

Bryoerythrophyllum alpigenum (Bryophyta, Pottiaceae) confirmed in the moss flora of Poland, with a review of the nomenclatural issues associated with this species name

Ryszard Ochyra

W. Szafer Institute of Botany, Polish Academy of Sciences, ul. Lubicz 46, 31-512 Kraków, Poland.
E-mail: r.ochyra@botany.pl

Abstract: Occurrence of *Bryoerythrophyllum alpigenum* (Jur.) P.C.Chen in Poland is confirmed. The species is known from a single record from the Western Tatra Mountains in the Polish Western Carpathians. A description and illustrations of the Polish material of this species is provided and its distribution mapped. Taxonomic and nomenclatural comments on *B. alpigenum* are presented and its global geographical distribution is reviewed. This species was first recognised as a variety, *Didymodon rubellus* var. *dentatus* Schimp., in 1860 by W. P. Schimper. It was subsequently described in 1882 by J. Juratzka as *Didymodon alpigenus* Jur. and its name should be ascribed to Juratzka alone, not to Venturi as suggested in *Index muscorum* and *D. alpigenus* Jur. is the basionym of *Bryoerythrophyllum alpigenum*. The epithet *alpigenus* appeared in the literature for the first time as *Trichostomum alpigenum* Venturi in Pfeffer's work of 1869 dealing with the mosses of the Rhaetian Alps, but the name was not validly published under Art. 36.1, because Pfeffer did not accept it. Likewise, the name *Didymodon alpigenus* was not validly published by Venturi ten years later under Art. 38.1, because no description or diagnosis or a reference to a previously and effectively published description or diagnosis were provided. The current statistics of the moss flora of Poland is given. Since the publication of the catalogue of Polish mosses in 2003, some 17 species, one subspecies and three varieties of moss have been added to and two species were excluded from the moss flora of Poland, so currently some 715 species, nine subspecies and 90 varieties are known to occur in the country.

Keywords: Carpathians, *Didymodon*, distribution, diversity, nomenclature, Musci, rare species, Tatra Mountains, taxonomy

INTRODUCTION

Bryoerythrophyllum P.C.Chen (Pottiaceae) is a medium-sized genus of about 35 species that are distributed nearly worldwide from the polar areas and through temperate regions of both hemispheres to tropical highlands and mountains. In Europe, the genus is represented by eight species (Hodgetts et al., 2020), all of which are rare or exceedingly rare and localised in the continent, except for the common bipolar *B. recurvirostrum* (Hedw.) P.C.Chen (Ochyra et al., 2008) and the fairly infrequent, disjunct panholarctic *B. ferruginascens* (Stirt.) Giacom. which deeply penetrates into the tropics (Blockeel, 2014). Two of the remaining species of the genus, *B. caledonicum* D.G.Long and *B. duellii* Blockeel, are narrow European endemics restricted to Scotland and Greece and Cyprus, respectively (Rothero, 2014; Blockeel et al., 2017) and the other two, *B. campylocarpum* (Müll. Hal.) H.A.Crum and *B. inaequalifolium* (Taylor) R.H.Zander, are principally tropical oreophytes penetrating to the south-western peripheries of the continent (Ellis et al., 2011, 2012a, 2013, 2018). Finally, *B. alpigenum* (Jur.) P.C.Chen and

B. rubrum (Jur. ex Geh.) P.C.Chen are highly disjunct Eurasian montane species (Fedosov & Ignatova, 2008), the former of which penetrates to the mountains in tropical East Africa (Kis, 1985; Sollman, 2008) and the latter occurs additionally at bipolar stations in the maritime Antarctic (Sollman, 2015).

In the only moss Flora of Poland, Szafran (1957) reported two species of *Bryoerythrophyllum*, namely *B. recurvirostrum* and *B. ferruginascens*. He used the then already unavailable generic name *Erythrophyllum* (Lindb. ex Braithw.) Loeske, which was introduced by Loeske (1908). Because it was a later illegitimate homonym of the algal generic name *Erythrophyllum* J.Agardh of 1872, Chen (1940, 1941) proposed *Bryoerythrophyllum* as a replacement of this name and it has subsequently gained wide acceptance. For the first species Szafran (1957) used the pre-Hedwigian epithet *rubellum* introduced by Hoffmann (1798) as *Bryum rubellum* Hoffm., an invalid name, whereas for the second species he proposed the name *Erythrophyllum ferrugi-*

nascens (Stirt.) Szafr. Alas, the intended new combination was not validly published, because the basionym was not cited in full and only an indirect reference to *Barbula ferruginascens* Stirt. of 1900 was given, whereas according to Art. 41.5 of the *Shenzhen Code* (Turland et al., 2018) a full and direct reference is required for names published after 1952. This requirement was already included in the *Paris Code* (Lanjou et al., 1956) which was in force when Szafran (1957) published the name.

Two years later Lisowski (1959) reported the third species of the genus *Erythrophyllum*, *E. alpigenum* (Jur.) Loeske (as *E. alpigenum* (Venturi) Loeske), from a single locality in the Western Tatra Mountains in the Polish Western Carpathians. The record of this species was ignored by Szafran (1961) who failed to comment on it in the section "Corrections and additions to Volume I" presented at the end of the second volume of his moss Flora of Poland which went to print only on 10 December 1960 and Lisowski's (1959) work was available to this author because it was cited in References.

This taxon was accepted in two subsequent editions of a checklist of Polish mosses (Ochyra & Szmajda, 1978; Ochyra et al., 2003), but as a variety, *Bryoerythrophyllum recurvirostrum* var. *dentatum* (Schimp.) H.A.Crum, Steere & L.E.Anderson, because its status as a species in its own right was questioned by some authorities (e.g. Crum et al., 1964; Flowers, 1973; Zander, 1978; Nyholm, 1989). Hodgetts (2015) reported *B. alpigenum* from Poland, apparently based on the earlier literature report. Because the voucher specimen of this species has never been re-examined since its collection, the author decided to revise it during the course of the preparation of a new checklist and red list of the mosses in Poland to verify whether this taxon was correctly reported from the country at all.

MATERIAL AND METHODS

The present study is based on the specimen which was collected in 1957 in the Western Tatra Mountains by the late Professor Stanisław Lisowski. It is currently housed in the bryophyte herbarium of the Natural History Collections at the Faculty of Biology of the Adam Mickiewicz University in Poznań (POZG) and its duplicate

is held in KRAM. The specimen was studied by routine microscopic and laboratory techniques. Photographs of the habit and anatomical details were taken using an E-600 Olympus camera mounted on an Olympus SZ61 binocular microscope and Olympus BX53 compound microscope. The distribution of the species was plotted on a map according to the ATMOS grid square system (Ochyra & Szmajda, 1981) using the CorelDraw X7(64-Bit) programme.

POLISH REPRESENTATION

Careful examination of the voucher specimen of *Bryoerythrophyllum alpigenum* from the Polish Western Tatra Mountains confirmed the correctness of its determination by Lisowski (1959). Although no original specimens of this species cited in the protologue have been studied, the Polish plants perfectly match other European and Asian collections of *B. alpigenum*. It is evidenced by the following description and the illustrations of the essential diagnostic traits (Fig. 1).

The Polish herbarium material of *Bryoerythrophyllum alpigenum* consists of medium-sized, fairly stiff and loosely tufted plants that are dull, dark green to olive-green above and reddish-brown to brown below. The stems are erect, irregularly branched to rarely simple, 0.8–2.5 cm tall, with clusters of red to red-brownish, smooth and branched rhizoids scattered at the base, in cross-section rounded to obscurely rounded-pentagonal, consisting of a large central strand, 4–5 layers of large, hyaline, thin-walled medullary cells and a 1–3-stratose cortex of rather large cells with brown and moderately thickened walls and without a hyalodermis. The leaves are contorted and crisped when dry, spreading on wetting, 2.5–4.0 mm long, 0.4–0.6 mm wide, plane to broadly concave, from an ovate to oblong, semivaginant and loosely appressed base gradually narrowed to a broadly lanceolate limb which is acute or broadly acute to apiculate and usually ending with a smooth, brown, pellucid conical apical cell. The leaf margins are unistratose and not bordered throughout, narrowly recurved to revolute on both sides from the base or somewhat above to mid-leaf or two thirds the leaf length, plane above, sharply dentate to far down from the apex with prominent teeth formed usually by one large, brown, smooth

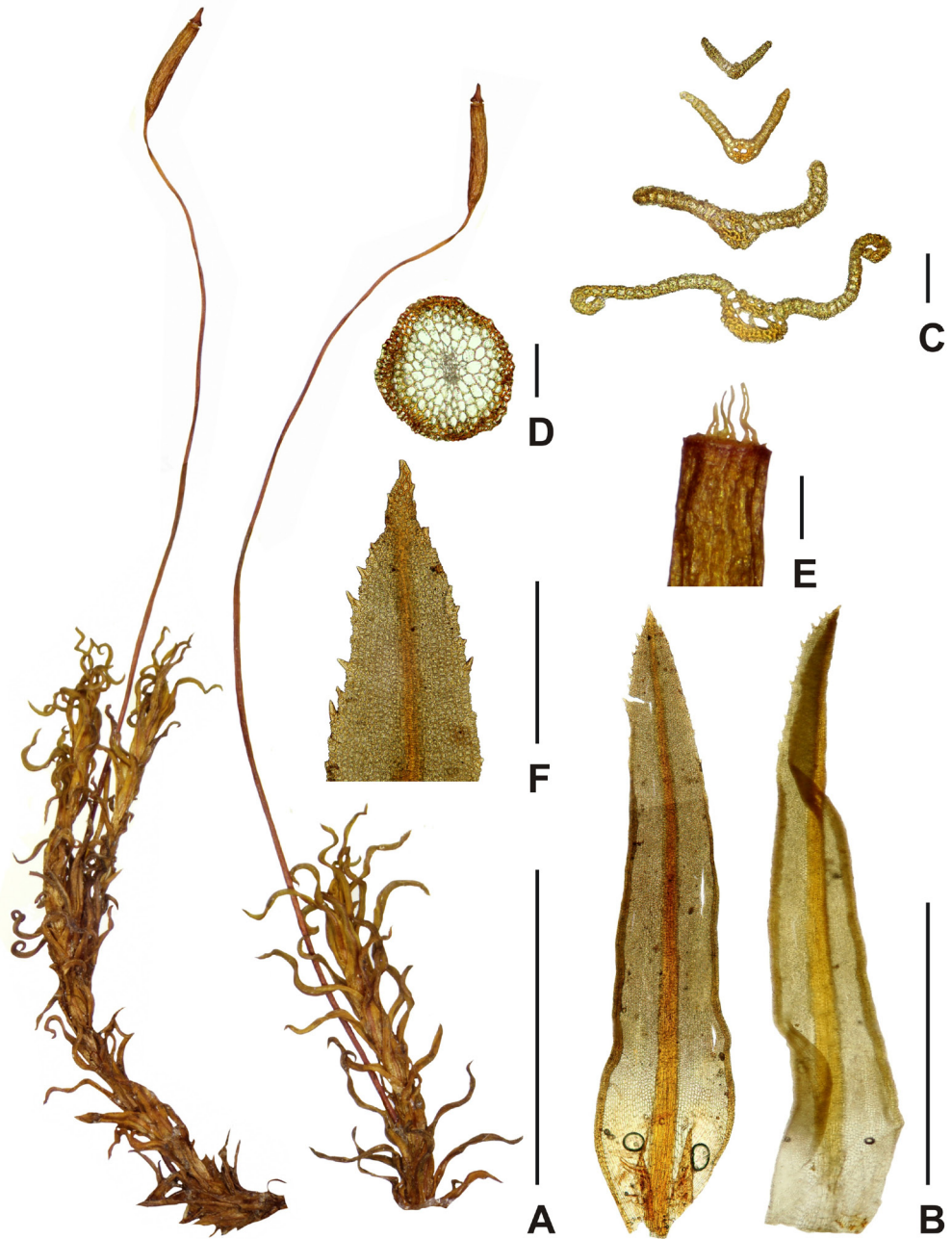


Fig. 1. *Bryoerythrophyllum alpigenum* (Jur.) P.C.Chen. A – habit of two shoots with sporophytes, dry; B – leaves; C – leaf cross-section, sequentially from base to apex; D – stem cross-section; E – upper part of urn with peristome teeth; F – distal part of leaf showing marginal dentation. All from *Lisowski 65515* (KRAM B-232478). Scale bars: A – 1 cm; B – 1 mm; C–D – 100 μ m; E – 1 mm; F – 0.5 mm.

and pellucid apical cell and often a few smaller, smooth or papillose basal cells. The costa is single, subpercurrent, 80–90 µm wide at the base, gradually tapering upwards, flat adaxially and strongly convex abaxially below, in transverse section semi-terete above and reniform to lunate in profile below, consisting of a median row of 2–4 enlarged guide cells which separates two stereid bands, smaller and reduced on the adaxial side and large and prominent on the abaxial side. The upper and median laminal cells are subquadrate, quadrate to hexagonal, with moderately evenly thickened walls, opaque due to the strong papillosity on both sides with 4–6 C-shaped papillae per lumen. The basal juxtacostal cells are elongate-rectangular, enlarged, 30–70 µm long and 10–15 µm wide, becoming narrower towards the margins, smooth, hyaline, thin-walled, lax and somewhat bulging. The plants from the Tatra Mountains are synoicous and they are in fine fruiting condition and produce sporophytes in great profusion. The perichaetia are terminal but they appear lateral owing to the subfloral innovation stretching to nearly the same direction as that of the preceding stem. The perichaetial leaves are elongate, sheathing and somewhat larger than the vegetative leaves but they are otherwise similar in shape. The setae are erect, straight, 1.5–2.0 cm long, smooth, reddish-brown and dextrorse on drying. The capsules are long exserted, erect, straight to somewhat curved, symmetric or nearly so, cylindrical, 2–4 mm long, 0.4–0.6 mm wide, smooth, leptodermous and reddish-brown. The operculum is stout, conical, to 0.6 mm long, straight or obliquely short-rostrate. The exothecial cells are short- to long-rectangular, arranged in regular longitudinal rows throughout the urn, 15–30 µm wide, 30–130 µm long, firm to moderately thicker-walled, becoming small, quadrate and thick-walled at the capsule mouth and forming a differentiated, 2–3-seriate, brown suboral ring. The stomata are situated at the extreme base of the urn, superficial, bicellular, with elliptical or rounded pori. The annulus is uniseriate, deciduous, composed of pale yellowish or pale brownish vesiculose cells to 50 µm long and extremely thick-walled. The 16 peristome teeth have a low basal membrane and become linear-lanceolate to filamentous above, 340–360 µm long, nodose-articulate, pale brown to yellowish, entire or irregularly cleft at the tips and densely finely papillose. The spores

are globose, brownish, 14–17 µm in diameter, finely papillose. The calyptra is cucullate, naked and smooth.

Because all morphological traits which are diagnostic for *Bryoerythrophyllum alpigenum* are present in the plants from the Tatra Mountains, this species is reinstated in the moss flora of Poland. So far, the species was only once recorded in Poland some 63 years ago, in the Dolina Kościeliska valley in the Western Tatra Mountains (Fig. 2), and it has not been rediscovered since. Habitat data for this specimen are scanty and the only information is that the moss was gathered in crevices of calcareous rocks. Because there is insufficient appropriate data on the distribution, abundance and current population state of *B. alpigenum* to allow a direct or indirect assessment of its risk of extinction in Poland, this species is classified in the Data Deficient (DD) category on the IUCN Red List of Threatened Species (IUCN, 2012, 2019). The same status has been granted to the species in Norway, Sweden and Slovakia (Hodgetts, 2015), although in the last-named the species is apparently erroneously recorded since it is missing from the newest checklist and red list of the Slovak mosses (Mišíková et al., 2020). On the other hand, *B. alpigenum* is listed as Vulnerable (VU) in Switzerland and Critically Endangered (CR) in Romania (Hodgetts, 2015). Finally, in the newest red list of European bryophytes it is considered as a Vulnerable species (Hodgetts et al., 2019).

Specimens examined: EUROPE. **POLAND.** Polish Western Carpathians, Western Tatra Mountains: Dolina Kościeliska valley, near the Wincenty Pol Cross at the outlet of the Dolina Smytnia valley below Zamki at the western end of the Żar Smreczyński ridge, lat. 49°14'10"N, long. 19°51'37"E, alt. 1060 m a.s.l., in a fissure of calcareous rocks, ATMOS grid square Gd-59, 30 August 1957, *Lisowski* 65515 (KRAM B-232478, POZG). **AUSTRIA. Tirol.** *Lienz District:* Innervillgraten, in springs in Ahrnthal valley, alt. 1600 m, *Gander* s.n. (*Flora Exsiccata Austro-Hungarica* No. 2327) (KRAM B-5567). *Imst District:* Ötztaler Alpen, Pitztal, on moist sandstone blocks on a wooded heap trickled by water of the Pitze stream above Schön, alt. ca 1060 m, 10 July 1980, *Düll* s.n. (KRAM B-50762). *Innsbruck-Land District:* near Kematener Waterfalls near Innsbruck on wet slate blocks, alt. 720 m, 19 August 1903, *Schiffner* s.n. (*Musci Europaei Exsiccati* No. 150) (KRAM B-62565); Lavirenbad near Hall, on schistose soil by stream, alt. ca 900 m, *Schiffner* s.n. (*Kryptogamae Exsiccatae* No. 1678b) (KRAM B-63927). **ITALY.** *Trentino-Alto Adige Region:* Val Gardena [Grödnertal],

in stream below Rifugio Firenze [Regensburgerhütte], *Achtner s.n.*, comm. *F. Matouschek* (*Kryptogamae Exsiccatae* No. 1678) (KRAM B-63939). ASIA. **RUSSIA.** **Altai Republic.** Altai Mountains, northern shore of Teletzkoe Lake, 1.5 km upstream Ok-porok Creek, on rocks near the stream, on rather lightened place, 25 June 1991, *Ignatov s.n.* (*Mosses of [the] USSR* No. 170) (KRAM B-92167).

DISCUSSION

Differentiation – *Bryoerythrophyllum alpigenum* belongs to the *B. recurvirostrum* complex of species and it is similar to the core species of this group. Since its inception it has been interchangeably considered either as a variety or subspecies of *B. recurvirostrum* or a distinct species. The latter approach appears to predominate in recent decades and the species status of *B. alpigenum* is widely accepted in the Floras, catalogues and checklists in Europe and Asia (e.g. Podpěra, 1954; Abramova et al., 1961; Savicz-Lyubitskaya & Smirnova, 1970; Corley et al., 1981; Bachurina & Mel'nichuk, 1988; Cortini Pedrotti, 2001; Li et al., 2001;

Ignatov et al., 2006; Hill et al., 2006; Aleffi et al., 2008; Hallingbäck et al., 2008; Ros et al., 2013; Hodgetts et al., 2020).

Despite the overall similarity to *Bryoerythrophyllum recurvirostrum*, the species is easily distinguished by its plane and sharply dentate leaves in the distal half or third. Occasionally, the dentation of the leaf margins extends to the proximal part of leaves and it is especially prominent on young leaves because on older ones it is usually obscured by the strong recurvature of the leaf margins in lower parts of the leaf. In addition, the plants are larger to moderately robust and the leaves are usually longer, 2.5–4.0 mm. Likewise, the capsules are usually long cylindrical, 2.5–3.8 mm, and often slightly curved. Interestingly, Hallingbäck et al. (2008) reported the extraordinarily large spores for the Scandinavian plants of *B. alpigenum*, 30–35 µm in diameter, which has not been confirmed either in Polish or Eurasian specimens (Cortini Pedrotti, 2001; Fedosov & Ignatova, 2008). Nor have such extremely large spores ever been detected in any

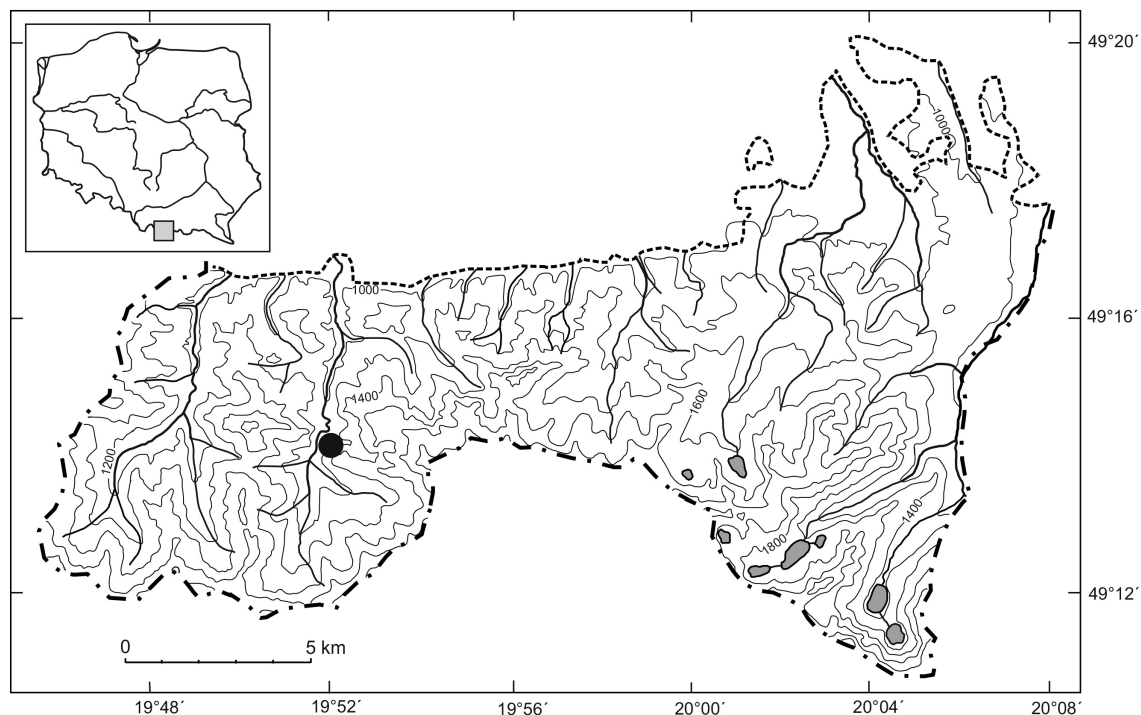


Fig. 2. Distribution map for *Bryoerythrophyllum alpigenum* (Jur.) P.C.Chen in the Polish Tatra Mountains and position of these mountains in Poland (inset).

species of *Bryoerythrophyllum*, in which their size does not exceed 20 µm in diameter (Zander, 1978, 2007; Fedosov & Ignatova, 2008).

The leaf margins of *Bryoerythrophyllum recurvirostrum* are recurved on both sides nearly to the apex and have only a few teeth at the leaf tip or are edentate. Moreover, the plants are small to medium-sized, the leaves are shorter, to 2.8 mm, and the capsules are generally straight and shorter, 1.2–2.8 mm. In order to leave no room for doubt as far as the specific distinctness of *B. alpigenum* is concerned, molecular analyses of eight Eurasian species of this genus were performed (Fedosov & Ignatova, 2008). The phylogenetic analyses of the ITS region carried out with use of the MP (NONA) and MB (Mr Bayes 3.1.2) programmes gave principally similar tree topologies and in both cases *B. alpigenum* formed separate clades with the highest support. In this way its status of a distinct species was convincingly demonstrated.

Taxonomic and nomenclatural history – *Bryoerythrophyllum alpigenum* was recognised for the first time as a separate taxon by Schimper (1860). He described it as a variety, *Didymodon rubellus* var. *dentatus* Schimp., on the basis of a specimen collected in the Alps of the state of Salzburg, Austria. Several years later it was recorded in the Rhaetian Alps of Switzerland (Pfeffer, 1869) and in the summer of 1870 G. Venturi collected this taxon in Val di Rabbi in the present Trentino-Alto Adige region of Italy and the specimens were distributed in the *Erbario Crittogamico Italiano* exsiccata under No. 457 as *Didymodon rubellus dentatus* (Cuccuini, 1997). Additional specimens of this taxon were found in the 1870s in the Alps of Austria, including the states of Styria, Salzburg and Tirol (Juratzka, 1882; Limpricht, 1888). Outside Europe, this variety has been reported from Clavering Island in East Greenland and the material was collected by the Second German North Polar Expedition of 1869–1870 on the schooner *Germania* under the command of Captain Karl Koldewey (Müller, 1874 as *Trichostomum rubellum* var. *dentatum* (Schimp.) Müll.Hal.). Finally, Müller (1883) reported this taxon for the first time from Asia where it was collected in the summer of 1881 by the Krause brothers on the Chukotka Peninsula.

While *Bryoerythrophyllum alpigenum* has now gained wide acceptance as a separate species,

nomenclatural problems related to the status of the species name itself and the correct citation of its author are still the subject of controversy. This name has an exceptionally entangled and chequered nomenclatural history and like no other name of European moss is fraught with many mistakes and errors in its interpretation. In fact, the only certain thing is that the epithet *alpigenum* was coined by Italian bryologist Gustavo Venturi (1830–1898), but it is only now becoming clear by whom, when and where it was validly published. If the data available in *Index muscorum* (Wijk et al., 1959, 1962, 1969), now regarded as the oracle on nomenclatural issues, are accepted it can be said that the epithet *alpigenus* was validly published as *Didymodon alpigenus* in Juratzka (1882) and the compilers of this bryological compendium considered it as a basionym of *Bryoerythrophyllum alpigenum*. At the same time this name was ascribed to Venturi alone followed by “in Juratzka” and this means that Venturi was the author both of the name and of the validating description, which is clearly not the case. Alas, the problem is much more complex and it needs more detailed explanation.

The epithet *alpigenum* appeared for the first time in the literature as the binomial *Trichost.[omum] alpigenum* in the work of W. Pfeffer (1845–1920), a well-known German plant physiologist, pharmacists and chemist, who in the early years of his scientific career was involved in studies on bryophytes of the Rhaetian Alps when living and working as an assistant pharmacist in Chur, Switzerland, in 1865–1869 (Fitting, 1920). He completed the moss Flora of these mountains which was initially published in March 1869 (Stafleu & Cowan, 1983) as a preprint (Pfeffer, 1869) and in December of the same year two reviews of it were published in *Hedwigia* (Juratzka, 1869) and *Botanische Zeitung* (H. S., 1869; these are apparently initials of Hermann Schlagintweit (1826–1882), an investigator of the Western Alps according to Frahm & Eggers, 1995). Only two years later this work was published as a regular fifth article with unchanged pagination in Volume 24 of *Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften* in Zürich (Pfeffer, 1871). Pfeffer (1869, p. 30) reported *Didymodon rubellus* [var.] β. *dentatus* from four localities in the Rhaetian Alps and gave a brief comment on this taxon: “Dr. Venturi hat neuerdings dieses Moos

zu einer eigenen Art, Trichost. *alpigenum*, erhoben” which means: “Dr. Venturi has recently raised this moss to species of its own, Trichost. [omum] *alpigenum*”. Unfortunately, this cannot be accepted as a valid publication of *Trichostomum alpigenum* as a replacement name for the Schimper’s (1860) variety. This is simply because Pfeffer did not accept the name (Art. 36.1) and it is clear that the whole entry for *Didymodon rubellus* β . *dentatus* was written by himself, so there is no suggestion that Venturi provided any of it.

The second time the epithet *alpigenus* was used for this pottialean moss was ten years later by Venturi (1879) himself. After graduating with a law degree, Gustavo Venturi worked as an attorney in Trento from where, since the late 1860s, he researched, as a hobby, bryophytes of the Alps in the Trentino-Alto Adige region. The results of his early studies were summarised in a list of mosses collected in the Italian Tirol (Venturi, 1879) and his long-term investigations on the bryophyte flora of this region were crowned in a treatment, which was published twenty years later, shortly after his death (Venturi, 1899). In the former work, Venturi (1879, p. 53) reported the following species collected at two localities in waterfalls: “*Didymodon alpigenus* mihi. – Ad cataracta. Rabbi et Pejo”. This is the second appearance of the epithet *alpigenus* and the authorship “mihi”, i.e. “me” (Venturi) indicates that he intended to publish *Didymodon alpigenus* as a new species but without any descriptive material, thus not validly publishing this name under Art. 38.1.

The first detailed treatment of *Didymodon alpigenus* was presented by the famous Austrian bryologist Jakob Juratzka (1821–1878) who, in the 1870s, was working on a Flora of the mosses of the Austro-Hungarian Monarchy. Unfortunately, his premature death interrupted this work and the manuscript covering acrocarpous mosses and a few families of pleurocarpous mosses was compiled and edited by J. Bredler and J. B. Förster and published posthumously four years after the death of its author (Juratzka, 1882). Amongst many taxonomic and nomenclatural novelties published in this Flora, he provided a thorough description of *D. alpigenus* along with the information on its habitat requirements and cited four gatherings from Austria and one from

the Trentino-Alto Adige region in Italy which then belonged to Austria, which were found to grow in moist and wet rock crevices near waterfalls and on stream banks in the foothills of the Alps.

The essential nomenclatural question is whether Juratzka’s (1882) intent was to describe *Didymodon alpigenus* as a new species or to introduce a new name for *D. rubellus* var. *dentatus* at species rank. It is because, on the one hand, Juratzka (1882) placed the legitimate (Art. 55.2) and previously published name *Didymodon rubellus* var. *dentatus* (Schimper, 1860) in synonymy of *D. alpigenus* and included the type material of this variety in the protologue of this species. Incidentally, the epithet *dentatus* could not be available in *Bryoerythrophyllum* due to *Bryoerythrophyllum dentatum* (Mitt.) P.C.Chen which is based on *Didymodon dentatus* Mitt. (Mitten, 1859). On the other hand, Juratzka (1882) provided a description of *Didymodon alpigenus* and cited no fewer than four other gatherings in the protologue and thus fulfilled the provisions of the valid publication of the name of a new species. It is most likely, however, that neither was Juratzka’s intent as he cited the name as “*Didymodon alpigenus* (Vent.)” apparently intending it as a new combination based on the unpublished synonym that he cited, “*Trichostomum alpigenum* Vent. in sched.”, not something permitted under modern rules of nomenclature.

The long-standing problem of deciding when a name was that of a new taxon or was a replacement name is successfully clarified in Art. 6.13 of the *Shenzhen Code* (Turland et al., 2018). Because the name *Didymodon alpigenus* proposed by Juratzka (1882) has not been so far typified, whichever specimen cited in the protologue can be selected as a lectotype, naturally, following Recommendation 9A. Selection of the Schimper specimen “ad arborum radices irroratas secus rivulum in *Velberthal* Pinzgaviae reperi” would establish *D. alpigenus* as a replacement name for *D. rubellus* var. *dentatus*, whereas selection of any other element from Juratzka’s (1882) account would make it the name of a new species.

The problem of the final nomenclatural status of the species name itself seems to be of secondary importance and will depend primarily on which specimen cited in the protologue will be chosen

as the lectotype. However, of special importance is also the authorship of the basionym of *Bryoerythrophyllum alpigenum*.

Apart from *Didymodon rubellus* var. *dentatus*, Juratzka (1882) placed two species designations in synonymy of *D. alpigenuus*, namely *D. dentatus* J.[ur.] in sched. and *Trichostomum alpigenum* Vent.[uri] in sched. which, according to him, were used on herbarium labels. The compilers of *Index muscorum* (Wijk et al., 1969) disregarded the publication of the latter binary designation in the works of Pfeffer (1869) and Juratzka (1882) and attributed it to Limpricht (1888). At the same time they failed to check Limpricht's (1888) ascription of *Didymodon alpigenuus* to Venturi (1879).

As noted above, when publishing *Didymodon alpigenuus*, Juratzka (1882) attributed the name to "(Vent.)". The reference to the unpublished designation *Trichostomum alpigenum* is not ascription of *D. alpigenuus* to Venturi (Art. 46.4) and the name should be cited as *D. alpigenuus* Jur., not as *D. alpigenuus* Venturi ex Jur. as accepted in the database TROPICOS [http://legacy.tropicos.org/name/35115769, accessioned on 22 April 2020] or, in no case, "Venturi in Jur." as done by Wijk et al. (1959, 1962, 1969), because there is no indication that Venturi provided the validating description.

Although Juratzka (1882) was the first to provide a description of *Didymodon alpigenuus* and thus validly publishing the name, his authorship of this name was generally ignored by his contemporaries and their successors and in all major Floras, exsiccatae and indices of mosses *D. alpigenuus* was commonly ascribed to Venturi (1879) in which this name was a classical *nomen nudum*, lacking any descriptive material (e.g. Limpricht, 1888; Kerner, 1893; Paris, 1904; Roth, 1905). When transferring *D. alpigenuus* to *Bryoerythrophyllum* Chen (1940) cited *Didymodon alpigenuus* Venturi 1879 as a basionym of *Bryoerythrophyllum alpigenum* (Jur.) P.C.Chen. Nevertheless, this combination is validly published under Art. 41.3 since before 1 January 1953 an indirect reference to a basionym or replaced synonym is sufficient for valid publication of a new combination and therefore errors in the citation of the basionym or replaced synonym, or in author citation, do not affect valid publication of such

names. Correctly, the basionym of *Bryoerythrophyllum alpigenuus* is *Didymodon alpigenuus* Jur.

In the present account only the entangled taxonomic and nomenclatural history of *Bryoerythrophyllum alpigenuus* and *B. recurvirostrum* var. *dentatum* is outlined and the correct authorship of the former name clarified. It is summarised in the following entry. These names have not so far been lectotypified and, unfortunately, the relevant original material of the two names has not been available for study either in BM or W, under the current health pandemic restrictions.

BRYOERYTHROPHYLLUM ALPIGENUM (Jur.) P.C.Chen
 Stud. Ostasiat. Art. Pottiaceae: 5. 1940 = *Didymodon alpigenuus* Jur., Laubm.-Fl. Oesterr.-Ung.: 98. 1882 [*Trichostomum alpigenuus* Venturi in W.Pfeffer, Bryogeogr. Stud.: 30. 1869, *nom. nud. in synon.*; *Didymodon alpigenuus* Venturi, Rev. Bryol. 6: 53. 1879, *nom. nud.*] = *Barbula rubella* subsp. *alpigenua* (Jur.) Kindb., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 7(9): 148. 1883 = *Barbula alpigenua* (Jur.) Lindb. & Arnell, Kongl. Svenska Vetensk. Acad. Handl., N. Ser. 23(10): 71. 1890 = *Erythrophyllum alpigenuum* (Jur.) Loeske, Hedwigia 47: 175. 1908 = *Didymodon rubellus* subsp. *alpigenuus* (Jur.) J.J.Amann, Fl. Mouss. Suisse 2: 91. 1918 [*D. rubellus* var. *alpigenuus* (Jur.) I.Hagen, Kongel. Norske Vidensk. Selsk. Skr. (Trondheim) 1928(3): 69. 1929, *nom. inval. in synon.*] = *Bryoerythrophyllum recurvirostrum* subsp. *alpigenuum* (Jur.) Giacom., Ist. Bot. Reale Univ. Reale Lab. Crittog. Pavia, Atti 5(4): 210. 1947. **Type citation:** [Austria] Steierm.: Am Rissachfall b. Schladming (B[reidler]). – Salzbg.: Am Fusse des Hundsstein b. Saalfelden u. am Krimler Fall (B[ar]tsch.); im Velberthale (Sch[im]p[er]). – Tirol: An nassen Orten unter der Thurneralpe b. Lienz (Gand[er].); am Wasserfall im Rabbithale unweit des Sauerbrunnens (Vent[uri]). (This name has not hitherto been lectotypified and no original material has been examined during the course of the present study.)

Didymodon rubellus var. *dentatus* Schimp., Syn. Musc. Eur.: 131. 1860 = *Trichostomum rubellum* var. *dentatum* (Schimp.) Müll.Hal., Zweite Deutsche Nordpolarf., Bot. 2: 74. 1873 [*Didymodon dentatus* Jur., Laubm.-Fl. Oesterr.-Ung.: 98. 1882, *nom. nud. in synon.*; *D. venturii*

Jur. in Paris, Index Bryol. Ed. 2, 2: 65. 1904] = *Barbula rubella* var. *dentata* (Schimp.) Braithw., Brit. Moss Fl. 1: 261. 1887 = *Barbula recurvirostris* var. *dentata* (Schimp.) C.E.O.Jensen, Skand. Bladmossfl.: 243. 1939 = *Didymodon recurvirostris* var. *dentatus* (Schimp.) Steere in Grout, Moss Fl. N. Am. 1: 187. 1938 = *Bryoerythrophyllum recurvirostrum* var. *dentatum* (Schimp.) H.A.Crum, Steere & L.E.Anderson, Bryologist 67: 163. 1964. **Type citation:** [Austria] ... in Velberthal Pinzgaviae reperi. (This name has not so far been lectotypified and no original material has been examined during the course of the present study.) First synonymised by Juratzka (1882: p. 98).

Geographical distribution – Global distribution of *Bryoerythrophyllum alpigenum* is still imperfectly known because of the serious discrepancies with regard to the taxonomic status of this species as well as the lack of the accurate assessment of its records from various parts of the globe. At present only the Eurasian range of this species is fairly well known. Its main centre of distribution is in the Alps, where it occurs from the foothills to the subalpine zone, including France (Legland & Garraud, 2018), Switzerland (Swissbryophytes, 2004–2020; Bagutti & Hofmann, 2007), Italy (Aleffi et al., 2008), Austria (Düll, 1991; Grims, 1996; Köckinger et al., 2008; Schröck et al., 2013) and Slovenia (Pavletić, 1955). It was also reported from Bavaria and Baden-Württemberg in Germany, but these records are doubtful since either the voucher specimens are missing and cannot be verified or they proved to be misnamed (Ahrens, 2000; Meinunger & Schröder, 2007). Outside the Alps, *B. alpigenum* is exceedingly rare in the Carpathians where some individual finds are known from the Western Carpathians of Poland (Lisowski, 1959 and the present account) and the Eastern Carpathians in the Ukraine (Bachurina & Mel'nychuk, 1988) and Romania (Mohan, 2015), but the latter two discoveries has never been critically verified. Likewise, the species is very rare in Scandinavia where single records are known from Norway and Sweden (Hallingbäck et al., 2008). The record of *B. alpigenum* from Slovakia (Hodgetts, 2015) appears to be erroneous since the species is missing from the newest checklist of the Slovak mosses (Mišíková et al., 2020).

In Asia, *Bryoerythrophyllum alpigenum* is widely distributed but scattered. It was reported for the first time from the Chukotka Peninsula by Müller (1883 as *Trichostomum alpigenum*) and later accepted by Brotherus (1918). However, this record was questioned by Abramova and Abramov (1980), who stated that one voucher specimen studied correctly represented *B. recurvirostrum*, thus making occurrence of *B. alpigenum* in the area dubious (Afonina, 2004). Currently in Russian Asia, this species is known from Siberia including Taimyr (Fedosov et al., 2015), Yakutia (Ivanova et al., 2005), the Altai Mountains (Fedosov & Ignatova, 2008), the Eastern Sayan Mountains in Buryatia (Afonina, 2009), the Western Sayan Mountains in the Republic of Khakasia (Ellis et al., 2019) and from a highly disjunct station on Iturup Island in the Southern Kurils in the Russian Far East (Fedosov & Ignatova, 2008). Additionally, the literature records show *B. alpigenum* as being known from Mongolia (Tsegmed, 2010), the Sino-Himalayan region (Xizang, Sichuan and Yunnan provinces) and Shaanxi province in China (Li et al., 2001) as well as the Eastern Himalaya in India (Lal, 2005) and Pakistan (Higuchi & Nishimura, 2003).

Outside Eurasia, *Bryoerythrophyllum alpigenum* was also reported from North America (e.g. Steere, 1938; Flowers, 1973; Ireland et al., 1987), but Zander (2007) disregarded all records of this species from this part of the Holarctic and merged them with *B. recurvirostrum*. *Bryoerythrophyllum alpigenum* belongs to a group of Holarctic mosses which deeply penetrate into the tropics where they occur at montane and altimontane elevations. It was recorded from Uganda, Kenya and Tanzania in tropical East Africa (Kis, 1985; O'Shea, 2006) and recently also from Ethiopia (Sollman, 2008). These records definitely need to be re-evaluated by verifying the determinations of the relevant voucher specimens.

Additionally, *Bryoerythrophyllum alpigenum* is sometimes considered a bipolar species which is known from Australasia. The primary source of this information is a comment on the discovery of *B. recurvirostrum* in New Zealand presented by Dixon (1923 as *Didymodon rubellus*), who found that the New Zealand specimens fully

matched the British plants which were classified as *Barbula rubella* var. *dentata* (Braithwaite, 1887; Dixon & Jameson, 1896). A year later, Dixon (1924) stated that “Whatever the value of *B. alpigena* therefore, it can scarcely be correct to unite it with Schimper’s variety, nor can we claim it as British”, thus excluding this taxon from the British moss flora and until now it remains unknown in the British Isles (Smith, 2004). Nevertheless, Sainsbury (1955) accepted this variety in the moss Flora of New Zealand, although his specimens bore out Dixon’s (1923) statement for New Zealand’s plants. Currently, *Bryoerythrophyllum alpigenum* is not accepted as a New Zealand species (Gibb et al., 2018).

Finally, the information on the occurrence of *Bryoerythrophyllum alpigenum* in Australia and/or Tasmania also sometimes appears in the literature (e.g. Savicz-Lyubitskaya & Smirnova, 1970 with a question mark; Li et al., 2001; Tsegmed, 2010; Ellis et al., 2019). It is very enigmatic because this species is not mentioned in any catalogues of Australian and/or Tasmanian mosses (Streimann & Curnow, 1989; Dalton et al., 1991; Streimann & Klazenga, 2002). It is very likely that this is the result of an error in Volume 2 of *Index muscorum* (Wijk et al. 1962) in which the occurrence of *Didymodon alpigenus* was indicated in “Austr. 1”, i.e. Australia and Tasmania. Although it was corrected for “Austr. 2” i.e. New Zealand in Volume 5 of *Index muscorum* (Wijk et al., 1969), the initial erroneous information on the occurrence of *B. alpigenum* in Australia began to live its own life and not rarely appeared in various publications dealing with this species.

Bryoerythrophyllum alpigenum was considered as a disjunct Holarctic subarctic-alpine species (Düll & Meinunger, 1989) or tropical subalpine-alpine-arctic species (Dierßen, 2001). If its current distribution is taken into consideration, *B. alpigenum* can be designated as a Eurasian temperate oreophyte weakly penetrating into the Arctic in Asia and extending to altimontane outposts in East African tropical mountains.

CONCLUDING REMARKS

The latest catalogue of Polish mosses was published 17 years ago (Ochyra et al., 2003) and it

contained 700 species, eight subspecies and 87 varieties which were classified in 207 genera and 55 families. Since then some 17 species have been added to the moss flora of the country, including *Orthotrichum shawii* Schimp. (Ruthe, 1873; Garilleti et al., 2006), *Bryoerythrophyllum alpigenum* (Jur.) P.C.Chen (Lisowski, 1959 and the present paper), *Fissidens rufulus* Bruch & Schimp. (Blockeel et al., 2006), *Zygodon stirtonii* Schimp. (Blockeel et al., 2007), *Leptophascum leptophyllum* (Müll.Hal.) J.Guerra & M.J.Cano (Fudali et al., 2009), *Grimmia teretinervis* Limpr. and *Didymodon validus* Limpr. (Ellis et al., 2010; Ochyra et al., 2011), *Thamnobryum neckeroides* (Hook.) E.Lawton (Ellis et al., 2012a; Stebel & Vončina, 2018), *Pterygoneurum lamellatum* (Brid.) Jur. (Ellis et al., 2015; Stebel et al., 2016), *Bryum gemmiferum* R.Wilczek & Demaret (Ellis et al., 2016), *Cryphaea heteromalla* (Hedw.) D.Mohr (Müller, 2016), *Ulotia intermedia* Schimp. and *U. crispula* Brid. (Caparrós et al., 2016), *Rhynchostegium rotundifolium* (Brid.) Schimp. (Vončina & Stebel, 2019), *Plagiothecium rossicum* Ignatov & Ignatova (Ignatova et al., 2019), and *Orthotrichum alpestre* Bruch & Schimp. and *O. schimperi* Hammar (Plášek & Ochyra, 2020). Moreover, one subspecies, *Pohlia nutans* subsp. *schimperi* (Müll.Hal.) Nyholm (Blockeel et al., 2005) and four varieties, namely *Barbula unguiculata* var. *robusta* Lindb. (Stebel et al., 2010), *Orthotrichum affine* var. *bohemicum* Plášek & Sawicki (Ellis et al., 2012b), *Microbryum davalianum* var. *conicum* (Schwägr.) R.H.Zander (Rusińska & Górski, 2012) and *Syntrichia ruralis* var. *epilosa* (Venturi) J.J.Amann (Ellis et al., 2018) have recently been discovered in Poland.

Unfortunately, changes in the flora of Polish mosses concern not only additions, but it turned out that two species were incorrectly recorded from the country. Examination of the voucher collections showed that the records of *Plagiomnium drummondii* (Bruch & Schimp.) T.J.Kop. (Stebel & Ochyra, 2004) and *Orthotrichum microcarpum* De Not. (Plášek & Sawicki, 2009) were based on misdeterminations and, accordingly, these two species were excluded from the bryoflora of Poland. Thus, considering all additions and deletions the flora of Polish mosses consists currently of 715 species, nine subspecies and 90 varieties.

ACKNOWLEDGEMENTS

Special thanks are due to Professor John McNeill, Edinburgh, U. K., for his priceless suggestions regarding nomenclatural issues and the valuable comment on the nomenclatural section of the paper. The author is also indebted to Dr Anna Rusińska, Poznań, for kindly allowing him to study the specimen of *Bryoerythrophyllum alpigenum* from POZG, Dr Vítězslav Plášek, Ostrava, the Czech Republic, for completing the plate, Mr Marian Wolski for generating the distribution map for this species in the Tatra and Professor Rodney D. Seppelt, Bundall, Queensland, Australia, for his kind revision of the English and valuable comment on the manuscript. The work has been financially supported through the statutory fund of the W. Szafer Institute of Botany of the Polish Academy of Sciences.

REFERENCES

- Abramova, A. L., Savicz-Lyubitskaya, L. I. & Smirnova, Z. N. 1961. *The handbook of the mosses of the Arctic of the USSR*. Moskva – Leningrad, Izdatel'stvo Akademii Nauk SSSR. 715 pp. (In Russian).
- Abramova, A. L. & Abramov, I. I. 1980. Materies ad examinationem bryoflorae Peninsulae Czukotka. *Novosti Sistematiki Nizshikh Rasteniy* 17: 179–200. (In Russian).
- Afonina, O. M. 2004. *Moss Flora of Chukotka*. Sankt-Peterburg, Botanicheskiy Institut im. V. L. Komarova RAN. 259 pp. (In Russian).
- Afonina, O. M. 2009. New moss records from Republic of Buryatia. 4. *Arctoa* 18: 273–274. <https://doi.org/10.15298/arctoa.18.07>
- Ahrens, M. 2000. *Bryoerythrophyllum* P. C. Chen. In: Nebel, M. & Philippi, G. (eds), *Die Moose Baden-Württembergs*. Band 1: Allgemeiner Teil. Spezieller Teil (Bryophytina I, Andreaeales bis Funariales). Stuttgart, Verlag Eugen Ulmer. Pp. 325–327.
- Aleffi, M., Tacchi, R. & Cortini Pedrotti, C. 2008. Check-list of the hornworts, liverworts and mosses of Italy. *Boccone* 22: 5–254.
- Bachurina, G. F. & Mel'nichuk, V. M. 1988. *The moss flora of the Ukrainian SSR – Andreaeidae, Bryidae. Part 2*. Kiev, Naukova Dumka. 180 pp. (In Ukrainian).
- Bagutti, B. & Hofmann, H. 2007. Die Moose des Kantons Bern (Schweiz). *Cryptogamica Helvetica* 21: 1–320.
- Blockeel, T. L. 2014. *Bryoerythrophyllum ferruginascens*. In: Blockeel, T. L., Bosanquet, S. D. S., Hill, M. O., Preston, C. D. (eds), *Atlas of British and Irish bryophytes. The distribution and habitat of mosses and liverworts in Britain and Ireland*. Volume 2. Newbury, Pisces Publications. P. 172.
- Blockeel, T., Kučera, J. & Fedosov, V. E. 2017. *Bryoerythrophyllum duellii* Blockeel (Bryophyta: Pottiaceae), a new moss species from Greece and Cyprus, and its molecular affinities. *Journal of Bryology* 39(3): 247–254. <https://doi.org/10.1080/03736687.2017.1317903>
- Blockeel, T. L., Bednarek-Ochyra, H., Ochyra, R., Garcia, C., Matcham, H. W., Sérgio, C., Sim-Sim, M., Stebel, A., Townsend, C. C. & Váňa, J. 2005. New national and regional bryophyte records, 11. *Journal of Bryology* 27(2): 163–168. <https://doi.org/10.1179/037366805X53103>
- Blockeel, T. L., Bednarek-Ochyra, H., Ochyra, R., Garilleti, R., Glime, J. M., Lara, F., Mazimpaka, V., Rusińska, A., Schaefer-Verwimp, A., Shabbara, H. M., Söderström, L., Stebel, A., Townsend, C. C., Váňa, J., Yayintaş, Ö. T. & Żarnowiec, J. 2007. New national and regional bryophyte records, 17. *Journal of Bryology* 29(4): 277–283. <https://doi.org/10.1179/174328207X249263>
- Blockeel, T. L., Enroth, J., Ertz, D., Hedderson, T. A. J., Holz, I., Jafari, M., Kürschner, H., Lara, F., Mazimpaka, V., Medina, R., Ramel, G., Schäfer-Verwimp, A., Shirzadian, S., Sotiaux, A., Sotiaux O., Stebel, A. & Tevili, A. 2006. New national and regional bryophyte records, 14. *Journal of Bryology* 28(3): 271–275. <https://doi.org/10.1179/174328206X157195>
- Braithwaite, R. 1887. *The British Moss-Flora*. Vol. I. Acrocarpi I, Part X. Fam. VIII. – Tortulaceae. III. Fam. IX. – Weberaceae. London, L. Reeve & Co. Pp. 245–315 + tab. xxxvii–xlv.
- Brotherus, V. F. 1918. Mosses (Bryales). Part 2. In: Fedchenko, B. A. (ed.), *Flora of Asian Russia*. Fascicle 13. Petrograd, Tipografiya M. P. Frolovoy. Pp. 81–182. (In Russian).
- Caparrós, R., Lara, F., Draper, I., Mazimpaka, V., & Garilleti, R. 2016. Integrative taxonomy sheds light on an old problem: the *Ulota crispa* complex (Orthotrichaceae, Musci). *Botanical Journal of the Linnean Society* 180: 427–451. <https://doi.org/10.1111/boj.12397>
- Chen, P.-C. 1940. *Studien über die ostasiatischen Arten der Pottiaceae. I*. Inaugural-Dissertation zur Erlangung des Doktorgrades gedehnt von der Mathematisch-Naturwissenschaftlichen Fakultät der Friedrich-Wilhelms-Universität zu Berlin. Dresden, C. Heinrich. 76 + [1] pp. [Preprint].
- Chen, P.-C. 1941. Studien über die ostasiatischen Arten der Pottiaceae. I. *Hedwigia* 80(1–2): 1–76.
- Corley, M. F. V., Crundwell, A., C., Düll, R., Hill, M. O. & A. J. E. Smith, A. J. E. 1981. Mosses of Europe and the Azores; an annotated list of species, with synonyms from the recent literature. *Journal of Bryology* 11(4): 609–689. <https://doi.org/10.1179/jbr.1981.11.4.609>
- Cortini Pedrotti, C. 2001. *Flora dei muschi d'Italia. Sphagnopsida, Andreaeopsida, Bryopsida (I parte)*. Roma, Antonio Delfino Editore Medicina-Science. xiii + 817 pp.

- Crum, H., Steere, W. C. & Anderson, L. E. 1964. New names for some North American mosses. *The Bryologist* 67(2): 162–164. <https://www.jstor.org/stable/3240801>
- Cuccuini, P. 1997. *L'Erbario Crittogamico Italiano. Storia e struttura di una collezione con una introduzione storica di A. Graniti*. Firenze, Museo Botanico dell'Università, Sezione del Museo di Storia Naturale. 165 pp.
- Dalton, P. J., Seppelt, R. D. & Buchanan, A. M. 1991. An annotated checklist of Tasmanian mosses. In: Banks, M. R., Smith, S. J., Orchard, A. E. & Kantvilas, G. (eds), *Aspects of Tasmanian botany – a tribute to Winifred Curtis*. Hobart, Royal Society of Tasmania. Pp. 15–32. <https://doi.org/10.26749/rstpp.124.2.15>
- Dierßen, K. 2001. Distribution, ecological amplitude and phytosociological characterization of European bryophytes. *Bryophytorum Bibliotheca* 56: 1–289.
- Dixon, H. N. 1923. Studies in the bryology of New Zealand, with special reference to the herbarium of Robert Brown, of Christchurch, New Zealand. Part IV. *New Zealand Institute Bulletin* 3(3): 75–152 + pls. vii–viii.
- Dixon, H. N. 1924. *The student's handbook of British mosses*. Ed. 3. Eastbourne, V. Sumfield. xlvii + 584 pp. + lxiii tab.
- Dixon, H. N. & Jameson, H. G. 1896. *The student's handbook of British mosses*. Eastbourne, V. T. Sumfield. xlvii + 520 pp. + lx tab. <https://doi.org/10.5962/bhl.title.55541>
- Düll, R. 1991. *Die Moose Tirols unter besonderer Berücksichtigung des Pitztals/Ötztaler Alpen*. [Band 1]. Bad Münstereifel, Ohlerath, IDH, Verlag. 224 pp.
- Düll, R. & Meinunger, L. 1989. *Deutschlands Moose. Die Verbreitung der deutschen Moose in der BR Deutschland und in der DDR, ihre Höhenverbreitung, ihre Arealtypen, sowie Angaben zum Rückgang der Arten*. 1. Teil: Anthocerotae, Marchantiatae, Bryatae: Sphagnidae, Andreaeidae, Bryidae: Tetraphidales – Pottiales. Bad Münstereifel, Ohlerath, IDH, Vewlag. 368 pp.
- Ellis, L. T., Asthana, A. K., Sahu, V., Srivastava, A., Bednarek-Ochyra, H., Ochyra, R., Chlachula, J., Colotti, M. T., Schiavone, M. M., Hradilek, Z., Jimenez, M. S., Klama, H., Lebouvier, M., Natcheva, R., Pócs, T., Porley, R. D., Sérgio, C., Sim-Sim, M., Smith, V. R., Söderström, L., Ștefănuț, S., Suárez, G. M. & Váňa, J. 2011. New national and regional bryophyte records, 28. *Journal of Bryology* 33(3): 237–247. <https://doi.org/10.1179/1743282011Y.0000000022>
- Ellis, L. T., Asthana, A. K., Sahu, V., Bednarek-Ochyra, B. H., Ochyra, R., Cano, M. J., Costa, D. P., Cykowska, B., Ochyra, R., Philippov, D. A., Dulin, M. V., Erzberger, P., Lebouvier, M., Mohamed, H., Ochyra, R., Orgaz, J. D., Phephu, N., van Rooy, J., Stebel, A., Suárez, G. M., Schiavone, M. M., Townsend, C. C., Váňa, J., Vončina, G., Yayintaş, Ö. T., Yong, K. T. & Zander, R. H. 2010. New national and regional bryophyte records, 25. *Journal of Bryology* 32(4): 311–322. <https://doi.org/10.1179/jbr.2010.32.4.311>
- Ellis, L. T., Bednarek-Ochyra, H., Ochyra, R., Benjumea, M. J., Saís, L. V., Caparrós, R., Lara, F., Mazimpaka, V., Dulin, M. V., Garilleti, R., Gremmen, N., Grundling, P.-L., Heras, P., Infante, M., Huttunen, S., Ignatov, M. S., Korvenpää, T., Lebouvier, M., Lewis Smith, R. I., Lin, S.-H., Yang, J.-D., Linström, A., Plásek, V., Rosselló, J. A., Sawicki, J., van Rooy, J. & Smith V. R. 2013. New national and regional bryophyte records, 35. *Journal of Bryology* 35(2): 129–139. <https://doi.org/10.1179/1743282013Y.0000000049>
- Ellis, L. T., Bednarek-Ochyra, H., Ochyra, R., Cykowska, B., Dulin, M. V., Ezer, T., Kara, R., Flores, J. R., Suárez, G. M., Garcia, C., Martins, A., Sérgio, C., Garilleti, R., Kirmaci, M., Agcagil, E., Kurbatova, L. E., Lebouvier, M., Papp, B., Szurdoki, E., Philippov, D. A., Plásek, V., Pócs, T., Sabovljević, M., Sawicki, J., Sim-Sim, M., Szűcs, P., Bidló, A., Váňa, J., Vigalondo, B., Lara, F., Draper, I., Virchenko, V. M. & Wolski, G. J. 2012b. New national and regional bryophyte records, 33. *Journal of Bryology* 34(4): 281–291. <https://doi.org/10.1179/1743282012Y.0000000030>
- Ellis, L. T., Alegro, A., Bansal, P., Nath, V., Cykowska, B., Bednarek-Ochyra, H., Ochyra, R., Dulin, M. V., Erzberger, P., Garcia, C., Sérgio, C., Claro, D., Stow, S., Hedderson, T. A., Hodgetts, N. G., Hugonnot, V., Kučera, J., Lara, F., Pertierra, L., Lebouvier, M., Liepina, L., Mežaka, A., Strazdiņa, L., Madžule, L., Rēriha, I., Mazooji, A., Natcheva, R., Phephu, N., Philippov, D. A., Plásek, V., Číhal, L., Pócs, T., Porley, R. D., Sabovljević, M., Salimpour, F., Behroozmand Motlagh, M., Sharifnia, F., Akhoondi Darzikolaei, S., Schäfer-Verwimp, A., Šegota, V., Shaw, A. J., Sim-Sim, M., Sollman, P., Spitale, D., Hölzer, A., Stebel, A., Váňa, J., van Rooy, J. & Vončina, G. 2012a. New national and regional bryophyte records, 32. *Journal of Bryology* 34(3): 231–246. <https://doi.org/10.1179/1743282012Y.0000000019>
- Ellis, L. T., Wilbraham, J., Aleffi, M., Asthana, A. K., Rawat, K. K., Gupta, D., Sahu, V., Katiyar, P., Asthana, G., Srivastava, A., Baráth, K., Bednarek-Ochyra, H., Bruno Silva, J., Emanuely de Araújo Farias, C., Rangel Germano, S., Czernyadjeva, I. V., Doroshina, G. Ya., Delgadillo Moya, C., Peña Retes, P., Erzberger, P., Fuertes, E., Garcia-Avila, D., Garilleti, R., Hedderson, T. A., West, A., Hugonnot, V., Kürschner, H., Lagrandie, J., Lara, F., Draper, I., Lebouvier, M., Lönnell, N., Hallingbäck, T., Mesterházy, A., Muñoz, J., Németh, C. S., Park, S. J., Sun, B.-Y., Pérez, G., Plásek, V., Poponessi, S., Vernanzoni, R., Gigante, D., Philippe, M., Porley, R. D., Sérgio, C., Ministro, P., Ștefănuț, S., Suárez, G. M., Flores, J. R., Sulayman, M.,

- Wilding, N. & Yoon, Y.-J. 2018. New national and regional bryophyte records, 54. *Journal of Bryology* 40(1): 74–97. <https://doi.org/10.1080/03736687.2018.1425573>
- Ellis, L. T., C. Ah-Peng, C., Aranda, S. C., Bednarek-Ochyra, H., Borovichev, E. A., Cykowska-Marzencka, B., Duarte, M. C., Enroth, J., Erzberger, P., Fedosov, V., Fojcik, B., Gabriel, R., Coelho, M. C. M., Henriques, D. S. G., Iliina, O. V., Gil-Novoa, J. E., Morales-Puentes, M. E., Gradstein, S. R., Gupta, R., Nath, V., Asthana, A. K., Koczur, A., Lebouvier, M., Mesterházy, A., Mogro, F., Mežaka, A., Németh, Cs., Orgaz, J. D., Sakamoto, Y., Paiva, J., Sales, F., Pande, N., Sabovljević, M. S., Pantivić, J., Sabovljević, A. D., Pérez-Haase, A., Pinheiro da Costa, D., Plášek, V., Sawicki, J., Szczecińska, M., Chmielewski, J., Potemkin, A., Schäfer-Verwimp, A., Schofield, W. B., Sérgio, C., Sim-Sim, M., Sjögren, S., Spitale, D., Stebel, A., Ștefanuț, S., Suárez, G. M., Flores, R. J., Thouvenot, L., Váňa, J., Yoon, Y.-J., Kim, J. H. & Zubel, R. 2015. New national and regional bryophyte records, 45. *Journal of Bryology* 37(4): 308–329. <https://doi.org/10.1179/1743282015Y.00000000035>
- Ellis, L. T., Aleffi, M., Asthana, G., Bhagat, C., Bakalin, V. A., Baráth, K., Becker, R., Bednarek-Ochyra, H., Boiko, M., Brito, M. R., Pimentel, C., Brugués, M., Sáez, L., Divojan, P., Enroth, J., Erzberger, P., Fedosov, V. E., Fontinha, S., Fuertes Lasala, E., Gabriel, M., Gallego, M., Gradstein, S. R., Himm, Th., Hugonnot, V., Ivchenko, T. G., Klimova, K. G., Kučera, J., Lamkowski, P., Lapshina, E. D., Lebouvier, M., López González, A. L., Ma, W.-Z., Manolaki, P., Monteiro, J., Vieira, C., Portela, A. P., Sim-Sim, M., Maksimov, A. I., Norhazrina, N., Syazwana, N., Asyifaa, S., Poponessi, S., Venanzoni, R., Gigante, D., Prosser, F., Potemkin, A. D., Kotkova, V. M., Sabovljević, M. S., Sabovljević, A. D., Schäfer-Verwimp, A., Sérgio, C., Garcia, C., Shevock, J. R., Stebel, A., Drobnik, J., Vončina, G. & Wei, Y.-M. 2018. New national and regional bryophyte records, 57. *Journal of Bryology* 40(4): 399–419. <https://doi.org/10.1080/03736687.2018.1523601>
- Ellis, L. T., Afonina, O. M., Czernyadjeva, I. V., Ivchenko, T. G., Kholod, S. S., Kotkova, V. M., Kuzmina, E. Yu., Potemkin, A. D., Sergeeva, Yu. M., Asthana, A. K., Gupta, D., Sahu, V., Srivastava, S., Bakalin, V. A., Bednarek-Ochyra, H., Campisi, P., Dia, M. G., Choi, S. S., Dagnino, D., Minuto, L., Turcato, C., Drapela, P., Dugarova, O. D., Tubanova, D. Ya., Enroth, J., Koponen, T., Klama, H., Erdağ, A., Kirmacı, M., Fedosov, V. E., Hodgetts, N. G., Holyoak, D. T., Jukonienė, I., Konstantinova, N. A., Savchenko, A. N., Vilnet, A. A., Krival, E. A., Kürschner, H., Lapshina, E. D., Larrain, J., Ma, W. Z., Maksimov, A. I., Marino, M., L., Müller, F., Pande, N., Park, S. J., Sun, B.-Y., Pivoras, A., Plášek, V., Puglisi, M., Sciandrello, S., Rajian, N. J., Suleiman, M., Schäfer-Verwimp, A., Shevock, J. R., Spitale, D., Stebel, A., Taha, M. A. & Porley, R. D. 2019. New national and regional bryophyte records, 61. *Journal of Bryology* 41(4): 364–384. <https://doi.org/10.1080/03736687.2019.1673601>
- Ellis, L. T., Agcagil, E., Kirmacı, M., Aleffi, M., Bakalin, V. A., Bednarek-Ochyra, H., Cykowska-Marzencka, B., Stryjak-Bogacka, M., Bojaca, G. F. P., Fantacelle, L. B., Araújo, C. A. T., Maciel-Silva, A. S., Bruno Silva, J., Calleja, J. A., Cano, M. J., Castillo Diaz, J., Gabriel, R., Dias dos Santos, N., Enroth, J., Erzberger, P., Garilleti, R., Hájek, M., Hedenäs, L., Heras, P., Infante, M., Kiebach, T., Koczur, A., Krawczyk, R., Kučera, J., Lebouvier, M., Lüth, M., Mazimpaka, V., Vigalondo, B., Lara, F., Nagy, J., Németh, Cs., Kovács, A., Nobis, M., Węgrzyn, M., Wietrzyk, P., Norhazrina, N., Vanderpoorten, A., Nowak, A., Poponessi, S., Gigante, D., Venanzoni, R., Plášek, V., Rangel Germano, S., Schäfer-Verwimp, A., Sérgio, C., Claro, D., Garcia, C. A., Shirzadian, S., Akhoondi Darzikolaci, A., Stebel, A., Suleiman, M., Yong, K.-T., Virchenko, V. M., Vončina, G., Yoon, Y.-J., Choi, H.-G. & Kim, J. H. 2016. New national and regional bryophyte records, 49. *Journal of Bryology* 38(4): 327–347. <https://doi.org/10.1080/03736687.2016.1225777>
- Fedosov, V. E. & Ignatova, E. A. 2008. The genus *Bryothyrophyllum* (Pottiaceae, Bryophyta) in Russia. *Arctoa* 17: 19–38. <https://doi.org/10.15298/arctoa.17.02>
- Fedosov, V. E., Borovichev, E. A., Ignatova, E. A. & Bakalin, V. A. 2015. The bryophyte flora of Eriechka River upper course (SE Taimyr) with comments on the first record of *Pseudoditrichum mirabile* in Asia. *Arctoa* 24(1): 165–186. <https://doi.org/10.15298/arctoa.24.17>
- Fitting, H. 1920. Wilhelm Pfeffer. *Berichte der Deutschen Botanischen Gesellschaft* 38: (30)–(63) + portrait.
- Flowers, S. 1973. *Mosses: Utah and the West*. Provo, Utah, Brigham Young University Press. xii + 567 pp.
- Frahm, J.-P. & Eggers, J. 1995. *Lexikon deutschsprachiger Bryologen*. Norderstedt, Books on Demand. 672 pp.
- Fudali, E., Szczepański, M., Rusińska, A., Rosadzinski, S. & Wolski, G. 2009. The current distribution in Poland of some European neophytic bryophytes with supposed invasive tendencies. *Acta Societatis Botanicorum Poloniae* 78(1): 73–80. <https://doi.org/10.5586/asbp.2009.010>
- Garilleti, R., Lara, F. & Mazimpaka, V. 2006. On the presence of *Orthotrichum shawii* Wilson (Orthotrichaceae) in California. *The Bryologist* 109(4): 110–115. [https://doi.org/10.1639/0007-2745\(2006\)109\[510:OTPOOS\]2.0.CO;2](https://doi.org/10.1639/0007-2745(2006)109[510:OTPOOS]2.0.CO;2)
- Gibb, E. S., Wilton, A. D., Schönberger, I., Fife, A. J., Glenny, D. S., Beaver, J. E., Boardman, K. E.,

- Breitwieser, I., Cochrane, M., de Pauw, B., Ford, K. A., Heenan, P. B., Korver, M. A., Novis, P. M., Prebble, J. M., Redmont, D. N., Smissen, R. D. & Tawiri, K. 2018. Checklist of the New Zealand flora – hornworts, liverworts and mosses. Lincoln, Manaaki Whenua-Landcare Research. 143 pp. <https://doi.org/10.7931/P14K9Z>
- Grims, F. 1999. *Die Laubmoose Österreichs*. Catalogus Florae Austriae, II. Teil, Bryophyten (Moose), Heft 1, Musci (Laubmoose). [Biosystematics and Ecology Series No. 15]. Wien, Österreichische Akademie der Wissenschaften. 418 pp.
- Hallingbäck, T., Lönnell, N. & Weibull, H. 2008. *Nationallynyckeln till Sveriges flora och fauna. Bladmoszor: Kompaktmossor – kapmossor. Bryophyta: Anoetangium – Orthodontium*. Uppsala, ArtDatatabanken, SLU. 504 pp.
- Higuchi, M. & Nishimura, N. 2003. Mosses of Pakistan. *The Journal of the Hattori Botanical Laboratory* 93: 273–291.
- Hill, M. O., Bell, N., Bruggemann-Nannenga, M. A., Brugués, M., Cano, M. J., Enroth, J., Flatberg, K. I., Frahm, J.-P., Gallego, M. T., Garilleti, R., Guerra, J., Hedenäs, L., Holyoak, D. T., Hyvönen, J., Ignatov, M. S., Lara, F., Mazimpaka, V., Muñoz, J. & L. Söderström, L. 2006. An annotated checklist of the mosses of Europe and Macaronesia. *Journal of Bryology* 28(3): 198–267. <https://doi.org/10.1179/174328206X119998>
- Hodgetts, N. G. 2015. *Checklist and country status of European bryophytes – towards a new Red List for Europe*. Irish Wildlife Manuals, No. 84. Ireland, National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. <https://www.npws.ie/sites/default/files/publications/pdf/IWM84.pdf>
- Hodgetts, N. G., Söderström, L., Blockeel, T. L., Caspari, S., Ignatov, M. S., Konstantinova, N. A., Lockhart, N., Papp, B., Schröck, C., Sim-Sim, M., Bell, D., Bell, N. E., Blom, H. H., Bruggemann-Nannenga, M. A., Brugués, M., Enroth, J., Flatberg, K. I., Garilleti, R., Hedenäs, L., Holyoak, D. T., Hugonnot, V., Kariyawasam, I., Köckinger, H., Kučera, J., Lara, F. & Porley, R. D. 2020. An annotated checklist of bryophytes of Europe, Macaronesia and Cyprus. *Journal of Bryology* 42(1): 1–116. <https://doi.org/10.1080/03736687.2019.1694329>
- Hodgetts, N., Cáliz, M., Englefield, E., Fettes, N., García Criado, M., Patin, L., Nieto, A., Bergamini, A., Bisang, I., Baisheva, E., Campisi, P., Cogoni, A., Hallingbäck, T., Konstantinova, N., Lockhart, N., Sabovljevic, M., Schnyder, N., Schröck, Ch., Sérgio, C., Sim Sim, M., Vrba, J., Ferreira, C. C., Afonina, O., Blockeel, T., Blom, H., Caspari, S., Gabriel, R., Garcia, C., Garilleti, R., González Mancebo, J., Goldberg, I., Hedenäs, L., Holyoak, D., Hugonnot, V., Huttunen, S., Ignatov, M., Ignatova, E., Infante, M., Juutinen, R., Kiebacher, Th., Köckinger, H., Kučera, J., Lönnell, N., Lüth, M., Martins, A., Maslovsky, O., Papp, B., Porley, R., Rothero, G., Söderström, L., Ștefănuț, S., Syrjänen, K., Untereiner, A., Våna, J., Vanderpoorten, A., Vellak, K., Aleffi, M., Bates, J., Bell, N., Brugués, M., Cronberg, N., Denyer, J., Duckett, J., During, H. J., Enroth, J., Fedosov, V., Flatberg, K.-I., Ganeva, A., Gorski, P., Gunnarsson, U., Hassel, K., Hespanhol, H., Hill, M., Hodd, R., Hylander, K., Ingerpuu, N., Laaka-Lindberg, S., Lara, F., Mazimpaka, V., Mežaka, A., Müller, F., Orgaz, J. D., Patiño, J., Pilkington, S., Puche, F., Ros R. M., Rumsey, F., Segarra-Moragues, J. G., Seneca, A., Stebel, A., Virtanen, R., Weibull, R., Wilbraham, J. & Żarnowiec, J. 2019. *A miniature world in decline. European red list of mosses, liverworts and hornworts*. Brussels, Belgium, IUCN. viii + 87 pp. <https://doi.org/10.2305/IUCN.CH.2019.ERL.2.en>
- Hoffmann, G. F. 1796. *Deutschlands Flora oder botanisches Taschenbuch. Zweyter Theil für das Jahr 1795. Cryptogamie*. Erlangen, bey Iohan Iacob Palm. [68 unnumbered] + 200 + [39 unnumbered, Index + addenda] pp. <https://doi.org/10.5962/bhl.title.126793>
- H. S. [Herman Schlagintweit]. 1869. Litteratur. Bryogeographische Studien aus den rhätischen Alpen, von W. Pfeffer. 142 S. 4°. (Aus der neuen Denkschr. der schweizer naturf. Gesellschaft.). *Botanische Zeitung* 27(51): 859–860.
- Ignatov, M. S., Afonina, O. M. & Ignatova, E. A. 2006. Check-list of mosses of East Europe and North Asia. *Arctoa* 15: 1–130.
- Ignatova, E. A., Fedorova, A. V., Kuznetsova, O. I. & Ignatov, M. S. 2019. Taxonomy of the *Plagiothecium laetum* complex (Plagiotheciaceae, Bryophyta) in Russia. *Arctoa* 28(1): 28–45. <https://doi.org/10.15298/arctoa.28.05>
- Ireland, R. R., Brassard, G. R., Schofield, W. B. & Vitt, D. H. 1987. Checklist of the mosses of Canada II. *Lindbergia* 13: 1–62.
- IUCN. 2012. *IUCN Red List Categories and Criteria: Version 3.1*. Second edition. Gland, Switzerland and Cambridge, UK, IUCN. iv + 32 pp. <https://portals.iucn.org/library/sites/library/files/documents/RL-2001-001-2nd.pdf>
- IUCN. 2019. *Guidelines for using the IUCN Red List categories and criteria*. Version 14. Prepared by the Standards and Petitions Subcommittee. Gland, Switzerland and Cambridge, UK, IUCN. 113 pp. <http://www.iucnredlist.org/documents/RedListGuidelines.pdf>
- Ivanova, E. I., Ignatova, E. A., Ignatov, M. S., Zotov, V. I., Krivoshapkin, K. K. 2005. Mosses. In: Danilova, N. S. (ed.), *Diversity of the plant world of Yakutia*. Novosibirsk, Izdatelstvo Sibirskogo Otdeleniya Rossiyskoy Akademii Nauk. (In Russian).
- Juratzka, J. 1869. Repertorium. Bryogeographische Studien aus den rhätischen Alpen. Von Dr. phil. W. Pfeffer. *Hedwigia* 8(12): 180–182.

- Juratzka, J. 1882. *Die Laubmoosflora von Oesterreich-Ungarn. Handschriftlicher Nachlass Jakob Juratzka's enthaltend die Beschreibung der in Oesterreich-Ungarn wachsenden Laubmoose mit Ausnahme der Leskeaceae, Hypnaceae, der Andreaeaceae und der Sphagnaceae.* Wien, W. Braumüller and Leipzig, F. A. Brockhaus. viii + 385 pp.
- Kerner, A. 1893. *Schedae ad Floram Exsiccatam Austro-Hungaricam. Opus cura Musei Botanici Universitatis Vindobonensis conditum.* VI. Vindobonae, e Typographia M. Salzeri. iv + 135 pp.
- Kis, G. 1985. *Mosses of South-East Tropical Africa. An annotated list with distributional data.* Vácrátót, Hungary, Institute of Ecology and Botany of the Hungarian Academy of Sciences. 170 pp.
- Köckinger, H., Suanjak, M., Schriegl, A. & Schröck, C. 2008. *Die Moose Kärntens.* [Sonderreihe Naturkärnten, Band 4]. Klagenfurt, Verlag der Naturwissenschaftlichen Vereins für Kärnten. 319 pp.
- Lal, J. 2005. *A checklist of Indian mosses.* Dehra Dun, India, Bishen Singh Mahendra Pal Singh. xi + 152 pp.
- Lanjouw, J., Baehni, Ch., Robyns, W., Rollins, R. C., Ross, R., Rousseau, J., Schulze, G. M., Smith, A. C., Vilmorin, R. de, Stafleu, F. A. 1956. *International Code of Botanical Nomenclature adopted by the Eighth International Botanical Congress, Paris, July, 1954.* [Regnum Vegetabile Vol. 8]. Utrecht – Netherlands, International Bureau for Plant Taxonomy and Nomenclature of the International Association for Plant Taxonomy. 338 pp.
- Legland, Th. & Garraud, L. 2018. *Mousses et hépatiques des Alpes françaises. Etat des connaissances, atlas, espèces protégées.* Gap-Charance, Conservatoire botanique national alpin. 240 pp.
- Li, X.-J., He, S. & Iwatsuki, Z. 2001. Pottiaceae. In: Li, X.-J., Crosby, M. R. & He, S. (eds), *Moss Flora of China. English version. Vol. 2. Fissidentaceae–Ptychomitriaceae.* Beijing – New York, Science Press and St. Louis, Missouri Botanical Garden. Pp. 114–249.
- Limpricht, K. G. 1888. *Die Laubmoose Deutschlands, Oesterreichs und der Schweiz.* I. Abtheilung: Sphagnaceae, Andreaeaceae, Archidiaceae, Bryineae (Cleistocarpae, Stegocarpae [Acrocarpae]). Lieferung 9. In: *Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschlands, Oesterreichs und der Schweiz.* Zweite Auflage. Band 4: Die Laubmoose Deutschlands, Oesterreichs und der Schweiz. Leipzig, Verlag von Eduard Kummer. Pp. 513–576.
- Lisowski, S. 1959. *Materiały do brioflory Tatr* [Materials to the bryoflora of the Tatra Mountains]. *Prace Komisji Biologicznej, Poznańskie Towarzystwo Przyjaciół Nauk, Wydział Matematyczno-Przyrodniczy* 21(2): 21–149. (In Polish with English summary).
- Loeske, L. 1908. *Die Moose Arlberggebietes.* *Hedwigia* 47: 156–199.
- Meinunger, L. & Schröder, W. 2007. *Verbreitungsatlas der Moose Deutschlands.* Band 2. Regensburg, Regensburgische Botanische Gesellschaft. 699 pp.
- Mišíková, K., Godovičová, K., Širka, P. & Šoltés, R. 2020. Checklist and red list of mosses (Bryophyta) of Slovakia. *Biologia* 75(1): 21–37. <https://doi.org/10.2478/s11756-019-00349-1>
- Mitten, W. 1859. Musci Indiae Orientalis; an enumeration of the mosses of the East Indies. *Journal of the Proceedings of the Linnean Society Supplement to Botany* 1: 1–171. <https://doi.org/10.5962/bhl.title.156377>
- Mohan, Gh. 2015. *Flora briofitelor din România.* Vol. 1. București, Editura ALL. 599 pp.
- Müller, C. 1883. Musci Tschutschici. *Botanisches Centralblatt* 16(2): 57–63; 16(3): 91–95; 16(4): 121–127.
- Müller, J. 2016. Einwanderung von *Cryphaea heteromalla* (Hedw.) D. Mohr nach Berlin und Brandenburg. *Veröffentlichungen des Naturkundemuseums Potsdam* 2: 37–43.
- Müller, K. 1874. Laubmoose. In: Lindeman, M. & Hartlaub, G. (eds), *Die Zweite Deutsche Nordpolarfahrt in den Jahren 1869 und 1870 unter Führung des Kapitän Karl Koldewey.* Zweiter Band. Wissenschaftliche Ergebnisse. Erste Abtheilung. I. Botanik. Leipzig, F. A. Brockhaus. Pp. 62–74.
- Nyholm, E. 1989. *Illustrated Flora of Nordic mosses.* Fasc. 2. Pottiaceae–Splachnaceae–Schistostegaceae. Copenhagen – Lund, Nordic Bryological Society. Pp. 75–141.
- Ochyra, R. & Szmajda, P. 1978. An annotated list of Polish mosses. *Fragmenta Floristica et Geobotanica.* 24(1): 93–145.
- Ochyra, R. & Szmajda, P. 1981. La cartographie bryologique en Pologne. In: Szweykowski, J. (ed.), *New perspectives in bryotaxonomy and bryogeography.* [Uniwersytet im. Adama Mickiewicza w Poznaniu Seria Biologia Nr 20]. Poznań, Wydawnictwo Naukowe Uniwersytetu im. Adama Mickiewicza. Pp. 105–110.
- Ochyra, R., Lewis Smith, R. I. & Bednarek-Ochyra, H. 2008. *The illustrated moss Flora of Antarctica.* Cambridge, Cambridge University Press. xvii + 685 pp. [+ 24 unnumbered pages with plates].
- Ochyra, R., Stebel, A. & Bednarek-Ochyra, H. 2011. *Grimmia teretinervis* (Grimmiaceae) and *Didymodon validus* (Pottiaceae), two moss species new to Poland. In: Zemanek, B. (ed.), *Geobotanist and taxonomist. A volume dedicated to Professor Adam Zajac on the 70th anniversary of his birth.* Cracow, Institute of Botany, Jagiellonian University. Pp. 47–67.
- Ochyra, R., Żarnowiec, J. & Bednarek-Ochyra, H. 2003. *Census catalogue of Polish mosses.* Kraków, Institute of Botany, Polish Academy of Sciences. 372 pp.
- O'Shea, B. J. 2006. Checklist of the mosses of sub-Saharan Africa (version 5, 12/06). *Tropical Bryology Research Reports* 6: 1–252.

- Paris, E. G. 1904. *Index bryologicus sive enumeratio muscorum ad diem ultimam anni 1900 cognitorum adjunctis synonymia distributioneque geographica locupletissimis*. Vol. II. Editio secunda. Paris, Librairie scientifique A. Hermann. 375 pp.
- Pavličić, Z. 1955. *Prodromus flore briofita Jugoslavije*. [Posebna Izdanja Odjela za Prirodne Nauke Knjiga 3]. Zagreb, Jugoslavenska Akademija Znanosti I Umjetnosti. 578 pp. (In Serbo-Croatian).
- Pfeffer, W. 1869. *Bryogeographische Studien aus den rhätischen Alpen*. [Zürich, Druck von Zürcher & Furrer]. 143 pp.
- Pfeffer, W. 1871. Bryogeographische Studien aus den rhätischen Alpen. *Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften* 24(5): 1–143.
- Plášek, V. & Ochyra, R. 2020. *Orthotrichum alpestre*, a new addition to the moss flora of Poland, with notes on *O. schimperii* (Orthotrichaceae: Bryophyta). *Acta Societatis Botanicorum Poloniae* 89(3): Article No. 89310. <https://doi.org/10.5586/asbp.89310>
- Plášek, V. & Sawicki, J. 2009. Does the epiphytic moss *Orthotrichum microcarpum* De Not. grow in Poland? *Časopis Slezského Zemského Muzea, Serie A – Vědy Přírodní* 58(2): 191–192.
- Podpěra, J. 1954. *Conspectus muscorum europaeorum*. [Práce Československé Akademie Věd, Sekce Biologická Sv. 3]. Praha, Nakladatelství Československé Akademie Věd. 697 pp.
- Ros, R. M., Mazimpaka, V., Usama Abou-Salama, U., Aleffi, M., Blockeel, T. L., Brugués, M., Cros, R. M., Dia, M. G., Dirkse, G. M., Draper, I., El-Saadawi, W., Erdağ, A., Ganeva, A., Gabriel, R., González-Mancebo, J. M., Granger, C., Herrstadt, I., Hugonot, V., Khalil, K., Kürschner, H., Losada-Lima, A., Luís, L., Mifsud, S., Privitera, M., Puglisi, M., Sabovljević, M., Sérgio, C., Shabbara, H. M., Sim-Sim, M., Sotiaux, A., Tacchi, R., Vanderpoorten, A. & Werner, O. 2013. Mosses of the Mediterranean, an annotated checklist. *Cryptogamie, Bryologie* 34(2): 99–283. <https://doi.org/10.7872/cryb.v34.iss2.2013.99>
- Roth, G. 1905. *Die europäischen Laubmoose*. Erster Band. Kleistokarpische und akrokarpische Moose bis zu den Bryaceen. Leipzig, Verlag von Wilhelm Engelmann. xiii + 598 pp. + lii Taf.
- Rothero, G. P. 2014. *Bryoerythrophyllum caledonicum*. In: Blockeel, T. L., Bosanquet, S. D. S., Hill, M. O., Preston, C. D. (eds), *Atlas of British and Irish bryophytes. The distribution and habitat of mosses and liverworts in Britain and Ireland*. Volume 2. Newbury: Pisces Publications. P. 173.
- Rusińska, A. & Górski, P. 2012. *Microbryum davalianum* (Bryophyta, Pottiaceae) in Poland: distribution and ecology. *Polish Botanical Journal* 57(1): 223–229.
- Ruthe, R. 1873. Ueber *Orthotrichum Shawii* Wils. *Hedwigia* 12(12): 177–182.
- Sainsbury, G. O. K. 1955. A handbook of the New Zealand mosses. *Royal Society of New Zealand Bulletin* 5: 1–490.
- Savicz-Lyubitskaya, L. I. & Smirnova, Z. N. 1970. *The handbook of the mosses of the U.S.S.R. The mosses acrocarpous*. Leningrad, Izdatel'stvo «Nauka», Leningradskoe Otdelenye. 824 pp. (In Russian).
- Schimper, W. Ph. 1860. *Synopsis muscorum europaeorum praemissa introductione de elementis bryologicis tractante*. Stuttgart, sumptibus Librariae E. Schweizerbart. vi + lix + 733 pp. + 1 map + pls. 1–8.
- Schröck, Ch., Köckinger, H., Amann, G. & Zechmeister, H. 2013. *Rote Liste gefährdeter Moose Voralbergs*. [iNatura Erlebnis Naturschau – Rote Listen 8]. Dornbirn, iNatura – Erlebnis Naturschau im Auftrag der Voralberger Landesregierung. 236 pp.
- Smith, A. J. E. 2004. *The moss Flora of Britain and Ireland*. Second edition. Cambridge, Cambridge University Press. xii + 1012 pp.
- Sollman, P. 2008. Studies on some pottiaceous mosses from Africa, 3. *Tropical Bryology* 29: 38–40. <https://doi.org/10.11646/bde.29.1.4>
- Sollman, P. 2015. The genus *Bryoerythrophyllum* (Musci, Pottiaceae) in Antarctica. *Polish Botanical Journal* 50(1): 19–25. <https://doi.org/10.1515/pbj-2015-0004>
- Stafleu, F. A. & Cowan, R. S. 1983. *Taxonomic literature. A selective guide to botanical publications and collections with dates, commentaries and types*. Volume IV: P-Sak. Ed. 2. [Regnum Vegetabile Vol. 110]. Utrecht, Bohn, Scheltema & Holkema and The Hague, dr. W. Junk b.v., Publishers, ix + 1214 pp.
- Stebel, A. & Ochyra, R. 2004. Incorrect records of *Plagiomnium drummondii* in Central Europe. *Journal of Bryology* 26(3): 233–35. <https://doi.org/10.1179/037366804X5378>
- Stebel, A. & Vončina, G. 2018. The moss *Thamnobryum neckeroides* (Neckeraceae) in Poland. *Herzogia* 31(1): 304–310. <https://doi.org/10.13158/099.031.0124>
- Stebel, A., Fojcik, B. & Zubel, R. 2016. *Pterygoneurum lamellatum* (Pottiaceae) – nowy gatunek mchu we florze Polski [*Pterygoneurum lamellatum* (Pottiaceae) – new species in the moss flora of Poland]. *Fragmenta Floristica et Geobotanica Polonica* 23(1): 139–143. [In Polish with English summary].
- Stebel, A., Ochyra, R. & Vončina, G. 2010. *Mosses of the Pieniny Range (Polish Western Carpathians)*. Poznań, Sorus. 114 pp.
- Steere, W. C. 1938. *Didymodon*. In: Grout, A. J., *Moss Flora of North America north of Mexico*. Vol. 1, Part 3. Newfane, Vermont, privately published. Pp. 185–190.
- Streimann, H. & Curnow, J. 1989. *Catalogue of mosses of Australia and its external territories*. [Australian Flora and Fauna Series Number 10]. Canberra, Australian Government Publishing Service. viii + 479 pp.

- Streimann, H. & Klazenga, N. 2002. *Catalogue of Australian mosses*. [Flora of Australia Supplementary Series Number 17]. Canberra, Australian Biological Resources Study. [5] + 259 pp.
- Swissbryophytes. 2004–2020. *Bryoerythrophyllum alpigenum* (Venturi) P. C. Chen. In: Swissbryophytes Working Group (ed.), *Moosflora der Schweiz*. Zürich, Universität Zürich. www.swissbryophytes.ch, Stand: 12.04.2020, https://www.swissbryophytes.ch/index.php/de/verbreitung?taxon_id=nism-789
- Szafran, B. 1957. Mchy (Musci). Tom I ["Mosses (Musci). Volume I"]. In: *Flora polska. Rośliny zarodnikowe Polski i ziem sąsiednich* ["Polish Flora. Spore plants of Poland and adjacent territories"]. Warszawa, Państwowe Wydawnictwo Naukowe. 449 pp. (In Polish).
- Szafran, B. 1961. Mchy (Musci). Tom II ["Mosses (Musci). Volume II"]. In: *Flora polska. Rośliny zarodnikowe Polski i ziem sąsiednich* ["Polish Flora. Cryptogamous plants of Poland and adjacent territories"]. Warszawa, Państwowe Wydawnictwo Naukowe. 407 pp. (In Polish).
- Tsegmed, Ts. 2010. Moss Flora of Mongolia. In: Ignatov, M. S. & Ignatova, E. A. (eds), *Biological resources and environmental conditions of Mongolia. Works of Joint Russian and Mongolian Complex Biological Expedition*. Vol. 56. Moskva, Institut Problem Ekologii y Evolutsyi im. A. N. Severtsova RAN. 634 pp. (In Russian).
- Turland, N. J., Wiersema, J. H., Barrie, F. R., Greuter, W., Hawksworth, D. L., Herendeen, P. S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T. W., McNeill, J., Monro, A. M., Prado, J., Price, M. J. & Smith, G. F. 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 Vol. 159]. Glashütten, Koeltz Botanical Books. xxxviii + 254 pp. <https://doi.org/10.12705/Code.2018>
- Venturi, G. 1879. Bryineae ex regione italica Tirolis, Tridentina dicta. *Revue Bryologique* 6(4): 49–62.
- Venturi, G. 1899. *Le muscinee del Trentino*. Trento, Stab. Lit. Tip. Giovanni Zippel. vii + 107 pp.
- Vončina, G. & Stebel, A. 2019. The moss *Rhynchostegium rotundifolium* (Brachytheciaceae) new to Poland. *Herzogia* 32(2): 503–507. <https://doi.org/10.13158/hea.32.2.2019.503>
- Wijk, R. van der, Margadant, W. D. & Florschütz, P. A. 1959. *Index muscorum*. Volume I (A–C). [Regnum Vegetabile Vol. 17]. Utrecht, International Bureau for Plant Taxonomy and Nomenclature of the International Association of Plant Taxonomy. xxviii + 548 pp.
- Wijk, R. van der, Margadant, W. D. & Florschütz, P. A. 1962. *Index muscorum*. Volume II (D–Hypno). [Regnum Vegetabile Vol. 26]. Utrecht, International Bureau for Plant Taxonomy and Nomenclature of the International Association of Plant Taxonomy. 535 pp.
- Wijk, R. van der, Margadant, W. D. & Florschütz, P. A. 1969. *Index muscorum*. Volume V (T–Z, Appendix). [Regnum Vegetabile Vol. 65]. Utrecht, International Bureau for Plant Taxonomy and Nomenclature of the International Association of Plant Taxonomy. xii + 922 pp.
- Zander, R. H. 1978. A synopsis of *Bryoerythrophyllum* and *Morinia* (Pottiaceae) in the New World. *The Bryologist* 81(4): 539–560. <https://doi.org/10.2307/3242341>
- Zander, R. H. 2007. *Bryoerythrophyllum* P. C. Chen. In: Flora of North America Editorial Committee (ed.), *Flora of North America north of Mexico*. Volume 27, Bryophyta, part 1. New York – Oxford, Oxford University Press. Pp. 565–569.

