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**Studies on Propaguliferous Species of *Pohlia* Section *Pohliella* in Poland.
Taxonomy and Distribution**

Studia nad rozmnożkowymi gatunkami *Pohlia* sekcja *Pohliella* w Polsce.
Taksonomia i rozmieszczenie

Исследование выводковых видов *Pohlia* секция *Pohliella* в Польше. Таксономия
и распространение

The species of *Pohlia* Hedw. genus of the section *Pohliella* Loeske (Bryaceae family) since Correns' (4) time have belonged to attractive small mosses with respect to their vegetative propagation. They are characterized by propagula (bulbs, gemmae) formed abundantly in the leaf axils of sterile rarely fertile stems of gametophyte (13—16, 25, 31, 34, 35). In the moss flora of Poland by Szafran (31) not all species of this section are given, mainly under different old names. So far 5 or 6 propaguliferous species have been given in different taxonomic ranges from Poland's territory. Warnstorf (32) has previously described *Pohlia* (as *Webera bulbifera*) on the basis of M. Grütter's specimens from the Kwidzyń region in the lower Vistula valley.

From the revised herbaria collections it appears that in territory of Poland *Pohlia filum* (Schimp.) Märt. does not occur and is easily mistaken with the related species *P. andalusica* (Höhn.) Broth. Its development stages in ontogeny can morphologically resemble the development stages of *P. andalusica*, in progressive modifications (Fig. 3). On the basis of the morphology of propagula, its phylogeny and geographical distribution, the species is closely related to *P. drummondii* (C. Muell.) Andrews (6, 18, 24, 27). The above characteristic features of the three species must be taken into consideration in the determination of plants of different development, age as well as time of collection (25, 26). Because of the difficulties in the distinction of the taxonomic features, their names and very complicated synonymy of the name used previously must be taken into consideration too.

SOME REMARKS TO THE SYSTEMATICS OF PROPAGULIFEROUS SPECIES
OF *POHLIA*

As yet, five bulbiferous species of genus *Pohlia* section *Pohliella* have been found in Poland. In the moss floras of the European countries published earlier six species were recognized. Still earlier Koch (12) had stated that *Pohlia annotina* (Hedw. emend. Corr.) Loeske and *P. grandiflora* are identical with *P. campototrachela* (Ren. et Card.) Broth. The latest critical taxonomic papers based above all on the types studied made possible correct determinations of the taxonomic status of species. However, the latter results are not always compatible in the interpretation of various authors. This refers particularly to the opinion of Demaret and Wilczek (6, 35), Lewis (14), Lewis and Smith (15, 16), Smith (30), Shaw (26—29) and Northorn-Richter (19). Similarly, the problem of the species nomenclature already described by Hedwig — *Bryum annotinum* appeared to be complex species and was often discussed (3, 7—9, 27, 28). The greatest difficulties in the nomenclature (28) resulted from the composition of this taxon which at present might be treated as complex species.

According to Wilczek and Demaret (35) *Pohlia campototrachela* comprises *P. annotina* and *P. proliger*a (Lindb. ex Breidl.) Lindb. ex Arnell. According to the new conception presented by Lewis and Smith (16) a distinct difference is preserved by *P. campototrachela*, *P. bulbifera*, *P. proliger*a (jointly with *P. annotina*) and *P. rothii* (Corr.) Broth. However, in the first and second proposition of the species system of section *Pohliella* Shaw (27—29) distinguishes *P. andalusica*, *P. annotina*, *P. bulbifera*, *P. campotrachela* and *P. proliger*a as separate species. In the paper of Northorn-Richter (19), the system as well as the key for determination of taxa was given according to the taxonomic conception of Shaw.

The present taxonomy of species, *Pohliella* section based on the conception of Lewis and Smith (16) has been accepted as correct in our paper. Therefore, we have included *Pohlia annotina* into *P. proliger*a and *P. rothii* into *P. andalusica*. In accordance with the generally accepted criteria and the main features given in the key to propaguliferous species growing in Poland, their phylogenetic sequence is as follows: *P. drummondii*, *P. andalusica*, *P. bulbifera*, *P. proliger*a and *P. campototrachela*. In the herbaria materials from the Polish Tatra the mountain species *P. filum* (Schimp.) Mart. has not been confirmed but *P. drummondii* only.

After time consuming examinations it can be concluded that for microscopic studies of all propaguliferous species a large collection of well

developed plants as well as a review of a large number of preparations are required. This concerns largely two species having different development forms of the propagula in relation to their size and shape, morphology of primordia, as in *Pohlia andalusica* and *P. prolifera*. However, young development forms of most species cause great difficulties in their determination, or they are completely undeterminable.

Key to species

- 1 Propagula 500—800 μ m long, primordia foliose extending down to middle of the body 1. *P. drummondii*
- 1* Propagula small 2
- 2 Primordia foliose on apical part of propagula 2. *P. andalusica*
- 2* Primordia not foliose 3
- 3 Propagula elongate, vermicular 4. *P. prolifera*
- 3* Propagula ovate, obovate 4
- 4 Primordia 1-cellular, apiculate 5. *P. camptotrachela*
- 4* Primordia multicellular, bulbiform 3. *P. bulbifera*

TAXONOMY, DESCRIPTION AND DISTRIBUTION OF SPECIES

Abbreviations of Herbaria

- HAL — Herbarium of the Martin-Luther-University, Halle, GDR.
 KRAM-B — Bryological Herbarium of the Institute of Botany Polish Academy of Sciences, Kraków.
 LBL-C — Bryological Herbarium of the Maria Curie-Skłodowska University, Lublin.
 POZG — Bryological Herbarium of the Adam Mickiewicz University, Poznań.
 SMA — Bryological Herbarium of the Department of Pharmaceutical Botany, Sosnowiec.
 WA — Herbarium of the Warsaw University, Warszawa.
 WRASL — Herbarium of the Wrocław University, Wrocław.

1. *Pohlia drummondii* (C. Muell.) Andrews

in Grout, Moss Fl. N. Am. 2: 196, 1935

Syn.: *Bryum drummondii* C. Muell., Bot. Zeit. 20: 328, 1862. *Webera drummondii* (C. Muell.) Jaeg., Ber. St. Gall. Naturw. Ges. 1874—1875: 137, 1876. — *Bryum catenulatum* Schimp., Syn. ed. 2: 471, 1876. — *Pohlia commutata* Lindb., Musci Scand.: 17, 1879. — *Bryum commutatum* (Lindb.) Boul., Musc. France 1: 278, 1884. — *Webera subcucullata* C. Muell. et Kindb. in Macoun et Kindb., Cat. Canad. Pl. 6: 113, 1892. — *W. pycno-decurrens* (C. Muell. et Kindb.) Macoun et Kindb., Cat. Canad. Pl. 6: 114, 1892. — *W. microdenticulata* C. Muell. et Kindb. in Macoun et Kindb., Cat. Canad. Pl. 6: 114, 1892. — *Bryum*

micro-commutatum Kindb., Bot. Not. 1896: 197, 1896. — *B. subpolymorphum* Kindb., Eur. N. Am. Bryin. 2: 390, 1897. — *B. microsporum* Kindb., Eur. N. Am. Bryin. 2: 388, 1897. — *Webera subpolymorpha* (Kindb.) Par., Index Bryol.: 1360, 1898. — *W. micro-commutata* (Kindb.) Par., Index Bryol.: 1354, 1898. — *Bryum alpinum* var. *denticulatum* Card. et Ther. in Holzinger, Bot. Gaz. 30: 123, 1900. — *Pohlia subpolymorpha* (Kindb.) Broth. in Engler et Prantl, Nat. Pfl. 1 (3): 548, 1903. — *P. lindbergii* Warnst., Beih. Bot. Centralbl. 16: 240, 1904. — *P. commutata* var. *lindbergii* (Warnst.) C. Jens. in Weim., Foert. Skand. Vaext. 2: 36, 1937. — *Webera commutata* var. *lindbergii* (Warnst.) C. Jens., Skand. Bladmosfl.: 159, 1939. — *Bryum jutunheimi* Hag. ex Podp., Acta Acad. Sc. Nat. Morav. 17: 93, 1945. — *Pohlia drummondii* var. *catenulata* (Schimp.) Podp., Consp. Musc. Eur.: 338, 1954. — *P. drummondii* var. *lindbergii* (Warnst.) Podp., Consp. Musc. Eur.: 339, 1954. — Index Musc. 1: 257, 285, 297, 334, 376, 1959; 4: 131, 133, 135, 140, 1967; 5: 184, 191, 198, 1969.

Plants in extensive or more dense, compact tufts, in montane habitats often flagelliform, glossy when dry; stems 0.5–1.5 cm high, red or rare blackish; leaves erect to spreading, rather strongly carinate or flexuose in dry condition, $\pm$ spreading and slightly carinate when moist, lanceolate to ovate-lanceolate, acute, denticulate above, 0.6–1.5 mm long, 0.4–0.60 mm wide; upper cells rectangular, rhombic to linear-rhombic, sometimes slightly vermicular, 45–65 (90) μ m long, 7–11 (14) μ m wide, at the margins rarely narrower formed one row; nerve very strong; propagula normally in 1–4 (5) upper leaf axial of sterile shoots, absent in fertile specimens, uniform in appearance, bulbiforms, ovate-oblong to cylindric very large, opaque, green, brown to red, 500–600 (1450) μ m long, 250–300 (700) μ m wide, with 4–6 (8), conspicuous, lanceolate leaf primordia at the apex or arising at different levels on the body, the leaf primordia flexuose; perigonia bulbiform, terminal on unbranched stems; perichaetial leaves abruptly acute and narrowly acuminate. Dioicous; seta 1.2–2.2 cm long, reddish-yellow; capsules cernuous to pendulous, ovate-pyriform, with short neck, 2–3 mm long; outer peristome teeth yellow, papillose, trabeculate; spores 12–20 (–24) μ m, ornamentation clavate; $n=11$, according to Ramsay (22) — Figs. 1 and 2.

Examined specimens: the Gorce Mts.: Lubawski stream, 1960, S. Lisowski 92938 (POZG as *P. rothii*); on NW slope of Turbacz Top, in ass. *Vaccinio-Piceetum tataricum*, 1250 m a.s.l., 1976, K. Karczmarz (LBL-C); the Beskid Sądecki Mts.: Skotarka montane clearing, south below Hala Łabowska pasture, on soil, 1973, H. Mamczarz (LBL-C as *P. rothii*); the Western Bieszczady Mts.: Szeroki Wierch Top, about 1100–1150 m a.s.l. — sandstones, NW exposition, 1972, R. Ochryra (LBL-C), about 1200 m a.s.l., 1972, R. O. 553, 558 (KRAM-B); the Higher Tatra Mts.: Valley below Koto in the Valley of Pięć Stawów Polskich, on wet soil among granite rocks, 1956, S. Lisowski (Br. Pol. 287), above the "Dolinka pod Kolem", on wet humus among granite rocks, 2050 m a.s.l., 1956, S. L. (Br. Pol. 288 as *P. commutata* var. *filum*), the Valley "Za Mnichem", on soil in snowbed, 1750 m a.s.l., 1956, S. L. (Br. Pol. 732).

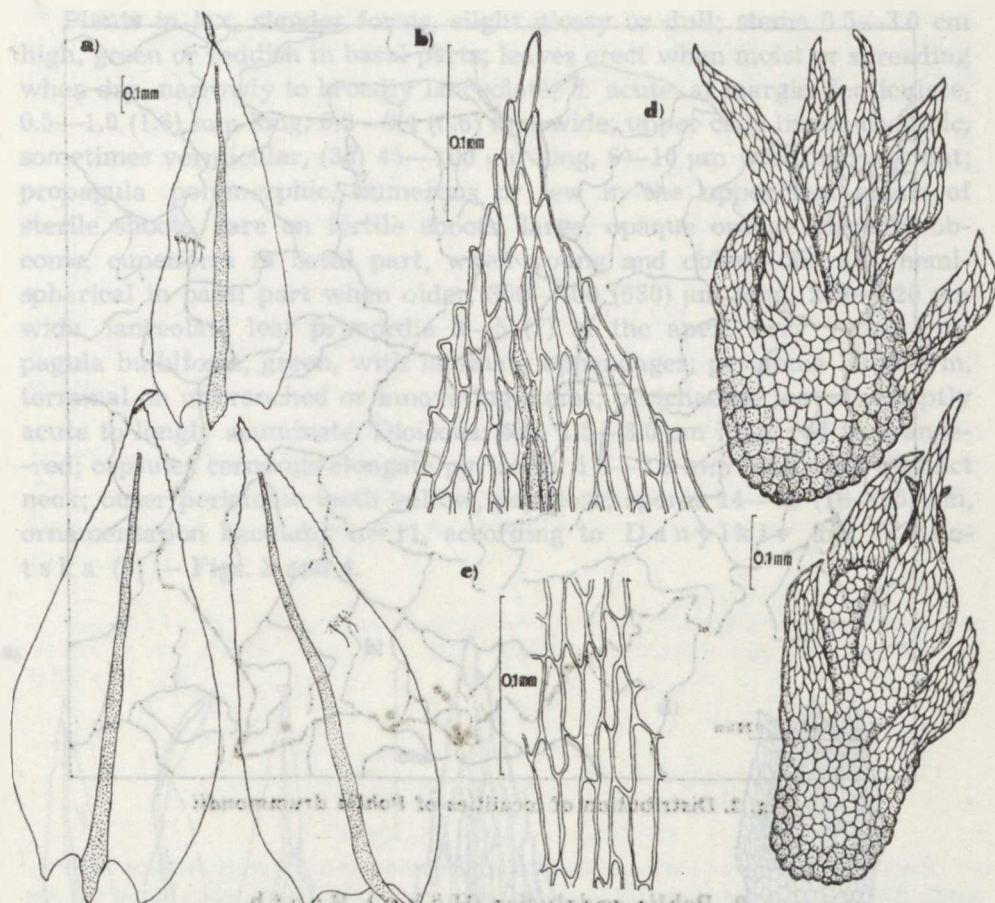


Fig. 1. *Pohlia drummondii*; a — leaves, b — leaf apex, c — central cells of leaf, d — propagula (based on specimens from Lisowski's Br. Pol. 287)

Selected exsiccata: Lisowski S., Bryotheca Polonica n. 287, 288, 732 (KRAM-B, LBL-C, POZG, WA, WRASL).

Habitat and ecology. This arctic-alpine species in Poland grows on acid sandy soils or weathered granite or sandstones and on wet humus in snowbeds, about pH 5.7—6.0. In the Polish Higher Tatra it grows above the upper forest zone up to 2000 m a.s.l.

General distribution. Its localities are scattered in North America from the Colorado State to the northern slopes of Brooks Range in arctic Alaska and Greenland (27), in the mountains of central and northern Europe, eastern Arctic, north Siberia, Far East and Caucasus (23).

Lectotype specimens: Rocky Mtns. (Drummond, Musci Am. no. 263 as *Bryum nutans* var. *minor*; BM; isotype NY).

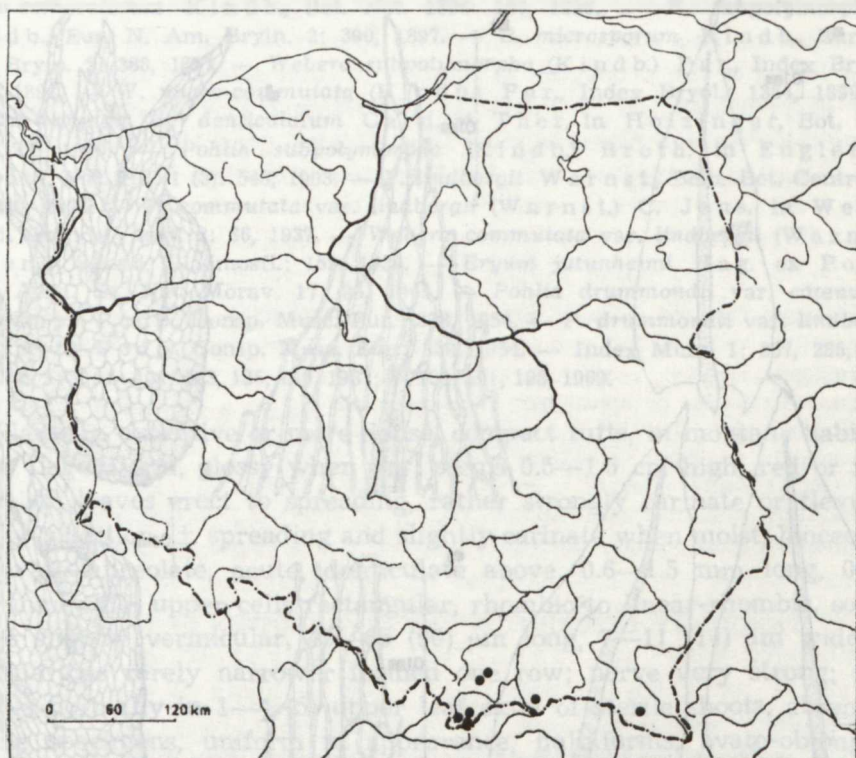


Fig. 2. Distribution of localities of *Pohlia drummondii*

2. *Pohlia andalusica* (Höhn.) Broth.

in Engler et Prantl, Nat. Pfl. 1 (3): 551, 1903

Syn.: *Webera andalusica* Höhn., Sitz. Ak. Wiss. Wien, Math. Nat. Kl. Abt. 1, 104: 326, 1895. — *W. annotina* var. *glareola* Ruthe et Grebe in Grebe, Hedwigia, Beibl. 40: 109, 1901. — *W. glareola* (Ruthe et Grebe) Limpr., Laubm. Deutschl. 3: 726, 1903. — *W. rothii* Corr. in Limpr., Laubm. Deutschl. 3: 728, 1903. — *Pohlia glareola* (Ruthe et Grebe) Broth. in Engler et Prantl, Nat. Pfl. 1 (3): 550, 1903. — *P. annotina* var. *glareola* (Ruthe et Grebe) Warnst., Krypt. Fl. Brandenb. 2: 429, 1904. — *P. rothii* (Corr.) Broth., Nat. Pfl. 1 (3): 551, 1903. — *P. rothii* var. *compacta* Ruthe et Loeske in Loeske, Verh. Bot. Ver. Brandenb. 46: 162, 1905. — *P. hercynica* Warnst. in Glow., Oest. Bot. Zeit. 63: 106, 1913. — *P. grandiflora* var. *glareola* (Ruthe et Grebe) Podp., Consp. Musc. Eur.: 340, 1954. — *P. camptotrachela* var. *glareola* (Ruthe et Grebe) Wijk et Marg., Taxon 14: 197, 1965. — Index Musc. 4: 129, 133, 134, 139, 1967; 5: 181—183, 188, 196, 838, 840, 1969.

Plants in lax, slender forms, slight glossy or dull; stems 0.5—3.0 cm high, green or reddish in basal parts; leaves erect when moist or spreading when dry, narrowly to broadly lanceolate, $\pm$ acute, at margin denticulate, 0.5—1.0 (1.6) mm long, 0.2—0.4 (0.6) mm wide; upper cells linear-rhombic, sometimes vermicular, (35) 45—100 μ m long, 6—10 μ m wide; nerve stout; propagula polymorphic, numerous or few in the upper leaf axials of sterile shoots, rare on fertile shoots, large, opaque orange, broadly obconic, cuneiform in basal part, when young and oblong-obovate, hemispherical in basal part when older, 300—400 (630) μ m long, 200—320 μ m wide, lanceolate leaf primordia 3—5 (7) at the apex, very young propagula bulbiform, green, with laminate appendages; perigonia bulbiform, terminal on unbranched or innovating stems; perichaetial leaves abruptly acute to longly acuminate. Dioicous; seta 1.5—3.0 cm long, red to orange-red; capsules cernuous elongate pyriform, 1.5—3.0 mm long, with distinct neck; outer peristome teeth yellow, papillose; spores 14—20 (16—25) μ m, ornamentation baculate; $n=11$, according to Danylkiv and Vysotska (5) — Figs. 3 and 4.

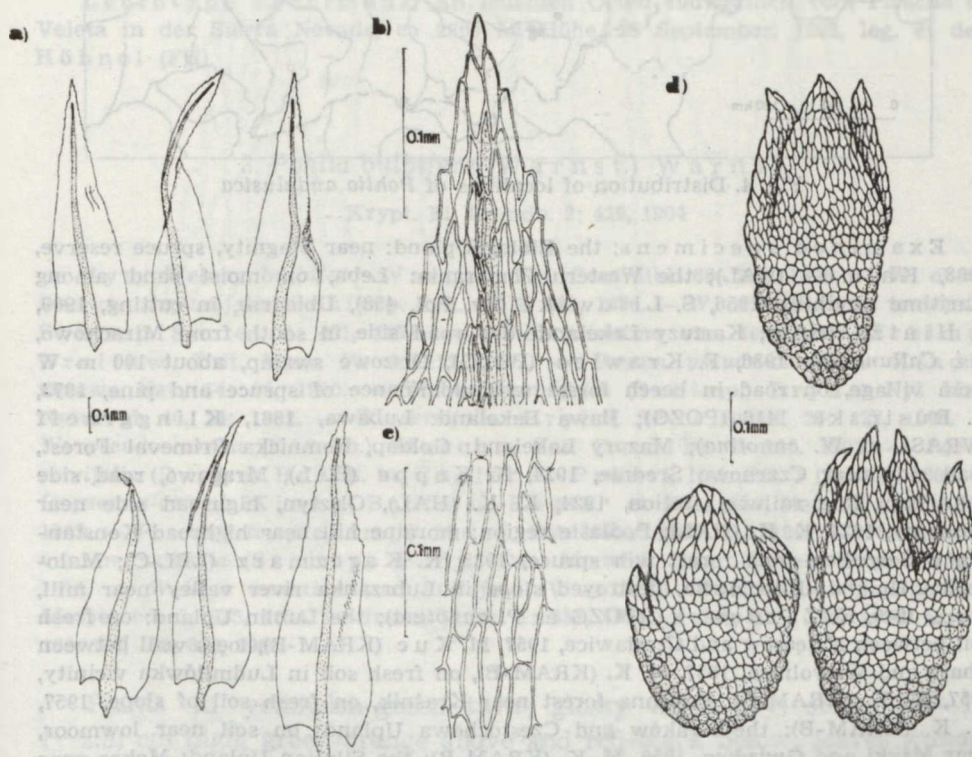


Fig. 3. *Pohlia andalusica*; a — leaves, b — leaf apex, c — central cells of leaf, d — propagula (based on specimens from Oświęcim-Błonie, leg. J. Ż.)

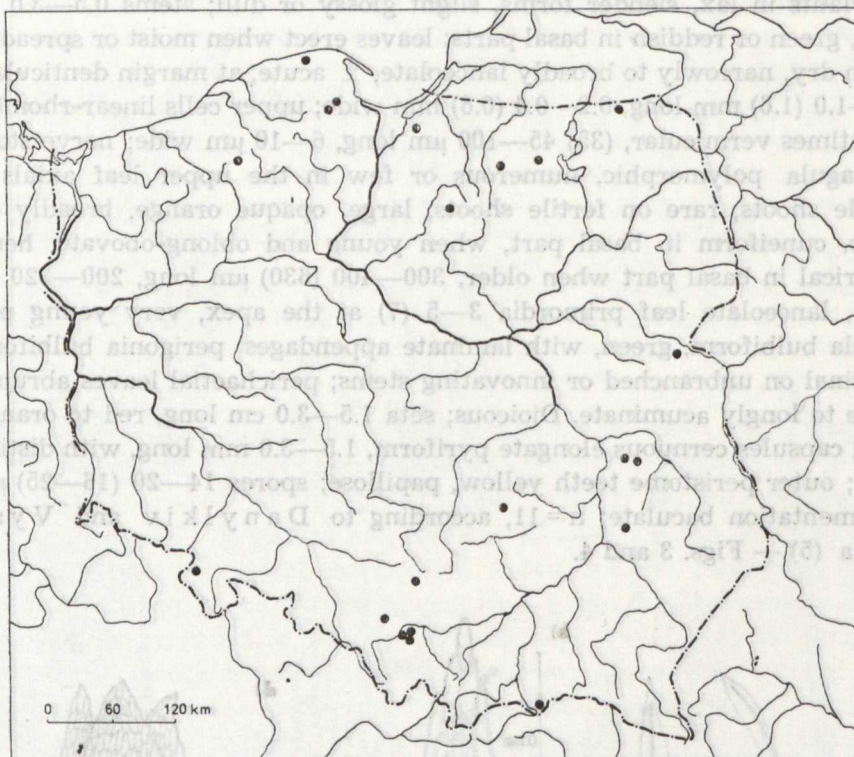


Fig. 4. Distribution of localities of *Pohlia andalusica*

Examined specimens: the Elbląg Upland: near Stagnity, spruce reserve, 1908, Kalmus (HAL); the Western Pomerania: Łeba, on moist sand among maritime sandhills, 1956, S. Lisowski (Br. Pol. 458), Ubiedrze, in cutting, 1909, F. Hintze (HAL); Kartuzy Lakeland: dry road side in south from Mirachowo, ass. *Callunetum*, 1936, F. Krawiec (POZG), Olszowe swamp, about 100 m W from village, on road in beech forest with dominance of spruce and pine, 1973, A. Rusińska 1416 (POZG); Iława Lakeland: Lubawa, 1861, Klinggraeff (WRASL as *W. annotina*); Mazury Lakeland: Goldap, Romnicka Primeval Forest, road side near Czarnowo Średnie, 1924, K. Koppe (HAL), Mrągowo, road side near Żabi Róg railway station, 1924, K. K. (HAL), Olsztyn, highroad side near Ruszajny, 1924, K. K. (HAL); Podlasie region: moraine hill near highroad Konstantynów-Serpelice, pine forest with spruce, 1985, K. Karczmarz (LBL-C); Małopolska Upland: Kopciówka, destroyed slope in Lubrzanka river valley near mill, c. sp., 1940, K. Zaznowski (POZG as *P. annotina*); the Lublin Upland: on fresh soil between Nałęczów and Czesławice, 1957, M. Kuc (KRAM-B), loess wall between Charz and Wąwolnica, 1957, M. K. (KRAM-B), on fresh soil in Ludmiłówka vicinity, 1957, M. K. (KRAM-B), Polichna forest near Krasnik, on fresh soil of slope, 1957, M. K. (KRAM-B); the Kraków and Częstochowa Upland: on soil near lowmoor, near Mżyki and Gwizdów, 1958, M. K. (KRAM-B); the Silesian Upland: Mokre near Mikołów, on cultivated soil of rye, 1973, K. Jędrzejko (SMA); the Oświęcim Basin: Oświęcim-Błonie, on margin of slag trail, 1981, J. Żarnowiec (SMA),

Sola river margin near Oświęcim and Stare Sawy, in ass. *Petasitetum hybridi*, 1981, J. Ż. (SMA), Oświęcim and Dwory, in ass. *Sagino-Bryetum*, 1981, J. Ż. (SMA); the Sudety Mts.: Stołowe Mts., roundabout way below Mały Szczeliniec and Duży Szczeliniec, west part, 1951, J. Szwejkowski (POZG); the Beskid Sądecki Mts.: Tylicz near Krynica, on river bank of Muszynka, 1973, H. Mamczarz (LBL-C).

Selected exsiccata: Bauer E., Musci Europaei Exs. ser. 10, n. 970 a et b (V as *P. rothii* var. *hercynica* Grebe et Loeske); S. Lisowski, Bryotheca Polonica n. 458 (KRAM-B, LBL-C, POZG, WA, WRASL).

Habitat and ecology. It grows in lowland and in higher mountains, mainly on denuded soils of roadsides, ditch margins and moraine hills. In the Lublin Upland it occurs on loess slopes with a low CaCO_3 content.

General distribution. North America from Colorado State, Northwest Territories to Greenland (27), east Subarctic, Ural and Siberia (23), and Europe (11, 21). Its highest localities to 4000 m a.s.l. are in the Brooks Range of Alaska and in the Olympic Mountains of Washington State (27).

Lectotype specimens: An feuchten Orten südwestlich vom Picacho de Veleta in der Sierra Nevada, ca 2800 M. Höhe, 28 September, 1892, leg. et det. Höhnelt (FH).

3. *Pohlia bulbifera* (Warnst.) Warnst.

Krypt. Fl. Brandb. 2: 429, 1904

Syn.: *Webera bulbifera* Warnst., Bot. Centralbl. 66: 230, 1896. — *W. annotina* var. *angustifolia* Schimp. Syn. ed. 2: 401, 1876. — *W. annotina* var. *tenuifolia* Schimp. Syn. ed. 2: 401, 1876. — *Pohlia annotina* var. *tenuifolia* (Schimp.) Braithw., Brit. Moss. Fl. 2: 152, 1892. — *Bryum pseudo-carneum* Kindb., Ottawa Nat., 14: 88, 1900. — *Webera tenuifolia* (Schimp.) Bryhn, Nyt Mag. Naturvid. 40, 34; 1902. — *W. serrifolia* Bryhn, Revue Bryol. 29: 127, 1902. — *W. pseudo-carnea* (Kindb.) Macoun, Cat. Canad. Pl. 7: 246, 1902. — *Pohlia serrifolia* (Bryhn) Broth. in Engler et Prantl, Nat. Pfl. 1 (3): 552, 1903. — *P. pseudo-carnea* (Kindb.) Broth. in Engler et Prantl, Nat. Pfl. 1 (3): 551, 1903. — *P. tenuifolia* (Schimp.) Moel., Bot. Notis. 1907: 143, 1907. — *P. annotina* var. *angustifolia* (Schimp.) Podp., Čas. Moravsk. Mus. Zemsk. Brno 13: 236, 1913. — *Webera annotina* var. *bulbifera* (Warnst.) Dix., Stud. Handb. Brit. Mosses ed. 3: 335, 1924. — Index Musc. 1: 357, 1959, 4: 129, 131, 140, 1967, 5: 181, 183, 197, 198, 838, 1969.

Plants in yellowish-green tufts, glossy when dry; stems 0.5–1.5 (–2.5) cm high, green-orange above and red-black below; leaves spreading to erect, flexuose when dry and wide-spreading when moist, almost narrowly and broadly lanceolate to ovate, acute, at margin denticulate,

0.6—1.0 (—1.5) mm long, 0.3—0.4 (—0.6) mm wide; upper cells rectangular, rhombic to linear rhombic, 45—85 (—100) μm long, 6—10 (—12) μm wide; nerve stout, ending below apex; propagula numerous in the upper leaf axials of sterile shoots, absent in fertile specimens, arising in clusters to 1—5 (7) in leaf axials, usually uniform in shape, yellowish-green, opaque, spherical to ovoid, often with short stalk (150—), 200—300 μm long, 120—200 μm wide, usually with 4—5 broadly triangular, concave, incurved and enclosing space over flattened top of propagula, primordia multicellular; perigonia bulbiform on stems; perichaetial leaves acute to acuminate. Dioicous; seta 1—3 cm long, orange-red to brown; capsules rare, pendulous, pyriform-ovate, smooth with distinct neck, 1.5—2.5 mm long; outer peristome teeth yellow, papillose, trabeculate; spores (17—) 22—20 (35) μm , ornamentation baculate; n = unknown (Figs. 5 and 6).

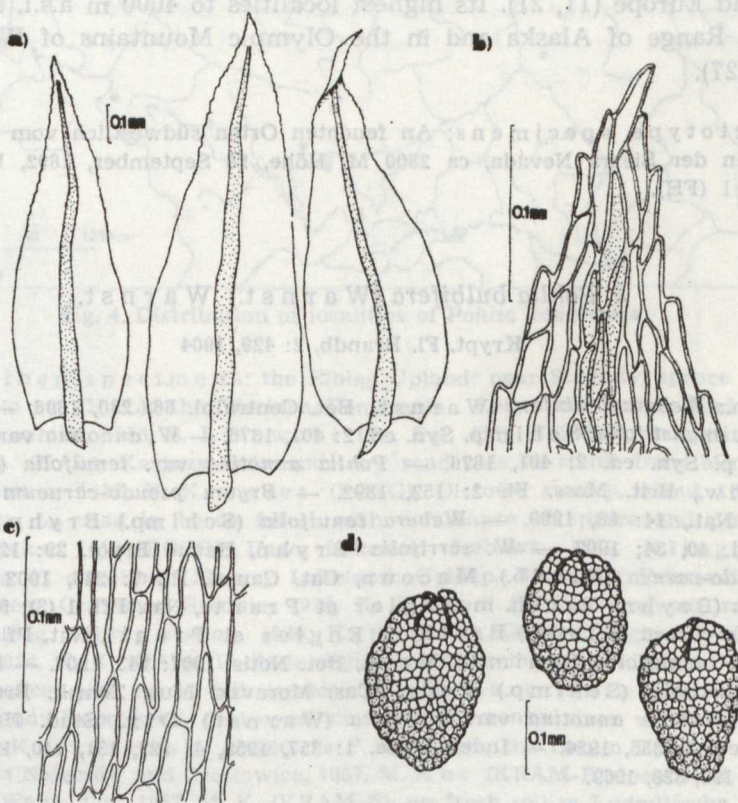


Fig. 5. *Pohlia bulbifera*; a — leaves, b — leaf apex, c — central cells of leaf, d — propagula (based on specimens from Rejów near Kielce, leg. K. Kaznowski)

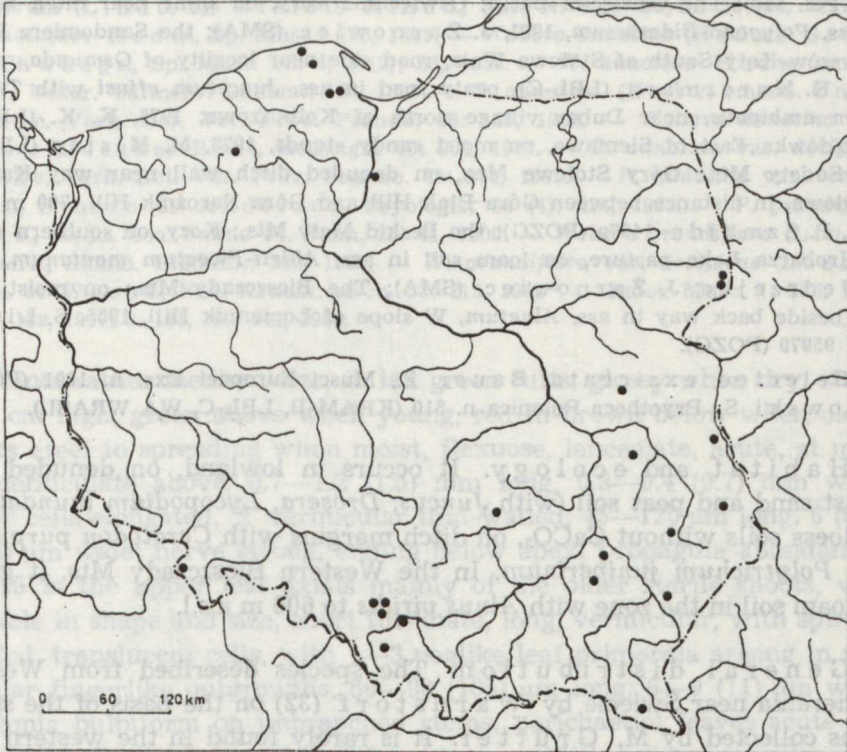


Fig. 6. Distribution of localities of *Pohlia bulbifera*

Examined specimens: the Western Pomerania: Lębork, margin of Choczewskie lake, 1904, Winkelmann 000015 (POZG as *W. annotina*), Słowińska National Park, sandhill depression North of Łącka Sandhill, among *Drosera rotundifolia*, *Juncus balticus* and *Lycopodium inundatum*, 1976, A. Rusińska 000022 (POZG as *P. rothii*), Ubiedrze, "Rötsee" lake, 1913, F. Hintze (Musci Eur. Exs. 1091); the Kartuzy Lakeland: Gołubie, about 2 km NW from village, Uniradze forestry, on naked turf in high peat bog, 1973, A. Rusińska 2437 (POZG), Borowo, about 1 km EEN from village, on sand near S shore of Karlikowskie lake, 1974, A. R. 3321 (POZG as *P. rothii*), Kwidzyń near Świecie, leg. M. Grütter (l. class.); Podlasie region: the Białowieża Primeval Forest, Browsk forestry, div. 130 B, in road ditch, 1980, K. Karczmarsz (LBL-C), Białowieża forestry, div. 639 A, ass. *Alnetum*, on uprooted spruce tree, 1980, K. K. (LBL-C), Trzebieszów forest near Łuków, forest road side, div. 40, 1977, Z. Sypiańska (WA as *P. annotina*); Łęczna and Włodawa Lakeland: Sobibór, on margin of Brudno lake, 1961, K. Karczmarsz (LBL-C); Silesian Upland: Mokre near Mikołów, on ravine wall upper Jamna river, 1973, K. Jędrzejko (SMA), Brynów near Katowice, on loamy soil in mixed pine forest, 1972, K. J. (SMA); Małopolska Upland: Rejów near Kielce, on bottom of pond lacking water, 1941, K. Kaznowski (POZG); the Lublin Upland: Radawiec forest near Lublin, in road ditch, 1957, M. Kuc (KRAM-B), on deluvial loess near Grabowiec, 1957, M. K. (LBL-C); Rostocze region: on loamy and loess slope of ravine upper Topólcza village near Zwierzyniec, c. sp., 1957, S. Lisowski

(Br. Pol. 510); The Oświęcim Basin: Oświęcim-Dwory, on slime near ditch margin in ass. *Polygono-Bidentetum*, 1981, J. Żarnowiec (SMA); the Sandomierz Basin: Przyszów-Kąty South of Stalowa Wola, road side near locality of *Osmunda regalis*, 1975, K. Karczmarz (LBL-C), peaty road in ass. *Juncetum effusi* with *Trematodon ambiguus*, near Dubas village north of Kolbuszowa, 1975, K. K. (LBL-C), Witoldówka East of Sieniawa, on moist sandy stands, 1973, M. Misiąg (LBL-C); the Sudety Mts.: Góry Stołowe Mts., on denuded ditch wall near way Karlów-Kudowa, in distance between Góra Ptak Hill and Góra Narożnik Hill, 790 m a.s.l., 1973, P. Szmajda 1497a (POZG); the Beskid Mały Mts.: Kozy, on southern slopes of Hrobacza Łąka pasture, on loam soil in ass. *Abieti-Piceetum montanum*, 1980, K. Jędrzejko, J. Żarnowiec (SMA); The Bieszczady Mts.: on moist loam soil beside back way in ass. *Alnetum*, W slope of Łopiennik Hill, 1955, S. Lisowski 95979 (POZG).

Selected exsiccata: Bauer E., Musci Europaei Exs. n. 1091 (POZG), Lisowski S., Bryotheca Polonica n. 510 (KRAM-B, LBL-C, WA WRASL).

Habitat and ecology. It occurs in lowland, on denuded acid moist sand and peat soil (with *Juncus*, *Drosera*, *Lycopodium inundatum*), on loess soils without CaCO_3 , on ditch margins with *Ceratodon purpureus* and *Polytrichum juniperinum*. In the Western Bieszczady Mts. it grows on loam soil in the zone with *Alnus viridis* to 600 m a.s.l.

General distribution. The species described from Western Pomerania near Świecie by Warnstorf (32) on the basis of the specimens collected by M. Grütter. It is rarely found in the western part of North America to the shore of Alaska and Yukon Territory, often in the north-eastern regions of Canada, Maritime Provinces and Labrador, and in the states of Wisconsin and Michigan (27), central and north Europe, Arctic, Siberia, Far East (23).

Type specimens: Poland, Westpreussen, bei Marienfeld, leg. Grütter.

Neotype specimens: Great Britain, bank of River Fillan, Crianlarich, W. Perth, October, 1967, leg. K. Lewis (NMW).

4. *Pohlia proliger* (Lindb. ex Breidl.) Lindb. ex Arnell

Bot. Not. 1894: 54

Syn: *Webera proliger* Lindb. ex Breidl., Mitth. Naturwiss. Ver. Steiermark 28: 122, 1891. — *W. proliger* Kindb., Forh. Vid. Selsk. Christ. 1888: 30 nom. nud. — *W. proliger* var. *tenella* Schiffn., Oesterr. Bot. Zeitschr. 51: 122, 1901. — *Pohlia proliger* var. *tenella* (Schiffn.) Herzog, Bibl. Bot. 73: 17, 1910. — *P. proliger* (Kindb.) Arnell, Bot. Not. 1894: 54. — *P. proliger* (Kindb.) Broth., Nat. Pfl. 1 (3): 551, 1903. — *Webera annotina* var. *proliger* (Lindb. ex Breidl.) Bryhn, Nyt Mag. Naturvid. 32 (3): 124, 1892. — *W. annotina* ssp. *proliger* (Lindb. ex Breidl.) Arnell, Revue Bryol. 20: 43, 1893. — *Bryum*

proligerum (Lindb. ex Breidl.) Kindb., Eur. N. Am. Bryin. 2: 384, 1897. — *B. annotinum* Hedw., Sp. Musc.: 183, 1801. — *Webera annotina* (Hedw.) Bruch in Schwaegr., Sp. Musc. ed. 4, 5 (2): 53, 1830. — *W. annotina* Hedw. emend. Corr., Unter. Vermehr. Laubm.: 159, 1899. — *P. annotina* (Hedw. emend. Corr.) Loeske, Verh. Bot. Ver. Prov. Brandb. 46: 181, 1905. — *Webera annotina* var. *decipiens* (Loeske) Roel, Hedwigia 46: 202, 1907. — *P. annotina* var. *decipiens* Loeske, Verh. Bot. Ver. Prov. Brandb. 46: 201, 1905. — *P. annotina* var. *loeskei* Crum, Steere et Anderson, Bryologist 68 (4): 434, 1965. — *P. grandiflora* Lindb., Medd. Soc. Fauna Fl. Fenn. 25: 41, 1900. — *Webera grandiflora* (Lindb.) C. Jens., Skand. Bladmfl.: 259, 1939. — *W. grandiflora* var. *decipiens* (Loeske) Jans. et Wacht., Ned. Kruidk. Arch. 53: 215, 1943* — Index Musc. 1: 356, 1959; 4: 129, 139, 1967; 5: 181, 195, 842, 1969.

Plants rather medium-size, in lax green tufts, glossy when dry; stems 1—3 cm high, green above when young, reddish-brown below when older; leaves erect to spreading when moist, flexuose, lanceolate, acute, at margin denticulate above, 0.7—1.2 (1.5) mm long, 0.3—0.4 (0.7) mm wide; upper cells elongated, $\pm$ vermicular thin-walled, 45—120 μ m long, 6 (8)—9 (12) μ m wide; nerve strong, ending below apex; propagula abundant to 10—25 in the upper leaf axials mainly of the older sterile shoots, very variable in shape and size, short turbinate, long, vermicular, with spirally twisted, translucent cells, with 1—3 peglike leaf primordia arising in unicellular fingerlike outgrowths, 60—90 (105) μ m long, 6—9 (11) μ m wide; perigonia bulbiform on unbranched stems; perichaetial leaves acute and acuminate. Dioicous; seta 1.5—3.0 cm long, reddish-brown; capsules rare, inclined to pendulous, pyriform-ovate, with neck, 1.5—2.5 mm long; outer peristome teeth yellow, papillose; spores 14—22 μ m, ornamentation baculate; $n=11$, according to Ramsay (22) — Figs. 7 and 8.

Examined specimens: the Western Pomerania: Dąbie near Szczecin, ditch beside roadway, 1895, Winkelmann (POZG as *P. grandiflora*), Czernin near Szczecin, ditch, 1888, W. (POZG as *P. grandiflora*), Warnia Góra Hill south Stargard, on road in forest along of roadway, with *Pogonatum aloides*, 1961, K. Koppe (HAL as *P. rothii*); the Kartuzy Lakeland: Bożanka near Wejherowo, on soil in willow scrub on slope beside of dirt road near W shore of Marchowo lake, 1972, A. Rusińska 720 (POZG as *P. grandiflora*), Wieżyca Hill, on gravel slope, in denuded stands from NE slope hill, 1971, A. R. 165 (POZG as *P. grandiflora*), Dzierżąno, on road in mixed pine forest with spruce, 1973, A. R. 2171 (POZG as *P. grandiflora*), Nowa Huta colony, on slope beside dirt road in the direction of Kamienne lake, 1971, A. R. 330 (POZG as *P. grandiflora*), Staniszewo, about 1.5 km SW of village, fallow land, 1972, A. R. 1219 (POZG as *P. grandiflora*), steep slope of road side, NW of Miechucin, 1937, F. Krawiec (POZG); Wielkopolska region: loam roadside slope beside forester's cottage Dobrapomoc in Krotoszyn district, 1955, S. Lisowski 95973 (POZG as *P. grandiflora*), 1957, S. L. (Br. Pol. 484 as *P. grandiflora*); the Elbląg Upland: Zastawno, field, 1980, K. Szmeja (POZG

* The other synonyms have been given by Lewis and Smith (16), and by Shaw (27).

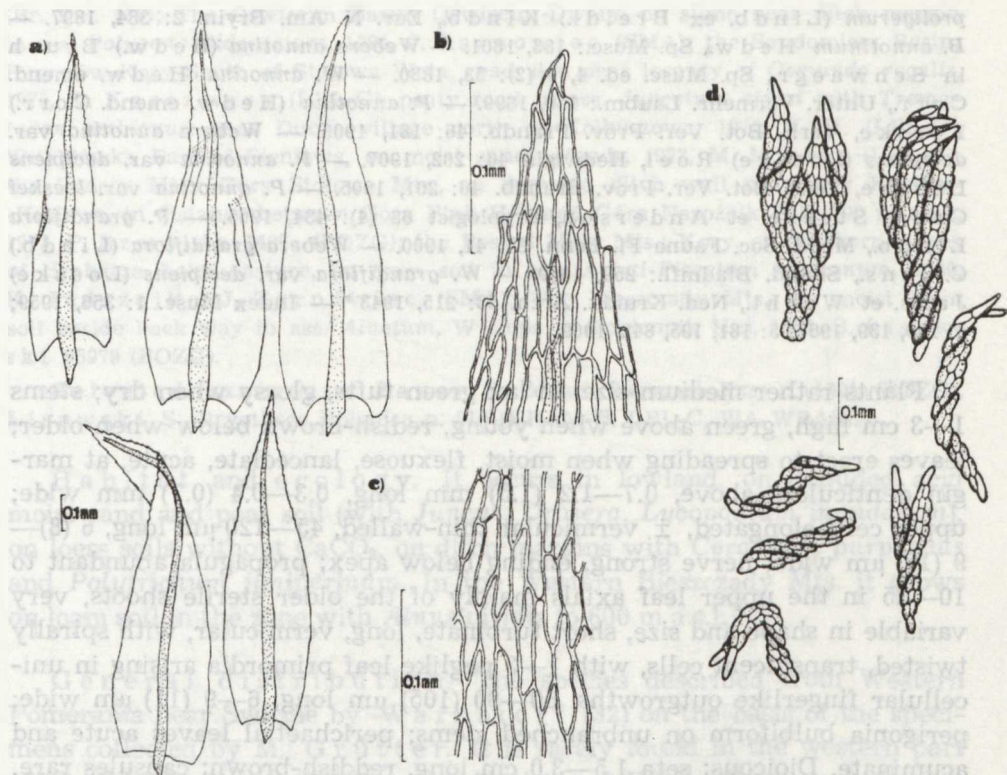


Fig. 7. *Pohlia prolifera*; a — leaves, b — leaf apex, c — central cells of leaf, d — propagula (based on specimens from Rogów near Grabowiec, leg. K. K.)

as *P. camptotrachela*); the Łława Lakeland: Wiśniewo near Lubawa, leg. Klinggraeff (WRASL as *Bryum annotinum*); the Mazowsze region: Krzynowłoga Mała, 4 km from Rągnów, on stubble, 1969, T. Mieczkowska (WA as *P. grandiflora*), Ostrów Mazowiecka, road side in forest near Kalinowo keeper's house, 1960, D. Sobotka (WA as *P. grandiflora*), Miedzianka near Węgrów, Miedzianka forest, on moist sand soil, 1965, H. Skowrońska (WA as *P. grandiflora*), Paprotnia near Kampinos, on soil beside gravel pit, 1975, D. Sobotka (WA as *P. grandiflora*); the Podlasie region: the Białowieża Primeval Forest, Czerlonka, on trail near forest, div. 544 A, 1969, F. Pszczółkowska (WA as *P. grandiflora*), Wola Sernicka near Lubartów, on stubble, 1965, K. Karczmarsz (LBL-C), Wandzin near Lubartów, on denuded soil beside ditch, 1959, K. K. (LBL-C as *P. grandiflora*); the Kraków and Częstochowa Upland: Morusy near Ogródzieniec, margins of forest gorge, 1957, M. Kuc (KRAM-B); the Silesian Upland: Kazimierz Górniczy-Sosnowiec, loam fallow land near rest center, 1973, K. Jędrzejko (SMA), Mokre near Mikołów, on cultivated field, 1973, K. J. (SMA), Kamyk-Łabodza forest near Chrzanów, on moist denuded sand, 1958, M. Kuc (KRAM-B); Toszek, cultivated field, 1955, M. K. (KRAM-B), Srocza Góra Hill near Toszek, cultivated field, 1955, M. K. (KRAM-B), Księży Forest near Pyskowice, 1955, M. K. (KRAM-B); the Małopolska Upland: Dąbrowa near Kielce, field between meadows in Silnica river valley, 1941, K. Kaznowski (POZG as *P. grandiflora*), field margin near Biesak, between

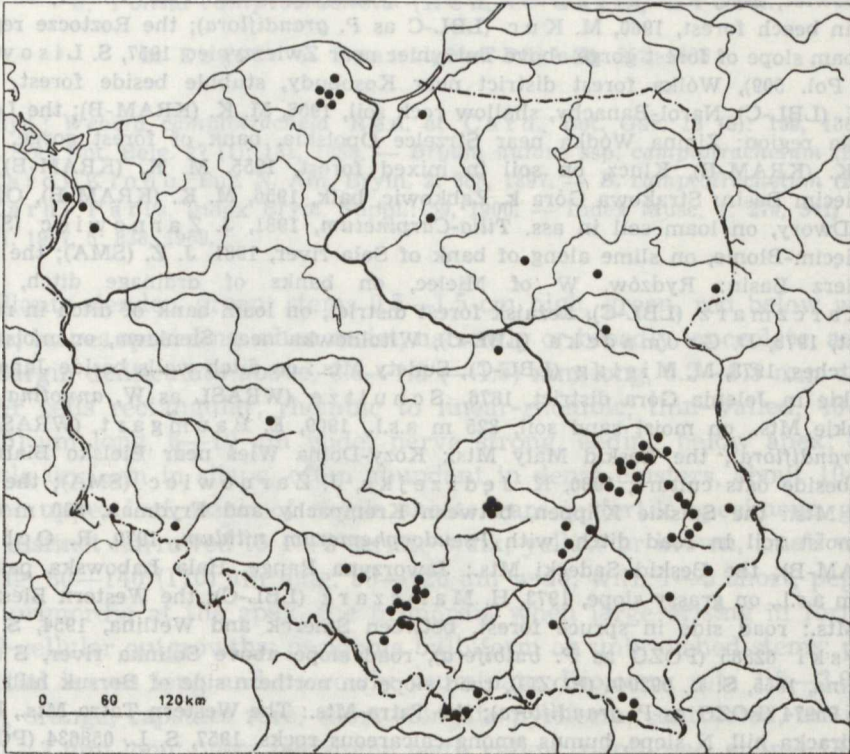


Fig. 8. Distribution of localities of *Pohlia prolifera*

Słowik and Sitkówka, 1941, K. K. (POZG as *P. grandiflora*), Słowik, on loess soil of forest way beside stream near village of Paszyc, 1941, K. K. (PZOG as *P. grandiflora*), Rejów near Kielce, on bottom of old pond, 1941, K. K. (POZG as *P. grandiflora*), Kunów near Opatów, loess slope, 1954, M. Kuc (KRAM-B), Zawichost-Winiarki, on soil with *Ditrichum homomallum*, 1955, M. K. (KRAM-B), Rytwiany forest near Strzegom, on fresh denuded soil beside road, 1956, M. K. (KRAM-B), Łoniów near Koprzywnica, 1955, M. K. (KRAM-B); the Lublin Upland: Zawieprzycze forest region, fallow land beside of monumental tower, abundantly with *Pottia truncata*, 1985, K. Karczmarsz (LBL-C), Charz near Wąwolnica, 1957, M. Kuc (KRAM-B), on loam soil near Nałęczów, 1966, K. K.: Musci Exs. Palat. Lubl. Polonia n. 136 (KRAM-B, LBL-C, POZG, WA), Stary Gaj near Nałęczów, on fresh denuded soil, 1957, M. Kuc (KRAM-B), Podgórz near Urzędów, loess slope, 1957, M. K. (KRAM-B), Wierzbica-Boby, denuded loess slope, 1957, M. K. (KRAM-B), Złota Góra hill near Wandalin, on soil in leafy forest, 1957, M. K. (KRAM-B), the forest W of Stara Bystrzyca, on fresh denuded soil, 1957, M. K. (KRAM-B), Dzierzkowice-Suchodół, loess wall, 1957, M. K. (KRAM-B), Sobianowice near Lublin, loess gorge, 1957, K. Karczmarsz (LBL-C), Ciecierzyn-Jakubowice, in Ciemięga river valley, on loess wall in dry gorge, 1957, M. Kuc (KRAM-B), Piaski Lutarskie-Wólka Studzieniecka, on fresh denuded soil, 1957, M. K. (KRAM-B), Namule forest near Krasnystaw, on cultivated field, 1955, M. K. (KRAM-B), forest W of Izbica, 1957, M. K. (LBL-C as *P. annotina*), on loam slope in Rogów near

Grabowiec, 1969, K. Karczmarsz (LBL-C), Sitaniec forest near Zamość, on loess soil in beech forest, 1960, M. Kuc (LBL-C as *P. grandiflora*); the Roztocze region: on loam slope of forest gorge above Turzyniec near Zwierzyniec, 1957, S. Lisowski (Br. Pol. 509), Wólka forest district near Kosobudy, stubble beside forest, 1964, M. K. (LBL-C), Narol-Banachy, shallow rock soil, 1958, M. K. (KRAM-B); the Lower Silesia region: Zimna Wódka near Strzelce Opolskie, bank of forest gorge, 1955, M. K. (KRAM-B), Klucz, on soil in mixed forest, 1955, M. K. (KRAM-B), the Oświęcim Basin: Strąkowa Góra k. Żabkowic, balk, 1956, M. K. (KRAM-B), Oświęcim-Dwory, on loam soil in ass. *Tilio-Carpinetum*, 1981, J. Żarnowiec (SMA), Oświęcim-Błonie, on slime along of bank of Sola river, 1981, J. Ż. (SMA); the Sandomierz Basin: Rydzów, W of Mielec, on banks of drainage ditch, 1975, K. Karczmarsz (LBL-C), Leżajsk forest district, on loam bank of ditch in mixed forest, 1973, D. Gromadzka (LBL-C), Witoldówka near Sieniawa, on moist soil in ditches, 1973, M. Misiąg (LBL-C); Sudety Mts.: on ditch walls beside Janowice Wielkie in Jelepia Góra district, 1876, Schultze (WRASL as *W. annotina*), the Izerskie Mts., on moist sand soil, 825 m a.s.l., 1909, E. Baumgart (WRASL as *P. grandiflora*); the Beskid Mały Mts.: Kozy-Dolna Wieś near Bielsko Biała, on soil beside oats culture, 1980, K. Jędrzejko, J. Żarnowiec (SMA); the Pieńiny Mts.: the Spiskie Klippen, between Krempachy and Frydman, 590 m a.s.l., on moist soil in road ditch, with *Pseudoephemerum nitidum*, 1979, R. Ochyra (KRAM-B); the Beskid Sądecki Mts.: Jaworzyna Range, Hala Łabowska pasture, 900 m a.s.l., on grassy slope, 1973, H. Mamczarz (LBL-C); the Western Bieszczady Mts.: road side in spruce forest, between Smerek and Wetlina, 1954, S. Lisowski 62885 (POZG as *P. bulbifera*), road slope above Solinka river, S from Wetlina, 1955, S. L. 092944 (POZG), road slope on northern side of Borsuk hill, 1955, S. L. 95974 (POZG as *P. grandiflora*); the Tatra Mts.: The Western Tatra Mts., Kopa Kondracka hill, N slope, humus among calcareous rocks, 1957, S. L. 058634 (POZG), the Higher Tatra Mts., Waksmundzka Valley, on slope above stream in spruce forest, 1957, S. L. (Br. Pol. 731), on granite gravel on summit, 2400 m a.s.l., 1963, M. Kuc (POZG as *P. grandiflora* var. *decipiens*).

Selected exsiccata: Lisowski S.: Bryotheca Polonica n. 484, 509, 731 (KRAM-B, LBL-C, POZG, WA, WRASL); K. Karczmarsz: Musci Exs. Palat. Lubl., Polonia n. 136 (KRAM-B, LBL-C, POZG, WA).

Habitat and ecology. It occurs very often in whole Poland on denuded, moist sandy soils, loams, and loess poor in CaCO_3 , more rarely on granite gravel. Its highest localities are in the Western Tatra Mts. to the altitude of 2400 m a.s.l.

General distribution. It is widely distributed in North America (26, 27), from uplands and mountain areas of West Shore of California and Oregon to the mountains of south Alaska, and in the southern part of Maritime Provinces, northern states of USA (Michigan, Wisconsin, Illinois). This species is frequent in Europe to the Azores and Madeira, in whole Africa, Siberia and Far East (23).

Lectotype specimens: Norway, Trontjelet, Osterdalen, 6 August, 1887, leg. et det. S. O. Lindberg (H).

5. *Pohlia camptotrachela* (Ren. et Card.) Broth.

in Engler et Prantl, Nat. Pfl. 1 (3): 552, 1903

Syn.: *Webera camptotrachela* Ren. et Card., Bot. Gaz. 13 (8): 199, 1888 et Bull. Soc. Bot. Belg. 27 (1): 131, 1888. — *Bryum nutans* ssp. *camptotrachelum* (Ren. et Card.) Kindb., Eur. N. Am. Bryin. 2: 385, 1897. — *B. camptotrachelum* (Ren. et Card.) Paris, Index Bryol. Suppl.: 59, 1900. — Index Musc. 1: 279, 341, 1959, 4: 131, 1967, 5: 838, 1969.

Plants slender, green; stems 0.5—1.5 cm high, green, red below when older; leaves spreading when moist, narrowly or broadly lanceolate, acute, at margin denticulate above, 0.8—1.2 (—1.5) mm long, 0.2—0.5 mm wide; upper cells rectangular, rhombic to linear-rhombic, thin-walled, 40—70 (—95) μm long, 6—10 μm wide; nerve strong, ending below apex; propagula uniform in shape, often abundant in dense clusters, about 10—25 in the upper leaf axials of sterile shoots, rare in fertile specimens, globose, distinct narrowed to 1—2 seriate stalk, yellow or brown, small when young, 80—140 (170) μm long, 80—120 μm wide, with 1—3 short, peglike leaf primordia at the apex, the primordia when large arising in form of 1—2-cellular outgrowths; perigonia bulbiform on unbranched stems; perichaetial leaves long and narrowly acuminate. Dioicous; seta 1.5—3.0 cm long, orange; capsules rare, short elongate pyriform, contracted, inclined, 2—3 mm long; outer peristome teeth yellow, papillosae; spores 13—16 (20) μm , ornamentation baculate; n =unknown (Figs. 9 and 10).

Examined specimens: the Western Pomerania: Uznam Is., Warszów, excavation of road side on meadow, 1907, Winkelmann 019979 (POZG as *P. grandiflora*); the Mazurskie Lakeland: Olsztyn, ditch beside brickfield, 1924, K. Koppe (HAL as *P. rothii*), Kudypy forest district, 1925, K. K. (HAL as *P. rothii*); the Podlasie region: moraine hill near highroad Konstantynów-Serpelice, pine forest with spruce, 1985, K. Karczmarsz (LBL-C); Zagwóźdź near Baranów upon Wieprz river, ditches along the highway, 1971, K. K. (LBL-C); the Kraków and Częstochowa Upland: Mzyki-Gniazdów, fresh soil beside fen, 1958, M. Kuc (KRAM-B); the Silesian Upland: Pławniowice near Ujazd and Dzierżna, on fallow land beside alder forest, 1973, K. Jędrzejko (SMA), Bytom-Miechowice, on loam soil in pine forest, 1974, K. J. (SMA), Czechowice near Glinice, road side in alder forest, 1973, K. J. (SMA), Wiesiołówka near Tucznawa in Dąbrowa Górnicza region, road side in pine forest, 1972, K. J. (SMA), Będzin-Grodziec, on soil in alder forest with *Fraginus excelsior*, 1972, K. J. (SMA), Ruda Śląska-Wirek, on mining bank, 1973, K. J. (SMA), Katowice, soil damming beside Rawa river, 1974, K. J. (SMA), Katowice-Starganiec, on trail in pine forest, 1972, K. J. (SMA), Katowice-Dębówka Mała, on loam soil beside cemetery, 1973, K. J. (SMA), Mysłowice-Bolina, on loamy gravel substratum beside mixed forest, 1974, K. J. (SMA), Żwaki-Tychy, slope in alder forest, 1974, K. J. (SMA), Mokre near Mikołów, loam slope in Jamna river valley, 1973, K. J. (SMA); the Lublin Upland: Wandalin-Rozdoły, on loess wall, 1957, M. K. (KRAM-B), Blinów-Ciechanówka, on loess, 1957, M. K. (KRAM-B), W from

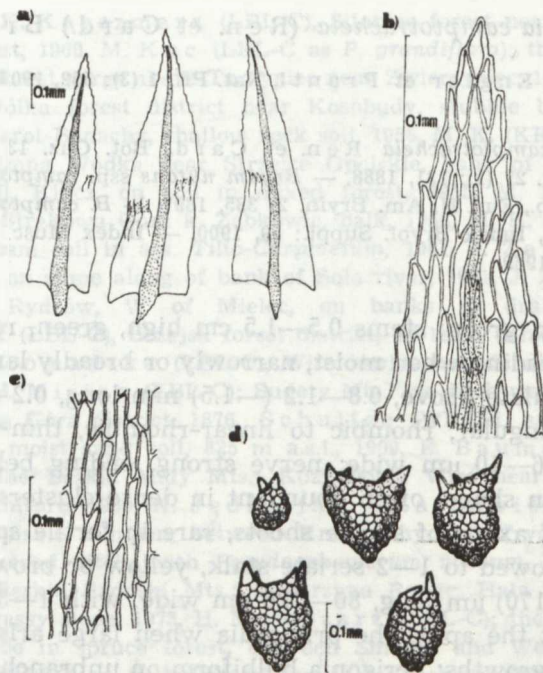


Fig. 9. *Pohlia camptotrachela*; a — leaves, b — leaf apex, c — central cells of leaf, d — propagula (based on specimens from Milde's Br. Siles. 22)

Weglin, on fresh denuded soil, 1957, M. K. (KRAM-B); the Roztocze region: Siedliska-Hrebenne, on denuded loess in mixed forest, 1958, M. K. (KRAM-B); in loamy ditch under stony hill near Bolesławiec, 1866, G. Limpricht (Br. Siles. n. 22), Wrocław-Leśnica, in wet ditches, 1865, Uechtritz (WRSL as *W. annotina*), Wrocław, on loam soil of fresh sandy excavation, 1877, U. (WRSL as *P. annotina*), beside roadway Karłowice-Wrocław, c.sp., 1882, Schultze 642 (WRSL as *W. annotina*), stubble beside Brynica near Opole, 1877, S. (KRAM-B); the Oświęcim Basin: Oświęcim-Dwory, on concrete flood gate beside bank of Wisła river, 1981, J. Żarnowiec (SMA), Oświęcim-Stare Stawy, on loam in ass. *Salici-Populetum*, 1981, J. Ż. (SMA), Dębnik near Brzeszcze, loam soil on meadow along bank of Wisła river, 1978, J. Ż. (SMA); the Sandomierz Basin: Zaklików, on peat soil in protective zone of forest beside roadway, about 1.5 km from bridge on Sanna river, 1975, K. Karczmarz (LBL-C), Chmielów near Tarnobrzeg, sandy road side, 1987, K. K. (LBL-C), Rydzów near Mielec, ditches among meadows, 1976, K. K. (LBL-C), Zmysłówka near Grodzisko Dolne, sandy road side, 1973, K. K. (LBL-C), Gniewczyzna Trynicka near Tryńcza, on road side, 1973, K. K. (LBL-C), Uszkowce near Oleszyce, in ditches on wet loamy substratum, 1973, M. Misiąg (LBL-C); the Przemyśl Highlands: Jarosław, loamy slope in brickfield, 1972, K. K. (LBL-C), Radymno, loess slope, 1972, K. K. (LBL-C); the Kaczawskie Highlands: in loamy ditch below hill near Bolesławiec, 1866, C. Limpricht (Br. Siles. n. 22 as *W. annotina*); the Beskid Mały Mts.: Kozy, Hrobacza Łąka hill, upper part of Żarnówka Mała stream, 1980, K. Jędrzejko, J. Żarnowiec (SMA), Hrobacza Łąka hill, on loam soil in beech forest, 1980, K. J., J. Ż. (SMA); the Beskid Sądecki Mts.: the

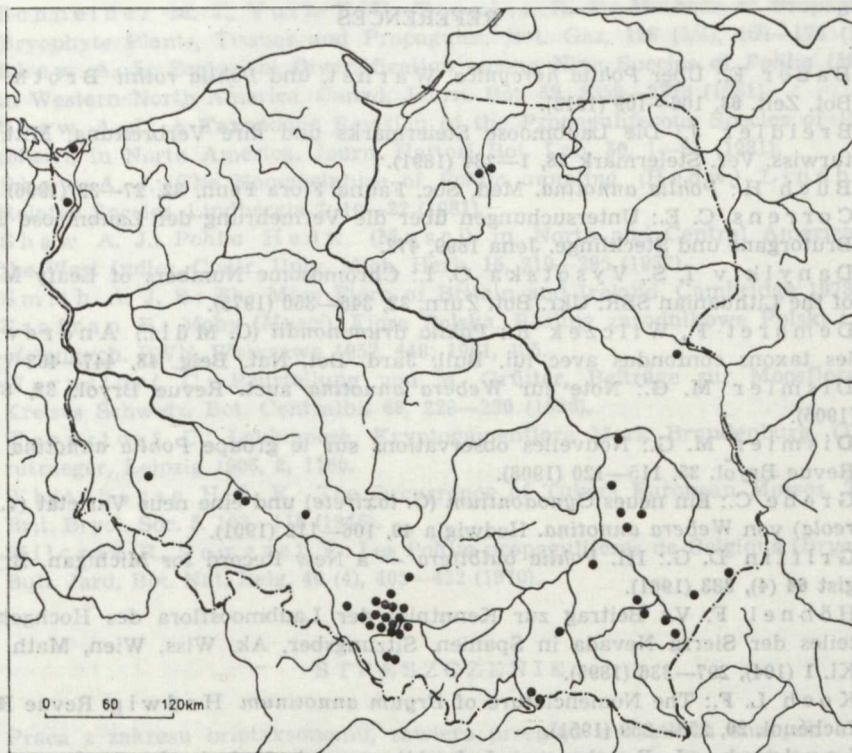


Fig. 10. Distribution of localities of *Pohlia camptotrachela*

Polana Skotarki meadow, S below the Hala Łabowska meadow, on soil, 1973, H. Mamczarz (LBL-C), Czarny Potok river, below Jaworzyna Krynicka, on soil in community with *Agrostis vulgaris*, about 635 m a.s.l., 1969, L. Dąbrowska (LBL-C).

Selected exsiccata: Mickiewicz J.: *Plantae Varsovienses Exs. n. 56* (LBL-C, POZG, WA); Milde J.: *Bryotheca Silesiaca n. 22* (WRASL).

Habitat and ecology. It often grows on bare sandy, loamy, more rarely, on peat soils, along roads, stream banks and on fallow land in lowland, in mountains still above 600 m a.s.l. The pH range of the substratum is 5.0—6.5.

General distribution. In North America from the shore of the Pacific to British Columbia (27), West Europe, central and south Sweden, the European part of USSR to Ural and West Siberia (23).

Lectotype specimens: *Webera camptotrachela* Ren. et Card., Am. Bor., California a cl. Lesquereux communicata (NY).

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STRESZCZENIE

Praca z zakresu briotaksonomii, zawiera przegląd wszystkich znanych obecnie w Polsce 5 gatunków rozmnożkowych *Pohlia* sekcji *Pohliella*. Ze względu na duże rozbieżności taksonomiczne w ujmowaniu zakresu wielu z nich (6, 12, 14—16, 26—28, 35) podano własną koncepcję ujmowania każdego gatunku. Dlatego konieczne było, obok badań mikroskopowych, podanie pełnej synonimiki i diagnoz z uwzględnieniem lektotypów. Wśród synonimów znajdują się nazwy, pod którymi badane gatunki w różnym ujęciu taksonomicznym podawane były w polskiej literaturze oraz w oznaczeniach okazów zielnikowych. Ze względu na dużą sterylność oraz podobieństwa w budowie sporofitu gatunków klucz do ich najłatwiejszego oznaczania oparto na cechach budowy dojrzałych rozmnożek (ryc. 1, 3, 5, 7, 9), będących organami wegetatywnego rozmnażania. Rozmieszczenie stanowisk oparto na badanych okazach, przedstawiając je na mapach punktowych (ryc. 2, 4, 6, 8, 10).

РЕЗЮМЕ

Работа из области бриотаксономии; она содержит обзор всех известных в настоящее время в Польше 5 выводковых видов *Pohlia* секции *Pohliella*. В связи с большими разногласиями в вопросе определения таксономического положения многих из них (6, 12, 14—16, 26—28, 35), автор дает собственную концепцию распространения каждого вида. С этой целью, кроме проведения микроскопических исследований, необходимо стало приведение полной синонимики и диагноз с учетом лектотипов. Среди синонимов находятся названия, под которыми изучаемые виды в разном таксономическом определении приводились в литературе также и в обозначениях травянистых экземпляров. В связи с исключительной

стерильностью и сходством в строении спорофита видов, ключ для их простейшего обозначения основан на признаках строения зрелых выводковых тел (рис. 1, 3, 5, 7, 9), которые являются органами вегетативного размножения. Размещение местообитаний основано на исследованных экземплярах и представлено на точечных картах (рис. 2, 4, 6, 8, 10).