Science and Technology Group Annual Report FY2020

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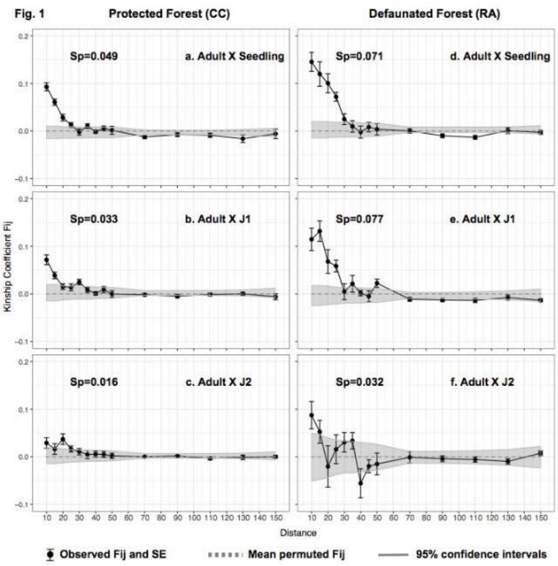
1 Introduction

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, to apply metabarcoding methods to assess how trophic interactions in forest communities maybe differ between disturbed and protected forests and whether these interactions changes following severe climate events such as typhoons [see 2.2].

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 FY2020, we commenced the marker development and genotyping for four tropical plant species in hunted forests and in protected forests where hunting is minimal or prohibited – *Pseudomalmea diclina, Guararibea witii*, *Sorocea pileata* and, *Attalea phalerata.* We conducted preliminary tests to assess the utility of both microsatellites and SNP markers in addressing our questions as well as and the cost effectiveness of the respective markers for processing large samples. Preliminary results Fig. 1 generated from *Attalea phalerata* using microsatellite markers indicated spatial genetic structure was 1.5 to 2-fold stronger in the hunted forest than in the protected forest. Moreover, both gene dispersal and neighborhood size were more than 2.5 times smaller at the hunted forest compared to the protected forest. Our spatial analyses also support the results of our genetic data, showing plant juveniles were more strongly aggregated in hunted than protected forests. Our preliminary findings are consistent with the loss of frugivore dispersal services at hunted sites.



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2.2 A landscape-scale study of interaction networks along disturbance gradients in Okinawa

Recent advances in molecular biology have helped to uncover the complex interactions among plants, insects and insect-associated microbes, and to highlight how microbes, like insect predators and parasitoids, can also modulate plant-insect interactions. These tritrophic interactions are however being disrupted by anthropogenic disturbance and climate change. In this study, we are using a combination of fieldwork, DNA metabarcoding, and eDNA technologies to document forest biodiversity and identify how trophic interactions changes along disturbance gradient and with the intensity of weather changes such as typhoons.

In collaboration with OKEON field support team, we have begun the collection of biodiversity data at 7 OKEON sites. We have completed the mapping and identification of ca. 1780 plants and the number of species found across the seven sites ranged between 36 to 57 species. Our preliminary analyses indicate higher plant biodiversity at less disturbed site. There were also changes in the dominant plant species associated with each site that was specific to their disturbance history and/or soil substrate.

In collaboration with Economo Unit and Susan Kennedy at Trier University, we are also carrying out metabarcoding on plant species collected at several sites in order to build a plant barcode library for downstream plant-insect herbivory analyses.

3 Collaborations

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

4 Publications and other output