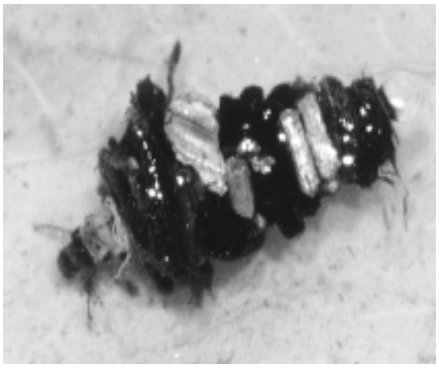
Summer Newsletter 2001 (Volume 2, Number 3)

ATBI QUARTERLY

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



M. Higgins

Limnephilus sp. makes its case of plant material, such as twigs and leaves.

D. Penrose

Lepidostoma sp. cuts symmetrical pieces of leaves for its case.

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Trond Larsen -- masthead photo

NOTE ON CADDISFLIES

Chuck Parker

The insect Order Trichoptera, or caddisflies, consists of an estimated 50,000 species worldwide, with approximately 1700 species known from North America north of Mexico. One hundred sixty-five have been identified from Great Smoky Mountains National Park, out of possibly 300 species that may eventually be found here. This compares with a total of slightly more than 400 species presently known from Tennessee as a whole. Caddisflies are very abundant in the Smokies, but are rarely noticed by most Park visitors. Adult caddisflies are nocturnal and closely resemble moths. Larval caddisflies are aquatic, living in virtually all of the Park's 2000 miles of streams, as well as in the springs, seeps, ponds, and lakes. Some caddisfly larvae are free-living, ranging about the rocks and moss in the streams searching for food. Many other larvae build shelters fixed to rocks, logs, or other stable substrates. These shelters may be made almost entirely of a sheet of silk and placed over a slight depression on the substrate surface. Others build delicate tubes of silk that are kept open by the current, which also brings food to a net which they construct. The larvae then simply graze their meals from particles trapped by the nets. Larvae of the family Hydropsychidae build sturdy retreats of sand particles glued together with silk, securely fixed to rocks and logs often in the strongest currents. At the front of the retreats the larvae spin "fish nets" of silk, which are strong enough to withstand the fast current. The whole structure is sturdy enough that if removed carefully from the water, it will be perfectly preserved. Because of the large mesh of the nets, these larvae feed on larger particles than do the larvae whose nets are more delicate and have smaller mesh sizes.

Many caddisfly larvae build portable cases that they carry about with them, enlarging the cases as they grow. Cases are characteristic of genera and occasionally of species. They may be made from either sand or other hard materials, or from leaf or stick pieces cut to the proper size and shape by the larvae and fitted together in genus- or species-specific patterns. Some larvae begin life making cases out of sand grains, and as they grow, change to making cases out of plant material. *Helicopsyche borealis* makes a coiled case of sand that looks just like a snail shell. *Ceraclea ancylus* makes a flattened case of very fine sand grains and has an extended hood with lateral flanges. The larva's head and legs are completely covered, concealing it from potential predators while it grazes on periphyton (algae, diatoms, and fungi) which grows on the surfaces of rocks.

Caddisflies are being investigated for the ATBI by the Aquatic Orders, Taxonomic Working Group (TWIG). In 1999 and 2000, we relied on student assistants John Cooper, Rich Harrington, and Dan Jones to make collections throughout the Park and to sort specimens to Order. Specimens then were sent to John Morse (Clemson University), Ollie Flint (Smithsonian Institution), Dave Etnier (University of Tennessee), Wayne Gall (Buffalo Museum of Science), and Chuck Parker (USGS) for identification and enumeration.

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PRESIDENT'S CORNER

Frank Harris

Recently, we held our spring DLIA Board meeting. Usually Board meetings are less than exhilarating experiences; however, this one was an exception. The first item was the introduction of Emily Jones, our newly hired coordinator for development. Expect to hear more soon from Emily (see page 11). She gives new meaning to the term enthusiasm.

Committee reports indicated activity across nearly all fronts. John Morse (science committee) reported that 16 new seed-money projects were selected for funding this year; a step closer towards learning about all the species in the Park.

Of particular note was the report from the nominating committee that reflected careful thought and dedication to seek out new Board members who will bring additional strength in business, national contacts and science credentials to our effort. We are in the process of inviting these new members now.

Finally, we looked ahead to the annual meeting scheduled for November 29-30 followed by the winter Board meeting on December 1, 2001.

The meeting ended, and we emerged into the warm May afternoon, excited about what we are doing and re-energized to move forward. I hope you have a safe and productive summer and that some of your time is spent in the Park.

Frank Harris
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2001 ATBI-DLIA ANNUAL CONFERENCE SET FOR NOVEMBER 29-DECEMBER 1

Jeanie Hilten

Mark your calendars now so you won't miss the ATBI gathering this winter at the newly refurbished Glenstone Lodge in Gatlinburg, TN. General sessions will be held Thursday, November 29 and Friday, November 30. Scientists will present reports on research of the past year, including those from mini-grant recipients. Teachers, students, and volunteers also are invited to give programs on their involvement with the ATBI.

Exhibits and displays will be open for viewing all day Thursday and Friday morning. A reception and fellowship time is planned for Thursday evening. The Discover Life in America Board will meet Saturday morning, December 1.
On Wednesday, November 28, DLIA photographers plan to have pre-conference workshops and field trips. For further information about the photo activities contact Kevin Fitz Patrick, media3@gte.net

More details will be forthcoming in the autumn ATBI Quarterly. Persons interested in helping coordinate conference details (exhibits, registration, door prizes, etc.) please contact me at <jeanie@discoverlife.org>.

Jeanie Hilten
DLIA Administrative Officer

Mission Statement
Discover Life in America will develop a model for research in biodiversity. DLIA will use this knowledge to develop and disseminate information to encourage the discovery, understanding, preservation and enjoyment of natural resources.

www.nps.gov/grsm
www.discoverlife.org
www.friendsofthesmokies.org
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VOLUNTEER ACTION

Jeanie Hilten

Equipped with talent, training, and dedication, Discover Life in America volunteers are ready to advance the All Taxa Biodiversity Inventory in the Park. Our volunteers are truly indispensable partners. There currently are about 70 folks who are members of this year's teams, plus others who are waiting in the wings for further orientation and involvement in upcoming events and continuing projects. Volunteer time from December of 2000 to May of 2001 totaled nearly 1600 hours.

The structure of DLIA's volunteer organization is built upon several "Project Teams:" Science/Taxonomy (team leader Tom Rogers) -- organizes work centered on bio-blitzes and other events such as scientists' specially requested searches (e.g. snowbank myxomycetes). Also, Dr. Chuck Parker is currently training three student volunteers, Derrick Oster, Derek Ratliff, and Mary Williams. These trainees sort insects to the ordinal level. Trail Surveys (team leader Jim Lowe) -- develops methods and provides training and crews for inventory, collecting, and mapping of trees, ferns, snails, beetles, etc. using the Park's trail system. The Fern Forays, part of the activities of this volunteer group, are led by Dr. Patricia Cox of the University of Tennessee and will take place June 23, July 14, and July 21. Adopt-a-Plot (no one team leader yet, but special thanks to Jim Burbank, Bob Hightower, Jimmy Breeden, Jim Lowe, Mary Williams, Becky Fox, and Mary McCord) -- assists Ian Stocks with collecting from the Malaise, pitfall, and beetle traps at the 11 instrumented ATBI plots throughout the Park. Photography and Art (team leader Kevin Fitz Patrick with help from Rebecca Schiflett) -- organizes the efforts of those who wish to donate their photos, artwork, graphics, and scientific illustrations for use in the ATBI for web pages, curriculum materials, and publications. Communications (special thanks to Ruthanne Mitchell, Beverly Shiels and Eric Guinn) -- helps with a wide variety of needs for database update, website development, office systems and other computer technical matters, and publications. Education/Outreach (team leader Judy Dulin) -- coordinates programs for teachers, students, and the community about the ATBI in the Smokies, and implements the Discover Life in America Education Plan. Scientist Host/Hospitality (special thanks to Mary McCord, Jim Burbank, and Marion Schlauch) -- check on, make improvements, and clean the Cosby House and Cades Cove House rented by DLIA from the Park for use by researchers. The team will also coordinate lodging for scientists in local homes near the Park.

There are from 10 to 30 volunteers in each team. We intend to have each volunteer in action as soon as possible. The goal is to have a team leader for each group who will act as coordinator. To participate in any of the above programs, contact me at jeanie@discoverlife.org or 865-430-4752.

Jeanie Hilten
DLIA Administrative Officer

The All Taxa Biodiversity Inventory aims to discover as much of the life in Great Smoky Mountains National Park as possible. Scientists will gather information on each specie's abundance and distribution while integrating ecology, taxonomy, and educational opportunities.

TAXON	SPECIES NEW TO SCIENCE (UNDESCRIBED)	SPECIES NEW TO PARK*
Slime molds:		
Myxomycetes	3	78
Dictyostelids	1	3
Protostelids	2	19
Fungi	1 (new genus)	0
Algae:		
Greens	0	33
Chrysophytes	0	4
Diatoms	2	86
Dinoflagellates	0	5
Blue-greens	0	11
Reds	0	2
Vascular Plants	1	0
Mollusks	2	3
Annelids:		
Earthworms	4	1
Aquatic oligochaetes	0	12
Crustaceans:		
Copepods	17	4
Bathynellaceans	1	0
Millipedes	1	1
Arachnids:		
Spiders	38	400+
Harvestmen	0	2
Collembola	27	84
Odonata	0	19
Neuroptera	0	17
Mecoptera	2	1
Trichoptera	6	26
Lepidoptera	1 (new tribe for N. America)	408
Diptera	5	0
Siphonaptera	1	0
Amphibians	0	2
Mammals	0	1
TOTALS:	115	1222

* Numbers do not include species new to science

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ECTOPARASITE BIODIVERSITY

Lance Durden

Microphthirus uncinatus (female), the world's smallest species of louse, is an ectoparasite of flying squirrels (*Glaucomys* spp.).

Tricholipeurus lipeuroides (male), a chewing louse that parasitizes white-tailed deer.

Solenopotes binipilosus (male), a sucking louse that parasitizes white-tailed deer.

It is probably safe to assume that most of us who have enjoyed fieldwork or hiking in the Smoky Mountains also have unintentionally provided bloodmeals to ectoparasites during these activities. Except in unusual cases, the ectoparasites in this area that opportunistically feed on humans are common, widespread species such as the American dog tick, the lone star tick, and one or two species of chiggers. Humans may find these ectoparasites annoying, particularly given the fact that some of them can transmit pathogens such as the causative agent of Rocky Mountain spotted fever. However, most of the ectoparasite species that parasitize vertebrates in the Smoky Mountains are associated with native mammals and birds, with lesser diversity on reptiles and amphibians. Far from being solely a cause of pathology or an inconvenience to their hosts, parasites are now recognized as integral components of healthy ecosystems. They can drive host evolution to promote community biodiversity and increase genetic diversity in host populations.

Most ectoparasites are host specific to varying degrees. For example, some feather mites and chewing lice often are host specific not only to a single species of bird but also to a particular body part of that bird. Other ectoparasites are less host specific and typically may be found on different species belonging to the same host genus. For example, certain fleas and sucking lice typically parasitize *Peromyscus* spp. (deer mice, white-footed mice, cotton mice, etc.). Further, some *Peromyscus*-associated ectoparasites also occur on a related sigmodontine rodent, the golden mouse, *Ochrotomys nuttalli*.

While true ectoparasites feed directly on their host, there are other invertebrates (usually arthropods) with different feeding modes that can co-infest the same host. Some of these organisms are facultative hematophages which feed either on host blood or on other resources, such as ectoparasites or other organic matter. Others may use the host for transportation (termed "phoresy") in order to reach a richer food source such as a mammal, a bird nest, or even a fungus. Still others are mainly nest inhabitants (nidicoles).

Preliminary studies show that ectoparasites and their host-relationships are very diverse in the Smoky Mountains. Although relatively few ectoparasite collections have yet been made in the Smokies, several new records of species from the Park and from Tennessee and North Carolina have been documented. In addition, one flea species new to science has been collected. Given that fleas are a relatively well-known group, this hints at the potential diversity of other ectoparasite groups, especially parasitic mites, which is a much more diverse and less studied group. Although the distributions of most of the host vertebrate species that inhabit the Smokies extend beyond the Park and beyond the southern Appalachians, all vertebrate species in the Smokies should be carefully examined for ectoparasites. Intuitively, it might be assumed that the geo-

graphical distribution of a host-specific ectoparasite mirrors that of its host and that any vertebrate species outside of the Park is not worth examining for ectoparasites. However, many host-specific ectoparasite species occupy only a fraction of the range of their host(s). For ectoparasites such as fleas and certain mites, which also have non-parasitic life stages, this may be caused by the effects of different climatic, edaphic, or other off-host factors. This phenomenon also occurs in permanent ectoparasites, such as some species of sucking lice, where external factors would seem to have little influence.

Although this note has considered ectoparasites of vertebrates, there is also a diverse array of ectoparasites and phoretic arthropods (mainly mites) associated with invertebrates that also deserve serious study. Any field workers in the Park who find ectoparasites on their study animals are urged to collect them by preservation in ethanol with an appropriate data label. I am most interested in the ectoparasites of mammals and in the fleas and ticks of birds.

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All photos courtesy of Oscar Pung
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THREE DAYS OF FERN FORAYS IN THE PARK

Patricia Cox


NPS Photo

Botrychium sp.

As a component of the ATBI, a re-evaluation of the pteridophyte flora is being conducted. Currently there are 64 species of ferns reported from Great Smoky Mountains National Park. The purpose of this study is five-fold: 1. to locate and validate herbarium voucher specimens for all species reported from the Park; 2. to revisit known fern localities to verify the plant's occurrence in the Park; 3. to search for new populations of species occurring in the Park and to find new additions to the pteridophyte flora; 4. to produce a database of current information on the pteridophytes; 5. to map the distribution of ferns in the Park.

Mapping the locations of species in the Park is the focus of the three days of research this summer. We will use the trail system as our transects and every 200 meters we will stop and make a 15 meter round plot and record which ferns are present, the percent coverage of each species, the associated tree species, the latitude and longitude, and elevation. The last two entries will be made from a GPS (global positioning system) unit. Specimens will be collected only if they cannot be identified in the field. The dates of the forays are June 23rd, July 14th, and July 21st. The first foray will take place in the vicinity of Metcalf Bottoms and the second at higher elevations near Newfound Gap. My goal is to field a minimum of four teams/day. If anyone is interested in participating, please contact Jeanie Hilten at jeanie@discoverlife.org.

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POINT REYES NATIONAL SEASHORE PLANS AN ATBI

Sarah Allen

Point Reyes National Seashore, and other members of the non-profit Tomales Bay Watershed Council to embark on an ATBI of Tomales Bay, a watershed within the boundaries of the Seashore. Community members, other agencies, and organizations are working with the Seashore and are beginning to formulate a plan for conducting the ATBI. The plan includes identifying the spatial and biological boundaries of the project, education linkages with local schools, proposed partners, products and funding. The Pacific Coast Learning Center will facilitate the inventory by providing housing, office space, and computer and lab facilities for scientists. This community- based endeavor may serve as a model for expanding the ATBI to other areas of the Seashore.

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VEGETATION AND ECOLOGY OF THE ATBI PLOTS

Michael Jenkins

During the summer of 1999, Vegetation Monitoring staff at Great Smoky Mountains National Park (GRSM) established 19 plots to serve as sampling sites for the ATBI. The locations of these plots were carefully selected to offer a cross-section of biotic communities within GRSM and target unique and threatened communities. Three of the plots (Clingmans Dome and both plots on Mt. Le Conte) are located in spruce-fir forests where most large Fraser fir (*Abies fraseri*) trees have been killed by the balsam woolly adelgid (*Adelges piceae*). Acid deposition and poor air quality also impact this community type. Three other plots (Double Spring, Indian Gap, and Trillium Gap) are located in high-elevation beech forests, which is one of the most rare and endangered community types in the southeastern United States. The trees in these forests are almost all American beech (*Fagus grandifolia*), a species that has been decimated by beech bark disease. Extensive rooting by European wild boar (*Sus scrofa*) has also seriously damaged these rare forests.

A plot is also located in Albright Grove, one of GRSM's finest old-growth forests. This forest contains majestic tulip poplar (*Liriodendron tulipifera*) and eastern hemlock (*Tsuga canadensis*) trees and its unique structure creates conditions that favor a highly diverse flora and fauna. The plot located at Oconaluftee is in a bottomland hardwood forest, which is among the most uncommon forest types in GRSM (less than 2% of the Park).

Three plots (Twin Creeks, Purchase, and Tremont) are in second-growth cove forests and placed across a 3500-foot elevation gradient within this forest type. The Twin Creeks and Purchase plots have very diverse overstory species compositions, while the overstory at the Tremont plot is nearly pure tulip poplar. Two other plots (Cataloochee and Ramsay Cascade) are located in areas of mature oak forest. The Cataloochee plot was once dominated by large American chestnut (*Castanea dentata*) trees, which are now large logs scattered across the forest floor. Large hemlock and silverbell (*Halesia tetraptera* var. *monticola*) trees dominate the Snake Den Ridge plot, which is located on a steep and rocky talus slope.

Four of the most interesting sites are located in non-forest areas. Gregory Bald and Andrews Bald are both large open areas that are dominated by grass species. Because they are surrounded by forest, they offer unique habitat for many organisms. Brushy Mountain is one of the Park's heath balds, which are covered with a nearly impenetrable shrub layer consisting largely of rhododendron. The origin and persistence of heath balds remain a mystery to ecologists. The final plot, in Cades Cove, is located in an abandoned agricultural field that floods seasonally. The soil on this plot was derived from limestone, which makes it more fertile than most areas outside of Cades Cove.

Most plots are 1 hectare (ha) squares (100 meters X 100 meters). To provide information to other scientists about the structure and species composition of plant communities within these plots, we collected extensive data within a 0.1 ha (20 m X 50 m) long-term monitoring plot embedded within each ATBI plot. These data include diameters of all trees, densities of woody saplings and seedlings, herbaceous species cover, volume and decay stage of down deadwood, and stand ages. Presently, we are collecting multiple soil samples from each plot to determine pH, organic matter content, and nutrient availability. This information will allow us to better understand how these factors vary with vegetation across entire plots and how this variability influences the distribution of species.

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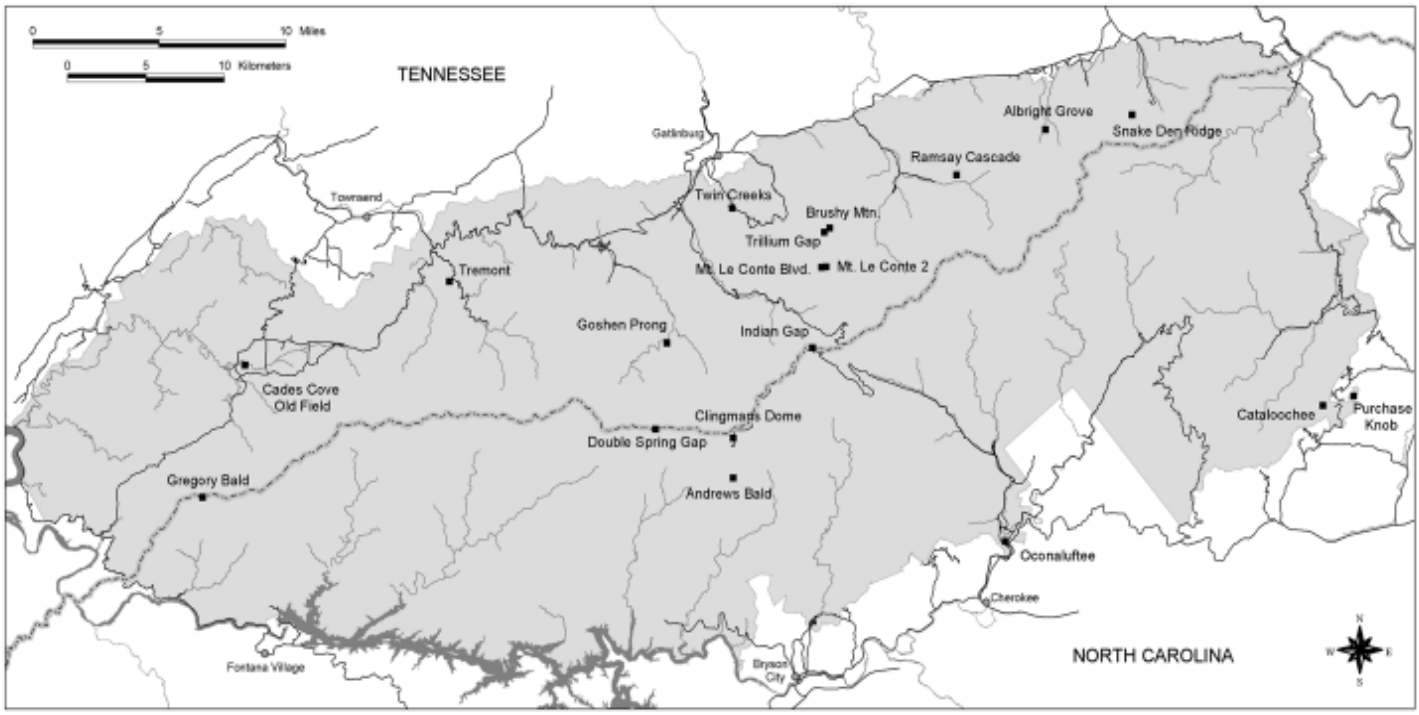
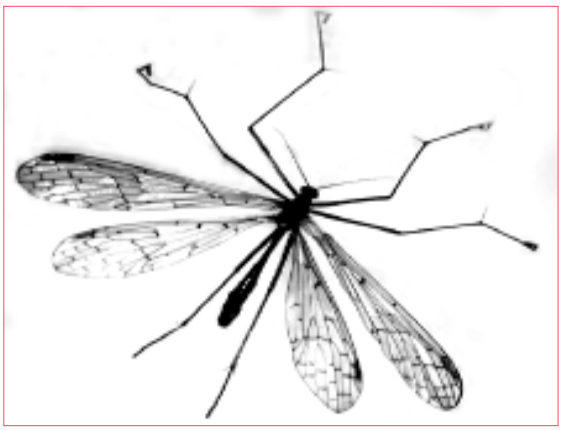
ATBI PLOT LOCATIONS - GREAT SMOKY MOUNTAINS NATIONAL PARK



FOREST COMMUNITY TYPES AND ELEVATIONS OF THE ATBI PLOTS

ATBI Plot Name	Community Type	Elevation (ft)
Albright Grove	Old-growth cove forest	3390
Andrews Bald	Grassy bald	5760
Brushy Mountain	Heath bald	4810
Cades Cove	Old field	1710
Cataloochee	Mature mesic oak forest (formerly American chestnut dominated)	4530
Clingmans Dome	Spruce-fir forest	6380
Double Spring	High elevation beech forest	5600
Goshen Prong	Second-growth rich cove forest	2940
Gregory Bald	Grassy bald	4940
Indian Gap	High elevation beech forest	5490
Mt. Le Conte Boulevard	Spruce-fir forest	6010
Mt. Le Conte2-West Point	Spruce-fir forest	6430
Oconaluftee	Second-growth bottomland hardwood forest	2010
Purchase Knob	Second-growth cove forest	5020
Ramsay Cascade	Mature dry oak forest	2950
Snake Den Ridge	Hemlock forest	3260
Tremont	Cove forest/second-growth tulip poplar	1500
Trillium Gap	High elevation beech forest	4600
Twin Creeks	Second-growth cove forest	1950



Bittacus pilicornis Westwood (family Bittacidae)

Panorpa helena Byers (family Panorpidae)

SEARCHING FOR SCORPIONFLIES

Trond Larsen

On my first day of exploration in Great Smoky Mountains National Park, I encountered a fantastic and bizarre insect whose two pairs of long, orange and black mottled wings framed a recurving abdomen equipped with a scorpion-like bulb. This was my first experience with a scorpionfly (Order Mecoptera), and the find represented the second specimen of its species for the Park and the only male. Despite its fearsome appearance, the male "stinger" is really a harmless pair of genital forceps used to grasp the female during copulation.

This ancient group of insects is represented by five families in North America, although the vast majority comprise the hangingflies of the family Bittacidae and the scorpionflies of the family Panorpidae. Both bittacids and panorpids are slow, diurnal flyers primarily inhabiting the dense herbaceous understory of moist woodlands. The hangingflies are named for their peculiar habit of hanging by their front legs from the underside of leaves, a position in which they wait to snare flying insects with the raptorial tarsi of their hind legs. Scorpionflies are quite different in appearance and feed primarily on dead and dying insects using their elongated mouthparts. Some species of scorpionfly feed on the prey of spiders and can disentangle themselves from the web using a salivary secretion. The larvae live near the surface of the soil, feeding chiefly on dead insects and other animal matter. The snow scorpionflies, family Boreidae, do not have functional wings and are found mainly on snow and moss in the winter.

Those who study Mecoptera have focused on sexual selection studies, examining the unusual behavior of many species in which the males offer nuptial gifts of carrion or insects to the females in exchange for a chance to copulate. Some believe ancestral Mecoptera to be the predecessors to Neuroptera (lacewings, fishflies, antlions, and snakeflies), Lepidoptera (butterflies and moths), Trichoptera (caddisflies), Diptera (flies), and Siphonaptera (fleas).

The southern Appalachians represent the center of North American Mecoptera diversity, although their distributions are not clearly defined. Great Smoky Mountains National Park encompasses a very high relative diversity of Mecoptera. Except for one unusual species collected only within a 25-meter radius on a single ridgetop, most of the species of Mecoptera are quite widely distributed across the Park. However, the elevational ranges of species in the Park are quite restricted. Data from my summer collecting expanded the Park's collection to 13 species, although difficult identifications of singleton female specimens complicate this number, which may be higher. Of this total, two species appear to be undescribed based on available keys; one is a new hangingfly record and one is a second scorpionfly record for the Park. The latter appears to be the beginning of an autumnal species emergence that has been documented elsewhere for Mecoptera in the Appalachians, but has not been well collected in Great Smoky Mountains National Park. Two species of snow scorpionflies have also been recorded in the Park, with the second record coming just this last year during the ATBI plot sampling. There may be between 10 and 15 species of Mecoptera not yet discovered in the Park, and with continuing collecting and observation of natural history, much more will be discovered about this fascinating group of insects.

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THE ARTHROPODS OF GREGORY'S CAVE

Jonathan Mays

Caves… are they harsh environments devoid of life or are they hidden pockets rich in biodiversity? As one would suspect, when compared to their above ground, or epigean, counterparts, caves are much lower in number of species; however, they offer a unique environment consisting of relatively constant physical conditions, such as temperature and light. This unique environment allows for a distinct fauna, members of which are rarely found in above-ground habitats mere meters away.

Caves in the Appalachian Mountains contain some of the highest species compositions of troglobites, or obligate cave dwellers, in the United States. Great Smoky Mountains National Park boasts 11 known caves within its boundaries, a few being some of the deepest in the eastern United States. Richard Wallace documented some of the Park's cave fauna in the 1980s, and an overall cave invertebrate inventory was completed by Will Reeves in 2000. Other than these inventories and a few studies on specific taxa, little is known regarding the biology of cave arthropods in the Smokies. Life histories of most cave dwelling arthropods are poorly known and techniques for quantitatively sampling arthropod populations in cave environments are few. Studies of this nature in the Park are non-existent.

This project focuses its efforts on one specific Park cave. Gregory's Cave, found in the Cades Cove area, offers a unique environment for a quantitative study and was selected for several reasons. Gregory's Cave has been gated since the 1950s, which protects the arthropod fauna from frequent human disturbance. More importantly, Gregory's Cave is an ideal shape and size. At just less than 200 meters in length, it is small enough to allow a thorough sampling effort of the arthropod fauna but large enough to support a diverse assemblage of arthropods. Furthermore, Gregory's Cave has received prior attention in the form of spot sampling inventories and research devoted to the amphipod *Stygobromus fecundus* (Amphipoda: Gammaridae) unique to this cave.

A standardized, quantitative study of Gregory's arthropod fauna has been underway since the fall of 1999. After preliminary sampling and a review of the literature, systematic sampling of the cave was begun in May of 2000. Sampling takes place once each month and consists of a two-day period where the cave is meticulously searched by a crew of three people. A total of 14 zones, each 10 meters in length, are examined in sequence. Each zone is further sub-divided into three sections (right wall, floor, left wall) with each member of the three person crew being responsible for one of these sections.

Much has already been learned from this study. An undescribed species of trichopetalid millipede belonging to the genus *Scoterpes*, first discovered by Will Reeves, currently is being described by Dr. William Shear at Hampden-Sydney College, VA. Many new records of arthropods in Gregory's Cave have been found, such as another millipede, *Sigmoria fumimontis* (Polydesmida: Xystodesmidae), an opilionid (daddy longlegs) species, and several spider species such as *Liocranoides coylei* (Araneae: Tengellidae) and *Maymena ambita* (Araneae: Symphytognathidae) to name a few. Also, much is being learned concerning the natural history of species such as *Nesticus barrowsi* (Araneae: Nesticidae), a troglobitic spider, including items of prey found in webs, average number of eggs per egg case, and typical number of instars before spiderling emergence. Using standardized, repeatable methods, relative population sizes and microhabitat preferences are being estimated along with the compilation of a comprehensive species list, none of which would be possible using traditional methods of one-time counts and spot searches.

Author sampling one of the rimstone pools in Gregory's Cave for aquatic arthropods.

Another purpose of this study is to monitor the rimstone pools in Gregory's Cave for the presence of *Stygobromus fecundus*. Since little is known regarding this rare amphipod, any information this study provides, especially seasonal occurrence or distribution within the cave, may prove useful for Park management and for future studies. Twelve monthly samples will provide information regarding fluctuations of the arthropod assemblage over a one-year period along with life history information concerning selected arthropod species.

This study ultimately seeks to establish a systematic cave-based protocol to provide a detailed record of species and their relative abundances and to establish methods that will be useful in ecological studies of other cave systems. Furthermore, species records from this study will add information to the ATBI and provide the Park with ecological information which may improve future management decisions.

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C. Riley Nelson

Long-legged fly (Dolichopodidae, *Condylostylus* sp.)

Brad Sinclair

Author collecting flies

FLIES IN GREAT SMOKY MOUNTAINS NATIONAL PARK: ATBI PROJECT RESEARCH

Brian Wiegmann

True flies, the insect order Diptera, are extremely diverse and abundant in GRSM. Flies are found in every habitat in the Park and they are surely one of the largest groups of insects found in the Smokies. Many flies are aquatic or semi-aquatic as larvae and so they flourish in the Park's many rivers, fast-flowing streams, seeps, and soggy bottoms. Many are also either plant feeders, such as leaf miners or fruit and seed feeders, or are parasites of plant feeding insects; therefore, their diversity and abundance is intimately associated with the large diversity of flowering plants found in the Park. Also, many are found in soil and decaying leaf litter, or feed on fungus. Early estimates suggest 500-800 species of flies in the Park, but fly taxonomists beginning work on the ATBI now expect that the number could easily reach 1500-2000 species.

The Diptera Taxonomic Working Group (TWIG) has been active in the ATBI for three years. Dipterists were among the first working groups to hold a Nature Quest field day in May 1999. Twenty-two dipterists worked over two days to initiate sampling, identify important habitats for additional collecting and discuss plans to circulate material among specialists. A potential new species of flower fly in the genus *Xylota* was collected during the Nature Quest and several species of scathophagid flies were considered new Park records. Dipterists commonly find new species when working on material from undisturbed and understudied habitats like the Smokies – there are undoubtedly many more new species to be found in the Park.

Because of their abundance and diversity, flies are a difficult group to survey. A standard collection technique is the use of a Malaise trap – a flight intercept trap that looks like a small pup tent. These traps bring in large samples that must be sorted and then processed by specialists, and identifications almost always require access to the primary taxonomic literature and to large reference collections.

The Diptera TWIG has established a central sorting and databasing effort organized by Dr. Peter Adler and graduate assistant, Will Reeves at Clemson University. Samples are processed from this facility with the goal of sending material to taxonomists and then receiving data back for entry into a relational database. There are more than 600 species names in the database, with many more samples awaiting processing. Ongoing efforts to collect and identify some of the Park's more prominent dipteran groups, such as Empididae (dance flies), Dolichopodidae (long-legged flies), Syrphidae (hover flies), and Tachinidae (Tachina flies — parasites of Lepidoptera and other insects) should yield a steady increase in the inventory of Smoky Mountain Diptera.

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DLIA EDUCATION COMMITTEE REPORTS ON ACTION PLAN

Judy Dulin

The Education Committee of Discover Life in America, an impressive group of local educators and researchers, has produced an action plan. Their goals include (1) to educate people about taxonomy and biodiversity, (2) to educate and train teachers, researchers, Park personnel, and volunteers, (3) to develop future scientists and naturalists, and (4) to identify resources needed to accomplish other goals.

The committee has already accomplished many of its objectives including incorporating All Taxa Biodiversity Inventory learning into existing environmental education programs, providing interpretive displays in Great Smoky Mountains National Park, providing outreach programs to the community, providing ATBI research training to teachers, and providing opportunities for students to become more involved in the project. Some of the most exciting events from this past year were teacher in-service training in both Tennessee and North Carolina, the development of Parks As Classrooms Units and Smoky Mountain Field School classes with biodiversity emphasis, and the opening of a Biodiversity Discovery Center at Oconaluftee Visitor Center. Another accomplishment for the committee was the creation of ATBI student intern positions at Great Smoky Mountains Institute at Tremont and summer educational opportunities at the Eugene Huskey Environmental Center in Sevier County.

The committee is rapidly making progress and is expected to meet all projected goals and objectives in the next three years. If interested in seeing the entire action plan or hearing more about the committee's projects, please contact the committee co-chairpersons Glenn Bogart <bogartg01@ten-nash.ten.k12.tn.us> or Dr. Susan Riechert <sriecher@utk.edu>.

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GREETINGS FROM EMILY JONES, DLIA COORDINATOR FOR DEVELOPMENT

I am very happy to be a part of DLIA. The ATBI project is important to the preservation and conservation of this Park we love so much. The implications of this study are far reaching. It will give those touched by the experience an exciting new way to look at the world in which we live.

My interest in Great Smoky Mountains National Park is hereditary. I grew up in Knoxville, Tennessee, as the child of a mother who dearly loved these mountains and passed that along to her children. My mother and uncle spent their childhood summers in a cabin nestled between mountains named Matthew, Mark, Luke and John. The mountain cabin was a source of joy (and income) during the depression and it served as a place of peace during World War II. It also held many a house party of dear friends during the 20's 30's and 40's.

I am privileged and honored to have the opportunity to put my skills in development to work in support of the ATBI. I have worked in fundraising, development, marketing and public relations for non-profit organizations and in media relations in the private sector. I hope to use some of that experience to help focus national attention on the ATBI. DLIA has the capacity to secure funding from national foundations and to attract private and corporate donors regionally, nationally, and perhaps internationally. I look forward to meeting you and welcome your input and ideas.

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NOTE FOR CONTRIBUTING AUTHORS

The deadline for the fall issue is September 5th. The Quarterly editors encourage authors to contribute short news stories (from 200 to 700 words). Please send your documents as either MS Word or Word Perfect files. Photographs or drawings may be sent as .TIF files (300 dpi) or as high resolution .JPG files attached to your e-mail message. Please supply credits for photos and drawings.

Ruthanne Mitchell, Newsletter Coordinator
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SESIIDS, OR CLEAR-WING MOTHS


Paul Super

Synanthedon fulvipes

Keith Langdon

There probably are 20 to 30 times as many moths as there are butterflies and skippers in the Smokies. The lepidopterists who are involved in the ATBI currently estimate perhaps as many as 3500 species live here. One interesting group of moths fly almost entirely in the day; these are the sesiids (family Sesiidae). Some of these animals often are seen visiting garden flowers. The adults are very fast fliers and probably are important pollinators of some plants. They are too erratic and too fast to effectively hand-net; fortunately, they can be attracted by synthesized chemicals that imitate the pheromone scent of the female moths. Dr. Jerome Grant and his colleagues at the University of Tennessee's Department of Entomology and Plant Pathology are doing just that. Small plastic phermone traps are hung out in ATBI plots and elsewhere. They are checked regularly by Park and Tremont staff, and other collaborators.

Several new Park records for the sesiids have been found, and one beautiful orange species, *Synanthedon fulvipes*, is a significant range extension. This species is found across Canada and south into the United States as far as northern New Jersey and Pennsylvania - until it turned up in pheromone traps at Tremont. Digital photos of the specimen were sent by Paul Super (the Tremont Science Education Specialist), to lepidopterists in South Carolina and California, and they confirmed the identification. This species is the 1141st moth species recorded at Great Smoky Mountains National Park.

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DISCOVER LIFE IN AMERICA T-Shirts, Mugs, and Mouse Pads for Sale

Show your support for the All Taxa Biodiversity Inventory (ATBI)! A colorful biodiversity design created by the Great Smoky Mountains Natural History Association is beautifully depicted on T-Shirts, mugs, and mouse pads. The items were produced by the folks at Over Your Head Productions for Discover Life in America. Items may be purchased from Jeanie Hilten.

T-Shirts come in S, M, L, XL, and XXL and are printed on a white or natural colored cotton shirt and cost $12.00 for S-XL and $14.00 for XXL. Mugs are $6.00 and mouse pads are $8.00. Please include a donation to cover the cost of shipping. To order, call 865-430-4752 or e-mail jeanie@discoverlife.org.

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