

# *Botrychium yaaxudakeit*

Stensvold & Farrar

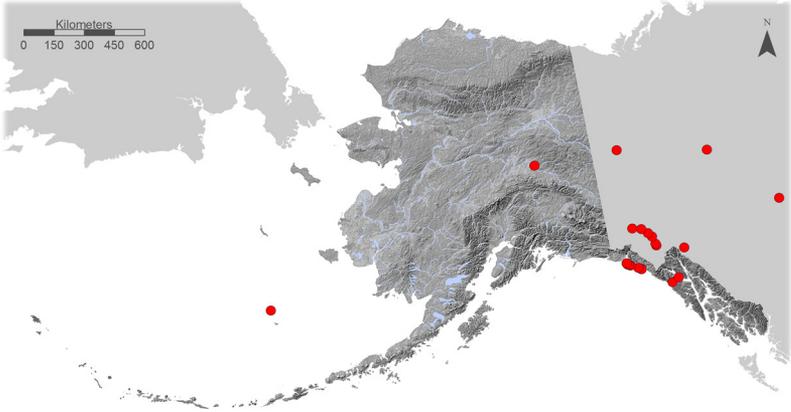
# Ophioglossaceae

**Global Distribution:** Patchy throughout western North America.<sup>51</sup>

**Alaska Distribution:** Coastal Rainforests, Intermontane Boreal, Bering Tundra.

**Ecoregions Occupied:** Gulf of Alaska Coast, Alexander Archipelago, Tanana-Kuskokwim Lowlands, Bering Sea Islands.

**Conservation Status:** S2 G3G4; USFS Sensitive.



## Description<sup>51, 57, 58</sup>

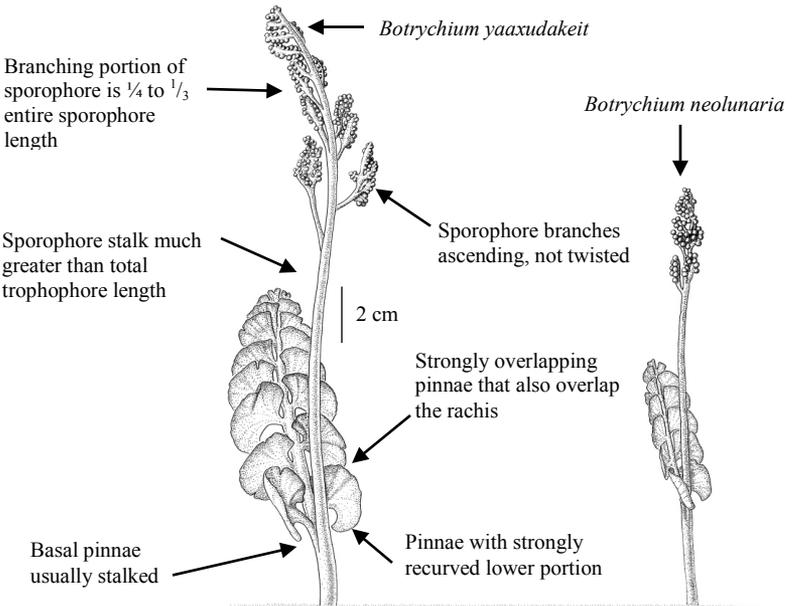


Illustration by Mary Stensvold, courtesy of American Fern Society

*Botrychium yaaxudakeit*

**General:** Frond divided into dissimilar vegetative blade (trophophore) and spore-bearing segment (sporophore); perennial, 8 to 25 cm tall with a common stalk 1 to 5 cm long.

**Trophophore:** Stalk 0 to 5 mm long; blade green, leathery, oblong to ovate, 1.5 to 11 cm long, 1.25 to 6 cm wide at the base, once pinnately divided; pinnae in 4 to 7 pairs, angled up, strongly overlapping one another with the top overlapping the rachis, bottom strongly recurved; basal pinnae 7 to 30 mm long, 9 to 32 mm wide, short-stalked, fan-shaped spanning an arc of 180° to 250°, usually symmetrical, margins entire to undulate or occasionally slightly toothed or shallowly cleft.

**Sporophore:** Stalk 5 to 9 cm long, much longer at maturity than total trophophore length; 1- to 2-times pinnately-divided at base of sporangial cluster; branching portion of sporophore is  $\frac{1}{4}$  to  $\frac{1}{3}$  entire sporophore length, branches ascending, not twisted.



## Ecology

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- Elevation:** Known from near sea level to 140 m in Alaska; up to 3,200 m elsewhere in western North America.<sup>51</sup>
- Landform:** Upper beaches, beach dunes, coastal outwash plains; abandoned fields, roadsides.
- Soil Type:** Sand; *Botrychium* gametophytes require mycorrhizae to grow beyond a 2- to 3-cell stage and reproduce, and sporophytes require mycorrhizae to develop enough to produce above ground leaves.<sup>55</sup>
- Moisture regime:** Mesic.
- Slope:** Flat to gentle.
- Aspect:** No particular aspect.
- Vegetation type:** Sparsely vegetated, moss.
- Associated species:** *Achillea millefolium*, *Androsace chamaejasme*, *Astragalus alpinus*, *Carex gmelinii*, *Chamaeperichlymenum canadense*, *Festuca rubra*, *Fragaria chiloensis*, *Honckenya peploides*, *Leymus mollis*, *Linnaea borealis*, *Lupinus nootkatensis*, *Moehringia lateriflora*, *Oxytropis campestris*, *Polemonium boreale*, *Rhinanthus minor* ssp. *minor*, *Rubus arcticus*, *Shepherdia canadensis*, *Taraxacum ceratophorum*.
- Longevity:** Long-lived perennial with a persistent rhizome that produces one leaf per year;<sup>55</sup> when collecting, remove only the above-ground portion with a knife.<sup>55</sup>
- Phenology:** Rhizomes of *Botrychium* species can remain dormant and produce no above ground growth for one to three years.<sup>55</sup>
- Population estimate:** There are 12 known occurrences in Alaska; several populations are abundant or locally common; below ground population of gametophytes and juvenile sporophytes at various developmental stages can occur at significantly higher densities.<sup>55</sup>
- Reproductive biology:** Spores of *Botrychium* species filter into soil and germinate in darkness;<sup>55</sup> self-fertilization is dominant, gametophyte density below ground often exceeds juvenile sporophyte density;<sup>55</sup> mortality rate of juvenile sporophytes is high;<sup>55</sup> sporophytes grow for several years below ground before the apex of the rhizome produces a leaf that emerges above ground;<sup>55</sup> sporophytes of *Botrychium tunux* do not reproduce vegetatively by gemmae.<sup>58</sup>
- Herbivory:** Above ground leaves of *Botrychium* species often regrow from rhizomes one to several years after

disturbances such as herbivory or fire with no decrease in plant vigor.<sup>55</sup>

### Similar Species<sup>51, 57, 58</sup>

Several other *Botrychium* species that occur in Alaska can be easily confused with *Botrychium yaaxudakeit*, and distinguishing characteristics are often difficult to recognize. The table below shows morphological traits that distinguish *Botrychium* species that occur in Alaska with basal pinnae that span at least 120°.

Species	Pinnae	Basal Pinnae	Sporophore Stalk	Sporophore
<i>Botrychium tunux</i>	Nearly overlapping to overlapping, not overlapping rachis	Broadly fan-shaped, asymmetrical, blade spanning arc of 120° to 180°	Equal to or less than total trophophore length	Branching portion of sporophore is ½ entire sporophore length
<i>Botrychium neolunaria</i>	Nearly overlapping to overlapping, not overlapping rachis	Broadly fan-shaped, blade spanning arc of 150° to 180°	Greater than total trophophore length	Branching portion of sporophore is ¼ to ⅓ entire sporophore length
<i>Botrychium yaaxudakeit</i>	Strongly overlapping each other and the rachis	Broadly fan-shaped, blade spanning arc greater than 180°	Much greater than total trophophore length	Branching portion of sporophore is ¼ to ⅓ entire sporophore length
<i>Botrychium lunaria</i> var. <i>lunaria</i>	Spreading, well separated	Broadly fan-shaped, blade spanning arc of more than 150°	Approximately equal to total trophophore length	Branching portion of sporophore is ½ entire sporophore length
<i>Botrychium minganense</i>	Spreading to ascending, well separated	Narrowly fan-shaped to oblong, blade spanning arc less than 120°	½ or more the total trophophore length	Branching portion of sporophore is ½ entire sporophore length