the risks of flying through the forest’s dense cloud cover. A private helicopter company offered to take the job, but the cost of more than $12,000 made that option far too expensive. “So we decided to access the park on foot,” says Lehr. Horses were used to help carry equipment, “but we did lose time as a result of extensive walking,” he says. “Nevertheless, we accomplished our research goals.”

“Extensive walking” is a mild description for what Lehr and his comrades endured in the course of their journey, including lack of oxygen, suffocating humidity and extreme cold at the higher elevations, where tiny grains of hail pelted their skin. When the horses could not be brought into areas such as cloud forests where the ground was too soft and trails too steep, Lehr and his team shouldered the bulging bags of supplies and scientific equipment themselves.

“The first day was easy,” the 43-year-old says with a smile. “But then it was exhausting. You have to walk very slowly, take a rest for some minutes and then continue. I was exhausted just taking my own body along.”

Lehr stands next to a cornerstone marking the easternmost corner of Pui Pui. The forest beyond is mostly unexplored.

Just once did he think he couldn’t continue. His feet were just too wet and cold from wading through creeks and stepping through muddy soil and his limbs ached from the slips and falls he’d taken climbing cliffs and crossing rocky ravines. Yet staying behind wasn’t an option because it would have jeopardized the expedition.

Lehr never forgot about the risks of hiking through territory that was home to pumas, jaguars and a variety of deadly snakes. On an earlier Peruvian expedition, he was reaching through a pile of leaves to catch a tiny frog when a guide’s machete fell near his hand. The blade stopped a poisonous snake, one with venom so deadly that a single bite could have led to the loss of an arm or a fatal wound.

There were other, less expected, dangers. Locals warned him to avoid a valley that might be inhabited by fleeing terrorists. One night, after the team set up camp, the guides suggested dimming flashlights to avoid detection by cocaine smugglers who made frequent use of a nearby trail.

'It's like opening a gift'

Such hazards rarely dampened the scientists' enthusiasm. After a dinner that might include canned fish and dried milk mixed with rainwater or filtered river water, they'd leave their tents to follow frog calls and wade through swamps in search of previously unknown species of amphibians that are often no bigger than a thumbnail.

Steep trails like this one proved exhausting to Lehr and his fellow explorers.

"When you're working in an area no one's been, you're very excited," Lehr says. "It's like opening a gift. You want to know what's inside."

Hours of searching can yield very little, but that wasn't the case when the team found a previously unknown female frog guarding a nest of marble-sized eggs. Lehr was ecstatic, collecting three of the eggs that hatched a few days later.

When he sees a new species, Lehr doesn't have to do an Internet search to confirm what years of field experience have taught him.

"I just know," he says.

In both PPPF and the nearby Yanachaga-Chemillén National Park, Lehr struck rich veins of biodiversity. Ten new frog species and two new lizard species were discovered. That made the grueling expeditions well worth the loss of 30 pounds and back pain from sleeping on cold ground, Lehr says.

"This is quite a good number for the area and time we have invested. It reflects that no one had been working this area before." Another factor was the region's geography: different species had evolved in the valleys separated by mountains.

One of the spoils of discovering a new species is the chance to name it. "That is the fun part," says Lehr, pointing to a photo of a red-bellied reptile on his computer screen. "Such a beautiful lizard. I don't know what I'll name it — but it will likely be something with red and belly," he says, laughing.

It's a pleasure Lehr has enjoyed since his early 20s, when he discovered his first new species — a turtle — while doing field research in South Vietnam. His fascination with reptiles and amphibians began much earlier. At age 4, he would follow his researcher father through German forests, scooping up frogs, collecting insects and identifying them by their scientific names. By high school he was breeding a

popular pet turtle, the red-eared slider, and won national recognition in Germany for investigating their courtship behavior.

While studying for his doctorate in zoology from Goethe University Frankfurt, he took his first expedition to Peru. Lehr continued his research while teaching and serving as curator of herpetology at the State Natural History Collections in Dresden, Germany. He joined Illinois Wesleyan's biology faculty as an assistant professor in 2009.

The human factor

Since his first journey to Peruvian forests back in 1997, Lehr has returned there almost two dozen times. Peru is

counted among 12 "megadiverse" countries: ones that contain a combined 70 percent of our planet's biodiversity. Some 440 species of reptiles and 511 frogs have been counted in Peru so far — many by Lehr himself — but he believes that might represent only 60 percent of diversity. "There's a lot to discover," he says.

Specimens Lehr collected in his most recent expeditions were tagged, photographed and preserved in the field for the flight home. After being analyzed in labs at the University of California at Berkley and the National University of San Marcos in Lima, they will be donated to the Museo de Historia Natural Universidad Nacional de San Marcos in Lima and the Field Museum in Chicago.

The rewards of the trip were many, such as finding previously unknown frog species.

Lehr hopes deeper analysis of his samples will yield insights into the possible causes of chytridiomycosis and why it is deadly to some amphibian species while leaving others unaffected. The invasive fungus started in Costa Rica but has spread throughout the world. Lehr and other herpetologists are looking at whether humans may have played a role in its spread, along with climate change and the thinning of the Earth's ozone layer.

"No one really knows what happened but it's responsible for the decline of many common amphibians and the extinction of some," he says. "They're gone forever. How that affects us, we don't really know." But what he does know is that it will eventually affect us. Amphibians are widely regarded as an indicator species, meaning their disappearance warns of environmental hazards for others, including humans.

Lehr hopes his discoveries of new species will also encourage increased conservation efforts in the areas he explores. "It's easier to protect something you know than what you don't know. There's so much destruction of habitat going on. It would be a pity if forests and animals disappear and we never had the chance to know them."

The mountain peaks of Pui Pui Protected Forest are shrouded in what one writer called "an eternal fog."

The biologist will return to Peru this summer to continue his search for both new species and new information on the spread of chytridiomycosis. He will be joined by colleagues from the United States, Peru and Czech Republic. Unfortunately, the expeditions are too dangerous for students, but he's hoping to secure a grant that will allow him to design a less-rigorous journey for them.

"Biodiversity is the prime focus," says Lehr of his past and future expeditions. Estimates range from 5 million to 100 million different forms of life on Earth, but only about two million have been catalogued so far. Lehr notes that certain species of amphibians and reptiles may be found exclusively on one mountaintop in the Andes. His worry is that those species may disappear before they are ever even found.

The decline and extinction of amphibians and reptiles in the Peruvian Andes is no different, Lehr adds, than if robins or sparrows suddenly began to vanish from our backyards. If it's a threat to a species, it's a threat to us.

"When we understand more about the species that live on this planet," he says, "we can understand how we are interconnected, and how each species contributes to our lives."