HONDURAS DISSERTATION/THESIS PROJECT

HO19 Factors affecting bird communities in cloud forest, Honduras

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Parque Nacional Cusuco (PNC) supports a highly diverse bird community, with over 250 species having been recorded within its borders. These include important Mesoamerican flagship species such as the Resplendent Quetzal (*Pharomachrus mocinno*), colorful parrots and toucans, and tiny hummingbirds. This rich diversity is in part a product of the complex and inter-related ecological, biogeographical and anthropogenic variables which influence the structure and distribution of avian communities throughout the park.

Altitude is one of the main drivers of species distribution patterns in PNC. From the lowest Park boundaries at around 500m above sea level to the highest peaks at 2200m, abiotic variables such as temperature, precipitation and relief change dramatically. This in turn affects the Park's vegetation structure, giving rise to a succession of different forest ecosystems along its 1700m altitudinal gradient. These range from tropical lowland forest to Pine-Oak woodland at middle altitudes, cloud forest at higher altitudes and, in the very highest parts of the Park, Bosque Enano elfin forest. These varied forest habitats each support different ecological niches and require different evolutionary adaptations; hence very different species and community assemblages can be found at varying altitudes throughout the park.

While altitude accounts for much of the variability in avifaunal communities across PNC, human activity has also had an important influence in determining the distribution of the Park's avifauna. Agricultural activity and logging have significantly altered ecosystems in some areas, particularly (but not exclusively)

in the buffer zone which encompasses much of the Park's lower altitudes. Extensive forest clearance has occurred in significant sections of PNC, with original primary forest being replaced by cultivated land and heavily disturbed scrub habitats, creating very different ecosystems which support bird communities with differing ecological adaptations and tolerances to those found in pristine forest. Substantial areas of forest in the buffer zone and near the edge of the core zone have also been disturbed by human activity to varying degrees, and again these patches of disturbed secondary forest types possess different habitat structures from the more pristine forest ecosystems found deeper within the Park's interior. This could also facilitate significant differences in avian community structure. It is also possible that a range of further environmental factors such as topography, drainage, geology, microclimates and edge effects could influence bird assemblages on a smaller spatial scale, further adding to the complexity of variables governing species distributions within the Park.

PNC therefore provides excellent opportunities for investigating how a range of ecological and anthropogenic factors can influence the composition of Neotropical bird communities, and there are numerous possibilities for university students wishing to conduct research projects in this study theme. Altitudinal effects and anthropogenic activities are inextricably linked in PNC, as human activity and related environmental disturbance are concentrated at lower altitudes due to the more optimal climate and topography, greater accessibility, and the less-stringent socio-economic regulations of the buffer zone. However, it would be entirely possible for students to focus on either one of these two major variables as long as the other was taken into careful consideration. Students could, for example, concentrate principally on examining how altitude influences the composition of bird communities by comparing data from a range of forested sites at different altitudes, all with relatively low disturbance levels, in order to gauge how increasing elevation influences species richness, incidence of cloud forest endemic species, community compositions, and species turnovers without significant influence from other factors. They could then also compare differentially disturbed sites at various altitudes to ascertain whether the more specialized, highly endemic avian assemblages at higher elevations are less tolerant of environmental disturbance than their lowland counterparts; an avenue of research which would have important conservation implications.

Similarly, it would be possible for students to focus primarily on examining how habitat disturbance influences bird communities by looking at a range of relatively undisturbed, disturbed and cleared agricultural sites in the Park which all lie within a similar altitudinal range. This would allow an evaluation of how species richness, abundance, community composition, and proportions of various avian sub-groups such as feeding guilds or endemic species vary across this disturbance gradient. It would also be possible to examine the extent to which PNC's management zones mitigate the impact of disturbance on bird communities by comparing avifaunal assemblages at sites in the higher elevations of the buffer zone with sites within a similar altitudinal zone within the core zone.

It is entirely suitable for students to choose to focus on either one of the two key variables of altitudinal influence and disturbance influence. However, there are also possibilities to examine both together in order to determine which environmental variables are most important overall in governing the distribution and structure of PNC's bird communities. A project along these lines could use all the established point count plots to collate data from a wide range of sites across different altitudes, disturbance levels and management zones. These data could then be analyzed using a series of General Linear Models, Principal Component Analyses or other multivariate statistics to identify the most influential variables governing the distribution of bird species and the structure of communities. There is

also the possibility of combining bird census data collected in the field with the Park's pre-existing GIS databases to produce a series of distribution maps exploring how key environmental variables determine spatial distribution patterns, and from this predict bird diversity hotspots within the Park.

The primary method students will use to investigate these research questions will be circular-plot point counts. These involve surveying a range of study plots scattered throughout various altitudes and habitats across PNC. There are currently 123 of these study plots, although the number used by students will depend on the specific research topic addressed. Each of these sites will be surveyed at least twice during the course of the season, with each survey consisting of a 10-minute timed count whereby all birds seen and heard within a fixed radius are recorded. These point-counts are conducted just after dawn each morning, this being the period when most bird species are active and vocalizing, thus yielding the most contacts. Most birds are detected by call; students will be assisted with this by experienced ornithologists familiar with the local avifauna, and will also be trained to recognize most of the Park's common species within their first week of survey work. Mist-netting surveys will also be conducted at a number of points over the course of the season, allowing the detection of cryptic species not easily detected by counts, and the capture-release abundance data obtained from the mist-netting protocol can also be used to supplement the findings of students working in this study theme.

Upon completion, students undertaking this project will have produced a very large ornithological dataset that can then be examined alongside detailed habitat structure data collected at each survey site by dedicated survey teams, and a range of environmental variables stored on PNC's GIS database.

Recommended Reading

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