

The Morphological Characteristics of Ant Communities Within Alabama

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Ants are ubiquitous components of terrestrial ecosystems and play important ecological roles. They can serve as ecological engineers, indicators of ecosystem health (bio-indicators), and important predators (e.g., native and invasive). The functional roles ants play in ecosystems is driven in part by their body size, and recent evidence suggests that habitat type (between different continents) influences body sizes of ant species. The aim of this study was to explore how body size and morphology vary across local and regional habitats. In addition to providing insight into their ecological roles in these habitats, any patterns observed could also provide sources of developing hypotheses about evolutionary trends and species diversification.

To explore if there were differences in size and morphology among habitats in Alabama, we used a publicly available database, *www.antweb.com*, to obtain measurements of the ten key morphological characters of each worker among all species in Alabama. From these data, there was no significant difference in ant size and shape across the different habitat types found in Alabama (i.e., temperate forest, open, urban, etc.). Field collection data were then used to test if the publicly available online specimens (e.g., *antweb*) were comparable to those found in the field. To do this, we narrowed the scope of sampling to ‘open canopy’ sites (e.g., grassy fields or fields without many trees) and forested sites (‘closed canopy’). These two habitats were most common among the collection descriptions of the online specimens. Additionally, based on previously published work, these samples were most likely to result in different morphologies and sizes if the local/regional patterns are similar to global patterns in body size. These samples were then weighed using a microbalance (most accurate measure of size) and measured for the same morphological characters (as above). Local variation of ants in different habitats were acquired and compared to publicly available images and body size data.

From the sites, we collected 60 bait traps, which included 1,319 collected ants. However, due to COVID

restrictions and lab closures, the data analysis is only partially complete. Currently, we are completing the morphological measurements to compare the morphological characters of Alabama ant species in open and closed canopy field sites. This comparison will help improve our understanding of global patterns in body size and their relevance to smaller ecological scales. In addition, these data provide a more complete data set for ant body size in Alabama that can be added to publicly available data repositories (*antweb.org*, *antwiki.org*, *antbase.org*, etc.). These data can then be used in conjunction with further research. For example, these data (in conjunction with publicly available datasets) could help explore how widely applicable global patterns in morphology and habitat compare to local scales, or if/how climate change might affect body sizes. Ultimately, this work will help document and describe phenotypic variation—one of the most fundamental questions in biology.

Statement of Research Advisor

This project is an exploration of the importance of scale in evaluating ecological patterns and hypotheses. The data collected by this project will be valuable to test if the ecosystem scale patterns align with local patterns. This project also builds a database of the species of Alabama, their habitat use, and morphological data, which will be of use for years to come.

-Bill D. Willis, Biological Sciences