

European National Parks with karst landscapes

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Introduction: Karst landscapes are generally rich in spectacular geomorphological and speleological phenomena. On the other hand, karst terrains are less suitable for traditional, agricultural land use. Historically, these settings meant mostly disadvantages, hence karst landscapes remained less densely inhabited and poor regions relatively to their neighboring areas (Telbisz *et al.* 2014, 2015, 2016). However, due to the extreme increase of tourism especially after the World War II, the situation changed as some karst phenomena like caves or gorges became popular tourist targets. Although many karst terrains were known for tourists since long ago, new trends like adventure tourism can

be also important due to activities such as canyoning, canoeing or caving. Moreover, geotourism is also a new possibility that may increase the awareness of tourists also in relation with karst terrains. However, not only the viewpoints of tourism, but the relative intactness of karst landscapes is also a significant factor, which made it possible to designate nature protection areas on karsts. Among IUCN categories, probably the ‘national park’ is the most respected and the best known category. Firstly, it is an interesting question to what extent karst landscapes are represented in this category. Secondly, whether these karstic or partly karstic national parks are able to maintain the local popu-



Fig. 1. Different karst national parks: a crowded (Krka), an old (Ordesa), a less visited (Burren), and one with strong cultural identity (Cevennes).

lation and help them getting better life conditions. The third question is, where mass tourism reaches karst areas, is the natural heritage violated in some way or not. In the present study, these issues are examined in a European context.

Spectacular karst phenomena: Karst is found on soluble rocks, especially limestone, marble, and dolomite (carbonate rocks), but is also developed on gypsum and rock salt (evaporite rocks). Karst landscapes are characterized by sinking streams, caves, enclosed depressions, dry valleys, gorges, natural bridges, fluted rock outcrops and large springs. Karst landforms are produced by rain-water dissolving rock, but other natural processes often intervene, such as river erosion and glaciation, which modify the karst forms and produce intermediate landscape styles such as ‘fluviokarst’, ‘glaciokarst’, *etc.* Most caves form by dissolution by normal meteoric waters, although some are dissolved by thermal waters enriched by CO₂ and occasionally acidified by oxidized H₂S. Other caves form by dissolution at the interface of fresh and salt water along the coast (Williams 2008). This variety of karst landforms and processes are also reflected in the diverse European karstic national parks.

Methods: Based on scientific literature, internet resources and field experiences we have collected a list of European national parks with karstic regions has been collected. Their geomorphological and geological values and monuments are compared, and their statistical characteristics and spatial distribution within Europe are analysed. Based on some selected examples, their role and potential in the tourism of national parks, and in the regional development in general are characterized.

Notable karst national parks in Europe: The first national parks in Europe were established in Sweden in 1909, in Switzerland in 1914 and in Spain in 1918. Spain is notable in our case, because both the Ordesa y Monte Perdido (Fig. 1) and the Picos de Europa national parks founded in 1918 are at least partially on karst terrains, more precisely on glaciokarst terrains, thus they are the oldest karst national parks in Europe. Since that time, more than 400 national parks were designated in

European countries, many of them including karst terrains. There are large differences among karst national parks in foundation year, area, surface karst type, number and extension of caves, visitors numbers, *etc.* The foundation of some national parks is certainly motivated by political factors as well, but most of them were created for nature protection and for tourism reasons. Just to mention a few examples, there are national parks with crowds of visitors, for example the Picos de Europa National Park attracts 1.8 million visitors/year, the Plitvice Lakes National Park (Croatia) receives 1.3–1.5 million visitors/year. Although Postojna Cave (Slovenia) is not part of a national park, it hallmarks the strength of cave tourism, because since its opening to the public in 1819 more than 38 million people have visited it. In some places, the national park administration already had to limit the number of visitors, for example, the number of tourists is restricted to 10,000 persons at a time at Skradinski Buk waterfall (Fig. 1) in the Krka National Park (Croatia) due to concerns over safety and damage to the landscape. On the other hand, there are much less visited national parks (*e.g.* Burren in Ireland: 75,000 visitors/year, Fig. 1), where national park managers make great efforts to increase the number of tourists. Finally, there are karst national parks, which are seemingly unknown for the large public.

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