

Didymodon coquimbensis (Pottiaceae), a new species from Chile

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ABSTRACT. A new moss species, *Didymodon coquimbensis* J. A. Jiménez & M. J. Cano, is described from Coquimbo Region in northern Chile. It is characterized mainly by its spirally twisted leaves when dry, the red to orange color in KOH, leaf apex strongly cucullate, costal guide cells in three layers with 5–9 cells in each layer, and a bulging ventral costal pad of cells. Drawings and SEM photographs of the main characters are given, and possible confusion with other closely related taxa is discussed.

KEYWORDS. Chile, *Didymodon coquimbensis*, Pottiaceae, taxonomy.



While examining Chilean collections of *Didymodon* Hedw. preserved in the herbarium of the Universidad de Murcia (MUB), for a taxonomic revision of this genus in South America, we came across a striking species. This specimen was found in the north of the Coquimbo Region, growing with *Pseudocrossidium chilense* R. S. Williams on taluses in dry places at 890 m. At first sight, the specimen is quite similar in aspect to some members of *Pseudocrossidium* R. S. Williams. However, a careful study of the specimen led us to the conclusion that it belongs to the genus *Didymodon*. Nevertheless, it was not referable to any known *Didymodon* species. Later the senior author had the opportunity to study the *Didymodon* and *Pseudocrossidium* holdings at MO where two additional specimens were found attributable to this species, but identified as *Pseudocrossidium apiculatum* R. S. Williams. Furthermore, both specimens were also collected in Coquimbo Region, close to the previous locality. After studying the types of the American taxa attributed to *Didymodon* and after comparing the specimens with the relevant literature, for example Allen (2002), Jiménez (2006), Magill (1981), Li et al. (2001) and Zander (1993, 2007), we concluded that these samples correspond to an undescribed taxon of

Didymodon. The new species is described, illustrated and compared with other closely related species.

Didymodon coquimbensis J.A. Jiménez & M.J. Cano,
sp. nov. **Figs. 1–7**

Folia exsiccatione spiraliter contorta, ovata vel ovato-lanceolata sed apice valde cucullata; lamina quidem, addito KOH, rubro-aurantiacas vel rubra; nervo lato, percurrenti, cellulis autem dorsalibus elongatis laevibusque, sectione transverse peracta eurycystes (bi-)tristratas monstranti, stereidis ventralibus carenti; laminae cellulis mediis atque superioribus quadratis vel subquadratis aut subrectangularibus, papillosis, cellulis quidem basalibus bene distinctis. Sporophytum ignotum.

TYPE: CHILE. COQUIMBO (IV REGIÓN): pr. Hurtado, 30°04'53"S, 70°43'39"W, 890 m, 15 Nov 2001, M. J. Cano 166a (MUB, holotype; BM, CONC, MO, isotypes).

Description. Plants to 1 cm high, growing in dense turfs, black to green-black; stems erect, simple or sometimes branched, without hyalodermis, sclerodermis developed, central strand present; axillary hairs filiform, 4–6 cells long, with 1 brown basal cell and hyaline upper ones; rhizoidal tubers absent.

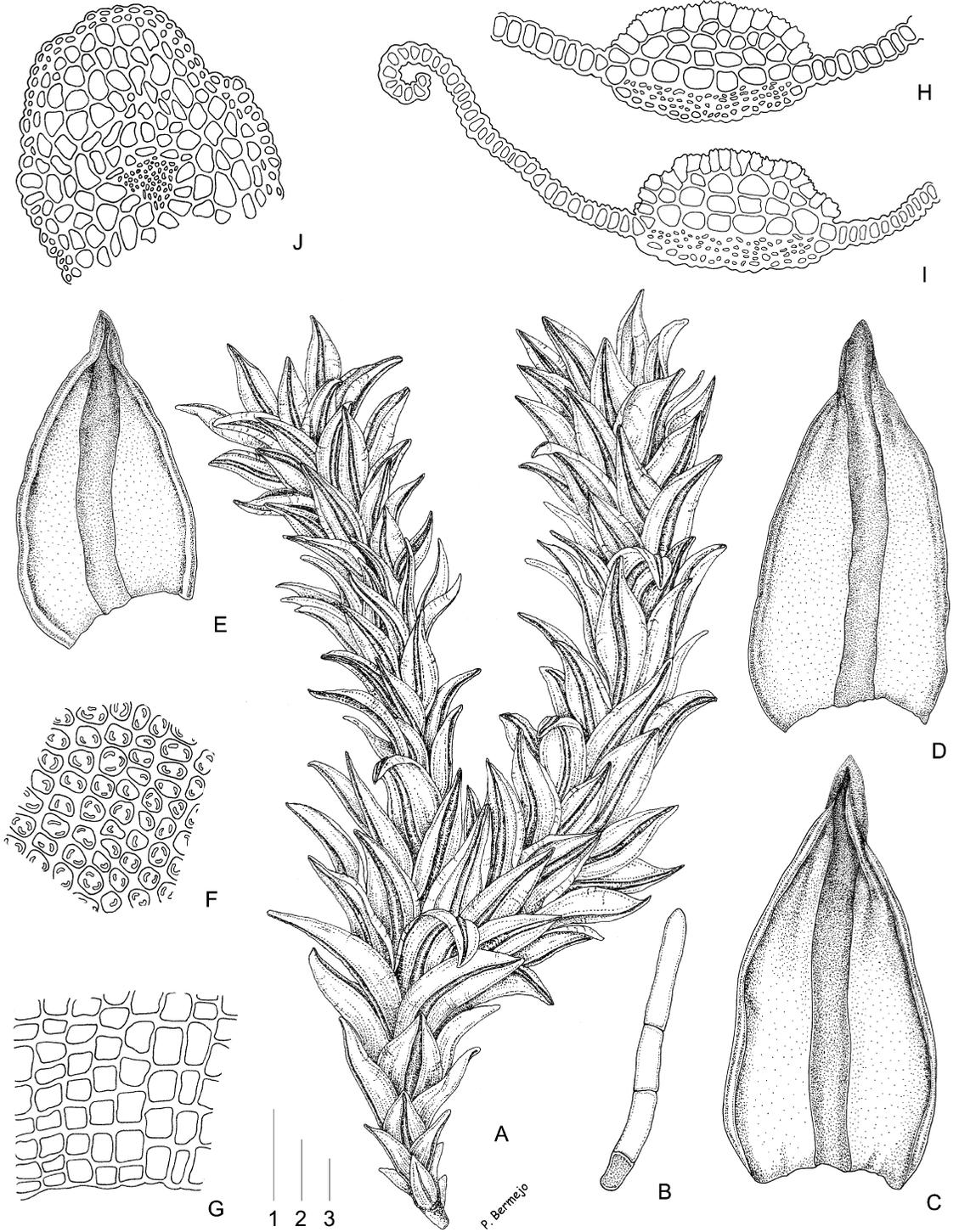
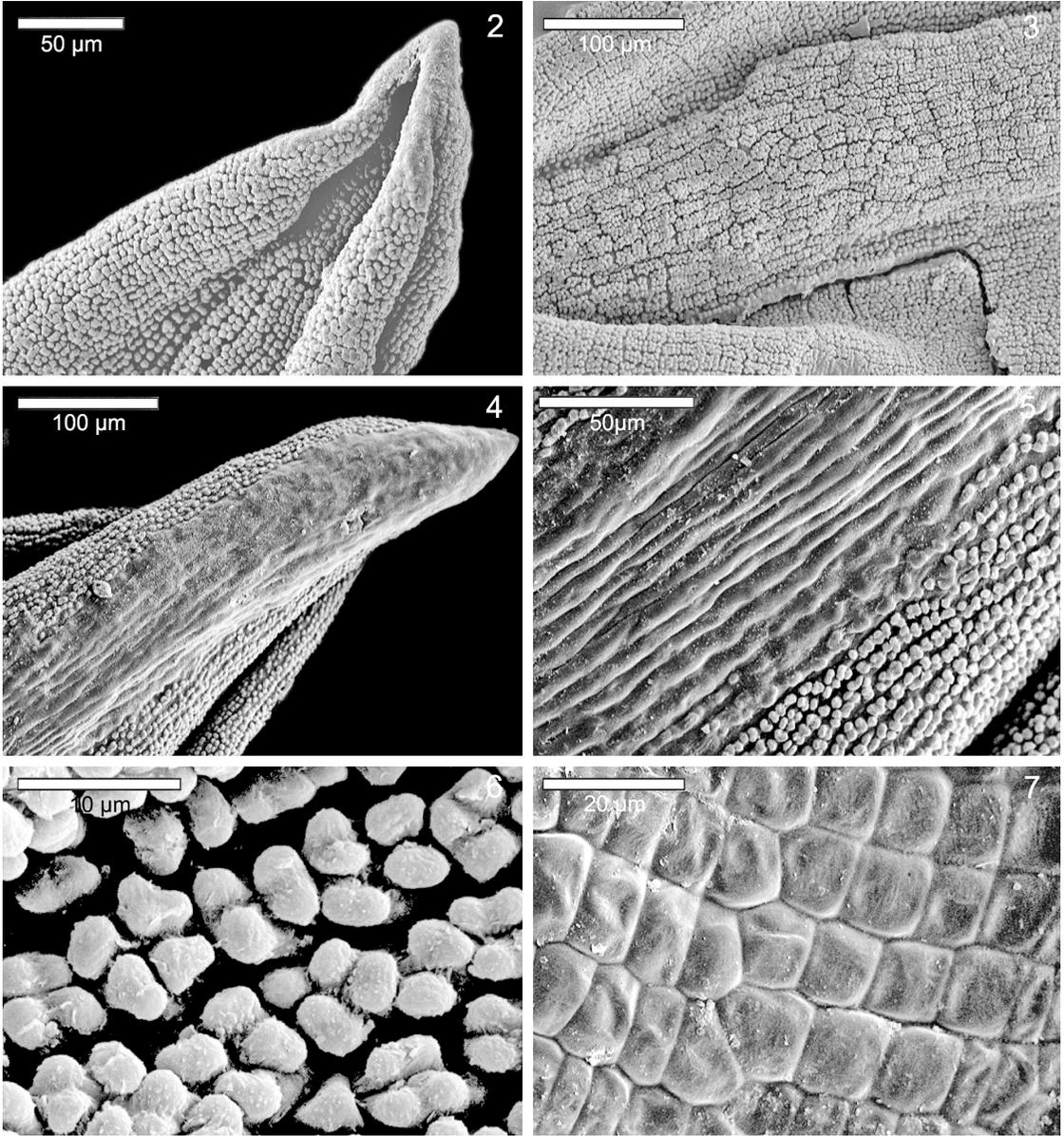


Figure 1. *Didymodon coquimbensis*. A. Habit, wet. B. Axillary hair. C–E. Leaves. F. Upper laminal cells. G. Basal laminal cells. H. Transverse section of the costa below midleaf. I. Transverse section of the costa at midleaf. J. Transverse section of stem. (All from the holotype). Scale bars: 1 = 1 mm (A); 2 = 0.25 mm (C–E); 3 = 25 μ m (B, F–J).



Figures 2–7. *Didymodon coquimbensis*. 2. Ventral surface of leaf apex. 3. Ventral surface of the costa in upper leaf. 4. Dorsal surface of leaf apex. 5. Dorsal surface of the costa in upper leaf. 6. Upper laminal cells. 7. Basal laminal cells. (All from the holotype).

Leaves spirally twisted around the stem when dry, erect-spreading when moist, ovate or ovate-lanceolate, seldom triangular, $0.8\text{--}1.7 \times 0.4\text{--}0.7$ mm; lamina unistratose, KOH+ red to orange; apex obtuse, strongly cucullate; margins entire, broadly recurved from base to the apex, occasionally bistratose near the apex; costa strong, generally widest at midleaf, $80\text{--}160$ µm wide, percurrent, not spurred; ventral cells of the costa in the upper middle of the leaf quadrate,

papillose, dorsal cells of the costa in the upper middle of the leaf elongate, smooth, in transverse section below midleaf elliptical, with (2–)3 layers of guide cells, with 5–9 cells in each layer, without ventral stereids, 2–3 layers of dorsal stereids, flat in shape, sometimes with hydroids, cells of the ventral surface layer bulging, papillose, those of the dorsal surface layer differentiated, smooth; upper and mid laminal cells quadrate, subquadrate or shortly rectangular,

often oblate near lower leaf margins, $5\text{--}11 \times 5\text{--}11 \mu\text{m}$, with 2–4 simple or bifurcate papillae per cell, thick-walled; basal cells mostly quadrate, sometimes shortly rectangular, $7\text{--}24 \times 7\text{--}18 \mu\text{m}$, differentiated juxtacostally or across leaf, mostly hyaline, smooth, thick-walled. Gemmae absent. Sexual condition apparently dioicous, only archegonia present, terminal on stem. Sporophytes unknown.

Additional specimens examined. CHILE. COQUIMBO (IV REGIÓN): Elqui, Quebrada San Carlos, 12 Oct 1984, Mahú 23753, 20846 (MO).

Etymology: The specific epithet refers to the geographical region where this species occurs.

Distribution and ecology. The two localities where *Didymodon coquimbensis* was collected are situated in the north of Coquimbo Region, Elqui province, near the Elqui River at 670 and 890 m. This area is characterized by a Mediterranean climate with an average annual temperature of 15.5°C , and precipitation of 157 mm per year. The dry season lasts approximately 8–10 months yearly. From a bioclimatic viewpoint, these localities belong to the Thermomediterranean belt with an arid ombrotype (Amigo & Ramírez 1998; Di Castri & Hajek 1976). In these conditions the vegetation is formed mainly by different species of Cactaceae, shrubs of the Asteraceae (such as *Flourensia thurifera*), *Puya* sp. and *Adesmia* sp. *Didymodon coquimbensis* occurs on very dry, sandy and exposed soils and taluses where it is mixed with other species with xeromorphic habits such as *Aloina roseae* (R. S. Williams) Delgad., *Pseudocrossidium chilense* R. S. Williams, *Didymodon australasiae* (Hook. & Grev.) R. H. Zander and *D. fuscus* (Müll. Hal.) J. A. Jiménez & M. J. Cano.

Discussion. *Didymodon nevadensis* R. H. Zander, an endemic species of western North America known from Canada (British Columbia), the United States (Colorado, Nebraska, Nevada, New Mexico, Texas) and northern Mexico (Chihuahua) (Zander 2007; Zander et al. 1995) appears to be the most closely related species. Characters such as the disposition of the leaves when dry, shape of the leaves, stratification and curvature of the leaf margins, and the percurrency of the costa are common to both species. However, *D. nevadensis* has a costa of 7–9 cells wide at midleaf, quadrate or shortly rectangular dorsal cells of the costa, the leaf apex commonly ending in a conical cell and the occasional

presence of rhizoidal tubers or axillary gemmae. On the other hand, *D. coquimbensis* has a rather wider costa at midleaf (more than 14 cells), elongate dorsal cells of the costa, lack of an apical conical cell, and no observed mechanism of asexual reproduction. Moreover, the new species can be differentiated from *D. nevadensis* by its striking anatomical structure of the costa which shows in transverse section 15–22 guide cells in three layers, whereas *D. nevadensis* has (5–)6(–7) guide cells in two layers.

This anatomical structure of the costa is unusual in *Didymodon* but is, for example, found in some species from the Southern Hemisphere such as *D. fuscus* and *D. luehmannii* (Broth. & Geh.) Catches.

Didymodon fuscus, a species recently transferred to *Didymodon* and an endemic of Chile and Argentina (Jiménez & Cano 2006), could be confused with *D. coquimbensis*. In addition to sharing a similar costa structure, both species have other similarities such as the leaves twisted when dry and the color of the lamina with KOH, but the smooth laminal cells, acute leaf apex and margins often bistratose distinguish *D. fuscus*.

Another close taxon is the Australian *Didymodon luehmannii* [holotype: Victoria, ad Loutit Bay, 1891, *Luehmann 608*, H-BR!]. It, like *D. coquimbensis*, has strongly papillose laminal cells, leaf margins recurved, transverse section of the costa without ventral stereids, numerous guide cells in three layers and the cells of ventral surface of the costa bulging. However, *D. luehmannii* differs in having leaves longly lanceolate with an acute leaf apex, an excurrent costa and a dorsal stereid band semicircular in shape. In contrast, *D. coquimbensis* has leaves ovate or ovate-lanceolate, an obtuse leaf apex, the costa percurrent and the dorsal stereid band flat in shape.

Some of the morphological characters shown by *Didymodon coquimbensis*, such as the color of the plants, the stance of the leaves when dry, the cucullate leaf apex, the lack of a ventral stereid band and hyaline basal cells are also found in *D. australasiae*. Small plants of *D. australasiae* possess much the same appearance as the new species; in addition, both species share similar ecological requirements, and sometimes grow together. Nevertheless, this species can be recognized readily from *D. coquimbensis* by its plane and bi- to tristratose margins in the upper part of the leaves.

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LITERATURE CITED

- Allen, B. 2002. Moss flora of Central America, Part 2. Encalyptaceae–Orthotrichaceae. Monographs in Systematic Botany from Missouri Botanical Garden 90: 1–669.
- Amigo, J. & C. Ramírez. 1998. A bioclimatic classification of Chile: woodland communities in the temperate zone. *Plant Ecology* 136: 9–26.
- Di Castri, F. & E. Hajek. 1976. *Bioclimatología de Chile*. Universidad Católica de Chile, Santiago de Chile.
- Jiménez, J. A. 2006. Taxonomic revision of the genus *Didymodon* Hedw. (Pottiaceae, Bryophyta) in Europe, North Africa and Southwest and Central Asia. *Journal of the Hattori Botanical Laboratory* 100: 211–292.
- & M. J. Cano. 2006. Two new combinations in *Didymodon* (Pottiaceae) from South America. *The Bryologist* 109: 391–397.
- Li, X.-J., M. R. Crosby & S. He. 2001. Moss Flora of China English version, vol. 2. Fissidentaceae–Ptychomitriaceae. Science Press & Missouri Botanical Garden Press. Beijing-St. Louis.
- Magill, R. E. 1981. Flora of Southern Africa. Bryophyta, Part 1, Mosses. Fasc. 1: Sphagnaceae–Grimmiaceae. Botanical Research Institute, Department of Agriculture and Fisheries, Pretoria.
- Zander, R. H. 1993. Genera of the Pottiaceae: mosses of harsh environments. *Bulletin of the Buffalo Society of Natural Sciences* 32: 1–378.
- . 2007. *Didymodon*. In *Flora of North America* Editorial Committee (eds.), *Flora of North America North of Mexico*, vol. 27. Bryophyta, part 1. Oxford University Press, New York and Oxford.
- , L. R. Stark & G. Marrs-Smith. 1995. *Didymodon nevadensis*, a new species for North America, with comments on phenology. *The Bryologist* 98: 590–595.

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