

An overview of *Sematophyllum* (Bryopsida, Sematophyllaceae) in the Iberian Peninsula

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Abstract – The genus *Sematophyllum* is revised for the Iberian Peninsula, where it is represented by two species, *Sematophyllum substrumulosum* (Hampe) E. Britton and *S. demissum* (Wilson) Mitt. The gametophyte and sporophyte of both species are described from Iberian samples; the names of both species are lectotypified and their distributions are brought up to date by revising numerous herbarium specimens; phytosociological and habitat data are provided. The type of *Hypnum bottinii* Breidl., a taxon known in the Iberian Peninsula from only one locality, is studied and compared with the original material for this citation. It is concluded that this is the taxon in question but that it should be considered as a species of *Isopterygium* (*I. bottinii* (Breidl.) Kindb.) (Hypnaceae).

Sematophyllaceae / *Sematophyllum* / Iberian Peninsula / Taxonomy / Chorology

INTRODUCTION

The Sematophyllaceae show a distribution pattern with an optimum in tropical forest environments, where its species are common and show the maximum degree of diversity. It is a family in which it is occasionally difficult to delimit genera and even its limits with nearby families is problematic, although recent phylogenetic studies attempting to clarify some of the questions in this respect (Hedenäs, 1995, 1997; Hedenäs & Buck, 1999). *Sematophyllum* with four species (*S. adnatum* (Michx.) E. Britton, *S. micans* (Mitt.) Braithw., *S. substrumulosum* (Hampe) E. Britton and *S. demissum* (Wilson) Mitt.) is the genus of the family most widely represented in Europe.

Sematophyllum adnatum is an American species recently cited in Italy (Brusa, 2000); *S. micans* has been placed in the Hylocomiaceae (as *Schofieldiella micans* (Mitt.) Buck) (Buck, 1997; Hedenäs, 2003) and more recently in the genus *Hageniella* (Sematophyllaceae) (Tan & Jia, 1999). Although *S. substrumulosum* and *S. demissum* are clearly placed within the family, the latter shows important similarities with *S. adnatum* and could perhaps be considered synonymous with it (Buck, 1998; O'Shea, 2002).

As regards the Iberian Peninsula, only *S. substrumulosum* and *S. demissum* have been cited and will be considered in this paper.

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Sematophyllum proposed by Mitten (1865) (type: *Sematophyllum demissum*), includes small or moderately robust plants, in dense, green, yellow-green, golden to brownish mats, usually shiny. Stems generally creeping, irregularly to subpinnately branched. Stem and branch leaves similar, erect to erect-spreading, homomallous to occasionally falcate-secund, concave, elliptic, oblong-ovate or ovate-lanceolate to lanceolate, acute, acuminate or subulate; margins plane or slightly recurved, entire, sinuose or serrulate above. Upper cells linear to longly rhomboidal or flexuose, smooth, with walls thickened and weakly porose; alar cells strongly inflated in 1-2 rows, usually hyaline. Autoicous. Perichaetial leaves erect, long-acuminate. Seta smooth, reddish to brownish; capsule suberect to horizontal, rarely pendulous, generally asymmetric; annulus none or vestigial; operculum rostrate to subulate; exothecial cells quadrate to short-rectangular, collenchymatous; exostome teeth 16, lanceolate to lanceolate-subulate, cross-striolate to papillose, furrowed along the median line, strongly trabeculate; endostome segments apically papillose, lanceolate-subulate and keeled, the basal membrane high, cilia single or paired, fragile. Spores spherical, finely papillose. Calyptrae cucullate.

TAXONOMIC NOTES AND RESULTS

Sematophyllum substrumosum (Hampe) E. Britton, *J. Bot.* **40**: 354. 1902 Fig. 1
 ≡ *Hypnum substrumosum* Hampe, *Bot. Zeitung (Berlin)* 20: 12. 1862.

Ind. loc.: “Insulae Canarienses, Lanceiros, in truncis putridis, 2000 ped. altum”.
Lectotype: BM, designated here. [Portugal] “Ad truncos putridus et ad terram humif...Ins. Canariens. – Lanceiros 2000’ “, *Trumpff legit* (BM).

Synonyms cited in Iberian Peninsula: None.

Plants small, irregularly pinnate-branched, creeping, green to yellow-green, very shiny when dry; branches (1)1.5-4.5(5) mm long. **Stem** brown to reddish, without central strand, outer cortical cells in 1-2 layers, very incrassate, inner cortical cells in 2-3 layers, weakly incrassate. **Rhizoids** red-brown, slightly branched, smooth, in small fascicles under the leaves. **Stem leaves** 1.2-1.5 × (0.35)0.4-0.5 mm, erect to erect-patent, sometimes homomallous, rarely spreading, concave, not plicate, narrowly ovate or ovate-lanceolate to lanceolate, gradually narrowed to longly acuminate apex; nerve very short, usually double, sometime indistinct or absent; margins plane or narrowly recurved in the lower third, entire or slightly sinuose to the apex. **Branch leaves** slightly smaller than stem leaves and more shortly acuminate. **Upper and midleaf cells** (50)60-100 × (4)6-10 μm, linear to flexuose, not or indistinctly porose; juxtacostal basal cells (40)50-90 × (4)6-8 μm, strongly incrassate and porose; alar cells in (1)2-3 rows, strongly inflated, hyaline, inferior row with 3-4 cells, 50-70 × 25-30 μm, upper rows with 1-2(3) cells, 30-40 × 20-25 μm. **Autoicous**. Inner perichaetial leaves with broad base and more suddenly acuminate apex than vegetative leaves. Perigonial leaves gradually or suddenly narrowed to broadly acuminate apex. **Seta** (6)9-15 mm, reddish, smooth. **Capsule** 1-1.2 × 0.4-0.5 mm, cylindrical, slightly curved, inclined to horizontal or pendulous. **Exothecial cells** quadrate to shortly rectangular, (20)25-60 × (18)19-38 μm. **Operculum** rostrate, 0.5-0.7(0.8) mm long. **Annulus** none, occasionally as a trace. **Exostome** orange to brown below, whitish above, densely trabeculate, 13-14(15) trabeculae in 50 μm, intertrabecular space cross-striolate, rarely papillose. **Endostome** pale yellowish, finely and sparsely papillose at the apex, segments 22-

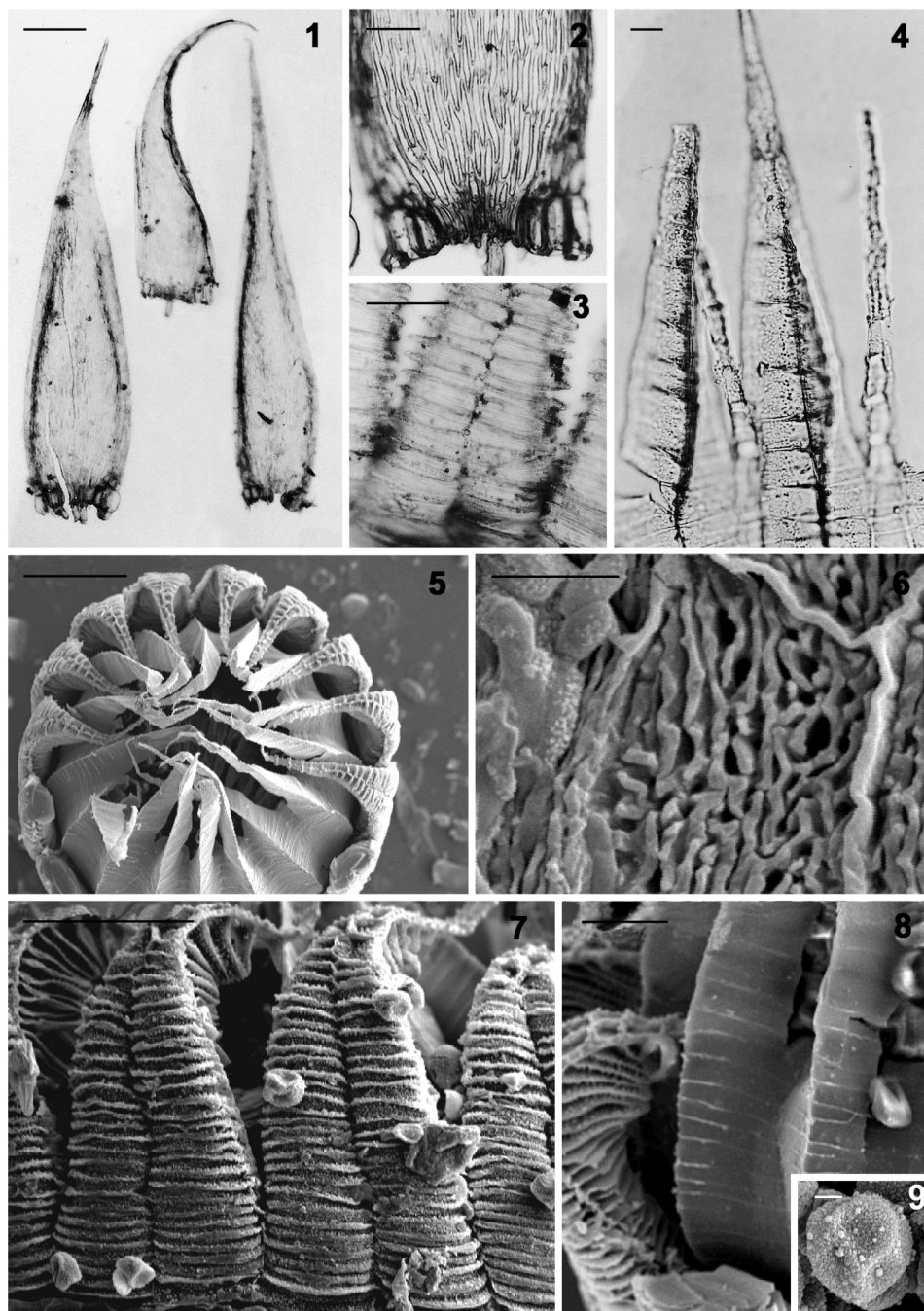


Fig. 1. *Sematophyllum substrumosum* (MUB 10407). 1. Leaves. 2. Alar and juxtacostal basal cells. 3. Exostome. 4. Endostome. 5. Peristome. 6. Intertrabecular ornamentation. 7. Exostome. 8. Endostome. 9. Spore. Scale bars: 1 = 0.20 mm; 2 = 50 μ m; 3 = 25 μ m; 4 = 5.3 μ m; 5 = 100 μ m; 6 = 5 μ m; 7, 8 = 25 μ m; 9 = 2.5 μ m.

Table 1. Floristic composition of the *Sematophyllum substrumulosum* community in the south of the Iberian Peninsula. *Relevé sites*: (Spain: Cadiz province) 1, 2, 3 and 5: Los Barrios, Sierra de Ojén, Los Cebrillos. 4 and 6: Los Barrios, Sierra del Niño, Gargantas del Niño. 7, 8 and 9: Tarifa, Sierra de Ojén, El Pedregoso. *Biotope*: A = *Arbutus unedo*, E = *Erica arborea*, R = *Rhododendron ponticum*.

Relevé number	1	2	3	4	5	6	7	8	9
Relevé size (m ²)	0.1	0.1	0.4	0.5	0.6	0.3	0.6	0.4	0.5
Habitat	A	A	E	E	R	A	R	A	R
Cover (%)	80	75	80	80	60	80	100	90	90
Slope (degrees)	0	0	10	0	90	60	0	90	30
Altitude (m a. s. l.)	450	400	400	450	450	500	450	350	400
Characteristic species of association									
<i>Sematophyllum substrumulosum</i>	4	3	1	2	1	2	1	3	3
<i>Frullania tamarisci</i>	1	2	1	1	.	.	2	2	1
Characteristic species of class (<i>Lepidozio-Lophocoletea heterophyllae</i> and <i>Frullanio-Leucodontetea sciuroidis</i>)									
<i>Lophocolea heterophylla</i>	2	.	+	.	1	.	+	.	1
<i>Microlejeunea ulicina</i>	+	.	.	.	.	.	+	.	.
<i>Metzgeria furcata</i>	.	+	1	+	1	.	.	.	+
<i>Hypnum cupressiforme</i>	.	1	3	3	.	.	.	+	1
<i>Isothecium myosuroides</i>	.	.	.	.	1	1	2	1	.
<i>Frullania dilatata</i>	.	.	.	.	.	1	.	.	.
<i>Hypnum cupressiforme</i> var. <i>resupinatum</i>	.	.	.	.	.	.	3	.	.
<i>Leptodon smithii</i>	.	.	.	.	.	.	.	1	.
<i>Cephalozia lunulifolia</i>	.	.	.	.	+	.	.	.	.
Other species									
<i>Lophocolea bidentata</i>	.	.	.	1	.	.	.	.	1
<i>Lejeunea lamacerina</i>	.	.	.	.	+	.	1	.	.
<i>Saccogyna viticulosa</i>	.	.	.	.	1	.	.	.	.
<i>Neckera pumila</i>	.	.	.	.	.	.	.	1	.

29 µm wide at base, cilia single, rarely paired, not or very narrowly perforate. **Spores** (9.5)10-16.5 µm in diameter, finely papillose.

Habitat — In the places where it was collected it is basically sapro-lignicolous or epiphytic and very rarely terri-humicolous. It usually appears at the base of tree trunks with decomposing bark in humid and shaded places. For this reason it is usually found alongside species of *Lepidozio-Lophocoletea heterophyllae* von Hübschmann 1976 (*Lophocolea heterophylla*, *Cephalozia lunulifolia*) and some epiphytes of *Frullanio-Leucodontetea sciuroidis* Mohan 1978 em. Marstaller 1985 and *Hypnetea cupressiformis* Jezek & Vondracek (*cf.* Drehwald & Preising, 1991; Bardat & Hauguel, 2002). It lives in association with *Frullania tamarisci*, *Lophocolea heterophylla*, *Metzgeria furcata*, etc. (Table 1).

Distribution — According to Düll (1985, 1992), De Beer & Arts (2000) and Holyoak (1996) in Europe it is found in Great Britain, Belgium, Sicily, Greece, Corsica, France, Spain, Italy, Portugal, and ex-Yugoslavia. It is present also in the Macaronesian islands (Azores, Madeira and Canaries) and North Africa. In the Iberian Peninsula, it is relatively frequent along the Atlantic coast of both Spain and Portugal, although it has also been found on the island of Majorca (*cf.* Casas

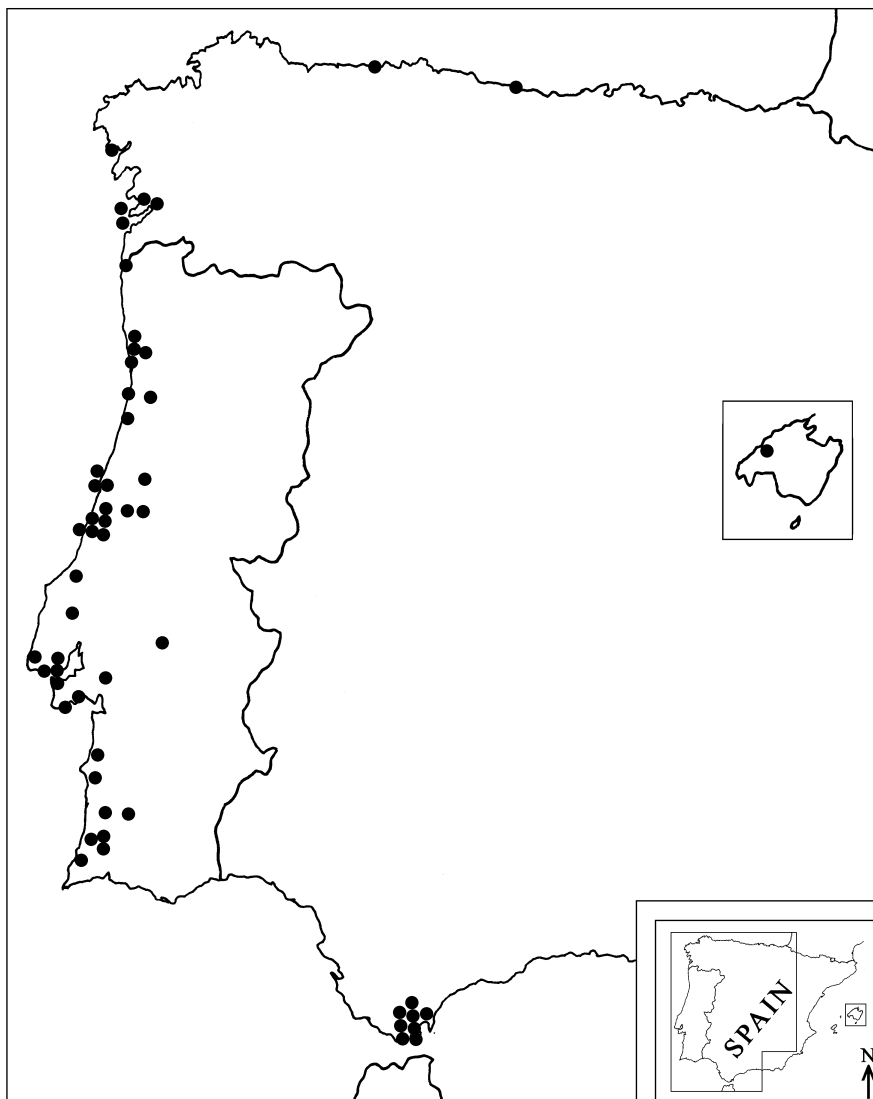


Fig. 2. Distribution of *Sematophyllum substrumulosum* in the Iberian Peninsula and Balearic Islands.

et al., 1985; Casas *et al.*, 2001). Figure 2 shows the localities mentioned in the bibliography, as compiled by Casas *et al.* (1985), and those corresponding to the material studied or revised in this contribution.

Selected specimens studied — **Portugal:** Algarve, ca 1km om Caldas de Monchique, 14-04-1989, *Hakelier* (NY). Baixo Alentejo, Odemira, 10-04-85, *Sérgio & Sim-Sim* (LISU 175542). Beira Litoral, Bussaco, 05-1911, *Dixon & Nicholson* (S). Beira Litoral, Rio Cermita, 5-03-1997, *Sérgio* (LISU). Douro Litoral, Grijó, *Sérgio* (LISU) s.

n.). Estremadura, Lisboa, Monsanto, 12-02-1985, *Melo et al.* (LISU 148840). **Spain:** Cádiz, Medina Sidonia, Sierra Blanquilla, Arroyo del Alisoso, 16-04-2000, *Guerra* (MUB 11145). Cádiz, Algeciras, Sierra del Niño, 15-3-1998, *Guerra et al.* (MUB 10407). Cádiz, Algeciras, Sierra de la Luna, Arroyo del Tiradero, *Hakelier* (S). Cantabria, Santoña, Monte Buceiro, 2-05-1988, *Muñoz* (MA 20986). La Coruña, Louro, 9-5-1997, *Reinoso* (SANT 3081).

***Sematophyllum demissum* (Wilson) Mitt., J. Linn. Soc., Bot. 8: 5. 1865** Fig. 3
 ≡ *Hypnum demissum* Wilson, *Engl. Bot. Suppl.* 2: pl. 2740. 1832.

Ind. loc.: "From the woods of Cromagloun Mountain, near the Upper Lake of Killarney, Ireland...". **Lectotype:** BM, designated here. [Ireland] "Nr. Killarney, Upper Lake, *Wilson mss.*, Jul? Sep. 1829" (Herb. Wilson in BM).

Synonym cited in Iberian Peninsula: *Eurhynchium demissum* (Wilson) Milde, *Bryol. Siles.*: 308. 1869.

Plants small to medium-sized, irregularly branched, usually creeping, green, yellow-green or yellow-brownish, shining when dry; branches 1.5-6(7) mm long. **Stems** brown to reddish, without central strand, outer cortical cells in 1-2(3) layers, very incrassate, inner cortical cells in 2-3(4) layers, weakly incrassate. **Rhizoids** reddish to brown, branched, smooth, in dense and long fascicles under the leaves. **Stem leaves** 1.3-1.6 × 0.4-0.6 mm, erect, erect-patent, nearly homomalous, strongly concave, not plicate, ovate to ovate-lanceolate, acute or short acuminate; nerve very short, usually double, rarely absent; margin plane, rarely recurved below, entire or sinuose. **Branch leaves** slightly smaller than stem leaves. **Upper and midleaf cells** (40)56-80 × (4)5-7 μm, linear to flexuose, not or indistinctly porose; juxtacostal basal cells (40)50-60 × 4-6 μm, incrassate and porose; alar cells in 1(2) rows, strongly inflated, hyaline, 40-48 × 13-18 μm. **Autoicous.** Inner perichaetial leaves very gradually acuminate. Perigonial leaves suddenly narrowed to broadly acuminate apex. **Seta** (9)10-14(16) mm, brown to reddish, smooth. **Capsule** 1-1.2 × 0.4-0.5 mm, cylindrical, slightly curved, inclined to nearly horizontal. **Exothecial cells** quadrate to shortly rectangular, 25-40 × 18-40(45) μm. **Operculum** subulate-rostrate, 0.6-0.8(0-9) mm long. **Annulus** none. **Exostome** brownish-yellow below, whitish above, 10-11(12) trabeculae in 50 μm, intertrabecular space densely papillose to papillose-striolate. **Endostome** pale yellowish, finely to densely papillose at the apex, segment 31-36 μm wide at base, cilia single or paired, not or very narrowly perforate. **Spores** (10)11-16(17) μm in diameter, finely papillose.

Habitat — This is a very rare species in the Iberian Peninsula, with largely unknown habitat preferences. Most citations are from the Basque Country and Navarra, where it is mentioned as a saxicolous or terri-saxicolous, acidophilous species (*cf.* De Miguel, 1988; De Miguel & Ederra, 1990). In Britain, Germany and Switzerland the habitat seems to be approximately similar to those indicated for Spain (Birks, 1994; Hedenäs & Bisang, 1999; Philipp, 1994).

Distribution — According to Düll (1985, 1992), the species is present in North America, North Africa and several European countries (Great Britain, France, Germany, Ireland, Switzerland, Italy and Norway); it has also been cited in Luxembourg (Arts, 1994) and Belgium (Schumacker & DeZuttere, 1982). In the Iberian Peninsula, it is known, from Navarra, Guipúzcoa (Basque Country), Asturias and Santander (Allorge, 1930, 1934) and Ávila (Cillero, 1945) — citations compiled by De Miguel (1988), in which the distribution was widened to Spain — and Galicia (Reinoso & García Molares, 2000). The citation from Ávila (an area with continental climate in the Iberian Peninsula) correspond to a species of

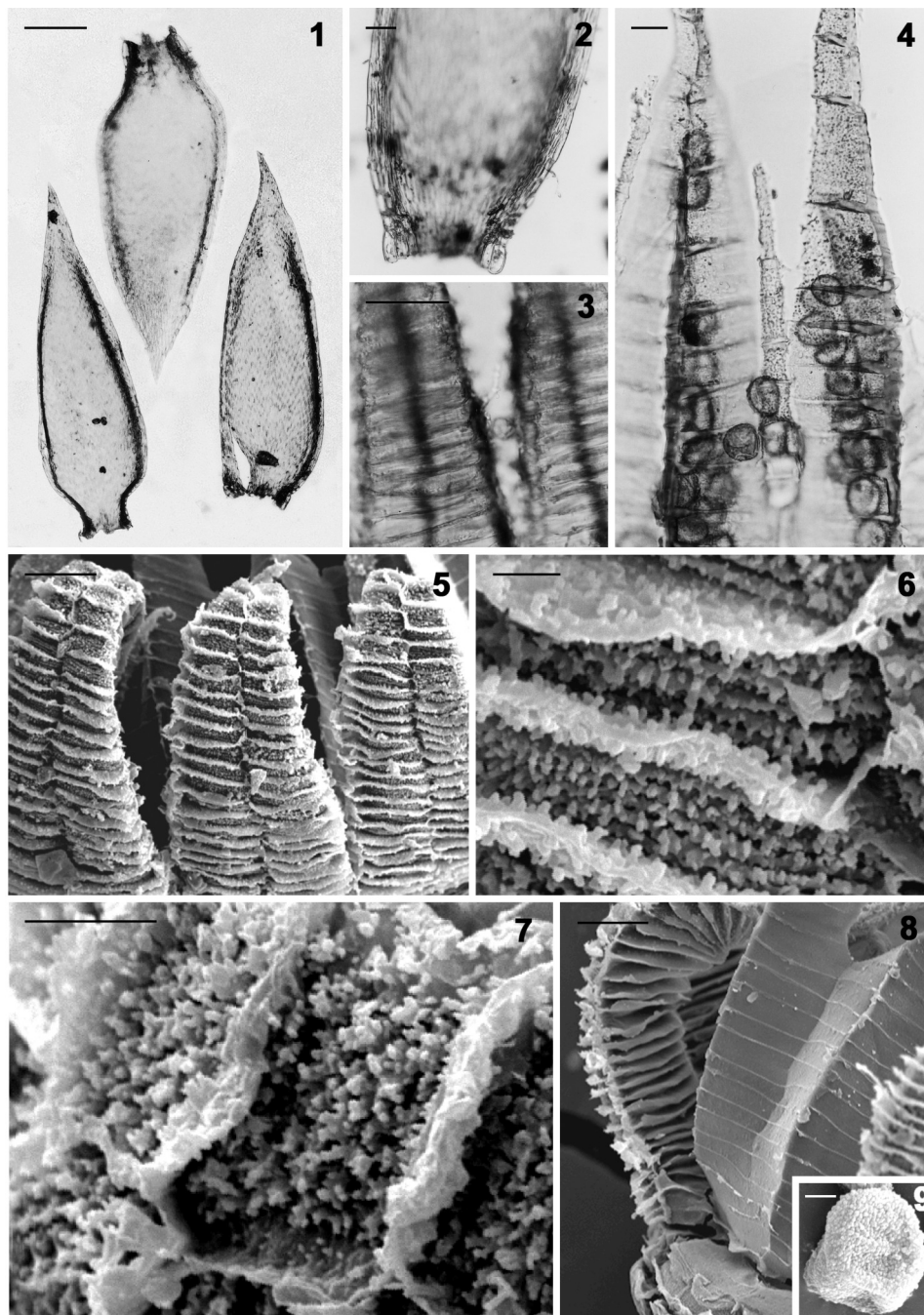


Fig. 3. *Sematophyllum demissum* (MUB 1997). 1. Leaves. 2. Alar cells. 3. Exostome. 4. Endostome. 5. Exostome. 6, 7. Intertrabecular ornamentation. 8. Endostome. 9. Spore. Scale bars: 1 = 0.25 mm; 2 = 60 μ m; 3 = 25 μ m; 4 = 5.3 μ m; 5 = 25 μ m; 6 = 2.5 μ m; 7 = 5 μ m; 8 = 20 μ m; 9 = 2.5 μ m.

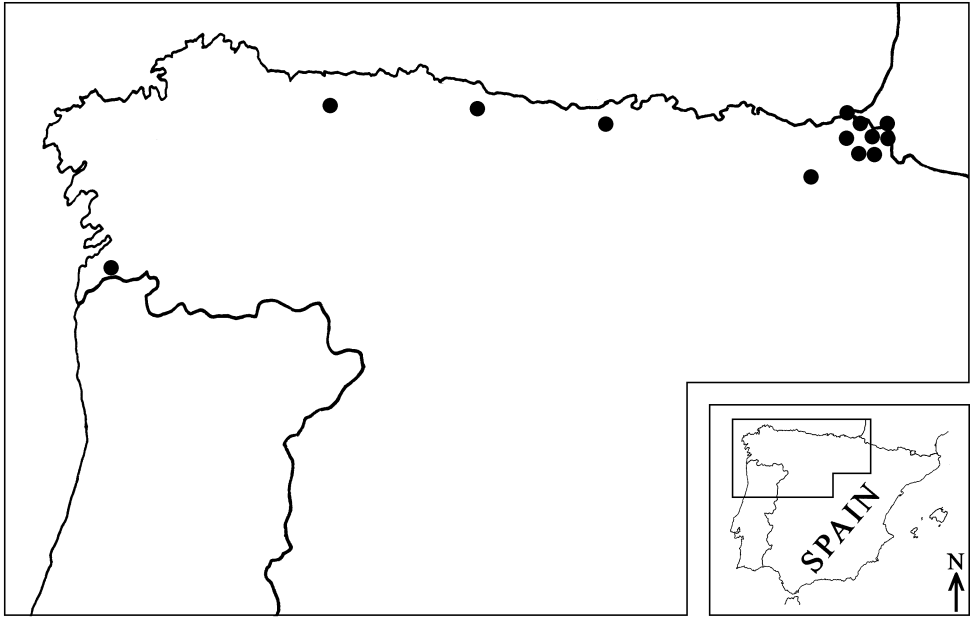


Fig. 4. Distribution of *Sematophyllum demissum* in the Iberian Peninsula.

Drepanocladus (MA-Musci 3536). Figure 4 shows the citations mentioned in the bibliography and those corresponding to the material studied.

Selected specimens studied — **Spain:** Navarra, Arano, *Ederra & De Miguel*, 14-06-1985 (MUB 1997). Navarra, Goizueta, *De Miguel*, 14-06-1985 (PAMP 05570). Navarra, Irurita, *De Miguel*, 26-6-1975 (PAMP 05571). Navarra, Ituren, *De Miguel*, 3-10-1985 (PAMP 05572).

EXCLUDED TAXON

***Sematophyllum bottinii* (Breidl.) Podp., *Consp. Musc. Eur.*: 660. 1954** (\equiv *Hypnum bottinii* Breidl., *Nuov. Giorn. Bot. Ital.* 13: 116. 1881. *Ind. loc.*: “in paludibus turficeis Piaggetta di Massaciuccoli dictis, prope Viareggio in Etruria...”). **Type:** [Italy] “Piaggetta di Massaciuccoli, p. Viareggio, Aprili 1880, *Bottini*” (BM!).

Allorge & Allorge (1945) cited this species under the name *Isopterygium bottinii* (Breidl.) Kindb. from Cádiz (southern Spain), the only Iberian site known to date for this taxon. We have studied a sample from Allorge herbarium (Espagne, Cádiz, Algeiras, vallée de la Miel, talus sil. suintant, *Allorge & Allorge*, 13-05-1934, in PC!) corresponding to this citation and compared it with type material of *Hypnum bottinii* confirming that it was the same taxon. However, the placement of this species in the genus *Sematophyllum* is an inappropriate combination since this species almost certainly belongs to the genus *Isopterygium* (Hypnaceae, *sensu* Buck & Goffinet, 2000). Another matter that needs to be cleared up is

whether *Isopterygium bottinii* can be considered a synonym of *Isopterygium tenerum* (Sw.) Mitt., as suggested by R. Schumacker and Z. Iwatsuki (*in litt.*), although the latter species has not been cited previously in the Iberian Peninsula.

CONCLUSIONS

The Sematophyllaceae are represented in the Iberian Peninsula by two species of the genus *Sematophyllum* (*S. substrumulosum* and *S. demissum*) that can be differentiated easily by the morphology of the leaves: *S. substrumulosum* has slightly concave leaves, closely ovate or ovate-lanceolate to lanceolate, gradually narrowing to a longly acuminate apex, while *S. demissum* has markedly concave leaves, broadly ovate to ovate-lanceolate, acute or short acuminate. There are also morphological differences in the peristome, which are not so useful for identification purposes. *Sematophyllum substrumulosum* has densely trabeculate exostome teeth (with 13-14(15) trabeculae in 50 μm length of tooth), while *S. demissum* has a lower density of trabeculae (10-11(12) trabeculae in 50 μm length of tooth). The intertrabecular ornamentation is cross-striolate, rarely papillose in *S. substrumulosum*, and densely papillose to papillose-striolate in *S. demissum*. The bases of the endostome segments are narrower in *S. substrumulosum* (22-29 μm) versus (31-36 μm) in *S. demissum*, probably due to the slightly broader capsules of the latter. Both species have an optimum Iberian distribution on the Atlantic seaboard of Portugal and northern Spain. *Sematophyllum substrumulosum* may be considered a relict species of the Tertiary, when the Mediterranean enjoyed a wetter, milder climate, now associated with the humid and hyperhumid ombroclimate of the European continent.

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