

Science and Technology Group

Annual Report FY2015: Juanita Choo

Juanita Choo Science and Technology Associate

1. Introduction

My research this year has focused on four areas: **(1)** revising and resubmitting the manuscript entitled “**(2)** research associated with how human disturbance impacts influence beetle abundance and diversity in the Venezuelan Amazon, **(3)** attempts to make contact with local famers for research collaborations, and **(4)** data compilation and translation of plants and vegetable use associated with the Okinawa Plant database and webpage,

2. Activities and Findings

(1) Life history traits influence the strength of distance- and density-dependence at different life stages of two Amazonian palms

Background: Natural enemies are known to be important in regulating plant populations and contributing to species coexistence (Janzen-Connell effects). The strength of Janzen-Connell effects (both distance and density-dependent effects) varies across species, however the life history traits that mediate those differences are not well understood. We compared Janzen-Connell effects across the life stages (seed through adult stages) of two sympatric palm species with distinct phenologies and shade-tolerances, two traits that may mediate the strength and timing of Janzen-Connell effects.

Methods: We studied populations of the common understory palm species *Attalea phalerata* and *Astrocaryum murumuru* in Manu National Park, Peru. We used seed predation experiments to assess Janzen-Connell effects in the seed stages. In the post-seed stages, we applied spatial analyses of the distributions of individuals and biomass in order to infer the strength of distance and density-dependent effects.

Results: Seed predation was both negative distance- and density-dependent consistent with the Janzen-Connell effects. However, only seedling recruitment for asynchronously fruiting *A. phalerata* was depressed near adults while recruitment remained high for synchronously fruiting *A. murumuru*, consistent with weak distance-effects. Negative density-dependent effects were strong in the early stages for shade-intolerant *A. phalerata* but weak or absent in shade-tolerant *A. murumuru*.

Conclusions: Distance and density-dependent effects varied among the life stages of the two palm species in a manner that corresponded with differences in the phenology and shade-tolerance of each species. Our study highlights the need to investigate how life history traits mediate both distance and density-dependent Janzen-Connell effects, which is a necessary step toward understanding how Janzen-Connell effects regulate plant populations and promote community-level diversity.

(2) Impacts of human disturbance and hunting on dung beetle diversity

Background: Dung beetles provide important ecosystem services ecologically and economically in the decomposition and nutrient recycling of large herbivore dung. Dung beetles are moreover potentially useful indicator species to assess the severity of human disturbance because their abundance, diversity, and dynamics are sensitive to human disturbance. In this study, our goal was to assess whether dung beetle abundance, species and trait diversity (activity time, dung handling characteristics, and size) are influenced by an increasing gradient of human disturbance.

Methods: Our study site is based within an indigenous community in the Amazon that previously practiced traditional hunting and subsistence farming. In the last 20 years, the community has experienced rapid cultural change due to external influences (e.g., sedentary vs. semi-nomadic lifestyles) and increased use of western materials (e.g., guns for hunting). These important changes may threaten the sustainability of their livelihoods and the regeneration of plant and animal resources. In order to quantify dung beetle abundance and diversity along a gradient of human disturbance, my collaborators and I are in the process of quantifying and identifying thousands of dung beetles sampled along four replicated transects extending from the center of an indigenous settlement in the Venezuelan Amazon. We are also obtaining vegetation information (species and tree structure) as well as environmental metrics to determine how these factors influence the beetle community.

Expected results: We are currently processing our beetle samples, plant and environmental data, and expect to have the compiled results in FY2016. We believe the results of our study may provide important preliminary indicators as to how cultural loss that is impacting indigenous communities all over the world could ultimately affect the broader forest community and biodiversity.

(3) Seeking research collaborations with local farmers

With the assistance of Yuka Ozaki, we attempted in FY2015 to visit and make contacts with local farmers. Our goal was to interview farmers to learn about their farming practices and identify local farmers who may be interested with working with OIST to establish long term research collaborations. We visited and interviewed five local farmers on the island. Although we identified potential areas of collaborations with a farmer, we were not able to establish formal agreements for collaborations. Due to the busy farming schedule during the growing season, we faced challenges with being able to establish regular contact with farmers as well as setting fixed schedules necessary for collecting data on site. We may continue to seek other farmers for possible collaboration in FY2016.

(4) Okinawa plants database and webpage

I have continued to work on developing the Okinawa plant database website. In FY2015, I worked on collating published information from the literature and websites on the biology, nutrition, and history of plant uses of locally grown Okinawan plants. Much of the key information has to be obtained from Japanese literature, which had to be translated before we could apply it to the database. This process has taken longer than expected and I have delayed the launch of the okiplants website FY2016 due to the ongoing additions and changes to the website.

3. Collaborations

- Economo Unit, OIST
- Beryl Simpson, University of Texas at Austin
- Patricia Alvarez-Loayza, Duke University

4. Publications and other output

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