

PROPOSED RESEARCH

Areas rich in species, commonly known as biodiversity hotspots, are of great conservation value. The Tropical Andes is one of five most important biodiversity hotspots regarding species richness and endemisms. The area is particularly rich in frog, bird, and plant species. However, little is known about evolutionary process that led to the origin of large number of species. Increasing land use intensification and climate change has produced dramatic changes in the landscape, treating several animal and plant species, making them more vulnerable to extinction.

The biodiversity of the Andes is the result of geological and climatic events that promoted species diversity. Two major events played an important role: (1) the uplift of the Andes created a variety of new habitats, and (2) climatic fluctuations (i.e., glaciations and inter-glaciations) produced fragmentation and isolation of plant populations, which eventually led to origin of new species.

Reconstruction of evolutionary relationships has been a major concern for biologist. Analysis of patterns of distribution between species is a tool commonly used a proxy for understanding species diversification and adaptation. More recently, phylogenies have provided fundamental framework for elucidating process of speciation and morphological diversification. Phylogenies based on molecular data are beginning to provide insight into species relationships and patterns of speciation. But, up to date, there are few phylogenies of plant groups for the Andes.

This study is motivated by the urgent need to improve our knowledge about patterns of diversity and morphological adaptations by plant groups in the Andes. As a study group, I choose to study *Polylepis* for the following reasons: (1) *Polylepis* is widely distributed along the Andes and inhabits a variety of ecosystems, (2) it includes around 25 five species which possess morphological variation associated with the type of ecosystem they inhabit, (3) it is a conspicuous element of the vegetation and there are several botanical collections throughout its entire distributional range, (4) a molecular phylogeny of the group is already available, and (5) a model of speciation has been proposed by Fjeldså & Kessler (1996), which will use as a framework for this study.

The main goal of this study is to assess patterns of diversification of *Polylepis* by integrating models of distribution and morphology. The present study will include three

major components. First, revision of botanical collections to assess morphological variation in species of *Polylepis*; second, generation of distribution models using niche modeling tools for each species; and third, integration of morphology and distribution models with the phylogeny of *Polylepis*.

I have already developed a database of *Polylepis* species, which includes geographic coordinates, where each species has been recorded. This database is based on botanical collections from several herbariums (e.g., Herbario Nacional de Bolivia, Missouri Botanical Garden) and publications. However, Ecuador is the third country the highest number of *Polylepis* species, there is very few published information available, particularly species restricted only to the country. Visiting QCA Herbarium at Universidad Pontifica del Ecuador will enable to create a robust database in order to effectively create species distribution models.

This research will help me to expand my dissertation by including analyzing patterns of speciation and diversification in *Polylepis*, a topic initially considered as part of my research plan, but limited by funding. Visiting QCA herbarium will also lead to establishing long term cooperation by developing research questions about the ecology and conservation of Andean mountain forests. Research projects will include a comparative perspective, by identifying species and systems with similar ecological characteristics in Ecuador and Bolivia. Future research projects will be developed in coordination with Herbario Nacional de Bolivia (LPB).

Funding will be use to covered living expenses and transportation. A total of \$US 4600 will be used for alimentation (\$US 50/day), US\$ 1500 for renting an apartment (\$US 500/month), and \$US 2900 for transportation, which will cover expenses associated with a round-trip flight from Bolivia to Ecuador and renting a car.