

20. BRYOXIPHIACEAE Besch. ex Besch.

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Plants small. **Stems** unbranched or infrequently branched subapically, bulblike or not at proximal end, erect or pendent, loosely to densely tufted, rarely solitary; axillary hairs filiform, hyaline, or basal and adjacent cell pale tan or pale rose-violet; paraphyllia none; pseudoparaphyllia none; rhizoids basal, light brown to reddish, smooth. **Leaves** distichous, tightly imbricate, changing little when dry, conduplicate; 1-costate, costae supporting low abaxial lamellae; laminal cells firm-walled, 1-stratose, smooth, somewhat bulging. **Sexual condition** dioicous; perigonia and perichaetia terminal, indistinct, without and with paraphyses, respectively, archegonia about $\frac{1}{2}$ length of paraphyses; antheridia and archegonia few. **Sporophytes** single. **Seta** short, erect or somewhat curved. **Capsule** subglobose, emergent, erect or somewhat inclined, radially symmetric, stomatose; annulus absent; peristome absent; operculum persistent, obliquely rostellate, attached to columella after dehiscence. **Calyptra** cucullate. **Spores** spheric.

Genus 1, species 2 (1 in the flora): North America, Mexico, West Indies, Europe, Asia.

Bryoxiphiaceae are found primarily in temperate regions.

SELECTED REFERENCES Britton, E. G. 1913. Bryoxiphiaceae. In: N. L. Britton et al., eds. 1905+. North American Flora.... 47+ vols. New York. Vol. 15, pp. 69–70. Löve, Å. and D. Löve. 1953. Studies on *Bryoxiphium*. Bryologist 56: 73–94, 183–203. Steere, W. C. 1937. *Bryoxiphium norvegicum*, the sword moss, as a preglacial and interglacial relic. Ecology 18: 346–358.

1. BRYOXIPHIMUM Mitten, J. Linn. Soc., Bot. 12: 580. 1869, name conserved • [Greek *bryon*, moss, and *xiphium*, sword, alluding to plant form]

Plants light green to brownish green, shiny. **Stems** with small, incrassate, pigmented epidermal cells; exterior cortical cells similar to epidermal cells; interior cortical cells larger, hyaline; central strand small. **Leaves** oblong-lanceolate, obtuse, becoming apiculate to aristate distally, the distal, perigonial, and perichaetial leaves long-subulate; margin nearly entire, crenate-serrulate at apex; costa smooth, strong, ending in or near apex, or ending in subula of distal and gametocelial leaves; distal and medial laminal cells irregularly quadrate to irregularly oblong, outer and marginal laminal cells narrow and elongate, oblong at insertion, elongate in subula. **Sporophytes** rare. **Spores** smooth, or nearly so.

Species 2 (1 in the flora): widespread but disjunct, largely temperate Northern Hemisphere.

1. *Bryoxiphium norvegicum* (Bridel) Mitten, J. Linn. Soc., Bot. 12: 580. 1869 [F]



Phyllogonium norvegicum Bridel, Bryol. Univ. 2: 674. 1827

Plants 4–30 × 0.5–1.5 mm (not including flaring distal subulate leaves). **Leaves** somewhat scale-like proximally; median leaves oblong-lanceolate, rounded or nearly so, 1–2 mm, becoming apiculate to aristate; distal and

gametoecial leaves 3–6 mm, long-subulate with ± twisted, ± hyaline, flexuous, smooth to spinose subula; costa ending few cells below apex in proximal and median leaves, ending in subula of distal and gametoecial leaves, interior cells of homogeneous stereids, exterior layer thinner-walled; abaxial lamella 1–6 cells high, sometimes absent, usually developed best on subulate leaves, usually ending well above insertion; interior laminal cells 11–40 × 9–18 μm; marginal cells 14–60 × 3.5–7.0 μm. **Seta** ca. 2 mm. **Capsule** ca. 1 mm. **Spores** 19–23 μm, slightly papillose.

Capsules mature Jul. Usually on undersides of moist, shaded, sandstone ledges and cliffs, these occasionally calcareous and often overhanging streams, infrequently on bluffs and boulders of conglomerate, gneiss and quartzite, soil, and overturned tree bases; low to high elevations (50–2800 m); Greenland; Alaska, Ariz., Ark., Colo., Ind., Iowa, Ky., Minn., Mo., N.Mex., N.C., Ohio, Tenn., Wash., Wis.; Mexico; West Indies (Dominican Republic); Asia; Atlantic Islands (Iceland, Madeira).

Mature spores have been found only once in North America, in a sporophyte collected in the Wisconsin Dells in July. According to S. M. Hague and W. H. Welch (1951), antheridia are present from March to August, and archegonia are evident from May to August. In spite of the specific epithet, the original collection of this distinctive moss was made in Iceland. Usually bright green, *Bryoxiphium norvegicum* has on occasion been mistaken for grass seedlings. *Bryoxiphium* can also be confused with another moss genus, *Fissidens*. In both genera the leaves are distichously arranged, and the conduplicate (folded lengthwise) portion and weak abaxial lamella of the larger and better developed leaves of *Bryoxiphium* can be mistaken for the vaginant and abaxial laminae, respectively, of *Fissidens*. Costal structure of the two genera, however, is quite different, and species of *Fissidens*, with few exceptions, have a well-developed haplolepidous peristome.

Á. Löve and D. Löve (1953) recognized two subspecies of *Bryoxiphium norvegicum*, subsp. *norvegicum* and subsp. *japonicum*, distinguished by the degree of serrulation on the distal parts of the perichaetial leaves. Within subsp. *norvegicum* they recognized two varieties, *norvegicum* and *mexicanum* (the latter variety recognized at the species level by H. A. Crum in A. J. Sharp et al. (1994), based on differences in the length of marginal cells in perichaetial leaves. According to Löve and Löve, North American populations north of Mexico belong to var. *norvegicum*, having perichaetial leaves only slightly serrulate and marginal cells much longer than the interior laminal cells. A report of *B. norvegicum* from Pennsylvania cannot be substantiated.