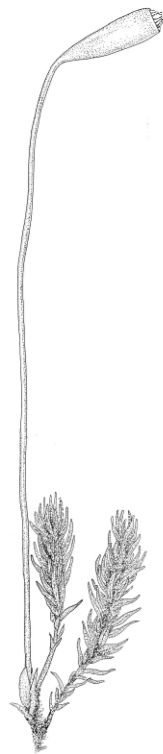




**FLORA OF NEW ZEALAND**  
**MOSSES**

**MIELICHHOFERIACEAE**



---

**A.J. FIFE**

Fascicle 47 – DECEMBER 2020

© Landcare Research New Zealand Limited 2020.

Unless indicated otherwise for specific items, this copyright work is licensed under the Creative Commons Attribution 4.0 International licence



Attribution if redistributing to the public without adaptation: "Source: Manaaki Whenua – Landcare Research"

Attribution if making an adaptation or derivative work: "Sourced from Manaaki Whenua – Landcare Research"

See Image Information for copyright and licence details for images.

#### CATALOGUING IN PUBLICATION

Fife, Allan J. (Allan James), 1951-

Flora of New Zealand : mosses. Fascicle 47, Mielichhoferiaceae / Allan J. Fife. -- Lincoln, N.Z. : Manaaki Whenua Press, 2020.

1 online resource

ISBN 978-0-947525-69-9 (pdf)

ISBN 978-0-478-34747-0 (set)

1.Mosses -- New Zealand -- Identification. I. Title. II. Manaaki Whenua – Landcare Research New Zealand Ltd.

UDC 582.344.824(931)

DC 588.20993

DOI: 10.7931/5g65-hh96

This work should be cited as:

Fife, A.J. 2020: Mielichhoferiaceae. *In*: Smissen, R. (ed.) *Flora of New Zealand — Mosses*. Fascicle 47. Manaaki Whenua Press, Lincoln.  
<http://dx.doi.org/10.7931/5g65-hh96>

Date submitted: 7 Aug 2020; Date accepted: 18 Aug 2020; Date published: 2 January 2021

Cover image: *Mielichhoferia bryoides*, habit with dehisced capsule. Drawn by Rebecca Wagstaff from *G. Brownlie 560*, CHR 427693.

# Contents

Introduction.....	1
Typification.....	1
Taxa	
<i>Mielichhoferiaceae</i> .....	2
<i>Eipterygium</i> Lindb. ....	3
<i>Eipterygium opararensense</i> Fife & A.J.Shaw .....	4
<i>Mielichhoferia</i> Nees & Hornsch. ....	5
<i>Mielichhoferia bryoides</i> (Harv.) Wijk & Margad. ....	6
<i>Ochiobryum</i> J.R.Spence & H.P.Ramsay .....	8
<i>Ochiobryum blandum</i> (Hook.f. & Wilson) J.R.Spence & H.P.Ramsay .....	8
<i>Pohlia</i> Hedw. ....	10
<i>Pohlia annotina</i> (Hedw.) Lindb. ....	11
<i>Pohlia australis</i> A.J.Shaw & Fife .....	12
<i>Pohlia camptotrachela</i> (Renauld & Cardot) Broth. ....	13
<i>Pohlia cruda</i> (Hedw.) Lindb. ....	14
<i>Pohlia elongata</i> Hedw. ....	15
<i>Pohlia nutans</i> (Hedw.) Lindb. ....	16
<i>Pohlia ochii</i> Vitt .....	17
<i>Pohlia tenuifolia</i> (A.Jaeger) Broth. ....	19
<i>Pohlia wahlenbergii</i> (F.Weber & D.Mohr) A.L.Andrews .....	20
References .....	22
Conventions .....	25
Acknowledgements .....	27
Plates .....	28
Maps .....	36
Index .....	38
Image Information .....	39



---

## Introduction

The four genera placed here in the Mielichhoferiaceae have been placed by previous Australasian workers in the Bryaceae. However, recent molecular studies have argued strongly for the removal of the large genera *Pohlia* and *Mielichhoferia*, as well as the smaller *Eipterygium*, from that family, and their placement in a resurrected Mielichhoferiaceae.

In a New Zealand context, *Pohlia* is the largest and the most familiar genus, with nine soil-inhabiting species in our flora. It is also the genus most likely to be confused with *Bryum*. However, species of *Pohlia* have more elongate laminal cells and lack a distinct leaf border. In *Pohlia* the costae nearly always end in or below the leaf apex, while in *Bryum* the costae are often excurrent. The two genera share well-developed double peristomes. Four of the *Pohlia* species occurring here produce distinctive axillary gemmae, which greatly aid identification. Several N.Z. *Pohlia* species are also widespread in temperate regions of the northern hemisphere.

The remaining three N.Z. genera placed in this family are each represented by a single species. *Mielichhoferia bryoides* is a widespread species in N.Z., most frequent on sheltered and dry soil in eastern parts of the country. Suberect, slightly asymmetric, oblong-cylindric capsules, basal perichaetia, and the functionally single peristome, collectively permit its field recognition.

*Eipterygium opararensense*, by contrast, is one of N.Z.'s most threatened moss species and is also the only member of its genus recorded from the temperate southern hemisphere. It is known from only two localities in the Nelson L.D, where the better-documented sites had fewer than 50 surviving plants at the time of its most recent survey.

The genus *Ochiobryum* is a very small genus comprising one to three species; it is placed here partly on the strength of its pohlioid laminal cells. *Ochiobryum blandum* is a very widespread species in N.Z. that occurs mostly in swift streams and seepages. It is a highly distinctive and lustrous plant, with oblong, bordered, and obtuse leaves.

---

## Typification

The following typifications are designated in accordance with the International Code of Nomenclature for Plants, Algae and Fungi.

***Bryum bealeyensis* R.Br.bis, Trans. & Proc. New Zealand Inst. 31: 457 (1899)**

Lectotype (designated here): N.Z., Marsh, on the hill at the back of the Bealey Hotel, February 1899, *R. Brown*, CHR 335248!

***Bryum binnsii* R.Br.bis, Trans. & Proc. New Zealand Inst. 31: 456 (1899)**

Lectotype (designated here): N.Z., Wet banks, Stewart Island, *R. Brown*, CHR 335250! A second syntype, collected by W. Bell at Dunedin, has not been seen.

***Mielichhoferia australis* Hampe, Linnaea 28: 204 (1856)**

Lectotype (designated here): Australia, "In austral. felix, Grampians", *F. Mueller s.n.*, Herb. Hampe, BM 000983478! See notes below.

***Mielichhoferia buchananii* R.Br.bis, Trans. & Proc. New Zealand Inst. 31: 443 (1899)**

Lectotype (designated here): N.Z., Canterbury, Mt Torlesse or Selwyn Gorge, *R. Brown s.n.*, CHR 335691!

***Schizymerium bryoides* Harv., Gen. S. Afr. Pl. 385 (1838)**

Lectotype (designated here): South Africa, Cap Bon Spei, *Harvey s.n.* [herb. Hooker 751], BM 000870621. Designated by J. Shaw, April 1984 in *herb.* BM, but not published. Image seen online, JSTOR Global Plants, accessed 5 March 2018. Isolectotype (designated here): BM 000870622! See notes below.

---

## Mielichhoferiaceae

**Plants** erect, small to medium-sized, dull or lustrous, variably coloured. **Stems** mostly simple, sometimes branched, often with subfloral innovations, in cross-section with a central strand present or rarely absent. **Leaves** uniform or rarely dimorphic, crowded near the shoot apex or evenly spaced, mostly erect or erect-spreading when moist, ovate-lanceolate, narrowly lanceolate, to broadly elliptic, sometimes bordered, toothed or rarely entire; **upper laminal cells** linear to rhombic, thick- or thin-walled, smooth, becoming shorter and laxer towards the insertion. **Costa** single, mostly thin, variable in length. **Axillary gemmae** sometimes present (in *Pohlia*) or absent.

**Dioicous, paroicous or rarely autoicous. Perichaetia** terminal or occasionally basal, often conspicuous and subtended by innovations. **Setae** usually single, elongate, flexuose; **capsule** stance variable, pendent to erect, cylindrical to pyriform to short-ovoid, with a long or short neck that is sometimes longer than the urn; **annulus** mostly present and revoluble; **operculum** conic, sometimes ± apiculate or rostrate; **stomata** superficial or immersed. **Peristome** mostly double and well-developed, sometimes greatly reduced (as in *Mielichhoferia*). **Calyptra** cucullate, smooth. **Spores** spherical, smooth or papillose.

**Taxonomy:** The genera *Pohlia*, *Epipterygium*, and *Mielichhoferia* are placed here in the Mielichhoferiaceae. This disregards an earlier stated intention (Fife 2015, p. 9) to treat these genera in the Mniaceae (q.v.). Their segregation from both the Mniaceae and the Bryaceae mirrors Shaw & Ramsay (2013), who were influenced by chloroplast DNA sequences published by Cox & Hedderson (2003). The genus *Ochiobryum* is also placed here on the strength of morphological evidence. *Pohlia* is represented in N.Z. by nine species, while each of the remaining three genera have only one regional species each.

Spence & Ramsay (2006, p. 320) retained *Ochiobryum* in their Australian treatment of the Bryaceae, opining that it appeared to be related to *Pohlia* and *Plagiobryum* (and, less plausibly, to *Leptobryum*). Previously published chloroplast genome molecular data presented by Cox & Hedderson (2003) show *O. blandum* (as *Bryum blandum*) embedded in their most likely tree (fig. 2) in a clade that includes the type of *Bryum* (*B. argenteum*). Their fig. 2 suggests an unresolved relationship to the northern hemisphere taxa *Bryum muehlenbeckii* and *B. alpinum*.

In their influential classification, Goffinet et al. (2009) accepted *Ochiobryum* and placed it in the family Mniaceae, a decision that I (Fife 2015) have previously accepted. However, on further reflection, the genera that Goffinet et al. placed in the Mniaceae, when viewed in a N.Z. context, seem a highly unnatural assemblage. It seems preferable to further restrict the Mniaceae and to place *Mielichhoferia*, *Pohlia*, and *Epipterygium* in the Mielichhoferiaceae, together with *Ochiobryum*. This partially conforms with Shaw & Ramsay's (2013) Australian treatment.

The placement of *Ochiobryum* in the Mielichhoferiaceae is a tentative solution, based in part on its upper laminal cells narrowly hexagonal or rhomboid, thin-walled, becoming longer in the lower leaf, its weakly developed border, and axillary perichaetia usually restricted to the plant base.

- |    |   |                       |
|----|---|-----------------------|
| 1  | <b>Vegetative leaves</b> acute, lacking a distinct border.....  | 2                     |
| 1' | <b>Vegetative leaves</b> obtuse or broadly rounded, with or without a distinct border.....  | 3                     |
| 2  | <b>Plants</b> lacking both secondary pigments and axillary gemmae; <b>vegetative leaves</b> with some wide-spreading marginal teeth; <b>perichaetia</b> basal; <b>paroicous</b> or <b>synoicous</b> ; <b>peristome</b> mostly single, with conspicuous and linear <b>endostome segments</b> arising from a short basal membrane and cilia lacking, with the <b>exostome</b> absent or highly reduced; <b>capsules</b> erect or weakly inclined..... | <i>Mielichhoferia</i> |
| 2' | <b>Plants</b> often with secondary pigments and often producing axillary gemmae; <b>vegetative leaves</b> mostly toothed, but the teeth not wide-spreading; <b>perichaetia</b> terminal; <b>dioicous</b> ; <b>peristome</b> double, <b>endostome segments</b> keeled and usually perforate and <b>cilia</b> mostly well-developed; <b>capsules</b> inclined, pendent, or only rarely suberect.....  | <i>Pohlia</i>         |

- 
- 3 **Plants** common and widespread, forming cushions in flowing water; **leaves** not distichous, broadly obtuse or rounded and often  $\pm$  cucullate at apex; **costa** rather thin, unbranched, subpercurrent..... *Ochiobryum*
- 3' **Plants** very rare and restricted to Nelson L.D., erect with several stems arising from a common point, on vertical irrigated granite or on rotten stumps; **leaves** distichous, broadly obtuse but not rounded nor cucullate; **costa** broad but diffuse at base, sometimes branched, ending far below leaf apex..... *Eipterygium*

## ***Eipterygium* Lindb., Öfvers. Kongl. Vetensk.-Akad. Förh. 19: 603 (1863)**

**Type taxon:** *Eipterygium wrightii* (Sull.) Lindb.

The following generic description draws on material in Shaw (1994).

**Plants** very small to medium-sized, pale- to brown-green to reddish,  $\pm$  complanate, lustrous or dull. **Stems** erect or reclining, often horizontal from a vertical substrate, often much branched at base, sometimes unbranched, with a distinct central strand in N.Z. species, with sparse rhizoids restricted to near base. **Leaves** mostly dimorphic (monomorphic in N.Z. species), the **lateral leaves** in 2–3 rows, obovate to broadly elliptic, acute (sometimes broadly so) to acuminate, scarcely altered when dry, sometimes decurrent; **reduced dorsal leaves** often present in 1–3 rows and narrowly to broadly lanceolate; **leaf margins** plane, entire to weakly serrate or crenulate near apex; **laminal cells** prosenchymatous, large, lax, and thin-walled, broadly rhombic to linear, narrowed at margins to form a border; **costa** weak, extending  $(\frac{1}{3}-)\frac{1}{2}-\frac{2}{3}$  the length of the lateral leaves, often red, usually shorter in dorsal leaves.

**Dioicous.** **Perichaetia** terminal, with perichaetial leaves similar to vegetative leaves or longer and narrower. **Perigonia** terminal and bulbiform. **Setae** elongate; **capsules** inclined, short cylindrical or pyriform; **exothecial cells** collenchymatous; **annulus** differentiated; **operculum** convex to conic; **peristome** well-developed and bryoid, with nodulose **cilia**.

**Taxonomy:** The gametophytes of most species of *Eipterygium* are characterised by having usually complanate and dimorphic, more or less elliptic leaves arranged in a 2/5 phyllotaxy. The plants usually have red pigments, laxly rhomboidal (prosenchymatous) leaf cells, weak costae, and more or less distinctly bordered leaves (Fife & Shaw 1990). The relatively short costae help distinguish it from *Pohlia*.

Shaw (1984) described the species of *Eipterygium* as "essentially uniform" in sporophyte morphology and noted that the "uniformity of the sporophytes lends cohesion to a genus of considerable gametophytic variability." Sporophytes are rare in most species of *Eipterygium*, which are apparently all dioicous.

*Eipterygium* is primarily a tropical genus, with a centre of diversity in, and near, Central America, but also occurring in tropical Africa and Asia. Its occurrence in temperate regions of the northern hemisphere (notably in western North America, Britain, and scattered localities in continental Europe, the Caucasus, the Himalayas, and Japan) is due to the wide range of one species, *E. tozeri* (Grev.) Lindb., which is the best known species. *Eipterygium opararensense* is the only member of the genus recorded from the temperate southern hemisphere.

Shaw & Ramsay (2013) recently published their opinion that *Eipterygium*, together with *Pohlia* and *Mielichhoferia*, should be isolated into the segregate family Mielichhoferiaceae. As rationale for this family, they cite molecular studies by Cox & Hedderson (2003).

**Etymology:** According to Meagher (2011), the generic name *Eipterygium* derives from "epi (almost, near) + pterygion (little wing), presumably referring to the appearance of the upper leaves, which are almost distichous and resemble wings, somewhat like *Mittenia*".



---

## ***Eipterygium opararens* Fife & A.J. Shaw, *New Zealand J. Bot.* 28: 375 (1990)**

Holotype: N.Z.: Nelson L. D., Oparara River Valley, A.J. Fife 7047, 16 December 1984, CHR 405896! Isotypes: BA, MICH, NSW, NY, WELT.

= *Eipterygium obovatum* Ochyra, *Polish. Bot. Stud.* 1: 52 (1991)

Holotype: N.Z., Nelson District, Tasman Mts., Kakapo Saddle, elev. ca. 1000 m, on base of rotting stump of *Nothofagus*, 23 January 1981, J.K. Bartlett 33016, AK 197610!

**Plants** very small, pale green or brownish green, strongly lustrous both fresh and dry, complanate. **Stems** pale yellowish or reddish brown, several arising from a common point, unbranched, to 15 mm tall, in cross-section c. 180–210 µm diam., with a well-defined central strand and 1–2 layers of thick-walled cortical cells, beset with sparse, nearly smooth, yellow-brown rhizoids near base. **Leaves** distichously arranged, not dimorphic, somewhat asymmetric (especially at base), broadly elliptic from a narrow base, broadly acute at apex, 1.5–2.1 × 0.7–0.85 mm, becoming smaller and scale-like towards the stem base; **margins** plane, entire or slightly crenulate, often with a few blunt teeth at the apex; **upper laminal cells** thin-walled, prosenchymatous, (90–)120–180(–195) × (21–)24–30 µm, somewhat longer and obliquely arranged below, 1–2 rows at margins firmer-walled, linear, c. 225–270 µm long, and forming a faint border most distinct at mid leaf. **Costa**  $\frac{1}{3}$ – $\frac{2}{3}$  the leaf length, broad and ± diffuse at base, sometimes branched, in cross-section with 2–3 layers of cells, weakly defined guide cells, and no stereids.

**Apparently dioicous. Perichaetia** terminal, with leaves somewhat narrower than vegetative leaves but not otherwise differentiated, with c. 5–8 archegonia and lacking paraphyses. **Perigonia** and **sporophytes** not seen.

**Illustrations:** Plate 1. Fife & Shaw 1990, figs 1–2; Ochyra 1991, figs 1–29 (as *E. obovatum*).

**Distribution:** SI: Nelson (Ōpārara Valley, Kākāpō Saddle).

Endemic.

**Habitat:** In liverwort mats over ± vertical and shaded granite, sometimes ± directly on granite, and on soil associated with rotten stumps or decaying trunks of southern beech. The known collections are from c. 200 m to c. 1000 m. All the Ōpārara Valley localities are from a riparian *Fuscospora fusca* dominated forest with scattered podocarp emergents and a *Weinmannia racemosa* and tree-fern understorey.

**Notes:** The best documented material was collected from very sheltered mats of *Kurzia hippuroides* and *Metrosideros perforata* over shaded, vertical (or overhanging) and weakly irrigated granite (or sometimes ± directly on the granite) in the Ōpārara Valley. Very weak irrigation (with slow drips when observed in dry weather) is usually present. *Eipterygium opararens* typically occurs as either single stems or small tufts among the *Kurzia hippuroides* mat. In addition to the *Kurzia*, *Mittenia plumula* appears to be a nearly constant associate, albeit usually at a distance of a few to several centimetres. Also collected from "soil inside [a] rotten trunk, with *Mittenia plumula* and *Fissidens pallidus*" c. 300 m from the type locality (P.J. Brownsey s.n., WELT M 028510) and in an apparently similar habitat at Kākāpō Saddle (AK 197610). Other associated mosses include *Calomnion complanatum*, *Distichophyllum rotundifolium*, and *Hypnodendron arcuatum*, and the hepatics *Acromastigum anisostomum*, *Balantiopsis diplophylla*, *Lembidium nutans*, and *Ceramanus tuberifera*.

*Eipterygium opararens* is among the rarest of N.Z. mosses and it is classified as Nationally Critical (Rolfe et al., 2016). A survey of the Ōpārara Valley population in March 2005 (Fife & Knightbridge 2005) determined that c. 175 individual plants were present at the type locality. The bulk (c. 150) of the plants grew in a nearly vertical vegetation mat of c. 1.0 × 1.5 m dimension. In June 2008 a wind-throw of trees adjacent to the rock face detached nearly all of the vegetation mat from the underlying granite, and in June 2009 Phil Knightbridge (pers. comm., June 2009) observed that the wind-throw event had severely affected the *Eipterygium* population. During a follow-on survey by Allan Fife and Jane Marshall in March 2010, only five tufts of *E. opararens* were found among the detached (and now mostly dead) *K. hippuroides* mat. More plants were found beneath a granite overhang only a few metres distant, where an estimated 30–35 plants, in an area of c. 80 mm diameter in a *K. hippuroides* mat, were documented; these appeared to be threatened with overgrowth by nearby plants of *Marchantia foliacea*.

Intensive searches in the immediate vicinity of the type locality (by Fife and Knightbridge in March 2005 and by Fife in March 2010) and in other parts of the Ōpārara Valley, including Fenian Creek area (by Fife, Macmillan, and Tangney in 1990) have failed to locate new populations.

---



---

In 1981 J.K. Bartlett collected this species from Kākāpō Saddle, some 30 km SSE of the Ōpārara Valley locality. The precise elevation of this collection is unclear as there is a discrepancy between the elevation given on the specimen (AK 197610, as 600–700 m) and that given in the protologue of *E. obovatum* (as “ca. 1000 m”). The Bartlett collection was recognised as an *Eipterygium* and reported (as *E. obovatum*) by Ochyra (1991). An intensive effort by D. Glenny in Dec. 1994 to find the species again on the Wangapeka Track (including the nearby Kākāpō Saddle) was unsuccessful, but further efforts to relocate this species in the immediate Kākāpō Saddle/Herbert Creek area or elsewhere in the Scarlett or Allen Ranges might be profitable.

The granite in the Ōpārara Valley is a coarsely grained, porphyritic potassic granite belonging to the Tūhua Intrusive Group [previously termed “Karama Granite” by Grindley (1978)]. Mineralogically similar granites (and/or diorites) are of very limited distribution in N.Z.

**Recognition:** Confusion seems likely only with reduced plants of *Cyathophorum bulbosum*, which often occur on the root plates of wind-thrown trees. In such instances the presence of reduced ventral leaves, more acute lateral leaves, and the less lustrous plants of *C. bulbosum* are sufficient to distinguish it from *E. opararensis*. *Mittenia plumula*, which is very often associated, is readily differentiated by its rounded leaf apices and strongly decurrent leaf bases.

**Etymology:** The species epithet refers to the type locality in the Ōpārara Valley.

## ***Mielichhoferia* Nees & Hornsch. in Nees von Esenbeck et al., *Bryol. Germ.* 2(2), 179 (1831)**

= *Schizymerium* Harv., *Gen. S. Afr. Pl.* 384 (1838)

Elements in the following description were taken from Crum’s (1994) treatment of *Schizymerium* for Mexico and from Shaw & Ramsay’s (2013) treatment of *Mielichhoferia* for Australia.

**Plants** small, pale green or yellow-green, mostly lustrous, forming turves or loose to compact tufts.

**Stems** erect, unbranched or forked. **Leaves** reduced on lower stem or uniform throughout, not complanate, erect or erect-spreading when moist, scarcely altered when dry, ovate-lanceolate to narrowly lanceolate, acute or acuminate, usually toothed above, unbordered, not decurrent; **mid laminal cells** linear-rhomboidal, usually laxer and ± subquadrate at base. **Costa** failing below leaf apex, percurrent, or rarely short-excurrent.

**Dioicous** or less often **paroicous**, **autoicous**, or **synoicous** (mostly paroicous in N.Z. material).

**Perichaetia** basal, with leaves smaller than vegetative leaves. **Perigonia**, when present, lateral and gemmiform. **Setae** elongate, slender, flexuose; **capsules** inclined or pendulous, rarely inclined or erect (as in N.Z. species), symmetric or slightly curved, often slightly swollen on one side, pyriform to oblong-cylindric, with a short or ± elongate, smooth or wrinkled neck; **mouth** transverse, not narrowed; **annulus** persistent; **operculum** conic, sometimes ± apiculate. **Peristome** double, single and endostomal, or rarely absent; **exostome**, if present, smooth and blunt; **endostome** usually consisting of ± linear, smooth or papillose segments (sometimes blunt, irregular, or anastomosing) arising from a low basal membrane and lacking cilia. **Spores** spherical, smooth, or ornamented.

**Taxonomy:** A type species for *Mielichhoferia* Nees & Hornsch. has not been designated. The type species for *Schizymerium* Harv. is *Schizymerium bryoides* Harv.

Dixon (1926) accepted three species of *Mielichhoferia* in our flora. Sainsbury (1955) recognised two species here, retaining them both in *Mielichhoferia*. Scott & Stone (1976) recognised only one species of *Mielichhoferia* from south-eastern Australia. The generic placement of the southern hemisphere and Australasian species placed by these authors in *Mielichhoferia* has become less clear in recent years. Following on from a study by Shaw & Crum (1984) of the peristome in *Mielichhoferia s.l.*, Shaw (1985) advocated the resurrection of the segregate genus *Schizymerium* Harv. for species with mostly paroicous sexuality and peristomes either entirely endostomal in nature or double and with unornamented exostome teeth.

Shaw (1985) provided a key to the three genera (*Mielichhoferia*, *Schizymerium*, and *Synthetodontium* Cardot) in what, at that time, he termed the subfamily Mielichhoferioideae of the Bryaceae. He simultaneously made new combinations in *Schizymerium* for 39 species, most of them previously placed in *Mielichhoferia*. A new combination was not made for the southern hemisphere *Schizymerium bryoides* Harv. as this species was originally described in *Schizymerium*.

Shaw & Ramsay (2013) more recently published a revision of the Australian material of *Mielichhoferia*, placing it together with *Pohlia* and *Eipterygium*, in a segregate family, Mielichhoferiaceae.

---

---

Shaw studied *Mielichhoferia*, *Pohlia*, and their allies for many years, and not surprisingly his concepts of its family placement and the circumscription of these genera have evolved.

Shaw & Ramsay (2013) opined that “molecular studies have shown that *Mielichhoferia* includes a natural (i.e., monophyletic) group of species that can have exostomial, endostomial or double peristomes. The sole Australian species of *Schizymerium*, *S. bryoides*, [has a peristome that] can be single or double with the exostome reduced or absent”. Consequently they treated the Australian species (which is shared with N.Z.) in *Mielichhoferia* rather than in *Schizymerium*. This generic and familial placement is accepted here.

Their commentary on the differences between *Mielichhoferia* and *Pohlia* is useful and it is quoted here: “Species of *Mielichhoferia* often resemble a small *Pohlia*, and they grow in similar habitats. However, they can be distinguished by the gametangia being borne on short lateral shoots in *Mielichhoferia* but terminally in *Pohlia*. Moreover, perichaetial leaves are smaller with a shorter costa and laxer cells in *Mielichhoferia* but longer or equal to vegetative leaves in *Pohlia*. The peristome of *Mielichhoferia* is more variable, usually single, slender, and delicate, reduced to 16 endostome segments joined at the base by a low basal membrane. By contrast, it is usually double, well developed and less variable in *Pohlia*”.

*Mielichhoferia* includes about 90 species and is most diverse in South America. Shaw & Ramsay’s (2013) statement that only a few of the species “could be regarded as being well known” suggests that revisionary work may result in a reduced number of species.

**Etymology:** The generic name commemorates Mathias Mielichhofer (1772–1847), an Austrian mining engineer and botanist who lived in Salzburg and collected bryophytes in the Austrian Alps.

### ***Mielichhoferia bryoides* (Harv.) Wijk & Margad., Taxon 11: 221 (1962)**

≡ *Schizymerium bryoides* Harv., *Gen. S. Afr. Pl.* 385 (1838)

Lectotype: South Africa, Cap Bon Spei, *Harvey s.n.* [herb. Hooker 751], BM 000870621.

Designated by J. Shaw, April 1984 in *herb.* BM, but not published. Image seen online, JSTOR Global Plants, accessed 5 March 2018. Isolectotype: BM 000870622! See notes below.

= *Mielichhoferia ecklonii* Hornsch., *Linnaea* 15: 118 (1841)

Syntype: South Africa, Cap Bon Spei, Löwenrücken, *Ecklon s.n.*, Herb. Hampe, BM! See notes below.

= *Mielichhoferia australis* Hampe, *Linnaea* 28: 204 (1856)

Lectotype: Australia, “In austral. felix, Grampians”, *F. Mueller s.n.*, Herb. Hampe, BM 000983478! See notes below.

= *Mielichhoferia tenuisetata* Mitt. in Hooker, *Handb. New Zealand Fl.* 750 (1867)

Type: N.Z., Canterbury, *A. Sinclair & J. Haast s.n.*, 1860–61, Herb. Hooker, BM 000517965!

= *Mielichhoferia buchananii* R.Br.bis, *Trans. & Proc. New Zealand Inst.* 31: 443 (1899) – as *buchanani*

Lectotype: N.Z., Canterbury, Mt. Torlesse or Selwyn Gorge, *R. Brown s.n.*, CHR 335691!

**Plants** pale green, lustrous, forming loose turves. **Stems** yellow- or dark-brown below, from < 5–c. 15 mm, usually several arising from a common point, otherwise unbranched except for subperichaetial innovation, sparsely beset below with yellow-brown and coarsely papillose rhizoids, in cross-section angled, with 1–2 layers of thick-walled and pigmented cortical cells and an ill-defined and small central strand. **Leaves** reduced on lower stem, larger and evenly distributed above, erect-spreading when moist, narrowly lanceolate, slightly narrowed at insertion, gradually tapered to an acute apex, mostly 0.8–1.3 × c. 0.25–0.4 mm (on upper stem), nearly flat, toothed nearly to base by blunt, wide-spreading and projecting cell ends, plane at margins; **mid laminal cells** linear-rhomboidal, mostly 90–150 × c. 10 μm, becoming ± shorter towards apex and insertion; **marginal cells** slightly narrower in a single row but not forming a distinct border, projecting strongly at upper ends. **Costa** rather stout, ending well below the leaf apex to nearly percurrent, lacking secondary pigments. **Gemmae** absent.

**Paroicous** or **synoicous**. **Perichaetia** basal, appearing lateral due to innovation, with leaves yellow, somewhat smaller, less toothed, and less strongly costate than vegetative leaves. **Setae** (10–)15–33 mm, pale brown, erect; **capsules** erect or weakly inclined, oblong-cylindric, weakly asymmetric and curved, 2.5–4.0 × c. 0.9 mm, with an ill-defined, tapered neck c. 1/3 the total capsule length, pale brown at maturity; **annulus** well-differentiated, persistent at mouth; **operculum** bluntly conic, sometimes weakly apiculate. **Peristome** single or double; **exostome** absent or highly reduced and scarcely extending beyond mouth; **endostome segments** linear, weakly nodose (as illustrated) to

---

---

appendiculate (not illustrated), non-perforate, c. 225–300 µm long (a few sometimes anastomosing or short and irregular), arising from a short, pale, and smooth basal membrane usually extending 15–75 µm beyond mouth. **Spores** 18–25 µm, nearly smooth.

**Illustrations:** Plate 2. Scott & Stone 1976, pl. 53; Magill 1987, fig. 96, 1–11.

**Distribution:** NI: S Auckland, (Ātiāmuri to Taupō and vicinity), Taranaki (Mt Egmont), Wellington (Mt Ruapehu); SI: Canterbury, Westland (Ōtira Gorge), Otago, Southland (Eyre Range).

Austral. Tasmania\*, mainland Australia\*, S Africa\*. Shaw & Ramsay (2013) recorded it from Madagascar.

**Habitat:** On soil in lowland to subalpine scrublands, grasslands, and in southern beech (mostly *Fuscospora cliffortioides* dominated) forest. Often on thin soil over dry greywacke, schist, or basalt outcrops. This is a characteristic and common species of sheltered loess banks and outcrops east of the Main Divide on the South I. It is a common species on Banks Peninsula and inland Otago L.D. Occurring to c. 1550 m (Mt Ruapehu) on the North I., and from c. 250 m (near Berwick, Otago L.D.) to c. 1500 m (Mt St Patrick, Canterbury L.D.) on the South I. Often associated with *Bartramia mossmaniana*, *B. papillata*, *Ditrichum* spp., and *Philonotis scabrifolia*.

**Notes:** Although only limited South African material of *M. bryoides* has been available for study, Magill's (1987) description and illustrations suggest that the species may be more variable with respect to endostome form (with segments sometimes more appendiculate and with a greater tendency to anastomose) in South Africa than in N.Z. Most capsules in the African lectotype of *Schizymerium bryoides* are too old to permit detailed examination. An illustration of the peristome in Wilson's herbarium shows a double peristome with short, rounded, and apparently smooth teeth, and irregular, strongly appendiculate endostome segments. There is also a tendency for South African material to have more strongly costate (percurrent to shortly excurrent) vegetative leaves than N.Z. material.

Scott & Stone (1976, p. 295) indicate that in some Australian populations a rudimentary exostome is sometimes present "but each tooth fades out above instead of continuing to a triangular point. The appearance is very much that of wax teeth melted by heat at the tips." Weakly developed exostome teeth can be observed in some N.Z. collections, including *B. Molesworth 115* (WELT M 009328) from near Queenstown, a collection cited by Sainsbury (1945).

The lectotype (BM 000870621) of *Schizymerium bryoides* Harv. was annotated *in herb.* BM by Shaw in April 1984. It is a very ample specimen and has associated notes and peristome, annulus, and leaf drawings by Wilson. Shaw's lectotypification was never published, and Shaw & Ramsay (2013) merely cited a type from southern Africa. The citation by Magill (1987, p. 338) of a holotype in BM is also incorrect. The numerous replicates of the Harvey specimen in BM and other herbaria require a lectotype to be formally designated, as done here. Only a single isolectotype (BM 000870622!) has been examined non-electronically.

Three syntypes for *Mielichhoferia ecklonii* Hornsch., all from the Cape of Good Hope region, were designated by Hornschuch; two were collected by Ecklon and the third by Zeyher. Images of several duplicates of these collections, kept in various herbaria, can be viewed on JSTOR Global Plants (accessed 5 March 2018). A duplicate of the Ecklon collection from Löwenrücken was annotated in BM as a potential lectotype by Shaw in April 1984, but this lectotypification seems not to have been published. Magill annotated the same duplicate (BM 000870619), as did Shaw, and cited it in his 1987 treatment of southern African *Mielichhoferia*. A different duplicate of the Löwenrücken collection (BM!) has been seen during the preparation of this account and it is cited above as a syntype. Formal designation of a lectotype for this name is desirable, but not done here.

The lectotype of *Mielichhoferia australis* Hampe was selected independently by both J. Shaw and Fife *in herb.* BM (000983478!), but neither selection was published. There are isotypes in BM (BM 000983479 and BM 000983480) (images seen online, JSTOR Global Plants, accessed 5 March 2018), indicating the desirability of formal lectotypification, and this is done here for clarity. The statement by Shaw & Ramsay (2013) that the collector of the lectotype is unknown is perplexing as the specimen in question was clearly collected by Ferdinand Mueller. It is also perplexing that Shaw & Ramsay incorrectly cite a holotype in BM when three specimens are present and two of them bear the "Herb. Hampe" stamp.

**Recognition:** The suberect, slightly asymmetric, oblong-cylindric capsules, basal perichaetia, and the functionally single peristome arising from a low endostomal membrane collectively permit its easy recognition in the field. The blunt, rather widely spreading marginal teeth and thin-walled, elongate laminal cells provide further distinction, especially in the absence of capsules. However, this paroicous

---

species commonly fruits. The development of the endostomal basal membrane and of appendiculae on the endostomal segments is quite variable.

Confusion is most likely between *M. bryoides* and *Pohlia nutans*. The lack of red pigments in the stem and costa, the thinner-walled laminal cells, and the basal perichaetia of *M. bryoides* help distinguish it from the *Pohlia*. The upper marginal teeth in *M. bryoides* are stronger and project from the leaf margin at a wider angle than those of *Pohlia nutans*. The two species could scarcely be confused when fruiting, given the marked differences in capsule stance and the nature of the peristomes.

**Etymology:** The specific epithet means appearing like a *Bryum*.

## ***Ochiobryum* J.R.Spence & H.P.Ramsay, *Phytologia* 87: 69 (2005)**

**Type taxon:** *Ochiobryum blandum* (Hook.f. & Wilson) J.R.Spence & H.P.Ramsay

**Taxonomy:** *Ochiobryum* is founded on *Bryum blandum* Hook.f. & Wilson, a species with a Campbell I. type. The species has been retained in *Bryum* by Australasian authors since its original description despite its anomalous morphology and habitat preferences relative to other Australasian *Bryum* spp.

Spence & Ramsay (2005) erected *Ochiobryum* to recognise the distinctive nature of the Campbell I. species. They later (Spence & Ramsay 2006) suggested that *Ochiobryum* may need expansion to accommodate up to three additional foreign (to Australia) species and (p. 320) characterised *Ochiobryum* as having “frequently complanate foliation, shiny pink to red coloration, elongate, pohlioid laminal areolation with a distinct border, and inclined to pendulous pyriforme capsules with complete peristomes and small spores”.

*Ochiobryum* seems best transferred to the Mielichhoferiaceae, for reasons discussed above.

No generic description is provided here, but one is available in Spence & Ramsay (2006).

**Etymology:** The genus *Ochiobryum* was named in honour of the late Harumi Ochi (1920–2001), an acknowledged expert on *Bryum*.

## ***Ochiobryum blandum* (Hook.f. & Wilson) J.R.Spence & H.P.Ramsay, *Phytologia* 87: 69 (2005)**

≡ *Bryum blandum* Hook.f. & Wilson, *London J. Bot.* 3: 546 (1844)

Isotype: N.Z., Campbell's Island, *J.D. Hooker* 22, Antarctic Expedition 1839–1843, Herb. Wilson, BM 001086486!

= *Bryum blandum* var. *luridum* Hook.f. & Wilson in Wilson, *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II*, 83 (1854)

Holotype: N.Z., "Bay of Islands," *J.D. Hooker* ("Wilson no. 352"), Antarctic Expedition 1839–1843, BM 001086490!

= *Calliargon laxirete* Zanten & J.K.Bartlett, *Cryptog. Bryol. Lichénol.* 7: 32 (1986)

Isotype: N.Z., Tongariro National Park, Mt. Ruapehu, 5 Dec. 1959, *B.O. van Zanten* 1617, CHR 351336! Isotypes in AK not seen.

**Plants** dark or pale green, bronze, or cerise, often dirty, sometimes nearly black in portions, usually lustrous, forming loose cushions in flowing water. **Stems** pink, dark red to nearly black in lower portions, c. 10–80 mm (rarely longer), often forked, sparsely beset below with dark red-brown and nearly smooth rhizoids, in cross-section with firm-walled cortical cells and central strand weak or absent. **Leaves** evenly spaced on stem, erect and imbricate or erect-spreading when moist, contorted when dry, oblong-ovate, broadly obtuse or rounded and often ± cucullate at apex, 0.7–2.0 mm, strongly concave, usually cerise near insertion or throughout, entire or weakly crenulate above, weakly bordered and plane at margins, not decurrent; **upper laminal cells** narrowly hexagonal or rhomboid, thin-walled, 5–7:1 and c. (54–)66–90(–105) μm long, becoming shorter and firmer-walled near apex, and longer (to c. 180 μm) towards insertion; **marginal cells** linear and ± firmer-walled to form a weak border c. 5–6 cells wide and extending above mid leaf; **basal cells** short, ± oblong in 1–2 rows at base, not markedly pigmented. **Costa** rather thin, usually ± cerise, subpercurrent. **Gemmae** absent.

**Dioicous.** **Perichaetia** in branch axils, usually near the base shoots, with **perichaetial leaves** not differentiated. **Perigonia** terminal or on short, lateral branches, the inner bracts c. 1 mm, broadly oblong-ovate and rounded apically, enclosing numerous antheridia. **Setae** c. 20–30(–40) mm, red, cygneous just below capsule; **capsules** uncommon, strongly inclined or pendent, narrowly pyriform,



---

2.6–4 × 1–1.3 mm, with a well-defined neck nearly ½ the total capsule length and wrinkled when dry; **stomata** numerous, superficial, restricted to neck; **operculum** low-conic, not apiculate. **Peristome** double; **exostome teeth** pale; **endostome** with perforate segments equal the teeth, and variably developed but usually rudimentary **cilia**. **Spores** variable in diameter, usually (14–)16–22(–36) µm.

**Illustrations:** Plate 3. Ochi 1968, fig. 1 (as *Bryum blandum*); van Zanten & Bartlett 1986, fig. 2 a–g (as *Calliargon laxirete*); Beever et al. 1992, pl. 15 (as *Bryum blandum*); Malcolm & Malcolm 2003, p. 8 (as *Bryum blandum*).

**Distribution:** NI: N Auckland, S Auckland, Gisborne, Hawke's Bay, Taranaki, Wellington; SI: Nelson, Marlborough (Leatham River), Canterbury, Westland, Otago, Southland; Ch; A; Ant; C.

Australasian. Tasmania\*, mainland Australia\*. The subsp. *handellii* occurs in eastern Asia.

**Habitat:** On rock (granite, greywacke, basalt, limestone, and probably scoria), and coarse sand or gravel in moving water, emergent or submerged (to at least 1.5 m) in swift streams; in seepage over rock or soil; on wet, dripping cliffs. Also sometimes occurring in artificial habitats such as urban storm drains. Usually in strongly insolated habitats, but occasionally in shaded situations in forests. Ranging from sea level to at least 1350 m (Tararua Range, Wellington L.D.) on the North I., and to at least 1600 m (St Arnaud Range, Nelson L.D.) on the South I. Frequently associated aquatic species include *Fissidens rigidulus*, *Tridontium tasmanicum*, *Cratoneuroopsis relaxa*, *Dicranella cardotii*, *Bryum laevigatum*, and *Philonotis tenuis*.

**Notes:** The endostomal cilia, usually nodose, can be zero, one, two, rarely three in number, and are rudimentary to well-developed, even within a single capsule. A collection from Maungatua, Otago L.D. (*J. Child 6084*, CHR 428564) characterises the endostomal variability that is a feature of this species. Between most segment pairs there are one or two tall, nodose, and sometimes anastomosing cilia. Between other segment pairs there are no cilia or a single highly reduced cilium. In a very few specimens (e.g., *K.W. Allison 1104*, Waitātī, Otago L.D., CHR 542730), however, appendiculate cilia that equal the segments do occur. Such well-developed cilia conform to the description of Sainsbury (1955, p. 275), but do not appear to be common.

The majority of material has spores between 15–22 µm; however, some material from Canterbury and Otago L.D. has been seen with spores either extremely variable in size (c. 18–36 µm in *H.D. Wilson BP716*, CHR 482776) or with a relatively narrow size range but very large (c. 27–39 µm in *K.W. Allison 1103*, CHR 542727). Such variably sized or large spores seem to be associated with larger (c. 4 mm long) than average capsules, but the associated gametophytes seem to be quite typical of the species. Taxonomic recognition of these larger-spored populations would serve little useful purpose at present, particularly given the infrequency of sporophytes in this dioicous species.

*Bryum handellii* Broth., from Yunnan, Formosa, and Japan, was treated as a subspecies of *B. blandum* by Ochi (1968), who cited a range of N.Z. collections and provided useful illustrations of type material of *O. blandum*. The cumbersome (but nomenclaturally justified) autonym *O. blandum* (Hook.f. & Wilson) J.R.Spence & H.P.Ramsay subsp. *blandum* is not employed here.

The type collection of the var. *luridum* Hook.f. & Wilson is, as its name implies, a dirty brown form of *B. blandum*. It falls within the range of continuous variation of the species and is interpreted as merely a shaded environmental form. Some isotypes in Wilson's herbarium bear the collection number "J.D. Hooker 40".

Jessica Beever (1992) initially realised that the sterile plants comprising the type of *Calliargon laxirete* belonged to the widespread and common *Ochiobryum (Bryum) blandum*.

**Recognition:** The very lustrous plants growing in aquatic situations, together with the ± oblong and obtuse leaves, make *Ochiobryum blandum* an easily recognised and very attractive species. It varies considerably in stature. *Ochiobryum blandum* occasionally forms spherical, floating 'moss balls' which are attached to the substrate by only a few stems.

Confusion is most frequent between the present species and *Bryum laevigatum*, a species that also occurs in aquatic situations. *B. laevigatum* is a coarser plant, with a much stouter costa, which protrudes more strongly abaxially, especially in dry plants. Its upper laminal cells are shorter, wider, and thicker-walled than those of *O. blandum*, resulting in its coarser appearance. The abundant rhizoids of *B. laevigatum* are densely and coarsely papillose, in sharp contrast to the sparse, nearly smooth rhizoids of *O. blandum*.

**Etymology:** The specific epithet *blandum* means soft.

---

## ***Pohlia* Hedw., *Sp. Musc. Frond.* 171 (1801)**

= *Webera* Hedw., *Sp. Musc. Frond.* 168 (1801) nom. illeg., non *Webera* Schreb. 1791

= *Mniobryum* Limpr., *Laubm. Deutschland* 2, 272 (1892)

**Type taxon:** *Pohlia elongata* Hedw.

**Plants** erect, small to medium-sized, in loose or dense turves, tufts, or scattered among other mosses, dull or lustrous, variably coloured. **Stems** mostly simple, sometimes forked, or branching by innovation, in cross-section with a central strand, with papillose or rarely nearly smooth rhizoids.

**Leaves** often crowded near the shoot apex, erect or erect spreading when moist, mostly little altered when dry, ovate-lanceolate to narrowly lanceolate or rarely ovate, acute, not bordered, ± toothed near apex or teeth extending c. ½ the leaf; **upper laminal cells** oblong-rhomboidal to linear, thin- or thick-walled, sometimes narrower at margins but not forming a distinct border, becoming shorter and laxer towards the insertion. **Costa** usually rather narrow, percurrent, ending below the apex, or rarely excurrent. **Axillary gemmae** frequent in some species but absent in others, clustered or solitary, bulbous or elongate.

**Diocious, paroicous** or **rarely autoicous** (*fide* Shaw). **Perichaetia** terminal, usually with the ♀ leaves enlarged. **Perigonia** terminal or lacking. **Setae** usually single, elongate, flexuose and twisted when dry, usually curved or hooked just below the capsule; **capsules** inclined, pendent, or rarely suberect, ± symmetric, elongate and clavate, pyriform, or sometimes short-ovoid, with a long or short sterile neck; **annulus** mostly present and revoluble; **operculum** conic, mammillate, or short-rostrate; **stomata** superficial or rarely immersed. **Peristome** double; **exostome teeth** 16, lanceolate, variable in colour, not or narrowly bordered; **endostome** arising from a short or tall finely papillose basal membrane, with **segments** keeled and usually perforate, and **cilia** either well-developed and nodulose or rarely rudimentary. **Calyptra** cucullate, smooth. **Spores** spherical, finely papillose.

**Taxonomy:** *Pohlia* is a large genus of nearly cosmopolitan distribution, although tropical species occur predominantly at higher elevation and even temperate species are largely confined to mountainous areas. Shaw (in Shaw & Ramsay 2013) considered it to include about 85 species, whereas earlier authors (e.g., Brotherus 1924, as *Webera* and *Mniobryum*) considered the genus to include a larger number of species.

Species of *Pohlia* are most likely to be confused with *Bryum*, but the present genus has more elongate laminal cells and leaves that lack a distinct border. The costa here nearly always ends in or below the leaf apex, while in *Bryum* the costa is often excurrent. According to Shaw & Ramsay, no species of *Pohlia* have appendiculate cilia (with the possible exception of *P. nutans*) or synoicous perichaetia, both of which are common in *Bryum s.l.* Confusion could also occur with *Mielichhoferia*, but the sole N.Z. representative of that genus has basal paroicous or synoicous perichaetia as well as suberect capsules with a single peristome.

There is an inexplicable lack of *Pohlia* (or *Webera* and *Mniobryum*) collections in the T.W.N. Beckett herbarium at CHR.

The family placement of *Pohlia* has attracted much attention in recent years. The decision to treat *Pohlia* in the Mielichhoferiaceae follows Shaw & Ramsay's (2013) treatment of the Australian members. Their placement of the genus here was informed by the study of Cox & Hedderson (2003). Goffinet et al. (2009) and other recent authors, including Smith (2004), have recently treated it as a member of the Mniaceae, while Sainsbury (1955) followed many earlier authors to treat this genus as part of the Bryaceae.

Approximately half of the species of *Pohlia* occurring in New Zealand are also widespread in the northern hemisphere, and so floristic accounts such as Crum & Anderson (1981), Smith (2004), and Shaw (1981) are useful here. A treatment of *Pohlia* in South Georgia has been provided by Clarke (1973). Little has been published since Sainsbury (1955) dealing specifically with N.Z. species, with the exception of the key to gemmae-bearing species and the description of *P. australis* by Shaw & Fife (1985).

**Etymology:** The generic name honours J.E. Pohl (1706–1780), a physician of Leipzig and Dresden.

1	<b>Plants</b> with axillary gemmae.....	2
1'	<b>Plants</b> lacking axillary gemmae.....	5

- 2 **Plants** decidedly glossy; **gemmae** linear-vermicular, greater than 500 µm long, with 1–2 short, peg-like leaf primordia..... *P. ochii*
- 2' **Plants** dull or weakly lustrous; **gemmae** spherical to oblong, less than 400 µm long, with 3–8 peg-like or laminate leaf primordia..... 3
- 3 **Leaves** 1.5–2.0 mm, strongly decurrent, strongly and rather sharply serrulate near apex; **axillary gemmae** oblong, 200–400 µm, with broadly triangular leaf primordia..... *P. australis*
- 3' **Leaves** 0.7–1.4 mm, weakly decurrent, bluntly serrulate near apex; **axillary gemmae** more variable in shape, often spherical, sometimes obovoid to clavate-vermicular; with short and peg-like leaf primordia..... 4
- 4 **Plants** dull; **axillary gemmae** consistently spherical to obovoid, c. 105–130 × c. 75–90 µm (excluding stalk), with uniseriate or biseriate stalks..... *P. camptotrachela*
- 4' **Plants** weakly lustrous; **axillary gemmae** mostly clavate-vermicular but some obovoid, at least some to 300 µm or greater in length, stalks not obvious or absent..... *P. annotina*
- 5 **Leaves** lanceolate-subulate, widest at insertion..... *P. tenuifolia*
- 5' **Leaves** not lanceolate-subulate, broader in outline and widest above the insertion..... 6
- 6 **Plants** lustrous, with a conspicuous metallic sheen; **endostomal cilia** nodose, mostly paired..... *P. cruda*
- 6' **Plants** not distinctly lustrous, lacking a conspicuous metallic sheen; **endostomal cilia** either rudimentary or well-developed..... 7
- 7 **Capsules** narrowly cylindrical, with the neck equal to the urn in length, inclined to suberect, c. 4.5–5.0 mm; **paricous** in N.Z.; **endostomal cilia** mostly rudimentary and paired..... *P. elongata*
- 7' **Capsules** not narrowly cylindrical, with a neck c. ½ the length of the urn horizontal to pendent, ≤4.0 mm; **dioicous** (*P. wahlenbergii*), **paricous** or sometimes **synoicous** (*P. nutans*); **endostomal cilia** well-developed and nodose or appendiculate..... 8
- 8 **Plants** whitish or glaucous-green when fresh; **upper laminal cells** thin-walled and lax, linear-rhombic; **dioicous**; **setae** single and rather short, c. 12 mm; **capsules** pendent, very short, ≤2.0 mm; **stomata** immersed; **endostomal cilia** mostly paired and nodose, not appendiculate..... *P. wahlenbergii*
- 8' **Plants** not glaucous when fresh; **upper laminal cells** thick-walled, linear; **paricous** or **synoicous**; **setae** longer, often very elongate, c. 18–35(–70) mm; **capsules** horizontal or nutant, mostly longer, 2.5–4.0 mm; **stomata** superficial; **endostomal cilia** paired or in 3s, either nodose or appendiculate..... *P. nutans*

### ***Pohlia annotina* (Hedw.) Lindb., *Musci Scand.* 17 (1879)**

≡ *Bryum annotinum* Hedw., *Sp. Musc. Frond.* 183 (1801)

Type: Germany. Not seen.

**Plants** more lustrous than N.Z. *P. camptotrachela*; **stems**, **leaves**, and **laminal cells** as in that species. **Gemmae** numerous in upper axils, to c. 10–12 per leaf, variable in shape, mostly clavate-vermicular but some obovoid, to 300 µm or greater in length, the primordia incurved, peg-like, 1 or 2 cells wide at base.

**Reportedly dioicous.** **Sex organs** and **sporophytes** not seen.

**Illustrations:** Not illustrated here. Shaw 1981, figs 28–29. Illustrations in Smith (2004, fig. 201, 1–2) show percurrent costae, unlike those occurring in N.Z. material.

**Distribution:** SI: Canterbury (Mt Studholme); Otago (Lammermoor Range).

Probably adventive, poorly documented. Tasmania\*. Scattered in the northern hemisphere; reported from Britain, Turkey, Asia Minor, Siberia, Macaronesia, North America, and Greenland by Smith (2004).



---

**Habitat:** Known from only two N.Z. collections. One collection is from the bank of a roadside drainage ditch and the other from a waste area beside a vehicle track, both in tussock grassland. Both collections are from approximately 1000 m elevation.

**Notes:** The name *P. flexuosa* Hook. has been applied to Tasmanian material by J. Shaw (in herb. CHR) and this name is likely to be a heterotypic synonym. In Smith's (2004) British Flora the Tasmanian material would key to *P. flexuosa*, and Smith notes that *P. flexuosa* is often confused with *P. camptotrachela* in Europe. Shaw (1981) noted that in North America *P. annotina* has highly variable gemmae even on single shoots and suggested that these may vary in form depending on the part of the growing season in which they are produced.

**Recognition:** The clavate-vermicular shape of some of the gemmae precludes referring material of this species to *P. camptotrachela*, the species with which it is most likely to be confused.

**Etymology:** According to Stearn (1966), the epithet means "a year old, belonging to last year". The meaning of this epithet is unclear; it was derived by Hedwig from an earlier Dillenean polynomial.

### ***Pohlia australis* A.J.Shaw & Fife, *New Zealand J. Bot.* 23: 183 (1985)**

Holotype: N.Z., Paparoa Mountains, cirque on east flank of Mt Priestly, 1050–1140 m a.s.l., A.J. Fife 5487, CHR104235!

**Plants** yellow-green, medium-sized, dull or weakly lustrous, in small loose tufts, frequently mixed with other species on soil. **Stems** to 10(–15) mm high, unbranched, red-brown, in cross-section angled, with a distinct central strand and 1(–2) layer(s) of incrassate cortical cells, very sparsely beset with red-brown, papillose rhizoids. **Leaves** small and distant on lower stem, becoming larger and slightly more crowded distally, erect-spreading to spreading, becoming weakly contorted when dry, lanceolate, slenderly acute, clearly serrulate near apex and serrulate to mid leaf or below, decurrent, plane or loosely recurved (more obviously when dry), (1.0–)1.4–2.0 mm × 0.25–0.35 mm, grading into perichaetial leaves (when present); **upper laminal cells** linear-rhomboidal or linear-hexagonal to ± vermicular, (75–)100–150 µm × 6–10 µm wide, firm or sometimes thin-walled, not altered at apex, becoming more oblong-rectangular and ± larger towards insertion. **Costa** ending a few cells below the apex, protruding abaxially, in transverse section with 2–3 guide cells and a group of abaxial stereids. **Gemmae** in groups of 3 or more in the upper leaf axils, yellow-green to yellow-brown, becoming darker with age, oblong, 200–385 µm long, c. 200 µm broad, with 4–9 triangular-laminate leaf primordia at the apex and lower on the gemma body; cells of the body isodiametric to short-rectangular, to 30 µm long, those of the leaf primordia more elongate.

**Dioicous. Perichaetia** terminal, overtopped by innovation, with leaves erect, lanceolate (not or scarcely ovate below), c. 2.5–3.0 mm. **Perigonia** terminal, overtopped by innovation, with differentiated leaves, the outer erect-spreading, longer, more ovate-lanceolate, more recurved, and more pigmented than vegetative, and 2.0–2.5 mm, the innermost leaves shorter. **Setae** elongate, flexuose, orange, c. 35 mm; **capsules** seen only slightly immature, pyriform with a neck c. equal to the urn in length, nutant due to curvature of upper setae, probably pale brown at maturity; **operculum** conic; **annulus** not seen; **exothecial cells** irregular (in single dissected capsule); **stomata** superficial. **Exostome** as per genus, pale; **endostome** with a high basal membrane, the **cilia** not clearly seen (perhaps broken?). **Spores** c. 15 µm, smooth.

**Illustrations:** Plate 4. Shaw & Fife 1985, figs 1–8.

**Distribution:** SI: Nelson (Scarlett Range, Paparoa Range); Canterbury (Mt Cassidy, Temple Basin) Westland (Kelly Range), Otago (near Tahakopa).

Endemic.

**Habitat:** Occurring on deeply shaded, sheltered, and friable soil; often beneath overhanging boulders or protected by species of snow tussock (*Chionochoa* spp.). Many of the confirmed collections are from sites with greywacke bedrock. This species remains known only from the South I., where it ranges from 420 m (near Tahakopa) to 1340 m (Scarlett Range). *Pohlia ochii* and *Ditrichum punctulatum* are sometimes associated. Capsules have been seen only in a specimen collected by P.J. Brownsey from near Tahakopa; the sporophyte description presented here is based entirely on this collection (WELT M027583).

**Recognition:** This species is unlikely to be collected without its characteristic axillary gemmae and has only once been collected with capsules. It is most likely to be confused with *P. camptotrachela*, but *P. australis* has larger and more obviously decurrent leaves, and fewer and larger gemmae per leaf

---

axil. Also, the leaf primordia here are triangular-laminate rather than peg-like, as in *P. camptotrachela*. The features outlined in the key to species should adequately distinguish it from other congeners.

**Etymology:** The species epithet *australis* means southern.

***Pohlia camptotrachela* (Renauld & Cardot) Broth., Nat. Pflanzenfam. [Engler & Prantl] 1(3), 552 (1903)**

≡ *Webera camptotrachela* Renauld & Cardot, *Bot. Gaz.* 13: 199 (1888)

Type: California. Not seen.

**Plants** small to medium-sized, slender, yellow-green, dull or weakly lustrous, forming turves on mineral soil. **Stems** 5–10(–15) mm, unbranched or nearly so, pale above, usually red near base, sparsely beset with coarsely papillose red-brown rhizoids, in cross-section with thick-walled cortical cells and a central strand. **Leaves** ± uniformly distributed along stem, erect or weakly erect-spreading when moist, erect-appressed and weakly contorted when dry, ovate-lanceolate, acute, bluntly serrulate by projecting cells above, (0.7–)1.0–1.4 mm, plane, decurrent; **mid laminal cells** linear-rhomboid and mostly with oblique end walls, firm-walled, mostly 60–90 × c. 9 µm. **Costa** stout, slightly undulate, fading below the apex. **Axillary gemmae** abundant (to 12 or more) in axils of upper leaves of sterile shoots, spherical or obovoid, green, yellow-green, or orange, c. 105–130 × c. 75–90 µm (excluding stalk), with 1–4 peg-like and incurved apical leaf primordia, borne on uniseriate or biseriate stalks.

**Dioicous.** **Perichaetia** terminal, the perichaetial leaves narrowly lanceolate, longer and gradually grading into vegetative leaves, to 3.0 mm. **Perigonia** terminal, bulbiform, the perigonial bracts lanceolate and c. 2.0 mm. **Sporophytes** unknown in N.Z.

**Illustrations:** Plate 4. Renauld & Cardot 1888, pl. 16; Shaw 1981, figs 31–32; Smith 2004, fig. 200, 1.

**Distribution:** SI: Nelson (Braeburn Track, Madmans Creek near Charleston), Canterbury (Temple Basin, Banks Peninsula), Westland (Lake Kaniere), Otago (Mt Cargill, Sullivan's Dam, near Tahakopa, Lammermoor Range), Southland (Longwood Range, South Borland Burn).

Probably adventive. Reported from western North America and northern Europe by Shaw (1981). Smith (2004) recorded it from Britain, Europe north to Fennoscandia, and Macaronesia. Shaw & Ramsay (2013) recorded it from a single alpine site in N.S.W.

**Habitat:** On mineral soil in disturbed, sometimes compacted, and usually insolated sites, with many collections from disturbed road or track margins. In the Longwood Range it occurred on the banks of a track-side drainage channel in a *Dracophyllum longifolium*–*Coprosma*–*Astelia*–*Chionochoa* shrubland. It grew on vertical soil in a roadside drainage ditch in mature *Lophozonia menziesii* forest near Tahakopa. Occurring on the South I. from 150 m (Madmans Creek) to 1400 m (Temple Basin). *Bartramia papillata*, *Campylopodium capillaceum*, *Pleurodium subulatum*, *Trematodon suberectus*, and *Isotachis intortifolia* are frequently associated. These habitats are consistent with the damp soil along a roadside site cited for a N.S.W. collection reported by Shaw & Ramsay (2013).

**Notes:** *Pohlia camptotrachela* was initially recorded in New Zealand by Fife (1984) from Madmans Creek. Subsequent collections show it to occur widely on the South I., but there are still no records from the North I. Perichaetia have been seen only in one specimen collected by P. Beveridge from near Tahakopa in the Catlins Region of Otago L.D., and the perichaetia description presented here is based on this collection (WELT M 039417).

**Recognition:** The present species is dull rather than lustrous, and has consistently smaller and more numerous gemmae and less strongly decurrent leaves than *P. australis*. The leaf primordia of the gemmae are here short and peg-like rather than broadly triangular, as in *P. australis*. *Pohlia camptotrachela* is a duller plant with smaller gemmae borne on uniseriate or biseriate stalks in contrast to the lustrous and less-well-documented *P. annotina*, where the stalks are absent or inconspicuous.

**Etymology:** The meaning of the epithet *camptotrachela* is unclear, with *campto* being a Greek element meaning bent. The epithet may refer to the setae (“pedicel”), which Renauld & Cardot (1888) considered to be “often geniculate at base”.

---

## ***Pohlia cruda* (Hedw.) Lindb., *Musci Scand.* 18 (1879)**

≡ *Mnium crudum* Hedw., *Sp. Musc. Frond.* 189 (1801)

Type : Germany. Not seen.

**Plants** blue- to white-green with a conspicuous red-brown stem, strongly lustrous when dry, usually forming dense turves. **Stems** variable in length, to at least 35 mm, unbranched, red-brown, in cross-section angled, with incrassate cortical cells and a conspicuous central strand, beset with red-brown and papillose rhizoids. **Leaves** sparse and distant below, becoming more crowded and larger towards shoot tip, erect or erect-spreading, little altered when dry, ovate-lanceolate to lanceolate, acute, crenulate to bluntly denticulate near apex, entire below, mostly plane at margins, slightly decurrent, 2.5–3.5 × 0.8–1.2 mm (smaller on lower stems; longer in perichaetia and perigonia); **upper laminal cells** linear-rhombic, mostly c. 120–210 × 12–15 μm, thin-walled, not altered at apex, becoming ± wider but otherwise little altered towards insertion. **Costa** ending well below the leaf apex, red near base, in cross-section semi-circular on abaxial surface, with median guide cells and two stereid bands. **Axillary gemmae** nil.

**Dioicous** or **paroicous**. **Perichaetia** terminal, the ♀ leaves narrowly lanceolate, strongly pigmented near insertion, longer and usually more erect than vegetative leaves, lacking paraphyses. **Perigonia** terminal and conspicuous, the ♂ leaves widely spreading, otherwise as perichaetial leaves, with many antheridia but lacking paraphyses. **Setae** one or sometimes two, yellow- or red-brown, flexuose, variable in length (mostly 12–22 mm); **capsules** inclined to horizontal due to curvature of upper setae when moist, often suberect when dry, oblong-cylindric or elongate-pyriform, with a neck shorter or equal to the urn, pale red-brown, (2.5–)3–5 mm; **annulus** revoluble; **operculum** conic or umbonate. **Exostome teeth** pale, lanceolate, narrowly bordered, very finely papillose on outer surface, strongly trabeculate on inner surface; **endostome** with a high basal membrane, with perforate **segments** nearly the height of the teeth and nodose, mostly paired **cilia**. **Spores** 24–27(–32) μm, brown.

**Illustrations:** Plate 5. Crum & Anderson 1981, fig. 244 h–k; Shaw & Ramsay 2013, unnumbered fig.

**Distribution:** NI: South Auckland (Maungapōhatu, Mt Pirongia), Wellington (Ōhutu Ridge, Mt Ruapehu); SI: Nelson, Marlborough (Cat Creek, Mt Fyffe, Inland Kaikōura Range), Canterbury, Westland (Pegleg Creek), Otago, Southland (Takahē Valley, Gertrude Valley); Ch; A.

Nearly cosmopolitan. Tasmania\*, mainland Australia\*, Patagonia\*. Crum & Anderson (1981) considered it to be widespread in both the northern and southern hemispheres.

**Habitat:** On mineral or humic soil over marble, limestone, greywacke, and lava (andesite?). Often in sheltered crevices and often at stream margins. On the South I. this species seems to favour, but is not restricted to, areas with calcareous, or at least cation-rich rock types, and is most frequent in montane to alpine habitats near to and east of the Main Divide; it appears to be absent in lowland areas on the West Coast. No material from Stewart Island has been seen, but this is probably a collection artefact. Documented from 1220 m (Ōhutu Ridge) to 1400 m (Mt Ruapehu) on the North I. On the South I. ranging from 183 m (Hunters Hills, Canterbury L.D.) and c. 350 m (Sugarloaf on Banks Peninsula in Canterbury L.D.) to at least 1900 m (Pisa and Remarkable Ranges, both Otago L.D.) Occurrences below c. 500 m elevation are infrequent. *Bartramia papillata*, *Distichium capillaceum*, *Grimmia pulvinata*, and *Philonotis scabrifolia* are common associates.

**Recognition:** The strongly lustrous and blue- to white-green of the leaves combined with conspicuous red-brown stems and costae, and marked decurrencies, make this species easily recognisable.

*Pohlia cruda* is similar in many ways to *P. nutans* but differs from it by its sheen, its mostly dioicous sexuality (and the presence of terminal perigonia in most populations), and mostly thinner-walled laminal cells.

Plants of *P. cruda* are likewise similar in colour to *P. wahlenbergii* (both have pale leaves and red stems), but the lustre in *P. cruda* usually precludes confusion. When fruiting, the longer (mostly 3–5 mm) oblong-cylindric or elongate-pyriform capsules of *P. cruda* contrast with the distinctly pendent and much shorter (mostly 1.5–2 mm) capsules of *P. wahlenbergii*.

**Etymology:** According to Crum & Anderson (1981, p. 532) the epithet *cruda* means “raw or immature and refers to a fresh or youthful appearance, actually a beautiful fresh, opalescent sheen”.

---

## ***Pohlia elongata* Hedw., Sp. Musc. Frond. 171 (1801)**

Lectotype: Europe, no precise collection data. Designated by Shaw (2006). Not seen.

= *Pohlia novae-seelandiae* Dixon, Bull. Torrey Bot. Club 42: 102 (1915)

Isotype: N.Z., Evans Flat, Tuapeka County, Otago, October, 1891, D. Petrie, WELT M 005742! (Lectotype in BM 000983722 viewed online, JSTOR Global Plants, accessed 21 Aug. 2017.)

**Plants** green or yellow-green, with an inconspicuous stem, not or weakly lustrous, forming turves. **Stems** rather short, to c. 10 mm in N.Z. material, mostly unbranched, yellow- to red-brown, in cross-section angled, with incrassate cortical cells and a conspicuous central strand, beset with yellow-brown, very finely papillose rhizoids below. **Leaves** small, sparse, and distant below, becoming much more crowded and larger towards shoot tip, erect or weakly spreading, little altered when dry, lanceolate to linear-lanceolate, acute, bluntly serrate or serrulate near apex, mostly recurved at mid leaf or below, not decurrent, mostly 1.5–2.5 × 0.25–0.4 mm; **upper laminal cells** vermicular, firm-walled, 51–75(–100) × 5–7 µm, becoming wider, more oblong, and thinner-walled towards insertion. **Costa** stout, strongly protruding abaxially, ending in or just below the apex, in cross-section with median guide cells and two stereid bands. **Axillary gemmae** nil.

**Paroicous** in N.Z. material, but reported as sometimes dioicous or autoicous. **Perichaetia** terminal, the ♀ leaves narrowly- or linear-lanceolate, to c. 3 mm. **Setae** single, yellow-brown, slender and flexuose, variable in length (but mostly 14–23 mm); **capsules** mostly horizontal due to curvature of the upper setae when moist, horizontal to suberect when dry, narrowly cylindrical, symmetric or nearly so, with a neck ± equal to the urn, pale brown, 3.0–4.5 mm; **annulus** revoluble; **operculum** conic or weakly beaked. **Exostome teeth** pale, lanceolate, narrowly bordered, very finely papillose on outer surface, strongly trabeculate on inner surface, extending c. 350 µm beyond the mouth; **endostome** with non-perforate or weakly perforate **segments**, and mostly paired but rudimentary **cilia**. **Spores** 18–21 µm.

**Illustrations:** Plate 6. Crum & Anderson 1981, fig. 243 a–h; Smith 2004, fig. 196, 1–6 (as *P. elongata* var. *elongata*); Shaw & Ramsay 2013, unnumbered fig.

**Distribution:** NI: Taranaki (Fanthams Peak Track); SI: Canterbury (Banks Peninsula, Mt Cook area including Sefton Bivouac Ridge and Sebastopol Creek), Otago.

Bipolar. Mainland Australia\*. Reported as widely distributed in the northern hemisphere as well as occurring in southern South America, southern Africa, and New Guinea by Shaw & Ramsay (2013).

**Habitat:** On sheltered soil banks, often among snow tussocks (*Chionochloa* spp.) On the North I. occurring at 1065 m on Taranaki–Mt Egmont. On the South I. ranging from 300 m (Tarras) to at least 1650 m (Cardrona Range). Frequently associated species include *Bartramia papillata*, *Ceratodon purpureus*, *Ditrichum cylindricarpum*, and *Pohlia cruda*.

**Notes:** Material from Glendhu Bluff (*K.W. Allison* 8336, CHR 429226 & 490425, Otago L.D.) is tentatively referred here, but it has perichaetia borne on short shoots at the base of tufts of plants rather than terminally on elongate unbranched shoots, as is representative of this species. The leaves in this material are also shorter than in the bulk of other N.Z. collections.

**Recognition:** The stout percurrent costae, paroicous sexuality and distinctly narrowly cylindrical and long-necked capsules here facilitate recognition regionally. The narrowly or linear-lanceolate perichaetial leaves and the stout costa often permit the recognition of non-fruiting material. However, *P. elongata* remains a sparsely documented species in N.Z., with the majority of collections from Otago L.D. Shaw & Ramsay (2013) consider this species throughout its worldwide range to be “widely distributed but never common”.

*Pohlia elongata* is most likely to be confused with *P. nutans*, with which it shares a dull appearance and paroicous inflorescences. But the present species differs by having more lanceolate leaves, much narrower, longer, and horizontal to suberect capsules, and endostomal cilia, which are rudimentary or absent. Shaw & Ramsay (2013) considered *P. elongata* to lack “the diagnostic, although not constant, orange [capsule] colour” of *P. nutans*, and noted that in Australia some sterile plants of *P. elongata* may be erroneously referred to *P. nutans*.

**Etymology:** The specific epithet refers to the strikingly elongate capsule neck.



---

## ***Pohlia nutans* (Hedw.) Lindb., *Musci Scand.* 18 (1879)**

≡ *Webera nutans* Hedw., *Sp. Musc. Frond.* 168 (1801)

Type: Europe. Not seen.

= *Bryum bealeyensis* R.Br.bis, *Trans. & Proc. New Zealand Inst.* 31: 457 (1899) – as *bealeyense*  
Lectotype: N.Z., Marsh, on the hill at the back of the Bealey Hotel, February 1899, *R. Brown*,  
CHR 335248!

= *Webera elatior* Dixon & Sainsbury in Sainsbury, *Trans. & Proc. Roy. Soc. New Zealand* 75: 179  
(1945)

≡ *Pohlia elatior* (Dixon & Sainsbury) Sainsbury, *Rev. Bryol. Lichénol., n.s.* 21: 219 (1952)

Holotype: Mount Girdlestone, Tongariro National Park, 8000 ft., on volcanic rock,

*G.O.K. Sainsbury* 966, Apr. 1939, BM 000517967! Isotypes: CHR 631148!, WELT M005741!

**Plants** gold-green or pale green, not glaucous when fresh, not lustrous, forming turves. **Stems** variable in length, to at least 20 mm, unbranched, red-brown, in cross-section angular, with incrassate cortical cells and a conspicuous central strand, beset (often sparsely) with red-brown, papillose rhizoids. **Leaves** closely spaced, more crowded and larger towards shoot tip (lacking a clear distinction between vegetative and perichaetial leaves), erect, little altered when dry, ovate- or ovate-lanceolate, acute or acuminate, weakly toothed above, entire and narrowly or strongly recurved at margins below, not decurrent, mostly 2.2–3.0 long × 0.5–0.7 mm (but smaller below); **upper laminal cells** linear, mostly 60–75 × c. 10 μm, thick-walled, not altered at apex, becoming ± shorter and wider towards insertion. **Costa** stout, mostly percurrent to short-excurrent, in cross-section (at mid leaf) semi-circular on abaxial surface, with 3–4 median guide cells, a large abaxial and a smaller adaxial stereid band. **Axillary gemmae** nil.

**Paroicus** or **synoicus**. **Perichaetia** terminal, the ♀ leaves grading into the vegetative leaves, lacking paraphyses, with antheridia present in axil of outer ♀ leaves or occasionally intermixed with perichaetia. **Perigonia** nil; antheridia numerous and mostly easily observed among the outer perichaetial leaves. **Setae** single, yellow- or red-brown, flexuose, variable in length but mostly c. 18–35(–70) mm; **capsules** horizontal to pendent, narrowly pyriform, with a neck c. ½ the length of the urn, orange-brown, mostly 2.5–4.0 mm; **annulus** strongly differentiated, revolute; **stomata** superficial; **operculum** conic. **Exostome teeth** pale, lanceolate, narrowly bordered, very finely papillose on outer surface, strongly trabeculate on inner surface; **endostome** with a high basal membrane, with widely perforate **segments** that are nearly the height of the teeth and nodose to appendiculate **cilia** in pairs or 3s. **Spores** small, 12–18 μm, pale brown, appearing smooth.

**Illustrations:** Plate 6. Crum & Anderson 1981, fig. 244 a–g; Beever et al. 1992, fig. 39; Malcolm & Malcolm 2003, p. 52; Shaw & Ramsay 2013, unnumbered fig.

**Distribution:** NI: N Auckland (Ahipara, Waipoua) including offshore islands (TK), S Auckland, Taranaki (Fantham's Peak), Wellington; SI: Nelson, Canterbury, Westland (Jacksons Bay), Otago, Southland (Invercargill, Awarua Bog); Ch; A; C. No convincing material has been seen from Gisborne, Hawke's Bay, or Marlborough L.D. (despite Sainsbury's 1955 report from the last), or from St. Only one collection has been confirmed from Westland L.D.

Cosmopolitan. Tasmania\*, mainland Australia\*, Patagonia\*. Crum & Anderson (1981) considered it to be widespread in both the northern and southern hemispheres.

**Habitat:** *Pohlia nutans* occurs in a wide range of terrestrial habitats but is best developed when growing in *Sphagnum* bogs, at tarn margins, or in wet tussock grasslands. Its many other habitats include roadside banks, glacial rubble, crevices in rock outcrops, dune slacks, rotten wood, and *Leptospermum/Kunzea* scrub. Material has been seen from peat that had been burnt 39 months prior (*P.N. Johnson* 52, CHR 242737, from Awarua Bog). Smith (2004) considers it to be “especially characteristic of acidic peaty or sandy soil” in Britain. Material collected from bogs and similar damp, acidic, and highly insulated sites is often much larger in stature than material from other habitat types. A single collection (*M.F. Sinclair s.n.*, CHR 491858, named by K.W. Allison) has been collected growing as a “weed in [a] water-logged pot” in a glasshouse in Christchurch; the material seems correctly named. On the North I. documented from 350 m (Waiotapu, S Auckland L.D.) to at least 1190 m (Tararua Range, Wellington L.D.), with one record from c. 2440 m (Mt Girdlestone, Wellington L.D.). On the South I. ranging from near sea level (Waitāī, Otago L.D. and Invercargill) to at least 1900 m (above the Caroline Glacier in Mt Cook National Park, Canterbury L.D.). Associated species are accordingly diverse and frequently include members of the genera *Bartramia*, *Chrysoblastella*, *Conostomum*, *Ditrichum*, *Philonotis*, *Polytrichum*, and *Sphagnum*.

---

---

**Notes:** *Pohlia nutans* is a highly variable species, but a suite of features facilitate its recognition, particularly the elongate to linear and thick-walled upper laminal cells, the stout costa, the weakly toothed upper margins, which are recurved towards the insertion, as well as the paroicous (sometimes synoicous) inflorescence, paired (–3) and strongly nodose endostomal cilia, and inclined, relatively short-necked capsules, which all aid the recognition of this widespread species. Very often specimens that lack sporophytes have sex organs, and the usually paroicous distribution of the antheridia greatly aids recognition. The occurrence of up to four endostomal cilia, as noted by Sainsbury (1955, p. 261), has not been confirmed.

As in the northern hemisphere material (Crum & Anderson 1981; Smith 2004), *P. nutans* from N.Z. often has exceedingly long and delicate setae. Plants with setae greater than c. 35 mm usually occur in bogs or other wet and insolated habitats. Both Crum & Anderson (1981) and Smith (2004) noted that *P. nutans* is variable in chromosome number.

A collection of *P. nutans* from Maungatua (Otago L.D.) by *J. Child 6088* [CHR 429247] was (in 1995?) tentatively considered by J. Shaw to represent a species of *Pohlia* unknown for New Zealand, which he (*in herb.*) termed “*Pohlia* species Y”. Shaw’s tentative opinion is not accepted here.

*Pohlia elatior* is retained in synonymy here (rather than in *Bryum pseudotriquetrum*, as stated in Fife 1995) partly on the strength of a 1995 annotation of the holotype by J. Shaw. In an earlier annotation he considered it a “lush form of *Pohlia nutans*”. It is highly aberrant material, with very elongate (to 35 mm) stems, and appears (despite Dixon’s comments that it is male material of a dioicous species, quoted by Sainsbury 1955, p. 359) to lack any sex organs. The costae are variable in length from subpercurrent to excurrent, the upper laminal cells are elongate and firm- to thick-walled, and the margins are as per *P. nutans*. The extremely aberrant morphology of the type collection is likely to be due to the great altitude of the collection site (c. 8000 feet, or 2440 m). It could be argued that Dixon and Sainsbury were unwise to describe a new species from sterile and apparently non-representative material. There seems to be no useful purpose served by questioning Shaw’s 1995 determination; it seems desirable that the poorly founded name *Pohlia elatior* fade from usage.

The name *P. nutans* var. *longisetata* Huebener was applied by Dixon (1926) to material collected near Bealey (Canterbury L.D.) by R. Brown. The material in question (CHR 491857) is unexceptional in the context of *P. nutans* in N.Z. and the name seems to have little or no currency in modern European or British floras. The name was not applied by Sainsbury (1955, p. 261) and is not considered further here.

**Recognition:** Smith’s (2004, p. 600) statement that despite its variability *P. nutans* is usually an easily recognised plant is correct. In occasional specimens the paroicous nature of the inflorescence cannot be demonstrated, but in such cases the thick-walled and elongate nature of the laminal cells point to this species. The dry, appressed leaves, pigmented and protruding costae, and recurved margins sometimes give the gametophytes of this plant a vague resemblance to *Ceratodon purpureus*.

*Pohlia nutans* is sometimes confused with *P. cruda*, but differs from it by its lack of sheen and its thicker-walled upper laminal cells. *Pohlia nutans* is invariably paroicous or synoicous (in N.Z.), whereas *P. cruda* is mostly dioicous and bears conspicuous terminal perigonia in some plants.

Confusion sometimes occurs with *Mielichhoferia bryoides*, particularly when sterile. The presence of secondary red pigments in the stem and costae, the thicker-walled upper laminal cells, and the terminal perichaetia in the present species should prevent confusion. The upper marginal teeth in the present species are less pronounced and do not project from the margin as widely as do those in *M. bryoides*, which project from the margin in a highly characteristic manner. The two species could not be confused when fruiting, given the marked differences in capsule stance and the nature of their peristomes.

**Etymology:** The specific epithet *nutans* refers to the nodding or drooping stance of the capsules.

### ***Pohlia ochii* Vitt, *Bryologist* 74: 471 (1971)**

Holotype: N.Z., Campbell Island, edge of Mt Lyall Ridge, *D.H. Vitt 2813*, NY 1186346. Not seen. (Image viewed online, JSTOR Global Plants, accessed 15 Jan. 2015.)

**Plants** medium-sized, lustrous, yellow to gold-green above, becoming red below, forming loose turves on friable, non-irrigated mineral soil. **Stems** mostly (5–)12–20(–30) mm, mostly unbranched, pale above, usually dark red near base, sparsely beset below with densely papillose and red rhizoids, in cross-section with a strong central strand. **Leaves** equally and distantly spaced on stems, erect-spreading both dry and moist, narrowly lanceolate-acuminate, usually sparsely and weakly serrulate in upper half or more by projecting cell ends or sometimes nearly entire, (1.3–)1.6–2.2 mm, plane at

---

margins, decurrent; **upper and mid laminal cells** linear, thin-walled but not lax, mostly 120–180 × c. 8 µm. **Costa** ending below the leaf apex, concolorous or red near insertion, in cross-section with an abaxial stereid band, and weakly differentiated guide cells and adaxial stereids. **Axillary gemmae** usually present, numerous or occasionally sparse in upper leaf axils, linear, apparently dextrorse, many-celled, strongly bent or twisted both moist and dry, (110–)175–350(–410) µm, with (0–)1–2 single-celled peg-like leaf primordia.

**Sexuality and sporophytes** uncertain.

**Illustrations:** Plate 4. Vitt 1971, figs 23–27.

**Distribution:** NI: Taranaki (Mt Taranaki), Hawke's Bay (track to Sunrise Hut), Wellington (Mt Ruapehu, John McDonald Road, Akatarawa Range); SI: Nelson, Marlborough (Black Birch Range, Mt Fyffe), Canterbury (Cora Lynn, Banks Peninsula), Westland (Sewell Peak, Madmans Creek, Newton Range, near Jackson Bay), Otago (Lindis Pass, Crown Range, Queenstown, Paradise, Black Gully, Leith Saddle), Southland (Stuart Range, Borland Burn, Grebe River, Percy Stream); A, C. Endemic.

**Habitat:** On friable non-humic soil. On steep and shaded banks, gravel banks, road cuts, in rock crevices, and similar substrates, very rarely on wood. Associated with a range of rock types (e.g., basalt, greywacke, gneiss) but avoiding calcareous substrates. Occasionally in the beds of intermittent watercourses, but not associated with seepages or permanently irrigated sites. Most often in southern beech dominated forest, but also occurring in podocarp forests, grasslands and scrublands. Documented from 660 m (John McDonald Road) to c. 1550 m (Bruce Road, Mt Ruapehu) on the North I. and from 60 m (Ōpārara River) to 1300 m (Mt Fyffe) on the South I. Very commonly associated mosses are *Ditrichum difficile* and *Mittenia plumula*, while *Bartramia papillata*, *Catagonium nitens*, *Ditrichum cylindricarpum*, *D. punctulatum*, *Leptotheca gaudichaudii*, *Philonotis tenuis*, *Pohlia australis*, and *P. cruda* and species of *Telaranea* are less frequently associated.

**Notes:** Sporophytes are extremely rare in *P. ochii*, and both the sexuality and the nature of the sporophytes are uncertain. One collection from Treble Cone (Otago L.D., *P. Beveridge AX-1a*, WELT M037925) bears sporophytes clearly attached to representative and gemmae-bearing shoots. This collection has paroicous perichaetia borne terminally on short (≤4 mm) shoots, with perichaetial leaves longer than vegetative, to at least 2.5 mm. The setae are straight, c. 7 mm, yellow-brown, and the capsules are clavate and weakly inclined when moist, 3.0–4.0 mm, with a long neck nearly equal to the urn. Peristome details are not observable and the few spores seen are 21–24 µm.

A collection from Borland Burn (*J.E. Beever 64-12b*, CHR 462055) consisting predominantly of representative and propaguliferous shoots of *P. ochii* also includes a small number of immature capsules. These differ markedly from the Treble Cone material, but no unambiguous connection between gemmae-bearing shoots and the sporophytes can be demonstrated. The perichaetia bear only archegonia (the plants are apparently dioicous), the flexuose setae are c. 35 mm, and the immature capsules are ± horizontal, broadly obovoid, and c. 2.8 mm long with an only moderately defined neck. It is not possible to reconcile these two morphologically different sporophytes, and the study of better fruiting material is required to clarify both the sexuality and sporophyte morphology of this species.

**Recognition:** Features that distinguish *P. ochii* from *P. wahlenbergii* are discussed under the latter species. *Pohlia ochii* and other gemmae-bearing species of *Pohlia* can be differentiated mainly by the morphology and number of their axillary gemmae, as outlined in the key. In the absence of gemmae, recognition can be very difficult and it seems best to rely on leaf shape, texture, tothing, and the nature of the insertion (± lanceolate, delicate, often serrulate, and decurrent in this species, poorly represented in Plate 4, N). The thin-walled upper laminal cells, its broad elevational range, and its presence on sheltered and friable soil can sometimes facilitate the naming of difficult specimens.

Confusion between *P. ochii* and *Philonotis tenuis* is possible, in part because the latter occupies similar (but often more calcareous) soil habitats. The laminal cells of *P. ochii* are smooth and linear, while those of *Philonotis tenuis* are prorate and much shorter (<32 µm). *Pohlia ochii* is decidedly more lustrous. The gemmae in *P. ochii* are very numerous and have peg-like primordia, while those of *Philonotis tenuis* are fewer (to five per leaf axil) and have laminate leaf primordia. The costa in the present species ends in the acumen, while that of *Philonotis tenuis* is excurrent. Once recognised, the two species present very different aspects.

**Etymology:** The epithet *ochii* honours the late Japanese bryologist Harumi Ochi (1920–2001), who specialised in the family Bryaceae and who published a useful revision for the subfamily Bryoideae in Australasia (Ochi 1970).



---

***Pohlia tenuifolia* (A.Jaeger) Broth., Nat. Pflanzenfam. [Engler & Prantl] 1(3), 549 (1903)**

≡ *Bryum tenuifolium* Hook.f. & Wilson, *London J. Bot.* 3: 546 (1844) nom. illeg., non *Bryum tenuifolium* Brid. 1801

≡ *Webera tenuifolia* A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1873–1874: 137 (1875)  
Lectotype: N.Z., Bay of Islands, *J.D. Hooker* 27, Aug. 1841, herb. Wilson 354, BM 000933725. Designated by J. Shaw, *in herb.* Image seen online, JSTOR Global Plants, accessed 21 Feb. 2018.

= *Bryum calcareum* R.Br.bis, *Trans. & Proc. New Zealand Inst.* 31: 450 (1899)  
Type: On damp banks, Weka Pass, *R. Brown*, CHR 335152!

**Plants** small, yellow-green, with a red stem, not or weakly lustrous when dry, usually forming loose turves or mixed with other mosses. **Stems** variable in length, 2 to at least 20 mm, unbranched, red, in cross-section with incrassate cortical cells and a central strand, beset with brown and nearly smooth rhizoids. **Leaves** sparse below, becoming more crowded and larger towards the shoot tip, erect-spreading, mostly homomallous, somewhat contorted when dry, lanceolate-subulate, entire or very weakly toothed at extreme apex, narrowly recurved in lower margins, not decurrent, mostly 1.8–3.2 × 0.25–4.0 mm (but smaller on lower stems); **upper laminal cells** obscure; **mid laminal cells** linear, firm-walled, mostly 60–105 × 5–7 µm, becoming broader and more oblong towards insertion. **Costa** extending to the leaf apex (but often appearing excurrent because of the obscurity of the upper lamina), in cross-section semi-circular and strongly protruding on the abaxial surface, with median guide cells and strong abaxial and weak adaxial stereid bands. **Axillary gemmae** nil.

**Dioicous.** **Perichaetia** terminal, the leaves differentiated only by size from the vegetative leaves. **Perigonia** inconspicuous, terminal, often overtopped by innovations (and then with multiple perigonia per shoot), with bracts shorter, broader, and more pigmented than adjacent vegetative leaves. **Setae** slender, flexuose, red, mostly (6–)9–14(–20) mm; **capsules** horizontal or nutant due to curvature of upper setae when moist, oblong-cylindric, pale red-brown, (1.0–)1.3–1.8 mm; **annulus** well-differentiated; **operculum** conic; **exothecial cells** oblong-hexagonal; **stomata** superficial. **Exostome** pale, the teeth narrowly bordered, very finely papillose on outer surface, strongly trabeculate on the inner surface; **endostome** with a rather low membrane and well-developed, perforate **segments**; **cilia** variable even within the same capsule, single, paired, or rudimentary, not or weakly nodose. **Spores** 14–18(–21) µm, nearly smooth.

**Illustrations:** Plate 7. Wilson 1854, pl. 85, fig. 5; Sainsbury 1955, pl. 39, fig. 3.

**Distribution:** NI: N Auckland (Waipoua, Titirangi, Auckland City, Waiheke I.), S Auckland (Te Aroha, Te Akatea, Rotorua and vicinity), Gisborne (Lake Waikaremoana), Hawke's Bay (Kiwi Station, Māhia Peninsula), Taranaki (Mt Messenger), Wellington (Manawatū Gorge); SI: Nelson, Marlborough (near Needles Point), Canterbury (Weka Pass, Banks Peninsula, South Branch of the Pareora River), Westland (Taramakau River), Otago (many localities in and near Dunedin, Waihola Hill, near Kaitangata). Martin (1949) recorded this species from St on the basis of a Robert Brown collection that has not been seen.

Endemic or austral. Shaw & Fife (1985) recorded the occurrence of this species in Chile and Brazil.

**Habitat:** Occurring on bare, often vertical soil (clay, pumice, and sand) or porose rock (e.g. mudstone) in habitats such as stream banks, roadside drains, and damp rock faces. On the North I. documented from less than 100 m (Auckland Domain) to at least 610 m (Lake Waikaremoana), and on the South I. from near sea level (Whanganui Inlet, Nelson L.D.) to at least 260 m (Banks Peninsula). *Bryum* spp., including *B. sauteri*, *Dicranella vaginata*, *Megaceros pellucidus*, and *Isotachis* spp. are frequent associates. *Pohlia tenuifolia* is an inconspicuous and sparsely collected species and is probably more widespread than collections indicate.

**Notes:** The type of *Bryum tenuifolium* has been seen only using JSTOR. It is a Hooker collection from the Bay of Islands. The lectotype in BM is accompanied on the same sheet by numerous detailed pencil sketches by Wilson. These, plus the illustrations in Wilson (1854, pl. 85, fig. 5), leave no doubt that the Hooker collection is representative of *Pohlia tenuifolia*.

*Bryum tenuifolium* Hook.f. & Wilson was a later homonym at the time of its publication and hence illegitimate. Jaeger (1875) published a later combination in the genus *Webera*, which must be taken as the basionym. In the *Flora Novae-Zelandiae*, Wilson (1854) considered this species to be closely allied or possibly identical to the South American species now known as *Pohlia humilis* (Mont.) Broth. No material of this name has been available for comparison.

---

Wilson (1854, p. 83) also published *Bryum tenuifolium* var. *exiguum*, but did not clearly designate a type. This name is not considered further here.

*Bryum calcareum*, *B. barrii*, *B. walkeri*, and *B. whittonii*, all described by Robert Brown, were placed in the synonymy of *P. tenuifolia* by Dixon (1926). Of these names, only *B. calcareum* has type material present in N.Z. herbaria. There is no practical reason to question Dixon's decisions.

**Recognition:** *Pohlia tenuifolia* is variable in stature, with the stems ranging from a few mm to over 20 mm in length, and setae that also vary in length. However, once the generic affinities of this plant are recognised, the lanceolate-subulate leaves that are widest at their insertion distinguish this plant from all other regional species of *Pohlia*, with the possible exception of *P. ochii*. The present species has leaves that are not decurrent, lacks axillary gemmae, and the plants are generally of smaller stature than *P. ochii*. Fruit are commonly produced in the present species (despite its dioicous sexuality), whereas in *P. ochii* they are extremely rare.

**Etymology:** The specific epithet *tenuifolium* refers to thin or delicate leaves.

### ***Pohlia wahlenbergii* (F.Weber & D.Mohr) A.L.Andrews, Moss Fl. N. Amer. 2, 203 (1935)**

≡ *Hypnum wahlenbergii* F.Weber & D.Mohr, *Bot. Taschenb. (Weber)* 280, 475 (1807)

≡ *Webera wahlenbergii* (F.Weber & D.Mohr) Fűrnr., *Flora* 12(2 Ergänzungsblätter): 35 (1829)

≡ *Mniobryum wahlenbergii* (F.Weber & D.Mohr) Jenn., *Man. Mosses W. Pennsylvania* 146 (1913)

Type: Germany. Not seen.

= *Pohlia albicans* Lindb., *Musci Scand.* 17 (1879) nom. illeg.

= *Bryum binnsii* R.Br.bis, *Trans. & Proc. New Zealand Inst.* 31: 456 (1899)

Lectotype: N.Z., Wet banks, Stewart Island, *R. Brown*, CHR 335250! A second syntype, collected by *W. Bell* at Dunedin, has not been seen.

**Plants** white- or glaucous-green when fresh, usually tinged pink or copper, not or scarcely lustrous, forming turves (often extensive) or scattered among other mosses. **Stems** variable in length, to at least 35 mm, pink, in cross-section angled, with incrassate cortical cells and a conspicuous central strand, beset with red-brown and nearly smooth rhizoids. **Leaves** evenly distributed on stem, erect-spreading, usually ± secund, little altered when dry, lanceolate or ovate-lanceolate, serrulate towards apex, plane or nearly so at margins, weakly or distinctly decurrent, mostly 1.5–2 × 0.3–0.4 mm; **upper laminal cells** linear-rhombic, mostly 90–150 × 10–12 μm, thin-walled and lax, becoming longer towards insertion. **Costa** ending below the leaf apex, mostly pigmented, in cross-section with weakly differentiated guide cells and stereid bands. **Axillary gemmae** nil.

**Dioicous.** **Perichaetia** terminal but sometimes overtopped by innovation, the leaves erect and longer than vegetative leaves, otherwise little differentiated. **Perigonia** terminal, the outer bracts wide-spreading, the inner reduced, enclosing antheridia and filiform paraphyses. **Setae** single and rather short, c. 12 mm, yellow-brown; **capsules** pendent, very short, 1.0–2.0 × c. 1.0 mm, short pyriform, becoming broadly urceolate and flaring at maturity, with a neck about ½ the length of the urn, red-brown; **exothecial cells** ± hexagonal, thick-walled; **annulus** apparently lacking; **stomata** numerous and immersed; **operculum** low-conic. **Exostome teeth** well-developed, pale brown; **endostome** with a high basal membrane, perforate **segments**, and **cilia** mostly paired and nodose. **Calyptra** as per genus. **Spores** 12–20 μm, yellow-brown, nearly smooth.

**Illustrations:** Plate 8. Crum & Anderson 1981, fig. 237; Seppelt 2004, fig. 79; Shaw 2006, fig. 2 S–T.

**Distribution:** NI: N Auckland, including offshore islands (HC), S Auckland, Gisborne (Waioeka Gorge, near Maungapōhātu, Lake Waikaremoana), Hawke's Bay (near Wairoa, Poporangi Stream, Puketitiri Road), Wellington; SI: Marlborough (D'Urville I., Resolution Bay, Hundalee Hills), Canterbury, Westland (near Waitutu, Lake Kaniere, Lake Ellery, near Haast), Otago; Southland (near Waimatuku) Ch, Ant; C; M. Recorded from A by Vitt (1979). No material has been seen from Stewart Island / Rakiura, although it was recorded from there (as *Bryum wahlenbergii*) by Hooker (1867, p. 439).

Nearly cosmopolitan. Shaw (2006) recorded it from Tasmania and southern mainland Australia, and considered it to be "one of the most abundant species of *Pohlia* at high latitude of the Northern and Southern Hemispheres".

**Habitat:** In seepages, at stream margins, and in swamps, on silt, clay, or rock and often on ± vertical surfaces. This widespread species is often associated with such moss species as *Bryum laevigatum*, *Cratoneurosis relaxa*, *Fissidens leptocladus*, *F. rigidulus*, and *Philonotis tenuis*. On the North I. it

---

ranges from near sea level (Ahipara, N Auckland L.D.) to at least 1200 m (Blyth Hut Track, Wellington L.D.). On the South I. it ranges from near sea level (Pororari River, Nelson L.D.) to at least 1100 m (Criffel Range, Otago L.D.). *Pohlia wahlenbergii* fruits uncommonly in N.Z. as well as elsewhere in its range. Shaw (2006) considered it to favour basic substrates.

**Notes:** Rarely (apparently when completely submerged) plants can be a dark brown colour and devoid of pink pigmentation.

Sainsbury (1955) considered *P. tasmanica* to be a Tasmanian endemic species. Scott and Stone (1976, p. 303) expressed doubt concerning its taxonomic status. Shaw (2006) placed *Mniobryum tasmanicum* Broth. and its numerous nomenclatural equivalents into synonymy with *P. wahlenbergii*, noting that “these plants...fall well within the range of variation for *P. wahlenbergii*”. *Mniobryum tasmanicum* is founded on three syntypes collected by W.A. Weymouth at Mt Wellington, Tasmania; none of these collections are among the many Weymouth specimens in CHR. However, N.Z. material named by both Dixon and Sainsbury as *M.* (or *Pohlia*) *tasmanicum* has been examined and referred without reservation to *P. wahlenbergii*. Therefore, no useful purpose can be served by questioning Shaw’s synonymy.

**Recognition:** *Pohlia wahlenbergii* is often confused with *P. cruda*. Both these species are usually white-green when fresh. However, the present species lacks the strong lustre of *P. cruda*, has generally shorter and often secund leaves, and is more strongly secondarily pigmented. When fruiting (infrequently in *P. wahlenbergii*), the much shorter (1.0–2.0 mm) capsules, which lack an obvious annulus, contrast sharply with the oblong-cylindric or elongate-pyriform, longer (2.5–5 mm), and annulate capsules of *P. cruda*. Both these species are dioicous and have conspicuous terminal perigonia, and both are widespread in N.Z.

*Pohlia wahlenbergii* is likewise sometimes confused with *P. ochii*. *Pohlia wahlenbergii* plants are scarcely lustrous with non- or scarcely decurrent leaves, while plants of *P. ochii* are strongly lustrous with decurrent leaves. When axillary gemmae are present in *P. ochii* they are diagnostic. The present species mostly has ± secund leaves in N.Z., while *P. ochii* does not. *Pohlia wahlenbergii* is nearly restricted to sites in or influenced by water, while *P. ochii* occurs on friable soil in drier and mostly strongly sheltered sites.

**Etymology:** The species epithet commemorates Göran Wahlenberg (1780–1851), a Swedish naturalist, author of *Flora Lapponica*, and a professor of medicine and botany at the University of Uppsala.

---

## References

- Andrews, A.L. 1935: Bryaceae (I). In: Grout, A.J. *Moss Flora of North America, North of Mexico*. Vol. 2. Newfane. 184–242.
- Beever, J.E. 1992: Taxonomic notes on two New Zealand mosses: *Bryobartlettia costata* Buck (Fabroniaceae) and *Calliargon laxirete* Zant. et Bartlett (Amblystegiaceae). *New Zealand Journal of Botany* 30: 205–206.
- Beever, J.E.; Allison, K.W.; Child, J. 1992: *The Mosses of New Zealand*. Edition 2. University of Otago Press, Dunedin.
- Brotherus, V.F. 1901–1909: Musci (Laubmoose) II Spezieller Teil. In: Engler, A.; Prantl, K. (ed.) *Die natürlichen Pflanzenfamilien*. Teil 1. Abt. 3. Engelmann, Leipzig. 277–1246.
- Brotherus, V.F. 1924: Musci (Laubmoose). II. Spezieller Teil. In: Engler, A. (ed.) *Die natürlichen Pflanzenfamilien*. Edition 2. Bd 10. Engelmann, Leipzig. 143–478.
- Brown, R. 1899 ("1898"): Notes on New Zealand Musci, and descriptions of new species. *Transactions and Proceedings of the New Zealand Institute* 31: 442–470.
- Clarke, G.C.S. 1973: A synoptic flora of South Georgian mosses: III. *Leptotheca*, *Philonotis*, *Mielichhoferia* and *Pohlia*. *Bulletin, British Antarctic Survey* 37: 53–79.
- Cox, C.J.; Hedderson, T.A.J. 2003: Phylogenetic relationships within the moss family Bryaceae based on chloroplast DNA evidence. *Journal of Bryology* 25: 31–40.
- Crum, H.A. 1994: Schizymenium. In: Sharp, A.J.; Crum, H.A.; Eckel, P.M. (ed.) *The Moss Flora of Mexico*. *Memoirs of the New York Botanical Garden* 69: 525–529.
- Crum, H.A.; Anderson, L.E. 1981: *Mosses of Eastern North America*. Columbia University Press, New York.
- Dixon, H.N. 1915: New and rare Australian mosses, mostly from Mitten's herbarium. *Bulletin of the Torrey Botanical Club* 42: 93–110.
- Dixon, H.N. 1926: Studies in the bryology of New Zealand, with special reference to the herbarium of Robert Brown. Part IV. *Bulletin, New Zealand Institute* 3(4): 153–238.
- Fife, A.J. 1984: Records of new or otherwise interesting mosses in New Zealand, including a new species of *Racomitrium*. *New Zealand Journal of Botany* 22: 1–6.
- Fife, A.J. 1995: Checklist of the mosses of New Zealand. *Bryologist* 98: 313–337.
- Fife, A.J. 2015: Bryaceae. In: Heenan, P.B.; Breitwieser, I.; Wilton, A.D. (ed.) *Flora of New Zealand — Mosses*. Fascicle 19. Manaaki Whenua Press, Lincoln.
- Fife, A.J.; Knightbridge, P. 2005: Distribution of the very rare moss *Epipterygium opararensense* and recommendations for track upgrades at Oparara. *DOC Research & Development Series* No. 221. 1–6.
- Fife, A.J.; Shaw, A.J. 1990: *Epipterygium* (Musci: Bryaceae) new to Australasia, with the description of *E. opararensense*, sp. nov. *New Zealand Journal of Botany* 28: 375–379.
- Fürnrohr, A.E. 1829: Sam. El. a Bridel-Brideri, a consil. secret. legation. Saxo-gothanae etc. Bryologia universa. *Flora, oder Allgemeine Botanische Zeitung* 12(2 *Ergänzungsblätter*): 1–60.
- Goffinet, B.; Buck, W.R.; Shaw, A.J. 2009: Morphology, anatomy, and classification of the Bryophyta. In: Goffinet, B.; Shaw, A.J. (ed.) *Bryophyte Biology*. Edition 2. Cambridge University Press, Cambridge. 55–138.
- Grindley, G.W. 1978: West Nelson. In: Suggate, R.P.; Stevens, G.R.; Te Punga, M.T. (ed.) *The Geology of New Zealand*. Government Printer, Wellington. 80–99.
- Hampe, E. 1856: Plantae Muellerianae. Musci frondosi Australasia felici lecti. (Continuatio). *Linnaea* 28: 203–215.
- Harvey, W.H. 1838: *The Genera of South African Plants, arranged according to the natural system*. Robertson, Cape Town.
- Hedwig, J. 1801: *Species Muscorum Frondosorum descriptae et tabulis aeneis lxxvii coloratis illustratae*. Barth, Leipzig.
- Hooker, J.D. 1867: *Handbook of the New Zealand Flora: a systematic description of the native plants of New Zealand and the Chatham, Kermadec's, Lord Auckland's, Campbell's, and Macquarrie's Islands*. Part II. Reeve, London.
- Hooker, J.D.; Wilson, W. 1844: Musci Antarcticici; being characters with brief descriptions of the new species of mosses discovered during the voyage of H.M. Discovery ships, Erebus and



- 
- Terror, in the southern circumpolar regions, together with those of Tasmania and New Zealand. *London Journal of Botany* 3: 533–556. [Oct. 1844]
- Hornschuch, F. 1841: Muscorum Frondosorum Novorum, quos in Africa Australiori Collegerunt Ecklon, Drège, Mundt et Mairie, Descriptiones. *Linnaea* 15: 113–157.
- Jaeger, A. 1875: Genera et species muscorum systematice disposita seu adumbratio florum muscorum totius orbis terrarum (continuatio) [Pars V]. *Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft 1873–1874*: 53–278. [More commonly available as the “Separatabdruck” of the same title: 1870–1879: 2 vols.]
- Jennings, O.E. 1913: *A Manual of the Mosses of Western Pennsylvania*. Pittsburgh.
- Limpricht, K.G. 1890–1895: *Die Laubmoose Deutschlands, Oesterreichs und der Schweiz*. Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. Bd. 4, Abt. 2. Kummer, Leipzig.
- Lindberg, S.O. 1863 (“1862”): Om ett nytt släkte, *Epipterygium*, bland bladmossorna. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar* 19: 599–609.
- Lindberg, S.O. 1879: *Musci Scandinavici in systemate novo naturali dispositi a S.O. Lindberg*. Jesaiae Edquist, Uppsala.
- Magill, R.E. 1987: *Bryophyta, Part 1 Mosses, Fascicle 2, Gigaspermaceae-Bartramiaceae*. Leistner, O.A. (ed.) *Flora of Southern Africa*. Botanical Research Institute, Pretoria.
- Malcolm, B.; Malcolm, N. 2003: *A Colour Atlas of the Genera of New Zealand's Mosses*. Micro-Optics Press, Nelson.
- Martin, W. 1949: The bryophytes of Stewart Island—Part I. *Transactions and Proceedings of the Royal Society of New Zealand* 77(2): 257–277.
- Nees von Esenbeck, C.F.D.; Hornschuch, C.F.; Sturm, J. 1831: *Bryologia Germanica, oder Beschreibung der in Deutschland und in der Schweizwachsenden Laubmoose*. Vol. 2(2). Fleischer, Leipzig.
- Ochi, H. 1968: On the status of *Bryum handelii* Broth. (Musci). *Journal of Japanese Botany* 43: 480–484.
- Ochi, H. 1970: A revision of the subfamily Bryoideae in Australia, Tasmania, New Zealand, and the adjacent islands. *Journal of the Faculty of Education, Tottori University. Natural Science* 21(1): 7–67.
- Ochyra, R. 1991 (“1990”): *Epipterygium* (Musci, Bryaceae), a genus new to Australasia. *Polish Botanical Studies* 1: 51–57.
- Renauld, F.; Cardot, J. 1888: New mosses of North America. I. *Botanical Gazette* 13: 197–203.
- Rolfe, J.R.; Fife, A.J.; Beever, J.E.; Brownsey, P.B.; Hitchmough, R.A. 2016: *Conservation status of New Zealand mosses, 2014. New Zealand Threat Classification Series*. Vol. 13. Department of Conservation, Wellington.
- Sainsbury, G.O.K. 1945: New and critical species of New Zealand mosses. *Transactions and Proceedings of the Royal Society of New Zealand* 75: 169–186.
- Sainsbury, G.O.K. 1952: Critical New Zealand mosses. *Revue Bryologique et Lichénologique, n.s.* 21: 213–225.
- Sainsbury, G.O.K. 1955a: A handbook of the New Zealand mosses. *Bulletin of the Royal Society of New Zealand* 5: 1–490.
- Sainsbury, G.O.K. 1955b: Notes on Tasmanian mosses from Rodway's herbarium: IV. *Papers and Proceedings of the Royal Society of Tasmania* 89: 21–35.
- Scott, G.A.M.; Stone, I.G. 1976: *The Mosses of Southern Australia*. Academic Press, London.
- Seppelt, R.D. 2004: *The Moss Flora of Macquarie Island*. Australian Antarctic Division, Kingston.
- Shaw, A.J. 1981: A taxonomic revision of the propaguliferous species of *Pohlia* (Musci) in North America. *Journal of the Hattori Botanical Laboratory* 50: 1–81.
- Shaw, A.J. 1984: Quantitative taxonomic study of morphology in *Epipterygium*. *Bryologist* 87: 132–142.
- Shaw, A.J. 1985: Nomenclatural changes in the Bryaceae subfamily Mielichhoferioideae. *Bryologist* 88: 28–30.
- Shaw, A.J. 1994: *Epipterygium*. In: Sharp, A.J.; Crum, H.A.; Eckel, P.M. (ed.) *The Moss Flora of Mexico. Memoirs of the New York Botanical Garden* 69: 506–507.
-

- 
- Shaw, A.J. 2006: A revision of the moss genus *Pohlia* Hedw. (Mniaceae) in Australia. *Systematic Botany* 31: 247–257.
- Shaw, A.J.; Crum, H.A. 1984: Peristome homology in *Mielichhoferia* and a taxonomic account of the North American species. *Journal of the Hattori Botanical Laboratory* 57: 363–381.
- Shaw, A.J.; Fife, A.J. 1985: *Pohlia australis* sp. nov. (Musci) from New Zealand with notes on some other austral *Pohl*ias. *New Zealand Journal of Botany* 23: 183–186.
- Shaw, A.J.; Ramsay, H.P. 2013: Australian Mosses Online. 69. Mielichhoferiaceae. ABRS, Canberra. Version 2 May 2013.  
[http://www.anbg.gov.au/abrs/Mosses\\_online/69\\_Mielichhoferiaceae.html](http://www.anbg.gov.au/abrs/Mosses_online/69_Mielichhoferiaceae.html)
- Smith, A.J.E. 2004: *The Moss Flora of Britain and Ireland*. Edition 2. Cambridge University Press, Cambridge.
- Spence, J.R.; Ramsay, H.P. 2005: New genera and combinations in the Bryaceae (Bryales, Musci) for Australia. *Phytologia* 87: 61–72.
- Spence, J.R.; Ramsay, H.P. 2006: Bryaceae. In: McCarthy, P.M. (ed.) *Flora of Australia*. Vol. 51 Mosses 1. ABRS, Canberra. 274–348.
- Stearn, W.T. 1966: *Botanical Latin: history, grammar, syntax, terminology and vocabulary*. Hafner Publishing Co., New York.
- van Zanten, B.O.; Bartlett, J.K. 1986: *Calliargon laxirete* Zant. et Bartlett, a new moss species from New Zealand, with some remarks on *C. sarmentosum* (Wahlenb.) Kindb. *Cryptogamie - Bryologie et Lichénologie* 7: 19–35.
- Vitt, D.H. 1971: New species of mosses from Campbell Island, New Zealand. *Bryologist* 74: 464–472.
- Vitt, D.H. 1979: The moss flora of the Auckland Islands, New Zealand, with a consideration of habitats, origins, and adaptations. *Canadian Journal of Botany* 57: 2226–2263.
- Weber, F.; Mohr, D.M.H. 1807: *Botanisches Taschenbuch auf das Jahr 1807. Deutschlands kryptogamische gewächse. 1. Abth. filices, musci frondosi et hepatici*. Akademischen Buchhandlung, Kiel.
- Wijk, R. van der; Margadant, W.D. 1962: New combinations in mosses (VII). *Taxon* 11: 221–223.
- Wilson, W. 1854 ("1855"): Musci. In: Hooker, J.D. *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror, in the years 1839–1843, under the command of Captain Sir James Clark Ross*. II. Flora Novae-Zelandiae. Part II. Flowerless plants. Lovell Reeve, London. 57–125.
-

---

# Conventions

## Abbreviations and Latin terms

Abbreviations	Meaning
A	Auckland Islands
A.C.T.	Australian Capital Territory
<i>aff.</i>	allied to ( <i>affinis</i> )
agg.	aggregate
Ant	Antipodes Islands
a.s.l.	above sea level
<i>auct.</i>	of authors ( <i>auctorum</i> )
B	Bounty Islands
C	Campbell Island
c.	about ( <i>circa</i> )
cf.	compare with, possibly the species named ( <i>confer</i> )
<i>c.fr.</i>	with fruit ( <i>cum fructibus</i> )
Ch	Chatham Islands
<i>comb. nov.</i>	new combination ( <i>combinatio nova</i> )
D'U	D'Urville Island
et al.	and others ( <i>et alia</i> )
et seq.	and following pages ( <i>et sequentia</i> )
ex	from
fasc.	fascicle
<i>fide</i>	according to
GB	Great Barrier Island
HC	Hen and Chicken Islands
Herb.	Herbarium
hom. illeg.	illegitimate homonym
I.	Island
ibid.	in the same place ( <i>ibidem</i> )
incl.	including
<i>in herb.</i>	in herbarium ( <i>in herbario</i> )
<i>in litt.</i>	in a letter ( <i>in litteris</i> )
<i>inter alia</i>	among other things ( <i>inter alia</i> )
Is	Islands
K	Kermadec Islands
KA	Kapiti Island
LB	Little Barrier Island
L.D.	Land District or Districts
<i>leg.</i>	collected by ( <i>legit</i> )
loc. cit.	in the same place ( <i>loco citato</i> )
l:w	length:width ratio
M	Macquarie Island
Mt	Mount
<i>nec</i>	nor
NI	North Island
no.	number
nom. cons.	conserved name ( <i>nomen conservandum</i> )
nom. dub.	name of doubtful application ( <i>nomen dubium</i> )
nom. illeg.	name contrary to the rules of nomenclature ( <i>nomen illegitimum</i> )
nom. inval.	invalid name ( <i>nomen invalidum</i> )
nom. nud.	name published without a description ( <i>nomen nudum</i> )
<i>non</i>	not
N.P.	National Park
N.S.W.	New South Wales
N.T.	Northern Territory (Australia)
N.Z.	New Zealand
op. cit.	in the work cited ( <i>opere citato</i> )
pers. comm.	personal communication

---



---

PK	Poor Knights Islands
P.N.G.	Papua New Guinea
<i>pro parte</i>	in part
Qld	Queensland
q.v.	which see ( <i>quod vide</i> )
RT	Rangitoto Island
S.A.	South Australia
<i>s.coll.</i>	without collector ( <i>sine collectore</i> )
<i>s.d.</i>	without date ( <i>sine die</i> )
sect.	section
SEM	scanning electron microscope/microscopy
<i>sensu</i>	in the taxonomic sense of
SI	South Island
<i>sic</i>	as written
<i>s.l.</i>	in a broad taxonomic sense ( <i>sensu lato</i> )
<i>s.loc.</i>	without location ( <i>sine locus</i> )
Sn	Snares Islands
<i>s.n.</i>	without a collection number ( <i>sine numero</i> )
Sol	Solander Island
sp.	species (singular)
spp.	species (plural)
<i>s.s.</i>	in a narrow taxonomic sense ( <i>sensu stricto</i> )
St	Stewart Island
<i>stat. nov.</i>	new status ( <i>status novus</i> )
subg.	subgenus
subsect.	subsection
subsp.	subspecies (singular)
subsp.	subspecies (plural)
Tas.	Tasmania
TK	Three Kings Islands
U.S.A.	United States of America
var.	variety
vars	varieties
Vic.	Victoria
viz.	that is to say ( <i>videlicet</i> )
vs	versus
W.A.	Western Australia

---

<b>Symbol</b>	<b>Meaning</b>
µm	micrometre
♂	male
♀	female
±	more or less, somewhat
×	times; dimensions connected by × refer to length times width
>	greater than
<	less than
≥	greater than or equal to
≤	less than or equal to
=	heterotypic synonym of the preceding name
≡	homotypic synonym of the preceding name
!	confirmed by the author
*	in distribution statements, indicates non-N.Z. localities from which material has been confirmed by the author

Technical terms conform to Malcolm, B.; Malcolm, N. 2006: *Mosses and other Bryophytes: an Illustrated Glossary*. Edition 2. Micro-Optics Press, Nelson.

Abbreviations for Herbaria follow the standard abbreviations listed in *Index Herbariorum*.

---

## Acknowledgements

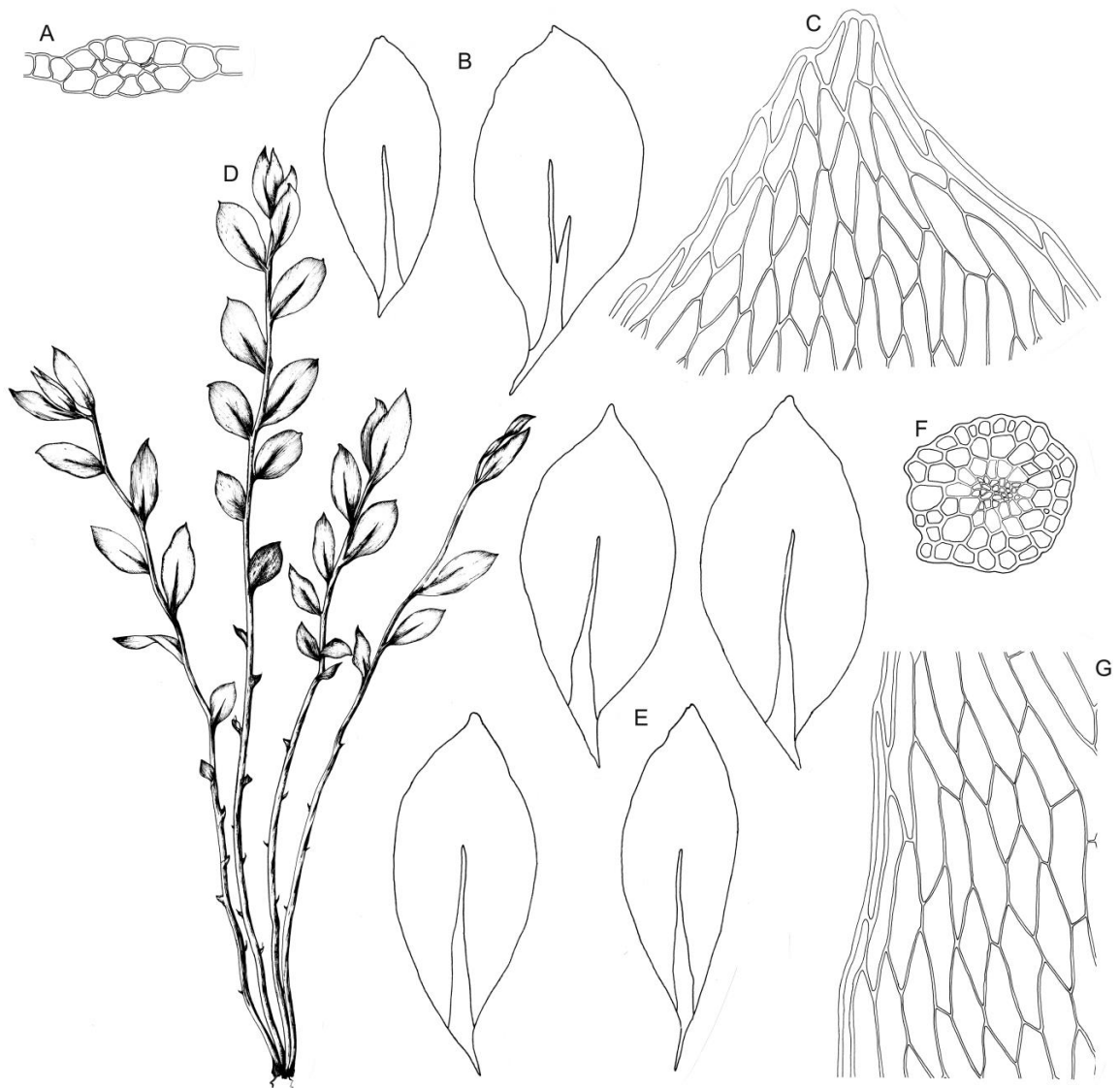
My colleagues Jessica Beever and Rod Seppelt each read the manuscript and suggested corrections and improvements; I am grateful to them both. I have been influenced by the recently published opinion of Jon Shaw and Helen Ramsay that *Eipterygium*, *Pohlia*, and *Mielichhoferia* should be isolated into a segregate family, Mielichhoferiaceae. Valuable plant records were provided by Jessica Beever, Peter Beveridge, Patrick Brownsey, David Glenny, Peter de Lange, and Bryony Macmillan. Rebecca Wagstaff meticulously and patiently made most of the line drawings, with the exception of those for *Pohlia tenuifolia*, generously drawn by Rod Seppelt, and *Eipterygium oparaense*, by the late Pat Brooke. Sue Gibb carefully and thoroughly confirmed literature references and made many other suggestions for improvement. Aaron Wilton, Katarina Tawiri, and Kate Boardman converted my text into a format suitable for electronic publication.

Collection managers at AK, BM, and WELT generously permitted me to borrow and study their herbarium materials, and Mary Korver arranged for these loans. Ilse Breitwieser helped in many ways, and Rob Smissen was instrumental in guiding this manuscript towards publication in the New Zealand eFlora series. The preparation of this treatment was supported by Strategic Science Investment Fund funding for Crown Research Institutes from the Ministry of Business, Innovation and Employment.

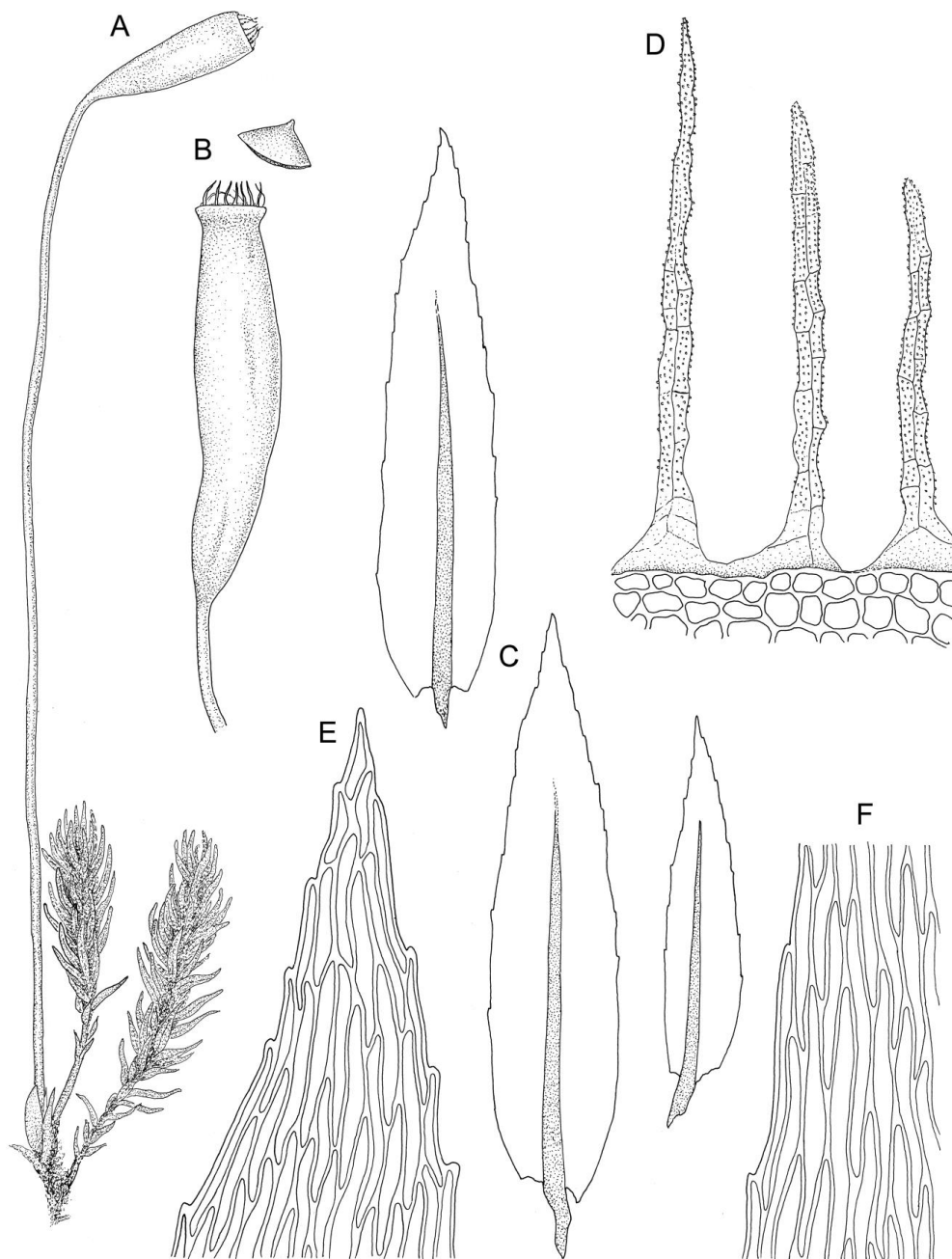
### **A.J. Fife**

Manaaki Whenua – Landcare Research, PO Box 69040, Lincoln 7640, New Zealand

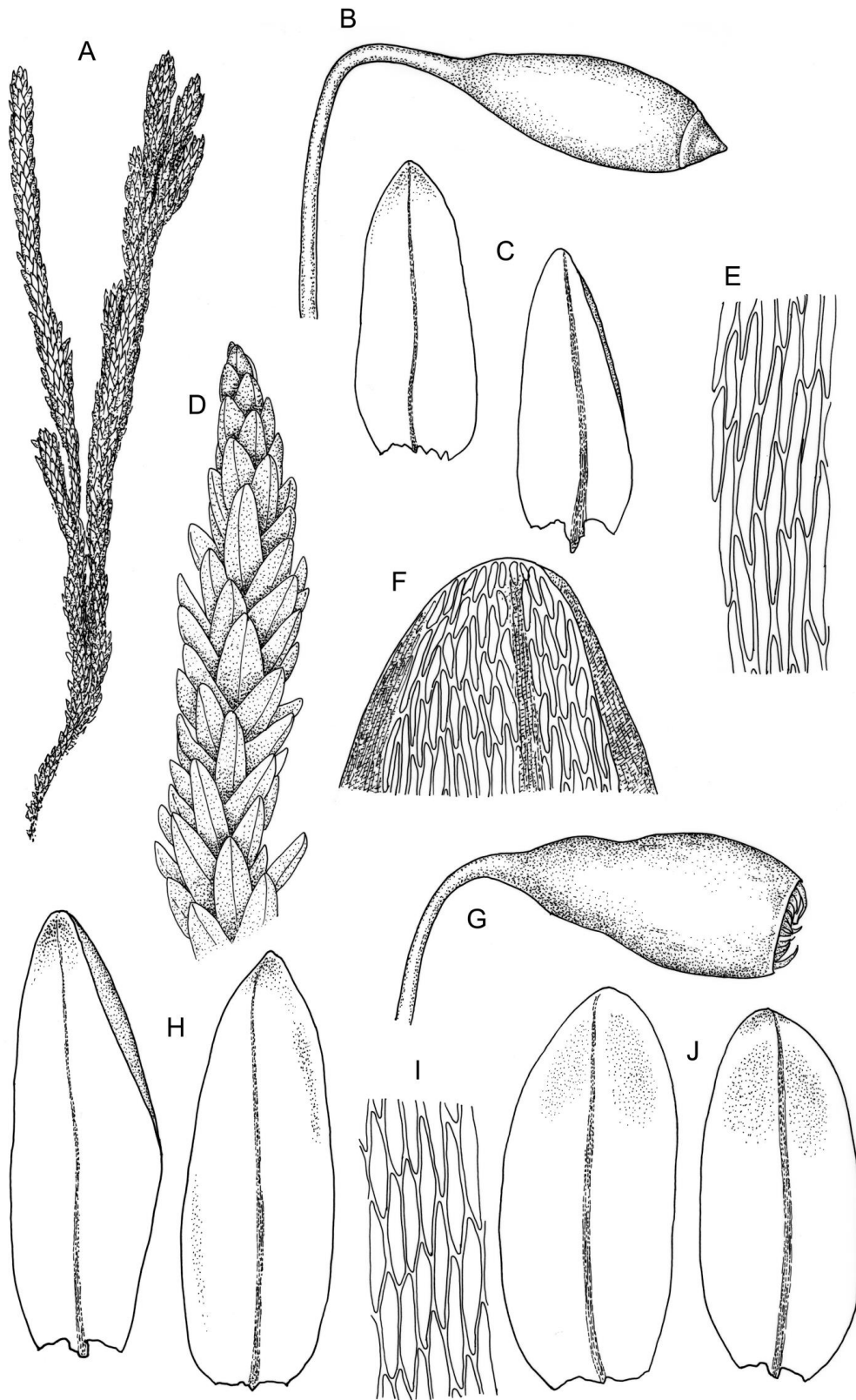
FifeA@landcareresearch.co.nz



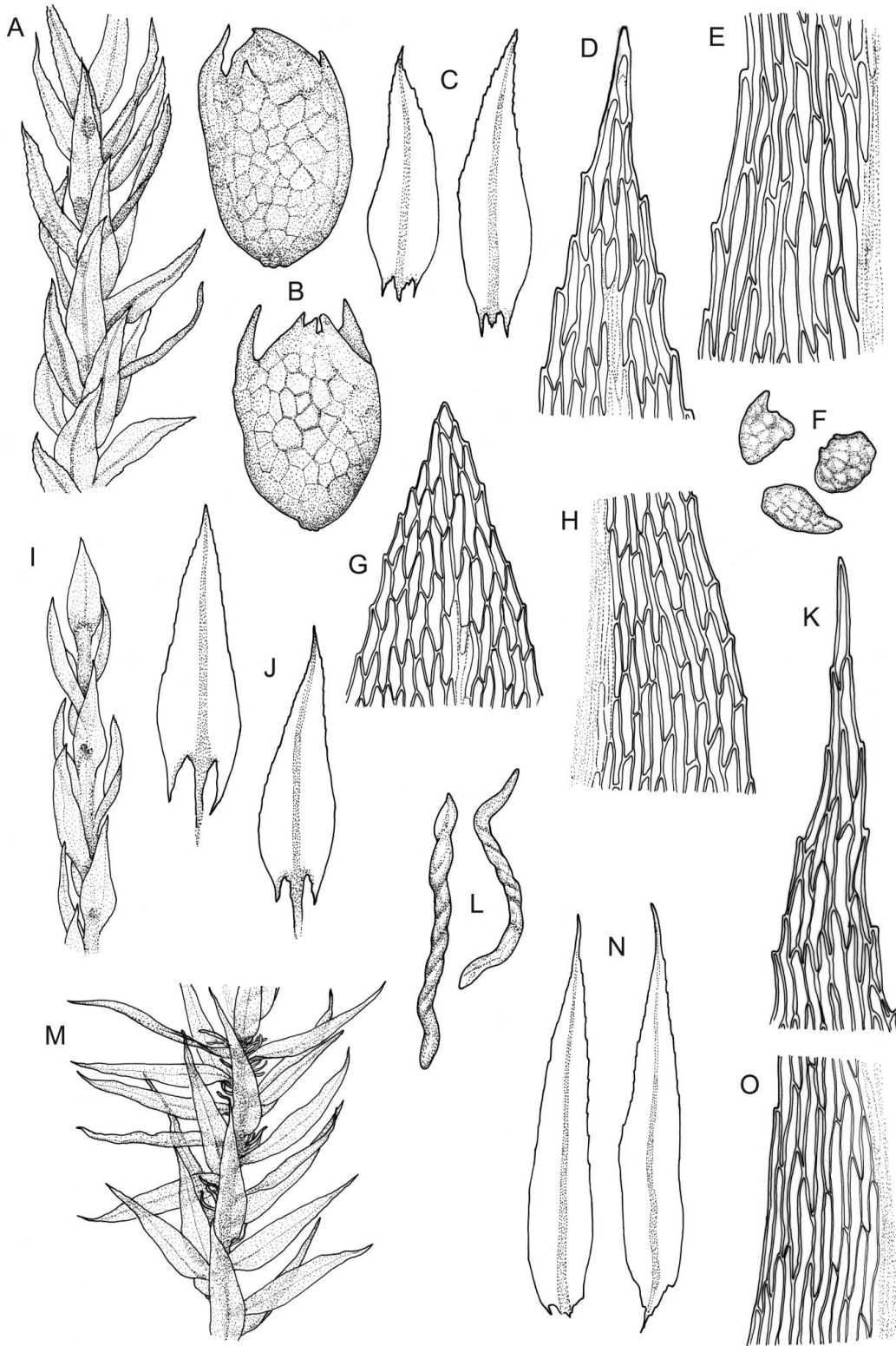
**Plate 1: Epipterygium. A–G: *E. opararensis*.** A, costa cross-section. B, leaves. C, leaf apex. D, habit. E, four leaves. F, stem cross-section. G, mid laminal cells at margin. Drawn from holotype, *A.J. Fife 7047*, CHR 405896.



**Plate 2: Mielichhoferia. A–F: *M. bryoides*.** A, habit with dehisced capsule. B, capsule and operculum, dry. C, three leaves. D, endostome segments. E, leaf apex. F, upper laminal cells at margin. Drawn from G. Brownlie 560, CHR 427693.

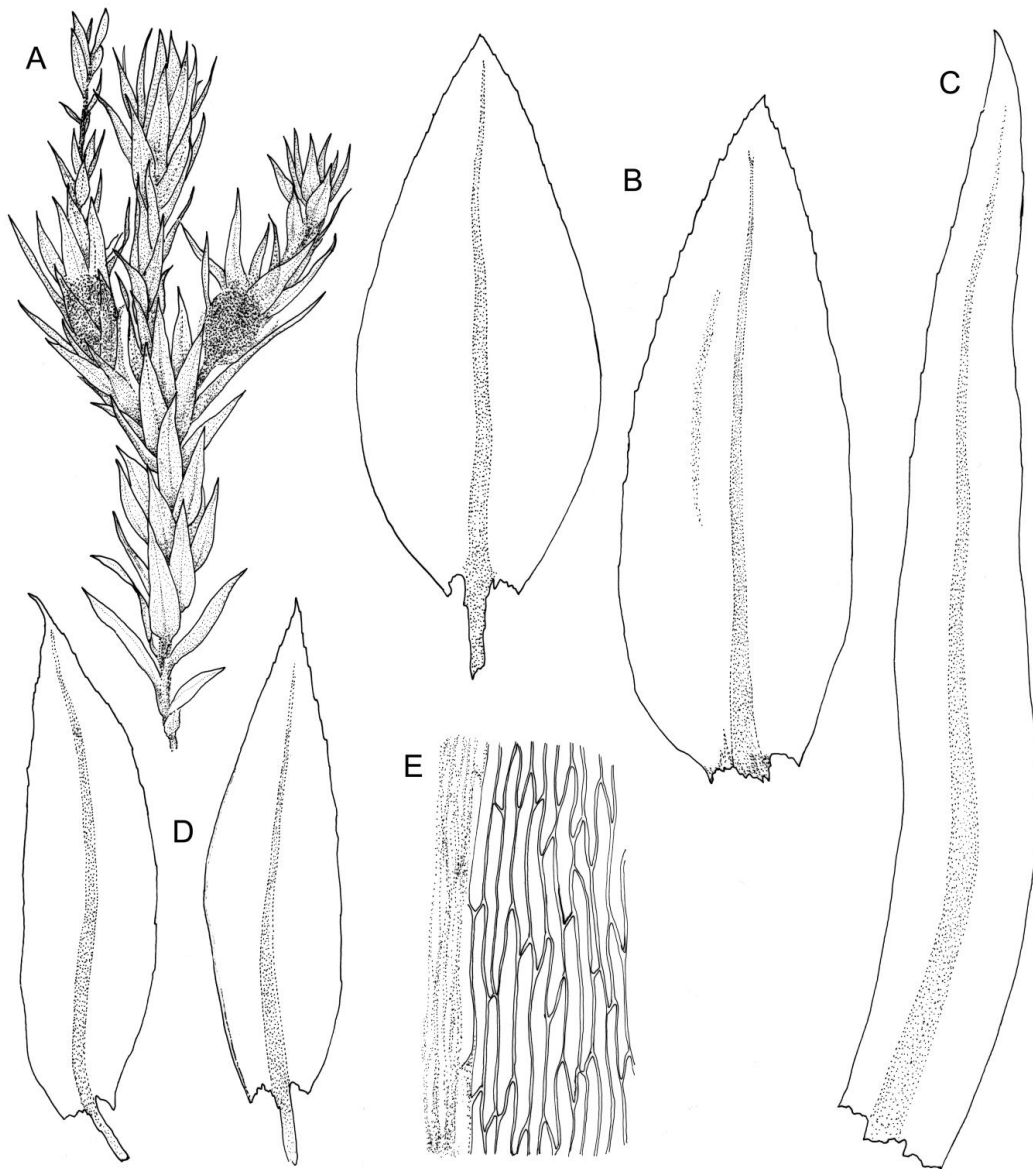


**Plate 3: Ochiobryum. A–J: *O. blandum*.** A, habit. B, capsule with operculum. C, leaves. D, shoot detail. E, upper laminal cells. F, leaf apex. G, capsule after dehiscence. H, leaves. I, upper laminal cells. J, leaves. A–F drawn from *J. Child 6084*, CHR 428564; G drawn from *G.B. Huang 423*, CHR 462948; H–I drawn from *G. Brownlie 669*, CHR 426064; J drawn from holotype, *J.D.Hooker 22*, BM-Wilson.



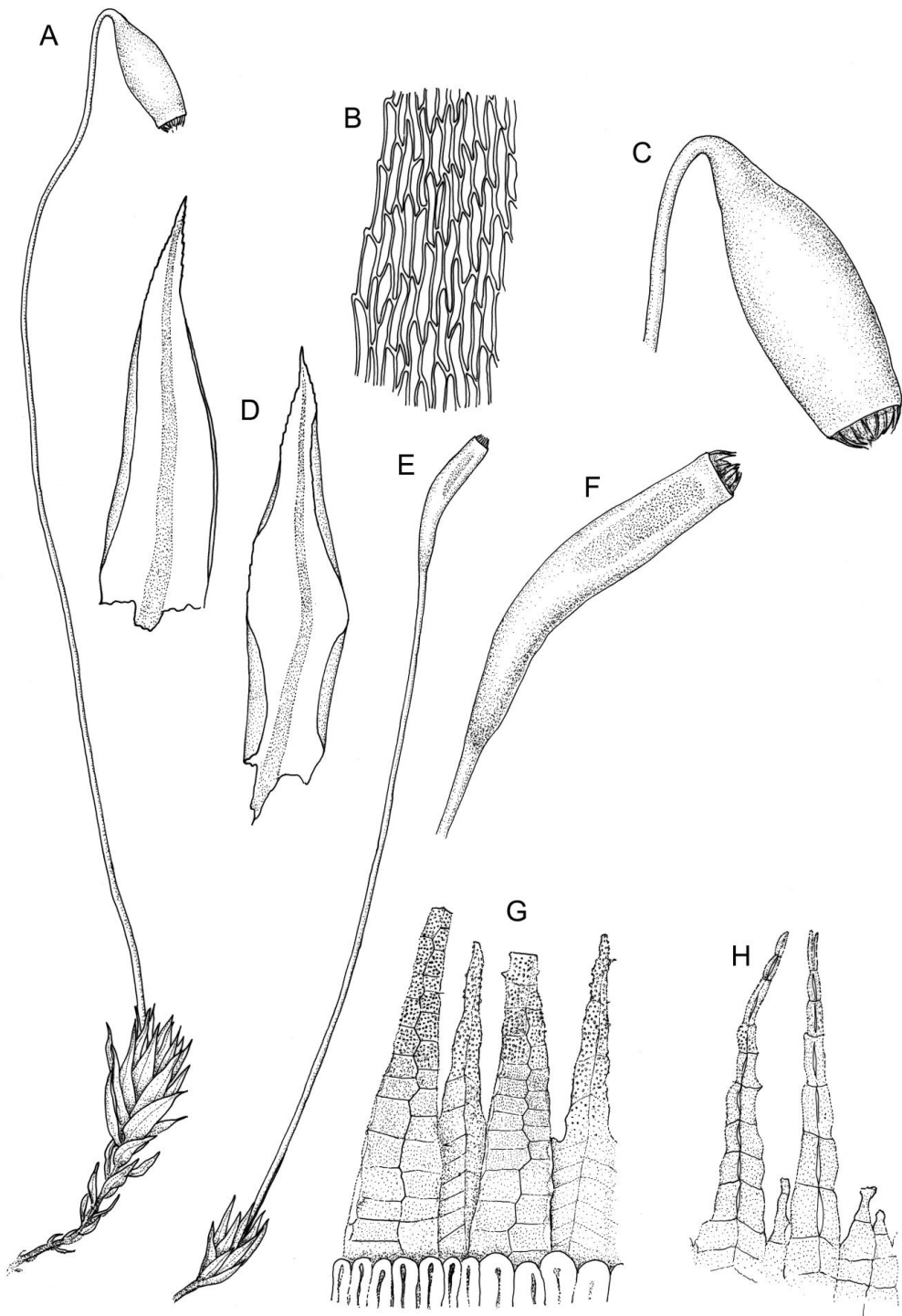
**Plate 4:**

**Pohlia.** A–E: *P. australis*. A, portion of shoot. B, gemmae. C, leaves. D, leaf apex. E, mid laminal cells at margin. F–J: *P. camptotrachela*. F, gemmae. G, leaf apex. H, mid laminal cells from costa to margin. I, portion of shoot. J, leaves. K–O: *P. ochii*. K, leaf apex. L, gemmae. M, portion of shoot. N, leaves. O, mid laminal cells from costa to margin. *P. australis* drawn from holotype, A.J. Fife 5487, CHR 104235. *P. camptotrachela* drawn from J. Child 5833, CHR 430885. *P. ochii* drawn from A.J. Fife 6813, CHR 405619.

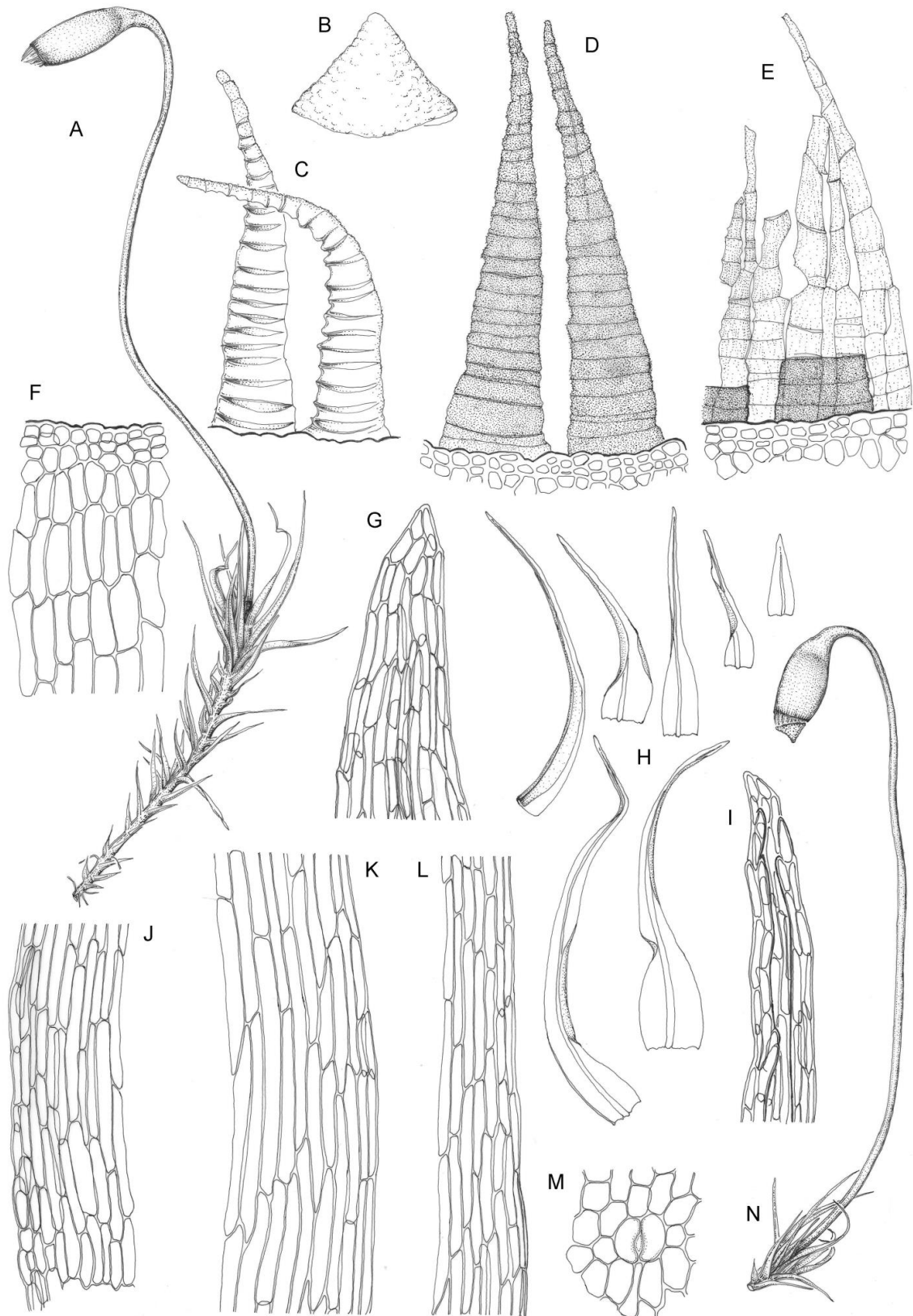


**Plate 5: Pohlia. A-E: *P. cruda*.** A, portion of shoot of male plant. B, leaves. C, perichaetial leaf. D, leaves. E, mid laminal cells adjacent to costa. A drawn from *L. Visch* 742, CHR 490476; B-C drawn from *A.J. Fife* 7318, CHR 406538; D-E drawn from *J. Lewinsky* 1474, CHR 351790.

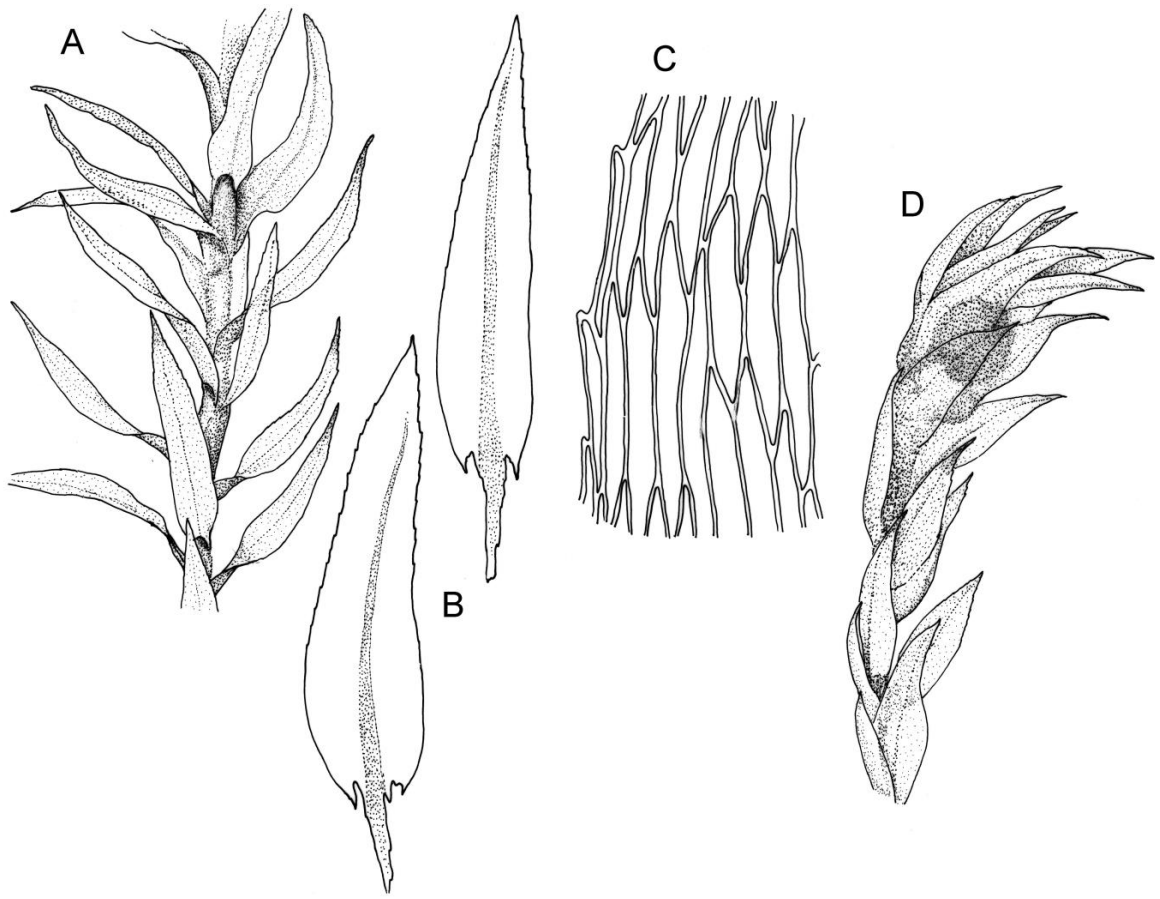




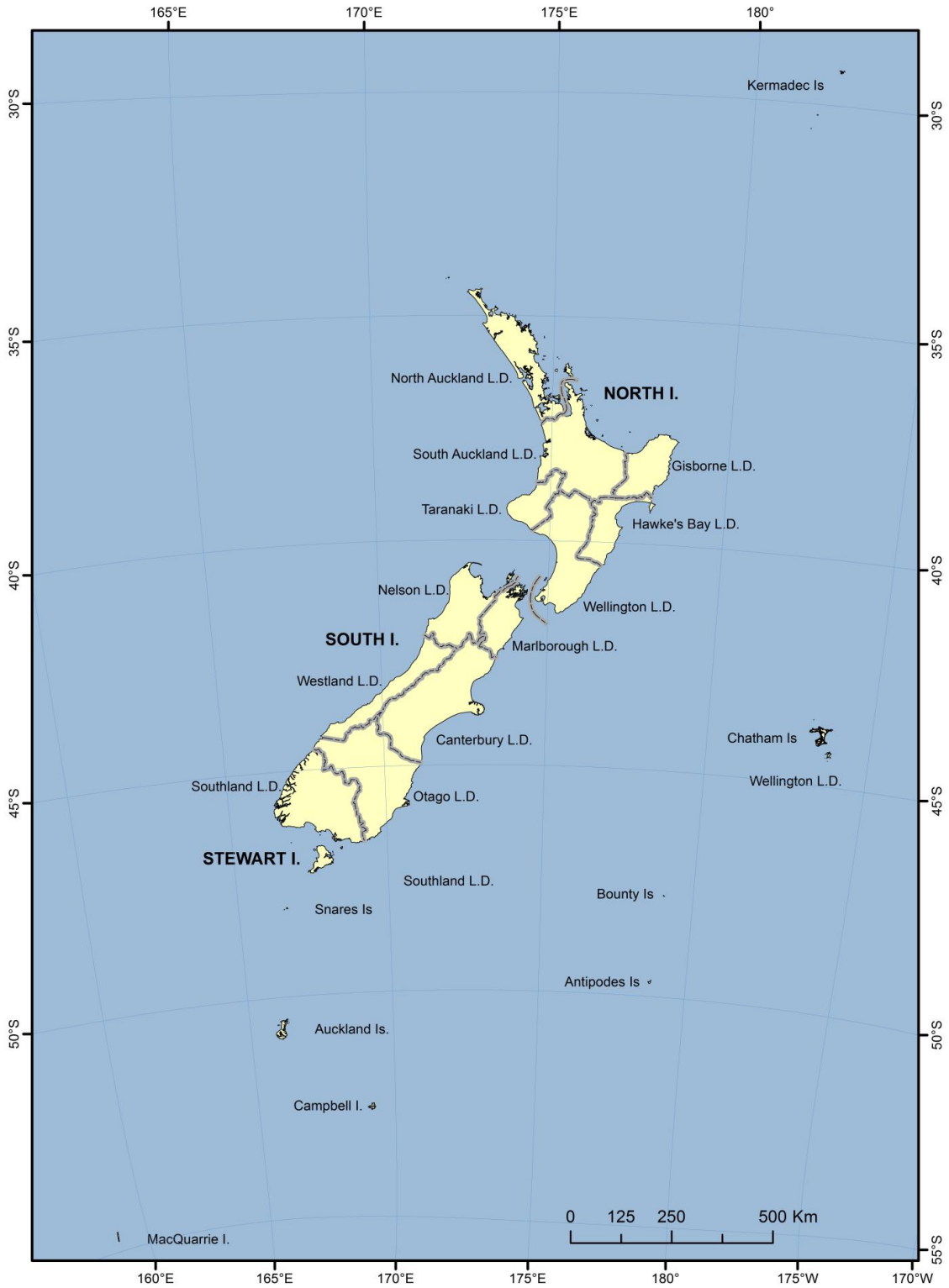
**Plate 6: Pohlia.** A–D: *P. nutans*. A, habit with capsule. B, mid laminal cells from costa to margin. C, moist capsule. D, leaves. E–H: *P. elongata*. E, habit with capsule. F, moist capsule. G, peristome detail. H, endostome segments and rudimentary cilia. *P. nutans* drawn from *P. Child s.n.*, 27 Jan. 1986, CHR 422973. *P. elongata* drawn from *J. Child 4809*, CHR 429266, and *J. Child 1459*, CHR 429215.



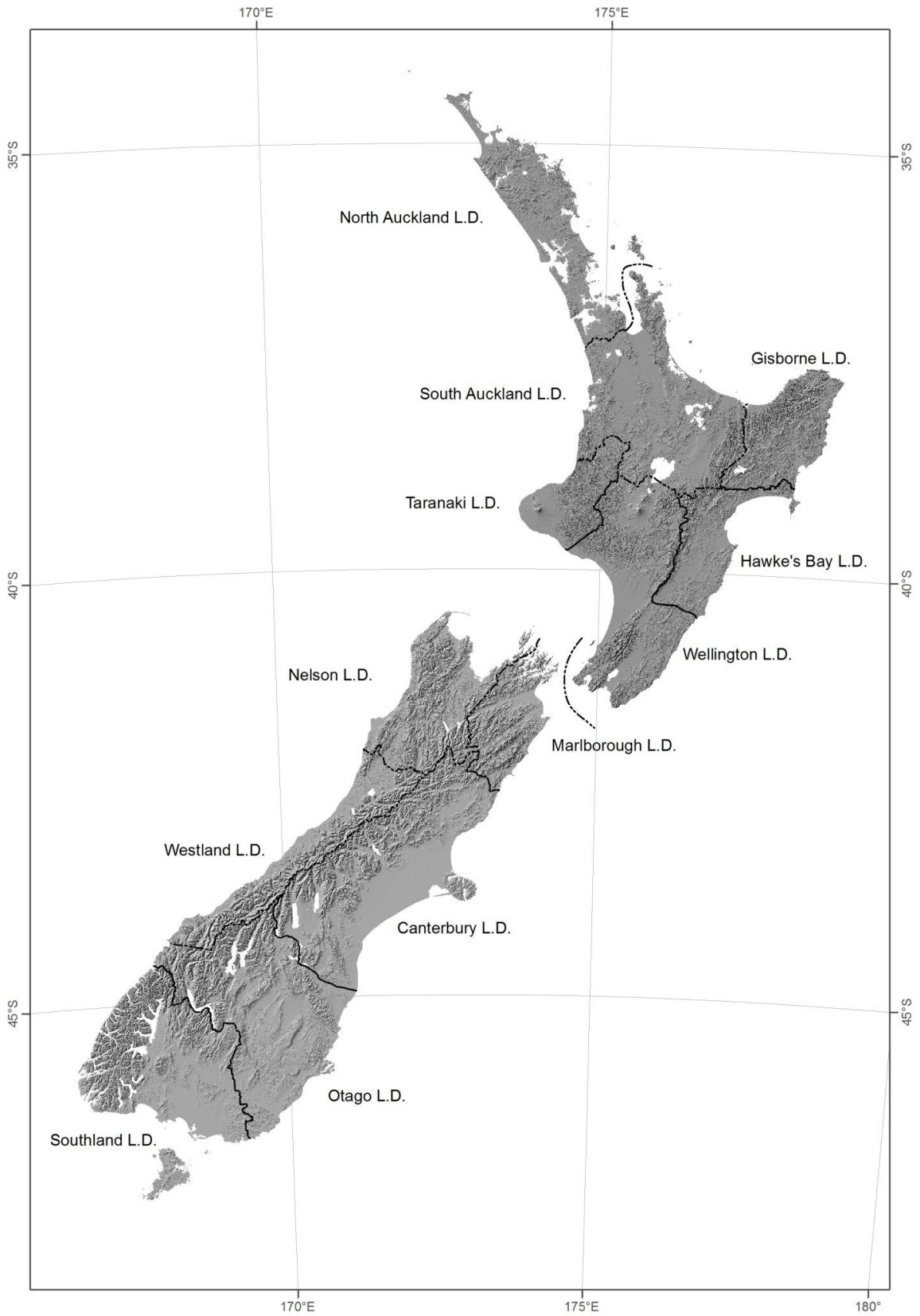
**Plate 7: Pohlia. A-N: *P. tenuifolia*.** A, plant with dehiscent capsule. B, operculum. C, inner surface of exostome tooth. D, outer surface of exostome tooth. E, outer surface of endostome with basal part of two exostome segments. F, exothelial cells at capsule mouth. G, leaf apex. H, sequence of seven leaves from shoot base to perichaetial leaf. I, leaf apex. J, cells from basal angle of leaf. K-L, mid leaf marginal cells. M, stomate. N, plant with partly dehiscent capsule. Drawn by R.D. Seppelt from *P.J. Brownsey s.n.*, 20 Oct. 1996, WELT M0031769.



**Plate 8: Pohlia. A–D: *P. wahlenbergii*.** A, portion of shoot. B, leaves. C, mid laminal cells adjacent to margin. D, apex of male plant. Drawn from E.A. Hodgson s.n., Jan. 1930, CHR 490471, and K.W. Allison 6090, CHR 490481.



**Map 1:** Map of New Zealand and offshore islands showing Land District boundaries



**Map 2:** Map of main islands of New Zealand showing Land District boundaries



---

## Index

Page numbers are in **bold** for the main entry,  
and *italic* for synonyms.

- Bryum annotinum* Hedw. 11  
*Bryum bealeyensis* R.Br.bis 16  
*Bryum binnsii* R.Br.bis 20  
*Bryum blandum* Hook.f. & Wilson 8  
*Bryum blandum* var. *luridum* Hook.f. & Wilson 8  
*Bryum calcareum* R.Br.bis 19  
*Bryum tenuifolium* Hook.f. & Wilson 19  
*Calliergon laxirete* Zanten & J.K.Bartlett 8  
*Epipterygium* Lindb. 2, **3**, 4, 5  
*Epipterygium obovatum* Ochyra 4  
*Epipterygium opararensense* Fife & A.J.Shaw 3, **4**  
*Hypnum wahlenbergii* F.Weber & D.Mohr 20  
*Mielichhoferia* Nees & Hornsch. 2, 3, **5**, 10  
*Mielichhoferia australis* Hampe 6  
*Mielichhoferia bryoides* (Harv.) Wijk & Margad.  
**6**, 17  
*Mielichhoferia buchananii* R.Br.bis 6  
*Mielichhoferia ecklonii* Hornsch. 6  
*Mielichhoferia tenuisetata* Mitt. 6  
*Mielichhoferiaceae* **2**  
*Mniobryum* Limpr. 10  
*Mniobryum wahlenbergii* (F.Weber & D.Mohr)  
Jenn. 20  
*Mnium crudum* Hedw. 14  
*Ochiobryum* J.R.Spence & H.P.Ramsay 2, **8**  
*Ochiobryum blandum* (Hook.f. & Wilson)  
J.R.Spence & H.P.Ramsay 2, **8**  
*Pohlia* Hedw. 2, 3, 5, 6, 8, **10**, 17, 18, 20  
*Pohlia albicans* Lindb. 20  
*Pohlia annotina* (Hedw.) Lindb. **11**, 13  
*Pohlia australis* A.J.Shaw & Fife 10, **12**, 13, 18  
*Pohlia camptotrachela* (Renauld & Cardot)  
Broth. 11–13, **13**  
*Pohlia cruda* (Hedw.) Lindb. **14**, 15, 17, 18, 21  
*Pohlia elatior* (Dixon & Sainsbury) Sainsbury 16  
*Pohlia elongata* Hedw. **15**  
*Pohlia novae-seelandiae* Dixon 15  
*Pohlia nutans* (Hedw.) Lindb. 8, 10, 14, 15, **16**  
*Pohlia ochii* Vitt 12, **17**, 21  
*Pohlia tenuifolia* (A.Jaeger) Broth. **19**  
*Pohlia wahlenbergii* (F.Weber & D.Mohr)  
A.L.Andrews 14, 18, **20**  
*Schizymenium* Harv. 5  
*Schizymenium bryoides* Harv. 6  
*Webera* Hedw. 10  
*Webera camptotrachela* Renauld & Cardot 13  
*Webera elatior* Dixon & Sainsbury 16  
*Webera nutans* Hedw. 16  
*Webera tenuifolia* A.Jaeger 19  
*Webera wahlenbergii* (F.Weber & D.Mohr)  
Fürnr. 20

---

## Image Information

<b>Image</b>	<b>Creator</b>	<b>Copyright</b>
Plate 1	P.A. Brooke	© Landcare Research 1990
Plate 2	R.C. Wagstaff	© Landcare Research 2020
Plate 3	R.C. Wagstaff	© Landcare Research 2020
Plate 4	R.C. Wagstaff	© Landcare Research 2020
Plate 5	R.C. Wagstaff	© Landcare Research 2020
Plate 6	R.C. Wagstaff	© Landcare Research 2020
Plate 7	R.D. Seppelt	© R.D. Seppelt
Plate 8	R.C. Wagstaff	© Landcare Research 2020
Map 1	A.D. Wilton	© Landcare Research 2014
Map 2	A.D. Wilton	© Landcare Research 2014



---

## Flora of New Zealand: PDF publications

The electronic Flora of New Zealand (**eFloraNZ**) project provides dynamic, continually updated, online taxonomic information about the New Zealand flora. Collaborators in the project are Manaaki Whenua–Landcare Research, the Museum of New Zealand Te Papa Tongarewa, and the National Institute of Water and Atmospheric Research (NIWA).

The eFloraNZ presents new systematic research and brings together information from the Manaaki Whenua–Landcare Research network of databases and online resources. New taxonomic treatments are published as fascicles in PDF format and provide the basis for other eFloraNZ products, including the web profiles.

eFloraNZ will have separate sets of PDF publications for algae, lichens, liverworts and hornworts, mosses, ferns and lycophytes, and seed plants.

For each eFloraNZ set the PDF files are made available as dated and numbered fascicles. With the advent of new discoveries and research the fascicles may be revised, with the new fascicle being treated as a separate version under the same number. However, superseded accounts will remain available on the eFlora website.

**Moss Set (ISBN 978-0-478-34747-0)**

The Moss Set covers indigenous and exotic mosses within the New Zealand Botanical Region.

Authors Allan Fife and Jessica Beever intend to publish *Flora of New Zealand Mosses* as a book. However, they decided to make completed family treatments available through the eFloraNZ project in advance of being published in hardcopy, to enable immediate use.

**Editor-in-Chief:** Aaron Wilton

**Series Editors:** Rob Smissen

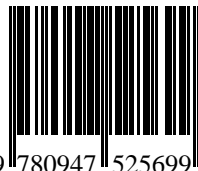
**Steering Committee:** Ilse Breitwieser, Pat Brownsey, Wendy Nelson, Rob Smissen, Aaron Wilton

**Technical production:** Kate Boardman, Bavo de Pauw, Sue Gibb, Ines Schönberger, Katarina Tawiri, Margaret Watts, Aaron Wilton

**Copy Editor:** Ray Prebble



ISBN 978-0-947525-69-9



9 780947 525699