Structure and diversity of flower flies (Diptera: Syrphidae) in northwestern Colombian Paramos: towards the identification of bioindicator species in the Tropical Andes

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Abstract

The Paramos are isolated mountain systems, located above the tree line and forming intracontinental "sky islands" surrounded by forests and disturbed areas. Despite their importance as water reservoirs and endemism concentration, are threatened by global warming and anthropic activities. We characterized the spatial distribution of Syrphidae diversity in two Paramo complexes in Colombia to identify potential bioindicators for montane habitats. We hypothesized that bioindicator species must be abundant and exhibit affinity for a particular habitat when replacement between and/or within habitats tended to be strong. Twelve bimonthly samples of ten days were done comprising 18 sampling stations distributed among three habitat types: Paramo, forest, and grassland. Flies were collected using ground and canopy Malaise traps, colored pan-traps, and sweeping. We estimated alpha and beta diversity components within and between habitats. We identified potential bioindicator species based on exclusivity and fidelity criteria. We collected 2783 specimens in 41 genera and 148 species. Paramo had the highest richness and collections (110 species, n= 1878), followed by forest (88 species, n= 357), and grassland (59 species, n= 571). Species replacement was dominant component of incidence-based betadiversity. Similar contribution of nestedness and turnover between paramo and grassland reinforces the hypothesis that grassland communities may represent disturbed paramo. We propose eleven genera and fourteen species as bioindicators of paramo, one genus for forest, and one genus and two species for grassland, potentially useful to evaluate and implement conservation programs in Andean ecosystems. **Implications for conservation** Bioindicator species facilitate monitoring ecosystems, a necessary procedure to forecast and mitigate variations due to climate change and anthropogenic advances. Paramos harbor great richness in relatively small areas and are under constant threat due to agricultural and mining practices. The conservation will guarantee not only persistence of ecological services provided by hoverflies but also protection of a unique component of world's biodiversity.
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