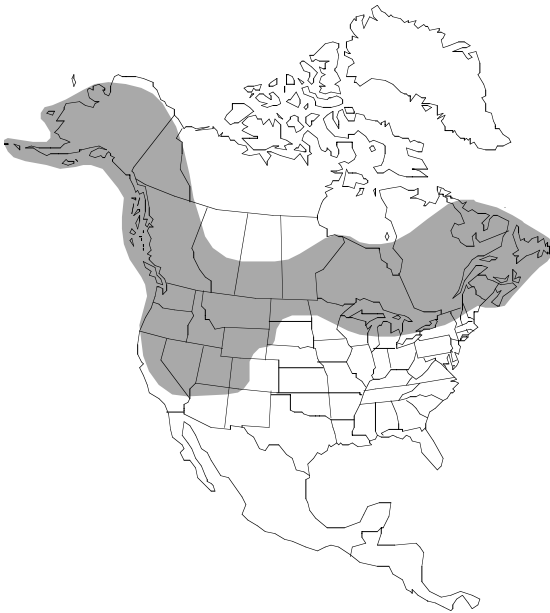


Botrychium minganense

Family:	Ophioglossaceae
Genus:	<i>Botrychium</i>
Subgenus:	<i>Botrychium</i> (syn. <i>Eubotrychium</i>)
Species:	<i>Botrychium minganense</i> Victorin
Synonym:	<i>Botrychium lunaria</i> Sw. var. <i>minganense</i> (Vict.) Dole
Common name:	Mingan moonwort
Ploidy:	Tetraploid



Published description: Trophophore stalk 0—2 cm, 0 to 1/5 length of trophophore rachis; blade dull green, oblong to linear, 1-pinnate, to 10 x 2.5 cm, firm to herbaceous. Pinnae to 10 pairs, horizontal to ascending, approximate to remote, distance between first and second pinnae not or slightly more than between second and third pairs, basal pinna pair approximately equal in size and cutting to adjacent pair, occasionally basal pinnae and/or some distal pinnae elongate, lobed to tip, nearly circular, fan-shaped or ovate, sides somewhat concave, margins nearly entire, shallowly crenate, occasionally pinnately lobed or divided, apex rounded, venation like ribs of a fan with short midrib. Sporophores 1-pinnate, 2-pinnate in very large, robust plants, 1.5-2.5 times length of trophophore. $2n = 180$ (from Wagner and Wagner 1993).



Identification

Botrychium minganense varies greatly with size and habitat. The combination of a strongly stalked trophophore and fan-shaped pinnae that span about a quarter of a circle are usually distinctive. A lax, recurved, yellow-green trophophore at the time of spore also helps to distinguish *B. minganense* from similar moonwort species.

Forms of *B. minganense* with unusually broad pinnae are often confused with *B. lunaria* and *B. crenulatum*. Of several, usually reliable, characters, the most dependable for separating these species is the pinna span of the lowermost pinnae. In *B. lunaria* and *B. crenulatum* the span (portion of a circle completed by the outer margin) is usually 120° to 180° whereas in *B. minganense* it is usually considerably less than 120°. Although the pinnae of *B. lunaria* and *B. crenulatum* can be shallowly cleft, their outer margins circumscribe a uniform arc. By contrast, the outer margin of the pinnae of *B. minganense* often appears lobed.

The trophophore of *B. minganense* is almost always distinctly stalked, with the stalk length equal to or greater than the distance between pinnae. If the trophophore of *B. lunaria* is at all stalked (usually it is sessile), the stalk length is less than the distance between pinnae. At the time of spore release, the length of the sporophore stalk also differs between these two species, with that of *B. lunaria* exceeding the trophophore length and that of *B. minganense* equal to or shorter than the trophophore length. This character must be used with caution as the sporophore stalk attains its full length only days before spore release. Another useful distinction between *B. lunaria* and *B. minganense* is dull to yellowish green color of the latter as opposed to the deep green of the former.

The pinnae of *B. crenulatum* are more or less perpendicular to the rachis and their outer margins are finely toothed whereas those of *B. minganense* are upwardly angled with smooth or lobed margins. The basal branches of the sporophore of *B. crenulatum* are distinctly the largest, often branched and twisted whereas the basal sporophore branches of *B. minganense* are smaller, usually unbranched and straight.

Botrychium minganense can also be difficult to distinguish from *B. pallidum*, especially in preserved plants. When fresh, plants of *B. pallidum* can be distinguished by their light gray-green "pallid" color, but this character fades quickly following collection, especially if plants are kept in plastic bags. Plants of *B. pallidum* are usually smaller than those of *B. minganense* with fewer pairs of pinnae (3-5 vs 5-7). The pinnae of *B. pallidum* are shorter and with broader attachment to the rachis and the side margins are recurved giving the pinnae a mushroom shape. *B. pallidum* pinnae are often bilobed with the upper lobe larger and the two lobes distinctly spreading, whereas pinnae of *B. minganense*, if lobed, are symmetrically lobed. Underground, *B. pallidum* produces numerous gemmae whereas *B. minganense* produces only a few.

In 1990 Wagner and Wagner concluded that two different taxa existed within what was considered *B. minganense* in the Great Lakes area and published the description of *Botrychium spathulatum* Wagner, applying this name to specimens with an overall similarity to *B. minganense*, but differing consistently in 24 different characters. *B. spathulatum* differs most clearly from *B. minganense* in having a sessile or nearly sessile trophophore with basal pinnae usually longer than the upper pinnae. Its spathulate pinnae are entire or irregularly cleft whereas those of *B. minganense* are more uniformly fan-shaped.

Forms of *B. minganense* with narrow pinnae can be distinguished from *B. ascendens* by their distinct trophophore stalk, absence of teeth on the outer pinnae margins, and longer stalked, more lax sporophore.

Distribution and Abundance

Botrychium minganense is among the most widespread and abundant moonworts, having been reported from 19 states and 12 Canadian provinces. Like other moonwort species, it occurs primarily in northern latitudes and at high elevations to the south. It is known from Labrador to New England westward across Canada and the northernmost tier of states to Alaska and south in the western mountains to California and Arizona. Recently it has been found in Iceland, its only known occurrence outside of North America.

Habitat

The habitat of *B. minganense* varies widely from dense forest to open meadow and from summer-dry meadows to permanently saturated fens and seeps. When in meadows, plants may stand in open sun or under dense herbaceous cover. The species is often found in association with old (>10 year) disturbances such as logging roads and road shoulders. It may be locally abundant and sometimes is the only moonwort present in a particular site, but often it occurs with other *Botrychium* species as scattered individuals. *B. minganense* may be less closely associated with calcareous soils than most moonworts. It is the species most commonly found on basaltic soils of the Blue Mountains of northeast Oregon.

Additional photographs of *Botrychium minganense*:

