HO01 Structural complexity in tropical cloud forest ecosystems

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The mountainous cloud forest of Cusuco National Park is a structurally diverse and complex ecosystem home to an abundance of species, a significant number of which are endemic and/or endangered.

The Park contains a huge amount of structural complexity which creates a vast array of microhabitats and niches for species to exploit;

- there is a patchwork of forest types across the Park, primarily dominated by either broadleaf or pine trees there are also mixed stands including tree ferns and palm trees

- the Park has an elevation gradient of over 700m, ranging in altitude from circa 1400m at its boundary to 2200m at its highest peak. There is also a buffer zone around the Park that descends to below 1000m

- very little of the Park is flat, slopes across the park can have widely ranging gradients (from 10° up to 50°)

Compounding this complexity is the historic and ongoing human disturbance of the Park ecosystem. Tracts of land have been deforested both in the buffer zone (legally) and in the core zone (illegally) for crop plantations and cattle grazing. Along with the legacy of logging conducted back in the 1950s-60s this has led to an additional gradient of human disturbance across the park, with some areas still untouched and others completely transformed into agricultural land.

Operation Wallacea has a continuing forest structure survey programme collecting data at over 100 plots across the Park. These plots cover all forest types, slope gradients, and disturbance levels, and range in altitude from 1050m to 2150m. Each plot is a 20m x 20m square within which data is collected on;

- circumference, height, and species of mature trees
- understorey density at height intervals up to 3m
- canopy openness
- leaf litter depth
- soil density
- evidence of human disturbance, ie. logging
- as well as the elevation, aspect, and slope gradient of the plot

Projects would look at relating structural variables and/or levels of human disturbance to a range of ecological factors. As a few examples, species data from the on-site ornithology or invertebrate teams could be used to define species richness at each plot; further microclimate data could be collected to look at the relationship to plot-specific temperature and rainfall; or, the biomass and carbon content of each plot could be calculated and related to its structural variables.

There are many paths a project could take within this research area and the following papers should stimulate more ideas.

Scott A. Lassau, Dieter F. Hochuli, Gerasimos Cassis, Chris A. M. Reid (2005) Effects of habitat complexity on forest beetle diversity: do functional groups respond consistently? *Diversity and Distributions*, **11**, 73–82

Chun-Chih Tsui, Zueng-Sang Chen, Chang-Fu Hsieh (2004) Relationships between soil properties and slope position in a lowland rain forest of southern Taiwan. *Geoderma*, **123**, 131-142.

Stephen E. Williams, Helene Marsh, John Winter (2002) Spatial scale, species diversity, and habitat structure: Small mammals in Australian tropical rain forest. *Ecology*, **83**, 1317–1329.

Chris McElhinny, Phillip Gibbons, Cris Brack, Juergen Bauhus (2005) Forest and woodland stand structural complexity: Its definition and measurement. *Forest Ecology and Management*, **218**, 1-24.

Robin L.Chazdon (2003) Tropical forest recovery: legacies of human impact and natural disturbances. *Perspectives in Plant Ecology, Evolution and Systematics*, **6**, 51-71.