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New records and range extension of some mosses in tropical areas of Chile

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Abstract: A total of thirteen mosses are reported as new for Chile: *Aloinella andina* Delgad., *Coscinodontella bryanii* R.S. Williams, *Didymodon acutus* (Brid.) K. Saito, *Erythrophylopsis fuscula* (Müll. Hal.) Hilp., *Fissidens excurrentinervis* R.S. Williams, *Grimmia molesta* J. Muñoz, *Grimmia pseudoanodon* Deguchi, *Jaffueliobryum williamsii* (Deguchi) Delgad., *Leptopteriginandrum austroalpinum* Müll. Hal., *Pseudocrossidium elatum* (R.S. Williams) Delgad., *Rhexophyllum subnigrum* (Mitt.) Hilp., *Saitobryum lorentzii* (Müll. Hal.) Ochyra, and *Syntrichia fragilis* (Taylor) Ochyra. In addition, *Grimmia plagiopodia* Hedw., which was previously known from Southern Chile, is reported ca. 3500 km more to the north, near the Bolivian border.

Introduction

Northern Chile from the border with Peru and Bolivia to the Tropic of Capricorn has a strong tropical influence. The cold running Humboldt, which provides Antarctic water from the south, and the Peruvian deep trough, which provides cold water from the depths of the Pacific Ocean, are responsible for the presence of one of the aridest deserts in the world (Atacama) as opposed to the tropical forests. In the interior of the country, near the Bolivian border, the territory rises abruptly, coming under the influence of the Bolivian „altiplano“. This area is included in the so-called Bloque Andino Central, an Andine meseta of ca. 3800 m, where the vegetation is

influenced by the summer rain (December to March) and the height above sea level. In these conditions, the vegetation, known in general as „puna“, is formed at lower altitudes by different species of Cactaceae, such as *Browningia candelaris* Britton & Rose, some grasses and shrubs such as *Baccharis boliviensis* (Wedd.) Cabrera, *Mentzelia ignea* (Phil.) Urb. & Gilg, *Trixis cacalioides* D. Don and *Viguiera pazensis* Rusby. From 3600 m to 4000 m, the vegetation consists mainly of small shrubs represented mainly by Asteraceae, such as *Parastrephia quadrangularis* (Meyen) Cabrera or *Senecio nutans* Sch. Bip. and above 4000 m, the

predominant vegetation is formed by the cushions of *Azorella compacta* Phil. and *Pycnophyllum molle* Remy and a tree *Polylepis tarapacana* Phil. (Grau 1995).

From the bryological point of view, there are few data concerning collections in these areas. Thus, according to He (1998), there was no record from Tarapacá (Región I) and only 8 mosses were reported from Antofagasta (Región II): *Bryum orthothecium* Cardot & Broth., *Cratoneuron filicinum* (Hedw.) Spruce, *Crossidium roseae* R.S. Williams, *Juratzkaea seminervis* (Kunze ex Schwägr.) Lorentz, *Leptobryum stellatum* (Herzog) Broth., *Pseudocrossidium replicatum* (Taylor) R.H. Zander, *Pseudoleskea chilensis* (Lorentz) Ochyra and *Syntrichia scabrinervis* (Müll.Hal.) R.H. Zander.

The mosses presented in this paper were collected during an expedition to the „tropical alpine“ areas of Tarapacá and Antofagasta Regions in Chile that took place in November 2001 by the author. All the specimens cited are deposited in MUB and duplicates, if available, in CONC.

Annotated list of species

Aloinella andina Delgad.

Tarapacá (Región I): pr. Putre, 18°12'05"S, 69°32'34"W, *Cano 217*; pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 265b*. New for Chile.

The new records were on exposed taluss at 3720 m among shrubs of Compositae and Cactaceae, and on hillside of *Polylepis besseri* Hieron. and Cactaceae at 3550 m. This species was only previously reported from Peru (Delgadillo 1975; Churchill et al. 2000). The Chilean material shows the typical characters provided by Delgadillo (1975): cucullate-tubulose leaf apex, papillae present on upper dorsal surface of the costa and leaf blade, upper leaf margin membranaceous and costa ending well below tip of hood. However, the lamina cells were less strongly papillose than the type material (holotype-NY!).

Coscinodontella bryanii R.S. Williams

Tarapacá (Región I): pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 253*; Pukará de Copaquilla, 18°23'02"S, 69°37'52"W, *Cano 274*. New for Chile.

This interesting species was only known from Matucana in Peru (Williams 1927; Murray 1984) and Bolivia (Churchill et al. 2000). The Chilean specimens were found on rocks on a hillside with *Polylepis besseri* at 3350 m and on soils accumulated at the base of rock at 3100 m in an open puna area. It is mainly characterized by its incurved, cucullate apex, bistratose lamina on the upper part and campanulate plicate calyptra. The Chilean specimen shows a less cucullate apex than the type material (isotype-PC!).

Didymodon acutus (Brid.) K. Saito

Tarapacá (Región I): pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 254a*. New for Chile.

This first reported sample of this rather wide-ranging species in Chile was collected on soil accumulated on rocks on a hillside with *Polylepis besseri* at 3350. According to Churchill et al. (2000), it was known from Venezuela, Colombia and Peru (sub *D. rigidulus* var. *gracilis* (Hook. & Grev.) R.H. Zander) in the tropical Andes. The sample shows the typical characteristic of this species: lanceolate leaves, costa excurrent, with quadrate superficial adaxial cells and smooth lamina cells.

Erythrophyllopsis fuscula (Müll. Hal.) Hilp.

Tarapacá (Región I): pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 270*. New for Chile.

This species was only known from some localities in Bolivia and Argentina (Grandstein et al. 2001). It is close to *Erythrophyllastrum andinum* (Sull.) R.H. Zander, but can be distinguished by the hyalodermis formed only by one layer of generally collapsed cells, longer lanceolate leaves, usually squarrose when moist, base more strongly sheathing with distinct shoulders and reniform costa transverse section and dorsal estereid band (in *E. andinum* both are semicircular) (Zander 1993). The new record was collected at 3350 m, in soil accumulated on rock on a hillside with *Polylepis besseri* and Cactaceae.

Fissidens excurrentinervis R.S. Williams

Antofagasta (región II): Geysers del Tatio, 22°20'28"S, 68°01'08"W, *Cano* 297. New for Chile.

This new record was found in a crevice of rock in an open puna area at 4260 m. It was easily recognized because it was fertile and showed the typically erect peristome teeth even when moist, irregularly divided and smooth below and spirally striate above. This taxon was known from Bolivia, Mexico and Peru (Pursell 1994).

Grimmia molesta J. Muñoz

Tarapacá (Región I), pr. Zapahuiria, 18°20'46"S, 69°33'18"W, *Cano* 255. New for Chile.

This taxon was described by Muñoz (1999) from a sole sample from Arequipa, Peru (*Hegewald & Hegewald* 5480). According to this author, the species is characterized by lanceolate, bistratose leaves with recurved margins, short straight setae, and immersed peristomate capsules with a compound and revoluble annulus. Also, the male buds arise at the ends of branches separated from the perichaetia. The Chilean specimen was found on exposed rock at 3350 m on a hillside with *Polylepis besseri*. It presented all the characters provided in the original description with the exception of the leaf margins, which were flat instead of recurved.

Grimmia plagiopodia Hedw.

Tarapacá (Región I): pr. Caquena, 18°06'02"S, 69°16'36"W, *Cano* 236.

Muñoz (1999) reported this species in South America from Santa Cruz and Mendoza (Argentina) and Magallanes (Chile). He (1998) reported it in XI Region of Chile. This reported, therefore, places it ca. 3500 km more to the north, near the Bolivian border. The samples presented all the characteristics of this species: unistratose leaves, with curved setae asymmetrically attaching to immersed, ventricose and peristomate capsules. Of note is the absence of hyaline hair-points in all the leaves, even in the perichaetial leaves unlike that recorded by Muñoz (1999) in the description of this species. However, the same author pointed out that South American specimens can present some mucous leaves and well within the expected normal range of variations of *G. plagiopodia*. The taxon was

collected on exposed rock with *Azorella* sp. in an open puna area at 4500 m.

Grimmia pseudoanodon Deguchi

Tarapacá (Región I): pr. Caquena, 18°06'02"S, 69°16'36"W, *Cano* 238a. New for Chile.

Species characterized by ovate to lanceolate leaves with flat margins and short, straight seta, which is centrally attached to the gymnostomous capsule. It was known from Argentina, Bolivia and Peru (Muñoz & Pando 2000). The new record grew on exposed rock at 4500 m in open puna areas.

Jaffuelobryum williamsii (Deguchi) Delgad.

Tarapacá (Región I): Pukará de Copaquilla, 18°23'02"S, 69°37'52"W, *Cano* 277b. New for Chile.

This taxon was described as an illegitimate name by Williams (1910) from an one specimen from Arequipa, Peru (*Grimmia julaceae* R.S. Williams). Deguchi (1987) substituted this illegitimate name by *Grimmia williamsii* Deguchi and suggested its relation with *Jaffuelobryum* Thér. Muñoz (1999), in his revision of Southern America *Grimmia*, included this as an excluded taxon and treated the name as a synonym of *J. wrightii* (Sull.) Thér. Finally, Delgadillo (2000) confirmed its inclusion in the genus *Jaffuelobryum* and provided convincing characters for considering this taxon at species level (*J. williamsii* (Deguchi) Delgad.). According to this latter author, *J. williamsii* is mainly characterized by julaceous stems that bear broadly and suborbicular leaves and it can be mainly distinguished from *J. wrightii* by its partly bistratose distal leaf lamina, a costa ranging from percurrent to short-excurrent, plane hair-point and a costal cells without stereids. The new records consists of a few plants with no sporophytes, although the gametophytic characters are more related with *J. williamsii* and coincide completely with the features provided in Delgadillo (2000). Only, the Chilean specimen presented a longer hair-point in some leaves, reaching up to 0.46 mm long. Anyway, no *Jaffuelobryum* has been recorded in Chile. The sample was collected on soil accumulated at the base of rock in an open puna area.

Leptopteriginandrum austro-alpinum Müll. Hal.

Tarapacá (Región I): pr. Caquena, 18°06'02"S, 69°16'36"W, *Cano 235*; pr. Parinacota, 18°11'16"S, 69°16'29"W, *Cano 244e*; pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 252a*. ANTOFAGASTA (REGIÓN II): Geysers del Tatio, 22°20'28"S, 68°01'08"W, *Cano 302*. New for Chile.

This species is known from Mexico, Alaska, Colorado, Africa and in neotropical areas from Peru to northern Argentina (Gradstein et al. 2001). It also was reported from Asia (Redfearn & Wu 1986; Ignatov & Afonina 1992; Tsegmed 2001). The Chilean specimens were collected in fissures of rocks at 3350-4500 m in an open puna area and on hillside with *Polylepis besseri* Hieron.

Pseudocrossidium elatum (R.S. Williams) Delgad.

Tarapacá (Región I): pr. Putre, 18°12'05"S, 69°32'34"W, *Cano 215*; pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 265a*; Pukará de Copaquilla, 18°23'02"S, 69°37'52"W, *Cano 276*; carretera Arica-Putre, km 75, 18°26'32"S, 69°45'34"W, *Cano 280a*. New for Chile.

Only reported previously from Peru and Bolivia (Churchill et al. 2000). The Chilean specimens were found growing with *Pseudocrossidium apiculatum* R.S. Williams in crevices and fissures of rocks with accumulated soil at 2580-3750 m, among shrubs of Compositae and Cactaceae, in a *Browningia candelaris* formation and on hillsides with *Polylepis besseri* and cacti. It is characterized by its smooth laminal cells, with supracostal filaments, lanceolate leaves, whose leaf margins are not differentiated as photosynthetic organs, and with some stereid cells sometimes differentiated immediately below the ventral filaments. It also has weakly differentiated perichaetial leaves, and axillary hairs with the basal cells thickened and brownish similar to those found in the genus *Didymodon*. In other *Pseudocrossidium* and *Crossidium* studied the basal cell of the axillary hairs was hyaline and thin walled. According to Zander (1993), this species shows an uncomfortably intermediate morphology between

Pseudocrossidium and *Crossidium*; he also suggests the recognition of this species as a monotypic genus.

Rhexophyllum subnigrum (Mitt.) Hilp.

Tarapacá (Región I): pr. Chañopalca, 18°01'35"S, 69°18'17"W, *Cano 242a*; pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 254b*; pr. Caquena, 18°06'02"S, 69°16'36"W, *Cano 231*. New for Chile.

Known from Argentina, Bolivia, Mexico, Peru, Southwestern United States (Gradstein et al. 2001) and Guatemala and Honduras (Allen 2002). The Chilean collections were found in fissures and soil accumulated on bases of rocks, at 3350-4560 m on hillsides of *Polylepis besseri*, rocky areas with *Polylepis tarapacana* and *Azorella* and in an open puna area. According to Zander (1993), this species is easily recognized by its lanceolate leaves which are widely spreading to squarrose when moist, with upper margins sharply and deeply dentate and laminal cells bistratose in patches across the leaves with the epidermis costa absent or weakly differentiated ventrally.

Saitobryum lorentzii (Müll. Hal.) Ochyra

Tarapacá (Región I): pr. Zapahuira, 18°20'46"S, 69°33'18"W, *Cano 251c*; carretera Arica-Putre, km 75, 18°26'32"S, 69°45'34"W, *Cano 278, 280c*. New for Chile.

The specimens were found on soil accumulated on rocks among vegetation dominated by cacti and *Polylepis besseri* at 3350 m and in a *Browningia candelaris* formation at 2580 m. It was known from Argentina (Müller 1882; Ochyra 1999) and Ecuador, Mexico and Peru (Gradstein et al. 2001). This species is distinguished by its obovate leaves, the absence of guide cells, the presence of a single stereid band on the dorsal side of the leaf and a wide band of smooth laminal cells along the margins of the upper half of the leaf, giving way to pluripapillose cells in the medial zone of the upper lamina cells (Zander 1993).

Syntrichia fragilis (Taylor) Ochyra

Tarapacá (Región I): pr. Putre, 18°12'05"S, 69°32'34"W, *Cano 213*; pr. Zapahuira,

18°20'46"S, 69°33'18"W, *Cano* 258. New for Chile.

This species is easily characterized by its oblong-lingulate to spatulate, mucous leaves, costa with hydroids and 3-5 stereid layers and, above all, by its fragile leaves which tend to detach in to fragments in any part of the lamina. It was collected in fissures and exposed rocks at 2550-3720 m among shrubs of Compositae and Cactaceae, and on hillside of *Polylepis besseri* and cacti. It is a wide-ranging species known from North-Central, Southwestern, South-Central, and Southeastern U.S.A.; Mexico; Central America, Caribbean, Western, Northern, and Southern South America, Brazil; Southwestern, Middle, and Southeastern Europe; Western Asia, Arabian Peninsula, China; Macaronesia, Northern Africa Northeast, West-Central, East, and South Tropical Africa, Southern Africa; Indian subcontinent (Allen 2002). In tropical Andes it has been recorded in Bolivia, Colombia, Ecuador, Peru and Venezuela (Churchill et al. 2000).

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References

- Allen, B. 2002. Moss Flora of Central America. Part 2. Encalyptaceae-Orthotrichaceae. Monographs in Systematic Botany from the Missouri Botanical Garden 90: 1-699.
- Churchill, S. P., D. Griffin III & J. Muñoz. 2000. A checklist of the mosses of the tropical Andean countries. *Ruizia* 17: 1-303.
- Deguchi, H. 1987. Studies on some Peruvian species of the Grimmiaceae (Musci, Bryophyta), pp. 19-74. In H. Inoue (ed.), Studies on cryptogams in southern Peru. Tokai University Press, Tokyo.
- Delgadillo, M. C. 1975. Taxonomic revisión of *Aloina*, *Aloinella* and *Crossidium* (Musci). *Bryologist* 78: 245-303.
- Delgadillo, M. C. 2000. Taxonomy of *Grimmia williamsii*. *Journal of Bryology* 22: 294-297.
- Gradstein, S. R., S. P. Churchill & N. Salazar-Alen. 2001. Guide to the bryophytes of Tropical America. *Memoirs of the New York Botanical Garden* 86: 1-577.
- Grau, J. 1995. Aspectos geográficos de la flora de Chile, pp. 63-83. In C. Marticorena, & R. Rodríguez (eds.), *Flora de Chile*. Vol. 1. Pteridophyta-Gimnospermae. Anibal Pinto S.A., Concepción.
- He, S. 1998. A checklist of the mosses of Chile. *Journal of the Hattori Botanical Laboratory* 85: 103-189.
- Ignatov, M. S. & O. M. Afonina. 1992. Checklist of mosses of the former USSR. *Arctoa* 1: 1-85.
- Müller, C. 1882. *Prodromus bryologiae argentinicae*. I. *Linnaea* 42: 217-486.
- Muñoz, J. 1999. A revision of *Grimmia* (Musci, Grimmiaceae) in the Americas. 1: Latin Americas. *Annals of the Missouri Botanical Garden* 86: 118-191.
- Muñoz, J. & F. Pando. 2000. A world synopsis of the genus *Grimmia* (Musci, Grimmiaceae). *Monographs in Systematic Botany from the Missouri Botanical Garden* 83: 1-133.
- Murray, B. 1984. A revision of the monotypic genera *Indusiella*, *Aligrimmia* and *Coscinodontella* (Musci: Grimmiaceae), with comments on convergent xeromorphological features. *The Bryologist* 87: 24-36.
- Ochyra, R. 1999. New combinations in neotropical mosses. *Fragmenta Floristica et Geobotanica* 44: 255-259.
- Pursell, R. 1994. Fissidentales. In A. J. Sharp, H. Crum & P. M. Eckel (eds.), *The Moss Flora of Mexico*. Part 1. Sphagnales to Bryales. *Memoirs of the New York Botanical Garden* 69: 31-81.
- Redfearn, P. L., Jr. & P.-C. Wu. 1986. Catalog of the mosses of China. *Annals of the Missouri Botanical Garden* 73: 177-208.
- Tsegmed, TS. 2001. Checklist and distribution of mosses in Mongolia. *Arctoa* 10: 1-18.
- Williams, R.H. 1910. Bolivian Mosses. Part II. *Bulletin of the New York Botanical Garden* 6: 227-261.

- Williams, R.H. 1927.** Mosses of Peru collected by the Captain Marshall Field Peruvian Expedition 1923. Publications of the Field Museum of Natural History. Botanical Series 4: 125-139.
- Zander, R. H. 1993.** Genera of the Pottiaceae: Mosses of harsh environments. Bulletin of the Buffalo Society of Natural Sciences 32: 1-378.