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## What is *Dichelyma antarcticum* C. Muell.?

**ABSTRACT:** On the basis of comparable habit, leaf morphology and leaf cell pattern, leaf and stem sectional anatomy, *Dichelyma antarcticum* C. Muell. is reduced to synonymy with *Blindia magellanica* C. Muell.

**Key words:** Subantarctica, bryology, taxonomy, *Dichelyma*, *Blindia*.

### 1. Introduction

*Dichelyma* Myr. is a small genus of pleurocarpous mosses consisting of five species occurring exclusively in the Northern Hemisphere (Welch 1960), although fifteen specific names have been correctly combined with this generic name (Wijk et al. 1962, 1969). Of these, only one name refers to the species described from outside the Holarctic, namely to *Dichelyma antarcticum* C. Muell. from the austral region. According to Welch (1960) the type collection of this species was examined by Frances E. Wynne, who regarded it as *Drepanocladus aduncus* (Hedw.) Warnst. var. *capillifolius* (Warnst.) Grout. Since the latter taxon has never been recorded in the Southern Hemisphere, I critically re-examined type material of *D. antarcticum* as part of a revision of the extra-Holarctic Amblystegiaceae.

Müller (1883, 1889) described *Dichelyma antarcticum*, the type of which was collected on Kerguelen Islands by F. C. Naumann during the course of the "Gazelle" Expedition around the world in 1874—1876. He compared this newly described species to some slender and delicate forms of *Dichelyma capillaceum* (With.) Myr. from eastern North America and northern Europe from which it differed in having much narrower and always straight

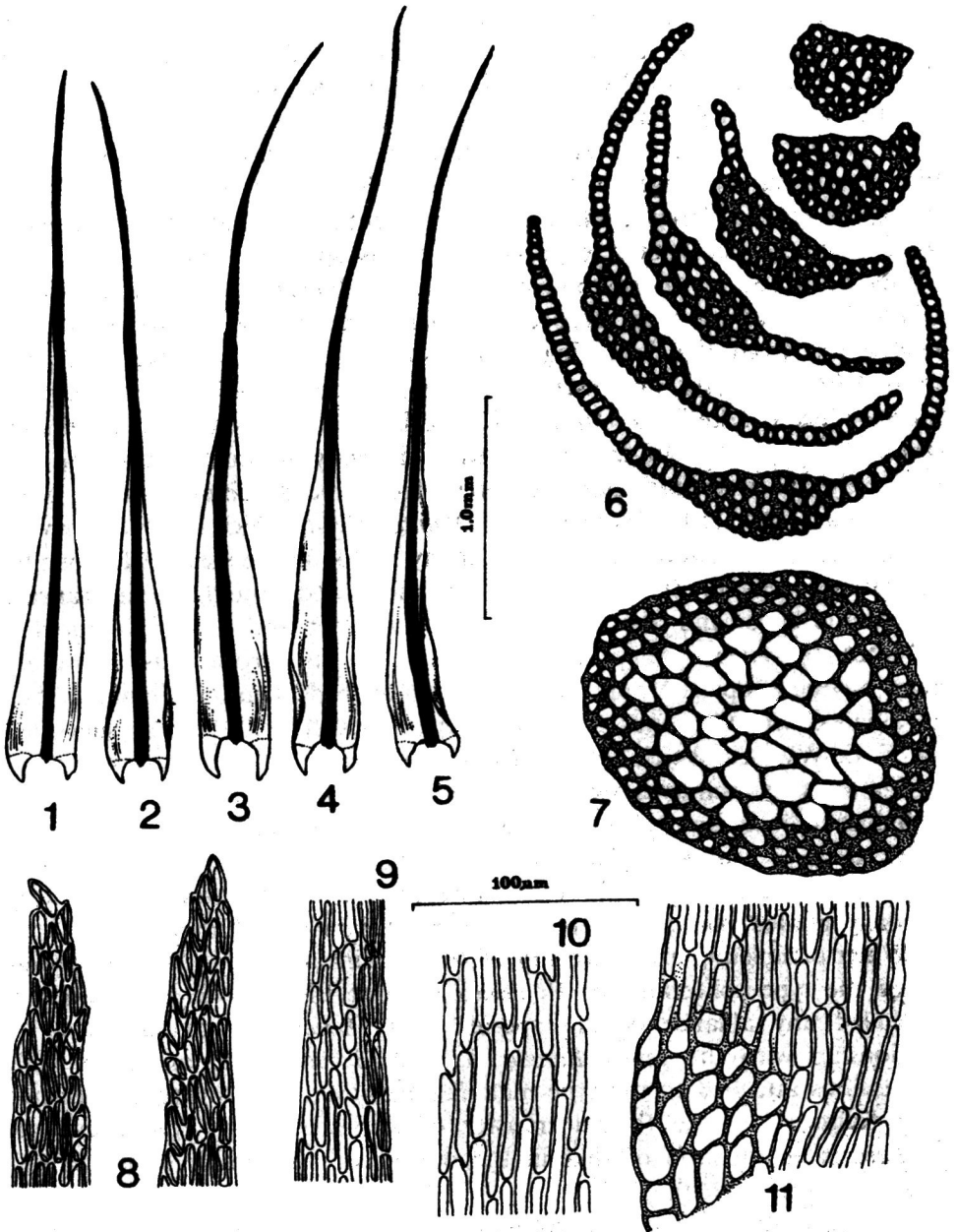
leaves with well-developed alar cells. It should be noted that Müller (1889) mentioned also *D. australe* Hampe, another species of this genus in the Southern Hemisphere. This herbarium name has never been validly published and it is missing from all bryological compendia including *Index Bryologicus* (Paris 1904) and *Index Muscorum* (Wijk et al. 1962, 1969). Unfortunately, the identity of this taxon must remain unknown, since no original material of *D. australe* is available from Hampe's herbarium at BM.

## 2. Material

*Dichelyma antarcticum* was described from two collections (Müller 1889), originals of which were almost certainly destroyed at the Berlin fire in 1943. However, duplicates of both syntypes have been located from herbaria in Stockholm (S) and London (BM). In both instances the material, though sterile, is sufficient to examine characters that are indispensable for establishing the identity of this species.

## 3. Results and discussion

The type material of *D. antarcticum* (Figs. 3—11) contains plants of medium size forming loose, lustrous, intricate tufts that are fulvous or brown-green in the uppermost portions, becoming brownish black to black and frequently denuded of leaves below. The stems are 1—9 cm high, slender, flexuose, simple or occasionally branched. In transverse section they are subround, without central strand and consist of 2—3, occasionally even 4, rows of strongly incrassate, small, brown cortical cells that surround 3—4 rows of larger, relatively thin-walled medullary cells. The leaves are crowded, straight to flexuose, occasionally slightly secund, erect to erect-patent when dry and wet, subulate from lanceolate, concave base and variable in size (2.5—4.5 mm long, 0.3—0.4 mm wide at base). The subulae are very fine, about 2 times as long as laminae, obtuse or acute and almost smooth to obscurely denticulate at the apex. The leaf margins are entire and erect to incurved. The costa is single, strong, 65—80  $\mu\text{m}$  wide at the base and fills the entire subula. In transverse section it is subelliptical, somewhat flattened ventrally and is composed of incrassate, nearly homogeneous cells. The leaf cells are long, straight, not porous, linear-elongate to narrowly elliptic-rectangular throughout the lamina and with ends truncate or oblique. The cell walls are thick and smooth or slightly roughened what is obvious only in transverse section. They are variable in size, 3—7  $\mu\text{m}$  wide, 20—40  $\mu\text{m}$  long in the upper part of the lamina and becoming longer towards the



Figs 1—11. *Blindia magellanica* Schimp. ex C. Muell. 1—5: leaves; 6: transverse sections of leaf; 7: transverse section of stem; 8: apical cells of leaves; 9: lamina cells below the excurrency of the costa; 10: mid-leaf cells; 11: angular cells (1—2 from isotype of *Blindia gracillima* Mitt. — LE; 3—11 from isolectotype of *Dichelyma antarcticum* C. Muell. — S).

base, reaching up to 65 μm in length. The alar cells are brown to orange-brown, subquadrate to short rectangular at margins, 20—40 μm long, 15—20 μm

wide, with strongly incrassate and smooth walls. They form very distinct, inflated and decurrent auricles that are separated from the costa by 5—8 rows of orange-brown cells at the insertion. Neither sporophytes nor sexual organs have been found on the type material.

It should not be too strange that, in the absence of sporophytes, plants growing submerged in lakes on Kerguelen Islands made Müller think of *Dichelyma capillaceum*, which grows in identical habitats. When casually seen, some slender habitat expressions of this species resemble indeed the plants described as *D. antarcticum*. However, *Dichelyma* is a well defined genus diagnosed by a set of peculiar characters that permit its immediate recognition from the remaining genera of mosses. It is a pleurocarpous moss with distinctly or obscurely trifarious leaves that are keeled and more-or-less conduplicate. In addition, cells are linear-flexuose to linear-rhomboidal throughout the lamina with distinctly attenuate ends, and the alar cells are not particularly different from the adjoining lamina cells. These characters are totally lacking in *D. antarcticum*, which is a moss having channelled leaves that are arranged in many ranks on the stem. Additionally, the lamina cells in *D. antarcticum* are linear and straight with truncate or oblique ends, and alar cells form very distinct and decurrent auricles.

Since *Dichelyma antarcticum* appears to be an acrocarpous, dicranoid moss having simple or only occasionally branched stems, it obviously has no alliance with the genus *Drepanocladus* (C. Muell.) G. Roth as suggested by F. E. Wynne (Welch 1960). *Drepanocladus* is a pleurocarpous moss having strongly branched stems and the superficial similarity of the leaves, including the strong and long excurrent costa and distinct angular cells, of *D. aduncus* var. *capillifolius* and the plants that are currently named *Dichelyma antarcticum* is doubtless due to convergent evolution of very remotely related plants that thrive in similar habitat conditions.

When completing a monograph of the Fontinalaceae, W. H. Welch examined the type collections of *D. antarcticum* at BM and S. She definitely precluded any alliance of this species with *Dichelyma* and suggested its relationship with the genus *Blindia* B., S. & G. as visible on labels with annotations attached to the type material. However, this suggestion has not been followed by the formal transfer of this species to *Blindia* as well as there is no mention of that in the published monograph of the Fontinalaceae (Welch 1960).

Having examined the type collections of *Dichelyma antarcticum* as well as type collections of several species of *Blindia* from the Southern Hemisphere, especially those described from Kerguelen Islands, I came to the conclusion that W. H. Welch was correct in suggesting the realignment of *D. antarcticum* in its true relationship. This species is indeed a *Blindia* and many structural characters confirm this conclusion. *Blindia* is a small acrocarpous moss genus consisting of 16 species that are predominantly distributed in the

Southern Hemisphere (Bartlett and Vitt 1986). Historically, species of *Blindia* in the austral region have been misunderstood. From one hand, a lack of appreciation of the morphological variation shown by some species has led to a number of new species being described. Many of these have been reduced to synonymy, mainly with *B. magellanica* Schimp. ex C. Muell., by Bartlett and Vitt (1986) in the latest survey of species in this genus. On the other hand, however, prior to this survey an ill-defined concept of *Blindia* resulted in the inclusion in it many species that are evidently anomalous in this genus. These were mostly species of various dicranoid genera, such as *Ditrichum* Hampe, *Dicranoweisia* Lindb. ex Milde, *Verrucidens* Card., *Chorisodontium* (Mitt.) Broth. and *Holodontium* (Mitt.) Broth., which are externally very similar to *Blindia*, but different peristome structure precludes their closer relationships. The safest distinguishing character between sterile plants of *Blindia* and the above mentioned genera is the anatomical structure of the costa. In *Blindia* the costa is composed of practically homogeneous cells in transverse section, whereas in dicranoid genera it consists in transverse section of well-developed adaxial and/or abaxial stereid bands and large central guide cells (Zanten 1971, Bartlett and Vitt 1986).

Of several species of *Blindia* that were described from Kerguelen Islands, the type collection of *B. gracillima* Mitt. was especially pertinent to comparison with *Dichelyma antarcticum*. This species was described by Mitten (1879) from material collected by A. E. Eaton during the Transit of Venus Expedition in the years 1874—1875. The type material of *B. gracillima* that I examined in Leningrad (LE) is in fine fruiting condition, and the typically seligeioid peristome confirms its correct generic placement. Comparison of types of both *Blindia gracillima* and *Dichelyma antarcticum* revealed excellent correspondence in all critical and taxonomically important characteristics. This refers to the habit, size and coloration of the plants, leaf shape and areolation as well as to the anatomical structure of the costa and the stem. The persuasive similarity of the plants of *B. gracillima* and *D. antarcticum* led me to the conclusion that both species are inseparable from one another and should be considered synonymous.

*Blindia gracillima* has recently been examined by Bartlett and Vitt (1986) who found that it falls within the range of variability of *Blindia magellanica* and synonymized both species, of which the latter has priority (Müller 1862). This species has a pan-temperate geographical range in the Southern Hemisphere, occurring in temperate regions of southern South America, Australasia and on all sub-Antarctic islands from South Georgia to Kerguelen Islands. In addition, this typically antipodal species is disjunctively distributed in the páramos of the northern Andes in Colombia and Ecuador, in the mountains in southeastern Brazil, in Lesotho in South Africa and in New Guinea (Bartlett and Vitt 1986).

*Blindia magellanica* is a variable species, a feature typical of all species growing in rheophytic or otherwise hydrophytic habitats. The setaceous leaves of *Blindia gracillima* (Figs 1—2) and *Dichelyma antarcticum* (Figs 3—5) have the very fine subulae that are about twice as long as the laminae and in this character they approach some reduced, aquatic forms of *Blindia robusta* Hampe, another antipodal species of *Blindia* having a temperate amphipacific distribution pattern. However, the large and inflated angular cells forming decurrencies, as well as the shorter and narrower lamina cells immediately separate the plants from Kerguelen Islands from *B. robusta*. Both *B. gracillima* and *D. antarcticum* appear to represent extreme aquatic expressions of *Blindia magellanica* that differ from small terrestrial forms in longer subulae, but there is a steady continuum in the length of subulae in various plants growing in fluctuating habitat conditions. Consequently, *Dichelyma antarcticum* is considered synonymous with *Blindia magellanica*.

*Blindia magellanica* Schimp. ex C. Muell., Bot. Zeit. 20: 328. 1862.

Syn. nov.: *Dichelyma antarcticum* C. Muell., Bot. Jahrb. 5: 82. 1883. Type: all new taxa proposed by Müller (1883) are listed in the section entitled "I. Bryologia Kerguelensis"; later, Müller (1889) wrote: Ins. Kerguelen, loco non indicato 12. Januario 1875, in aquosis. In lacu Margot ad lapides Novbr. 1874 [Lectotype (chosen here): "Ex Museo botanico Berolinensi. *Dichelyma antarcticum* C. Müll. n. sp. Kerguelensl. Dr. Naumann 1874" — BM!; isolectotype: S-Roth (2 specimens)! Syntype: "Ex Museo botanico Berolinensi. *Dichelyma antarcticum* var. *nanum* C. Müll. Kerguelen Margot 800', Nov. 1874, Dr. Naumann" — S-Möller!].

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## 5. Streszczenie

W trakcie niemieckiej wyprawy naukowej dookoła świata w latach 1874—1876 na statku „Gazelle” dr F. C. Naumann zebrał w 1874 roku na Wyspie Kerguelen nowy gatunek mchu opisanego przez Müllera (1883, 1889) jako *Dichelyma antarcticum* C. Muell. Był to pierwszy i jak dotąd jedyny gatunek tego rodzaju znany z południowej półkuli. W 1960 roku W. H. Welch w monografii rodziny Fontinalaceae stwierdziła, że gatunek *D. antarcticum* był zbadany przez Frances E. Wynne, która zsynonimizowała go z *Drepanocladus aduncus* (Hedw.) Warnst. var. *capillifolius* (Warnst.) Grout.

Ponowne zbadanie obu syntypów *Dichelyma antarcticum*, zdeponowanych w zielnikach w Londynie (BM) i Sztokholmie (S) doprowadziło autora niniejszego artykułu do stwierdzenia, że gatunek ten nie ma bliższego związku ani z rodzajem *Drepanocladus* (C. Muell.) G. Roth, ani z rodzajem *Dichelyma* Myr. Pierwszy z nich jest typowym mchem bocznozarodniowym, o lodydze bardzo silnie porożgalezianej. Również *Dichelyma* jest mchem silnie rozgalezionym, który cechuje się trójrzędowym ułożeniem liści na lodydze oraz brakiem komórek skrzydłowych liści. Tych cech zupełnie jest brak u *Dichelyma antarcticum*. Natomiast kształt liści i ich budowa anatomiczna u tego gatunku wykazują bardzo wielkie podobieństwo do *Blindia magellanica* Schimp. ex C. Muell. Liście u obu tych gatunków posiadają bardzo długie, szydlasty kończyk, który jest całobrzegi lub niewyraźnie ząbkowany na samym szczycie. Poza tym typ *Dichelyma antarcticum* charakteryzuje się dalszymi unikalnymi cechami, których brak jest w rodzaju *Dichelyma*: (1) żyłka liścia wypełnia cały kończyk; (2) komórki skrzydłowe liścia są silnie zróżnicowane, brązowe lub pomarańczowo-brązowe i tworzą zbiegające uszka; (3) komórki blaszki liściowej są grubościennie, wąsko-prostokątne, 20—40 µm długie i 3—7 µm szerokie; (4) komórki żebra w przekroju poprzecznym są homogeniczne. Wszystkie te cechy są typowe dla *Blindia magellanica* Schimp. ex C. Muell., polimorficznego gatunku o wokółbiegunowym typie zasięgu na południowej półkuli. *Dichelyma antarcticum* jest szczególnie podobna do *Blindia gracillima* Mitt., gatunku opisanego przez Mittena (1879) także z Wyspy Kerguelen. Jednakże Bartlett i Vitt (1986) uważają ten gatunek za wodną modyfikację *B. magellanica* nie mającą żadnej wartości systematycznej. Również *Dichelyma antarcticum* posiada ten sam zespół cech diagnostycznych i musi być traktowana jako nowy synonim *Blindia magellanica*.