

Evaluating biodiversity dimensions of a small isolated outcrop (Csóka-kő, Keszthely Mountains)

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ABSTRACT

Dolomite outcrops are well known for their high ability to retain plant diversity. Due to isolation and reduced sizes, they often support small plant populations, which may be exposed to anthropic pressure due to tourism. We evaluated the botanical and ecological importance of the small isolated outcrop Csóka-kő and of the surrounding Kő-hát, located in the Keszthely Mountains. We grasped the concept of biodiversity by assessing its three different aspects: species richness, diversity of plant families and the number of protected species, and we evaluated the influence of climate on the geoelement composition. In a relatively short study period, we identified 188 vascular plant species across 141 genera and 55 families, of which several were red listed. Submediterranean geoelements were the third most frequent, indicating the expected influence of the Submediterranean climate in this region. Our findings signal outstanding floristic diversity and conservation value of Csóka-kő and its surroundings.

Keywords: Conservation, Geographic distribution, Red list, Phylogenetic tree, Species richness

1. INTRODUCTION, PROFESSIONAL BACKGROUND

Csóka-kő (46°49'02.6"N 17°14'15.3"E) is a dolomite outcrop located at the Southern edge of Keszthely Mountains in Hungary (Figure 1). The dominant vegetation at its foothills is represented by Turkey oak – Sessile oak forests, which on shallower soils and in warmer habitats transition to scrub woodlands alternating with patches of steppes and rock grasslands^[1]. The floristic composition of the area is strongly influenced by the Submediterranean climate, marked by the presence of species like *Hippocrepis emerus*, *Cotinus coggygria*, *Himantoglossum adriaticum*^[1]. Csóka-kő is home

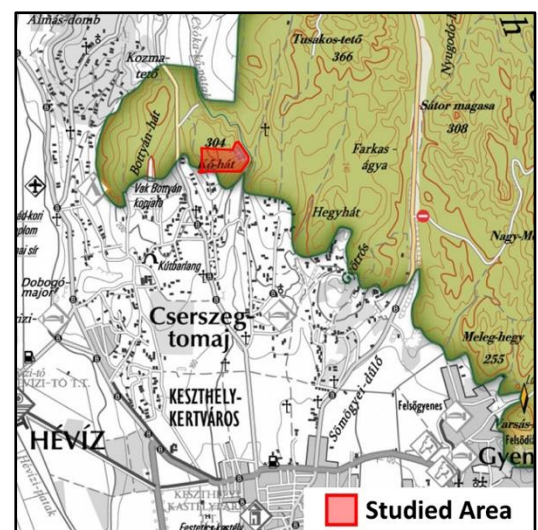


Figure 1. Map showing the geographical location and the approximate extent of the studied area.

to several rare endemic species to Hungary such as *Sorbus danubialis* and *Seseli leucospermum*, as well as rock grassland relicts such as *Aurinia saxatilis*^[1]. The habitat has escaped the historical Black pine (*Pinus nigra*) plantations, due to which the vegetation has been preserved in a relatively natural state^[2]. Csóka-kő belongs to the Natura 2000 network of protected areas in Europe, being included in the Keszthely Mountains Special Area of Conservation, designated based on species also present on Csóka-kő (e.g., *Seseli leucospermum*) and habitats such as 6190-Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*), and 91H0-Pannonian woods with *Quercus pubescens*^[1]. Despite its importance for conservation, a detailed floristic checklist of Csóka-kő is still missing. The only reference available to us thus far is a summary species list of 29 taxa, compiled in 2002 by Dr. Judit Bódis (unpublished data). Kő-hát is a steppe grassland of 800 m² connected to the hiking-trail leading to Csóka-kő. On Kő-hát, physical weathering of the dolomite bedrock resulted in shallow soils and high diversity of plant species and habitats, such as the Pannonian-Balkan Turkey oak – Sessile oak forests and Pannonian woods with *Quercus pubescens* (codes 91M0 and 91H0 in Annex I of the EU Habitat Directive)^[1]. Both Csóka-kő and Kő-hát are exposed to severe anthropic pressure from tourism.

2. AIMS

The main goal of this study was to prepare the vascular plant species checklist of Csóka-kő and Kő-hát, and to highlight the biodiversity and ecological importance of these habitats. We aim to raise awareness on the protected plant species found here, and on the conservation value of dolomite outcrops in general. Our research will serve management plans directed to contribute to the biodiversity conservation in the area.

3. MATERIALS AND METHODS

Fieldwork has started on the 28th of February 2020 and is still ongoing. Csóka-kő and Kő-hát were visited every week to follow the emergence of species across the seasons, and species were identified using the Hungarian Flora ^[3]^[4]. All species identified were documented via photographs compiled in a visual-database, and several species were collected in a personal herbarium for precise identification. We evaluated three aspects of biological diversity: the total number of vascular plant species (species richness), the diversity of plant families, and the number of taxa in the Red List of Hungary^[5] and in Annex II of the EU Habitat Directive^[1] We investigated the effect of Submediterranean climate on the geoelement composition of the area using the Flora Database of Hungary^[6]. All data were compiled in an Excel spreadsheet, and barplots representing the diversity of plant families and geoelements were prepared in R 4.0.3 using the GGplot2 package^[7].

4. RESULTS AND DISCUSSION

Species richness and diversity of plant families

Since 28 February 2020 a total of 188 vascular plant species were identified on Csóka-kő and its surroundings. The checklist includes 141 genera of 55 families, and it is still incomplete, especially for species of Poaceae and Cyperaceae families and apomictic species of *Sorbus* and *Hieracium* genera. The most species-rich families were Fabaceae with 17 taxa and Rosaceae with 15 taxa (excluding *Sorbus* microspecies), and further five other families had 9-15 species, indicating their high diversity (Figure 2).

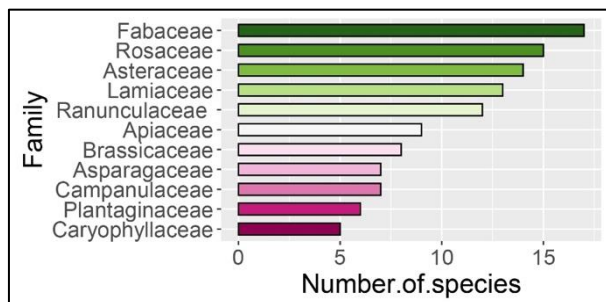


Figure 2. Barplot showing the number of vascular plant species in the most species-rich families at Csóka-kő and Kő-hát.

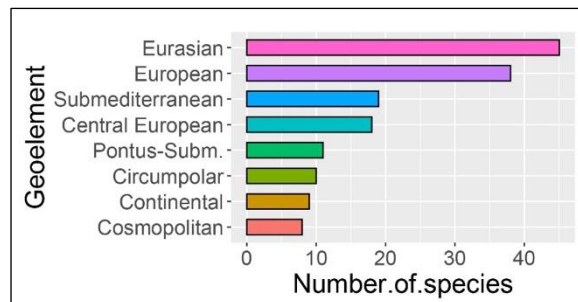


Figure 3. Barplot showing the number of vascular plant species in the most species-rich geoelements at Csóka-kő and Kő-hát.

Protected species

We identified several red listed species in the area. *Hippocrepis emerus*, a vulnerable (VU) species according to IUCN and restricted to the Balaton uplands in Hungary^[3] has a notable-sized population next to the Csóka-kő dolomite outcrop. At Kő-hát, there was an abundance of protected species (e.g. *Linum tenuifolium*, *Pulsatilla pratensis*), and a smaller population of the endangered (EN) *Himantoglossum adriaticum*, listed in Annex II of the Habitat Directive. Populations of several species were negatively impacted by uncontrolled tourism.

Submediterranean climate

Most species (45) were Eurasian geoelements (e.g. *Pimpinella saxifraga*), followed by the European geoelement represented by 38 taxa (e.g. *Campanula patula*). The third most common distribution was the Submediterranean geoelement (19 taxa, e.g. *Cotoneaster tomentosus*), which outranked the Central European and Continental counterparts (Figure 3). This composition indicates the expected strong influence of the Submediterranean climate in the region.

5. CONCLUSION

The flora checklist, although still incomplete, indicates the outstanding floristic diversity and the notable conservation value of Csóka-kő dolomite outcrop and of Kő-hát in the surroundings. The Submediterranean influence can differentiate the role and importance of the studied area from other similar dolomite outcrops located at more Northerly geographic positions in Hungary, where the climate is different. The results serve as a very useful tool for raising public awareness on the outstanding biodiversity of open dolomite

grasslands and on plant species of high conservation interest in Hungary, protected by national and European legislation.

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