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LIVERWORTS OF PEATLANDS AND *TEPUALIA STIPULARIS* (HOOK. & ARN.) GRISEB. SWAMP FORESTS IN ISLA GRANDE DE CHILOÉ (CHILE): KEY FOR IDENTIFICATION

Hepáticas de las turberas y bosques pantanosos de *Tepualia stipularis* (Hook. & Arn.) Griseb. de la Isla Grande de Chiloé (Chile): clave para la identificación

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ABSTRACT
Bryophytes play a key role in peatland ecosystems; they participate directly in the constitution of peat and in the maintenance of these ecosystems. Nevertheless, the knowledge of this group is highly limited, specifically for liverworts. Therefore, we present a key to determine liverworts, restricted to peatland habitats and swamp forests of *Tepualia stipularis* (Hook. & Arn.) Griseb. of Isla Grande de Chiloé (Chile). This key includes the main reported taxa for these ecosystems and it is based on vegetative characters to facilitate identification. Fifty-two species and 28 genera are included. These taxa belong to 19 families. The best represented families are: Lepidoziaceae, Lophocoleaceae, Plagiochilaceae, and Aneuraceae. *Chiloscyphus*, *Plagiochila,* and *Riccardia* are the richest genera. A separate key for each group with similar characters and alphabetical taxa list are provided.

Key words. Bogs, Southern South America, bryophytes, hepatics, key.

RESUMEN
Los briófitos juegan un rol clave en los ecosistemas turbosos, participan directamente en la constitución de la turba y en el mantenimiento de estos ecosistemas. Sin embargo, el conocimiento de este grupo es muy limitado, especialmente para las hepáticas. En consecuencia, se presenta una clave para determinar hepáticas, restringidas a turberas y bosques pantanosos de *Tepualia stipularis* (Hook. & Arn.) Griseb. de la Isla Grande de Chiloé (Chile). Esta clave incluye los principales taxones hallados en estos hábitats y está basada en caracteres vegetativos para facilitar la identificación. Se presentan 52 especies y 28 géneros. Estos taxones pertenecen a 19 familias. Las familias mejor representadas son Lepidoziaceae, Lophocoleaceae, Plagiochilaceae y Aneuraceae. Los géneros con la mayor cantidad de especies son *Chiloscyphus*, *Plagiochila* y *Riccardia*. Se entregan además claves separadas para cada grupo de plantas con caracteres afines y una lista en orden alfabético de los taxones incluidos.

Palabras clave. Turberas, sur de América del Sur, briófitos, hepáticas, clave**.**

INTRODUCTION

Bryophytes form an important part of peatland ecosystems. Peat is often made up largely of bryophyte biomass, and 90-100% of the ground layer is usually covered by bryophytes (Vitt & Belland 1995). Nevertheless, this group is poorly known and rarely included in floristic and vegetation studies because they are difficult to sample and identify.
The knowledge of Chilean bryophyte flora is highly limited. Normally, this botanical group is not considered in studies of flora and vegetation. Thus, bryophytes are not included in the Red Book of Chilean Terrestrial Flora (Benoit 1989).

Field identification of bryophytes is generally difficult, as it requires the examination of microscopic characters and time-consuming work in the laboratory. Moreover, the identification of Chilean liverwort flora is fraught with difficulty due to the sparseness of recent taxonomic literature. Hässel de Menéndez & Rubies (2009) published a Catalogue of the Marchantiophyta and Anthocerotophyta; nevertheless, Chile does not have a national compilation work of liverwort flora yet. The closest monographic work is Cryptogamic Flora of Tierra del Fuego (Hässel de Menéndez & Solari 1976) but unfortunately it only includes a few orders and families. In addition, there are only a few works that include keys for determination of species, e.g., Hepaticae of Brunswick Peninsula (Engel 1978). An alternative way to determine Chilean specimens is to use exotic works, such as: New Zealand flora (Engel & Glenny 2008), Latin-American floras (Gradstein *et al.* 2001, Gradstein & Pinheiro da Costa 2003), compilations of Southern Hemisphere species (Schuster 2000, Schuster 2002) or monographic papers (Fulford 1963, Fulford 1966, Fulford 1968, Fulford 1976). However, these works only consider some species and genera.

In Chiloé, peatlands and *Tepualia stipularis* (Hook. & Arn.) Griseb. forests are closely related by their bryophyte floras (Villagrán & Barrera 2002, Villagrán *et al.* 2003, Villagrán *et al.* 2002, Villagrán *et al.* 2005) and their origins (Díaz *et al.* 2007, Díaz *et al.* 2008, Zegers *et al.* 2006).
During the fieldwork of floristic and ecological research in *Sphagnum* peatlands and *Tepualia* forests of Isla Grande de Chiloé (Chile), bryophytes were collected and studied. In that work, bryo-lichenic flora was described and compared, finding that these ecosystems are related but have differences in their compositions (León 2012). As a complement of that study, we present a key to determine liverworts, restricted to peatland habitats and swamp forests of *Tepualia stipularis* (Hook. & Arn.) Griseb. of Isla Grande de Chiloé (Chile). The aims of this work are to increase the knowledge of local bryophyte flora and to facilitate the identification of these plants.

Study area

The study area is located in the Isla Grande de Chiloé, Región de Los Lagos, Chile (42°-43° S and 73°-75°W). The prevailing climate is wet temperate with a strong oceanic influence (di Castri & Hajek 1976). The total annual rainfall is about 2,300 mm (CONAF 2009), reaching 5,000 - 6,000 mm in some areas, with a mean summer temperature of 10.2ºC and a mean winter temperature of 6.2ºC (Pérez *et al.* 2003).

The vegetation of Chiloé Island has a mixed composition of broad-leaved evergreen rain forests and it mainly belongs to the North Patagonian and Valdivian forests. North Patagonian forest type is floristically defined by the dominance of shade-tolerant conifers (Podocarpaceae), in addition to *Drimys winteri* J.R. Forst. & G. Forst. and *Nothofagus nitida* (Phil.) Krasser in the main canopy, and

together with *Tepualia stipularis* and other Myrtaceae tree species in the understory. Valdivian forests are generally dominated by a different set of broad-leaved evergreen tree species, such as *Eucryphia cordifolia* Cav. and *Aextoxicon punctatum* Ruiz & Pav., and several Myrtaceae species in the main canopy and subcanopy (Armesto *et al.* 1996, Donoso 1993, Gutiérrez *et al.* 2009). Nevertheless, the rural landscapes of Chiloé Island are also composed by shrublands, secondary forests, plantations of exotic tree species, anthropogenic grasslands, peatlands, and swamp forests.

In Chiloé, the most abundant peatlands are dominated by lax cushions of *Sphagnum* moss. In general, these cushions are associated with other bryophytes and lichens, also, with sedges (*Carex magellanica* Lam. and *Oreobolus obtusangulus* Gaudich.), rushes (*Juncus procerus* E. Mey., *J. stipulatus* Nees & Meyen and *Apodasmia chilensis* (Gay) B.G. Briggs & L.A.S. Johnson) and shrubs (*Empetrum rubrum* Vahl ex Willd., *Baccharis patagonica* Hook. & Arn. and *Tepualia stipularis*). Furthermore, these areas can present isolated trees such as: *Pilgerodendron uviferum* (D. Don) Florin, *Nothofagus antarctica* (G. Forst.) Oerst. and *N. nitida*. Considering the origin of peatlands, we can recognize two types: glaciogenic and anthropogenic (Díaz *et al.* 2008). Glaciogenic peatlands were formed by peat accumulation in open water after glacial retreat. Anthropogenic peatlands correspond to flooded areas colonized by *Sphagnum* moss after the burning or logging of forests (*Tepualia stipularis, Pilgerodendron uviferum* and *Fitzroya cupressoides* (Molina) I.M. Johnst.) in areas with poor drainage soils.

The most common swamp forests are dominated by *Tepualia stipularis*. This type of forest can be associated with *Pilgerodendron uviferum* and/or *Drimys winteri*. It grows in waterlogged areas (García & Ormazabal 2008) and it can accumulate organic matter (Veblen & Schlegel 1982).

We studied ten sites located in the northern and central parts of the island. Two kinds of *Sphagnum* peatlands were studied, which were defined according to their origin and their characteristic vegetation (Díaz *et al.* 2008). The three study areas representing the glaciogenic peatland (GP) type were: Río Negro, Los Caulles, and Púlpito; and the five study areas representing the anthropogenic peatland (AP) were: Senda Darwin, Lecam, Pumanzano, Río Chepu and Teguel. In addition, two sites of *Tepualia* forest were sampled, Parque Nacional Chiloé and another area of Senda Darwin.

The nomenclature and classification follow Hässel de Menéndez & Rubies (2009) and Crandall-Stotler *et al*. (2009), respectively.

RESULTS

The key presented below is based on vegetative characters to facilitate the identification. Fifty-two species and 28 genera are included. These taxa belong to 19 families. The best represented families are: Lepidoziaceae (10 species), Lophocoleaceae (8 species), Plagiochilaceae (7 species), and Aneuraceae (7 species). *Chiloscyphus*, *Plagiochila* and *Riccardia* are the richest genera. A separate key for each group with similar characters is provided.

1. Plants without leaves (thallose)...Group A
1'. Plants with leaves (foliose).....2

2. Leaves conduplicate.....Group B
2'. Leaves non-conduplicate.....3

3. Leaves deeply dissected into hair-like segments which are not more than 1-2 cells wide at base.....Group C

3'. Leaves undivided or divided into segments which are more than 2 cells wide at base...4

4. Leaves of mature stems always 3-10 lobed .....Group D
4'. Leaves of mature stems unlobed or bi-lobed; leaf margins entire, dentate or ciliate.....5

5. Leaf insertion slightly or clearly incubous.....Group E
5'. Leaf insertion transverse or succubous 6

6. Underleaves lacking or minute.....7
6'. Underleaves distinct.....8

7. Leaf insertion clearly succubous .....Group F
7'. Leaf insertion transverse or slightly succubous.....Group G

8. Cuticle striate to papillose.....Group H
8'. Cuticle smooth.....Group I

GROUP A. Thallose (*Riccardia*)

1. Thallus with multicellular projections.....2
1'. Thallus without multicellular projections 4

2. Thallus with a peripheral layer of overlapping empty cone cells..... ***Riccardia prehensilis* (Hook. & Tayl.) C. Massal.**
2'. Thallus without a peripheral layer of overlapping empty cone cells.....3

3. Thallus with squamiform multicellular projections.....***Riccardia spinulifera* A. Massal.**
3'. Thallus with filiform multicellular projections.....***Riccardia hyalitricha* Hässel**

4. Thallus filamentous, wide 1 to 2.5 times the thickness; small cells with thickened walls.....***Riccardia alcicornis* (Hook. f. & Tayl.) Trev.**
4'. Thallus ribbon-shaped, wide more than 2.5 times the thickness.....5

5. Branches mainly pluripinnate; epidermal cells with distinct thickened walls..... ***Riccardia amnicola* Hässel**
5'. Branches simple or pinnate; epidermal cells with walls thin to slightly thickened.....6

6. Plants forming dense carpets; apices of the axes directed along the same lines; branches very short; diameter of the inner cells similar; thallus thick.....***Riccardia floribunda* (Stephani) A. Evans**
6'. Plants creeping, mixed with other bryophytes; branches simple to pinnate; diameter of the inner cells larger than the central cells; thallus laminar.....***Riccardia rivularis* Hässel**

GROUP B. Foliose. Conduplicate

1. Leaf insertion transverse or succubous....2
1'. Leaf insertion incubous.....3

2. Leaves with dentate lamellae; insertion line single.....***Schistochila***
Underleaves bifid from 4/5 its length; leaf cells elongated parallel to the lamellae and thin hyaline walls. ***Schistochila lamellata* (Hook.) Dumort.**
2'. Leaves without dentate lamellae; insertion line complex.....***Balantiopsis***
Plants frequently with a deep red pigmentation; dorsal lobes dentate-laciniate, narrowed to the apex, and strongly flattened over the ventral lobes. ***Balantiopsis cancellata* (Nees) Stephani**

3. Underleaves absent.....***Radula***
Dorsal lobe ovate and concave; ventral lobe half the size of dorsal lobe. ***Radula decora* Gottsche ex Stephani**
3'. Underleaves present.....4

4. Underleaves with margin entire.....***Porella*** Trigones large, knot-like; perianth mouth narrow, short-ciliate, the cilia of 1 to 3 thick-walled cells; underleaves rounded and recurved at apex; lobes and underleaves usually of similar size. ***Porella subsquarrosa*** **(Nees & Mont.) Trevis.**

4'. Underleaves bilobed or with irregular margin.....5

5. Ventral lobe united for most of their length with dorsal lobe along an elongated keel; perianth usually pentagonal; hyaline papilla distal to ventral lobe tooth; plants green to yellow-green.....***Cheilolejeunea*** **spp.**

5'. Ventral lobe nearly free from dorsal lobe; plants often with reddish, brownish, or dark green coloration.....6

6. Leaf margins entire.....***Frullania*** Ventral lobes inflated and obliquely inserted; stylus acute, inconspicuous and composed of only a few cells. ***Frullania boveana*** **C. Massal.**

6'. Leaf margins ciliate.....7

7. Underleaves of main axis bifid..... .....***Gackstroemia*** Paraphyllia lacking; dorsal lobes of main axis auriculate; cilia of dorsal lobes of branch leaves and helmets consistently present. ***Gackstroemia magellanica*** **(Lam.) Trevis.**

7'. Underleaves of main axis quadrifid..... .....***Lepidogyna*** Paraphyllia present; dorsal lobe cordate; ventral lobe lanceolate or cylindrical with a unciform tooth; small trigones. ***Lepidogyna menziesii*** **(Hook.) R.M. Schust.**

GROUP C. Foliose. Leaves with hair-like segments

1. Lamina obtrapezoidal with 5 segments, segments with several opposite cilia; hyaloderm absent.....***Leiomitra*** Stems without paraphyllia; lamina of leaf without superficial cilia; some of the divisions of leaf segments recurved. ***Leiomitra elegans*** **(Lehm.) Hässel de Menéndez**

1'. Lamina rectangular with (2)4-6 segments, uniseriate, without opposite cilia; hyaloderm present.....2 (***Telaranea***)

2. Stem leaves with a lamina of 3 or 4 rows of cells high; segments 4 or 6 cells long; perianth mouth crenulate.....***Telaranea plumulosa*** **(Lehm. & Lindenb.) Fulford**

2'. Stem leaves with a lamina 1 or 2 rows of cells high; segments straight and stiff, 5 or 6 cells long; perianth mouth ciliate..... .....***Telaranea blepharostoma*** **(Stephani) Fulford**

GROUP D. Foliose. Stem leaves 3-10 lobed

1. Isophyllous (underleaves similar to lateral leaves in size and shape).....2

1'. Anisophyllous (underleaves differing in form and size from lateral leaves).....3

2. Plants robust (5-8 mm wide); stem leaves and underleaves laciniate.....***Lepicolea*** Leaf-segments ending in a hyaline tip of a few to several long cells; vitta absent. ***Lepicolea ochroleuca*** **(L. f. ex Spreng.) Spruce**

2'. Plants minute (0.3-0.6 mm wide); stem leaves and underleaves without teeth..... .....***Kurzia*** Base of leaf segments 5 to 10 cells wide; leaves erect-spreading, segments only slightly incurved; stem with a layer of 12 large cortical cells.....***Kurzia setiformis*** **(De Not.) J.J. Engel & R.M. Schust.**

3. Leaves with 2-3 teeth at apex; branching forked; plants 1-6 mm wide.....***Bazzania*** Leaves 3-thoothed, without vitta; underleaves with margin dentate-aserrate, hyaline border and connate with a pair of lateral leaves. ***Bazzania peruviana*** **(Nees) Trevis.**

3'. Leaves divided into 4-6 segments; branching bipinnate; plants 0.5-1.5 wide... .....4(***Lepidozia***)

4. Margin of leaves and underleaves without teeth or cilia.....5
4'. Margin of leaves and underleaves with one to several teeth or cilia.....6

5. Leaf segments in conspicuous pairs, incurved; leaf-cells large, usually 16-25 × 16-20 µm at base of a segment; cuticle smooth.....***Lepidozia fuegiensis*** **Stephani**
5'. Leaf segments not conspicuous in pairs, 4 to 6 cells wide at base; leaf-cells 17-20 × 20 µm at the base of a segment; cuticle papillose.....***Lepidozia laevifolia*** **(Hook. f. & Taylor) Gottsche, Lindenb. & Nees**

6. Dorsal margin of the leaf with a sharp tooth; underleaf lamina with at least one large tooth on either side.....***Lepidozia chordulifera*** **Taylor**
6'. Dorsal margin of the leaf denticulate, and short-ciliate or with several teeth near the base; underleaf lamina usually with a lateral tooth on either side.....***Lepidozia chiloensis*** **Stephani**

GROUP E. Foliose. Leaves of mature stems unlobed or 2-lobed; incubous

1. Hyaloderm present.....***Hyalolepidozia***
Leaves bifid, clearly incubously oriented, wider than stem and ±contigous. ***Hyalolepidozia bicuspidata*** **(C. Massal.) S.W. Arnell ex Grolle**
1'. Hyaloderm absent.....2

2. Isophyllous or subisophyllous (underleaves similar to lateral leaves in size and form)...3
2'. Anisophyllous (underleaves differing in form and size from lateral leaves).....4

3. Leaves distinctly vittate, vitta of elongate cells extended into each lobe; leaves falcate-lanceolate, deeply bifid (50-70% of the leaf), lobes lanceolate to acuminate..... .....***Herbertus***
Leaves and underleaves more than twice as long as wide; lobe of leaves and underleaves acuminate by only 2 or 3 cells; vitta covering about half the width of the base, ending well below the apex; trirradiate trigones and thick walls. ***Herbertus runcinatus*** **(Taylor) Kuhnem.**
3'. Leaves never vittate, bilobed (5-50% of the leaf); lobes never lanceolate or acuminate... .....***Isotachis***
Margins of underleaves with 4 to many broad teeth; median leaf cells without intermediate thickenings; trigones conspicuous; cuticle slightly papillose. ***Isotachis madida*** **(Hook. f. & Taylor) Mitt.**

4. Leaves unlobed, apices entire or bidentate; cortical cells with thick wall.....***Calypogeia***
Underleaves bilobed with rhizoids at base. ***Calypogeia sphagnicola*** **(Arnell & J. Perss.) Warnst. & Loeske**
4'. Leaves deeply bifid or trifid, lobes lanceolate to acuminate; cortical cells with thin wall.....***Acromastigum***
Ventral segment of nearly twice as long as dorsal segment; cell walls distinctly pigmented with yellow or brown, specially cortical cells. ***Acromastigum anisostomum*** **(Lehm. & Lindenb.) A. Evans**

GROUP F. Foliose. Leaves of mature stems unlobed or 2-lobed. Underleaves lacking or minute. Clearly succubous

1. Plants very small (0.5-1 mm wide); leaves bilobed.....***Cephalozia skottsbergii*** **Steph.**
1'. Plants medium to robust (4-8 mm wide); leaves entire to dentate.....2 (***Plagiochila***)

2. Leaves long trapezoidal to rectangular....3
2'. Leaves oval to obcuneate.....5

3. Leaves curved rectangular, ventral and dorsal margin without teeth.....***Plagiochila lophocoleoides*** **Mont.**

3'. Leaves trapezoidal, ventral and dorsal margin with teeth.....4

4. Plants laterally compressed in dry condition; leaves trapezoidal; leaf apex with 2-3 strong unequal teeth; median cells isodiametric..... ***Plagiochila stictaecola*** **Mont.& Gottsche**
4'. Plants flat in dry condition; leaves long trapezoidal; leaf apex with 2-5 unequal strong teeth; median cells longitudinally enlarged.....***Plagiochila rubescens*** **(Lehm. & Lindenb.) Lindenb.**

5. Plants arborescent.....6
5. Plants not arborescent.....7

6. Plants dendroid (5-8 cm long); leaves quite distant; dorsal leaf margin entire, 3-4 short teeth with 1 cell long near the apex of leaf; ventral leaf margin with 6-7 teeth with 3-4 cells long.....***Plagiochila subpectinata*** **Besch. & C. Massal.**
6'. Plants short arborescent (1-1,8 cm long), originated from a vigorous creeping system with stoloniferous microphylous branches; leaves imbricate; teeth of different size , all around leaves (20-30 teeth).....***Plagiochila lechleri*** **Gottsche**

7. Leaves imbricate; marginal teeth 1-2 cells long.....***Plagiochila hookeriana*** **Lindenb.**
7'. Leaves distant; marginal teeth 1-5 cells long.....***Plagiochila chonotica*** **Tayl.**

GROUP G. Foliose. Leaves of mature stems unlobed or 2-lobed. Underleaves lacking or minute. Transverse or slightly succubous

1. Leaves bifid.....***Anastrophyllum***
Leaves strongly falcate-secund, asymmetric, broadly overlapping dorsally; leaf margins smooth and entire, sometimes weakly crenulate. ***Anastrophyllum schismoides*** **(Mont.) Stephani**
1'. Leaves orbicular and entire.....2

2. Terminal branching completely absent; flagellae regularly produced...***Cryptochila***
Leaf surface smooth; trigones lacking; stem cortex in 3 (4) cell layers with strongly thickened walls. ***Cryptochila grandiflora*** **(Lindenb. & Gottsche) Grolle**
2'. Terminal branching present; flagellae only rarely and sporadically produced, mostly absent.....***Jamesoniella***
Leaf surface coarsely papillose; trigones medium to bulging; stem cortex poorly differentiated in 1 layer of thickened cells. ***Jamesoniella colorata*** **(Lehm.) Stephani**

GROUP H. Foliose. Leaves of mature stems unlobed or 2-lobed. Underleaves distinct. Cuticle striate to papillose

1. Leaf apices undivided- short bifid; perianths absent.....***Saccogynidium***
Leaves ovate, leaf cuticle with peg-like papillae. ***Saccogynidium australe*** **(Mitt.) Grolle**
1'. Leaf apices distinctly bifid; perianths present.....2

2. Leaves ovoid to oblong; leaf-margins entire.....***Nothostrepta***
Leaves always longer than wide; underleaves lanceolate, connate at the base with one leaf. ***Nothostrepta bifida*** **(Stephani) R.M. Schust.**
2'. Leaves obtrapezoidal; leaf-margins dentaculate-lacinate.....***Balantiopsis***
Asymmetric leaves; dorsal lobe less than half of ventral lobe; underleaves ovate and bifid. ***Balantiopsis asymmetrica*** **(Herzog) J.J. Engel**

GROUP I. Foliose. Leaves of mature stems unlobed or 2-lobed. Underleaves distinct. Cuticle smooth

1. Perianth strongly laterally compressed, mouth truncate, wide, 2-lipped..... .....***Leptoscyphus***

Leaves entire; perianth mouth dentate; plants not laterally compressed; underleaves bifid, segments divergent, sinus obtuse, segments 3 cells wide at base. ***Leptoscyphus huidobroanus*** **(Mont.) Gottsche**

1'. Perianth trigonous to trigonous inflated.... .....2 (***Chiloscyphus***)

2. Leaf apices entire or with a few sporadic teeth.....3

2'. Leaf apices dentate, lobate or bifid.....5

3. Leaves deeply adaxially concave, orbicular to reniform; underleaves orbicular to subrectangular, apices undivided or shorty bifid.....***Chiloscyphus humilis*** **(Hook. f. & Taylor) Hässel de Menéndez**

3'. Leaves plane or convex, not adaxially concave, ovate; underleaves bifid with numerous lateral teeth.....4

4. Plants robust (4-6 cm wide); stem 18-22 cells wide; leaves red brown with green apices; underleaves close to one leaf; perianth mouth dentate.....***Chiloscyphus horizontalis*** **(Hook.) Nees**

4'. Plants delicate (1-4 cm wide); steam 6-16 cells wide; leaves brown or red-brown; underleaves connate on both sides to leaves; mouth perianth lacinate..... ***Chiloscyphus magellanicus*** **Stephani**

5. Leaf clearly bifid or sometimes trifid.....6

5'. Leaf ciliate or with many teeth, not clearly bifid.....7

6. Leaves mainly subrectangular, bifid, rarely trifid, sinus sub-truncate; underleaves connate with leaves on both sides, wings conspicuous.....***Chiloscyphus attenuatus*** **(Stephani) J.J. Engel & R.M. Schust.**

6'. Leaves ovate, bifid, sinus round (U-form); underleaves connate on one side to a leaf base, the wing very narrow..... ***Chiloscyphus subviridis*** **(Hook. f. & Taylor) J.J. Engel & R.M. Schust.**

7. Leaves broadly ovate, long decurrent; underleaves deeply inserted on the stem and long decurrent by a narrow band, free from the leaves.....***Chiloscyphus striatellus*** **C. Massal.**

7'. Leaves rectangular to orbicular, scarcely decurrent; underleaves connate with both rows of leaves, wings narrow or scarcely developed.....***Chiloscyphus breutelii*** **(Gott.) Engel & Schust.**

Taxa included

Acromastigum anisostomum (Lepidoziaceae)
Anastrophyllum schismoides (Scapaniaceae) (Fig. 2H)
Balantiopsis asymmetrica (Balantiopsidaceae)
Balantiopsis cancellata (Balantiopsidaceae) (Fig. 1D)
Bazzania peruviana (Lepidoziaceae) (Fig. 2I)
Calypogeia sphagnicola (Calypogeiaceae) (Fig. 2D)
Cephalozia skottsbergii (Cephaloziaceae)
Cheilolejeunea sp. (Lejeuneaceae)
Chiloscyphus attenuatus (Lophocoleaceae)
Chiloscyphus breutelii (Lophocoleaceae)
Chiloscyphus horizontalis (Lophocoleaceae) (Fig. 3A)
Chiloscyphus humilis (Lophocoleaceae)
Chiloscyphus magellanicus (Lophocoleaceae)
Chiloscyphus striatellus (Lophocoleaceae)
Chiloscyphus subviridis (Lophocoleaceae)
Cryptochila grandiflora (Jamesoniellaceae)
Frullania boveana (Frullaniaceae) (Fig. 1G)
Gackstroemia magellanica (Lepidolaenaceae) (Fig. 1H)
Herbertus runcinatus (Herbertaceae) (Fig. 2G)
Hyalolepidozia bicuspidata (Lepidoziaceae) (Fig. 3D)
Isotachis madida (Balantiopsidaceae)
Jamesoniella colorata (Jamesoniellaceae) (Fig. 3B)
Kurzia setiformis (Lepidoziaceae) (Fig. 2B)
Leiomitra elegans (Trichocoleaceae) (Fig. 1J)

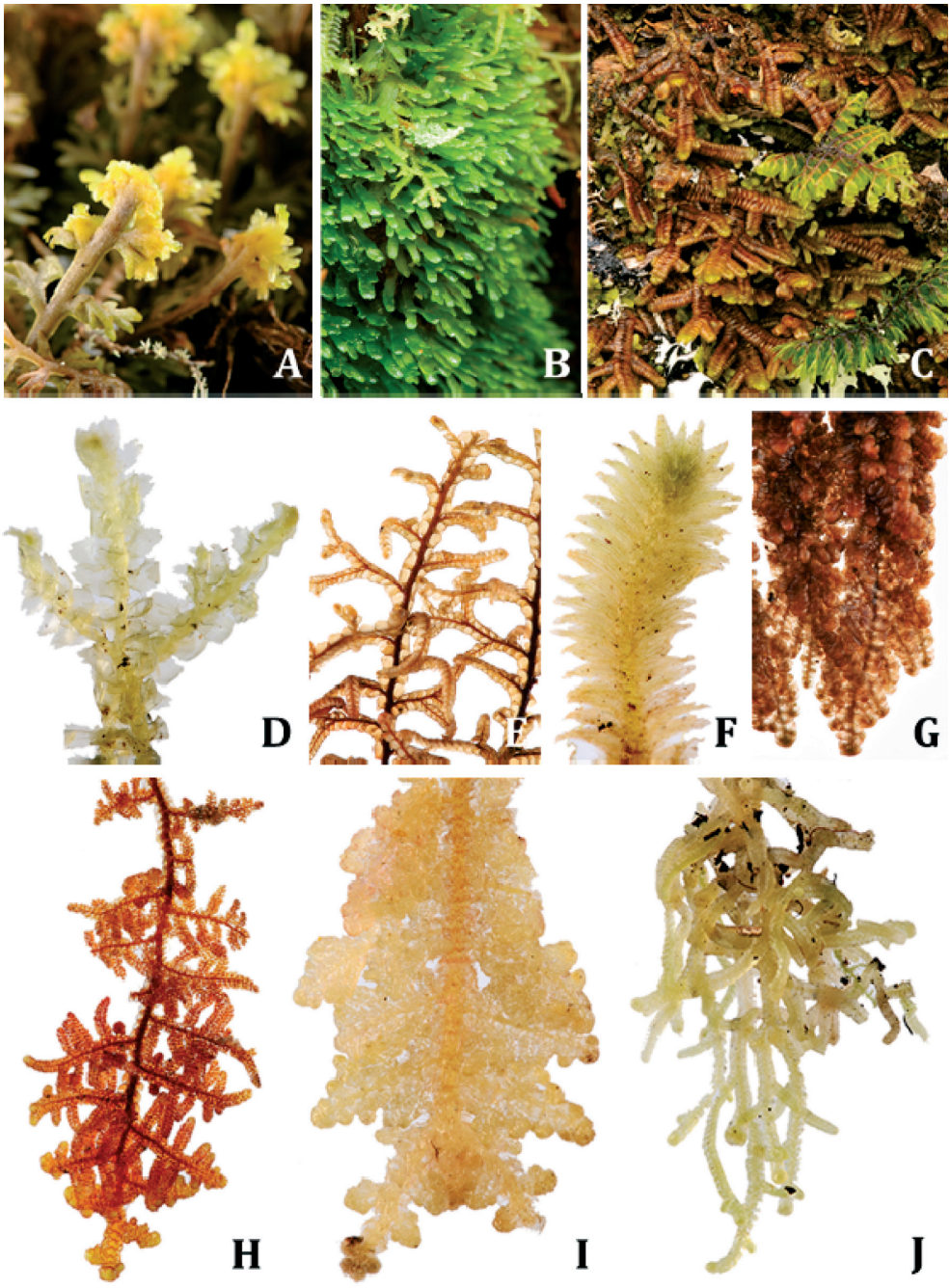

Fig. 1. Liverworts of peatlands and *Tepualia* forests, Chiloé, Chile. **A**, *Riccardia prehensilis* (Hook. & Tayl.) C. Massal.; **B,** *Riccardia rivularis* Hässel; **C**, *Porella subsquarrosa* (Nees & Mont.) Trevis.; **D**, *Balantiopsis cancellata* (Nees) Stephani; **E**, *Radula decora* Gottsche ex Stephani; **F**, *Schistochila lamellata* (Hook.) Dumort.; **G**, *Frullania boveana* C. Massal.; **H**, *Gackstroemia magellanica* (Lam.) Trevis.; **I**, *Lepidogyna menziesii* (Hook.) R.M. Schust.; **J**, *Leiomitra elegans* (Lehm.) Hässel de Menéndez.

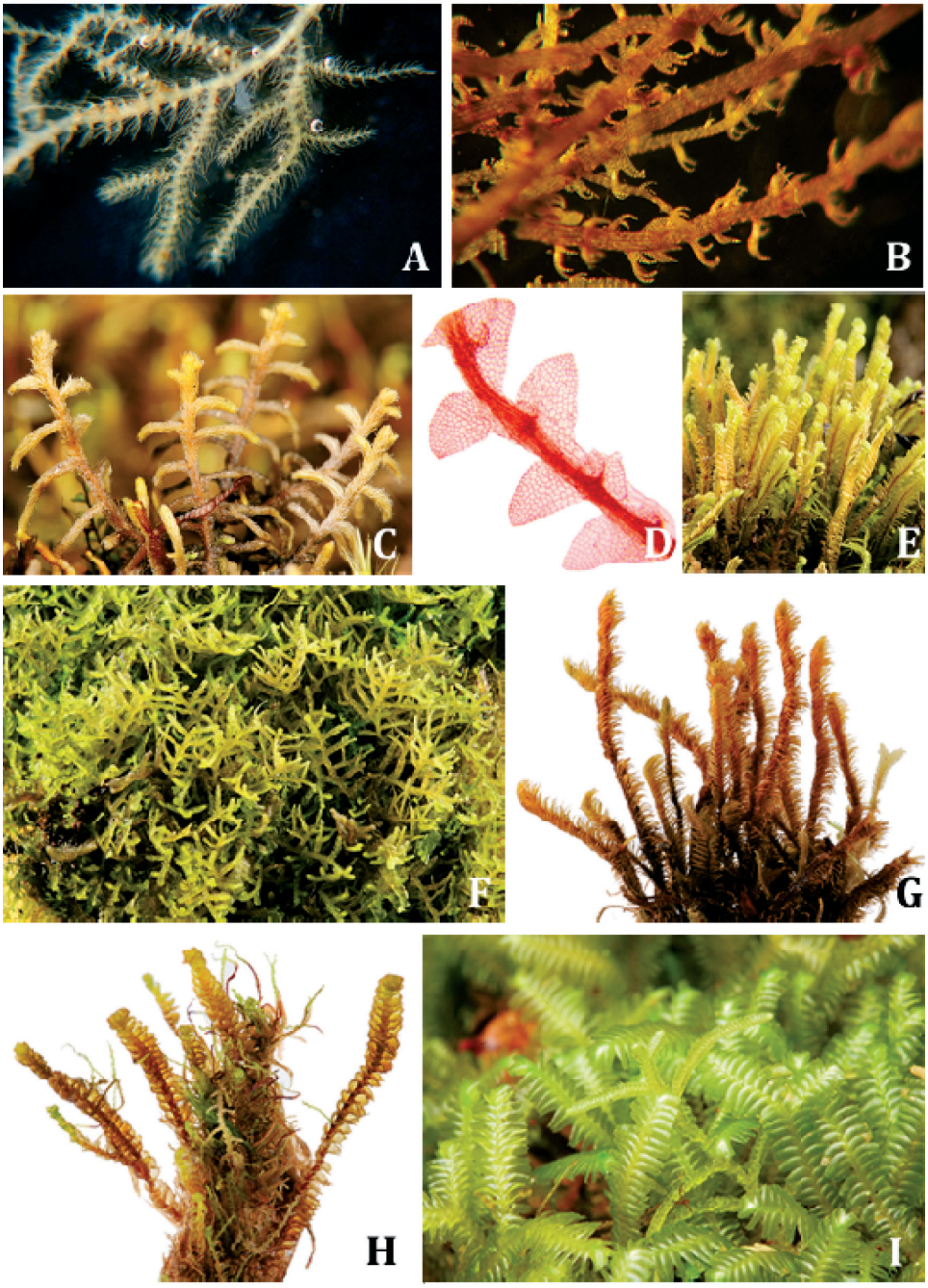

Fig. 2. Liverworts of peatlands and *Tepualia* forests, Chiloé, Chile. **A**, *Telaranea blepharostoma* (Stephani) Fulford; **B**, *Kurzia setiformis* (De Not.) J.J. Engel & R.M. Schust.; **C**, *Lepicolea ochroleuca* (L. f. ex Spreng.) Spruce; **D**, *Calypogeia sphagnicola* (Arnell & J. Perss.) Warnst. & Loeske; **E**, *Plagiochila stictaecola* Mont.& Gottsche; **F**, *Lepidozia chordulifera* Taylor; **G**, *Herbertus runcinatus* (Taylor) Kuhnem.; **H**, *Anastrophyllum schismoides* (Mont.) Stephani; **I**, *Bazzania peruviana* (Nees) Trevis.

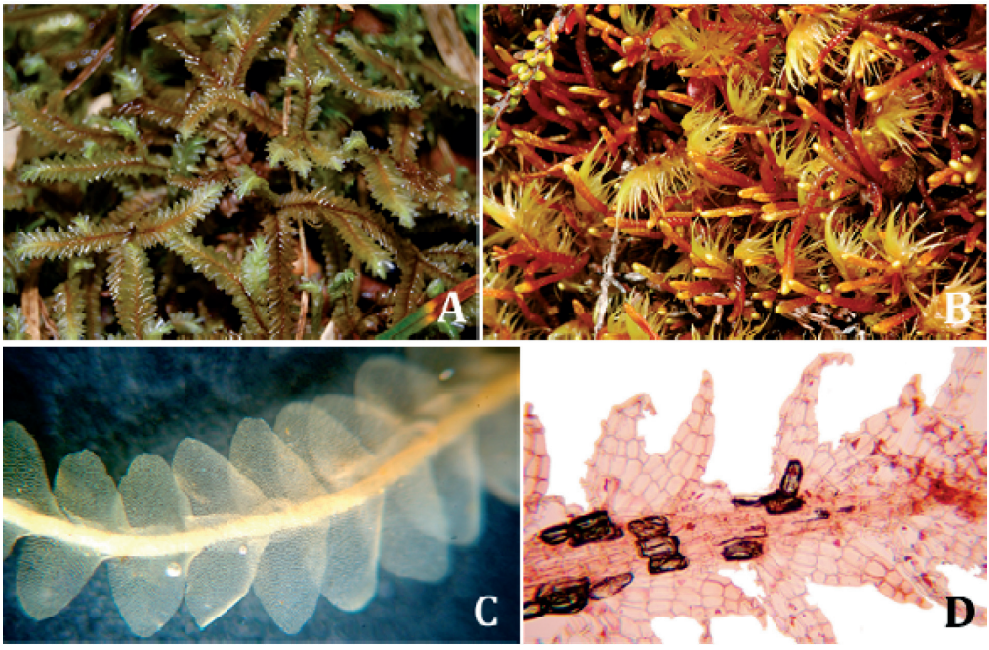

Fig. 3. Liverworts of peatlands and *Tepualia* forests, Chiloé, Chile. **A**, *Chiloscyphus horizontalis* (Hook.) Nees; **B**, *Jamesoniella colorata* (Lehm.) Stephani; **C**, *Saccogynidium australe* (Mitt.) Grolle; **D**, *Hyalolepidozia bicuspidata* (C. Massal.) S.W. Arnell ex Grolle.

Lepicolea ochroleuca (Lepicoleaceae) (Fig. 2C)
Lepidogyna menziesii (Lepidolaenaceae) (Fig. 1I)
Lepidozia chiloensis (Lepidoziaceae)
Lepidozia chordulifera (Lepidoziaceae) (Fig. 2F)
Lepidozia fuegiensis (Lepidoziaceae)
Lepidozia laevifolia (Lepidoziaceae)
Leptoscyphus huidobroanus (Lophocoleaceae)
Nothostrepta bifida (Jamesoniellaceae)
Plagiochila chonotica (Plagiochilaceae)
Plagiochila hookeriana (Plagiochilaceae)
Plagiochila lechleri (Plagiochilaceae)
Plagiochila lophocoleoides (Plagiochilaceae)
Plagiochila rubescens (Plagiochilaceae)
Plagiochila stictaecola (Plagiochilaceae) (Fig. 2E)
Plagiochila subpectinata (Plagiochilaceae)
Porella subsquarrosa (Porellaceae) (Fig. 1C)
Radula decora (Radulaceae) (Fig. 1D)
Riccardia alcicornis (Aneuraceae)
Riccardia amnícola (Aneuraceae)
Riccardia floribunda (Aneuraceae)
Riccardia hyalitricha (Aneuraceae)
Riccardia prehensilis (Aneuraceae) (Fig. 1A)
Riccardia rivularis (Aneuraceae) (Fig. 1B)
Riccardia spinulifera (Aneuraceae)
Saccogynidium australe (Geocalycaceae) (Fig. 3C)
Schistochila lamellata (Schistochilaceae) (Fig. 1F)
Telaranea blepharostoma (Lepidoziaceae) (Fig. 2A)
Telaranea plumulosa (Lepidoziaceae)

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