

UNIVERSITY OF CANTERBURY DOCTORAL SCHOLARSHIPS RESEARCH PROPOSAL

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Vertical stratification and mechanisms of species coexistence within the robber fly assemblage of a tropical rain forest canopy

Determining the mechanisms of species coexistence is one of the central themes in Ecology (Chesson and Case 1986, Kneitel and Chase 2004). In tropical forests, hundreds if not thousands of species coexist by finely partitioning resource and habitat use at multiple spatial and temporal scales (Basset *et al.*, 2003). Since Terry Erwin's seminal studies in Panama in the early 1980s (Erwin 1982), it has become much more widely recognized that forest canopies support a diverse, highly-distinctive and poorly-known fauna and flora (Basset *et al.*, 2003). It is thought that many tropical organisms partition habitat usage in three dimensions, and often exhibit strong vertical stratification in distribution and abundance. However, remarkably little is known about the relative importance of abiotic gradients, resource partitioning and species interactions in determining these patterns. The aim of the proposed research is to investigate the mechanisms of species coexistence in a diverse and important group of tropical forest insects, the robber flies (Diptera: Asilidae) of Panama.

Robber flies are a diverse and conspicuous group of predatory insects of considerable interest for ecological studies (Shelly 1985, Knutson 1972). Despite this, knowledge of the systematics, behaviour and ecology of tropical species is poor, particularly in the Neotropical region (Fisher and Hespeneide 1991). For example, of the 315 species listed for Central America, the proportion of additional species that remain to be discovered may be as high as 40 to 70 %, depending on the locality. In a critical study of the ecology of Central American robber flies, Shelly (1984a,b) monitored light conditions of perch sites and the thoracic temperature of 15 Asilidae species in a Panamanian rain forest. In this study, he emphasized the existence of light- and shade-seeking guilds within robber fly communities. Furthermore, in each of those guilds the variability and specificity in ecological niches (height and type of perch sites) and foraging preferences (in prey size and type) are believed to be the most important factors allowing species to coexist (Lavigne 1985, Scarbrought 1982, Shelly 1985). Surprisingly, though, with the exception of Shelly's (1985) observation of daily vertical migration in light-seeking asilid species, nothing is known about the functional importance of robber flies in the canopy.

The first stage of my research will aim at improving knowledge of the autecology of Neotropical robber flies in canopy habitats (abundance, foraging behaviour and potential prey). At the same time, I will compare canopy, treefall gap and understorey assemblages in order to assess the degree of habitat specialization. Secondly, I will contribute to the systematic knowledge of Central American Asilidae, in describing new species of particular interest. With support from the Smithsonian Tropical Research Institute (www.stri.org) and Project-IBISCA in Panama (Investigating the Biodiversity of Soil and Canopy Arthropods: www.naturalsciences.be/cb/ants/projects/ibisca_main.htm) the field work will be performed at the STRI canopy crane site in the San Lorenzo protected area (Colon, Panama). Canopy sites will be accessed by crane and by single rope technique in treefall gaps of varying size. The composition and relative abundance of asilid assemblages in canopy and in the understorey will be assessed using Malaise traps and censuses along pre-defined transects, both situated in shade and sun. Microclimatic and habitat structure variables will be monitored at all sites. The proposed research will contribute significantly to knowledge of Neotropical Asilidae and to a greater understanding of the mechanisms promoting species coexistence in tropical forest canopies.

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