2014 Summer Research Experiences (SRE) for Undergraduates and Teachers
Abstract

MARKEN, J., ROOKS, N., WHYTE, B., MACK, K. and M. ZEFFERMAN. Could Diminishing Aggression in the Invasive Argentine Ant Cause Supercolony Collapse? National Institute for Mathematical & Biological Synthesis, Knoxville, TN; College of William & Mary, Williamsburg, VA; University of Tennessee, Chattanooga, TN; SUNY Plattsburgh, Plattsburgh, NY.

Supercolonies are collections of ant colonies whose workers treat each other as kin despite being effectively unrelated. Applying inclusive fitness theory suggests that supercolonies are structured upon inherently unstable social behaviors, leading many to predict that supercolonies will collapse from exploitative “cheats” invading the group. Here we propose a new theory on supercolony collapse focusing instead on behavioral and ecological constraints which support the supercolony structure, and we examine how these might change over time with a spatially explicit agent-based model of invasive Argentine ant supercolonies in their environment. Invasive populations of Argentine ants assemble the largest supercolonies ever recorded, forming collections of colonies up to 6,000 km wide that avoid aggression with each other. Conspecific aggression in Argentine ants is avoided only when ants bear similar enough chemical recognition cues. Rival supercolonies use distinctly different recognition cues, leading to intense intraspecific aggression. Within a supercolony this aggression towards outsiders selects against variations in recognition factors, but if aggression were to diminish over time, recognition factors would be free to vary, allowing supercolonies to fragment. Our model simulates how cases like gene drift in aggressive behaviors, as well as other scenarios, can lead to the collapse of supercolonies.