

PLAGIOTHECIUM PLATYPHYLLUM (BRYOPHYTA),
A RARE SPECIES IN HUNGARY

Peter ERZBERGER^{1*}, Csaba NÉMETH², Michael SAUER³, József NAGY⁴
and Beáta PAPP⁵

¹Belziger Str. 37, D–10823 Berlin, Germany; *erzberger.peter@gmail.com

²GINOP Sustainable Ecosystems Group, Centre for Ecological Research
H–8237 Tihany, Klebelsberg Kuno út 3, Hungary

³Esslinger Str. 18, D–72124 Pliezhausen, Germany

⁴The Museum and Library of Hungarian Agriculture

H–1146 Budapest, Városliget, Vajdahunyadvár, Hungary

⁵Department of Botany, Hungarian Natural History Museum,
H–1431 Budapest, Pf. 137, Hungary

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Abstract: All specimens deposited under the name *Plagiothecium platyphyllum* Moenk. in the bryophyte herbarium of the Hungarian Natural History Museum in Budapest (BP) were revised, along with some recent collections of the authors. As a result of this revision a majority of the specimens was found to belong to other species, and only *ca* 10% could be confirmed as *P. platyphyllum*, originating from eight locations, with recent collections from two sites only. The amended distribution of the species is mapped according to the Central European Mapping Scheme, and the corresponding specimens are cited in detail. The habitat of the Hungarian occurrences is characterised and compared to the literature. The morphological features of *P. platyphyllum* are described and illustrated by photographs, and the characters distinguishing this species from related taxa are discussed. We include an analytical key for the Hungarian species of the genus *Plagiothecium*.

Key words: distribution, habitat, herbarium revision, illustrated key, nematogones

INTRODUCTION

Plagiothecium platyphyllum was described by MÖNKEMEYER (1927). The author remarked: “*P. platyphyllum* ist durch Blattform und Zellnetz so gut ausgezeichnet, daß es, einmal erkannt, mit keiner anderen Art zu verwechseln ist” (MÖNKEMEYER 1927: 867; translation: *P. platyphyllum* is so well characterised by leaf shape and areolation that it cannot be confused with any other species, once recognised). However, the species has often been misidentified (SAUER and MASTRACCI 2001, MEINUNGER and SCHRÖDER 2007). NYHOLM (1979: 643) writes: “This species is variable, confusing and often difficult to interpret. It seems to me probably to be a form between *P. denticulatum* and *P. succulentum*.”

In the two standard handbooks of Hungarian bryology (BOROS 1968, ORBÁN and VAJDA 1983), *P. platyphyllum* Mönk. has been reported from 14 floristical regions of Hungary: Zemplén Mts, Bükk Mts, Mátra Mts, Börzsöny Mts, Visegrád Mts, Vértes Mts, Balaton Uplands, Sopron Mts, Kőszeg Mts, Vendvidék, Őrség, Vasi-hegyhát, Inner Somogy, Mecsek Mts. In apparent contradiction to such a wide distribution, it is characterised as rare (“ziemlich selten”: BOROS 1968: 386, “ritka”: ORBÁN and VAJDA 1983: 486). According to the red list of Hungarian bryophytes (PAPP *et al.* 2010), *P. platyphyllum* is rated as data deficient (DD), and during the current bryophyte recording project (ERZBERGER and NÉMETH 2016), which encompasses all of the floristical regions mentioned above, the species was not found until very recently. When one of us (B. P.) collected a specimen of a large *Plagiothecium* at the Jeli Arborétum at Kám that seemed to fit the modern descriptions of the species, we began a more conscious search for it. We asked why it had not been detected during our earlier floristical fieldwork – had we perhaps not understood the correct characters used for identification? When we consulted the bryophyte collection in the Hungarian Natural History Museum in Budapest (BP), it turned out that 119 specimens were labelled *P. platyphyllum*, collected between 1923 and 1972 mainly by Á. Boros and L. Vajda within the present territory of Hungary, and constituting the vouchers for the regions published. We thought that a revision of these specimens might shed some light on possible differences between our concept of the species and that of the collectors.

In particular, we addressed the following questions:

- Which morphological characters allow a reliable identification of *P. platyphyllum*?
- What is the distribution of the species in the country, and in what habitats does it grow?
- What conclusions can be reached for the conservation of the species in Hungary?

MATERIAL AND METHODS

All specimens deposited as *Plagiothecium platyphyllum* in the bryophyte collection of the Hungarian Natural History Museum, Budapest (BP) and collected in present-day Hungary were revised, in total 123 specimens. (This number includes 4 specimens collected recently by B.P. in addition to the 119 historical specimens mentioned in the introduction.) For the purpose of comparison, some non-Hungarian material was also studied: a specimen collected by P.E. in the Austrian alps during a meeting of the BLAM (Bryologisch-Lichenologische Arbeitsgemeinschaft für Mitteleuropa) in 2001 (B-Erzberger 7502), as well as original material of the species collected in Germany by J. Bornmüller in Thuringia

and determined by Wilhelm Mönkemeyer (Cryptogamae exsiccatae editae a Museo Hist. Natur. Vindobonensi 4055. *Plagiothecium platyphyllum* Mönkem. Deutschland: Thüringer Wald, feuchte Wände des Marderbach-Grundes bei Dietharz; leg. J. Bornmüller s.a., det. W. Mönkemeyer, BP 85532).

Nomenclature follows PAPP *et al.* (2010). The confirmed records of *P. platyphyllum* were mapped according to the Central European mapping scheme (BARTHA *et al.* 2015).

Microscopic photographs were taken with a Nikon Eclipse E-200 microscope and a QImaging MicroPublisher 3.3 RTV camera.

Due to difficulties in the delimitation of the species, we did not immediately reach a definite conclusion from our revision. During the first stage of the revision, of the 123 specimens held under the name *Plagiothecium platyphyllum* only 45 were thought to be likely candidates for true *P. platyphyllum* on the basis of modern accounts (LEWINSKY 1974, NYHOLM 1979, FAGERSTÉN 1998, SAUER and MASTRACCI 2001, SMITH 2004, MEINUNGER and SCHRÖDER 2007) and comparison with the original material (see above). Therefore, we invited M.S. to participate in our revisionary work and showed him a small selection of the presumed candidates, 8 specimens from BP and two recent collections by the first author. It turned out that our concept of *P. platyphyllum* not only differed markedly from that of Boros and Vajda, but also from that of M.S., who confirmed only two of our determinations, and identified seven specimens as *P. nemorale* and one as *P. denticulatum*. In successive discussions we tried to arrive at more clear-cut criteria for the discrimination of *P. platyphyllum*. After studying the material for a second time, a further 30 critical specimens including recent collections were seen by M.S., and of these 11 were confirmed as *P. platyphyllum*, 18 were revised as *P. nemorale* and 1 as *P. succulentum*.

RESULTS AND DISCUSSION

The following specimens represent *Plagiothecium platyphyllum*.

(Abbreviations: leg. = collected by; det. = identified by; dupl. = duplicate; soc. = associated bryophytes; hb. = herbarium; s.n. = without number; a.s.l. = above sea level).

Bükk Mts 7988.2: Comit. Borsod. In rupibus porphy. sept. silvat. montis Nagy István erőse prope Nagyvisnyó, 900 m a.s.l., 09.08.1953, leg. Á. Boros, BP 145900. **7989.1:** Comit. Borsod. In petrosis porphy. fagetorum septent. montis Borovnyák prope Ómassa, 800–850 m a.s.l. 04.08.1953, leg. Á. Boros, det. Jedlička, BP 145898 (with a note: *Plagiothecium platyphyllum* Moenkemeyer Dr.

Jos. Jedlička). – **Börzsöny Mts 8079.4**: Comit. Nógrád. In rupibus andesiticis umbrosis cacuminis montis Nagy-Hideg-hegy, montes Börzsöny, 22.04.1956, leg. L. Vajda, det. J. Jedlička, BP 47711, dupl. BP 57526, dupl. BP 145934 (with sporophytes), dupl. BP 57512 (*soc. Plagiochila porelloides, Dicranum scoparium, Isothecium alopecuroides*), dupl. BP 71680 (leg. et det.: 25.07.1966, L. Vajda). Pest County, Peröcsény, Nagyhideg-hegy, északi kitettségen, andezit kőgörgetegen, N 47° 56' 16.0", E 18° 55' 22.0", 820 m a.s.l., 30.07.2016, leg. J. Nagy, det. P. Erzberger, hb. J. Nagy, dupl. B-Erzberger s.n., 19.10.2019, leg. J. Nagy, Cs. Németh, B. Papp, P. Erzberger, B-Erzberger 26995, 27000, 27001, 27004, 27006, 27009. – **Vértes Mts 8575.4**: Comit. Komárom. In faginetis ad Szentgyörgyvár prope Oroszlány, 300 m a.s.l. 07.10.1957, leg. Á. Boros, BP 145873 (with sporophytes). – **Kőszeg Mts 8665.1**: Comit. Vas. Ad marginem rivuli vallis Walkgraben dictae Kőszeg, 400 m a.s.l. 09.10.1930, leg. A. Visnya, BP 146398, det. Jedlička (with sporophytes, with a note: "Meghatározás megerősítésre szorul. Kérek belőle 1934 márc. 11 Boros" – 'Identification needs confirmation. I would like a duplicate 11 March 1934 Boros'). – **Vasi-hegyhát 8967.1**: Comit. Vas. Ad rivulos alnetorum vallis rivi Koponyás versus Jeli pr. Kám, 200 m a.s.l. 12.05.1965, leg. Á. Boros, BP 146391. – **Őrség 9065.3**: Comit. Vas. In alnetis versus silvam Csonka-erdő prope Szőce, 220 m a.s.l. 15.08.1954, leg. Á. Boros, BP 146386, det. Jedlička (with sporophytes, with a note: *Plagiothecium platyphyllum* Moenkemeyer Dr. Jos. Jedlička in litt). – **Mecsek Mts 9974.2**: Baranya County, Cserkút (Pécs), acidophilous *Quercetum* forest, N 46° 04' 01.7", E 18° 07' 43.7", 190 m a.s.l. 18.05.2013, leg. et det.: B. Papp, BP 187139.

When we compare the results of our revision with the distribution published for Hungary in the 20th century (BOROS 1968, ORBÁN and VAJDA 1983), we must conclude that the latter was largely based on erroneous identifications, and instead of the 14 floristical regions we can confirm the species in only 7: Bükk Mts, Börzsöny Mts, Vértes Mts, Kőszeg Mts, Vasi-hegyhát, Őrség, and Mecsek Mts (Fig. 1). Of 119 historical specimens labelled *P. platyphyllum* in BP, only 11 or fewer than 10% could be confirmed (Table 1). This clearly indicates that Boros, Vajda, and the Czech specialist Jedlička, who annotated a number of the specimens, had a wider concept of the species than modern authors.

It is therefore of fundamental importance to interpret correctly the diagnostic characters described in the literature.

Most modern accounts (TUOMIKOSKI *et al.* 1973, LEWINSKY 1974, NYHOLM 1979, SAUER and MASTRACCI 2001, SMITH 2004, MEINUNGER and SCHRÖDER 2007, CANO 2018) consider the presence of an extended group of thin-walled, isodiametric and often hyaline cells in the leaf apex as an important character of *P. platyphyllum*. These cells can produce rhizoids or propagula or become eroded in older leaves, and are therefore called rhizoid initials

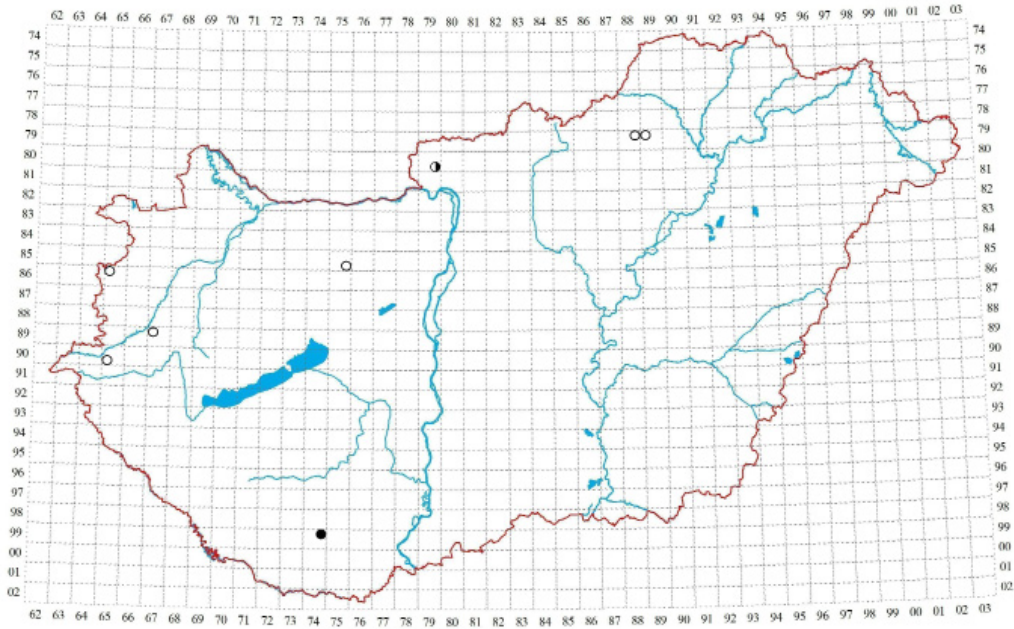


Fig. 1. Records of *Plagiothecium platyphyllum* in Hungary (open circles = before 1973; half solid circles = before and after 1973; solid circles = after 1973).

or nematogones (Fig. 2a–b, d–e). However, other species of the genus, viz. *P. nemorale* and *P. succulentum*, also can display this feature, although normally to a smaller extent. We studied this character in the original material determined by Moenkemeyer (Fig. 2a). When we found specimens with a similarly large group of rhizoid initials, we tentatively identified these also as *P. platyphyllum*. These plants, however, often had leaf cells that were much wider than the limits described in the literature (10–16 μm : SAUER and MASTRACCI 2001, or even less, e.g. 10–13 μm : CANO 2018). We tentatively assumed that this character might perhaps be more variable than reported in the literature. It was only with the help of M.S. that we realised that in many cases *P. nemorale* was at hand (Fig. 2c). Unfortunately, some recently published data on the occurrence of *P. platyphyllum* in Őrség (Szöce), Vasi-hegyhát (Kám), and Zala (Vétyem) were based on some of these critical specimens that were later revised to *P. nemorale* (PAPP and SZURDOKI 2018), and they should therefore be deleted. Interestingly, some historical collections from Szöce and Kám are true *P. platyphyllum* (see above), but no recent collections of this species have been made in these localities. At present, the only recently collected specimens of *P. platyphyllum* in Hungary are from the Börzsöny Mts (Nagy-Hideg-hegy, leg. J. Nagy *et al.*) and the Mecsek

Mts (Cserkút, *leg.* B. Papp). In October 2019 four of us (all authors except M. S.) went on an excursion to the Börzsöny site (Fig. 7b). However, we did not succeed in recognising the species in the field. Fortunately, subsequent microscopic examination showed that among much *P. nemorale*, *P. platyphyllum* was also present in good quantity, and we had collected it inadvertently (B-Erzberger 26995, 27000, 27001, 27004, 27006, 27009, Fig. 6).

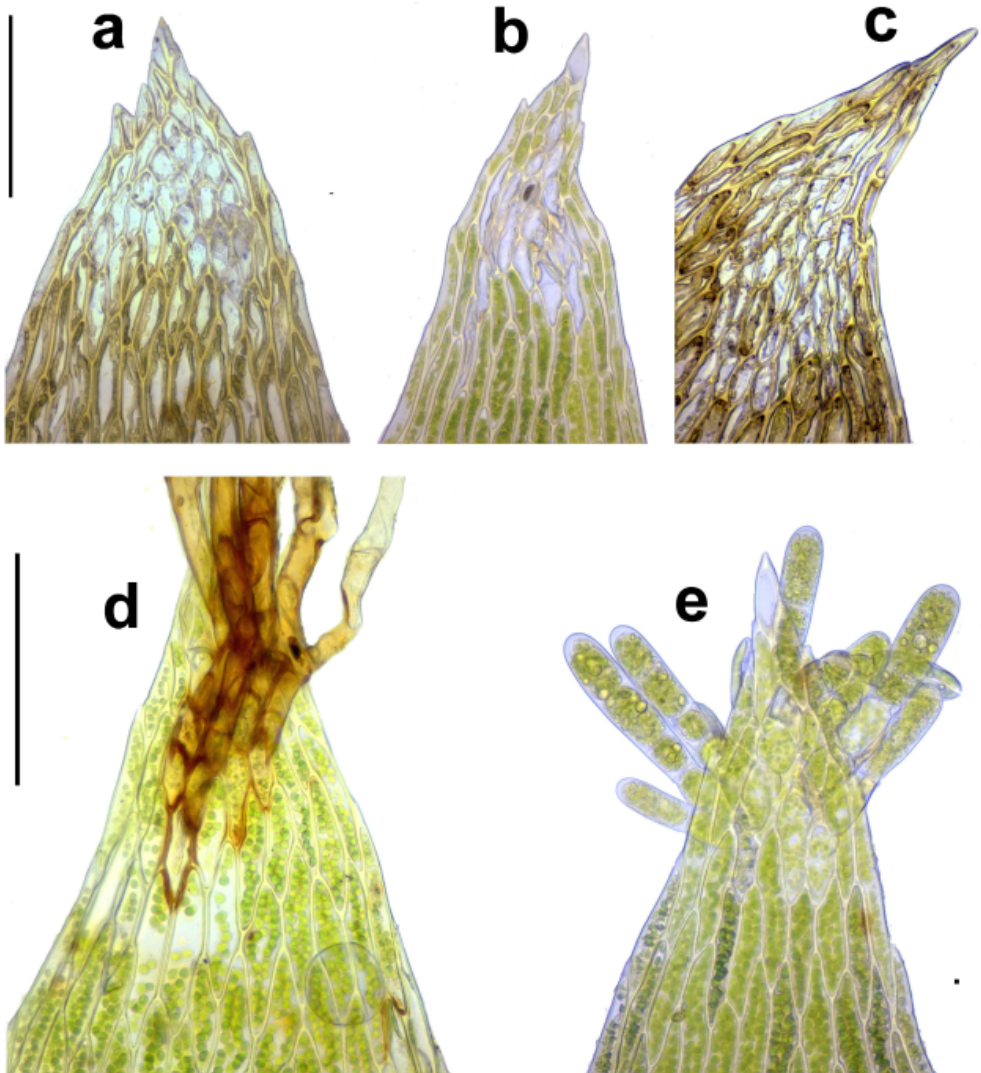


Fig. 2. Leaf tips of *Plagiothecium* species. – a, b, d, e: *P. platyphyllum* (a = original material, Thüringer Wald, Dietharz, det. Moenkemeyer, BP 85532; b, d, e = Börzsöny Mts, Nagy-Hideg-hegy, B-Erzberger 27001). – c: *P. nemorale* (Bakony Mts, Uzsa, BP 145878). Scale bar 100 μm . Observe rhizoid initials (nematogones) (a, b, c); denticulations (a, b); leaf borne rhizoids (d) and propagula (e) (photos: Cs. Németh).

It appears to be relevant that no mention of the nematogones can be found in the taxonomic literature available at the time of Boros and Vajda (MÖNKEMEYER 1927), and in particular in the publications of the Czech specialist Jedlička, who annotated many specimens in BP and on whom the Hungarian bryologists obviously relied to some extent (JEDLIČKA 1948, 1950). This may in part explain the difficulties in recognising the true *P. platyphyllum* at the time of Boros and Vajda. Of the 26 specimens annotated by Jedlička as *P. platyphyllum*, 9 (35%) were confirmed as this species, but 14 (54%) were revised to *P. nemorale* and 3 (11%) to *P. succulentum*.

The production of propagula by the nematogones, which we observed in the freshly collected material from the Börzsöny site (Fig. 2e), is also reported by TUOMIKOSKY (1973), FAGERSTÉN (1998) and HUBER (1984), whereas e.g. LEWINSKY (1974) and CANO (2018) state that vegetative propagation by fusiform brood bodies is unknown or has not been observed in *P. platyphyllum*. Obviously this is an infrequent phenomenon not regularly encountered. Among the Hungarian species of *Plagiothecium*, only *P. latebricola* commonly produces such fusiform propagula at the leaf tips (ERZBERGER and BARÁTH 2017, LEWINSKY 1974).

From the number of specimens revised as other species of the genus (Table 1) it is evident that *P. nemorale* and *P. succulentum* are morphologically most closely related to *P. platyphyllum* and therefore most likely to be confused with it. As regards the decurrent alar cells, *P. platyphyllum* and *P. denticulatum* share the character state that these cells are in part inflated, although this holds only for the outer cell row in *P. platyphyllum* (Fig. 3a–c), whereas in *P. denticulatum* inflated cells are present throughout (Fig. 3d). In Table 2 we compare the morphological characters relevant for the identification of these species.

Table 1. Revision of the 119 historical specimens inserted in *Plagiothecium platyphyllum*.

species named as result of revision	no of specimens
<i>Plagiothecium cavifolium</i> (Brid.) Z. Iwats.	16
<i>Plagiothecium curvifolium</i> Schlieph. ex Limpr.	1
<i>Plagiothecium denticulatum</i> (Hedw.) Schimp.	10
<i>Plagiothecium laetum</i> Schimp.	2
<i>Plagiothecium nemorale</i> (Mitt.) A. Jaeger	58
<i>Plagiothecium platyphyllum</i> Mönk.	11
<i>Plagiothecium succulentum</i> (Wilson) Lindb.	20
indet. (poor material)	1

Table 2. Comparison of *P. platyphyllum* with *P. nemorale*, *P. succulentum* and *P. denticulatum*.

character	<i>P. platyphyllum</i>	<i>P. nemorale</i>	<i>P. succulentum</i>	<i>P. denticulatum</i>
leaf size (mm)	2–2.6 × 1.2–1.4	(1.4)1.7–2.7(3) × 0.7–1.3	1.5–3 × (0.6)0.8–1.0	1.3–2.1 × 0.7–0.9
leaf shape (Fig. 5)	ovate to ovate lanceolate, narrowed to acute short apex	ovate to wide-lanceolate, narrowed to obtuse to wide-acute apex	lanceolate to ovate-lanceolate, gradually narrowed to acuminate apex	oblong ovate to oblong lanceolate, ovate or elliptic, narrowed to acute or obtuse apex
leaf symmetry (Fig. 5)	slightly asymmetric	symmetric	symmetric	asymmetric
margin at apex	denticulate (Fig. 2a,b)	entire, sometimes denticulate	entire	usually denticulate at apex
apical cell (µm)	(18)29–34 × 5–8	hexagonal, (19)35–41 × 8–12	linear, 26–35(45) × 6.5–8.0	19–26 × 7–8
group of nematogones	usually extended, of numerous cells, often with rhizoids or sometimes propagula, or eroded (Fig. 2a,b)	occasional, if present usually small, but sometimes of numerous cells (Fig. 2c), rhizoids or propagula not observed	occasional, small	absent
axillary gemmae	unknown	occasional	occasional	occasional
leaf cell size	(70)80–140(160) × 10–15(16) µm (Fig. 4a)	(65)75–140(155) × 15–22(25) µm (Fig. 4b)	(130)150–250 × (10)13–18(20) µm	72–140(149) × 10–15 µm
decurrences	2–4 cells wide, of rectangular to quadrate cells, the outer row often rounded to slightly inflated, often remaining attached to the detached leaf in a long band (Fig. 3a–c)	1–3 cells wide, of rectangular, not inflated cells, narrow	1–3 cells wide, of rectangular, not inflated cells	3–5(6) cells wide, of ovate, rounded-rectangular or quadrate generally inflated cells (Fig. 3d)
sexual condition	autoicous	dioicous	polyicous (monoicous)	autoicous

In conclusion, *Plagiothecium platyphyllum* can be recognised by the combination of the following characters:

- large plants (Fig. 6);
- an extended group of rhizoid initials in the leaf apex, often eroded away (Fig. 2a–b, d–e);
- slight, but sharp denticulations at the leaf apex (not always present) (Fig. 2a–b);
- a long group of decurrent cells that often remains attached to the leaf when removed from the stem, 2–4 cells wide, at least some of the outer cells with rounded outlines (Fig. 3a–c);
- mid leaf cells not wider than 15 μm (Fig. 4a);
- slightly asymmetric leaves tapering evenly to an acute point (Fig. 5a).

These characters are, however, not always fully and equally well developed.

Habitat

According to the information included on the specimen labels, in Hungary *P. platyphyllum* grows in two types of habitat, according to elevation. At lower elevations, at 400 m a.s.l. or below, the collections are from the vicinity of water courses or wetlands (particularly Alder carr). For instance at Cserkút the species was found near a spring bog (Cardamino-Montion Br-Bl. 1926) formed along a temporary rivulet in an acidophilous oak forest (Fig. 7a). *Philonotis caespitosa*, *Plagiomnium undulatum*, *Plagiothecium denticulatum*, *Pohlia nutans*, *Rhizomnium punctatum* and *Sphagnum fimbriatum* can be mentioned as associated bryophytes in the surrounding area.

At higher elevations, 820–900 m a.s.l., the species was found in forests, in shaded, moist situations, on mainly acidic rock or stones (porphyry, andesite) often with a northern exposition near the summits of the northern mountain range (Bükk Mts, Börzsöny Mts: Fig. 7b). Apart from *P. nemorale*, associated bryophytes at the Börzsöny site (Nagy-Hideg-hegy) include *Anomodon rugelii*, *Barbilophozia barbata*, *Brachythecium geheebii*, *Jamesoniella autumnalis*, *Pseudoleskea saviana* and *Sanionia uncinata*.

According to the literature, *P. platyphyllum* is a calcifuge moss of wet, shaded habitats in montane areas (springs, wet rock crevices, by waterfalls and on stream banks: BLOCKEEL *et al.* 2014, SMITH 2004, SAUER and MASTRACCI 2001, MEINUNGER and SCHRÖDER 2007). This type of habitat corresponds to the Hungarian occurrences in the Bükk Mts and Börzsöny Mts. However, the growth sites in the colline area (Vértes Mts, Kőszeg Mts, Vasi-hegyhát, Órség and Mecsek Mts) differ from the typical habitat in other parts of Europe. They may represent a special type of lowland site with montane affinities (“Mikroklimawinkel” in

BOROS 1968), favoured perhaps by the cooler climate of western Hungary with greater precipitation, and by edaphic factors like the gravel deposits in Örség and Vasi-hegyhát (BOROS 1968). According to PLĂMADĂ (2001), in Romania *P. platyphyllum* has also been recorded in the lowlands, although rarely.

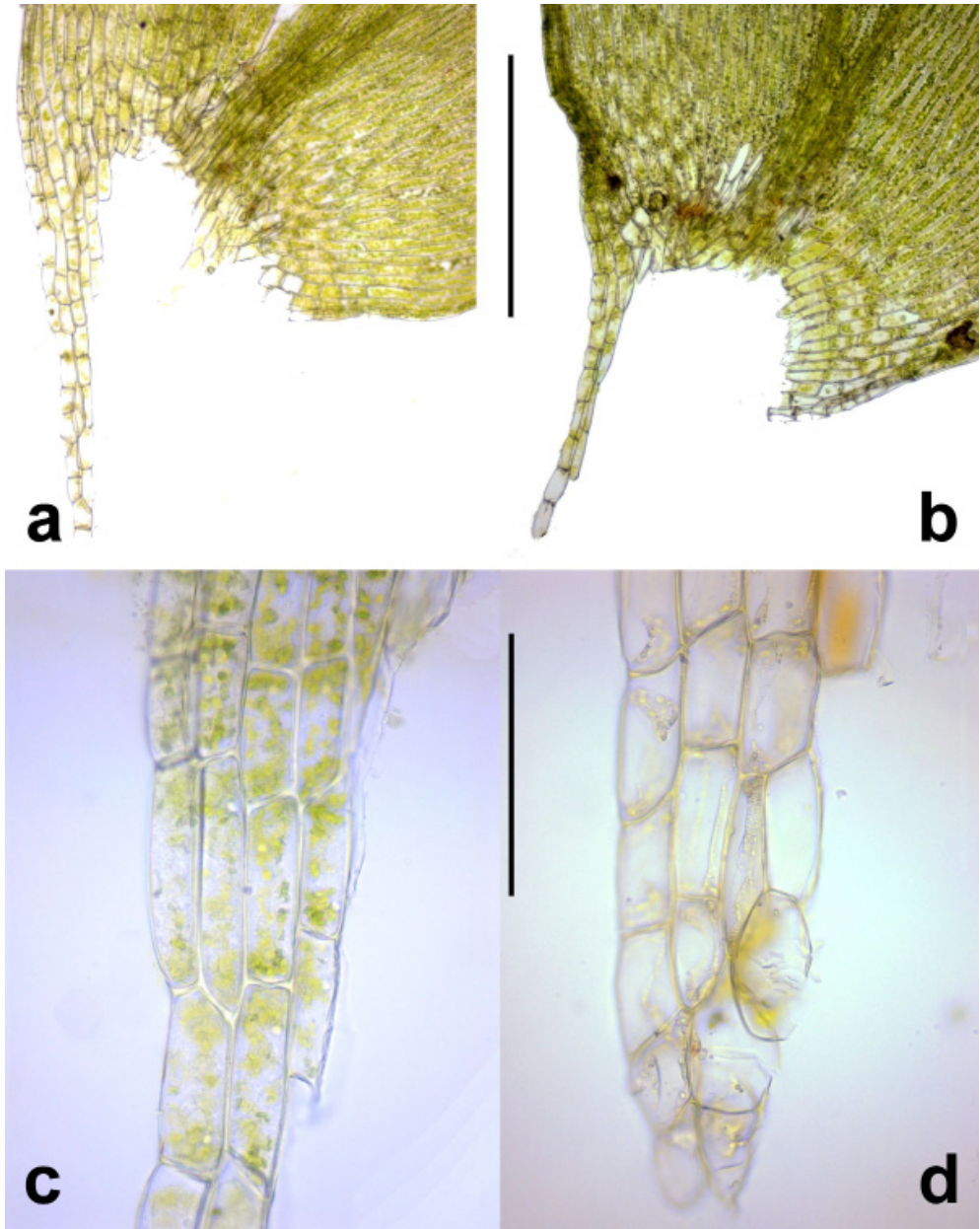


Fig. 3. Decurrent alar cells of *Plagiothecium* species: a–c = *P. platyphyllum* (B-Erzberger 27001); d = *P. denticulatum* (Vértes, Pusztavám B-Erzberger 15102). Scale bars a–b: 200 μm , c–d: 100 μm (photos: Cs. Németh).

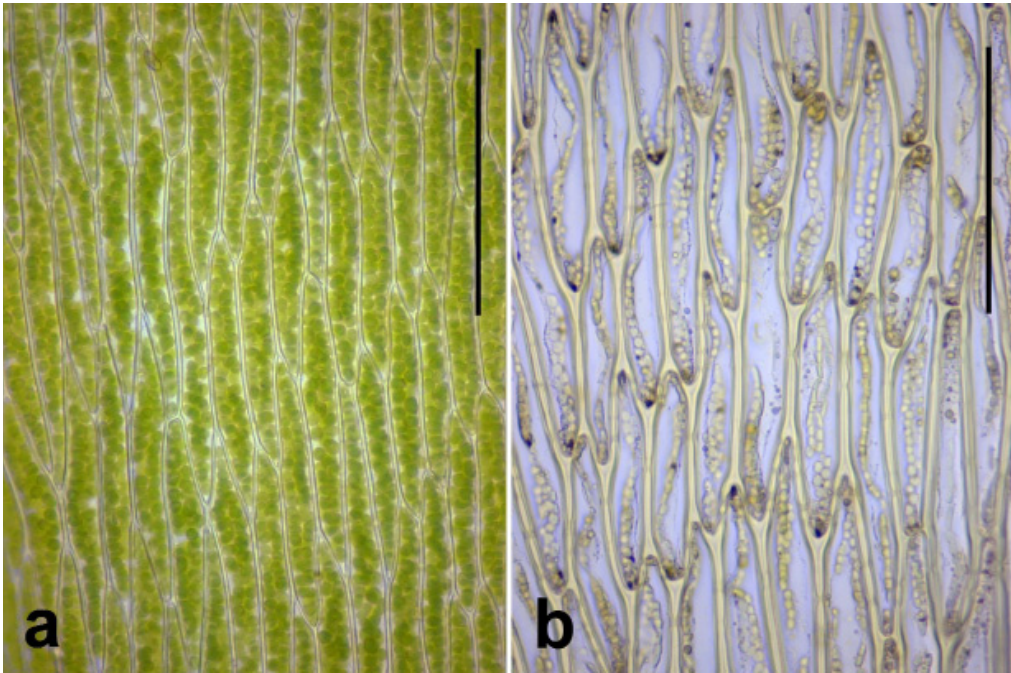


Fig. 4. Leaf cells of *Plagiothecium* species: a = *P. platyphyllum* (B-Erzberger 27001); b = *P. nemorale* (Vértes, Pusztavám, CsN 5434). Scale bar 100 μ m (photos: Cs. Németh).

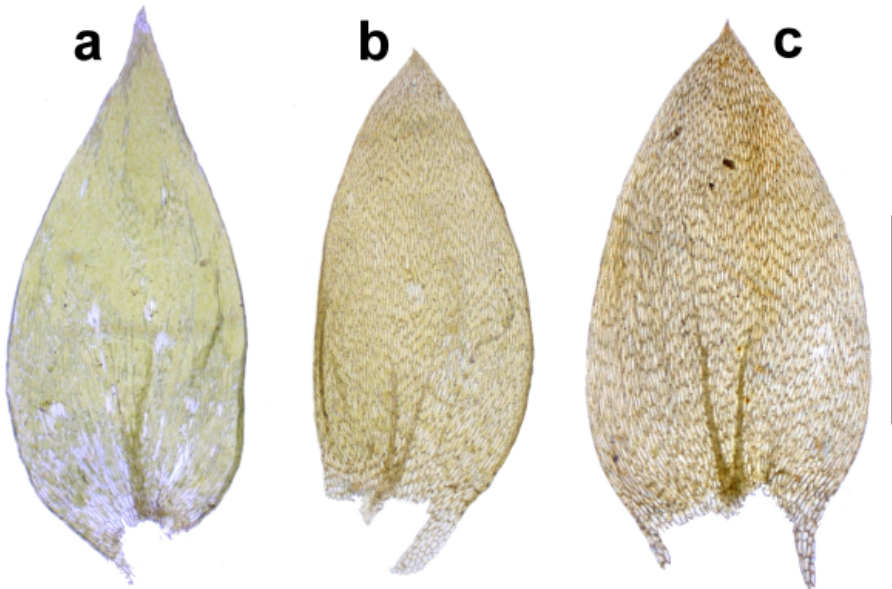


Fig. 5. Leaves of *Plagiothecium* species: a = *P. platyphyllum* (B-Erzberger 27001); b = *P. denticulatum* (Bakony, Farkasgyepű, B-Erzberger 16302); c = *P. nemorale* (Vértes, Pusztavám, CsN 5434). Scale bar 1 mm (photos: Cs. Németh).



Fig. 6. Habit of *Plagiothecium platyphyllum* (B-Erzberger 27001) (photo: Cs. Németh).

Key to Hungarian species of *Plagiothecium* (mainly based on LEWINSKY 1974)

- 1 Leaves whitish green, 2–5 mm long, imbricate, strongly transversely undulate; decurrent alar cells with straight outer walls; on forest soil *P. undulatum* (Hedw.) Schimp.
- Plants without this combination of characters 2
- 2 Median laminal cells narrow, < 10 µm wide; small plants, usually only 2–3 cm long 3
- Median laminal cells > 10 µm wide; medium-sized to large plants 5
- 3 Leaves 0.9–1 mm long and ca. 0.35 mm wide, symmetric, gradually acuminate to a long point, often with uniseriate gemmae and rhizoids at the tip; laminal cells 5(–8) µm wide
..... *P. latebricola* Schimp.
- Leaves longer and wider (mostly >0.5 mm wide), asymmetric, apex less longly drawn out, usually without gemmae (but gemmae frequent in leaf axils); laminal cells wider 4
- 4 Leaf apices plane; leaves asymmetric usually with one curved and one straight side, to 1.2 mm long, alar cells decurrent in 1–2 rows, not clearly delimited, not auriculate, with straight outer walls, rectangular *P. laetum* Schimp.
- Leaf apices curved downward towards substrate when moist; leaves asymmetric with two curved sides, >1.2 mm long, alar cells forming a distinct group, decurrent in 2–4(5) rows, mostly somewhat auriculate, often with weakly bulging outer walls, isodiametric or rectangular; capsule horizontal to inclined, often gibbous *P. curvifolium* Schlieph. ex Limpr.
- 5 Decurrent alar cells inflated, oval to rounded, with bulging walls, sometimes only a few cells rounded and most cells rectangular or quadrate; laminal cells not wider than 16 µm 6
- Alar cells not inflated, the decurrent cells rectangular, not rounded; laminal cells wider than 16 µm or not 8
- 6 Alar cells mostly rectangular or quadrate, forming a long triangular group decurrent in 2–4 rows along stem and often remaining on the detached leaf, at least some of the outer cells with rounded outlines; apical part of lamina usually with a group of thin-walled short cells (rhizoid initials) often eroded; some leaves only weakly asymmetric; large plants to 10 cm long
..... *P. platyphyllum* Mönk.
- Most alar cells strongly inflated, rounded, forming an oval group usually less long, often wider, decurrent in 3–4(6) rows; leaves without rhizoid initials at apex; all leaves distinctly asymmetric; medium-sized plants 7
- 7 Laminal cells in ± distinct transverse rows, therefore leaves sometimes transversely undulate when moist; margins at apex often completely without denticulations; leaves 2.5–4 mm long, strongly complanate, strongly asymmetric, at least some with one straight and one curved side; decurrent alar cells in 4–6(8) rows; plants of wet habitats *P. ruthei* Limpr.
- Laminal cells not in transverse rows, leaves not transversely undulate when moist; margins at apex often denticulate; leaves 1.5–2.5(3) mm long, less strongly complanate, asymmetric, mostly with both sides curved; decurrent alar cells in 3–5 rows; plants of humid, but not particularly wet habitats *P. denticulatum* (Hedw.) Schimp.
- 8 Leaves ± symmetric, concave; plants julaceous, decumbent (examine older plants; young plants of other species can look similar); mid-leaf cells (8)10–12(15) × 65–120(150) µm
..... *P. cavifolium* (Brid.) Z. Iwats.
- Leaves symmetric to ± asymmetric, plane; mid-leaf cells wider or longer 9
- 9 Majority of mid-leaf cells longer than 150 µm and 10–20 µm wide (7–10 times as long as wide), not in transverse rows; apical end cell linear, elongate; leaf apex occasionally with rhizoid initials *P. succulentum* (Wilson) Lindb.
- Mid-leaf cells 15–22(25) × (65)75–140(155) µm (4–6 times as long as wide) in ± transverse rows; apical end cell rhomboidal; leaf apex usually with (few) rhizoid initials
..... *P. nemorale* (Mitt.) A. Jaeger



Fig. 7. Habitat of *Plagiothecium platyphyllum*: a = at Cserkút (Mecsek) (photo: B. Papp); b = at Nagy-Hideg-hegy (Börzsöny) (photo: Cs. Németh).

Conservation aspects

According to the latest European Red List of bryophytes (HODGETTS *et al.* 2019), *P. platyphyllum* is rated as LC (least concern). In Hungary, the species was in the DD (data-deficient) category in PAPP *et al.* (2010), but since two extant populations have been detected recently, this category is no longer applicable.

The two known populations are very small, each of them has less than 50 mature individuals (less than 50 occupied quadrats of $1 \times 1 \text{ m}^2$). According to the IUCN criteria (IUCN STANDARDS AND PETITIONS SUBCOMMITTEE 2017), with a maximum total number of individuals less than 250 and in each subpopulation less than 50 individuals *P. platyphyllum* would qualify as critically endangered (CR) C2ab(i). Fortunately, the known occurrences are situated in protected areas: the Börzsöny Mts are within the Duna–Ipoly National Park, and the locality near Cserkút belongs to the Duna–Dráva National Park. However, since the species occurs in habitats that are highly sensitive to climate change (e.g. rising temperatures in mountain areas, drying of temporary watercourses in the lowlands) a decline in population size and habitat quality can be projected.

Since the species cannot be recognised with certainty in the field, it is probably overlooked as the common *P. nemorale*. Hopefully, the present account will contribute to a better knowledge of the species and stimulate further discoveries, leading to a re-evaluation of its threat status in Hungary.

* * *

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