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GATLINBURG, TENNESSEE

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Earwigflies in the Great Smokies

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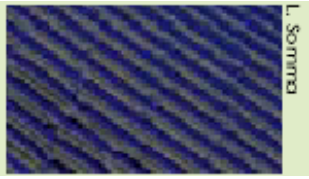
Since first being described by Edward Newman in 1838, the earwigfly, *Merope tuber*, has been somewhat of an enigma to American entomologists. It was rarely collected for some time since its discovery, and only single specimen records existed when serendipity would allow for one to be observed at a glowing lantern or under an overturned stone. Early accounts of this peculiar insect would often liken its appearance and behavior to a scuttling roach, transparent moth, or winged earwig. It is actually a member of the ancient insect order Mecoptera; its more common relatives known as the scorpionflies. The Smokies are home to numerous mecopteran species, and these mountainous habitats could be the epicenter of origin for the uniquely North American earwigfly. *Merope tuber* (family Meropeidae) occurs throughout much of eastern North America, where it is largely restricted to eastern deciduous forests with an intermittent stream or water source nearby. There is only one other known member of the family Meropeidae, and to find it, one must travel to western portions of Australia.

Left: *Merope* tuber, female. Right: *Merope* tuber, male. (Photos by D. Serrano and J. Dunford.)

The name “tuber” is derived from the distinct lobe, or jugum, located at the base of the forewings along the hind margin. The undersides of the juga are serrated and rubbed against a serrated thorax to allow the earwigfly to stridulate, or produce sound. Stridulation typically occurs as a defense behavior when disturbed, but also could be used to communicate with the opposite sex or in the spacing of individuals occurring in aggregations. Male earwigflies are known for having large clasper-like genitalia, resembling the cerci of an earwig. The earwigfly’s overall flattened appearance suggests that they are geophilic (earth-loving), and probably spend much of their time close to the ground hiding in various cracks and crevices.



Left: Scarring Electron Micrograph (SEM) of serrations on thorax. Right: SEM of serrations on jugum.

Collection samples taken by Gary Steck and Bruce Sutton (Florida State Collection of Arthropods) for the ATBI have generated several new GSMNP insect records, but it was the discovery of a single male earwigfly that caught our attention. Nearly 20 individuals have since been pulled from summer (June-September) Malaise trap samples from sites at Twin Creeks, Cades Cove, and Purchase Knob, in 2003 and 2004. Charles Parker (United States Geological Survey) provided several additional earwigfly records associated with specimens collected between 1999-2002 from GSMNP, many of which were taken at Twin Creeks. There have been only a few sites reported in the literature where individuals have been taken in high numbers, however *M. tuber* is no longer considered as rare as it was in the past, due in large part to on-going biodiversity surveys and better insect trapping/collecting methods (i.e., light, pitfall, Malaise traps). GSMNP records have generated interest for compiling a more complete distribution of *M. tuber* in North America; thus we are preparing a review paper which will include literature records as well as numerous unrecorded museum and personal records.

We have found that earwigflies taken at GSMNP are on the average larger in size and darker in color than the typically smaller and paler forms found in other parts of eastern North America. The earwigfly’s presence in the Park is not a mystery; however, its life history is. While other related mecopteran larvae are caterpillar-like in appearance, the earwigfly larva is entirely unknown. Considered by some the “holy grail” of immature insect forms, many entomologists believe it could provide significant insight into the evolutionary relationships of advanced holometabolous insects (those with complete metamorphosis). Other mecopteran relatives are known to occur on the surface of the soil in leaf litter as larvae; perhaps the earwigfly larva exists somewhere in between that niche and the

water sources that are often associated with adult collection records---just waiting to be discovered this year at GSMNP.

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Snorkel Surveys of Great Smoky Mountains National Park Fish

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Historical fish collection records from Great Smoky Mountains National Park (GSMNP) were first summarized in 1990 by Damien Simbeck, then a graduate student at the University of Tennessee (UT). This summary, which included a series of 1988- 1990 UT Zoology Department collections, totaled more than 220 collections. Simbeck's list of fishes known from the Park, comparing currently known occurrences and distributions with those from the past, produced a total of 79 species. Virtually all of these collections were doubtless made with a seine and/or a backpack electroshocker. These longstanding collection tools of fisheries biologists have notable limitations, and, in the case of shockers, potentially significant impacts on aquatic communities or sensitive species. Direct visual surveys of fish populations and communities are far less intrusive, with a number of efficiency advantages. (Picture at right: Smoky madtom, *Noturus baileyi*; a species being returned to Abrams Creek.)

In order to fill geographic data gaps from past samples, snorkel surveys were conducted in selected waters of the Park in 2002-2003 by Conservation Fisheries, Inc. (CFI). Snorkeling was employed at all but a few sites to maximize sampling efficiency and minimize impacts.

Sixty-seven surveys were devoted to fish community assays in 26 streams in GSMNP between 30 April 2002 and 25 October 2003. Anywhere from one to six sites were sampled in each stream. Fifty-one fish species were observed out of 665 total species records. Many of the observations represented new stream reach or upstream species records. Significant finds included previously unknown populations of the fantail darter, *Etheostoma flabellare*, and Tennessee