BOOK OF ABSTRACTS

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Plant Conservation and Ecosystem Restoration in the Mediterranean

4th Mediterranean Plant Conservation Week

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Rare or common? Developing protection schemes for bisexual-parthenogenetic species

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Parthenogenetically reproducing species, which lack at least some of the genetic recombination mechanisms, are more vulnerable to loss of genetic diversity compared to sexually reproducing species. Investigating the role of sexual ancestor populations in maintaining genetic diversity and, consequently, the acclimation potential of parthenogenetic populations will provide the basis for developing effective conservation measures. *Chara canescens* has been chosen as the model organism to investigate this because of the relevance of this organism group. Charophytes play an important role as habitat engineers in mesotrophic to eutrophic water bodies by providing shelter for zooplankton and juvenile fish, allowing for efficient top-down control of phytoplankton and consequently stabilizing clear-water conditions, which enhances the ecosystem service provision. For coastal water lagoons, *Chara canescens,* as the only true brackish water species of charophytes, is the key element for stabilizing clear-water status. Until now, only parthenogenetic populations are known for coastal lagoons world-wide; sexual reproducing populations are restricted to Mediterranean and Pannonian inland brackish water sites, whereas the distribution maximum clearly is in the Baltic Sea region, requiring long-distance vectorial transport. Protecting the coastal stands only will not be effective, because their fitness depends to a high degree from connectivity with inland brackish water sites. Those inland sites are, if at all, protected for other reasons, mainly bird protection, which can result in conflicts of interests and even harm the charophyte stands. In order to develop effective transnational conservation strategies, it is necessary to provide the site managing authorities with the knowledge about niche structure to allow multi-target management of the sites bearing the extremely rare bisexual populations. Unravelling recent as well as past gene flow via stepping-stone habitats will allow for estimation of the effects of lost inland brackish water sites and identifying potential gaps which need to be restored. For this, niche structure differences between parthenogens and bisexuals as well as the restoration suitability of lost habitats needs to be assessed. The presentation (showing data from a Biodiversa+ project) will give an overview about the current state of knowledge, highlighting the role of diaspore banks as “hidden biodiversity elements”. These diaspore reservoirs are not only ensuring mid-term resilience of temporary or/and degraded habitats but could be also potentially useful for restoration initiatives.

Keywords: Charophytes, *Chara canescens*, inland brackish water, wetlands, integrated protection

An international network for the protection of sexual and parthenogenetic populations of streptophytic green macroalgae (*Chara canescens*)

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The loss of genetic diversity is considered a key element in entering the extinction vortex. This is especially true for asexually reproducing species, where recombination of traits is limited to the genetic variability of a single parent. The conservation of genetic diversity is thus a central element of conservation concepts. This presentation focuses on a project (Biodiversa+ 2021-2022) studying the stonewort *Chara canescens*, a species consisting of a few sexually reproducing populations and widespread asexual ones. The asexual populations are mainly found in Europe, with a few outposts recorded from North America, Australia and Central Asia. Sexual populations are very rare, only five sites are currently known worldwide, four in the Mediterranean and one in the Pannonian Basin. Previous studies have shown that the *Chara canescens* asexual populations have a higher genetic diversity than assumed. These results have led to the establishment of this hypothesis: “Species consisting of linked sexual and asexual populations can overcome the risk of loss of genetic diversity as long as efficient transfer of genotypes between populations is ensured”. So far, little is known about the connections between sexual and asexual lineages of a species. We will gather the knowledge necessary for the development of transnational conservation strategies. Based on this, we will establish a network for the sustainable conservation of C. canescens, as said, composed of extremely rare bisexual and common parthenogenetic populations. For this, field work at recent sites as well as analysis of herbarium material will be carried out to unravel recent and past gene flow within and between populations. The key activities will be: (1) to identify former and recent inland brackish water sites suitable for sexually and parthenogenetically reproducing populations, (2) to gain knowledge on recent and past genetic diversity of the target species, (3) to evaluate the potential of a few sexual populations in sustaining the genetic diversity of the widespread parthenogenetic populations. These data will provide a sound scientific basis for the ultimate goal: to develop management plans for inland brackish water sites that meet the requirements of C. canescens embedded in a transnational network of conservation sites with sexually mature populations, and focus on maintaining effective gene flow. In this presentation, the strategies to develop this plan, consisting of recommendations for site management and information exchange among network partners will be put forward.

Keywords: aquatic flora, charophytes, conservation strategies, genetic diversity, inland brackish water

Masters of survival: Why are climate relict plants so important?

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The Mediterranean Basin hosts several plant species that are defined as climate relicts. Most of them have a very narrow distribution range, and their survival is very often related to particularly favourable (micro)climatic conditions (e.g., no or slight seasonal water stress, no frost damage). Many of these relict plants represent the last remnants of ecosystems once widespread across the entire Palearctic; they gradually disappeared during the Pleistocene, mostly due to repeated glacial events.
Understanding the strategies adopted by climate relicts to face global changes is of paramount interest and may help us to bear light on ongoing climate change. In fact, to survive in the long-term, such plant species underwent important niche shifts, which in turn often required deep changes in their physiological, anatomical, and reproductive traits. Moreover, most climate relicts live “out of context”, behaving like “special guests” that bear many traits that are uncommon in the plant communities where they currently grow. In fact, they often represent the only survivors of the extinct ecosystems they used to live in, and past global changes may have affected not only the assemblage of co-occurring vascular plants, but also other key components such as pollinators, seed dispersers, predators, symbiotic soil organisms or pathogenic fungi.
The study of the distribution pattern of relict plants looks very promising and of paramount concern when combined with the study of other biogeographically peculiar taxa. For instance, it cannot be a coincidence if large ferns of paleotropical origin, narrow-ranged and evolutionary isolated plants, species belonging to monotypic and/or endemic genera or subgenera, and plants with highly fragmented distribution ranges grow in the same region. Instead, the co-occurrence of such plants may provide valuable pieces of knowledge to the understanding of specific mechanisms and processes allowing their persistence until present time and may represent a useful, complementary clue for identifying important and still neglected refugial areas.

Keywords: adaptation, ecosystem functioning, evolution, historical biogeography, species assemblages