

## A new species of *Didymodon* Hedw. (Pottiaceae, Bryophyta) from Peru

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*Didymodon incurvus* J. A. Jiménez & M. J. Cano, is described and illustrated as a new species based on specimens collected from the Puno department in southern Peru. The new taxon is distinguished from others species of the genus by its oblong-lanceolate and appressed leaves when dry, incurved margins above midleaf, and the presence of a bulging ventral costal pad of cells. A key to species of *Didymodon* in Peru is provided. © 2008 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2008, 156, 221–226.

ADDITIONAL KEYWORDS: Musci – Neotropics – taxonomy.

### INTRODUCTION

In the course of a revision of the genus *Didymodon* for South America (cf. Jiménez & Cano, 2006), Peruvian material, recently collected by the second author, was examined. Among these collections, several specimens of an interesting taxon were found that did not match the concept of any of the species known in the genus. The specimens, collected on volcanic soils from different localities of Puno (southern Peru), are apparently similar to *Didymodon revolutus* (Cardot) R. S. Williams, a pantropical species that occurs in the USA, Mexico, Guatemala, Ecuador and Yemen (Jiménez, Ros & Cano, 2003). However, a detailed study of this material revealed that these specimens are differentiated amongst other characters by their incurved leaf margins. This distinctive feature is unique within *Didymodon*, which indicates that these samples merit recognition as a distinct species.

There are no studies of *Didymodon* in Peru; in fact, no identification key for the Peruvian species exists. For this reason, we include here a key that allows its identification.

### MATERIAL AND METHODS

Microscopic examination and measurements were undertaken using an Olympus-BH2 light microscope, while microphotographs were obtained with a spot insight 3.5 camera mounted on this microscope. The leaf surface was studied using a Jeol JSM-6100 SEM. The material was fixed in 3% glutaraldehyde with 0.1 M cacodylate buffer at 4 °C, washed in cacodylate and saccharose buffer, dehydrated in an increasing acetone gradient (30, 50, 70, 90 and 100%), critical-point dried and sputtered with a gold layer 200–300 Å thick.

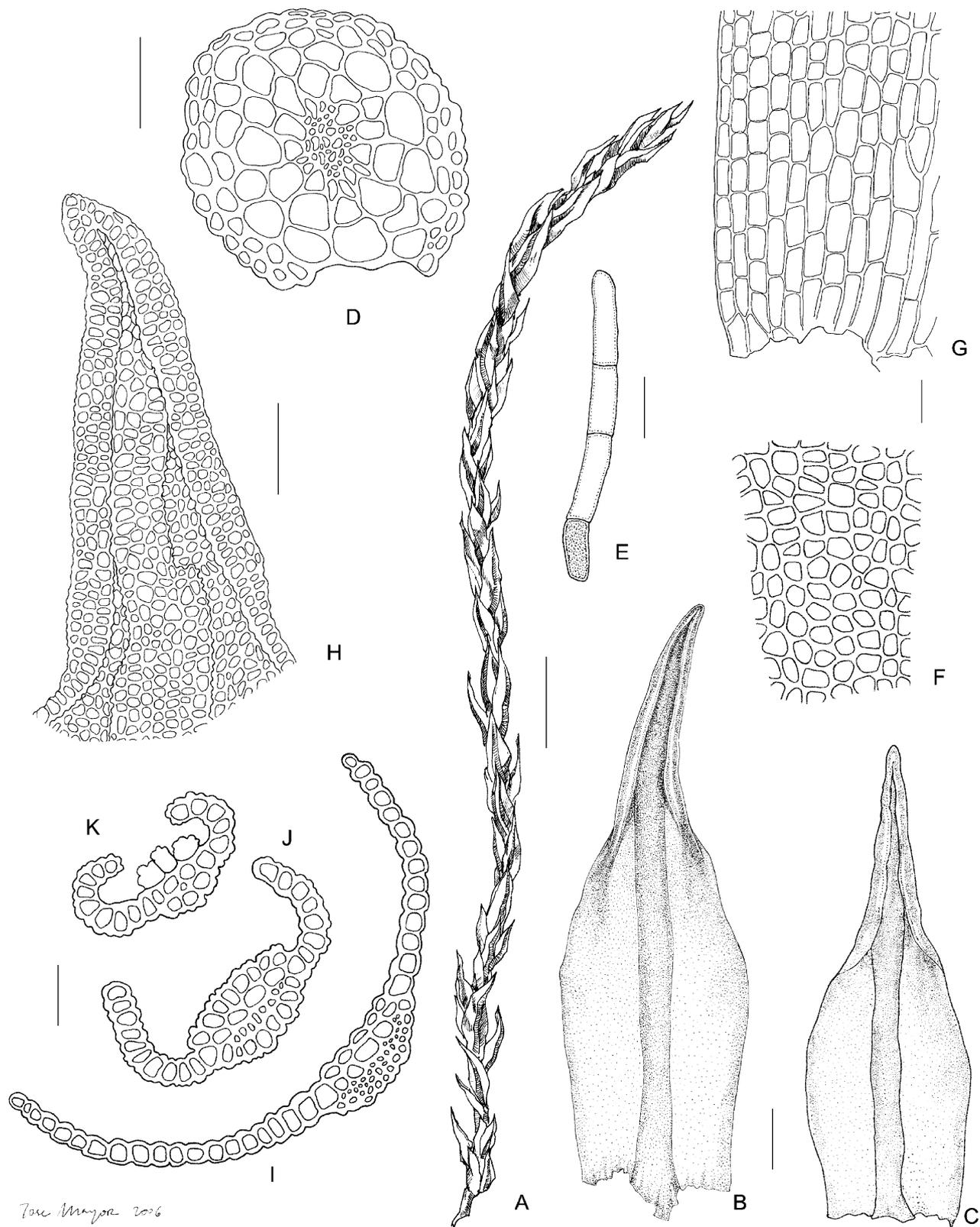
### SPECIES DESCRIPTION

*DIDYMODON INCURVUS* J. A. JIMÉNEZ & M. J. CANO  
SP. NOV. (FIGS 1–13)

*Type:* Peru. Puno, pr. Putina, 14°46'54'S, 69°59'15'W, 3970 m, 5.iv.2005, *M. J. Cano 2279b* (Holotype: MUB 20703; isotype: MO).

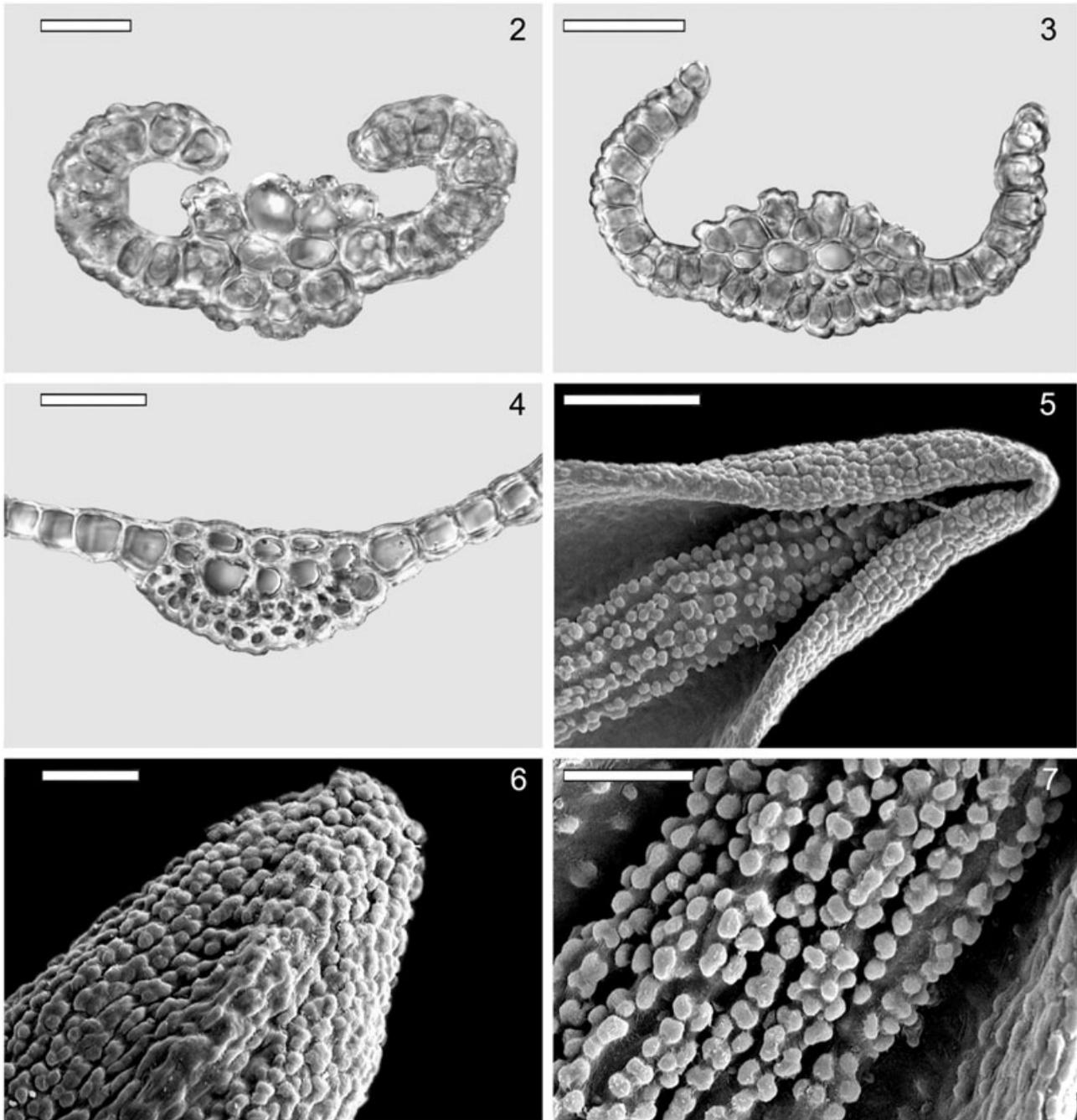
*Diagnosis:* Folia exsiccatione adpressa, oblongo-lanceolata, in dimidia superiore parte margine incurvata; nervo ut plurimum apicem attingenti sed nunquam excurrenti, sectione transverse peracta eurycystes monostratas monstranti, stereidis carenti;

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**Figure 1.** *Didymodon incurvus* (from the holotype). A, habit. Scale bar, 0.1 cm. B, C, leaves. Scale bar, 0.1 mm. D, transverse section of stem. Scale bar, 50 µm. E, axillary hair. Scale bar, 20 µm. F, upper laminal cells. Scale bar, 25 µm. G, basal laminal cells. Scale bar, 20 µm. H, leaf apex. Scale bar, 60 µm. I, J, K, leaf cross-sections. Scale bar, 35 µm.

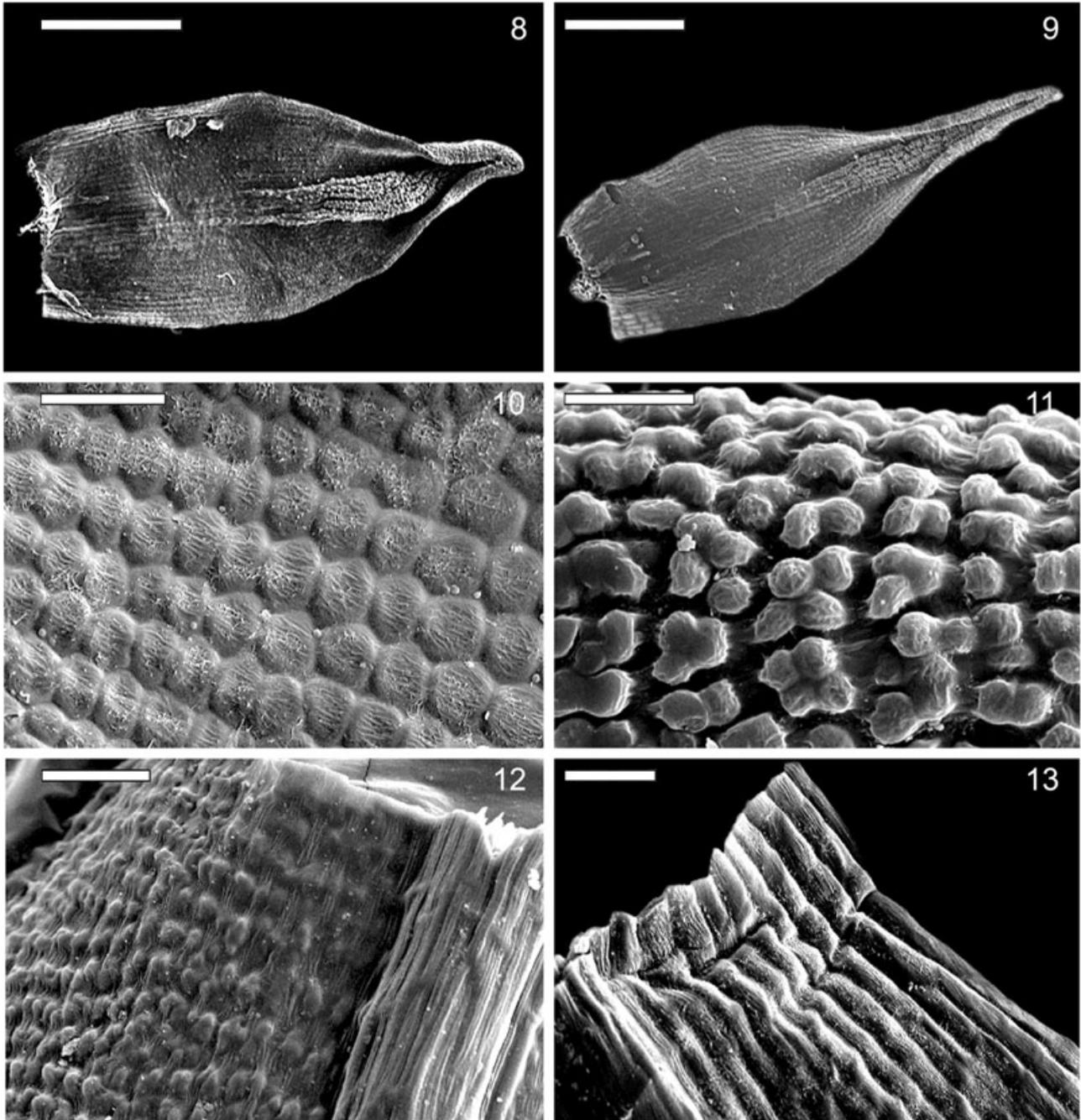


**Figures 2–7.** *Didymodon incurvus* (from the holotype). Fig. 2. Cross-section at upper leaf. Scale bar, 25  $\mu\text{m}$ . Fig. 3. Cross-section at midleaf. Scale bar, 40  $\mu\text{m}$ . Fig. 4. Cross-section at leaf base. Scale bar, 30  $\mu\text{m}$ . Fig. 5. Ventral surface of leaf apex. Scale bar, 50  $\mu\text{m}$ . Fig. 6. Dorsal surface of leaf apex. Scale bar, 20  $\mu\text{m}$ . Fig. 7. Ventral surface of the costa in the upper middle of the leaf. Scale bar, 20  $\mu\text{m}$ .

laminae cellulis mediis atque superioribus quadratis fere aut brevi rectangularibus. Sporophytum ignotum.

*Description:* Plants 0.2–1.4 cm high, growing in loose turfs, olive-green or brown-green, rarely brownish. Stems erect, simple, hyalodermis absent or some-

times present in patches, central strand differentiated, sclerodermis weakly developed or absent; axillary hairs filiform, 3–6 cells long, the basal cell brown and the remainder hyaline; rhizoidal tubers absent. Leaves appressed when dry, erect-patent to patent when moist, oblong-lanceolate, abruptly



**Figures 8–13.** *Didymodon incurvus* (from the holotype). Figs 8, 9. Leaves. Scale bar, 200 µm. Fig. 10. Ventral upper laminal cells. Scale bar, 20 µm. Fig. 11. Dorsal upper laminal cells. Scale bar, 10 µm. Figs 12, 13. Basal laminal cells. Scale bar, 25 µm.

narrowed to the apex, not decurrent at base, 0.45–1.2 × 0.2–0.45 mm; lamina unistratose, green to yellowish with KOH; apex obtuse; margins entire, plane in the lower middle part, incurved in the upper part of the leaf, unistratose. Costa 40–80 µm wide at leaf base, ending below the apex or percurrent, seldom spurred; ventral cells of the costa just above

midleaf quadrate, bulging, papillose; dorsal cells of the costa just above midleaf quadrate or shortly rectangular, smooth or papillose; transverse section semicircular, with 3–4 guide cells in 1 layer, with no ventral stereids and 1–2 layers of dorsal stereids, without hydroids; ventral surface cells of costa bulging, papillose, dorsal surface cells differentiated,

KEY TO SPECIES OF *DIDYMODON* IN PERU

1. Leaf margins incurved in the upper part of the leaf.....*D. incurvus*
1. Leaf margins plane, recurved or revolute in the upper part of the leaf.....2
2. Ventral cells of the costa elongated in upper leaf.....3
2. Ventral cells of the costa quadrate to shortly rectangular in upper leaf.....4
3. Leaves ligulate to oblong-lanceolate, usually with an obtuse or rounded apex; costa generally ending several cells below the apex, very rarely percurrent.....*D. topiaceus*
3. Leaves lanceolate, with apex acute; costa percurrent or shortly excurrent.....*D. laevigatus*
4. Basal laminal cells clearly differentiated from the rest, hyaline.....5
4. Basal laminal cells not differentiated, not hyaline.....6
5. Stems with hyalodermis; leaves long-lanceolate; basal marginal cells clearly differentiated, long-rectangular to elongate, in 2–6 rows.....*D. umbrosus*
5. Stems without hyalodermis or occasionally present in patches; leaves oblong-lanceolate to lanceolate, ovate or triangular; basal marginal cells not or weakly differentiated, quadrate to shortly rectangular.....*D. australasiae*
6. Lamina entirely or mostly bistratose in the upper half.....7
6. Lamina unistratose.....8
7. Costa percurrent; laminal cells papillose.....*D. minusculus*
7. Costa long-excurrent as a subula; laminal cells smooth.....*D. rigidulus* var. *subulatus*
8. Lamina red or brown-reddish with KOH.....9
8. Lamina green or yellow with KOH.....10
9. Transverse section of the costa with 2–3 layers of ventral stereids, with a bulging layer of cells on the ventral surface.....*D. pruinus*
9. Transverse section of the costa without ventral stereids, without a bulging layer of cells on the ventral surface.....*D. vinealis*
10. Leaf margins unistratose, apex sharp, not thickened, plants without gemmae in the axils of the leaves.....*D. rigidulus* var. *gracilis*
10. Leaf margins bistratose in the upper part, apex blunt, thickened, plants generally with gemmae in the axils of the leaves.....11
11. Leaves strongly incurved when dry, leaf margins plane or slightly recurved above midleaf, upper and middle laminal cells rounded to oval.....*D. humboldtii*
11. Leaves appressed when dry, leaf margins recurved from base to 1/2 or 3/4 of the leaf, upper and middle laminal cells quadrate.....*D. rigidulus* var. *rigidulus*

smooth or papillose. Upper and middle laminal cells rounded, subquadrate, shortly rectangular or oblate, 4–18 × 5–14 µm, smooth or with 1–4 low, simple or bifurcate papillae per cell, thick-walled; basal cells rectangular to shortly rectangular, 14–40 × 8–14 µm, not differentiated in shape from the rest, not hyaline, smooth, seldom papillose, generally thick walled. Gemmae absent. Sexual condition unknown. Sporophyte unknown.

*Etymology:* The specific epithet for this new species refers to the incurved margins of the leaves, which are unique in the genus *Didymodon*.

*Distribution:* Peru, endemic.

*Ecology:* *Didymodon incurvus* grows in the Puna at 3915–4510 m on soil and taluses among volcanic rocks together with *Bryoerythrophyllum bolivianum* (Müll. Hal.) R. H. Zander, *Ceratodon purpureus* (Hedw.) Brid. and *Syntrichia percarcosa* (Müll. Hal.) R. H. Zander.

*Additional specimens examined:* PERU. PUNO: Collacachi, 15°59'16"S, 70°01'05"W, 10.iv.2005, *M. J. Cano 2315b* (MUB 20621). Huaychuni, 16°23'27"S, 70°18'24"W, 10.iv.2005, *M. J. Cano 2347d* (MUB 20651).

## DISCUSSION

*Didymodon incurvus* is a distinct species characterized by leaves which are oblong-lanceolate, appressed when dry, lamina unistratose, green to yellowish with KOH, apex obtuse, margins incurved above midleaf, transverse section of the costa without ventral stereids, and by the presence of a bulging ventral costal pad of cells. The incurved margins are a unique feature of this new species within the genus *Didymodon*. According to Zander (1993), the presence of stem, occasionally with a hyalodermis, leaf margins not decurrent, adaxial stereid band absent, and KOH colour reaction yellow suggests its placement in the sect. *Asteriscium* (Müll. Hal.) R. H. Zander.

The most closely related taxon to this new species seems to be *Didymodon revolutus*, which is also in

sect. *Asteriscium*, and which shares such characters as leaves appressed when dry, leaf margins plane in the lower part of the leaves, costa ending below the apex or percurrent, costa structure, and the colour of the lamina with KOH. However, *D. revolutus* has ovate or elliptical leaves with apex cucullate, margins revolute above, and costa strongly spurred above midleaf. Moreover, *D. revolutus* can have unicellular gemmae in the leaf axils (Zander, 1994, 2007), while *D. incurvus* lacks them.

*Didymodon australasiae* (Hook. & Grev.) R. H. Zander and *D. umbrosus* (Müll. Hal.) R. H. Zander, two widely distributed species, are in many respects similar to *D. incurvus*, and could be confused with it, but both differ from *D. incurvus* by their leaves being crisped, twisted or incurved when dry, leaf margins plane or lightly recurved and bi- to tristratose above midleaf, and basal laminal cells differentiated (Jiménez *et al.*, 2005; Jiménez, 2006).

Another species with a bulging ventral costal pad of cells is the Andean *D. pruinus* (Mitt.) R. H. Zander, but it has revolute margins, lamina red in colour with KOH solution, and transverse section of the costa with two stereid band.

In general appearance, this new species resembles *D. rigidulus* var. *gracilis*. However, this latter species has an acute leaf apex (obtuse in *D. incurvus*), leaf margins recurved (incurved in *D. incurvus*), and ventral surface cell layers of the costa not bulging.

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