



The rediscovery of *Dicranella circinata* (Dicranellaceae, Bryophyta), with comments on other southern South American species of *Dicranella*

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With 6 figures

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Abstract: Fertile populations of *Dicranella circinata* Herzog, a poorly known endemic moss species from southern Chile, were recently found in Chiloé Island. The species was previously known only from the type collection, which consists of just a few sterile plants. The first illustrations of this previously insufficiently known taxon, and the description of its sporophytes, together with new geographical, ecological and morphological data, are here provided. Discussion about the taxonomy and nomenclature of the other southern South American species of *Dicranella* is also presented. We propose two new combinations for names previously placed in the neglected genus *Anisothecium* Mitt. [*Dicranella elegans* (Duby) Larraín, and *Dicranella fontana* (Herzog) Larraín], and new synonyms for *D. aulacocarpa* Mont. and for *D. pseudorufescens* Cardot & Broth.

Key words: Chile, Chiloé Island, *Dicranella circinata*, Dicranellaceae, taxonomy.

Introduction

The genus *Dicranella* (Müll.Hal.) Schimp. is a group of small to medium-sized terricolous dicranoid mosses characterized by the erect to erect-spreading, straight to sometimes secund or even circinate leaves, sometimes with a flexuose subula, without differentiated alar cells, and a relatively narrow costa (with some exceptions), occupying less than 1/4 of the leaf base. The leaves usually clasp the stem thus

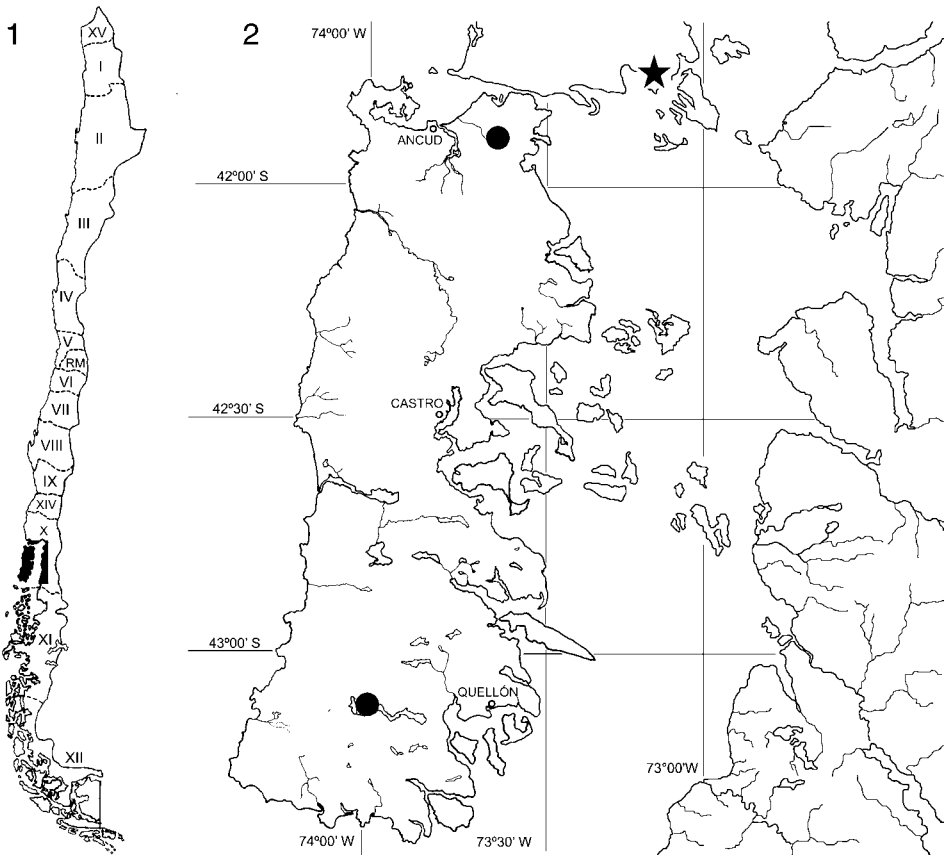


Fig. 1. Distribution of *Dicranella circinata*. 1. Map of Chile with Chiloé Island and neighboring mainland in black. 2. Map of Chiloé Island and adjacent areas showing the type locality (star) and the two new localities where the species was recently found (full circles).

presenting a differentiated leaf base, ovate or sheathing, often hyaline, formed by rectangular or elongated cells, although many species in the group have the leaves not clasping the stem, and thus not at all differentiated in a sheathing base and a spreading and subulate leaf apex. Among the sporophytic traits, the seta is erect, straight or flexuose, the capsule is erect to somewhat inclined, usually slightly asymmetrical, smooth or furrowed, subglobose to elliptical, most of the time with a well developed peristome made up of 16 deeply divided teeth, distally papillose and often vertically furrowed, and a cucullate calyptra.

During the preparation of an inventory of the moss flora of "Senda Darwin" Biological Station, located east of Ancud, in northern Chiloé Island, Chile (Fig. 1), a rare dicranalean moss appeared among the collections. Although the specimen matched *Dicranella* in all its gametophytic traits, the lack of a well developed peristome, a trait unknown among the known austral species of the genus, made us doubt its

generic placement. When checking the list of species known for Chile (He 1998), we thought it could correspond to *Dicranella circinata* Herzog, a poorly known taxon (Crosby et al. 2000) described from sterile material collected by Gerhard Helmut Schwabe in Calbuco in the year 1937 on the Chilean continental coast just across from Chiloé Island (Herzog 1954). Examination of the type material of this name confirmed our preliminary observations.

The discovery of fertile plants deserves reconsideration of this Chilean endemic moss. Therefore, a complete description, illustrations, ecological information and maps of the known distribution of the species in a narrow range of the Valdivian rainforest of southern Chile are provided.

We also compared this taxon with the other eight *Dicranella* species reported for southern South America (Chile and Argentina south of 36°S), for which we studied several types and other relevant collections deposited at BM, H, CONC, and LIL. Some taxonomic and nomenclatural comments about the southern South American species of the genus, as well as a key for determining them, are also provided.

Description

Dicranella circinata Herzog, Rev. Bryol. Lichénol. 23: 71. 1954. TYPE: Südchile: Calbuco, Westküste. Leg. G.H.Schwabe, aus Sammlung 1937, n° 167 [LECTOTYPE (selected here): JE!, ISOTYPE: LIL!]. Figs 2–6

PLANTS medium sized, fairly slender, bright green when young, dull green to black when old, in rather dense tufts. STEMS simple, erect, 1.5–5.0 cm long, brown to brownish green, sometimes inconspicuously branched at the tips, strongly interwoven in the basal parts with neighboring plants; in cross section rounded, with a more or less conspicuous central strand, cortex formed by large thin-walled cells up to 8 cells thick, with an epidermal layer of 1(–2) row(s) of small thick-walled cells, in surface view elongated, 4–8 times longer than wide, smooth. Rhizoids scattered along the basal part of the stems, sometimes also above, pellucid, reddish brown, smooth or slightly verrucose, sinuose. Axillary hairs abundant along stems, somewhat flexuose, 6–7(–11)-celled, with two basal short and brownish cells and 4–9 elongated and hyaline distal cells. LEAVES loose, erect, flexuose, sometimes strongly falcate-secund, occasionally circinate, almost touching their own bases with their tips when moist, 3.8–4.5 mm long, becoming larger and more crowded at the apex of the plant, the distal leaves reaching 6 mm, with an enlarged sheathing base with longitudinal cuticular thickenings, and an abruptly differentiated long-spreading subula 3–4 times longer than the base; sheathing base of leaves 0.8–1.0 mm long, (0.4–)0.5–0.8 mm wide, quadrate, slightly bordered by at least 7 rows of elongated, thin-walled, hyaline cells, in cross section U-shaped, unistratose, with isodiametric laminal cells, some cells slightly higher than wide, slightly bulging mostly on the dorsal surface; margins plane, entire except in the shoulder region where it is uneven; costa formed by (4–)6–7(–10) guide cells in mostly one row, sometimes with some dorsal guide cells in a second row, vanishing in the subula; subula abruptly differentiated, contracted into a long straight to circinate sub-cylindrical point, flexuose when dry, entire,

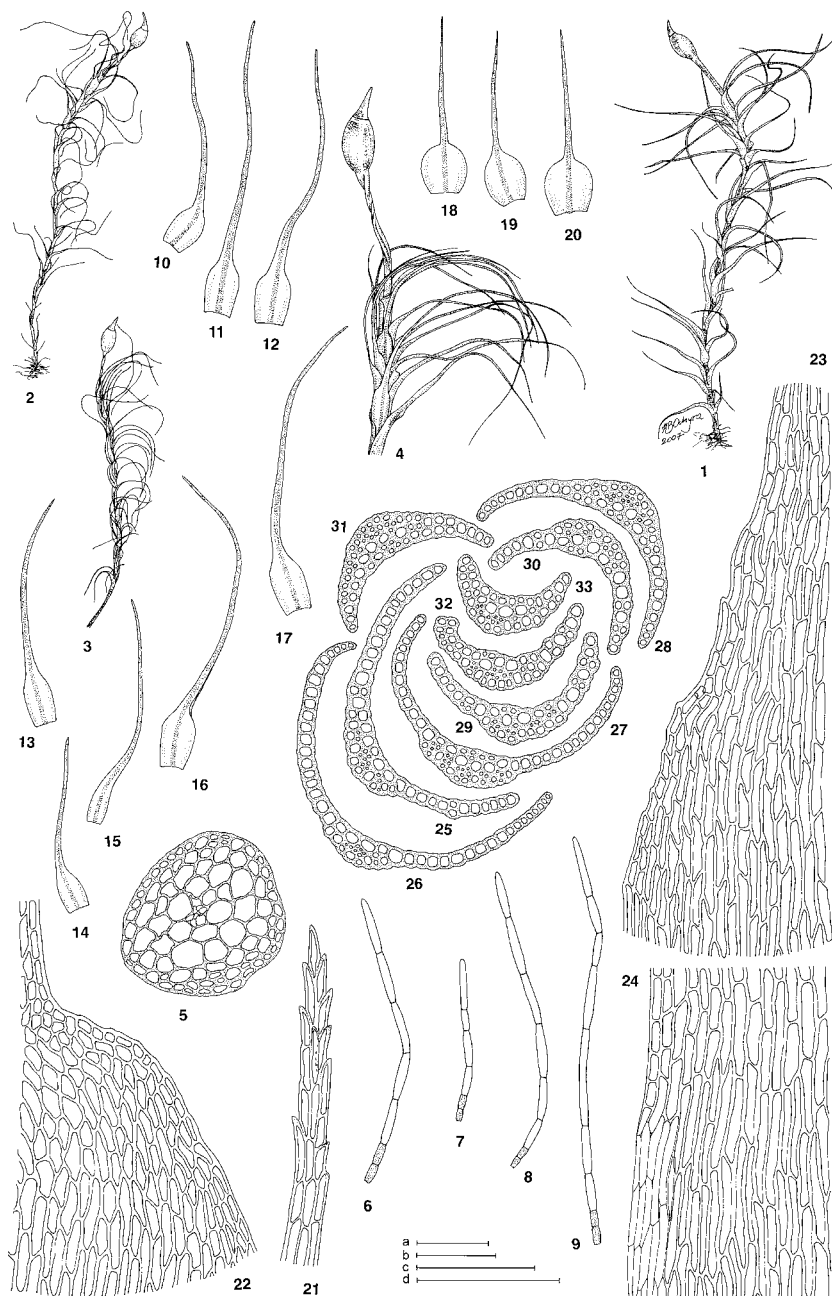


Fig. 2. *Dicranella circinata*. 1. Habit, wet. 2–4. Habit, dry. 5. Stem cross-section. 6–9. Axillary hairs. 10–20. Spectrum of vegetative leaves showing variation. 21. Leaf apex. 22–23. Laminal cells at shoulders. 24. Mid-leaf cells at margin. 25–33. Leaf cross-section, sequence from base to apex. [1–2 from Larraín & Salinas 23306; 3–33 from Larraín 23484; both in KRAM]. Scale bars: a. 1 mm (4, 10–20); b. 100 μm (6–9); c. 100 μm (5, 21–33); d. 0.5 cm (1–3).

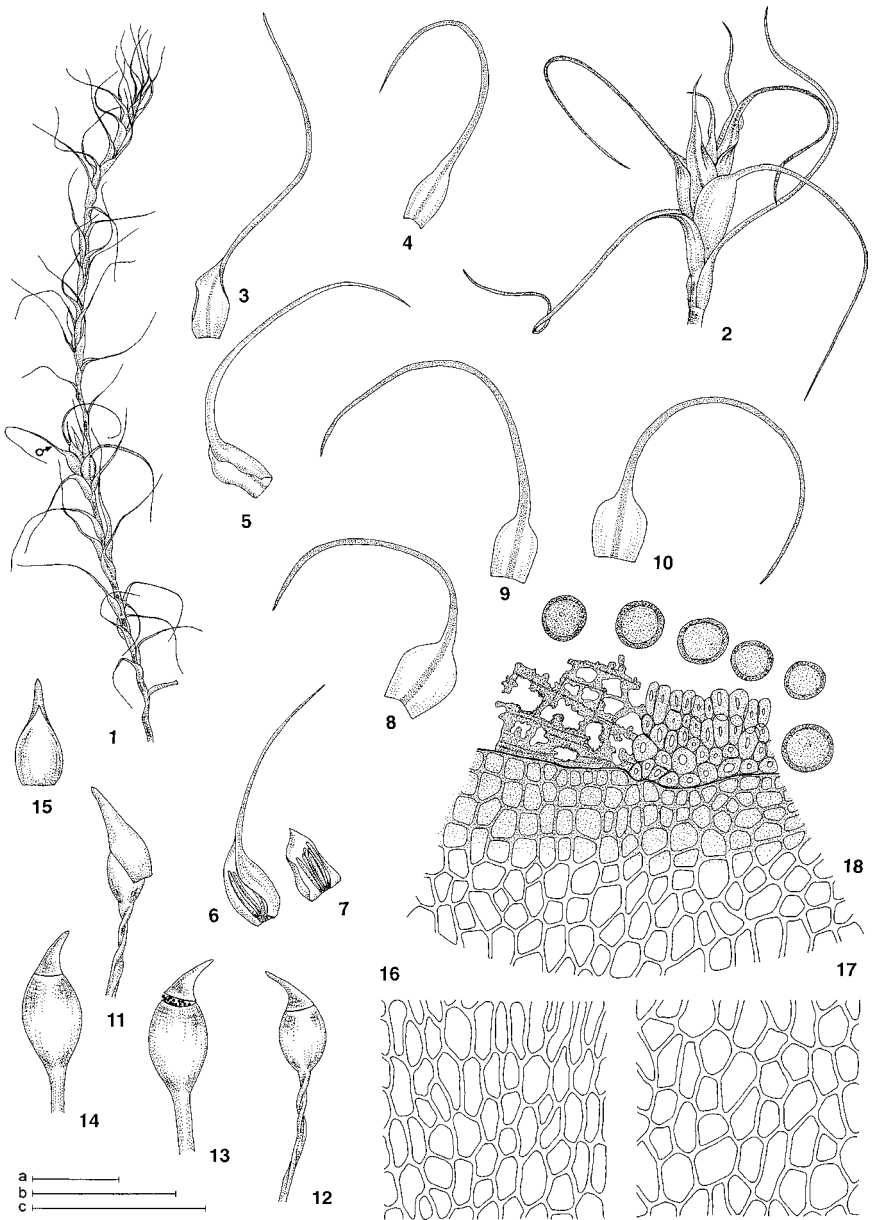


Fig. 3. *Dicranella circinata*. 1. Habit of male plant, dry. 2. Perigonium, dry. 3-7. Perigonial bracts. 8-10. Perichaetial leaves. 11. Capsule with calyptra, dry. 12. Operculate capsule, dry. 13-14. Operculate capsules, wet. 15. Calyptra. 16. Exothecial cells at base of urn. 17. Mid-urn exothecial cells. 18. Exothecial cells at capsule mouth, rudimentary peristome, portion of annulus and spores. [1, 8-10, 13-15 from Larraín 23484; 2-7, 11-12, 16-18 from Larraín & Salinas 23306; both in KRAM]. Scale bars: a. 1 mm (2-15); b. 100 μm (16-18); c. 0.5 cm (1).

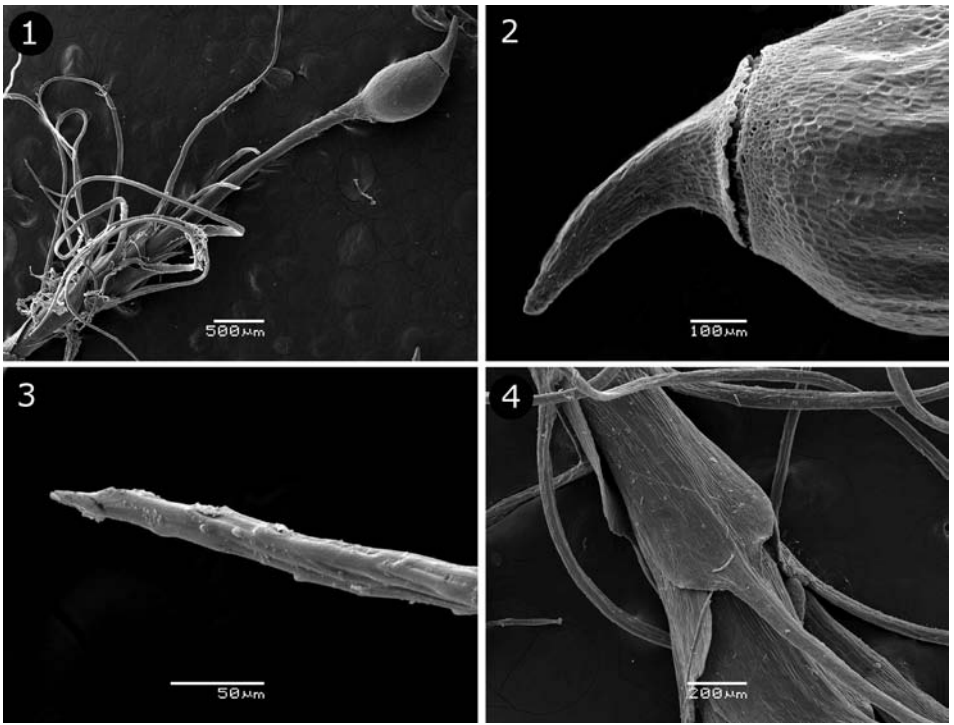


Fig. 4. *Dicranella circinata*. SEM photographs. 1. Habit. 2. Portion of capsule and operculum. 3. Leaf apex. 4. Leaf base, shoulders and subula. (1, 3 and 4 from Larraín 23484; 2 from Larraín & Salinas 23306; both in CONC).

with 1–3(–more) blunt (rarely sharp) teeth on the apical margins (from projecting cell ends), ending in a single conical to rhomboidal cell, in cross section cylindrical-elliptic, 68–75 μm wide, 45–55 μm high, with (1–)2–3 large central guide cells, surrounded by groups of stereids irregularly placed and enclosed by several epidermal thin-walled cells; laminal cells rectangular, elongated, thin-walled, more or less arranged in rows, with acute to blunt ends, non pitted, yellowish brown, becoming shorter and wider to the insertion and irregularly shaped at the shoulders, smooth; lower cells 50–90 μm long, 7–9(–10) μm wide, rectangular; upper laminal cells mostly isodiametric; alar cells undifferentiated. **DIOICIOUS.** **PERIGONIA** bud-shaped, appearing axillary due to subfloral innovations. **ANTHERIDIA** elliptic lanceolate in numbers of ca. 20, stalked; paraphyses abundant. **PERICHAETIAL LEAVES** not differing from upper stem leaves or somewhat larger. **SETA** single, light brown, becoming blackish when old, (2.0–)2.2–2.5 mm long, 170 μm wide, sinistrose at the upper end when dry, slightly dextrose at the base, with rectangular cortical cells, 8–12 times longer than wide, becoming shorter, quadrate or hexagonal and isodiametric towards the neck of the capsule; vaginula brownish, 0.8 mm long, bearing several axillary hairs, surface cells rectangular, smooth, thin-walled, becoming shorter and wider

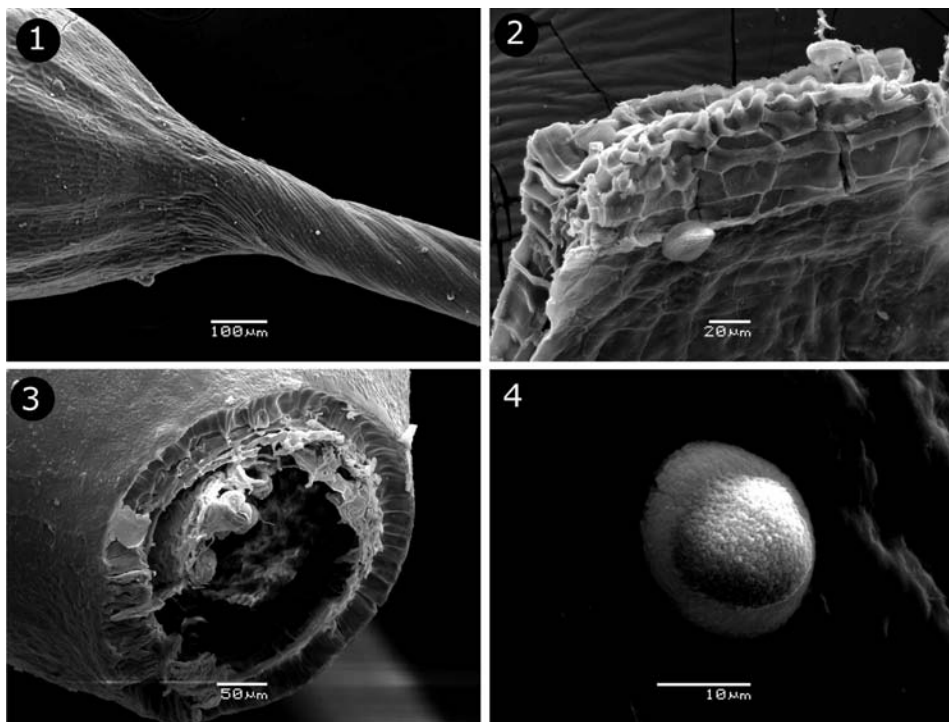


Fig. 5. *Dicranella circinata*. SEM photographs. 1. Base of capsule and seta. 2. Peristome (view from inner side). 3. Capsule mouth, showing annulus and reduced peristome. 4. Spore. (1–2, 4 from Larraín & Salinas 23306; 3 from Larraín 23484; both in CONC).

towards the base. CAPSULE erect, straight, subglobose to ovoid when mature, light brown, becoming darker with age, gradually narrowed towards the mouth and the base, slightly asymmetric, 1.0–1.2 mm long, 0.6 mm wide, smooth, rarely slightly sulcate when dry; exothecial cells elongate, somewhat hexagonal, irregularly arranged, thick-walled, becoming smaller, more rounded or quadrate and walls incrassate towards the mouth, forming a distinctive 4–8 seriate reddish tissue just below the annulus; stomata absent; annulus conspicuous, deciduous, formed by a row of long pellucid thick-walled cells and 1 or 2(–3) rows of smaller cells beneath them; peristome greatly reduced forming a trabeculate and perforated basal membrane, inserted below the mouth; operculum long rostrate, curved, 0.6–0.7 mm long. SPORES oval to spherical, yellowish brown, slightly verrucose, 20–25 μm in diameter. CALYPTRA cucullate, smooth, pellucid, brown, the base almost entire, sometimes with a small division in the middle of the base.

Dicranella circinata is readily distinguished from all other southern South American species of the genus by the greatly reduced peristome, the very long subulate and flexuose leaves, which have an abruptly differentiated sheathing base, and the partially sub-aquatic habitat. The subula completely fills the distal part of the leaves, so in



Fig. 6. *Dicranella circinata*. Field photograph of sterile plants at Senda Darwin Biological Station, Ancud, Chiloé, 27 Feb 2007, Larraín 27306 (CONC).

cross section it is seen as a perfect cylinder of cells. This species is endemic to the lowlands of the Valdivian region where it seems to be very rare. This region of Chile has been one of the most intensely collected in the whole country and there are no additional reports in the literature since its description.

SPECIMENS EXAMINED: CHILE, Región de los Lagos (X), Provincia de Llanquihue, comuna de Calbuco, Calbuco, Westküste. 28-VIII-1937. Schwabe 167 (JE, LIL; type of *D. circinata*); Provincia de Chiloé, comuna de Ancud, Estación Biológica Senda Darwin, a orillas de un charco en medio de matorral pantanoso al NW del predio de la estación, 41°52'52"S; 73°39'45"W, alt. 30 m. 16-II-2003. Larraín 23484 (CONC, KRAM, NY, JE); camino a bosque "El Tepual", bajo el agua en pequeño charco poco profundo en medio del sendero, 41°52'55"S; 73°40'20"W, alt. 30 m. 26-I-2003. Larraín & Salinas 23306 (CONC, KRAM, SGO, S); sobre el barro a orillas de un charco en medio de matorral pantanoso al NW del predio de la estación, 41°52'52"S; 73°39'56"W, alt. 30 m. 17-II-2007. Larraín 27306 (CONC, SGO, KRAM, US); comuna de Quellón, Yaldad, lago Chaiguaco, en tundras 300 m antes de llegar al lago, en charcos secos entre matorrales y tundras, 43°13'31"S; 74°00'42"W, alt. 160 m. 16-I-2006. Larraín 25819 (CONC, NY, KRAM, SGO, S).

Ecology

The first populations of *Dicranella circinata* found at Senda Darwin Biological Station were growing together with *Polytrichastrum longisetum* (Sw. ex Brid.) G.L.Sm. and *Campylopus acuminatus* Mitt. in the bottom of seasonal shallow puddles on the ground of open bushy peatlands dominated by the shrub *Baccharis patagonica*

Hook. & Arn. with scattered *Drimys winteri* J.R.Forst. & G.Forst and the ferns *Blechnum chilense* (Kaulf.) Mett. and *Gleichenia cryptocarpa* Hook. A couple of years later the species was found in a second locality on the island sharing similar ecological conditions, more than 100 km southwards, near lake Chaiguaco in Quellón county (Fig. 1), but in this site the species was forming monospecific colonies in the shallow puddles. The plants were growing in an open area among *Pilgerodendron uviferum* (D.Don) Florin secondary forest with surrounding vegetation dominated by the dwarf conifer *Lepidothamnus fonkii* Phil. and *Oreobolus obtusangulus* Gaudich., with scattered shrubs of *Berberis microphylla* G.Forst., *Pernettya* spp., and some Cyperaceae and Juncaceae species. Both sites are characterized by acidic soils with poor drainage, high rainfall (over 2 m per year) and cool temperatures (mean annual 9°C). In both areas the presence of *Sphagnum magellanicum* bogs was observed, covering small areas between forests or shrublands. Extensive field work in adjacent areas in mainland Chile for the last eight years has not yet yielded new localities for the species.

Comments on other southern South American species of *Dicranella*

Greene (1986) reported 20 species of the *Dicranella/Anisothecium* group for southern South America (Am6 of Wijk et al. 1959), however, five of these species (*Anisothecium capituligerum* (Müll.Hal.) Thér., *A. lorentzii* (Müll.Hal.) Broth., *A. rufipes* (Müll.Hal.) Dusén, *Dicranella argentinica* (Müll.Hal.) Kindb. and *D. guilleminiana* (Mont.) Mitt.) correspond to neotropical species from north-central Argentina and Uruguay. Merging Greene's (1986) checklist (excluding the neotropical species) with those listed by He (1998) and Matteri (2003), there are 19 species of this group so far reported for the temperate area of southern South America. Many of these names have been synonymized or placed in other genera by subsequent works (Newton 1977, Ochyra & Matteri 1996, Matteri & Calabrese 1999, Ochyra 1999a, Ochyra et al. 2008), and one species has been moved from *Ditrichum* to *Anisothecium* (Ochyra 1999b). After updating the list of species, there remain nine accepted species of the group so far reported for southern Chile and Argentina. Five of them are listed by Crosby et al. (2000) as insufficiently known taxa, which indicates that the group needs further revisionary studies.

The species of *Dicranella* possessing stomata, peristome with a basal membrane and no annulus, have been regarded by some authors as belonging to *Anisothecium* Mitt. (Allen 1994, He 1998, Ochyra 1998, Ochyra 1999b, Matteri 2003). However, all of these traits are present in some of the *Dicranella* species (Ochyra et al. 2003, Allen 2005) that are presently recognized taxonomically. In addition, the genus *Anisothecium* has a controversial nomenclatural history (Newton 1977, Ochyra et al. 2003, Ochyra et al. 2008). For these reasons, several recent floras, as well as other more classical works, some of them listed by Newton (1977), treat *Anisothecium* as a synonym of *Dicranella* (e.g. Gradstein et al. 2001, Smith 2004, Allen 2005, Casas et al. 2006, Hallingbäck et al. 2006, Crum 2007, Ochyra et al. 2008, Frey & Stech 2009). Therefore, it is necessary to establish two new combinations for *Anisothecium elegans* (Duby) Thér. and *A. fontanum* (Herzog) Ochyra. These nomenclatural changes are listed within the following list of the southern South American species of the group:

1. *Dicranella aulacocarpa* (Mont.) Mitt., J. Linn. Soc., Bot. 12: 36. 1869.

Dicranum aulacocarpum Mont., Ann. Sci. Nat. Bot., sér. 3, 4: 113. 1845. ≡ *Aongstroemia aulacocarpa* (Mont.) Müll.Hal., Syn. Musc. Frond. 1: 431. 1848. Type citation: ad terram nudam in Chile australiori cum *Campylopod*e flexuoso mixtum legit cl. C.Gay. Isotypes: BM!, LIL!

Dicranella subclathrata Lorentz, Moosstudien 159. 1864. ≡ *Dichodontium subclathratum* (Lorentz) Paris, Index Bryol. 324. 1894. ≡ *Aongstroemia subclathrata* (Lorentz) Müll.Hal., Gen. Musc. Frond. 325. 1900. Type citation: [Chile] Prope Valdiviam. Leg. Dr. Krausse. Type: BM!, **syn. nov.**

Dicranum aulacocarpum was described by Montagne (1845) based on a single collection from southern Chile by Claude Gay. The original description emphasized the dioicous sexuality of the plants, the differentiated leaves with a sheathing base and a recurved subula, an evanescent costa, and an ovate, substrumose and striate capsule with a simplex annulus. Mitten (1869) placed the species in *Dicranella*, describing the leaves as entire, and disagreeing with Montagne when describing the costa as completely filling the subula. He also lists an additional collection by Lobb from Chiloé Island. Since then, the species has not been reported again in the literature. Matteri & Calabrese (1999) suggest that this name could be a synonym of *Campylopodium euchlorum* (Mont.) Matteri, although they could not locate the type. We did find a duplicated specimen of the type collection from PC at LIL (Gay s.n., Chile), and indeed the costa completely fills the subula, it is not evanescent, however, the leaf margins are not completely entire as stated by Mitten (1869), but they are uneven in the shoulder region. Although the leaf cells don't have the characteristic mamillae at both cell extremes present in *D. campylophylla*, the cross section of the upper part of the sheathing base of the leaves shows a relatively thick costa made up of a conspicuous row of guide cells between a weak layer of ventral stereids and a more developed group of dorsal stereids, with an evident dorsal epidermis. This leaf section is almost identical to that presented by Dusén (1905; Taf. 4, Fig. 5) when describing *Aongstroemia persquarrosa* (currently considered a synonym of *D. campylophylla* because of the conspicuous mamillae on the upper leaf cells), except that Dusén's illustration does not show the weak band of ventral stereids, and the guide cells appear exposed on the ventral side of the leaf. It is probable that *D. aulacocarpa* is just a weakly mammillose form of the widely distributed *D. campylophylla*, but this warrants further study. *Dicranella subclathrata*, although synonymized by Brotherus (1924) with *Anisothecium jamesonii*, matches in all diagnostic characters with *D. aulacocarpa*.

2. *Dicranella campylophylla* (Taylor) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1870–71: 382. 1872. (For a complete list of synonyms see Ochyra & Newton (1985)).

Dicranum campylophyllum Taylor, London J. Bot. 7: 281. 1848. ≡ *Aongstroemia campylophylla* (Taylor) Müll.Hal., Syn. Musc. Frond. 2: 608. 1851. ≡ *Anisothecium campylophyllum* (Taylor) Mitt., J. Linn. Soc., Bot. 12: 40. 1869. Type citation: [Ecuador] On Pichincha. Prof. W.Jameson. 8th Aug. 1847. Isotype: BM!

Dicranum cardotii R.Br. bis, Trans. & Proc. New Zealand Inst. 35: 329. Pl. 36, fig. 9. 1903. ≡ *Dicranella cardotii* (R.Br.bis) Dixon, New Zealand Inst. Bull. 3(3): 77. 1923. ≡ *Anisothecium cardotii* (R.Br.bis) Ochyra, Moss Fl. King George Island Antarctica: 114. 1998. Type citation: [New Zealand] On damp banks, tributary of the River Hapuka, near Koikoura. Collected by Robert Brown. Type: BM (not found). First synonymized by Robinson (1986), but see also Ochyra et al. (2008).

Aongstroemia persquarrosa Dusén, Ark. Bot. 4(1): 11. Pl. 4, Figs. 1–10. 1905. ≡ *Dichodontium persquarrosium* (Dusén) Cardot, Wiss. Erb. Schwed. Südpolar-Exp. 4(8): 59. 1908. ≡ *Anisothecium persquarrosium* (Dusén) Broth. in Engl., Nat. Pflanzenfam. (ed. 2) 10: 177. 1924. Type citation: [Chile] Patagonia occidentalis in valle fluminis Aysen, ubi speciem et in rupibus arena obtectis (c. fr. vetustis) et in rupibus irrigatis (c. fr. parum evolutis) m. Februario legi [Leg. P.Dusén]. Isotype: LIL! First synonymized by Newton (1977) with *Dicranella cardotii*.

Dicranella campylophylla is one of the commonest species of the genus in southern South America, although it has been reported mostly as *Dicranella cardotii* or *Anisothecium cardotii*. It is quite a variable species, that is readily distinguishable due to its sheathing leaf bases, the mammillose upper laminal cells and subula, which can be easily seen in cross section, and on the marginal shoulder region from a superficial view, where they appear as elevated projections of both the distal and proximal extreme of each cell. This is a well-known austral species occurring in the northern Andes, southern South America, several subantarctic islands, the maritime Antarctic, South Africa, and temperate Australasia (Ochyra & Newton 1985, Ochyra et al. 2008). In Chile it is present from the Metropolitan Region to Cape Horn (He 1998), and in Argentina it has been reported from Tierra del Fuego and the Falkland Islands (Matteri 2003). Churchill & Linares (1995) discuss under *Dicranella convoluta* (Hampe) A.Jaeger, that it could possibly be a synonym of *D. campylophylla*. Judging by their illustrations (Fig. 67: g–j), we agree with their taxonomic conclusions, but they failed to observe that Hampe’s name would have priority over Taylor’s, since Taylor’s name is 18 years older than Hampe’s. We prefer not to propose *D. convoluta* as another synonym of *D. campylophylla* until we observe the type material of the former name.

3. *Dicranella circinata* Herzog, Rev. Bryol. Lichénol. 23: 71. 1954.

No further comments on this species are needed.

4. *Dicranella elegans* (Duby) Larraín, **comb. nov.**

Dicranum elegans Duby, Mém. Soc. Phys. Genève 20: 353. Pl. 1, Fig. 1. 1870. ≡ *Dichodontium elegans* (Duby) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1877–78: 370 (Gen. Sp. Musc. 2: 634). 1879. ≡ *Aongstroemia elegans* (Duby) Broth., Nat. Pflanzenfam. I(3): 308. 1901. ≡ *Anisothecium elegans* (Duby) Thér., Rev. Bryol. Lichénol. 7: 170. 1935. Type citation: Ad Valdivia (Chili) detectum a. cel. Cumming [sic] inter herb. Hedwig-Schwägrichen specimina indeterminata asservatum. Type: G? (non vidi).

This species was first described by Duby (1870) based on an undetermined specimen in the Hedwig-Schwägrichen herbarium, collected by Hugh Cuming in Valdivia between 1826 and 1831. From the original description and illustrations it seems that the name could be a synonym of *Symblepharis krausei* (Lorentz) Ochyra & Matteri, but the type specimen must be located and studied before making this taxonomic change. Meanwhile, the species is transferred to *Dicranella* until more detailed studies are carried out.

5. *Dicranella fontana* (Herzog) Larraín, **comb. nov.**

Ditrichum fontanum Herzog, Rev. Bryol. Lichénol. 23: 70. 1954. ≡ *Anisothecium fontanum* (Herzog) Ochyra, Fragm. Flor. Geobot. 44: 242. 1999. Type citation: Südpole: Termas de Puyehue, Pichi Juan, auf Quellboden, leg. G.H.Schwabe, n° 85. Type: JE!

Ditrichum fontanum remained a neglected species until Ochyra (1999b) resurrected it and placed it in the genus *Anisothecium*, despite the sterile condition of the only collection known of this taxon, made by G.H.Schwabe in 1940 at Termas de Puyehue, in the Andes above Osorno, south-central Chile. We agree in all aspects with Ochyra's (1999b) taxonomic opinion, although the availability of fertile material of this species would confirm its definite systematic placement. The species is characterized by the long subulate, nonsheathing leaves, unistratose below and bistratose above, and by the presence of a weak border of quadrate cells in the shoulder region that contrast with the much longer inner laminal cells. The name is here transferred to *Dicranella* due to the agreement to cease using the genus name *Anisothecium*.

6. ***Dicranella hookeri*** (Müll.Hal.) Cardot, Bull. Herb. Boissier, sér. 2, 6: 4. 1906.

Aongstroemia hookeri Müll.Hal., Syn. Musc. Frond. 2: 607. 1851. ≡ *Anisothecium hookeri* (Müll.Hal.) Broth. in Engl., Nat. Pflanzenfam. (ed. 2) 10: 178. 1924. Type citation: [Chile] Insula Eremitae ad Cap. Horn: J.D.Hooker. Type: BM!

Aongstroemia patagonica Müll.Hal., Hedwigia 36: 98. 1897. ≡ *Dichodontium patagonicum* (Müll.Hal.) Paris, Index Bryol. Suppl. 114. 1900. ≡ *Dicranella patagonica* (Müll. Hal.) Broth. in Engl. & Prantl, Nat. Pflanzenfam. 1(3): 311. 1901. Type citation: [Argentina] Patagonia, inter 50°–52° lat. austr.: Moreno et Tonini in Museo de La Plata. Isotype: LIL! First synonymized by Ochyra (1999a).

Anisothecium perpusillum Dusén, Rep. Princeton univ. Exp. Patagonia, Botany 8(3): 66. Pl. 7, Fig. 1-2. 1903. ≡ *Dicranella perpusilla* (Dusén) Cardot, Wiss. Erb. Schwed. Südpolar-Exp. 4(8): 61. 1908. Type citation: [Argentina] Patagonia australis, ubi species verisimiliter in territorio fontinali fluminis Rio Chico lecta est. Type: S (non vidi). First synonymized by Newton (1977).

Meesia patagonica Dusén, Rep. Princeton Univ. Exp. Patagonia, Botany 8(3): 95. Pl. 11, Fig. 1. 1903. Type citation: [Argentina] speciei Patagonia australis, ubi verisimiliter in territorio fontinali fluminis Rio Chico lecta est. Isotype: H! First synonymized by Matteri & Ochyra (1999).

Like *Dicranella campylophylla*, *D. hookeri* is a very common species in southern South America. It was described by C.Müller based on material collected by Hooker at Hermite Island, Cape Horn. It is present in Chile from the Atacama Region (San Félix, Valle del Huasco, Larraín & Zegers 25125, CONC) to Cape Horn (He 1998), and in Argentina in Santa Cruz and Tierra del Fuego Provinces (Matteri 2003). It has a very similar distribution pattern to *D. campylophylla*, occurring in the northern Andes, southern South America, the maritime Antarctic, some subantarctic islands, South Africa, and temperate Australasia (Ochyra et al. 2008). It is similar to *D. campylophylla* in the shape of the leaves and general aspect, but it can be readily distinguished from the latter species by the smooth upper laminal cells, the widely spaced leaves, and the frequent presence of rhizoidal tubers that are 150 µm in diameter (in *D. campylophylla* the tubers are less frequent and up to 200 µm in diameter).

7. ***Dicranella pseudorufescens*** Cardot & Broth., Kongl. Svenska Vetenskapsakad. Handl. 63(10): 11. Pl. 1, Fig. 11. 1923.

≡ *Anisothecium pseudorufescens* (Cardot & Broth.) Broth., Nat. Pflanzenfam. (ed. 2) 10: 178. 1924. Type citation: [Chile] Patagonia austr.: Seno Otway, haud procul Rio Grande in declivi argilloso ad rivulum (142). Isotype: LIL!

Dicranella pseudorufescens Cardot & Broth. var. *leptoclada* Cardot & Broth., Kongl. Svenska Vetenskapsakad. Handl. 63(10): 11. 1923. ≡ *Anisothecium pseudorufescens* (Cardot & Broth.) Broth.

var. *leptocladus* (Cardot & Broth.) Kuhnem., Lilloa 2: 54. 1938. Type citation: [Chile] Patagonia austr.: Seno Otway, Río Grande, barranca ad oram maris (142). Isotype: LIL!, **syn. nov.**

This species is characterized by the falcate-secund, gradually narrowed lanceolate leaves, the absence of a differentiated sheathing leaf base, the laxly areolated leaf lamina, smooth laminal cells, entire subulae, and subglobose capsules. We were able to check the types of both varieties described by Cardot & Brotherus (1923) from collections made by Thor Halle and Carl Skottsberg in 1908 from Río Grande, Isla Riesco, Otway Sound, Magallanes, Chile (Halle 141, type of *D. pseudorufescens*, and Skottsberg 142, type of the var. *leptoclada*, both isotypes at LIL), and found that they seem to be ecological modifications of the same genotype. The var. *leptoclada* consists of slightly larger plants with thicker-walled leaf cells, and a stronger costa. All the diagnostic characters, however, are shared by the two specimens observed.

8. *Dicranella skottsbergii* Cardot & Broth., Kongl. Svenska Vetenskapsakad. Handl. 63(10): 10. Pl. 1, Fig. 12. 1923.

Anisothecium skottsbergii (Cardot & Broth.) Broth. in Engl., Nat. Pflanzenfam. (ed. 2) 10: 178. 1924. Type citation: [Chile] Patagonia austr.: Seno Otway, Ins. Riesco haud procul Río Grande, in declivi argilloso litoris marini (140). Isotype: LIL!

Dicranella skottsbergii was described based on a single collection made up of a few male plants collected by Carl Skottsberg from Río Grande, Isla Riesco, Otway Sound, Magallanes Province, Chile, in 1908 (Skottsberg 140, isotype at LIL). The plants are ca. 1 cm high, the leaves are decurrent and have an ovate base, weakly clasping the stems and ending in an abruptly contracted and entire subula, with smooth, small quadrate and obscure laminal cells at the shoulders, and a very narrow, thin nerve.

9. *Dicranella vaginata* (Hook.) Cardot, Wiss. Erb. Schwed. Südpolar-Exp. 4(8): 60. 1908.

Dicranum vaginatum Hook., Pl. Crypt. Pl. 3b. 1816. ≡ *Aongstroemia vaginata* (Hook.) Müll.Hal., Syn. Musc. Frond. 2: 608. 1851. ≡ *Anisothecium vaginatum* (Hook.) Mitt., J. Linn. Soc., Bot. 12: 39. 1869. ≡ *Dichodontium vaginatum* (Hook.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 363. 1872. Type citation: [Colombia] In convallibus Andinum Granatensium inter Almaguar et Pasto, altitud. 1200–1500 hexapod. Type: BM (non vidi).

Although we have not been able to see the type of *Dicranum vaginatum* Hook. from Colombia, collected between Almaguar and Pasto by A.Humboldt and A.Bonpland (Hooker 1816), after checking the detailed descriptions in Müller (1851) and Mitten (1869), and the discussion in Cardot (1908), the main character distinguishing this species from all other South American related species seems to be the dentate leaf subula. Cardot (1908) believed that the species was not present in southern South America and he states that the records for this taxon from the area are misdeterminations of *D. hookeri*. We have examined the original material of *Dicranella flexiseta* Dusén (Dusén 265, Colico, Cautín Province, Chile, NY!), a nomen nudum subsequently reported by Herzog & Hosseus (1938) from Valdivia (Hosseus 62, CONC!), and we could not place any of these specimens in any of the other species known for southern South America, mainly because of the presence of conspicuous teeth in the leaf subula of some leaves. The report of Dusén (1905) of *Aongstroemia vaginata*

from Colico seems to be based on this same specimen (Dusén 265). Additionally, we have checked the specimen recorded for Valdivia by Thériot (1934) as *D. vaginata* (Gunckel 3176, CONC!), and an unreported specimen from Arauco Province, south of Tirúa (Ireland & Bellolio 33318, CONC!). The plants are very similar in habit to *Aongstroemia gayana* (Mont.) Müll.Hal., and also share with the latter the isodiametric and obscurely areolated upper cells of the sheathing leaf base (at the shoulder region of the leaves). However, after observing an isotype of *A. gayana* at LIL (Gay s.n., Chili Austral), and several collections of this species deposited at CONC, we found that the denticulate subula is never present in this species, and would be a useful trait for separating the taxa (although some leaves of the Chilean "*D. vaginata*" have almost no teeth in the leaf subulae, so several leaves should be observed). When comparing the Chilean specimens with the original description and illustrations by Hooker (1816), we noted that the leaf margins in *D. vaginata* are described as crispate, and the individual leaf illustrations show leaves much more gradually contracted from base to subula, whereas in the Chilean specimens observed, the leaves are abruptly contracted into the canaliculated subula, presenting a well differentiated shoulder region. Despite these differences, we now prefer to treat these Chilean specimens mentioned above with dentate subulae and straight leaf margins as *D. vaginata* until more exhaustive revisionary studies are undertaken.

Key to the southern South American species of *Dicranella*

- 1 Leaves with a more or less enlarged, sheathing base, abruptly to gradually contracted into a narrow, erect to squarrose subula..... 2
- 1' Leaves lacking an enlarged and sheathing base, gradually narrowing from base to apex..... 8
- 2 Distal subula long, more than four times longer than the clasping base, often circinate; peristome greatly reduced..... *D. circinata*
- 2' Distal subula at most three times longer than the clasping base, erect or falcate-secund, never circinate; peristome well developed, made up of 16 teeth, often divided to the middle or below..... 3
- 3 Upper leaf cells strongly mammillose, with double mammillae, one on each cell extreme.....
..... *D. campylophylla*
- 3' Upper leaf cells smooth..... 4
- 4 Distal part of subula with scattered teeth..... *D. vaginata*
- 4' Distal part of subula entire and smooth, with no teeth at all..... 5
- 5 Leaves undulated, even when wet..... *D. elegans*
- 5' Leaves not undulated..... 6
- 6 Leaves with conspicuous decurrencies..... *D. skottsbergii*
- 6' Leaves not decurrent..... 7
- 7 Leaves strongly clasping the stem; stems densely foliated; subula abruptly contracted, long and flexuose, two times longer than the clasping base or more; leaf lamina at shoulder region unistratose
..... *D. aulacocarpa*
- 7' Leaves slightly clasping the stems, widely spaced along stems; subula less abruptly contracted, not flexuose, as long as the sheathing base or a bit longer, rarely two times longer than the base; leaf lamina at shoulder region bistratose..... *D. hookeri*
- 8 Lower costa in cross section differentiated, with guide cells, a stereid band, and dorsal epidermis
..... *D. fontana*
- 8' Lower costa in cross section homogeneous, made up of a group of 10–15 undifferentiated cells
..... *D. pseudorufescens*

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