

Editorial

Biodiversity in Karst Landscapes: Introduction to the Special Issue

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Karst landscapes are a set of various features built of rocks that are soluble in water. They represent a mosaic of environmental and climatic conditions, such as sinking streams, sinkholes, large spring caves, or enclosed depressions. Together with the heterogeneity of the habitat, the local influence of the climate and the geographical isolation, this leads to an extraordinary biological diversity with endemic species. Speciation and the presence of discontinuous populations with phylogenetically distinct origins are often found there. These landscapes are highly sensitive to human impacts; nevertheless, many of them are under severe anthropogenic pressure due to the long history of overpopulation, freshwater consumption, agricultural irrigation or climate change today. Although recognized as important areas from both a human and a biological or scientific point of view, karst areas are still highly threatened, and little studied worldwide.

The aim of this Special Issue was to highlight new research on the biological value and importance of karst landscapes and the need for their protection. In this issue, we have published 11 outstanding papers from around the world, covering a range of organisms, study areas and topics. The studies were conducted in China, Russia, Israel, Palestine, Europe, Mexico, and Brazil. They cover a wide range of organisms, from microbes to plants, invertebrates such as mites, spiders or benthic macroinvertebrates, and vertebrates such as fish.

We are particularly pleased that four papers have been made in a widely recognised biodiversity hotspot in Europe that is still insufficiently explored—the Dinaric Karst [1–4]. Two papers focus on endemic fish species [1,2] from the genus *Telestes* and the species *Delminichthys krbavensis* (Zupančič and Bogutskaya, 2002). High intraspecific genetic diversity and high vulnerability of *Telestes* species are found as well as a high potential threat from invasive species [1]. The second paper on the fish fauna [2] is the first report ever on a species of the endemic genus *Delminichthys*. Detailed descriptions of morphometric features as well as meristic counts of the species' early development are presented to provide a better understanding of this vulnerable part of its life history. The third paper [3] addresses plant communities and their architecture in relation to the environment in a typical karst landform-enclosed terrain depression known as a doline, with a strong ecological gradient. It was confirmed that *dolines* have a high conservation value. The fourth paper [4] addresses water beetle species living exclusively in karst springs in the Dinaric Karst region and gives a detailed overview of its taxonomical, biological, and ecological characteristics. All these contributions strongly emphasised the need to implement conservation measures in this area.

Although oribatid mites are very diverse and abundant animals in karst habitats, they are still poorly studied. The paper [5] in our issue is of particular importance, as it deals with their diversity and ecology in the karst landscapes of European Northeast Russia and includes a detailed analysis of soil types and plant communities. Another paper focusing on terrestrial ecosystems examines the carbon cycle of karst forests in China [6] and identifies the amount of litter carbon input as the main factor in the carbon saturation deficit.



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Cave ecosystems are inevitable habitats when karst areas are discussed, so two papers address cave biota. The first [7] examined the zonation of spider assemblages based on the ecological zonation of Levantine caves in Israel and Palestine. Both environmental conditions and competition are the driving forces for the spatial dynamics of cave spiders with a high degree of endemism and defining a hotspot of biodiversity. The second paper [8] addresses the microbiota in a specific environment of ferruginous and quartzite caves, the Iron Quadrangle (IQ) region in Brazil [8]. The microbiota identified showed biotechnological potential in addition to their taxonomic and ecological importance, highlighting the urgent need for conservation programmes in these highly anthropogenically influenced areas.

In addition to terrestrial biota, papers in the issue also cover the freshwater representatives. The beta diversity of benthic invertebrates was studied in 13 tropical lakes [9] and that of microcrustaceans in 17 lakes [10] in Mexico. There, high benthic invertebrate diversity was found in combination with high environmental heterogeneity, underlining the importance of conservation measures at the regional level. In another part of the world, in a typical European karst environment, the Lake Doberdò [11], benthic communities and seasonal trends in environmental conditions were studied using a multiannual approach, which clearly showed that this biodiversity reservoir is very sensitive to climate change and human water use.

Although the papers in this Special Issue are at first glance very different, they have a common message: karst areas all over the world are at the same time reservoirs of biodiversity, often inhabited by endemic or specific species, but potentially threatened by today's climate change and anthropogenic impacts. Further recognition of these areas is necessary to develop monitoring programmes and conservation measures, and Special Issues such as this are needed to further promote this topic.

Conflicts of Interest: The author declares no conflict of interest.

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