

## PHYSICOGEOGRAPHICAL CONDITIONS OF THE ČERGOVSKÝ MINČOL, THE NATIONAL NATURE RESERVE AND THE PRESENT STATE OF ITS PROTECTION

Eva Michaeli

---

*Department of Geography and Geoecology, Faculty of Humanities and Natural  
Sciences, University of Prešov, Prešov, Slovakia*

**Abstract:** The Čergovský Minčol was declared to be the National Nature Reserve (state nature reserve) in 1986 with the aim of protecting the typical mountainous Carpathian flora of the highest mountain meadow parts of the Čergov, representing also the East Carpathian species and forest-associations of the highest levels of this mountain range. Its area is 171.08 hectares. Within the structure of the protected territories of the Outer West Carpathians and within the little diversified East Beskydy flora, it represents an important locality situated on the borderline of two floristically different regions: *Carpatica occidentale* and *Carpatica orientale*.

**Key words:** nature conservation, national nature reserve, mountainous Carpathian flora.

### 1. POSITION, DELIMITATION AND FACILITIES OF THE NATIONAL NATURE RESERVE

National nature reserve of the Čergovský Minčol is part of the subprovince of the Outer West Carpathians, of the region of the East Beskydy and of the geomorphologic complex of the Čergov where it is situated in the southwest part of the mountain range. It is situated on the borderline of the following districts: Stará Ľubovňa (in the cadastre of Kyjov), Bardejov (in the cadastre of Livovská Huta) and Sabinov (in the cadastre of Kamenica) of the present-day Prešov region. The reserve is of the shape of a star. Its main ridge is in its southwest part. It begins with the altitude of 1094 m above sea level, continues with Minčol of 1156.7 m above sea level, then continues with the altitudes of 1135 m and 1128.4 m above sea level and gradually decreases to the altitude of 1050 m

above sea level. The lowest point of the reserve, its altitude being 832.5 m above sea level, is in the basin of the Križovský stream. The relative altitude difference is 324.2 m. The main European water-divide runs through the reserve, the tributaries of the Poprad, the Torysa and the Topľa rise here. There is a concrete pylon on Minčol, a wooden signalling tower at the altitude of 1135 m above sea level, and a wooden cross (6 m) at the altitude of 1128.4 m above sea level. Minčol is a crossroad of tourist paths. This is where the long-distance route No. 0918 = E3 begins going through the most beautiful areas of the mountains in Slovakia. The reserve is equipped with five official information tables of state nature conservation. In addition, there are paths here used by animals. No infrastructure facilities are situated here.

## 2. PHYSICOGEOGRAPHICAL CONDITIONS

**Tectonics and geological structure.** The Čergov mountain range represents a massive block and positive sheet - fold - fault morphostructure in the system of mobile zone with positive movement tendency. It is part of the geological tectonic unit of Polonidy, of its main zone of Beskydikum (Mahel' 1987). It is a complex of sheets accumulated on the platform before the Inner Carpathians. The area concerned is built of the Biele Karpaty - Krynica unit (thickness: 1700 - 2300 m) of the main Magura sheet whose differentiation of litofacia is not as stable as in the more external partial units, which results from its position with regard to the source area that supplied the Magura flysh material (Nemčok et al. 1990). The geological structure of the Čergovský Minčol is monotonous. It is built of the Strihov group of strata for which occurrence of psefitic components is characteristic (Nemčok et al. 1990). It originates from Lutet and lower Priabon.

In this group of strata thick bank sandstones with the strata of clays and microconglomerates are uniquely represented, it is a thick psamitic flysh. The sandstone form banks whose thickness is of 20 cm - 350 cm and they have tabular separation. The banks of conglomerates are irregular occurrence in the group of strata. They have either irregular or tabular separation. Clays are of strong sandy character and form locations with the thickness of about 30 cm. Locally they prevail. Sliding blocks with boulders of Mesozoic, crystalline and sandstones are the component parts of stratigraphico-lithologic sequence of the Strihov group of strata. Quaternary period is represented by eluvial - deluvial weathered clayey sandstones and clayey stones of the Strihov sandstones. With regard to geological structure, and due to little thickness, they are of low importance.

### 2.1. Georelief

The Čergov is of massive character in an advanced stage of division. Its georelief is to a large extent influenced by geomorphologic value of the rocks, but its essential

features have been conditioned by geologico - tectonic development of the territory in question. After Miocene formation levelling, the mountain range was unevenly lifted above the surrounding hilly country. It represents positive sheet - fault - fold morphostructure of the flysh Carpathians, with the main type of erosion - denudation relief on the more resistant sandstones of the Magura flysh, and with the subtype of fluvial denudation crest relief of rocks. Fault slopes of the Čergov, along which the mountain range was lifted and inclined northwards, are deeply cut by regressive erosion of the tributaries of the Topľa, the Torysa and the Poprad, especially in the zones of tectonic disturbances, or in the locations of clayey - marl locations. In some places, the main ridge has the character of edge, and stretches from north - west to south - east, in accordance with the Carpathian curve. Relatively long side crests, transversely located, is divided by valleys and has constant altitude of a few meters above 900 m. Relative altitude differences in valleys are 200 - 450 m. In the reserve, the Topľa and the Solisko had the deepest impact on the mountains - below the main ridge - exercised by regressive erosion and resulting in the curvature. The Čergov Minčol is situated on the main ridge of the mountains and on five side crests. Their shape is even, within the range of 1000 - 1100 m above sea level. The highest point of the Minčol is 1156.7 m above sea level. The slopes along the main ridge and side crests are of erosion - fault origin, they are considerably steep; the slope valleys are deep, v - shaped and with weakly developed or missing flood - plain. In Pleistocene frost weathering occurred. On ridges, periglacial forms of relief developed e.g. periglacial hills and erosion - denudation mountain - saddles. In addition, initial stages of subsurface disturbances (combering) developed here, manifested on the central ridge of the Čergov Minčol in a complex of lengthwise striae (their depth being 30 - 50 cm) and insignificant degrees which are manifested laterally. The striae are 200 - 300 m long and run along the main ridge from northeast to southwest. Up to the present time no separation of the sides of future dislocations has occurred. Other forms of relief which are represented here are denudation plateaus on the main ridge and side crests. They are situated at the altitudes of 1000 - 1100 m above sea level. They are 80 m wide and 300 m long. They do not represent ideal flat surfaces because they are mildly undulated. They can be classified as residues indicating middle mountain level system of levelling that was probably formed in Neogen (Bizubová, Minár 1992) between the Sayer and Atic stage of tectonic movements. The most widely spread form of relief in the reserve is represented by smoothly modelled erosion - fault slopes. They are steep (inclination of above 29 degrees), straight and convexly bent, locally covered with clayey - stony deluvials (fragments of sandstones 5 - 10 cm and clayey soil). In the spring, area of the Križovský stream they are distorted by landslides, elsewhere by shallow, river - bed -like, not branched dellen. Landslides in this central part of the mountains, built exclusively of sandstones, do not represent a frequent form of georelief. Their separation walls are low and their surface is irregularly divided and on sides surrounded by insignificant rifts. Landslides are caused by the critical inclination of the slope and progressive erosion of the Križovský stream tributaries. In the final part of its valley, as well as in the valley of the Topľa, short and not deep erosion striae have been formed interfering only in the weathered cover. They are young, unstable forms of relief.

After Miocene formation levelling of the mountains (Karpát/Baden) and during the Atic stage of movements (Panon/Pont), uneven lifting of the mountains occurred, and the residues of the surface of that period are preserved in the form of denudation plateaus on the main ridge and on the side crests. In further periods, they were not significantly remodelled, only slightly distorted due to the processes of periglacial and fluvial modelling in Quaternary.

## **2.2. Climatic conditions**

The Čergov Minčol is part of the cold area, district C1, which is mildly cold, with the average temperature in July 12 - 16 degrees of Celsius. With regard to climatic - geographic type, the area has cold mountainous climate, with the average temperature in January being -5 - -7.2 degrees of Celsius, and average temperature in July being 13.5 - 16 degrees of Celsius. The annual rainfall is 800 - 1000 mm. The rainy month is July and the driest month is February. Snow layer lasts for approximately 120 days.

## **2.3. Waters**

The main European water - divide is situated in the reserve. The Soliská stream rises on the western slopes of the Minčol flowing into the Poprad, on the north - east slopes the Krížovský stream rises flowing into the Topľa and in the south - west, below the main ridge, the Sokolí stream rises, the tributary of the Lipiansky stream flowing into the Torysa. The type of outlet regime of the streams is snowy - rainy. The highest outflow is in March - April and the lowest is in January - February or September - October. A less significant increase in outflow in late autumn is of lesser importance. Supplies of subterranean waters are insignificant. On the slopes above the valley of the Krížovský stream, there are several rift springs with insignificant outflow.

## **2.4. Structure of Soil Cover**

The soil cover of the Čergov Minčol is little varied, which results from monotonous geological structure of the territory, the relief, as well as from the relatively small area of the reserve. The structure of the soil cover here is formed by disctric cambisol, spodic cambisol, stagno - gleyic cambisol, cambisol and typical ranker. Distric Cambisol. In the reserve, it occurs approximately up to the altitude of 1000m above sea level, on flysh sandstones, poor in minerals, of the Strihov group of strata, of the Biele Karpaty - Krynica unit. With regard to the granular structure, these soils are considerably variable, but they are predominantly clayey - sandy and sandy - clayey soils of medium skeleton soils. Humus horizon is relatively high, especially in the upper parts of the profile, the average contents being approximately 3.5%, but it is of low quality. It mainly contains weakly disintegrated organic substances of roots of plants, acid (of light colouring) humus with a large portion of fulvoacids. In the whole profile the soil reaction is

strongly acid, 4.7 pH/KCL. Up to the depth of 60 cm, the sorption complex is undersaturated. The thickness (B) of the horizon is 30 cm and it is predominantly of rusty brown colour. It contains a considerable amount of fragments of solid rocks of various sizes. C1 horizon is represented by weathered sandstones of the Strihov group of strata that gradually change into solid rock in the C-horizon. Spodic Cambisol it is a prevalent soil type in the reserve. Concerning its granular structure, it is relatively even, in the whole profile it is of sandy - clayey structure. In addition to the process of sialitization, the process of weak podsolization is also represented here. There are whitened sand grains in the humus horizon. Contents of humus is high (5.2%), it is a mostly acid light humus. Soil reaction is acid 4.1 - 4.2 pH/KCL. Stagno - gleyic Cambisol is found only on "islets" - small landslides where soil horizon gets moisturised and there are more intensive processes of surface gleying. With regard to the granular structure, these soils are clayey soils or clayey - loamy soils. Within the whole profile, soil reaction is acid. Cambisol ranker is found in denudation plateaus of the main ridge of the Čergov Minčol. They are skeleton soils with weakly differentiated profile. Humus horizon is dark gray, 20 cm thick and the humus is of low quality.

## 2.5. Vegetation

In the structure of vegetation cover grassy and forest plant - associations are equally represented. The main ridge and side crests are covered with mountain meadows which cover approximately half of the area of the reserve (83 hectares). In forest spinnys beech is prevalent, both solitaires and larger groups of pine trees occur in the spring area of the Topľa. Mountain meadows have come into existence as a result of the economic activity of the inhabitants in the surrounding villages. The following economic activities were dominant: sheep breeding, cattle breeding, lumbering and charcoal burning directly in wooded areas. The meadows were locally utilised as late as 70s as single - haymeadows and part of them as pastures. Later spontaneous development has led to the change in species diversification - in favour of *Vaccinium myrtillus*, *Nardus stricta* and *Luzula silvatica*. On the mountain meadows of the Čergov, 230 taxones of higher plants (Kliment 1996) have been observed 9 of which are protected plants, e.g. *Lilium martagon*, *Gentiana asclepiadea*, *Lycopodium clavatum* and 5 species which are endangered to varying degrees, e.g. *Dactylorhiza sambucina*. The most widely spread types of mountain meadows in the reserve are bilberry and cowberry mountain meadows with *Nardus stricta*, *Allyssum flexuosa* and *Poa Chaixi* (Kliment 1996). L. Dostál and S. Humečňanský have classified them as Homogyno alpinae - Nardetum, Mráz 1956 (Kliment 1996) have preliminarily included them into the association *Hieracio lachenalii* - Nardetum. Plant cover of *Rubus idaeus* is spread all over the territory of the reserve. It is mostly monotonous, and in continuous copses *Vaccinium myrtillus* as well as *Poa Chaixi* can be found here. Marshy associations of the Caltion union can be found on the north - east slopes in the spring area of the Krížovský stream where springs and swamps occur. Trampled associations can be found especially on the main ridge and side crests where tourist paths lead, and also in the areas of bilberry and cowberry meadows. Their floristic composition contains also strange species. The only natural representatives of

plant associations of the reserve are the vegetation of wet spots occupying small areas, and forest associations. The above-mentioned variants of mountain meadows are secondary associations that have been formed as a result of human activities.

Forest associations occupy a major area to the northeast and a minor area to southwest of the main ridge. On the slopes below the main ridge mountain, beech of limited growth (*Fagetum humile*) can be found. These trees occupy areas of over 1000 m above sea level, approximately 6% of the reserve area (*Fagus silvatica*, *Acer campestre*, *Abies alba*) and damaged by decay. The most widespread trees are fern fir beech (*Abieto fagetum*). They can be found in the Křížovský stream valley. In the tree etage *Fagus silvatica*, *Abies alba*, *Picea excelsa*, and, occasionally, *Acer pseudoplatanus* can be found. *Fageto aceretum* represents copse in the valleys of left-side tributaries of the Křížovský stream. On the southwest slopes below the peak of Minčol, at the altitude of 1050 - 1157 m above sea level, the association *Fageto - Aceretum humile* can be found. With regard to the tree etage, *Fagus silvatica* (90%) and *Acer pseudoplatanus* (10%) are prevalent. Forest vegetation fulfils the role of soil protection. At the altitudes of above 1000m above sea level, the trees are of smaller growth. They are 100 - 150 years old, younger groups being 15 - 30 years old. The majority of trees suffer from decay.

### **3. THE PRESENT STATE OF PROTECTION OF NATIONAL NATURE RESERVE**

The Čergov Minčol is classified as an A category of protected areas which are the most valuable parts of not only Slovak countryside. Within the country's structure, they represent an important area of a high value, with regard to natural sciences, and ought to be preserved owing to diversity of conditions and forms of life. The present state of protection is insufficient, and it requires more rigorous rules and increased thorough protection, specifically regarding the components, which are subject to this protection. Negative impact on the physico - geographical complex of the Čergov Minčol is especially exercised by mass hiking (tourist meetings) and picking of berries. These activities result in damaging of vegetation by trampling, combing of bushes, making fire and polluting of the reserve. Apart from these factors, natural environment of the reserve is also endangered by fertilisers and pesticides applied in the nearby wooded areas. Plant associations representing a typical mountainous and Carpathian flora of the highest mountain meadow parts of the Čergov are subject to protection in the national nature reserve. The East Carpathian species and several forest associations of the highest parts of the mountains represent them. Mountain meadows in the Čergov have arisen due to economic activities. Decrease in its intensity and other diversification have resulted in the change in species structure and, locally also in gradual return of forest associations as well as in overgrowing of weed associations. Solutions to these problems are very difficult and economically demanding. On the Čergov mountain, meadows that have

been left to develop spontaneously, change in diversification of species (in favour of bilberry and some grasses) has been observed. Blossoming species of the family Orchideaceae, forest species and also some grasses have subsided. Picking which, however, can be allowed under certain limitations, prevents bilberry from further spread. Grazing cannot be allowed here though occasional grazing would be very suitable. With regard to the occurrence of bilberry and other weed species (*Rubus ideus*) and with regard to the inclination of the slopes and costs, moving is practically unrealistic. Active deposit of pioneer trees (aspen, willow, birch, raspberry) on Poloninky can be eliminated by regulated goat grazing even though grazing in nature reserves is generally banned (Kliment 1996). Solitaires of some pioneer trees and of pine could be removed by thorough and continuous protection, e.g. combination of cutting and application of black foil which would prevent them from further growing or combination of this process with regulated goat grazing (Kliment 1996). Cutting could eliminate raspberries. The Čergov mountain meadows have been formed throughout centuries under permanent economic impact and therefore preserving of these meadows is largely dependent on permanent protection. With regard to these facts, it is necessary to ask a question - whether the aim of controlled protection is to preserve the present state on the whole area of meadows, or to mow some small areas and thus make them closer to their original state. Another issue is the renewal of mountain meadows on forest - attacked areas (Poloninky). Here complete return to hay-meadows can be regarded as troublesome and even unrealistic. These localities could be rather left for spontaneous development (Kliment 1996). Soil fund of the reserve is endangered by acid rains containing toxic chemicals. Application of natural mineral rocks in the form of powder ranks among the reliable melioration means aiming at improving sorption soil complex. As a counter measure eliminating the impact of acid rains in mountain national nature reserves, big-area limestone application has been introduced, however, without expected effect. Experiments have shown that on soils with highly acid raw humus surface the application of limestone proves to be helpful only with simultaneous application of nitrogenous fertilisers (Hraško, Bedrna 1986).

## References

- Atlas SSR (1980): Geografický ústav SAV a Slovenská kartografia. Kapitola VI., mapa 1, 2, 3, 4, 6, 7, 9. Bratislava.
- Bizubová, M., Minár, J. (1992): Some new aspects of denudation chronology of the West Carpatians. Abstracts of papers. Time frequency and dating in Geomorfology. Bratislava, p. 10.
- Dostál, L. (1980): Odborné botanické úlohy riešené v Múzeu SSR v Prešove v rokoch 1977-78. Zborník Východoslovenského múzea. Košice - Prírodné vedy, Košice, 20, pp. 289 -292.
- Hraško, J., Bedrna, Z. (1986): Aplikované pôdoznanectvo. Príroda. Bratislava, pp. 253-281, 369-380.
- Kliment, J. (1996): Vyššie rastliny Horských lúk Národnej prírodnej rezervácie Čergovský Minčol. Ms. (Depon. in SAŽP, stredisko Prešov).
- Kvitkovič, J. (1977): Stredný uhol sklonu reliéfu Slovenska a priestorové rozloženie jeho hodnôt. Geografický časopis, Vol. 29, No. 1. Veda SAV. Bratislava, pp. 3-18.

- Maheľ, M.**, (1987): Geologická stavba československých Karpát. Palcoalpinske jednotky, diel 1. Veda SAV, Bratislava, pp. 41-46.
- Masaryk, Š. a kol.**, (1980): Vápnenie pôd. Príroda. Bratislava, pp. 46-48.
- Mičian, L.**, (1977): Všeobecná pedogeografia. Vysokoškolské učebné texty. PF UK. Bratislava, pp. 32-33, 51-53.
- Mičian, L.**, (1972): Pôdy. In: Slovensko - Príroda. Obzor. Bratislava, pp. 393-397.
- Michaeli, E.** (1996): Národná prírodná rezervácia Čergovský Minčol. Inventarizačný výskum maloplošného chráneneého územia. Geologická stavba, reliéf, pôdy. Ms. 33 s. (Depon. in SAŽP, stredisko Prešov).
- Nemček, A.** (1982): Zosuvy v slovenských Karpatoch. Veda vydavateľstvo SAV. Bratislava, pp. 135-143.
- Nemček, J. et al.** (1990): Vysvetlivky ku geologickej mape Pienin, Čergova, Ľubovnianskej a Ondavskej vrchoviny, 1:50000. GÚDŠ. Bratislava, pp. 54-58.
- Nemček, J.** (1990): Geologická mapa Pienin, Čergova, Ľubovnianskej a Ondavskej vrchoviny. GÚDŠ, Bratislava.
- Šály, R.** (1962): Hlavné typy lesných pôd na Slovensku. Vydavateľstvo SAV. Bratislava, pp. 175-179, 190-191.

## Resume

### Fyzickogeografické pomery národnej prírodnej rezervácie Čergovský Minčol a stav jej ochrany

Národná prírodná rezervácia Čergovský Minčol bola vyhlásená v roku 1986 za účelom ochrany typickej horskej karpatskej kveteny najvyšších hôľných partií Čergova so zastúpením východokarpatských druhov a lesných spoločenstiev najvyšších polôh pohoria. Má rozlohu 171,08 ha. V štruktúre chránených území Vonkajších Západných Karpát, v botanicky málo pestrom obvode východobeskydskej kveteny, predstavuje dôležitú lokalitu nachádzajúcu sa na rozhraní dvoch floristicky odlišných oblastí, Carpatica occidentale a Carpatica orientale. Čergovský Minčol patrí do A kategórie chránených území, ktoré sú najcennejšími časťami prírody nielen Slovenskej republiky. Predstavujú v štruktúre krajiny dôležité arcály s vysokou prírodovedeckou hodnotou, ktoré je potrebné zachovať najmä z aspektu udržania rôznorodosti podmienok a foriem života. Ochrana územia súčasnou formou je nedostatočná, vyžaduje si sprísnenie a zvýšenú komplexnú starostlivosť, ale najmä starostlivosť špecifickú o zložky, ktoré sú predmetom ochrany. Negatívne vplyvy na fyzickogeografický komplex Čergovského Minčola má najmä masová pešia turistika (turistické zrazy) a zber lesných plodov. Z týchto aktivít vyplýva poškodzovanie vegetácie zošľapovaním, česaním lesných plodov, zakladaním ohnísk, znečisťovanie odpadom. Okrem týchto faktorov prírodné prostredie rezervácie ohrozuje i používanie umelých hnojív a postrekov proti škodcom v okolitých lesných porastoch. Horské lúky na Čergove vznikli hospodárskou činnosťou človeka. Pokles jej intenzity a iná diverzifikácia podmienili zmenu ich druhovej štruktúry a pomiestne postupný návrat lesných spoločenstiev, ako aj zarastanie plevelnými spoločenstvami. Riešenie týchto problémov je veľmi obtiažne a ekonomicky náročné. Pasenie tu nemožno obnoviť v plnej miere (je v rezerváciách vlastne zakázané), ale občasné prepásanie porastov by bolo veľmi vhodné. Obnovenie



kosenia lúk, vzhľadom na porasty čučoriedky a iných plevelných druhov (*Rubus ideus*), ale aj v súvislosti so sklonmi svahov a ekonomickými nákladmi na kosenie, je prakticky nereálne. Nálet pionierskych drevín navrhujú ochranári likvidovať usmerneným prcpásaním porastov kozami (Kliment 1996). Solitéry niektorých pionierskych drevín a smreka by bolo možné odstrániť komplexnejšou a trvalejšou starostlivosťou napr. kombináciou vypálenia, použitia čiernych fólií, ktoré by zabránili ich zmladzovaniu, prípadne kombinovať tento proces usmerneným prcpásaním porastov kozami (Kliment 1996). Horské lúky Čergova sa sformovali hospodárskou činnosťou človeka, preto aj udržiavanie ich stavu je vo veľkej miere podmienené jeho sústavnou starostlivosťou. V tejto súvislosti je potrebné položiť si otázku, či zámerom riadenej ochrany územia je zachovať terajší stav na celej ploche lúk, alebo niektoré menšie areály kosiť a takto sa priblížiť k ich pôvodnému druhovému zloženiu. Ďalším problémom je obnova horských lúk na lesom silne atakovaných plochách. Tu návrat ku kosným lúkam možno považovať za nerálny (Kliment 1996). Pôdny fond rezervácie je ohrozený kyslými dažďami a dažďami obsahujúcimi toxické chemikálie. Medzi osvedčené melioračné prostriedky na úpravu sorpčného komplexu pôd patrí použitie prírodných minerálnych hornín vo forme mletých múčok. V horských NĽR sa začalo používať u nás v súvislosti s kyslými dažďami veľkoplošné vápnenie, zatiaľ však bez väčšieho efektu. Pokusy ukázali, že na pôdach s veľmi kyslým surovým humusom vápnenie pomáha len vtedy ak sa použijú súčasne i dusíkaté hnojivá (Hraško, Bedrna 1986).