3 POTENTIAL LATERAL EXPANSION OF POLYLEPIS
FOREST FRAGMENTS IN CENTRAL ECUADOR

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ABSTRACT

High-Andean forests formed by *Polylepis* are among the most endangered forest types in South America and effective strategies are urgently required to facilitate their conservation. The remaining forest stands are presently distributed in discontinuous patches which usually form abrupt boundaries with the adjacent grassland vegetation. Mechanisms of natural regeneration in this transition zone between forest and grass paramo are still poorly understood. The present study investigates the establishment of seedlings, saplings and vegetative shoots along edges of *Polylepis incana* and *P. pauta* forests in the Páramo de Papallacta, central Ecuador. For each species, we analysed 18 transects of 20 m in length, which traversed the edge zone, and sampled 10 subplots of $2 \times 2$ m each. Differences between subplot positions were analysed using a repeated measures ANOVA. In addition, we determined correlations of altitude and grazing parameters of the *P. incana* transects with regeneration data. Seedling numbers of both species were significantly higher in the forest interior than in the exterior, presumably due to less extreme climatic conditions and a more continuous seed rain. Sapling and ramet numbers, however, showed a clear maximum at the forest boundary, which indicates that favourable light conditions are required for sapling and ramet establishment. The importance of vegetative reproduction increased towards *P. incana* stands at higher altitudes, because the overall number of seedlings and saplings decreased significantly with increasing altitude. Sexual regeneration is limited at the upper distribution limit of the species, which we ascribe to extreme climatic conditions. In *P. pauta* stands, in contrast, there was no effect of altitude. Grazing by ungulates did not affect the recruitment of saplings or vegetative shoots in the investigated *Polylepis* stands, but trampling resulted in a significant increase in the abundance of *P. incana* seedlings. Our results show that boundaries of *Polylepis* stands are zones of high natural recruitment. Fire is expected to be the most
relevant factor for the formation of edges at lower altitudes, as the use of fire strongly affects the reproductive boundary zone of the remaining *Polylepis* forests, whereas grazing at moderate animal loads does not lead to any severe consequences for these forest communities. We conclude that stands below the upper treeline would expand continuously towards the exterior if human impact ceased, and that the present patchy distribution of *Polylepis* is as a result of anthropogenic influence and not of natural site conditions.