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Author: Price, Michelle J.

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Two hundred years in the dark: A type for the moss *Encalypta crispata*

Michelle J. Price

Abstract

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The historically important Hedwig-Schwägrichen collection in G contains type material linked with the moss names of Johannes Hedwig. These originate from species that he described as new to science, or that were ascribed to him when his 1801 publication *Species muscorum frondosorum* was designated as the starting point for moss names (excepting *Sphagnaceae*). A small number of the Hedwig type specimens have not been found within the G holdings, amongst which was *Ptychomitrium crispatum* (Hedw.) A. Jaeger (*Ptychomitriaceae*). This species was newly described by Hedwig in his 1801 work, under the name *Encalypta crispata* Hedw., based on material from the Cape of Good Hope in South Africa that was collected by the Swedish naturalist Carl Peter Thunberg. The specimen used by Hedwig to describe this species was recently found in one of the original Hedwig herbarium storage cases, amongst a set of reference material that had not been accessioned into the herbarium. After more than two-hundred years in obscurity, the newly rediscovered holotype material of *Ptychomitrium crispatum* is discussed herein. A description and illustration of *Ptychomitrium crispatum* is given, based on the type and other material from South Africa.

Keywords

PTYCHOMITRIACEAE – *Ptychomitrium* – Mosses – Hedwig-Schwägrichen herbarium – Nomenclature – Typification – Taxonomy

Address of the author:

Conservatoire et Jardin botaniques de la Ville de Genève, C.P. 71, 1292 Chambésy, Switzerland
and Laboratory of Plant Systematics and Biodiversity, Department of Botany and Plant Biology, University of Geneva,
Sciences III, 30 quai Ernest-Ansermet, 1211 Geneva 4, Switzerland. E-mail: michelle.price@ville-ge.ch

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Introduction

HEDWIG (1801)'s publication *Species muscorum frondosorum* is the designated starting point for the nomenclature of mosses, excluding the Sphagnaceae (TURLAND et al., 2018: Art. 13.1(b)). The majority of the mosses that were newly described or validated in Hedwig's work represent well-known, mostly widespread species from the northern hemisphere, although some species also originated from the tropics or southern hemisphere. The latter were mainly based on collections made by the Swedish botanist Olof Peter Swartz (1760–1818), in the most part from Jamaica, or by the Swedish naturalist Carl Peter Thunberg (1743–1828) from South Africa.

The retrospective typification of moss names that were validated in HEDWIG (1801) but were based on names that originated from works published before 1 January 1801 can be complicated (see GEISSLER, 2000; PRICE, 2005). For these names, the history of each of the entities cited in the protologue often needs to be disentangled in order to identify the original material related to the name, to establish the historical concepts related to the entities themselves, as well as to determine the origin(s) of the material on the Hedwig herbarium sheets (see ELLIS & PRICE, 2013, 2015). The situation concerning the treatment of species and varieties that were described as new to science by Hedwig (see PRICE & ELLIS, 2011) is usually more straightforward as the single specimens in the Hedwig collection, that agree with the protologue, represent holotypes (even though type designation was not widely practiced by authors at that time, see TURLAND et al., 2018: Art. 9.1) and further typification only needs to be carried out in cases where more than one sheet is present per name, where later specimens of different origins have been added to the sheet and/or where two, or more, different taxa are present on a sheet (e.g. *Weissia calycina* Hedw., PRICE, 2002), or when the specimens have not been located (see Appendix I). In addition, the over two-hundred year old specimen(s) must be carefully examined *in situ* to confirm the identity of the specimens, and thus to ensure the taxonomic identity of the material and the correct application of the name in question.

During a recent move of the cryptogamic collections in G for renovation work, seven folders from the Hedwig-Schwägrichen herbarium were found in one of the original Hedwig herbarium storage cases (see PRICE, 2005: Fig. 2). Four of these folders, labelled in Hedwig's handwriting "*Grimmia*", "*Orthotrichum*", "*Phascum*" and "*Weissia*", each contained a single herbarium sheet. These were either unlabelled or labelled by C.F. Schwägrichen, and held packets of different species (between 3 and 19 sub-packets per sheet). They presumably constituted a reference collection for each of these genera. All the sub-packets on these sheets are labelled in the handwriting of Schwägrichen. A single folder, labelled "*Neckera*" by Hedwig, was empty, while the remaining two folders were labelled by Schwägrichen, one as "*Racomitrium*"

and the other as "*Notarisia* Hamp". The first contained a single herbarium sheet with three subpackets of *Racomitrium* specimens attached, and the second contained two loose subpackets and three herbarium sheets of "*Encalypta crispata*". Two of the herbarium sheets lacked label information and, respectively, had one and two specimens that were glued directly to the sheet. The final sheet was identified as the missing type of Hedwig's *Encalypta crispata* Hedw. (= *Ptychomitrium crispatum* (Hedw.) A. Jaeger).

The herbarium sheet for *Encalypta crispata* [G00048628] (Fig. 1) could be easily identified as original to Hedwig based on the combination of the characteristic blue specimen cover, the distinctive paper and format of the herbarium sheet, the specimen label in Hedwig's handwriting, and the typical arrangement of the plants on the sheet (see images in PRICE, 2005). The locality information given on the herbarium sheet label corresponds to that in the protologue, and the plant on the left side of the sheet [G00048628] (Fig. 1) also resembles the original illustration in HEDWIG (1801: tab. 10 and Fig. 2). Based on the observation of plant material from numerous Hedwig herbarium sheets by the present author it appears that a number of his specimens were wetted and then pressed in the wet state, before being glued to the herbarium sheets, either as single specimens or in one or several rows of single or multiple plants. The material of *Encalypta crispatum* contains one plant that was treated in this way and one that was attached when it was dry. After careful examination of the two stems *in situ* using a dissecting microscope, and via the careful removal of one leaf from each of the plants for microscopic determination both stems on the herbarium sheet "*Encalypta crispata*" were confirmed as being *Encalypta crispata*. After examination the material was placed into labelled sub-packets and returned to the specimen.

Hedwig's "*Encalypta crispata*" has an uncomplicated nomenclatural history. Between 1819 and 1849 this species was transferred (see typification section below) to the *Grimmiaceae* (under *Grimmia* Hedw.), *Ptychomitriaceae* (under *Brachysoleteum* Rchb., *Brachypodium* Brid. [nom. illeg.], and *Notarisia* Hampe, all now synonyms of *Ptychomitrium* Fürnr.) or *Orthotrichaceae* (under *Orthotrichum* Hedw.) before being recognised as belonging to *Ptychomitrium* by JAEGER (1874: part 4) where it has remained ever since.

A type for Hedwig's *Encalypta crispata*

Encalypta crispata was newly described by HEDWIG (1801) based on plants collected by the Swedish naturalist C.P. Thunberg from the Cape of Good Hope, South Africa. HEDWIG (1801) gave the following diagnosis for his new species "*Encalypta crispata* *divisa*, *foliis lineari-lanceolatus acuminatus madore patentibus siccitate tortilibus, sporangiis crebis cylindricis.*" evoking its linear-lanceolate, acuminate leaves that are spread-

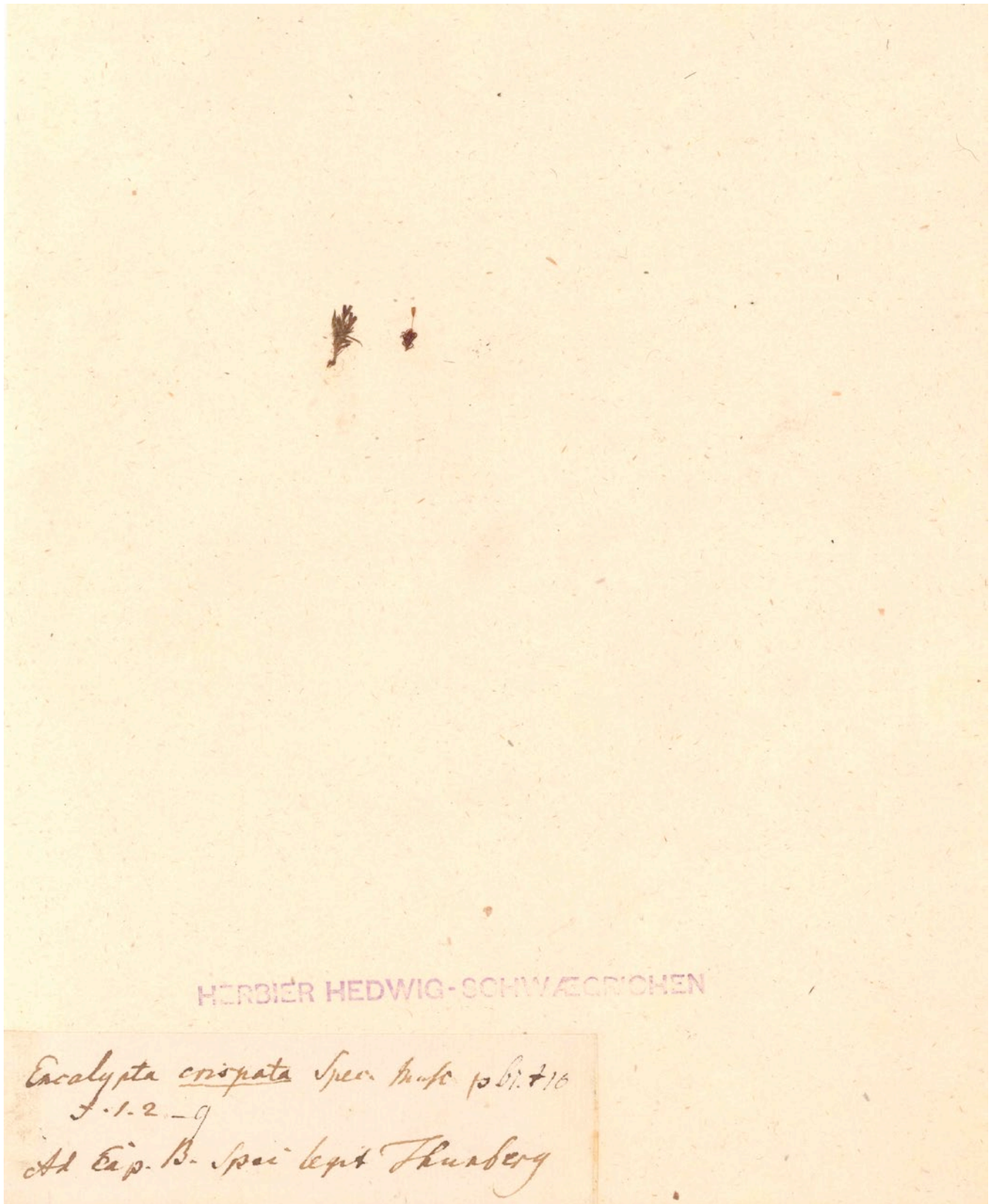


Fig. 1. – The rediscovered holotype of Hedwig's *Encalypta crispata* Hedw at G.

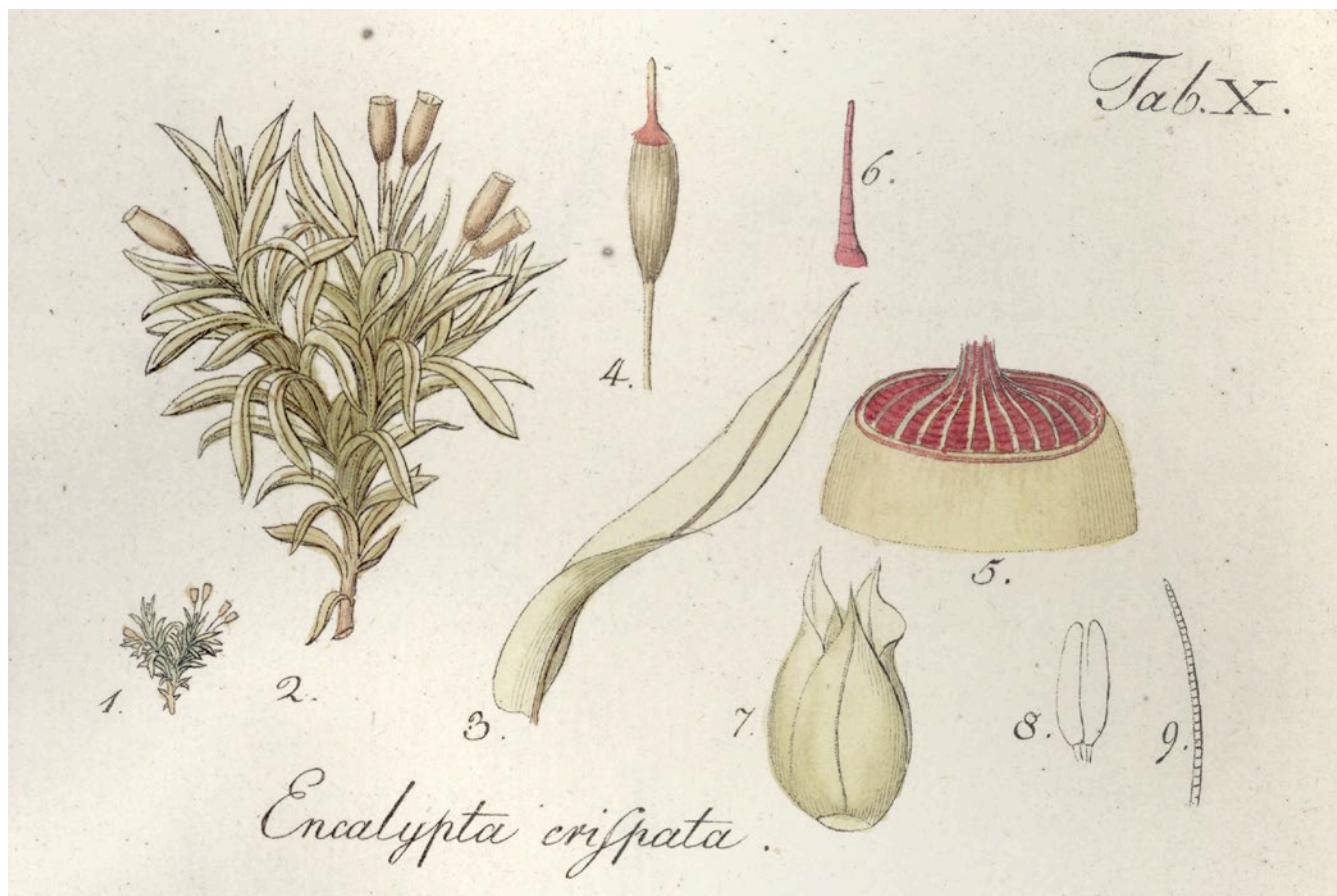


Fig. 2. – Original illustration of *Encalypta crispata* Hedw. from Hedwig's *Species muscorum frondosorum* of 1801, tab. 10. [Original figure legend: "fig. 1. planta naturalii magnitudine, fig 2. eadem acuta lente o., fig. 3. folium augm. III., fig. 4. sporangium operculatum augm. I. fig. 5. sporangii pars augm. III. fig. 6. peristomii dens augm. IV. fig. 7. Flos masculus augm. III. fig. 8. folliculi augm. IV. fig. 9. filum succulentum floris augm. IV."]

ing when moist and twisted when dry, and its numerous cylindrical capsules. He also provided an illustration (HEDWIG, 1801: tab. 10, fig. 1–9) and succinct description of it: "Truncus aetate crebro divisus, erectus. Folia conferta, bene madida patentia reflexaque, siccitate crispata, ductulorum fasciculo lutescente. Pedunculi breves, pallidi. Sporangia cylindrica, viridantia matura, atque evacuata e luteo fuscidula. Operculum recta rostratum, rubrum. Annulus tenuis." [The trunk (stem) is often branched with age, erect. Leaves crowded, spreading and recurved when wet, crisped when dry, nerve deep yellow. Seta short, pale. Capsules cylindrical, green when mature, dark yellow when empty. Operculum straight, beaked, red. Annulus thin.]

Encalypta crispata Hedw. in *Sp. Musc. Frond.* 61: tab. 10. 1801.

- ≡ *Ptychomitrium crispatum* (Hedw.) A. Jaeger, *Gen. Sp. Musc.* 1: 381. 1874.
- ≡ *Glyphomitrium crispatum* (Hedw.) Brid. in *Muscol. Recent Suppl.* 4: 30. 1818.

- ≡ *Orthotrichum crispatum* (Hedw.) Hook. & Grev. in *Edinburgh J. Sci.* 1: 115. 1824.
- ≡ *Brachypodium crispatum* (Hedw.) Brid. in *Bryol. Univer.* 1: 147, 717. 1826.
- ≡ *Grimmia crispata* (Hedw.) Spreng. in *Syst. Veg.* 4(1): 155. 1827.
- ≡ *Brachysteleum crispatum* (Hedw.) Hornsch. in *Fl. Bras.* 1(2): 20. 1840.
- ≡ *Notarisia crispata* (Hedw.) Mont. in *Hist. Nat. Îles Canaries* 3(3): 41. 1849.

Type: "Caput bonae spei. Thunberg."

Holotypus: SOUTH AFRICA: Cape of Good Hope, s.d., Thunberg s.n. (G [G00048628]!; iso-: UPS [B-039370 image seen]).

Plants small to medium-sized, stems 1–2 cm long, occasionally branched above, caespitose, dark green, brownish below. *Leaves* crispate-incurved dry, with the costa visible and

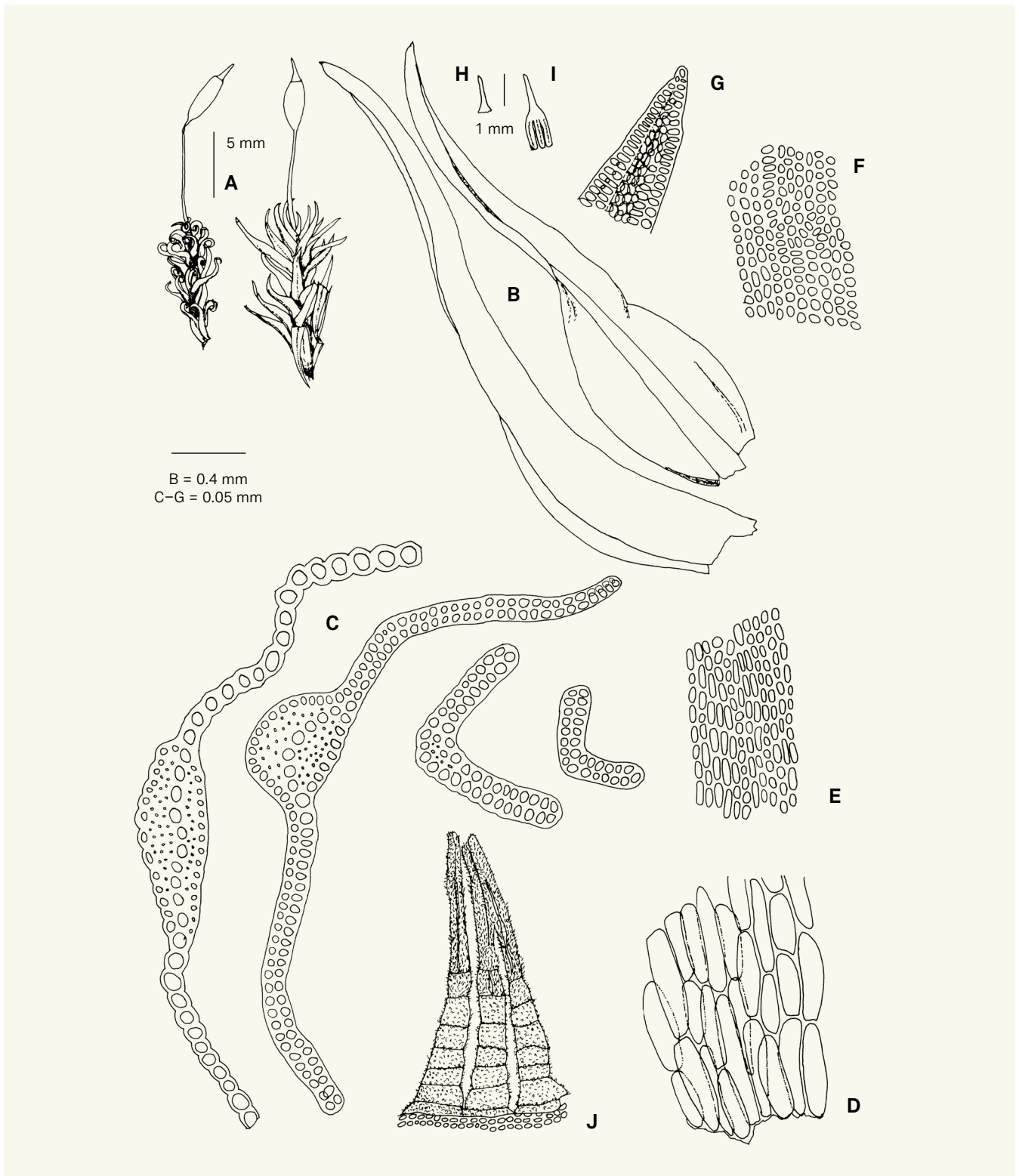


Fig. 3. – *Ptychomitrium crispatum* (Hedw.) A. Jaeger. **A.** Plants in dry (left) and wet (right) state; **B.** Leaves; **C.** Leaf cross-sections from leaf base, middle, upper part and apex (left to right); **D.** Basal cells; **E.** Cells from widest part of the leaf; **F.** Upper leaf cells; **G.** Leaf apex; **H.** Operculum; **I.** Calyptra; **J.** Peristome teeth (outer side). [A–D, F: Hedderson 15676 (BOL); E, G–J: Wilms s.n. (G)]

yellow-green on the dorsal side, wide-spreading to slightly reflexed wet, leaves rounded below to weakly keeled above (seen in cross-section); linear-lanceolate (often narrowly so) from a short-oblong to elliptical, weakly sheathing base, (2.0–)3.0–5.0 mm long; apex acute to subcucullate; leaf margins entire. Lamina bistratose, cells smooth throughout, basal cells rectangular to rhomboidal, yellowish, thin-walled, mid- to upper laminal cells rounded-quadrate, somewhat irregular, 5–8 μm diameter, incrassate. Costa percurrent, narrow, in section prominent dorsally (half-moon shaped on dorsal side); epidermal cells rectangular to rounded, dorsal epidermal cells smooth, ventral epidermal cells smooth to mammillose, in mid-leaf with central row of 6–7 small, incrassate guide cells between ventral and dorsal bands of stereids, ventral stereid band with 2 or 3 cell layers, dorsal stereid band with 3–6 cell layers. Perichaetial leaves undifferentiated. *Seta*, single, 4–8 mm long, yellowish. *Capsule* short-cylindrical-ovoid, 1.5–2.0 mm long, yellow-brown, mouth red. *Peristome* with 16 narrowly triangular, filiform teeth, perforated, reddish-yellow, densely papillose on inner and outer sides. *Operculum* rostrate, to 1 mm long. *Calyptra* mitrate, plicate.

Notes. – *Ptychomitrium crispatum* is a predominately saxicolous species that grows in cushions or dense tufts on various different rock types in grasslands or shrublands, up to an altitude of c. 2000 m (see species description and information in MAGILL & VAN ROOY, 1998: 474). It is characterized by its linear-lanceolate, acuminate leaves that are spreading to reflexed when wet and crispate-incurved when dry (reminiscent of the forms seen in *Tortella* (Müll. Hal.) Limpr. or *Holomitrium* Brid.). One feature of this species that can easily be seen in dry specimens is the prominent costa that is yellow-green and paler than the surrounding lamina. This species, one of the most widespread members of the genus in South Africa (MAGILL & VAN ROOY, 1998), can be separated from the close *Ptychomitrium subcrispatum* Thér. & P. de la Varde by its bistratose lamina and margins (in *P. subcrispatum* the leaf margins are bistratose and the lamina is unistratose, or occasionally bistratose in patches). MAGILL & VAN ROOY (1998) mention similarities between *P. crispatum* and *P. cucullatifolium* (Müll. Hal.) A. Jaeger, and certain difficulties encountered when naming intermediate specimens, but maintained the latter taxon at the rank of species, indicating that lowland plants from the southern Drakensberg under this name possess the typical cucullate leaves and incrassate leaf cells. The rediscovery of the type of *P. crispatum* in G will facilitate future taxonomic investigations of the South African species of *Ptychomitrium*.

Ptychomitrium crispatum is known from Africa (Lesotho, Madagascar, South Africa, Swaziland, Tanzania, Zimbabwe: CROSBY et al., 1983; SIM, 1926; MAGILL & VAN ROOY, 1998; O'SHEA, 2006). Material in G from the Canary Islands, originating from the E. Bourgeau *Plantae Canarienses*

exsiccatae (no. 1141, G00048713, G00048714), that was filed under *P. crispatum* was identified by the present author as being *P. nigescens* (Kunze) Wijk & Margad. CAO et al. (2003) report *P. crispatum* from *Index Muscorum* geographical units “Am6” and “Am5” (see WIJK et al., 1959), likely based on information given in the earlier work of MAGILL & VAN ROOY (1998) who mention that *P. crispatum* is known from southern South America and the Juan Fernandez Islands. The previous reports of *P. crispatum* from South America and Antarctica appear to be erroneous, possibly based on the accepted name *P. fernandesianum* (Mitt.) A. Jaeger having been considered as a potential synonym of *P. crispatum*, although this synonymy has not been stated directly in the literature. *Ptychomitrium crispatum* is not listed in the checklists for Chile (HE, 1998; MULLER, 2009) or Argentina (MATTERI, 2003), nor is it present in ROBINSON'S (1975) treatment of the mosses of the Juan Fernandez Islands (where only *P. fernandesianum* is listed). *Ptychomitrium crispatum* may thus be a true African endemic (O'SHEA, 1999, 2006).

Selected specimens examined. – SOUTH AFRICA. Cape Prov.: Hermanus Distr. Mossel River, 29.IX.1953, *Garside 6630* (BOL [BOL171333]); Cape Town, “Exsiccate no. 141, Prom. B. Sp.”, 1875–77, *Rehmann s.n.* (G [G00048651]). Eastern Cape Prov.: Addo Elephant Park area, Zuurberg, 19.III.2005, *Hedderson 15930* (BOL [BOL171334]). Western Cape Prov.: Robertson Area, Klaas Voogds West, Bergendal Farm, W side of Heuningberg, 16.VII.2004, *Hedderson 15525* (BOL [BOL171335]); Tafelberg, s.d., *Breutel s.n.* (G [G00048650]). KwaZulu Natal Prov.: Port Shepstone Distr., Oribi Gorge, 5.I.2004, *T.A.J. Hedderson 15473* (BOL [BOL171337]). Limpopo Prov.: Louis Trichardt area, S Side of Soutpans Berg, 8.X.2004, *Hedderson 15676* (BOL [BOL171336]). TANZANIA. [Arusha Region]: Longido Hill in Maasai Distr., above Londigo village, 1900–2000 m, 16.VI.1989, *Pocs & Nsolomo 89192/G* (G [G00048249]).

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Appendix I

The 18 species described as new to science by HEDWIG (1801) for which, to date, an original herbarium sheet has not been located in G.

- Anictangium bulbosum* Hedw.
Anictangium planifolium Hedw.
Barbula lanceolata Hedw.
Dicranum falcatum Hedw.
Dicranum fasciatum Hedw.
Dicranum xanthodon Hedw.
Gymnostomum pulvinatum Hedw.
Gymnostomum rutilans Hedw.
Hypnum arcuatum Hedw.
Hypnum contextum Hedw.
Hypnum microcarpon Hedw.
Hypnum tenuifolium Hedw.
Leskea gracilescens Hedw.
Leskea rotulata Hedw.
Polytrichum pumilum Hedw.
Pterigynandrum ciliatum Hedw.
Pterigynandrum hirtellum Hedw.
Weissia radians Hedw.