

***Trichostomum basilatinervium* (Pottiaceae, Bryophyta), a new species from the Mediterranean region of Chile**

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Abstract

A new moss species, *Trichostomum basilatinervium* sp. nov., is described and illustrated from the Mediterranean region of Chile. *Trichostomum basilatinervium* is distinguished morphologically from other *Trichostomum* species by its imbricate leaves towards the stem base, appressed, sometimes contorted, with the apical ones incurved and crispat when dry, margins weakly denticulate or crenulate at the transitional area, lamina prolonging towards the mucro, costa broadest at base, in cross-section with 8–16 guide cells in two incomplete layers, usually with pairs of guide cells at the edges, and gymnostomous capsules. Drawings and light microscope photographs of the new species are provided, and possible confusion with other closely related taxa is discussed. Distribution of the new species is mapped.

Key words: Biodiversity, cryptic species, morphology, specimen based research, taxonomy

Introduction

Trichostomum Bruch is one of the most diverse genera within the Pottiaceae family and has traditionally been considered as a “wastebasket” genus for species that cannot be easily assigned to other genera (Zander 1993). According to Alonso *et al.* (2016), the taxonomic delimitation of *Trichostomum* has consistently challenged taxonomists due to its high morphological variability and the large number of taxa it comprises. Currently, 81 valid species are recognized within this genus (Brinda & Atwood 2025). However, nearly 700 names associated with *Trichostomum* have been published (Tropicos.org 2025), reflecting the complexity of its taxonomy. Morphologically, the genus *Trichostomum* is characterized by its leaves with usually plane margins, a costa with two stereid bands, an orange to yellowish-orange KOH leaf reaction, and a stem with a well-developed central strand (Zander 1993, Guerra 2006).

Despite its worldwide distribution, *Trichostomum* exhibits its greatest species richness in the tropical regions of South America, which host 43 of the 81 currently recognised species (Gradstein *et al.* 2001). Most of these taxa remain poorly known (Crosby *et al.* 1999), as they have not been recorded since their descriptions.

As part of an ongoing integrative taxonomic study of *Trichostomum* in South America, we examined many specimens of Chile that had been previously identified as *Trichostomum brachydontium* Bruch (Larraín *et al.* 2020). Detailed morphological assessment revealed that these specimens do not conform to the diagnostic features of *T. brachydontium* or any other species currently described from the continent, suggesting the presence of an undescribed taxon.

In this paper, we present our argument for recognizing these plants as a new species and its inclusion in *Trichostomum*. Additionally, we provide information on the distribution and ecology of this new species accompanied by illustrations and a map; furthermore, comparisons with closely related species are provided.

Materials and methods

In the framework of the ongoing integrative taxonomic study of the genus *Trichostomum* in South America, more than 300 specimens of *Trichostomum* were studied, including most of the type material of the taxa attributed to the genus in South America. The specimens included in this paper were deposited in CONC, MO and MUB institutional herbaria, and in the third author's personal herbarium (Herb. JL). The samples were studied with the typical anatomical and morphological methods applied for the Pottiaceae (Zander 1993). Microscopic examinations and measurements were taken with an Olympus BH-2 light microscope and microphotographs were obtained with a Jenoptik ProgRes C7 camera mounted on the microscope. Laminal cells measurements and categorization of basal laminal cells followed Alonso *et al.* (2018), although the 'transition zone' character is defined as the percentage of the leaf occupied by transition cells, i.e. the cells in between the papillose laminal cells and the smooth basal laminal cells. Specimens were examined in 2% potassium hydroxide.

Taxonomy

***Trichostomum basilatinervium* M.J.Cano, M.T.Gallego, Omar Rodr. & Larraín, *sp. nov.* Figs. 1–2.**

Diagnosis: It differs from other *Trichostomum* species in its imbricate, appressed, sometimes contorted leaves when dry, weakly denticulate or crenulate margins in the transition zone, stem lacking tomentum, costa (74)90–140(226) µm wide at base, with 8–16 guide cells in two incomplete layers in the basal zone, and sporophytes with eperistomate capsules.

Type:—CHILE. Región de Valparaíso: Provincia de Petorca, Comuna de La Ligua, Los Molles, parque privado Puquén, 32°14'17.9"S, 71°31'19.4"W, 20 m a.s.l., 31 July 2016, J. Larraín 40633, with A. Larraín (holotype CONC, isotypes Herb. JL, MUB).

Description:—*Plants* 3–10 mm high, forming dense tufts, yellowish-green, shiny. *Stems* 2.10–8.80 mm high, erect, not tomentose, simple or scarcely branched; in cross-section rounded, (120)140–220 µm in diameter, with a weakly developed hyalodermis and a sclerodermis of 1–3 layers; central strand differentiated; axillary hairs filiform, consisting of 4–9 hyaline cells, 60–160 µm long. *Rhizoids* red-brown, smooth. *Leaves* imbricate, appressed, sometimes contorted, apical leaves incurved and crisped when dry, erect-patent when moist, oblong-lingulate, sometimes elliptic-lanceolate or oblong-lanceolate, (1.10)1.36–2.00(2.70) mm long, (0.30)0.44–0.56 mm wide at the base, 0.36–0.50 mm wide at mid-leaf, 0.24–0.36 mm wide in the upper part, not canaliculated, usually slightly undulate above the base, not constricted in the upper third of the base, sometimes fragile, hyaline base 15–36% of total leaf length, not sharply delimited, transition zone 3–10% of total leaf length; lamina unistratose throughout, sometimes irregularly bistratose at the base, prolonging into the mucro, yellow-orange in KOH reaction; margins entire in the basal area, papillose-crenulate in the middle and upper parts, weakly denticulate in the transitional zone, flat or plane-inflexed, sometimes slightly incurved in the upper zone, bordered by a layer of smooth or less papillose cells at the lower third of the leaf; apex obtuse to acute; costa (74)90–140(226) µm wide at base, 26–36(60) µm wide at apex, brownish, excurrent in a straight mucro (40)60–100(122) µm long, ventral surface cells quadrate and papillose from near base to apex, dorsal surface cells linear and smooth from base to apex, in cross-section biconvex at base, plano-convex at mid-leaf and above, with 8–16 guide cells in two incomplete layers at base, with paired guide cells at the edges, 6–12 guide cells in one layer, sometimes in two incomplete layers at midleaf and 4–6 guide cells in one layer at upper part, 2–6 layers of ventral stereids and 2–5 layers of dorsal stereids at midleaf, ventral surface cells differentiated, subquadrate to rounded, (4)6–10 × 8–12 µm, with bifurcate papillae, dorsal surface cells differentiated, subquadrate to rounded, 4–8 × 4–6 µm, smooth, sometimes first 2–3 dorsal surface cells differentiated near lamina, papillose; upper and midleaf laminal cells mostly subquadrate, sometimes rectangular or quadrate, (2)4–10 × 4–8 µm, thick-walled, with 4–5 bifurcate papillae, 2 µm high; upper and midleaf marginal cells oblate, sometimes quadrate, (2)4–6 × 4–10 µm, thick-walled, with 4–5 bifurcate papillae, 2 µm high; lower basal cells rectangular or oblong, 16–34 × 6–12 µm, thin-walled, smooth; marginal basal cells not differentiated from lower basal cells; central basal cells oblong-hexagonal, rectangular or oblong, (16)28–44 × 6–10 µm, thin-walled, smooth; juxtaostal basal cells rectangular to oblong, 28–40 × 4–10 µm, thin-walled, smooth; transitional cells rectangular, quadrate, oblate, rounded or irregular, (2)4–14 × 4–8 µm, thick-walled, smooth. *Specialized asexual reproduction* not seen. *Dioicous*. *Perichaetial leaves* undifferentiated. *Seta* 3.00–3.36 mm long, twisted to the left from the middle to the upper part, brownish. *Capsule* stegocarpous, erect and exserted; theca ellipsoid, 0.90–1.00 × 0.50–0.56 mm, light brown; exothelial cells rectangular to oblong-hexagonal, 4–

$6 \times 4\text{--}6 \mu\text{m}$, thick-walled; stomata phaneroporous at base; annulus not observed, gymnostomous; operculum rostrate, 0.30–0.46 mm long. *Calyptra* cucullate, 1.24–1.36 mm long, smooth, yellowish to brown. Spores immature.

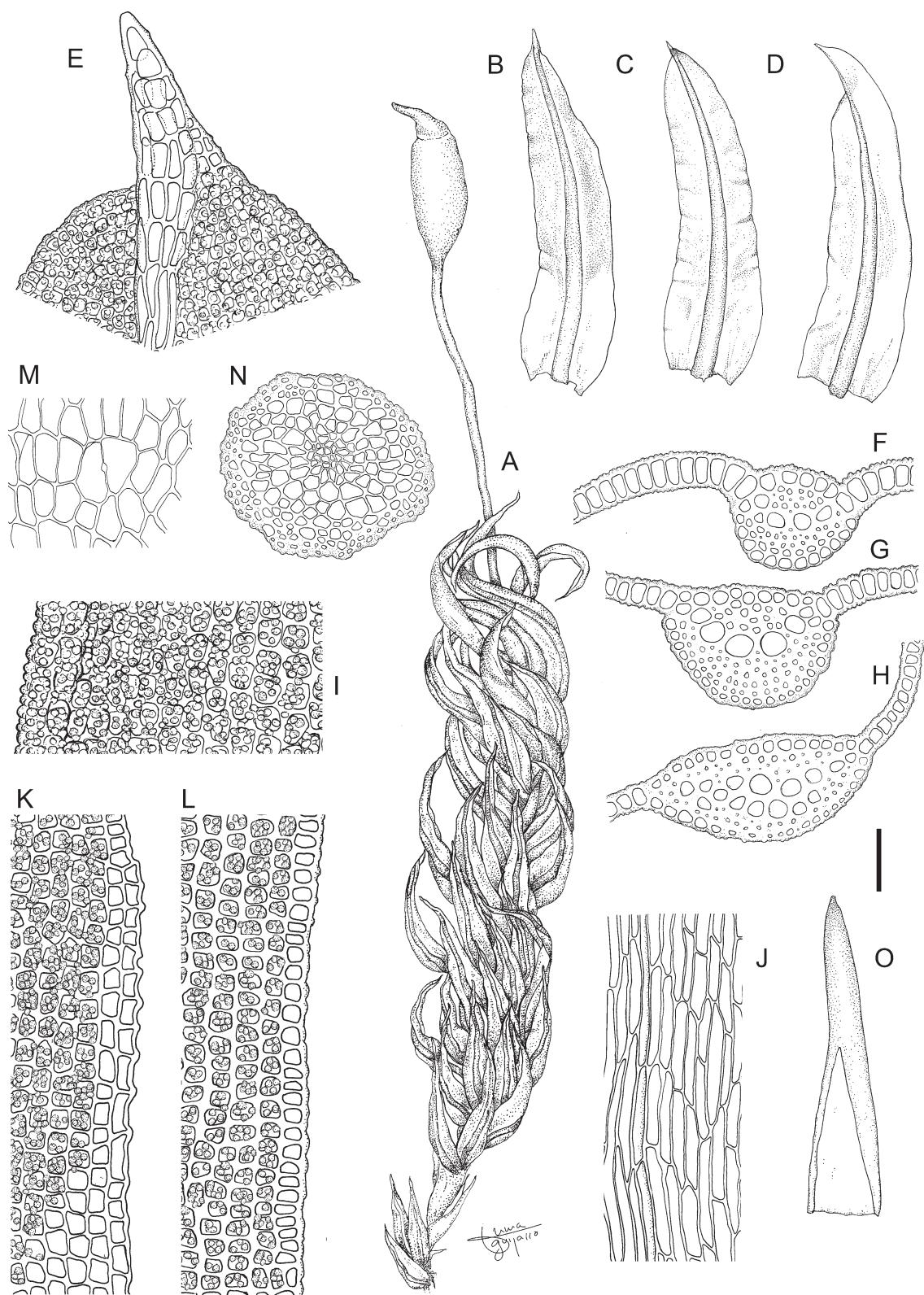


FIGURE 1. *Trichostomum basilatinervium*. A: Habit, B–D: Leaves, E: Leaf apex, F: Leaf cross-section at apex, G: Leaf cross-section at midleaf, H: Leaf cross-section at base, I: Marginal cells of the lamina at apex, J: Juxtacostal basal cells, K: Marginal cells of the lamina at transitional zone, L: Marginal cells of the lamina at midleaf, M: Stomata and exothelial cells of the capsule, N: Cross-section of the stem, O: Calyptra. Scale bar: A, 0.53 mm; B–D, 0.29 mm; E, 36 μm ; F, 15 μm ; G, 28 μm ; H, 30 μm ; I–J, 12 μm ; K–M, 14 μm ; N, 47.5 μm , O, 0.25 mm. (All from Larraín 40633, MUB).

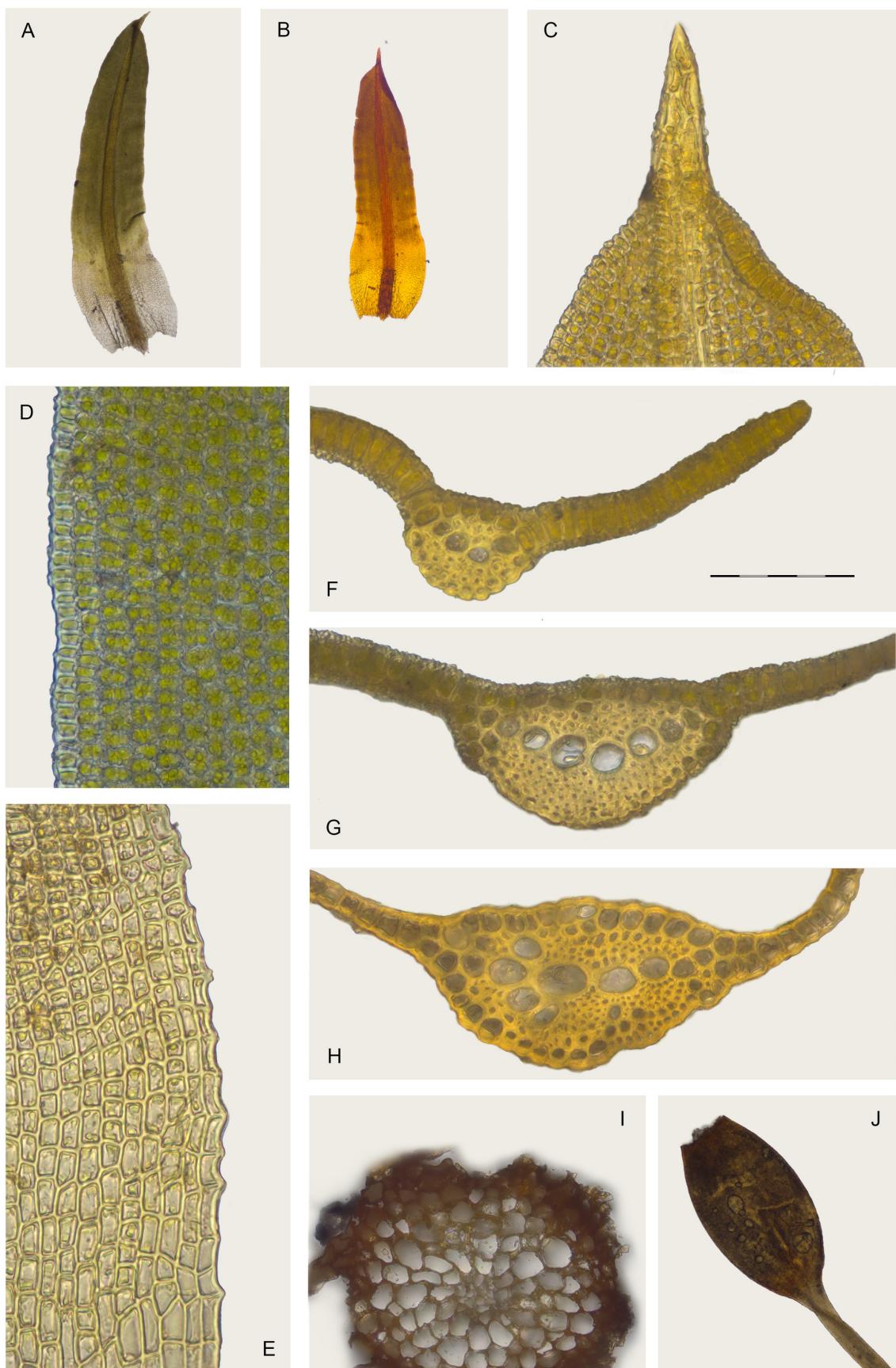


FIGURE 2. *Trichostomum basilatinervium*. A: Leaf, B: Leaf in KOH reaction, C: Apex, D: Marginal cells of the lamina at midleaf, E: Marginal cells of the lamina at transitional zone, F: Leaf cross-section at apex, G: Leaf cross-section at midleaf, H: Leaf cross-section at base, I: Cross-section of the stem, J: Capsule. Scale bar: A–B, 1.20 mm; C–D, 45 μ m; E, H, 75 μ m; F–G, 67 μ m; I, 116 μ m; J, 0.87 mm. (All from Larraín 40633, MUB).

Etymology:—The specific epithet ‘basilatinervium’ refers to the wider costa at the base of the leaf, which is characteristic of this species.

Habitat: On dry, exposed soil, roadsides, coastal slopes and eroded ravines in Chilean sclerophyllous forests dominated by *Cryptocarya alba* (Molina) Looser, *Peumus boldus* Molina, *Lithraea caustica* (Molina) Hook. & Arn., *Quillaja saponaria* Molina, and *Kageneckia oblonga* Ruiz & Pav., and scrublands dominated by *Vachellia caven* (Molina) Seigler & Ebinger, *Lithraea caustica*, *Baccharis* spp., *Bahia ambrosioides* Lag., *Pouteria splendens* (A.DC.) Kuntze, *Fuchsia lycioides* Andrews, *Berberis actinacantha* Mart., *Escallonia* spp., *Puya* spp., *Myrceugenia* spp., *Gochnatia* spp., *Chusquea* spp., *Schinus* spp., *Echinopsis* spp., *Eulychnia* spp., *Frankenia* spp., *Nolana* spp., and *Colliguaja* spp.; between 20–610 m a.s.l. It usually grows mixed with other soil bryophytes as *Archidium* spp., *Barbula costesii* Thér., *Bartramia stricta* Brid., *Brachytenium acuminatum* Harv., *Bryoerythrophyllum campylocarpum* (Müll. Hal.) H.A.Crum, *Bryum dichotomum* Hedw., *Catagoniopsis berteroana* (Mont.) Broth., *Didymodon australasiae* (Hooker & Greville) R.H.Zander, *Fissidens* spp., *Fossombronia* spp., *Funaria* spp., *Gertrudiella* spp., *Gongylanthus dusenii* Steph., *Oxymitra incrassata* (Brot.) Sérgio & Sim-Sim, *Paraphymatoceros diadematus* Hässel, *Pohlia chilensis* (Mont.) A.J.Shaw, *Pseudocrossidium* spp., *Syntrichia* spp., *Trichostomum williamsii* R.H.Zander, *Triquetrella patagonica* Müll.Hal., among others.

Distribution:—The new species is endemic to central Chile, found in the lowlands from Elqui Province (Coquimbo Region) to Talca Province (Maule Region). (Fig. 3).

Specimens examined:—CHILE. **Coquimbo:** Provincia de Elqui, Comuna de La Higuera, Chungungo, cerros al N del poblado, justo al NE de Chungungo Viejo, 4 March 2023, *Larraín* 47173 (Herb. JL, MUB); Provincia de Chopoa, Comuna de Canela, cerro Talinay de Huentelauquén, 30 September 2018, *Larraín* 43082 (herb. JL, MUB), 13 October 1978, *Mahú* 11831 (CONC, MO); 22 September 2023, *Larraín* 47323 (herb. JL, MUB); Comuna de Los Vilos, Fundo Caracas, Quebrada El Negro, Los Vilos, 14 October 2020, *Larraín* 44085A (herb. JL), *Larraín* 44088 (herb. JL, MUB).

Valparaíso: Provincia de Petorca, Comuna de La Ligua, Ruta 5 Norte justo al sur del límite con la 4ta Región, 1.5 km al sur del peaje de Pichidangui, 13 October 2020, *Larraín* 44114 (herb. JL); Los Molles, parque privado Puquén, 31 July 2016, *Larraín* 40620 (herb. JL, MUB), *Larraín* 40639 (herb. JL), *Larraín* 40613 (herb. JL), 11 February 2007, *Larraín* 27263 (herb. JL), *Larraín* 27264 (herb. JL); Provincia de Valparaíso, Comuna de Casablanca, Fundo Obregón, cerros al S de Laguna Verde, 7 September 2021, *Larraín* 45119 (herb. JL, MUB), 45097B (herb. JL), 45109 (herb. JL, MUB); Laguna Verde, sector La Meseta, encima de comunidad ecológica Monte Curauma, 6 September 2021, *Larraín* 45016B (herb. JL); Fundo Polcura, cerros costeros entre Placilla y Quintay, 7 September 2021, *Larraín* 45045 (herb. JL, MUB); Quintay, acantilados sur, cerca de Playa Chica, 3 September 2017, *Drapela* 47 (herb. JL); Comuna de Viña del Mar, Palmar El Salto, entre Siete Hermanas y Rodelillo, 15 July 2016, *Larraín* 40354A (herb. JL, MUB); Provincia de San Antonio, El Quisco, Punta de Tralca, quebrada Guallilemu, 18 November 1976, *Mahú* 11849 (MO), 8 February 1981, *Mahú* 13498 (MO). **Región Metropolitana:** Provincia de Melipilla, Comuna de Melipilla, Reserva Privada Altos de Cantillana, Quebrada El Cepillo, sendero entre el refugio Rangue y el río, 11 November 2017, *Larraín* 42221 (herb. JL, MUB); Comuna de Alhué, cuesta Alhué, 6 September 2007, *Larraín* 28958 (Herb. JL).

Libertador Bernardo O'Higgins: Provincia de Cardenal Caro, Comuna de Pichilemu, Quebrada El Roble, 2 October 1981, *Moreno* 12804 (CONC, MO); Provincia de Colchagua, Comuna de Placilla, entre Nancagua y San Fernando, Lo Moscoso, valle del río Tinguirica, 22 January 2009, *Larraín* 31684 (herb. JL, MUB). **Maule:** Provincia de Curicó, Comuna de Vichuquén, Lago Vichuquén, ladera SW, 2 September 2007, *Larraín* 28689 (herb. JL), *Larraín* 28693B (herb. JL); Provincia de Talca, Comuna de Curepto, cruce a Llongocura Alto, camino entre Gualleco y Curepto, 01 September 2007, *Larraín* 28634 (herb. JL, MUB), *Larraín* 28642 (herb. JL, MUB), *Larraín* 28643A (herb. JL).

Discussion

Trichostomum basilatinervium is an endemic species from the Mediterranean region of Chile. It is diagnosed by the following set of character states: stem not tomentose, leaves imbricate towards the base, appressed, sometimes contorted, the apical ones incurved and crispatate when dry, broadest in the basal zone, margins weakly denticulate or crenulate at transitional area, bordered by a layer of smooth cells or less papillose at the lower third of the leaf, lamina prolonging towards the mucro, costa (74)90–140(226) μm wide at base, with 8–16 guide cells in two incomplete layers, usually with pairs of guide cells at the edge, and sporophytes with eperistome capsules.

All specimens of *T. basilatinervium* studied here were previously identified as *T. brachydontium* (Larraín *et al.* 2020). Despite their similar morphology and ecology, *T. brachydontium* is readily distinguished from *T. basilatinervium*



FIGURE 3. Map of South America showing the known geographical distribution of *Trichostomum basilatinervium*.

by its crispatate leaves (vs. imbricate towards the stem base, appressed, sometimes contorted, with apical ones incurved and crispatate when dry in *T. basilatinervium*), a narrower basal costa (63–120 µm in *T. brachydontium*; (74)90–140(226) µm in *T. basilatinervium*) and with fewer guide cells (6–9 in a single layer in *T. brachydontium*; 8–16 guide cells in two incomplete layers in *T. basilatinervium*). In addition, *T. brachydontium* typically exhibits slight tomentum development on the stem (absent in *T. basilatinervium*), and capsules with a developed peristome (vs. gymnostomous in *T. basilatinervium*). However, eperistome specimens of *T. brachydontium* have been reported from other areas, such as South Africa (Magill 1981). All specimens reported as *T. brachydontium* in Larraín *et al.* (2020) that are not listed as paratypes here, were, in fact, misidentifications of *Bryoerythrophyllum campylocarpum*, a common but seldom collected moss species in central Chile.

Trichostomum littorale Mitt. and *Trichostomum meridionale* Ros, O.Werner, R.D.Porley are species found in regions of Europe with an Oceanic Mediterranean climate, although the distribution of the second species also includes Macaronesia (Ros *et al.* 2022). Both species resembles *T. basilatinervium* in having leaf margins weakly denticulate or crenulate in the transitional area and stems lacking tomentum. However, *T. littorale* can be readily distinguished from *T. basilatinervium* by the arrangement and number of guide cells in the basal zone of the costa (4–8 guide cells in a single layer; 8–16 guide cells in two incomplete layers in *T. basilatinervium*), the size of the mucro (20–85 µm long; (40)60–100(122) µm long in *T. basilatinervium*), and the presence of flagelliform branches (absent in *T. basilatinervium*). *Trichostomum meridionale* differs from *T. basilatinervium* in its lingulate to spatulate leaves, occasionally panduriform or lanceolate (oblong-lingulate, sometimes elliptic-lanceolate or oblong-lanceolate in *T. basilatinervium*), the size of the mucro (25–60 µm long in *T. meridionale*; (40)60–100(122) µm long in *T. basilatinervium*), the arrangement and number of guide cells in the basal zone of the costa (4–6 in a single layer in *T. meridionale*; 8–16 in two incomplete layers in *T. basilatinervium*), and the presence of capsules with a rudimentary peristome, sometimes absent (gymnostomous in *T. basilatinervium*).

In this study, we examined the type specimen of *Trichostomum elliottii* (Chile, Concepción, December 1903, Scott-Elliott 133, PC0100021!), a poorly known species from central Chile, documented only from two collections (Dusén 1906; Herzog 1954). This species shares several characters with *T. basilatinervium*, such as weakly denticulate or crenulate margins in the transition zone and sporophytes with gymnostomous capsules. However, *T. elliottii* can be distinguished from *T. basilatinervium* by its margins bordered by a layer of smooth or less papillose cells to midleaf (to the lower third of the leaf in *T. basilatinervium*), fewer guide cells in the basal zone (4–6 guide cells in a single layer; 8–16 guide cells in two incomplete layers in *T. basilatinervium*), costa 36–60 µm wide at base [(74)90–140(226) µm wide in *T. basilatinervium*], with 1–2 layers of ventral stereid bands in the basal zone (2–6 in *T. basilatinervium*), and thicker cell walls in basal cells (thinner walled in *T. basilatinervium*).

Another Chilean species of the genus *Trichostomum* is the endemic *T. williamsii* R.H.Zander, restricted to a few localities in the central part of this country (Williams 1915, Thériot 1921, Larraín & Drapela 2022). It can be readily distinguished from *T. basilatinervium* by its cleistocarpous capsules (stegocarpous in *T. basilatinervium*), costa excurrent in a shorter mucro (18–56 µm long vs. (40)60–100(122) µm long in *T. basilatinervium*), and fewer guide cells in the basal zone (2–4 guide cells in a single layer, 8–16 guide cells in two incomplete layers in *T. basilatinervium*).

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