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A botanical crossroads between the Alps and the Mediterranean - the unique flora of the Maritime Alps and the Ligurian Apennines

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Transition zones are areas of extraordinary richness, regions where different elements and species meet and fuse together in unique mosaics of biodiversity. The Ligurian region, embedded between the heights of the Maritime Alps and the spurs of the Apennines, with a constant sight of the Mediterranean Sea, perfectly fits that definition. It is not just a perception but a consolidated scientific reality: recent analyses on Italian plant diversity have confirmed Liguria as one of the most biodiverse regions of the country (with 3574 plant species in 5418 km^2) and, consequently, it is a biodiversity hotspot in Europe (D'Antraccoli et al., 2024). This extraordinary concentration of plant taxa is the result of a complex interaction between geographical, climatic and historical factors. In a relatively small region, we can experience a spectacular transaction from strictly Mediterranean ecosystems dominating the coastline, to alpine and subalpine environments that characterize high elevations. The co-presence of different climates and heterogeneous geological substrates has resulted in the presence and co-existence of an incredible number of plant taxa with completely different ecological requirements: on the one hand, plants from the Mediterranean maquis, thermophiles that are resistant to summer drought, and, on the other hand, alpine endemics, glacial relicts adapted to cold climates and a short growing season (Figures 1, 2).

The climate in the coastal parts of the region led to the development of many significant gardens, one of the most famous being in La Mortola (Hanbury Botanic Gardens). This was established by Thomas Hanbury and his brother Daniel as an acclimatisation garden in the late 19th Century, and it is now a world-renowned botanical garden.

The region is also the subject of much scientific research. For example, the flora of the French and Italian Maritime Alps was used in a study by Adamo et al. (2021). The authors hypothesised that research attention is skewed towards colourful, conspicuous and broadly

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FIGURE 1 Habitats in the Maritime Alps. A, woodlands on the lower slopes in Val Roya. B, transition from alpine meadows to rocky slopes towards Rocca Abisso. Photographs Gabriele Casazza.

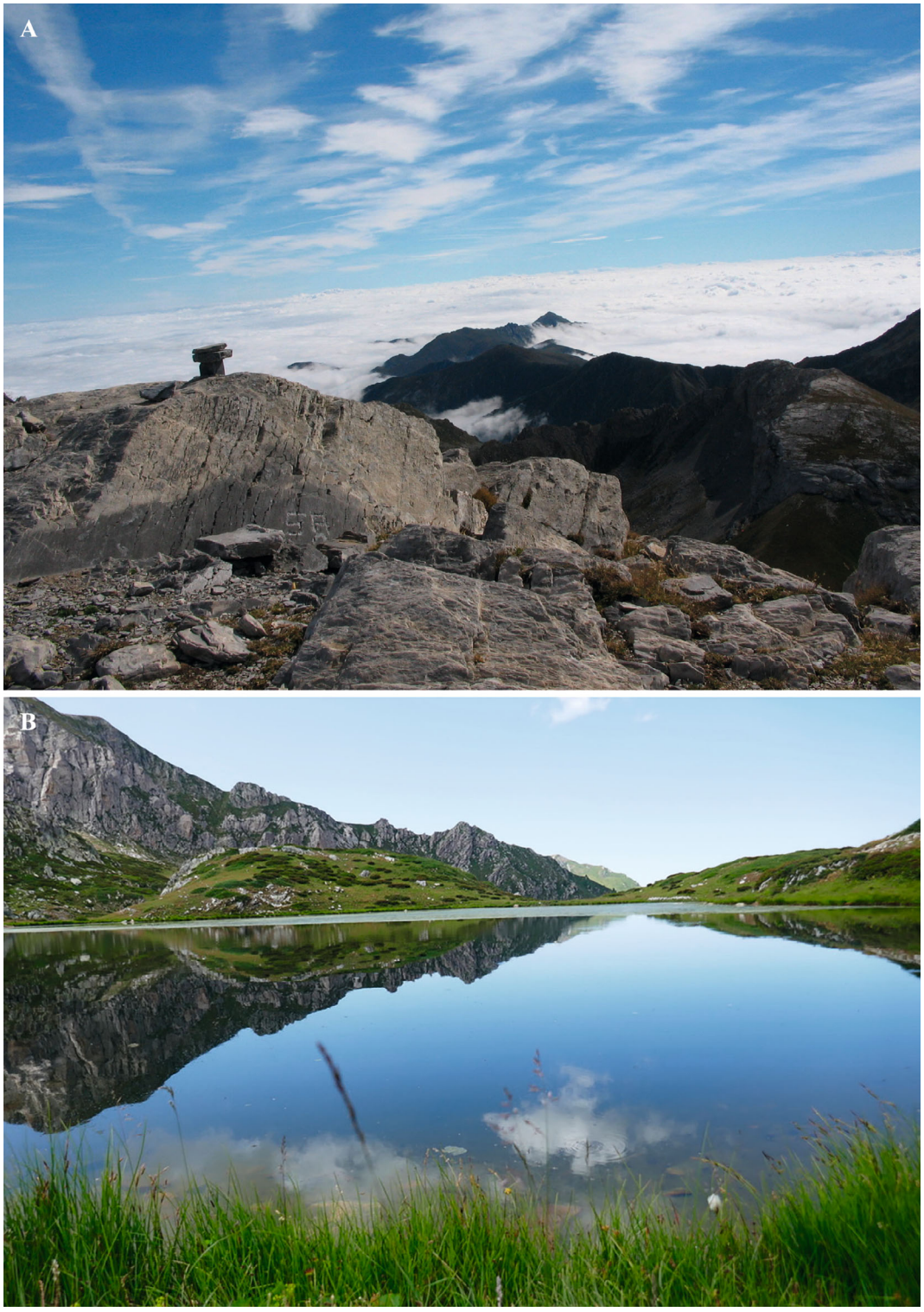


FIGURE 2 Habitats in the Maritime and Ligurian Alps. A, summit area in the Mongioie-Marguareis mountain range. B, Brignola Lake in the Ligurian Alps. Photographs Maria Guerrina.

distributed flowers, and in this study involving 113 species from the Maritime Alps, this was shown to be the case. For example, *Gentiana ligustica*, with showy, bright blue flowers, was the subject of much research, whereas some other species with less showy flowers, including *Berardia lanuginosa* (Guerrina et al., 2025, this issue), were comparatively poorly studied.

The interest in the floristic heritage of the Ligurian region is, however, not only recent. In the eighteenth and nineteenth centuries, the Maritime Alps became a prime destination for botanists and naturalists, especially from the UK. Attracted by the mild climate and by the promise of botanical discoveries, many of these visitors became passionately committed to the study of the local flora, leaving a heritage of knowledge that is still considered fundamental. Among these pioneers, Clarence Bicknell (1842–1918), a British vicar with eclectic interests, stands out. He was an amateur archaeologist, botanist, artist, Esperantist, author and philanthropist. He moved to Bordighera in 1878 and dedicated his last 40 years to the systematic exploration of the Ligurian Alps (Chippindale, 1984), describing and illustrating several plant species, as well as petroglyphs found in the Vallée des Merveilles. His works, including *Flowering Plants and Ferns of the Riviera and Neighbouring Mountains* (Bicknell, 1885), are not just floristic checklists, but true masterpieces enriched with splendid illustrations and watercolours, that combine scientific rigour with a profound aesthetic sensitivity. Despite his significance, Bicknell was not the only such person - he was part of a vibrant community of scientists and naturalists focusing on this area. In his own works, Bicknell mentioned and acknowledged the work of predecessors and contemporaries, including John Traherne Moggridge (1842–1874), a British naturalist who focused on the flora of Menton and surrounding areas. Bicknell himself mentioned the fact that in the preface of his *Contributions to the Flora of Mentone* Moggridge (1864) "*exhorted others to follow his example, and publish for the benefit and pleasure of the constantly increasing winter residents of the Riviera drawings of the many beautiful and interesting plants that may be met with along this coast and among its neighbouring mountains*". Moved by these words, Bicknell followed Moggridge's advice (Bicknell, 1885). Moggridge's work on the Maritime Alps was so important that one species portrayed in this number (*Fritillaria moggridgei*; Mucciarelli et al., 2025) was dedicated to him, as a lasting testament to his contribution. These naturalists not only collected specimens for herbaria, but also described distribution ranges, ecologies and phenologies, establishing the foundation for the modern phytogeography of this area.

The flora of the Ligurian Apennines attracted as much attention as the neighbouring Alps, with significant discoveries by botanists. In this framework it is impossible not to mention Domenico Viviani (1772–1840), former professor at the University of Genoa and founder of its Botanical Garden, and one of the pioneers of botany in Italy. During his explorations in the Ligurian Apennines, he found a spectacular orchid, unknown at that time. He described it as *Orchis brevicornis* in 1804 (described and illustrated in this issue as *Orchis patens* subsp. *brevicornis*; Calevo et al., 2025), unaware that a few years before a similar taxon had been described from the Algerian Atlas (*Orchis patens*). The Ligurian plants represented the first record in Europe for *Orchis patens* and the Ligurian population still represents the only one on the continent, the biggest population, and the most studied for conservation (Calevo et al., 2021, 2023). This discovery underlines how the Apennines, often perceived as less "wild" than the Alps, can also host inestimable treasures of biodiversity (Figure 3).

Nowadays this extraordinary natural heritage is challenged by a global threat: climate change. Alpine species are among the most vulnerable to the effect of global warming. Being adapted to conditions of deep cold temperatures and well-defined seasonal cycles, their persistence is strictly dependent on climatic conditions. Increasing temperatures are setting off a chain of cascading processes that threaten their survival. Large-scale studies across Europe have revealed a phenomenon known as thermophilisation where the more competitive, temperate-adapted species, once restricted to lower elevations, are moving upslope, favoured by milder winters and an extended growing season. This migration is generating an unsustainable competitive pressure on alpine species that cannot further migrate upslope – they are in a topographical



FIGURE 3 A, Ligurian Apennines and Mediterranean Sea from the Park of Portofino, a habitat of *Orchis patens* subsp. *brevicornis*; B, wetland (in August) on Mount Beigua. Photographs Jacopo Calevo.

cul-de-sac—and are being deprived of resources (e.g. space, light, nutrients) due to competition with more aggressive and/or fast-growing species. The result is a slow and inexorable contraction of their ranges (Pauli et al., 2012). Endemic species such as *Berardia lanuginosa* (also in this issue; Guerrina et al., 2025) or saxifrages from the Maritime Alps that found shelter in the alpine ridges and rock crevices are among these species.

Talking about the flora of the Ligurian Apennine and Maritime Alps is therefore simultaneously an exercise of naturalistic admiration and an act of responsibility. Studying, documenting and disseminating knowledge of these taxa, as we are trying to do in this issue of *Curtis's Botanical Magazine*, are the first crucial steps to build collective awareness of their importance and fragility. Understanding the evolutionary history of an endemic fritillary or orchid means understanding the value of a unique ecosystem, an open-air laboratory where evolution has been operating for millennia. Their preservation depends on our ability to act now, by protecting their habitats and by mitigating the impacts of stressors that constantly threaten to erase this inestimable treasure of European biodiversity.

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