

**Antipodal mosses: XVI. The first record
of the genus *Sematophyllum* (Sematophyllaceae)
in the Subantarctic, with a description
of *S. lebouvieri* sp. nov.**

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Abstract – *Sematophyllum lebouvieri* Ochyra is described as a new species from Îles Kerguelen in the Subantarctic and Isla de los Estados in the Tierra del Fuego archipelago in southern South America. The new species is an aquatic moss, closely related to *S. secundifolium* (Müll. Hal.) Mitt. from Isla Hermite near Cape Horn, but it is distinct at a glance in being a robust plant with larger, broadly ovate or elliptical, not secund leaves which are rounded or obtuse-apiculate to subacute at the apex and have plane to narrowly reflexed margins that are distinctly serrulate at the apex. The discovery of this species on Îles Kerguelen represents a new addition of the genus *Sematophyllum* and the family Sematophyllaceae to the bryoflora of the Subantarctic.

Bryophyta / distribution / Îles Kerguelen / *Sematophyllum* / Sematophyllaceae / Subantarctica / taxonomy / Tierra del Fuego / Southern Ocean

INTRODUCTION

Sematophyllum Mitt. is a large but still poorly known genus of pleurocarpous mosses. Since its inception (Mitten, 1864), some 400 species, excluding *nomina nuda*, were given names under this generic name (Wijk *et al.*, 1967, 1969). Of these, 170 species are still residual in *Sematophyllum* but over 100 of them have never been studied since their description (Crosby *et al.*, 2000). The genus is predominantly distributed in tropical areas and it is absent from cold regions of both hemispheres. It was admittedly reported, with some doubt, from Macquarie Island (lat. 54°30' S, long. 158°57' E), (Seppelt, 1977, 1980, 1981) but later it was definitely excluded from the moss flora of this subantarctic island (Seppelt, 2004).

The furthest south record of *Sematophyllum* is apparently from Isla Hermite (lat. 55°50' S, long. 67°40' W) near Cape Horn in the Tierra del Fuego archipelago. From there, *Sematophyllum secundifolium* (Müll. Hal.) Mitt. was described (Müller, 1851 as *Hypnum secundifolium* Müll. Hal.) on the basis of the specimens collected by J. D. Hooker during the Antarctic voyage of 1839-1843

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and reported in his *Flora Antarctica* as *Hypnum lithophilum* Hornsch. (Wilson & Hooker, 1847). It is actually the only correct report of the genus *Sematophyllum* from the southernmost part of South America. Bartram (1946) described *Sematophyllum aureonitidum* E. B. Bartram from Tierra del Fuego but this species is conspecific with *Rhaphidorrhynchium scorpiurus* (Mont.) Broth. (Seki, 1974).

In the Eastern Hemisphere, Wilson & Hooker (1845) reported *Hypnum leptorrhynchum* Brid. from the Auckland Islands (lat. 50°40' S, long. 166°10' E), but this material was described by Müller (1851) as *Hypnum leucocytus* Müll. Hal. This species was subsequently transferred to *Sematophyllum* by Sainsbury (1955), but currently it is positioned in *Warburgiella* Broth. as *Warburgiella leucocytus* (Müll. Hal.) B. C. Tan, W. B. Schofield & H. P. Ramsay (Tan *et al.* 1998; Ramsay *et al.* 2002).

In the vast Southern Ocean region surrounding the Antarctic continent, the Sematophyllaceae are very poorly represented. So far, only a single species of the genus *Sematophyllum*, *S. crassiusculum* (Brid.) Broth., was found in the Tristan da Cunha archipelago in the middle of the South Atlantic Ocean sector (Bridel, 1812), reaching the southernmost record on Nightingale Island (lat. 37°28' S, long. 12°32' W) (Dixon, 1960). Additionally, the genus *Rhaphidorrhynchium* has been recorded from the highly isolated islands of Île Amsterdam (lat. 37°50' S, long. 77°30' E) and Île Saint-Paul (lat. 38°43' S, long. 77°31' E) in the South Indian Ocean sector where it is represented by one and two species, respectively (Bescherelle, 1875), which badly need taxonomic re-assessment.

In general, the family Sematophyllaceae is scarcely represented in the regions south of latitude 40° S. So far, only five species of *Rhaphidorrhynchium* M. Fleisch. and one *Sematophyllum* are known from southern South America (Seki, 1974; He, 1998; Matteri & Schiavone, 2002; Müller, 2009); five species of *Sematophyllum*, one *Wijkia* H. A. Crum, one *Rhaphidorrhynchium* and two *Warburgiella* from Tasmania (Tan *et al.*, 1998; Ramsay *et al.*, 2002, 2004); and three *Sematophyllum*, three *Rhaphidorrhynchium*, and one *Wijkia* from New Zealand (Fife, 1995).

While in Buenos Aires in 1995, I was given by the late Celina M. Matteri some moss specimens of obscure and uncertain identity. Amongst them I found a small single specimen from Isla de los Estados consisting of a relatively large pleurocarpous moss with concave, broadly ovate to elliptical leaves, rounded to obtuse-apiculate or subacute at the apex and a short double costa. The specimen evidently fitted the concept of the genus *Sematophyllum* but was unlike any species known to me. Because of the scantiness of the material, I was reluctant to describe it as a new species, hoping that more material would be discovered in due course.

Nearly a decade later Niek Gremmen, from Diever, Holland, came to Kraków bringing a set of moss specimens he had collected on Îles Kerguelen in 2004. Amongst them I found a pretty specimen of an aquatic moss collected in a stream which immediately reminded me the South American specimen from Isla de los Estados and with which it proved to be identical. Because I had field work on subantarctic Îles Kerguelen in prospect, I deferred the decision to describe this moss until I could see and collect it in its natural environment. Having accurate instruction from Niek Gremmen regarding its site, I easily rediscovered the moss in the sluggish streamlet near Jacky Hut on Péninsule Courbet on Grande Terre. I am delighted to name it in honour of Marc Lebouvier, friend and colleague, who made the trip to Îles Kerguelen, my life dream, a reality and was a faithful companion in the field work.

DESCRIPTION

***Sematophyllum lebouvieri* Ochyra, sp. nov.**

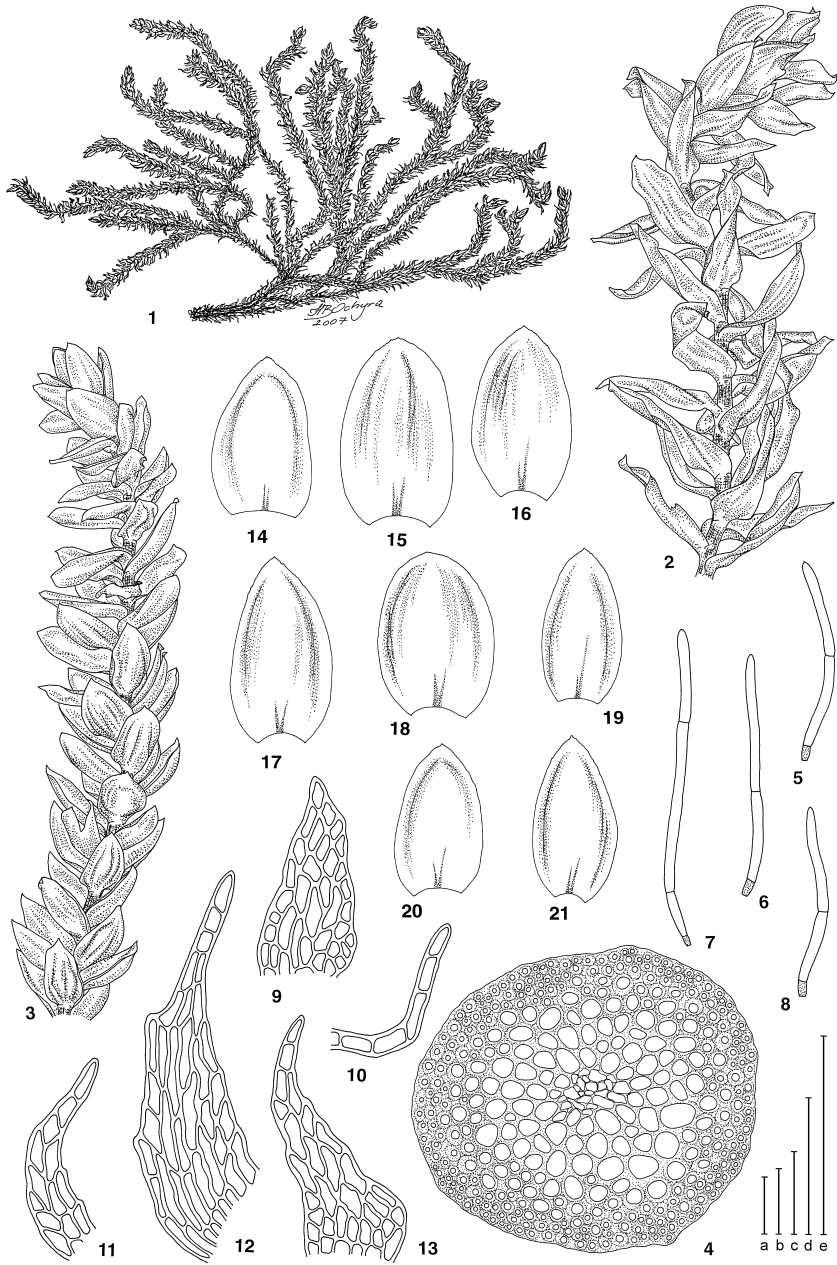
Figs 1–27

Diagnosis: *Species haec* *Sematophyllo* secundifolio *Fuegiano proxima*, sed ab eo plantis robustis, foliis non secundis, laxioribus maioribusque, late ovatis vel ellipticis, apice rotundo-obtusis, obtuso-apiculatis vel subacutis, marginibus planis vel anguste reflexis, apice serrulatis recedit.

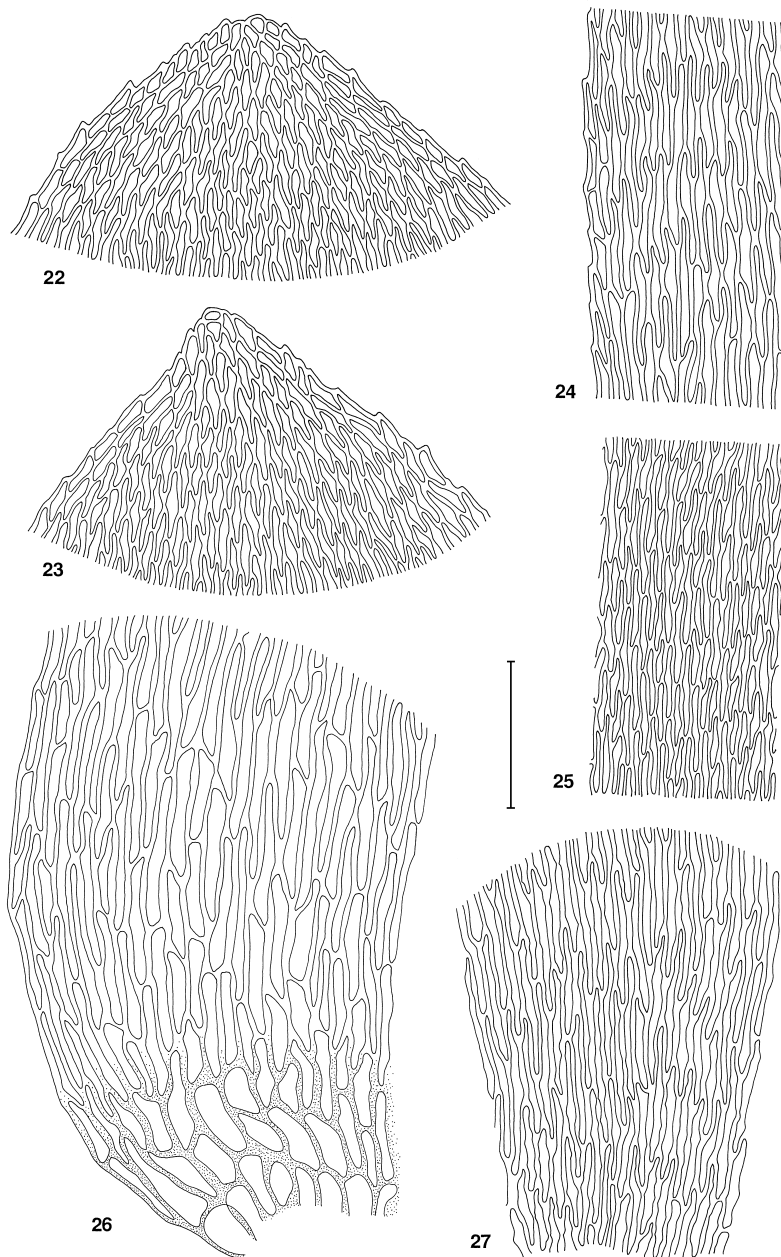
Type: SUBANTARCTICA. ÎLES KERGUELEN. GRANDE TERRE, PÉNINSULE COURBET: in an intermittent streamlet behind Jacky Hut, ca 7 km north-west of Port-aux-Français and 100 m east of Rivière du Sud at the entrance to Val Studer, lat. 49°19'23.1" S, long. 70°07'52.3" E; alt. 40 m; attached to stones and submerged in standing or slowly flowing water of streamlet or in pools; 30 November 2006, *Ochyra* 968/06 (with Christophe Brumbt and Bart Klinck) (Holotype: KRAM; isotypes: BM, KRAM, NY, PC).

Description: **Plants** aquatic, submerged or intermittently emergent, usually trailing from a single point of attachment, relatively large and robust, forming rather stiff, shiny, loose mats, yellow- to brownish-green, occasionally blackish-brown above, brown to blackish-brown below. **Stems** floating or creeping, to 7 or occasionally 10 cm, freely and irregularly branched, moderately stiff, reddish-brown to brown, lustrous, becoming blackish-brown to brown-black, with a varnish luster and usually denuded of leaves below, in transverse section rounded to elliptical, with a distinct, fairly large central strand, consisting of 2-4 rows of small cortical cells with brown to reddish-brown, strongly incrassate walls and small lumina, abruptly passing into a medulla of 4-6 rows of large, hyaline, thick-walled cells; **rhizoids** abundant in the basal part, long, not or sparingly branched, smooth, glossy, light brown to reddish-brown; **axillary hairs** abundant, filiform, uniseriate, 3-4-celled, with a short, brown basal cell and 2-3 elongate, hyaline upper cells; **pseudoparaphyllia** foliose, triangular, occasionally filiform. **Stem and branch leaves** similar, the stem leaves sometimes only somewhat larger, little changed and contorted when dry, slightly distant to close and overlapping, loosely erect-appressed to erect-spreading or wide-spreading, usually ragged in the lower part of stems and branches, broadly ovate or elliptical, deeply concave, usually plicate on drying, (2.1-)2.4-2.8(-3.0) × (1.0-)1.2-1.5(-1.6) mm, rounded or obtuse-apiculate to subacute at the apex, broadly inserted, not or slightly decurrent; **margins** plane to narrowly reflexed, serrulate at the apex, entire below; **costa** very variable, short and double, concolorous and obsolete or darker and well demarcated from the laminal cells, yellowish-brownish, with one branch markedly broader and longer, simple or forked, reaching 1/4-1/3 way up the leaf; **laminal cells** smooth, prosenchymatous, (50-)70-90(-120) × 4-6 μm, linear or linear-flexuose, usually rounded, not or weakly narrowed at the apices, with moderately thick and occasionally porose walls, becoming shorter towards the apex, 30-50 × 5-6 μm, spindle-shaped to oblong-hexagonal; **alar cells** often short-rectangular, rhomboidal to irregular, 30-40 × 10-16 μm, with thicker and sometimes porose walls, forming a fairly distinct group gradually passing into basal cells or not markedly different from other basal cells, concolorous with the adjacent laminal cells or somewhat brownish; **basal cells** often thicker-walled and porose, sometimes yellow-brownish and forming a colourful strip across the insertion. Sexual organs and sporophytes unknown.

Additional specimens seen (Paratypes): SUBANTARCTICA. ÎLES KERGUELEN. GRANDE TERRE, PÉNINSULE COURBET: an intermittent streamlet behind Jacky Hut, ca 7 km north-west of Port-aux-Français and 100 m east of Rivière du Sud at the entrance to



Figs 1-21. *Sematophyllum lebouvieri* Ochyra. – **1.** Habit, wet. **2.** Portion of branch, dry. **3.** Portion of branch, wet. **4.** Cross-section of stem. **5-8.** Axillary hairs. **9-13.** Pseudoparaphyllia. **14-21.** Leaves. [All from *Ochyra* 968/06, holotype, KRAM]. Scale bars: a – 1 cm (1); b – 1 mm (2); c – 1 mm (14-21); d – 100 μ m (4-13); e – 0.5 cm (3).



Figs 22-27. *Sematophyllum lebouvieri* Ochyra. – 22-23. Leaf apices. 24-25. Mid-leaf cells. 26. Angular cellst. 27. Basal leaf cells. [All from Ochyra 968/06, holotype, KRAM]. Scale bar: 100 μ m.

Val Studer, lat. 49°19'23.1" S, long. 70°07'52.3" E; alt. 40 m; attached to stones and submerged in standing or slowly flowing water of streamlet or in pools; 30 November 2006, *Ochyra 971/06* (with Christophe Brumbt and Bart Klinck) (H, KRAM); same locality, 26 December 2006, *Ochyra 3355/06* (with Christophe Brumbt) (KRAM); same locality, 12 January 2004, *Gremmen K-108* (KRAM, PC, S).

SOUTH AMERICA. ARGENTINA. ISLA DE LOS ESTADOS: Bahia Blinders, lat. ca 54°40' S, long. ca 64°55' W; 6 November 1971, *Matteri 1589* (Expedición Botánica R. . Hero, National Science Foundation, Tierra del Fuego - Isla de los Estados, Octubre - Noviembre 1971) (BA 21643, KRAM).

TAXONOMIC DISCUSSION

As is the case with most large and morphologically diverse moss genera, *Sematophyllum* is a heterogeneous taxon which needs a thorough revision and possibly should be split into several segregates (Hedenäs & Buck, 1999). In its present circumscription *Sematophyllum* is a nondescript genus which is characterised primarily by the absence of various specialised traits. According to its current definition which appears in various Floras, *Sematophyllum* is designated as a genus consisting of plants having homomallous leaves of various shape with a short and double costa and conspicuously differentiated alar cells which are abruptly inflated, sometimes bubble-shaped and often coloured, as well as collenchymatous exothecial cells. This neat diagnosis is certainly too general and does not apply strictly to a number of species which are currently positioned in *Sematophyllum*. Additionally, species of this genus are markedly differentiated in their ecological preferences and practically they occupy a wide array of habitats. Most species of *Sematophyllum* are associated with dry or eventually humid sites growing epiphytically on bark of boles, exposed roots of trees and logs but also on soil, humus and rocks. However, some species occur in wet habitats, growing on rocks in or beside streams and *S. lebouvieri* as an aquatic moss is not exceptional in its ecological predilections within the genus.

Sematophyllum lebouvieri is apparently one of the largest species within the genus, having the leaves 2.4-2.8 mm long and 1.2-1.5 mm wide on average, whereas in most species of *Sematophyllum* they do not exceed 2 mm in length. The leaves are heteromallous, i.e. they are not directed to one way only but spread in all directions and they are broadly ovate or elliptical, deeply concave, with rounded or obtuse-apiculate to subacute apices. Additionally, the leaf margins are plane or narrowly reflexed and distinctly serrulate at the apex only, the areolation is of linear to linear-flexuose cells with moderately thickened walls that are weakly porose in the basal part and the alar cells are usually distinct but do not form distinct auricles. The costa is short and double, usually with one branch markedly longer, simple or forked to spurred distally, and it varies considerably from indistinct and poorly differentiated to darker and well demarcated from the laminal cells.

Sematophyllum lebouvieri appears to be most closely related to *S. secundifolium*, a poorly known species from Isla Hermite in the Tierra del Fuego archipelago which is still known only from a single type collection consisting exclusively of sterile plants. Originally described as *Hypnum secundifolium* (Müller, 1851), it was soon associated with the sematophyllean mosses by Mitten (1869), who placed in it *Sematophyllum*, and Jaeger (1878), who

transferred it to *Rhaphidostegium* (Schimp.) De Not., an illegitimate name for *Sematophyllum*. Dixon (1921) transferred this species to *Drepanocladus* (Müll. Hal.) G. Roth, showing its similarity to *Scorpidium scorpioides* (Hedw.) Limpr., then placed in that genus, on account of its variable costa. The variable costa condition is weak evidence of the relationships of this moss and actually *S. secundifolium* has little else in common with amblystegialean mosses, except for similar ecological predilections. *Sematophyllum secundifolium* shares the similar costa and leaf areolation with *S. lebouvieri* but it is a less robust plant, although still larger from other congeners, with distinctly secund and homomalous leaves. These are generally smaller, 1.8-2.1 mm long, 0.8-0.9(-1.0) mm wide, oblong-ovate, oblong to nearly lingulate, with margins reflexed or platter-edged to widely recurved in the lower half which are entire throughout or obscurely, bluntly serrulate at the apex.

In the large genus *Sematophyllum*, there are several aquatic species which share a similar leaf shape with *S. lebouvieri*, although they are generally smaller, to 2 mm long. *Sematophyllum grandicellulosum* (Müll. Hal.) Broth., from north-western Argentina, is at once distinct in its leaf areolation of oblong-hexagonal mid-leaf cells which are only 28-48 μm long (Farias & Matteri, 1999). There are a few aquatic species of *Sematophyllum* with broadly ovate leaves in Brazil (Sehnem, 1978), for example *S. cochleatum* (Broth.) Broth. and *S. campicola* (Broth.) Broth., but they differ immediately in leaf areolation having thin-walled, oblong-hexagonal cells, 50-70 μm long, 8-14 μm wide, and well developed, large, thin-walled, pellucid alar cells forming a distinct angular group. *Sematophyllum brasiliense* (Herzog) Ochyra has imbricate and closely appressed, rotund to broadly ovate leaves but it is distinct in its large, hyaline, bubble-shaped alar cells which form sharply delimited groups in the leaf angles (Ochyra, 1999). Finally, *S. steerei* (Sharp) Ochyra from Mexico has broadly ovate leaves which are constricted at the base, deeply concave and usually cucullate at the apex, but the laminal cells are thin-walled, prosenchymatous, 40-70 μm long, and the alar cells are thin-walled, quadrate and form a large prominent pellucid group.

Sematophyllum lebouvieri is unique among the species of *Sematophyllum* in having thick-walled and porose alar cells. The similar alar cells are known only in *S. secundifolium* from Tierra del Fuego and *S. homomallum* (Hampe) Broth. from Australia, Tasmania and New Zealand. However, the latter is at once distinct from *S. lebouvieri* in its ovate-lanceolate to oblong leaves which are short bluntly acuminate, markedly homomalous and much smaller, 1.2-1.8 mm long and 0.5 mm wide. Additionally, *S. homomallum* is a terrestrial xerophytic moss, often growing on dry exposed rocks, sometimes corticolous on tree bases and branches and only seldom found in swampy and wet areas.

HABITAT AND DISTRIBUTION

In Îles Kerguelen *Sematophyllum lebouvieri* is a typical aquatic moss growing attached to stones found in a sluggish intermittent streamlet or in standing water in pools. It grows submerged or periodically emergent, forming pure, monospecific floating mats. No other aquatic mosses were found nearby and only some shoots of *Acaena magellanica* (Lam.) Vahl extend to the water. No information about the habitat is available for the plants from Isla de los Estados,

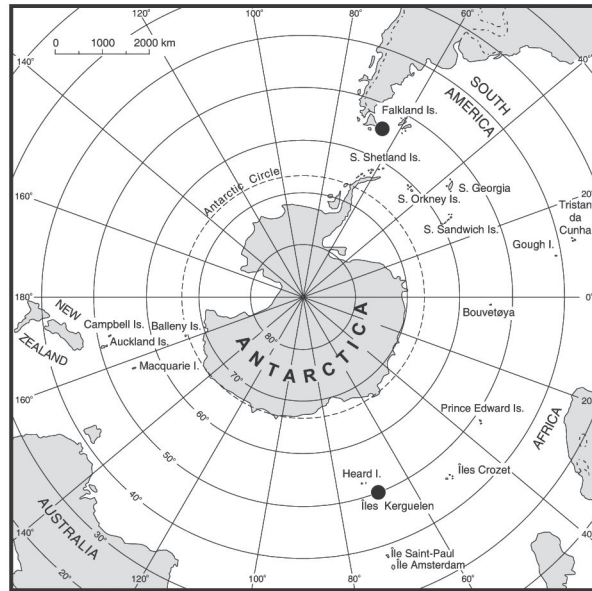


Fig. 28. Map of the global distribution for *Sematophyllum lebouvieri* Ochyra.

although the presence of silt in the lower part of stems may indicate that the moss grows in wet situation as well.

At present *Sematophyllum lebouvieri* is known to occur in two very disjunct stations: in subantarctic Îles Kerguelen and in the north-western side of Isla de los Estados, the easternmost island of the Tierra del Fuego archipelago (Fig. 28). Therefore the species should be considered as an amphiatlantic south-cool-temperate species rather than amphiatlantic subantarctic one, because in Îles Kerguelen it occurs at a low elevation, just near sea level. The difference between these two categories of distribution patterns is sometimes subtle and, generally, they consist of taxa which are distributed in cool-temperate regions of southern South America, on South Georgia, Tristan da Cunha and Gough Island in the South Atlantic Ocean and extend to the subantarctic islands of the Kerguelen Province in the South Indian Ocean (Ochyra, 1998; Ochyra *et al.*, 2008). The most typical examples of south-cool-temperate amphiatlantic species are *Holodontium strictum* (Hook. f. & Wilson) Ochyra (Ochyra, 1993), *Ditrichum conicum* (Mont.) Mitt. and *D. ditrichoideum* (Cardot) Ochyra (Ochyra & Lewis Smith, 1998), *Plagiothecium ovalifolium* Cardot and *P. orthocarpum* Mitt. (Bednarek-Ochyra *et al.*, 1999), *Bucklandiella pachydictyon* (Cardot) Bednarek-Ochyra & Ochyra, *Pohlia wilsonii* (Mitt.) Ochyra and *Bryum orbiculatifolium* Cardot & Broth. (Ochyra *et al.*, 2008).

The population in Îles Kerguelen is small and the species was found only in one streamlet which is situated in close proximity to a field hut which is often visited by staff from the nearby base at Port-aux-Français. The population may be heavily endangered with destruction and should be protected. Naturally, discovery of other populations of this moss in Îles Kerguelen is possible with further field studies.

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