



HONDURAS DISSERTATION/THESIS PROJECT

HO22 Assessing the 'dilution effect' in Cusuco National Park: bats and bat flies

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Bats (Chiroptera) are the second-most diverse group of living mammals, after rodents, and comprise more than 1,300 species. Several adaptations have uniquely and effectively expanded their ecological breadth – including flight, echolocation, and a generally nocturnal lifestyle. Moreover, bats have many different food sources such as insects, other vertebrates, blood, fruit, and nectar. These feeding guilds are associated with distinctive morphological adaptations, especially in the New Worlds leaf-nosed bats. Bats vary in the roosts they use, from permanent structures such as caves and mines to ephemeral structures such as 'leaf tents.'

Owing in part to these unique adaptations, bats are parasitized by a plethora of organisms: mites, bugs, fleas, and flies. Among these, the flies are among the most conspicuous. They live in the fur and on the flight membranes of bats where they feed on blood.

There are several recent studies about bat flies, discussing host specificity, unbalanced sex ratios in bat fly populations, associations with functional traits in bats, and population structure. The problem often is that datasets are too small to make far-reaching conclusions. This project will contribute to a new dataset encompassing large numbers of bat flies and focuses on effects of habitat.

Students taking this option will join our long-term bat monitoring program in Cusuco, and will spend each evening in the field assisting our teams with capturing, identifying, and measuring a series of morphometric variables the bats of the cloud forest ecosystem found here. Additionally, students will also determine whether each captured bat is parasitized by bat flies, and, if so, count the number of parasites present. As the permanent study site locations in Cusuco encompass a wide range of sites, including some which occur deep within the heart of the reserve where anthropogenic disturbance is low, and others close to the forest edges in close proximity to cleared land and other anthropogenically altered ecosystems, students will be able to test if a 'dilution effect' occurs in the bat community in Cusuco; i.e. do bat parasite loads increase proportionally with increased ecosystem disturbance? This hypothesis has been successfully tested in various tropical forest ecosystems, but has never been examined within the context of a Mesoamerican cloud forest. Students will also have the opportunity to investigate other variables which may have a bearing on bat fly parasitism rates, such as altitude, bat feeding guild and bat roosting behavior.

Recommended Reading

Civitello, D.J., Cohen, J., Fatima, H., Halstead, N.T., Liriano, S., McMahon, T.A., Ortega, C.N., Sauer, E.L., Sehgal, T., Young, S. & Rohr, J.R. (2015) Biodiversity inhibits parasites: Broad evidence for the

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Bertolal, P.B., AiresII, C.C., FavoritoIII, S.E., Graciollil, G., Amakul, M. & Pinto-da-Rocha, R. (2005) Bat flies (Diptera: Streblidae, Nycteribiidae) parasitic on bats (Mammalia: Chiroptera) at Parque Estadual da Cantareira, São Paulo, Brazil: parasitism rates and host-parasite associations. *Memórias do Instituto Oswaldo Cruz*, 100.

Patterson, P.D., Dick, C.W. & Dittmar, K. (2008) Parasitism by bat flies (Diptera: Streblidae) on neotropical bats: effects of host body size, distribution, and abundance. *Parasitology Research*, 103: 1091-1100.

Pilosof, S., Dick, C.W., Korine, C., Patterson, B.D. & Krasnov, B.R. (2012) Effects of Anthropogenic Disturbance and Climate on Patterns of Bat Fly Parasitism. *PLoS One*, <https://doi.org/10.1371/journal.pone.0041487>

Johnson, P.T.J. & Thieltges, D.W. (2010) Diversity, decoys and the dilution affect: how ecological communities affect disease risk. *Journal of Experimental Biology*, 213: 961-970.