

Detecting Argentine Ants (*Linepithema humile*) on California's Channel Islands

Korie C. Merrill^{1,2}, Erin Wilson Rankin², Dong-Hwan Choe², Christie Boser³ and Tom Zink¹

¹ Soil Ecology and Restoration Group

² University of California, Riverside

³ The Nature Conservancy

Introduction

The Argentine ant, *Linepithema humile* (Mayr), is an extremely invasive ant species that has spread to urban, commercial and natural areas worldwide and this pervasive expansion has had detrimental ecological and economic effects. As a result, vast amounts of resources have already been allocated to the control of this species in urban and agricultural areas and new efforts are underway to control them in ecologically sensitive habitats, such as California's Channel Islands (Figure 1). As Argentine ant eradication efforts are implemented in these areas, the need for a standardized detection protocol is essential because if small populations of ants go undetected during pre- or post-treatment stages, then eradication will likely fail. Accurate detection of the few remaining nests is often challenging, and the small surviving populations often result in the failure of eradication program (Hoffman et al. 2011). The aim of this project is to develop an efficient detection protocol for Argentine ants. The first step of establishing these protocols is to determine the best bait to use for trapping Argentine ants.



Figure 1. Map of California's Channel Islands



Figure 2. Non-toxic baits at monitoring point, each vial placed 1-2m apart.

Methods

In aid of creating such protocols, we conducted field trials to assess bait attractant efficacy for Argentine ant detection throughout the year. Two plots have been used to conduct this study and two have been set up for future replication. Each plot consists of 20 points, separated by 20m in a grid design. Non-toxic baits were set in a block design, 1-2m apart from each other surrounding the pitfall location and left for 24 hours (Figure 2). Three baits with different attractants were formulated based off of: 1) results from the Krushelnycky and Reimer (1998) paper on bait preference in Haleakala National Park, 2) on ease of use in the field and 3) overall cost. The three non-toxic baits were:



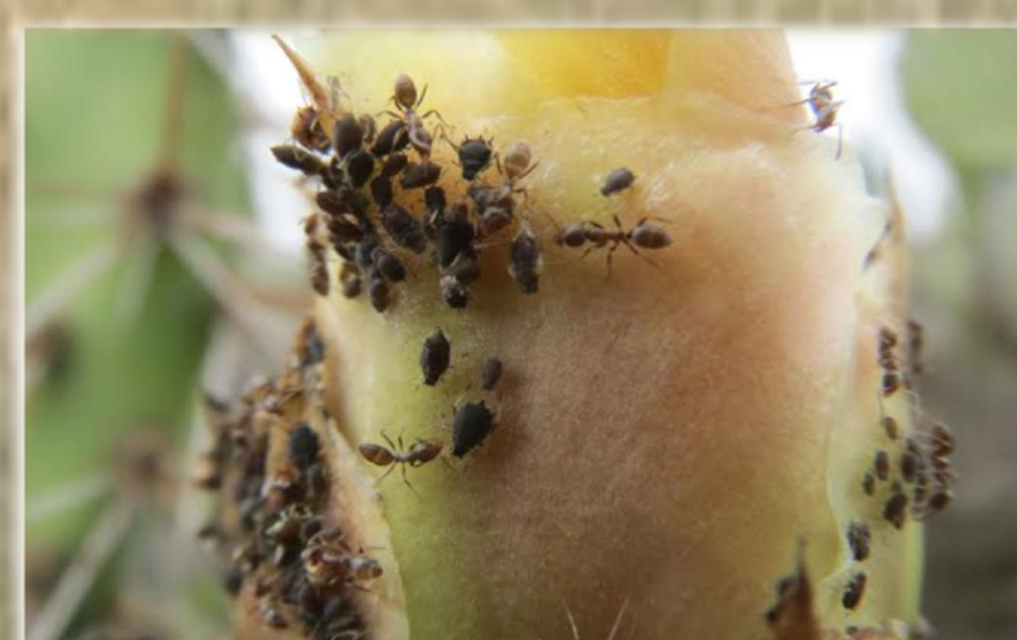
Figure 3. Close-up of sugar egg vial at a monitoring point.

- Scrambled egg with sucrose mixture
- Argentine ant trail pheromone sucrose water solution
- Sucrose water solution

One saturated cotton ball for each liquid bait or ~1g of egg mixture was placed in a 50-ml vial and then placed at a monitoring point approximately one hour before sunset. After 24 hours the vials were collected, frozen and the numbers of individuals in each vial were counted. This data was analyzed using post-hoc linear regression of means in Rstudio 3.1.0.

Contact Information

Korie C. Merrill
Soil Ecology & Restoration Group
San Diego State University Biology Department
5500 Campanile Dr.
San Diego, CA 92182 USA
kmerrill@mail.sdsu.edu



Argentine ants foraging aphids on Prickly pear fruit. Photo by Ida Naughton 2014.

Literature Cited

Hoffmann B., Davis P., Gott K., Jennings C., Joe S., Krushelnycky P., Miller R., Webb G., Widmer M. (2011) Improving ant Eradications: details of more successes, a global synthesis, and recommendations. *Aliens* 31:16-23.
Krushelnycky P., and Reimer N. (1998). Bait preference by the Argentine ant (Hymenoptera: Formicidae) in Haleakala National Park, Hawaii. *Environmental Entomology* 27, 1482-1487.

Results

Overall the number of Argentine ants captured for each non-toxic bait across 4 months was not significantly different (p -values >0.05). However comparison of ants captured each month, pheromone sucrose water is significantly more attractive than egg (p -value=0.000, 0.000) and sucrose water (p -value=0.002, 0.010) in October and November (Figure 4).

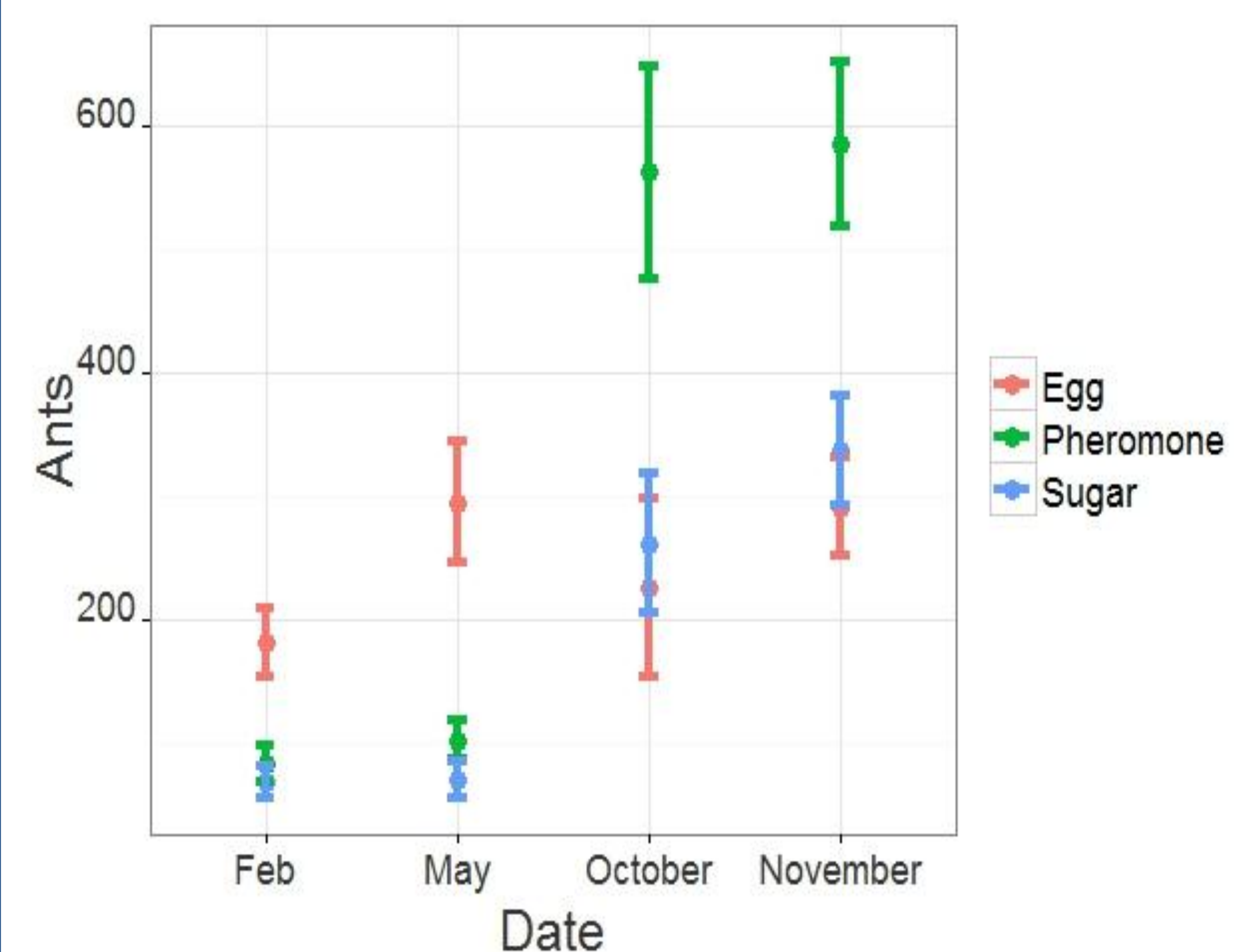


Figure 4. Post-hoc linear regression scatter plot of means (red -sugar egg, green -pheromone sucrose water and blue-sucrose water).



Conclusions

In February and May there was no significant difference in the number of ants collected with the three non-toxic baits. However, sugar egg appears to be slightly more attractive in the spring than in the fall winter months. In October and November pheromone attracted more Argentine ants. Changes in nutritional need throughout the year can explain the changes in bait preference. In the spring reproduction increases thus the demand for protein increases (Krushelnycky and Reimer 1998). We would then expect foraging activity to decrease as the nest size decreases in winter. Instead foraging activity increased. Surprising was not only the increase in attractiveness of the pheromone sucrose water but the increase in ants captured during the fall. In the future, this information could be used to standardize Argentine ant detection protocols in a diversity of ecosystems. All three of these baits are relatively easy to use in the field this data can influence land managers on what baits to use when implementing an Argentine ant detection, monitoring or control project.

Acknowledgements

We thank the following for their help on this project: Melissa Booker, Kevin Carr, Calypso Gagorik, Nicole Gutzman, Cause Hanna, Emma Havstad, Aaron Hebshi, Richard Hillary, David Holway, Emily Howe, David James, Bryan Munson, Ida Naughton, Sarah Sheldon and Sheena Sidhu.