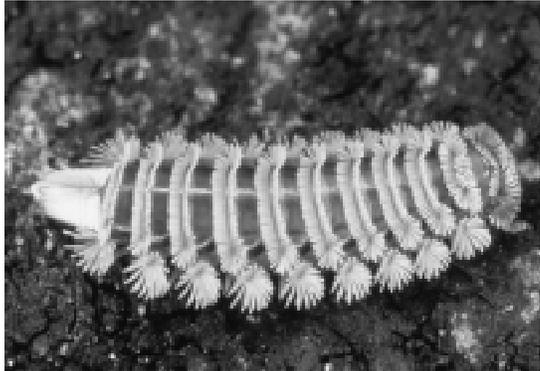
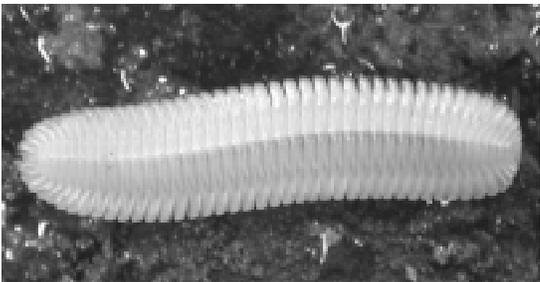


# ATBI QUARTERLY

Great Smoky Mountains National Park, The Natural History Assoc., Discover Life in America, and Friends of the Smokies



*Polyxenus fasciculatus*. photo by James Cokendolpher



*Petasertes* sp. collected at Ash Hopper trailhead, photo by Ernie Bernard

One of the best times to collect millipedes is early spring on a warm drizzly night.

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## Millipede March

Tom Rogers

Twenty volunteers participated in the first "Millipede March" which was held on the twenty-third of March. We gathered at Twin Creeks in the evening for a barbecue dinner and went into the field just before dusk. One of the best times to collect millipedes is early spring on a warm, drizzly night.

We knew it was a bit early in the year for things to be active but decided to use the opportunity for our first attempt. We divided into three teams, one team going to Metcalf Bottoms, one went to Ash Hopper trailhead and one worked across from the nature trail near Sugarlands. We sifted leaf litter and searched the residue for critters. We found ten species of millipedes representing eight families.

Dr. Richard Hoffman, an expert on Diplopoda who works with the Virginia Museum of Natural History, is identifying and studying the millipede fauna of the Park for the All Taxa Biodiversity Inventory (ATBI). About 900 species have been described from the U.S. He estimates that about 50 to 60 species of millipedes will be found in the Park. They range in size from species like *Polyxenus fasciculatus* that is about one-fourth inch long to the four-inch long *Narceus americanus*.

Spring is not only a good time to locate a large number of millipedes, it is the best time to find mature male millipedes. One of the challenges faced in studying the millipede fauna is the fact that only the mature males can be identified to species. They mature primarily in the spring and only survive for a few weeks after maturing. Much of the material collected so far in the pitfall traps (from the on-going structured ATBI plots) is immature or female and can't be fully identified.

One particularly interesting species collected is *Polyxenus fasciculatus*, which looks at first glance, like a unique dermestid beetle larva. It is a soft millipede with tufts of complex hairs. When an ant attacks it, these hairs break loose and then interlock to trap the ant. Millipedes feed on decaying plant material. Their activity functions to break down material into tiny pieces, which is then more readily processed by microorganisms. They also play an important role in the cycling of calcium in the ecosystem. Thus, millipedes are a crucial component of the forest food web.

We are planning another Millipede March on the eighteenth of May-Join us! For more information contact Jeanie Hilten, DLIA Administrative Officer at <jeanie@discoverlife.org> or 865-430-4752.

Tom Rogers, Science/Taxonomy Team Leader-DLIA Volunteer

Orkin

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Emily Jones, Development Coordinator

## The President's Corner

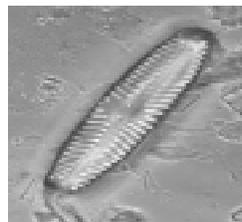
Frank Harris

On March 8-9 we held our strategic planning workshop at Park Headquarters—my thanks to all who were able to participate in this exciting and fast-moving session. We accomplished a great deal, and left the all-day session with assignments for each committee (Science, Education, Development, Communications, Marketing, etc.) to bring together a document for consideration at the May Board meeting. Clearly, since we began a few years ago, we have made a lot of progress on the all species survey; progress paralleled by extraordinary educational activities. I think when the Board meets in May, it will have two distinct paths to choose between—one path would pretty much keep us at the current level of activities while the other would build toward significant growth in species survey and associated education and outreach activities. The choice will be one of forecasting how much we can grow financially—on our own. These are difficult economic times to be on the receiving side of philanthropy. One index we need to develop is how *many* contributors can we claim. Big giving totals are important but at our stage of development, numbers of contributors count a great deal. Therefore, I would ask that you think about what we are trying to do here in Great Smoky Mountains National Park for biodiversity research and education and whether you can help us move this vision forward. The species are counting on us.

Frank Harris

Oak Ridge National Laboratory  
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Thanks to the efforts of Board member David Scanlon, Discover Life in America T-shirts, mugs, and mouse pads are now for sale in several of Great Smoky Mountains Natural History Association (NHA) Park stores! The proceeds from the sales of the items will go to Discover Life to further efforts of the All Taxa Biodiversity Inventory. Sugarlands, Oconoluftee, and Cades Cove Visitor Centers, and Great Smoky Mountains Institute at Tremont will offer the DLIA products. NHA is a partner of the National Park and whenever you purchase anything from their stores, you are supporting a wide array of Park projects. The Natural History Association also has a mail order number: 865-436-0120. To become a member of NHA, contact Judy Collins at 865-436-7318, ext. 22.



## Protista Pursuit

June 27-30, 2002

The upcoming Protista Pursuit on June 27-30 will inventory the entire group that you would anticipate, including algae, diatoms, dinoflagellates, cellular and plasmodial slime molds, oomycetes, chytrids, and protozoa. Many other groups of "charismatic microfauna" will be sampled as well. These include seed shrimp, clam shrimp, water fleas, tardigrades, ostracods, rotifers, gastrotrichs, and the very small species of insects, snails and millipedes. A wide variety of habitats will be sampled and we can use all the help we can get. Plan to join us! Please contact Jeanie Hilten 865-430-4752 or [jeanie@discoverlife.org](mailto:jeanie@discoverlife.org) for information.

## Public Awareness of ATBI Grows

Becky Nichols

Recently I gave an invited presentation at Cuyahoga Valley National Park in Ohio and was amazed at how many people in the audience, which was made up primarily of local citizens, had already heard of the ATBI in the Smokies. Since the beginning of this project in 1998, articles have appeared in Newsweek, Southern Living, and Science, to name just a few, but news of the ATBI now is spreading around the world. Thanks to reporters such as Duncan Mansfield of the Associated Press, articles have been circulating not only in newspapers around the U. S., but in other countries as well, such as in the Bangkok Post. Also, last fall we were visited for three days by Hubertus Breuer, a German reporter who produced a full-page article about the ATBI which appeared in the German daily newspaper, Die Zeit.

In addition to popular articles, we now are getting to the point where inventory results and species descriptions are being published in peer-reviewed journals, and scientific papers are being presented at regional and national society meetings. Some of these societies include: Entomological Society of America, North American Benthological Society, American Institute of Biological Sciences, Association of Southeastern Biologists, George Wright Society, and many others. We encourage everyone who is presenting ATBI information at professional meetings or to any other audience, to please let us know so we can keep a record of it. This information is very important for fundraising efforts as businesses and foundations need to be made aware of the tremendous level of interest in the ATBI.

Through recruitment activities that Stephanie Stocks and others have been pursuing, many of the local universities are now well aware of the project and have been encouraged to involve students through employment, graduate projects, internships, and even volunteering. We have had a lot of response as a result of these efforts, and now have an even stronger local interest, which we feel is essential for the long term success of this project.

Becky Nichols, Park Entomologist  
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TAXON	SPECIES NEW TO SCIENCE	SPECIES NEW TO PARK
Microsporidia	1	4
Slime molds	14	110
Fungi	1 (new genus)	6
Algae	42	210
Plants	0	2
Protozoans	0	10
Nematomorpha (horse hair worms)	0	3
Nematodes (roundworms)	1	2
Mollusks (snails, slugs, mussels)	3	4
Tardigrades (waterbears)	0	19
Annelids (segmented worms)	4	14
Crustaceans (copepods, crayfish, etc)	25	6
Millipedes	1	1
Pauropods (small arthropods)	2	31
Arachnids (spiders, mites, ticks)	39	479
Collembola (springtails)	37 (1 new genus)	97
Diplura (primitive insects)	0	1
Ephemeroptera (mayflies)	3	0
Odonata (dragonflies, damselflies)	0	19
Blattodea (cockroaches)	0	1
Plecoptera (stoneflies)	0	3
Homoptera (hoppers)	0	1
Neuroptera (lacewings, antlions, fishflies, dobsonflies, etc.)	0	8
Dobsonflies,		
Coleoptera (beetles)	2	0
Mecoptera (scorpionflies) (scorpionflies)	2	1
Siphonaptera (fleas)	1	0
Diptera (flies)	42	129
Trichoptera (caddisflies)	8	45
Lepidoptera (moths and butterflies)	1 (new tribe for NA)	535
Hymenoptera (bees, wasps, ants)	3	0
Amphibians	0	2
Mammals	0	1
<b>TOTALS</b>	<b>232</b>	<b>1752</b>

Please direct taxa table questions or comments to Becky Nichols.

# “Unique” Habitats in Great Smoky Mountains National Park

Keith Langdon

There has been much discussion about the wide variety of major habitats found in the Smokies. They range from dry pine-oak forests, to pre-European grasslands, to boreal-like coniferous forests to the deciduous cove forests and mysterious “heath balds.” Systematic invertebrate sampling by USGS in

ATBI techniques are extremely useful in learning about the resources on specific tracts of land.

some of these major habitats is producing very interesting results. But what of the many smaller, “unique” habitats in the Park? I am referring to sites that are themselves very diverse. For example, the Park contains:

- 2 of the 3 deepest caves in the eastern U.S.
- high elevation cliff-face seeps
- “ultra-mafic” rock probably from seafloor sediment before there was an Atlantic Ocean (a recent USGS discovery)
- waterfall spray zones
- soils under large cliff overhangs where it has never rained and several minerals new to science have been found
- the water column and sediment in several valleys embayed by reservoirs
- outcrops of rock that are both extremely acidic and radioactive
- and, let’s not forget the old-growth tree canopies of those different forests!

So, what fraction of the total number of species in the Park do these unique habitats contain? Generally speaking, we do not know most of the life that occurs in them, but the ATBI is helping us learn...that’s part of the discovery process. There has been an increasing number of ATBI activities that focus in these areas. Central Missouri State University’s tree canopy project, and Western Carolina University’s just-completed comprehensive inventory of Gregory’s Cave are two examples.

Some of the most interesting finds from a biological viewpoint are the creatures that Ernest Bernard at the University of Tennessee has been finding in the unusual soils. To date, 17 species of springtails (*Collembola*) new-to-science have been discovered here, and many new Park records.

Another project that contributes to the ATBI is occurring at a 68-hectare (168 acre) tract called Ravensford on the North Carolina side of the Park, near Oconaluftee. This tract is the subject of a proposed land exchange between the National Park Service and the Eastern Band of the Cherokee Indians (EBCI). As part of the Environmental Impact Statement (EIS) that is being prepared for this proposed exchange, 20 natural resource studies were conducted, as well as studies of cultural resources, impacts to viewsheds, hydrology, wetlands, and hazardous materials. The studies selected by the NPS were funded by the EBCI as per an agreement.

The Ravensford site is a flat, alluvial area with very deep, rich, igneous-influenced soils, and it also contains what may be the largest wetland in the Park. USDA soil scientists found it the most productive forest site in either of the Carolinas, based on growth data for tuliptrees, which is a standard way of measuring forest productivity in this region.

At the community level, Alan Weakley, the Chief Ecologist for NatureServe (formerly part of The Nature Conservancy) found a globally rare variant of Montane Alluvial Forest, which he believes is the last such remnant left in North Carolina. The wetland turned out to be a degraded version of a Southern Appalachian Acid Bog, which is also classified as globally rare. Jan and Willis Reid found at least three and possibly as many as six new, undescribed species of copepods associated with the wetland, plus some described taxa that are very rare.

John Morse and his colleagues at Clemson University found 15 undescribed species of aquatic insects, and lepidopterist J. Bolling “Bo” Sullivan who has collected moths from all over North Carolina for 30 years, has demonstrated that it is the most species-rich site for moths in the state! An ATBI study plot was installed on the Ravensford tract about 5 years ago, which showed a very high number of vascular plants. Subsequent work by Park staff found several rare plant species and one possible new record for North Carolina. The Smokies’ largest and best remaining stand of the declining Butternut (*Juglans cinerea*), a federal species of concern, is on the tract. David K. Smith of the University of Tennessee and Paul Davison of the University of North Alabama surveyed non-vascular plants. They found six moss and three liverwort species that were new to the Park, even though this flora is better known here than in almost any other reserve in the U.S. One liverwort is listed as “endangered” by the state of North Carolina.



The Ravensford site is a flat, alluvial area with very deep, rich, igneous soils, and it also contains what may be the largest wetland in the Park.



Some of the most interesting finds from a biological viewpoint are the creatures that Ernest Bernard at the University of Tennessee has been finding in the unusual soils. To date, 17 species of springtails (*Collembola*) new-to-science have been discovered here, and many new Park records. Also, pauropods, a species-poor primitive group of arthropods that live in the soil, have 26 species recorded from the Ravensford tract, including at least two that are new to science. These numbers could still climb higher because most authorities have yet to respond back with identifications for a number of the less common groups of soil organisms.

The vertebrate TWIG targeted some of their Park-wide activities at Ravensford. Even they had some superlatives: the Meadow vole (*Microtus pennsylvanicus*) was “re-discovered” in the Park here after 35 years, and the Meadow jumping mouse (*Zapus hudsonicus*) was found in the Park here for the first time in 65 years. Other Park-rare terrestrial and aquatic vertebrates were also found on the tract.

Thus far, over 50 species new to science, dozens of new Park records, and hundreds of new locations in the Park have been documented.

What does all this mean for the ATBI? Well for starters, it shows that ATBI techniques are extremely useful in learning about the resources on specific tracts of land. This project has

provided an important increase in knowledge for science and Park stewardship. Park managers in particular are grateful to be able to base decisions and scarce agency resources on the best knowledge. When decisions are made later this year regarding the proposed land exchange, solid information on the natural resources of that tract will be included in the decision.

It also demonstrates that a substantial fraction of this landscape’s “biodiversity” may be tied to habitats that are small and often subsumed into larger habitat categories. Further, it strongly indicates that land managers (everywhere) need to sample for far more groups of life during environmental assessments—especially when there are distinctive site characteristics.

Finally, discovering the natural heterogeneity of the landscape and the species that depend on it, will be a big step towards a more complete ecological understanding, which may become one of the most prominent achievements of the ATBI effort.

Keith Langdon, Inventory and Monitoring Coordinator  
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# Air Pollution Concerns at Great Smoky Mountains National Park

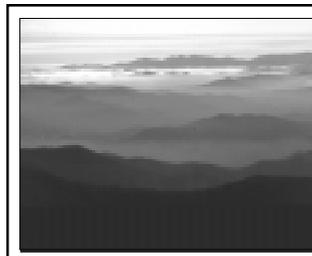
Jim Renfro

Monitoring and research conducted over the past 20 years in Great Smoky Mountains National Park (GRSM) has shown that airborne pollutants emitted outside the Park and transported into the Park are significantly impacting Park resources (streams, soils, vegetation, and visibility), visitor enjoyment, and public health. The burning of fossil fuels (e.g., coal, oil, gas) produces emissions of sulfur dioxide and nitrogen oxides that convert into harmful secondary pollutants (e.g., sulfates, nitrates, ozone). Winds coming into the southern Appalachian Mountains carry pollutants from as far away as the Tennessee, Ohio, and Mississippi River valleys, the industrial cities of the Southeast and Midwest, the Gulf States, and the Northeast. The height and physical structure of the mountains, combined with predominant weather patterns tend to trap and concentrate air currents entering the southern Appalachians.

## Ozone Pollution and Effects to Vegetation:

Ground-level ozone (O<sub>3</sub>) pollution, produced by the reaction of nitrogen oxides and volatile organic compounds in the presence of sunlight, is one of the most serious and pervasive air pollutants injuring vegetation at GRSM. Ozone exposures at GRSM are among the highest in the eastern U.S. and have exceeded the National Ambient Air Quality Standard (NAAQS) for the protection of public health. Since May 1998, the Park has exceeded the 8-hour ozone NAAQS on 142 different days. Ozone is transported long distances from large urban areas to rural forested areas like GRSM. On average, daily O<sub>3</sub> levels over the ridge-tops of the Park are up to two times higher than Knoxville or Atlanta levels. Since 1984, field surveys have identified 90 plant

species that exhibit O<sub>3</sub>-like foliar injury symptoms in the Park. Thirty species of plants that were exposed to O<sub>3</sub> under controlled conditions in fumigation chambers, showed foliar damage at O<sub>3</sub> levels that occur in the Park. To further quantify this injury, permanent vegetation monitoring plots and field surveys were conducted. In general, the higher the elevation, the more severe the O<sub>3</sub> concentrations and leaf injury. In especially sensitive species including black cherry and tall milkweed, the incidence of O<sub>3</sub> injuries can be as high as 90 percent and is having overt effects to the vegetation of the Park. Ozone also is causing certain



Air pollution is shrinking scenic views, damaging plants, degrading high elevation streams and soils, and affecting public health in Great Smoky Mountains National Park

sensitive plant species to grow slower (e.g., tuliptree and black cherry).

## Acid Deposition Impacts to Aquatic and Terrestrial Resources:

The Park receives some of the highest deposition rates of sulfur and nitrogen of all monitored locations in North America. These pollutants are not only deposited from rainfall, but also from large amounts of dry particles and from cloud water. Annual wet nitrate deposition has increased 16 percent from 1981-2000 at GRSM. The annual average acidity (pH) of rainfall at the Park is 4.5, 10 times more acidic than natural rainfall pH (5.0-5.6). Cloud water acidity averages 3.5 pH and has been measured as low as 2.0 pH. Cloud-water concentrations of sulphate and nitrate have increased since 1994. Both long-term

chronic and episodic acidification are adversely affecting sensitive streams and soils. Most high-elevation Park streams are highly sensitive to acidification with little ability to neutralize acids resulting from sulfur and nitrogen pollution. Certain high elevation Park streams have the highest nitrate levels of any systems in the U.S. draining undisturbed watersheds. Certain high elevation soils in the Park's spruce-fir ecosystem are experiencing advanced stages of nitrogen saturation, causing leaching of forest nutrients like calcium and mobilizing toxic aluminium that can hurt vegetation (by inhibiting uptake of nutrients) as well as biota in streams.

## Clean Air Act Requirements:

Congress passed the Clean Air Act (Act) in 1970, establishing national policy toward preserving, protecting, and enhancing air quality. The 1977 Clean Air Act Amendments designated all national parks that exceeded 6,000 acres in size as mandatory Class I areas worthy of the

greatest degree of air quality protection under the Act. The 1990 Amendments to the Act left intact the requirements for Class I area protection, while providing additional tools to accomplish the protection. Under the Act, the federal land manager has been given the affirmative responsibility to assure that air quality and the air quality-related values in Class I areas, such as GRSM, do not deteriorate, and to take an aggressive role in protecting, preserving and enhancing the Park's resources. Ozone, visibility, and weather data are available on the Park's real-time air quality web site: [www2.nature.nps.gov/ard/parks/grsm/look\\_RockWeather.htm](http://www2.nature.nps.gov/ard/parks/grsm/look_RockWeather.htm).

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## Bird-watching: Up Close and Personal

Paul E. Super

*“So, naturalists observe, a flea Has smaller fleas that on him prey, And these have smaller still to bite ‘em; And so proceed ad infinitum.”*

—Jonathan Swift, quoted in Bartlett’s Familiar Quotations, 10<sup>th</sup> edition

Since the summer of 2000, I have captured almost 500 birds of 45 species in different locations about the Park, looking for their parasites. In this pursuit, I was assisted by over 35 dedicated volunteer assistants, most of them high school students. We placed nets in locations where birds are likely to fly through, such as near water or across hedgerows in fields. The birds hit the nets in mid-flight and if they don’t bounce back out, they are likely to become entangled in the soft mesh and remain there unhurt for us to remove.

When a bird is removed from the net, the first thing we do is determine the species, age, gender, and take several measurements that support our determination. During this process, we also scan the bird’s body for ectoparasites. Lice and ticks often are on the back of the head where the bird cannot so easily preen them off. Very small mites may be in-between the barbs of the feathers. Fleas and hippoboscids, an odd beast that looks like a flattened house fly, move quickly about the body feathers and are hard to catch. Each parasite group must be sent to different specialists for identification. Many of these groups are so poorly understood that the specimens must be stored until some future scientist studies the taxonomy of that group.

Ectoparasites are only a part of the birds’ fauna. Often, in response to being caught, a bird will void itself and this bird poop (sic), if collected properly, can be examined under the microscope for

the eggs and larvae of a huge diversity of parasitic worms. The birds also are host to a diversity of bacteria, fungi, and viruses, and so are most of the parasites.

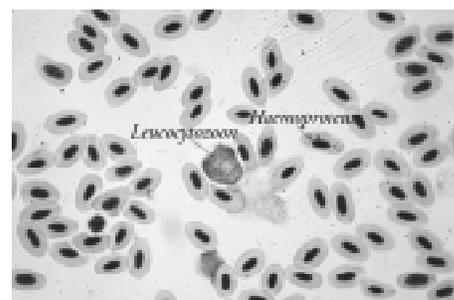
Another group of internal parasites are microscopic, one-celled parasites of the blood. These haematozoa are transmitted from bird to bird by mosquitoes and other biting flies. They pass through part of their life cycle in the gut wall and salivary glands of the fly and the rest of their lives in the birds’ internal organs and circulating blood. If the flies do not live long enough to take multiple blood meals (and thereby transmit the disease), then the parasite will not survive in that bird population. These parasites include the genera *Trypanosoma* (related to African sleeping sickness organisms), *Haemoproteus*, *Leucocytozoon*, and *Plasmodium* (the same genus that causes malaria in humans, but different species in birds). To examine the bird for these parasites, I take a drop of blood from the bird’s toe, smear it one-cell thick on a microscope slide, stain it, and spend many fun-filled hours in the lab staring through a compound microscope at thousands of blood cells.

Most parasites are not especially harmful to their hosts under normal conditions. A population of birds that becomes exposed to a novel parasite can experience a much more serious response. In Hawaii, the introduction of cage birds harboring *Plasmodium*, and the presence of the right species of mosquito for spreading it, killed off most of the native Hawaiian birds in the low elevations. The surviving birds live near the top of the volcanoes where the climate is too cold for the mosquitoes to transmit the parasite. Could some of our southern Appalachian races of more northern birds, like the Black-capped Chickadee or the Red Crossbill, be protected from lowland

parasites by the climate on their mountaintops? Will they become exposed to new and harmful parasites if the global climate warms? Questions like these can only be answered in part by projects like the ATBI that allow us to determine the situation now and which can focus our research efforts in the future.



Author and Bonnie Jo Voorhis examine a Kingfisher for parasites while Tremont participants look on, 2000.



*Leucocytozoon* sp. and *Haemoproteus* sp.

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# DLIA Grant Program Grows to \$100,000 for ATBI Researchers

Jeanie Hilten and John Morse

Grant money supplied by the Great Smoky Mountains Natural History Association and Friends of Great Smoky Mountains National Park is supporting All Taxa Biodiversity Inventory research in the Park for the 2002 season. Dr. John Morse, Discover Life in America Board member and Science Committee Co-Chair, assisted by Tammy Morton, administered the ATBI grant program. The review panel included nine scientist members of the DLIA Board. Forty-four proposals were submitted for a total of \$280,000 for the \$100,000 budgeted for this year. The granted proposals' executive summaries will soon be on the Discover Life web site. Recipients will present written and oral reports of results to date at the winter 2002 annual meeting of the ATBI, with a final report due 1 May 2003.

DLIA hopes to obtain additional sources of financial support in order to encourage the tremendous amount of research needed to complete the ATBI. Individuals and organizations interested in assisting with the funding of future ATBI research please contact Emily Jones at Friends of Great Smoky Mountains National Park, 865-453-2428.

## 2002 DLIA Grant Program Awardees

Peter H. Adler and Will K. Reeves, Clemson University; Blood-sucking flies and their endosymbionts.

Paul J. Bartels, Warren Wilson College; Tardigrade inventory year 2.

Charles R. Bartlett, University of Delaware; Initial biotic inventory of the Planthoppers (Hemiptera: Fulgoroidea) of the Great Smoky Mountains National Park.

Christopher Carlton, Louisiana State University; Proposal for continued support of the Coleoptera TWIG and Sorting Center at the Louisiana State Arthropod Museum.

Edward Clebsch, The University of Tennessee (Professor Emeritus); Intensive and extensive collecting of pseudoscorpions in Great Smoky Mountains National Park.

Terry Griswold, Utah State University, and Patricia Lincoln, Coker College; Preliminary inventory of the bees of Great Smoky Mountains National Park.

Jeffrey R. Johansen, John Carroll University; Description of new algal species from aerial environments in the Great Smoky Mountains National Park.

John M. Johnston, US EPA; Oribatid mite inventory and ecology in the Great Smoky Mountain National Park.

Danny R. Jones and Arnold G. Eversole, Clemson University; The crayfishes (Decapoda: Cambaridae) of the Great Smoky Mountains National Park, North Carolina and Tennessee.

Harold W. Keller, Central Missouri State University; Tree canopy biodiversity (arthropods, macrofungi, molluscs, and myxomycetes) in the Great Smoky Mountains National Park.

Paris L. Lambdin and Jerome F. Grant, The University of Tennessee; A checklist of the insect fauna associated with eastern hemlock, *Tsuga canadensis* (L.), in the Great Smoky Mountains National Park.

Susan Makosky and Rex Lowe, Bowling Green State University; Diatoms of the Great Smoky Mountains National Park: New diatom reports in the Great Smoky Mountains National Park of the Bacillariophyceae genus, *Pinnularia*.

Donald G. Manley, Clemson University; Inventory of velvet ants (Hymenoptera: Mutillidae) in the Great Smoky Mountains National Park.

Seán P. O'Connell, Western Carolina University; An investigation of the bacterial and archaeal diversity in soils and waters of Great Smoky Mountains National Park.

Katharine A. Owens, College of Charleston; Ground beetle populations in forest tracts of varying ages.

Michelle Prysby, Great Smoky Mountains Institute at Tremont; Tremont teacher intern.

Huzefa Raja, University of Illinois Urbana-Champaign; Saprobic freshwater ascomycetes and fungi imperfecti that occur in aquatic habitats in the Great Smoky Mountains National Park.

Edward G. Riley and John A. Jackman, Texas A & M University; A web-based identification guide to the leaf beetles (Coleoptera: Chrysomelidae) of the Great Smoky Mountains National Park.

Ulf Scheller, Järpås, Sweden; Taxonomic studies on the Pauropoda (Arthropoda, Myriapoda) of Great Smoky Mountains National Park.

Brian Scholtens, College of Charleston, and David Wagner, University of Connecticut; Lepidoptera Bio-Blitz 2002.

Michael Schwartz, Agriculture and Agri-Food Canada; Heteroptera TWIG.

Tor Tønsberg, University of Bergen; Lichens.

G. Thomas Watters, The Ohio State University; Mollusc diversity in the Great Smoky Mountains National Park: All Taxa Biodiversity Inventory.

Mark J. Wetzel, Illinois Natural History Survey; To continue an inventory of freshwater Oligochaeta (Annelida) at selected sites in the Great Smoky Mountains National Park, North Carolina and Tennessee, USA.

## ATBI/DLIA Calendar of Events

In the coming year, Discover Life in America is coordinating more ATBI volunteer training and several exciting special events —“bio-quests”. If you are interested in becoming a volunteer and have not yet participated in one of the orientation sessions, please note we will offer in 2002. Enroll soon because space is limited. There will also be specialized training and other educational programs in conjunction with the bio-quests.

For more information about upcoming events, contact Jeanie Hilten (DLIA Administrative Officer), [jeanie@discoverlife.org](mailto:jeanie@discoverlife.org), or Tom Rogers (DLIA Board and Science/Taxonomy-volunteer team leader), [trogers@rollinscorp.com](mailto:trogers@rollinscorp.com). For the Fern Forays contact Pat Cox (University of Tennessee) [pcox@utk.edu](mailto:pcox@utk.edu), or Stephanie Stocks at [istocks@earthlink.net](mailto:istocks@earthlink.net).

**Saturday, May 11:** Photography workshop led by Kevin Fitz Patrick and Rebecca Shiflett. Contact Kevin at [media3@gte.net](mailto:media3@gte.net) for more information.

**Saturday, May 18-Sunday May 19:** Volunteer Orientation II. Purchase Knob, NC. Optional field/lab activities on Sunday.

**Saturday, May 18:** “Turk’s-cap lily trail survey I” on the Thomas Divide to Kanati Fork trail. We will meet at Sugarlands Visitor Center at 9:00 am on each of the Turk’s-cap lily trail surveys, except June 29 (meeting place TBA). Please bring a lunch, water, and a raincoat (just in case). For more information or to sign up for these surveys, please contact Stephanie Stocks at 865-453-2306 or by email at [istocks@earthlink.net](mailto:istocks@earthlink.net). Or you can contact Jeanie Hilten at [jeanie@discoverlife.org](mailto:jeanie@discoverlife.org).

**Sunday, May 19:** Beginners sorting class will be held at the Appalachian Highlands Science Learning Center (Purchase Knob) near Waynesville, NC, in the Park. Probably it will begin around noon (bring a sack lunch for a picnic) and last until late afternoon.

**Saturday, June 1:** “Turk’s-cap lily trail survey II” on the Trillium Gap to Brushy Mountain trail.

**Saturday, June 8:** “Fern Foray I”. Meeting place to be announced. The Fern Forays, coordinated by Dr. Patricia Cox at the University of Tennessee, involve trail hikes with sampling points to identify ferns. Pat provides at least one “real botanist” with each group of volunteers, so don’t hesitate to join the fun.

**Sunday, June 9-Thursday, June 12:** A variety of activities centered around the June 10-11 “Lepidoptera Quest”. Scientists please contact Dave Wagner, [dwagner@unconnvm.uconn.edu](mailto:dwagner@unconnvm.uconn.edu), Brian Scholtens, [scholtensb@cofc.edu](mailto:scholtensb@cofc.edu), or Tom Rogers, [trogers@rollinscorp.com](mailto:trogers@rollinscorp.com), to participate in the collecting and sorting. There will be volunteer training on June 9 and programs for students and teachers on June 12-13.

**Saturday, June 15:** “Turk’s-cap lily trail survey III” on the Fork Ridge trail from Clingman’s Dome road.

**Monday, June 17 – Friday, June 21:** “Bat Blitz” bio-quest. Volunteers and the public will not be involved directly in this work, but are invited to attend bat awareness education programs. Contact Jackie Belwood at [ohiobats@aol.com](mailto:ohiobats@aol.com) for more information.

**Saturday, June 22:** “Fern Foray II”. Meeting place to be announced.

**Thursday, June 27-Sunday, June 30:** “Protista Pursuit” bio-quest. Sugarlands Training Room. This venture will survey not only protozoans and algae, but also other life forms collected along the way, such as tardigrades. Contact Tom Rogers at [trogers@rollinscorp.com](mailto:trogers@rollinscorp.com) for more information.

**Saturday, June 29:** “Turk’s-cap lily trail survey IV” on the Mt. Sterling trail to backcountry campsite 38 (North Carolina side of the Smokies). Meeting place to be announced.

**Saturday, July 13:** “Fern Foray III”. Meeting place to be announced.

**Saturday, July 20-Sunday, July 21:** “Snail Search” bio-quest. Sugarlands Training Room.

**Friday, July 26 - Sunday, July 28:** “Myxomycete (Slime Mold) Quest”. Meeting place to be announced.

**Saturday, July 27:** “Fern Foray IV”. Meeting place to be announced.

**Friday, October 4-Sunday, October 6:** “Bloomquist Biological Foray” (bryophytes) at Purchase Knob. Contact Ken McFarlan at the University of Tennessee, 865-974-2256.

**Wednesday, December 4-Saturday, December 7:** DLIA/ATBI Annual Conference, Glenstone Lodge, Gatlinburg, TN. Photo workshop Wed., general sessions Thurs. and Fri., and Board meeting Sat. am.

## Doing Business: Corporate Support for ATBI: Or participating in the most exciting scientific exploration project since Lewis and Clark headed for the Pacific Ocean!



Emily Jones is the DLIA Development Coordinator

### Emily Jones

Discover Life in America is moving into a new stage of development as ATBI begins its fifth field year. This amazing project, made up of the best and brightest park staff, scientists, researchers, photographers, graduate students, educators and citizen scientists working together on a model for research in biodiversity, was recently termed "The Worlds Biggest Science Project" by

*Southern Living Magazine.*

As we attract scientist and the popular press, we gain support from visionary corporate partners to develop scientific methodologies and tools for understanding global biodiversity. These corporate partners also provide necessary funds to involve educators, volunteers, and school children in incredible hands-on learning experiences with the ATBI.

There are many opportunities for companies who want to share in the ATBI vision and excitement of discovery. In developing corporate supporters, we provide opportunities for employees to volunteer, give executives the opportunities to roll up their sleeves and get out in the field, and provide interactive presentations to take the excitement of discovery beyond Park boundaries and into board rooms. I'd like to share a few recent partnerships and I invite you to talk to others in the private sector about ways they can be a part of this exciting new adventure.

**Financial Support:** Dollywood, Fujifilm, Westgate Resorts, and Science Application International Corporation (SAIC) have all committed financial support toward science, education and volunteer activities. This year's butterfly quest prompted Dollywood to fund educational workshops, student field experiences and collection and identification activities. An early partner, Fujifilm, renewed commitment to develop educational pages on our new website and train photographers. Westgate Foundation, committed to involvement in communities where Westgate Resorts are located, will support our volunteer program, and SAIC funds have purchased computers to map species distribution.



Photo by Rebecca Shifflet

**In-kind Support:** Donated goods and services are vital to non-profit organizations. Through Friends of the Smokies and DLIA, companies help reduce ATBI costs by providing everything from llamas (Smoky Mountain Llama Treks), so

scientists can work in remote locations, to Bennett's Bar-B-Que for hungry students. Goods and services for the Wildflower and Biodiversity Auction raise needed funds. Creative services from Color Central, Skyline Exhibit Group and EarthSong Photography raise public awareness. Computer equipment from Tennessee Valley Authority takes on new life in science education programs while Kodak film, donated through the National Park Foundation, is used to record new discoveries.

**Executive Leadership:** Corporate leadership translates to volunteer leadership. Tom Rogers of Orkin and Kevin Fitz Patrick of Media Divide have given both time and valuable expertise and have been driving forces on the bio-quest and the Photography Teams.

Other opportunities for corporate involvement in the ATBI include:

**Internships:** The ATBI provides a tremendous opportunity to encourage, nurture and support young people's interest in science and taxonomy. Corporate internships, endowments, and educational programming make a real difference in encouraging gifted students toward careers in science and science education.

**Personnel:** Teams or individual employees can do volunteer work on many levels. Look for upcoming opportunities to add real science and field experiences to corporate retreats and leadership programs in the near future.

**Biodiversity Conference and Bio-quest Sponsorship:** Connect with scientists and researchers working on the ATBI by sponsoring conference workshops, breakout sessions, receptions, or guest speakers for the Annual Biodiversity Conference held in late fall or be part of the excitement of a bio-quest involving scientists, students and volunteers in intense field collection and identification activities.

**Special Event Sponsorship:** Companies can play a pivotal role in leveraging DLIA's financial resources by underwriting special events. The Biodiversity and Spring Wildflower Auction bring new donors and volunteers to ATBI while giving businesses the opportunity to play an important role in Park stewardship.

If your company would like to become involved in the ATBI or if you know of someone who could use more information about corporate and business opportunities, please contact me at Friends of the Smokies (865) 453-2428. The ATBI is an adventure in learning and discovery, every single day!

Emily Jones, DLIA Development Coordinator  
Friends of Great Smoky Mountains National Park  
fotsej@bellsouth.net.

# Volunteer Action

Jeanie Hilten

## Myxomycete Weekend July 26-28

Plans are set for a "Myxo Blitz" in the Park during the weekend of July 26-28, 2002. The blitz is being organized by members of the Slime Mold TWIG of the All Taxa Biodiversity Inventory (ATBI). The event will consist of a myxomycete workshop and slide presentation on Friday evening, collecting trips to various localities in the Park on Saturday, and a wrap-up session on Sunday morning. The objective is to add to what is known about the myxomycete biota of the Park and will serve as an opportunity for anyone interested in these fascinating organisms to learn about them. The blitz will be based at the Great Smoky Mountains Institute at Tremont (GSMIT), a residential environmental education center located a few miles into the Park from the Townsend entrance (see their web site at [www.gsmiit.org](http://www.gsmiit.org)). Anyone interested in participating in the blitz should contact Dr. Steve Stephenson ([sstephenson@mail.fscwv.edu](mailto:sstephenson@mail.fscwv.edu)).

Jeanie Hilten



Chuck Parker (center) and volunteers David Fowler (left) and David Johnston (right) capture millipedes collected from the leaf litter sifter boxes

Collecting invertebrates from the ATBI plots, leading trail surveys, entering data, taking photographs, cleaning houses for scientist use, organizing bio-quests, preparing packets of information, sorting arthropods, giving outreach programs, developing curricula for educators, planning and coordinating training of other volunteers—these are just a few of the pursuits that engage Discover Life in America volunteers.

They contribute many thousands of

hours, but just as valuable as the time is their energy, new ideas, talent, creativity, and experience in a wide array of fields.

On March 23, we trained 30 new prospects for assisting with the ATBI, and what a fine "graduating class" it was! Some have backgrounds in teaching, some in business, and some in science. The training program included an introduction to the objectives of the ATBI given by Keith Langdon (NPS), a summary of the volunteer project teams presented by

Jeanie Hilten and Emily Jones, a review of the new discoveries to date from Chuck Parker (USGS), a session on backcountry safety by Park Ranger Steve Kloster, and an afternoon of activities at Twin Creeks. A barbeque supper from Bennett's was provided for volunteers and Millipede March participants funded by Orkin, thanks to Tom Rogers.



Rosemary Saczawa participated in DLIA Volunteer Training in March

The new volunteers are eager to begin projects for the coming research season, in the company of the "old hands" who are

## Conference Slide Show Available

The 2001 ATBI Conference slide presentation is now available in a convenient PowerPoint format. This 8 minute and 29 seconds show depicts a year of the ATBI at work in Great Smoky Mountains National Park. Some 80 different images represent the collection of aquatic entomology specimens in February, the Beetle Blitz in June, the dragonfly collection in August, high school students and scientists working together, and the Park's natural resources personnel in the field. To enhance the ATBI presentation, DLIA volunteers Don McGowan and Rebecca Shifflett have pulled accompanying landscapes, wildlife, and wildflower photographs from their Great Smoky Mountains portfolios. To check out a copy of the ATBI 2001 PowerPoint show contact Jeanie Hilten at Discover Life in America ([jeanie@discoverlife.org](mailto:jeanie@discoverlife.org)).

already deeply involved with our work. There will be another orientation session May 18 at Purchase Knob, in which two high school classes are enrolled, along with other interested "citizen scientists".

This year we intend to have volunteer support for our on-going Project Teams (Science/Taxonomy, Trail Surveys, Adopt-a-Plot, Photography and Art, Education, Host/Hospitality, Communications, Development, Community Relations) as well as for the special collecting efforts we call Bio-Quests (See Calendar of Events). In addition, we have well trained, skilled volunteers available to scientists to assist them in their field or lab work as requested, including photographing the researchers in action, as well as the objects of their study!

Thanks once again to all of you who donate your best efforts to the wonderful project that is the All Taxa Biodiversity Inventory!

Rebecca Shifflett  
DLIA Volunteer Photographer

Jeanie Hilten  
DLIA Administrative Officer  
[jeanie@discoverlife.org](mailto:jeanie@discoverlife.org)

## Pi Beta Phi Elementary School Students Participate in Park ATBI Research

Judy Dulin

One hundred eleven students from Pi Beta Phi Elementary School in Gatlinburg collected and identified insects and other invertebrates for the All Taxa Biodiversity Inventory (ATBI). This two-day educational adventure included one day in the classroom learning about biodiversity and taxonomy and one day in the Park with teachers, Park Service personnel, Discover Life in America staff, scientists, and parent volunteers setting up research plots and collecting as many species of invertebrates as possible.

"Our plot was very diverse," said 8<sup>th</sup> grade student Levi Rowland on his evaluation of his team's 30' by 30' plot. "There was a wide range of habitats for the insects in our plot to live in. There were many trees and rhododendron bushes, along with rocks, limbs, rotting logs, moss, and a lot of moist rich leaf litter," Levi concluded. Although the focus of the research was insects, snails, spiders, centipedes and millipedes, many students found salamanders and one team even encountered a buck drinking from the creek that ran through their plot.

Students are very excited that Park managers will some day use their data to develop better plans for preserving the biodiversity of the Park. Scientists have identified over 200 new species that have never been identified anywhere in the world. To learn more about how teachers and students can become involved in ATBI research, go to the Discover Life in America (DLIA) homepage at [www.discoverlife.org](http://www.discoverlife.org) or call Jeanie Hilten at 865-430-4752.

Judy Dulin  
Parks As Classrooms Project Coordinator  
Pi Beta Phi Elementary School  
dulinj@ten-nash.ten.K12.tn.us



Student James Orange (left), showing volunteer parent, Amber Hansen (right), and student John Coy (middle) his insect discoveries.

### Spring Awakening Naturalist Weekend May 17-19, 2002

Great Smoky Mountains Institute at Tremont has scheduled a special event dedicated to in-depth explorations of the Park. The program begins with a Friday night supper and ends after lunch on Sunday. The cost is \$160.00. One hour of graduate credit is available for an additional fee. Contact Science Education Specialist Michelle Prysby at 865-448-6709, ext. 14.

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