ABSTRACT

Impact of rock climbing on cliff flora

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Climbing has become an increasingly popular sport in recent years, with the number of practitioners constantly rising. As an activity that takes place both in gyms and in natural environments, it seems obvious that it can have an impact on ecosystems and biodiversity. Some studies have looked at this impact in certain regions of the world and we decided to measure it on our local cliffs. In addition to investigating the presence of an impact, we aim to comprehend the adaptive mechanisms of plant communities to climbing. This involves closely observing responses at the species level.

Our study is spotted in the cliffs of the Thaurac, above Saint-Bauzille-de-Putois, in the department of the Hérault (France). Assisted by a climbing instructor, we conducted a plant inventory using abseiling techniques along vertical 2-meter-wide transects, descending from top to bottom. Three conditions were considered : unequipped without climbing equipment (21 transects), equipped with low climbing frequency (23 transects), and equipped with high climbing frequency (19 transects). To mitigate the impact of abiotic conditions, all transects were conducted on geographically proximate cliffs oriented to the South. For each transect, we recorded the identification of every species and the respective count of individuals per species.

To assess the impact of climbing on cliffs, we utilized various ecological indices and employed multiple models. Our analysis involved calculating the Hill index, a biodiversity measure incorporating proportional abundance, as well as the Simpson and Shannon indexes. Surprisingly, we observed no significant differences among the three modalities. Additionally, a Factorial Analysis of Correspondences (AFC) examining dissimilarities in plant composition between the conditions revealed no notable distinctions. These outcomes collectively indicate a lack of significant differences in large-scale species richness and community composition among the unequipped, low climbing frequency, and high climbing frequency modalities.

Delving deeper, we scrutinized the effect on abundance using a generalized linear model (GLM) and discovered that abundance in the "equipped with high climbing frequency" condition is significantly lower than in the other two modalities. Further categorizing relative abundance unveiled three groups within plant communities: 11 species negatively impacted by climbing activities, 4 species notably present in areas with high climbing intensity, and 43 species seemingly unaffected by climbing. A more detailed examination of life forms highlighted shrubs as the most affected, likely during the purging phase. Interestingly, contrary to findings in other studies, we did not observe an increase in species labeled as "specialists" with the escalation of climbing intensity. These comprehensive findings shed light on the nuanced impact of climbing on plant communities, emphasizing the need for a multifaceted approach in understanding ecological responses to climbing activities.

At the community scale, the impact of climbing on vegetation appears minimal, with areas both with and without climbing largely sharing the same species. However, specific species demonstrate susceptibility or resilience to this activity. Identifying these sensitive species holds the potential for implementing targeted management measures. Although clearing the cliff has limited long-term effects, as plants tend to reclaim the environment, the recurrent presence of climbers exerts continual pressure on the vegetation overall. This emphasizes the need for ongoing consideration and measures to mitigate the sustained impact on the plant community.