

ATBI QUARTERLY

Great Smoky Mountains National Park, Discover Life in America, and Friends of Great Smoky Mountains National Park



Bio-Blitz coordinator Dr. Dave Wagner, and other lepidopterists.



Lepidopterists sorting and identifying their catch

MOTH & BUTTERFLY BIO-BLITZ YIELDS AMAZING RESULTS

On July 25th and 26th of this year, over 20 professional and amateur lepidopterists took part in a "bio-blitz" in Great Smoky Mountains National Park. Lepidopterists are scientists who study the insect order Lepidoptera, which includes moths, butterflies, and skippers. Dave Wagner of the University of Connecticut organized the event and members of the team were

from such places as the Smithsonian Institution, the U. S. Department of Agriculture, the Chicago Field Museum, The Nature Conservancy, and various universities from all over the country. Working as part of the All Taxa Biodiversity Inventory, the goal of these scientists was to identify as many species as possible from within the Park during a 24-hour period. Collecting techniques included black-lighting at night, which attracts moths, and netting butterflies during the day. In certain instances, such as with commonly occurring species, or with those that are easily identifiable, the insects did not even need to be collected. However, in many cases, collections were necessary for identification.

By the end of the event, 706 species were positively identified, 301 of which previously were not known to occur in the Park. This number undoubtedly will grow as more of the collected specimens are identified, which often is a time consuming and tedious process. The total amazed even the lepidopterists involved, whose pre-collection estimates ranged from 350-600 species. This brings the total number of lepidopteran species known to occur in the Park up to nearly 1100 species; however, this is by no means a complete inventory of the order, and after much discussion, participants agreed that the total could range as high as 3500 species.

In addition to the tremendous diversity found, many other important discoveries were made. At least 25 undescribed species and one undescribed genus were collected during this project. This means that these taxa have only recently been discovered and have not formally been named yet. A key find was a ghost moth, a dark brown moth about the size of a quarter found only at high elevations. Several were found on Clingman's Dome, which is the highest peak in the Park. This moth has been seen only in two other places: in the mountains of West Virginia and on Mt. Mitchell in North Carolina.

A one-day inventorying effort like this has never been done on this scale before. This was the third such "bio-blitz" to occur in the Park, with algae and Diptera (fly) events occurring last year. We hope to have more in the future. See page 11 for a list of the principal team members and their institutional affiliations. For more information contact:
Dave Wagner - dwagner@uconnvm.uconn.edu.

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As readers of this newsletter will discover, this has been an active summer with lots of exciting things happening. After a long period of gestation and deliberation, Discover Life in America (DLIA) now has a formal General Agreement with the National Park Service. The significance of this agreement is that we now are “officially” recognized by the NPS, a recognition required by national fund-raising organizations (e.g., The National Parks and Conservation Association) before we can participate in fund-raising campaigns. Mary Williams already is exploring how we can participate in these campaigns as well as gain access to significant individual donors.

Having completed the national process, we followed by recently signing a Co-operative Agreement with the Great Smoky Mountains National Park (GRSM). The significance of this agreement is more immediate and critical for day-to-day operations of DLIA and the ATBI. This document will serve as the vehicle for transferring funds from GRSM to DLIA so that projects can be carried out (e.g., 3-year inventory of vertebrates).

Also on the fund-raising front, we are at the proposal stage with a major national company for support of our activities. This likely will start out at a modest level of support with the potential to increase over time. I will keep you posted!

Finally, several of us from the Friends, Tremont, GRSM, and DLIA met recently to discuss fund-raising specifics, such as how we will staff the effort and whether collectively we are at a point of needing a capital campaign (improvements at the Purchase, equipment for GRSM Science Center, etc.). The model on the table is that we would combine forces with the Friends, becoming part of their annual budget request for part of our support, and in turn, we would support the hiring of additional staff for the Friends to work on our collective behalf. I find this model attractive given the time and incremental costs to support fund-raising. Nothing about this arrangement would preclude our individual fund-raising efforts. Expect this to come forward as a formal proposal to the Board at our next meeting. Regarding a capital funds campaign, the consensus was that we were both ready and in need of such a major, coordinated campaign. We tasked ourselves to determine capital funds needs and bring back a preliminary list to our next meeting (December 19-21). To that end, please e-mail suggested items that might be included in capital needs for DLIA. This also will be an item for Board discussion and approval.

I would be remiss in not mentioning the staff changes in our mighty organization. As you know, Jody finished his two-year commitment to us and he and his wife have moved on to Colorado. He is with us in spirit and I certainly applaud his work for us these past two years. We have been very lucky to attract Jeanie Hilten to become part of our merry band. Jeanie's background is in forestry (ecology education) and anthropology (geology minor) from the University of Illinois. She has been in the area some 25 years, working most recently at Tremont and earlier with the Blount County Soil Conservation District and still earlier as a seasonal ranger with GRSM — a wealth of relevant experience. I also have not yet met “anyone who is anyone” in Gatlinburg who does not know Jeanie and who does not think she is special. She can be reached at the DLIA number (865-430-4752) and her e-mail is jeanie@discoverlife.org. Welcome, Jeanie!

www.discoverlife.org

DO YOU WANT TO BE CLEAR ABOUT WHO'S WHO? READ THIS



Keith Langdon, Great Smoky Mountains National Park

The All Taxa Biodiversity Inventory, or "ATBI", is a term used in scientific literature for an all-species inventory performed in a given area over a relatively short period of time. This term has become well known to biologists and ecologists mostly due to the coordination and work of Dr. Dan Janzen and many others in Costa Rica.

In some respects the term "taxa" has its drawbacks when dealing with the lay public, as Park employees discovered when conducting a briefing for congressional staffers in Washington ("...taxes? We can't have new taxes!"). In some circles we have just referred to an "All Species Inventory" to avoid definitions and explanations. For those closer to the project, it's still ATBI.

As discussed at the first ATBI conference in December 1997, this project is much too big for any single park, agency, university, or museum. Instead we have formed a non-profit organization called Discover Life in America, Inc., or "DLIA". DLIA is composed of scientists, educators, and others from many institutions who want to see this project happen, and they have invested their time and expertise to do so.

At first under the legal wing of the Park's highly successful Friends group, and with additional significant support from the Park's Natural History Association (NHA), DLIA now is legally independent and is laying the ground work with the two "parent" organizations just mentioned, to become financially self sufficient. Due to many similar long term goals, DLIA probably will always have close ties to the Friends, NHA, and other emerging partners. However, the foremost operational partner is the National Park Service staff at Great Smoky Mountains National Park.

Very briefly, in operation, the ATBI aims to discover as much of the life in the 2,000+ km Great Smoky Mountains National Park as possible. Scientists will sample so as to contribute information on each species' distribution, relative abundance and associated taxa in the Park. The project will also maximize the integration of educational opportunities, all the while furthering taxonomy, ecology, and other field sciences.

Thank You! to Friends of the Smokies, the Great Smoky Mountains Natural History Association, and the National Park

Starting the wheels turning for any new venture requires both spark and fuel. So many different organizations and individuals have provided these components. The spark of ideas for the research work to be done has scientists and volunteers making tremendous contributions to ATBI. Yet, an on-going energy source is required. Friends of the Smokies, the Great Smoky Mountains Natural History Association, and the National Park have provided necessary financial and in-kind contributions—fuel for the engine! In addition to the millions of dollars of support given to Great Smoky Mountains National Park and the Institute at Tremont, the Friends and NHA have generously funded a wide variety of Discover Life projects, including the research awards for 13 studies for the ATBI. The office, technical, and bookkeeping support is also crucial to our efforts and much appreciated. Twin Creeks Natural Resources Center and other branches of Great Smoky Mountains National Park have given invaluable assistance with scientific expertise, office space, reasonably priced housing, public relations, and transportation. DLIA extends a heartfelt "Thank You" to these wonderful organizations and invites others to join the team!

Jeanie Hilten, DLIA

Discover Life in America DECEMBER MEETING

After a bit of discussion and figuring, we are back with the December 19-20, 2000 dates for the DLIA meeting, which will combine a board meeting with an annual gathering. Thank you for your patience as we try to juggle many schedules! Glenstone Lodge in Gatlinburg will host us. Please mark your calendars (again!) and we surely hope you will be able to attend. Pass this note along to others who may need to know.

NOTE FROM JEANIE

HILTEN, DLIA

It is exciting to be a part of a project so ambitious and far-reaching as the ATBI. Just as the roles of every living thing in the Smokies combine to make a complex ecosystem, our contributions as participants in this venture unite to form a web of knowledge. The more we are able to connect with each other—scientists, teachers, students, volunteers, resource managers—the stronger and larger the web grows.

To forge links between individuals and groups involved with the ATBI and to allow communication to flow is a major aspect of my role with Discover Life in America. I welcome suggestions, comments, questions, and points of view from one and all. Together we are opening new windows on our precious heritage in Great Smoky Mountains National Park. The discoveries should result in environmental stewardship built upon a foundation of science and strengthened with the mortar of cooperation.

jeanie@discoverlife.org

DLIA

1314 Cherokee Orchard Rd.

Gatlinburg, TN 37738

#865-430-4752

COPEPODS AND BATHYNELLACEANS OR, “YOU STUDY WHAT?”

Janet W. Reid

One of the most joyous things about the on-going inventory of life in Great Smoky Mountains National Park is the opportunity to study and appreciate the entire array of living beings, from the large and familiar to the small and the very, very small. Some of the less well known groups of animals and plants, including copepod and bathynellacean crustaceans, are being studied in the Smokies for the first time ever.

Copepods are tiny crustaceans of the Order Copepoda, named from the Greek for “oar-foot”. Adults are about pinhead-size and look a bit like microscopic shrimp, although they are not closely related (Figure 1). Copepods are extremely numerous in the “plankton,” the tiny plants and animals that live floating in oceans and lakes, but most of the 12,000 or so known species live in other aquatic and semi-aquatic habitats: mud and sand bottoms of nearly all kinds of water bodies, from the deep sea to tiny puddles; between sand grains in beaches and streambeds; in cave waters and porous subterranean sediments; in wet and moist soils and mosses; and in water-holding plants such as treeholes and between the leaves of bromeliads. Others live as associates or parasites on and inside the bodies of invertebrates such as corals, mollusks, and crayfish, and on vertebrates including fish, amphibians, and even whales. There probably are copepods in your compost heap.

Copepods primarily are a marine group but several lineages have invaded continental habitats. In freshwater there are four main free-living groups: calanoids (order Calanoida), cyclopoids

(order Cyclopoida), harpacticoids (order Harpacticoida), and gelyelloids (order Gelyelloida). Copepods have been best studied in Europe where there is a long tradition of faunistic studies in all kinds of habitats. North American limnologists historically have concentrated on studying lakes, ponds, and rivers. Interest in other kinds of wetlands and subterranean habitats is steadily increasing, but no single area has been completely surveyed. About 290 species now are known from all of North America north of Mexico.

Although the Great Smoky Mountains National Park contains no large bodies of water except the bordering Fontana and Chilhowee Lakes, there is a wide array of surface wetlands and subterranean waters. My husband Willis and I, with lots of help from Keith Langdon, Chuck Parker, and Becky Nichols, took samples in several areas, mainly in Cades Cove, Little River, around Twin Creeks, Cosby Creek, Twentymile Creek, Fontana and Chilhowee Lakes, and Clingmans Dome and the Balsams during two brief sampling trips in October 1998 and May-June 1999. Although at the time the Park was passing through a record drought, we recorded 62 species. This total is comparable to numbers from much larger areas such as all of North Carolina or the Great Lakes. To put it another way, about one-fourth of North American cyclopoid and harpacticoid species are present in the Smokies. Seventeen of the 62 recorded species are new or probably new to science.

Obviously there still are more species to be found. For example there is a calanoid living in Gum Swamp in Cades

Cove that is robin’s-egg-blue, but still is unidentified. Because Gum Swamp was dry or nearly dry during previous visits, we only collected one juvenile individual. While Willis was admiring the pretty blue copepod in the sorting dish, a larger cyclopoid pounced on it and ate it! Since most copepods can only be reliably identified from adults, we let the cyclopoid have its last meal before it was preserved for study.

The most surprising find so far was a species of cyclopoid known as *Speocyclops yezoensis*. Until a single female was discovered in a spring just behind the Twin Creeks Natural Resources Center, *S. yezoensis* had been known only from northern Japan and southeastern Alaska. This new record established a 3,000 mile range extension and prompted a re-examination of the species, which resulted in a proposal to separate it into its own genus, *Itocyclops*, named for a distinguished Japanese biologist (Reid and Ishida, 2000) (Figure 1).

Information from the Smokies collections has already helped assess the conservation status of some species. The calanoid *Skistodiaptomus carolinensis*, found in Fontana Lake, was previously known only from Lake Ravenel in Macon County, North Carolina, and was listed as a species of “special concern” and as “threatened/ vulnerable” in the 1996 IUCN Red Book. *Attheyella obatogamensis*, a northern species which is rare in the North Carolina Piedmont, turned out to be common in the Park. *Stolonicyclops heggiensis*, previously known only from Heggie’s Rock in Georgia, occurred at several locations in the Park.

Bathynellaceans (order Bathynellacea) are small (1-3 mm long), exclusively freshwater crustaceans that look something like a centipede with 6 or 7 pairs of long thin swimming legs (Figure 2). They live mainly in well-oxygenated gravelly sediments in and near streams. Possibly because of their strict

habitat requirements, they are very rarely collected.

Bathynellaceans are not a particularly species-rich group, and only about 180 species are known worldwide. In North America, 9 species have been described from Texas, Colorado, and California. It was a pleasant surprise to find a new species in the Smokies, living in gravel bars in Cosby and Abrams Creeks. This new animal is now being studied, to describe it and estimate its relationship with other species.

A lot of work remains to be done before the Smokies copepods, bathynellaceans, and other small crustaceans can be considered even "well known," much less completely known. Most of the sub-drainage basins have not yet been sampled at all. The deeper creekbed sediments probably harbor several small parastenocaridids, of which we have found only a few so far. Underground cave waters need to be investigated, which is now being done, mainly by Will Reeves of Clemson University. Deep groundwaters may harbor their own cryptic fauna. The new species must be described, which in some cases will require intensive study of all their North American relatives as well. And of course we have to find out what that blue copepod in Gum Swamp is.

Janet W. Reid
Research Associate and Volunteer
Department of Invertebrate Zoology
National Museum of Natural History
Smithsonian Institution
jwrassoc@erols.com

A Complete Bibliography on Smokies Species:

Clamp, J.C. (compiler), W.F. Adams, J.W. Reid, A.Y. Taylor, J.E. Cooper, C. McGrath, D.J. Williams, D.J. DeMont, W.O. McLarney, G. Mottesi & J. Alderman. 1999. A report on the conservation status of North Carolina's freshwater and terrestrial crustacean fauna. Scientific Council on Freshwater and Terrestrial Crustaceans, North Carolina Wildlife Resources Commission, Raleigh. 92 pp.

Reid, J.W. and T. Ishida. 2000. *Itocyclops*, a new genus proposed for *Speocyclops yezoensis* (Copepoda: Cyclopoida: Cyclopidae). *Journal of Crustacean Biology* 20(3): 589-596.

Strayer, D.L. and J.W. Reid. 1999. Distribution of hyporheic cyclopoids (Crustacea: Copepoda) in the eastern United States. *Archiv für Hydrobiologie* 145(1): 79-92.

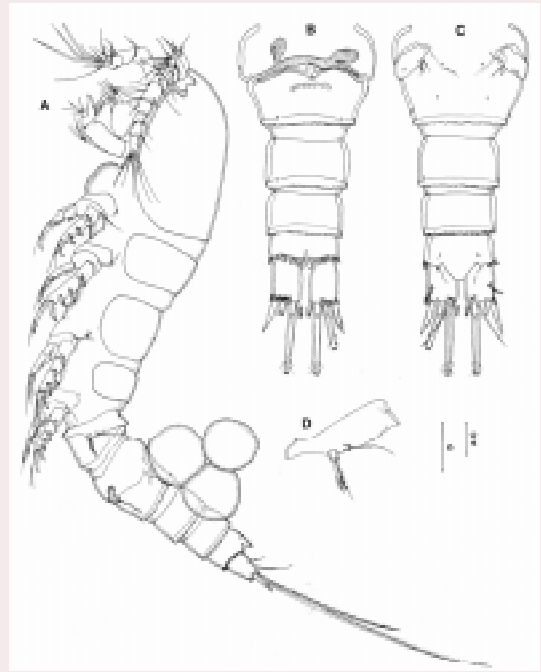


Figure 1. A cyclopoid copepod, the female *Itocyclops yezoensis* found at Twin Creeks.

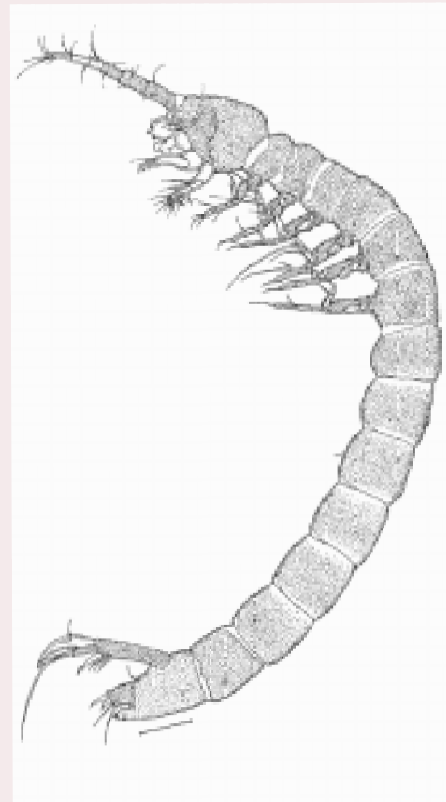


Figure 2. An adult female bathynellacean from Cosby Creek.

NSF GRANT PROPOSAL

Norm Johnson and Mike Sharkey

Norm Johnson (Ohio State University) and Mike Sharkey (University of Kentucky) are currently preparing a proposal to the National Science Foundation's Biotic Surveys and Inventories (BS&I) panel for a deadline in early November. The proposal is for a long term grant. If successful, the grant will be for a 5 year period and it will be renewable. BS&I long term grants have been awarded only twice in the past so competition is fierce. The rewards are potentially great, as the funding ceiling is many times higher than traditional 3-year NSF grants. It is hoped that several full time positions will be funded for the term of the grant.

The responsibilities associated with these positions will include coordination and communication, data input into the ATBI database, and facilitating inventory research in the Park by providing training in programs to generate interactive keys and other ATBI products. They will be requesting monies to support the efforts of individual workers, along lines similar to the small grants program that comes directly out of the Discover Life in America budget.

Finally, funds will be sought to help support the annual ATBI meeting. The whole emphasis is to facilitate work on the ground and to further the integration of the many individual efforts into a more cohesive project.

One aspect of the proposal that NSF would find very favorable is to identify alternative funding that could replace NSF over a 10-15 year period.

Any ideas in this arena should be forwarded to Norm (Johnson.2@osu.edu) or Mike (msharkey@ca.uky.edu).

WHERE IS THAT WORM?

Sam James

Recently there has been a lot of excitement about earthworms in Great Smoky Mountains National Park. The start of the ATBI effort coincided roughly with the discovery of a large earthworm species at the higher elevations in the Park. Matt Slaughter, a trail volunteer, collected the first one, and various other volunteers and Park personnel found others. Early this year I was notified of the capture of several large earthworms from the Roan Mountain area, but they escaped their packaging during shipment. Based on the description given by the man who found them, Alan Trently, these worms may be similar to the Smokies worms. It is clear that something big lives in the soils of the high mountains. Inspired by the collections and the knowledge that this big worm, a member of the North American genus *Diplocardia*, is a species new to science, I set out in June to look for it myself.

After most of a week touring the ATBI permanent plots, nothing resembling the desired worm was unearthed. Two juveniles from the beech gap forest near Double Springs looked like they might be the same species. However, it was not a wasted week. I found another new species, this one of the genus *Bimastos*, also a native North American group. It is also large for its genus, about two-thirds the size of a nightcrawler, and it lives in the soil and litter layer of the high elevation forests. I found a large number of them on Clingman's Dome. I also found two other species of *Bimastos*, another possible new species of *Diplocardia*, *Eisenoides carolinensis*, and *Sparganophilus eiseni*, all native worms. Several exotic species were found at sites with more human impact, such as Twin Creeks, Cade's Cove, and Oconaluftee.

Summarizing the outcome of this collecting foray, I would say that I should have come at a wetter time of year, because it was hard to find anything at all in the soil. I had the best luck searching under the bark of decaying logs, the favored habitat of most *Bimastos* species. Nevertheless it was a highly

successful trip, having uncovered at least one more new species and quite likely two.

Forests and balds are not the only places to find earthworms from the Smokies. With a grant from Discover Life in America, I went to search the earthworm collection of the Canadian Museum of Nature, in Aylmer, Quebec. Thirty years ago John Reynolds, then a graduate student at the University of Tennessee, made extensive collections in the state, including some of the Park. His collection ended up in Canada, where it has lain virtually undisturbed until this summer. The collection contains another new large species of *Diplocardia*, very distinctly different from the highlands large species. This one was collected from tulip poplar stands at or below 3000 feet elevation, but it would be premature to state that the species does not occur in other forest types or at higher elevations. The collection also contained numerous other earthworm species, some native and some exotic. The native species already reported in published reports are *Bimastos longicinctus*, *B. zeteki*, *Diplocardia singularis* and *Eisenoides carolinensis*.

The picture emerging is that the GRSM is home to at least ten native species, and probably more. The most exciting fact is that 3 or 4 of these are new species, and I will be working hard to get these published as soon as possible. In order to get a broader perspective on earthworms of the mountains of eastern Tennessee, I also searched the Canadian Museum for the counties neighboring or including the Park. This did not add much to the list of potential residents of the Park, but extended the known range of one of the new species to Grainger County. *Komarekiona eatoni*, a very unique worm of a family containing only one species, was found in Cocke County, and I strongly suspect it may also dwell in the Park. However, more searching in a wetter season will be required to verify this and to get a more complete picture of the earthworms of the Great Smoky Mountains.

Sam James, Department of Life Sciences
Maharishi University of Management
sjames@mum.edu

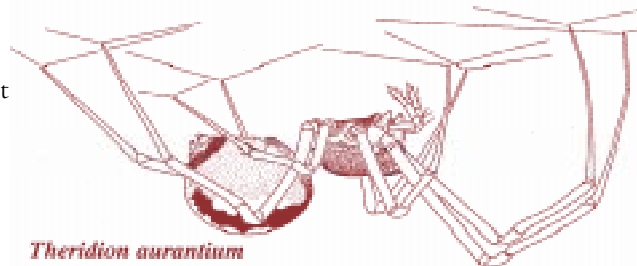
PROGRESS SUMMARY OF GSMNP SPIDER INVENTORY

Fred Coyle at Western Carolina University has been devoting nearly all of his research effort since 1995 to an inventory of the spiders of Great Smoky Mountains National Park (GRSM). Most of the funding for the project has come from the National Science Foundation, but seed grants were also provided by Western Carolina University and the National Park Service. Although Coyle began this project before the Great Smokies ATBI plan was developed, the products of his inventory project should contribute nicely to the ATBI goals. Here is a thumbnail sketch of the project (which will probably take three more years to complete) and results to date:

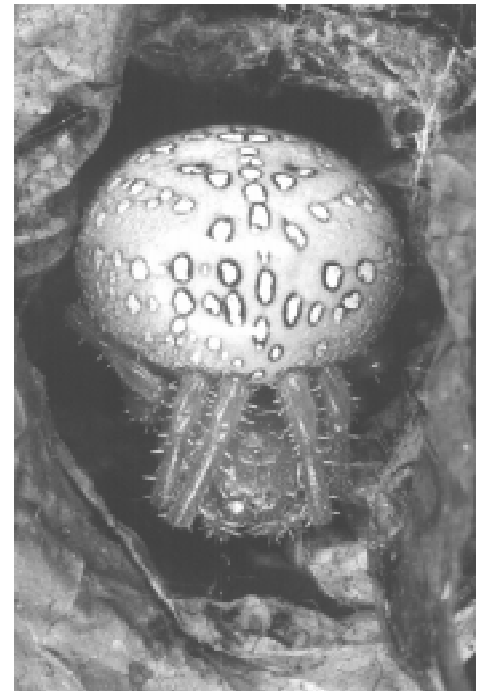
The key objectives are to determine what spider species live in GRSM and how they are distributed among the Park's habitats. The results will be distributed via the Internet in the form of an electronic database (Biota), and a spider identification guide useful for testing ecological hypotheses and species richness estimators, facilitating further research on spiders, managing resources, and educating Park visitors. Coyle and his students have collected about 2380 samples (about 1930 1-hr ground, aerial, beat, and sweep samples and 450 1 meter sq. litter samples) containing an estimated 45,000 adult spiders from 17 intensively sampled focal sites representative of 16 of the Park's major biotic community types and from numerous accessory sites representing additional habitats. The number of sample units per focal site ranges from 48 (spruce-fir) to 112 (cove hardwood). Coyle's sampling protocol, a modified Coddington protocol, has been field tested in tropical and temperate forests, and involves a team of collectors using four standardized methods that sample spiders in all microhabitats and vegetation strata except the forest canopy. The protocol yields large and statistically tractable replicate data sets which reflect the relative abundance of species in the sites and habitats studied and hopefully will provide comparable views of species richness, taxonomic composition, and guild structure across diverse communities and regions. To date, about 85% of the adult spiders have been sorted to morphospecies, about 40% of the adults have been identified, and 15% have been entered into the Biota database. The adults identified to date comprise 474 species, 38 of which (8%) appear to be undescribed.

Four papers based on this inventory are in press and five others are in preparation. These papers include analyses of the habitat distribution patterns, life cycles, and behavior of some of the most common and speciose spider genera in the park, descriptions of the spider assemblage structure of selected sites, and evaluations of the effectiveness of species richness estimators.

Frederick Coyle
Department of Biology
Western Carolina University
Cullowhee, NC 28723
coyle@wpoff.wcu.edu



Theridion aurantium



An *Araneus iviei* female in its curled up leaf retreat. This orb weaving species was not known from anywhere south of Pennsylvania before the GRSM spider inventory team found it in the Park. It appears to prefer marshy habitats.



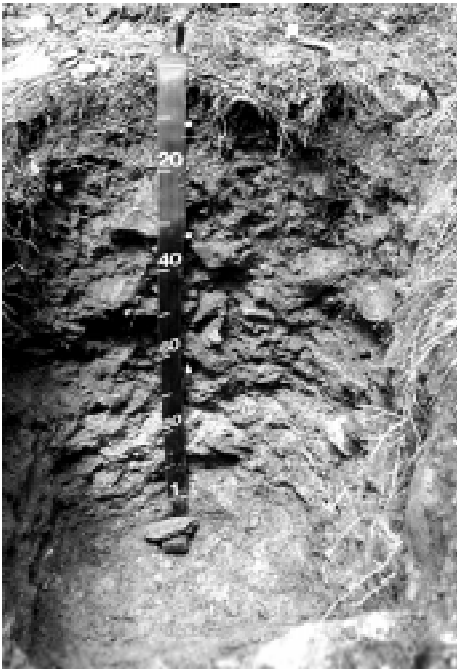
A sample being collected using a beating sheet.

COMPREHENSIVE SOIL SURVEY UNDERWAY IN THE PARK

Anthony Kheil



Guyot Series: deep, well-drained, high elevation residual soil formed from metasandstone



Heintooga Series: deep, well-drained high elevation colluvial soil that has a high content of fragments

The comprehensive soil survey of Great Smoky Mountains was initiated in November 1998, with the purpose of characterizing and inventorying the soils and landscapes. The scale of soil mapping will be 1:24,000 (1" = 2000') which will allow the delineation of soil map units down to four acres. During this extensive project, field soil scientists will investigate the physical and chemical properties of the soils throughout the Park. Some of the soil parameters that will be investigated will be organic matter content, pH, base cation status, bulk density, drainage characteristics, slope and landscape position, mineralogy, parent material characteristics, and soil temperature status.

As of September 2000, approximately 120,000 acres of the 550,000 acres in the Park have been mapped and the soils have been characterized. Most of these 120,000 acres are located in the Cataloochee Creek and Abrams Creek watersheds. Some mapping has been completed in the Sugarlands and Greenbrier areas. The extent and content of the soils that occur on the heath balds has been determined to contain two soils that are formed mainly from organic matter and from metasedimentary sandstone and phyllite. The organic soils are very unique to the Park and have only been observed in very limited areas outside GRSM. We are still unsure of the origin of the heath balds in the Park.

The soils in Cades Cove have been mapped and for the most part this is the only area in the Park where certain soils occur. These soils were primarily formed from material deposited by water (alluvium) and material moved down from the surrounding hillsides (colluvium).

Some of the most unique soils in GRSM occur above 5,000 feet. These are being investigated and field soil scientists have already discovered eight new soil series (this is the equivalent of eight new species of soils!). Currently, 18 new soil series have been identified in the Park and it is estimated that at least 10 more new soil series will be identified before the project is completed. This is a startling discovery. Normally in a survey of this size there will be one or perhaps two new soil series identified.

The Park is shaping up to be a big challenge for the field staff due to its uniqueness and complexity. Normally, the soil surveys that the Natural Resources Conservation Service conducts are agricultural and urban land use based. This survey of GRSM is one of the first surveys that we have conducted for mainly research purposes. The challenge arises not only from the complexity of the soils in the Park but also from the developing of interpretations for the soils that are inventoried that will be of benefit to the various researchers working on inventorying and monitoring in the Park. We welcome any and all input as to the type of research that is ongoing in the Park, and we also encourage the various researchers to contact us with questions about the soils located in various research areas and their implications to ongoing research.

Anthony Kheil, Soil Survey Project Leader
USDA-Natural Resources Conservation Service
akhie@tn.nrcs.usda.gov

STUDENTS OF ALL AGES ASSISTING WITH THE ATBI AT THE GREAT SMOKY MOUNTAINS INSTITUTE AT TREMONT

Paul Super

Students have been coming to the Great Smoky Mountains Institute (GSMI) at Tremont for over 30 years to become connected with nature in a residential setting. Since the spring of 1998, GSMI has put a special focus on teaching students about the life of the Smokies through hands-on participation with real research projects, especially the ATBI. For example, 15 students from Glen Estes High School in Ohio came to the Smokies for a weekend in May with a mission: to relocate the caddisfly *Neophylax kolodskii*.

Pupal cases were collected from 38 sites throughout the watershed where this Park endemic was last found in 1987. Dr. Chuck Parker is rearing the cases in an artificial stream tank over the summer. We'll find out in the fall, when the adults emerge, if this species has been rediscovered.

Students and staff at Tremont have trapped moths one night per week since July 1998. This effort has resulted in the identification of 450 species of moths, almost 80 of them previously unreported in the Park. Important seasonal flight pattern data are also being collected.

Six area students and two high school ecology teachers netted and banded songbirds every ten days during the summer while they assisted a study of bird survivorship, productivity and parasites. Many other volunteers assisted as well, helping to collect mites, lice, and parasitic flies unique to birds (all expected to be new Park records) and 185 blood samples to be tested for unicellular blood parasites.

Working with Dr. Robert Anderson of the Canadian Museum of Natural History, two students have been collecting beetles in the Tremont area, looking especially for scarab beetles and developing beetle-host plant relationships.



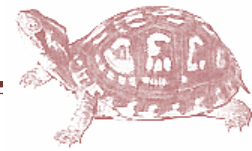
Students collecting



Sorting moths at the Bio-Blitz

Nine teenagers from as far away as New York and Florida participated in the first Tremont Teen Science Camp. While learning a variety of scientific methods, they collected soil invertebrates, added two new moths to Park records, collected parasites from birds, and added two species for the recent Moth and Butterfly Bio-Blitz. Through the teen Science Camp and the other programs GSMI is running, we are helping to achieve the ATBI goal of developing the scientists of tomorrow.

Paul Super
Science/Education Specialist
Great Smoky Mountains Institute at Tremont
newt@smokiesnha.org



DLIA PROJECT FUNDED BY NATURAL RESOURCES PRESERVATION PROGRAM OF NPS

The Natural Resources Preservation Program of the National Park Service has just funded a three year project to Discover Life in America to finish field work, distribution maps and web pages on the Smokies 450 species of invertebrates. It will also begin work on parasites of vertebrates. The funding, which amounts to \$310,000 over the three years, will mostly go to vertebrate and vertebrate parasite biologists associated with the ATBI, although some will be retained by the Park's Inventory & Monitoring Office to coordinate the web-page development of each species.

The program only funds projects that can be finished within three years. As we make progress in other groups, we will attempt to obtain additional funding. Contact Jeanie Hilten or Keith Langdon for more information.



Central Missouri State University photo

TREES OF GREAT SMOKIES PROVIDE MOUNTAINS OF OPPORTUNITY FOR STUDENT RESEARCHERS

Armed with the proper gear and a strong commitment to research, a team from Central Missouri State University spent its summer exploring what may be one of the nation's last great frontiers — tree canopies in Great Smoky Mountains National Park. The probe of these “islands in the sky” has already resulted in at least one possible new species with help from a tree-climbing team of Central undergraduate students. They were led by Harold Keller, the university's director of sponsored research and professor of biology, in cooperation with a multidisciplinary research team of scientists from the United States and Sweden. This team included Professor Uno Eliasson from the University of Goteborg, Sweden; Professor Thomas Gaither from Slippery Rock University, Slippery Rock, Pennsylvania; Dr. Jay Raveill from Central Missouri State University, Warrensburg, Missouri; Dr. Alex Ciegler, West Colum-

bia, South Carolina; Dr. Paul Davison from the University of North Alabama; Dr. Ted Stampfer, Santa Fe, New Mexico; and David Smith of the University of Tennessee at Knoxville, Tennessee.

The tree canopy biodiversity research project was funded by the National Science Foundation's Biotic Surveys and Inventories Program. “Biodiversity” is a word that has been incorporated into the environmental lexicon and has been given high priority. Keller said, “If we don't know what the organisms are that live and exist in different places, its hard to know and evaluate the impact of any adverse environmental factors on the area.”

The tree canopy in old-growth forests provides the setting for this survey and inventory project in the Cades Cove area of the Park in eastern Tennessee. The researchers are particularly interested in learning more about the different types of myxomycetes, that exist, as well as

macrofungi, mosses, liverworts and lichens. Treetop samples have come from study plots that are marked as part of the All Taxa Biodiversity Inventory, Discover Life in America effort that will attempt to document all living organisms in the Park.

So far, exploration has taken the collegiate tree climbers to limbs as high as 115 feet in search of the first baseline biodiversity data from the tree canopy. Climbers took samples from more than 80 trees and 20 tree species during their initial visit to the Park, June 18-July 8. They returned to the forest July 30 to Aug. 20 for additional sampling. Joining Keller for the first field foray of the study were students, Laura Henley, Independence; Prairie Matthews, Blue Springs; Melissa Skrabal, Columbia; and James “Buck” Counts, Warrensburg. They were accompanied in August by Kenneth Snell, a Central graduate student who teaches in Kansas City. The students' preparation for the trip began in May with a two-day training session on the double rope climbing technique at the University's Pertle Springs recreation area. The group also worked on different exercises to enhance their strength and stamina to better meet the treetop challenges.

Skrabal, a senior biology major and member of Central's cross country team, said the project has sometimes involved long hikes through the woods carrying 75-pound backpacks. But that's a small challenge compared to the actual tree climbing, she said, adding that “I really didn't know what I was getting into.” “Our trees in Missouri look like toothpicks compared to the ones we climbed out there,” Skrabal remarked. She learned the ropes to tree climbing quickly, however, and was able to make a valuable contribution to the research effort. While perched 48 feet above the ground in a white oak canopy, she found a plant/animal type of organism, which Keller believes may be a new species of myxo-

mycete. Visible with a hand lens, the organism Skrabal found had a brilliant, iridescent, gold outer wall and a pink, calcareous stalk. Keller often uses the phrase, "the biological jewels of nature" to describe their beautiful forms, shapes and colors.

This was a case of paying attention in class. Skrabal said she knew what to look for after attending one of Keller's lectures one rainy day when the climbers couldn't enter the tree canopy. He urged them to look for plasmodial tracks, squiggly, worm-like lines on the tree bark. "While I was up in the tree I actually saw something like that. I just couldn't believe it," Skrabal said.

Laura Henley, a senior biology major from Independence, said an important part of the research effort is the collection of bark samples taken at various heights in each tree. These samples are placed in moist chambers simulating the outdoor environment, then left overnight to be observed the following day for possible growth of new organisms.

Henley is one of three students who are participating in the project who also received their own undergraduate research grants from NSF. Instead of joining the group in August, however, she plans to stay on campus and examine some of the specimens collected from the first visit. One of her other goals is to eventually do a photo study documenting various stages of life for the myxomycetes found in different oak species in the Smoky Mountains. She stressed that one of the contributions the group can make through its research is to help determine if there is a healthy ecosystem surrounding the tree canopies. "The importance of the myxomycetes is that if there is a wide distribution of species, then you know you have a healthy ecosystem," Henley remarked.

Counts, a junior agriculture and biology major from Warrensburg, said he is looking forward to a return visit to the Smoky Mountains. In addition to

climbing, the opportunity to work with Keller and other research scientists is one of the things he said he has enjoyed most about the project. "It's a great experience. When you can get out in the field and learn from instructors and people who have several years experience, that's always going to help you," he remarked.

Snell, who made his first trip with the research group in August, noted the value of the tree-climbing instructional session in terms of preparing him for what lay ahead. "I have to admit that I was a bit skeptical of the idea that I would be up in a tree at the end of a rope in just two days of training. I had learned my knots and read the techniques beforehand, but until I was hanging there from that oak, trusting the 'Blake hitch' I had just tied, I didn't quite get it," he said. Snell looked forward to the climbing experience so much that he bought his own gear and planned to try it out in Washington before heading to the Smoky Mountains. "I am certain that the training will prove to be invaluable in the field where we will be able to collect the myxomycetes, lichens and other groups high in the canopy with techniques which are safe for both trees and climbers," he said.

Whatever their research may yield, all of the participants may have found something they weren't necessarily searching for in the tree canopies - the climbing bug. Students like Skrabal have shared their interest with family members. Others say they'll never look at a tree the same way. "I try to walk five to ten miles a day," Henley said. "Now when I walk around campus I look up into the trees and wonder, can I climb that? I think it's got me hooked on tree climbing."

For more information contact:
Harold Keller
Central Missouri State University
haroldkeller@hotmail.com

LEPIDOPTERISTS' BIO-BLITZ TEAM

David Wagner, University of Connecticut (Event Organizer)

James Adams, Dalton State University

John Brown, Systematic Entomology Lab, USDA

Donald R. Davis, Smithsonian Institution

Marc Epstein, Smithsonian Institution

Paul Goldstein, Field Museum

John Himmelman, author and amateur lepidopterist

Buck Lewis, Systematic Entomology Lab, USDA

Eric Metzler, Ohio Lepidopterists' Society

Michael Pogue, Systematic Entomology Lab, USDA

Jerry Powell, University of California, Berkeley

Brian Scholtens, College of Charleston

Dale Schweitzer, The Nature Conservancy

Bo Sullivan, amateur lepidopterist

Mike Thomas, Connecticut Agricultural Experiment Station

Assistance provided by:

Keith Langdon, GRSM

Becky Nichols, GRSM

and other Park staff

Chuck Parker, USGS

Paul Super and students, GSMI



This is the first issue of our newsletter and we would appreciate hearing from you. Please send us your comments.

ADVICE TO AUTHORS

The ATBI Quarterly newsletter welcomes short news stories or short articles (from 200 to 700 words). Specifications for submitting text: electronic files must be submitted in an PC compatible format, such as MS Word Version 6.0. Drawings, photographs, charts or tables should be saved as TIF files at 300 dpi. A general rule for a graphic is to limit your image size to about 4 x 6 inches. You may attach both text and graphic files to your E-mail message. You may also place the text within the body of the E-mail.

Note: TIF images are generally large files and take time to download from the Internet, so please send TIF files one at a time.

The deadline for submitting stories/articles for the Winter 2001 newsletter is January 15, 2001. Please send your text and/or graphics to:

Newsletter Coordinator/Producer
Ruthanne Mitchell
cwmitchell@ntown.com

\$40,000 IN AWARDS PRESENTED TO ATBI RESEARCHERS

Grant money supplied by the Friends of the Smokies and the Great Smoky Mountains Natural History Association is supporting ATBI work for the 2000 summer season. DLIA Board Member and Science Committee Co-Chair Dr. John Morse administered evaluation of the proposals which were reviewed and rated by eight other scientists. Thirteen proposals were either fully or partly funded, with \$96,309 in requests and \$40,000 allocated. The projects involve a variety of life forms, from slime molds and fungi to annelids, caddisflies and other aquatic insects, copepods, and Lepidoptera. There will be another request for proposals in January, 2001. Congratulations to these scientists for their selection to receive funding:

Dr. Dan Otte, Dept. of Entomology, Academy of Natural Sciences,
Philadelphia, PA

Dr. Charles R. Parker, USGS, Biological Resources Division

Dr. David K. Smith, Dr. B. Eugene Wofford, and Dr. Patricia B. Cox,
Department of Botany, University of Tennessee

Dr. Steven L. Stephenson, Department of Biology, Fairmont College

Dr. Ernest C. Bernard, Department of Entomology and Plant Pathology,
University of Tennessee

James C. Cokendolpher, Lubbock, Texas

Dr. Joseph V. McHugh, Department of Entomology, University of Georgia

Dr. William Moser, Smithsonian Institution and Dr. Don Klemm, U.S. EPA

Dr. Janet W. Reid, Department of Invertebrate Zoology,
Smithsonian Institution

Dr. Mark J. Wetzel, Illinois Natural History Survey

Dr. Steven Wilhelm, Department of Microbiology, University of Tennessee

Dr. Donald R. Davis and Dr. John W. Brown, National Museum of
Natural History

Dr. Sam James, Department of Life Sciences,
Maharishi University of Management

ATBI QUARTERLY

Friends of Great Smoky Mountains National Park
130 Bruce Street, Suite 101
Sevierville, TN 37738

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