

Acta Botanica Weberi

A JOURNAL OF BOTANICAL RESEARCH, THOUGHTS, THEORIES, HISTORY, AND PERSONALITIES



Rhizoplaca weberi

Photo: Linna Weber Müller-Wille

ABW NUMBER 3 – 2020

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ISSUED MARCH 2020

DR. WILLIAM A. WEBER

* NOVEMBER 16, 1918, NEW YORK CITY – † MARCH 18, 2020 LONGMONT, CO

It is with deep sorrow we hereby mark the passing at the age of 101 of our dearly loved father, grandfather and great-grandfather – Dr. William Alfred Weber. He passed away peacefully in his sleep with family present at the TRU Community Care Hospice of the Longmont United Hospital in Longmont, Colorado, while recovering from a recent fall. His final views through his windows were of his beloved Rocky Mountains, including a panorama view of the Indian and Long's Peaks.

This issue of *Acta Botanica Weberi* is both the first posthumous issue and the last that Dr. Weber was able to contribute final touches to himself. We as a family will continue to publish further issues in his memory, will endeavour to keep the standards equal to his scientific rigour, and will do our utmost in bringing his remaining unfinished writings to publication.

NOTE FROM THE EDITORS

Acta Botanica Weberi is published by members of the Weber family and distributed free of charge through the williamaweber.com website. It was specifically founded to publish hitherto unpublished papers by William A. Weber. It was decided that at the age of 99, Dr. Weber could no longer wait on the peer review process to see his latest writings published if they were not to become posthumous works. Instead he and we felt that publication in this form to be the most appropriate at his age. The resulting dissemination of these works among his botanical colleagues, known and unknown, and the uses, references and discussions thus arising will be enough of a peer review and contribute to the continuing endeavors to research scientific questions.

As Bill Weber embarks on his second century, he finds he has over the years written on various topics that he never published. With the editorial and technical help of family members versed in the world of computers, he would like to bring some of those writings to light.

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PHILONOTIS IN COLORADO (AN INFORMAL INVESTIGATION)

William A. Weber (completed and edited by Linna Weber Müller-Wille & Ragnar Müller-Wille)*

Professor and Curator Emeritus

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ABSTRACT

The genus *Philonotis* is considered to be almost an impossible genus to classify. However, if we deal with it within a small area of the world, especially one like the Colorado Rocky Mountains, in which the habitats tend not to intergrade with each other, we are discovering that there really are different species, and they can be approached both in the field as well as under the microscope. This article expands upon and supersedes the treatment of *Philonotis* published previously in *Bryophytes of Colorado* (Weber and Wittmann 2007). Dr. Weber's wish and hope was that this treatment would be an inspiration for others to embark on further research into this important but neglected genus.

*EDITORIAL NOTE

Dr. Weber started working on this treatment of *Philonotis* in 2008 and 2009. This published version has been painstakingly proofread by Linna Weber Müller-Wille under instructions from Dr. Weber. Essentially, this entailed cross checking, using the Herbarium's digitized database, the specimen collections lists in the article text with the original packets housed at the Herbarium in Boulder, especially with the annotations made by Dr. Weber on the packets themselves. Dr. Weber approved the final article. It was then prepared for publication by Linna Weber Müller-Wille and Ragnar Müller-Wille. Unfortunately this process was not quite completed before Dr. Weber's death.

PHILONOTIS IN COLORADO

The genus *Philonotis* is considered to be almost an impossible genus to classify. However, studying it within a small area of the world, especially one like the Colorado Rocky Mountains, in which the habitats tend not to intergrade with each other, we are discovering that there really are different species, and they can be approached both in the field as well as under the microscope. This article expands upon and supersedes the treatment of *Philonotis* published previously in *Bryophytes of Colorado* (Weber and Wittmann 2007).

The following are the most used treatments for the North American species:

Seville Flowers wrote the chapter on *Philonotis* for Grout's *Moss Flora of North America* (1935). This is most useful in providing references and places where the original descriptions may be found, as well as some of the type localities.

Flowers' *Mosses: Utah and the West* (1973), pp. 327–336, is well worth reading. Flowers was a field man and an excellent teacher. He discusses technique, variability, and his frustrations very cogently.

For Rocky Mountain species, Nyholm's *Illustrated Moss Flora of Scandinavia* (1960), Fascicle 4, pp. 294–300, is especially useful since it includes our Rocky Mountain high altitude species.

A. J. E. (Tony) Smith, *Moss Flora of Britain and Ireland*, second edition, revised (2006) (*Philonotis*, pp. 648–656), is an excellent account of the genus as it occurs in Great Britain. Smith obviously has a great deal of experience in the field and laboratory, and his discussions are very useful.

Norris & Shevock (2004), *Madroño* 51:85–86 essentially agree with our treatment, but maintain *P. caespitosa* (not in BFNA treatment), *P. calcarea* (BFNA lists only from Greenland), and *P. muhlenbergii* (= *P. capillaris* fide BFNA)

The treatment of *Philonotis* in *Flora of North America* (*Flora of North America*, vol. 28: Bryophyta, part 2. BFNA 2014) is unfortunately not as satisfactory as it should be. Some of the incomplete parts of this are discussed here under the species.

The genus

If you are unfamiliar with the genus *Philonotis*, consult the treatment in Flowers' *Mosses: Utah and the West* (1973, pp. 327–336). Flowers struggled mightily to understand the genus.

To become acquainted with *Philonotis*, sooner or later you will have to dissect leaves and determine whether there are mammillae and/or prorulae on the cells and where they are. However, you can come close to the correct identification in the field, almost all the time, by paying attention to the altitude, habitat, and macroscopic features. Colorado has at least six distinct species.

Some terminology

Sexuality. All of our Colorado species produce unisexual plants in different clumps. A conspicuous field character, especially of the male plants, is that the terminal end of the stem has conspicuous spreading innovations of short branches, the males with a flower-like rosette of broader leaves and an interior cluster of brown filaments and antheridia. The male shoots also have a length of the stem situated below the “flower” on which the leaves are closely appressed to the stem, creating a distinctive “stem”. The

female shoots, while having innovations, lack strongly differentiated perichaetia. Most of your collections will be sterile, but it is always a thrill to see these marvelous flower-like terminal structures. The sporophytes have a well-developed seta and curved, plump and ribbed capsules.

Costa. The costa may not reach the leaf apex, or may be percurrent or long excurrent. The costa is abaxially almost smooth, only a very few mammillae visible. However, the costa in *P. seriata* is studded with sharp-pointed papillae-like mammillae, and the leaf arrangement is such that one may be able to see leaves in more or less vertical rows.

Leaf shape and attitude. Leaf shape is important and in Colorado plants at least, not as variable as expected. The leaves may be lanceolate, plane, and broadest at the base, or they may be ovate lanceolate, broadest just above the suddenly narrowed base. The leaves are either tightly appressed to the stem or they are simply spreading out from the base, or they are catenulate, with the leaf base widely spreading but the lamina curving back, forming the aspect of a chain. Leaf plications seem to me to be variable and of minor significance in our species.

Leaf margins and teeth. The leaf margins may be plane or variously recurved. The marginal teeth are of special significance. Single, or simple, teeth always face toward the leaf apex, and taper to a fairly sharp point. “Double” teeth may be likened to your forefingers; join them in a straight line and push on the tips. That is what a double tooth resembles. Single teeth are associated with the overlapping end (mammilla, prorula or scindula) of the cell that encroaches over the next distal cell; where the scindula does not have a cell to creep over, it is a marginal tooth. Be warned that it is sometimes difficult to decide whether the teeth are single (the tooth consisting of the distal portion of the cell) or double (consisting of the ends of two adjacent cells). Often when the cells are very large and broad, with very thin walls, the mammillae are very difficult to see or find.

Mammillae and papillae. Mammillae are hollow bumps in the cell wall. In only three species, *P. yezoana*, of the Pacific and north Atlantic coast and Japan, the Mexican and tropical *P. scabrifolia*, and *P. corticata*, the mammillae are on the surface of the middle of the cell. On the other species, the mammillae are distal or proximal or both, the position associated respectively with single or double teeth. They may be present on only one face. In a few species, the mammillae are few or lacking. Papillae are sharp-pointed, conical teeth on the cell surface. This occurs in *Philonotis seriata*, where the basal cells are very strongly papillose. There is variability. Do not rely on the teeth of the upper third of the leaf. They may often be single; the teeth of the mid-leaf margin is most reliable.

Robustness. Most of the species are stiffly erect with innovations that are erect. They usually have a distinctly yellowish case. A few species are weak, even almost creeping, and green or blue-green. These include *P. marchica* and *P. uncinata*.

Tomentum. The lower stems are variably tomentose, in a few species conspicuously so. The rhizoids are slender, branched, and covering the whole stem.

Color. Most species are bright yellow or straw-colored. *P. americana*, however, is distinctly blue-green, both in the field and when dried.

Habitat. The species appear to have distinct habitat preferences: seeps from springs along road cuts, moist ledges, and alpine tundra. These will be discussed under the species treatments.

Hints on collecting

Collectors of *Philonotis* ought to separate the massive clumps so that the leaves of the older stems are easily visible. Squeezing a huge clump results in something that resembles bear scat and in order to examine it the wad must be soaked out again. It is very important to be able to examine the leaf arrangement in the older portions of the stem, which often differ very much from those of the first year.

The species

To understand the species, it is essential to first consider *Philonotis fontana* in the broadest sense. What can distinguish the original (type) species, as it was described by Hedwig in 1801 as *Mnium fontanum*, from the numerous varieties described later and maintained today? Has anyone examined the Hedwigian type? Does one exist? The original description is not helpful: “*Mnium fontanum*, caule simplice geniculus inflexa.”

Frahm & Eggers (1995) write (my loose translation): “So it is that the most famous bryologist actually was always an amateur who, day after day had to visit the sick, and came to the mosses only in the early mornings and late evenings. His (Hedwig’s) herbarium passed to his son, and in 1810 was purchased by Schwägrichen. This combined herbarium was bought at an auction by Duby, and following the latter’s death was again put up for sale, [eventually] going to the Boissier Herbarium in Geneva where the duplicates were reunited with Hedwig’s specimens that were in the De Candolle herbarium.” Is there a specimen at Geneva?

Nyholm (1954–1969) writes: “When well developed, this species is characteristic and easily known. However, there are intermediate forms between it and *P. tomentella*, as well as small and poorly developed forms close to it which are almost impossible to recognize. To know the variation of this species and its relation to *P. caespitosa* and *P. tomentella*, I am convinced that it is necessary to carry out cultivation experiments and cytological and genetic studies.”

Nyholm almost disposes of *P. caespitosa* when she says, “This species has been recorded many times in Scandinavia, but its systematic position seems to me to be uncertain. It is closely related to *P. fontana* but it is more slender and has narrower and more falcate leaves.”

Smith (2004, 2006) calls *P. fontana* “a very variable species”, and then goes about showing how the other species that he recognizes differ, but no author that I know of circumscribes *P. fontana, sensu stricto*. In Colorado we probably are justified in dealing with the ‘varieties’, as some recent authors do, by recognizing these as valid species, but the ‘real’ *P. fontana* occurs mostly in eastern North America and Eurasia.

Norris & Shevock (2004) distinguish *P. americana* by the characteristic catenulate leaves, while plants with imbricate leaves include *fontana* and *tomentella*, *fontana* having ovate leaves, the costa not very excurrent, and *tomentella*, with leaves narrowly lanceolate to ovate-lanceolate; costa very strongly excurrent. We find the stem leaves in *tomentella* very broadly ovate!

We feel that Flowers’ (1973) reports from Utah are probably incorrect in not recognizing *P. fontana* segregate species, that we do not have *P. fontana, sensu stricto*, and most of our very middle-altitude

collections belong to *P. americana*. We recognize as species his var. *americana* and var. *pumila*, and we consider that var. *caespitosa* is of no taxonomic significance. *P. tomentella* is a husky plant with black stem leaves that are appressed and long-attenuate. What we believe is *P. seriata* occurs in southern Wyoming close to the Colorado border. A slender plant in southeastern Colorado may be the subtropical species *P. uncinata* (inclusive of *P. glaucescens* and *P. hastata*), which needs further study in Colorado and worldwide).

Note: The collections listed under each of the species below are the specimens housed in the Herbarium in Boulder, Colorado. Each listing starts with the two letter abbreviation for the county where the specimen was collected in Colorado. To avoid confusion, please note that the B-numbers listed here are the original Herbarium/Weber catalogue numbers that appear on the packets themselves and are not the same as the B-numbers under which the specimens are listed in the online database of the Herbarium which are actually bar codes.

Philonotis americana (Dismier) Dismier

Synonym: *Philonotis fontana* (Hedwig) Bridel var. *americana* (Dismier) Crum, Bryologist 72:244, 1969.

This species is very nicely characterized by having catenulate stem leaves, especially evident on the older parts of the stem. Not only does this feature have a chain-like appearance, but makes the stem easily visible between the more remotely arranged leaves. The stems of the current generation can be densely foliate with slender and falcate-secund. In drowned or very shaded situations this shows great plasticity. The stems can be extremely slender, but useful markers are the ovate leaf shape, slightly revolute, double teeth except at the extreme apex, and cells of almost uniform short size, and sometimes distinctly catenulate leaves in the older stems.

Habitat: Very common in the middle altitudes of the mountains, up into the subalpine. A characteristic species that can be seen on mountain road-cut seeps, visible from a speeding car!

Distribution: Western U. S., Eastern Canada. We have a specimen from Cheboygan County, Michigan.

In the foothills of the Front Range, there is a *Philonotis* occurring on drier sites, on cliff faces, especially in rock crevices. It is true green, forming dense, low clumps of slender stems with curiously contorted leaves. The leaves are unusual in that they are very convex, broadly ovate, and they tend to be incurved and somewhat keeled throughout the stem, merely acute or very shortly acuminate; the costa is percurrent or only slightly excurrent. The marginal teeth are very shallow, double except for those at the leaf terminus. The cells are remarkably uniform, broad and short-rectangular from leaf base to apex. Mammillae are very hard to find. The plant is very uniform at all sites.

Collections: BL: 4 mi. W. of Camp Dick and Peaceful Valley, 2987m, *Holmes Rolston, III* 79055 (B-95040);

BL: Bog, hill north of CU Campus, 9500 ft., *Geneva Sayre* 323 (B-23533);

BL: 8 miles NW. Nederland, North Fork Middle Fork Boulder Creek, 10650 feet., *Flowers* 9851 (B-67636);

BL: 8 miles NW of Nederland, North Fork Middle Fork Boulder Creek, 10360 ft., *Flowers* 9852 (B-67792);

BL: 2-3 mi W. of Nederland, *Weber* B-41712;

- BL: junction Science Lodge-Rainbow Lakes road, 9000 ft., *Khanna (B-14938)*;
BL: west slope Bear Peak, 7000 ft., *Weber 7907 (B-23549)*;
CC: Grizzly Gulch, S of Bakersville; 11000 ft., *Weber 7885 (B-23547)*;
CC: St. Mary's Glacier; Silver Lake; 3100 msm, *Weber & Wittmann B-110820*;
CC: Stevens Gulch, NE of Gray's Peak, 12000 ft., *Hermann 24929 (B-95043)*;
CF: St. Elmo, 10000 ft., *Kiener 6737 (B-67832)*;
DA: Castlewood State Park, Castle Rock S Quadrangle, 6400 ft., *Weber, Wittmann & Smith 2.7a (B-114929)*;
EA: Burns, Big Spring, 9600 ft., *Morris 69 (B-95033)*;
GA: 2 mi N of Stump Park Cowcamp. Burns 10100 ft., *Peter R. Morris 413 (B-95047)*;
GA: RMNP, E end of West Ten Lakes Park, 11600 ft., *Willard 62131 (B-43058)*;
GA: S. 4 mi SE of Fraser, 9400 ft., *Holmes Rolston, III 79054 (B-95039)*;
GA: Fraser Experimental Forest, Byers Creek road; 3050 msm, *Weber & Wittmann B-110882*;
GA: Fraser Creek, Mary Jane Ski area; 3000 msm, *Weber & Wittmann B-110480*;
GF: Skinny Fish Creek, 34 miles N Glenwood Springs, 9500 ft., *Hermann 24255 (B-42269)*;
GF: Middle Derby Trail; 3/4 mi E of Roberts Trail. Burns. 9500 ft, 2896m, *Morris 53 (B-95032)*;
GF: Lynx Creek, 35 miles N Glenwood Springs, 9500 ft., *Hermann 24244 (B-42199)*;
GL: road to Apex, near summit, *Grout (B-23531)*;
GL: Tolland, *Grout (B-62313)*;
GL: 2 mi. N of Apex, 10000 ft., *Grout (B-23530)*;
GL: Rollins Pass, Yankee Doodle Lake, 3180 msm., *Weber & Wittmann B-110954*;
GL: Two mi. from Apex, 3200m, *Grout (B-62315)*;
GN: Along Ohio Creek, 8500 ft, 17 miles NW of Gunnison, *Hermann 24436 (B-42250)*;
HN: 7.5 mi SE of Lake City, Rambouillet Park, *Austin 22730 (B-117324)*;
HN: Lower Matterhorn Fen, Big Blue Wilderness, 10500 ft., *Gay Austin 7529 (B-114114)*;
HN: Lower Matterhorn Fen, Big Blue Wilderness, 10500 ft., *Austin 76 (B-114115)*;
JA: 1/2 mi S of Cameron Pass, 7 mi ESE Gould, 9800 ft alt., *Hermann 23847 (B-42196)*;
JA: Upper Slide Lake, 1/2 mi NE of Mt. Ethel, 10720 ft., *Holmes Rolston, III 82206 (B-95031)*;
LA: along Purgatoire River, *David Cooper (B-85558)*;
LR: 1 mile W of Peterson Lake, alt 9500 ft., SSW Rustic, *Hermann 24298 (B-42366)*;
LR: RMNP, 3300msm., Hague Creek Drainage near Mummy Range, *Driver & Cooper 3037 (B-117282)*;
LR: RMNP Longs Peak, Jims Snowpatch, 11100 ft., *Kiener 3416 (B-62353)*;
LR: RMNP, 1-2 miles below Fern Lake, 10000 ft., *Weber & Grove (B-36621)*;
LR: Brown's Lake Trail, 9800 ft., *Holmes Rolston, III 79041 (B-95038)*;
LR: Big Thompson River Canyon, alt 7500 ft, 8 miles W Loveland, *Hermann 17650 (B-10155)*;
LR: Manhattan Hill, Rustic., 8000 ft., *Holmes Rolston, III 79054 (B-62352)*;
LR: Longs Peak. 11100 ft., *Kiener 13207 (B-62352)*;
LR: 1 mi NW of Eaton Reservoir, 8600 ft., *Holmes Rolston, III 79056 (B-95042)*;

- LR: Bear Lake-Emerald Lake trail, RMNP, 9600-10400 ft., *Redfearn 11346 (B-9940)*;
LR: 1 mile W of Peterson Lake, alt 9500 ft., *Hermann 24301 (B-42367)*;
LR: Little South Cache La Poudre River, 9000 ft, 28 miles W Fort Collins, *Hermann 16979 (B-66917)*;
LR: RMNP, Longs Peak. 11100 ft., *Keiner 3416 (B-62375)*;
LR: Big Thompson River, Fern Lake trail, RMNP, *Hermann 23920 (B-45271)*;
LR: RMNP, Longs Peak. 11150 ft., *Kiener 9215 (B-62354)*;
LR: Big Thompson River Canyon, 8 miles W Loveland, 7500 ft., *Hermann 17650 (B-62323)*;
MF: Routt National Forest, 3.7 mi beyond Sawmill Campground, 2940 m, *Flock FB-105810 (B-96052)*;
OR: Camp Bird Mine road 3 mi above junction, *Weber & Wittmann B-111906*;
OR: Road to Camp Bird Mine, San Juan Mts, 5.5 mi SW Ouray, 9800 ft., *Hermann 23238 (B-38352)*;
PA: Trail to Wheeler Lake, N of Mt. Lincoln, 12300 ft., *Weber 883 (B-27476)*;
PA: East side of Mosquito Pass, Ten Mile Range, W of Alma, 12600 ft., *Weber, Wittmann & Lehr B-117357*;
PT: Independence Pass, 11500 ft. *Matthews 1098 (B-89545)*;
PT: Roaring Fork valley, Aspen to Lost Man Campground, 8000 ft. - 10200 ft., *Weber B-10898*;
PT: Independence Pass, 12090 ft., *Clebsch 13588 (B-66902)*;
PT: Independence Pass: Hwy 82, west below pass, 12000 ft., *Matthews 1082 (B-89803)*;
RT: Park Range, Routt National Forest, 1-2 mi above Slavonia, 2700-3000 m, *Weber & Nelson (B-49346)*;
RT: Gilpin Lake, Routt National Forest; 10338 ft., *Holmes Rolston, III 84118 (B-95035)*;
SA: San Juan National Forest, No-Name Basin, 11000 ft., *Michener 102 (B-13580)*;
ST: McCullough Gulch, Breckenridge Quad, 366m, *Weber B-112717*;
ST: 2 mi up Vail Pass from Frisco; 8800 ft., *Weber, Munger & Kunkel (B-46353)*;
ST: Interstate 70, mile marker 191, 3200m, *Driver 032 (B-117954)*;
ST: Blue Lake Dam area, Monte Cristo Creek Valley, Ten Mile Range, 3000m *Weber & Wittmann B-111146*.

Possibly this is what was published by Renault & Cardot as *Philonotis venella* in *Botanical Gazette* 22:51.1896. *New Mosses of North America* VI, pp 48-53. "PHILONOTIS VENELLA C. Muell. var. *Coloradensis*. – Areolation more chlorophyllose; marginal cells narrower, teeth of the leaves more patulous. Sterile. – Perhaps a small, depauperate form of *Ph. Muehlenbergii* Brid.? Colorado: Springdale, Boulder Co. Marie Holzinger, 1892, commun. J.M. Holzinger."

Philonotis marchica (Willdenow) Bridel, Bryol. Univ. 2:23, 735. 1827.

Synonym: *P. muhlenbergii* (Schwaegrichen) Bridel, Bryol. Univ. 2:22. 1827.

Bartramia muhlenbergii Schwaegrichen, Suppl. 1:58. 1816.

This is a very delicate species, allied to *P. uncinata*. The leaves are loosely spreading, straight, blue-green, narrowly triangular (isosceles) from base to acute apex. The costa just reaches the slender leaf apex. The prorulae are common and conspicuous, especially in the basal cells, and are distally placed and rounded. The distal cells are narrow, and the basal cells are short and broadly rectangular. The teeth are single from base to apex. It cannot be confused with the larger common species that are yellow-green and have proximal prorulae.

Collections: BL: Little Royal Gorge, *Weber & Wittmann B-110600*;

BL: Gregory Canyon, 6800 ft., granite cliffs, *Weber & Wittmann B-112133*;

BL: Calypso Cascades, in fir wood Thunder Lake Trail, Wild Basin, 9150 ft, 3.5 miles W. of Allenspark, thin soil on granite boulder at edge of Cony Creek, *Hermann 24563 (B-42331)*;

DG: Castlewood Canyon State Park, on seasonally moist rocks or canyon rim, *Weber & Wittmann B-112995*;

FN: Phantom Canyon, between Florence and Victor, 5900-6000 ft., 5-6 mi N of Hwy. 50 junction, *Weber & Wittmann B-112194*;

GA: RMNP, picnic area on Road 34, *Kosovich-Anderson 5.3 (B-116929)*;

GL: Black Hawk Quadrangle, ca 500 ft W of the Gilpin Public Library entrance, 9000 ft, *Weber & Wittmann B-118811*;

LR: Cache La Poudre River, 9000 ft., 28 mi W Fort Collins, *Hermann 16968 (B-67592)*;

LR: RMNP, Hidden Valley Creek, on sandy bank, 10700 ft., *Hermann 27613 (B-60474)*;

LR: Pinewood Springs, *Hermann 27628 (B-60494)*;

LR: 8 mi W of Loveland, in crevice of granite boulder, *Hermann 17634 (B-10158)*;

LR: Big Thompson River Canyon, 7500 ft, crevice in granite boulder in river, ca 8 miles W. of Loveland, *Hermann 17634 (B-66840)*;

LR: W shore of Bear Lake, on undersurface of overhanging gneiss boulder, 9500 ft., *Hermann 16944 (B-66847)*;

LR: Glacier Gorge, 9800 ft., moist peaty bank, *Hermann 24883 (B-42946)*;

ML: Bank of South Clear Creek near crest of waterfall E of South Clear Creek Campground, ca 23 mi W Creede, 9200 ft, *Hermann 26587 (B-52448)*;

SH: Valley View Hot Springs, west base of Sangre de Cristo Range, ca. 8700 ft., along streamlet below upper pool, in *Quercus gambelii* thicket, *Erdman 77b (B-113542)*.

CF: San Isabel National Forest, Mineral Basin area, *Smith (B-117620)*;

CF: San Isabel National Forest, 12300 ft., Mineral Basin area, *Smith (B-117619)*;

GN: Rustler's Gulch, N of Gothic, 11000 ft., *Lehr (B-112958)*;

LP: 10 mi N of Hesperus, 9000 ft., *Pursell 3211 (B-1983)*;

ML: Chattanooga Fen, base of Red Mountain, *Cooper 2365 (B-110457)*;

PA: Four-Mile Creek road SW of Fairplay, 3000m, *Weber B-63640*;

PT: Castle Creek, 8200 ft., *Clebsch & Clebsch 13417 (B-67486)*;

SA: Chattanooga Fen, *Lyon NV44 (B-113177)*;

Philonotis pumila (Turner) Kindberg, European and N. American Bryiniae (Mosses) 2:328.1897.

Synonym: *Bartramia fontana* Swartz (1800, pre-Hedwigian name) var. *pumila* Turner, Musci Hibernici 167. 1804.

Philonotis fontana (Hedwig) Bridel var. *pumila* Turner.

Plants tightly packed, short, the green parts only a few cm high; leaves appressed, crowded, not catenulate, broadly cordate-ovate straight or only slightly falcate, abruptly narrowed, costa very slightly excurrent. Stems packed in a dense tomentose mat below. This is an infrequent plant mostly occurring on the tundra and subalpine ecotone.

Collections: BL: Niwot Ridge, 11,400 ft., *Flock & Shushan LTER B-106 (B-82624)*;

BL: Trail to Mitchell Lake, 10,600 ft., *Hermann 27127 (B-57502)*;

GA: Fox Park, Buchanan Pass Trail; 10400 ft., *Holmes Rolston, III 80136 (B-95037)*;

GF: Island Lake Trail, Burns, 11000 ft., *Morris 50 (B-95046)*;

JA: Michigan Lakes Trail, Never Summer Mts, 10400 ft., *Hermann 27916 (B-64531)*;

LR: Endovalley, RMNP, W of Fan Lake, 2600 m, *Cottrell 2 (B-100451)*;

LR: RMNP, Hidden Valley Creek, above Trail Ridge Rd, 11000 ft., *Hermann 27620 (B-95044)*;

ME: Grand Mesa, SW of Cold Sore Reservoir, 10779 ft., *Austin 139 (B-115649)*;

PA: W of Fairplay, Coney Lake, 12500 ft., *Mazurek 628 (B-113047)*;

PT: Independence Pass. 12090 ft., *Clebsch 13589 (B-62010)*;

RB: Vaughn Lake, 27 mi NE Buford, 9500 ft., *Hermann 24231 (B-42194)*;

RT: On trail along Fish Creek, E Steamboat Springs; 7500 ft., *Hermann 23860 (B-42286)*;

SM: Prospect Basin, 10 km S of Telluride, 11170 ft., *Cooper 2424 (B-112383)*;

ST: 2 mi up Vail Pass from Frisco, 8800 ft., *Weber, Munger & Kunkel (B-46350)*.

Distribution: American Arctic south to western U.S., and eastern Canada, Eurasia, and Iceland. Not represented in the British Flora.

Philonotis seriata Mitten. J. Linn. Soc. London, Bot. Suppl., 1869.

A robust species differing from *P. fontana* by the costa being densely covered abaxially by sharp pointed papillae, and having the upper stem leaves so arranged as to create the impression of vertical lines of cells. The leaf cells and marginal teeth also are much more conspicuously mammillose.

Distribution: BFNA reports this Eurasian species only from south Greenland. Dismier (1907) reported [my translation]: “While studying, in the museum herbarium, collections made by Breutel in Greenland, I have found three specimens which match without doubt *Ph. seriata*. This species is new for North America.”

Specimens: Yelena Kosovich-Anderson collected this in the Medicine Bow Range west of Laramie, Wyoming, near the Colorado border, it is therefore likely to be found in Colorado as well.

Collections: Medicine Bow National Forest, Snowy Range, *Kosovich-Anderson 1527 (B-116882)*;

Medicine Bow National Forest, Snowy Range, *Kosovich-Anderson 1523 (B-116938)*.

Philonotis tomentella Molendo in Lorentz, Mosstudien, 1864. [not Lorch]

Synonym: *P. fontana* var. *tomentella* (Molendo) Dixon. Smith, unbelievably, synonymizes under this name *P. fontana* var. *pumila* (Turner) Bridel

Although he does not list the name, the author of the BFNA treatment evidently includes this under *Philonotis fontanus* var. *fontanus*. This species is evidently strictly alpine in Colorado. It is usually a very robust plant making deep cushions. The species is not even mentioned in the BFNA treatment. Smith (2004, 2006) says: “*P. tomentella* is close to *P. fontana* but has more slender stems with narrower leaves with long, sometimes subulate, points and acute inner perigonal leaves; these differences seem constant and the plant is worthy of specific status.”

Not only the above, but in *P. tomentella*, the leaves are long and narrow, often falcate-secund, giving a shaggy appearance to the clump. Moreover, the leaves are not at all catenulate and they are very densely distributed and appressed along the stem so that the stem is not visible because of all the overlapping leaf bases. Male plants have elongate stems with appressed leaves and do not have a shaggy appearance, but they occur with the normal form of the female plants, and the leaves are usually falcate-secund but not loosely or catenulate in the lower stem sections.

Specimens: I first encountered this species on Mount Evans, collecting with Herman Persson, who immediately recognized it in the field.

Collections: BL: Caribou, Weber (B-41718);

BL: below Isabelle Glacier, 11400-11800 ft., Vera Komarkova (B-42032);

BL: Eldora, NW of Diamond Lake, 11,000 ft., Hermann 26682 (B-52713);

BL: Blue Lake, 11,320 ft., Chapman 24 (B-29872);

BL: 4th of July Campground, Arapahoe Massif, Flowers 9852 (B-40799);

BL: Niwot Ridge, 3475m, Flock & Shushan LTER B-110 (B-82623);

CC: E of Berthoud Pass; 11000 ft., Tolstead 10181 (B-62051);

CF: St. Elmo, 10,000 ft., Kiener 6737 (B-23548);

GA: .5 mile S. of Rollins Pass, 14 miles NE. Winter Park, 3536m, Hermann 25657 (B-44962);

GA: West of Baker Mtn. 12 mi. NW of Grand Lake 10000 ft., Douglass & Douglass 60-263 (B-5226);

GA: RMNP, Ute Trail, S of Lake Irene, 10500 ft., Hermann 26503 (B-57230);

GF: Island Lake Trail, Burns, 11500 ft., Peter R. Morris 60 (B-95169);

GL: Rollins Pass, 11,000 ft., above Yankee Doodle Lake, Weber, Vaarama, Khanna (B-11175);

GL: Rollins Pass, above Yankee Doodle Lake, 11000 ft., Weber, Vaarama, Khanna (B-11173);

GN: National forest below Gothic Natural Area, 3048m, Khanna 26 (B-15340);

HN: Slumgullion Fen, above Lake City, 2900m, Weber & Wittmann B-116813;

LR: Blue Lake Trail, WNW of Chambers Lake Campground, 9800 ft., Hermann 27587 (B-60491);

LR: RMNP, Trail Ridge, 10800 ft., Keiner 7167 (B-62032);

LR: RMNP, Trail Ridge Rd, W of Gore Range Overlook, 11600 ft., Weber 27658 (B-60379);

LR: Blue Lake Trail, 3 m W of Chambers Lake, 10400 ft., Holmes Rolston, III 80079 (B-95168);

LR: Cameron Pass, 10000-11500 ft., Baker 23 (B-23550);

ML: 1/2 mi W of Wolf Creek Pass, 10800 ft., Hermann 23355 (B-95045);

ML: 1/2 mi W of Wolf Creek Pass, 10800 ft., Hermann 23355 (B-38366);

OR: Red Mountain Pass, N of summit, 11000 ft., Weber, Wittmann, Lehr (B-112586);

- OR: 8 mi SW of Ouray, on Camp Bird Mine road to Yankee Boy Basin, 10000 ft., *Hofer* (B-118407);
- PA: Michigan Lake, N of Jefferson, 11000 ft., *Weber, Porsild & Holmen* (B-4391);
- PA: Trail to Wheeler Lake, N of Mt. Lincoln, 12300 ft., *Weber* 8829 (B-66826);
- PA: Trail to Wheeler Lake, N of Mt. Lincoln; 12300 ft., *Weber* 8829 (B-23551);
- PT: below Independence Pass, 12000 ft., *Clebsch & Clebsch* 13556 (B-62334);
- PT: Roaring Fork valley, between Aspen and Lost Man Campground, 8000-10200 ft., *Weber* B-10899;
- PT: Roaring Fork Canyon below Lost Man Campground, *Weber* B-111975;
- PT: Roaring Fork valley, between Aspen and Lost Man Campground, 8000-10200 ft., *Weber* B-10912;
- RT: Gilpin Lake, NE of Slavonia trailhead, Mt. Zirkel Wilderness, 10338 ft., *Holmes Rolston, III* 84139 (B-95036);
- SA: Mineral Creek, NW of Silverton, 10440 ft., *Lemly, Chimner & Cooper* 2246 (B-116813);
- SA: S of Red Mountain Pass, above Chattanooga, 3100 m, *Weber & Wittmann* B-111043;
- SA: Chattanooga Iron Fen, S of Red Mountain Pass; 10250 ft., *Weber & Wittmann* B-111021;
- SA: Base of Red Mountain Pass, E of Chattanooga Iron Fen, *Austin* 84 (B-114105);
- ST: Blue Lake, Mosquito Range, 11700 ft., *Weber & Anderson* (B-34256).

Philonotis uncinata (Schwägrichen) Bridel.

Synonym: *P. glaucescens* (Hornschuch) Brotherus

Plants very slender relatively unbranched, the leaves spreading when dry. Leaves just under 1 mm long, pale or translucent, very narrowly lanceolate, not broadened at the base; costa smooth, long excurrent. Leaves appearing almost linear when dry. Margin slightly revolute distally, plane proximally. Marginal teeth in pairs in lower half of leaf, single large, and pointed ones at leaf apex. Mammillae distal. Leaf cells short-rectangular throughout, hardly differentiated from one end of the leaf to the other. A slender plant found in southeastern Colorado and currently identified as *P. americana* may actually be *P. uncinata*, which needs further study in Colorado and worldwide.

Collections: No sure specimen, possibly LA: Along Purgatoire River, *D. Cooper* B-85558 (currently under *P. americana*).

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ABOUT THE AUTHOR

William A. Weber was born in New York City in 1918. He began to study bryophytes in 1933 when he was shown a small collection by his high school biology teacher, Grace Esternaux (born 1901), who had taken a bryology course at Cornell University. His first botanical paper was published in 1940 (see below). He has field bryological experience in the United States including Alaska and Hawaii, Canada, Mexico, Costa Rica, the Galapagos Islands, Canary Islands, Chile, Australia, Papua New Guinea, Europe, Nepal, and Russia. His most recent book on bryophytes was published in 2007 (Weber & Wittmann). His field investigations have taken him to many parts of the world and have included lichens, bryophytes, vascular plants, as well as phytogeography. His long-standing flora of Colorado (2012) culminated in a two volume work that included keys, phytogeographical and historical background material and stories from the field. He has published biographical works on Wilhelm Suksdorf, T.D.A. Cockerell, and C. C. Parry. He has a broad base as a character actor, choral singer, recorder player, and loves to sing Gilbert and Sullivan at the drop of a hat. He is a unique specimen.



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