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Editorial

An Introduction to Conservation Biology of Vascular Plants

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Vascular plants, i.e., plants with a vascular system containing xylem and phloem that include ferns, gymnosperms, and angiosperms, with nearly 350,000 species and subspecies currently accepted [1], provide crucial primary production, as well as vital socioeconomic (e.g., food, drugs, building materials, and human well-being) and environmental services (e.g., soil, water, and animal conservation). However, the diversity of vascular plants is very unevenly distributed and subjected to many threats across the globe. It is known that the diversity patterns of vascular plants are correlated with different measures of geodiversity [2], which represents the diversity of abiotic parameters such as topography, climate, or soils [3,4]. As a consequence, global centers of vascular plant diversity coincide with highly geo-diverse areas in the tropics and subtropics. Habitat loss, direct exploitation, indirect human influence through changing local ecological interactions (e.g., invasion of non-native plants), natural disasters, pollution, and intrinsic factors (e.g., unfavorable species traits) have been listed among the main threats for plant conservation worldwide. These threats can also lead to plant extinctions and this problem is globally known [5–7]. As these processes are exacerbated by global climate change, one of the most critical issues on the global agenda is the need to preserve native plant biodiversity for future generations. In general, the best strategy for long-term biodiversity conservation is in situ conservation, notably the enhancement of the degree of protection or the designation of new protected areas. Nevertheless, this strategy is deemed insufficient in reducing the increasing losses of both species and natural habitats around the world [8]. For this reason, some ex situ techniques have been suggested, such as germplasm banks, living plant collections, and managed relocations. Despite this knowledge, the conservation of plant diversity has received considerably less attention than the conservation of animals, perhaps because plants lack the popular appeal of many animal groups [9]. As a result, plant conservation is greatly under-resourced in comparison to animal conservation [10]. Since a high proportion of plant species are predicted to face extinction in the near future, for plant conservation, it is essential to understand their spatial distribution on Earth, but also their eco-biology and the threats to which they are subjected.

This Special Issue of *Diversity* on "Conservation Biology of Vascular Plants" explores some aspects of conservation biology of plants. The studies presented here were carried out in Italy, a territory known for its extraordinary floristic richness and high rate of endemic richness [11], located within the hotspot of the Mediterranean Basin [12]. It is hoped that the papers contained herein will inspire and encourage future applications in plant conservation across the globe.

The paper by D'Auria et al. [13] deals with the cypress forest of Fontegreca in southern Italy. Although its native status in Europe and Italy is still a subject of debate [14,15], this forest seems to be the only example of natural cypress forest in western Europe characterized by *Cupressus sempervirens* L. var. *horizontalis* (Mill.) Laudon (Cupressaceae) [16]. In order to improve knowledge on this interesting topic, in this study, the authors carried out an in-depth investigation of the recent history of the cypress forest of Fontegreca by reviewing historical documents, together with soil charcoal and pedological analysis. The authors found that the first historical document which mentions this forest used for grazing and wood collection is from the year 1506. The results of soil chemical properties and anthracological analysis, based on taxonomic identification and the 14C dating of charcoal pieces from soil profiles, allowed the young age of soils to be ascertained due to slope erosion and the presence of forest species, dating back to the second half of the 20th century.

Silvestro et al. [17] investigated the strategy of seed release adopted by *Primula palinuri* Petagna (Primulaceae) to improve knowledge on the biology of this Italian endemic species and promote its conservation. *Primula palinuri*, which generally grows on limestone cliffs and rocky slopes along the Tyrrhenian coast of Italy between southern Campania and northern Calabria, was recently assessed as WU (vulnerable) in the IUCN Red List of the Italian Flora [18]. The authors of this study reported, for the first time, the occurrence of serotiny (i.e., aerial seed banks) in the genus *Primula*. Field data on the reproductive phenology of *Primula palinuri* showed that: (1) species can develop an aerial seed bank, lasting up to two years; and (2) capsules look mature and dry in July, some of them show first cracks on the apex in August, and start to dehisce and disperse the seeds in October. In a laboratory test, authors showed that the repetitive wet and dry cycles served as the main environmental factor triggering capsule dehiscence. To be more specific, after capsule dehiscence is triggered by cycles of wet–dry conditions, capsules promptly close when wet and slowly open again upon drying. With this adaptive strategy, once capsules open, seeds are not released at the same time. The ability of *Primula palinuri* to distribute seed release over time can be interpreted as an opportunistic strategy to cope with the uncertainty of environmental conditions.

In order to monitor the conservation status of habitat listed in annex I and plant species listed in annexes II of the Habitat Directive (Council Directive 92/43/EEC) in inaccessible sites to scholars, Strumia et al. [19] tested the use of an unmanned aerial vehicle (commonly known as a drone). The authors, who conducted their study on a coastal cliff of southern Italy rich in species of phytogeographic interest and compared the observations carried out by four botanists with no homogeneous background, stated that four of the five target species (i.e., *Eokochia saxicola* (Guss.) Freitag and G. Kadereit, *Primula palinuri* Petagna, *Crithmum maritimum* L., and *Dianthus rupicola* Biv. subsp. *rupicola*) were easily detected without differences between the data collectors. Only *Limonium remotispiculum* (Lacaita) Pignatti was difficult to identify due to the small size of its rosette and inflorescence and the grayish color of the leaves that cause it to "blend" in with the rock in the background. The authors point out that their results support the use of UAVs as an affordable and fast survey technique that can rapidly increase the number of studies on cliff habitats and improve ecological knowledge on their plant species and communities.

In a scenario of global changes, the conservation of nature, and therefore also of vascular plants, requires multidisciplinary approaches. At the same time, rapid changes in ecosystems, mainly induced by unsustainable anthropogenic activities, require urgent conservation actions and new development models for populations all over the world. It is therefore necessary that political decision-makers, often insensitive or ignorant in the confrontation of these crucial issues, acquire this new awareness aimed at long-term sustainable development. The hope is that the documents presented in this Special Issue can help to achieve this essential goal for the life of humans and other species on Earth.

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