

## ***Botrychium tunux***

**Family:** Ophioglossaceae  
**Genus:** *Botrychium*  
**Species:** *Botrychium tunux* Stensvold & Farrar  
**Common Name:** Moosewort  
**Ploidy:** Diploid



**Published description:** Rhizomes erect, unbranched. their apex 2–5 cm below the soil surface, bearing 6–22 (ave. 14) fleshy roots; gemmae absent. Above-ground plants 6–12 (ave. 9) cm tall with a common stalk 0–3 (ave. 1.5) cm long. Trophophores yellow-green, leathery; stalks 0–1 cm long; blades 2.5–7 (ave. 4) cm long, 2–4 (ave. 3) cm wide, narrowly ovate to ovate, once pinnate. Pinna pairs 4–6, more or less perpendicular to the rachis, separated to slightly overlapping, not overlapping the rachis. Basal pinnae 7–20 (ave. 13) mm long, 7–18 (ave. 12) mm wide, sessile, fan-shaped spanning an arc of 120–180°, often asymmetrical, with the basal portion expanded; basispic inner margins straight to shallowly concave; outer pinna margins entire or occasionally incised or lobed with rounded sinuses; veins dichotomous, 3–5 major veins entering the pinna base, 45–55 veins ending at the margins. Sporophores 5–10 (ave. 7) cm long; sporophore stalks 2.5–5 (ave. 4) cm long and shorter than or equaling the length of the trophophore; sporangia-bearing portion erect, 1–2-pinnate, broadly ovate in outline, branches 4–6, ascending to spreading, especially the lowermost, which are often twisted such that the sporangia project downward; sporangia partially embedded in the distally thickened sporangiophore branches. Spores 38–42 (ave. 40)  $\mu\text{m}$  in longest diameter, released later than those of *B. lunaria* var. *lunaria*. Apparently diploid. (Stensvold, Farrar and Johnson-Groh 2002).

## Taxonomy

*Botrychium tunux* was described in 2002 by Stensvold, Farrar and Johnson-Groh, based on plants from coastal Alaska. In its type locality *B. tunux* grows with *B. neolunaria* and had previously been considered to be that species. The same was true in the Spring Mountains of southern Nevada, the only other site where it had been collected prior to its description.

## Identification

The common name 'moosewort' refers to the distinctive appearance of the thick, asymmetrical, notched lower pinnae that resemble a pair of moose antlers.

*Botrychium tunux*, *B. neolunaria*, *B. lunaria* var. *lunaria*, *B. lunaria* var. *crenulatum* and *B. yaaxudakeit* are the only moonwort species in which the span of the outer margin of the basal pinnae equals or exceeds 150°, i.e., a half-moon shape. *B. tunux* can be differentiated from similar species by the asymmetry of its basal pinnae that are often enlarged or elongated in the lower half, and by the more rounded shape of its middle and upper pinnae. *B. tunux* further differs from these taxa in having a sporophore stalk that is shorter than the length of the trophophore. Its stiffly spreading sporophore branches, the lowermost of which are often twisted such that the sporangia project outward or downward, are similar to those of *B. lunaria* var. *lunaria* and *B. lunaria* var. *crenulatum*. In plants of the same trophophore height and in the same habitat, *B. tunux* is a stouter plant with trophophore and sporophore standing stiffly upright. The pinnae margins of *B. tunux* are often broken by shallow clefts with broadly rounded sinuses. In the contiguous United States, plants tend to be smaller with more rounded pinnae, resembling the upper half of larger northern plants.

## Distribution

*Botrychium tunux* is most abundant in coastal Alaska in the vicinity of Yakutat and in the mountains of Wrangell-St. Elias National Park in Alaska and in adjacent Kluane National Park in Yukon Territory. It is known also from Montana, Idaho, Colorado, New Mexico, Nevada and California.

## Habitat

In its coastal Alaska habitats *B. tunux* grows on beach sand deposits sparsely to densely vegetated by bryophytes and herbaceous plants. Its natural high mountain habitats include sparsely vegetated erosional slopes and rocky stream terraces. It also occurs in gravelly roadside shoulders and ditches, and, especially in Alaska, in bush plane landing strips. In the southern Rocky Mountains *B. tunux* grows in sparsely vegetated gravelly substrates at high elevations. In California *B.*

*tunux* has been found in rocky mountain meadows at the head of Virginia Canyon in Yosemite National Park, on soil derived from metasedimentary bedrock.

### **Population Genetics**

*Botrychium tunux* expresses a moderate amount of genetic variability with the mountain populations of Alaska and Yukon displaying the greatest allelic variability. Coastal populations and those of the contiguous United States tend to contain subsets of the northern mountain populations suggesting that the latter are the source of coastal and southern populations, derived from single or a few spores.

### **Phylogenetic Relationships**

*Botrychium tunux* is most closely related to European genotypes of *Botrychium lunaria* var. *lunaria*. It is also morphologically more similar to *B. lunaria* var. *lunaria* than to *B. neolunaria*, expressing the shorter sporophore stalk with twisted lower branches often seen in *B. lunaria* var. *lunaria* and *B. lunaria* var. *crenulatum*, but absent from *B. neolunaria*. Presumably the divergence between *B. neolunaria* from *B. lunaria* var. *lunaria* is more ancient than that of *B. tunux* and *B. lunaria* var. *crenulatum*.

An apparent allotetraploid resulting from hybridization between *B. tunux* and *B. campestre* var. *lineare* in Montana (Glacier National Park) and Colorado is under study.

Additional images of *Botrychium tunux*:



With small *B. neolunaria* in  
background at left