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MOUNTAIN PINE HABITATS IN THE MARAMUREŞ MOUNTAINS NATURE PARK (I): DISTRIBUTION AND MANAGEMENT

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Abstract: This paper proposes to establish a synthesis of research, protection measures and regeneration initiatives for mountain pine (a priority EU habitat type, *4070** - Bushes with *Pinus mugo* and *Rhododendron myrtifolium)* from inside the Maramureş Mountains Nature Park, and also to depict the distribution of this vegetation in the area.

Viewing these communities on a historical scale, we can observe pressure on them in the early 19th century, with a peak in the sixth and seventh decades of the last century, so their range in the area studied was reduced in the 20th century by about 40–50%. It is interesting to note that preservation of mountain pine habitats in the Maramureş Mountains was then strictly related to the protection of black grouse in its favoured habitat type.

Underlining previous contributions related to structure, functions and regeneration possibilities we would like to argue the necessity to continue them and develop new ones from the perspective of principles and methods of monitoring and ecological management. The distribution map of these habitat types (Fig. 1) shows the high degree of fragmentation of the approximately 2,400 ha surviving, which supports ecological reconstruction projects, such as that started in 2008 in Ruscova Forest Department.

All the elements combined in this paper will be the basis for improving the two monitoring protocols realized and eventually for the improvement of the management plan of the Nature Park.

Keywords: *Pinus mugo*, mountain pine habitat, Maramureş Mountains Nature Park

Introduction

Mountain pine (*Pinus mugo),* a procumbent shrubby species, endemic to the continent of Europe, has its optimum development in the Carpathians and Balkans. It is hard to reconstruct the full complexity of its evolution and biogeographical implications. It is, however, certain that during the last glaciations there was an uninterrupted continuity of mountain pine cover, confirmed by palinological analysis from the Park's eastern peat bogs [6].

The area covered today by mountain pine represents only a small part of the range it covered a few centuries ago; the main reason for its deforestation was to increase subalpine pastures. In Maramureş County, 80 years ago mountain pine covered over 3,500 ha, of which approximately 1,525 ha (43.6 %) had been burned and cleared by 1975 [9]. The effects of clear-cut on soils and also on structure and secondary vegetation dynamics have been presented in various natural history studies [1, 2, 8, 11].

The research on the ecology of the European black grouse (*Lyrurus tetrix*) was the very first to be conducted in the earliest measures in Maramureş County related to the protection of mountain pine habitats (representing the habitat of this bird). A result was the County Council Decision 127/1971 for the protection of some important natural areas, from which the reserve of Cornu Nedeii Ciungii Bălăsinii (with an initial land surface of 800 ha) was set up for European black grouse.

Later (1974–1977) mountain pine habitats from the Maramureş Mountains (Gărgălău–Prislop–Cearcănu–Cornu Nedeii area) and Rodna Mountains were the subject of some interdisciplinary research developed by the Centre of Biological Research in Cluj-Napoca and the Laboratory of Physical Geography in Babeş–Bolyai University, Cluj-Napoca.

As a conclusion to this research the Executive Committee of Maramureş County Council decided to forbid cutting mountain pine over the entire County and also to extend the reserve area to 2,400 ha. This nature reserve is recognised by Law 5/2000, but it is limited only to the initial area of 800 ha.

Following the project Phare Credo no. 98–RO/UA–25–S–04, of which the main objective was to create the transboundary Romanian-Ukrainian biosphere reserve Maramureş Mountains, the fauna reserve 'Cornu–Nedeii–Ciungii Bălăsinii' was included as a core area [7]; and then by the Government Decision 2151/2004 it was included as a core area in the Maramureş Mountains Nature Park.

By the Order of Ministry of Environment and Sustainable Development no. 1964/2007 about 70% percent of the Maramureş Mountains Nature Park is designated as a site of community interest (SIC), having the code RO SCI 0124 – Maramureş Mountains.

In the declaration process an important role was played by the existence of priority habitat *4070** - Bushes with *Pinus mugo* and *Rhododendron myrtifolium,* the structure and management of which the present paper will emphasize, as a first contribution to a study begun as the PhD. thesis of the first author.

Materials and Methods

Focusing on the habitat *4070*,* we have used the specialist literature for a synthetic description of its structure and of management measures applied up till now for reconstruction and improvement of the conservation status of mountain pine habitats in the area studied.

Then, by field identification and correlation with the Corine Landcover Habitats map, we have realised the mapping of this entire habitat in Maramureş Mountains Nature Park. For this purpose we have also used satellite images and forest management plans for producing a mountain pine map for the Park (Fig. 1.), which includes about 2,400 ha.

In order to monitor the evolution of the conservation status of this habitat, two monitoring protocols were elaborated with the main purpose to identify large-scale changes of the habitat. To assure the coherence of data collection, standard data sheets were elaborated which complete the instructions from the protocols. The first *4070** habitat monitoring protocol regards the evolution of mountain pine areas using satellite images and the second one is based upon comparing fixed point photos using the same camera and objective. Considering the time frequency of realising the satellite images and aerial photos, and also the natural dynamic of mountain pine habitats, for both protocols we proposed to apply the time frequency of five years.

The structure and sozological value will be presented in a further paper.

Results and Discussions

From a phytosociological point of view, the following cenotaxa correspond to this habitat type: *Rhododendron myrtifolii-Pinetum mugi* Borza 1959, em. Coldea 1995 (syn.: *Pinetum mugi carpaticum* auct. rom., *Calamagrostio villosae-Pinetum mugo* Sanda et Popescu 2002) [4], for most of the areas in the Carpathian mountains, and for the situations when the first species is missing, *Vaccinio myrtilli-Pinetum mugo* Hadač 1956 [5].

According to Coldea [3], in the cenotic structure of mountain pine habitats in Maramureş there are three well-defined layers: shrub, herb and moss layer. The shrub layer is dominated almost exclusively by *Pinus mugo.* In the herb layer are: *Vaccinium myrtillus, V. vitis-idaea, Empetrum nigrum, Calamagostris arundinacea, Deschampsia cespitosa, D. flexuosa* and *Listera cordata.* The moss layer is mostly formed by: *Sphagnum nemoreum, S. rusowii, S.*

quinquefarium, *Hylocomium splendens*, *Dicranum scoparium*, *Pleurozium schreberi*, *Polytrichum strictum* and *Pholia sphagnicola.*

Fragmentation of this habitat type is increased especially due to human intervention. Inside the boundaries of the Maramureş Mountains Nature Park are numerous islands of mountain pine (Fig.1), especially distributed on high mountain slopes, where accessibility is reduced. The largest compact area of mountain pine of the Maramureş Mountains Nature Park is situated on the Jupania massif, where we estimate there exists about 470 ha.

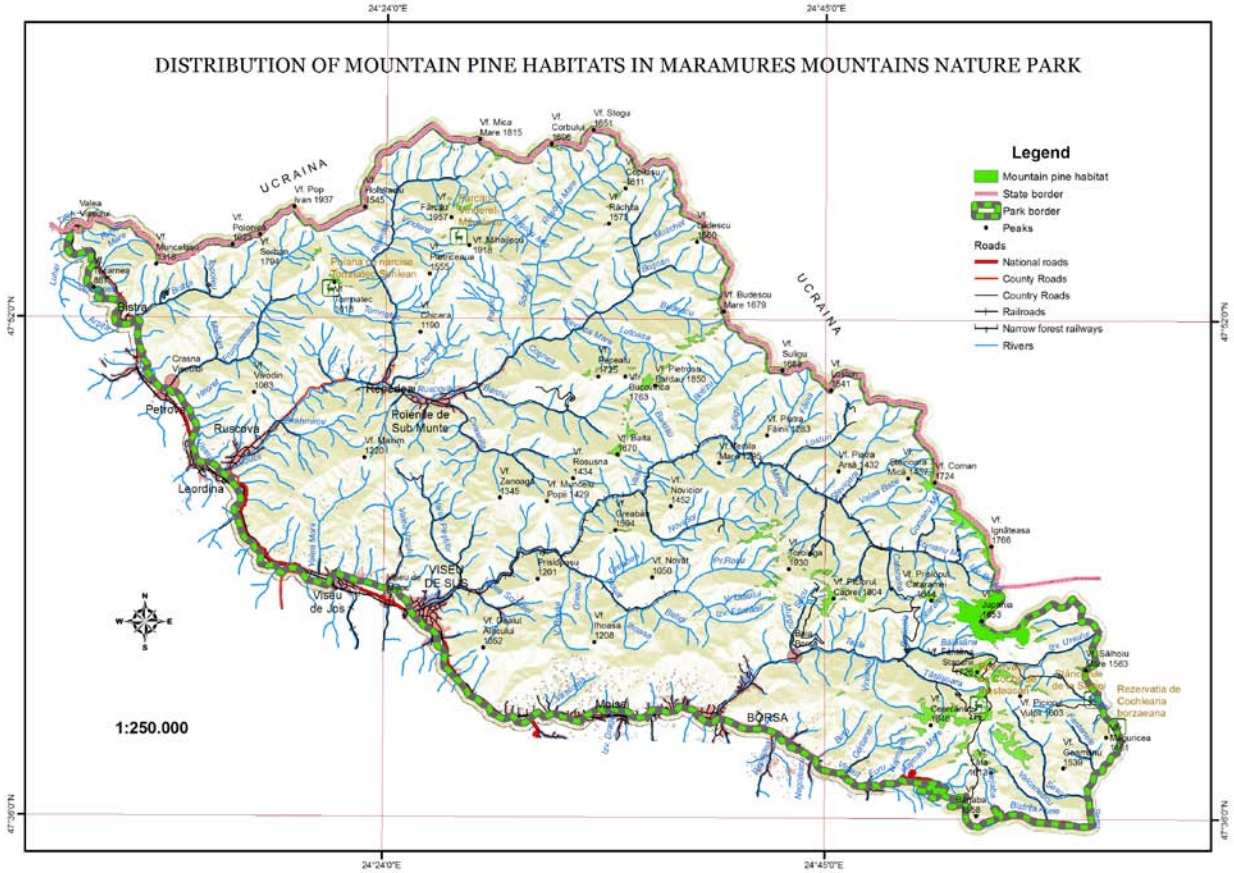

Fig. 1: Distribution of mountain pine habitats in Maramureş Mountains Nature Park

Regarding natural regeneration from seed, it has been noticed that this is very difficult and happens only haphazardly and in the shelter of massed mountain pine, being very low in areas affected by previous deforestation [13].

Studies regarding vegetative regeneration (using branches) showed that regeneration is possible but at a low speed of advancement that would require at least a century for expansion of the mountain pine by about 100m [8].

The only valid solution remains artificial regeneration, by planting saplings grown in seed-beds. At the Borşa Forest District, artificial regeneration of mountain pine was studied starting with cone harvesting, seed storage, determination of seed qualitative indicators, germination stimulation, sowing technique and sapling removal, continued by plantation, showed that mountain pine saplings became viable after five years and that in experimental plots (situated in Pietrosu Mare Reserve) the rate of success was 76%.

In the Cornu Nedeii area, with the direct co-ordination of Mr eng. Pînzaru, a pilot mountain pine plantation was established, which is now more than 20 years old, where mountain pine and Arolla pine saplings (*Pinus cembra)* were planted on 0.2 ha of land.

At the international seminar concerning Natura 2000 sites management (October 2006, Galway, Ireland), recommendations were made regarding 4070* habitat management, with the main purpose of keeping the habitats in a favourable conservation status [10].

Another recommendation regarded the reconstruction of areas formerly covered by mountain pine and now with a high risk of erosion. Such an area in the Maramureş Mountains Nature Park is the torrential Vinderel Basin, part of the Repedea basin. In the past, in this torrent basin the woody vegetation was cut for increasing alpine pasture, and nowadays the surface and depth erosion has amplified and has an important impact on the entire landscape.

In order to reduce the torrent potential in the area, the Maramureş Mountains Nature Park Administration, within the project GEF-UNDP no. 41462, realised a pilot project on ecological reconstruction of the *4070** priority habitat. In the autumn of 2008 a plantation of 1.2 ha was created in Production Unit 3 Repedea, Forest District Ruscova (at 1,800m altitude); 3,000 mountain pine saplings with soil pack were planted in irregular hollows. The saplings were seven years old and were obtained by seeds from the Cornu Nedeii Ciungii Bălăsinii nature reserve and grown on in the Borsa Forest District nursery. After a first evaluation (in May 2009) the rate of success is only 40%.

Once the ecological reconstruction project for the *4070** priority habitat is finished, it will be necessary to realize a monitoring protocol in order to measure the success of regeneration and of herb and moss layers installed into the phytocenosis. This monitoring protocol, together with information regarding to structure and area covered by mountain pine, will be part of the 4070* habitat conservation plan.

We also consider it necessary to apply at a Park scale some methods for the protection of the habitat presented here, methods destined to maintain and improve the conservation status. General and specific methods will be elaborated in future directly related to habitat extension, endangered species, topology, amplitude and impact of potentially destructive activities, land owners, resources valuation, expense, etc., according to the scheme proposed by Stăncioiu *et al.* [12]. Of course some general measures will also be taken into account, as follows: enclosure of experimental plots, strict control of cattle grazing, control of wild hoofed animals, a permanent guard, control of tourism and strict control of any new bulding in the area, etc.

Conclusions

As at national level, the area covered by mountain pine in Maramureş Mountains Nature Park suffered over time a significant decrease due to anthropogenic factors, now being restricted to about 2,400 ha.

Due to its conservation value and to the multiple functions of the habitat *4070**, an emphasis related to protection and regeneration of mountain pine areas existed even before 1989. These were stressed in the last decade in national and international projects or as a result of setting up the Nature Park.

Management measures, mapping the areas covered by mountain pine, ecological reconstruction (on a 1.2 ha area in the Vinderel torrent basin) and elaboration of the two conservation status monitoring protocols are unique elements, but based on previous studies and correlated with the existing status of the Maramures Mountains Nature Park.

The main argument for the efforts made in the conservation of this habitat type could be its Tardiglacial origin and the fact that its regeneration will need a new Tardiglacial, as stated three decades ago by the academician N. Boşcaiu.

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HABITATELE CU JNEAPĂN ÎN PARCUL NATURAL MUNŢII MARAMUREŞULUI (I): DISTRIBUŢIE ŞI MANAGEMENT

(Rezumat)

Lucrarea de faţă şi-a propus să realizeze o sinteză asupra cercetărilor şi acţiunilor de protecţie şi de refacere a jnepenişelor din perimetrul actualului Parc Natural Munţii Maramureşului, precum şi o prezentare a distribuţiei acestor formaţii vegetale în această zonă.

Considerate de Boşcaiu (1975) ca relicte tardiglaciare, jnepenişele joacă un rol ecologic major în conservarea unor specii vegetale şi animale sau în protecţia versanţilor şi bazinelor superioare ale pâraielor ce-şi au originea în alpinul şi subalpinul Carpaţilor. Toate acestea justifică încadrarea tipului de habitat *4070** „Tufărişuri de *Pinus mugo* şi *Rhododendron myrtifolium*" într-unul prioritar la nivelul CE.

Privind istoric soarta lor, constatăm o agresiune începând cu zorii secolului al XIX-lea, cu un maxim în deceniile 6 şi 7 ale secolului trecut, astfel că în zona studiată suprafaţa acestora s-a redus cu 40-50% numai în decursul secolului XX. Apoi, pare interesant de subliniat faptul că, în Munţii Maramureşului, protejarea jnepenişelor a fost strict legată de protecţia cocoşului de mesteacăn, al cărui habitat preferat îl constituie.

Subliniind contribuţiile anterioare, privitoare la structura, funcţiile şi la posibilităţile de refacere a jnepenişelor, s-a dorit să se argumenteze necesitatea continuării unora şi demarării altora noi, prin prisma principiilor şi metodelor de management ecologic şi de monitorizare. Harta distribuţiei acestor formaţii (fig. 1) ilustrează gradul puternic de fragmentare a celor cca 2.000 ha, aspect ce sprijină proiectele de reconstrucţie ecologică, aşa cum este cel început în 2008, în OS Ruscova.

Toate elementele reunite în această lucrare vor sta la baza perfecţionării celor două protocoale de monitorizare realizate, iar în final la definitivarea Planului de management al întregului parc natural.

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