

Project Title: Inventory of the insect fauna the western eco-regions of Arkansas, with special emphasis on surveying distributions of known insect endemics.

Project Summary: Arkansas has many unique habitats that host a wide diversity of plants and animals. The Interior Highlands, which includes a large region of the state is likely one of the most diverse regions in the US, but like Arkansas, has received little inventory work in regards to its insect fauna. Numerous endemic species are known from Arkansas, however these species may simply represent the tip of the iceberg in terms of unique diversity located within the state. This project proposes to start inventorying the insect fauna of Arkansas in order to establish knowledge on endemics and their distributions.

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SWG amount requested: \$64,376

Match amount: \$82,489

Total Project Cost (SWG + Match): \$146,865

Need:

Much of Arkansas is located within the region known as the Interior Highlands, an extremely understudied area of high biodiversity and potentially large number of endemic species. Suspected diversity and endemism are a result of the ancient history of the region, having been continually habitable for approximately 320 million years and an area of refuge for all life forms during periods of glaciation and other climatic and geological events that occurred in North America. Biodiversity and endemism in the state can also be attributed to the large number of unique habitats in the state including various types of hardwood and pine forests, prairies, glades, expansive cypress and water tupelo swamps, higher elevation habitats and an extensive karst system. More than 200 species of endemic plants and animals reside in the Interior Highlands, including approximately 70 known insect endemics, however, these numbers likely only account for a small percentage of the insect diversity and endemism in the state. The primary problem with establishing insect endemism in Arkansas is the lack of inventory work previously performed. In comparison to other regions in the US considered to be areas of high diversity and endemism (Appalachians, Pacific Northwest, Southwestern US), one could consider the Arkansas insect fauna poorly known. Preliminary studies over the years support the idea that the Interior Highlands and the state of Arkansas should no longer be overlooked by scientists interested in biodiversity and endemism.

The 2012 Arkansas Wildlife Action Plan (AWAP) lists the emerging issue to understand “Arkansas’s unique biogeography” including the “status of disjunct and relict populations”. The associated action is to “obtain baseline distribution and population status on multiple species” of insects. This is the appropriate starting point for any insect diversity work, because until baseline data on insect diversity, distributions and population status are determined, trying to conserve Arkansas’s unique insect fauna may be futile. As it currently stands, there is a desperate need to survey the insect fauna across the state’s unique habitats and regions to establish the baseline data to determine endemism, potential conservation status of species, and most importantly, to put Arkansas on the map as a biodiversity hotspot in the US.

Location of Work:

Terrestrial habitats in the Ozark Highlands, Boston Mountain, and Ouachita Mountain eco-regions listed in the AWAP will be sampled. Specific localities within these eco-regions will focus on virgin or well-protected habitats with an emphasis on areas known for unique habitats and endemism. Our sampling will include sites within various types of hardwood and pine forests, prairies, glades, cypress and water tupelo swamps and higher elevation habitats. We expect widespread sampling across these eco-regions in order to inventory and discover species as well as attempt to establish distributions for endemic species.

Objective:

The primary objective is to survey the above mentioned eco-regions in order to establish an inventory of species present, with special emphasis on discovering endemic taxa. Efforts will focus on sampling unique habitats within these regions and areas identified in the AWAP as hosting known endemics. For the known endemics, this project will also serve to help establish distributions for these species. In order to make this primary objective feasible, specific identification efforts will be limited to insect groups identified as containing Arkansas endemics by the AWAP and groups that the PI has special knowledge of and are likely to include unique, endemic taxa due to their ecological preferences. The primary objective will be to identify species in particular families of Coleoptera, Hemiptera, Lepidoptera, Hymenoptera (specifically ants) and Orthoptera, but other by-catch will be identified as possible.

A secondary objective is to train a new M.S. student in arthropod biodiversity and systematics. We have a potential student lined up, but funding is necessary to bring him into the program. The M.S. student would be broadly trained in insect taxonomy, ecology, sampling methods, and curation techniques.

Approach:

We will use a combination of pitfall traps (targeting ground running insects) and malaise traps (targeting flying insects) along with hand collection and leaf litter extraction. Collection trips will vary in their proximity to Fayetteville. Those sites amenable to day trips will be visited frequently. Upon selecting sites close to Fayetteville, malaise traps and pitfalls will be set and checked weekly over a three week period in the spring/early summer and again in the late summer/early fall. Hand collecting and litter sampling will be performed during each visit. Arthropods from the litter samples will be extracted with modified Berlese funnels owned by the PI on the UA campus. For sites that cannot be checked frequently due to their distance from Fayetteville, we will plot out a sampling route that allows us to set malaise and pitfall traps every day for 7-10 days before returning to Fayetteville. We will then repeat the route picking up traps as we go, allowing each to be in place for at least seven days. Each route will be done twice, once in the late-season collecting period (2012 or 2013) and once in the early-season period (2013 or 2014) to account for seasonal differences. Hand collecting and litter sampling will occur along the routes and at all times during the year. On extended overnight trips (both close to and far from Fayetteville) we will use mercury vapor lamps and hanging sheets to attract insects for hand collecting. All collected specimens will be stored in ethanol until they can be properly prepared (mostly pin mounted). Identification will occur in the PI’s lab. Species will be photographed and entered in the PI’s database. The two current Ph.D. students work with the PI and are experts in numerous insect groups and will help with identifications. While this project is not directly related to their dissertations, it will provide some necessary specimens as well as serve to further train them in insect systematics.

Expected Results and Benefits:

Known endemics to the state will likely be collected and distributions expanded (or distributions confirmed to be restricted to very specific localities). More importantly, because this is a survey based project, an extensive list of identified insect species will be obtained with rates of occurrence and distributions. This will allow rare or unique species to be identified and may lead to establishing conservation priorities for particular insect species or habitats. A photographic guide of rare and unique species will be produced by the PI and the database with collection information and distributions will be accessible to the public via the internet.

Proposed Budget:

Budget Items	SWG Funds	UA Match
Personnel and Fringe: PI Dowling (equivalent 3.6 months over 2 yrs)	0	\$28,692
Personnel and Fringe: MS Student (2 years) (UA pays tuition)	\$33,024	\$14,774
Collection and Curation Supplies (e.g., vials, ethanol, traps, insect pins, drawers, cabinets)	\$10,000	
Travel: mileage (based on UA mileage rate of \$0.42/mile)	\$8,500	
Travel: food and lodgings (2 people/~80 days in the field)	\$7,000	
Indirect Costs (10% to SWG and unrecovered indirect costs to UA)	\$5,852	\$39,023
Totals	\$64,376	\$82,489

Dr. Ashley P.G. Dowling

Professional Preparation:

Ph.D., 2005, University of Michigan, Department of Ecology and Evolutionary Biology, Ann Arbor, M
B.S., 1997, University of Arizona, Department of Ecology and Evolutionary Biology, Tucson, AZ

Appointment:

Assistant Professor, 2008-present, Department of Entomology, University of Arkansas

Current Grants:

National Science Foundation. "PEET: Using monographs, cybertaxonomy, and phylogenetics to train a future generation of water mite systematists (Acari: Hydrachnidia)". Lead PI with Co-PI A. Radwell, \$725,557), 2012-2017

Peer Reviewed Publications:

Currently 34 publications on arthropod biodiversity and taxonomy.

Student Advising:

Currently training and advising two Ph.D. and one M.S. students in arthropod systematics and has worked with several UA undergrads on Ozarks arthropod biodiversity projects that served as their honors theses.