



HONDURAS DISSERTATION/THESIS PROJECT

HO11 Ecology of moths in the tropical cloud forests of Honduras

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Lepidoptera – butterflies and moths – are the second most diverse order of insects. Currently 165,000 species have been described and many more await description. Distribution in population and levels of endemism within Lepidoptera effectively reflect overall biodiversity within an area due to their dependence on specific larval host plants, interactions with predators, and their role as long-distance pollinators (New 2004). Furthermore, they are vulnerable to pressure from changing land use providing a good measure of deforestation (Beck *et al.* 2006). Many of these factors have been well studied within the temperate regions and have been significantly important in the development of invertebrate conservation strategies (Bonebrake *et al.* 2010). However, the knowledge of tropical Lepidoptera is severely lacking, especially in areas of high biodiversity.



This problem is further intensified by the structure of tropical forests - the majority of the biomass and biodiversity are contained within the canopy which can be >30m above ground level. The vertical structure of a forest is comprised of distinct vegetation layers that modulate biotic and abiotic factor in the forest canopy. This results in a high diversity of microhabitats that contain many different communities of organisms (Schulze *et al.* 2011).

The identification of these organisms can be largely simplified using DNA barcoding. DNA barcoding is based on the sequence diversity within a short, standardized segment of the cytochrome c oxidase I mitochondrial gene to identify unique species (Hebert *et al.* 2003). DNA barcoding has the potential to significantly aid Lepidoptera species identification and discovery within a tropical environment (Hajibabaei *et al.* 2006). Lepidoptera have been a major target for analysis since the earliest developments of DNA barcoding (<http://www.lepbarcoding.org/>). As of September 2013, 46% of the world's 165,000 known species have been barcoded on the Barcode of Life Database (BOLD, www.barcodinglife.com). Within Parque Nacional Cusuco, this database was tested by a preliminary study carried out in 2011 that DNA barcoded 200 ground level Lepidoptera. Within this relatively small sample size, barcoding revealed 146 unique species. The BOLD database was able to identify

87% into a family and 64% into a species. Families included Bombycidae, Crambidae, Elachistidae, Erebidae, Geometridae, Lasiocampidae, Megalopygidae, Noctuidae, Notodontidae, Saturniidae, and Sphingidae.

The main focus of this project will be to determine the ecology of moths and link this to various population parameters such as species diversity, abundance and distribution across the forests of the park. Specimens are sent to Oxford University's Natural History Museum for further analysis including taxonomic and genetic analyses.

Recommended Reading

- Beck, J., Kitching, I. & Linsenmair, K. (2006). Effects of Habitat Disturbance can be Subtle Yet Significant: Biodiversity of Hawkmoth-Assemblages (Lepidoptera: Sphingidae) in Southeast-Asia. *Biodiversity & Conservation*, 15, 465-486.
- Bonebrake, T.C., Ponisio, L.C., Boggs, C.L. & Ehrlich, P.R. (2010). More than just indicators: A review of tropical butterfly ecology and conservation. *Biological Conservation*, 143, 1831–1841.
- Hajibabaei, M., Janzen, D.H., Burns, J.M., Hallwachs, W. & Hebert, P.D.N. (2006). DNA barcodes distinguish species of tropical Lepidoptera. *Proceedings of the National Academy of Sciences*, 103, 968-971.
- Hebert, P.D.N., Cywinska, A., Ball, S.L. & deWaard, J.R. (2003). Biological identifications through DNA barcodes. *Proceedings of the Royal Society of London, Series B*, 270, 313-321.
- New, T.R. (2004). Moths (Insecta: Lepidoptera) and conservation: background and perspective. *Journal Of Insect Conservation*, 8, 79-94.
- Schulze, C.H., Linsenmair, K.E. & Fiedler, K. (2011). Understorey versus canopy: patterns of vertical stratification and diversity among Lepidoptera in a Bornean rain forest. *Springer*, 69, 133-152.