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Tortula splachnoides (Hornsch.) R.H.Zander, taken on July 2016 in Valparaíso Province (photo corresponds to voucher *Larraín 40299*, CONC, cited in the article)

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New bryophyte records from the Mediterranean region of Chile

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ABSTRACT
Based on recent fieldwork and examination of herbarium collections from different parts of the Mediterranean climate areas of Chile, we report ten new bryophyte records for the country, including three liverwort and seven moss taxa. Six of these records are also new to South America. In addition, *Trichostomum brachydontium* Bruch is newly reported for continental Chile. Most species reported here correspond to ephemeral taxa, mostly visible only during the wet winter months (June-September). These results stress the need for further basic exploration of Chile bryophyte flora, and the urgent need to improve the cryptogamic collections in national herbaria. *Acaulon uleanum* Müll.Hal. and *Ephemerum argentinicum* Schiavone & Sarmiento are excluded from the bryophyte flora of Chile.

KEYWORDS
Biodiversity,
Bryophyta,
floristics,
herbarium specimens,
Marchantiophyta.

RÉSUMÉ
Nouveaux signalements de bryophytes de la région méditerranéenne du Chili.
Sur la base des travaux de terrain récents et d'examens portant sur des collections d'herbiers provenant de différentes regions à climat méditerranéen du Chili, nous rapportons dix nouveaux enregistrements de bryophytes pour le pays, dont trois taxa d'hépatiques et sept taxa de mousses. Six de ces enregistrements sont également nouveaux en Amérique du Sud. De plus, *Trichostomum brachydontium* Bruch est récemment signalé pour le Chili continental. La plupart des espèces signalées ici correspondent à des taxons éphémères, généralement visibles uniquement pendant les mois humides de l'hiver (juin à septembre). Ces résultats soulignent la nécessité de poursuivre l'exploration fondamentale de la flore de bryophytes du Chili et le besoin urgent d'améliorer les collections cryptogamiques dans les herbiers nationaux. *Acaulon uleanum* Müll.Hal. et *Ephemerum argentinicum* Schiavone & Sarmiento sont exclus de la flore de bryophytes du Chili.

MOTS CLÉS
Biodiversité,
Bryophyta,
floristique,
spécimens d'herbier,
Marchantiophyta.

INTRODUCTION

Chile is long and narrow country with a geographical position that allows the existence of a huge ecosystem diversity, mostly due to its ample latitudinal and altitudinal gradient, ranging from *c*. 17.5°S to 56.0°S, and from sea level to *c*. 6900 m a.s.l. These include high Andean steppes and extremely dry deserts in the north, dry shrublands ("matorral"), dry sclerophyllus forests, and high Andean steppes in the central part of the country, to perhumid evergreen forests to the south, which alternates with deciduous forests, Patagonian steppes, tundra vegetation and peatlands (Gajardo 1994).

Historically, the bryophyte flora of the drier parts of Chile (north of 37°S), which includes the Andean Altiplano, the Atacama Desert, and the Mediterranean region, has received much less attention than the lush and abundant bryophyte flora of the humid southern forests (Larraín *et al.* 2019). In the last years, several bryologists have made important collections in the central and northern parts of the country, increasing the number of specimens available to document the rich bryophyte flora of this region. Some of these collections include those of Manuel Mahú at MO, Robert Ireland and Gilda Bellolio's at CONC, Frank Müller's at DR, and those of the authors of this contribution (at CONC and MUB). However, the winter ephemeral bryophyte flora of central Chile is still little known, due to their short life span, and to the few collections available made during the rainy season (Larraín *et al.* 2019). A few of these winter ephemerals have been recently reported as new for Chile (Larraín 2017; Larraín *et al.* 2017).

The aim of this study is to contribute to the knowledge of the still little known bryophyte diversity of central Mediterranean Chile, with an emphasis on ephemeral taxa.

MATERIAL AND METHODS

Over the last four years (2016-2019), numerous bryophyte collecting expeditions to central Chile were conducted by the first author (JL), especially during the winter months (June-September), corresponding to the wet season in central Chile. These new collections were complemented with the study of older collections made by the authors, together with collections from central Chile and reference material kept in several herbaria (BM, CONC, DR, E, F, H, JE, MO, MUB, NY, PC, RO, S, SGO), in order to document bryophyte taxa not yet reported for central Chile. The total of the localities explored and the origin of the herbarium vouchers studied is shown in Figure 1. This work is part of an ongoing project towards the preparation of a bryophyte flora of central Chile, the part of the country that has Mediterranean climate.

Study area

The limits of the Mediterranean climate in Chile is a matter of controversy, with quite different interpretations of different authors (Luebert & Pliscoff 2006). For practical reasons, it is here defined as the complete territory of Coquimbo, Valparaíso, O'Higgins, Maule, and Metropolitan Regions, an area spanning from *c*. 29.0°S to 36.5°S (Fig. 1). A very diverse arrangement of ecosystems can be found along this extensive area, including deserts in its northernmost part which receive less than 100 mm of rainfall per year, to evergreen and deciduous forests in the southernmost part of the range which receive more than 1500 mm of rainfall per year (Hajek & di Castri 1975; Luebert & Pliscoff 2017), spanning an altitudinal range from the sea level to the peaks of the Andes Mountains exceeding 6000 m a.s.l. The rainfall in this area concentrates during the late autumn and winter months (May-August), whereas during the rest of the year it seldom rains. The most wet vegetation, rich in bryophytes, develops along the coast in areas where the fog coming from the ocean is stopped by the coastal mountains. In drier areas of the interior, the bryophyte flora strongly depends in the humidity available during the rainy season, with many taxa completely disappearing during the summer.

RESULTS AND DISCUSSION

As a result of the study of these recently collected specimens, and examination of herbarium collections from central Chile, we report here ten new bryophyte records for Chile, six of which are also new records for South America, and one new record for continental Chile bryophyte flora, for a species formerly known only from the Juan Fernández Is. within Chilean territory. These new records correspond to eight mosses and three liverworts. For each species we provide diagnostic morphological characters, morphological remarks of the Chilean populations, ecological observations, and their complete world distribution.

Based on our ongoing studies, and including the additions here reported, the bryophyte flora of Mediterranean Chile (as here defined) would contain *c*. 492 taxa, corresponding to 348 mosses, 138 liverworts, and six hornworts (unpublished preliminary data).

Phyllum MARCHANTIOPHYTA Stotler & Crand.-Stotl.
Family Arnelliaceae Nakai
Genus *Stephaniellidium* S.Winkl. ex Grolle

Stephaniellidium sleumeri (Müll.Frib.) S.Winkl. ex Grolle

Specimens examined. — **Chile**. Región de Valparaíso: Provincia de Valparaíso, Comuna de Valparaíso, Reserva Nacional Lago Peñuelas, en suelo de espinal de *Acacia caven*, sendero "las orquídeas", sitio abierto, en suelo del espinal, debajo de colonia de *Pogonatum*, 33°10'57.7"S, 71°29'13.1"W, 350 m, 13.VII.2016, *J. Larraín 40311A* (CONC); Comuna de Viña del Mar, Palmar El Salto, entre Siete Hermanas y Rodelillo, matorral abierto al costado de la Ruta Las Palmas, en el suelo, 33°03'58.0"S, 71°31'54.7"W, 257 m, 15.VII.2016, *J. Larraín 40322A* (CONC, F); Provincia de Marga-Marga, Comuna de Quilpué, orilla de tranque junto a la Ruta F-50 entre Villa Alemana y Lo Orozco, a medio camino entre Los Quillayes y la viña Catrala, matorral abierto de *Lithraea*, *Colliguaja*, *Acacia* y *Trevoa*, en el suelo,

33°10'01.0"S, 71°21'01.3"W, 259 m, 25.VII.2016, *J. Larraín 40532* (CONC); Provincia de Petorca, Comuna de La Ligua, Los Molles, parque privado Puquén, entre matorrales de *Bahia ambrosioides*, *Baccharis*, *Lithrea caustica*, *Pouteria splendens*, *Fuchsia lycioides*, en suelo expuesto, 32°14'17.9"S, 71°31'19.4"W, 20 m, 31.VII.2016, *J. Larraín 40628* (CONC). — Región Metropolitana: Provincia de Melipilla, Comuna de Melipilla, Reserva Privada Altos de Cantillana, sendero entre el refugio Rangue y el río El Cepillo, bosque bajo de *Lithraea-Peumus-Quillaja*, en suelo abierto en claro del bosque en costra biológica, 33°51'21.0"S, 70°58'55.0"W, 660 m, 6.VIII.2018, *J. Larraín 42711A* (CONC); sector la Cayetana, camino entre el refugio y la Quebrada del Árbol, en suelo abierto, 33°50'41.7"S, 71°00'09.9"W, 420 m, 21.VI.2019, *J. Larraín 43553* (CONC).

Remarks

This taxon is easily overlooked because it often grows slightly buried in the soil and it is easily covered with vascular plants and other bryophytes when the growing season starts. But it is readily distinguished by the succubous, concave, plicate leaves with several (at least three) longitudinal folds, and the sporophyte that develops from a subterranean marsupium, densely tomentose.

Stephaniellidium sleumeri is an Andean taxon, previously recorded for NW Argentina, south Brazil, Peru, Colombia and Venezuela (Gradstein *et al.* 2001; Schuster 2002). It has been found to be a common species of the ephemeral bryophyte flora in central Chile, growing on exposed bare soil within dry shrubland and open *Acacia caven* savannas, between sea level and 660 m a.s.l.

A complete description and illustrations of this species are given by Müller (1951), and Schuster (2002).

Family Fossombroniaceae Hazsl.
Genus *Fossombronia* Raddi

Fossombronia wondraczekii (Corda) Dumort. ex Lindb.

Specimens examined. — **Chile**. Región Metropolitana: Provincia de Maipo, Comuna de Paine, Reserva Privada Altos de Cantillana, entrada de la reserva, en suelo, 33°52'09.3"S, 70°55'20.8"W, 28.VIII.2018, *X. Romero s.n.* (CONC). — Región de Valparaíso: Provincia de Valparaíso, Comuna de Valparaíso, Reserva Nacional Lago Peñuelas, sector E, en suelo, 33°10'35"S, 71°28'49"W, 350 m, 9.VIII.2017, *C. Gatica 1b* (CONC). — Región del Maule: Provincia de Talca, Comuna de Empedrado, portón "Los Boldos" llegando a la Reserva Nacional Los Ruiles sector El Fin, en plantación de pinos, en tierra junto al camino, camping, mezclado con *Bryum dichotomum* y *Fissidens curvatus*, 35°37'11"S, 72°19'33"W, 450 m, 30.VIII.2007, *J. Larraín 28467B* (CONC); Comuna de Constitución, Junquillar, en fragmento de bosque de *Peumus boldus* y *Quillaja saponaria* en ladera oeste, suelo entre población de *Peumus boldus*, entre plantas de *Plagiochasma rupestre*, 35°15'55"S, 72°20'11"W, 10 m, 1.IX.2007, *J. Larraín 28602B* (CONC).

Remarks

This taxon is clearly separated from the rest of *Fossombronia* species of Chile by the distal spore faces with conspicuous parallel lamellae. The spores size ranges between 35-45 µm, with proximal face slightly echinate, and the elaters are bispiral.

The genus *Fossombronia* is a common component of the ephemeral bryophyte flora of central Chile, growing on

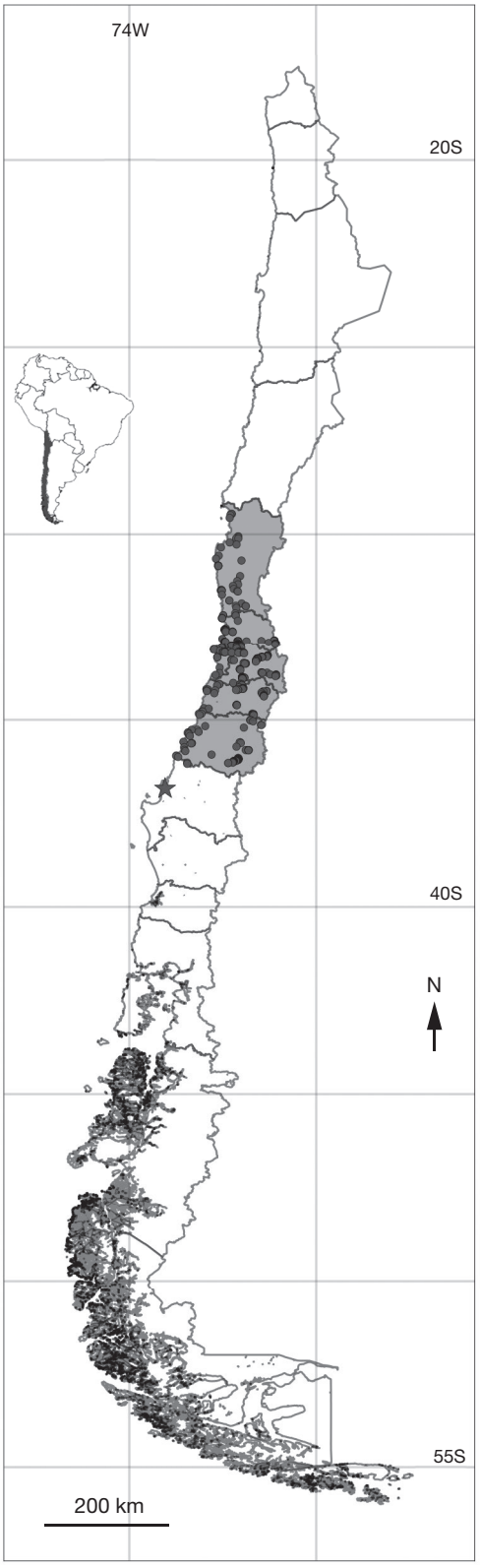

Fig. 1. — Map of Chile with the central Regions shaded (Coquimbo, Valparaiso, Metropolitan, O'Higgins and Maule). **Black dots** represent recently explored localities, or provenience of the studied herbarium vouchers. The **star** out of the shaded zone represents the only voucher mentioned in the text outside the study area (southernmost locality of *Acaulon mediterraneum*). On the left is depicted the map of South America showing Chile in black. Grid lines are separated by 5 degrees.

disturbed, exposed soil in open dry forest habitats or dry shrublands. However, the genus is still poorly known in the country, with three new species recently described (Hässel de Menéndez & Villagrán 2007; Müller 2017). So far, nine species of *Fossombronia* have been reported for Chile (Müller 2017), four of them having lamellate distal spore faces, although none of the Chilean taxa have perfectly parallel lamellae on the distal face of spores like *F. wondraczekii* has.

Fossombronia wondraczekii was found either in disturbed and well conserved habitats, growing on bare soil in exposed places, mixed with other ephemeral bryophytes. This taxon has a wide world distribution, including North America, warm and temperate Europe, North Africa, Asia and Australia (Schuster 1992a). These are the first records of this taxon for Chile and also for South America.

A complete description and illustrations of this species are given by Schuster (1992a).

Family Ricciaceae Rchb.
Genus *Riccia* L.

Riccia lamellosa Raddi

Specimens examined. — **Chile**. Región de Coquimbo: Provincia de Elqui, Comuna de La Higuera, pr. Choros, suelo descubierto bajo *Echinopsis*, 29°19'18"S, 71°14'10"W, 215 m, 12.XI.2001, *M.J. Cano 146* (MUB[MUB37386]); Provincia de Limarí, Comuna de Ovalle, Termas de Soco, en matorral con *Proustia* y *Eulychnia*, 30°43'58.1"S, 71°29'29.8"W, 85 m, 16.VIII.2017, *X. Romero TS-02b* (CONC); Parque Nacional Fray Jorge, Nebelwald nahe der Küste, Waldwegböschung, 30°32'S, 71°39'W, 600 m, 17.III.2001, *F. Müller C1946* (DR); entre la caseta y La Administración, matorral de *Caesalpinia*, en suelo, 30°39'37"S, 71°39'41"W, 180 m, 12.IX.1986, *M. Mahú 21989 pp* (MO[MO5235885] pp); Terraza Chapiquilla, matorral de *Fuchsia*, *Anisomeria* y *Adesmia*, en roca, 50 m, 11.IX.1986, *M. Mahú 22682* (MO[MO5235878]), Quebrada el Zapallo, en suelo, 50 m, 10.IX.1986, *M. Mahú 22679* (MO[MO5235886]); La Escondida, matorral de *Trichocereus*, *Erioscyse* y *Caesalpinia*, en el suelo, 270 m, 10.IX.1986, *M. Mahú 22678* (MO[MO5237163]), *22675* (MO[MO5237164]), *22677* (MO[MO5237165]), Cuesta Las Cardas, en suelo orilla de la carretera, 30°18'26"S, 71°15'25"W, 20.IX.1986, *M. Mahú 23997* (MO[MO5237281]); Provincia de Choapa, Comuna de Illapel, Reserva Nacional Las Chinchillas, a un costado de la Ruta D-705, en matorral de *Flourensia* junto a la antigua línea del tren, en suelo abierto, 31°31'32.0"S, 71°05'53.2"W, 501 m, 28.VII.2017, *J. Larraín 41815A* (CONC); Cerro Talinay, 5 km al N de Huentelauquén, al E de la carretera, suelo abierto, 31°29'44"S, 71°33'17"W, 230 m, 14.XII.1979, *M. Mahú 12376* (MO[MO5237056]). — Región de Valparaíso: Provincia de Petorca, Comuna de Papudo, pr. Papudo, talud protegido, 32°31'12"S, 71°28'20"W, 50 m, 10.XI.2001, *M.J. Cano 109* (MUB[MUB37387]); Comuna de Zapallar, Zapallar, Cardos Dulces, matorral de *Cryptocarya*, en el suelo, 32°32'51"S, 71°26'00"W, 180 m, 23.VII.1980, *M. Mahú 24008* (MO[MO5237173]), Chincolco, 32°13'19"S, 70°50'05"W, 30.VII.1980, *I. Vila 13600* (MO[MO5237154]); Provincia de Valparaíso, Viña del Mar, Jardín Botánico, en suelo, 33°02'47"S, 71°30 7"W, 30 m, 2.VIII.1978, *M. Mahú 22159* (MO[MO5237171]), Laguna Peñuelas, en suelo orilla de la carretera frente a bosque de *Cupressus*, en suelo, 33°09'56S, 71°31'59W, 380 m, 8.VII.1980, *M. Mahú 13033 pp* (MO[MO5237060] pp); Provincia de San Antonio, El Quisco, Punta de Tralca, N de la Quebrada Guallilemu, matorral de *Baccharis linearis* y *B. concava*, en suelo arenoso orilla de un sendero, 33°25'12"S, 71°41'26"W, 40 m, 16.IX.1984, *M. Mahú 21011* (MO[MO5236766]); Isla Negra, en suelo, 33°26'32"S, 71°40'55"W, 30 m, 1.XI.1988, *M. Mahú 22812* (MO[MO5235793]); Mirasol, 33°19'19"S, 71°39'00"W, VIII-1976, Tapia 4823 (MO[MO5237067]); IX-1988, *S. Tapia 22197* (MO[MO5237172]). — Región Metropolitana: Provincia de Maipo, Comuna de Paine, Reserva Privada Altos de Cantillana, sendero entre el refugio Puerta del Espino y el Refugio Rangue, en pastizal abierto con grandes *Quillaja* y un corral para ganado, en suelo expuesto, 33°52'07.7"S, 70°58'41.8"W, 926 m, 10.XI.2017, *J. Larraín 42167* (CONC); Provincia de Melipilla, Melipilla, sepultura en suelo orilla de la carretera, 33°40 44 S, 71°13 40 W, 2.VIII.1980, *M. Mahú 23592* (MO[MO5237071]), Cuesta Zapata, ladera exp S en el suelo, 33°23'45"S, 71°15'24"W, 480 m, 24.VIII.1971, *M. Mahú 6374* (MO[MO5237168], H). — Región del Maule: Provincia de Talca, Vilches Bajo, orilla de la carretera, matorral de *Acacia caven*, *Peumus boldus*, *Quillaja saponaria*, *Lithraea caustica*, en suelo entre el pasto, 35°53'S, 71°13'W, 350 m, 9.XII.1990, *M. Mahú & S. Tapia 50194* (MO[MO5148241]).

Remarks

This taxon has been systematically overlooked in central Chile and most herbarium vouchers confused with *Riccia sorocarpa* Bisch., but it is immediately distinguished from the later by the ventral scales that are hyaline and exceed the thallus borders, giving the plants a characteristic look even when dry in herbarium specimens. Microscopically it can be distinguished from *R. sorocarpa* by the spores which are more or less oval-rounded (strongly tetrahedral in *R. sorocarpa*), and usually lacks a wing in *R. lamellosa*.

This taxon has been reported for Argentina and Uruguay as *Riccia austinii* Steph. (Hässel de Menéndez 1962; Hässel de Menéndez & Rubies 2009). Jovet-Ast (1991) synonymyzed this name under *R. lamellosa*, and reported it also from Brazil in South America. The global range of this species includes South and North America, Mediterranean Europe, Africa, central and west Asia, and Australia (Bischler-Causse *et al.* 2005). Schuster (1992b: 543) recognizes the New World populations as a subspecies (*Riccia lamellosa* subsp. *austinii*), but he did not validly publish this new combination. The South American populations have spores spherical or depressed spherical, complete lack of the spore wing, and the triradial ridges delimiting inner faces hardly perceptible (Schuster 1992b). The Chilean material perfectly matches this morphology.

A complete description and illustrations of this species are given by Hässel de Menéndez (1962, as *Riccia austinii*), Jovet-Ast (1991), and Schuster (1992b, as *Riccia lamellosa* subsp. *austinii*).

Phyllum BRYOPHYTA Schimp.
Family Bryaceae Rchb.
Genus *Bryum* Hedw.

Bryum gemmilucens R.Wilczek & Demaret

Specimens examined. — **Chile**. Región Metropolitana: Provincia de Maipo, Comuna de Paine, Reserva Privada Altos de Cantillana, sector Puerta de Quillayes, sitio abierto entre bosque de *Quillaja*

con matorral de *Azara* y *Baccharis*, junto a pirca de piedra, en suelo abierto, 33°53'37.2"S, 70°58'30.6"W, 1530 m, 9.XI.2017, *J. Larraín 42051A* (CONC); sendero entre Puerta de Quillayes y La Montura, ladera exposición N con matorral xerofítico, *Puya*, *Azorella*, y *Neoporteria*, sobre tierra en suelo protegido bajo *Baccharis*, 33°53'40.3"S, 70°58'30.9"W, 1560 m, 9.XI.2017, *J. Larraín 42059B* (CONC).

Remarks

This taxon is superficially similar to the very common *Bryum dichotomum* Hedw., but it is characterized by having numerous bulbils per leaf axil (more than five), each between 150-200 µm, sometimes smaller (to 40 µm the young ones), and with very small or without leaf primordia. The bulbils differ from those described for North American populations (Spence 2014) in being glossy and red.

This species is apparently rare in central Chile, found at a single location in the Metropolitan Region, growing in open soil and underneath shrubs in very dry montane vegetation, around 1500 m a.s.l. These are the first records of *B. gemmiluscens* in South America, being previously known from Mediterranean Europe, North Africa, Turkey, California, and the Canary Islands (Ros *et al.* 1999; Uyar & Cetin 2004; Spence 2014).

A complete description and illustrations of this species are given by Guerra *et al.* (2010).

Family Pottiaceae Hampe
Genus *Acaulon* Müll.Hal.

Acaulon mediterraneum Limpr.

Specimens examined. — **Chile**. Región de Coquimbo: Provincia de Choapa, Comuna de Los Vilos, Quebrada Quelón, por Ruta E-37-D entre Quelón y Tilama, en sitio seco con matorral de *Adesmia* junto al camino, en parte alta de la quebrada, en suelo abierto, 32°06'29.4"S, 71°10'08.2"W, 629 m, 27.VII.2017, *J. Larraín 41773B* (CONC); Provincia de Limarí, Comuna de Ovalle, por camino al Parque Nacional Fray Jorge (Ruta D-540), algunos kilómetros al W de Punilla, en ladera con matorral denso junto al camino, en suelo abierto, 30°34'03.8"S, 71°36'38.2"W, 427 m, 29.VII.2017, *J. Larraín 41968* (CONC). — Región de Valparaíso: Provincia de Valparaíso, Comuna de Valparaíso, Punta Curaumilla, entre Laguna Verde y Quintay, cerca del faro, en acantilados costeros con matorral de *Baccharis vernalis, Puya chilensis, Bahia ambrosioides, Eryngium paniculatum* y *Lobelia polyphylla*, en suelo abierto entre arbustos, 33°06'32.9"S, 71°44'02.7"W, 97 m, 29.VI.2016, *J. Larraín 40278* (CONC, MUB); Comuna de Quintero, Cerro El Mauco, en la cumbre del cerro, en matorral denso de *Baccharis-Lithraea-Quillaja* con algunos *Myrceugenia rufa* dispersos, 32°52'52.0"S, 71°25'38.3"W, 725 m, 14.VIII.2017, *J. Larraín 42042* (CONC, MUB). — Región del Biobío: Provincia de Concepción, Comuna de Concepción, Cerro Caracol, on soil among grass in clearing, 36°49'S, 73°02'W, 250 m, 25.IX.2001, *R. Ireland & G. Bellolio 31903* (CONC, MO, MUB, NY).

Remarks

The studied specimens have spores somewhat smaller than those described from European populations, ranging between 20-25 µm, in just a few specimens reaching up to 30 µm, conspicuously echinate. The rest of the morphology perfectly matches the available descriptions of this taxon (Sérgio 1972; Stone 1989; Guerra 2006a). The only previous record of the genus for Chile (Ireland *et al.* 2006), reported as *Acaulon uleanum* Müll.Hal. (Ireland & Bellolio 31903, CONC!), also corresponds to *A. mediterraneum*, readily separated from *A. uleanum* by the echinate spores (smooth in *A. uleanum*: Ule 64, PC!). The later taxon should then be excluded from the bryophyte flora of Chile.

This taxon is rather common during rainy winters in central Chile (June-September), growing in open soil among dry shrubby vegetation or in forest clearings, from sea level to 725 m a.s.l. These are the first records of *A. mediterraneum* in South America, being previously known from Europe, Macaronesia, Northern Africa, Southwestern Asia (Turkey), United States (California), and Australia (Stone 1989; Jiménez *et al.* 2002; Smith 2004; Dirkse & Losada-Lima 2012; Toren 2015).

A complete description and illustrations of this species are given by Guerra (2006a).

Genus *Ephemerum* Hampe

Ephemerum serratum (Schreb. ex Hedw.) Hampe

Specimens examined. — **Chile**. Región de Valparaíso: Provincia de Valparaíso, Comuna de Valparaíso, Reserva Nacional Lago Peñuelas, en suelo de espinal de *Acacia caven*, sitio abierto, en suelo del espinal, 33°10'57.7"S, 71°29'13.1"W, 350 m, 13.VII.2016, *J. Larraín 40315* (CONC); Comuna de Viña del Mar, Palmar El Salto, entre Siete Hermanas y Rodelillo, matorral abierto al costado de la Ruta Las Palmas, en el suelo, 33°03'58.0"S, 71°31'54.7"W, 257 m, 15.VII.2016, *J. Larraín 40329* (CONC); quebrada El Quiteño, bosque de *Jubaea chilensis*, con *Cryptocarya*, *Peumus* y *Eucalyptus* y retamos introducidos, en el suelo, 33°03'26.7"S, 71°31'04.5"W, 101 m, 21.VII.2016, *J. Larraín 40402* (CONC, MUB); Provincia de Petorca, Comuna de Petorca, por ruta E-37-D, junto al Estero Las Palmas, entre Padegua y Palquico, matorral de *Talguenea trinervis* al costado de la carretera, en suelo desnudo, 32°18'30.8"S, 71°05'55.3"W, 356 m, 27.VII.2017, *J. Larraín 41741* (CONC, MUB). Región del Maule: Provincia de Talca, Comuna de Constitución, Junquillar, en fragmento de bosque de *Peumus boldus* y *Quillaja saponaria* en ladera oeste, en suelo abierto, 35°15'55"S, 72°20'11"W, 10, 1.IX.2007, *J. Larraín 28600C2* (CONC).

Remarks

The specimens here reported match well the descriptions available of this taxon: the leaves are lanceolate, 1.0-1.2 mm long, with dentate to weakly serrulated borders, laminal cells smooth, and costa absent. The capsules are less than 500 µm in diameter, with a sharp apiculus, although variable in shape from capsule to capsule, and few stomata in the proximal third of the capsules; the spores are 50-70 µm in diameter, round to oval, brown, dull, coarsely papillose, without a hyaline veil.

The genus *Ephemerum* has been rarely collected in Chile, with only one known report of the genus for Coquimbo Region (He 1998). The specimen reported by He (*Mahú 21967*, MO!) as *Ephemerum argentinicum* Schiavone & Sarmiento does not correspond to this taxon, although the scarcity of the material did not allow a proper identification.

The only capsule available for examination shows stomata only in the proximal half of the capsule, discarding the possibility it belongs to *E. argentinicum*, which has stomata throughout the capsule wall (Schiavone & Sarmiento 1985). It might correspond to *E. serratum* also, but it did not have mature spores to determine its identity with confidence. More specimens from Coquimbo Region are needed to check these observations.

This taxon is common during the winter months in rainy years, but it seems that its extremely short life cycle has precluded botanists to collect it in the past. It grows in wet, open soil in dry forests and shrubland clearings, between sea level and 350 m a.s.l. *Ephemerum serratum* was previously known from Europe, North and South Africa, North America and New Zealand (Crum & Anderson 1981; Sérgio 1982). These are then the first records of the taxon in South America.

A complete description and illustrations of this species are given by Crum & Anderson (1981), Sérgio (1982), and Infante *et al.* (2010).

Genus *Microbryum* Schimp.

Microbryum fosbergii (E.B.Bartram) Ros, O.Werner & Rams

Specimen examined. — **Chile**. Región de Coquimbo: Provincia de Elqui, Comuna de Coquimbo, Hacienda El Tangue, al S de Puerto Aldea por Ruta D-516, justo antes de las casas de la hacienda, en cortes de tierra del camino vehicular, en suelo abierto, 30°20'50.0"S, 71°32'56.1"W, 87 m, 29.VII.2017, *J. Larraín 41957* (CONC, MUB).

Remarks

This taxon is considered a variety of *M. starckeanum* (Hedw.) R.H.Zander by Zander (1993, 2007a), being the only (but consistent) differences the cleistocarpic capsules and lack of peristome seen in *M. fosbergii*, which lead Bartram (1930) to describe this new taxon from Californian plants. The studied specimen has consistently cleistocarpic capsules, with just six stomata located at the base, spores *c*. 25 µm, with tall warts, setae *c*. 3 mm tall, and plants very small, less than 2 mm tall. Only one species of the genus *Microbryum*, *M. davallianum* (Sm.) R.H.Zander, has been previously reported from Chile (Cano & Gallego 2008). However, it has proven to be a quite common component of the winter ephemeral bryophyte flora of central Chile. In this genus, sterile specimens might be impossible to identify solely on morphology.

The only collection of this taxon so far found in central Chile was growing on dry soil banks on road cuts near the sea shore, at 87 m a.s.l. This species has been reported only for California, New Mexico, Baja California and the Iberian Peninsula (Bartram 1930; Ros *et al.* 2005; Allred 2011), so this is the first record of this taxon for South America.

A complete description and illustrations of this species are given by Bartram (1930), and Ros & Werner (2006).

Microbryum starckeanum (Hedw.) R.H.Zander

Specimens examined. — **Chile**. Región de Coquimbo: Provincia de Choapa, Comuna de Canela, por Ruta D-895, al S del empalme con la Ruta D-71, en quebrada con matorral de *Porlieria chilensis* con *Lithraea* dispersos y abundantes cactus *Opuntia*, en suelo abierto, 31°22'33.6"S, 71°13'47.5"W, 595 m, 28.VII.2017, *J. Larraín* 41865A (CONC, MUB). — Región de Valparaíso: Provincia de Petorca, Comuna de Petorca, por ruta E-37-D, junto al Estero Las Palmas, entre Padegua y Palquico, matorral de *Talguenea trinervis* al costado de la carretera, en suelo abierto, 32°18'30.8"S, 71°05'55.3"W, 356 m, 27.VII.2017, *A. Larraín & J. Larraín 41749* (CONC, MUB).

Remarks

This taxon is characterized by the small plants with apiculated leaves with recurved margins, stegocarpous capsules, and strongly warty spores, *c*. 25 µm in diameter. In the Chilean material studied, all the capsules exhibit a rudimentary peristome.

Microbryum starckeanum was found growing on bare exposed soil among dry shrublands in central Chile, between 350-600 m a.s.l., during the wettest month of the winter in central Chile (July). This taxon is distributed in western North America and Mexico, Europe, Macaronesia, North Africa, China, New Zealand (Zander 2007a; Zhao *et al.* 2009), and Australia, where it has been apparently introduced (Duell 1984). These are the first records of this taxon for Chile and also for South America.

A complete description and illustrations of this species are given by Ros & Werner (2006), and Zhao *et al.* (2009).

Genus *Tortula* Hedw.

Tortula acaulon (With.) R.H.Zander

Specimen examined. — **Chile**. Región de Valparaíso: Provincia de Marga Marga, Quillota, formación de *Acacia caven* con *Maytenus boaria* y algo de matorral de *Sophora macrocarpa*, en parche lineal de vegetación nativa, algo intervenido, rodeado por sectores de uso agrícola, 32°51'57.4"S, 71°11'15.0"W, 186 m, XI.2016, *P. Sandoval s.n.* (CONC).

Remarks

The Chilean specimen studied has oblong-lanceolate leaves, completely smooth laminal cells, immersed, cleistocarpic, shortly apiculate capsules, and spores *c*. 30 µm in diameter. The specimen collected is in a very poor condition, but the presence of a few well developed capsules allowed proper identification. It was growing on bare soil in open native vegetation within highly disturbed agricultural land, at *c*. 200 m a.s.l.

This is a globally widely distributed taxon, known from Europe, North Africa, temperate Asia, Australia, and North, Central and South America (Cano & Gallego 2008). In South America, this species was previously known only from Buenos Aires Province in Argentina, and Montevideo in Uruguay (Cano & Gallego 2008).

A complete description and illustrations of this species are given by Guerra (2006b, as *Phascum cuspidatum*), and Cano & Gallego (2008).

Tortula splachnoides (Hornsch.) R.H.Zander

Specimens examined. — **Chile**. Región de Valparaíso: Provincia de Valparaíso, Comuna de Valparaíso, Punta Curaumilla, entre Laguna Verde y Quintay, cerca del faro, en acantilados costeros con matorral de *Baccharis vernalis, Puya chilensis, Bahia ambrosioides, Eryngium paniculatum* y *Lobelia polyphylla*, en el suelo junto al mar, 33°06'33.3"S, 71°44'10.9"W, 15 m, 29.VI.2016, *J. Larraín 40299* (CONC, MUB), planicie frente al mar, entre rocas litorales, sobre tierra junto a las rocas litorales, 33°06'34.0"S, 71°44'10.6"W, 11 m, 27.VII.2016, *J. Larraín 40590* (CONC, MUB); en suelo expuesto, *J. Larraín 40593* (CONC), *40594* (CONC); Provincia de Petorca, Comuna de La Ligua, Los Molles, parque privado Puquén, entre matorrales de *Bahia ambrosioides*, *Baccharis*, *Lithrea caustica*, *Pouteria splendens*, *Fuchsia lycioides*, en suelo expuesto, 32°14'26.8"S, 71°31'06.4"W, 30 m, 31.VII.2016, *J. Larraín 40596* (CONC, MUB), *40609* (CONC), *40611* (CONC), *40619B* (CONC); 32°14'17.9"S, 71°31'19.4"W, 20 m, *J. Larraín 40625B* (CONC).

Remarks

This taxon has cleistocarpic capsules, sometimes dehiscing by an irregular circumferential line around the middle of the urn, with large stomata on the urn base, and spores 30-35 µm in diameter, finely verrucose. The leaves are concave, with entire margins, distal laminal cells irregular-quadrate, smooth, sometimes minutely papillose, proximal laminal cells larger and hyaline, smooth, nerve variable from leaf to leaf, subpercurrent to percurrent, in cross section without guide cells, with two large ventral surface cells, and a central group of substereids disposed in 2(3) rows at midleaf, and more or less differentiated dorsally.

This taxon belongs to *Tortula* sect. *Schizophascum* (Müll.Hal.) R.H.Zander, a small section of the genus with three known taxa characterized by plants living close to the sea, leaves with costal section lacking guide cells and with stereid band more or less centrally arranged, and cleistocarpous capsules often dehiscing by irregular circumferential lines (Zander 1993). This section has a Southern Hemispheric distribution, previously known only from South Africa, New Zealand, and Australia, and now also from southern South America. The three taxa currently accepted in the group (*Tortula splachnoides*, *T. willisiana* R.H.Zander, and *T. maritima* (R.Br.bis) R.H.Zander) are all regarded as highly variable (Magill 1981; Zander 1993), and it has been suggested these three taxa might correspond to extreme expressions of a single, variable taxon (Magill 1981).

We studied a syntype of *Dendia maritima* R.Br.bis (NY936236!), collected by Robert Brown in Godley Heads, close to Christchurch, New Zealand. The plants are identical to the material from Chile regarding leaf shape, the thin cell walls, and smooth leaf cells, however spore size is a bit larger in the New Zealand plants (up to 40 µm in diameter), and the leaf costa in cross section has more strongly developed surface cells dorsally. This latter character seems to be variable judging by the illustrations in Zander (1993, cf. plate 88: 5), where the dorsal surface cells of the costa are not so strongly differentiated. In this later character, the Chilean plants are much more similar to the South African *Tortula splachnoides* Hornsch. as illustrated by Magill (1981: 208). The type specimen of *Phascum splachnoides* Hornsch. at NY (NY 1448642!, NY1448643!) correspond to a single plant in a pauper condition and a microscope slide. We could not find cross sections in the prepared slide, and the poor material did not allow further dissection. But it is evident that the leaf shape and mostly smooth leaf surface, match perfectly with the material recently found in Chile. We could not find in NY the type material of *Phascum drummondii* Wilson (synonym of *Tortula willisiana* R.H.Zander) mentioned by Zander (1993). Although the illustrations of the type of this name provided by Wilson (1848 table I, A) do not show the leaf cross sections, the general shape of the plants and leaves suggest this name could also be a synonym of *T. splachnoides* and the differences be part of the variability of this interesting taxon.

In conclusion, the studied specimens and the descriptions and illustrations available clearly confirm these names refer to very closely related taxa (if not one species). However, as already Magill (1981) and Zander (1993) have stated, more material from the complete geographic range of these species are needed to be able to properly study the observed morphological variability. A deeper morphological study of *Tortula* sect. *Schizophascum* is needed. Meanwhile, we use the older name available within the group for the Chilean populations.

A complete description and illustrations of this species are given by Magill (1981).

Genus *Trichostomum* Bruch

Trichostomum brachydontium Bruch

Specimens examined. — **Chile**. Región de Coquimbo: Provincia de Choapa, Comuna de Canela, Cerro Talinay de Huentelauquén, en parte alta de quebrada boscosa, matorral arborescente de *Acrisione denticulata*, *Myrceugenia correifolia*, *M. rufa, Baccharis*, en el suelo del matorral, 31°29'38.4"S, 71°31'55.9"W, 739 m, 29.IX.2018, *J. Larraín 43011B* (CONC); 31°29'27.3"S, 71°32'42.1"W, 566 m, 30.IX.2018, *J. Larraín 43082* (CONC); Comuna de Los Vilos, bosque en la cumbre del cerro Santa Inés, sobre Pichidangui, en el suelo seco entre matorrales camino al bosque, 32°09'40"S, 71°29'28"W, 650 m, 10.II.2007, *J. Larraín 27198* (CONC, EIF). — Región de Valparaíso: Provincia de Petorca, Comuna de La Ligua, Los Molles, Puquén, entre matorrales secos junto al mar, suelo seco entre arbustos, 32°14'07"S, 71°31'19"W, 30 m, 11.II.2007, *J. Larraín 27263* (CONC, EIF), *27264* (CONC); Provincia de Quillota, Comuna de Nogales, Cuesta el Melón, sendero que sale de la 3ª curva grande hacia arriba, a la derecha, suelo del camino, expuesto, junto a la entrada, 32°36'36"S, 71°14'11"W, 500 m, 16.IX.2006, *J. Larraín 25987A* (CONC), en la cima del cerro, en pequeño corte de tiera junto al sendero, expuesto, 32°36'32"S, 71°14'08"W, 500 m, 16.IX.2006, *J. Larraín 26024A* (CONC); Provincia de Marga-Marga, Comuna de Olmué, Parque Nacional La Campana, sector Granizo, en suelo seco del camino entre 1ª y 2ª aguada, 32°58'10"S, 71°07'29"W, 800 m, 11.II.2007, *J. Larraín 27241A* (CONC); sector Cajón Grande, entre "paso de los robles" y portezuelo Ocoa, en talud junto al sendero, 32°58'53"S, 71°05'48"W, 850 m, 18.IX.2007, *J. Larraín 29704* (CONC); llegando a la cumbre por bosques de *Nothofagus macrocarpa*, 32°58'37"S, 71°05'42"W, 1100 m, 18.IX.2007, *J. Larraín 29711* (CONC); Provincia de Valparaíso, Comuna de Quintero, Cerro El Mauco, subida desde antenas de telecomunicaciones hasta la cumbre del cerro, en planicie de altura con matorral de *Haplopappus*, sobre tierra en talud, 32°52'43.7"S, 71°26'36.4"W, 480 m, 14.VIII.2017, *J. Larraín 42033* (CONC), a lo largo del sendero a través de matorral denso en ladera con ex-

posición sur, sobre tierra en el suelo junto al sendero, 32°52'47.4"S, 71°26'01.2"W, 610 m, 14.VIII.2017, *J. Larraín 42039* (CONC); en la cumbre del cerro, en matorral denso de *Baccharis-Lithraea-Quillaja* con algunos *Myrceugenia rufa* dispersos, en el suelo a la sombra, 32°52'52.0"S, 71°25'38.3"W, 725 m, 14.VIII.2017, *J. Larraín 42041A* (CONC), en el suelo expuesto, 32°52'52.0"S, 71°25'38.3"W, 725 m, 14.VIII.2017, *J. Larraín 42043* (CONC); Comuna de Valparaíso, Laguna Peñuelas, en suelo orilla de la carretera frente a bosque de *Cupressus*, en suelo, 380 m, 8.VII.1980, *M. Mahú 13033* (MO, mixed with *Riccia lamellosa*), Rodelillo, Valparaíso cerca de Placilla, matorral de *Chusquea cumingii, Eryngium paniculatum*, gramineas y *Chloraea disioides*, 33°03'53.9"S, 71°33'19.9"W, 19.X.2017, *P. Drapela 76* (CONC); Provincia de San Antonio, Punta de Tralca, Quebrada Guallilemu, matorral de *Colliguaja* y *Chusquea*, en suelo, 60 m, 8.I.1981, *M. Mahú 13498* (MO, mixed with *Bartramia stricta*), *13502* (MO, mixed with *Bartramia stricta*), 40 m, 18.II.1976, *M. Mahú 11849* (MO, 3 specimens). — Región Metropolitana: Provincia de Chacabuco, Comuna de Til Til, Cuesta la Dormida, en bosque de *Cryptocarya-Peumus-Lithraea*, en talud a la sombra a 50 m del estacionamiento, 33°03'41"S, 71°00'34"W, 1260 m, 19.IX.2007, *J. Larraín 29715* (CONC); Provincia de Maipo, Comuna de Paine, Reserva Privada Altos de Cantillana, Quebrada El Cepillo, sendero entre el refugio Rangue y el río, por bosque de *Cryptocarya* y matorral de *Acacia-Peumus-Colliguaja*, en talud de tierra, 33°51'10.6"S, 70°58'55.7"W, 610 m, 11.XI.2017, *J. Larraín 42221* (CONC); 33°51'12.4"S, 70°58'57.2"W, 600 m, 11.XI.2017, *J. Larraín 42224B* (CONC); en paredes rocosas del camino vehicular de la cuesta Rangue en frente del refugio de la reserva, en pared de tierra junto al camino, 33°51'08.6"S, 70°58'50.8"W, 620 m, 11.XI.2017, *J. Larraín 42257* (CONC), 33°51'08.2"S, 70°58'48.4"W, 620 m, 11.XI.2017, *J. Larraín 42259* (CONC); 33°51'10.5"S, 70°58'46.4"W, 595 m, 11.XI.2017, *J. Larraín 42268B* (CONC), *42272* (CONC); sendero entre el refugio Rangue y el río El Cepillo, bosque bajo de *Lithraea-Peumus-Quillaja*, en suelo abierto en claro del bosque en costra biológica, escaso, 33°51'21.0"S, 70°58'55.0"W, 660 m, 6.VIII.2018, *J. Larraín 42713* (CONC); Provincia de Melipilla, Comuna de Melipilla, Reserva Privada Altos de Cantillana, cerros al E de Quebrada El Cepillo, matorral bajo de *Colliguaja-Peumus-Lithraea-Quillaja*, en suelo abierto en claro del bosque en costra biológica, 33°51'21.8"S, 70°58'52.0"W, 664 m, 6.VIII.2018, *J. Larraín 42718* (CONC), *42728* (CONC). — Región del Libertador Bernardo O'Higgins: Provincia de Colchagua, Comuna de Placilla, entre Nancagua y San Fernando, Lo Moscoso, valle del Río Tinguiririca, cerros con exposición sur sobre viñedos (viña Emiliana), sobre suelo protegido entre *Chusquea*, bajo grandes *Nothofagus glauca*, a la sombra, 34°35'49"S, 71°07'43"W, 490 m, 22.I.2009, *J. Larraín 31683B* (CONC); Provincia Cardenal Caro, Comuna de Pichilemu, Predio forestal Tanumé, CONAF, sector escuela de Tanumé, bosque de *Myrceugenia exsucca*, en suelo abierto saliendo del bosque, 34°12'25"S, 71°55'52"W, 300 m, 4.IX.2007, *J. Larraín 28806A* (CONC). — Región del Maule: Provincia de Talca, Comuna de San Clemente, Vilches Bajo, orilla de la carretera, matorral de *Acacia caven, Peumus boldus, Quillaja saponaria, Lithrea caustica*, en suelo entre el pasto, 35°53'S, 71°13'W, 350 m, 9.XII.1990, *M. Mahú & S. Tapia 50195* (MO, mixed with *Riccia sorocarpa*), *50183* (MO, mixed with *Bartramia stricta, Barbula unguiculata, Camptodontium cryptodon, Philonotis krausei*), Comuna de Curepto, cruce a Llongocura Alto, camino entre Gualleco y Curepto, en quebrada erosionada con *Cryptocarya alba-Peumus boldus-Kageneckia oblonga*, suelo seco, 35°09'57"S, 71°58'19"W, 200 m, 1.IX.2007, *J. Larraín 28634* (CONC, MUB), *28642* (CONC, MUB), *28643A* (CONC); Comuna de Constitución, Junquillar, en fragmento de bosque de *Peumus boldus* y *Quillaja saponaria* en ladera oeste, en suelo abierto, 35°15'55"S, 72°20'11"W, 10 m, 1.IX.2007, *J. Larraín 28600D* (CONC); Comuna de Empedrado, portón "Los Boldos" llegando a la Reserva Nacional Los Ruiles sector El Fin, en plantación de pinos, en pared de roca, 35°37'28"S, 72°20'26"W, 400 m, 31.VIII.2007, *J. Larraín 28470B1* (CONC), 380 m, 31.VIII.2007, *J. Larraín 28479* (CONC); en talud, *J. Larraín 28484* (CONC); Provincia de Cauquenes, Comuna de Chanco, Reserva Nacional Los Ruiles, sector Río Curacautín, en bosque de *Nothofagus obliqua-N. glauca*, sobre rocas en zona de picnic, 35°49'57"S, 72°30'15"W, 50 m, 19.VIII.2007, *J. Larraín 28351A* (CONC).

Remarks

The Chilean specimens studied are all in the smallest range of the known variability of the plants (Magill 1981; Guerra 2006c; Zander 2007b), rarely exceeding 5 mm tall, and leaves hardly reaching 1.5 mm long. Chilean specimens are seldom fertile. The plants are brownish, with leaves with flat margins and ended in a small sharp mucro, costa in cross section robust, with well developed ventral and dorsal stereid bands, and 5-6 guide cells at midleaf.

Trichostomum brachydontium is a very common taxon in central Chile, growing in a diversity of habitats including different types of dry forests and shrublands, between sea level and 1260 m a.s.l. These records are the first reports of the taxon for continental Chile, as it was previously known from the Juan Fernández archipelago and Easter Is. (Müller 2009). This is a wide-spread species in South, Central and North America, Eurasia, Africa, Atlantic Islands, Pacific Islands, Indian Ocean Islands, Australia and New Zealand (Zander 2007b).

A complete description and illustrations of this species are given by Magill (1981), and Guerra (2006c).

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