

HOW TO ENTICE Predators to Patrol Your Yard

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FEBRUARY/MARCH 2010 WWW.NWF.ORG WORLD EDITION

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NEW SPECIES FROM ANCIENT CAVES

Biologists exploring the underworld of California's southern Sierra Nevada are discovering a host of new species as well as threats to cave habitat **BY TROY ANDERSON**

Deep inside one of 260 caves in California's Sequoia and Kings Canyon National Parks, Shane Fryer stared for 20 minutes at a square-meter of ground, seeing little of interest. Then he noticed a tiny, moving dust flake. Grabbing a magnifying lens, he peered closer at a minuscule, eyeless pseudoscorpion with two pincers—a new species, one of 31 recently discovered in the labyrinth of caves beneath the spectacular beauty of the southern Sierra Nevada.

"It's completely exciting," says Fryer, a National Park Service (NPS) cave specialist helping with a biological survey of the caves. "I was thinking of major people going into the deep Amazon, Madagascar or New Guinea and finding these new species, but here I am, up in the Sierra, looking through soil and finding species that are new to science."

Jean Krejca, a biologist with the consulting firm Zara Environmental who led the survey, is

especially fascinated by the discovery of the pseudoscorpion, a top predator in this subterranean world. Lacking a stinging tail, it injects venom with its razor-sharp claws. "They are kind of the lions of the caves," Krejca says. "They are pale and have arms with big claws in front—giving them kind of a badass predator look."

Remarkable for the number of new species located in an area as small as the 1,352 square miles of Sequoia and Kings Canyon National Parks, this survey comes amid a worldwide boom in cave-fauna studies. Scientists are exploring a growing number of the world's hundreds of thousands of caves. Venturing into an alien world up to 1,600 feet below ground, on multimile journeys that can last weeks, researchers are discovering an "incredible ditch of life," says Malcolm Field, editor-in-chief of the *Journal of Cave and Karst Studies*.

Over the millennia, diminu-



BIOLOGIST
Cyndie Walk
uses a device
for sucking
tiny creatures
into a jar as
part of a
search for
new species
in caves in
Sequoia and
Kings Canyon
National
Parks. This
Titiotus
spider (above)
is one of the
recently
discovered
species.

tive cave-dwellers have learned to navigate, mate and hunt in pitch black. Possessing extraordinarily slow metabolisms, some go months without food and can live up to 10 times longer than their surface counterparts. Biologists believe some cave crayfish live more than a century, compared to just a few years for their above-ground kin. Without need for pigmentation to protect them from the sun, most cave dwellers are white or translucent. One intriguing cave critter is a springtail that is less than 0.2 inches long and that uses its tail to catapult into the air when escaping predators. "It's the equivalent of a human jumping over the Empire State Building," Fryer says.

Another peculiar characteristic of many cave animals is eyelessness. In a world without light, eyes serve no purpose. Biologists believe that in some species the organs have been replaced over time with other sensory adaptations. Eyeless animals often rely on long hairs and appendages that detect other cave animals through air current disturbances, vibrations and water-chemical changes. The creatures also use an enhanced sense of hearing and smell to find prey and other food—mostly bat guano, dead animals, sticks, leaves, fungus and other organic compounds that wash or blow into caves.

The Nature Conservancy estimates that 60,000 cave-dwelling animal species exist worldwide, including many not yet discov-





AT THE opening of Palmer Cave, in the southern reaches of California's Sierra Nevada, light showers on a researcher (left). Biologist Vivian Lofton searches for aquatic life in a pool in Lilburn Cave. A newly discovered millipede species that rarely sees daylight (below).



ered or described. While crustaceans, bats and spiders “as big as your hand” are easily spotted, many cave creatures are so small biologists rely on magnifying lenses and microscopes to see them. “A big cave animal to me is one that takes up a good portion of a dime,” says Julian J. Lewis, an Indiana-based expert in cave biology who serves on the board of the American Cave Conservation Association.

Most of these animals are not protected, and little is known about their ecosystems, populations, preferred foods and reproduction. In the United States, animals found only in caves and groundwater habitats represent more than half of all imperiled species, but less than 4 percent have federal protection. Some species exist only in a single cave, making them highly vulnerable to extinction. Cave biologists fear that sewage, pesticides, fire-suppression chemicals and other pollutants are threatening the fragile ecosystems. A recent study by several federal agencies and universities—the Western Airborne Contaminants Assessment Project—found that airborne contaminants exceed human health thresholds at 20 national parks



in the western United States.

Scientists also are concerned about impacts from the growing popularity of caving. People leave bits of hair, skin and food in caves, disrupting the animals’ low-energy environments. “If [cave animals] come across a cracker crumb, they’ve found the pot of gold at the end of the rainbow,” Fryer says.

A caver for more than 50 years, Tom Aley, president of the Ozark Underground Lab in Protom, Missouri, says inexperienced spelunkers often step on cave animals and disturb hibernating bats, driving them to abandon their habitat. This loss of bats reduces the food supply for other animals.

Knowing where to step is important to preserving cave animals and other rare artifacts. Many caves, used by Native Americans for ceremonial purposes and as burial grounds, contain pictographs and ancient skeletons of bears and other animals. “There are caves in the U.S. that have saber-toothed cat tracks in mud that are 12,000 years old, and the tracks are still in the mud,” says NPS cave specialist Joel Despain.

Cave protection is also a pragmatic measure. Scientists say cave animals serve as “decomposition communities” that help keep groundwater clean. One-

quarter of the world gets its freshwater from karst aquifers of hollowed-out bedrock—caves.

The largely unexplored realm of caves also may provide clues for a National Aeronautics and Space Administration (NASA) search for extraterrestrial life. NASA scientists are curious whether microbial life-forms may exist in similar areas below the surface of Mars.

Meanwhile, as part of efforts to protect life here on Earth, officials at Sequoia and Kings Canyon are revising their cave management plans to restrict access and to dedicate many caves to biological research. President Obama recently signed legislation designating nearly 90,000 acres of Sequoia and Kings Canyon as wilderness areas. This protection will preclude surface development leading to cave water pollution and will protect caves from commercial development.

Scientists say they still have much to learn about life in the underworld, a biosphere as vital as the one above. “These animals have been here for hundreds of thousands of years, and I think they deserve our respect and protection,” Despain says.

TROY ANDERSON is an award-winning reporter for the Los Angeles Daily News.