Science and Technology Group
Annual Report FY2022

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1 Introduction

I apply a combination of field data, molecular, and spatial analyses to evaluate how human activities impact plant-plant and plant-animal interactions. My collaborators and I are using a multi-species comparison to study how hunting and the loss of seed dispersal services from hunted mammals could influence gene dispersal and the spatial genetic structure of tropical tree species in the Peruvian Amazon [see 2.1]. In Okinawa, we are collaborating with the Economo Unit and OKEON team to assess forest diversity across relatively disturbed and protected forested sites in Okinawa. The data will be used to understand forest resilience under climate and anthropogenic disturbance [see 2.2] and to aid reforestation strategies [see 2.3].

2 Activities and Findings

2.1 Multispecies comparison of hunting impacts on the dispersal and genetic structure of forest plants in the Peruvian Amazon

In FY2022, we worked on refining the molecular protocols and bioinformatics pipelines to genotype the population of nearly 2500 plant samples in our study. Our goal is to identify SNP markers that will allow us to genotype tree individuals for parentage and population genetic analyses to address questions relating to hunting impacts on plant population genetics. As part of this work, we tested the feasibility of various bioinformatics pipelines to extract ploidy information from our ddrad database. In addition, we completed the DNA extraction from leaf samples from the Reserva Amazonica site. Finally, additional fieldwork was necessary this fiscal year to collect leaf samples from very tall trees because our previous use of wood DNA from these trees failed to produce the necessary quantity of DNA.

2.2 Forest biodiversity and the impacts of disturbance gradients in Okinawa

In collaboration with OKEON field support team, we completed our tree biodiversity survey at an additional 7 OKEON sites for a total of 14 surveyed forest sites. Across all 14 sites, we collected species identity of each tree, measured the dbh of all trees greater than 1 cm diameter, and took canopy photographs at all sites to estimate forest canopy openness. Our completed forest census included 3417 trees.

2.3. Applying forest biodiversity research data to campus reforestation

Using our tree biodiversity data above, combined with research on Okinawa traditional knowledge, we completed a volunteer-led campus reforestation project to replant native trees in an open area on campus. With Izumi Fukunaga as collaborator, we obtained a grant from the Okinawa Prefectural Government for this project. The hope is to continue such reforestations on campus and in the nearby communities to both promote biodiversity conservation and revitalize interest in the traditional uses of trees both as forest corridors and natural barriers against typhoons.

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3 Collaborations

Evan Economo, OIST
OIST OKEON
Varun Swamy, San Diego Zoo
Susan Kennedy, Trier University

4 Publications and other output

Kennedy, Susan, Jerilyn Calaor, Yazmin Zurapiti, Julian Hans, Masashi Yoshimura, Juanita Choo, Jeremy C. Andersen et al. "Richness and resilience in the Pacific: DNA metabarcoding enables parallelized evaluation of biogeographic patterns." *Molecular Ecology* (2022).