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Posted Date: 16 July 2025

doi: 10.20944/preprints202507.1349.v1

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Article

The Conservation Status of the *Sphagnum* Species in Romania

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Abstract

New distribution data on *Sphagnum* species have led to the need for re-evaluation of their conservation status. The article presents the conservation status assessment of Romania's *Sphagnum* species, carried out according to the latest IUCN criteria. Based on the analyzed data, 34 *Sphagnum* species are confirmed for Romania, one species requires confirmation, and 5 species are rejected. Over the past two years, three *Sphagnum* species were published as new to Romania. The re-evaluation of the conservation status of *Sphagnum* species in Romania has led to the assessment of eight threatened species, fewer than in the previous assessments.

Keywords: *Sphagnum*; threatened species; peat bogs; bryophytes; biodiversity conservation; Romania

1. Introduction

The genus *Sphagnum* has attracted the attention not only of bryologists, but also of all botanists, ecologists, conservationists, palynologists, and climate change researchers. *Sphagnum* L. species are included in the EU Habitats Directive, Annex V, except for *S. pylaesii* Brid., which is listed in Annex II (DIRECTIVE 92/43/CEE) [1].

Comprising over 300 species worldwide, genus *Sphagnum* represents one of the most significant moss groups in wetland ecosystems and is crucial to the creation and upkeep of peat bogs because it retains water and acidifies the environment, which prevents organic matter from decomposing and encourages the buildup of peat [2–4]. Peat bogs store significant amounts of carbon (covering about 3% of the land surface), provide refuge for numerous rare species, and are considered priority ecosystems at the European level [5,6]. However, these habitats face significant threats from drainage, peat extraction, and climate change, all of which adversely impact biodiversity and the ecosystem services they provide. Consequently, as habitat builders, species of the genus *Sphagnum* have aroused major interest in attempts to combat the effects of climate change through large-scale restoration and reconstruction actions.

The Institute of Biology Bucharest has participated in the restoration of 23 peat bogs in the last ten years, an activity financed by four EEA grants. An additional 23 peat bogs have been restored in Romania by other institutions participating in the national peat bog restoration program, financed by the Ministry of Environment, Waters and Forests through the EEA - Environment Program. Furthermore, ongoing monitoring and adaptive management techniques are necessary due to the dynamic nature of peatland habitats under anthropogenic pressures and climate change.

The International Union for Conservation of Nature`s (IUCN) criteria, which incorporate variables such as population size, demographic trends, distribution region, and particular threats, are used to do the conservative assessment of *Sphagnum* species [7,8]. The re-evaluation of the conservation status of these species and their habitats has become crucial in recent years due to growing anthropogenic pressures, habitat degradation, and the availability of new dispersion data. This reassessment is critical to ensure the long-term persistence of *Sphagnum* species within Romania and to inform efficient conservation strategies.

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Bryological research in Romania began over 200 years ago, reflecting the log-standing scientific interest in the country`s bryophyte flora. The first book in which *Sphagnum* species were reported was published in 1846 [9], where Baumgarten J.C.G. cites five species: *Sphagnum capillifolium* (Ehrh.) Hedw., *S. compactum* Lam. & DC., *S. cuspidatum* Ehrh. ex Hoffm., *S. palustre* L., and *S. squarrosum* Crome. Since then, over 2,000 articles on bryophyte species in Romania have been published, several hundred of which focus on *Sphagnum* species. The most comprehensive work appeared in 1998 and describes 32 *Sphagnum* species from Romania [10] (pp. 30–89).

Over time, 40 *Sphagnum* species have been published for Romania, of which five have been rejected. The conservation status of Romania's bryophyte was assessed in 2012 [11], 2019 [7], and 2020 [12], reflecting changes in distribution patterns, habitat conditions, and emerging threats.

In Romania, the *Sphagnum* species are dominant in the habitats: *Active raised bogs* (NATURA 2000 code: 7110), *Transition mires and quaking bogs* (NATURA 2000 code: 7140), *Bog woodland* (NATURA 2000 code: 91D0), frequent in *Depressions on peat substrates of the Rhynchosporion* habitat (NATURA 2000 code: 7150), and are pioneer species in *Degraded raised bogs still capable of natural regeneration* habitat (NATURA 2000 code: 7120) [1]. Also, the *Sphagnum* species are frequent in mountain forests, especially in spruce fir forests, in subalpine bushes, in subalpine meadows or on mountain wet rocks, up to 2,500 m a.s.l. The *Sphagnum* species have been reported in *Blanket bogs* habitat (NATURA 2000 code: 7130) [1], but this type of habitat does not occur in Romania.

In this paper, we present the updated list of *Sphagnum* species recorded in Romania, accompanied by a reassessment of their conservation status based on the latest IUCN criteria and recent field data, aiming to support ongoing conservation efforts.

2. Materials and Methods

The list of *Sphagnum* species in Romania was compiled using literature, herbaria, open access databases [13] and field data during the period 2001-2025, especially 2021-2025.

More than 60 peatlands across Romania were investigated, as:

- Maramureș County: Vlășchinescu Peatbog, Hărnicești Peatbog, Tăurile Chendroaiei (Tăul de la Gutâi) Peatbog;
- Suceava County: Lucina-Găina Peatbog, Tinovul de lângă drum - Lucina Peatbog, Lucina Est Peatbog, Lucina Vest Peatbog, Poiana Stampei Peatbog, Pilugani Peatbog, Tinovul cel mare de la Coșna Peatbog, Tinovul Jinului Peatbog, Tinovul Românești Peatbog, Teșna Peatbog, Bahnele Bancului I Peatbog, Bahnele Bancului II Peatbog, Șaru Dornei Peatbog;
- Bistrița-Năsăud County: Drăgoiasa Peatbog, Grădinița Peatbog, Larion Peatbog;
- Călimani Mountains: Iezer Lake Peatbogs;
- Harghita County: Mohoș Peatbog, Sâncrăieni-Sântimbru Peatbogs, Dumbrava Harghitei Peatbog;
- Siriu Mountain: Lacul cu ochi Peatbog;
- Buzău County: Manta Lake Peatbog;
- Prahova County: Bâlbâitoarea Peatbog;
- Bucegi Mountains: Nucet Peatbog, Lăptici Peatbog – Blana Valley, Lăptici II – Scândurilor Valley Peatbog, the peatbogs of Lăptici Valley;
- Ierzer-Păpușa Mountains: Iezer Lake Peatbogs;
- Sibiu County: Mlaca Tătarilor Peatbog, Lacul lui Vizante Peatbog, Avrig Peatbogs;
- Făgăraș Mountains: Zârna Lake Peatbogs, Podragu Lake Peatbogs, Capra Lake Peatbogs, Bâlea Lake Peatbogs, Puha Valley Peatbogs;
- Vâlcea County: Mosoroasa Peatbog;
- Șureanu Mountain: Iezerul Șureanu Peatbog;
- Parâng Mountains: Câlcescu (Gâlcescu) Peatbog, Gaura Valley Peatbogs;
- Hunedoara County: Pește Peatbog;
- Retezat Mountains: Bucura Lake Peatbogs, Lia Lake Peatbogs, Galeș Lake Peatbogs; Tăul dintre Brazi Peatbog; Poiana Pelegii Peatbog;

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- Țarcu Mountains: Mătania Valley Peatbogs;
- Mehedinți County: Tăul fără fund de la Poiana Mare-Obârșia Peatbog; Mlaștina în trepte din Poiana Mare Obârșia Cloșani Peatbog; Tăul fără fund de la Busești, Gornenți Peatbog;
- Apuseni Mountains: Molhașul cel mare de la Izbuc Peatbog;
- Gilău Mountains: Molhașul de la Călățele Peatbog; Dâmbu Negru-Între Drumuri Peatbog; Negrușul Finciului-Rovina Mare Peatbog.

The RoBioAtlas (2023) web application [14] was used to create the investigated peatlands map (Figure 1). The Web Application uses GPS Coordinates (WGS 84) to generate species / habitats / ecosistems distribution maps for Romania.

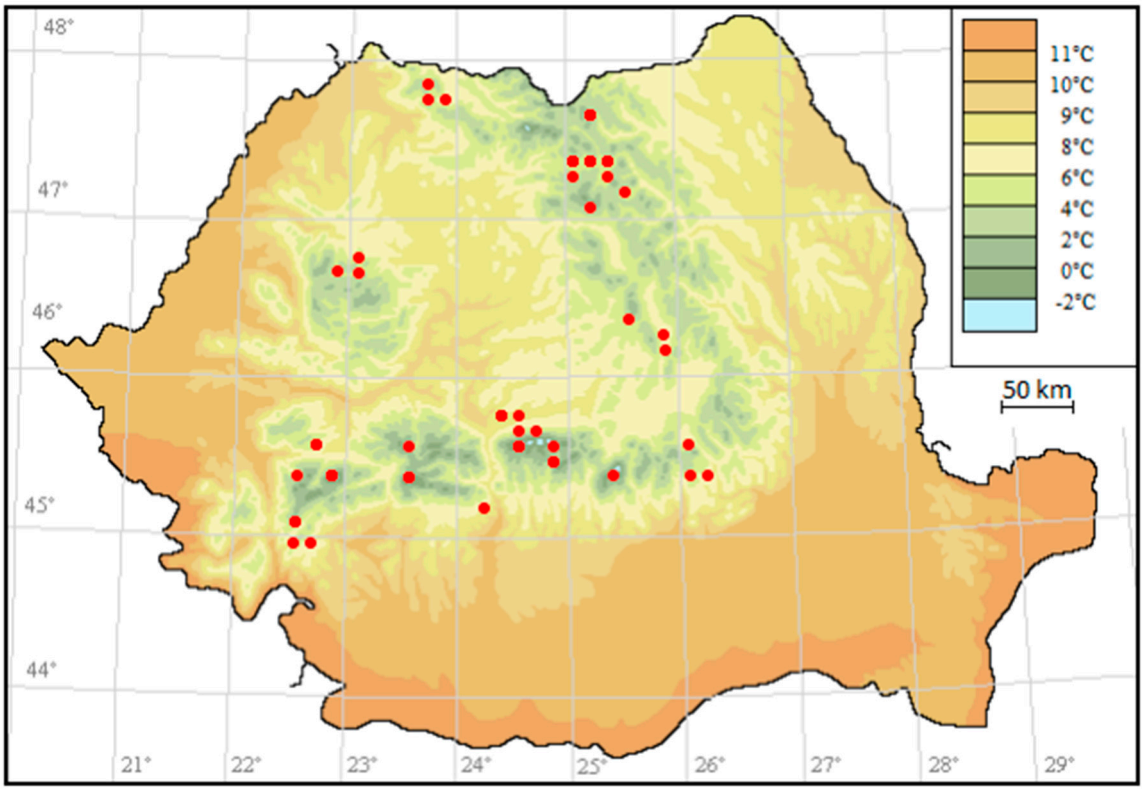

Figure 1. Mean annul temperature map, Romania: the investigated peatlands (red dotts).

The conservative assessment was carried out according to Guidelines for Using the IUCN Red List Categories and Criteria, Version 16 [8]. The assessment of *Sphagnum* taxa in Romania was carried out at the species level. The *Sphagnum* species, which in previous assessments [11,12] were included in the categories DD – Data Deficient (three species) and NE – Not Evaluated (one species) were re-evaluated in this study.

In assessing the conservation status of *Sphagnum* species, the following were also taken into account: peatlands fragmentation in Romania [15] and peatlands current threats to peatlands, including climate change [16].

The *Sphagnum* species nomenclature is according to Hodgetts et al. (2020) [17].

No generative artificial intelligence (GenAI) has been used in this paper.

3. Results

3.1. Sphagnum Species Rejected to Romania

Over time, five *Sphagnum* species published for Romania have been rejected: *S. annulatum* H. Lindb. ex Warnst., *S. molle* Sull., *S. pulchrum* (Lindb. ex Braithw.) Warnst., *S. pylaesii* Brid. [10,18] and *S. magellanicum* Brid. [19].

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Sphagnum annulatum was reported from Poiana Stampei Peatbog, Romania, 25.05.1925, *leg. & det.* Papp C., and Dofteana Valley, Târgu Ocna, Romania, 6.08.1951, *leg. & det.* Papp C. [20], *rev*. Plămadă E., as. *S. fallax* (H. Klinggr.) H. Klinggr. [10]; from Poiana Stampei Peatbog, 11.05.1957, *leg. & det.* Papp C. [20], *rev*. Plămadă E., as. *S. flexuosum* Dozy & Molk. [10] and from Poiana Stampei Peatbog, 20.05.1957, 15.05.1959, *leg. & det.* Papp C. [20], *rev*. Plămadă E., as. *S. angustifolium* (C.E.O. Jensen ex Russow) C.E.O. Jensen [10]. In the BUCA Herbarium we found *Sphagnum annulatum* samples from Poiana Stampei Peatbog, Romania, 25.07.1925, *leg. & det.* Papp C., but are *S. angustifolium*, *rev.* Ștefănuț M.-M., 29.02.2025, BUCA *B6875.*

Sphagnum molle was reported from Poiana Stampei Peatbog, Romania, 23.07.1925, 20.05.1956, 15.05.1959, *leg. & det.* Papp C. [20], *rev*. Plămadă E., as. *S. fuscum* (Schimp.) H. Klinggr. [10]. However, we have not found samples of *S. molle* by Papp C. in the BUCA Herbarium.

Between 2021 and 2024 we visited the Poiana Stampei Peatbog multiple times (Figure 2), but did not find the two species reported by Papp C., *Sphagnum annulatum* or *S. molle.*

(**a**) (**b**)

Figure 2. Poiana Stampei Peatbog, Romania: (**a**) the wooden bridge, 19.09.2024; (**b**) *Sphagnum* area view, 19.09.2024.

Sphagnum pulchrum was reported from Lăptici Peatbog, Bucegi Mountains, Southern Carpathians, Romania, 13.07.1940, *leg.* Cretzoiu P., *det.* Papp C., *rev*. Plămadă E., as *S. quinquefarium* (Braithw.) Warnst., FRE *2393* [10]. The samples of *S. pulchrum* from the BUCA herbarium are all *S. quinquefarium*, *rev*. Ștefănuț M.-M., 20.05.2025, BUCA *B6982-B6985*.

We visited Lăptici Peatbog, Bucegi Mountains, in 2022 and 2025 (Figure 3), but did not find *Sphagnum pulchrum.*

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(**a**) (**b**)

Figure 3. Lăptici Peatbog, Romania, 12.06.2025: (**a**) Image from drone; (**b**) *Sphagnum* area view, the wooden bridge.

Sphagnum pylaesii was reported in 1972 by Debreczy Z. from the Retezat Mountains at Lia Lake, Ana Lake and Bucura Lake [21]. The samples were revised by Lange B. as *S. platyphyllum* (Lindb. ex Braithw.) Warnst. [22]. In 1999, Jakab G. reported *S. pylaesii* from Tăul lui Dumitru Peatbog, Maramureș County, Romania, *leg*. Jakab G., *det*. E. Szurdoki [23], later revised by E. Szurdoki as *S. platyphyllum*.

We visited the peatbogs near Lia Lake and Bucura Lake, Retezat Mountains, in August 2024 (Figure 4), but did not find *Sphagnum pylaesii.*

(**a**) (**b**)

Figure 4. Retezat Mountains, Romania, 24.08.2024: (**a**) The peatbog on the edge of Lia Lake; (**b**) Bucura Lake.

Sphagnum magellanicum was previously reported as a common species in Europe, but proved to be restricted only to South America; in Europe, only *S. medium* Limpr. and *S. divinum* Flatberg & K. Hassel are present [19].

3.2. Sphagnum Species to Be Confirmed for Romania

The first report of *Sphagnum jensenii* H. Lindb. was in 1959 from a small peatbog on Sărăcinul Mic Valley, Lotru Mountains, Southern Carpathians, 1260 m a.s.l., *leg.* Ștefureac T., Lungu L. &

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Popescu A., 1955-1956, *det.* Ștefureac T. [24]. Currently, the habitat is covered by water from the Vidra hydropower Lake. For this reason, we can say that this site of *S. jensenii* is extinct in Romania.

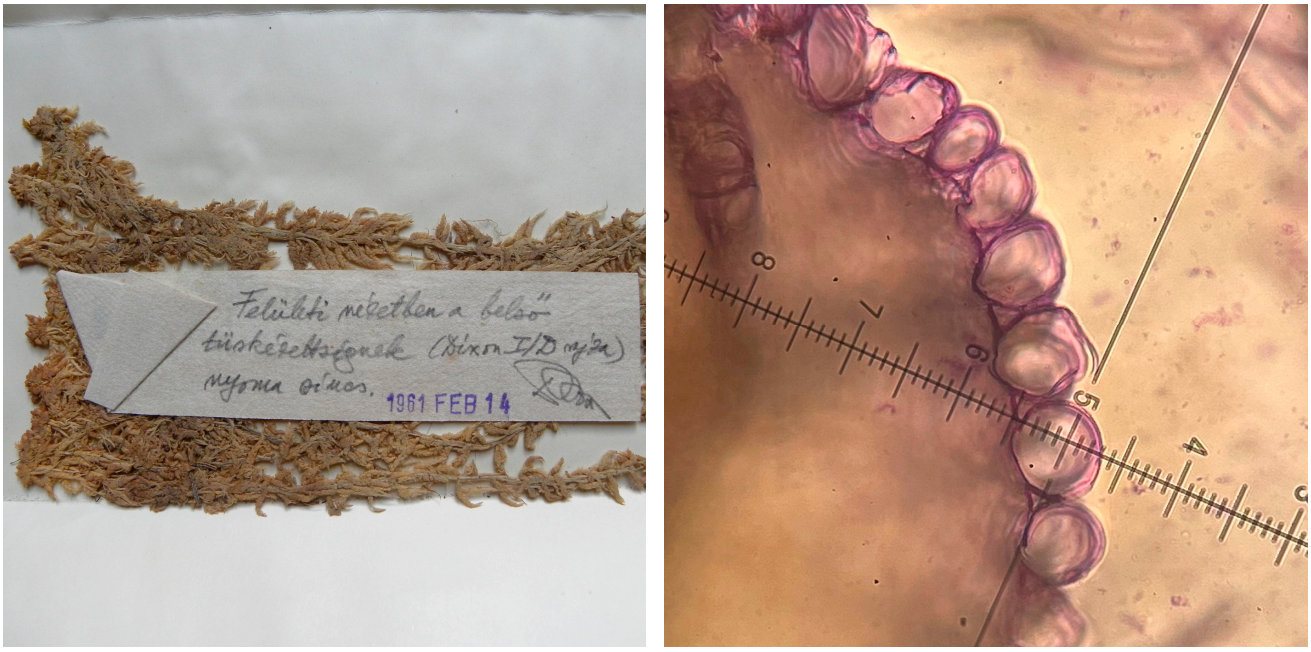
The second report of *S. jensenii* was in 1973 from Cristișor-Neagra Broștenilor Peatbog, Suceava County, *leg.* & *det.* Lungu L. [25].

Other *S. jensenii* reports have been included as synonyms of *S. annulatum*, which were later not confirmed or rejected. The presence of the species *S. jensenii* must be confirmed; until then we will evaluate the species as uncertain to Romania and include it in DD – Data Deficient category.

3.3. Sphagnum Species Confirmed to Romania

Sphagnum affine Renauld & Cardot was reported from Molhașul de la Râșca Peatbog, Văleni, Cluj County, Romania, 920-940 m a.s.l., 25.10.1915, *leg*. & *det*. Győrffy I., Péterfi M., as S. *imbricatum* Hornsch. var. *cristatum* Warnst. fo. *fuscescens* Warnst. BP *7450/S*, *7451/S* [26], *rev*. Ștefănuț M.-M. [27] (Figure 5). This was first confirmed report of *S. affine* to Romania. *S. imbricatum* was reported also from Mohoș Peatbog, Harghita County [28], but we didn't find herbarium samples for checking. In the old reports of *S. imbricatum* were included *S. affine* and *S. austinii* Sull.

After almost 100 years, *S. affine* was found in Molhașul de la Râșca Peatbog, 1070 m a.s.l., 46.70849°N, 23.05224°E, 26.07.2013, *leg*. Sass-Gyarmati A., Jakab G., *det.* Sass-Gyarmati A., 2014, EGR, CL, published on 30.06.2025 [29], BUCA *B12946*, *conf*. Ștefănuț M.-M., 23.06.2025.



(**a**) (**b**)

Figure 5. *Sphagnum affine*, Romania: (**a**) *S. affine* from Văleni, Cluj, County, Romania, 25.10.1915 (photo Papp Beáta); (**b**) *S. affine* – transversal section on branch leaf (photo Papp Beáta).

Sphagnum papillosum Lindb. was recently reported from the Vlășchinescu Peatbog, Maramureș County, Romania, 885 m a.s.l., 19.04.2024, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12295*, *B12311*, *B12312*, *B12325* [27] (Figure 6). This is the fourth report of *S. papillosum* for Romania.

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(**a**) (**b**)

Figure 6. *Sphagnum papillosum* in Vlășchinescu Peatbog, Romania, 19.04.2024: (**a**) Vlășchinescu Peatbog, Romania; (**b**) *S. papillosum* from Vlășchinescu Peatbog.

3.4. New Sphagnum Species Recently Published for Romania

Sphagnum divinum Flatberg & K. Hassel was reported as new to Romania in 2024 from Tinovul de lângă drum Peatbog, Lucina, Suceava County, 1159 m a.s.l., 19.10.2023, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12274, B12275* [30] (Figure 7a). This species was found in other peatbogs as well: Tăul Obcioarei Peatbog, Maramureș Mountains, 47.684861°N, 24.536667°E, 1043 m a.s.l., 2014, *leg.* Goia I., *det.* Flatberg K.I., TRH *B96689/1*; Găina-Lucina Peatbogs, Suceava County, 47.647309°N, 25.195054°E, 1164 m a.s.l., 2014, *leg.* Goia I., *det.* Flatberg K.I., TRH *B96691/1*; Corund, Hargita County, 46.504176°N, 25.254747°E, 954 m a.s.l. 7.08.2024, *leg.* Nagy Z., *det.* Czołczyński B. [13]; Padiș-molidiș Peatbog, Molhașul cel mare de la Izbuc Peatbog, Molhașul de la Călățele, Mluha Peatbog [29]; Iezerul Șureanu Peatbog, Șureanu Mountains, 45.580971°N, 23.508663°E, 1735 m a.s.l., 29.07.2021, *leg.* & *det.* Ștefănuț S., BUCA *B12331*; Șaru Dornei Peatbog, Suceava County, 47.258928°N, 25.356447°E, 902 m a.s.l., 4.09.2023, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12294*; Teșna Românești Peatbog, Suceava County, 47.365580°N, 25.137234°E, 868 m a.s.l., 5.09.2023, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12292*; Găina-Lucina Peatbogs, Suceava County, 47.647370°N, 25.195349°E, 1163 m a.s.l., 19.10.2023, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12458*; Coșna Peatbog, Suceava County, 47.374197°N, 25.167738°E, 858 m a.s.l., 20.10.2023, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12282*, 19.09.2024, *leg.* Ștefănuț S., *det.* Ștefănuț M.-M., BUCA *B12326, B12327*; Pilugani Peatbog, Suceava County, 47.341472°N, 25.167588°E, 872 m a.s.l., 10.04.2024, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12308*; Tăurile Chendroaiei Peatbog, Gutâi Mountains, 47°42'35.63"N, 23°50'8.50"E, 1057 m a.s.l., 20 April 2024, *leg.* & *det.* M-M. Ștefănuț, BUCA *B12487*; Hărnicești Peatbog, Maramureș County, 47.808603°N, 23.826399°E, 1007 m a.s.l., 21.04.2024, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12289, B12390, B12391*; Peșteana Peatbog, Hunedoara County, 45.543508°N, 22.806266°E, 518 m a.s.l., 24.08.2024, *leg.* Ștefănuț S., *det.* Ștefănuț M.-M., BUCA *B12357, B12358*, *B12366*, *B12368- B12372*, 08.05.2025, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12481*; Tăul fără fund de la Poiana Mare-Obârșia Peatbog, Mehedinți County, 45.048267°N, 22.663262°E, 1035 m a.s.l., 06.05.2025, *leg.* Moroșanu A.-M., Ștefănuț M.-M., *det.* Ștefănuț M.-M., BUCA *B12483-B12486*; Bâlbâitoarea Peatbog, Prahova County, 45.389099°N, 26.104811°E, 863 m a.s.l., 26.06.2025, *leg.* Moroșanu A.-M., Ștefănuț S., *det.* Ștefănuț M.-M., BUCA *B12490*; Mlaca Tătarilor Peatbog, Sibiu

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County, 45.715082°N, 24.650163°E, 541 m a.s.l., 12.03.2025, *leg.* Moroșanu A.-M., Ștefănuț M.-M., *det.* Ștefănuț M.-M., BUCA *B12347* (Figure 7b).

(**a**) (**b**)

Figure 7. *Sphagnum divinum*, Romania: (**a**) *S. divinum*, Tinovul de lângă drum Peatbog, Lucina, Suceava County, 19.10.2023; (**b**) *S. divinum*, Mlaca Tătarilor Peatbog, Sibiu County, 12.03.2025.

Sphagnum medium Limpr. was reported as new to Romania in 2024 from Avrig Peatbog, Avrig, Sibiu County, 405 m a.s.l., 12.03.2024, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12280* (Figure 8a); Tinovul de lângă drum Peatbog, Lucina, Suceava County, 1160 m a.s.l., 19.10.2023, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12283*; Tăul de la Gutâi Peatbog, Gutâi Mountains, Maramureș County, 1057 m a.s.l., 9.10.2023, *leg.* Moroșanu A.-M., *det.* Ștefănuț M.-M., BUCA *B12293* [31]; Vlășchinescu Peatbog, Maramureș County, Romania, 885 m a.s.l., 19.04.2024, *leg.* & *det.* Ștefănuț M.-M. [27]; Molhașurile Căpățînii, Mluha Peatbog [29]. This species was also found in Mohoș Peatbog, Harghita County, 46.136389°N, 25.902778°E, 1051 m a.s.l., 2014, *leg.* Goia I., *det.* Flatberg K.I., TRH *B96689/1* [13]; Mlaca Tătarilor Peatbog, Sibiu County, 45.715082°N, 24.650163°E, 541 m a.s.l., 29.04.2011, *leg.* & *det.* Ștefănuț S., BUCA *B4364*; Pilugani Peatbog, Suceava County, 47.341555°N, 25.167579°E, 872 m a.s.l., 10.04.2024, *leg.* & *det.* Ștefănuț M.-M., BUCA *B12418- B12422* (Figure 8b); Peșteana Peatbog, Hunedoara County, 45.543156°N, 22.806419°E, 517 m a.s.l., 24.08.2024, *leg.* Ștefănuț S., *det.* Ștefănuț M.-M., BUCA *B12373- B12375*, *B12417*, 8.05.2025, *leg.* Moroșanu A.-M., Ștefănuț M.-M., *det.* Ștefănuț M.-M., BUCA *B12488*; Bâlbâitoarea Peatbog, Prahova County, 45.389376°N, 26.105351°E, 863 m a.s.l., 26.06.2025, *leg.* Moroșanu A.-M., Ștefănuț S., *det.* Ștefănuț M.-M., BUCA *B12491*.

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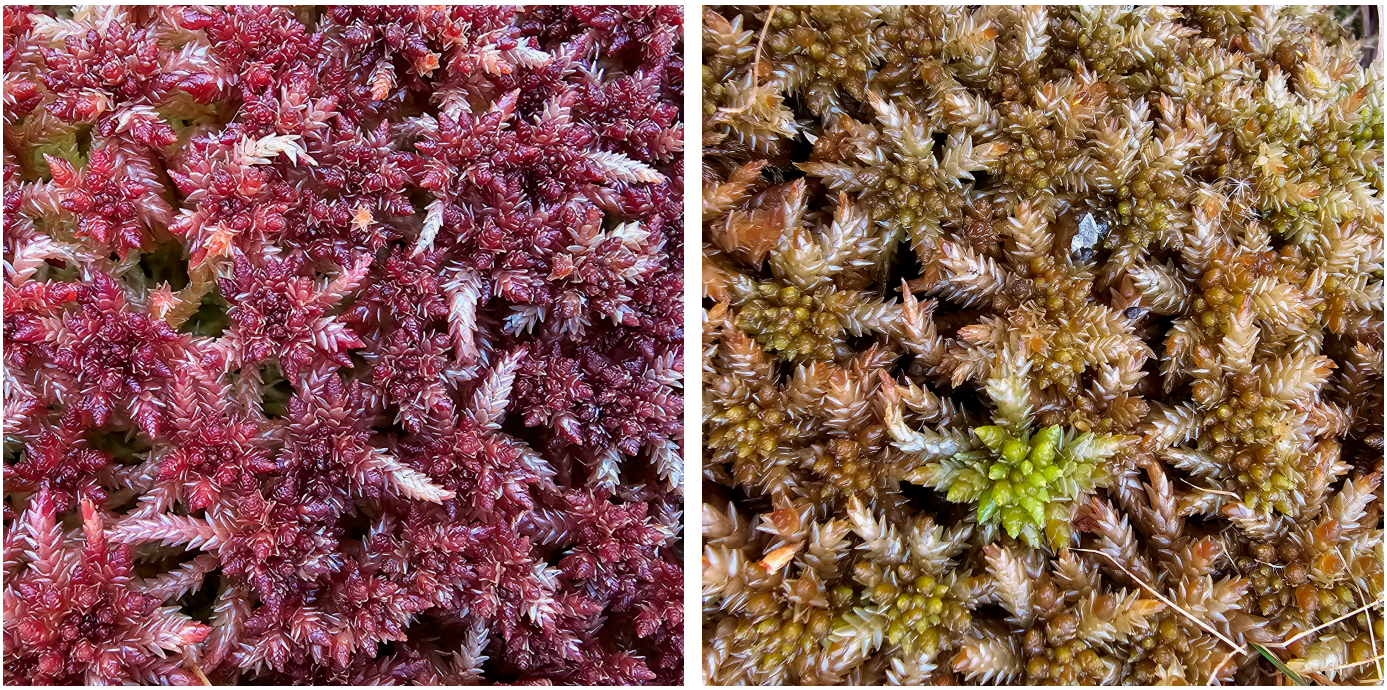

(**a**) (**b**)

Figure 8. *Sphagnum medium*, Romania: (**a**) *S. medium* from Avrig Peatbog, 12.03.2024.; (**b**) *S. medium* from Pilugani Peatbog, 10.04.2024.

Sphagnum subfulvum Sjörs subsp. *subfulvum* has reported as new to Romania in 2025 from Tăurile Chendroaiei Peatbog, Gutâi Mountains, Eastern Carpathians, 20 April 2024, *leg*. & *det*. Ștefănuț M.-M., *conf*. Ștefănuț S. and Flatberg K.I., BUCA *B12320-B12323* [32], TRH *B124094/1* [13](Figure 9).

(**a**) (**b**)

Figure 9. *Sphagnum subfulvum* in Tăurile Chendroaiei Peatbog, Gutâi Mountains, Romania, 20.04.2024: (**a**) *S. subfulvum* (brown) and *S. capillifolium* (with red pigmentation); (**b**) *S. subfulvum* in front and *S. medium* in background.

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3.5. Conservation Status of the Sphagnum Species in Romania

Using literature, herbarium, and field data, we were able to re-evaluate the *Sphagnum* species in Romania. The evaluation was carried out in accordance with the latest IUCN version of guidelines [8].

For the conservation status assessment of the *Sphagnum* species in Romania, the extent of occurrence (EOO), area of occurrence (AOO), number of locations, habitat fragmentation, population size, conservation status of peatlands, threats and pressures, age of the reporting data, and the range of the species in Europe and the world were taken into account.

So far, we have identified 34 *Sphagnum* species with a certain presence in Romania, while one species remains to confirmed and until then, it is included in DD – Data Deficient category.

The list of *Sphagnum* species in Romania and the conservation status assessment are presented in Table 1, compared with previous assessments [11,12].

Table 1. The checklist and red list of *Sphagnum* species of Romania.

Taxon	Ștefănuț & Goia, 2012	Hodgetts & Lockhart, 2020	Present, 2025
Subgenus ***Rigida*** (Lindb.) A. Eddy			
Sphagnum compactum Lam. & DC.	LC	LC	LC
Subgenus ***Sphagnum***			
Sphagnum affine Renauld & Cardot	NE	NE	**CR** B1ab(ii,iii)+B2ab(ii,iii)
Sphagnum centrale C.E.O. Jensen	LC	LC	LC
Sphagnum divinum Flatberg & Hassel	-	-	LC
* *Sphagnum magellanicum* Brid.	LC	-	-
Sphagnum medium Limpr.	-	-	LC
Sphagnum palustre L.	LC	LC	LC
Sphagnum papillosum Lindb.	**CR** B1ab(ii,iii)+B2ab(ii,iii)	**CR**	**EN** B2ab(ii,iii,iv)
Subgenus ***Acutifolia*** (Russow) A.J. Shaw			
Section ***Squarrosa*** (Russow) Schimp.			
Sphagnum squarrosum Crome	LC	LC	LC
Sphagnum teres (Schimp.) Ångstr.	LC	LC	LC
Section ***Polyclada*** (C.E.O.Jensen) Horrell			
Sphagnum wulfianum Girg.	**EN** B2b(iii,iv); C1	**EN**	**CR** A1c
Section ***Acutifolia*** Wilson			
Sphagnum capillifolium (Ehrh.) Hedw.	LC	LC	LC
Sphagnum fimbriatum Wilson	LC	LC	LC
Sphagnum fuscum (Schimp.) H. Klinggr.	LC	LC	LC
Sphagnum girgensohnii Russow	LC	LC	LC
* *Sphagnum molle* Sull.	DD	DD	-
Sphagnum quinquefarium (Braithw.) Warnst.	LC	LC	LC
Sphagnum rubellum Wilson	LC	LC	LC
Sphagnum russowii Warnst.	LC	LC	LC
Sphagnum subfulvum Sjörs	-	-	**CR** B1ab(ii,iii)+B2ab(ii,iii)
Sphagnum subnitens Russow & Warnst.	LC	LC	LC
Sphagnum warnstorfii Russow	LC	LC	LC
Subgenus ***Subsecunda*** (Lindb.) A.J. Shaw			
Sphagnum auriculatum Schimp.	**VU** B2ab(ii,iii,iv)	**VU**	NT
Sphagnum contortum Schultz	LC	LC	LC

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Sphagnum inundatum Russow	**VU** B2ab(ii,iii,iv)	**VU**	NT
Sphagnum platyphyllum (Lindb. ex Braithw.) Warnst.	NT	NT	NT
* *Sphagnum pylaesii* Brid.	-	-	-
Sphagnum subsecundum Nees	NT	NT	NT
Subgenus ***Cuspidata*** Lindb.			
Sphagnum angustifolium (C.E.O. Jensen ex Russow) C.E.O. Jensen	LC	LC	LC
* *Sphagnum annulatum* H. Lindb. ex Warnst.	DD	DD	-
Sphagnum balticum (Russow) C.E.O. Jensen	**EN** B2ab(ii,iii,iv)	**EN**	**EN** B2ab(ii,iii,iv)
Sphagnum cuspidatum Ehrh. ex Hoffm.	LC	LC	LC
Sphagnum fallax (H. Klinggr.) H. Klinggr.	LC	LC	LC
Sphagnum flexuosum Dozy & Molk.	LC	LC	LC
Sphagnum jensenii H. Lindb.	**EN** B2ab(ii,iii,iv)	**EN**	DD
Sphagnum majus (Russow) C.E.O. Jensen	**VU** B2ab(ii,iii,iv)	**VU**	**VU** B2ab(ii,iii,iv)
Sphagnum obtusum Warnst.	**EN** B2ab(ii,iii,iv)	**EN**	**EN** B2ab(ii,iii,iv)
* *Sphagnum pulchrum* (Lindb. ex Braithw.) Warnst.	DD	DD	-
Sphagnum riparium Ångstr.	LC	LC	LC
Sphagnum tenellum (Brid.) Pers. ex Brid.	**EN** B2ab(ii,iii,iv)	**EN**	**EN** B2ab(ii,iii,iv)

* Exluded species; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; LC – Least Concern; DD – Data Deficient; NE – Not Evaluated; B1 – Extent of occurrence (EOO); B2 – Area of occurrence (AOO); a – Severely fragmented OR Number of locations; b – Continuing decline observed, estimated, inferred or projected in any of: (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations; A1c – Population reduction suspected for a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality; C1 – An observed, estimated or projected continuing decline.

4. Discussion

Of the 34 *Sphagnum* species with certain distribution in Romania, eight are endangered at the national level. Among the threatened species category, three are classified as CR – Critically Endangered, four as EN – Endangered and one species as VU – Vulnerable.

The conservation status of the species *Sphagnum wulfianum* was changed from EN B2b(iii,iv); C1 to CR A1c, due to the fact that, although it has been reported from several bogs in Romania, the data are very old and, the species has not been found in the last 50 years. We have searched for this species in the peat bogs where it was previously reported (Coșna, Poiana Stampei and Drăgoiasa Peatbogs), but have not found it so far. The species is located in Romania at the southernmost limit of its global range. Future research will help clarify the actual conservation status of this species.

The conservation status of *Sphagnum papillosum* has been changed from CR B1ab(ii,iii)+B2ab(ii,iii) to EN B2ab(ii,iii,iv), as the species has been recorded from three new sites in the last eight years. We believe that the species is much more widespread than currently known and further research could lead to its assessment as vulnerable VU B2ab(ii,iii,iv), NT – Near Threatened or perhaps even LC – Least Concern. A similar situation applies to *Sphagnum majus*, *S. obtusum*, and *S. tenellum*, which, following improved field research, may no longer be included in the threatened categories.

New distribution data for the species *Sphagnum auriculatum* and *S. inundatum* have led to their classification in the NT category.

Among all *Sphagnum* species we have confirmed 30 species in the field, while five species remain to be confirmed in the field: *S. affine*, *S. cuspidatum*, *S. jensenii*, *S. obtusum*, and *S. wulfianum*. Of these, *S. affine*, *S. cuspidatum* and *S. obtusum* have been confirmed to Romania based on herbarium samples.

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5. Conclusions

The new distribution data makes the assessments of the conservation status of *Sphagnum* species in Romania constantly changing. The existing information gap due to the limited number of specialists capable of accurately identifying *Sphagnum* species, the lack of published studies, the extensive work still required, and the large number of peat bogs (over 300), that should be reassessed at the national level.

We hope that, by the end of the doctoral research period, in 2028, a clearer picture of the distribution of *Sphagnum* species in Romania will emerge, along with improved assessment of them from a conservative point of view. Additionally, we anticipate that new species may be reported to Romania.

Even though *Sphagnum* species in Romania are included in Annex V of the Habitats Directive and do not require legal protection, we considered that the species assessed here as threatened: *Sphagnum affine, S. balticum, S. majus, S. obtusum, S. papillosum, S. subfulvum, S. tenellum*, and *S. wulfianum* should be included on the list of nationally protected species. From these, *Sphagnum balticum, S. subfulvum, S. tenellum*, and *S. wulfianum* are priority species.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org, Figure S1: title; Table S1: title.

Author Contributions: Conceptualization, S.Ș., M.-M.Ș.; methodology, M.-M.Ș., S.Ș.; field investigation, M.-M.Ș., S.Ș., A.-M.M.; writing—original draft preparation, M.-M.Ș., S.Ș., A.-M.M.; projects administration, S.Ș. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by project no. RO1567-IBB03/2025 through the Institute of Biology Bucharest of Romanian Academy and the EEA Grants: PeatRO2 (RO-ENVIRONMENT-0004), PeatRO3 (RO-ENVIRONMENT-0005) and PeatRO4 (RO-ENVIRONMENT-0014). The contribution of M.-M.Ș. is part of her doctoral thesis founded by the Romanian Academy. Open access funding by the Institute of Biology Bucharest of Romanian Academy.

Data Availability Statement: The data presented in this study are either available in the article, or available on request from the authors.

Acknowledgments: We thank to the Hungarian National Museum Public Collection Centre, Budapest, Hungarian Natural History Museum, Department of Botany, Bryophyte Collection, and to Papp B. for the photos of *Sphagnum affine*. We fully thank to Flatberg K.I. from Norwegian University of Science and Technology, Trondheim, Norway, for the help provided in identifying and confirming *Sphagnum* species from Romania.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations

The following abbreviations are used in this manuscript:

BP	Hungarian National Museum Public Collection Centre, Budapest, Hungarian Natural History Museum, Hungary; Botanical Department, Bryophyte herbarium, *S* – *Sphagnum* collection
BUCA	Romanian Academy Herbarium, Institute of Biology Bucharest, Romania; *B* – Bryophyte herbarium
CL	Herbarium of Babeș-Bolyai University in Cluj-Napoca, Romania
EGR	Herbarium of Eszterházy Károly Catholic University in Eger, Hungary
EU	European Union
FRE	Flora Romaniae Exssicata
IUCN	The International Union for Conservation of Nature

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TRH	Trondheim Herbarium, Norwegian University of Science and Technology Museum, Norway; *B* – Bryophyte herbarium

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