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SOME ASPECTS REGARDING THE PRESERVATION STATUS OF THE 4060 HABITAT – ALPINE AND BOREAL SHRUBS FROM THE CĂLIMANI NATIONAL PARK

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INTRODUCTION

The preservation status of the 4060 habitat "Alpine and boreal shrubs" was established during 2010 – 2014 within two European projects. This fact allowed us to analyze the evolution of the habitat preservation status, to identify its threats, and to recommend a series of regulations to reduce the impact.

According to the Romanian Manual for Interpretation of EU Habitats coordinated by Dan Gafta and Owen Mounford (2008), the 4060 habitat – alpine and boreal shrubs - comprises several subtypes: 31.41 – Alpine short shrubs of Ericaceae; 31.42 – Rhododendron acidophylous shrubs; 31.43 – Mountain shrubs of short Juniperus; 31.44 – *Empetrum-Vaccinium* bushes from the high mountains; 31.46 – *Bruckenthalia* shrublands; 31.47 – Alpine Bear berry shrublans; 31.49 – Mountain avens area; 31.4A – Subalpine short shrublands of blueberry; 31.4B – Mountain shrublans containg *Sarothamnus scoparus* and *Genista sp.* (common broom).

MATERIAL AND METHODS

The inventory and assessment of the preservation status was accomplished on 70% of the park's area, aproximately 16.800 hectares. The area was bordered using maps. Therefore, in order to assess their preservation state and to determine various habitats' location within the natural park, we identified the exact specific floristic composition. The entire area was thoroughly searched to depict the types of habitats (correlated with the identification of plant species and communities that define each type of habitat).

Several floristic sketches to scales were accomplished, and the plant species were identified by means of plant determinators. The GPS coordinates were registered for each sketch to scale.

The preservation status' evaluation was made by means of the floristic sketches to scale, considering the floristic content, the presence of rare and vulnerable species, and of the environmental factors as well. Those were systematic and thorough observations on the entire park surface, within sample areas relatively uniformly disposed on the sample area.

The main investigation methods are the regular ones, as it follows:

Itinerary research - applied only once - it allowed the identification of the structural features, of the spread and spatial variability in ecosystems or territorial ecosystem complexes.

Stationary reasearch – applied several times consecutively - favoured a wider development in time and was done using more detailed methods, lead to some results on the dynamics of phenomena, of the ecosystemic and interecosystemic processes.

The two research methods solved different yet complementary aspects of the vegetation research. The itinerary reasearch solved issues regarding the description, inventory and mapping. The stationary research solved some matters on the vegetation dynamic within both the ecosystem and the landscape; the latter are more complex, as they related to the ecological factors, to the animals and microorganisms.

The necessary materials for this study were: GPS, photo camera, maps showing the park's boundaries, determinator, field files.

RESULTS AND DISCUSSIONS

The 4060 habitat "Alpine and boreal shrubs"(see photos 1-6) lies on large areas, representing about 15 - 20% of the park's surface, and is present in the next areas: Retiţiş, Voivodeasa, Bradul Ciont, Călimani Izvor, Călimanul Cerbului, Negoiul Unguresc – Pietrosul, Stâncile lui Ilieş, Strunior, Bistricior, Lucaciu, 12 Apostoli, Pietrele Roşii, Tamău, and Măieriş.

This habitat is characterized by short, very short or prostrated units from the alpine and subalpine level, dominated by ericaceae, *Dryas octopetala*, short juniper, *Sarothamnus* and *Genista* species.

The edifying species are: *Juniperus sibirica, Rhododendron myrtifolium, Vaccinium*

gaultherioides, Vaccinium myrtillus, Vaccinium vitis-idaea, Empetrum nigrum ssp. hermaphroditicum, Loiseleuria procumbens,

The characteristic species are: *Campanula abietina, Rhododendron myrtifolium, Vaccinium gaultherioides, Vaccinium myrtillus, Vaccinium vitis-idaea, Empetrum nigrum ssp. hermaphroditicum, Loiseleuria procumbens, Cetraria islandica, Thamnolia vermicularis*.

Other important species were: *Campanula serrata, Potentilla ternata, Luzula luzuloides, Picea abies, Homogyne alpina, Soldanella hungarica ssp. major, Oxalis acetosella, Campanula alpina, Primula minima, Festuca supina, Juncus trifidus, Hieracium alpinum, Ligusticum mutellina, Deschampsia flexuosa, Pulsatilla alba, Antennaria dioica, Pinus mugo, Carex atrata, Luzula sylvatica, Lycopodium selago, Nardus stricta, Lonicera caerulea, Anthoxanthum odoratum,*.

The 4060 habitat "Alpine and boreal shrubs" is represented by four subtypes that lie on a few hundred hectares, the altitude exceeding 1600 m. These 4 subtypes are:

- the 31.42 subtype, the shrublands of *Rhododendron and Vaccinium* – occupy representative areas in the alpine region, sometimes descending in the subalpine region as isles within the *Pinus mugo* and *Juniperus* area, on average to very aslope land;
- the 31.43 subtype, the shrublands of *Juniperus sibirica* form short shrublands and lie on relatively small but compact and island-shaped areas;
- the 31.44 subtype, the shrublands of *Empetrum – Vaccinium*, lie on very small areas, of dozens of square metres, on eroded and less accessible ground;
- the 31.4A subtype, very short subalpine *Vaccinium* shrublands, are secondary and lie on subalpine land, in which the *Juniperus - Pinus mugo*, and *Picea abies* shrublands were broken down.

The number of identified species in each research point exceeds 10 species. The most frequent are: *Rhododendron myrtifolium, Juniperus sibirica, Vaccinium myrtillus, V. vitis-idaea, V. gaultherioides, Pinus mugo, Juncus trifidus, Campanula alpina, Lycopodium selago, Pulsatilla alba, Deschampsia flexuosa, Luzula luzuloides, Carex atrata, Homogyne alpina, Hieracium alpinum, Primula minima* etc.

Generally speaking, the covering rate of shrublands is good, ranging between 80 to 100%; the lichens and mosses do not exceed 10%, and the vegetation deprived area is of maximum 10%.

The invasive plant species are: *Veratrum album, Deschampsia caespitosa, Rumex alpinus*.

The field reasearch in the Şaua Voivodeasa – Bradu Ciont area indicated that the 4060 habitat dispalyed a favourable preservation state, the number of species identified within each observation point exceeds 10, amongst which the most frequent are: *Juniperus sibirica, Vaccinium gaultherioides, V. vitis-idaea, V. myrtillus, Rhododendron myrtifolium, Pulsatilla alba, Pinus mugo*.

The pasturage was present with normal limits, and the invasive species represented less than 1%. One or two individuals of *Veratrum album* were seldom encountered.

Within the Călimani Izvor and Călimanul Cerbului areas (exceeding 2000 m in altitude) there were dozens of hectares of alpine and boreal shrublands in a favourable preservation state.

The characteristic subtypes for this area are mainly 31.42 and 31.43, spread at more than 1900 m in altitude, sometimes descending towards 1800 m on the Northern slopes.

The edifying species are: *Rhododendron myrtifolium, Juniperus sibirica, Vaccinium gaultherioides, V. vitis-idaea, V. myrtillus, Juncus trifidus*.

The areas such as: Lucaciu, 12 Apostoli, Pietrele Roşii, and Tamău display large surfaces of dozen hectares of Juniperus at the upper forest side, and on the windy plateau areas very small areas, of a few hundred suare metres, with *Empetrum-Vaccinium* shrublands. The *Vaccinium* areas replaced the deforested areas with *Picea abies* and juniper shrublands.

The most common species are: *Juniperus sibirica, Campanula abietina, Vaccinium myrtifollium, V. viti-idaea, V. gaultherioides, Empetrum nigrum* ssp. *hermaphroditicum, Nardus stricta, Campanula serrata, Calamagrostis villosa, Luzula sylvatica, Picea abies, Soldanella montana, Homogyne alpina*.

The menaces are: the invasive species - *Veratrum album, Deschampsia caespitosa, Rumex alpinus*, and the intense pasturage in the Pietrele Roşii – Tamău region. The advanced growth of *Picea abies* seedlings is the major threat for this area.

The Măieriş region represents the area in which the first individuals of *Pinus mugo* and *Rhododendron myrtifolium* appeared, easily passing to the 4070 habitat Shrubland of *Pinus mugo* and *Rhododendron myrtifolium* that lie on large surfaces within the Călimani National Park. The most frequent species remain: *Juniperus sibirica, Vaccinium myrtillus, V. vitis-idaea, V. gaultherioides, Empetrum nigrum* ssp. *hermaphroditicum, Nardus stricta, Campanula abietina, Campanula serrata, Picea abies, Homogyne alpina* etc., together with *Rhododendron myrtifollium, Pulsatilla alba, Ligusticum mutellina, Juncus trifidus* and so on.

The main threat of this area remains the advanced growth of spruce seedlings within the inner side of the 4060 habitat 4060; the other threats are: the pasturage and the invasive species – *Deschampsia caespitosa, Veratrum album,* and *Rumex alpinus*.

There were identified *Juniperus* shrublands in the Stâncile lui Ilieş area, scattered on rather large land surfaces (a few hectares), in which the shrub layer covers 50-80%; the rest of the land up to 95% is covered with *Vaccinium gaultherioides, V. vitis-idaea, V. myrtillus, Festuca supina,* or *Nardus stricta*.

The invasive species present in that region were: *Veratrum album,* and *Deschampsia caespitosa*.

Regarding the threats in the area, the following issues were acknowledged: the pasturage was present within normal limits, and the spruce seedlings displayed an advanced growth to the inner parts of the pastures.

Concerning the Şaua Tihului area, the subtype 31.4A – very short subalpine *Vaccinium* shrublands – was secondary, and certainly appeared as a consequence of the juniper trees deforestation, meant to prepare the land for pasturage. The area is characterised by a normal sheep pasturage in the nearby, towards the forest limit, where the sheepfold is placed. This area lies on a few square hundred metres.

The main edifying and characteristic species are: *Vaccinium myrtillus*, *V. vitis-idaea*, *Luzula sylvatica, Homgyne alpina, Pinus mugo, Campanula abietina*.

At the Western outermost part of the Călimani mountains, in between Strunior and Bistricior peaks, the 4060 habitat reaches almost 2000 m in altitude, and lies on some dozen hectares. Its preservation state is favourable; no real or potential threats were identified in the region.

The average number of identified species on the sample surface was higher than 10 up to 15. The most common were the following: *Rhododendron myrtifolium, Vaccinium gaultherioides, V. vitis-idaea, V. myrtillus, Juniperus sibirica, Campanula abietina, C. alpina, Juncus trifidus, Ligusticum mutellina, Pulsatilla alba* etc. The coverage area of the shrublands in those points ranged between 75-95%, the lichens and mosses up to 10%, and the land deprived of vegetation is of maximum 5 %.

Among the invasive species we mention *Veratrum album*.

Regarding the threats and endangerements for the 4060 habitat, they are displayed below:

The sheep pasturage in normal limits does not affect the habitat. It is present within the boundaries of the Călimani National Park in several regions, such as: Reţitiş, Lacul Iezer, Strunior, Pietrele Roşii etc. The intensive sheep pasturage damages the habitat, as it triggers the growth of invasive species (*Rumex alpinum* and *Veratrum album*). The habitat's viability in the long run is significantly altered in those regions.

The advanced growth of the spruce seedlings (*Picea abies*) represents another menace for the habitat. Unless some regulations to replace those shoots will be enforced, the habitat will change its composition and shape, turning from a shrubland into a woody habitat. The habitat's long-term viability in that place is seriously affected.

The picking of terrestrial plants, in general**:** the blooming plant species are an attraction to tourists. There are many tourist who pick plants for their private collections or for some institutions (such as museums). These plants are removed from their natural environment together with their underground parts, leading to the extinction of that plant species. The habitat's viability in the long run is not majorly affected for that specific place.

The blueberries' harvesting using special combs causes the damage of the *Vaccinium* sp. shrubs, that may become dry for future. The special combs' use may alter some parts of the habitat. The people that harvest the berries sometimes leave behind garbage, in other cases they light fire, exposing the habitat to fire threats. The habitat's viability in the long run is seriously affected.

The leisure activities by means of trips within the park's limits may affect the fauna and flora due to noises, plant damage, treading underfeet or destroying some herbal plants, may cause damages to some trees while writing names on their bark, garbage disposal etc. In some cases, dogs run unleashed and may scare the animals that populate that area. This antropic menace is located along the tourists' routes, access roads, the Iezer lake, and the Pietrele Roşii camping area. The habitat's viability is severely damaged in the region.

The air pollution is caused by car escapement gas. Another air pollution cause is the smoke produced by wood burn made by tourists or shepherds. The dust rising along the access roads is another air pollutant. It affects the herbs growing on both sides of the access roads, by clogging the plant stomates and altering the plant gas exchange with the environment.

The garbage and solid waste is left behind by some tourists that do not collect food remains, cans, bottles, or plastic and paper bags, that should be disposed to the closest garbage container.

The sound pollution does not severely impair the plants and habitats, but represents a pressure for the animals in the region that may lead to birds abandoning their nests, for instance.

The invasive species (se photos 9-10): there are some regions in which the intensive pasturage triggers large areas covered with *Rumex alpinum*, *Veratrum album* or *Deschampsia cespitosa*. These regions generate plant communities different from the prior ones, and may lead to the dissolution or fragmentation of the previous habitat.

The spruce seedlings sometimes grow in the inner parts of the pastures and shrublands; this advanced growth may change the land's destination from the structural viewpoint. The habitat's viability in the long run is significantly altered.

Within the camping areas, several fire bedstones are built by means of cutting some trees or shrubs. The Iezer lake is a touristic highly appreciated destination, in which we noticed several fire bedstones. They constitute a fire threat unless being unsurveilled or ceised by tourists.

The regulations to diminish the impact are:

In case of the intensive pasturage: the establishment of the pasturage areas and of the maximum sheep number/surface unit, depending on each pasture and its level of degradation. The sheep pasturage within the floristically degraded pastures with invasive species should be prevented during that year, allowing its reestablishment. Each pasture should be thorougly analyzed before its use for animal pasturage.

Locating the areas in which the proposed regulation will be enforced – this should be applied for all the pasturage areas within the Călimani National Park. According to field notes and observations, the most affected pastures are the ones from Pietrele Roşii, Strunior, Fața Gardului, and Reţitiş.

The removal of spruce (*Picea abies*) (see photos 7-8) seedlings from the pasture areas: during our field research we noticed shrublands invaded by spruce seedlings, as well as pastures and shrublands in which the spruce seedlings and the individuals of *Veratrum album* had been cut off. This reveals the fact that there already is an environmental management being applied. Our recommendation is to accomplish this actions annually only where necessary.

The location of the areas in which this proposed regulation will be enforced: pastures and shrublands from Reţitiş, Pietrele Roşii, and Tamău.

The plant harvesting together with their underground parts causes their extinction within that region. This action should be restricted and some fines should be imposed. The plant picking (including the underground parts) should be allowed by the areas' conservator, and only for the plants belonging to stable populations. This aspect should be vulgarized by means of info boards, broshures, flyers, volunteers.

The mushroom, lichen, and forest fruit harvesting should be approved by the area's conservator. The blueberries and the cranberries should be picked without the use of special combs. The persons that harvest forest fruit usually leave garbage behind. In this view, they should be informed that the waste disposal implies fines. All these should be vulgarized by means of the info boards, broshures, info campains, volunteers.

The touristic routes and camping places should be permanently maintained in order to avoid the threat of tourists off tracks. The tourists should be informed (using some info panels, flyers, maps) on the regulations enforced in case of non-compliance.

The air pollutions and the noise: the actions meant to reduce the impact refer to the least possible car use. If still used, the autovehicles should comply from the technical viewpoint and run at a low speed to avoid dust clouds. Concerning the solid waste, the best solution is to convince the tourists to gather their garbage into bags and carry them to the nearest container.

Fire prevention within the park's limits: the tourists should be informed on this topic and on the regulations and fines to be enforced in case of non - compliance.

Locating the areas in which the proposed regulations will be applied: vulgarized by means of some info boards, flyers, broshures, maps of tourist tracks, info campains, volunteers – all located at the park's entrances, along tourist tracks, special rest areas, info points, chalets, and guesthouses.

CONCLUSIONS

The preservation state of the 4060 habitat – "Alpine and boreal shrubs" from the Călimani National Park was evinced during 2010 – 2014 by means of two European projects. We were able to assess a positive tendancy to evolve for this habitat, we identified the threats and came with a series of regulations to diminish the impact.

The 4060 habitat – "Alpine and boreal shrubs" is represented by four subtypes that lie on a few hundred hectares, more than 1600 m in altitude. The most common species are: *Juniperus sibirica, Campanula abietina, Vaccinium myrtifollium, V. vitiidaea, V. gaultherioides, Empetrum nigrum* ssp. *hermaphroditicum, Nardus stricta, Campanula serrata, Calamagrostis villosa, Luzula sylvatica, Picea abies, Soldanella montana, Homogyne alpina,* and *Pulsatilla alba*.

The coverage area of the shrublands in the majority of our observations points ranged between 50 - 95%, the lichens and mosses up to 10-15%, and the land deprived of vegetation is of maximum 5 %.

The invasive plant species are represented mainly by *Rumex alpinum*, *Veratrum album* or *Deschampsia cespitosa.*

The major threats for this habitat are: the harvesting of forest fruit (blueberries, cranberries) using the specially manufactured combs, the advanced growth of the spruce seedlings inside the shrublands, and the intensive pasturage.

ABSTRACT

The 4060 habitat – Alpine and boreal shrubs - is an important habitat in Europe due to its floristic diversity, as it represents a food, nesting and shelter source for the biodiversity in the area. Being submitted to many antropic and natural threats, this habitat may suffer a negative evolution concerning the preservation status. This present paper aims to

describe several issues on the preservation state of this type of habitat, as well as the threats and regulations in order to diminish the impact. The purpose is to maintain the biodiversity in the area unaltered in the near future.

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Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photos 1, 2, 3, 4, 5, 6 illustrate aspects of the 4060 habitat - ”Alpine and boreal shrubs”
in the Călimani National Park

Photo 7

Photo 8

Photos 7, 8 represent the advanced growth of the *Picea* genus inside the 4060 habitat –
”Alpine and boreal shrubs”

Photo 9

Photo 10

Photos 9 and 10 display the presence of the invasive plants within the 4060 habitat of community interest -
”Alpine and boreal shrubs”