Trade-offs in locomotion performance across ecological contexts: turtle ant running speed in the canopy

Author(s): Corinne Tarantino, Scott Powell

Institution(s): Department of Biological Science, The George Washington University, Washington DC, USA ; Department of Biological Science, The George Washington University, Washington DC, USA

Evolutionary trade-offs in trait function constrain how organisms interact with their environment. The canopy environment is structurally complex, with foraging surfaces of a range of sizes and orientations, and often dominated by ants. Nevertheless, little is known about how ants use canopy structures as they forage, and what trade-offs they might experience. Turtle ants (*Cephalotes*) are a species-rich genus of canopy ants that have undergone exceptional morphological diversification. In particular, workers of all species have elaborate body armor that is likely to have costs for foraging performance. Moreover, absolute and relative leg length varies considerably across species, which is also likely to impact locomotion performance. This project examines performance trade-offs in turtle ants across different ecological contexts that occur in the canopy. The focal species for this study was *Cephalotes texanus*, a representative of turtle ant species with short and uniform leg length. Performance ability was measured by recording peak running speeds across a variety of surface widths and orientations in laboratory experiments. Peak running speed was relatively slow compared to other recorded running speeds in ants. Nevertheless, there were no significant differences in peak running speed across different diameters and orientations. Remarkably, this means that *C. texanus* attains peak running speed even when running vertically on structures barely wider than their body. These results suggest that the short, uniform legs of some turtle ant species may represent a fascinating adaptation to foraging in the structurally complex canopy: reduced peak speed is traded-off against attaining maximum speed regardless of the running surface. Ongoing laboratory and field studies are contrasting these findings against other species with different morphology. Broadly, this research contributes to understanding functional trade-offs between organismal structure and environment.