

Why *Plagiothecium sylvaticum* (Brid.) Schimp. (*Plagiothecium*, Plagiotheciaceae) has priority over *P. platyphyllum* Mönk.?

Grzegorz J. Wolski¹, Mikołaj Latoszewski¹, William R. Buck²

¹ University of Lodz, Faculty of Biology and Environmental Protection, Department of Geobotany and Plant Ecology, ul. Banacha 12/16, 90–237 Lodz, Poland

² Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY 10458-5126, New York, USA

Corresponding author: Grzegorz J. Wolski (grzegorz.wolski@biol.uni.lodz.pl)

Abstract

Re-assessment of the lectotype of *Hypnum sylvaticum* Brid. ($\equiv$ *Plagiothecium sylvaticum* (Brid.) Schimp.) (B 31 0915 01) showed that this specimen is characterised by dense, 6–10 cm long stems, pale green, yellowish-green to dark green and dull foliage; with complanate, ovate, not imbricate and not julaceous, 2.0–3.0 × 1.0–1.6 mm leaves; acute and denticulate, often eroded apices; 75.0–160.0 × 12.5–20.0 µm laminal cells at mid-leaf, which form diagonal rows, and decurrencies of 3–4 rows of rectangular to square, inflated cells, forming distinct auricles. Thus, this specimen represents the characteristics of the taxon currently referred to as *Plagiothecium platyphyllum* Mönk. Taking into account the above and the fact that the name *H. sylvaticum* was published first, the correct name for the species is *Plagiothecium sylvaticum*. Whereas the later one (*P. platyphyllum*) is a synonym. Additionally, in this article for the name *P. platyphyllum*, a lectotype is designated and a new synonym (*Plagiothecium ruthei* f. *submersum*) is proposed for the resurrected *P. sylvaticum*.

Key words: Lectotype, Plagiotheciaceae, *Plagiothecium*, re-assessment, synonymisation, taxonomy, Zennosuke Iwatsuki



Academic editor: Matt von Konrat

Received: 15 January 2024

Accepted: 26 March 2024

Published: 12 April 2024

Citation: Wolski GJ, Latoszewski M, Buck WR (2024) Why *Plagiothecium sylvaticum* (Brid.) Schimp. (*Plagiothecium*, Plagiotheciaceae) has priority over *P. platyphyllum* Mönk.? PhytoKeys 241: 103–120. <https://doi.org/10.3897/phytokeys.241.118858>

Copyright: © Grzegorz J. Wolski et al.
This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Introduction

Hypnum sylvaticum Brid. [$\equiv$ *Plagiothecium sylvaticum* (Brid.) Schimp.] is one of the oldest names that has been placed in *Plagiothecium* Schimp. (Bridel 1801; Schimper 1851). Importantly, since this taxon was described, its interpretation has changed quite radically. *Hypnum sylvaticum* usually was defined very broadly and many other, often unrelated species were associated with this name (e.g. Gravet (1883); Dixon (1896); Jensen (1939); Koppe (1949); Barkman (1957)). Therefore, dozens of names related to this taxon have been described and also, as indicated Iwatsuki (1970), this species is one of the most complicated in the history of the genus.

Hypnum sylvaticum was described by Samuel Élisée von Bridel in “*Muscologia Recentiorum*” (Bridel 1801) (Fig. 1) and was also illustrated by the author (Fig. 2). Shortly after it was described, it was not always distinguished as a separate species, but was often treated as a variety, for example, *H. denticulatum* var. *sylvaticum* (Brid.) Turner (Turner 1804). A dozen years later, Bridel in “*Bryologia Universa*” proposed transferring *H. sylvaticum* to the genus

Stereodon (Brid.) Brid., as *S. sylvaticus* (Brid.) Brid. (Bridel 1827). Then, 24 years later, Wilhelm Philipp Schimper included this taxon in the genus *Plagiothecium*, as *P. sylvaticum* (Brid.) Schimp. (Schimper 1851) and so, until the second half of the 20th century, it was recognised under this name (Fig. 3).

The second half of the 19th century brings a variety of ways of interpreting this taxon. Some authors (e.g. Wilson (1855); Sullivant and Lesquereux (1865); Scheutz (1869)) still included it in the genus *Hypnum* Hedw., giving *P. sylvaticum* as a homotypic synonym. Others, i.e. the vast majority of researchers, following Schimper (1851, 1856), distinguished it as a representative of the genus *Plagiothecium* (e.g. Lorentz (1864); de Notaris (1867); Smith (1870); Jaeger (1875–1876); Schimper (1876); Mitten (1891); Macoun (1892); Husnot (1892–1894).

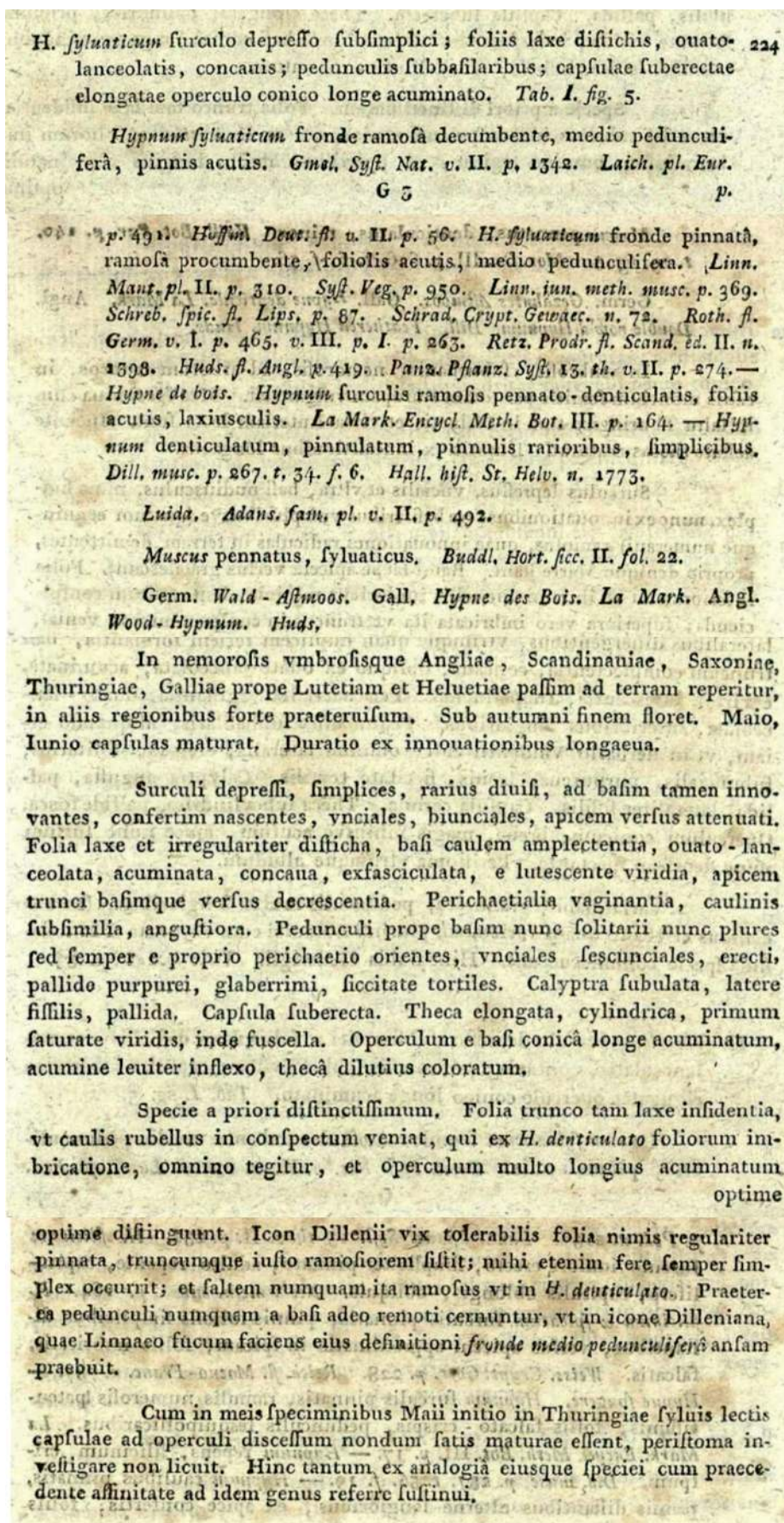
On the other hand, e.g. Milde (1869), we note one of the first times where this name was recorded as *P. silvaticum* Schimp. in Lindberg [*nom. illeg. orthogr. pro P. sylvaticum* (Brid.) Schimp.]. Subsequently, *P. silvaticum* would usually appear in the literature as *P. sylvaticum* (e.g. Lindberg (1871, 1879); Molendo (1875); Zetterstedt (1877); Kindberg (1882); Warnstorf (1885); Brotherus and Salen (1890); Klinggraeff (1893); Velenovský (1897); Schiffner (1898)). Another error is an entry given by Macoun (1898), who had a typographical error as *P. sylraticum nom. illeg. orthogr. pro P. sylvaticum* (Brid.) Schimp.

In the second half of the 19th century, several dozen taxa were described within *P. sylvaticum*, mainly as varieties, less frequently as forms. The first of them was the one proposed by Schimper (1856) – *P. sylvaticum* var. *orthocladium* (Schimp.) Schimp., which was a new combination of the previously described *P. orthocladium* Schimp. Currently, this taxon is considered a synonym of *P. cavifolium* (Brid.) Z.lwats. (Wolski et al. 2021).

A few years later, Molendo (1865, 1866) proposed three varieties for *P. sylvaticum* – *P. sylvaticum* var. *laxum* Molendo, *P. sylvaticum* var. *myurum* Molendo and *P. sylvaticum* var. *luridum* Molendo. Additionally, Walther and Molendo (1868) proposed *P. sylvaticum* var. *roeseanum* (Hampe ex Schimp.) A.W.H. Walther & Molendo. Almost at the time when Walther and Molendo (1868) proposed this new variety, Lindberg (1865) wrote the name incorrectly as var. *roesei* – *P. sylvaticum* var. *roesei* Lindb., with Kindberg (1883) changing its status to a subspecies – *P. sylvaticum* subsp. *roesei* (Lindb.) Kindb. (*orthogr. pro P. roeseanum* Hampe ex Schimp.). The reproduction of this error in literature led to its dissemination amongst researchers for decades to come (e.g. Lindberg (1865); Kindberg (1883)).

At the end of the 19th century, the above-mentioned Nils Conrad Kindberg in Macoun (1890) proposed *Plagiothecium sylvaticum* var. *squarrosus* Kindb. and Limpricht (1897) published two forms – *P. sylvaticum* f. *propaguliferum* Ruthe ex Limpr. and *P. sylvaticum* f. *elatum* Breidl. ex Limpr. which, a few years later, Warnstorf (1899, 1905) changed the status to varieties – *P. sylvaticum* var. *propaguliferum* (Ruthe ex Limpr.) Warnst. and *P. sylvaticum* var. *elatum* (Breidl. ex Limpr.) Warnst. The above-mentioned Carl Warnstorf (1899) at the same time described two other taxa – *P. sylvaticum* var. *flavescens* Warnst. and *P. sylvaticum* var. *longifolium* Warnst.

Additionally, Spruce (1880), at the end of the 19th century, proposed new varieties of the described taxon – *P. sylvaticum* var. *phyllorhizans* Spruce and *P. sylvaticum* var. *succulentum* (Wilson) Spruce. However, for the last one, several years later, Amann and Meylan (1918) proposed a new combination – *P. sylvaticum* subsp. *succulentum* (Wilson) J.J. Amann & Meyl.

Figure 1. Diagnosis of *Hypnum sylvaticum* from "Muscologia Recentiorum" (Bridel 1801).

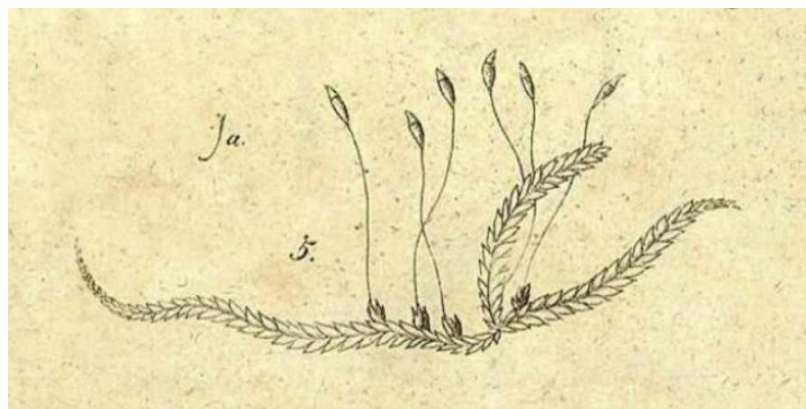


Figure 2. Drawing of *Hypnum sylvaticum* from "Muscologia Recentiorum" (Bridel 1801).

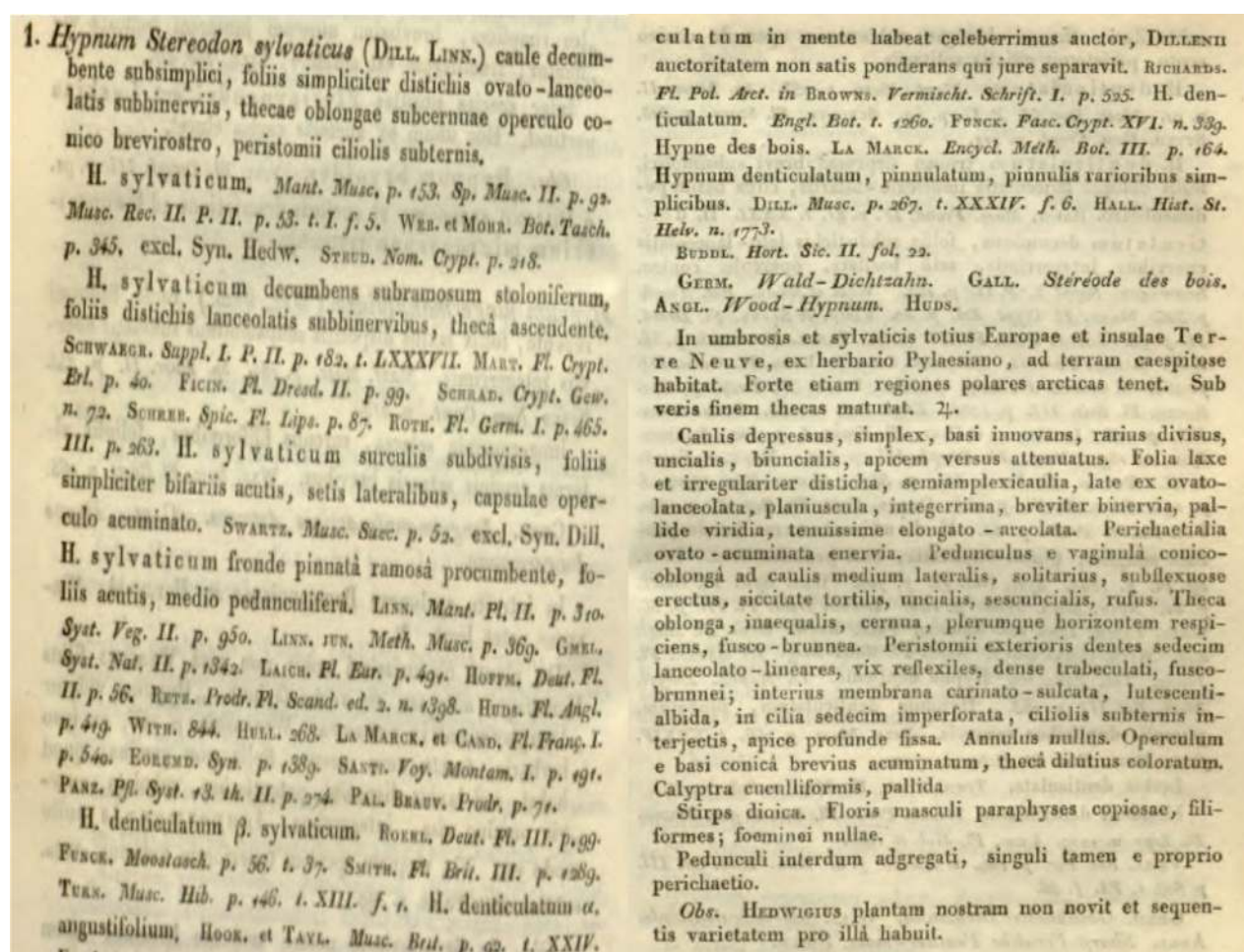


Figure 3. Description of *Stereodon sylvaticus* from "Bryologia Europaea" (Bridel 1827).

Almost at the same time as Spruce (1880), another researcher, Röhl (1891, 1915), proposed five infraspecific taxa of this species – *P. sylvaticum* var. *gracile* Röhl, *P. sylvaticum* var. *latifolium* Röhl nom. illeg., *P. sylvaticum* var. *submersum* Röhl, *P. sylvaticum* f. *viride* Röhl and *P. sylvaticum* var. *robustum* Röhl. The latter name (*P. sylvaticum* var. *robustum*) was later illegitimately used by Podpěra (1906) – *P. sylvaticum* var. *robustum* Schiffn. ex Podp. nom. illeg.

Apart from the above-mentioned bryologists, in the mid-19th century, many researchers published new names, mainly varieties of *P. sylvaticum*: Sendtner

(1861) proposed *P. sylvaticum* var. *connivens* Sendtn. in G. Gerber *nom. nud.*; Juratzka (1864) – *P. sylvaticum* var. *cavifolium* Jur. in Rabenhorst; and Gravet (1883) – *P. sylvaticum* var. *rupestre* Warnst. ex Grav.

The following years brought additional new varieties, Delogne (1885) proposed *P. sylvaticum* var. *repens* Delogne, Cardot (1885) – *P. sylvaticum* var. *rivulare* Debat ex Cardot, Renault and Cardot (1893) proposed *P. sylvaticum* var. *sullivantiae* (Schimp. ex Sull.) Renault & Cardot, which was a new combination of the previously described *H. sullivantiae* Schimp. ex Sull. Another taxon – *P. sylvaticum* var. *nervosum* Renault is given by Ferdinand François Gabriel Renault (1894) and Velenovský (1897) published *P. sylvaticum* var. *orthocarpum* Velen. In the same year, Breidler (1897) published new names – *P. sylvaticum* var. *monoicum* Breidl. in Limpricht *nom. nud.*, Limpricht (1897) proposed *P. sylvaticum* f. *robustum* Pfeff. ex Limpricht *nom. illeg.* and *P. sylvaticum* f. *propaguliferum* Lindb., Schiffner (1898) offered *P. sylvaticum* var. *fontanum* Schiffn., while Paris (1898) recognised a new variety – *P. sylvaticum* var. *nemorale* (Mitt.) Paris.

The first half of the 20th century also abounds with dozens of new taxa, mainly varieties of *P. sylvaticum*. At the very beginning of 20th century, Paul Sydow (1904) proposed a new combination of *P. sylvaticum* var. *cryptarum* (Renault & Hérib.) P.Syd. for a taxon previously classified by Renault and Héribaud (1899) as *P. denticulatum* var. *cryptarum* Renault & Hérib. At about the same time, Schiffner (1905) described *P. sylvaticum* var. *pseudoneckeroideum* Schiffn., while Kern (1906) described *P. sylvaticum* var. *auritum* Kern, Bottin (1907) proposed *P. sylvaticum* var. *minus* Bott. and Broeck (1914) published *P. sylvaticum* var. *filiforme* Broeck.

The following years brought even more new names: Cardot (1912) proposed three varieties – *P. sylvaticum* var. *latifolium* Cardot, *P. sylvaticum* var. *pseudoroseanum* Cardot and *P. sylvaticum* var. *rhynchostegioides* Cardot; Mönkemeyer (1909, 1927, 1949) listed three new taxa, one variety – *P. sylvaticum* var. *longicuspis* Mönk. in Geheeb and two forms – *P. sylvaticum* f. *pungens* Mönk. and *P. sylvaticum* f. *acutum* Mönk. *nom. inval.*

Subsequent researchers gave further names; Fritz Koppe (1931) distinguished *P. sylvaticum* var. *neglectum* (Mönk.) F.Koppe and *P. sylvaticum* var. *platyphyllum* (Mönk.) F.Koppe., the same author (Koppe 1949) also proposed a new form *P. sylvaticum* f. *laticuspis* F.Koppe. Jensen (1939) published two others – *P. sylvaticum* f. *longifolium* (Mönk.) C.E.O.Jensen, which is a new combination of *P. succulentum* var. *longifolium* Mönk. described by Mönkemeyer (1927) and *P. sylvaticum* f. *cavernarum* C.E.O.Jensen. However, 15 years later, Podpěra (1954) published the same name – *P. sylvaticum* f. *cavernarum* Podp. *nom. nud. et nom. illeg.*

In the second half of the 20th century, few authors recognised this taxon. In most cases, it was replaced by *P. neglectum* described by Mönkemeyer (1927). However, Podpěra (1954) proposed *P. sylvaticum* var. *fluitans* Podp. *nom. nud.* and the above-mentioned form *P. sylvaticum* f. *cavernarum* Podp. Barkman (1957) reported *P. sylvaticum* var. *neglectum* f. *orthocladium* (Schimp.) Barkman and *P. sylvaticum* var. *neglectum* f. *platyphyllum* (Mönk.) Barkman. The last name was given by Landwehr (1966) – *P. sylvaticum* f. *gemmaescens* Landwehr *nom. nud.*

As the above historical review indicates, over the decades, not only dozens of infraspecific names have been described within *P. sylvaticum*, but also the way

of understanding and perceiving this taxon has been very diverse, most often too broadly. Already at the end of the 19th century, Walther and Molendo (1868) distinguished *P. sylvaticum* var. *roeseanum*, which was a new combination of the previously described *P. roeseanum* Hampe ex Schimp. now known as *P. cavifolium* (Brid.) Z.Iwats. The idea of combining this taxon with *P. sylvaticum* persisted until the mid-20th century (Molendo 1875; Braithwaite 1896–1905; Héribaude 1899; Meylan 1905; Jensen 1939).

Spruce (1880) described *P. sylvaticum* var. *succulentum* and Amann and Meylan (1918) proposed a new combination of this taxon – *P. sylvaticum* subsp. *succulentum*, indicating its relationship with *Hypnum denticulatum* var. *succulentum* Wilson, described by Wilson (1855) and currently understood as *P. succulentum* (Wilson) Lindb. This approach was also adopted by, for example, Dixon (1896, 1904).

Paris (1898) distinguished *P. sylvaticum* var. *nemorale*, listing this variety as a new combination of *Stereodon nemoralis* Mitt. now known as *P. nemorale* (Mitt.) A.Jaeger. Koppe (1931) distinguished *P. sylvaticum* var. *neglectum*, reducing *P. neglectum* (currently a synonym of *P. nemorale* (Wolski et al. 2021)) to a variety. The idea of combining this taxon with *P. sylvaticum* appeared in literature until the mid-20th century (Barkman 1957).

The above-mentioned Koppe (1931) distinguished *P. sylvaticum* var. *platyphyllum*, while Barkman (1957) recognised *P. sylvaticum* var. *neglectum* f. *platyphyllum*, which are new combinations of the previously described *P. platyphyllum* Mönk. (Mönkemeyer 1927).

The consequence of the appearance of new names to describe the same taxon was chaos in its interpretation. In the mid-20th century, Greene (1957) indicated that the use of the name *P. neglectum* should be reconsidered and to replace it with *P. sylvaticum*. Greene's perception of *P. sylvaticum* is closely related to the taxon currently understood as *P. nemorale*, as indicated by the figures in the text of the manuscript.

The approach presented by Greene (1957) was supported by Nyholm (1965), which gave *P. sylvaticum* ($\equiv$ *H. sylvaticum*), for which *P. neglectum* (= *P. nemorale*) is a synonym. Thus, in Europe, some researchers called the same species *P. sylvaticum* (e.g. Greene (1957); Nyholm (1965)), while others called it *P. neglectum* (Podpěra 1954; Barkman 1957).

Outside of Europe, the history of the described taxon is equally dynamic. The first records of *P. sylvaticum* for North America were given by Lesquereux and James (1884), Renauld and Cardot (1892), Macoun (1898), and Cardot and Thériot (1902). However, Robert R. Ireland (1969), in his revision of the genus *Plagiothecium*, excluded *P. sylvaticum* and other related species (*P. sylvaticum* var. *orthocladium*, *P. sylvaticum* var. *succulentum* and *P. neglectum*) from the North American bryoflora. Moreover, he indicated that all North American taxa, so far called *P. sylvaticum*, belong to the *P. roeseanum* complex (= *P. cavifolium* complex).

However, in Japan, *P. sylvaticum* was noted until the mid-20th century (Sakurai 1954). A breakthrough moment in the understanding and perception of this name, not only in Japan, occurred with the Iwatsuki (1970) publication.

Taking into account the above, the aim of the following article is: analysis of the lectotype of *H. sylvaticum* Brid.; determining the taxonomic status of *P. sylvaticum*; and indicating any new synonymy for the examined taxon.

Materials and methods

The following research was based on the analysis of the lectotype of *Hypnum sylvaticum* Brid. (B 31 0915 01) which is currently stored in the Botanischer Garten und Botanisches Museum, Freie Universität Berlin, Herbarium B.

Nomenclatural types, original collections and the Wilhelm Mönkemeyer Herbarium are deposited in the Herbarium of the University of Hamburg, Herbarium HBG. This is indicated not only by the Index of Botanists (<https://kiki.huh.harvard.edu>, accessed 06 November 2023), but also in the Walther and Martienssen (1976) manuscript, which documents the bryological collections of this Herbarium. Specimens of *P. platyphyllum* from the Wilhelm Mönkemeyer Herbarium were borrowed and then subjected to a detailed review and re-assessment.

Additionally, types, original collections and specimens of *P. ruthei* f. *submersum* Bizot *in sched.* (PC 0132598; PC 0132599) deposited in the Muséum National d'Histoire Naturelle, PC Herbarium were analysed.

Results and discussion

Hypnum sylvaticum Brid. case

In 1967, Zennosuke Iwatsuki studied the original collection of *Hypnum sylvaticum* Brid. (B 31 0915 01) [= *P. sylvaticum*] (Iwatsuki 1967, in adnot.). He described this specimen as “Lectotype of *Hypnum sylvaticum* Brid. = *Plagiothecium sylvaticum* (Brid.) B.S.G.” and he used these analyses in his revision of the genus *Plagiothecium* (Iwatsuki 1970) where he indicated that specimen (B 31 0915 01) as the lectotype of *H. sylvaticum* (Fig. 4).

In this revision, Iwatsuki (1970) additionally pointed out that “this specimen has an autoicous inflorescence and a fairly wide-decurrent wing on the leaf” and that “it is identical with plants which we now generally call *P. denticulatum*”. Thus, in the above-mentioned manuscript, Iwatsuki (1970) synonymised *H. sylvaticum* with *P. denticulatum*. Additionally, Iwatsuki wrote that, since the lectotype of *H. sylvaticum* is identical with *P. denticulatum*, “we should use another name for the taxon which has been called “*P. sylvaticum*” or “*P. neglectum*”. Thus, he proposed to use a different, earlier name for these taxa: *P. nemorale* (Mitt.) A. Jaeger.

The above assumption, given by Iwatsuki (1970) that *H. sylvaticum* s.str. is a synonym of *P. denticulatum*, while *P. sylvaticum* sensu auct. and *P. neglectum* are synonyms of *P. nemorale*, has been widely accepted by many bryologists and persists to this day.

After Iwatsuki (1967, in adnot.), the above-mentioned specimen (B 31 0915 01) was analysed by Ireland (1968, in adnot.), who indicated, just the same as Iwatsuki, that this specimen represented *P. denticulatum*, leaving a note on it “Lectotype of *Hypnum sylvaticum* Brid. Selected by Z. Iwatsuki = *Plagiothecium denticulatum* (Hedw.) Brid. Some plants autoicous!!” This material was last examined by Zuo (2010, in adnot.), who indicated that “plant examined may probably be a *Plagiothecium platyphyllum* Mönk.” (Fig. 4).

The specimen (B 31 0915 01) representing the lectotype of *H. sylvaticum* (= *P. sylvaticum*) is medium size to large, with 6–10 cm long stems; the foliage is pale green, yellowish-green to dark green, dull, without metallic lustre; the plants form rather dense mats; stems are complanate-foliate, in cross-section

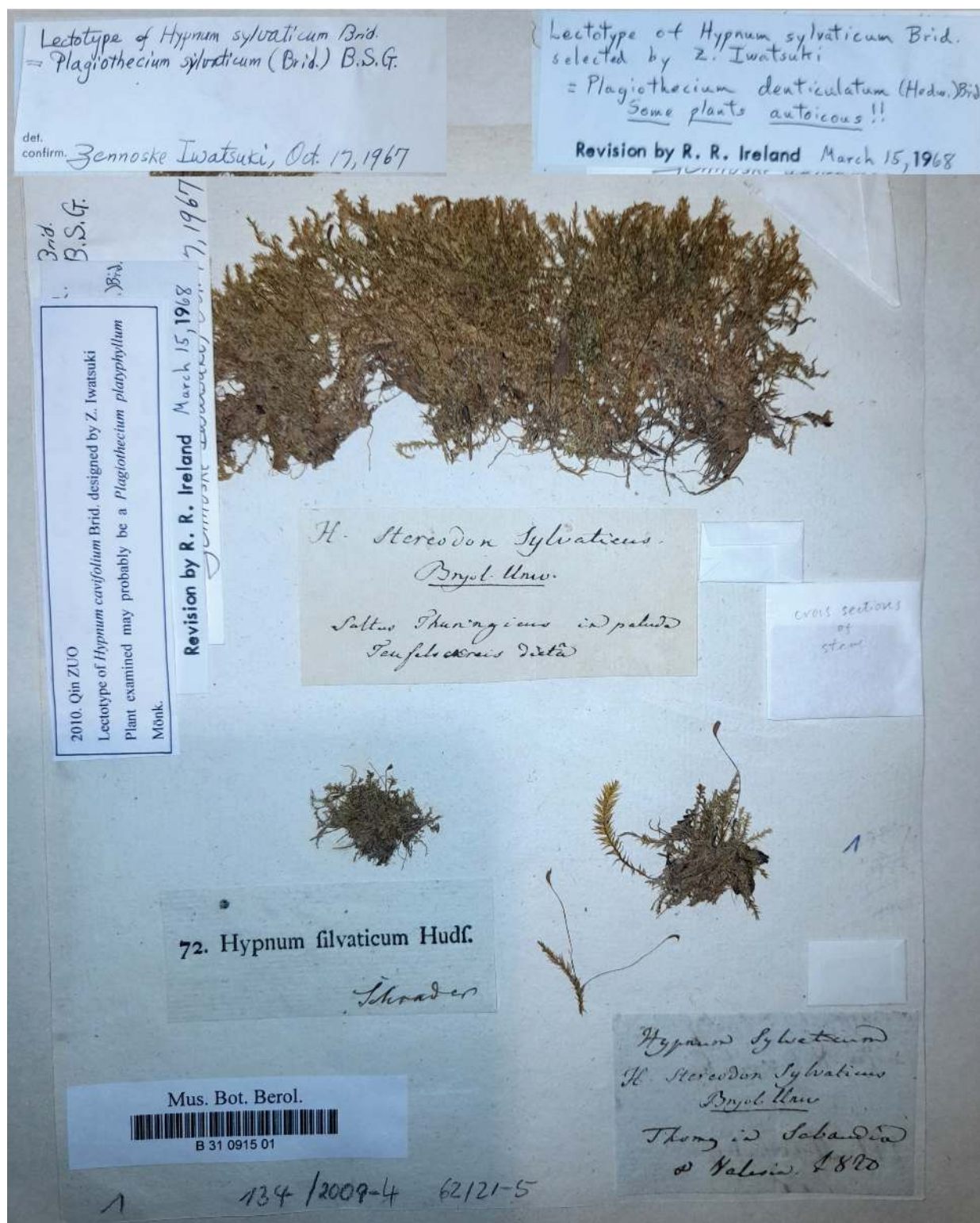


Figure 4. The lectotype (the clump at the top of the sheet) of *Hypnum sylvaticum* (B 31 0915 01).

rounded, 400–450 µm; leaves are complanate, symmetric, ovate, not imbricate and not julaceous; those leaves from the middle of the stem are 2.0–3.0 mm long and the width measured at the widest point is 1.0–1.6 mm; apex is acute and denticulate, often eroded; costae are two, rather thick and strong, extending usually to 1/3 or 1/2 of the leaf length; leaf cells are almost symmetrical, forming

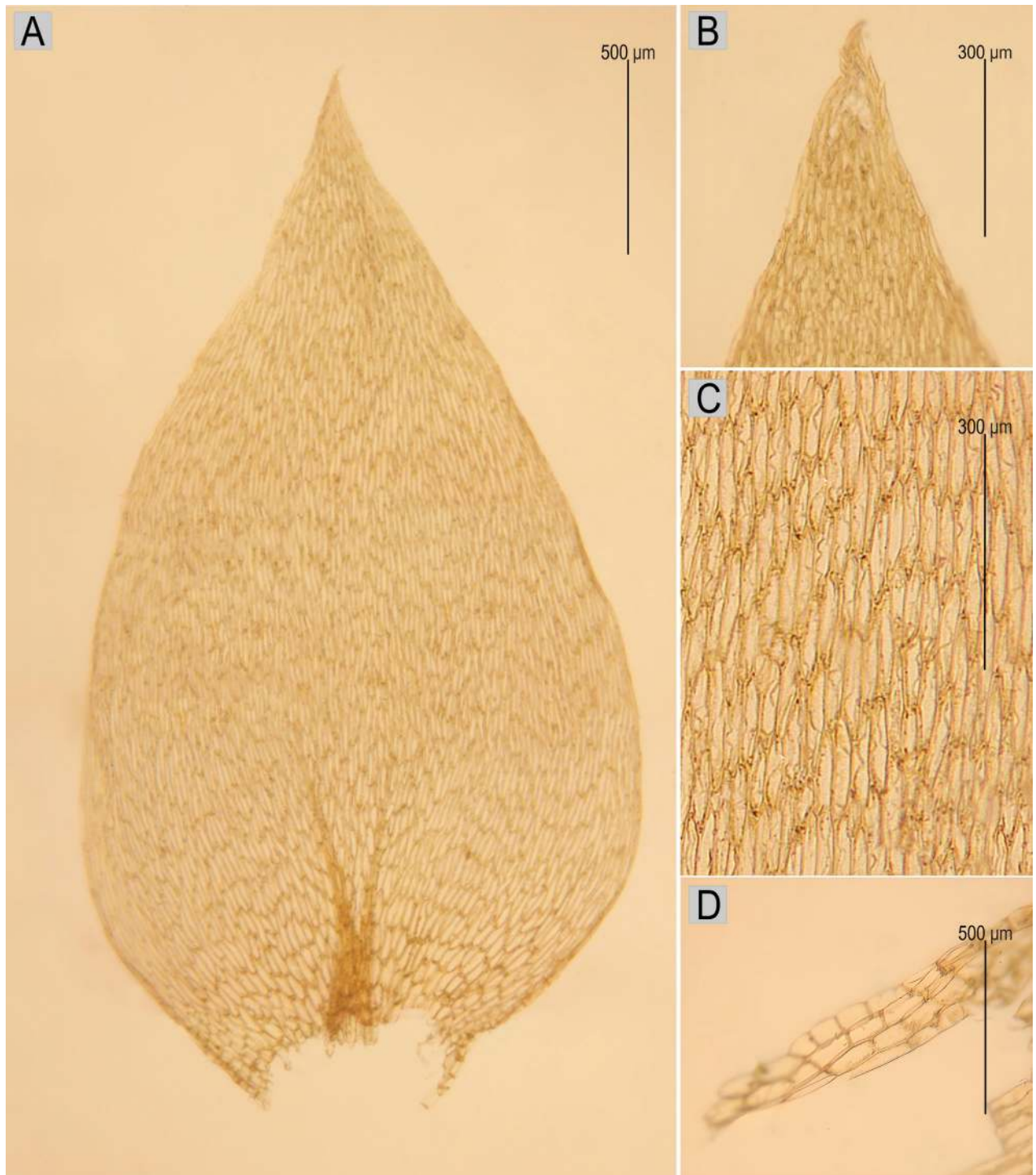


Figure 5. The most important taxonomic features of *Hypnum sylvaticum* **A** leaf **B** eroded, denticulate leaf tip **C** cells of the central part of the leaf arranged in regular diagonal rows **D** decurrency composed of inflated cells (based on lectotype B 31 0915 01).

diagonal rows, the length and width are variable, but dependent on location: $80\text{--}148 \times 10\text{--}19\text{ }\mu\text{m}$ at the apex, $75\text{--}160 \times 12.5\text{--}20\text{ }\mu\text{m}$ at mid-leaf, $88\text{--}112 \times 15\text{ }\mu\text{m}$ towards insertion; due to wide cells, the leaf areolation is lax; decurrencies are formed of 3–4 rows of rectangular, inflated cells, forming distinct and long auricles, 0.4–1.1 mm; sporophytes have setae to 4 cm long; capsules are inclined, 2.5 mm long and 1.2 mm wide; operculum is 500 μm long (Fig. 5).

Our critical re-examination of the lectotype specimen of *H. sylvaticum* confirmed Zuo's suspicions and showed that the above-mentioned specimen (B 31 0915 01) represents the taxon currently understood as *P. platyphyllum* (Fig. 5). The features of the examined specimen, lectotype of *Hypnum sylvaticum* [= *P. sylvaticum*] (B 31 0915 01) not only perfectly reflect the features of this species given so far by many researchers (e.g. Jensen (1939); Jedlička (1948); Greene (1957); Nyholm (1965); Smith (2001); Li and Ireland (2008); Cano et al. (2018), but also match perfectly with the type collection of *P. platyphyllum* from the Wilhelm Mönkemeyer Herbarium, currently deposited in HBG.

Thus, taking into account the above facts and the fact that the name *Hypnum sylvaticum* (= *Plagiothecium sylvaticum*) was published first (Principle III; article 11, Shenzhen Code, Turland et al. 2018) for specimens with dense, 6–10 cm long stems, pale green, yellowish-green to dark green and dull foliage; with leaves complanate, ovate, not imbricate and not julaceous, 2.0–3.0 × 1.0–1.6 mm; acute and denticulate, often eroded apex; 75–160 × 12.5–20 µm cells at mid-leaf, forming diagonal rows and decurrencies of 3–4 rows of rectangular to square, inflated cells, forming distinct auricles, we propose to use the earlier name – *Plagiothecium sylvaticum* (Brid.) Schimp. and *Plagiothecium platyphyllum* should be treated as its synonym.

***Plagiothecium ruthei* f. *submersum* Bizot in sched. case**

Plagiothecium ruthei f. *submersum* (PC0132598), currently housed in PC, consists of three turfs. On the same sheet, there is another specimen (PC0132599) representing the same taxon, also from the M. Bizot Herbarium, but collected much later – in 1940 (Fig. 6).

Plagiothecium ruthei f. *submersum* is medium size to large; dark green to green; dull; without metallic lustre; forming rather dense mats; stems complanate-foliate, in cross-section rounded; leaves complanate, symmetric, ovate, not imbricate and not julaceous; those leaves from the middle of the stem 2.8–3.0 × 1.0–1.2 mm; apex eroded, acute and denticulate, with commonly occurring rhizoids; costae two, rather thick and strong, extending usually to 1/3 or 1/2 of the leaf length; leaf cells almost symmetrical, these near apex often eroded, the length and width variable, but dependent on location: 85–160 × 9–17.5 µm at the apex, 112.5–150 × 12.5–15 µm at mid-leaf, 46–130 × 19–34.5 µm towards insertion; due to wide cells, leaves areolation lax; decurrencies of 3–4 rows of rectangular to square, inflated cells, forming distinct auricles, 600 µm long; sporophytes unknown (Fig. 7).

Taking into account the above facts and the fact that the specimen representing *P. ruthei* f. *submersum* is identical to *P. sylvaticum* (= *P. platyphyllum*), we propose the former herbarium name (*P. ruthei* f. *submersum*) treated as a synonym of the latter (*P. sylvaticum*).

Lectotypification of *Plagiothecium platyphyllum* Mönk.

Plagiothecium platyphyllum was described by Wilhelm Mönkemeyer (1927) in “Die Laubmoose Europas”. Mönkemeyer (1927) quotes various specimens that he analysed and on the basis of which he described this taxon. On the other hand, he states that: „In Laubwäldern auf Humus, über Gestein, an Felsen” (in deciduous forests on humus, on rocks); „in der Grundform von mit zuerst bei

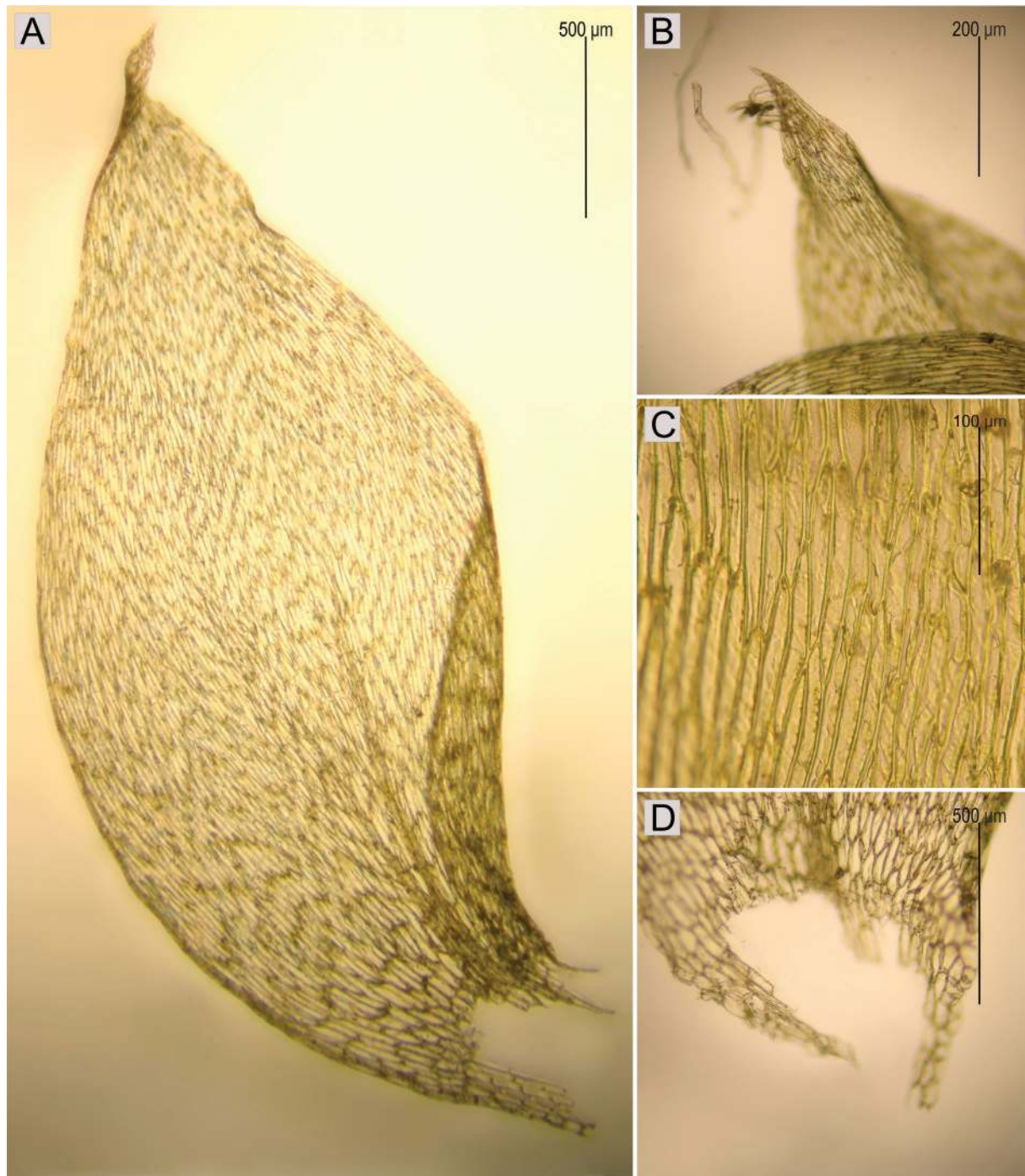


Figure 7. The most important taxonomic features of *Plagiothecium ruthei* f. *submersum* **A** leaf shape **B** leaf apex with rhizoids **C** cells of the middle part of the leaf **D** leaf insertion (based on PC0132598).

Mountains, from Bohemia, the Bavarian Forest, Moravia, Switzerland (Canton of Uri), northern Italy (Province of Como) and Bulgaria became known to me).

Analysing the entire Mönkemeyer collection of *Plagiothecium platyphyllum* stored in the HBG Herbarium, we could conclude that most of the specimens from those cited by Mönkemeyer in this Herbarium were absent. However, a specimen hand-signed by Mönkemeyer from his private herbarium was found, specimen cited by him as “aus Thüringen”. This specimen is characterised by a large turf with sporophytes material (Fig. 8). Therefore, it was decided to propose this specimen as the lectotype of *Plagiothecium platyphyllum* Mönk.

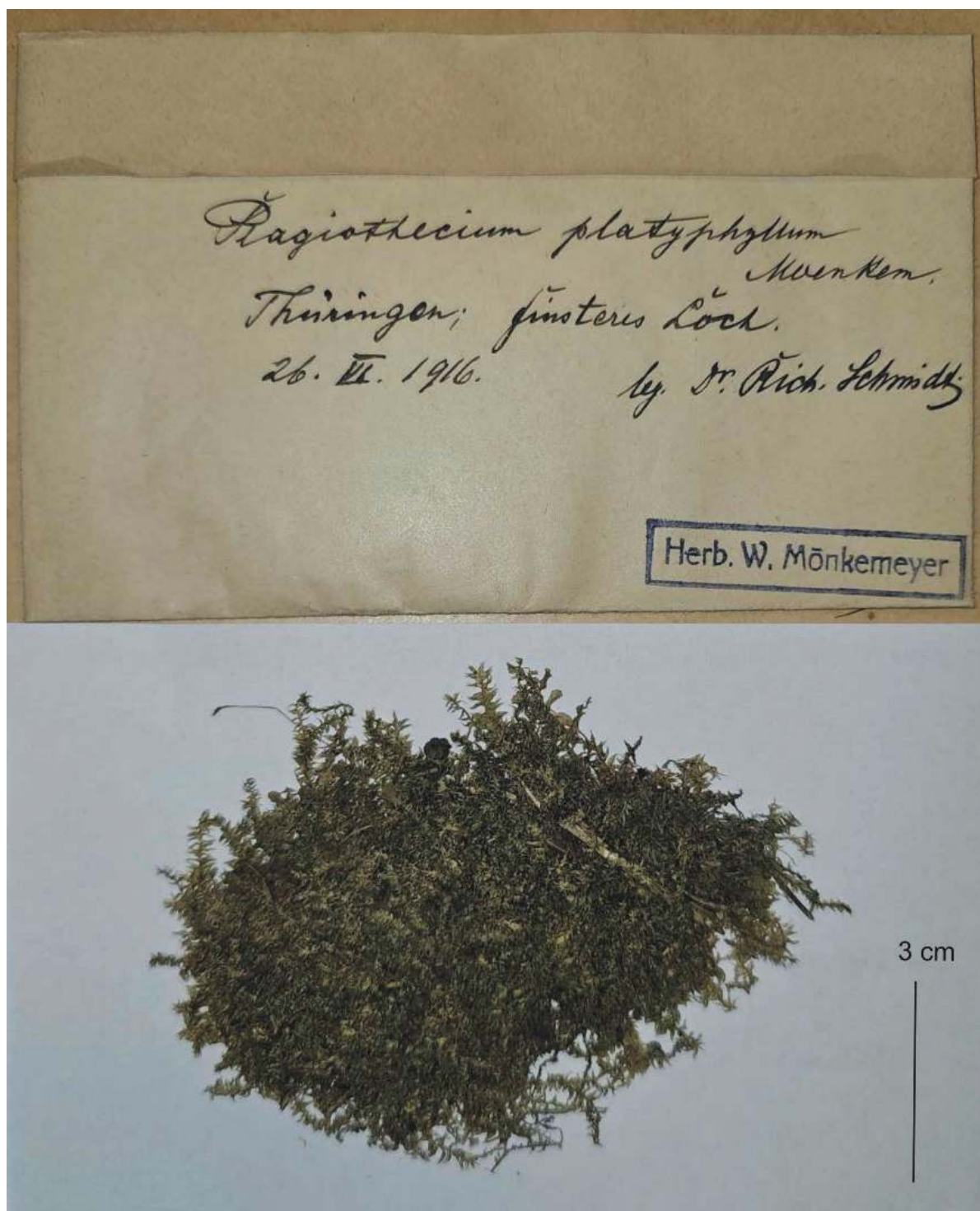


Figure 8. The lectotype of *Plagiothecium platyphyllum* Mönk. (HBG).

Taxonomic treatment

Plagiothecium sylvaticum (Brid.) Schimp., Bryol. Europ. 5: 192, 503 (1851); *Hypnum sylvaticum* Brid., Muscol. Recent. 2(2): 53, 1 f. 5 (1801) (Figs 1, 2); *Hypnum denticulatum* var. *sylvaticum* (Brid.) Turner, Muscol. Hibern. Spic. 146 (1804); *Stereodon sylvaticus* (Brid.) Brid., Bryol. Univ. 2: 825 (1827); *Hypnum denticulatum* subsp. *sylvaticum* (Brid.) Boulay, Musc. France, Mousses 85 (1884); *Plagiothecium denticulatum* subsp. *sylvaticum* (Brid.) Dixon, Stud. Handb. Brit.

Mosses 437 (1896). **Lectotype** (the clump at the top of the sheet, selected by Iwatsuki 1970): [Germany], saltus Thuringicus in paluda, ex herb. Brid., B 31 0915 01! (Figs 4, 5).

Plagiothecium platyphyllum Mönk., Laubm. Europ. 866, 207b (1927); *P. sylvaticum* var. *platyphyllum* (Mönk.) F.Koppe, Abh. Ber. Naturwiss. Abt. Grenzmark. Ges. Erforsch. Heimat Schneidemühl 1931: 80 (1931); *P. neglectum* subsp. *platyphyllum* (Mönk.) Szafran, Fl. Polsk. Mchy 2: 288 (1961), *comb. inval.* Type: Germany, bei Gersfeld in der Rohn 1906, ferner mir aus Thüringen und dem sächsischen Vogtlande unter anderer Bezeichnung bekannt geworden; The Czech Republic, ferner 1911 im Böhmerwalde bei Eisenstein gesammelt. **Lectotype** (designated here): Germany, Thüringen, Finsteres Loch, 26 June 1916, leg. Rich. Schmidt, HBG! syn. nov. (Fig. 8).

Plagiothecium ruthei f. *submersum* Bizot, *in sched.* Basis: France, Vosges, Hohnack, immergé dans le lac du Frankenthal, M. Bizot 2910, PC0132598! syn. nov. (Figs 6, 7).

Acknowledgements

The authors would like to thank all the Curators of the Herbaria mentioned above for the opportunity to analyse their valuable collections.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding

No funding was reported.

Author contributions

GJW - Conceptualization, Writing - original draft, Writing - review and editing, Data curation, Investigation, Project administration, Supervision, Visualization; ML - Writing - original draft, Writing - review and editing, Investigation, Visualization; WRB - Writing - original draft, Writing - review and editing, Investigation.

Author ORCIDs

Grzegorz J. Wolski  <https://orcid.org/0000-0003-1480-8003>

Mikołaj Latoszewski  <https://orcid.org/0009-0003-5228-210X>

Data availability

All of the data that support the findings of this study are available in the main text.

References

Amann JJ, Meylan C (1918) Flore des Mousses de la Suisse. Herbar Bossier, Geneve 1: 174.

- Barkman JJ (1957) Het geslacht *Plagiothecium* in Nederland. Buxbaumia. Uitgeverij Dr. W. Junk. N.V. Hauge 11: 13–29.
- Bottin A (1907) Monografia delle briofite del Piemonte. Webbia 2: 384. <https://doi.org/10.1080/00837792.1907.10803458>
- Braithwaite R (1896–1905) The British moss-flora. Pleurocarpi. Hypnaceae, Pterygo-phyllaceae, Neckeraceae, general index. 303 Clapham road, London, Vol. 3: 1–373.
- Breidler J (1897) Die Laubmoose Deutschlands, Oesterreichs und der Schweiz. Eduard Kummer. Leipzig 3: 273.
- Bridel SÉ (1801) Muscologia Recentiorum 2: 53, 1 f. 5.
- Bridel SÉ (1827) Bryologia Universa, Joan. Ambros Barth Lipsiae 2: 825.
- Broeck H (1914) Les Muscinées de l'Herbier belge du Jardin botanique de l'État à Bruxelles. Bulletin du Jardin Botanique de l'État à Bruxelles 4: 243–311. <https://doi.org/10.2307/3666522>
- Brotherus VF, Salen Th (1890) Musci Lapponiae Kolaënsis. Heredum J. Simelit, Helsingforsle, 97–98.
- Cano MJ, Guerra J, Cros RM (2018) Plagiotheciaceae M. Fleisch. In: Guerra J, Cros RM (Coords) Flora Briofítica Ibérica, Sociedad Española de Fitosociología, Murcia, Spain.
- Cardot J (1885) Notice sur quelques mousses de Belgique. Bulletin de la Société Royale de Botanique de Belgique 24(2): 86.
- Cardot J (1912) Mousses nouvelles du Japon et de Corée. Bulletin de la Société Botanique de Genève, Geneva 4: 385–426.
- Cardot J, Thériot I (1902) The mosses of Alaska. Proceedings of the Washington Academy of Sciences, The Academy, Washington, D.C., 4: 293–372.
- de Notaris G (1867) Cronaca della briologia italiana. Co' tipi del R.I. de'sordo-muti, Genova, 2: 2.
- Delogne CH (1885) Annales de la Société Belge de Microscopie 9: 144.
- Dixon HN (1896) The student's handbook of British mosses. V.T. Sumfield Standard Office, London, 430–440. <https://doi.org/10.5962/bhl.title.55541>
- Dixon HN (1904) The student's handbook of British mosses second edition, revised and enlarged. V.T. Sumfield, London, 586 pp.
- Gravet PJF (1883) Enumeratio muscorum Europaeorum. Revue Bryologique 10: 34. <https://doi.org/10.3406/linly.1883.17234>
- Greene SW (1957) The British Species of the *Plagiothecium denticulatum*–*P. sylvaticum* Group. Transactions of the British Bryological Society 3(2): 181–190. <https://doi.org/10.1179/006813857804829623>
- Héribaud J (1899) Les muscinées d'Auvergne, Librairie des sciences naturelles, Paris, 227–233.
- Husnot T (1892–1894) Muscologia gallica. Descriptions & figures des mousses de France et des contrées voisines. T. Husnot, A. Cahan, par Athis, 2: 348–355.
- Ireland RR (1969) A taxonomic revision of the genus *Plagiothecium* for North America, north of Mexico. National Museum of Natural Sciences Publication in Botany, The National Museum of Canada, Ottawa, ON, Canada 1: 1–118.
- Iwatsuki Z (1970) A revision of *Plagiothecium* and its related genera from Japan and her adjacent areas. I. The Journal of the Hattori Botanical Laboratory 33: 331–380.
- Jaeger A (1875–1876) Genera et species, muscorum systematice disposita. Adumbratio flore muscorum totius orbis terrarum, 444–454.
- Jedlička J (1948) Monographia specierum Europaerum gen. Plagiothecium s.s. (Partis specialis I. Sumarium). Publ. Fac. Sci. Univ. Masaryk 308: 1–45.

- Jensen CEO (1939) Skandinaviens Bladmossflora. Ejnar Musnksgaard, København, 492–497.
- Juratzka J (1864) Bryotheca Europaea. Heinrich, Dresden 16: 785.
- Kern F (1906) Jahresbericht der Schlesischen Gesellschaft für Vaterländische Cultur 83 Abt. 2b: 16.
- Kindberg NC (1882) Die Arten der Laubmoose (Bryineae) Schwedens und Norwegens. Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar, P. A. Norstedt & Soner, Stockholm 7: 1–167.
- Kindberg NC (1883) Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar 7: 47.
- Klinggraeff H (1893) Die Leber- und Laubmoose West- und Ostpreußens. Herausgegeben mit Unterstützung des Westpreußischen Provinzial-Landtages vom Westpreußischen Botanisch-Zoologischen Verein. Wilhelm Engelmann, Danzig, 1–317.
- Koppe FB (1931) Abhandlungen und Berichte der Naturwissenschaftlichen Abteilung der Grenzmarkischen Gesellschaft zur Erforschung und Pflege der Heimat. Schneidemühl 1931: 80.
- Koppe FB (1949) Die Moosflora von Westfalen IV. Abhandlungen aus dem Landesmuseum für Naturkunde zu Münster in Westfalen 12: 1–96.
- Landwehr J (1966) Atlas van de Nederlanse Bladmossen. Koninklijke Nederlandse Natuurhistorische Vereniging, Amsterdam 89: 422.
- Lesquereux L, James TP (1884) Manual of the mosses of North America. S. E. Cassino & Company, Boston, 362–371. <https://doi.org/10.5962/bhl.title.4666>
- Li D, Ireland RR (2008) Plagiotheciaceae. In: Ren-liang H, You-fang W, Crosby MR (Eds) Moss Flora of China: Amblystegiaceae to, Plagiotheciaceae. Science Press and Missouri Botanical Garden Press, Beijing and St. Louis, 219–243.
- Limpricht KG (1897) Die Laubmoose Deutschlands, Oesterreichs und der Schweiz. Eduard Kummer. Leipzig 3: 260.
- Lindberg SO (1865) De Hypno elegante Hook. Botaniska Notiser 8–9: 143.
- Lindberg SO (1871) Revisio critica iconum in opere Flora Danica Muscos illustrantium. Societatis litterarias fennicas, Helsingforsle, 70–71.
- Lindberg SO (1879) Musci scandinavici in systemate novo naturali dispositi. lesaiar Roquist, Upsaliae, 39.
- Lorentz PG (1864) Moosstudien. Wilhelm Engelmann, Leipzig, 1–111.
- Macoun J (1890) Contributions to Canadian Bryology no. 3. Bulletin of the Torrey Botanical Club (and Torrey) New York, 17: 279. <https://doi.org/10.2307/2476281>
- Macoun J (1892) Catalogue of Canadian plants. Part VI. - Musci. William Foster Brown & Co., Montreal, 211–216.
- Macoun JM (1898) The cryptogamic flora of Ottawa. The Ottawa Naturalist 11: 194–195. <https://doi.org/10.5962/bhl.title.57618>
- Meylan C (1905) Catalogue des mousses du Jura. Bulletin de la Société Vaudoise des Sciences Naturelles 41: 97–172.
- Milde CAJ (1869) Laubmoos-Flora von Nord- und Mittel-Deutschland. unter besonderer Berücksichtigung Schlesiens und mit Hinzunahme der Floren von Jütland, Holland, der Rheinpfalz, von Baden, Franken, Böhmen, Mähren und der Urugegend von München. Bryologia Silesiaca. Arthur Felix, Leipzig, 314–321. <https://doi.org/10.5962/bhl.title.32328>
- Mitten W (1891) On the species of musci and hepaticae recroded from Japan, The Transactions of the Linnean Society of London. S.V. Taylor and Francis, Sea Lion Court, Fleet Street, London, 178–179.

- Molendo L (1865) Moos-Studien aus den Algäuer Alpen. Beiträge zur Phytogeographie Vereins Augsburg 18: 174.
- Molendo LJ (1866) Bryologische Reisebilder aus den Alpen. Flora 49: 268.
- Molendo L (1875) Bayerns Laubmoose: Vorläufige Übersicht mit besonderer Rücksicht auf Niederbayern. Separat-Abdruck aus dem IX. Jahresberichte des Naturhistorischen Vereins in Passau, Wilhelm Engelmann, Leipzig, 229–235.
- Mönkemeyer W (1909) Allgemeine Botanische Zeitschrift für Systematik. Floristik. Pflanzengeographie. Karlsruhe 15: 187.
- Mönkemeyer W (1927) Die Laubmoose Europas. IV Band Ergänzungsband Andrales-Bryales. In: Rabenhorst L (Ed.) Kryptogamen-Flora von Deutschland, Österreich und der Schweiz, Akademische Verlagsgesellschaft, Leipzig, 865.
- Mönkemeyer W (1949) Abhandlungen aus dem Landesmuseum für Naturkunde zu Münster in Westfalen 12: 77.
- Nyholm E (1965) Illustrated Moss Flora of Fennoscandia. CWK Gleerup, Lund, Sweden 2: 620–647.
- Paris EG (1898) Index bryologicus sive, Enumeratio muscorum hucusque cognitorum adjunctis synonymia distributioneque geographica locupletissimus. Parisiis.
- Podpěra J (1954) Conspectus Muscorum Europaeorum. Československé Akademie Věd, Praha, 650–658.
- Podpěra J (1906) Nový druh mechu z Prostějovska. Věstník Klubu Přírodovědeckého v Prostějově, Prostějov, 8: 46.
- Renauld FFG (1894) Descriptions & figures des mousses de France et des contrées voisines. Muscologia Gallica, T. Husnot, Paris, 352.
- Renauld FFG, Cardot J (1893) Recherches sur les mousses du Japon. Revue Bryologique 20: 22.
- Renauld FFG, Héribaude J (1899) Mémoires de l'Académie des Sciences, Belles-lettres et Arts de Clermont-Ferrand 14: 229.
- Renauld FFG, Cardot J (1892) Musci Americae septentrionalis. In Extrait de la Revue Bryologique 19: 55–57.
- Röll J (1891) Die Thüringer Laubmoose und ihre geographische Verbreitung. Deutsche Botanische Monatsschrift 9: 131.
- Röll J (1915) Die Thüringer Torfmoose und Laubmoose und ihre geographische Verbreitung. Mittheilungen des Thüringischen Botanischen Vereins 32: 227–230.
- Sakurai K (1954) Muscologia japonica. Hattori Botanical Laboratory, Iwanami Shoten, Tokyo, 142–148.
- Scheutz NJ (1869) Florula bryologica alpium Dovrensis, 1–30.
- Schiffner VF (1898) Interessante und neue Moose der böhmischen Flora. Österreichische botanische Zeitschrift. Carl Gerold's Sohn, Wien 48: 425–430. <https://doi.org/10.1007/BF01794350>
- Schiffner VF (1905) Sitzungsberichte des Deutschen Naturwissenschaftlich-Medicinischen Vereins für Böhmen "Lotos" in Prag, 53: 46.
- Schimper WP (1851) Bryologia Europea 5: 192, 503.
- Schimper WP (1856) conspectum diagnosticum familiarum, generum et specierum, adnotationes novas atque emendationes. Corollarium Bryologiae Europaeae. Libraria E. Schweizerbart, Stuttgartiae, 1–506.
- Schimper WP (1876) Synopsis muscorum Europaeorum: praemissa introductione de elementis bryologicis tractante. Libraria E. Schweizerbart Stuttgartiae, Vol. 1.
- Sendtner O (1861) Die Laubmoose des Algäus. Bericht des Naturhistorischen Vereins in Augsburg 14: 52.

- Smith CP (1870) The Moss Flora of Sussex; together with 2 notes on the structure and reproduction of mosses. The Brighton and Sussex Natural History Society, Brighton, 14.
- Smith AJE (2001) The Moss Flora of Britain and Ireland. Cambridge University Press, Cambridge, 621–634.
- Spruce R (1880) Sive de muscis nonnullis adhuc neglectis, prætervisis vel confusis, nunc recognitis. Musci præteriti. Journal of Botany. British and Foreign 18: 357.
- Sullivant WS, Lesquereux L (1865) Musci boreali-americi quorum specimina exsiccata. Columbi Ohioensis, Sumptibus Auctorum, 1–96. <https://doi.org/10.5962/bhl.title.62401>
- Sydow P (1904) Pilze (ohne die Schizomyceten und Flechten). Botanischer Jahresbericht 27: 200.
- Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Koeltz Botanical Books, Glashütten. <https://doi.org/10.12705/Code.2018>
- Turner D (1804) Muscologiae Hibernicae Spicilegium. J. Black Sumptibus Auctoris: Yarmouth, 146–148.
- Velenovský J (1897) Mechy české. Nákladem České Akademie Císaře Františka Josefa pro vědy, slovesnost a umění, Praha, 319–328.
- Walther K, Martienssen G (1976) Die Laubmoostypen des Herbariums Hamburgense. Institut für Allgemeine Botanik der Universität Hamburg, Hamburg.
- Walther AWH, L Molendo (1868) Beiträge zur Pflanzengeographie und Systematik und zur Theorie vom Ursprunge der Arten. Die Laubmoose Oberfrankens, Wilhelm Engelmann, Leipzig, 177. <https://doi.org/10.5962/bhl.title.50749>
- Warnstorf C (1885) Moosflora der Provinz Brandenburg. Verhandlungen des botanischen vereins der Provinz Brandenburg, R. Gaertners Verlagsbuchhandlung Hermann Heyfelder, Berlin, 1–94.
- Warnstorf C (1899) Miscellen aus der europäischen Moosflora. Allgemeine Botanische Zeitschrift für Systematik, Floristik. Pflanzengeographie 5: 35.
- Warnstorf CF (1905) Kryptogamenflora der Mark Brandenburg. Laubmoose, Gebrüder Borntraeger, Leipzig, 817.
- Wilson W (1855) Bryologia Britannica; containing The Mosses of Great Britain and Ireland, systematically arranged and described according to the method of Bruch and Schimper. Longman, Brown, Green, and Longmans London, 1–440.
- Wolski GJ, Nour-El-Deen S, Cienkowska A, Bożyk D, El-Saadawi W (2021) The genus *Plagiothecium* Schimp. (Plagiotheciaceae, Bryophyta) in Eurasia: An annotated checklist with distribution and ecological data. Plants 10(5): 868. <https://doi.org/10.3390/plants10050868>
- Zetterstedt JE (1877) Florula Bryologica Montium Hunneberg et Halleberg. Kungliga Svenska Vetenskaps-Akademiens Handlingar. Kongliga Vetenskaps-Akademiens. P. A. Norstedt & Soner, Stockholm, 24.