Nicaragua:
Land of 100 Bat Species

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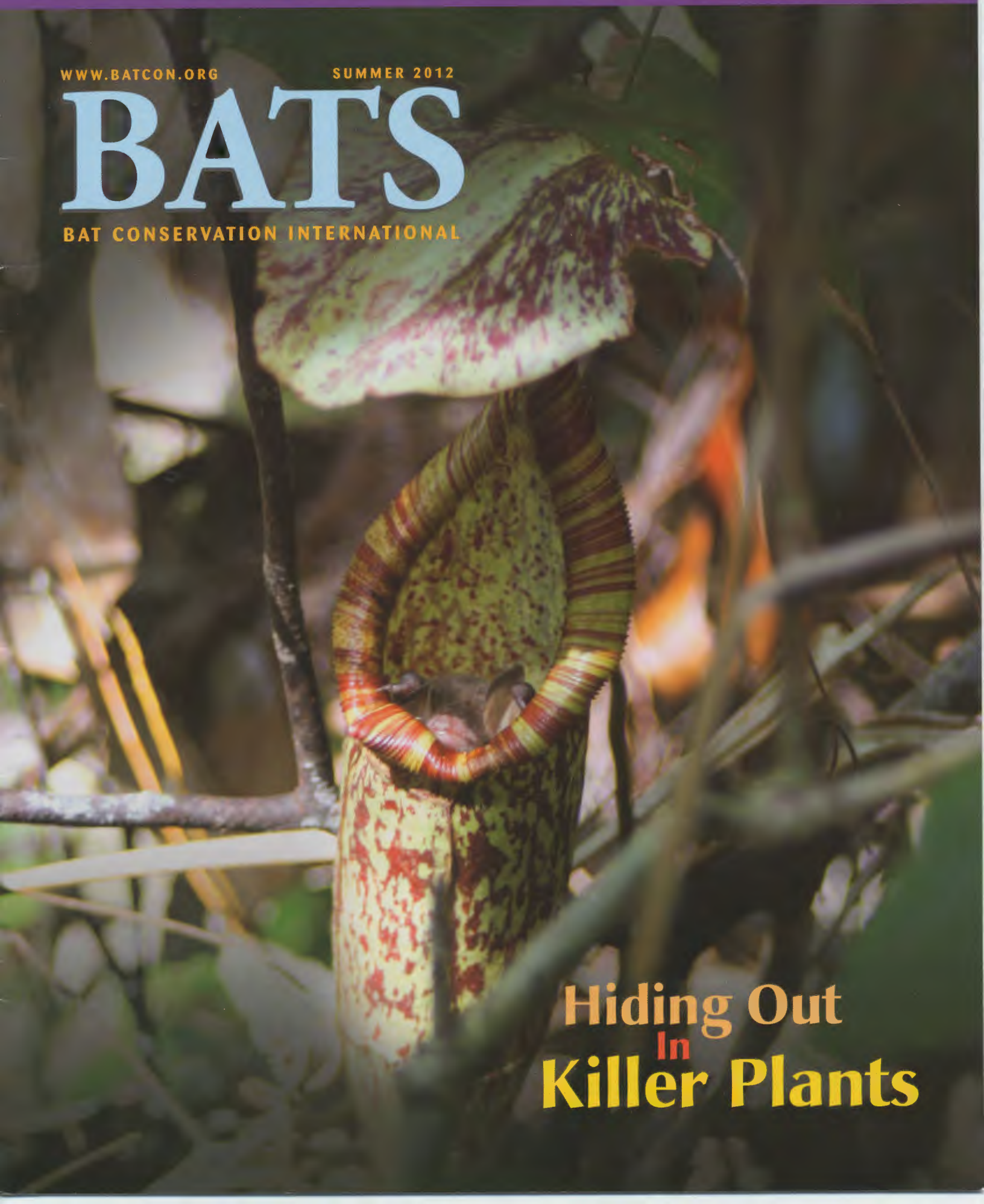

Hiding Out In Killer Plants

Nicaragua: Now the Land of 100 Bat Species

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By Carol Chambers

White-throated round-eared bats (*Lophostoma silvicolum*) roost in termite nests in trees in Nicaragua's Paso del Istmo, as they do elsewhere in Central America.

The few remaining patches of old-growth tropical dry forest of Nicaragua's Paso del Istmo offer enchanting landscapes. Shaded and cool, they are alive with movement and sound as monkeys, birds and other creatures cavort among the trees. At night, fireflies flicker like stars, creating the illusion of a night sky beneath the forest canopy. Tree trunks can be massive columns, as wide as a picnic table, or tall sculptures buttressed with fins at the base. The hillsides are webbed with narrow paths created over many years by people, livestock or leaf-cutter ants.

In contrast, traversing the young forests is often slow, hot and difficult work. The small trees, shrubs and vines struggling to refill cleared terrain act as barricades to movement. And inhospitable residents such as wasps often make their presence uncomfortably felt.

The Paso del Istmo is a narrow strip of low mountains sandwiched between Lake Nicaragua and the Pacific Ocean. This isthmus is only 12 miles (19 kilometers) wide, but it is a critical passageway for wildlife migrating between North and South America or moving locally among forests of Central America.

And it contains an important tract of tropical dry forest – one of the most endangered forest ecosystems in the world. This forest is rapidly being replaced by croplands of beans or rice or by non-native commercial trees such as teak. Surviving old growth is often reduced to isolated patches, with dire consequences for forests and wildlife. My colleagues and I came to Nicaragua to study how forest fragmentation impacts bat communities. That research continues, but we've already made some exciting discoveries.

I had visited this area previously with Suzanne Hagell, a former graduate student at Northern Arizona University. Using genetic analysis, she discovered that black-handed spider monkeys (*Ateles geoffroyi*) were significantly inbred, largely because of their limited ability to move among the few large, disconnected forest patches remaining on this landscape. Bats, however, are more mobile than monkeys so their genetic diversity may be less affected by forest fragmentation.

So instead of collecting DNA as Suzanne did, I "captured" the bat community using mist nets to intercept bats flying along forest corridors and bat detectors to capture their echolocation calls in forest patches of different sizes and levels of isolation. Bat Conservation International and the Percy Sladen Memorial Fund helped fund this project and the U.S. Bureau of Land Management loaned us the Anabat detectors.

We were especially interested in a group of gleaning and carnivorous bats of the subfamily Phyllostominae because they prefer mature forest habitat. The Phyllostominae bats are a diverse lot, ranging from about the mass of a U.S. penny to 100 times that weight. Their short, broad wings and long legs and tail membranes make them agile flyers in dense vegetation. Because

these forest-dwellers are not usually found in highly disturbed areas, their presence (or absence) can indicate whether forest restoration efforts could benefit the bat community.

I spent December 2011 and January 2012 in the Paso del Istmo. Paso Pacífico, a Nicaraguan organization run by women dedicated to restoring and conserving ecosystems of Central America's Pacific slope, helped me locate a field station, guides and landowners willing to collaborate. We set nets across shallow streams and rivers and quickly began capturing bats.

Sixteen colleagues and friends from the United States and Canada helped with the mist-netting. Nicaragua's premier bat biologist, Arnulfo Ramón Medina Fitoria, also joined us. He taught me how to distinguish especially tricky species, such as those in the genus *Carollia*, that are identified by the shape and size of their incisors or color-banding patterns of their fur.

Biology students Josè Gabriel Martinez Fonseca and Marlon Francisco Chaves Velasques of the Universidad Nacional Autónoma de Nicaragua became our acoustic specialists. After on-site training by Chris Corben, designer of the Anabat, and Kim Livengood of Titley Electronics, Martinez and Chaves deployed bat detectors, rotating them weekly among more than 100 forest patches from January to May.

You don't see bats with acoustic monitoring, but you can determine activity levels from the number of calls recorded and you can often identify species from their calls. Instead of placing detectors along the stream corridors where we netted, we placed them in mature forest that ranged from very small (several trees) up to about four miles (6.4 kilometers) across. We sealed the Anabats inside plastic bags using PVC elbow joints to cover microphones and used bungee cords to attach each Anabat to a tree six and a half feet (2 meters) aboveground.

Three species (none of them Phyllostominae bats), accounted for just over half of all the bats we captured.

The Jamaican fruit bat (*Artibeus jamaicensis*) appeared most frequently in our nets. These are vocal, strong and aggressive animals, and their tendency to flip and entangle themselves in the nets – plus their very strong bite – made them rather unpopular captives.

We found dozens of Seba's short-tailed bats (*Carollia perspicillata*) roosting in culverts, although these roost generalists also use hollow trees, logs, caves and buildings. They eat fruits and flowers of several common "pioneer plants" found in young forests.

Common vampire bats (*Desmodus rotundus*) feed on blood, primarily from livestock. We captured vampires so full of blood their mass increased by more than half. That these three were our most often captured species suggests that altered forest landscapes seem to favor generalists that were adapted to human disturbances such as logging and farming.

Just over 5 percent of almost 1,500 bats that we captured represented the gleaning and carnivorous subfamily *Phyllostominae*. We captured some incredible examples of these species, however, including the woolly false vampire bat (*Chrotopterus auritus*). This is not a vampire bat at all but a rare, large animal

This pale-faced bat (*above*) is the first of its species to be found in Nicaragua and raised the nation's species count to 100. (*Left photo*) A colorful Wagner's mustached bat flies through tropical dry forest.

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Arnulfo Medina, one of the leading bat biologists in Nicaragua, worked with the research team in the Paso del Istmo. Here he weighs a bat captured in a mist net.

found in mature forests. We also identified white-throated round-eared bats (*Lophostoma silvicolum*) and chestnut short-tailed bats (*Carollia castanea*), neither of which was predicted to occur on the Pacific side of Nicaragua.

By January 26, just five days before I was due to return to the United States, we had "bagged" 40 of Nicaragua's 99 known bat species. On our 34th night of netting, we felt that we had thoroughly described the bat community in our study area. On this night, our nets across a stream and along forest paths were snagging dozens of bats per hour and had even added two new species to our count.

Then I removed a large bat from one of our nets. The bat's wing tips looked bleached white, and I wondered if the bat had an injury. I took it to the processing table and, to my great surprise, our field guides showed it to be a pale-faced bat (*Phylloderma stenops*). And our already-exciting evening became absolutely thrilling.

Arnulfo pointed to the goose bumps on his arms. Although he spoke only Spanish and I only English, I was beginning to understand that this large bat in my hands, with her short brown fur and long gray wings, was, in fact, the most amazing capture of our two months of mist-netting. In Fiona Reid's *Mammals of Central America and Southeast Mexico*, the range map for this rare, forest-dwelling species showed only a question mark for Nicaragua. We had established the first record in the country of the pale-faced bat, a species Arnulfo had been hoping to capture for 11 years. As Arnulfo held her gently, we took pictures, documented her white wing tips and a small gland under her throat, then released her.

That wonderful addition and yet another new capture later that night (the hairy big-eyed bat, *Chiroderma villosum*) brought our species count for the project to 44. And it increased the confirmed number of bat species in Nicaragua to exactly 100. I didn't even care that during our next – and last – night of netting, more than 60 percent of our captures were Jamaican fruit-eating bats that shredded my handling glove.

Our work in Nicaragua is already paying off in several ways. We certainly increased our knowledge of the bats of Nicaragua, and we helped educate people in a number of communities about the value of their bats. This fall, I will examine our large collection of acoustic data to document bat-activity levels in forest patches.

Our netting data, meanwhile, show that although we captured more individual bats in disturbed (logged and farmed) landscapes on the Paso del Istmo than in mature forests, we caught more species near large patches of mature forest. These fragments of mature forest are helping some bat species maintain a foothold in this region, but the patches need to be larger and more connected. The results of our research suggest future strategies for conserving these wonderfully diverse and useful animals.

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A sampling of the bats of Nicaragua

Woolly false vampire bat (*Chrotopterus auritus*)

Fringe-lipped bat (*Trachops cirrhosus*)

Wrinkle-faced bat (*Centurio senex*)

Common vampire bat (*Desmodus rotundus*)

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