THE CHARACTERIZATION OF THE HABITAT 7110* - *ACTIVE RAISED BOGS* FROM THE NATURA 2000 SITE ROSCI0002 APUSENI

Violeta BORUZ[1*]

[(1)] University of Craiova, "Al. Buia" Botanical Garden, 26 C-tin Lecca Street, Craiova, Romania

author e-mail: violetaboruz@yahoo.com

Abstract

The Natura 2000 site ROSCI0002 Apuseni, whose boundaries largely overlap with those of the Apuseni Natural Park, with only minor exceptions, was designated for the protection of habitats and species, including wetland and peatland habitats. In this report is analyzed a priority peatland habitat, specifically Habitat 7110 - Active raised bogs (PAL. CLASS.: 51.1), which holds high conservation value at the European level. This peatlands, which store large quantities of carbon within peat layers, generally cover small areas and are under threat of disappearance.*

Habitat 7110, identified within the ROSCI0002 Apuseni protected natural area following studies conducted over two vegetation seasons in 2021-2022, is complexly characterized in terms of distribution, floristic and phytocenological diversity and the management measures necessary to preserve its typical structure.*

Key words: Habitat 7110* - Active raised bogs, structure, distribution, ROSCI0002 Apuseni, Romania

INTRODUCTION

The site of community importance, ROSCI0002 Apuseni, largely overlaps with the Apuseni Natural Park, with certain exceptions: the inhabited areas of Beliş and Albac, which are included in the Apuseni Natural Park but excluded from ROSCI0002 Apuseni. The Apuseni Natural Park and the integrated protected areas are situated in western Romania, in the central-northwestern part of the Apuseni Mountains, covering sections of the Bihor Massif to the south and the Vlădeasa Massif to the north. The Apuseni Natural Park is a protected natural area of national interest, being included in the category of natural parks, corresponding to the Vth IUCN category "protected landscape: protected area mainly managed for landscape conservation and recreation."

The ROSCI0002 Apuseni site, a community interest protected natural area, was designated by the Order of the Minister of Environment and Sustainable Development No. 1964/2007, regarding the establishment of the protected natural area regime for sites of community importance as an integral part of the European Natura 2000 ecological network in Romania, with subsequent amendments and additions. Spanning an area of 75,876.50 hectares, as per the standard formular of the protected natural area, it represents a region with highly varied biodiversity, protected for key species and habitats of community and priority interest.

The diversity of vegetation in the Apuseni Natural Park and ROSCI0002 Apuseni is partly due to the presence of numerous bogs and peat marshes, which are water-dependent. The bogs of the Apuseni Mountains, locally called "molhașuri," are mainly found within the spruce forests floore and the subalpine floore. These peatlands are oligotrophic swamps, remnants from the glacial period, playing an ecological role in regulating the water regime of the entire area. Besides their

unique appearance, which gives the landscape a distinctive character, these peatlands are particularly notable for their phytogeographical elements of significant scientific interest.

According to the classification by Emil Pop (1960), two main groups of bogs intersect within the park's boundaries: the swamps on the Bihorean mountainous block and those along the upper reaches of the Someșul Cald River. These bogs form either on siliceous substrates in nearly horizontal areas (such as “Molhașurile de la Izbuce”) or in karstic areas where the doline floors are impermeabilized by clay (Padiș, Bârsa, Onceasa, Vărășoaia). Particularly interesting vegetation associations have been described in these bogs.

Some of the most characteristic bogs in the Apuseni Mountains, showcasing unparalleled scenic beauty, are those along the upper reaches of the Someșul Cald River. Within the Izbuc-Călineasa-Ic bog series, the important peatland complex includes the natural reserves of “Molhașul Mare de la Izbuc” and the “Molhașurile din Valea Izbucelor”. The surface is located in the area of the springs of Someșul Cald, at altitudes of approximately 1000 meters.

The most attractive part is the Molhașul Mare de la Izbuc, belonging to the Beliș locality, a protected area where several species considered glacial relicts can be observed, among which one of the rare species of carnivorous plants on the Romanian territory, *Drosera rotundifolia*, also present in the other peatlands in the area.

The peatland habitats of high conservation value at the European level, identified as representative for the Apuseni Natural Park and the Natura 2000 ROSCI0002 Apuseni site, include *7110* - Active Raised Bogs* (PAL. CLASS: 51.1), *7140 - Transition mires and quaking bogs* (PAL. CLASS: 54.5), *7150 - Depressions on peat surfaces of the Rhynchosporion* (PAL. CLASS: 54.6), and *91D0* Bog woodland* (PAL. CLASS.: 44.A1 up to 44.A4).

This report focuses on Habitat 7110* - Active Raised Bogs, analyzing its distribution within the protected natural area, phytocenotic structure, the pressures and threats acting upon it, and general management measures necessary to maintain or improve its favorable conservation status.

MATERIALS AND METHODS

Following complex research conducted within the protected natural area ROSCI0002 Apuseni, during the period from June to August of 2021 and 2022, peatland habitats, including *Habitat 7110* - Active Raised Bogs*, were identified and mapped to support the Management Plan. Habitats identification was based on the specific plant associations characterizing each habitat, considering dominant and characteristic species. This was achieved through personal observations and references from specialized literature (Sanda et al. 2008; Coldea et al. 2017; Chifu et al. 2014; Gafta & Mountford, coord, 2008; Doniță et al. 2005, 2006).

Mapping and inventorying of Habitat 7110* were conducted across the entire protected area by surveying and characterizing pre-defined polygons based on existing orthophotos and/or satellite images. Habitat type determination was informed by sources such as: The Interpretation Manual of European Union Habitats (EUR 28), European Commission, DG Environment, Nature ENV B.3.; as well as the Natura 2000 Habitat Interpretation Manual for Romania, edited by Gafta & Mountford, coord (2008) for community important

habitats, and Habitats of Romania by Doniță et al. 2005, 2006.
The nomenclature of species mentioned follows the Euro+Med Plantbase Project.

RESULTS AND DISCUSSION

The Habitat 7110* - Active raised bogs is classified as a priority habitat, in these peatlands large amounts of carbon are stored in the peat layers, and the peatlands have in their composition the pollen grains formed over time and preserved in the peat layers. To keep these pollen grains in good condition, either an acid or anaerobic environment was necessary. As a result, the sporo-pollinic spectra of the peat from these peatlands constitute the most important microstratigraphic archives for the reconstruction of the vegetation history of the Apuseni Mountains.
This habitat is dependent on the presence of water, it is usually formed on flat lands where water drainage is very reduced. It is one of the most interesting types of habitats in Romania, especially due to the fact that it develops on acidic soils, poor in nutrients, and the water level is strictly maintained by the input of precipitation, keeping a water level higher than that of the water table, with perennial vegetation dominated by brightly colored pillows (mounds) of *Sphagnum* spp. that allow the swamp to rise in its central part (Gafta & Mountford, coord, 2008).

***Structure and Distribution of the Habitat in the Studied Area*:**

Research conducted as part of the Management Plan development revealed that Habitat 7110* has an insular distribution within the central-northern sector of the Apuseni Natural Park and ROSCI0002 Apuseni site. This distribution results from specific local conditions: flat terrain, acidic substrate, lower annual temperatures, and high precipitation, which together create optimal conditions for this habitat. Within this site, Habitat 7110* often forms a mosaic with other peatland habitats, such as Habitats 7140, 7150, and occasionally 91D0*.
Habitat 7110* was identified in the following areas of the protected site (Fig. 1): the peat bog at Ic Ponor, “Molhașul din Groapă”, “Molhașurile din Valea Izbucelor”, “Molhașul Mare de la Izbuc”, the peat bog Cuciulata, Padiș Bălileasa, and Piatra Arsă. Small fragments of habitat were also identified in Sâvla, but also in Padiș, Șesu Padiș where the transformation of primary eutrophic sphagnets into transitional sphagnets is best observed, sometimes also showing oligotrophic portions.

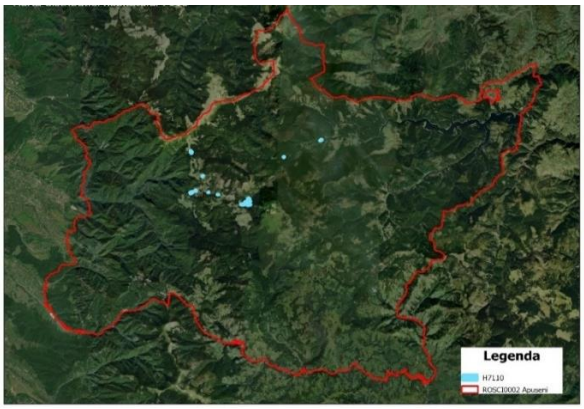

Fig. 1. Location of habitat 7110* in ROSCI0002 Apuseni

In the habitat fragments 7110* from the site, phytocoenoses of *Eriophoro vaginati-Sphagnetum recurvi* Hueck 1925 were identified – at “Molhașul din Groapă”, Padiș, Padiș Bălileasa, Cuciulata, Piatra Arsă and on smaller surfaces in the peat bog at Ic Ponor, “Molhașurile din Valea Izbucelor”, “Molhașul Mare de la Izbuc” (Fig. 2). Phytocoenoses of the association *Sphagnetum magellanici* (Malcuit 1929) Kärstner et Flössner 1933 subass. *typicum* were also identified on small surfaces - at “Molhașul Mare de la Izbuc” (in the northern part of the marsh and towards the center) and “Molhașul din

Groapă". Large areas of the peatlands in the natural protected area are occupied by phytocenoses of the association *Empetro nigri-Sphagnetum fusci* Osvald 1923 as observed at "Molhașul Mare de la Izbuc" (Fig. 3), "Molhașurile din Valea Izbucelor", the peat bog at Ic Ponor.

Some of the communities of this type, from the flat, wetter areas of the "Molhașul Mare de la Izbuc" peat bog, are dominated by *Andromeda polifolia*, thus distinguishing the well-individualized local facies from a physiognomic point of view - subass. *andrometosum* (in accordance with Coldea et al. 2018), an aspect observed both in this peatland and in several of the peat bogs in Izbucelor Valley. It was also observed that some phytocoenoses of *Empetro nigri-Sphagnetum fusci* that form on the higher areas of the "Molhașul Mare de la Izbuc" peat bog are dominated by *Molinia caerulea* (according to Coldea et al. 2018).

Fig. 2. General aspect, habitat 7110*- "Molhașul Mare de la Izbuc" (Photo Violeta Boruz)

Fig. 3. Habitat 7110*, phytocenoses of *Empetro nigri-Sphagnetum fusci* - "Molhașul Mare de la Izbuc" (Photo Violeta Boruz)

In the protected natural area ROSCI0002 Apuseni, the Natura 2000 habitat 7110* has the following corresponding habitats in Romania:

- National habitat *R5101 Southeast Carpathian, meso-oligotrophic, acid peatlands with Eriophorum vaginatum and Sphagnum recurvum* (*PalHab: 51.11 Bog hummocks, ridges and lawns*).

From the phytocenotic point of view, it was identified ass. *Eriophoro vaginati-Sphagnetum recurvi* Hueck 1925 (syn.: *Eriophoro-Sphagnetum* auct. rom.).

In the specialist literature ass. *Eriophoro vaginati-Sphagnetum recurvi* is cited from the protected natural area of the following areas: Padiș (Kovács & Páll, 1963 in Chifu T., edit., 2014), "Molhașurile din Valea Izbucelor", "Molhașul Mare de la Izbuc" (Coldea et al. 2018).

Following the studies carried out, the national habitat R5101 was identified at Padiș (Fig. 4), the Padiș plateau, near the area called Pietrele Onachii, The peat bog from Ic Ponor, "Molhașurile din Valea Izbucelor", "Molhașul Mare de la Izbuc", where it occupies marginal areas of peatlands. It was also identified at "Molhașul din Groapă", Padiș-Bălileasa (Fig. 5), Cuciulata (Fig. 6), Piatra Arsă (Fig. 7).

Fig. 4. Aspect from habitat 7110*, phytocenoses of *Eriophoro vaginati-Sphagnetum recurvi* - Padiș (Photo Violeta Boruz)

Fig. 5. Habitat R5101, general aspect, phytocenosis of *Eriophoro vaginati-Sphagnetum recurvi* - Padiș Bălileasa (Photo Violeta Boruz)

Fig. 6. Habitat 7110*, general aspect, ass. *Eriophoro vaginati-Sphagnetum recurvi*, the peat bog Cuciulata (Photo Violeta Boruz)

Fig. 7. Habitat 7110*, general aspect, ass. *Eriophoro vaginati-Sphagnetum recurvi*, Piatra Arsă (Photo Violeta Boruz)

➢ National habitat *R5102 Southeast Carpathian peatlands, oligotrophic with Sphagnum magellanicum* (*PalHab: 51.11 Bog hummocks, ridges and lawns*).

From the phytocenotic point of view, it was identified ass. *Sphagnetum magellanici* (Malcuit 1929) Kästner et Flössner 1933 (Syn.: *Eriophoro vaginati – Sphagnetum* Pop et al. 1968).

In the specialist literature ass. *Sphagnetum magellanici* is cited from the protected natural area from the following places: Padiș plateau (Kovács & Páll 1963), "Molhașul Mare de la Izbuc" (Coldea et al. 2018).

Following the studies carried out, the national habitat R5102 was identified on small areas at Padiș, "Molhașul Mare de la Izbuc" (Fig. 8) and "Molhașul din Groapă", towards the central part of the peatland.

Fig. 8. Habitat R5102, general aspect, at the limit of contact with phytocenoses of *Rhynchosporetum albae* - "Molhașul Mare de la Izbuc" (Photo Violeta Boruz)

The peat bogs from Apuseni are notable for the presence of rare species, such as: *Pedicularis limnogena* ("Molhașurile din Valea Izbucelor", 'Molhașul Mare de la Izbuc", Cuciulata, Padiș, Padiș Bălileasa – Fig. 9, Piatra Arsă); *Dactylorhiza cordigera* ("Molhașurile din Valea Izbucelor", "Molhașul din Groapă", Cuciulata, Padiș, Padiș Bălileasa); *Vaccinium microcarpum* ("Molhașurile din Valea Izbucelor" – Fig. 10, "Molhașul Mare de la Izbuc", "Molhașul din Groapă", Cuciulata, swamp near the surface called Pietrele Onachii, The peat bog from Ic Ponor, Padiș, Padiș Bălileasa); *Carex limosa* ("Molhașurile din Valea Izbucelor", "Molhașul Mare de la Izbuc" – Fig. 11); *Scheuchzeria palustris*

(“Molhașurile din Valea Izbucelor”, “Molhașul Mare de la Izbuc” – Fig. 12);

Fig. 9. *Pedicularis limnogena* – Padiș Bălileasa, ROSCI0002 Apuseni (Photo Violeta Boruz)

Fig. 10. *Vaccinium microcarpum* – “Molhașurile din Valea Izbucelor”, ROSCI0002 Apuseni (Photo Violeta Boruz)

Fig. 11. *Carex limosa* in “Molhașul Mare de la Izbuc”, ROSCI0002 Apuseni (Photo Violeta Boruz)

Fig. 12. *Scheuchzeria palustris* – “Molhașul Mare de la Izbuc”, ROSCI0002 Apuseni (Photo Violeta Boruz)

Carex pauciflora (“Molhașurile din Valea Izbucelor”, “Molhașul Mare de la Izbuc” – Fig. 13, “Molhașul din Groapă”, Cuciulata, swamp near the surface called Pietrele Onachii, The peat bog from Ic Ponor, Padiș, Padiș Bălileasa);

Fig. 13. *Carex pauciflora* in “Molhașul Mare de la Izbuc”, ROSCI0002 Apuseni (Photo Violeta Boruz)

Empetrum nigrum subsp. *nigrum* (“Molhașurile din Valea Izbucelor”, “Molhașul Mare de la Izbuc” – Fig. 14, “Molhașul din Groapă”, swamp near the surface called Pietrele Onachii, The peat bog from Ic Ponor, Padiș Bălileasa); *Andromeda polifolia* (“Molhașurile din

Valea Izbucelor", "Molhașul Mare de la Izbuc" – Fig. 15); *Drosera rotundifolia* ("Molhașurile din Valea Izbucelor", "Molhașul Mare de la Izbuc", "Molhașul din Groapă" – Fig. 16, Piatra Arsă), and others.

Fig. 14. *Empetrum nigrum* subsp. *nigrum* - in "Molhașul Mare de la Izbuc", ROSCI0002 Apuseni (Photo Violeta Boruz)

Fig. 15. *Andromeda polifolia* in "Molhașul Mare de la Izbuc", ROSCI0002 Apuseni (Photo Violeta Boruz)

Fig. 16. *Drosera rotundifolia*, in the habitat 7110*, detail - "Molhașul din Groapă" (Photo Violeta Boruz)

In some habitat fragments, the presence of some indicator species for disturbance (such as eutrophication indicator species, ruderal species, species indicating a tendency to reduce the water regime of peatlands) was observed: *Veratrum album*, *Juncus effusus*, *Molinia caerulea*, *Calluna vulgaris*, and others. In some parts of the peatlands, some of these disturbance indicator species occupy larger areas.

Thus, the presence of species such as *Calluna vulgaris*, *Molinia caerulea*, which were observed at "Molhașul Mare de la Izbuc", "Molhașurile din Valea Izbucelor", as well as at Ic Ponor, "Molhașul din Groapă", Cuciulata, Padiș, Padiș Bălileasa, Piatra Arsă, indicates a tendency to reduce the water level in the peatlands.

The species *Molinia caerulea* (Fig. 17) was observed on larger areas at "Molhașul Mare de la Izbuc" towards the central area of the peatland and at the periphery of the Cuciulata peatland, towards the spruce forest. It was observed with reduced presence in the other peatlands.

Fig. 17. *Molinia caerulea* – the peat bog Cuciulata, ROSCI0002 Apuseni (Photo Violeta Boruz)

The *Calluna vulgaris* species (Fig. 18), although it has a low presence in the peatlands from Izbuce, "Molhașul din

Groapă", Cuciulata, the peat bog near the surface called Pietrele Onachii, Padiș, Padiș Bălileasa, can expand as well as in the peat bog of at Ic Ponor.

Fig. 18. *Calluna vulgaris* in "Molhașurile din Valea Izbucelor", ROSCI0002 Apuseni (Photo Violeta Boruz)

In some areas, certain anthropogenic activities have been noticed, which currently do not have a high impact on this habitat, such as: Leaving tourist trails by visitors during mountain hikes - which creates paths on the surface of wetland habitats and can lead to the change species composition (succession); Grazing - can lead to the accumulation of organic material in the peatland. Some of the peat bogs, located near the meadows (Padiș, Padiș Bălileasa, Piatra Arsă) are sometimes transited by animals, the soils and vegetation around them being thus strongly disturbed. Also, the animals that enter the habitat can destroy the characteristic species and bring an unwanted supply of organic matter to the already rather fragile system of the peatland, transforming the oligotrophic habitat into a mesotrophic one; Carrying out drainage or other works to reduce the water regime in these habitats; Access with motorized vehicles outside public roads.

As general protection and conservation measures, measures that were also stipulated in the Management Plan, it is recommended: Keeping wetlands and peatlands in their natural state without changing the water regime; Practicing responsible tourism and hiking only on tourist routes; Prohibition of carrying out activities that contradict the purpose of protection and conservation of active peatlands, such as: grazing, drainage, burning, removal of vegetation, discharge of pollutants into surface and underground waters, waste storage, peat exploitation, deliberate introduction of non-native species, conversion of active peatlands, diversions of springs/watercourses feeding active peatlands, access by motorized means, modification of the natural configuration of the land.

In general, in the Apuseni Natural Park, respectively in the Natura 2000 site ROSCI0002 Apuseni, The active peat bogs are well preserved, not being affected by the peat exploitations or by other major anthropogenic activities.

CONCLUSIONS

The habitat 7110* identified in the protected natural area ROSCI0002 Apuseni following the studies carried out in the period 2021-2022 was characterized as complex in terms of distribution, structure and anthropogenic impact. It is a priority habitat, the habitat fragments present in the protected natural area generally occupy small areas. This habitat is representative of the Apuseni Mountains from floristic and ecological considerations and have a favorable conservation status. The high number of rare species for Romania's flora gives these peatlands an important floristic and scientific value.

Thus, these peatlands stand out especially for the phytogeographic elements of particular scientific interest, such as: *Drosera rotundifolia*, *Andromeda polifolia*, *Vaccinium microcarpum*, *Carex limosa*, *C. pauciflora*, *Eriophorum vaginatum*, *Empetrum nigrum* subsp. *nigrum*, *Scheuchzeria palustris*, *Rhynchospora alba* - rare species, species considered glacial relicts in Romania's flora, but also by the presence of endemic species such as *Pedicularis limnogena* and other rare species.

Knowing the distribution of this habitat in the protected natural area will facilitate the monitoring of plant species and typical plant communities, and the recommended management measures aim to maintain and ensure in the future an optimal state of conservation.

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