

Vascular Epiphyte Diversity within the La Chonta Forestry Concession, Bolivia

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H. Goddings, J. Greenwood and A. Turnbull

Project Bosque, University of Edinburgh and the University of Uppsala

Short Report

Introduction

Vascular epiphytes are plants that grow on other plants, upon which they are dependent for mechanical support, but not for nutrients. Epiphytes make up about ten percent of all vascular plant species world-wide and they are almost exclusively found in tropical forests. For this reason, they constitute a large part of the global plant biodiversity and in tropical countries represent up to 25% of all vascular plant species (Neider et al. 2001). In the specific region of the forest in which our research was undertaken no previous studies had ever been carried out on the epiphyte community.

The aim of our study was to assess the diversity of the vascular epiphyte communities in both undisturbed and logged natural habitats within the reserve and to try and establish the impacts, if any, that logging has had on the epiphyte communities present.

Methodology

For the purposes of the vascular epiphyte canopy study the climbing team focused specifically on one tree species, the commercially valuable *Ficus boliviana*. Within the La Chonta forestry concession there are a number of study areas which are maintained by the Instituto Boliviano de Investigación Forestal (IBIF). For the purpose of this study five study plots were sampled in total. Non-logged data was taken from plots maintained by IBIF, which have not been harvested, but minimal liana cutting has occurred. This practise is thought to have had little impact on the test plots. Two plots having undergone standard Silvicultural treatment (Normal), also maintained by IBIF, which have been harvested, on average five years ago, according to the current logging practise in the La Chonta concession were investigated. Data was also collected from previously logged areas, not maintained as IBIF research plots, which are referred to as 'logged areas'. These areas have previously been logged according to the same FSC regulations, but remain close to a substantial logging road, which has been active as one of the main access roads in the last year. Work was undertaken in this study outside of IBIF research areas due to the lack of suitable trees in logged research plots.

Results and Discussion

The epiphyte life span can be very different from one species to another, let alone one family to another. Some individual orchids can reach up to fifty years in age, where others may only last a year (Zotz et al, 1996). The nature of the vascular epiphytes is

for communities to accumulate on a host tree according to its age and size. The successional development and diversity is also partly decided by phorophyte representation (Freiberg and Freiberg, 2000). Studies in Bolivia by Ibisich (1996) have shown the earliest time an epiphyte community is likely to reach its climax is approximately 25 years. In general, epiphyte diversity and abundance are positively correlated to the successional stage of a forest (Gentry and Dodson, 1987).

Diversity is an indication of community composition rather than simply the abundance or distribution. The comparison of diversity in a plant community is most applicable when being carried out on a species level. Although this study could not achieve this, interesting interpretations can be drawn on the family level diversity.

Ground Based Survey

The Mann-Whitney results showed a positive statistical result to bromiliaceae, piperaceae and ferns having been affected by the change in habitat committed by logging. The normal distribution approximation conferred a statistical difference may occur between the bromiliaceae ($|z_0| = -2.98$), piperaceae ($|z_0| = -3.56$), and pteridophytes ($|z_0| = -2.66$) communities of each study site. No difference was found to exist between the proportion of orchidaceae in non-logged and logged communities. This suggests that the impacts of logging on the dry, tropical shrub layer in the semi-deciduous woodland of our study site can be observed and quantified at the family level for vascular epiphytes.

Both bromiliaceae and piperaceae show, on average, a higher proportion of diversity in the Control (Testigo) plots compared with the Normal logged plots. The Control plots show a significantly higher number of established canopy trees than the Normal plots, due to the removal of on average 62 trees per plot (27 hectares) during logging. This change in canopy cover between plots will influence the amount of irradiation reaching the shrub layer and consequently resulting in a change in the habitat characteristics (Benzing, 2004). A change in canopy matrix will affect the air moisture levels within the shrub layer, therefore affecting a key factor determining an epiphyte's ability to occupy such a habitat (Freiberg, 2004). Studies by Hall et al. (1998) showed that a total of 43 epiphyte species were present in a primary forest in contrast to after logging activities where this number was drastically reduced to 1 epiphyte species being present. The change in the bromiliaceae community could be a direct result of the changes in microclimate as many bromeliads show specific demands to humidity (Griffiths et al, 1984).

“Orchids are the richest family in the neotropics, constituting in some regions up to 57% of epiphyte diversity.” (Ibisich, 1996). Orchids are also an important part of the epiphyte community in the Guarayos forest reserve, with family levels accounting for a high proportion of epiphyte diversity. In ecological terms it is an important finding that in our study area normal logging practices are having a minimal effect on the orchidaceae component of the vascular epiphyte community diversity in the shrub layer.

For the four families researched the proportion of diversity range has remained at similar levels in both treatment plots; normal logging and the control. This may suggest that not all the shrub layer in the normal plots has been affected by the

logging of selected trees. Thus, allowing the possibility for undisturbed epiphyte diversity within logged forests.

The shrub layer epiphytes are normally dependant on large mature trees that have upon them an abundant epiphyte community, which feeds the shrub layer below with seeds and asexual plant material, whose role it is to colonise the sub strata. When trees are selected for logging, normally the healthier and more vigorous trees are felled, as they represent the best tree architecture for timber processing and production. Although there are regulations to protect and maintain the number of healthy specimens in the forest as “seed trees” for regeneration, it will not always be adhered to in forest concessions such as La Chonta. Therefore the choice of canopy trees selected for logging must also have an effect on the successional development of the vascular epiphyte shrub layer community.

Ficus Boliviana Canopy Survey

The removal of substantial trees from the normal and logged study areas had an effect on the diversity of the vascular epiphyte community in the canopy of these plots. The main difference that occurred in the overall community is that there was a decrease in the orchidaceae community. Studies by Barthott et al. (2004) found that a decrease in orchid contribution to species diversity is mainly due to a less diverse phorophyte structure and a less differentiated microclimate in disturbed and secondary vegetation compared with primary forest.

Where orchid diversity decreases, an increase in piperaceae diversity may replace what has been lost. A species of piperaceae found in our study area, *pepermonia*, are well known for being one of the few genera of epiphytes that have no mycorrhiza root relationship with a fungus, which makes them reliable on themselves for nutrient and water supply. This phenomenon has made them better suited to the variety of conditions in which an epiphyte might find itself (Benzing, 2004). It has been proven that anthropogenic disturbances also force a shift in species composition in an epiphyte community to more drought tolerant species (Wolf, 2005). These ideas lend reason for piperaceae dominances in the new disturbed conditions. These changes are highlighted in the differences in zone diversity. Zones 1 and 2 show the most swing, from a majority of orchidaceae in non-logged forests to a dominant piperaceae community in both logged areas.

The diversity of vascular epiphytes was found to vary according to zone within the sites and between logged and non-logged conditions in the shrub layer, but that logging had little effect on the canopy epiphyte communities in La Chonta, Bolivia.

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Further information and a full report can be supplied on request from hgoddings@googlemail.com.