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Division Lycopodiophyta

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DIVISION LYCOPODIOPHYTA

Clubmosses

Perennial herbs with alternation of generations, the generations differentiated and ultimately independent; sporophyte well developed, with roots, stems, and microphylls; vascular system protostelic, without leaf gaps; leaves typically alternate and often spirally arranged, either scale- or grasslike, with a single, unbranched vascular bundle; sporangia solitary, subtended by a sporophyll, the sporophylls aggregated into a definite or indefinite strobilus; spores dimorphic (megaspores and microspores) in Utah materials.

Key to the Families

1. Plants aquatic, submerged in ponds or lakes, or occasionally growing on exposed mud, grasslike; leaves long and slender, from a broadly clasping base; sporangia at base of leaves ........................................ Isoetaceae, p. 13
   — Plants terrestrial, growing in dry, rocky situations, leaves small and scalelike; sporangia in terminal strobili .............................................................. Selaginellaceae, p. 13

ISOETACEAE Reichenb.

Quillwort Family

Plants perennial, aquatic, amphibious, or sometimes terrestrial herbs; stems cornlike, with leaves (microphylls) clustered in a close spiral at the summit of the stem; leaves simple, elongate, dilated basally, the blade hollow and transversely sejunct, the outermost sterile, the innermost bearing megasporangia, and the next innermost bearing microsporangia; sporangia solitary, enclosed in a cavity on the ventral side of the leaf base; ligule (a small flaps of tissue) borne above the sporangial cavity; spores dimorphic, of microspores and megaspores; \( x = 21 \).

*Isoetes* L.

Stems very short; leaves more or less cylindrical, elongate, the peripheral tissues often containing longitudinal strands of sclerenchyma; sporangia borne at the base of the leaves, usually covered by a velum or thin flap of tissue.


1. Megaspores obscurely tuberculate or ridged (as viewed at high magnification) ........................................ 2
   — Megaspores spinose, crested, or ridged (as viewed at high magnification) ........................................ 3

2(1). Leaves mostly less than 15 cm long; hyaline sporophyll margins less than 1 cm long above the sporangium; sclerenchymatous strands essentially lacking. *I. bolanderi*

   — Leaves mostly more than 15 cm long; hyaline sporophyll margins mainly 1—5 cm long above the sporangium; sclerenchymatous strands obvious. *I. howellii*

3(1). Megaspores mostly less than 0.5 mm wide, spinose; leaves subulate ........................................ *I. echinospora*

   — Megaspores mostly more than 0.5 mm wide, crested or ridged; leaves linear in the lower portion at least ........................................ *I. lacustris*

*Isoetes bolanderi* Engelm. Bolander Quillwort. Leaves mostly 2—12 cm long, gradually tapering from the broad base, slender, soft; hyaline margins extending to ca 1 cm above the sporangium; velum covering to ca 1/2 of the sporangium; megaspores 0.3—0.5 mm wide, obscurely tuberculate, ridged, or wrinkled. Ponds, lake margins, and sometimes on mud, at 1310 to 3205 m in Duchesne, Garfield, Salt Lake, Sevier, Summit, and Utah counties; British Columbia to Montana, south to California. Arizona, and Colorado; 14(i).

*Isoetes echinospora* Durieu Spiny Quillwort. Leaves mostly 2.5—10 cm long, gradually tapering from the broad base, slender, soft, straight or curved, hyaline margins extending mostly 1—4 (5) cm above the sporangium; velum covering less than 1/2 of the sporangium; megaspores 0.3—0.6 mm wide; more or less spiny with blunt, truncate, or bifid spines; \( n = 21 \). Ponds, lake margins, and in mud at 2300 to 3085 m in Duchesne and Summit counties; widely distributed in North America; circumboreal; 3(i).

*Isoetes howellii* Engelm. Howell Quillwort. Leaves mostly 15—25 (30) cm long, linear, very slender, firm; hyaline margins extending 1—5 cm above the sporangium; velum covering less than 1/2 of the sporangium; megaspores 0.3—0.5 mm wide; with low tubercles, ridges, or wrinkles. Pond margin (Dry Lake) at ca 1735 m in Cache County; Washington to Montana, south to California; 3 (0).

*Isoetes lacustris* L. Lake Quillwort. Leaves linear, mostly 3—12 cm long, slender, firm; velum covering less than 1/2 of the sporangium; megaspores 0.5—0.8 mm wide, with crests or ridges; \( 2n = 110 \). Reported for the Uinta Mts. (Intermountain Flora 1: 184. 1972); widely disjunct in North America; circumboreal; 0 (0).

SELAGINELLACEAE Reichenb.

Spikemoss Family

Plants low, creeping, forming loose mats or dense tufts among rocks, mosslike in habit and appearance; stems branched, slender, erect or prostrate; leaves (microphylls) numerous, small, oblong to lanceolate, to 3 mm long, sessile and imbricate, all alike and spirally arranged; heterosporous, the sporophylls green, ovate-triangular, slightly larger than the vegetative leaves, arranged in 4 ranks, sharply keeled and forming a 4-angled terminal strobilus often not much different than the vegetative stem; microsporangia and megasporangia axillary and randomly disposed in the strobilus, orange or yellowish; microspores numerous, megaspores 3—4 in each megasporangium, orange; prothallia minute, retained in the spore wall; \( x = 7, 8, 9 \).

*Selaginella* Beauv.

Evergreen herbs with dichotomously to monopodially branched stems; leaves numerous, imbricate, small; strobili biserual, the lower sporophylls usually producing megasporangia and the upper ones microsporangia.


1. Plants loosely matted, the branches distant, long and spreading ........................................ 2
   — Plants densely tufted or matted, the branches short .... 3
Selaginella densa Rydb. Rydberg Spike moss. [S. rupesstris var. densa (Rydbl.) Clute; S. scopulorum Maxon]. Plants caespitose, densely tufted, the stems becoming 10–12 cm long, creeping, with numerous short compact and ascending branches; leaves densely imbricate, 2.3–3 mm long, 0.2–0.4 mm wide, pale green, brownish below, lanceolate to linear-oblong, tapering toward the apex, rounded and boat-shaped at base, narrowly grooved dorsally, short-ciliate marginally (often sparingly so), erect, 1.2–2.5 cm long or longer, sharply 4-angular, sporophylls triangular-ovate, 1.5–2 mm long, the bristle tip ca 1 mm long; megasporangia ca 0.4 mm thick, more or less distinctly roughened; 2n = 18. Rocky ledges and talus slopes in pinyon-juniper, sagebrush, spruce-fir, lodgepole pine, krummholz, and alpine tundra communities at 2700 to 4300 m in Daggett, Duchesne, Grand, San Juan, and Summit counties; Alaska to California, east to Manitoba, the Dakotas, New Mexico, and Arizona; 16 (0).

Selaginella mutica D. C. Eaton Awnless Spike moss. Plants very slender in widely spreading mats; stems 10–40 cm long, distantly and somewhat pinnately branched, 1 mm thick; leaves closely imbricate in 6 distinct rows, 1 mm long, 0.2–0.3 mm wide, oblong to oblong-ovate, obtuse, the upper ones with very short hyaline points, the margins with spreading cilia; strobili slightly broader than the vegetative branches, sharply 4-angular, long and slender, 1.3–3 cm long, often curved; sporophylls ovate-triangular, 1.5–1.8 mm long, concave and keeled, the margin ciliate, the apex shortly bristle-tipped; megasporangia ca 0.3 mm thick, undulate to nearly smooth or somewhat roughened. Rocky crevices, often in sandstone and shale, in sagebrush, pinyon-juniper, mixed desert shrub, ponderosa pine, and Douglas fir communities at 1730 to 2330 m in Emery, Garfield, San Juan, Uintah, and Wayne counties; Colorado to Arizona, New Mexico, and Texas; 13 (0).

Selaginella underwoodii Hieron. Underwood Spike moss. [S. fendleri (Underw.) Hieron.]. Plants in spreading tufts or mats; stems slender, becoming 20–30 cm long, creeping; the branches long and distant, spreading, to 8 cm long, prostrate or ascending; leaves rather loosely imbricate, dark green, 2.3–4 mm long, lanceolate or oblong-lanceolate, to triangular-lanceolate; tapering at the apex, tipped with a pale yellowish bristle 0.4–0.9 mm long, the margins shortly and distinctly ciliate; strobili ascending or erect, to 3 cm long; sporophylls triangular-ovate to lanceolate, 1.5–2.5 mm long, the apex shortly mucronate, the margins sparingly ciliate; megasporangia ca 0.3 mm thick, somewhat roughened; n = 7, 14, 18, 21. Rocky ledges and crevices in sagebrush, mountain brush, and ponderosa pine communities, mainly on Navajo Sandstone, at 1650 to 2500 m in Kane and Washington counties; Arizona, Colorado, Wyoming, New Mexico, and Texas; 4 (0).

Selaginella utahensis Flowers Utah Spike moss. Plants very similar to S. watsonii, but differing in the leaves which typically have a very short white point to 0.1 mm long or less, or occasionally with a setum, but this seldom over 0.2 mm long, or the point obsolete and the leaves wholly mutinous. Ledges and crevices in Navajo Sandstone in sagebrush, oakbrush, pinyon-juniper, and ponderosa pine communities at 1060 to 2350 m in Kane and Washington (type from Zion Canyon) counties; Nevada; 4 (i).

Selaginella watsonii Underw. Watson Spike moss. Plants in dense tufts or somewhat matted; stems 5–15 cm long, creeping; branches erect or ascending, to 4 cm long and 2.3 mm thick; leaves crowded, imbricate, dark green, brownish below, oblong-lanceolate, 2.3–3 mm long, 0.5–0.7 mm wide, concave, boat-shaped at back and with a narrow groove dorsally, the margins sparingly ciliate, the apex with a yellowish green bristle 0.2–0.4 mm long; strobili erect or diverging from the stem tips, sharply 4-angular, to 2.5 cm long (often much shorter); sporophylls triangular-lanceolate to ovate-lanceolate, sharply keeled, 2 mm long, 1.3 mm wide at the base, the margins smooth or finely ciliate; megasporangia ca 0.4 mm thick, somewhat roughened. Ledges or talus slopes in mountain brush, ponderosa pine, aspen, spruce-fir, lodgepole pine, krummholz, and alpine tundra communities at 1290 to 4250 m in Beaver, Box Elder, Duchesne, Garfield, Juab, Millard, Piute, Salt Lake (type from Cottonwood Canyon), Sevier, Summit, Tooele, Uintah, Utah, Washington, and Wayne counties; California to Nevada, Oregon and Montana; 70 (iii).

DIVISION EQUISETOPHYTA

Hornsetails

Perennial herbs with alternation of generations, both ultimately independent; sporophyte with roots, stems, and whorled scalelike microphylls; stems photosynthetic (or sometimes dimorphic and the fertile ones lacking chlorophyll), longitudinally ribbed and grooved, jointed, and usually hollow in the internodes, simple or with whorled branches through the sheathing leaf bases; sporangia borne beneath stalked peltate scales (sporangioles) closely grouped in whorls, forming a terminal strobilus; spores alike (homosporous), with the exine forming hygroscopic elaters; x = 108.

EQUISETACEAE Michx.

Hornsetail Family

Perennial, the stems annual or perennial, typically hollow, jointed, longitudinally ribbed; leaves microphyllous, whorled, small, and scalelike; strobili spike-like, bearing numerous stalked, peltate scales with sporangia on the lower surface; spores numerous, spherical, with a thick perispor consisting of 4 spirally wound bands (elaters), these hygroscopic.