



## HONDURAS DISSERTATION/THESIS PROJECT

### HO09 Effects of Habitat on Ectomycorrhizal Fungi

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Fungi are the least studied biological Kingdom, with only 1-2% of the estimated 5–10 million species being described, and there are groups for which even basic molecular phylogenetic work is lacking. The incorporation of DNA-based methods has exposed the restrictions of morphological assessments and casts doubt upon some earlier taxonomic assignments. Generally, however, taxonomic implications of molecular data should only be put in place after careful examination of specimens and after a thorough search for morphological and/or ecological evidence and confirmation.

At a moment of global losses of biodiversity, and with a vast majority of fungal species being undescribed, it is important not only to take advantage of state-of-the-art technologies, but to push forward collecting efforts. The ectomycorrhizal (ECM) plant-fungal mutualism is globally widespread, but knowledge of the diversity of the fungi involved in this keystone symbiosis is incomplete, especially in tropical areas. ECM fungi enhance host plant nutrient uptake, provide protection against root diseases, and alleviate effects of abiotic stresses.

The aim of this project is to quantitatively investigate how environmental factors influence the genus-level diversity of ECM fungal communities within the cloud forests of Cusuco National Park, Honduras. Fruiting bodies of ECM formers will be collected (e.g., *Amanita*, *Cortinarius*, *Lactarius*, *Russula*, *Suillus*) in designated 20m x 20m plots. These fruiting bodies will be obtained via slow, careful searches within these plots, including meticulous raking of leaves and overturning of dead wood. Fungi will be identified to the Family or Genus level, with identification training provided by an expert mycologist who will be present on-site for the first part of the research season.

Students will then be able to correlate the diversity and abundance of ECM communities found within each of the 20m x 20m habitat plots with a range of habitat variables to determine the importance of various environmental drivers on fungi community structure in Cusuco National Park. These habitat datasets can incorporate the variables measured as part of the standard habitat structure surveys conducted in Cusuco National Park each year, which encompass tree counts, tree circumference measurements, canopy density, understorey density and slope. This can be supplemented, if desired by measuring micro-habitat variables that might be particularly pertinent to fungi community structure, such as quantity of dead wood and leaf litter depth. On completing this project students should be able to develop a novel appreciation of community structure of ECM fungus communities in a poorly-studied cloud forest ecosystem, and the environmental factors with govern this community structure.

### Recommended Reading

Dickie, I.A. (2007) Host preference, niches and fungal diversity. *New Phytologist*, 174: 230– 233.

- Ferrer A, & Gilbert, G.S. (2003) Effect of tree host species on fungal community composition in a tropical rain forest in panama. *Diversity and Distributions*, 9: 455– 468.
- Gardes, M. & Bruns, T.D. (1996) Community structure of ectomycorrhizal fungi in a *Pinus muricata* forest: Above- and below-ground views. *Canadian Journal of Botany*, 74: 1572– 1583.
- Lee, S.S. (1990). The Mycorrhizal association of the Dipterocarpaceae in the tropical rain forests of Malaysia. *Ambio* 19: 383– 385.
- Lilleskov, E.A., Bruns, T.D., Horton, T.R., Taylor, D.L. & Grogan, P. (2004) Detection of forest stand-level spatial structure in ectomycorrhizal fungal communities. *FEMS Microbiology Ecology* 49: 319– 332.
- Peay, K.G., Kennedy, P.G., Davies, S.J., Tan, S. & Bruns, T.D. (2010) Potential link between plant and fungal distributions in a dipterocarp rainforest: community and phylogenetic structure of tropical ectomycorrhizal fungi across a plant and soil ecotone. *New Phytologist*, 185: 529–542.