

***Porella biedermannii* sp. nov.
(Marchantiophyta, Porellaceae)
and other new records of liverworts
and hornworts from Central Chile**

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Abstract – *Porella biedermannii* from the Región del Maule in central Chile is described and illustrated. The species is characterized by ovate leaf lobes with curved inwards apices and dentate or appendiculate ventral base, obliquely inserted, oblong-ovate leaf lobules with distinctly reflexed apices and dentate margins, underleaves with distinctly reflexed apices and dentate margins, and stem surfaces covered with numerous filiform paraphyllia. The paper also reports 22 species of liverworts and two hornworts as new from the Región del Maule, and three liverwort species as new from Región Coquimbo of central Chile.

Marchantiophyta / *Porella* / liverworts / hornworts / new records / new species / Chile

INTRODUCTION

During excursions by the author in the years 1999, 2000, and 2001 the bryophyte flora of selected sites within the Maule (VII) region, which is situated in central Chile about 250 km south of the capital Santiago de Chile, was studied. This region is characterized by strong human influence, and large parts of the area, especially in the central Chilean valley, are now under cultivation. Arable land, vineyards, fruit plantations and settlements predominate. In the area of the coast range, the formerly dominant *Nothofagus* forests have been almost completely cleared and replaced by cultivated land or plantations of *Eucalyptus globulus* Labill. and *Pinus radiata* D. Don. In the Andean range the situation is more favourable, and larger stands of the natural forest vegetation survive, at least in the more remote, deep valleys.

The liverwort and hornwort flora of the Maule region of Chile is still insufficiently known. In the catalogue of the liverworts and hornworts of southern South America (Hässel & Rubies 2009) only 12 species are listed from this region: *Aneura pinguis* (L.) Dumort., *Cephaloziella divaricata* (Sm. & Sowerby) Schiffn. var. *scabra* (M. Howe) Haynes (= *C. subpapillosa* Herzog), *Chiloscyphus koepensis* (Gottsche) Steph., *Clasmatocolea humilis* (Hook.f. & Taylor) Grolle (= *Chiloscyphus humilis* [Hook.f. & Taylor] Hässel), *C. rigens* (Hook.f. & Taylor) J.J. Engel (= *Chiloscyphus rigens* [Hook.f. & Taylor] Hässel), *Lophocolea apophylla* (Hässel)

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Váña (= *Chiloscyphus apophyllus* Hässel), *L. lenta* (Hook.f. & Taylor) Gottsche, Lindenb. & Nees (*Chiloscyphus lentus* [Hook.f. & Taylor] J.J.Engel & R.M.Schust.), *Nephrolejeunea radulifolia* (C.Massal.) L.Söderstr. & A.Hagborg (= *Austrolejeunea radulaefolia* [C.Massal.] R.M.Schust.), *Pachyglossa exilis* (Herzog & Grolle) Hässel & Solari, *Pedinophyllopsis abdita* (Sull.) R.M.Schust. & Inoue, *Sauteria chilensis* (Lindenb.) Grolle, and *Schistochila stratosa* (Mont.) A.Evans. Hässel (2008) added *Plagiochila sticticola* Mont. & Gottsche (= *P. bispinosa* Lindenb.).

Pereira *et al.* (2006) added the following species from the surroundings of the village El Colorado: *Frullania* cf. *quillotensis* (Nees & Mont.) Nees & Mont., *Lophocolea muricata* (Lehm.) Nees, *L. semiteres* (Lehm.) Mitt., *Metzgeria* sp., *Myriocoleopsis minutissima* subsp. *myriocarpa* (Nees & Mont.) R.L.Zhu, Y.Yu & Pócs (= *Cololejeunea minutissima* [Sm.] Schiffn. subsp. *myriocarpa* [Nees & Mont.] Schust.), and *Porella chilensis* (Lehm. & Lindenb.) Trevis. Müller & Pereira (2006) added *Blepharolejeunea securifolia* (Steph.) R.M.Schust, *Cololejeunea microscopica* var. *africana* (Pócs) Pócs & Bernecker (= *Aphanolejeunea asperrima* [Steph.] Steph.), *Lejeunea hahnii* Solari, *Lepidozia cupressina* (Sw.) Lindenb. (= *L. chordulifera* Taylor), *Marchantia berteriana* Lehm. & Lindenb., *Noterochlada confluenta* Taylor, *Radula striata* Mitt., *R. tectiloba* Steph., *Symphogyna circinata* Nees & Mont., *S. rubritincta* A.Evans, and *Syzygiella colorata* (Lehm.) K.Feldberg, Váña, Hentschel & Heinrichs (= *Jamesoniella colorata* [Lehm.] Schiffn.) from the reserve Los Ruiles. Pereira *et al.* (2014) added *Frullania* cf. *magellanica* F.Weber & Nees, and *Porella subsquarrosa* (Nees & Mont.) Trevis. A new *Fossombronia* species, *F. hahnii* Frank Müll., was recently described (Müller 2017); two further *Fossombronia* species, *Fossombronia fernandeziensis* Steph. and *F. peruviana* Gottsche & Hampe and a species of *Riccia* were also reported from the region.

Currently, about 34 liverworts and hornworts are known from the region, in addition to two species that were identified only to genus level. Continued determination of the collected material led to several additions for the liverwort and hornwort flora of the region as well as of the more northern region Coquimbo. Among the material is a *Porella* specimen which cannot be assigned to one of the previously described species. Therefore it is described as a new species. Other collections include species which were hitherto known only from more southern regions of Chile. These new occurrences in the Maule region are major range extensions of the known distribution.

The nomenclature of liverworts and hornworts in this paper follows Söderström *et al.* (2016).

THE NEW *PORELLA* SPECIES

The genus *Porella* in Latin America was first revised by Swails (1969) who accepted 23 species. Later, So (2005) reduced the number of accepted species to 13. Swails (1969) treated *Porella capehorniensis* Swails, *P. subsquarrosa*, *P. recurva* (Taylor) Kühnem., and *P. chilensis* from Chile and southern Argentina. So (2005) excluded *P. capehorniensis* from the area, because the record was based on a mislabelled fragment of an Asiatic species. Furthermore, she reduced *P. recurva* to a synonym of *P. chilensis*. Therefore only two species, *P. subsquarrosa* and *P. chilensis*, are known from Chile and southern Argentina. Both species are relatively widely distributed in the region and were also gathered many times during the excursions referenced above. During determination of the *Porella* collections made

in the Región del Maule of central Chile, a *Porella* with dentate leaf lobules and underleaves came to my attention, which differed from the edentate *P. chilensis* and *P. subsquarrosa*. The material was thus compared with the other Latin American species (Swails 1969, So 2005) and species from other regions (Hattori 1978, So 2002, Schuster 1980, Müller 1951-1958, Schumacker & Vána 2005). It differs from all known *Porella* species and is therefore described as a new species:

***Porella biedermannii* Frank Müll. sp. nov.**

Figs 1-14

Typus: Chile, VII Región del Maule, province Talca, Armerillo (= 70 km SE of Talca), secondary valley of the Río Maule, valley with *Nothofagus* forest, epiphytic, 35°43'S, 71°01'W; 24.03.1999, leg. Frank Müller C629 (DR).

Diagnosis: The species differs from all other *Porella* taxa by the following combination of characters: ovate leaf lobes with apex curved inwards and dentate or appendiculate ventral base; obliquely inserted, oblong-ovate leaf lobules with distinctly reflexed apices and dentate margins; underleaves with distinctly reflexed apices and dentate margins; stem surface covered with numerous filiform paraphyllia.

Description: Plants medium-sized, olive-brown to yellow-brown, without an acrid peppery taste, stem to 6 cm long, 2.3-3.0 mm wide with leaves, irregularly bipinnate, the branches of the *Frullania*-type; stem without leaves 327-396 µm in diameter, in transverse section 13-18 cells across, the cortical band brown, of 3-4 layers of small extremely thick-walled cells, 19-30 µm wide × 14-21 µm high, surrounding a lighter medulla of larger thin-walled cells 16-39 µm wide × 14-22 µm high, stem surface cells in exterior view 31-54 µm long × 11-17 µm wide, cell walls thick-walled, stem surface covered with numerous filiform paraphyllia, varying in size, to 170 µm long.

Line of leaf insertion oblique, leaves imbricate, lobes spreading, ovate, convex, the apex curved inwards, 1.6-1.8 mm long, 1.0-1.3 mm wide at the base, 0.8-1.1 mm wide in median part, the apex rounded, the margins entire except for 1-11 teeth at the ventral base, teeth uniseriate or biseriata at base, 2-15 cells long, on the dorsal base sometimes also with 1-3 teeth or an larger appendage with 1-2 teeth at margin, ventral margin flat. Cells of the upper portion of the lobe isodiametric or little longer than wide, 13-24 µm wide × 17-30 µm long, thick-walled, trigones indistinct, without bulging sides, the cuticle smooth; cells at the margin subquadrate 13-19 µm wide × 13-20 µm long, basal leaf cells 18-29 µm wide × 25-44 µm long; oil bodies not seen.

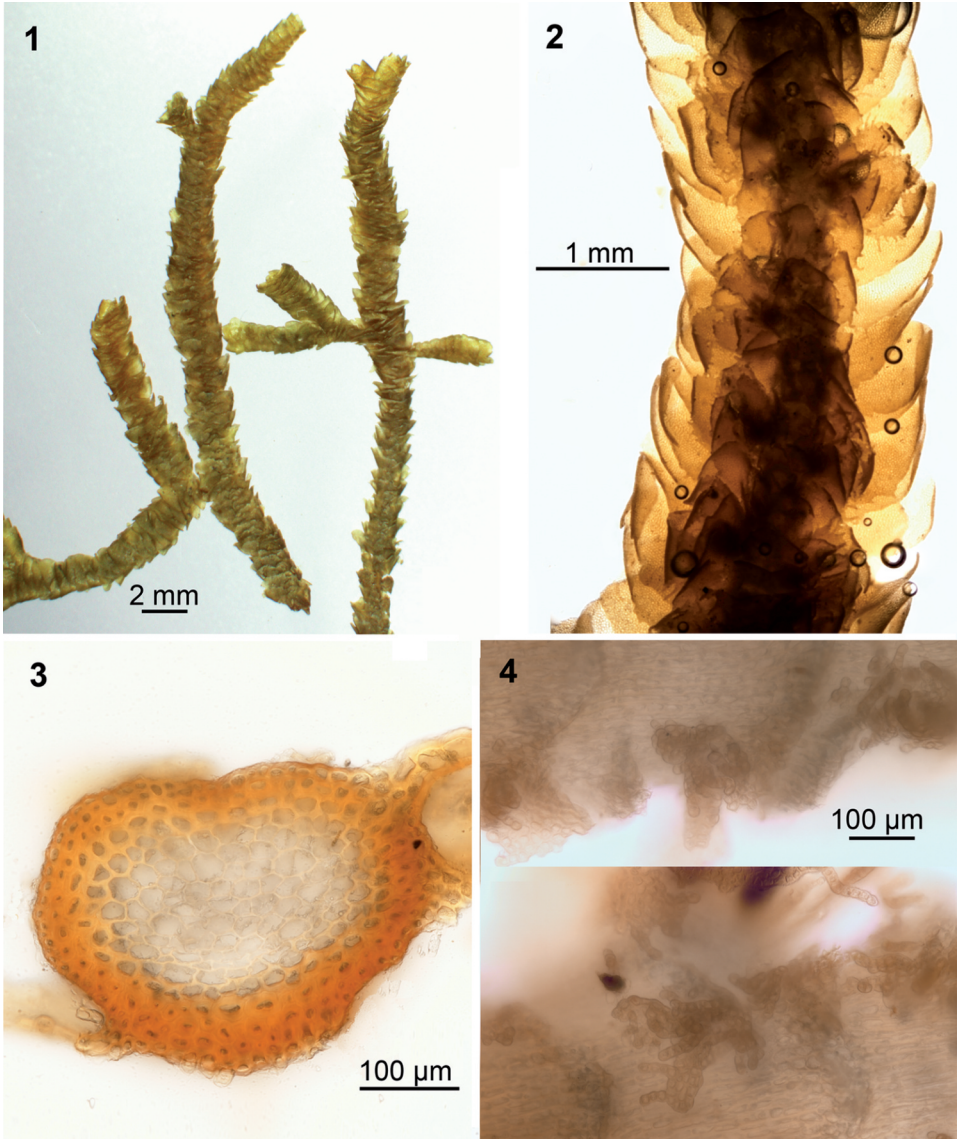
Lobules obliquely inserted, oblong-ovate, 644-896 µm long, 383-529 µm wide, apex obtuse, reflexed, the margins with short to long teeth, upper part of the teeth uniseriate, basal part 1-3seriate, the base of the lobules scarcely decurrent, upper cells of the lobules isodiametric, 14-21 µm wide × 13-24 µm long, middle lobule cells isodiametric to oval, 16-24 µm wide × 20-29 µm long, basal cells of the lobules oval, 18-24 µm wide × 26-39 µm long, keel very short or not present.

Underleaves approximate to imbricate, 1.5-2 times as wide as the stem, oblong-ovate, 600-787 µm long, 479-707 µm wide, base widened and auriculate, the apex obtuse and strongly reflexed, the margins with short to long teeth, upper part of the teeth uniseriate, basal part 1-3seriate.

Dioicous (?). Androecia unknown. Gynoecia on very short lateral branches along both sides of the main stem; bracts ovate-lanceolate, with strongly long-dentate margins, 0.9-1.1 mm long, 0.4-0.5 mm wide, bract lobules oblong-lanceolate, 0.5-0.7 mm long, 0.2-0.3 mm wide, margins strongly long-dentate, bracteoles 0.7-0.9 mm long, 0.4-0.5 mm wide, margins longly dentate; gynoecia 6-10; perianth and sporophyte not seen.

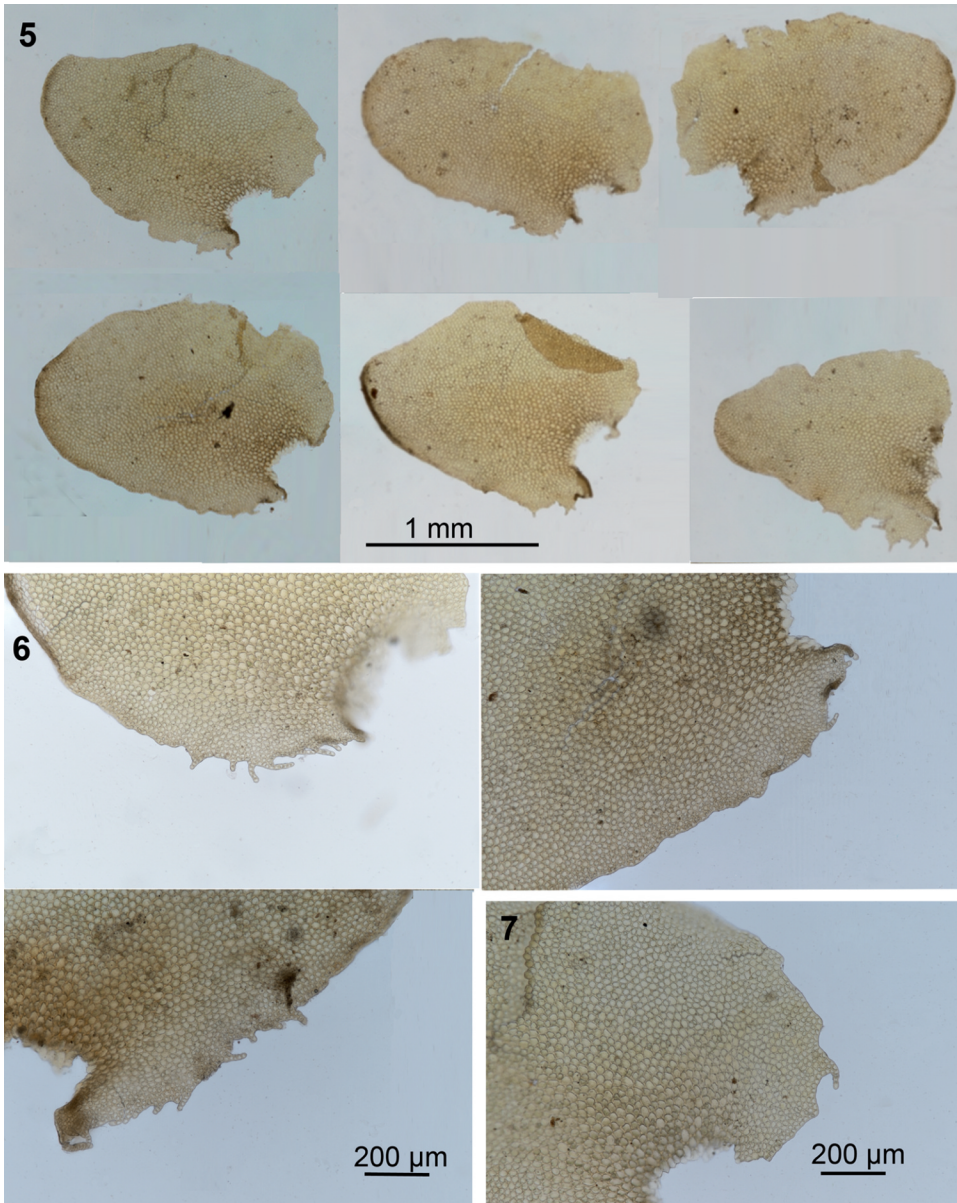
Etymology: The new species is named in honor of the German bryologist Siegfried Biedermann.

Habitat and distribution: The species is hitherto only known from its type locality in the Región del Maule of central Chile. The type locality is situated in a remote, deep valley in the Andean range in an area with larger stands of natural forest vegetation. The species was found as an epiphyte in forests dominated by *Nothofagus* trees.

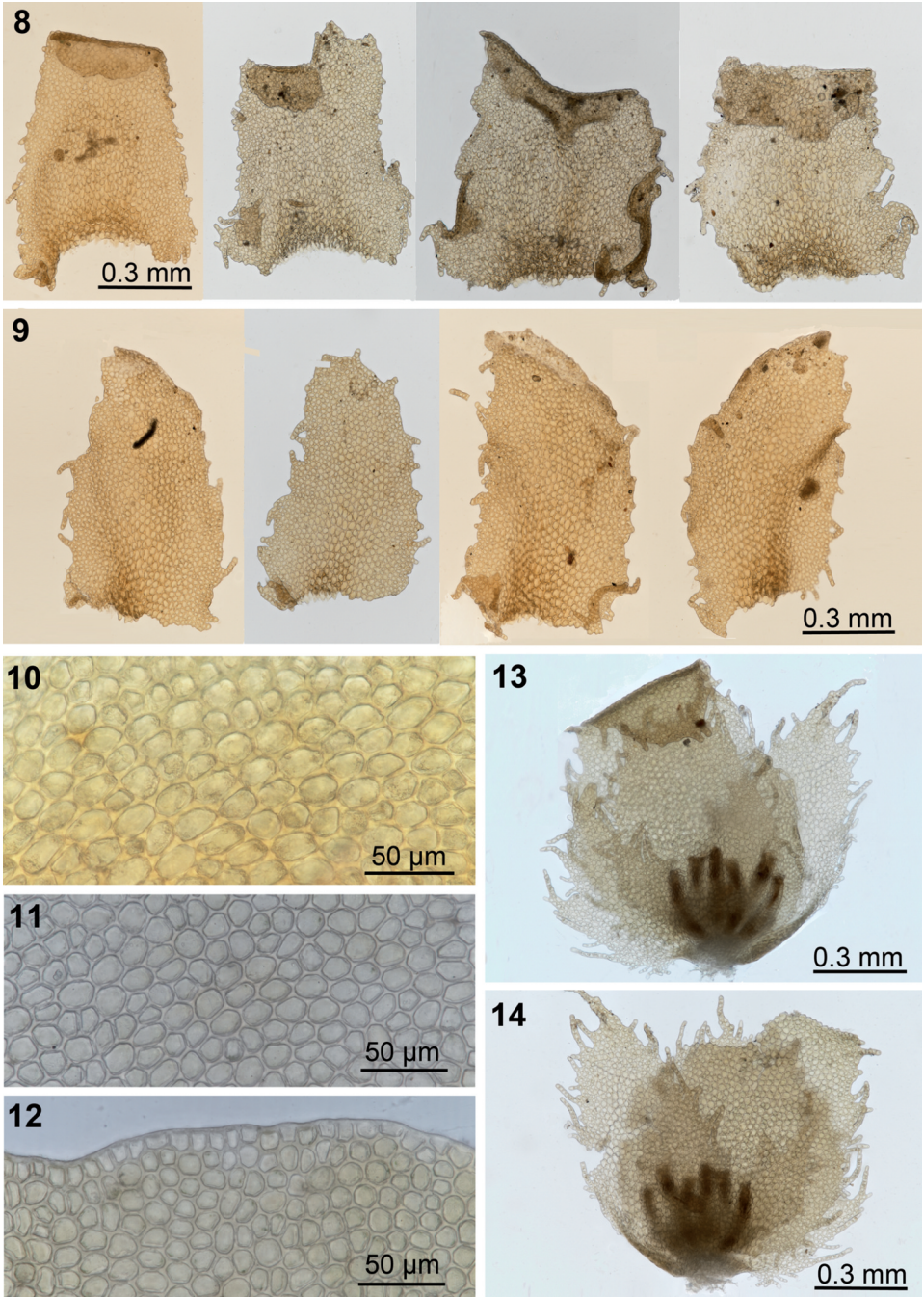


Figs 1-4. *Porella biedermannii*. **1.** Plants in dorsal view. **2.** Portion of a stem in ventral view. **3.** Stem transverse section. **4.** Ventral view of stem showing paraphyllia, underleaves removed. All from *Frank Müller C629*.

Discussion: The two other Chilean *Porella* species are quite distinct from *P. biedermannii*. Both differ from *P. biedermannii* by entire lobules and underleaves. In *Porella subquarrosa*, the lobules are broadly ovate and usually of similar size than the underleaves, and the underleaf margins are strongly recurved. *Porella chilensis* differs from *P. biedermannii* by triangulate-ovate leaf lobes with acute, apiculate or narrowly obtuse apex, leaf cells with conspicuous trigones, and lobules arranged parallel to the stem.



Figs 5-7. *Porella biedermannii*. 5. Leaf lobes. 6. Ventral lobe margin at base. 7. Dorsal lobe margin at base. All from Frank Müller C629.



Figs 8-14. *Porella biedermannii*. 8. Underleaves. 9. Leaf lobules. 10. Basal cells of lobe. 11. Upper cells of lobe. 12. Cells at the margin in upper part of lobe. 13. Female inflorescence in ventral view. 14. Female inflorescence in dorsal view. All from Frank Müller C629.

The other Latin American species with partly dentate underleaves and lobules differ in various details.

In *P. crispata* (Hook.) Trevis. the lobes are distinctly bordered, the lobe margins are entire or have only one or two large teeth at the ventral base, the ventral margin is strongly crispate, the lobe cells have trigones with bulging sides, the margin of lobules and underleaves is undulate, but in general not dentate or only has a few basal teeth, the underleaves are not reflexed.

Porella brasiliensis (Raddi) Schiffn. differs by a verruculose cuticle of the leaf cells, widely spreading leaf lobes with flat, not incurved apices, not reflexed underleaves, and lobules more than 2× as long as wide arranged parallel to the stem.

Porella reflexa (Lehm. & Lindenb.) Trevis. shares with *P. biedermannii* the distinctly reflexed apices of underleaves and lobules. It differs however by leaf lobes bordered by a row of inflated, quadrate or rectangular cells, elongate upper leaf lobe cells, entire or only basally toothed underleaves and lobules, and the absence of stem paraphyllia.

Porella brachiata (Taylor) Spruce shares with *P. biedermannii* the presence of paraphyllia on the stem. It differs from it by its larger size, smaller upper leaf lobe cells (17-20 µm in diameter) with conspicuous and bulging trigones, and lobules that are arranged parallel to the stem.

Porella leiboldii (Lehm. & Lindenb.) Trevis. differs by widely spreading, larger leaf lobes, underleaves with recurved margins, and the lobules and underleaves are only dentate or appendiculate near base.

There are also differences between *Porella biedermannii* and similar species with dentate underleaves and lobules margins from outside Latin America. *Porella biedermannii* shares many character states with *P. arboris-vitae* (With.) Grolle, an European species with the disjunct East Asian subsp. *nitidula* (Mass. ex Steph.) Hatt. (*Porella nitidula* [Mass. ex Steph.] Hatt.). Beside the toothed lobules and underleaves, *P. arboris-vitae* shares with *P. biedermannii* the very short or absent keel. *Porella biedermannii* differs from *P. arboris-vitae* by the absence of an acrid peppery taste, more strongly reflexed lobules and underleaves, rounded and not acute dorsal lobes, and the presence of stem paraphyllia.

SPECIES NEW FOR ADMINISTRATIVE REGIONS OF CENTRAL CHILE

Acrobolbus urvilleanus (Mont.) Trevis. (*Tylimanthus urvilleanus* [Mont.] Hässel & Solari)

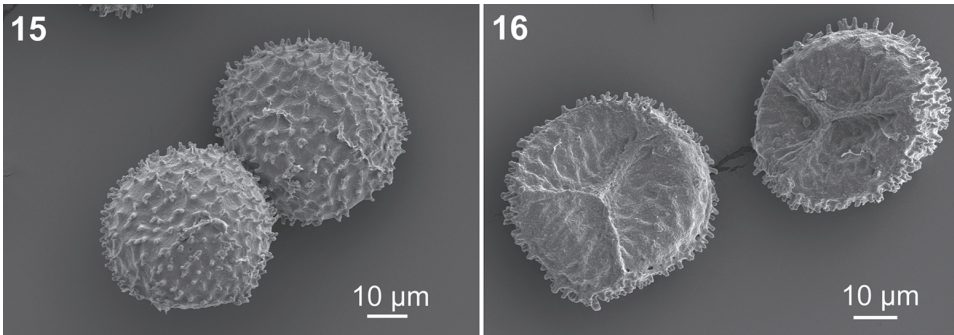
VII Región del Maule, province Cauquenes: Reserva nacional Los Ruiles, *F. Müller C1043*.

A Patagonian endemic known from southern Argentina, southern Chile, and the Falkland Islands. The hitherto known northernmost records were in Río Negro Province of Argentina and in Cautín Province of the region of Araucanía (IX) of Chile (Hässel & Rubies, 2009). The new record is a major extension of the distribution of the species to the north.

Anthoceros peruvianus Steph.

VII Región del Maule, province Talca: Laguna del Maule, *F. Müller C210*.

The proximal spore surface has an obvious net of depressions and is otherwise free of verrucae and other outgrowths, and at the distal surface a prominent reticulate network is lacking (Figs 15-16). The spore morphology of the newly



Figs 15-16. *Anthoceros peruvianus*. **15.** SEM image of distal spore wall patterns. **16.** SEM images of proximal spore wall patterns. All from *Frank Müller C210*.

collected material exactly matches the description and figures in Hässel (1990). For a long time the species was only known from the type collection in Peru, but Hässel & Villagrán (2007) reported it as new for Chile from Petorca province of V Región de Valparaíso.

Cephalozia badia (Gottsche) Steph.

VII Región del Maule, province Talca: Laguna del Maule, *F. Müller C221*.

An American subantarctic species known from Antarctica, subantarctic islands (South Shetland Islands, South Orkney Islands, South Georgia, South Sandwich Islands), Falkland Islands, Tierra del Fuego, western Patagonia, and New Zealand (Bednarek-Ochyra *et al.*, 2000; Engel, 2007). In Chile the species was previously only known from the region of Magallanes and Antártica Chilena (XII) with northernmost records in Ultima Esperanza Province.

Clevea spathysii (Lindenb.) Müll.Frib.

IV Región de Coquimbo, province Limarí: Samo Alto, *F. Müller C1988*.

In Chile the species is better known as *Athalamia robusta* (Steph.) S.Hatt. and under this name it is included in the catalogue of Hässel & Rubies (2009). *Athalamia robusta* was synonymized under *Athalamia andina* (Spruce) S.Hatt. by Bischler-Causse *et al.* (2005) and later this species was synonymized under *Clevea spathysii* by Rubasinghe (2011). *Clevea spathysii* is distributed in areas with a Mediterranean climate. Following Rubasinghe (2011) the distribution of *Clevea spathysii* based on confirmed herbarium material includes Algeria, Argentina, Bolivia, Chile, Ecuador, Georgia, Greece, Italy, Jordan, Mexico, Mongolia, Morocco, Namibia, Oman, Peru, Portugal, Spain, U.S.A. (California, Texas), Yemen, and Zimbabwe. In Chile the species was hitherto known from the regions V Valparaíso, Región Metropolitana de Santiago and X Los Lagos (Gradstein & Cuvertino, 2015; Hässel & Rubies, 2009; Rubasinghe, 2011).

Dumortiera hirsuta (Sw.) Nees

VII Región del Maule, province Cauquenes: Curanipe, Salto de agua Tregualemu, *F. Müller C51, C756*; province Talca: Constitución, Quebrada Pellin, *S. Hahn C2277*.

The species has a pantropical distribution and extends north- and southwards into temperate regions. In Chile the species was hitherto known from Chiloé in region X Los Lagos, and from the Juan Fernández Islands (Hässel & Rubies, 2009).

Hygrolembidium isophyllum R.M.Schust.

VII Región del Maule, province Talca: Laguna del Maule, *F. Müller* C221.

An American subantarctic species known from West Antarctica, subantarctic islands (South Georgia), the Falkland Islands, and southern Chile and Argentina. In Chile the species was hitherto known from the regions VIII Bío-Bío, and XII Magallanes (Hässel & Rubies, 2009). The new record in region VII marked the northernmost known locality of the species.

Isotachis humectata (Hook.f. & Taylor) Steph.

VII Región del Maule, province Talca: Laguna del Maule, *F. Müller* C191, *S. Hahn* C2392, C2393.

A Patagonian endemic known from southern Chile, southern Argentina, and the Falkland Islands. In Chile the species was hitherto known from the regions V Valparaíso, VIII Bío-Bío, X Los Lagos, XI Aisén, and XII Magallanes (Hässel & Rubies, 2009).

Leiomitra elegans (Lehm.) Hässel

VII Región del Maule, province Cauquenes: Curanipe, *S. Hahn* C2391; Curanipe, Salto de agua Tregualemu, *F. Müller* C49, C755; province Talca: Constitucion, Quebrada Pellín, *S. Hahn* C2253.

The species is known from southern Chile and southern Argentina; records from tropical areas of South America (Colombia, Brazil) are most likely erroneous and need confirmation (see e.g. comments in Gradstein & Costa, 2003). In Chile the species was till now known from the regions IX Araucanía, X Los Lagos, XI Aisén, XII Magallanes, and from Juan Fernández Islands (Hässel & Rubies, 2009). The new records in region VII are the northernmost on the Chilean mainland.

Lepicolea ochroleuca (Spreng.) Spruce

VII Región del Maule, province Cauquenes: Curanipe, *S. Hahn* C2394; Curanipe: Salto de agua Tregualemu, *F. Müller* C37, C745, C760.

An amphiatlantic species known from southern Africa, Tristan da Cunha, New Zealand, and Central and South America. In Chile the species was previously known from the regions V Valparaíso, IX Araucanía, X Los Lagos, XI Aisén, XII Magallanes, and Juan Fernández Islands (Hässel & Rubies, 2009).

Lethocolea radicata (Lehm. & Lindenb.) Grolle

VII Región del Maule, province Cauquenes: Reserva Nacional Los Ruiles, *F. Müller* C168, C178. Province Talca: Reserva Nacional Altos del Lircay, *F. Müller* C1285; La Mina, *S. Hahn* C2171.

The species is widespread in Central and Southern Chile and Argentina, furthermore it occurs on Falkland Islands and subantarctic islands (Crozet, Marion, Prince Edward). In Chile the species was hitherto known from the regions V Valparaíso, Región Metropolitana de Santiago, IX Araucanía, X Los Lagos, XI Aisén, XII Magallanes, and from Juan Fernández Islands (Hässel & Rubies, 2009; Gradstein & Cuvertino, 2015).

Lunularia cruciata (L.) Dumort. ex Lindb. subsp. *thaxteri* (A.Evans & Herzog) R.M.Schust.

VII Región del Maule, province Talca: Armerillo, *F. Müller* C660, C1115.

Lunularia cruciata subsp. *thaxteri* was synonymized with subsp. *cruciata* by Boisselier-Dubayle *et al.* (1995), but their subsp. *thaxteri* specimen was identified with some doubt and originated from Madeira, far from the known range. The newly collected Chilean material matches the description of the taxon by Evans & Herzog

in Herzog (1938). It has strongly thickened epidermal cells, purplish ventral side of thallus and purplish ventral scales and epidermal pores bounded by fewer rings but with more cells in each ring. In Chile, subsp. *thaxteri* is known from the regions V Valparaíso, Región Metropolitana de Santiago, VIII Bío-Bío, X Los Lagos, and from Juan Fernández Islands (Hässel & Rubies, 2009).

Marchantia polymorpha L.

VII Región del Maule, province Talca: Reserva Nacional Altos del Lircay, *F. Müller* C1449; valley of Río Maule below Laguna del Maule, *F. Müller* C228; province Curicó: Laguna de Teno, *S. Hahn* C2315.

The cosmopolitan species was hitherto known in Chile from Juan Fernández Islands and the regions IX Araucanía, X Los Lagos, XII Magallanes, and XV Arica and Parinacota (Hässel & Rubies, 2009; Ardiles & Peñaloza, 2013; Ardiles & Fariña, 2014).

Metzgeria divaricata A.Evans

VII Región del Maule, province Talca: El Colorado, *F. Müller* C475; Constitución: Pantanillos, *F. Müller* C391; Constitución: Quebrada Pellín, *S. Hahn* C2123, C2254; Armerillo, *F. Müller* C640; province Cauquenes: Curanipe, Salto de agua Tregualemu, *F. Müller* C79, C80; Reserva nacional Los Ruiles, *F. Müller* C802, C811.

The species is known from southern Chile and southern Argentina. As no recent revision of the Chilean species of *Metzgeria* is available, the revision of Evans (1923) was used for the determination of the material. As stated by Gradstein & Cuvertino (2015) *M. divaricata* is a poorly known species very similar to the widespread neotropical *M. myriopoda* Lindb., and probably a synonym of the latter. In Chile the species was hitherto known from the regions IV Coquimbo, Región Metropolitana de Santiago, VIII Bío-Bío, IX Araucanía, X Los Lagos, and XII Magallanes (Hässel & Rubies, 2009).

Pachyglossa austrigena (Hook.f. & Taylor) L.Söderstr. (*Chiloscyphus austrigenus* [Hook.f. & Taylor] J.J.Engel & R.M.Schust.)

VII Región del Maule, province Talca: Reserva Nacional Altos del Lircay, *F. Müller* C679, C697, C699, C716.

The species is distributed in southern South America, Falkland Islands and subantarctic islands (Tristan da Cunha, Inaccessible Island), while subsp. *okaritana* (Steph.) L.Söderstr. (*Chiloscyphus austrigenus* subsp. *okaritanus* [Steph.] J.J.Engel) is distributed in Australia and New Zealand. In Chile the species was already known from the regions V Valparaíso, IX Araucanía, X Los Lagos, XI Aisén, and XII Magallanes (Hässel & Rubies, 2009).

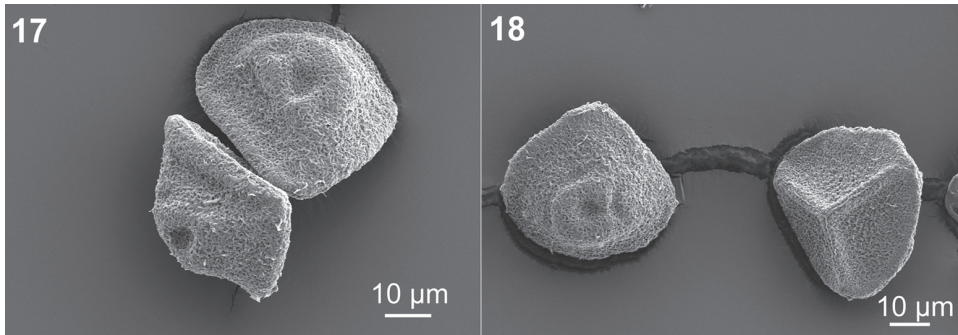
Paracromastigum subsimplex (Steph.) Fulford & J.Taylor

VII Región del Maule, province Talca: Constitución, Pantanillos, *F. Müller* C392, *S. Hahn* C2395.

A species of southern South America (Chile, Argentina) including Falkland Islands. In Chile the species was hitherto known from the regions X Los Lagos, XI Aisén, and XII Magallanes with northernmost records in the province of Valdivia (Hässel & Rubies, 2009). The record in the Región del Maule is a major range extension of the species to the north.

Phaeomegaceros squamuliger (Spruce) J.C.Villarreal subsp. *squamuliger* (*Phaeoceros squamuligerus* [Spruce] Hässel)

VII Región del Maule, province Talca: Reserva Nacional Altos del Lircay, *F. Müller* C1183, C1564.



Figs 17-18. *Phaeomegaceros squamuliger* subsp. *squamuliger*. **17.** SEM image of distal spore wall patterns. **18.** SEM images of proximal (right) and distal (left) spore wall patterns. All from Frank Müller C1183.

This species is known from Ecuador, Chile, and Argentina (Hässel & Rubies 2009, Villarreal *et al.*, 2010). Villarreal *et al.* (2010) transferred *Phaeoceros squamuligerus* (Spruce) Hässel to *Phaeomegaceros* and described the new subspecies *hasseli* from Osorno in region X of Chile, different from typical *Ph. squamuliger* by the absence of dorsal outgrowths and the presence of pronounced ridges surrounding the central depression on the distal face of the spores. The above mentioned material from region VII clearly belongs to subsp. *squamuliger* as demonstrated by spore morphology (Figs 17-18). In Chile subsp. *squamuliger* was previously known from the regions X Los Lagos, and XII Magallanes (Hässel & Rubies, 2009; Villarreal *et al.*, 2010).

Plagiochasma rupestre (J.R.Forst. & G.Forst.) Steph. var. *rupestre*

IV Región de Coquimbo, province Limarí: Samo Alto, F. Müller C1995. VII Región del Maule, province Talca: Constitución, Pellines, S. Hahn C2190; Armerillo, S. Hahn C2334; province Curicó: Reserva Nacional Radal Siete Tazas, F. Müller C1772.

Widespread in warm regions of the world. It has been recorded from Europe, the Mediterranean area and Macaronesia, SW Asia, India, tropical and S Africa, the Mascarenes, Australia, New Zealand, Oceania, the New World from southern U.S.A. to southern S America (Bischler-Causse *et al.*, 2005). In Chile the species was already known from the regions V Valparaíso, Región Metropolitana de Santiago, VI O'Higgins, VIII Bío-Bío, IX Araucanía, X Los Lagos, XV Arica and Parinacota, and from Juan Fernández Islands (Hässel & Rubies, 2009; Ardiles & Fariña, 2014).

Radula hastata Steph.

VII Región del Maule, province Talca: Reserva Nacional Altos del Lircay, F. Müller C1251.

An endemic of southern South America (Chile, Argentina). In Chile the species was hitherto known from the regions IX Araucanía, X Los Lagos, XII Magallanes, and Juan Fernández Islands (Hässel & Rubies, 2009).

Radula punctata Steph.

VII Región del Maule, province Talca: Constitución, Quebrada Pellin, S. Hahn C2267, C2284; Armerillo, F. Müller C1097; province Cauquenes: Chanco, Reserva nacional Los Ruiles, F. Müller C1067.

The species has its distribution center in Chile and Argentina, where it is known as *Radula plumosa* Mitt. ex Steph., a species synonymized under *R. punctata*

by Solari (1978). *Radula punctata* is furthermore reported from Peru and Colombia (Yamada, 1987; Uribe & Gradstein, 1998). In Chile the species was hitherto known from the regions VIII Bío-Bío, IX Araucanía, X Los Lagos, XI Aisén, XII Magallanes, and from Juan Fernández Islands (Hässel & Rubies, 2009).

Reboulia hemisphaerica (L.) Raddi

VII Región del Maule, province Curicó: Reserva nacional Radal Siete Tazas, *F. Müller C1773*.

Widespread in warm-temperate areas all over the world (Bischler-Causse *et al.*, 2005). In Chile the species was already known from the regions V Valparaíso, X Los Lagos, XII Magallanes, and from Juan Fernández Islands (Hässel & Rubies, 2009).

Riccia sorocarpa Bisch.

IV Región de Coquimbo, province Limarí: near Parque Nacional Fray Jorge, *F. Müller C1946*. VII Región del Maule, province Talca: Laguna del Maule, *F. Müller C222*.

The species is nearly subcosmopolitan in distribution. In South America it is known from Argentina, Chile, Uruguay, and Peru (Jovet-Ast, 1991; Hässel & Rubies, 2009). In Chile the species was hitherto known from the regions V Valparaíso and Región Metropolitana de Santiago (Hässel & Rubies, 2009; Gradstein & Cuvertino, 2015).

Schistochila splachnophylla (Hook.f. & Tayl.) Steph. (*Pachyschistochila*

splachnophylla [Hook.f. & Tayl.] R.M.Schust. & J.J.Engel)

VII Región del Maule, province Talca: Laguna del Maule, *F. Müller C211*.

The distribution of the species includes southern South America, Falkland Islands, Gough Island, and New Zealand (Schuster & Engel, 1977). In Chile the species was known from the regions X Los Lagos, XI Aisén, XII Magallanes, and from Juan Fernández Islands (Hässel & Rubies, 2009). The newly documented high altitude record in region VII is the northernmost known record in mainland southern South America.

Solenostoma crassulum (Nees & Mont.) Steph. (*Jungermannia crassula* Nees & Mont.)

VII Región del Maule, province Talca: Constitución, Pantanillos, *F. Müller C393*; Reserva nacional Altos del Lircay, *F. Müller C1138, C1260*. All cited specimens were confirmed by J. Vána.

This species is known from southern South America (Chile, Argentina), the Falkland Islands, Tristan da Cunha, Inaccessible Island, and Gough Island (Vána, 1974). In Chile it was hitherto known from the regions V Valparaíso, Región Metropolitana de Santiago, VIII Bío-Bío, IX Araucanía, X Los Lagos, XI Aisén, XII Magallanes, and Juan Fernández Islands (Hässel & Rubies, 2009).

Symphogyna podophylla (Thunb.) Nees & Mont.

VII Región del Maule, province Talca: Armerillo, *S. Hahn C2402*.

The species is distributed in tropical and southern Africa, and South and Central America (Schaumann *et al.*, 2003). In Chile the species was hitherto known from the regions X Los Lagos, XI Aisén, XII Magallanes, and from Juan Fernández Islands (Hässel & Rubies, 2009).

Targionia hypophylla L.

VII Región del Maule, province Talca: Armerillo, *F. Müller C1129*.

This species is widely distributed throughout warm-temperate and tropical regions of the world. In Chile it was hitherto known from the regions V Valparaíso,

Región Metropolitana de Santiago, X Los Lagos, and XV Arica and Parinacota (Hässel & Rubies, 2009; Gradstein & Cuvertino, 2015; Ardiles & Peñaloza, 2013; Ardiles & Fariña, 2014).

DISCUSSION

With the addition of 25 species, the liverwort and hornwort flora of the Maule region now includes some 59 species. Regardless of the progress toward inventory research made during the last two decades, the liverwort and hornwort flora of the region is far from being completely known and further studies are warranted. Due to the high geomorphological variation – from coastal habitats to high mountains with elevations of up to 4100 m in the Andean range – the liverwort and hornwort flora must be much more species rich. The liverwort and hornwort flora of the region includes Mediterranean elements (e.g. *Clevea spathysii*, *Lunularia cruciata* subsp. *thaxteri*, *Plagiochasma rupestre*, *Targionia hypophylla*), tropical/warm-temperate species (*Dumortiera hirsuta*), subcosmopolitan species (*Marchantia polymorpha*, *Riccia sorocarpa*), as well as Southern Hemisphere/southern Patagonian species, which reach in the area their northernmost known distribution limit. To the last group with remarkable range extensions to the north belong *Acrobolbus urvilleanus*, *Cephalozia badia*, *Hygrolembidium isophyllum*, and *Paracromastigum subsimplex*. Many of these species were found in alpine habitats at altitudes above 2000 m at the locality Laguna del Maule.

The site with the new species *Porella biedermannii* is situated within a recently established private protected area, the Parque Natural Tricahue, and therefore it will hopefully be protected against deforestation.

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