Carlsbad Caverns

National Park Service
U.S. Department of the Interior

Carlsbad Caverns National Park
New Mexico

CANYONS & CAVES

A Newsletter from the Resources Stewardship & Science Division

Issue No. 37 **Summer 2005**

A tree lizard, *Urosaurus ornatus*, poses for the camera in this photo taken during the summer 2004 Herpetology Inventory. (NPS Photo by Chris Newsom)

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All issues (thanks to Kelly Thomas and Bridget Litten) can be downloaded as a PDF file from the park website -**.http://www.nps.gov/cave/pub-pdf.htm**
Address: 3225 National Parks Highway, Carlsbad, New Mexico 88220

RESOURCE NEWS

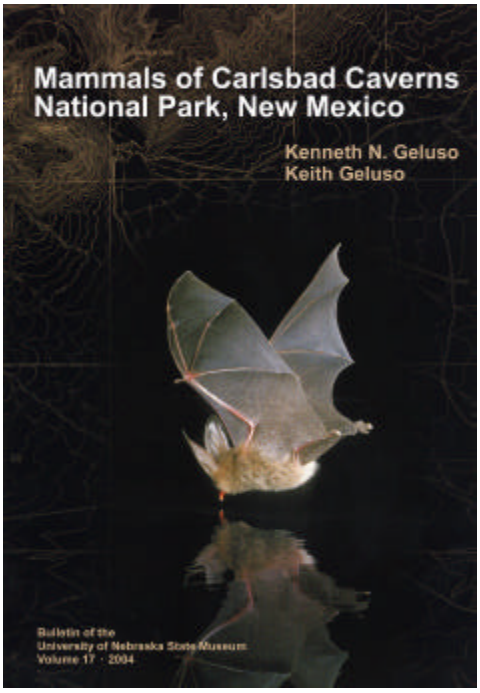
DESERT CENTIPEDES, SCORPIONS, & OTHER BITING AND STINGING ANIMALS are on the prowl with the advent of warm weather. Employees are cautioned to be alert for these native desert dwellers inside buildings, offices, and living quarters. Outside, these animals are part of the desert environment and should be safely removed from buildings and released back into the desert whenever possible. Scorpions and other small invertebrates can be easily caught in a jar and released away from buildings. The desert centipede is a much more formidable creature when encountered in a building. Desert centipedes have a very nasty bite (just ask Dave Roemer, Chuck Barat, or Paul Burger) and move very fast, but

they can be safely removed from buildings as well without harming them. A very healthy 8-inch-long desert centipede was recently rescued from a wall in Dean Vernon's office by placing a 5-gallon bucket over the centipede and forcing it to run into the bucket. Once in the closed end of the bucket, the bucket was turned upright. Not able to get out of the bucket because of the smooth sides, the centipede was then safely carried out into the desert for release. In lieu of a bucket, a trash can works fairly well for this also. All situations will be different, but with perseverance and ingenuity, most centipedes should be able to be removed safely from buildings in the park. For help in removing these desert creatures, please call Renee West at ext. 3099, Dave Roemer at ext. 3094, or Dale Pate at ext. 3107 or others in the RS&S Division. We are out of our offices at times so keep calling.

BIOLOGIST SEEKS DRIER CLIMATE – Kelly Fuhrmann, biologist in the Resources Stewardship & Science Division recently accepted a fire-effects monitoring position at Zion National Park in Utah. We wish Kelly well on his new assignment.

WELCOME to the RS&S Division to Elizabeth Armstrong and Kim Griffith. Both are volunteers through the Student Conservation Association program. Elizabeth is working with Dave Kayser and the cultural resources program while Kim is performing various duties with Biology and Cave Resources folks.

LONG AWAITED BOOK – The Mammals of Carlsbad Caverns National Park, New Mexico by Kenneth N. and Keith Geluso has finally been published as a bulletin of the University of Nebraska State Museum. This book includes a descriptive narrative of 63 mammal species known to be found in the park, 5 species that have been extirpated in the last 150 years, and 11 species with uncertain status.



LOOKING AT THE EFFECTS OF INFRASTRUCTURE ON CAVE LIFE

by Paul Burger

Many of you have seen several researchers crawling along the ground near the cave trails or looking at small areas of the cave walls and wondered what they were looking for. What you are seeing is an attempt to quantify the effects of the cave infrastructure (cave trails, stone walls, lights, etc.) on the biology of Carlsbad Cavern. These researchers have been contracted by the park to look at both invertebrates and microbial life.

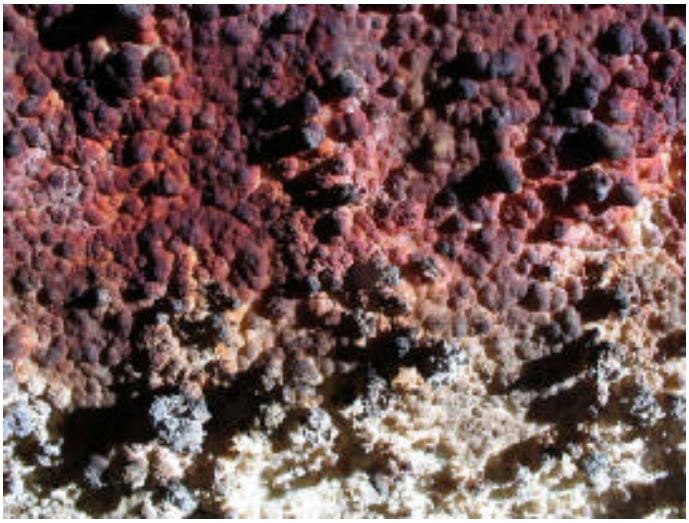
INVERTEBRATE SURVEY

Dr. Jean Krejca of Zara Environmental is doing several transects throughout the cave to determine how infrastructure is affecting the type and abundance of various species. An earlier study done by Dr. Diana Northup in the 1980s showed there were high populations of a small number of species in areas where there was more outside food (trash, bits of food, etc.) than in relatively undisturbed areas. Dr. Krejca is comparing transects from undisturbed, off-trail areas, near-trail areas, and in the underground developed area (restrooms, pump room, and visitor use area) in order to see if there are any differences. She is also investigating whether the presence of the paved cave trail acts as a kind of highway or as a barrier to invertebrate movement.

A Scolopendromorph centipede found in the Underground Concessions area. Photo by Dr. Jean Krejca, Zara Environmental

MICROBIAL SURVEY

Dr. Hazel Barton of Northern Kentucky University is investigating the microbes that inhabit the cave walls and ceiling. She is identifying the microbes to see what types are in the cave as a way to determine what they are using as a food source. In general, you would expect microbes that use nutrients from the rock in areas where there is little organic input. You would expect microbes that thrive on introduced organic matter in areas where there is more human impact. By comparing the microbe types in relatively undisturbed areas to those with much more human impact (i.e. the trail system and other visitor areas) we expect to be able to determine the human impacts on the cave microbes.



Red patina possibly caused by microbial activity near the Secondary Stream Passage. Photo by Dr. Hazel Barton, Northern Kentucky University

WHO'S DINING ON OUR ENDANGERED CACTI??

by Renée West

When our two pincushion cacti were listed under the Endangered Species Act in 1986, the threats were listed as: commercial and private collectors, destruction or modification of habitat, and natural limiting factors and threats. Threats included such things as fire, animal trampling, seed predation, competition for space, or special soil requirements. Danger from insects wasn't considered, but times are changing.

In the last few weeks, biotech Kristin Dorman-Johnson has photographed two different insects feeding on the federally threatened Lee pincushion cactus, *Escobaria sneedii* var. *leei.* [We also have the federally endangered Sneed pincushion (*E. sneedii* var. *sneedii*).]

Two nymphs (immature stages) of cactus bugs investigating the federally listed Lee pincushion cactus. (NPS Photo by Kristin Dorman-Johnson)

Not surprisingly, these insects are known as the cactus longhorn beetle (genus *Moneilema*) and the cactus bug (genus *Chelinidea*). Look closely at almost any prickly pear or cholla around and you'll likely see both these native animals feeding on it. The cactus bugs are in the class Hemiptera, or true bugs (family Coreidae, leaf-footed bugs). The beetles are in the class Coleoptera (beetles), in the family Cerambycidae, or long-horned beetles. Neither has yet been identified to species.

Both these cactus feeders reportedly eat mostly prickly pears and cholla cacti. They have both been studied for their potential to be used as biocontrols in Australia on the invasive American cacti there. Here, they are among the natural control agents that help keep our own prickly pears in check.

They are raising some concern now because it's the first time they have been reported on our federally listed cacti. Related species have caused havoc with rare cacti elsewhere in the state. Bob Sivinski, botanist for the State of New Mexico, reports that the cactus longhorn beetles will also feed on (and lay eggs in) smaller cacti.

A cactus longhorn beetle feeds on a Lee pincushion cactus despite the dense spines. (NPS Photo by Kristin Dorman-Johnson)

"Most of the adult Mesa Verde cacti and Brack's cacti in San Juan County were wiped out three years ago by this, or the similar species, *Moneilema semipunctatum,*" Sivinski writes. "This is first evidence I've seen of a *Moneilema* attacking *Escobaria sneedii*. Hope they don't develop a taste for it."

Damage to the tissues of Lee pincushion following feeding by cactus longhorn beetle. (NPS Photo by Kristin Dorman-Johnson)

Moneilema beetles don't just eat cactus pads, either. The larvae also get into the act, feeding on both stems and roots. There was hope that the tightly packed spines of Lee pincushion cactus would deter the feeding, but the photos show they did not.

The cactus bugs (*Chelinidea*) lay their eggs on the undersides of cactus spines. They go through several immature stages called nymphs before becoming adults. Both adults and nymphs feed on cacti, usually in large groups. At first the damage looks like light spots on the pads, then the spots grow together and the epidermis starts to die. Fungi often invade the damaged areas and cause large black infected spots.

The potential for damage to the cactus populations is not known. These are most likely native insect species, but it's possible that last year's high rainfall has resulted in many more insects than normal. One endangered cactus researcher has recommended that the park set up small monitoring plots to document the situation.

QUESTIONS & ANSWERS

Got resource or science questions about the park? Send them to us and we will try to answer one or more in each issue.

From Terry Burton – I am wondering if there are plans to conduct pollen studies within the cave this year. The reason I ask is because of something I noticed last summer. I came aboard late last June and suffered from allergies. Yet, when I would go into the Main Corridor or Big Room I would be completely comfortable, sneeze and itchy eyes-free. Then as the summer went on, by late August I no longer found relief from the symptoms inside the cave. So I concluded that with continuous visitation, perhaps the visitors brought in enough pollen with them (on their clothes, hair, skin, shoes) that allergies were something to still be suffered. What do you think?

Answer by Dale Pate – There are no researchers that will be looking at pollen movement in Carlsbad Cavern this year. There are a couple of past research projects that probably did some pollen research, though more from a look at past climatic conditions. We do have a research project that is involved with an initial study on airborne microbes in Carlsbad Cavern for this year. This study also looked at airborne particulate matter from the entrance area to the Big Room. We have also had at least one other study that measured airborne particulate matter in the Big Room area, but only in the summer. Additionally, the park and other researchers have done extensive radon monitoring in the cave in the past. I'm sure there are other studies as well that I have not mentioned.

The observations you made are valid ones, though I suspect that the system and mechanisms for the symptoms you displayed are very complex. Air currents in the main part of the cave play a significant role in the entire system. As soon as the temperature outside starts dropping below the average temperature of the cave (56º-57ºF), cold, dry air starts plunging down the large entrance. As winter progresses, there are many days and nights where the outside temperature is colder, so this air movement into the cave continues for a long period of time. As cold, dry air falls into the cave, it pushes warm moist air up to the ceiling and out the upper portion of the main entrance and out the second natural entrance. You will notice during this time that the paved trails in most parts of the cave dry out and the humidity drops significantly. This is why the thenardite (a dehydration product of mirabalite) grows during the winter months in the area along the long loop of Lower Cave. Conversely, during the summer months when the air temperature rises above the average cave temperature, this air movement system changes dramatically. There is always air exchange occurring at the entrance so air movement does not stop completely, but it is totally different from the winter system. Without the cold, dry air plunging into the cave, humidity rises significantly for a period of months. The paved trails in many areas become wet and stay wet.

I suspect that the symptoms you notice are more associated with mold or other fungi growing on all the organic material such as pollens, lint shed by thousands of visitors, the occasional droppings from ringtails, raccoons, bats, and other sources. These materials begin to rot as they are exposed to high humidity for months at a time.

Your questions and observations have been interesting and may help us to consider directing some future research to this complex air movement system and how it may relate to visitors and employees.

CAVING SAFELY – THE *"RULES OF THREE"* ARE NOT ENOUGH

by Tom Bemis

This article is borrowed from the March/April 2005 issue of "The Safety Buzz", a newsletter from the Safety Committee at Carlsbad Caverns National Park.

Ask most experienced cavers about caving safety and they will normally spout the *rules of three:*

1. Don't go caving with less than three people in the group.

2. Each caver should take at least three sources of light.
3. Tell three people where you're going and when you expect to be back.

These rules have been drilled into the minds of cavers (and hotly debated) for decades. They are generally good advice, but two of the three will help only ***AFTER*** there has been an accident.

There was a recent spike in caving accidents requiring rescue in southeastern New Mexico. In a little over a one-year span, five cavers required rescue compared to a norm of less than one every three years (none of these were in the park). Following the rules of three would not have prevented any of these accidents.

Was this glut of accidents an anomaly, or had something changed? There had not been a corresponding increase in the number of permitted cave trips, so this rash of accidents was not due to dramatically increased caving activity.

Perhaps if we look at the root causes, we can find a common thread:

- Two accidents involved inexperienced cavers tripping or falling in non-technical, horizontal caves.
- One accident involved an improperly equipped, inexperienced caver falling in a technical cave.
- One accident involved an experienced caver improperly using equipment in a semi-technical cave.
- One accident involved an experienced caver becoming entrapped while entering an unstable virgin cave.

From the above statistics, it is apparent that experience does not prevent accidents, not does following the rules of three. It is also apparent that the lack of difficulty of a cave does not preclude accidents. At first glance in fact, the causes appear highly dissimilar, but if we look a little closer they all appear to stem from two basic causes: overconfidence and/or complacency.

All the accidents occurred while the people were attempting something of which they assumed they were capable. Most were not attempting anything that they would consider difficult. This is probably why most of the accidents occurred. If we are comfortable with what we are doing, we tend to be less cautious.

In reality, we are probably often safer when we are performing difficult tasks because our guard in up. I once watched a caver cautiously use a hand line to come down a slippery slope. When she was off the slope and standing on a dry, level floor, she tripped and sprained her ankle. Why? She felt secure and let her guard down.

There is no safe time underground. What would be considered a minor incident on the surface underground can be life threatening. Medical care can be hours, or even days away, if available at all. Rescue litters won't fit through tight, winding crawls.

Rescue personnel refer to the first hour after an accident as the *golden hour*. The chances of surviving a serious injury drop precipitously if that time is exceeded. An injured caver is not going to make it to the hospital during that magic time. Pilots are understandably reluctant to take their life flight helicopters underground.

How can cavers decrease their chances of becoming injured while caving? Perhaps the following suggestions will help:

1. Remember where you are. Few places are as remote from medical care as the back of a cave. It may be easier to get help to an astronaut 100 miles up than to a caver 100 feet down.
2. Keep your mind on what you are doing. Be vigilant.
3. Remain aware of your surroundings. With experience, people can even become complacent about standing on the edge of a pit.
4. Keep an eye on the others and ask them to do the same for you.
5. Be prepared for a long stay. Are you prepared with food, water, light, and warmth? Remember that even in a warm cave hypothermia can kill you faster than the lack of food or water.
6. Don't leave your pack to check the lead. You could become stranded without life sustaining supplies.
7. Don't attempt anything without proper training. Try new techniques on the surface where help is readily available.
8. Remember that when you take a risk, you are risking the safety of everyone in your group as well as that of the rescuers who come for you.
9. Evaluate every obstacle with an eye towards whether a litter could pass through, as well as what damage would be inflicted on the cave with the passing of the litter and rescuers.
10. Adhere to the rules of three, just in case.

Caving is a rewarding, popular sport that can be done relatively safely. If an accident does occur, however, the consequences can be dire. Few cavers fully comprehend the risks. Many of the safest cavers I have encountered over the years have been those who were either involved in an actual accident or rescue, or who have had cave rescue training.

If you are sincerely interested in caving, the best way to ensure your own safety is to attend a rescue practice session and help transport a patient in a litter through a cave. Only then will you appreciate the need to cave softly and safely.

UNDERGROUND SECRETS OF HARVESTER ANTS

by Renée West

For many years we have been trying to map and understand the underground passages and chambers found in caves within Carlsbad Caverns National Park. On a totally different scale, harvester ants have been creating amazing underground passages and chambers as well. We see harvester ant nests all over the place—next to the Nature Trail and the visitor center,

by the GIS office, and dozens of other places around the buildings and in the backcountry. But the part of the nest we can see is even less than the figurative 'tip of the iceberg'. Don't you wonder what they do under there? How many ants live in a nest? How big are the nests underground?

Dr. Walter Tschinkel looks at a harvester ant nest he excavated after filling with plaster in Florida. Florida harvester ants are believed to have similar nests to harvester ants in the West. (Photo by Charles Badland)

Fortunately, these questions have also intrigued several scientists. The most dramatic discoveries are coming from those who excavate entire nests, a relatively new technique that involves filling a nest with plaster and then digging a hole beside it. It's quite a specialty – an art, really – to do this well. Dr. Walter Tschinkel of Florida State University developed the technique. Tschinkel has shown that some harvester ant nests can be as deep as about 10 feet, with delicate passageways and intricate chambers. In some ways, it looks a little like a map of Lechuguilla Cave!

There are many species of harvester ants in North America. Those near the GIS office were identified in 2003 as red harvester ants—*Pogonomyrmex barbatus*. Those that inhabited the nest in the photo with Dr. Tschinkel were Florida harvester ants, *P. badius.* Their nests are believed to be similar to those of our red harvesters, who seem to stay years in one nest. (Ants in the genus *Pogonomyrmex* are sometimes called pogos for short.)

"Florida harvester ants move irregularly, but average between once and twice a year," said Tschinkel in an email. "No idea what makes them move. Many western Pogos are very sedentary. Some hardly ever move, or perhaps never. I think it's pretty reasonable to assume that the subterranean structure will be similar to *P. badius* (Florida harvester ants)."

A 2003 photo of the harvester ant nest close to the GIS office. (NPS Photo by Dale Pate)

As for how many ants are likely to be living in a mature nest, studies have shown that the largest ant colony had about 12,000 ants. The average was around 10,000 (Gordon 1999). An ant nest gets started when a queen is fertilized by males, drops her wings, and starts digging. When she has a large enough chamber, she begins producing offspring, and many of them take over further excavations. The nest is, as Taber (1998) put it, "a giant single-parent family committed to the care of sisters and an occasional brother." Queens can live for 10 or 20 years, workers only about one year. The colony survives as long as the queen. The new ants (mostly females) become workers of various sorts (McClintock 2003). Gordon (1999) has spent years watching ant behavior and has given a lively description of the activities and division of labor in nests. She says there are interior workers who care for the queen, eggs, and larvae, and who sort and store seeds brought in by the exterior workers. Exterior workers are foragers, who bring food, and patrollers, who patrol the area around the nest. Exterior workers make up only 25 percent of the colony, so there are about three times as many ants underground as the ones we see.

The same harvester ant nest in 2005 (NPS Photo by Kristin Dorman-Johnson)

Harvester ants carry and consume lots of seeds, of course, but that's not all they eat. While harvester ants are not strictly vegetarians, they are not hunters either. The protein in their diets is mostly made up of the exoskeletons of other insects. The only live prey they take is termites. Those soft defenseless insects make tasty morsels. We may think of harvester ants as being the all-important main food for horned lizards. But in the natural 'eat and be eaten' cycle, they may also be important for keeping termite populations under control. Nature's pest control operators? Why not!

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McClintock, Jack. 2003. The Secret Life of Ants: A myrmecologist captures the delicate subterranean mansions of the insect world's master architects. Discover magazine, Vol. 24 (11). Available at: http://www.discover.com/issues/nov-03/features/the-secret-life-of-ants/

Taber, Stephen Welton. 1998. The World of the Harvester Ants. Texas A&M University Press, College Station.

2005 NSS CONVENTION

by Dale Pate

Paul Burger and Dale Pate attended the 2005 National Speleological Society Convention in Huntsville, Alabama from July 11-15. In addition to meeting with numerous researchers and volunteers that work at Carlsbad Caverns National Park, both presented papers as well. Dale presented an overview of the restoration and conservation of The Rookery in Lower Cave including the installation of the walkways along the visitor route and the excellent work done by numerous volunteers from the Cave Research Foundation. Paul's presentation was on his dye trace project to determine flow paths and travel times for water entering Bat Cave Draw from the Bat Flight parking lot into different portions of Carlsbad Cavern.

Others giving papers on Carlsbad Caverns National Park related work included the following: John Punches and Anmar Mirza presented their volunteer work to develop a SAR preplan for the upper portions of Lechuguilla Cave; Brian Kendrick presented recent exploration highlights in Lechuguilla Cave; Jessica Snider presented her Master's thesis work on UV radiation sensitivity in cave bacteria collected from Left-Hand Tunnel in Carlsbad Cavern and from surface bacteria; Penny Boston presented back to back papers on cave ferromanganese deposits from Spider and Lechuguilla Caves and a comparison of cave and surface rock varnish microbial communities based on manganese and iron interactions; and Nicholas Taylor presented a paper on the work that he and others including Hazel Barton have been involved with concerning impacts to microbial communities from humans in Carlsbad Cavern. In addition, Penny Boston also presented work by graduate student S. Shindo on micrometeorological processes in Carlsbad Cavern.

Also during the convention, Paul and Dale met with numerous individuals and other NPS and other agency cave specialists on various aspects of cave management and research including Louise Hose (Director of the National Cave and Karst Research Institute) who gave a presentation on recent activities for the Institute. In addition, Paul met with volunteer cartographers working on maps of Lechuguilla Cave to coordinate efforts and set a schedule for the printing of a new addition of updated maps.