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THE NEED OF EXTENDING THE PROTECTED AREA STATUS IN LEOATA MOUNTAINS

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Abstract
Leaota Mountains have not been studied nearly at all until our researches, from the perspective of the invertebrate fauna. Subsequently to these studies carried out in the north-western sector of this Massive, we have identified 248 taxons at the level of species and other 5, at the level of the genre. The cause of this remarkable biodiversity is represented by the diversified geological and geomorphological composure, alongside with a multitude of micro-climates types, all these taking shape through the development of diverse environmental conditions which are thus responsible for the existence of a very wide invertebrate fauna diversity also, which is though not fully known. In Leaota Mountains, the Natura 2000 ROSCI0102 site was created, with a surface of only 1393 hectares (Antofie and Pop, 2013); when it was created, the existing invertebrate species in these mountains were unknown. The identification, through our researches, of a large number of species, of a endemicity degree of more than 9%, as well as of some new and rare invertebrate species for the Romanian fauna, corroborated with the need of also protecting the karstic relief in this area, leads us to the conclusion that the extension of the protected area status for the north western sector of Leaota Mountains also is extremely necessary.

Keywords: protected area, ROSCI0102-Leaota site, invertebrates, MSS

1. INTRODUCTION

Leaota Mountains, located in the Bucegi Mountains group, though quite accessible, have not been studied from the perspective of the invertebrate fauna until the beginning of our research, compared to the neighboring mountains, Piatra Craiului and Bucegi. Regarding the vertebrates fauna, research was earlier made, which concluded that on the Leaota area, nearly all large and small vertebrates species were signaled, which are representative for the Romanian Carpathians. Leaota Mountains are separated from the Piatra Craiului Mountains through a lower area, the Bran-Rucăr-Dragoslavele Corridor, limited by craggy areas from the mountain surface. The access from this corridor to the mountain sector of Leaota is made through keys that clearly limit the area of the corridor from the one of the mountains: Ghimbav and Cheii Keys, followed by Rudărița, Crovului Keys. In the north-western area of Leaota Mountains, the geology is diversified, taking shape as a limestone and schist relief, developed on crystalline schist. The latter represent nearly 74% of the Leaota Massive surface (Murătoreanu, 2009). The karstic relief in Leaota was divided in two

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sectors: the Dâmbovița and the Ialomița sectors (Antofie and Pop, 2013). The north western side of Leaota Massive displays a very interesting and more developed geology; thus, there is here a limestone sector, which in fact represents an extension of the one in Piatra Craiului. The Dâmbovița karstic relief in the north western side of Leaota Mountains, though having a relatively low surface, displays all the phenomena that is specific to karst. From the geomorphological perspective, these types of relief, developed on limestone and schist geological substrate, have led to a diversity of topo-climates, of which we mention, through analogy with the neighboring Bucegi: the specific climate of internal valleys, the climate of external slopes (Bleahu, 2004). We thus exemplify the first climate type, the one of the internal valleys, in our interest area, with the climate of Rudărița, Cheii, Urdăriței, Crovului and Popii Valley. Murătoreanu (2009) cites Sultana (1976) which presents the existence of more (topo) climates types in the north-western area of Leaota: the Bădeni Valley topo-climate, similar to the one of the intermountain depressions, then the northern slopes climate, with higher humidity and lower annual average temperatures, the one of the southern and eastern slopes, with higher humidity and average temperatures, as well as the high mountains climate (more than 1700 m altitude), and the Ghimbav Basin topo-climate, characterized by the circulation of air currents alongside its direction. Teodoreanu (2006) notices a topo-climate of limestone keys in the north-western area of Leaota Mountains.

The geological, geomorphological, micro-climatic diversity have led to a high biodiversity from the fauna perspective also, which we have noticed subsequently to the researches made for 3 years, 2013-2016, when we had studied the invertebrate fauna in the north-western side of Leaota Mountains, which was located in the edaphic or the mesovoid shallow substratum (MSS), both the limestone and schistground. The reached results represent something new for this massive, being the first ones regarding the invertebrate fauna.

2. MATERIALS AND METHODS

For the fauna research, we have placed 9 ecological stations, in the limestone and crystalline schist areas (Fig. 1). The stationaries were placed in an edaphic or mesovoid shallow substratum (MSS). Thus, we placed stationary 1 (Berbece's Brook), 4 (Rudărița Valley), 6 (Popii Valley), 7 (Ghimbav Valley) and 9 (Bădeni Valley) on an edaphic substratum. Stationaries 1, 6 and 9 had a schist substratum with litosoil. Stationaries 4 and 7 were placed on the limestone scree substratum also covered in litosoil. The stationaries placed in scree were: stationary 2 (Ghimbav Mountain, southern slope), 3 (Căpățâna Mountain, southern slope) and 8 (Colțul Surpat area), in limestone MSS; stationary 5 (Popii Valley) in schist MSS.

The gathering of the fauna material in the stationaries placed in edaphic environment was made by placing 5 Barber traps, in the corners and in the middle of an imaginary square, with a 5 m side. In the MSS, the gathering of the invertebrate samples was made using the survey method. To this extent, we placed 3 samples in stationaries no. 2, 3 and 8, with limestone MSS, at 1m, 0.75 m and 0.5 m depth, and in stationary 6, with schist MSS, we placed 3 samples at 0.5 m depth and one at 1m depth. The gathering of the collected fauna using the samples was made on a monthly basis, similar to the case of the stationaries placed in the edaphic environment. Each sample consists of a PVC tube, 8 cm diameter, 10 cm longer than the depth from which we wanted to collect. The tube was perforated in the lowest 10 cm area, the 8 cm holes being to allow the fauna elements to reach the inside of the tube. In each tube, we placed a 10 cm high glass, with the same diameter as the internal diameter of the tube, so that the margin of the glass to stick itself to the tube, in the lower side of the perforated tube. We placed the conserving liquid (ethylene-glycol or ethyl alcohol) in the

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glass (similar to the Barber traps placed in edaphic substratum), and a low alimentary attractant. The superior side of the tube, located at the level of the scree surface, was covered by a protective lid. The gathering of the fauna covered all the seasons for the samples, and for the soil stationaries, the collecting process was made during winter, summer and autumn. In the samples, or in the soil, we placed devices for the monitoring of the relative humidity and temperature ecologic factors.
The fauna material was chosen and the determinations were made by specialists from the "Emil Racoviță" Speology Institute of the Romanian Academy in Bucharest.

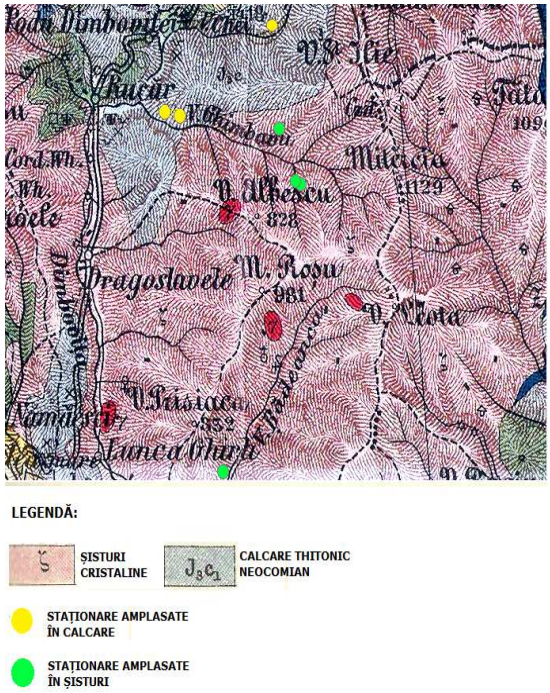

Figure 1. Geological map of Leaota Masiff (Popovici – Hatzeg, 1899). The placement of the ecological stationaries (Dorobăț, 2016)

3. RESULTS AND DISCUSSIONS

Regarding the natural habitats that are specific to the studied area, where the stationaries were placed, we enumerate the habitat types that we have identified in the field: **91V0 Dacian beech forests (*Symphyto-Fagion*)** (Gafta and Mountford, 2008); **8120 Limestone scree and limestone schist from the mountain to the alpine floor (*Thalaspietea rotundifolii*)** (Gafta & Mountford, 2008); **91E0* Alluvial forests of *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)** (Gafta and Mountford, 2008; Doniță *et al*., 2005); **8160* Carbonic medio-european scree from the collinear and mountain floors** (Gafta and Mountford, 2008).
We extracted, from the 9 ecologic stationaries, 9556 individuals of 253 taxons of Phylum Arthropoda, subphylums Chelicerata, Crustacea, Hexapoda și Myriapoda (Dorobăț, 2016). The percentage distribution of the identified taxons is displayed in Fig. 2.
248 taxons were determined at the species leve and other 5 ones at the gender level (Dorobăț, 2016). Considering the fact that this study is the first one on the invertebrate fauna in Leaota Mountains, we can say that nearly 100%, the identified areas are signaled for the first time in the studied area (Dorobăț, 2016). The species that have been determined in this sector are represented, from the bio-geographical perspective, by European elements (107 species), palearctic elements (31

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species), followed by the central-eastern-European ones (29), holarctical species (15 species) Carpathian endophytes (16 species), cosmopolitan species (11), Euro-Asian species (11), endemic species for Romania (8), Euro-Caucasian species (3), as well as one Alpino-Carpathian, one Eastern-European and Eastern-Asian species, the last one being considered as invasive for Romania (Dorobăț, 2016).

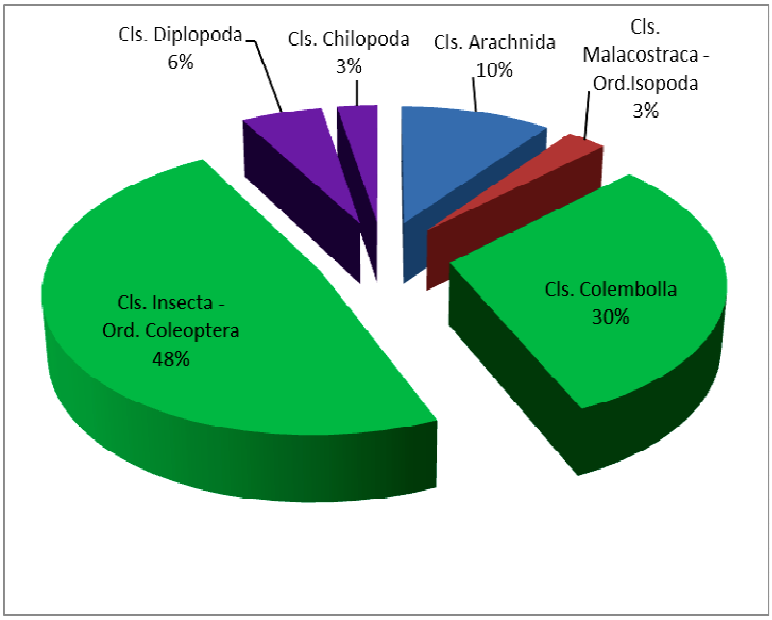

Figure 2. The percentage distribution of the identified taxons (Dorobăț, 2016)

Of these species, in the north-western area of Leaota Massive, we have identified three new species for the Romanian fauna (two species of Collembola and one of Araneae), as well as other three species (Collembola) which are considered rare, two of them having been cited only a single time and the third one having been previously cited by Stach, in 1934 and Popa, in 2010 (Popa & Dorobăț, 2015). As well, we notice that in the studied area, of the *Nesticus balacescui* (Araneae) endemite, troglobiont; Nae (2010) shows that it has been initially considered endemic only in Bucegi and Leaota, then, the author has signaled it in its research on the neighboring Massive, Piatra Craiului, too (Dorobăț, 2016).

The endemicity degree calculated subsequently to the research made in this geographical area in Leaota is 9.08% (Dorobăț, 2016).

All these results show that the fauna biodiversity of this area in the north-western part of Leaota Mountains is high. Moreover, to check the eventual existence of new fauna elements, we placed the ecologic stationary 9 in Bădeni Valley, where we extracted the fauna elements just once. Even if the functioning of this stationary has been short, subsequently to this unique invertebrate capture, we have identified 3 new species, different from the ones in the other stationaries (Dorobăț, 2016). This shows very clearly that the potential of discovering new invertebrate species is very high not only in our interest area, but also in the entire Leaota Massive. The result of the estimations made with Jack-knife 2 comes to support this affirmation, showing that the collected and identified species in the edaphic environment would represent only 40.6% of the total 225 estimated species, and the collected material in the MSS would only represent 59.7% of the total estimated species (Fig. 3) (Dorobăț, 2016).

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As for the actual protected area status of the Leaota Mountains, a surface of 13.93 square kilometers is represented by the ROSCI0102 Leaota community significance with an important ecological role in the maintenance of the habitats, the flower species, the fauna and the protection of the endangered elements, being and integrating part of the Natura 2000 European ecologic network (Antofie and Pop, 2013) (Fig. 4).

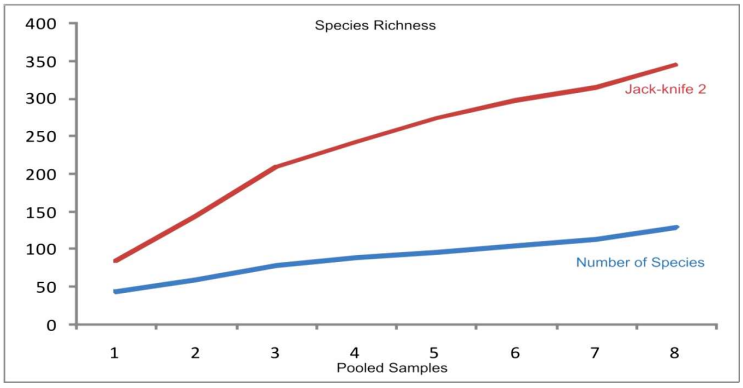

Figure 3. Estimation of species richness using Jack-knife 2 estimator for the three sampling stations Ghimbav, Rudărița and Valea Popii (Dorobăț, 2016)

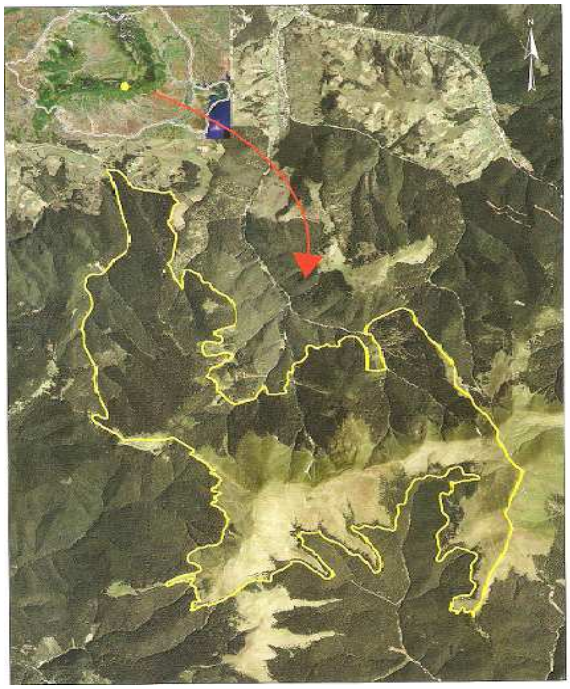

Figure 4. Limits of protected area ROSCI0102 in Leaota (Antofie and Pop, 2013)

This was possible as a result of the Environment and Forest Ministry Order no. 2387/2011 regarding the modification and completion of the Environment and Sustainable Development no. 1964/2007. This protected area includes 5.08% of the Leaota Mountain surface, neighbored in the East with ROSCI0013 Bucegi sit, and in the north-west with the ROSCI0194 Piatra Craiului site (Antofie and Pop, 2013). The geographical location of this site in Leaota between the two others belonging to the neighboring massifs clearly show the ecological corridor function that it has, its

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significance being very high though. This is one of the reasons for which we consider that the merely 5.08% of the Leaota Massive that is provided to the protected area are not sufficient. The main arguments though are the ones regarding the fauna results of our research regarding the invertebrates. The fact that only in this relatively small area, we identified 253 taxons, not signaled in Leaota until now, represents the main motivation of our demarche. Moreover, the existence of three new species for the Romanian fauna, as well as of other three rare species, strengthen the argumentation due to which an extension of the protected area to the entire north-western side of Leaota Mountains would lead to a much more protection of the species and to the completion of the ecological corridor function role which this site is desired to play, ROSCI0102 Leaota. Practically, an extension of the site surface to the contact with the south-eastern limit of the Piatra Craiului National Park (Fig. 5a, b), the Dâmbovița Valley and even including Bădeni Valley, is considered very opportune, providing a higher chance to the conservation of the biodiversity in Leaota Mountains, especially considering that, as we have shown, there is a very high probability of identifying, following some previous research, other new or rare species even for the Romanian fauna.

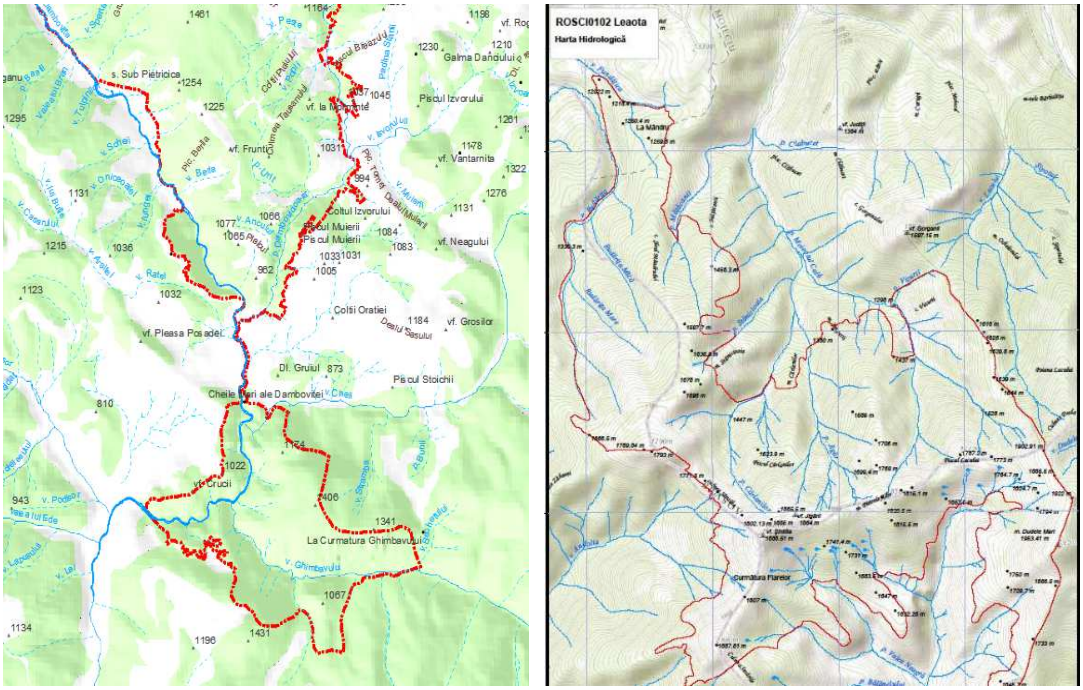

Figure 5. a. South-eastern limit of the Piatra Craiului National Park (http://www.pcrai.ro/files/Limitele%20PNPC.pdf); b. Limit of the protected area ROSCI0102 Leaota (http://www.mmediu.ro)

Moreover, the proposed extension of the protected area would also lead to the protection of the karstic relief, which, as mentioned, represents a continuation of the one in Piatra Craiului. This relief type takes shape through spectacular keys, caves (we thus mention Uluce, Fulga, Decebal Caves), avens (Crovului Aven) with a high ecological role regarding the troglobiont fauna.

4. CONCLUSIONS

In the north-western side of Leaota Mountains, we have identified, for the first time, 248

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invertebrate species as a result of our research (Dorobăț, 2016).
Made estimations clearly show that the possibility of new invertebrate species existence is very high, nearly 225 new species still being undiscovered (Dorobăț, 2016).
Of the species we have discovered in Leaota, 3 are new species and 3 are rare species for the Romanian fauna. Thus, the probability that amongst the nearly 225 still undiscovered invertebrate species in Leaota, of existence of some new or rare species for the Romanian fauna is very high (Dorobăț, 2016).
Due to this reason, from the perspective of the new data we have reached about the fauna of these mountains, we consider that the area of just 1393 hectares of the Natura 2000 site is totally insufficient, not only regarding the protection of the rare or new invertebrate species of the Romanian fauna, but also regarding the ecological corridor role the site plays. The limits of this site were set before our research, at that moment the fauna wealth of invertebrates being unknown.
To this extent, we propose its extension to the contact with the limit of the National Piatra Craiului Park, considering that only by doing this; we complete the ecologic function of the ROSCI0102 Leaota site. This eventual extension would protect, at the same time, both the karstic and schist relief, so diversified in this area, itself having a decisive role for the existence of a fauna diversity which has not been still entirely discovered.
This proposal would also be in accordance with the European policies regarding the environmental protection and the fact that, unfortunately, in Romania, the surfaces that, through a manner or another, are ranked as protected area are still insufficient, both as number and size.

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