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Comunicación Breve

Mosses of Peatlands in Isla Grande de Chiloé - Chile: keys for identification

Musgos de turberas en la Isla Grande de Chiloé - Chile: claves para identificación

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RESUMEN

Los briófitos juegan un rol clave en las turberas. Sin embargo, el conocimiento de este grupo es escaso en el sur de Sudamérica. Se presenta una clave de identificación de musgos de turberas de la Isla Grande de Chiloé (Chile). La clave está separada para cada grupo con caracteres similares.

INTRODUCTION

Mosses dominate the ground layer in southern Chilean peatlands. The function of the peatland ecosystem is highly dependent on this moss layer, and both production and decomposition, as well as community development, are all influenced by this layer of mosses (Vitt & Wieder 2008). Unfortunately, we know little about this component of the flora, especially in southern South America.

In Chile, knowledge of mosses is scarce. There is still lacking a national compilation of the moss flora. There are some monographic works, but they only include a few orders and families. Moreover, there are only a few works that include keys for determination of species, like the mosses of the Juan Fernández Archipelago (Robinson 1975), the mosses of Senda Darwin Biological Station in Chiloé (Larraín 2007), or the mosses of Isla Navarino (Buck & Goffinet 2010).

For this reason, the aim of this work is to present a key for determination of mosses focused in peatland habitats of Isla Grande de Chiloé in southern Chile (41°–43°S, 75°–73°W). This study will contribute to increase the knowledge of the local bryophyte flora and facilitate the identification of these organisms.

Study area

Isla Grande de Chiloé is located in the Los Lagos Region of Chile (42°-43°S and 73°-75°W). Chiloé's climate is wet temperate with a strong oceanic influence (Di Castri & Hajek 1976). Mean summer temperature is 10.2 °C and mean winter temperature is 6.2 °C (Pérez *et al.* 2003). Annual rainfall fluctuates between 1,900 and 2,300 mm (CONAF 2009).

We studied mosses of peatlands dominated by lax cushions of *Sphagnum* moss associated with other bryophytes, lichens, sedges, rushes, and elfin shrubs, as well as swampy shrubland habitats dominated also by *Sphagnum* (Fig. 1).

RESULTS

Forty-four species in 29 genera are included. *Campylopus, Dicranoloma* and *Sphagnum* are the most species-rich genera and the best-represented families are Sphagnaceae and Dicranaceae. This key is based mainly on vegetative characters, when possible. A separate key for each group with similar traits, and an alphabetical list of taxa are provided.

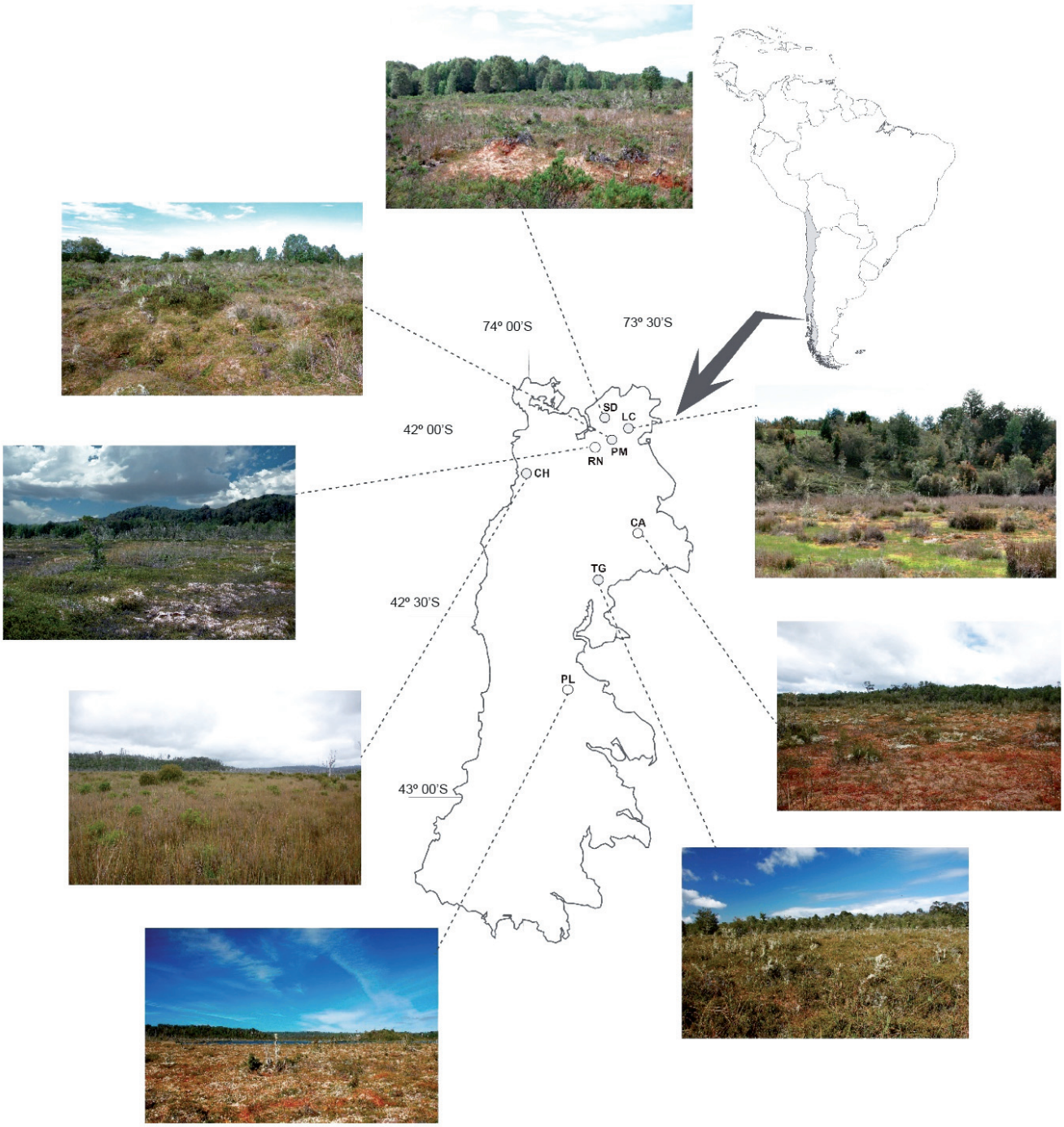

Figura 1. Location of studied peatlands in Chiloé island. PL, Púlpito; CA, Caulles; and RN, Río Negro; SD, Senda Darwin; CH, Chepu; PM, Pumanzano; LC, Lecam; and TG, Teguel. / Localidades de las turberas estudiadas en la isla de Chiloé. PL, Púlpito; CA, Caulles; and RN, Río Negro; SD, Senda Darwin; CH, Chepu; PM, Pumanzano; LC, Lecam; and TG, Teguel.

1. Plants with branches in fascicles; laminal cells dimorphic, leaf lamina consisting of narrow green cells in a network enclosing large, inflated hyaline cells ..... ***Sphagnum*** (Group A)
1'. Plants lacking the above combination of characters 2
2. Leaves with lamellae on the ventral surface ..... ***Polytrichum longisetum***
2'. Leaves without lamellae 3
3. Leaf cell walls strongly sinuous and nodulose ..... ***Racomitrium geronticum***
3'. Leaf cells not as above 4
4. Stems erect, simple or sparsely branched, forming mats or cushions; sporophytes terminal (on occasions apparently lateral due to subapical shoots); plants acrocarpous 5
4'. Stems usually prostrate, creeping and freely branched, forming carpets; sporophytes lateral, arising from a perichaetial bud or a short specialized branch; plants pleurocarpous 10
5. Leaves with narrow costa, absent in the upper third, sometimes completely absent; capsule with red annulus and peristome ..... ***Eucamptodon perichaetialis***
5'. Leaves with a well-defined costa; annulus and peristome never red 6
6. Leaf cells lax, smooth and thin-walled ..... Group B
6'. Leaf cells dense, smooth to papillose and thick-walled 7
7. Costa broad (more than 1/3 the width at the base of leaf), filling the leaf apex ..... Group C
7'. Costa narrow (less than 1/3 the width at the base of leaf), not filling the leaf apex 8
8. Alar cells clearly distinct ..... Group D
8'. Alar cells weakly differentiated or undifferentiated 9
9. Upper leaf cells long-rectangular ..... Group E
9'. Upper leaf cells quadrate, rhomboidal or rounded ..... Group F
10. Leaves without a costa, or costa short and double 11
10'. Leaves with a well-defined single costa reaching at least midleaf 12
11. Leaves with alar cells undifferentiated ..... Group G
11'. Leaves with alar cells distinct ..... Group H
12. Plants regularly pinnate ..... Group I
12'. Plants variously branched ..... Group J

GROUP A. *Sphagnum*

1. Cortical cells of stem and branches usually with spiral fibrils; branch leaf green cells in cross-section rounded, centrally located, completely enclosed by adjacent hyaline cells ..... ***Sphagnum magellanicum***
1'. Cortical cells of stem and branches without spiral fibrils; branch leaf green cells not as above 2
2. Branch leaf green cells in cross-section oval with equal exposure on both surfaces; stem hyalodermis in 1 layer; hyaline cells of branch leave with numerous pores crowded in bead-like rows along the commissures; brownish green plants ..... ***Sphagnum subsecundum***
2'. Branch leaf green cells in cross-section triangular with unequal exposure towards one side; pores few to numerous, not placed along the hyaline cells commissures; plants bright green, yellow or reddish 3
3. Branch leaf green cells in cross-section triangular with more exposure on the outer surface; yellowish green plants, usually submerged ..... 4 (sect. *Cuspidata*)
3'. Branch leaf green cells in cross-section triangular with more exposure on the inner surface ..... 5 (sect. *Acutifolia*)
4. Branch leaves strongly crisped and squarrose when dry ..... *Sphagnum* sp.
4'. Branch leaves straight when dry ..... ***Sphagnum falcatulum***
5. Stem leaves spathulate, fimbriate around the whole upper part; plants yellowish-green ..... ***Sphagnum fimbriatum***
5'. Stem leaves triangular with acute apex; plants pink or bright red ..... ***Sphagnum capillifolium***

GROUP B. Acrocarpous. Leaf cells lax, smooth and thin-walled.

1. Leaves distinctly bordered; costa excurrent ..... ***Bryum pseudotriquetrum***
1'. Leaves not bordered; costa percurrent ..... ***Pohlia nutans***

GROUP C. Acrocarpous. Leaf cells dense and thick-walled, costa broad.

1. Costa cells homogeneous in cross-section; capsule pyriform; peristome double ..... ***Leptobryum pyriforme***
1'. Costa cells heterogeneous in cross-section; capsule ovoid to oblong-cylindrical; peristome single 2
2. Leaf cross-section with a clear medial row of guide cells between a ventral and a dorsal layer of stereids .... ***Chorisodontium aciphyllum***
2'. Leaf cross-section not as above ..... 3 (***Campylopus***)
3. Leaves without hairpoints ..... ***Campylopus pyriformis***
3'. Leaves ending in a hyaline hairpoint 4
4. Hairpoints reflexed or recurved 5
4'. Hairpoints straight 6
5. Hairpoints reflexed; costa often with dorsal lamellae to 2 cells tall ..... ***Campylopus introflexus***
5'. Hairpoints recurved less than 90º; costa without dorsal lamellae..... ***Campylopus aureonitens*** subsp. ***recurvifolius***

6. Upper laminal cells quadrate; costa excurrent in a long awn ..... ***Campylopus incrassatus***
6'. Upper laminal cells oval; costa shortly excurrent 7
7. Transverse section of costa with ventral stereids; costa filling more than 1/2 of leaf width at base; slender plants, usually light green ..... ***Campylopus clavatus***
7'. Transverse section of costa with ventral hyalocysts; costa filling less than 1/2 of leaf width at base; plants robust, usually black or brown ..... ***Campylopus acuminatus***

GROUP D. Acrocarpous. Leaf cells dense; costa narrow and alar cells differentiated.

1. Leaves lanceolate with long acumen (equal or longer than lamina); costa with more than 6 guide cells in cross-section ..... ***Dicranoloma robustum***
1'. Leaves lanceolate with short acumen; costa with 2–5 guide cells in cross-section 2
2. Leaves falcate, ended in a flat and serrate apex; plants green to yellow-green ..... ***Dicranoloma billardierei***
2'. Leaves straight, ending in an entire and channelled apex; plants bright yellow ..... ***Dicranoloma imponens***

GROUP E. Acrocarpous. Leaf cells dense; costa narrow; alar cells weakly differentiated or undifferentiated and upper leaf cells elongate-rectangular.

1. Leaf base not bordered; leaves plicate at base only ..... ***Breutelia dumosa***
1'. Leaf base bordered by narrow and elongate cells; leaves plicate throughout ..... ***Breutelia subplicata***

GROUP F. Acrocarpous. Leaf cells dense; costa narrow; alar cells weakly differentiated or undifferentiated and upper leaf cells quadrate, rhomboidal or rounded.

1. Leaves 5-ranked 2
1'. Leaves not conspicuously ranked 4
2. Costa excurrent; capsule subglobose ..... ***Conostomum pentastichum***
2'. Costa subpercurrent; capsule cylindrical ..... 3 (***Zygodon***)
3. Stems prostate with erect branches; leaves more than 2 mm long, clearly 5-ranked; basal leaf cells dimorphic in definite yellow-orange bands alternating with hyaline bands ..... ***Zygodon pentastichus***
3' Stems erect; leaves diffusely 5-ranked, less than 1 mm long; basal leaf cells without alternating color bands ..... ***Zygodon hookeri*** var. ***leptobolax***
4. Leaves with dentate margins, at least in the upper third 5
4'. Leaves with entire margins 6
5. Leaf margin bistratose with double teeth; costa with dorsal spines; leaf cells smooth ..... ***Hymenodontopsis mnioides***
5'. Leaf margin unistratose with single teeth; costa smooth; leaf cells papillose ..... ***Leptodontium longicaule*** var. ***microruncinatum***
6. Marginal cells at leaf base with thickened transverse walls; leaves without sheathing base, straight; plants epiphytic ..... ***Ulota rufula***
6'. Marginal leaf cells with transverse and longitudinal walls evenly thickened; leaves subulate with a sheathing base, strongly falcate to circinate; plants terrestrial, often submerged ..... ***Dicranella circinata***

GROUP G. Pleurocarpous. Costa weak or absent. Alar cells undifferentiated

1. Costa single, weak, vanishing below midleaf; capsules smooth ..... ***Lepyrodon patagonicus***
1'. Costa double and short or absent; capsules ribbed 2
2. Leaves small (1.0–2.5 mm long), loosely inserted, spreading and clearly longitudinally plicate ..... ***Ptychomniella ptychocarpa***
2. Leaves medium or large (2.0–6.8 mm), densely imbricate, squarrose or recurved and plicate only at base 3
3. Leaves medium sized (2.0–4.1 mm), strongly squarrose; leaf apex abruptly acuminate ..... ***Ptychomnion densifolium***
3'. Leaves large (4.0–6.8 mm), straight to slightly recurved; leaf apex gradually acuminate ..... ***Ptychomnion cygnisetum***

GROUP H. Pleurocarpous. Costa not conspicuous. Alar cells differentiated

1. Alar cells weakly differentiated from surrounding cells 2
1'. Alar cells strongly differentiated from surrounding cells 3
2. Stems with central strand; pseudoparaphyllia narrow-lanceolate to subfilamentose; flagelliform branches usually present; plants terricolous ..... ***Hypnum cupressiforme*** var. ***mossmanianum***
2'. Stems lacking central strand; pseudoparaphyllia more broadly foliose; flagelliform branches lacking; plants epiphytic ..... ***Hypnum chrysogaster***
3. Leaves narrowly lanceolate, falcate, gradually narrowed into a long slender acumen ..... ***Rhaphidorrhynchium callidum***
3'. Leaves broadly ovate-oblong to elliptical, straight, apex obtuse or rounded 4
4. Stem leaves oblong to cordate-ovate; alar cells small, forming a well-defined, auriculate, excavate, and rounded to broadly ovate group ..... ***Acrocladium auriculatum***
4'. Stem leaves oblong-ovate; alar cells large, hyaline and inflated, not excavate, forming a triangular or ± quadrate group ..... ***Calliergonella cuspidata***

GROUP I. Pleurocarpous. Costa conspicuous. Plants regularly pinnate.

1. Leaves dimorphic, stem leaves wide-cordate and branch leaves linear-lanceolate ..... ***Kindbergia praelonga***
1'. Leaves monomorphic 2
2. Stems with numerous paraphyllia; leaf cells papillose ..... ***Thuidiopsis furfurosa***
2'. Stems without paraphyllia; leaf cells smooth ..... ***Rigodium pseudothuidium***

Group J. Pleurocarpous. Costa conspicuous. Plants variously branched.

1. Leaves strongly falcate-secund, longitudinally plicate; alar cells forming a clear triangular group; leaf marginal cells not porose; seta smooth throughout ..... ***Sanionia uncinata***
1'. Leaves straight, smooth; alar cells not differentiated; leaf marginal cells with porose walls; seta rough distally ..... ***Daltonia gracilis***

Alphabetic list of taxa included

Acrocladium auriculatum (Mont.) Mitt.
Breutelia dumosa Mitt.
Breutelia subplicata Broth. (Fig. 3E)
Bryum pseudotriquetrum (Hedw.) P.Gaertn., B.Mey. & Scherb. (Fig. 2I)
Calliergonella cuspidata (Hedw.) Loeske (Fig. 4D)
Campylopus acuminatus Mitt. (Fig. 2F)
Campylopus aureonitens (Müll.Hal.) A. Jaeger subsp. *recurvifolius* (Dusén) J.-P.Frahm
Campylopus clavatus (R.Br.) Wilson
Campylopus incrassatus Müll.Hal.
Campylopus introflexus (Hedw.) Brid. (Fig. 2E)
Campylopus pyriformis (Schultz) Brid.
Chorisodontium aciphyllum (Hook.f. & Wilson) Broth.
Conostomum pentastichum (Brid.) Lindb. (Fig. 3F)
Daltonia gracilis Mitt. (Fig. 4E)
Dicranella circinata Herzog (Fig. 3I)
Dicranoloma billardierei (Brid. *ex* Anon.) Paris (Fig. 3B)
Dicranoloma imponens (Mont.) Renauld (Fig. 3C)
Dicranoloma robustum (Hook.f. & Wilson) Paris (Fig. 3A)
Eucamptodon perichaetialis (Mont.) Mont. (Fig. 2D)
Hymenodontopsis mnioides (Hook.) N.E.Bell, A.E.Newton & D.Quandt
Hypnum chrysogaster Müll.Hal. (Fig. 4A)
Hypnum cupressiformis Hedw. var. *mossmanianum* (Müll.Hal.) Ando
Kindbergia praelonga (Hedw.) Ochyra (Fig. 4F)
Leptobryum pyriforme (Hedw.) Wilson
Leptodontium longicaule Mitt. var. *microruncinatum* (Dusén) R.H.Zander
Lepyrodon patagonicus (Cardot & Broth.) B.H.Allen
Pohlia nutans (Hedw.) Lindb.
Polytrichum longisetum Sw. *ex* Brid. (Fig. 2G)
Ptychomniella ptychocarpa (Schwägr.) W.R.Buck *et al*. (Fig. 3J)
Ptychomnion cygnisetum (Müll.Hal.) Kindb. (Fig. 3G)
Ptychomnion densifolium (Brid.) A.Jaeger
Racomitrium geronticum Müll.Hal. (Fig. 1H)
Rhaphidorrhynchium callidum (Mont.) Broth.
Rigodium pseudothuidium Dusén (Fig. 4C)
Sanionia uncinata (Hedw.) Loeske (Fig. 4H)
Sphagnum capillifolium (Ehrh.) Hedw.
Sphagnum falcatulum Besch. (Fig. 2B)
Sphagnum fimbriatum Wilson (Fig. 2C)
Sphagnum magellanicum Brid. (Fig. 2A)
Sphagnum subsecundum Nees
Thuidiopsis furfurosa (Hook.f. & Wilson) M.Fleisch. (Fig. 4B)
Ulota rufula (Mitt.) A.Jaeger (Fig. 3D)
Zygodon hookeri Hampe var. *leptobolax* (Müll.Hal.) Calabrese
Zygodon pentastichus (Mont.) Müll.Hal (Fig. 3H)

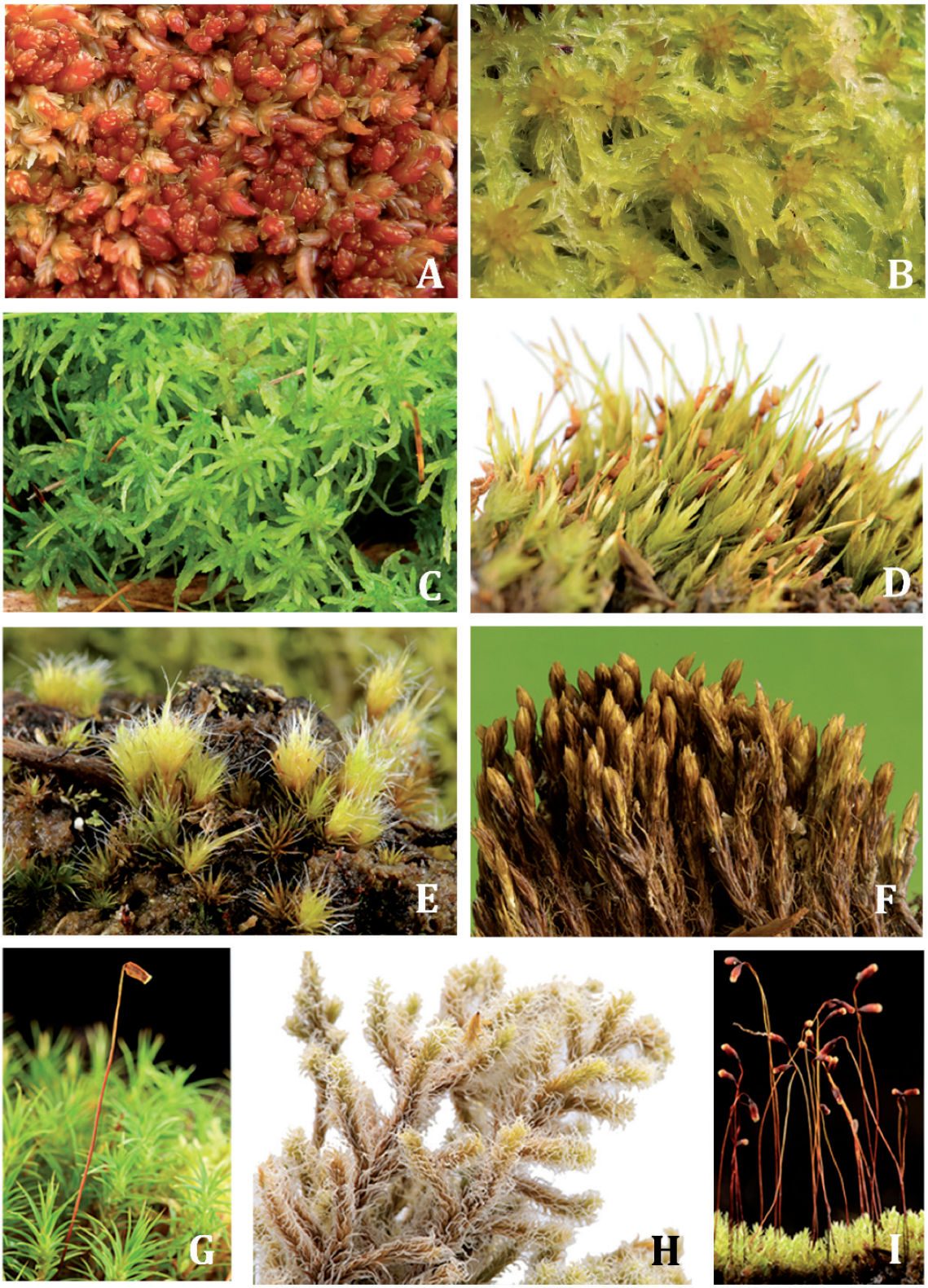

Figura 2. **A,** *Sphagnum magellanicum* Brid.; **B**, *Sphagnum falcatulum* Besch.; **C**, *Sphagnum fimbriatum* Wilson; **D**, *Eucamptodon perichaetialis* (Mont.) Mont.; **E**, *Campylopus introflexus* (Hedw.) Brid; **F**, *Campylopus acuminatus* Mitt.; **G**, *Polytrichum longisetum* Sw. *ex* Brid.; **H**, *Racomitrium geronticum* Müll.Hal.; **I**, *Bryum pseudotriquetrum* (Hedw.) P.Gaertn., B.Mey. & Scherb.

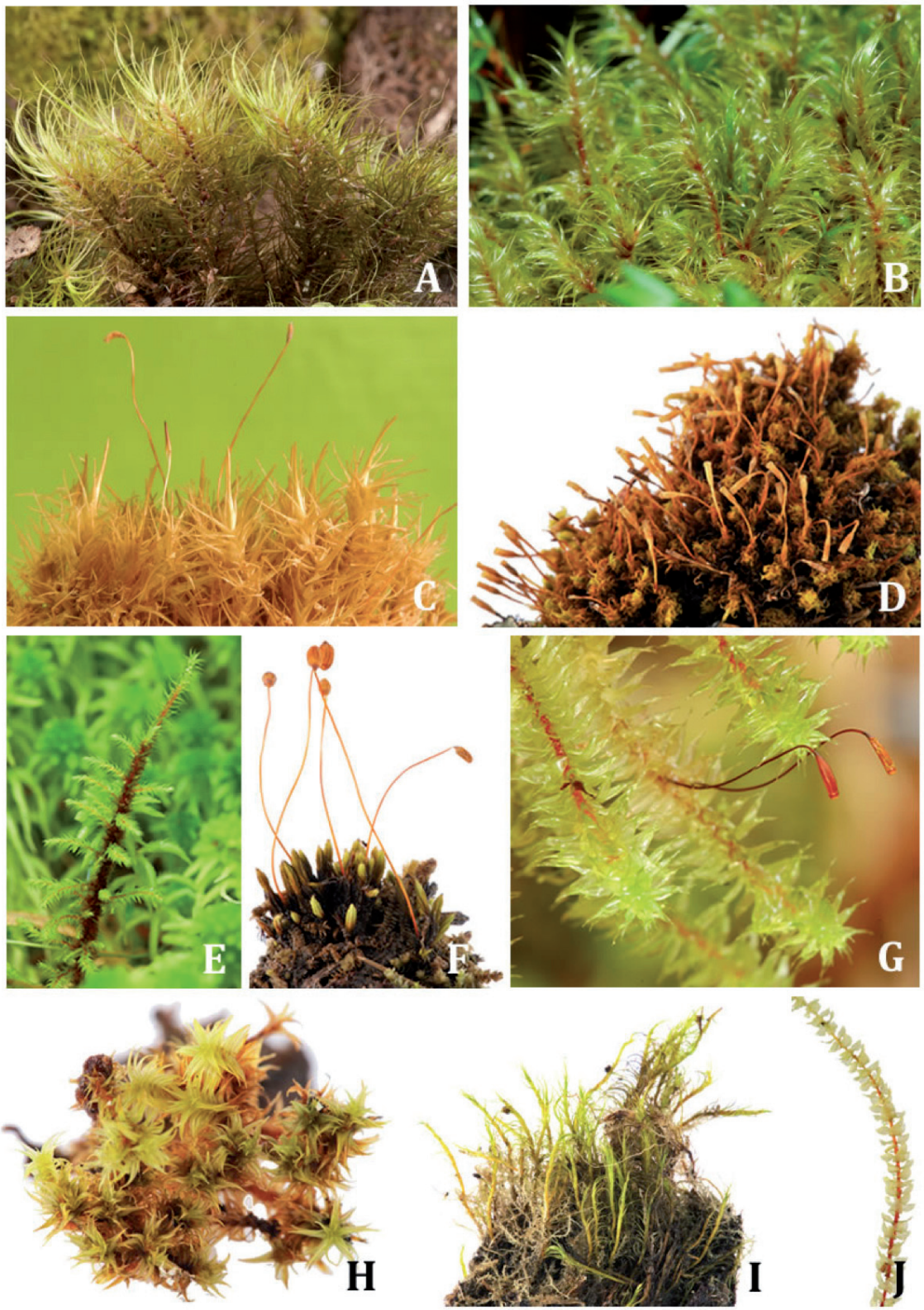

Figura 3. **A,** *Dicranoloma robustum* (Hook.f. & Wilson) Paris; **B**, *Dicranoloma billardierei* (Brid. *ex* Anon.) Paris; **C**, *Dicranoloma imponens* (Mont.) Renauld; **D**, *Ulota rufula* (Mitt.) A.Jaeger; **E**, *Breutelia subplicata* Broth.; **F,** *Conostomum pentastichum* (Brid.) Lindb.; **G**, *Ptychomnion cygnisetum* (Müll.Hal.) Kindb.; **H**, *Zygodon pentastichus* (Mont.) Müll.Hal.; **I**, *Dicranella circinata* Herzog; **J**, *Ptychomniella ptychocarpa* (Schwägr.) W.R.Buck *et al.*

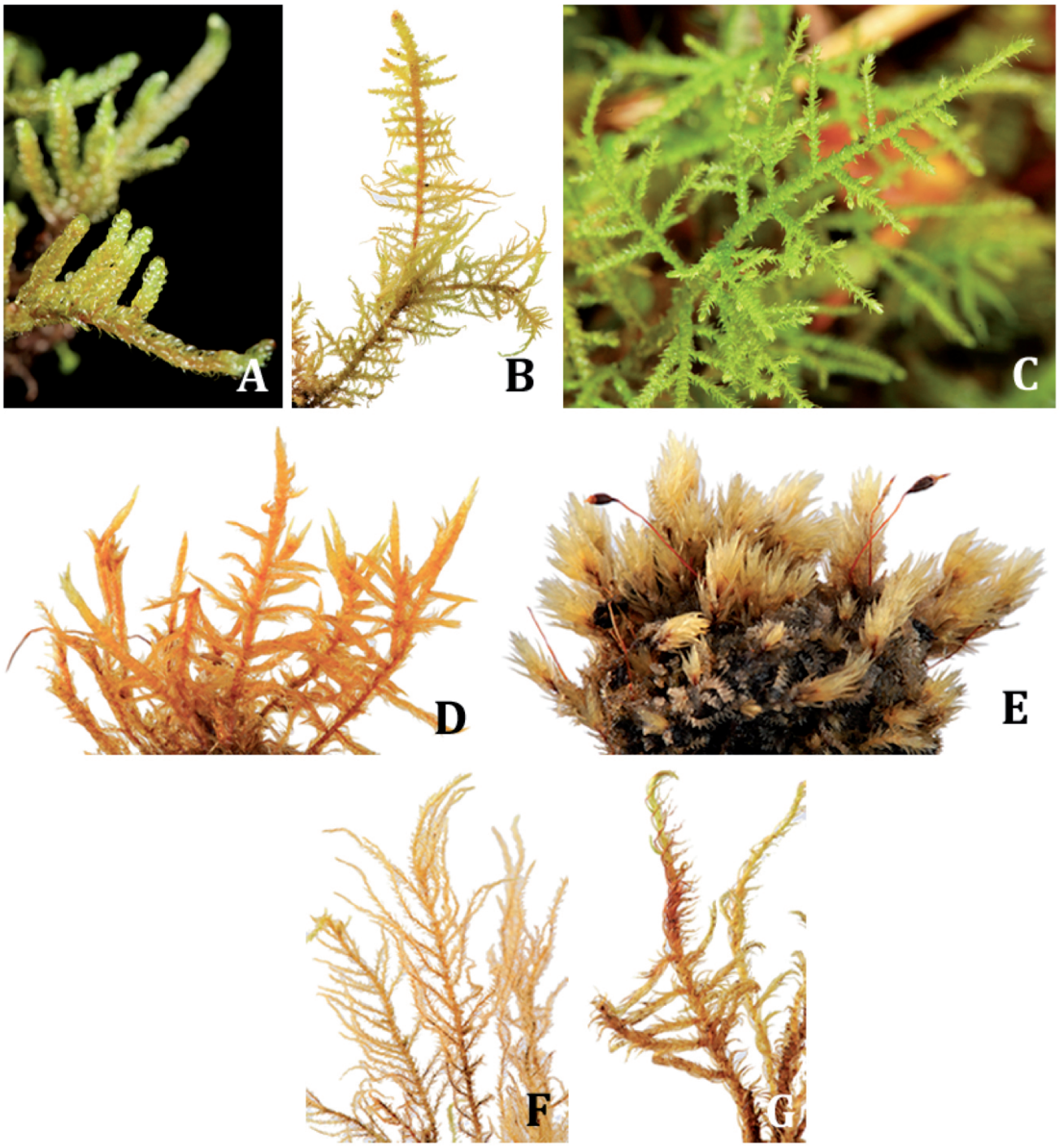

Figura 4. **A**, *Hypnum chrysogaster* Müll.Hal.; **B**, *Thuidiopsis furfurosa* (Hook.f. & Wilson) M.Fleisch.; **C**, *Rigodium pseudothuidium* Dusén; **D**, *Calliergonella cuspidata* (Hedw.) Loeske; **E**, *Daltonia gracilis* Mitt.; **F**, *Kindbergia praelonga* (Hedw.) Ochyra, **G**, *Sanionia uncinata* (Hedw.) Loeske.

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