GEOPARK OF THE CZECH REPUBLIC
FOR INSCRIPTION IN THE UNESCO GEOPARKS NETWORKS

Bohemian Paradise

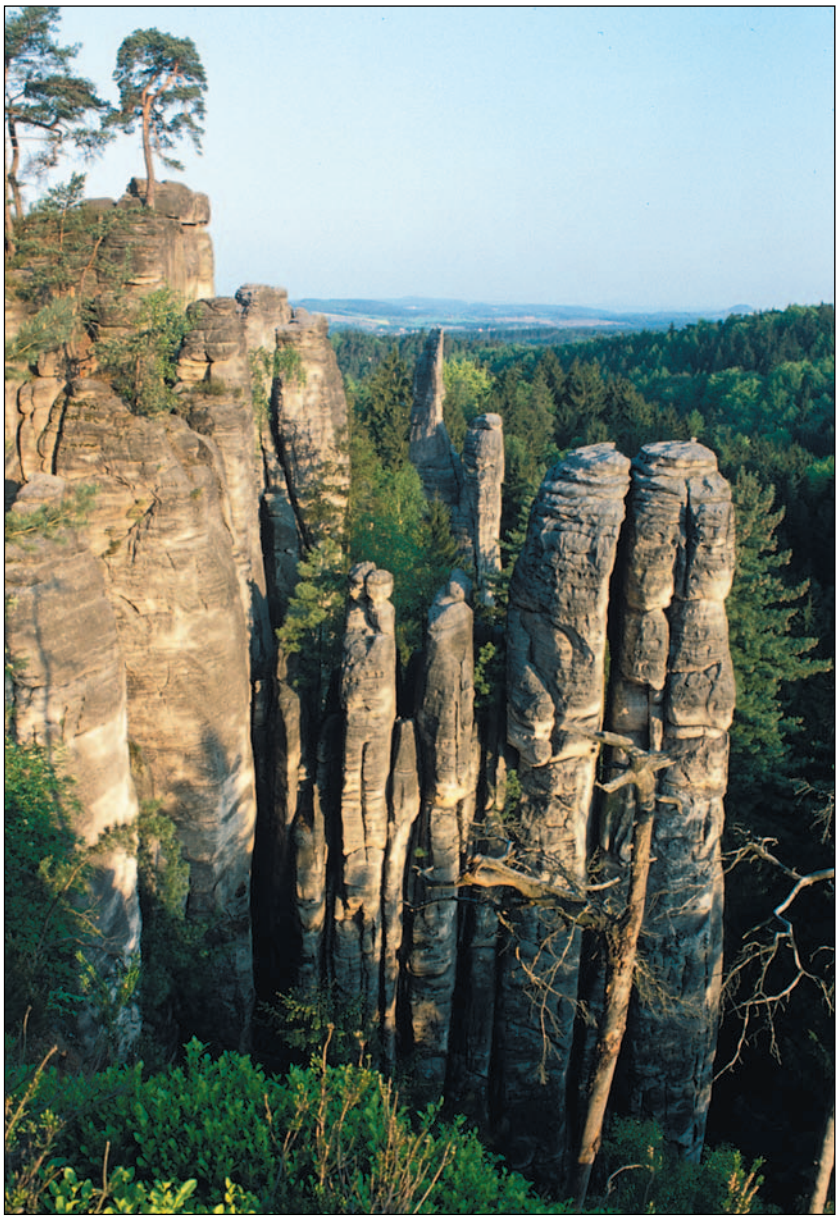

Foto: Lukáš Blek

2005

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I. GEOLOGY AND LANDSCAPE

I.1. IDENTIFICATION OF THE TERRITORY

The tourist region Bohemian Paradise is situated on the area of 118 municipalities, which are administratively located on the area of 5 discricts, 3 regions a 2 regions NUTS II.

State: Czech Republic

Region: Region of *Hradec Králové*,
Region of *Liberec,*
Region of Central Bohemia.

Name of the geopark: Bohemian Paradise

Precise definition of the area in the map and its geographical coordinates:

The Bohemian Paradise geopark covers an area between the towns of *Jičín, Mnichovo Hradiště, Železný Brod, Jilemnice* and *Nová Paka*. The Bohemian Paradise is located in the northern part of the Czech Republic, approx. 70 km NE of Prague. It is situated in three Regions (*Liberec, Hradec Králové* and Central Bohemia). The town of *Turnov* can be considered the centre of the relevant area.

northernmost location:	50° 40‘ 13“ N
	15° 10‘ 56“ E
southernmost location:	50° 26‘ 44“ N
	15° 27‘ 49“ E
westernmost location:	50° 31‘ 05“ N
	14° 59‘ 25“ E
easternmost location:	50° 31‘ 39“ N
	15° 34‘ 35“ E

Area of the geopark: **700 km^2**

Ownership: The nominated property has various owners – persons, institutions, municipalities and the state.

Populations: approx. 100 000

Organization: Authority of the Geopark

The council of the geopark has been working since January 2005. The council includes specialists from the Ministry of Environment – M. Pásková, M. Holý, Administration of Nature Protection – P. Dolejský, P. Pešout, L. Šoltysová, Geological Institute of the Academy of Sciences of the Czech Republic – J. Adamovič, R. Mikuláš, J. Ulrych, Museum of the Bohemian Paradise – T. Řídkošil, Charles University – J. Datel, J. Bruthans, V. Ziegler, AOPK ČR – J. Hromas, V. Petříček, Czech Geological Survey – P. Mixa.

Destination management of the area: M. Pásková, L. Šoltysova and T. Řídkošil.

The Bohemian Paradise Protected Landscape Area was established by means of Directive No. 70 261/1954 Coll. issued by the Ministry of Culture of the Czechoslovak Socialist Republic on 1/3/1955 (Official Gazette 1955, section 31) with the administrative office in *Turnov.* In 1992, the acceptance of the Nature and Landscape Protection Act No. 114/1992 Coll. by the Czech National Council confirmed the Bohemian Paradise Protected Landscape Area in the appendix to the aforementioned act.

The declaration was carried out through the Government Decree 508/2002 Coll., approved on 14 October 2002 by the government of the Czech Republic and published on 5 December 2002.

Správa ochrany přírody (Administration of Nature Protection) – Director: PhDr. Petr Dolejský, Nuselská 39, 140 00 Praha 4.

Správa Chráněné krajinné oblasti Český ráj (Administration of the Bohemian Paradise Protected Landscape Area), a state administration body in the field of nature protection, Head: RNDr. Lenka Šoltysová, headquarters: Antonína Dvořáka 294, 511 01 Turnov.

Muzeum Českého ráje (Museum of the Bohemian Paradise), Director: PhDr. Vladimíra Jakouběová, Skálova 70, 511 01 Turnov

Maps and plans defining the boundaries of the geopark

1. Location of the geopark in the world

2. Location of the geopark in Europe

3. Location of the geopark in the Czech Republic

4. Geological map of the proposed geopark

5. Boundaries of the proposed geopark

Hrubá Skála Castle

SCIENTIFIC DESCRIPTION

a. INTRODUCTION

The stretch of land known as the Bohemian Paradise, together with the neighbouring areas, shows some of the first-class geological phenomena amidst one of the best preserved traditional landscapes in the Czech Republic. The territory around Turnov, Sobotka, Jičín, Lomnice nad Popelkou, Semily, Železný Brod and Mnichovo Hradiště was proclaimed the first protected landscape area in the former Czechoslovakia in 1955. The picturesque area along the middle reach of the Jizera River is well known for its scenic beauties, castles, chateaus and rural architecture.

This romantic landscape impresses the visitor by various rock shapes, landform scales and sceneries. Deep valleys and ravines are lined with sandstone cliffs of different shapes, and host systems of quiet ponds and streams within floriferous to mesophilous meadows. This landscape is dominated by the basaltic spires of the Trosky Castle ruin.

Because of its isolation and inaccessibility the Bohemian Paradise landscape was an important advantage for its residents and served as a shelter. The area also hosted pegan settlements, which is documented by numerous archaeological sites and artefacts, and also by several dozens of folktales and legends referring to real or supernatural beings in this area. This mystery is the essence of the *genius loci* of the Bohemian Paradise.

The oldest evidence of human settlements dates to the Paleolithic era. Caves and rock-shelters in the rock cities (Bělá near Rozumov, Middle Paleolithic age, 50,000 BC) were inhabited by hunters. Rocks to be used as a starting material for tool production started to be exploited at ca. 4200–2200 BC. Folks with "the Pouring Cups" culture were using rock cavities at Kozákov Hill such as Babí pec or Jislova Cave for the manufacture of chipped tools. The geological variability of the area and the 400 years-old tradition of stone grinding and jewellery at Turnov provided a basis for professional and scholarly work extending beyond the boundaries of the region and the Czech Republic.

b. GENERAL GEOLOGICAL DESCRIPTION

Variscan orogenic processes, during which the accretion of microcontinents now forming the Bohemian Massif was completed, are generally overprinted by younger, Alpine processes. Strike-slip movements in the Late Cretaceous were responsible for the subsidence of a lozenge-shaped basin between Moravia and Saxony, its flooding by a shallow sea and its progressive filling with detrital material. This was when the sandstones of the Bohemian Paradise were formed. Major younger faults with vertical displacement of over 1000 m include the Lusatian Fault (Lužice F.) bounding the occurrences of Cretaceous sediments in the NE and the Marginal Sudetic Fault even farther to the NE. They belong to the fault set activated during the NE–SW compression in the latest Cretaceous and earliest Tertiary (much like the Franconian Fault in Bavaria) and now represent the limitations of the Bohemian Massif. So, much of the overall geological setting in the Bohemian Paradise has been controlled by post-Cretaceous tectonic movements. On the present erosional surface, the Bohemian Cretaceous Basin adjoins the Permo-Carboniterous Krkonoše Piedmont Basin and the epizonally metamorphosed Krkonoše-Jizera Crystalline Complex in the northeast. This ranks the Bohemian Paradise among the geologically most heterogeneous areas in central Europe. Stratigraphy, structure and metamorphic history of the pre-Cretaceous units cannot be fully covered within a short excursion. Some of the notes below should, however, give an idea about possible targets for geotourism outside the heavily-visited sandstone core area as they lie within a 15 km distance from the limits of the proposed Geopark territory.

In late Variscan times, a complex of fine clastic sediments intercalated with basaltic effusions was epizonally metamorphosed to produce the Železný Brod unit dominated by phyllites. This is unconformably overlain by a complex of Permo-Carboniferous rocks many hundreds of metres thick with a clear shift from earlier terrigenous deposition to later volcaniclastic and volcanic deposition. Triassic and Jurassic rocks are not preserved. Late Cretaceous rocks – mostly sandstones – reach a total preserved thickness of over 600 m and cover most of the surface of the area. In the north, they are overlain by high sand and gravel terraces (Pliocene) of the Jizera River and by effusions of young basaltic rocks.

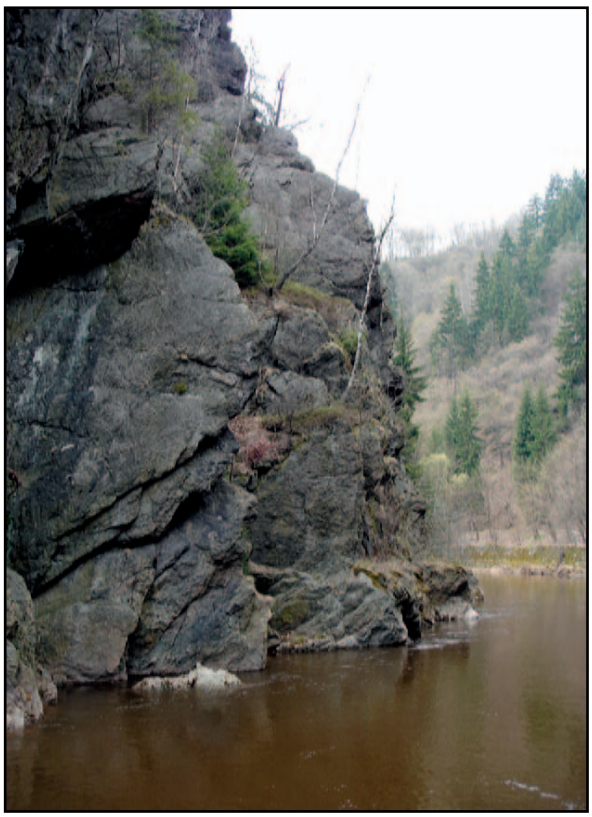
ŽELEZNÝ BROD CRYSTALLINE UNIT

Epizonally metamorphosed rocks of the Železný Brod unit are a part of the Krkonoše-Jizera Crystalline Complex. The characteristic feature of this unit is the presence of Upper Devonian and Silurian rocks. Three independent rock complexes can be roughly distinguished on the Czech side of the Krkonoše-Jizera Crystalline Complex:

1. oldest complex of Proterozoic age
2. Lower Paleozoic complex
3. Upper Devonian – Lower Carboniferous complex

Their mutual relationship is unconformable, transgressive or tectonic. The individual complexes differ not only in their age and rock composition, but to a certain degree also in their structure and grade of regional meta-morphism. The Proterozoic complex mainly forms the mountainous region of the Krkonoše Mts. It comprises also some smaller parts of the Železný Brod crystalline unit.

The Lower Paleozoic complex is distributed in the area of Železný Brod. The lower, older part of the complex is partly exposed in the cores of anticlines in the northern environs of Železný Brod. Its upper part, of Silurian age, has a larger lateral extent. It overlaps transgressively both the above described older Ordovician complexes and for the greater part previously folded and metamorphosed complexes of Proterozoic age. Locally developed quartzites are overlain by graphitic phyllites with intercalations of metalydites. The greenish chlorite-sericite phyllites with lenses of crystalline limestones to dolomites in the lower part belong to the youngest Silurian members. The most active basaltic volcanism centred around Železný Brod, where the volcanic sequence attains a thickness of as much as several hundred metres.



Rieger path

Bítouchov – Early Paleozoic volcanic complex and albite granite

Deeply incised valley of the Jizera River between the villages of Bítou-chov and Spálov offers an instructive, well exposed section through a considerable part of the uppermost Lower Paleozoic rock sequence in the southwestern part of the Krkonoše-Jizera Crystalline Complex. In a section 3 km long, lying 4 km SE of Železný Brod, a body of granite is exposed with the Silurian volcanic complex represented by tuffite, diabase (metamorphosed into metadiabase and various types of greenschists), keratophyre and quartz porphyry. The volcanic complex is about 300 m thick.

Bítouchov granite

LATE PALEOZOIC SEDIMENTS

Carboniferous and Permian rocks lie immediately below the Cretaceous sediments. Rocks filling the Mnichovo Hradiště Basin are exposed in a narrow belt along the Lusatian Fault NW of Kozákov Hill. East of Kozákov, Permo-Carboniferous rocks are exposed over a large area and ranked to the Krkonoše Piedmont Basin. Carboniferous fill of the basin is represented by the Semily Formation with reddish-brown petromictic sandstones, upwards grading into mudstones. Locally developed grey horizons with coal indicate a more humid climatic oscillation. In the Permian, volcanic deposition dominated over clastic deposition, and the successions of effusive rocks of the Vrchlabí Formation are only infrequently interrupted by reddish brown mudstones and sandstones. The Rudník Horizon features lacustrine sediments including thin coal seams.

LATE PALEOZOIC VOLCANICS

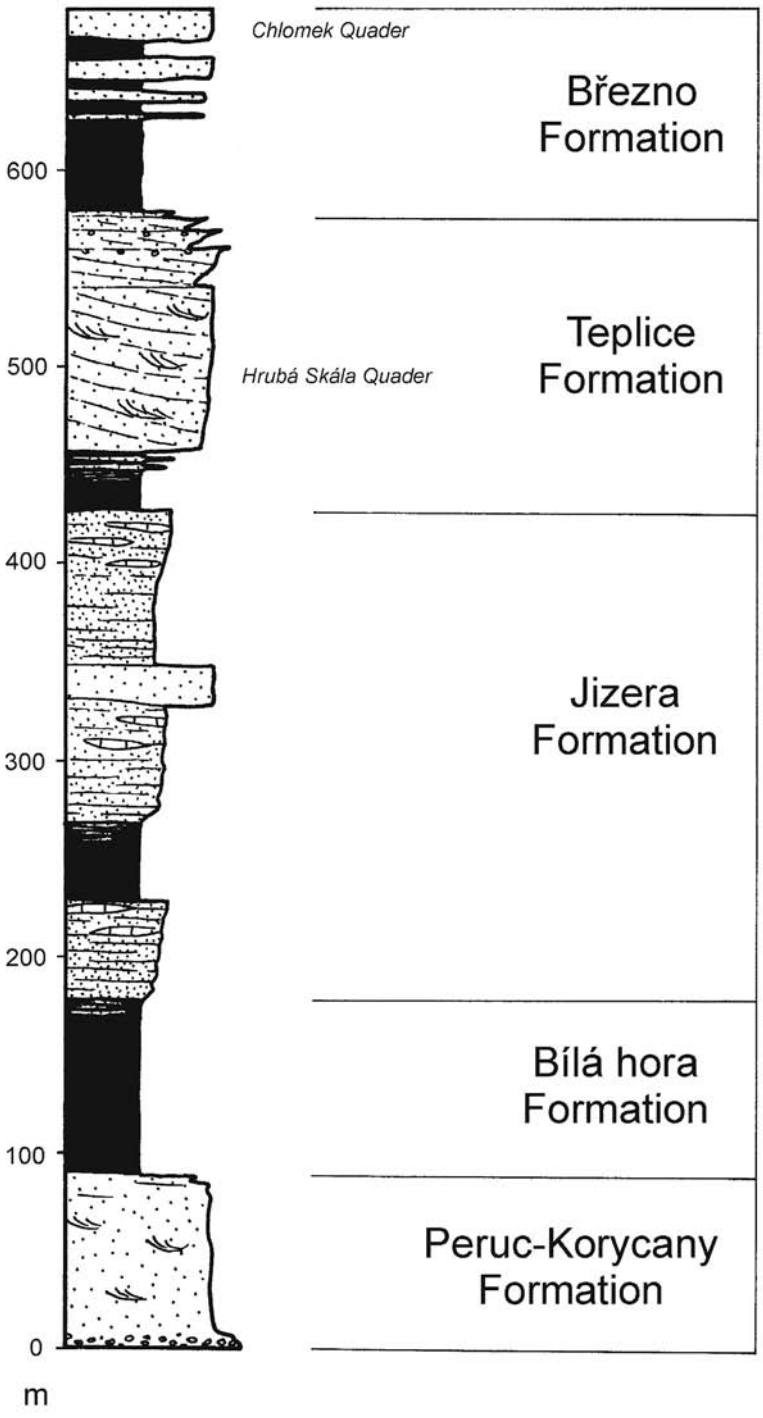
The fill of both Permo-Carboniferous basins documents increasing volcanic activity with complexes of superimposed lava flows and volcaniclastics. The two essential rock types preserved in huge thickneses are quartz porphyries or meta-rhyolites (partly in the form of ignimbrites) and melaphyres, which is a traditional name for local basaltic and andesitic rocks. The peak volcanic activity dates to the Early Permian (Autunian).

CRETACEOUS SEDIMENTS

Shallow marine sediments of Upper Cretaceous age (Cenomanian to Coniacian) cover most of the surface of the Bohemian Paradise area. The Lusatian Fault now forms the NE tectonic limitation of the Bohemian Cretaceous Basin but the sea probably never extended too far beyond this fault in the Cretaceous: sediments along the northern basin margin are generally coarse, indicating a near source area and syn-depositional tectonic activity in this area.

A vertical section of the fill of the Bohemian Cretaceous Basin in this area is shown below. Prominent sandstone outcrops developed in two units: the Peruc-Korycany Formation (Cenomanian), the tilted tectonic slice of which is exposed along the Lusatian Fault only, and the Teplice Formation (Upper Turonian to Coniacian). While the lower unit features mostly parallel-stratified sandstones with occasional conglomerate beds, the upper unit is much more complex. The Teplice Fm. sandstones sharply overlie a thin (1–10 m) interval of deeper-water claystones at the base of the unit. Their lower part is

represented by a body of the so-called Hrubá Skála Quader, a large (60–130 m) subaquatic sand delta prograding from the land offshore and showing complex internal architectures. This is overlain by a sandstone package 20–50 m thick, documenting progressive sea-level rise: bases of individual cycles are formed by bioturbated fine-grained sandstones and their tops by conglomerate beds.



CENOZOIC VOLCANICS

Occurrences of young basaltic rocks in the Bohemian Paradise are of two types. Effusions of olivine basalt along the Lusatian Fault form lava flows (see Sokol Trail, Stop 2) and are Pliocene in age. Their radiometric ages range between 6.6 and 3.95 million years, although some effusions may be even younger as indicated by a lava flow overlying high terrace gravels of the Jizera River. Basaltic occurrences in the central Bohemian Paradise mostly form shallow subvolcanic bodies (plugs, dykes, sills) and rare surface bodies (spatter cone of Trosky Hill, see Trosky Trail) and some of them have been radiometrically dated to 24.6 mil. years (Střelečská hůra Hill) to 20.6 mil. years (Čeřovka Hill).

Among the sites representing the first type, Kozákov Hill, Smrčí and Podmoklice are the most instructive ones. Although Kozákov Hill (6 km S of Železný Brod) probably did not function as a lava conduit itself, it was the site of lava accumulation from the near sources. Lava flows covered the area of several km^2 with an average thickness of about 20 m. Effusions of lava were followed by the deposition of volcanic bombs and ashes. Olivine basalt is quarried at Smrčí, 2 km SE of Železný Brod. Two lava sheets are exposed: the lower is characterized by a thick colum-nar jointing, the upper by fine columnar jointing. At Podmoklice locality (3.5 km SE), even four effusions and two tuff layers are preserved.

Trosky Castle – Basaltic spatter cone injected by a dyke

Spinel lherzolite xenoliths from this volcanic area are in the focus of international scientists as they provide information on pressure and temperature evolution of deeper layers of the Earth. They consist of olivine, bronzite, clinopyroxene and spinel. Some grains of olivine have a gem quality.

The sites representing the second type are Trosky Hill (see Trosky Trail), Střelečská hůra Hill and a small basanite intrusion complex recently uncovered during sand exploitation at Střeleč.

HYDROGEOLOGY

Geological resource of special importance in the Bohemian Paradise and Krkonoše Piedmont area is water. The whole area of the Bohemian Paradise lies in the basin of the Jizera River and is drained by its left-handed tributaries. Large reserves of drinking groundwater are locked in the high-porosity Teplice Formation sandstones themselves but even more prominently in the calcareous sandstones of the Jizera Formation below. Other formations and crystalline rocks provide lower yields of groundwater mostly bound to fissures in rock.

FOSSILS

Greenish phyllites of the Železný Brod crystalline unit, probably Ordovician in age, have preserved a unique paleontologic content: numerous and diverse traces of feeding, made by invertebrates on the sea bottom (the so-called feeding trace fossils, fodinichnia, namely *Phycodes, Planolites, Dictyodora, Bifungites*, and large star-like structures). Their uniqueness lies in their preservation in metamorphosed rocks and in their probably deep-ocean origin; these settings have rarely been studied through the Lower Paleozoic rocks.
Uppermost Carboniferous and Permian sediments at the foothills of the Krkonoše Mts. locally contain trunks and fragments of silicified wood. In the vicinity of Nová Paka, two prominent and highly decorative forms occur: trunks of gymnosperms, so-called araucarites (e.g., *Dadoxylon*), and "false stems" of arboreous ferns (*Psaronius*). Fish and amphibian fauna is characteristic for several horizons, formed typically by black claystones or dark bituminous limestones. Few specimens of sharks and shark-like vertebrates (*Acanthodes, Bohemiacanthus*) have been reported, besides relatives of the modern sturgeon (e.g., *Sphaerolepis*). Numerous genera and species of cryptogamous plants (e.g., *Odontopteris, Alethopteris*) are also frequent. Last but not least, footprints of amphibians and reptiles are occasionally found.

Fossil remains of shallow marine animals in the Cretaceous sediments are mostly found in the mudstones above and below quartzose sandstone bodies where the preservation potential is higher. Relatively common is the Middle Turonian ammonite and bivalve fauna (oyster beds) from sandy limestone intercalations in the Jizera Formation in the Turnov area. Claystones at the base of the Teplice Formation contain Late Turonian bivalve fauna (*Mytiloides carpathicus)* while the top of the Teplice Formation yielded Coniacian bivalves, such as *Cremnoceramus waltersdorfensis* and *Mytiloides lusatiae*. Rich Coniacian bivalve fauna was found in hematitized sandstones in the Prachovské skály Cliffs representing an equivalent of the Rohatce Member above the Teplice Formation. Sandstones of the Březno Formation yielded Upper Coniacian ammonite and bivalve fauna.

MINERALS

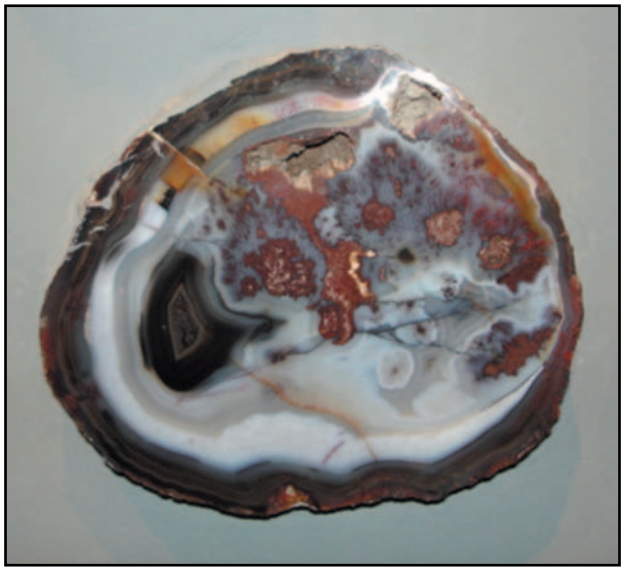
The Bohemian Paradise and the Krkonoše Piedmont area have been well known for finds of interesting minerals. Bohemian Paradise yields some particularly nice minerals, most notably quartz varieties, silicates such as olivine, pectolite, zeolites, and ores of copper. Specimens of these and many other minerals are exhibited in the Museum of Bohemian Paradise at Turnov, in museums at Lomnice, Nová Paka and in jewellery shops throughout the Bohemian Paradise.

Star quartz from Strážník Hill

PRECIOUS AND DECORATIVE STONES

Mineralogical variability of the area and the 300 years-old tradition of stone grinding and jewellery make Turnov the centre of Czech jewellery-making. Minerals have attracted man by their variability and aesthetical features since long ago. The tenor of magnificence of precious stones is a harmonic unit connecting perfection of shapes, fine shades of colours and lustre. Each cut of a gemstone has to keep its gorgeous appearance even after long-term wearing in jewellery and under different kinds of influence. An old mineral pit was

found at Kozákov Hill, maybe from the period of Emperor Rudolph II. Jasper is formed by microcrystalline quartz with admixtures of chalcedony, opal, iron oxyhydroxides and other minerals. These give jasper an interesting structure, even more prominent after being polished on a thwart cut. Heliotrope, opaque green jasper with red spots resembling drops of blood is the most valuable variety of jasper. Agate is formed by layers of microcrystalline quartz, chalcedony and opal. The history of gem production at Turnov has expressively influenced the School of Applied Arts (founded in 1884). It is connected with the names of many professors and graduates who became outstanding personalities of Bohemian art and craft of the past and present.



Agate from the Votrubec Quarry

MINERAL EXPLOITATION

The Střeleč quarry 10 km NW of Jičín exploits quartzose sandstones of the Teplice Formation for the production of glass and foundry sands. The complex of the deposits is divided by an iron-rich "red layer" into two parts. The upper part (thickness 40–50 m) is composed of yellowish to light yellowish-brown fine-grained quartzose sandstones, less frequently medium-grained sandstones. Elevated iron contents preclude the use for glass sand production but allow to utilize sandstone from this interval for foundry purposes. The red layer (thickness 1–8 m) is formed by violetish red, deep red and rusty-brown fine-grained clayey silty sandstone, coloured with hematite and goethite. The lower part of the quarry below this layer is formed by whitish-grey, fine-grained quartzose sandstones suitable for glass production (so-called Bohemian Crystal). In places, very coarse quartz grains to small quartz pebbles are present. Accessories are feldspars, mica and heavy minerals. The thickness of the lower part is 20–40 m, however, the unexploited reserves lie now well below the groundwater table.

Several quarries in operation are opened in basaltic rocks: "Na Rovném" at Podmoklice near Semily, Proseč, Záhoří, and Smrčí near Železný Brod.

Chuchelna Quarry

SANDSTONE PHENOMENON

The sandstone phenomenon can be defined as a complex of biotic and abiotic factors. They are connected to prehistoric, historic and present-day interferences, which are influenced by the specific, sandstone rock city relief. Due to erosion processes, sandstone areas are morphologically well articulated and form a landscape similar to e.g. karst areas.

The list of factors shaping sandstone rocks is long. The sand grain deposition in the shallow Upper Cretaceous sea was mainly influenced by basin dynamics. Also, the basin sedimentary architecture, textures and partly the character of the source area were related to this. The different thicknesses of sandstone bodies result from different levels of subsidence rate. Tectonic movement during the Tertiary caused block uplifts (several dozens of square kilometres) and faulting, tilting of strata and typical vertical rectangular jointing. Up to the present time, the porous sandstone is easily permeable to ion (Ca, Na, K, Fe etc.) –bearing liquids. Specific present-day processes take place on the sandstone surface, the place where the solutions evaporate. There are two effects of the evaporation process: the superficial layer is either consolidated (if SiO_2 is precipitated in it) or eroded by salt efflorescences. Both processes are strongly influenced by climate and microclimate. Surface consolidation and erosion may coincide at one place. The two processes can

substitute each other during time. The abnormal microrelief forms result from erosion/consolidation alternations. The role of vegetation is more complicated – somewhere protective, elsewhere destructive. It depends on plant species and biotic/abiotic interactions. Also mechanical and frost erosion are obvious factors, equally as the non-uniform distribution of solutions in the rock (circulation along joints, increase in soil moisture through capillary action). Several factors are influenced by temperature and precipitation regimes. Other important factors are animal bioerosion and rock pressure.

The Bohemian Paradise is an area with a harmonically formed landscape and a characteristic relief with modelled thick-bedded sandstone breached by formations of neo-volcanic origin and morphologically divided up by watercourses. Inorganic and organic influences have given rise to a balanced landscape with a colourful mosaic of natural forests, cliffs, meadows and wetland ecosystems. The Bohemian Paradise lies in the relatively warm climate zone of the Czech Mesophyticum and is a unique area located between the initial rock cities on the southern edge of the Cretaceous Basin and the mature sandstone areas of Northern Bohemia.

The rock cities of the Bohemian Paradise represent the most complete and most varied group of characteristic elements and forms of the sandstone phenomenon of the Temperate Zone. Slope movements, landslides, salt erosion, the selective removal of mouldered sandstone and the armouring of rock surfaces by protective crusts can be found in each of the rock cities in the Bohemian Paradise at various stages of preservation and occurrence. The sandstone phenomenon of the Bohemian Paradise is the result of an interaction of a very wide group of geological, biological and anthropogenic phenomena and processes. The richness of various geomorphologic shapes and valuable biotic components give the Bohemian Paradise a very high aesthetic as well as scientific value.

The numerous caves, niches, rock shelters, hollows, arches, tunnels, rock windows, pseudo-lapiés, rock mushrooms, balanced boulders, encrustations and honeycombed rocks represent the classic meso-forms and micro-forms of sandstone rock cities.

Thanks to their geomorphologic segmentation and significant superficial diversity, the original habitats of natural forest communities, marsh meadows, moors and fens, natural lake and riverbank vegetation, steppe vegetation and mesophilous meadows have been preserved in the rock cities. These habitats are a significant source of biodiversity for the surrounding countryside. As a consequence of the habitat diversity in the area of the Bohemian Paradise, almost 1000 species of higher plants have been documented from this area. Just as the plants, animal life is also an indicator of the segmentation and variety of natural conditions. The extensive water and marsh habitats significantly influence the total number of species, which is currently estimated at 30,000.

The Bohemian Paradise landscape is unique for its quaintness and has an exceptional position in relation to other sandstone phenomenon landscapes. This is why this romantic landscape impresses – various shapes, scales and scenes, alternations of deep valleys and ravines which are braided by rocks of different shapes, plateaus with skyline views to dwarfed hills, and systems of quiet pond surfaces and streams in the middle of floriferous moist to mesophilous meadows. In this landscape, the Trosky castle ruin based on basaltic volcanic rocks dominates and forms the vision of a biblical paradise. All of this is hidden in the midst of bramble forests and is protected from the cultural landscape. Because of this isolation and inaccessibility the picturesque Bohemian Paradise landscape was an important advantage for its residents and served as shelters. The region was also a numinous pagan area, which is documented by numerous archaeological localities and artefacts, and also by several dozens of folktales and legends referring to real or supernatural beings of this area. This mystery is the basis of the Bohemian Paradise *genius loci*.

The rock cities of the Bohemian Paradise comprise unique biotopes of endangered plant and animal species. Flora is represented by gametophyte fern populations of *Trichomanes speciosum* and orchids like *Cypripedium calceolus, Gymnadenia montana*, and *Liparis loeselii.* The biotope of the orchid *Epipactis albensis* is of global importance (Red List). Important animal species (birds and mammals) are: *Ciconia nigra, Ciconia ciconia, Pernis apivorus, Haliaetus albicilla, Bubo bubo, Alcedo atthis, Caprimulgus europaeus, Ficedula hypoleuca, Rhinolophus hipposideros, Eptesicus nilsoni* and *Lutra lutra*. Partial research has demonstrated the existence of very rare species among invertebrates.

The rock cities of the Bohemian Paradise show examples of all main processes related to the temperate sandstone phenomenon – i.e. slope movements and rockfall salt erosion, selective erosion of unreinforced sandstone, encrustation of rock surfaces by opal, selective encrustation along tectonic zones, role of vegetation etc.

The Bohemian Paradise landscape has also a unique aesthetic value. The buffer zone includes all important landscape complexes as well as important naturally and culturally dominant features.

c. DESCRIPTION OF GEOLOGICAL SITES

EXCURSION ALONG THE JIZERA RIVER

The proposed excursion route leads across the Železný Brod crystaline unit towards the north, up the romantic valley of the Jizera River. It is called the Rieger path. It begins in a narrow gorge 1 km W of Bítouchov. The walls of this gorge are composed of albite granite. Relatively least altered granite can be observed in fragments and boulders along the path and in the outcrops. About 250 m towards the north, behind the cottage near the weir, the granite contains an elongated body of compressed amphibole diorite about 40 metres wide. It passes into the marginal facies, which in the direction of the route acquires an increasingly more pronounced phyllonite character, resembling sericite quartzite phyllite. The thickness of this phyllonitized zone is about 250 m. The granite phyllonite locally hosts tabular blocks of metabasites. Some 400 m farther north, the albite granite body is replaced by greenschists, which dominate the following, more than 1 km long section. Varieties with actinolite, which are commonly without carbonate, and varieties without actinolite, in which carbonates are abundant, can be distinguished. The most common mineral associations are the following: albite – actinolite – chlorite – epidote – titanite (quartz) and albite – calcite (dolomite) – chlorite – titanite quartz. The greenschists have sometimes a markedly banded structure produced by metamorphic differentiation. Keratophyres and quartz keratophyres (meta-rhyolites) of greyish-blue colour are also present. The rocks form a syncline. The lower part of the volcanic complex consists of tuffites, which are best exposed near the railway bridge across the Kamenice River in the vicinity of the Spálov railway station. The rocks are markedly schistose, of grey colour with a violet or green tinge. They are rich in carbonates with disseminated quartz grains, more rarely also albite grains; the pyroclastic component is manifested by the presence of chlorite, actinolite, epidote and ore minerals.

Excursion to Kozákov Hill

Kozákov Hill (15 km E of Turnov) is the highest peak on the border between the Bohemian Paradise and Krkonoše Piedmont area. The lava flows of melaphyres have been always famous for the finds of semi-precious stones in vesicles and vugs in the rock. First culmination of volcanic activity dates to the Early Permian (Autunian). Several lava bodies are preserved on Kozákov Hill, where the ascent of magma was facilitated by the presence of faults coinciding with the course of the present Lusatian Fault. Melaphyres on the southwestern slope of Kozákov Hill are commonly characterized by intersertal texture, and are rather andesitic than basaltic in composition.

Votrubec Quarry

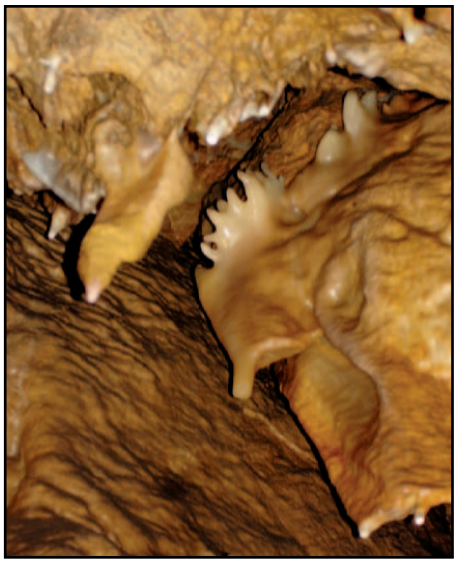
Votrubec Quarry

The largest exposure is the shelf quarry, a property of the Votrubec family. The classic locality offers not only a wide scale of minerals but also a series of remarkable phenomena in Early Permian volcanics. The rock is amygdaloidal and the following minerals can be found in amygdales and veinlets: agate, amethyst, analcite, apophyllite,

barite, calcite, chabasite, chalcedony, chlorite, desmine, dolomite, fluorite, harmotome, hematite, heulandite, laumontite, malachite etc. Seven lava sheets, spread an a wet, transvaporization producing substratum and one tuffitic interlayer can be recognized here. The lava movement produced typical sructural features such as the elongation of amygdules and rolling and ropy fabrics. They indicate from them that the lava flowed from E to W, oblique to the actual, tectonically modified dip of the lava sheets. The sheets show systematic trends of chemical changes from the lowest to the highest one which can be attributed to the gradual mild fractionation of the same magmatic source.

Bozkov Cave

The Bozkov Dolomite Cave is situated between the Bohemian Paradise and the Giant Mountains National Park. It formed in a body of Ca-dolomite of the Železný Brod crystalline unit. These are the only dolomite caves in the Czech Republic open to the public. The karst underground system of corridors and caves has been gradually discovered since mid 1950s, and about 450 m of paths were opened to the public in 1969. Besides specific characteristics of dolomite caves, the Old Cave is rich in dripstone decorations. They are remarkable for the unique decorations on the cave walls and ceilings including quartz boxworks. The New Cave is remarkably shaped by the effects of the aggresive water from adjacent acid rock. Quartz ledges protrude from the walls and roofs as the result of long-term selective corrosion. A part of the New Cave is still under water, forming the Bohemia's largest underground lake in the Lake Chamber.



Decorations on the cave walls

ROCK CITIES IN THE CRETACEOUS SANDSTONES

The sandston-rock cities of the Bohemian Paradise have developed as a set of 10 independent smaller rock cities with wall altitudes of about 60 m. These rock cities (including their buffer zones) are isolated and form an integral territorial complex with a unique preserved nature of world scientific and conservational values.

The whole area consists especially of Mesozoic (Cretaceous) sandstones of different age (Cenomanian, Turonian, Coniacian). The macrorelief is very diverse – it is a mixture of basins, hills and uplands. Also, numerous canyons and valleys with well-developed meads are important. The main components of the land surface originated during the tectonic phases of the Tertiary connected to movements at the *Lužice* fault. Numerous quests originated. During the Tertiary, volcanic rocks and dykes frequently penetrated Mesozoic sandstones. Riverbed changes strongly influenced the landscape and mesorelief formations. A lot of historical monuments are preserved in the area. They accentuate the natural dominant features and increase their aesthetic value.

The complex compires the Hrubá Skály rock city, Apolena rock city, Příhrazské skály (rocks), Údolí Plakánek (valley), Kozlov (Chlum), Suché skály (rocks), Prachovské skály (rocks), Klokočské a Betlémské skály (rocks), rocks at Sokol, and Kozákov.

Among them, Hrubá Skála rock city, Příhrazské skály (rocks), Suché skály (rocks), and rocks at Sokol have been selected for description in more detail. They represent most of typical and attractive (both scientifically and aesthetically) features of the geology and geomorphology of rock cities of the area.

HRUBÁ SKÁLA ROCK CITY

Geology

The rock city is formed by low- to medium-lithified, light-grey quartzose sandstones (without cyclic development) of the so-called "Hrubá Skála block" (Teplice Fm.). The thickness of the sandstones is 120 m, and the height of rock walls exposed exceeds 80 m. Surfaces of four orders are developed in the sandstone. The largest surfaces are planes of submarine erosion. They originated during collapses of a submarine delta body (probably in connection to seismic activity). The second-order surfaces are gently inclined planes dipping S to SE at low angles (4°); they represent foresets of a submarine delta. Cross bedding (several metres in size) are produced by sand dune migration across the delta

body. Lower-order surfaces are formed by planar beds or cross-bedding foreset laminae (several tens of centimetres in size). The sandstone body is underlain by calcareous claystones and marlstones the surface of which is marked by spring issues. They are not permanently exposed. Directions of currents and large dune migration changed from the S (at the bottom of the block near Sedmihorky) to SE (at the top of the block – Mariánská Viewpoint) in the Hrubá Skála area. The rock city represents an erosional remnant of the Hrubá Skála block which is confined by the fault in the Libuňka Stream valley in the NE, Kacanovy Creek in the W, Předěly valley in the S, and Vyskeř Hill massif formed by basanite and relics of the Březno Fm. marlstones. The main joint directions are NW-SE and NE-SW. Both joint directions contain iron impregnations of tube-like shapes, especially near Valdštejn and former village of Nouzov. Silicified sandstones were mined for building stone near Konice. With the exception of Vyskeř Hill, no occurrences of young volcanic rocks were recorded. Tops of the Hrubá skála area are surrounded by the Pliocene river gravels to sands.

Macrorelief

Hrubá Skála rock city represents a remnant of denudation of a plateau. The average altitude exceeds 380 m above sea level, the base of the plateau lies 250 m above sea level. Towards the Libuňka Stream valley, some parts of the block are eroded to a high level, thus forming typical rock cities. They possess sets of rock pillars quite far from each other. Their ground plan is square to rectangular, and their height exceeds their width several times. The most prominent and well developed groups of rock cities are (from W to E): the Maják pillar vicinity, group of Kapelník and Dračí skála. They count several dozens of perfectly developed pillars. Other parts of the Hrubá Skála area have the character of a further undissected plateau relict. Towards the NE, the indented rock margins with short valleys, rock spurs and pillars are present. SW part of the Hrubá Skála block is divided by three marked valleys (Jezírka, Děšťové údolí, Hadí údolí) which have the character of wide canyons surrounded by rock outcrops with few pillars.

Meso- and microrelief

Rock pillars exceed 50 m in height from higher sides and 90 m from valleys bottoms. Tops are usually rounded, without soil cover, pseudoclints are sometimes developed. The wall ornamentation is mainly derived from basic sedimentary structures and it consists especially of horizontal ledges and embowed honeycombs. Several sandstone beds are

selectively eroded and form marked furrows containing rock hollows (Sfinga group). The marked rock galleries are developed at some places (valley wall of Kapelník pillar, Ottova pillar), spherical to rhombic hollows tens of centimetres in size (Podmokly pillar vicinity), lowly indented vertical clefts (specially Dračí skála) and/or rock pseudo-gates (Ocún, Brána, Blatník). Microrelief typical for everywet outcrops (very shallow ledges and poorly developed walls rich in honeycombs) is developed in the Údolíčka (Hadí, Dešťové údolí) vicinity.

Hrubá Skála rock city represents the most completely sandstone rock city phenomenon developed in the Bohemian Paradise area with the highest and the most impressive rock pillars developed.

APOLENA ROCK CITY

Geology

This structured escarpment is formed by poorly lithified sandstones of the Teplice Fm. with cyclic arrangement indicated at its top. Sandstones are mostly fine-grained, medium- to coarse-grained at bases of some cliffs. Tectonic disposition to weathering lies in a dense network of vertical joints striking WNW-ESE (with spacings of several metres) and NNE-SSW (with spacings of several tens of metres). Huge Subrecent sand-dominated talus cones fills of crevasses are present.

Macrorelief

Apolena rock city is formed by a single cliff front at the altitude of 350-370 m above sea level. It lies on the SW slope of the high topped by two volcanic pipes of Trosky Hill (488 m). The whole length of the rock city (including two short valleys of N–S and NW–SE directions) exceeds 1000 m. The height of the sandstone cliffs exceeds 30 m.

Meso- and microrelief

Rock spurs, pillars with elongate rectangular ground plan and linear series of pillars prevail. At the bases of the cliffs (especially in the southern part), ledges and strata-bound caves are developed. One rock arch and several natural windows are present. Rock pillars are characterized by round tops, almost free of vegetation. As indicated by the wear of anthropogenic graffiti on their tops, very fast erosion rate of the sandstone can be expected

(i. e., 10 cm per 100 years). Rock surfaces bear locally dominant crusts. , Sloping shelves are sometimes developed at cliff bases, indicating former positions of sand talus cones or soil horizon. Rhombic honeycombs dominate vertical walls, and biogenic structures (nest holes of solitarily living bees) are also common.

Specifics in the scope of the Bohemian Paradise PLA Apolena rock city differs from other cities of the Bohemian Paradise in its very poor lithification of the fine-grained sandstone. Due to this, the erosion is more rapid and the meso- and microrelief formation is accelerated. It is the only one area in the Bohemian Paradise (and also in the Bohemian Massif) where the rhombic honeycombs prevail and where they form patterned systems covering the whole rock walls.

PŘÍHRAZY ROCKS

Geology

Rock cities called "Příhrazské skály" are a part of the so-called Žehrov tectonic block, limited by fault systems: in the Žehrovka Stream valley in the NE, in the Jizera River valley in the NW, at the line of Kněžmost – Přepeře in the SE. SE part continues to the Plakánek Valley which is described separately below. Příhrazy rock cities are composed of medium-grained kaolinic sandstones of the Hrubá Skála block (Teplice Fm.), the level of lithification is low to medium. Sedimentary structures are represented by clinoforms and by trough cross-bedding. The highest parts of the sections are formed by upwards-coarsening cycles of bioturbated sandstones with conglomerate beds at the top. Clinoforms dip to the south. The cross-bedding (thickness of several metres) is well documented in the Drábské světničky Cliffs at the highest parts of the outcrops. Southwesterly dips of its foreset laminae indicate predominant flow directions during the sedimentation. In the Neogene, the area was penetrated by dykes of volcanic rocks (olivine nephelinites to basanites). The largest stock is Mužský Hill (463 m); it is surrounded by erosional relics of late Coniacian calcareous claystones to clayey limestones. Morphologically most important dyke is 2.5 km long and 3 m thick, striking WSW-ENE in the area of Branžež and Zakopané. Tensional joints striking NW-SE (Železné věže E of Mužský Hill) contain goethite fills and tube-like impregnations. Joints of E-W strikes (eastern part of the Příhrazy rock city) are closed, sheared and often silicificated. The sandstone body overlies the marlstones of the Teplice Fm. Their bulging on the margins of the Příhrazy rock city (western margin) results in landsliding (for the last time in 1928). Quaternary is represented by loess (Pleistocene) and sand talus slopes (Holocene).

Macrorelief

The basic component of macrorelief is the Mužský Hill plateau with the conical elevation formed by neovolcanic rocks in the axial part. This plateau is divided into several areas. The northern margin, Příhrazy – Drábské Světničky line, is formed by a continuous series of cliffs, indented by gorges and chimneys, with numerous spurs and pillars with low to high walls.). Typical rock cities are missing. The NW margin of the plateau comprises a number of rock pillars (i. e., complex of Drábské světničky), prominent valleys (NW–SE) lined by cliffs and sand talus at the bottoms. The southern side of the plateau is dissected by a dense network of canyons of the so-called Příhrazská údolíčka (smaller valleys). The sandstone plateau is extremely indented on its upper margin, forming spurs, gorges, chimneys and corners. Towards the east, the area converts to ridges and valleys of W–E direction with less marked rock outcrops. Two rock massifs are situated near the SE margin of the Příhrazy plateau, having the character of smaller table mountains: Sokolka and Křinecká skála (also Dráb etc.).

Meso- and microrelief

Mesorelief is characterized by rock walls incised by narrow (1–2 m) passages, chimneys, and corners. Rock pillars occurr isolated on the plateau margin (rock needle of Kočka) or in smaller groups (Drábské světničky, Kobyla vicinity), on spurs just above canyon forks (Bohatýr in the southern part) and also below canyons margins (Minaret in Údolíčka). The height of rock walls is 20 to 40 m. Southern walls of Sokolka Hill massif contain shear joints striking E–W. Furthermore, they are characterized by rapid formation of superficial encrustations covering vertical, overhanging and receding rock walls. Several instructive ledges are developed on the southern slopes and also insects holes are present here. Sinuous furrows and ledges parallel to synsedimentary deformation structures dominate in the western wall of Sokolka Hill. The top of the hill bears karren of different sizes and shapes and is covered by warts (cm sizes) developed around goethite nodules. The Příhrazská údolíčka area is characterized by cliffs 15–20 m high, covered by numerous honeycombs and spherical structures (i. e., caves and niches). Tensional joints are dveloped in the Železné věže vicinity (NE margin of the Příhrazy plateau), being accentuated by vertical ironstone layers. They are combined with bowl-like structures situated on opposite walls, thereby proving the dilation by first tens of centimetres. Rock microrelief on the northern margin of the Příhrazy plateau (including Drábské světničky) shows co-influence of primary sedimentary structures (subhorizontal and sloping ledges),

erosion controlled by several factors (honeycombs), evaporation of fluids rich in SiO2(superficial encrustations) and tectonics (tensional joints). Pseudo-sinkholes are developed on the plateau margin and one of them continues by an abyss 22 m deep. Specifics in the scope of the Bohemian Paradise PLA The meso- and microrelief of the Příhrazské skály is the most variegated in the Bohemian Paradise sandstone phenomenon province. Two smaller massifs resembling table mountains of Sokolka and Křinecká skála are sporadic in the Bohemian Paradise area. Rock formations containing marked microrelief components such as rock superficial encrustations, tensional joints and vertical ironstone layers are also rather rare within the PLA area. It is specific also by presence of numerous basaltic dykes.

Příhrazské skály are important due to the most preserved forest complexes, especially beech woods in the Bohemian Paradise province. The occurrence of thermophytic plant components – the protected species of Stipa joannis and gametophytic generation of Trichomanes speciosum fern, is unique.

PLAKÁNEK VALLEY

Geology

The area is composed of medium-grained quartzose sandstones of the Teplice Fm. with low degree of lithification. These sandstones are exposed in huge outcrops at both sides of the Klenice Stream valley including its branches. Dominant clinoforms dip SSW (0–10°) and probably represent a prograding submarine delta front. Rapid alternations of silty sandstones and siltstones are developed above the main sandstone body. This part represents a transition to the Rohatce Member. This level is overlain by younger marlstones and calcareous claystones of Březno Fm. which are preserved mostly on the plateau developed above the valley. They give rise to many travertine bodies on valleys edges, which accumulate at a high rate at present. A prominent component of the valley is its moist alluvial plain about 50 m wide. It is formed by sand-dominated deposits of Holocene age. Towards the N–NW, this area passes, with no prominent outcrops present, into one with groups of cliffs near Mužský Hill (Příhrazy, Žehrovský les). The southern boundary is sharp, tectonic, defined by the Střehom Fault (WSW–ENE) with southern block subsided.

Macrorelief

The area is formed by a typical canyon-like valley with an alluvial plain filled with Holocene deposits. The length of the valley is 2 km, with the additional length of outcrops in side valleys of ca. 2000 m.

Meso- and microrelief

Rock walls (20–30 m high) prevail, sometimes starting right from the alluvial plain. Rock pillars with marked valley walls and lower upper walls are less frequent. Horizontal to subhorizontal ledges and honeycombs are the most frequent components of microrelief. Gravity-induced rockfall is the most important on slopes with high gradient. Approximately in the middle of the valley, a larger crevasse cave is developed. Horizontal to subhorizontal ledges and sinuous ledges are characteristic for permanently wet rock parts. The superficial encrustations are not developed at these parts. The rock moisture enables vegetation cover (mosses, lichenes) in some places.

KOZLOV (CHLUM)

Geology

The rock city is composed of quartzose medium-grained sandstones of the Hrubá Skála block (Teplice Fm.). The sandstone body is 20 m thick only, being overlain by marlstones (not exposed) and, probably, by some other sandstone bodies. The sandstones do not form continuous exposures. Marlstones of the Březno Fm. are preserved at the top of the plateau near the village of Pohoří. The rock city represents the western part of the erosional relic of the Hrubá Skála block.

Macrorelief

The ridge of Kozlov Hill (Chlum) dominates the northern part of area. It contains a rock city regularly and instructively developed at its summit. The ridge is of the W–E direction in the peak area and it bends towards the SE. The ridge in the southern part (including the village of Pohoří) is of the WNW–ESE direction. Rock exposures are developed here especially on northern slopes of the ridge. They do not form a rock city but a series of outcrops and gravitationally separated rock pillars.

Meso- and microrelief

Top part of the ridge of Kozlov represents a unique example of smaller, regularly formed rock city with blocks lying only several metres to several tens of metres from one another, rectangular to square in ground plans. Peak parts of the cliffs pass towards the north to a relief modelled by gravity slide movements – allochthonous rock pillar blocks lie several dozens of metres from their original position. Several metres sized blocks lie in distal parts of slopes. Their microrelief (honeycombs orientation) proves repeated gravity movements during the last several centuries. The unique large crevasse cave is situated in mid-heigth of the northern side of the ridge. It is developed inside a giant overturned sandstone block with vertical beds. As indicated by sedimentary, biogenic and mechanical structures, the two rock walls (lying 2 m from each other) represent a negative and positive of one surface. The block accumulation is so huge, that the block with the cave inside is not exposed.

Microrelief of the sandstone rock city and block accumulation is controlled predominantly by sedimentary structures – i. e., cross-bedding. Honeycombs rarely form dense "nets"and are usually developed in wider spacings (tens of centimetres to metres). Due to frequent block movements, they belong to less frequent morphotypes. Rock exposures lying on the northern slope of the Pohoří plateau were influnced by similar processes. Several gravitationally separated sandstone blocks (10 x 10 x 10 m) in linear arrangement lie below the rock wall. The gravity separation processes, when the block base movement was more rapid than that of its upper part, were more intensive here than on the Kozlov ridge. These processes resulted in the formation of caves. Microrelief characteristics are similar to those at Kozlov. In addition, oblique ledges are excellently preserved. They document a former position of soil cover on rock sides.

Specifics in the scope of the Bohemian Paradise PLA Chlum (Kozlov) vicinity presents a combination of sandstone block separation and gravity movement processes. In other areas, these phenomena are not represented by so large concentration with complete scale of geomorphological expressions.

SUCHÉ SKÁLY (ROCKS)

Geology

This sharp rocky ridge is formed by a belt of quartzose sandstones of the Peruc-Korycany Fm. It is parallel to the Lužice Fault line, striking WNW–ESE. It is bounded by Permian andesites and latites in the NNE and by marlstones of the Bílá hora Fm. in the SSW (these are covered by fallen sandstone blocks). Sandstones are mostly coarse-grained, sometimes passing to cross-bedded (several tens of centimetres) conglomerates. Their bedding planes are subvertical to overturned near the main structure of the Lužice Fault. Three fault systems can be distinguished: 1. faults parallel to the ridge, reverse faults and normal faults with silicified fault planes, slickensides and a dense network of quartz veinlets; 2. fault and joint systems perpendicular to the course of the ridge, with ruptures opened with and/or without strike-slip movement, poorly silicified and more frequently with Fe encrustations; 3. faults striking E–W, reactivated as strike-slip faults, silicified with quartz cement, thus being very resistant against erosion. Several directions of tectonic deformation are present (strongly silicified tectonic ribs and less silicified regular veinlets).

Macrorelief

The erected Cenomanian block forms a single rocky ridge continuing, on the right bank of the Jizera River, with the so-called Vranovský hřeben Ridge towards Frýdštejn. The base of the ridge exceeds the thickness of 80 m. The length of the ridge is 1 km only with wall heights of 40–80 m in the SSW part and 10–30 m in the NNE. Towards the ESE, the ridge is lower and turns into isolated cliffs, and finally to a ridge with no rocks exposed.

Meso- and microrelief

The rock ridge of Suché skály can be divided into four main rock "pillars" (not in the sense of geomorphologic terminology) and several independent "teeth" at these four structures and in their vicinity. The ridge line is predisposed by the orientation of silicified faults and by the system of quartz veinlets resistant to erosion. Saddles between the segments are predisposed by transverse tectonic structures. Gently dipping E–W-striking faults form morphologically prominent ledges. Microrelief is represented by exhumed quartz veinlets and ribs, honeycobs in some places, and slickensides east of the middle of the ridge. An isolated rock pillar located somewhat south of the ridge can be mentioned.

Specifics in the scope of the Bohemian Paradise PLA Suché skály rock ridge is developed in an erected, strongly lithified tectonic block. Due to this, it represents a unique locality in the scope of the Bohemian Paradise area and sandstone phenomenon in general, too. It controls the pattren of macrorelief. Moreover, the tectonic avtivity is responsible for the origin of unique slickenside surfaces.

PRACHOVSKÉ SKÁLY (ROCKS)

Geology

The rock city is formed by weakly to moderately lithified, medium-grained quartzose sandstones of the Teplice Fm. Sandstones become coarser upwards within individual cycles, they contain cross-bedding (several tens of centimetres thick) with laminae dipping to the south. The sandstone body forms exposures 140 m thick, their footwall is formed by marlstones. The rock city represents an erosional remnant of a sandstone plateau . It was penetrated by several volcanic bodies – i. e., stocks and dykes of basaltic rocks (Svinčice, dykes in the vicinity of Blata). Tectonic predisposition of erosional processes is based on a very dense network of vertical joints striking WSW–ENE (with spacings of several metres) and perpendicular joints striking NNE–SSW (with spacings of several tens of metres).

Macrorelief

Prachovské skály represents a very complexly shaped erosional remnant of a sandstone plateau dissected by gorges and wider valleys. Parts of the plateau now form a rock city with slender and high pillars and blocks.

Meso- a microrelief

Rock ledges, pillars (of elongated rectangular ground plans) and wall-like structures prevail. The microrelief of sandstone rock city and block accumulation microrelief is controlled by primary sedimentary structures – i. e., horizontal stratification and cross-bedding. Honeycombs form "compact nets" in a few places. Vertical joints, chimneys and corners are apparent.

Specifics in the scope of the Bohemian Paradise PLA Prachovské skály rock city represents a well developed sandstone phenomenon including high pillars, in contrast to Hrubá Skála markedly elongated in ground plan (WSW–ENE), often forming linear walls.

KLOKOČSKÉ AND BETLÉMSKÉ SKÁLY (ROCKS)

Geology

The rock area is formed by quartzose sandstones of the so-called Hrubá Skála "Quader" (Teplice Fm.), overlying calcareous sandstones to sandy limestones of the Jizera Fm. and basal calcareous claystones (reduced here to thickness of a few metres) of the Teplice Fm. The quartzose sandstone body thickness exceeds 140 m. Clinoforms dip towards the SSW (angle of 12–15°) and they represent the most important sedimentary structures. Their original dip angle can be calculated by subtracting 5° of tectonic dip (towards SW) of the whole sandstone block. Clinoforms represent bedding planes of a front of a prograding subaquatic delta. The packages bounded by clinoforms contain cross-bedding several metres thick – this structure documents the migration of dunes towards N and S. Bodies of volcanic rock have not been reported from in this area. The marked joints accompanied by strong silicification are almost parallel to the main Lužice Fault structure (NW–SE). Ferruginous impregnations in sandstone have the form of tubes and joint fillings. The rock city area is bounded by a fault zone in the Libuňka Stream valley and by the Stebenka Stream valley in the SW and by the Podloktuší – Klokočí – Podloučky fault zone in the NE

Macrorelief

Betlémské and Klokočské skály are two sandstone areas developed in the Klokočí cuesta. The character of the cuesta is predisposed by the SSW–dips of the sandstone body and the clinoforms. Betlémské skály area is a smaller rock city while Klokočské skály area lie in the front of the cuesta, being characterized by marked rock walls, however, small rock pillar groups can be also found there. Tectonic deformations had the largest influence on the formation of macroforms and alsomesoforms – i. e., the cuesta and the Zelený důl canyon.

Meso- and microrelief

Marked rock pillars of different sizes exceed heights of 5 – 30 m. Caves are an important phenomanon of this area. About 300 caves of different kinds are developed in the Klokočí cuesta, – fissure caves, crevasse caves, talus caves, caves on bedding planes and cave niches. The microrelief is abnormally variegated. Honeycomb-covered walls with

excellent geometry and architecture are present much like ledges. The occurrences of vertical and oblique grooves and ribs is connected with the presence of several centimetres thick sandstone laminae. This phenomenon is markedly different from common joints (forming vertical crevasses), karren forming sinuous surface (but not a plate continuing into rock massif). The best localities in the Klokočské skály are the Koník Cliff and walls below the Pětichlapka Cliff. These "discontinuities" are apparent on fresh erosional surfaces (cliff tops at touristic viewpoints and trails), having the form of 1–3 cm thick "veinlets" of different-coloured sandstone. They scorch slowly after rains and they are sharply bounded against the surrounding rock. No signs of movement are visible on these structures. They reach 20 m in depth and width, being apparent on vertical walls. Zones of this altered sandstone are vertical and also oblique in some places. At the locality of Deka, they dip at an angle of approximately 70° and represent two systems. Larger concentrations of these "tectonic zones" in some rocks are observed at the "Pod Pětichlapkou" locality. Here, the cross-sections of about 30 plates are devloped in several m2 of rock surface (their spacingss are several centimetres to tens of centimetres). About 50 small grooves are present at locality of "Koník" within a distance of 15 m. They are developed at places of the above mentioned zones. Towards the inside, some zones are forking, with root-like separation of grooves. They also merge in rare cases. About 65 smaller grroves were observed 5 m below the peak of "Koník" – in contrast to 50 ones at the top. In downward direction, some of these "discontinuities" disappear: less than 20 were observed at the at the base of the cliff 15 m below.

These "tectonic zones" form different rock surfaces and markedly enrich the microrelief. Usually, they form shallow small grooves with U-shaped cross-sections (several centimetres deep). They may exceed 20 cm in depth on vertical walls. The bottom of these grooves is flat – the final shape resembles a miniature of a deeply incised farm-track path. Keg-like cross-sections are more common. If these structures lie paralel to one another, they resemble rails in their shape and size.

Specifics in the scope of the Bohemian Paradise PLA The Klokočí cuesta represents a "geomorphological textbook". Almost all meso- to microrelief forms are developed here in an area of three square kilometres.

SOKOL

Geology

The area is formed by fine- to medium-grained quartzose sandstones of the Hrubá Skála "Quader". It is an erosional remnants in higher parts of the Sokol and Zbirohy hills. Tectonic dips (5–10° towards SSE) are connected with the Lužice Fault system (1 km NW of the area). Sandstones contain a large variety of sedimentary structures. Cross-bedding (7 m thick) is developed in the highest parts (Tyršova skála). Its foreset laminae dip towards SSE. Planar and trough cross-bedding 15–20 cm thick and partly herringbone bedding are developed at the Chléviště locality. Frequent sinuous erosional planes with hummocky cross-stratification (proving the influence of strong storm events below the fair-weather wave base) are developed at Chléviště and Zbirohy. The joint system is characterized by prevalence of NNE–SSW and WNW–ESE strikes. The Sokol Hill is built by a body of basaltic intrusive breccia. Other basaltic intrusions probably represent some of the youngest phases of volcanic activity (Miocene – Pliocene). Spherical and tube-like ferruginous impregnations are frequent. Holocene talus and block accumulations of quartzose to calcareous sandstones are important. The erosional borders are limiting factors for horizontal sandstone cliff distribution in the Sokol area. Very deep valley to canyon of the Jizera River borders the area in the west. Large calcareous sandstones outcrops of the Jizera Fm. are developed between the Jizera River and Sokol Hill (with quartzose sandstones).

Macrorelief

The Sokol Hill macrorelief belongs to the richest and the most complicated in the Bohemian Paradise area. The independent elevation of Zbirohy (452 m) with a castle ruin forms a ridge of W–E direction. A relatively narrow rocky ridge is developed in the W and a narrow flat edge occurs in the east. The NW slope of Zbirohy Hill (towards the Jizera River) includes two rock wall levels of calcareous sandstones with huge gravity-induced accumulations of blocks and boulders. The length of the continuous outcrop is 1000 m. Irregular mound-like to bell-like shape of the Sokol Hill peak (N of the area) is modified by the presence of basaltic bodies. Two isolated pillars are present near the top. A smaller rock city of Chléviště lies on the western slpoe, the rock city of Kalich in the SW, and the Besedlice rock city in the south.

Meso- a microrelief

Western part of the Zbirohy Ridge is basically formed by quartzose sandstone block accumulations. Primary outcrops are small rock spurs and towers on the crestline. Surfaces are smooth, rounded and/or with "tectonic ribs". Chain-shaped honeycombs are present. Frequent furrows originated by movement of live trees. They are situated on block edges. Spherical hollows (tens of centimetres in size) and potholes are less frequent. Several rock spurs and smaller pillars lie in the eastren part of the ridge. Rock ledges are copying primary sedimentary structures. Honeycombs prevail in rockshelters.

The Besedice rock city is formed by a group of rock pillars separated by crevasses and/or narrow chimneys. The height of the walls exceeds 10 m. Horizontal to oblique ledges (following primary sedimentary structures), sinuous ledges and honeycombs in rockshelters are basic microrelief components. Numerous tectonic ribs form several systems dipping at an angle of 45°. Similar rock city of Kalich is composed of less lithified sandstone. Rock niches and fallen blocks are more frequent here. Chléviště is the largest rock city in the Sokol Hill area. It lies on a rim above the Jizera River valley. The rock wall heights exceed 20 m. Internal part of the rock city contains numerous smaller caves, gorges and passages between fallen blocks

The series of outcrops in calcareous sandstones below Rakousy has a different character. Small (tens of cm) exfoliation scales prevail, parallel to the direction of rock walls. Fissure caves are frequent. In their shape, they rather resemble karst shapes than pseudokarst shapes. Thin "blister-like" superficial layers and imperfect hemispherical honeycombs occur occasionally. Several vaulted rockshelters (with height of max. 5 m) are developed in the outcrops. Fossil finds (bivalve Pinna sp. preserved in living position) are notable alike very old crevasses with several fill generations. According to partly lithified fill, we assume that they are of Tertiary age. The presence of several fill generations proves dilation of joints in several phases.

Specifics in the scope of the Bohemian Paradise PLA Calcareous sandstone outcrops are the best developed in the Bohemian Paradise area. They contain peculiar and still poorly documented microrelief. Rock cities of Chléviště, Kalich and Besednice are characterized by "maze" occurrences – i. e., labyrinths of narrow passages between rock blocks. The western side of the Zbirohy Ridge is typical by fallen rock blocks. Primary sandstone outcrops are less developed.

KOZÁKOV

Geology

Geology of the Kozákov Hill rock city is predisposed (Měsíční údolí and Kozákovské Drábovny) by the presence of the Lužice Fault system. Cenomanian sandstone blocks of the Peruc–Korycany Fm. were uplifted and eroded on the western slope of Kozákov Hill. Fine- to medium-grained sandstones are present. Bedding planes show prominent tectonic dips (15–30°) towards SW. Orthogonal jointing affected the character of mesorelief (like in sandstone rock cities with subhorizontal bedding). It comprises vertical joints, which gives the cliffs rhombic shapes. In additon to vertical open joints, joints systems dipping at 45° are present, too. Usually, they are manifested by a plate of strongly silicified sandstone.

Macrorelief

Měsíční údolí Valley on the slope of Kozákov Hill is predisposed by unique configuration of tectonically tilted sandstone outcrops, forming a canyon in the bottom part. Their upper walls lie farther apart. The rock walls are 15–20 m high or more, 30 m in the lower reach of the valley.

Meso- and microrelief

Subvertical rock walls with numerous vertical joints and chimneys prevail. Rock pillars derived from massifs are rare. Sandstone in the lower parts is poorly lithified and easily eroded. Numerous niches to bedding caves are developed at cliff bases. Superficial encrustations originate rapidly at cliff bases and are equally rapidly eroded. Due to this, several atypical shapes are developed here – small basins developed inside the honeycombs and covered by encrustations. Tectonic ribs are connected with oblique joint systems, being more marked towards the present sandstone surface. Sandstone blocks are densely interlaced by "tectonic ribs" and they form "box-like" structures during the erosion. Zigzag veinlets of silicified sandstone of several directions are developed on walls of the Měsíčné údolí Canyon near its mouth.

Specifics in the scope of the Bohemian Paradise PLA The rock city is the only one in the Bohemian Paradise area developed in tectonically markedly dipping sandstone. The forms of macro- (Měsíční údolí) and microrelief are also specific, connected with specific geological conditions. It is the areally largest outcrop of the Peruc-Korycany Fm. sandstones in the Bohemian Paradise.

I.2. GEOLOGICAL HERITAGE- PROTECTION SITUATION

The area is widely geologically diversified. The current shape of the Bohemian Paradise originated in complex processes beginning more than 400 million years ago.
The Bohemian Paradise Protected Landscape Area was established by means of Directive ref. no. 70 261/1954 issued by the Ministry of Culture of the Czechoslovak Socialist Republic on 1/3/1955 (Official Gazette 1955, section 31) with the administrative office in Turnov. In 1992, the passing of the Nature and Landscape Protection Act no. 114/1992 Coll. by the Czech National Council saw the Bohemian Paradise Protected Landscape Area confirmed in the appendix to the aforementioned act. Each of the rock cities is also protected as the small-scale protected areas.

The values and quality of the existing and proposed extended areas are demonstrated by the existence of 4 national nature monuments at Bozkov Cave, Suché skály, Strážník and Kozákov, 10 nature reserves at Valley Jizera, Hrubá Skála, Podtrosecká Valley, Příhrazské skály, Plakánek Valley, Žabakor, Prachovské skály, Bučiny u Rakous, Na hranicích and Klokočské skály, 11 nature monuments at Apolena, Bažantník, Libuňka, Meziluží, Trosky, Tachov, V dubech, Vústra, Oborská luka, the Ondříkovický pseudo-karst system and Vražda fishpond, 1 nature park at Malá Skála and 11 registered significant landscape elements in the expanded areas. The small-size protected areas were established with the purpose of protecting geomorphologic phenomena, semi-natural woodland and meadow communities.

The entire territory is part of the Protected Water Accumulation Area of the North Bohemian Cretaceous System.

The protection regime of the different areas is exactly defined in Nature and Landscape Protection Act No. 114/1992 Coll.

The following bodies and institutions are in charge of protection of nature and landscape according to Act No. 114/1992 on nature and landscape protection in valid amendments:

Administration of the Bohemian Paradise Protected Landscape Area, charged with state administration in the field of nature protection within the area of the PLA; Head: RNDr. Lenka Šoltysová, headquarters: A. Dvořáka 294, 511 01 Turnov

Ministry of the Environment, odbor výkonu státní správy V (Section V of the State Administration Dept.), Director: Ing. Milan Kubíček, headquarters: tr. I. máje 97, 460 01 Liberec;

Liberec Region Council – Governor: Ing. Skokan; odbor životního prostředí (Environment Department), Head: Ing. Jaroslava Janečková; address: Krajský úřad Libereckého kraje, U Jezu 642/2a, 460 01 Liberec 1;
Hradec Králové Region Council – Governor: Pavel Bradík; odbor životního prostředí (Environment Department), Head: RNDr. Miroslav Krejzlík; address: Krajský úřad Královehradeckého kraje, Resslova 1229/2a, 500 01 Hradec Králové
Agentura ochrany přírody a krajiny CR (Agency for Nature and Landscape Protection), Manager: RNDr. Martin Dušek, Kališnická 4-6, Praha

The provisions for the protection of the territory

Act No. 114/1992 Coll. on nature and landscape protection in valid amendments

Decree No. 395/1992 Coll., which further defines regulations of Act No. 114/1992 Coll. on nature and landscape protection

Regulation of the Government No. 508/2002 Coll., proclaiming the Český ráj Protected Landscape Area

Decree No. 236/1999 Coll., designating Bozkov Dolomite Caves Nature Monument

Decree No. 5/1998 of the Administration of the Bohemian Paradise Protected Landscape Area dated 21/03/1998, designating Hruboskalsko Nature Reserve

Decree No. 3/1999 of the Administration of the Bohemian Paradise Protected Landscape Area dated 24/05/1999, designating Příhrazské skály Nature Reserve

Decree No. 1/1998 of the Administration of the Bohemian Paradise Protected Landscape Area dated 21/03/1998, designating Apolena Nature Reserve

Decree No. 2/1999 of the Administration of the Bohemian Paradise Protected Landscape Area dated 21/03/1998, designating Plakánek Valley Nature Reserve

Decree No. 1 of the District Council in Jablonec nad Nisou dated 03/02/1997, designating Maloskalsko Nature Park

Decree No. 1 of the District Council in Semily dated 07/06/1995, designating Bučiny u Rakous Nature Park

Decree No. 227 of Okresní národní výbor (former District Council) in Semily dated 13/06/1985, designating Klokočské skály and Kozákov Protected Nature Monuments

Decree No. 2/2000 of the District Council in Jičín, designating Prachovské skály Natural Reserve

Decree of the Okresní národní výbor (former District Council) in Jablonec nad Nisou dated 01/10/1965, designating Suché skály Protected Nature Monument

Act No. 100/2001 Coll., the Environmental Impact Assessment Act

Act No. 289/1995 Coll., the Forestry Act

Act No. of the CNC 200/1990 Coll., the Administrative Infractions Act

Act No. of the CNC of 282/1991 Coll., the Czech Environment Inspection Act

Act No. 449/2001 Coll., the Game Management Act

Act No. 50/1976 Coll., the Urban Planning Act and Building Code, in valid amendments

Decree No. 415 of the Government of the CR dated 17/06/1998, establishing the State Programme on Nature Protection

Decree No. 38 of the Government of the CR dated 10/01/2001, updating the State Environmental Policy

List of selected documents involving the nominated property:

Management Plan for the Bohemian Paradise Protected Landscape Area, Bohemian Paradise Protected Landscape Area Administration, approved by the Ministry of the Environment of the Czech Republic and valid since 2004.

Evaluation of the Scenery of the Bohemian Paradise Protected Landscape Area, F. Jeřábek Architect's Office, 1999. Basic document for the Bohemian Paradise Protected Landscape Area Administration.

Development Programme for Protected Landscape Areas, Administration of Protected Landscape Areas of the Czech Republic, Prague, 2000.

Cultural and Historical Potential of the Bohemian Paradise Rock City Landscapes, Atelier Landart, Town Planning Institute, Faculty of Architecture, Czech Technical University, Prague, VÚ Silva Tarouncy KOZ, Průhonice (Jan Hendrych, Michaela Líčeníková), 2001.

Geological and Geomorphologic Description of the Rock Cities in the Bohemian Paradise, Institute of Geologie of the Academy of Sciences of the Czech Republic, Prague (Radek Mikuláš, Václav Cílek, Jiří Adamovič), 2001.

Analysis of Tourism Potential of the Bohemian Paradise Region, DHV ČR, spol. s r. o., 2001. Compiled for the Association of Municipalities and Towns of the Bohemian Paradise as a basis for the Concept for Long-Term Sustainable Development of Tourism in the area of the Bohemian Paradise.

Framework Strategy for the Development of Tourism in the Area of the Bohemian Paradise, Regional Development Agency Ltd, Liberec, March 2002. Compiled for the Association of Municipalities and Towns of the Bohemian Paradise as a basis for the Concept for Long-Term Sustainable Development of Tourism in the area of the Bohemian Paradise.

I.3. NATURAL AND CULTURAL HERITAGE

Forests were affected by the assotiation changes in the past including exotic components introduction – *Pinus strobus, Pseudotsuga menziesii, Larix decidua, Quercus rubra, Robinia pseudoacaccia.* Specific plans concerning rock cities charges were introduced after 1990. They are continually incorporating into forest economic plans with the aim of natural forests revitalisation and exotic components eliminationIn scope of Péče o krajinu program (Antierosive precaution, Florescenece meadows revitalisation), land arrngement and agroenvonmental arrangements, the intensively agriculturally exploited areas causing erosional and eutrophication processes are eliminated. The great variety of the nature of the whole Bohemian Paradise is also illustrated by the communities of plants and by the animals that have found their home there. The sandstone is overgrown with mixed woods. Most of these trees are pines. Birches, Norwegian spruces, wood beeches, summer oaks and, to a lesser extent, white-barked firs and some other wood species are also growing there. Although traces of settlement may already be found in prehistoric times (Hrada, Klamorna, the Prachovské Skály rocks), the medieval fortified castles, big or small (Valdštejn, Frýdštejn, Valečov, Rotštejn, Kost, Trosky), chateaux (Mnichovo Hradiště, Hrubý Rohozec, Hrubá Skála, Humprecht) and ecclesiastical buildings (Jičín, Rovensko pod Troskami, Sobotka, Turnov, Vyskeř) are the most expressive monuments, all this being supplemented by ancient works of vernacular architecture (Dolánky, Sobotka, Železnice, Osek) and dozens of statues or reliefs sculpted from the rocks (Kopic's Farm, Vranov).

II. MANAGMENT STRUCTURES

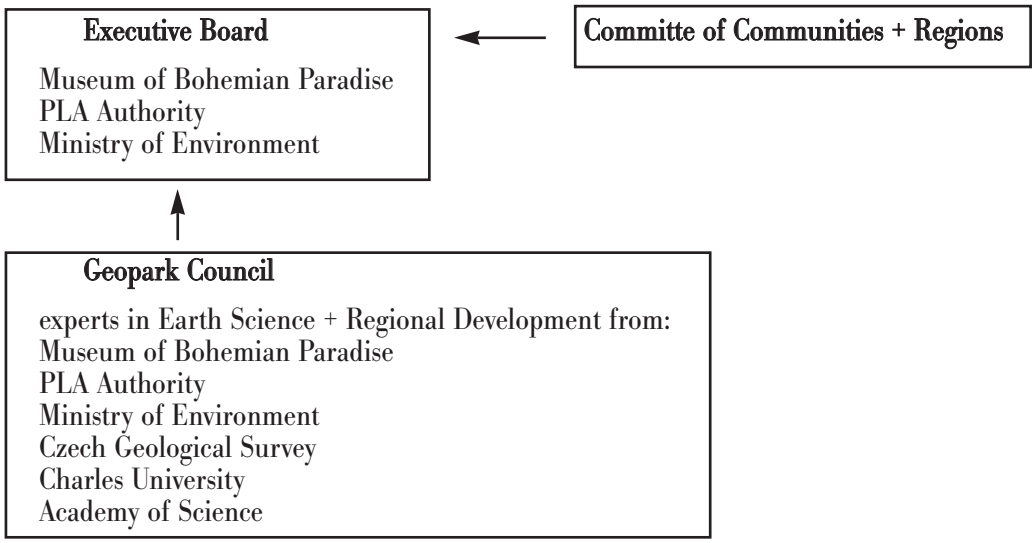
Management Desicion-making procedure

The main body in the decision making process will be the "Executive Board" which will proceed according to the advice of its consultative body "Geopark Council" composed from experts in Earth sciencies and regional development.

Geopark Council will hold its meetings twice per year to support conception and strategic decision making of the Executive Body.

The Executive Body consults all the destination management decisions with the „Committee of Communities and Regions" (majority agreement) so that any decision could be made without the consent of representatives of local authorities.

Destination Management



Správa Chráněné krajinné oblasti Český ráj (the Administrative Authority of the Český ráj Protected Landscape Area), which is a professional environmental institution exercising the power of state within the area of the CHKO and concurrently a professional organisation. It hears infractions and imposes penalties for infractions and illegal acts, issues decrees declaring nature reserves and monuments within the territory of the CHKO. Head: RNDr. Lenka Šoltysová, headquarters: A. Dvořáka 294, 511 01 Turnov. 20 Boroughs and authorised councils as environmental entities, within their administrative areas, register significant landmarks and monuments, assess and define the local environmental stability systems, declare memorial trees, approve tree cutting and keep a file of publicly accessible purpose-built roads, ways and footpaths.

Municipalities:

Obec (Borough) Karlovice Mayor – Vlasta Špačková, Obecní úřad Karlovice, 511 01 Turnov
Obec Koberovy Mayor – Jindřich Kvapil, Obecní úřad Koberovy, 468 22 Železný Brod
Obec Mírová pod Kozákovem Mayor – Jaroslav Havlíček, Obecní úřad Mírová pod Kozákovem 512 54
Obec Holín Mayor – Ing. Dana Malá, Obecní úrad Holín, 506 01 Jičín
Obec Zámostí-Blata Mayor – Ing. Miroslav Adamec, Obecní úřad Zámostí-Blata, 506 01 Jičín
Obec Libošovice Mayor – Josef Ort, Obecní úřad 507 44 Libošovice
Obec Dobšín Mayor – Luboš Bárta, Obecní úřad Dobšín, 294 04 Dolní Bousov
Obec Troskovice Mayor – Ing.Václav Martínek, Obecní úřad Troskovice, 512 63 Rovensko pod Troskami
Obec Hrubá Skála Mayor – Josef Novotný, Obecní úřad Hrubá Skála, 511 01 Turnov
Obec Rakousy Mayor – Ing.Karel Guznar, Csc., Obecní úřad Rakousy, 511 01 Tunov
Obec Kacanovy Mayor – Oldřich Loutchan, Obecní úřad Kacanovy, 511 01 Turnov
Obec Klokočí Mayor – Vlastimil Hudský, Obecní úřad Klokočí, 511 01 Turnov
Obec Žďár Mayor – Oldřich Housa, Obecní úřad Žďár, Břehy 20, 294 11 Loukov
Obec Boseň Mayor – Marie Pšeničková, Obecní úřad Boseň, 295 01 Mnichovo Hradiště
Obec Knežmost Mayor – Ing.Vítezslav Pospíšil, Obecní úřad Knežmost, 294 02 Knežmost
Municipalities with extended authiority outside the area under protection of CHKO Český ráj register in their districts important lanscape elements, they evaluate and define local systems of ecological stability and the provide their protection.
Město (the Town of) Turnov, Mayor – Ing. Milan Hejduk, Městský úřad Turnov, 511 22 Turnov
Město Mnichovo Hradiště, Mayor – Jaroslav Myška, Městský úřad Mnichovo Hradiště, Masarykovo nám. 1, 295 21 Mnichovo Hradiště
Sdružení Český ráj (Bohemian Paradise Association) is an entity that deals with the development, promotion and marketing of tourism and prepares documents to obtain finance, issues promotional material and coordinates all activities in promoting tourism of the Český ráj area. The Sdruzeni is a free association of the local municipalities and other corporate entities. One the basic principles is a maintainable development of regional tourism. The Sdružení is represented by, and dealings are conducted on its behalf by the chairperson of the board of administrators – PhDr. Hana Maierová; Sdružení Český ráj, A. Dvořáka 334, 511 01 Turnov, www.cesky-raj.info

Geopark Finantial Recources

The budget of the Geopark will be done on the base of the more resources financing – it will be composed from the sources of the Turnov Museum, the PLA Authority, Ministry of Environment, Czech Geological Survey, Local comunities and regions end local businesses.

- Ministry of the Environment
- Ministry of Agriculture
- Ministry for Local Development
- Regional Councils
- District Councils
- Local communities
- Local businesses

III. INTERPRETATION AND ENVIRONMENTAL EDUCATION

The expression Český ráj (Bohemian Paradise) is a name of the tourist region. The tourist atractvity a uniqueness of the region is based on the contration of boundary area, delimitated by distance from habited centres and character of the Český ráj area as a natural barrier. The area of Český ráj is constituted by western part of Jičín Highlands, in the north conected with Ještěd – Kozákov edge and Jizerské hory (Jizera Mountains), in the northwest connected with Krkonoše foothills. The centre of Český ráj is created by sandstone plateaus which are important landscape barrier and also transport barrier demarcating south and west situated flat area of Cetraceous plateau. Various naturalistic values are used for education of all age categories. Is often a theme for final, diploma works or doctoral thesis.

IV. GEOTURISM

The Regions declared in their programmes and long term concepts regarding large scale protected areas the support to sustainable development aiming to preserve the framework of the landscape and improvement of environment.

A programme for sustainable tourism development in the Bohemian Paradise region has been made for the Bohemian Paradise Association. In September 2001, the "Analysis of the Potential of the Bohemian Paradise Region" was completed. A medium–term plan and a plan of action with proposed monitoring, a proposed system of tourism management, designation of limits and potentials for the development of tourism from the point of view of environment protection, including a marketing plan and presentation and promotion of the region was completed by October 2002.

In the area there are regularly organised geoexcursions for basic, secondary schools and universities. During last several years the number of incoming tourists (from Germany, Holland, Poland, Switzerland, Russia etc.) focused and interested in geotourism has increased. Thanks to cooperation between Sdružení Český ráj (Bohemian Paradise Association) and CHKO (the Administrative Authority of the Český ráj Protected Landscape Area) there were built up programmes and tourist products dealing with the theme of geotourism. These products should promote the uniqueness of the protected area and outstanding areas for geotourism (prospects or finding places of minerals) with their postproducts (stonecutting or jewellery workshops, museums etc.). Excessive sports and recreational utilizations (climbing, orienteering, mountain bikes, riding, tourism) are regulated in scope of protective regim in the Bohemian Paradise area and independent natural monuments (see No.114/1992 Sb.).

Indoor shows

- exposition of Geology and Mineralogy in the Museum of Bohemian Paradise at Turnov with interactive, hands-on shows, backed by the Information Centre in this museum
- exposition of Mineralogy and Paleontology in the Municipal Museum and Treasury at Nová Paka
- local mineral exposition in the Municipal Museum and Gallery at Lomnice nad Popelkou
- local mineral exposition in the Museum at Železnice

- numerous information centres in towns and at the field base of the Bohemian Paradise PLA Administration at Krčkovice

Outdoor shows and trails

- educational trail Plakánek Valley including interpreted sites of geological character (sandstone stratigraphy, past sandstone extraction in small quarries), the interpretative booklet for children visiting this trail available
- educational trail Rieger path with a number of interpreted geosites in crystalline rocks
- guided services in the Votrubec Quarry (Permian lava flows, not in operation)
- guided tours at the Trosky Castle ruin on an exhumed basaltic dyke, with geology interpretation

Events

- annual seminars on the nature of the Bohemian Paradise organized by the Bohemian Paradise PLA Administration with scientific lectures to address wider public
- annual workshops on gemstone preparation and related crafts organized by the Museum of Bohemian Paradise at Turnov
- guided geological tours on request organized by the Pedagogical Faculty of the Charles University Praha

Publication activities orientated at the public

- numerous maps and guides published by the Bohemian Paradise PLA Administration, Czech Tourist Club, NGOs and private subjects
- four local journals for the public regularly publishing on the nature of the Bohemian Paradise (Krkonoše a Jizerské hory, Od Ještěda k Troskám, Muzejní noviny Jičín, Sborník Muzea Českého ráje)
- pictorial books on sandstone-related phenomena from this area published by many publishers on national scale

FUTURE FACILITIES PLANNED

- transformation of the present information centre located in the Museum of Bohemian Paradise at Turnov into the Geopark Information Centre
- establishment of five new geo-educational trails (Hrubá Skála, Příhrazy, Klokočské skály, Sokol Hill and Trosky Hill) and doubling of the Plakánek Valley general educational trail with one focused on geology
- establishment of a group of certified Geopark guides; two types of guided tours will be provided differing in the depth of scientific insight

V. SUNSTAIBLE REGIONAL ECONOMY

The economy of region is basically based on small and middle size companies providing tourism services. Thanks to more than 200 years old history stone cutting and processing there can be find numbers of private workshops or small companies dealing with this special handicraft tradition logically connected with natural potential of the region.

VI. PUBLIC ACCESS

The area of Český ráj is sitated some 80 kilometres from Prague – the capital city of Czech Republic. The whole region is easily reachable by car, bus or train from the area of the Czech Republic or Europe. Turnov as a natural centre of the region is situated on the highway from Prague to Liberec leading to Germany and Poland. The area is suitable for a week or a weekend stay for Czech tourists or incoming visitors from Saxony, Brandenburg or Lower Silesia.

SDRUŽENÍ ČESKÝ RÁJ
adresa: Dvořákova 335, 511 01 Turnov
tel.: 481 366 225 fax.: 481 366 221
e-mail: cesky-raj@turnov.cz

Věc:
The nomination Geopark of the Czech Republic
for inscription in the UNESCO Geopark network

Turnov 30. 4. 2005

Our Association of Bohemian Paradise agree with the nomination of Bohemian Paradise as an European Geopark and is fully prepared to cooperate on its sustainable development and protection.

We agree that the main values of this region lie in its geological heritage and that any activity which could destroy or diminish these values cannot be developed on the area of the Bohemian Paradise.

Ilona Maicová

The chairwomen of the Association of Bohemian Paradise

SDRUŽENÍ ČESKÝ RÁJ
A. Dvořáka 335, 511 01 Turnov, IČO: 150 45 838
telefon: 481 366 225, fax 481 366 221

SIGNATURE ON BEHALF OF THE STATE PARTY

RNDr. Libor Ambrozek
Minister of the Environment, Czech Republic
Prague, April 2005

This documentation for the nominated geopark has been prepared by the Bohemian Paradise Protected Landscape Area Administration in cooperation with the Ministry of the Environment

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Cover photo: Prachovské skály
Maps: Map of the Bohemian Paradise – © Geodézie ČS a. s.
Geological Map of the Bohemian Paradise – © Czech Geological Survey
Specialist texts: Jiří Adamovič, Václav Cílek, Radek Mikuláš, Tomáš Řídkošil,
Factual information and text editing: Lenka Šoltysová, Aleš Hoření, Tomáš Řídkošil
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Composition, graphic layout: Zdeněk Bičík, Leoš Erben
Print: Gentiana, Jilemnice


ARCTIC OCEAN
Arctic Circle
Europe
Czech Republic
Asia
America
Africa
Equator
ATLANTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
Australia
Antarctic Circle
Antarctica
1


ATLANTIC OCEAN
Norwegian Sea
Barents Sea
White Sea
North sea
Baltic Sea
Celtic sea
Bay of Biscay
Black Sea
Caspian Sea
Mediterranean Sea
Iceland
Reykjavik
Faeroe Is. (Den.)
Shetland Is. (U.K.)
Orkney Is. (U.K.)
Hebrides
Oslo
Stockholm
Helsinki
Tallinn
Riga
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Sofia
Tbilisi
Baku
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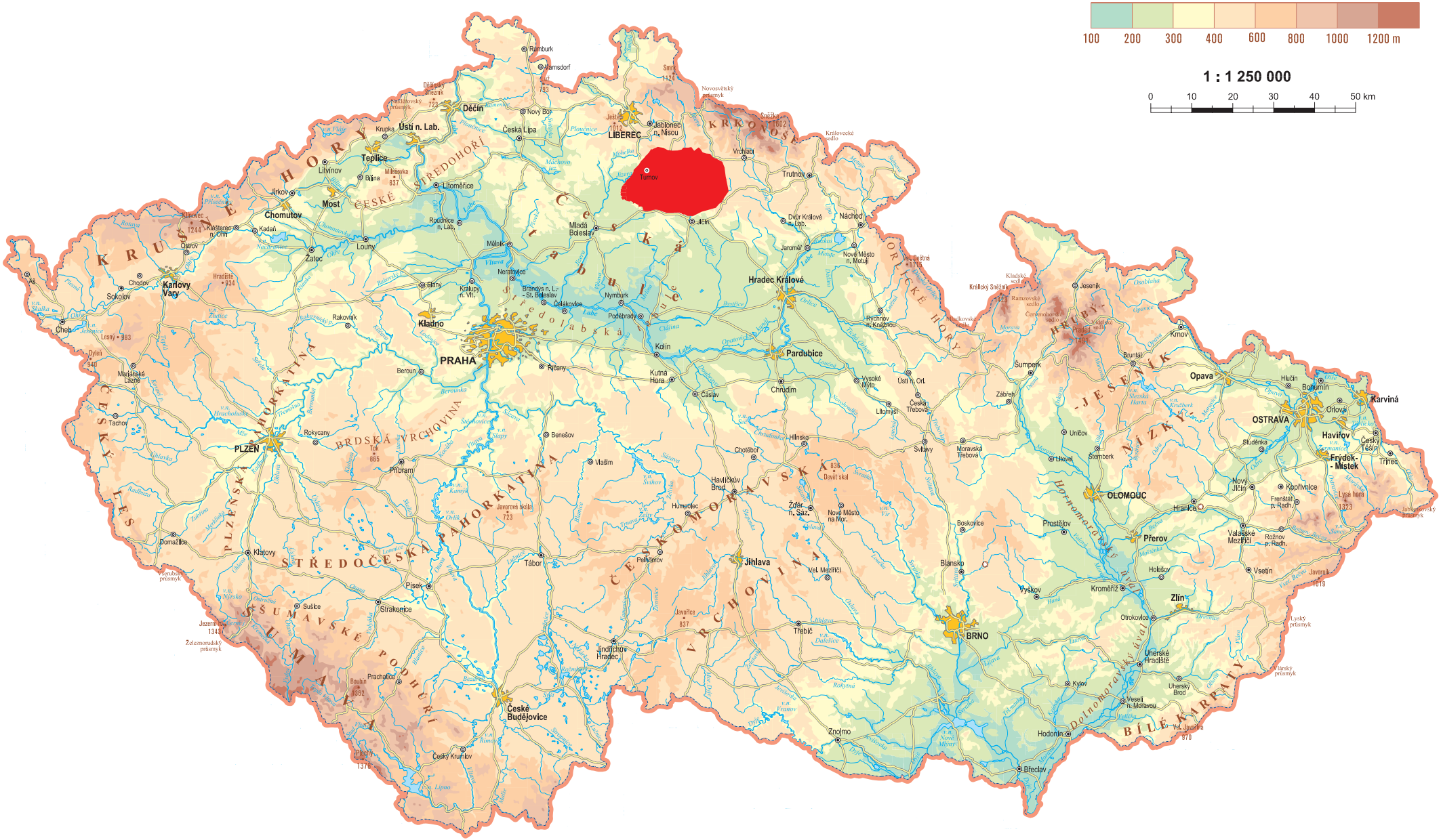
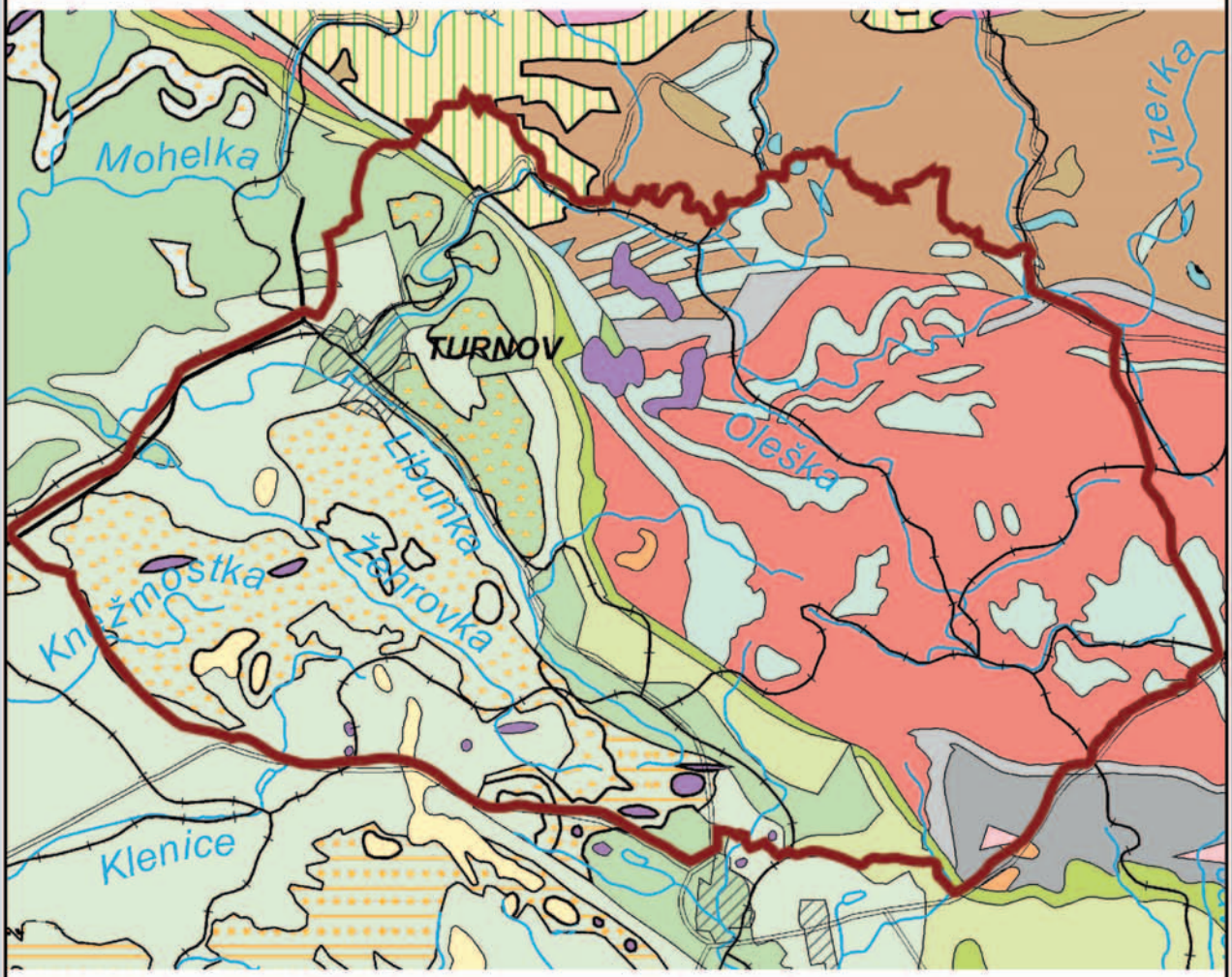
Madrid
Lisbon
Monaco
San Marino
Corsica
Rome
Sardinia
Ankara
TEHRAN
El-Djazaïr
Ar-Rabat
Tunis
Sicily
Malta
Valletta
Athens
Rhodes
Cyprus
Lefkosia
Beirut
Damascus
Baghdad
Crete
2

Location of the geopark in Czech republic



BOHEMIAN PARADISE GEOPARK



- olivine alkali basalt, basanite
- Santonian to Coniacian (Březno Formation): quartzose sandstone
- Santonian to Coniacian (Březno Formation): calcareous claystone
- Santonian to Turonian (Teplice and Březno Formations): calcareous claystone
- Turonian (Jizera Formation): calcareous sandstone
- Turonian (Bílá hora and Jizera Formations): calcareous claystone, marlstone
- Cenomanian (Peruc-Korycany Formation): sandstone, conglomerate, claystone
- Santonian to Turonian (Teplice and Březno Formations): quartzose sandstone
- Barruelian (Stephanian A), Cantabrian, Westphalian D: terrestric red and grey silty claystone, siltstone, sandstone
- Stephanian B: terrestric red and grey silty claystone, siltstone, arkosic sandstone
- Lower Permian (Autunian) and Upper Carboniferous (Stephanian C): terrestric red and grey silty claystone, arkosic sandstone, conglomerate, coal seams near base
- coarse two-mica granite
- Upper Carboniferous and Permian: rhyolite, dacite and their tuffs
- Upper Carboniferous and Permian: andesite and its tuffs
- weakly metamorphosed siliciclastic sediments, marble intercalations
- weakly to moderately metamorphosed siliciclastic sediments
- quartzite
- marble
- greenschist
- Upper Carboniferous and Permian: basalt, basaltandesite
- fine porphyritic biotite granite

1:250000

0 5 10 Km

N

boundary of geopark

BOHEMIAN PARADISE GEOPARK