Acacia-Ant Defenders in Kenya: What Are the Costs and Where Do They Matter?

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Whistling-thorn acacia (*Acacia drepanonolobium*) is a common savanna tree in Kenya. Its name stems from the whistling sound produced when breezes blow over holes in the bulbous thorns that fill its branches. The creators of these holes are tiny ant defenders that set up residence inside thorns, feed on tree sap and in exchange, provide very effective defense against herbivory by some of the worlds largest mammals - giraffe, elephants, and other browsers. On the surface the interaction seems beneficial for both the trees and the ants but - how much do trees pay for this protective service? Do trees without ant defenders actually grow better than trees without competitive grass? Does where a tree lives change the dynamics of these interactions? These questions motivated the research I conducted this summer at the Mpala Research Centre in Laikipia, Kenya.

Ecological interactions between species fall along a continuum from negative - one or both interactors is negatively affected (e.g. predation and competition) - to positive - one or both interactors benefit (e.g. facilitation and mutualism). These two interaction types are most often studied in isolation with negative interactions historically receiving much more attention. Growing interest in positive interactions has produced many studies exploring the type and strength of benefits but which largely ignore the costs of these partnerships. In the rare case that the costs of mutualism are measured, they lack context with the costs of negative interactions like competition. Without this comparison of costs, it remains unclear how the net effects of multiple interactions influence individual organisms and if the labels placed on species relationships are accurate (e.g. mutualist vs. competitor).

Using Acacia drepanolobium as a focal species, I am able to explore how the costs of resident ant defenders of the tree ('mutualists') compare with the cost of grass ('competitors'). Fully factorial manipulations of ant and grass absence were implemented last summer and this summer I was able to begin measuring

treatment effects on tree growth and reproduction. This experiment also allows me to test how comparative costs change with different ant defender species and across an environmental gradient. With the help of three UF undergraduates, I was able to quantify differences between sites along the gradient. Data collected in 2010 suggests that for some measures of growth, the presence of ant partners actually costs trees more in growth

than the presence of grass competitors. It also appears that location and ant partner species affect the comparative difference between competitors and mutualists. More time and measurement will be required to fully parse treatment differences but these initial findings will help guide my further research on costs and consequences of plant-ant defense.

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