

CHARACTERISTICS OF THE BIOGEOGRAPHY IN ROȘIA MONTANĂ AREA AND ITS TOURISTIC VALUE

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Abstract: Roșia Montană is the oldest mining locality in Romania, being attested for the first time on 6th February 131 AD. Its complex sistem of underground mining galleries, especially the Roman ones, are well known as being of high archaeological value. Also, despite the long industrial activity that has taken place here for circa two millenia, Roșia Montană displays a high diversity of species of plants which are listed on the Red List in Romania, among which eight protected orchid species, such as: *Dactylorhiza maculata*, *Orchis coriophora*, *Dactylorhiza sambucina* etc., and also a few important plant communities, which appear on the Annex I of the European Union Habitats Directive. Some important species of rare mammals are as well comprised by Annex II of the Habitats Directive of the European Union, for instance: *Lynx lynx*, *Lutra lutra*, *Canis lupus* and *Ursus arctos*. Many plant and animal species are present in the area due to the bimillenary mining activity, mainly as a result of the creation of a significant number of artificial (man-made) lakes used to grind ores during the antiquity times, as well as the presence of waste rock dumps. This study aims to reveal the biodiversity of the Roșia Montană area and its importance in the tourism context.

Keywords: biodiversity, mining, protected species, Roșia Montană, tourism

Introduction:

Romania has the highest biodiversity of all members and candidate countries of the European Union, with no less than five biogeographical regions: Continental, Alpine, Black Sea, Pannonian and Steppic. An important part of the protected areas are situated in the Carpathian area.

In order to protect the global biodiversity, in 1948 there was created the International Union for Conservation of Nature (IUCN), the first and largest organization of this kind in the world. In the

IUCN frame, there were established six categories of protected areas and was created the Red List of Threatened Species, aiming at monitoring all species of plants and animals which are globally threatened with extinction.

The main legislative instrument designed at the European Union level which is meant to protect its increasingly threatened natural wealth is *Natura 2000 Network*, with its two main sections: Special Areas of Conservation (SCA) and Special Protection Areas (SPAs).

Special Areas of Conservation have been established according to the 1992 Habitats Directive (92/43), which concerns the conservation of natural habitats and of the wild fauna and flora, meanwhile the Special Protection Areas have been created in compliance with the 1979 Birds Directive

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(79/409), the latter regarding the conservation of the avifauna.

Hence, the main objectives of the Natura 2000 Network is the selection and preservation of the most important types of habitats (Annex I of the Habitats Directive) and the most important species throughout the European Union (Annex II of the Habitats Directive and Annex I of the Birds Directive).

The sites of Community Importance (SCI) are those areas declared and proposed by the member and candidate states in order to ensure the protection and conservation of species and habitats which are considered to be of Community interest, until their acceptance as Special Areas of Conservation in the Natura 2000 Network.

Being situated in an area well-known for its wild and attractive landscape, namely Apuseni Mountains, Roşia Montană holds two protected areas, Piatra Corbului (a natural monument, IV IUCN category) and Piatra Despicată (a natural reservation, III IUCN category) and at the same time it is close to many other protected areas and Natura 2000 sites belonging to the Apuseni Natural Park, as Special Protection Areas (SPA) and zones which include Sites of Community Importance (SCI).

It is often assumed that on the territory of Roşia Montană the long mining activity and associated pollution have destroyed most parts of the biodiversity. However, according to Annex I and II of the Habitats Directive in the European Union and the Red List of Romania, one can find many natural habitats of Community interest and species of plants and animals requiring the designation of Special Conservation Areas.

There have been conducted several significant studies which relate to the existing biodiversity of Roşia Montană, among which Akeroyd and Jones (2006), Roman et. al (2009), Akeroyd (2012), Gligor (2012), Roman (2013).

Biodiversity is an important element for the development of tourism in rural area, especially eco-tourism, rural tourism and agritourism. Roşia Montană is located in a

region with important natural and man-made attractions, at about 15-20 km from the Apuseni Natural Park, and has itself a great tourism potential, this fact being proven by some studies which aim to justify its proposal on the UNESCO Tentative List (***) (2009; Wilson et al. 2011). Consequently, even if the area is often considered as being a polluted one and with a low and insignificant biodiversity, there are however some strong arguments which prove the opposite.

Materials and methods:

Roşia Montană is the most ancient mining locality from Romania, documentarily attested since 6th February 131 AD and well-known for its richness in gold and silver ore since Antiquity. It is situated in the median basin of Arieş River and belongs to the North-East Metaliferi Mountains and of the mining area known as Gold Quadrilateral, meanwhile in administrative terms, the locality is located in the North-West of Alba county (Fig. 1).

Roşia Montană has become famous due to its gold and silver ores deposit, which is the biggest in Europe, and the place has lately been "advertised" even more due to the Roşia Montană Gold Corporation mining project. Whereas the above-mentioned company claims that the area suffers from rising pollution level, the analyze of the biodiversity shows that there are many important habitats and species of large interest of protection at the European Union level, and consequently of touristic interest.

Results and discussion:

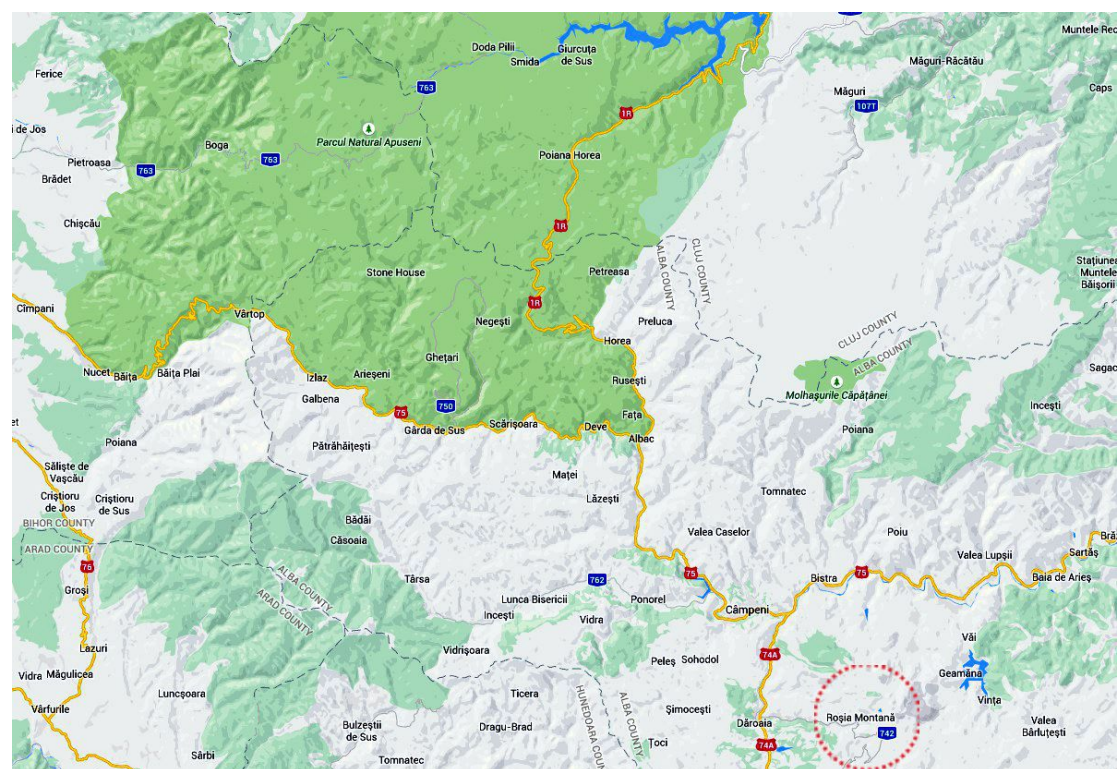
Flora

It was found that over 60% of the Roşia Montană territory is covered with grasslands of High Nature Value comprising mostly pastures and hay fields (Akeroyd 2012). Within these mountain hay meadows were

identified at least 10 species of orchids, out of which 8 appear on the Red List of Romania. The calcareous grassland rich in orchid species is included in Annex 1 of the

European Union Habitats Directive, this being more significant as basic soils or soils rich in heavy metals rarely show species of orchids.

Figure no. 1 The Apuseni Mountains with Roșia Montană territory and some of the major touristic objectives in the region



Roșia Montană territory hosts many plant communities which appear on the Annex I of the European Union Habitats Directive and on the Red List of Romania: metal-rich rock outcrops with *Asplenium septentrionale* (Forked Spleenwort) and *Silene nutans* subsp. *dubia* (R 6219) (Doniță et al. 2005; Doniță et al. 2006) and siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* (EU 8230); mine debris rich in metals colonized by different metallophyte species; oligotrophic pastures rich in local species including *Acidophilus* mountain *Nardus* pastures (nard grass) (EU 6230); mesotrophic, montane hay meadows rich in species (EU 6520); base-rich mire with *Eriophorum latifolium* (Broad-leaved

Cotton-grass); acid mire presenting *Drosera rotundifolia* (Round-leaved Sundew) (EU 7110); woodland edge with *Alnus incana* (Grey Alder); *Telekia speciosa* (Heartleaf Oxeye) or alluvial forests with *Alnion incanae* (EU 91E0) (Akeroyd and Jones 2006; Akeroyd 2012).

Also, according to EIM (2011), two more plant communities which appear in Annex 1 of the European Union Habitats Directive were found: semi-natural dry grasslands with *Festuco-Brometalia* and scrubland facies on calcareous substrates (EU 6210), this habitat being characteristic for Șulley area, which semi-natural grasslands with *Brachypodium pinnatum* (Tor-grass); there were found four rare

species of orchids. The second habitat is represented by *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (EU 6410), with *Parnassia palustris* and *Gladiolus imbricatus*, in Balmoșești village area.

Plant species which are found on the Roșia Montană territory and which also appear on the Red List of Romania, according to Oprea (2005) are rare species, such as: *Silene nutans* subsp. *dubia*, and *Sedum rubens*, which belong to Metal-rich rock outcrops; *Anacamptis morio* (Green-winged Orchid), *Dactylorhiza maculata* (Heath Spotted Orchid), *Gymnadenia borealis* (Heath Fragrant Orchid), *Anacamptis coriophora* (Bug Orchid), *Neotinea ustulata* (Burnt Orchid), *Platanthera bifolia* (Lesser Butterfly Orchid), *Dactylorhiza sambucina* (Elder-flowered Orchid), *Traunsteinera globosa*, all of them being orchid species; *Silene atropurpurea*, *Trollius europaeus* (European globeflower), *Scorzonera purpurea* subsp. *rosea*, all of them found in mesotrophic hay meadows; *Drosera rotundifolia* (Round-leaved Sundew), *Carex limosa* (Mud Sedge), belonging to acid mire; *Comarum palustre* (Purple Marshlocks), *Carex dioica* (Dioecious Sedge), belonging to base-rich mire and vulnerable species: *Anacamptis pyramidalis* (Pyramidal Orchid), an orchid, and *Arnica montana* (Mountain Arnica) which appears in mesotrophic hay meadows.

According to EIM (2011), there were conducted researches at the end of which there were identified some aquatic ecosystems of water bodies and wetlands, as follows: shallow mineral mire with *Equisetum-Carex*, *Equisetum fluviatile* (Water Horsetail) and *Carex riparia* (Greater Pond-Sedge), on the South of the Tăul Mare lake; shallow mineral mire with *Carex*, especially *Carex riparia*, appears also on the South of the Tăul Mare lake, usually associated with other aquatic and mire ecosystem types; shallow mineral mire with *Equisetum*, especially with *Equisetum fluviatile*, *Persicaria amphibia* (Water Smartweed) and *Typha angustifolia* (Lesser

Bulrush); this type can be observed along the southern shore of Tăul Mare lake; shallow mineral mire with *Typha* (*Typha angustifolia* and *Typha latifolia*) appears on the South of Tăul Mare lake and also around other lakes where it covers very small areas; shallow organic mire with *Sparganium erectum* (Branched Bur-reed), *Persicaria amphibia* etc., appears only at Tăul Țapului lake and in some small wetlands; shallow organic mire with *Carex*, only at Tăul Țapului lake; shallow organic mire with *Equisetum* (*Equisetum fluviatile* and *Lemna minor*) only at Tăul Țarina lake; shallow mineral mire with *Carex riparia*, observed only at Tăul Țarina lake; shallow submerged aquatic ecosystem with *Myriophyllum spicatum* (Eurasian watermilfoil), noticed at Tăul Corna lake; shallow aquatic ecosystem with *Persicaria amphibia*, noticed only on the southern shore of Tăul Mare lake in combination with other aquatic and shallow mire types.

Apparently surprising, even mine dumps, which represent an important part of the total mining area show a certain level of plant diversity. As it has been shown in some research papers (Roman et al. 2009; Roman 2013) regarding the floristic composition, performed on four abandoned dumps of different ages (2-60 years) from Cetate and Cărnic areas, there were identified 45 metallophyte plant species genetically adapted to soils with a high content of heavy metals, among which the most common are the following: *Tussilago farfara* (Coltsfoot); *Agrostis capillaris* (Common Bent); *Carex pairaei* and *Carex caryophyllea* (vernal sedge); *Deschampsia flexuosa* (Wavy Hair-grass); *Betula pendula* (Silver Birch); *Pinus sylvestris* (Scots Pine); *Populus tremula* (Common Aspen); *Poa pratensis* (Common Meadow Grass); *Genista sagittalis* (Winged Broom); *Calluna vulgaris* (Heather); *Vaccinium vitis-idaea* (Lingonberry) and *Vaccinium myrtillus* (European Blueberry).

Fauna

The fauna in Roşia Montană is in general the one specific to the Apuseni Mountains, so we will see different species of mammals, birds, fish, amphibians, reptiles and insects. The EIM (2006) conducted on the mining area delimited by RMGC mentioned numerous invertebrate and vertebrate species. Concerning vertebrate species, there have been identified 83 species of birds, 31 species of mammals, several species of fish of the family *Cyprinidae* (carp family) and *Esocidae* (pike) introduced into the lakes Tăul Mare, Brazi, Anghel, Corna etc., seven species of amphibians and four species of reptiles.

The mining area has a wide number of bird species, many being rare or less common. Among the rare species there are found: *Gallinula chloropus* (Common Moorhen); *Otus scops* (Scops Owl); *Asio otus* (Long-eared Owl); *Upupa epops* (Common Hoopoe); *Picus canus* (Grey-headed Woodpecker); *Dryocopus martius* (Black Woodpecker); *Dendrocopos medius* (Middle Spotted Woodpecker); *Dendrocopos leucotos* (White-backed Woodpecker); *Lullula arborea* (Woodlark); *Anthus pratensis* (Meadow Pipit); *Saxicola rubetra* (Whinchat); *Parus montanus* (Willow Tit); *Parus cristatus* (Crested Tit); *Lanius excubitor* (Great Grey Shrike); *Nucifraga caryocatactes* (Nutcraacker).

Numerous less common bird species have their habitats here: *Anas platyrhynchos* (Mallard); *Accipiter gentilis* (Northern Goshawk); *Accipiter nisus* (Sparrowhawk); *Falco tinnunculus* (Kestrel); *Coturnix coturnix* (Common Quail); *Phasianus colchicus* (Common Pheasant); *Athene noctua* (Little Owl); *Strix aluco* (Tawny Owl); *Picus viridis* (Eurasian Green Woodpecker); *Galerida cristata* (Crested Lark); *Motacilla cinerea* (Grey Wagtail); *Luscinia megarhynchos* (Nightingale); *Saxicola torquata* (Common Stonechat); *Oenanthe oenanthe* (Wheatear); *Phylloscopus trochilus* (Willow Warbler); *Regulus ignicapillus* (Firecrest); *Parus ater* (Coal

Tit); *Certhia familiaris* (Treetreeper); *Corvus frugilegus* (Rook); *Corvus corax* (Common Raven); *Carduelis chloris* (Greenfinch); *Carduelis spinus* (Eurasian Siskin).

Concerning mammals, besides the frequently found common species, such as *Lepus europaeus* (European Hare), *Vulpes vulpes* (Red Fox), *Sciurus vulgaris* (Eurasian Red Squirrel) etc., there is also mentioned a range of rare species: *Arvicola terrestris* (European Water Vole); *Apodemus agrarius* (Striped Field Mouse); *Martes martes* (European Pine Marten); *Martes foina* (Stone Marten); *Sus scrofa* (Wild Boar); *Capreolus capreolus* (European Roe Deer), and much less common ones: *Myotis blythii* (Lesser Mouse-eared Bat); *Myotis nattereri* (Natterer's Bat); *Myotis daubentonii* (Daubenton's Bat); *Eptesicus serotinus* (Serotine); *Plecotus austriacus* (Gray Big-eared Bat); *Nyctalus noctula* (Noctule); *Clethrionomys glareolus* (Bank Vole); *Muscardinus avellanarius* (Hazel Dormouse); *Meles meles* (Eurasian Badger); *Mustela nivalis* (Least Weasel); *Mustela putorius* (European Polecat).

There are also mentioned other rare species of mammals (Gligor 2012), such as: *Lynx lynx* (Eurasian Lynx), *Felis silvestris* (Wild Cat), *Lutra lutra* (Eurasian Otter), *Canis lupus* (Gray Wolf) or *Ursus arctos* (Brown Bear), the last two species being of high importance at European level and appear sporadically in the mining area. All these species (excepting the Wild Cat) appear ranked in Annex II of the Habitats Directive of the European Union.

The importance of the biodiversity for tourism

The importance of the biodiversity for the development of tourism in rural areas is unquestionable. Especially, rural tourism as agritourism need to put their grounds on a health and rich wildlife, even more when it comes about mountainous areas. Roşia Montană is such an area, and, as proved above, it owns a wide selection of valuable

species of plants and animals, and also some habitats are worth protection. The natural frame needs to be preserved in order to support a sustainable tourism development.

Considering such forms of rural tourism as agritourism and ecotourism, it is particularly important the high degree of the High Nature Value grasslands occurrence, either as pastures or mountain hay meadows.

The presence of the original vegetation encourages agritourism by supporting the local population's interest in increasing cattle raising, which is the main form of farming in mountainous areas, and even more in the Apuseni Mountains area.

Payments for lands which are included in the agri-environment APIA category support farmers to enhance the number of cattle in their households and also facilitate the possibility to turn their houses into rural accommodation units so as to practice agritourism. RMGC project would make this impossible, taking into consideration that all payments concerning agri-environment lands category would be cancelled, as the land would lose its original quality.

The distance between the RMGC mining project perimeter and Apuseni Natural Park is about 15-20 km, which is why in the case of starting the mining project, numerous natural and therefore tourist attractions will be affected, as many protected areas - natural reservations and natural monuments, belonging to the Natura 2000 Network - are located close to the Roşia Montană mining area.

It is worth remembering that in the Bihor Mountains, upstream Cîmpeni and into the upper basin of Arieş River there lie two tourist resorts of local interest, Arieşeni and Albac, located on Arieşul Mare Valley. At the same time, Arieşul Mic Valley also has significant tourist attractions: Găina Mountain, Avram Iancu Memorial Museum, Snails Hill etc. The same site is the best example of preserving the „Moţi” community.

Arieş Upper basin is therefore valuable from a touristic point of view (but not only) and the start of RMGC project poses an

important danger for any attempt to exploit in a wise way all these touristic attractions.

Other areas with significant tourism potential, particularly in the light of the natural environment in the vicinity of the Roşia Montană mining area, are the Metaliferi Mountains, Trascăului Mountains and Muntele Mare-Gilău Mountains.

Conclusions:

Roşia Montană is a mountainous mining area, where the main activity – mining - has provoked important changes at the level of the biodiversity, especially by creating a large number of anthropic lakes and by the apparition of many waste rock dumps. As it has been revealed, there are many habitats and plant species which are included, in order to be protected, in Annex I of the European Union Habitats Directive and on the Red List of Romania, and some species of rare mammals which are comprised by Annex II of the Habitats Directive of the European Union.

These habitats and species of plants and animals have a significant importance on the development of tourism, namely agritourism, besides the significant archaeological and cultural heritage the locality owns.

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Rezumat:

**CARACTERISTICILE BIOGEOGRAFICE
DIN ZONA ROȘIA MONTANĂ ȘI
VALOAREA EI TURISTICĂ**

Roșia Montană este cea mai veche localitate minieră din România, fiind atestată documentar pentru prima oară în data de 6 februarie 131 AD. Sistemul complex de galerii subterane, în special cele romane, sunt bine cunoscute pentru valoarea lor arheologică. De asemenea, în poșida unei îndelungate activități industriale de aproximativ două milenii, Roșia Montană se remarcă printr-o diversitate mare de specii de plante care sunt incluse pe Lista Roșie din România, dintre care opt specii de orhidee protejate, cum ar fi: *Dactylorhiza maculata*, *Orchis coriophora*, *Dactylorhiza sambucina* etc., precum și câteva plante de importanță comunitară, prezente în Anexa I din Directiva Habitate. Câteva dintre cele mai importante și rare mamifere sunt incluse în Anexa II din Directiva Habitate, ca de exemplu: *Lynx lynx*, *Lutra lutra*, *Canis lupus* și *Ursus arctos*. Multe specii de plante și animale au apărut în zonă atât ca urmare a activității miniere bimilenare, în special datorită apariției încă din antichitate a unui număr semnificativ de lacuri artificiale folosite la fărâmișarea minereului, cât și datorită prezenței depozitelor de steril. Acest studiu și-a propus să prezinte biodiversitatea zonei de la Roșia Montană și importanța ei pentru turism.

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