

**Bioinventory of  
Bloominton Cave  
Washington County, Utah**



# **Bioinventory of Bloomington Cave, Washington County, Utah**

## **Final Report**

G.O. Graening  
Department of Biological Sciences, California State University, Sacramento  
9000 J Street, Sacramento, CA 95819-6077

Tom Gilleland  
MineGates, Inc.  
4980 N. Campbell Ave., Tucson, AZ 85718

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## **Introduction**

Bloomington Cave is a limestone solution/tectonic cave located within the White Hills Karst Area, Mojave Desert, Great Basin Ecoregion. Bloomington Cave has 7,136 feet (1.35 miles) of mapped horizontal cave passage, and 240 feet of vertical relief (Timpanogos Grotto 2009). This bioinventory effort partially fulfills a Management Objective in the Bloomington Cave Management Plan (Voyles and Ferris 2009).

## **Methods**

### **Ocular Surveys and Opportunistic Collections**

This study was limited to macrofauna, and focused primarily on invertebrates. Vertebrates and macroscopic invertebrates were counted visually with helmet-mounted lights. Opportunistic searches consisted of collecting arthropods as they were encountered throughout the cave. Specimen collection locations shown on the cave map in Exhibit A. An intuitive search technique was employed, where search effort was focused in areas most likely to contain invertebrates, based upon our current understanding of habitat and diet preferences, or the subterranean niche in general. These focal areas included the entrance ecotone, the undersurface of rocks, concentrations of organics, and deep in the aphotic zone.

Collection tools consisted the bare hand, forceps, small aquarium dip net, and aspirator. Collections were minimal, and performed only when the identification could not be made in situ or with photography. Typically one to two specimens are all that are required of a particular taxon; most taxonomic keys require males, which usually constitute a smaller impact than collecting females.

Two site visits were performed:

- 28 June 2010, G.O. Graening, Tom Gilleland, Kyle Voyles, Jason Knight, 23 man-hours
- 3 July 2010, Jason Knight, 2 man-hours

## **Bait Traps**

Baited pitfall traps were also employed, and consisted of small plastic jars buried at ground level, baited with rancid Limburger cheese and filled with propylene glycol (the preservative), and covered with a mesh screen to exclude rodents and larger invertebrates. Traps were deployed on 28 June 2010 and retrieved on 3 July 2010. Traps were deployed as follows: 2 traps in aphotic zone of the “Sand Box” (Station 10); 1 trap in aphotic zone of the South Entrance (Station 3); 1 trap in twilight zone of North Entrance (Station 8). Trap locations shown on the cave map in Exhibit A.

## **Taxonomic Identification and Curation**

Voucher specimens were preserved in 90-95% EtOH to preserve DNA. Specimens were identified at CSUS Dept. of Biological Sciences by Dr. Graening, or sent to collaborating taxonomic specialists. Specimens may reside temporarily in personal collections of the taxonomists (for later deposition in a public museum once determinations are made). The default repository is the California Academy of Science’s Entomology & Invertebrate Collections.

The following taxonomic specialists collaborated on this project:

- Beetles (Tenebrionidae): Dr. Rolf Aalbu
- Beetles (Rhadine): Dr. Thomas Barr
- Beetles (Staphylinidae): Dr. Richard Hoebeke
- Millipedes: Dr. Bill Shear
- Orthoptera: Dr. Theodore Cohn
- Lepidoptera (moths): Dr. Jerry Powell (Essig Museum, UC Berkeley)
- Arachnids: Dr. Darrel Ubick, Tracy Audisio, Joel Ledford (all 3 with California Academy of Sciences); Dr. James Cokendolpher.

Determinations, and other taxonomic correspondence, is provided in Exhibit C.

## **Results**

### **Literature Review**

A thorough review of the literature was attempted. No previously published reports or articles were found that pertained to Bloomington Cave, although the search was not exhaustive. The Bloomington Cave Management Plan has the following unpublished faunal accounts:

“No systematic inventories of cave life in Bloomington Cave have yet been conducted nor has population data on any species been regularly collected. The cave is known to support a variety of invertebrates, including beetles, crickets, spiders, and millipedes, some of which may be previously unknown species. Reptiles, such as sidewinders and several of the more common Mojave Desert lizards, often seek shelter within the cave. Packrats, kangaroo rats, and ground squirrels, as well as Townsend’s big-eared bats, have also been observed in the cave. Townsend’s big-eared bats are considered to be a species at risk by BLM and the State of Utah, because of declining populations and habitat loss. Fringed myotis bats, that have some potential to be using Bloomington Cave, are also a BLM and State-listed species at risk.” (p. 4, Voyles and Ferris 2009)

“On November 28, 1952, members of the Southern California Grotto who were exploring Bloomington Cave reported seeing more than 200 bats in a single flight in the cave.” (p. 4, Voyles and Ferris 2009)

“Today, relatively few bats are observed in Bloomington Cave. As many bat species, particularly Townsend’s big-eared bats, are particularly sensitive to habitat disturbances, it is likely that the large groups of visitors and inappropriate visitor activities, such as campfires and spray painting, have forced at least some of these bats to abandon this cave.” (p. 6, Voyles and Ferris 2009)

On an article about cave species of the family Macrosternodesmidae, Shear and Shelley (2007) write:

“...an undescribed genus whose species possess 18 segments has been found in at least one Utah cave” (p. 66, Shear and Shelley 2007)

There are many articles regarding the fauna of Utah and surrounding States that may assist in identifying the Utah subterranean fauna; these include:

- Buecher, D.C., and R.M. Sidner. 1999. Bats of Kartchner Caverns State Park, Arizona. *Journal of Cave and Karst Studies* 61:102-107.
- Culver, D.C., L.L. Master, M.C. Christman, and H.H. Hobbs III. 2000. The obligate cave fauna of the 48 contiguous United States. *Conservation Biology* 14(2):386-401.
- Herron, D. 2007. Cave critters collected by David Herron, Forest Geologist, Ashley National Forest, last updated October 2007. 6 pp.
- Nicholas, G. 1960. Checklist of macroscopic troglobitic organisms of the United States. *American Midland Naturalist* 64(1):123-160.
- Packard, A. S. 1877. On a new cave fauna in Utah. *Bulletin of the United States Geological and Geographical Survey* 3:157–169.
- Pape, R.B., D.B. Thomas, and R.L. Aalbu. 2007. A Revision of the genus *Eschatomoxys* Blaisdell (Tenebrionidae: Pimeliinae: Edrotini) with notes on the biology. *The Coleopterists Bulletin* 61:519-540.
- Peck, S.B. 1998. A summary of diversity and distribution of the obligate cave-inhabiting faunas of the United States and Canada. *Journal of Cave and Karst Studies* 60(1):18-26.
- Reddell, J.R. 1994. The cave fauna of Texas with special reference to the western Edwards Plateau. Pp. 31–50 in: W. R. Elliott and G. Veni, eds. *The Caves and Karst of Texas*, National Speleological Society, Huntsville, Alabama. 252 pp.
- Shear, W.A., and M.S. Shelley. 2007. The milliped genus *Tidesmus* Chamberlin, 1943 (Polydesmida: Macrosternodesmidae). *Zootaxa* 1656:51–68.

- Wynne, J.J., C.A. Drost, and K.D. Voyles. In prep. Ecological Inventory of Caves on Grand Canyon-Parashant National Monument. Arizona. Intl. Journal of Speleology.

### **Bloomington Cave Faunal Checklist To Date**

The Faunal Checklist is presented in Exhibit B.

29 species were identified to date as occurring in Bloomington Cave, including 6 mammals and 3 reptiles. Invertebrates detected to date are a mixture of common surface (epigean) species and a few cave limited or cave adapted species (= troglobionts). At least 4 species new to science occur in Bloomington Cave. Exhibit C provides the raw correspondence from taxonomists, which details the progression of the species' descriptions. Exhibit D provides photographs of some of the fauna. A discussion is provided next of some of the most important, or focal, species.

### **Focus Species in Bloomington Cave**

- Troglobiotic millipede. new species in genus *Pratherodesmus*, (family Macrosterodesmidae); Specimens sent to Dr. Bill Shear (Hampden-Sydney College) for future description in a taxonomic journal.
- New species of troglobiotic beetle. *Eleodes* (subgenus *Caverneleodes*) sp. nov., being described by Dr. Rolf Aalbu, who states: "*While one is Eleodes (Melaneleodes) carbonarius obsoletus, a common Great Basin species, the other is another record of a new cave species in the subgenus Caverneleodes I am describing currently. GREAT FIND! Most of the records I currently have are from Arizona. I now have records from six caves in Northern Arizona and one cave in Utah*"
- New species of beetle, genus *Rhadine* (*perlevis* group), but not troglobiotic; being described by Dr. Thomas Barr.
- Psocoptera. Probably the same taxon of a new genus (family Sphaeropsocidae, gen. nov.) being described in Grand-Canyon-Parashant National Monument, Arizona
- Rhabdiphoridae: prob. *Ceuthophilus*: new genus and species in Grand-Canyon-Parashant National Monument, Arizona; specimens were sent to Dr. Theodore Cohn at the Univ. of Michigan Museum of Zoology
- Palpigradi: a small, probably juvenile, micro-whip scorpion was collected. It is unclear whether this is a rare species or not; the Order Palpigradi is not well studied.

As additional taxonomic determinations by specialists are completed and received, we will provide the BLM St. George Field Office with one or more Technical Letter Addendum email reports that updated the faunal checklist for Bloomington Cave.

### **Discussion and Recommendations**

## **Current and Potential Threats**

Bloomington Cave has been subject to heavy human use, as well as vandalism. The Cave Management Plan states: "*Bloomington Cave has been impacted by more than a century of unmanaged and often inappropriate visitor uses.*" (p. 4, Voyles and Ferris 2009)

The following current or potential threats were identified:

- The overuse and/or misuse of the caves by visitors may have caused the abandonment of the cave by bat populations; this may have interrupted an important energy input into the caves.
- The overuse and/or misuse of the caves by visitors may have caused direct or indirect adverse affects on the cave fauna, such as by trampling, introduction of toxins (e.g. volatile organic compounds from spray paint, heavy metals from batteries), or alteration of the foodweb by introduction of novel food sources (excrement, snack crumbs, etc.)
- Global climate change, as a universal threat, may alter the temperature and moisture regimes of caves, making them less suitable for cave-dependent faunas.

Management objectives and planned actions in the Management Plan (p. 13-14) appear to be adequate to address these concerns, except for the threat of global climate change (for which there appears to be no feasible mitigation). The following recommendations are also suggested.

### **Recommendation # 1: Restore Bat Populations**

Restore bat populations to restore seasonal energy input of guano in the cave ecosystem. The recent installation of bat-friendly gates is an important first step. Restriction of cave use during months when bats establish roosts, or during critical hibernation or maternity periods, is advised. This restriction of use could be in the form of complete exclusion of cave visitation, or the closure of certain rooms or entrances of the cave. Management objectives and planned actions in the Management Plan (p. 13) appear to be adequate to protect bat populations

### **Recommendation # 2: Additional study**

We recommend the continuation of the literature search and review, and the development of a state-wide checklist of subterranean faunal occurrences. We recommend that additional bioinventories of Bloomington Cave be performed, as well as the adjacent caves in the White Hills Karst Area. The bioinventory of Bloomington Cave is not complete; numerous inventories are typically necessary to characterize the fauna of a single cave. The inventory of adjacent caves is necessary to determine if the novel species found in Bloomington Cave are endemic to this single cave, or to this cave region, or are not rare because they occur in many other habitats. These recommendations are consistent with the Management Objectives in the Management Plan (p. 13).

We also recommend the addition of another subject heading and blank lines on the "Bloomington Cave Post-Trip Report" to allow cavers to record non-bat cave life seen; visitors should also be encouraged to submit photographs of cave life.

## **Acknowledgements**

We would like to thank Kyle Voyles, for funding this study, and for his discovery of several of the troglolithic species during this study. We are indebted to the collaborating taxonomists, whose taxonomic knowledge is irreplaceable, including the following: Tracy Audisio, Dr. Rolf Aalbu, Dr. Thomas Barr, Dr. Theodore Cohn, Dr. James Cokendolpher, Dr. Richard Hoebeke, Joel Ledford, Dr. Jerry Powell, Dr. Bill Shear, and Dr. Darrell Ubick.

### **Literature Cited**

Herron, D. 2007. Cave critters collected by David Herron, Forest Geologist, Ashley National Forest, last updated October 2007. 6 pp.

Shear, W.A., and R.M. Shelley. 2007. The milliped genus *Tidesmus* Chamberlin, 1943 (Polydesmida: Macrosternodesmidae). *Zootaxa* 1656:51–68.

Timpanogos Grotto. 2009. Bloomington Cave Map, Washington County, Utah. Cartography by Brandon Kowallis, Kyle Voyles, and Jon Jasper.

Voyles, K., and D. Ferris. 2009. Bloomington Cave Management Plan, Washington County, Utah. U.S. Department of the Interior, Bureau of Land Management, St. George Field Office, St. George, Utah. 30 pp.







Exhibit B: Faunal Checklist for Bloomington Cave

Scientific Name	Common Name	Count	1	2	3	4	5	6	7	8	9	10a	10b	11	Notes / Sources*
Invertebrates															
Phylum Arthropoda	Animals with Segmented Legs														
Class Arachnida	Spiders, Mites, Scorpions, etc.														
Order Araneae	Spiders														
Family Tengellidae	Tengellid Spider														
Species undetermined	Hunting Spider	15	X	X	X	X	X	X	X	X	X				
Family Lycosidae?															
Species undetermined	2nd spider species	2	X												
Family Undetermined															
Species undetermined	3rd spider species	1	X	X											small spider w/ spherical abdomen
Order Schizomida?	Whip scorpion														
Family Undetermined															
Species undetermined	Whip scorpion	1										X			
Order Pseudoscorpiones	False Scorpions														
Family Undetermined															
Species undetermined	False Scorpion	1		X											
Class Chilopoda	Centipedes														
Order Lithobiomorpha	Stone Centipedes														
Family Lithobiidae	Stone Centipedes										X				
Species undetermined	Garden centipede														
Class Diplopoda	Millipedes														
Order Polydesmida	Polydesmid millipedes														
Family Macrosternodesmidae															
Species undetermined	New species of cave millipede	3										X			Troglobiont, new species
Class Entognatha	Six-legged invertebrate														
Order Collembola	Springtails														
Family Entomobryidae	Springtails														
Species undetermined	Tomocerus sp.?	20								X	X				large, elongate, gray
Family Undetermined															
Species undetermined	2nd springtail species	30													small, white, globular
Class Insecta	Insects														
Order Coleoptera	Beetles														
Family Carabidae	Ground Beetles														
Species undetermined	Cave Beetle	10			X	X	X	X							New species
Family Leiodidae	2nd species		X												
Species undetermined	Round Fungus Beetles	50													
Species undetermined	Round Fungus Beetle														
Family Staphylinidae															
Species undetermined	Darkling Beetles														
Family Tenebrionidae	Darkling Beetles														
Species undetermined	Darkling Beetle	15			X	X	X	X	X	X	X				common Great Basin species



Scientific Name	Common Name	Count	1	2	3	4	5	6	7	8	9	10a	10b	11	Notes / Sources*
<i>Neotoma prob. lepida</i>	Desert Woodrat	?				X									Sign only (scat, middens and amberat)
<i>Mus sp.?</i>	Mouse, undetermined	1												X	
Family Sciuridae	Squirrels														
prob. <i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel	?		X											Sign only (burrow)
Class Reptilia	Reptiles														
Order Squamata	Snakes & Lizards														
Family Phrynosomatidae	Fence Lizards														
prob. <i>Uta stansburiana</i>	Side-blotched Lizard	?													reported by BLM (2009)
Family Teiidae	Whiptail Lizards														
prob. <i>Aspidoscelis tigris</i>	Western Whiptail Lizard	?													reported by BLM (2009)
Family Viperidae	Pit Vipers														
<i>Crotalus prob. cerastes</i>	Rattlesnake or Sidewinder	?													reported by BLM (2009)

\*Source is this study, unless otherwise specified

Bureau of Land Management (BLM). 2009. Bloomington Cave Management Plan, Washington County, Utah. Prepared by Voyles, K., and D. Ferris. U.S. Department of the Interior, Bureau of Land Management, St. George Field Office, St. George, Utah. 30 pp.

Exhibit C: Correspondence from Taxonomists

**From:** RLA [raalbu@comcast.net]

**Sent:** Friday, July 02, 2010 4:15 PM

**To:** Dr. G.O. Graening

**Subject:** Re: Tenebrionids from Utah cave 4 U

Hi Geo; Got your specimens. While one is *Eleodes (Melaneleodes) carbonarius obsoletus* Say, a common Great Basin species, the other is another record of a new cave species in the subgenus *Caverneleodes* I am describing currently. GREAT FIND! Most of the records I currently have are from Arizona. I now have records from six caves in Northern Arizona and one cave in Utah.

I am headed that way at the end of this month on my way to So. Ariz. and would be very interested if either you, Tom or Kyle would be able to show me some of these caves to get additional specimens. The dates I would be in the area would be the beginning of the last week of July or the end of the first week of August. Please forward this email to them if you can't make it.

Cheers, Rolf

Rolf L. Aalbu, Ph.D. Director of Research Western Cave Conservancy

**From:** Dr. G.O. Graening

**To:** 'RLA'

**Sent:** Wednesday, June 30, 2010 10:47 PM

**Subject:** RE: Tenebrionids from Utah cave 4 U

Fantastic.

I'll put them in the mail first thing tomorrow morning. The specimens, of course, are yours to keep. BLM made no stipulations on the final repository.

The attached management plan for the cave has additional info, including location. I did not get the coordinates while on-site, but we can get this from the land manager Kyle Voyles, who you probably know from the tenebrionid collections in Arizona.

thanks geo

Dr. G. O. "Geo" Graening, Adjunct Professor

**From:** RLA [mailto:raalbu@comcast.net]

**To:** Dr. G.O. Graening

**Sent:** Wednesday, June 30, 2010 9:49 PM

**Subject:** Re: Tenebrionids from Utah cave 4 U

Hi Geo; Sure send them to the address below. I would be interested especially interested in species from Washington Co., as I am currently describing new species from that area.

Thanks, Rolf

**From:** Dr. G.O. Graening

**To:** 'RLA'

**Sent:** Wednesday, June 30, 2010 9:34 PM

**Subject:** Tenebrionids from Utah cave 4 U

Greetings Rolf,

I just got back from a quick trip to Utah, where I helped Kyle Voyles (BLM) inventory Bloomington Cave, Washington Co., Utah. We collected 2 tenebrionid specimens. May I send

them to you? If yes, shall I send them to: 18 Sea Lion Court, Sacramento, CA 95831 ?  
Hope to cave with you soon, - geo  
Dr. G. O. "Geo" Graening, Adjunct Professor

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**From:** Tracy Audisio [tracy@troglophile.com]

**Sent:** Thursday, July 15, 2010 11:36 AM

**To:** Dr. G.O. Graening

**Subject:** Weird arachnid

Hi Geo,

Darrell isn't sure what it is. He said schizomid is a likely candidate, or it could be a palpigradi. After looking at pictures online, it certainly looks more like a palpigradi. Either way, it is a juvenile... so collecting an adult with a tail would be useful.

-Tracy

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**From:** Thomas C. Barr [tcbarr@comcast.net]

**Sent:** Sunday, July 04, 2010 1:56 AM

**To:** G.O. Graening

**Subject:** Re: Rhadine specimens from Utah cave

Geo,

This will acknowledge the safe receipt of the *Rhadine* specimens from Bloomington Cave, Washington Co, Utah. Of course I know where Washington County is, but where is Bloomington Cave?

Jut Wynne and I are planning to describe a pair of near sibling spp of *Rhadine* from opposite sides of the Lower Colorado River in NW AZ. The northern one of these occurs in several quite remote caves reached by Jeep from St George, including the Grand Wash and the Parashant, so it is to this one that I will first compare the specimens you collected. They appear to belong to the *perlevis* group, which includes a number of species (described and otherwise) from caves in AZ, NM, and Chihuahua. None of these species is troglobitic, although in an arid region they seek shelter in caves and mammal burrows.

More later when I get a chance to make some comparisons with material on hand. With luck I'll get to it next week. In any event any Utah record for *Rhadine* is new information about this unusual genus. Thanks for sending this material.

Regards, Tom

**From:** "G.O. Graening" <graening@csus.edu>

**Sent:** Wed, 30 Jun 2010 21:43:45 -0700

**To:** "Thomas C. Barr" <tcbarr@comcast.net>

**Subject:** Rhadine specimens from Utah cave

Greetings Dr. Barr, I just got back from a trip to Utah, where I helped Kyle Voyles (BLM) inventory Bloomington Cave, Washington Co., Utah. We collected 4 beetle specimens that appear to be *Rhadine*. May I sent them to you for identification?

Sincerely, - Geo

Dr. G. O. "Geo" Graening, Adjunct Professor

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**From:** cokendolpher@aol.com  
**Sent:** Monday, July 19, 2010 7:05 AM  
**To:** graening@csus.edu; jreddell.caves@mail.utexas.edu  
**Subject:** Re: Weird arachnid; request ID to ordinal level

Hi Geo,

Based on the presence of the pygidium and the shape of the chelicerae I would call it a Palpigradi. It is definately not a schizomid. As I recall there are members of this order in California and Oregon (or was it Washington), so Utah would not be a surprise.

Cheers, James C.

**From:** Dr. G.O. Graening <graening@csus.edu>  
**To:** 'James Reddell' <jreddell.caves@mail.utexas.edu>; 'James C. Cokendolpher' <Cokendolpher@aol.com> Cc: 'Tracy Audisio' <tracy@troglophile.com>

**Sent:** Sat, Jul 17, 2010 12:57 pm

**Subject:** Weird arachnid; request ID to ordinal level

1Greetings James and James, I hope all is well with you both.

I just got back from a quick trip to Utah, where I helped Kyle Voyles (BLM) inventory Bloomington Cave, Washington Co., Utah.

We collected a very strange arachnid (and did not see any others like it).

Darrel Ubick stated that it was, unfortunately, a juvenile, and surmised that it might be a schizomid or palpigradid. Two pictures are attached that my colleague Tracy Audisio shot as a montage at the Cal. Academy of Sciences against a backdrop of white sand. The very small size of the individual made it hard to image properly

Would you mind looking at these pics of this very small individual, since you guys are the schizomid experts of the World, and perhaps tell us which arachnid order it falls into?

If my memory serves me correctly, there was a filament coming out of the end of the abdomen (telson? cerci?), but it was not longer than the abdomen itself, as might be expected in Palpigradi. If true, this filament is broken off and lost.

thanks! geo

Dr. G. O. "Geo" Graening, Adjunct Professor

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**From:** E. Richard Hoebeke [erh2@cornell.edu]

**Sent:** Tuesday, July 27, 2010 12:42 PM

**To:** graening@csus.edu

**Subject:** Cave staphylinids

Geo:

I have received the 3 samples of specimens that you recently sent and can provide the following identifications:

Trail Junction Cave, Siskiyou Co., CA - Staphylinidae: *Quedius (Microsaurus) planus* Hatch, male Elateridae: *Limonius pictus* VanDyke

Bloomington Cave, Washington Co., UT - Staphylinidae: *Quedius (Microsaurus)* sp., female (male needed for this subgenus to identify to species)

Rippled Cave, Amador Co., CA - Staphylinidae: *Lobrathium* sp.

It was necessary to remove the specimens from alcohol and mount the specimens for identification. May I retain these specimens here at Cornell?; they will be incorporated into the research collection.

Best wishes, Rick Hoebeke

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**From:** Bill Shear [wshear@hsc.edu]

**Sent:** Monday, July 12, 2010 1:15 PM

**To:** G.O. Graening, **Cc:** Kyle Voyles

**Subject:** Re: another specimen from Bloomington, and results from the first bioinventory of the Marble Valley Karst Area!

Hello Geo,

The male has been dissected, and Kyle was right in his instinctive call—it's new species of *Pratherodesmus*. It appears closest to *P. despaini*, but that species is from California, so yours is quite distinct. These little guys are not easy to dissect and study, they are so small and brittle. I usually take out the gonopods and temporarily mount them on a microscope slide. The problem is that the weight of the coverglass sometimes crushes them and this happened with one of the pair in this case. The coxa of the gonopod was crushed down over the telopodite, so only one of the gonopods is really fit for study and with just one view. Soooo—we need at least another male.

I'm hoping that the additional specimen you mentioned will be male. Indeed several more would be even better. I am planning a trip to the SEM facility for September and it would be great to take this along for pictures comparable to those in the *Pratherodesmus/Nevadesmus* paper, but that would require new males.

You will recall that you got a new species of *Nevadesmus* from Children's Cave last year; if collecting there is remotely possible, enough material to SEM would allow description of both of these.

I know there are conservation concerns about over-collecting, but the main habitat for these millipeds is actually in the microcaverns and crevices in the karst, not so much the big cave spaces that we can crawl into. For that reason I don't think there is much concern about hurting the population through collection. A study was carried out in arid caves in Western Australia that showed that when the cave was baited with water and food, many more millipeds than anticipated "came out of the woodwork" to the bait. My old lab-mate Stewart Peck has collected literally quarts of millipeds in some caves, using bait, without discernable lessening of numbers on subsequent visits.

Now, talking of Marble Valley! That stuff sounds really exciting. Of course I am eager to see the millipeds, so send them right off. Darrell is correct in that I am gathering material for a study of *Taracus*. This is a very interesting genus with a lot of new species, including a very big very strange-looking one Neil Marchington sent me from a cave in southern Oregon. Your photos definitely show a *Taracus* (and great pictures they are). I can't tell from the pictures themselves if this is new, described, or one of the new ones I have found already. The pale color and rather attenuate chelicerae suggest some troglomorphy going on here, but also the specimen could be a juvenile, which would at least explain the pale color. Also, from the photo, the eyes look big and functional. Several *Taracus* are troglophiles and get into caves where they are available. Your specimens are probably about as far north as the genus goes, so that's interesting too. Just as with millipeds, males are needed for complete descriptions of Opiliones.

As for a mailing address, I don't know what to tell you. The campus itself is our "village" out in the country and there really are no street addresses. Everybody picks up their mail at the post office (my box is #96). Maybe that will help. FedEx and UPS drop off here at Gilmer Hall, which



likewise has no street address. Anyway, if you just use "Department of Biology, Hampden-Sydney College, Hampden-Sydney VA 23943" stuff will get here.  
Best wishes and many thanks for the exciting specimens. Bill

Exhibit D: *In situ* Photography of Animals in Bloomington Cave



New species of ground beetle (*Rhadine* sp. nov.)



Masked hunter assassin bug (*Reduvius* sp.) camouflaged with sand



Masked hunter assassin bug (*Reduvius* sp.) camouflaged, a lie-in-wait predator





A cave cricket (prob. *Ceuthophilus*)



A cave-adapted pseudoscorpion





Hunting spider (prob. Tengellidae)





Darkling beetle (*Eleodes carbonarius obsoletus*)



New species of cave-adapted millipede (*Pratherodesmus* sp. nov.)