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Geographical and Altitudinal Distribution of Tillandsials in Southern Peru, and their Relationship with Topographic Variables: Orientation and Slope

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Context/Purpose:
In the coastal deserts of Peru and Chile, there are ecosystems that survive thanks to the fog coming from the sea. Although the vegetation is mostly annual, there is a perennial formation, which is known as "tillandsial". This xerophilic vegetation does not have functional roots, so water is obtained directly from the humidity coming from the fogs. The tillandsiales can be declared as fragile, since if any change were to happen in their main source of water, the populations would be seriously affected, altering the life of other species that depend on them. It is therefore important to understand the biogeographic patterns that govern the distribution of tillandsials, in order to implement plans for their conservation.

Methods:
Distribution areas were determined using herbarium records and satellite images from Google Earth (with a resolution of 0.6 m). Then, using a 30 m resolution ASTER elevation raster, orientation and slope raster models were produced; then, at the altitude, orientation and slope raster, they were trimmed according to distribution areas and the data were analyzed.

Results:
Distribution maps of tillandsiales in the departments of Arequipa, Moquegua and Tacna were made. The analysis showed that these plant formations have a greater surface area between 800 and 1100 m a.s.l., preferably located towards the SW orientation, and on low slopes (between 0-8°).

Interpretation:
The results show that tillandsiales are located in areas far from the coast, preferably towards the leeward side of the hills, plains or small elevations located behind the coastal mountain range, which indicates that they prefer some range of humidity. On the other hand, the raster analysis showed that tillandsials are located in a range of altitude, according to the layer of clouds coming from the sea; they present an SO orientation, which is related to the direction of the wind and humidity coming from the ocean; and they are located in their majority in low slopes, which could be explained on the basis of their adaptation to take advantage of the humidity of the fogs.

Conclusion:
The distribution patterns of tillandsiales are closely linked to moisture from the sea; altitude, orientation and slope respond to the layer of clouds from the sea. The knowledge generated will provide new knowledge about these exceptional plant formations and will serve as a basis for understanding how they survive such a hostile environment, conservation plans will be guided in a more appropriate way.