Changes in species richness and diversity of cryptogamic communities in páramo ecosystems

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Páramo represents the tropical alpine ecosystems in the Neotropical region, located between the upper forest line and the permanent snow line (Luteyn, 1999). This ecosystem is extremely diverse and houses the richest high mountain flora of the world (Smith & Cleef, 1988). Cryptogamic communities are also highly diverse in páramos with a total of 1298 species reported till date (Luteyn, 1999). Despite the high diversity, very few studies have been centered on both bryophytes and lichens in páramo systems, especially from an ecological perspective.

Objectives
To study the cryptogamic flora of certain páramos in Ecuador and to analyze which factors could be driving the distribution of these organisms.
To compare the composition and richness of lichens and bryophytes in different paramos of southern Ecuador and to determine if these differences could be related with the altitude as a surrogate of the varying climatic conditions.

Methodology
The field work was realized in five paramos located in southern Ecuador (Loja and Azuay provinces): Punzara, Loma del Oro, Cajanuma, Jimbura and Cajas, an altitudinal range between 2770 and 3930m.

The sampling design consisted of forty sampling units of 40 x 40 cm randomly selected in undisturbed zones within each páramo. We estimated the coverage values of all the species of lichens and bryophytes in each sampling unit. We determined the species richness and composition on 200 units.

Results
We recorded a total of 103 taxa (57 lichens and 46 bryophytes). We found 22 exclusive taxa at high elevation (Cajas), but only 8 species were exclusive from the paramo at lowest elevation (Punzara). Results showed that the most relevant predictor of the total richness and diversity (Simpson's Inverse) of the soil communities was the elevation, with a positive relation. Lichens dominated in all sampling units, with an average cover between 50% and 75%, while bryophytes never exceeded of 30%. Cladoniaceae was the most predominant family and the best represented with 29 taxa belonging to the genera *Cladia* (4 species) and *Cladonia* (25 species).

Conclusions
Results showed the great diversity and species composition of lichens and bryophytes in the paramos of the southern Ecuador. The environmental variable that played an important role in the species richness and diversity was the elevation.