

Initiatives



Honorable Minister of State, Environment and Forests Government of India at National workshop Project Snowleopard. Photo: Yash Veer Bhatnagar.

and Kashmir, Nature Conservation Foundation, and International Snow Leopard Trust, India.

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The Importance of Mediterranean Alpine Biodiversity in Central Spain

Rosario Gavilán and Alba Gutiérrez Girón

Alpine communities in central Spain are found at the top of the Sistema Central, an east-west running mountain range consisting of different mountain chains. These communities grow in a somewhat reduced space, at altitudes of over 2,000 metres; the summits in this range are always below 2,300 - 2,350 metres, except Almanzor (2,592 metres), Peñalara (2,429 metres) and El Calvitero (2,401 metres) among others. The threats affecting conservation of alpine biodiversity are mainly related to the influence of big cities such as Madrid, the third most populous city in Europe with over three million inhabitants and more than six million in the Greater Madrid Area. The city is only 60 kilometres from the Sierra de Guadarrama, one of the mountain ranges in the Sistema Central. There are other smaller cities such as Ávila and Segovia with populations of approximately 50,000 which are also located very near the Sistema Central mountains. They exert an influence on the landscape similar to Madrid and there are similarities in their use of mountain resources.

Threats to mountain environments come mainly from recreational uses such as the presence of traditional ski resorts or worse still, the new ski resorts being built in some areas of the western Sistema Central. Hiking is probably the least harmful leisure activity in mountain areas, but hiking trails in many cases require some form of refurbishment.

Water supply in Mediterranean countries is always a serious concern for governments. In Madrid water comes from precipitation, as well as from snowmelt from mountain areas and is conserved in reservoirs situated in the surrounding valleys in the Sierra de Guadarrama. The conservation of natural vegetation can guarantee slope stabilization and prevent erosion processes which impact plant communities at lower altitudes and exert a strong negative influence on the capacity of reservoirs downhill.

The outlook for conservation of small alpine areas close to high population concentrations is poor in terms of sustainable development. We are currently developing research into alpine vegetation which includes interspecific associations, spatial patterns and processes, the study of rare flora and the monitoring of alpine vegetation to detect future changes. These surveys may assist decision-makers and people in charge of these areas to improve their conservation policies.

We have studied the role of plant species in forming organised communities by comparing small-scale spatial associations among species. High-mountain vegetation in these areas includes different communities depending on the habitats. We have focused on vegetation that covers the top of mountains in two areas: Sierra de Béjar and Sierra de Guadarrama, where communities are organised in patches or sometimes strips. The particular geomorphology of these ranges and the natural erosion processes have caused the tops of these mountains to be more or less flat, usually exposed to strong winds. In these environments, plant communities have a wide variety of species adapted to extreme conditions. There is an abundance of cushion plants together with other hemicryptophytic taxa and a scarcity of annuals (Gavilán et al. 2002).

Patch composition shows a majority presence of perennial plants, mainly cushion chamaephytes and hemicryptophytes. Among cushion plants, *Armeria caespitosa*, *Jasione crispa* and *Plantago penyalarensis* are common in patches, restricted to the highest altitudinal level. There is a larger number of hemicryptophytic species than cushions and most of them have a wider altitudinal distribution range; these are grasses such as *Festuca curvifolia*, *F. iberica*, *Nardus stricta*, etc., frequently found in patches. Only a few species of Compositae, such as *Leucanthemopsis alpina* or *Pilosella vahlii* show a more restricted altitudinal distribution.



Aspect of alpine plant community in Sistema Central. Blooming cushions of *Minuartia recurva* enclosing plants of *Jurinea humilis*, *Pilosella vahlii* or *Festuca curvifolia* inside. Photo: Rosario Gavilán and Alba Gutiérrez Girón.



High summits of Sierra de Gredos, western Sistema Central. Photo: Rosario Gavilán and Alba Gutiérrez Girón

Geographical distribution of species is similar in both territories; however some species have a particular, territorial distribution. This is the case of *Festuca curvifolia* and *Armeria caespitosa*, which are distributed in eastern territories, or *Dianthus gredensis* in western areas. There are also differences in life forms in both territories. Cushion plants are more prevalent in Sierra de Béjar than in Sierra de Guadarrama, except for *Minuartia recurva*. This fact could be related to the stage of the patches, as those rich in cushion plants are at earlier stages. In other cases the presence of some herbs, such as *Agrostis trunctula*, could also be related to pioneer patches.

Some of the most frequent species do not show statistically significant associations, as has been demonstrated in similar studies. For instance, *Festuca curvifolia* does not facilitate the growing of other species, probably due to its particular clonal growth (Körner, 2003), which makes it able to colonise new environments by forming monospecific strips of vegetation in some special situations. Similarly, other species, mostly cushions, but also other hemicryptophytes such as *Leucanthemopsis alpina* or *Agrostis trunctula*, can also act as pioneers. These species form monospecific patches in pioneer stages that allow other species to become established, thereby contributing to the development of the plant community.

Differences in the number of species on patches between both territories could be due to the pressure of grazing on these communities; the mountain goat (*Capra pyrenaica*) is less common in the higher altitudes of the Guadarrama range than in Béjar. In Béjar there is a greater pressure of grazing by cattle (sheep and cows), although sheep grazing is increasing in Guadarrama. The presence of *Festuca curvifolia* means this grassland is not very palatable to cows due to the hard leaves of this plant. They prefer *Festuca iberica* or *Nardus stricta* pastures which usually develop in meadows or concave sites where snow remains for longer, except in very dry summers. The flowers of a cushion plant, *Silene ciliata*, are usually eaten by sheep. This could have consequences on its reproduction

and on plant community development. However, the higher altitudes of the western mountains, with their greater influence by westerly winds which bring more winter precipitation in the form of snow or ice, could also produce a different plant community dynamism.

At the same time as there are positive interactions between plants, some plants also have a negative effect on others and do not allow seedlings to emerge or limit the potential growth of a newly established plant.

References

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