

HONORS PROJECT *DOLOMEDES* 2025-2026

Faculty: Dr. Gustavo Silva de Miranda

Project Title: What evolutionary mechanisms underlie range size differences in closely related species? A case study with fishing spiders (*Dolomedes*)

Project Summary:

One of the central questions in evolutionary biology is why some species become widespread while closely related species with similar niches remain restricted. Range size is often linked to abiotic and evolutionary and ecological factors such as climate, selection, demography, and population structure. Species with higher variation – whether in morphology, physiology, or genetics – may be better able to colonize diverse environments, while those with lower variability may remain limited to narrow habitats.

Fishing spiders (*Dolomedes*) provide an ideal system to investigate these ideas. For example, *Dolomedes tenebrosus* (Fig. 1) and *D. scriptus* are widely distributed across North America, whereas their sister species *D. okefinokensis* is confined to the Okefenokee Swamp and surrounding areas. These species share similar size and ecological roles, making their contrasting ranges an excellent case study. By combining morphology and genomics, this project will assess the degree of inter- and intraspecific variability within widespread and restricted *Dolomedes* species to determine potential drivers of differential adaptive capacities.



Figure 1. Adult female *Dolomedes tenebrosus*.

The project will involve DNA extraction and sequencing, with bioinformatic analyses of ultraconserved elements (UCEs) to perform species delimitation, phylogenomics, and capture of single-nucleotide polymorphisms (SNPs). Regional sampling of *D. triton*, *D. tenebrosus*, and *D. okefinokensis* populations will allow investigation of morphological variation, gene flow, reproductive isolation, and potential cryptic species. Environmental gradients (east–west, north–south, elevation, vegetation, soil type) will also be considered to connect intraspecific variability to ecological opportunity.

By integrating fieldwork, morphology, and genomics, this project will advance understanding of the evolution of species range limits. Results will provide insight into evolutionary mechanisms shaping biodiversity and inform predictions of species resilience under climate change.

Student Research Assistant Responsibilities:

- Participate in fieldwork to collect spider specimens
- Sort and identify specimens under the microscope
- Measure morphological variation within and among populations
- Extract DNA and prepare samples for sequencing
- Conduct bioinformatic analyses (species delimitation, phylogenomics, SNP capture from UCEs)
- Read and summarize scientific literature
- Write reports and synthesize data into figures/tables
- Design and present a research poster summarizing findings