

27. ERPODIACEAE Müller Hal.

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Plants small, prostrate, usually freely branched, usually in mats. **Stems** smooth, radiculose, rhizoids smooth, in clusters contiguous to leaf insertion on abaxial side; axillary hairs minute, 2–3 cells in length, basal cell small, apical cell enlarged, \pm clavate; paraphyllia none; pseudoparaphyllia minute, ovate, acute; epidermal layer \pm bulging, outer cortical cells small, firm-walled in 1–2 layers, similar to epidermis, interior cortical cells somewhat uniform, enlarged, thin-walled; central strand absent. **Leaves** of stems and branches similar, usually imbricate, \pm monomorphic and spirally arranged, or distinctly dimorphic and arranged in two dorsal and two ventral rows, erect or spreading and \pm complanate when dry, spreading and often \pm complanate when moist, bilaterally symmetric or asymmetric, lanceolate to ovate or elliptic, rounded, obtuse, or acute, acuminate to subulate, ecostate; margin elimbate, entire; laminal cells firm-walled, smooth or pluripapillose, distal cells quadrate (including rhombic) to hexagonal, oblate-hexagonal or rhomboidal, proximal cells oblate-oblong in several marginal rows, often elongate in mid-proximal region. **Specialized asexual reproduction** absent. **Sexual condition** autoicous; perigonia gemmiform, axillary; perichaetia terminal on short axillary branches, leaves erect, usually enlarged and sheathing sporophyte at maturity. **Sporophytes** usually numerous, solitary in perichaetia. **Seta** short to nearly absent, usually straight. **Capsule** immersed to shortly exerted, erect, radially symmetric, oblong- or ovoid-cylindric, pale yellow to yellow-brown; exothecial cells thin-walled, oblong to oblong-hexagonal, estomatose or stomatose, stomata superficial, restricted to base or proximal half of theca; annuli none to well developed; peristome none, or diplolepidous, composed of 16 papillose, lanceolate teeth, or reduced to irregular, pale, papillose segments; opercula conic-apiculate to conic-rostrate. **Calyptra** small, usually covering only opercula and distal ends of thecae, mitrate, lobed, smooth to \pm papillose, more or less plicate, plicae often serrate or serrulate, or rarely, large, twisted, covering capsules completely and clasping the distal end of seta, or rarely, cucullate, \pm papillose, non-plicate. **Spores** finely papillose to nearly smooth, relatively large.

Genera 5, species 26 (3 genera, 4 species in the flora): North America, Mexico, West Indies, Central America, South America, Asia, Africa, Australia, primarily in tropical and subtropical regions.

This family includes the genera *Aulacopilum* Wilson, *Erpodium* (Bridel) Bridel, *Solmsiella* Müller Hal., *Venturiella* Müller Hal., and *Wildia* (Müller Hal.) Brotherus. A sixth genus, *Microtheciella* Dixon, was transferred to the family Microtheciellaceae (H. A. Miller and A. J. Harrington 1977). *Solmsiella* is often combined with *Erpodium* (H. A. Crum 1972; A. Touw 1992; I. G. Stone 1997; D. M. Vital 1980). Stone also combined *Aulacopilum*, *Venturiella*, and *Wildia* with *Erpodium*, thus reducing the family to a single highly variable genus. *Erpodium*, *Solmsiella*, and *Venturiella* are recognized in North America.

SELECTED REFERENCES Crum, H. A. 1972b. A taxonomic account of the Erpodiaceae. *Nova Hedwigia* 23: 201–224. Pursell, R. A. 1994. Erpodiaceae. In: A. J. Sharp et al., eds. *The moss flora of Mexico*. *Mem. New York Bot. Gard.* 69: 581–588. Pursell, R. A. and B. H. Allen. 2002. Erpodiaceae. In: B. H. Allen, ed. *Moss flora of Central America*. Part 2. *Monogr. Syst. Bot. Missouri Bot. Gard.* 90: 523–531. Stone, I. G. 1997. A revision of Erpodiaceae with particular reference to Australian taxa. *J. Bryol.* 19: 485–502. Vital, D. M. 1980. Erpodiaceae (Musci) do Brasil. M.S. thesis. Universidade Estadual de Campinas.

- 1. Peristome well developed, consisting of 16 lanceolate, papillose teeth; proximal laminal cells rhomboidal 3. *Venturiella*, p. 473
- 1. Peristome absent; proximal laminal cells quadrate to hexagonal.
 - 2. Leaves arranged in more than 4 rows, ± monomorphic 1. *Erpodium*, p. 471
 - 2. Leaves arranged in 4 rows, distinctly dimorphic, dorsal leaves larger than ventral leaves 2. *Solmsiella*, p. 473

1. ERPODIUM (Bridel) Bridel in H. G. L. Reichenbach, *Consp. Regn. Veg.*, 32. 1828
 • [Greek *erpo*, creeping, alluding to growth habit]

Anoetangium subg. *Erpodium* Bridel, *Bryol. Univ.* 2: 167. 1827

Plants dull or shiny, light to dark green. **Leaves** ± monomorphic, spirally arranged, appressed or spreading and complanate when dry, spreading and often complanate when wet, bilaterally symmetric to asymmetric, ovate, elliptic, or lanceolate, rounded to obtuse, or acute, acuminate to subulate; laminal cells smooth or pluripapillose, distal cells rhombic to hexagonal, proximal cells oblate-oblong in several marginal rows. **Perichaetial leaves** enlarged or not, sheathing. **Seta** short, usually straight. **Capsule** immersed to shortly exserted, stomata few; annulus none to broad and persistent; peristome absent (or present); operculum usually rostrate. **Calyptra** mitrate, lobed at base, ± plicate.

Species 17–24 (2 in the flora): North America, Mexico, West Indies, Central America, South America, Africa, Australia.

- 1. Leaves hyaline-subulate; laminal cells smooth 1. *Erpodium acrifolium*
- 1. Leaves obtuse to rounded; laminal cells pluripapillose 2. *Erpodium domingense*

1. *Erpodium acrifolium* Pursell, *Bryologist* 69: 465.
 1966 [F]

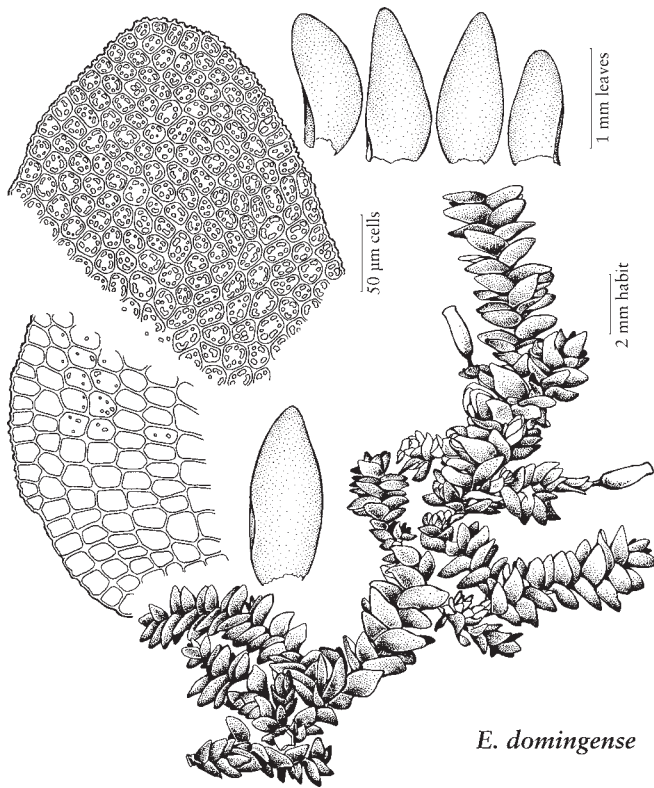


Plants shiny, dark green, irregularly branched, branches ± erect, in loose mats. **Leaves** imbricate when dry, widely spreading when wet, not complanate, symmetric to ± asymmetric, 0.6–1.1 mm, ovate to oblong-lanceolate, subulate, subula hyaline, smooth to serrulate; laminal cells bulging, smooth, thin- but firm-walled, quadrate to oblate-hexagonal, 16–38 µm × 20–

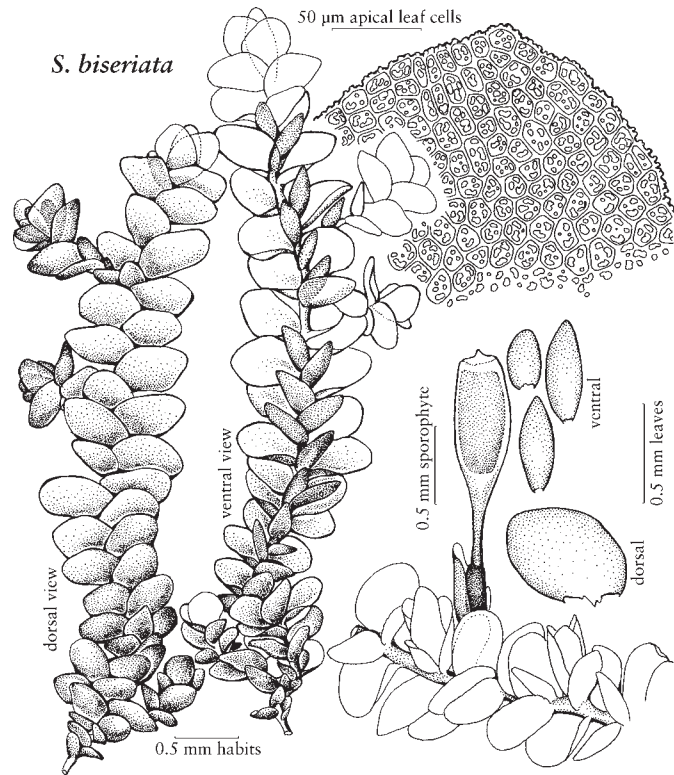
36 µm; marginal cells slightly smaller. **Perichaetial leaves** enlarged, sheathing. **Seta** short to virtually absent, 0.04–0.08 mm. **Capsule** immersed to emergent, yellow-brown, ovoid-cylindric, 0.9–1.1 mm, stomatose; annuli broad, 2–3 rows of ± quadrate cells wide, persistent; peristome absent; operculum erect-rostrate. **Calyptra** to 0.6 mm, smooth, plicate, plicae serrate. **Spores** 23–32 µm, minutely papillose.

Dry areas on bark of trees and rocks; low to moderate elevations; Tex.; Mexico (Sonora, Tamaulipas).

In general aspect, *Erpodium acrifolium* resembles *E. beccarii* G. Venturi, a wide ranging species found in Mexico but not known from the United States. Both

*E. domingense*

ERPODIUM • SOLMSIELLA

*S. biseriata*

species have subulate leaves. However, *E. acrifolium* has smooth laminal cells whereas the laminal cells of *E. beccarii* are pluripapillose.

2. *Erpodium domingense* (Sprengel) Müller Hal., Bot. Zeitung (Berlin) 1: 774. 1843 [F]



Anoetangium domingense Sprengel, Neue Entd. 3: 3. 1822

Plants dull green, often somewhat yellowish or brownish, irregularly branched, in dense mats. **Leaves** loosely appressed when dry, spreading and \pm complanate when wet, asymmetric, ovate to elliptic, rounded to obtuse, 0.5–0.9 mm;

laminal cells pluripapillose, rounded-hexagonal, 14–19 μ m, oblate-hexagonal in several rows at margins proximally. **Perichaetial leaves** not enlarged, ovate, obtuse to acute, sheathing. **Seta** to 0.5 mm, somewhat curved. **Capsule** shortly exserted, oblong-cylindric, to 1

mm, stomatose; annulus and peristome absent; operculum obliquely rostrate. **Calyptra** 0.5 mm, smooth to \pm papillose, \pm plicate, plicae smooth. **Spores** 26–32 μ m, finely papillose.

Dry areas on bark of trees, shrubs and exposed roots, rotting wood, rocks; low elevations; Tex.; Mexico; West Indies (Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, St. Thomas); Central America (Panama); Pacific Islands (Galápagos Islands).

Erpodium domingense is found in Cameron and Hidalgo counties.

Erpodium domingense might be confused with *Solmsiella biseriata*. Both species have pluripapillose laminal cells. The leaves of *E. domingense*, however, are arranged in several rows and are more or less monomorphic, whereas the leaves of *S. biseriata* are arranged in four rows and are distinctly dimorphic. *Erpodium cubense* E. G. Britton, endemic to Cuba, is similar to *E. domingense* but has much smaller laminal cells (9–11 μ m), emergent capsules, and smaller spores (18–20 μ m).

2. SOLMSIELLA Müller Hal., Bot. Centralbl. 19: 149. 1884 • [For H. M. C. L. F. zu Solms-Laubach, 1842–1915, German botanist]

Plants dull, light to yellow-green, becoming brownish with age. **Leaves** ± complanate both dry or wet, arranged in 4 rows, dimorphic, dorsal leaves larger, ± asymmetric, ventral leaves smaller, ± symmetric; laminal cells pluripapillose. **Perichaetial leaves** slightly enlarged, sheathing. **Seta** short. **Capsule** shortly exserted, oblong-cylindric, stomata few or absent; annulus narrow, persistent; peristome absent; operculum obliquely apiculate to rostellate. **Calyptra** cucullate, ± papillose, non-plicate. **Spores** finely papillose.

Species 1: North America, Mexico, West Indies, Central America, South America, Asia, Africa, Australia.

1. *Solmsiella biseriata* (Austin) Steere, Bryologist 37: 100. 1935 [F]



Lejeunea biseriata Austin, Proc. Acad. Nat. Sci. Philadelphia 21: 225. 1870; *Erpodium biseriatum* (Austin) Austin; *Solmsiella kurzii* Steere

Plants irregularly branched, usually in loose mats. **Dorsal leaves** ± asymmetric, oblong-ovate to elliptic, rounded, 0.45–0.65 mm. **Ventral leaves** smaller, ± symmetric, ± ligulate, rounded, 0.25–0.45 mm; laminal cells thin- to firm-walled, thickened and brown with age, 10–16 × 8–13 μm, oblate-hexagonal in numerous basal, marginal rows. **Perichaetial leaves** ovate, obtuse to rounded. **Seta** 0.6–0.8 mm. **Capsule** 0.55–0.85 mm, pale yellow; annuli a single row of quadrate cells; peristome absent; opercula conic, obliquely apiculate to rostellate. **Calyptra** 0.5 mm. **Spores** finely papillose, 21–31 μm.

Dry areas, bark of trees and rocks; low to moderate elevations; Fla., Ga., La.; Mexico (San Luis Potosí, Tamaulipas); West Indies (Cuba, Dominican Republic); Central America (Guatemala); South America (Brazil, Paraguay, Venezuela); Asia; Africa; Australia.

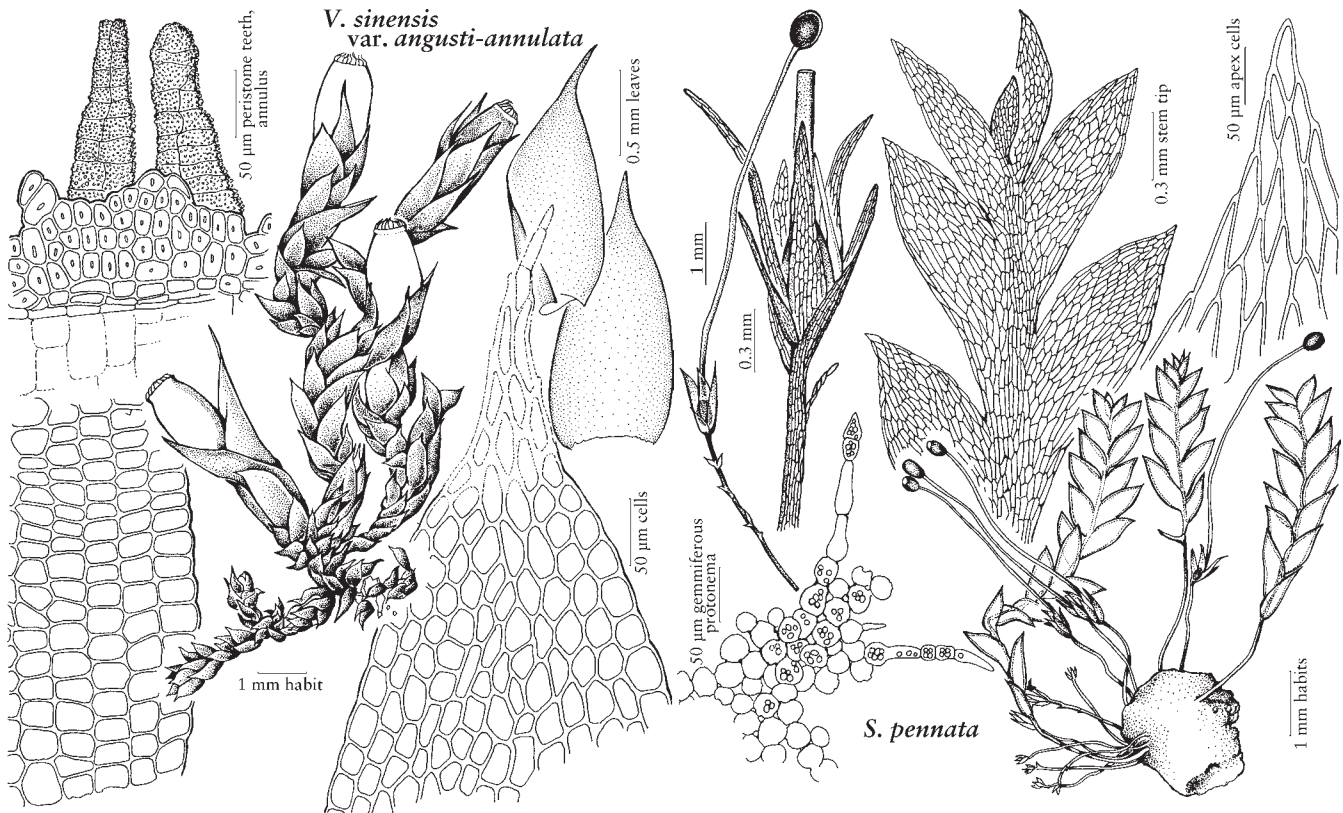
Solmsiella biseriata is known from Jefferson County in Florida, Richmond County in Georgia and Iberia Parish in Louisiana.

A. Touw (1992) noted that Malesian collections came from man-made habitats; similar habitats in the Americas should be carefully examined. *Solmsiella biseriata*, to the casual observer or the uninitiated, can be mistaken for a small leafy liverwort, as reflected in the genus of the basionym. However, its dimorphic leaves, arranged in 4 rows, and cucullate calyptra will distinguish it from *Erpodium domingense*, which has more or less monomorphic leaves arranged in several rows and mitrate calyptra.

3. VENTURIELLA Müller Hal., Linnaea 39: 421. 1875 • [For G. Venturi, 1830–1898, Italian lawyer and bryologist]

Plants dull, dark green. **Leaves** imbricate, erect when dry, giving stem and branches a terete appearance, spreading when wet, ovate, subulate, subula flat, hyaline, serrulate; laminal cells smooth, linear in subulae, rhomboidal distally, quadrate to oblate in several proximal, marginal rows. **Perichaetial leaves** pale, erect, enlarged, sheathing. **Seta** quite short, straight. **Capsule** immersed to emergent, erect, cylindrical, pale yellow, stomatose, stomata numerous in proximal half of theca; annuli narrow or broad, persistent; peristome teeth well developed, 16, lanceolate, papillose, orange; operculum apiculate to rostrate. **Calyptra** mitrate, smooth, plicate, plicae serrulate. **Spores** finely papillose.

Species 1: North America, Asia.



VENTURIELLA • SCHISTOSTEGA

1. *Venturiella sinensis* (Ventenat) Müller Hal., *Linnaea* 39: 422. 1875 [F]

Erpodium sinense Ventenat in G. L. Rabenhorst and G. Winter, *Bryotheca Eur.* 25: 1211. 1873

Varieties 2 (1 in the flora): sw United States, Asia (China, Japan, Korea, Taiwan).

1a. *Venturiella sinensis* var. *angusti-annulata* Griffin, *Phytologia* 57: 58. 1985 [E][F]



Plants irregularly branched, in dense mats. **Leaves** to 1.2 mm; laminal cells smooth, distal cells rhomboidal, $38\text{--}57 \times 15\text{--}18 \mu\text{m}$, proximal cells quadrate to oblate in several marginal rows. **Perichaetial leaves** ovate, long-acuminate. **Seta** short, 0.5 mm.

Capsule 1.5–1.8 mm; annulus narrow, $57\text{--}69 \mu\text{m}$ wide, in 4 rows of quadrate to octagonal cells. **Calyptra** 0.6 mm. **Spores** $21\text{--}30 \mu\text{m}$.

Dry areas on trunks and limbs of trees; moderate elevations; Ark., Okla., Tex.

In the flora area, *Venturiella sinensis* is known only from Stone County in Arkansas, Blaine, Cherokee, Comanche, Payne, and Washita counties in Oklahoma, and Culberson County in Texas. G. J. Ikenberry et al. (1960) reported the species found on an elm tree near the campus of Oklahoma State University in Stillwater.

Venturiella sinensis is the only Erpodiaceae in North America with a well developed peristome; the other species, *Wildia solmsiellacea*, occurs in Australia and New Caledonia. D. G. Griffin and A. J. Sharp (1971) in a comparison of North American and Asian collections of *V. sinensis* recognized two varieties, based primarily on a difference in the width of the annuli ($57\text{--}69 \mu\text{m}$ in North American specimens vs. $69\text{--}129 \mu\text{m}$ in Asian specimens). In addition, the annular cells of North American plants are quadrate to octagonal while in the Asian plants the distal tiers of annular cells are usually ellipsoidal to rhomboidal.