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The Črni Kal Quarry - An Example of Destroying Geotopes

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Abstract

Although we are slowly becoming aware of the necessity to preserve the geotopes, there are also problems arising from their protection. It is practically impossible to save some of geotopes in their entirety of which the quarry of Črni Kal near Koper is one example. Here are many interesting fossils including Palaeogene corals, foraminifera, molluscs and Pleistocene mammals in infilled karst caves.

1. INTRODUCTION

People are becoming increasingly aware of the need to protect natural, cultural and historical treasures. This is inevitably a compromise between present needs and the preservation of our heritage for future generations. Although in many cases this intent has come too late, it is still possible to save many sites.

This generalisation is also applicable to special geological sites, which following the example of biotopes, are called geotopes. After STÜRM (1994) the "Geotopes are distinct parts of the geosphere of outstanding geological and geomorphological interest. They have to be protected against influences which could damage their substance, form or natural development". Bearing in mind a planned and energetic form of protection, the geotopes have only been cared for relatively recently. Only important localities of fossils, minerals, rocks, karst caves and other speleothems, tectonic forms, significant profiles, geomorphologic forms, etc. are considered. They have to be protected against devastation or damage. They are natural monuments of great importance for science and the public (PAVLOVEC, 1996).

There are different forms of protection, from loose legislation to strict restriction. In Slovenia there are some geotopes that are considered to be natural monuments, of which the Triglav national park is the most strictly protected, as the removal of fossils, rocks, minerals, landscape and others, is prohibited. The Škocjan caves (Škocjanske jame) have the special status of being under the protection of UNESCO, as the only geotope of this kind in Slovenia.

The protection of a geotope by legal legislation is one thing, but the actual implementation of such documents is often difficult. Physical protection of geotopes with fences and similar measures is quite effective, yet in most of the cases it is impossible to undertake. Such geotopes are under threat of devastation as soon as their locations are generally known. This is also the case for protected plants and other objects.

In 1995 the following declaration was adopted at the symposium in Sofia: "Our duty is to protect the geotopes for future generations. The history of the Earth is as important as the history of the human being. The devastation of cultural monuments is a criminal act against humanity. It is also impossible to restore attractive geological spots. We are all their guardians; especially governments that can influence the protection of geotopes" (PAVLOVEC, 1996). Theoretically speaking, this declaration is sound, but the practical physical protection of a geotope is problematical. It is almost impossible to control the execution of protective measures in the entire Triglav park. Undoubtedly there are people who now and then take an ammonite from the region of the Triglav lakes or any other fossil from somewhere else. There is a comparatively small number of guards who very rarely patrol the area.

An extraordinarily interesting and problematic example concerning the protection of geotopes was described by Stürm. Close to Zürich there are glacial traces that represent "the most magnificent morainic landscape in Switzerland" (STÜRM, 1994). However, building material for structures in Zürich has been taken from this very interesting locality. Severe struggles between architects and environmental protectors have finally led to the successful protection of the landscape. Stürm remains sceptical about the situation and is afraid of further devastation.

When protecting or even designating geotopes other, often entirely economic problems may arise. Undoubt-

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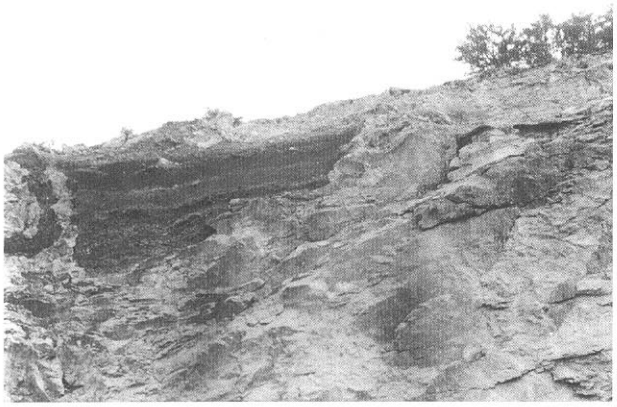

Fig. 1 A karst cave filled with sediments, a Middle Palaeolithic station, discovered in 1955 in the Črni Kal quarry.

Fig. 2 The 1955 excavation of the Palaeolithic station at Črni Kal.

edly the extraction of ore in the Mežica mine could not be stopped merely because of the well-known beautiful crystals of wulfenite. Sometimes the experts fail in their choice of the best possible way to protect geotopes. In the surroundings of Drenov grič near Ljubljana there are remarkable speleothems and tectonic phenomena, interesting and important fossils, and interesting developments of the Upper Triassic strata. This area has been determined as a place of geological interest with information boards, a small geological collection and other such features. Some artistic pieces - "forma viva" - have been added. Regretfully the organizers have allowed the artists to use other rock types as well, which do not fit geologically into this environment, to the detriment of the appearance of the geotope.

A second problematic case of geotope protection is the quarry of Črni Kal near Koper in south-western Slovenia.

2. INTERESTING GEOLOGICAL SIGHTS IN ČRNI KAL QUARRY

At Črni Kal many interesting fossils can be found. The alveolina-nummulites limestones from the Eocene are rich in foraminifera, belonging mainly to the genera *Alveolina*, *Nummulites* and *Orbitolites*. The remains of molluscs and sea urchins are sparse, but corals and other macrofossils also occur. In some places, karst clay that has infilled karst caves is rich in the remains of Pleistocene mammals. Prehistoric human tools and artefacts have also been found. Tectonic phenomena, especially tectonic mirrors and faults are clearly visible.

2.1. PALAEOLITHIC STATION

In spring 1955 at the quarry, close by the Ljubljana-Koper highway, blasting of limestone masses revealed a cave filled with Quaternary sediments in the quarry wall at a height of 20 m (Figs. 1 & 2). In the red clays, of Riss-Würm age, BRODAR (1958) discovered a fire place with burnt animal bones, while in the Lower Würm, he came across some Neanderthal tools. Some years ago, the back wall of the quarry (Fig. 3) disclosed one part of a shaft filled with red clay, stalactites and various herbivorous fauna. On the fragments of (*Rhinoceros*?) ribs, cuts made by stone tools were clearly seen. Isotopic studies of the sinter (GR.N-22338) revealed an age superior to 45.000 years.

2.2. FORAMINIFERA

The quarry is located in the alveolina-nummulites limestone of Eocene age. Some parts are rich in alveolinas, while nummulitins are concentrated in the others (Fig. 4). Beside alveolinas, orbitolites are present, but they are generally sparse. Alveolinas reach several centimeter in diameter. The largest nummulites belong to the species *Nummulites polygyratus* DESHAYES, that was first discovered in this very place, in the oldest part of the Middle Eocene (MIKUŽ & PAVLOVEC, 1995). It was previously believed that *Nummulites polygyratus* belonged to the Upper Cuisian. In some beds there are numerous "operculinas" (*"Assilina" praespira*), as well as true assilinas, for example *Assilina istrana* PAVLOVEC (= *Assilina spira abrardi* SCHAUB).

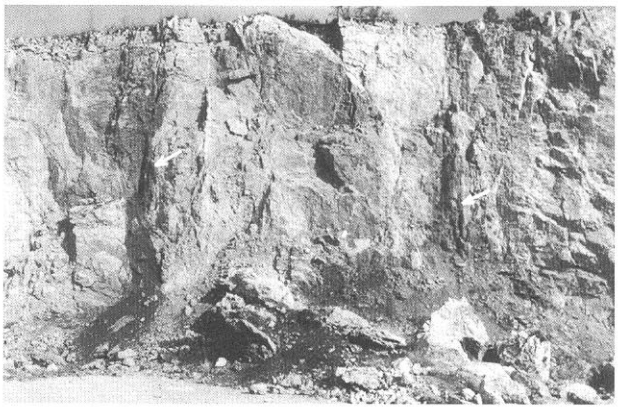

Fig. 3 The 1997 remains of the Palaeolithic station in the quarry of Črni Kal.

Fig. 4 Nummulitins distribution in the Eocene limestone in the quarry of Črni Kal as an example of palaeoecological events.

Some "nests" of nummulitins and their irregular distribution in the sediment are especially interesting, indicating both a partial shift of sedimentation with waves and streams, and a rough sea bottom. In this respect some parts of the quarry represent an extraordinary opportunity for the study of palacobiocoenoses.

2.3. MOLLUSCS

The shelly partings are rather sparse. The most interesting snail species is *Campanile giganteum* (LAMARCK), the largest known snail in Slovenia (MIKUŽ & PAVLOVEC, 1995). It is especially famous because it was found in the Eocene alveolina-nummulites limestone. Other snails of approximately the same size, occur most frequently in the clastic rocks of Dalmatia and Herzegovina, but are sparse in limestones.

2.4. CORALS

Corals rarely occur in the Črni Kal quarry. Some years ago they were concentrated at the entrance to the quarry, but this material has been removed. There also used to be the remains of a minor reef. Furthermore, a new species *Cylicosmilia crnikalensis* KOLOSVÁRY was determined. Ten genera with 16 species have been discovered within the reef (KOLOSVÁRY, 1967).

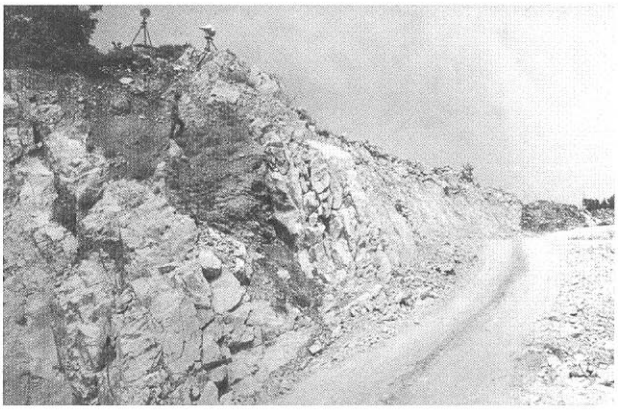

Fig. 5 Autochthonous cave sediments with fossil remains of the cave bear.

2.5. PLEISTOCENE MAMMALS

Systematic excavations of the uncovered area of the vast cave system of Črni Kal, disclosed autochtonous Upper Pleistocene sediments rich in a mammal macrofauna. RAKOVEC (1958) discovered the remains of cave bear, cave lion, cave hyena and wolf, and more abundant herbivorous animals including red deer, elk, roe deer, ibex, bovides (*Bos* or *Bison*), wild horse and rhinoceros.

Progressive enlargement of the quarry repeatedly revealed new caves, releasing besides rubble, mainly the bones of cave bear (Fig. 5). More recently the back wall of the quarry (Fig. 3) opened again on a partial cave shaft filled with sediments and bone remains of the above mentioned herbivorous animals and numerous birds.

2.6. TECTONICS

The quarry of Črni Kal is located in a schuppen structure in the region of Ćićarija. Consequently, numerous faults can be observed in the quarry (Fig. 6). In the surrounding region the alternation of alveolina-nummulites limestones with flysch is evident. In some parts of the quarry and its surroundings there are exemplary tectonic mirrors and parallel fault systems. At the boundary line between the limestone and flysch there are minor springs under the limestone walls. The protection of these characteristic tectonic structures and springs would be welcome.

3. PROTECTION OF GEOTOPES

The Črni Kal quarry is a good example of how difficult or impossible it is to protect the geotopes. The coral reef has been totally ruined. The Palaeolithic station has been destroyed, as well as some parts containing interesting foraminifera. It is also impossible to terminate the operation of the quarry or reduce the production or redirect its activities merely because of the geo-

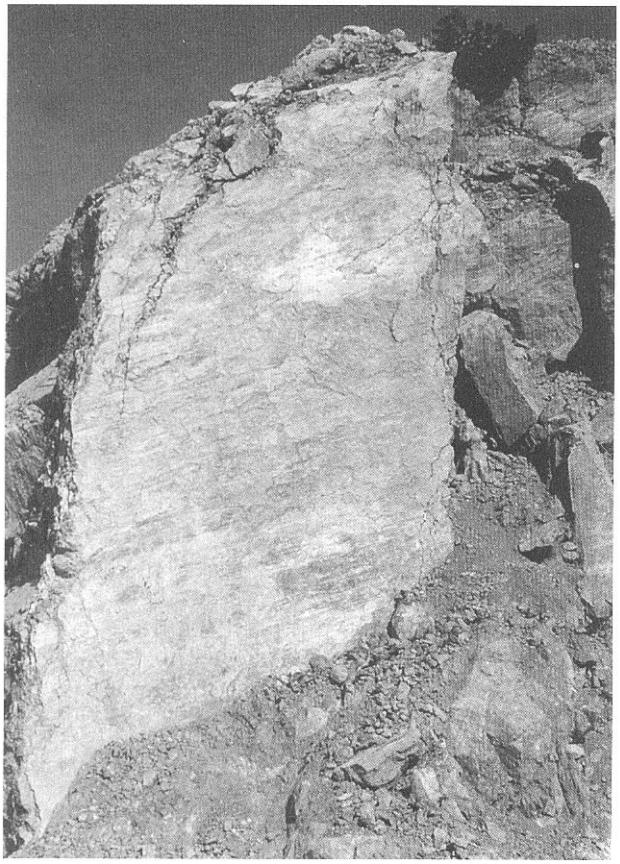

Fig. 6 The traces of tectonic movements in the Črni Kal quarry.

topes. In such cases there are only a few protective measures which may be possible to implement:

- to determine and protect interesting geological features in the parts of the quarry where exploitation has ceased;
- to permanently control the extension of the quarry and simultaneously save geological phenomena before they are devastated, and
- to protect the visitors against falling stones, blasting and other activities in the quarry.

Education of workers and visitors is of great importance. They have to be taught to respect the geotopes, not to destroy them and to inform the experts about eventual new interesting finds.

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