

**Lycopodiaceae (Clubmoss Family) Key**  
**Key to species in Newfoundland and Labrador**  
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- 1a. Plants with sporangia attached laterally at the base of photosynthetic leaves (sporophylls), not organized into strobili (*Huperzia*). ..... **2**
- 1b. Plants with sporangia organized in terminal strobili, each sporangium subtended by scale-like bracts. .... **7**
  - 2a. Plants with older senescent portions of stems long trailing (up to 1 m long), covered with brown leaves; erect shoots green, 1.4–2 dm tall, with strong annual constrictions; leaves oblanceolate, 7–11 mm long, with 1–8 small teeth near the apex; gemmae in 1 pseudowhorl at the end of each year's growth. ....  
 .....***Huperzia lucidula*** (shining firmoss)
  - 2b. Plants lacking or with short trailing senescent stems (to 8 cm long), rooting at the base of erect shoots, 0.6–3 m tall, with weak or no annual constrictions; leaves narrowly triangular to oblanceolate, apices entire or with 1–3 teeth; gemmae in pseudowhorls or scattered throughout the shoot. .... **3**
- 3a. Gemmae in 1–3 pseudo-whorls at the end of each year's growth; erect shoots 8–18 cm tall; leaves lustrous; mature shoot leaves narrowly triangular, triangular, to linear-lanceolate, divergent to spreading..... **4**
- 3b. Gemmae occurring throughout mature portion of erect shoots, not organized in discrete pseudowhorls; erect shoots 6–11 cm tall; leaves lustrous or dull; mature shoot leaves narrowly triangular to lanceolate-ovate, appressed. .... **5**
  - 4a. New (juvenile) shoots strongly curved downward at the tip; gemmae in 2–3 pseudowhorls at the end of each growth season; mature shoot leaves 3.5–5.5 mm long; in Newfoundland, known only from Gros Morne Mt., GMNP. ....  
 .....***Huperzia miyoshiana*** (Pacific firmoss)
  - 4b. New (juvenile) shoots erect at the tip; gemmae in 1 pseudowhorl at the end of each growth season; mature shoot leaves 4–7.5 mm long; plants of alpine areas throughout much of the Province.....***Huperzia selago*** (northern firmoss)
- 5a. Shoots dichotomously branched 1–2 times; mature stem leaves 2–3.5 mm long, arranged in vertical rows; gemmae green, dull; lateral gemmae leaves oblong, divergent, with ± parallel sides below the tip and acute apices, upper gemma leaf oblong, blunt, less than ½ the length of the acuminate central leaf; plants of alpine areas throughout much of the Province. .... ***Huperzia appressa*** (mountain firmoss)

- 5b. Shoots branched once, usually near the base; mature stem leaves 3–5 mm long, not arranged in obvious vertical rows; gemmae yellow to yellowish-brown and lustrous; lateral gemmae leaves elliptic to obovate, ascending, with convex outer margins and obtuse apices, upper gemma leaf elliptic to oblong, about ½ the length of the acute central leaf; plants of alpine or tundra areas, rare in the Province. .... **6**
- 6a. Decumbent portion of stems up to 1 cm long; mature stem leaves dull, 3-5 mm long, appressed to stem; gemmae 2.4–2.7 mm long, inner margin of lateral gemmae leaves convex; rare in arctic tundra regions of Labrador. .... ***Huperzia arctica*** (arctic firmoss)
- 6b. Decumbent portion of stems 3–8 cm long; mature stem leaves lustrous, 3–4 mm long, usually spreading or ascending to appressed; gemmae 3.0–3.2 mm long, inner margin of lateral gemmae leaves straight; rare in talus slopes and alpine meadows of insular Newfoundland. .... ***Huperzia continentalis*** (continental firmoss)
- 7a. Leaves 4- or 5-ranked, scale-like and overlapping, or slender, subulate, and adnate to the stem for less than half of their length (*Diphasiastrum*). .... **8**
- 7b. Leaves 6-ranked or leaves not arranged in distinct vertical rows; leaves flat, linear to lanceolate, attached at the base, the blade not adnate to the stem. .... **13**
- 8a. Ultimate branches strongly flattened in cross-section, or somewhat flattened to nearly quadrate (square); upper branch surface convex, lower surface concave; leaves 4-ranked; branches arranged in horizontal fan-shaped arrays, or spreading irregularly; strobili 2–6, peduncled. .... **9**
- 8b. Ultimate branches terete (round), or quadrate (square) in cross-section with upper and lower branch surfaces convex; leaves 4-or 5-ranked; branches mostly erect; strobili 1–2, sessile or short-peduncled. .... **11**
- 9a. Branches somewhat flattened to nearly quadrate (square) in cross-section, spreading to loosely ascending, bluish-green, glaucous beneath; leaves of lower (abaxial) surface similar in size to those of upper (adaxial) surface. .... ***Diphasiastrum tristachyum*** (blue ground-cedar)
- 9b. Branches strongly flattened in cross-section, spreading irregularly or horizontally; bright to dark green, not glaucous beneath; free portion of lower surface (abaxial) leaves much shorter than lateral and upper (adaxial) leaves. .... **10**
- 10a. Plants with irregularly spreading branches, giving the plant a scraggly appearance, ultimate branches 2–4 mm wide; with strong annual constrictions; strobili 1-2 on scaly peduncles. .... ***Diphasiastrum complanatum*** (northern ground-cedar)

- 10b. Plants with regular, fan-shaped branches, 2–3 mm wide, lacking noticeable annual constrictions, strobili 2–5 on naked peduncles. ....  
..... ***Diphasiastrum digitatum*** (southern ground-cedar)
- 11a. Leaves mostly 5-ranked, not overlapping; stems round in cross-section; strobili usually solitary and sessile. ....***Diphasiastrum sitchense*** (Sitka ground-cedar)
- 11b. Leaves 4-ranked, overlapping; stems quadrate (square) to somewhat flattened, with rounded edges; strobili 1 or 2, sessile or short-peduncled. .... **12**
- 12a. Upper (adaxial) and lateral leaves adnate to the stem for about half their length; lower (abaxial) leaves shorter and trowel-shaped (trullate), with the base somewhat stalked; strobilus solitary, sessile..... ***Diphasiastrum alpinum*** (alpine ground-cedar)
- 12b. Upper (adaxial) and lower (abaxial) leaves similar in size and shape, appressed to the stem, lateral leaves slightly larger with spreading tips; strobili 1 or 2, peduncled, with sporophylls and sporangia scattered downward along the peduncle. ....  
.....***Diphasiastrum* ×*sabinifolium*** (savinleaf ground-cedar)
- 13a. Terminal strobili with leafy sporophylls; horizontal stems creeping along substrate surface, giving rise to erect, fertile, unbranched shoots; branch leaves not organized in vertical rows (ranked); plant of wet habitats (*Lycopodiella*). .... **14**
- 13b. Terminal strobili with scaly sporophylls; stems creeping, with simple to many-branched erect shoots; branch leaves 6-ranked; plants of dry or mesic habitats. .... **15**
- 14a. Creeping stems giving rise to 1 (usually) or 2 short fertile shoots, 3.5–6 cm tall; strobili 1–2 cm long, sporophylls spreading; plants mainly north of 45° N, in lowland and upland areas. .... ***Lycopodiella inundata*** (northern bog-clubmoss)
- 14b. Creeping stems giving rise to 1 to 7 fertile shoots, 13–40 cm tall; strobili 2.5–6 cm long, sporophylls appressed; plants mainly south of 45° N and in lowland areas (elevations less than 100 m). .... ***Lycopodiella appressa*** (southern bog-clubmoss)
- 15a. Horizontal stems creeping along the substrate surface, leafy; erect shoots simple or dichotomously few-branched; annual constrictions abrupt and conspicuous; fertile shoots with sessile or peduncled strobili. .... **16**
- 15b. Horizontal stems subterranean; erect shoots many-branched, appearing bushy or 'tree-like'; annual constrictions absent or inconspicuous; fertile shoots with 1–7 sessile strobili (*Dendrolycopodium*). .... **18**
- 16a. Erect shoots dominant, 15–30 cm tall, simple or dichotomously-branched once or twice; leaves linear-lanceolate, 5–8 mm long, dark green, margins denticulate near the acute apex; strobilus solitary, sessile. .... ***Spinulum annotinum*** (stiff clubmoss)

- 16b. Creeping stems dominant, long-trailing; erect shoots 7–40 cm tall, dichotomously-branched several times; leaves linear-subulate, 4–6 mm long, green, margins entire, apices bristle-tipped; strobili 1–6, on peduncles 3.5–12.5 cm long. .... **17**
- 17a. Leaves 4–6 mm long, apex terminating in a slender white bristle 3.5–4 mm long; strobili 2–6; the Provincial range is restricted mainly to Newfoundland, but one location is known from the Lower Churchill Valley, central Labrador. ....  
 ..... ***Lycopodium clavatum*** (running clubmoss)
- 17b. Leaves 3–5 mm long, apex terminating in a slender white bristle 1–3 mm long; strobilus solitary, or if 2, the strobili nearly sessile; the Provincial range is restricted mainly to Labrador, but 2 disjunct populations are reported from opposite sides of insular Newfoundland. .... ***Lycopodium lagopus*** (one-cone clubmoss)
- 18a. Primary upright stem prickly, with stiff spreading leaves, 3.5–4 mm long; annual constrictions absent; lateral branches round in cross-section, 5–8 mm across; the 6-ranked leaves with 2 upper, 2 lower, and 2 lateral leaves, each of equal length; Provincially common. .... ***Dendrolycopodium dendroideum*** (prickly tree-clubmoss)
- 18b. Primary upright stem not prickly, bearing appressed leaves, 3.5–4.5 mm long; annual constrictions inconspicuous; lateral branches round in cross-section, 4–7 mm across; the 6-ranked leaves with 1 upper, 1 lower, and 4 lateral leaves, each of equal length; rare in Newfoundland. ....  
 ..... ***Dendrolycopodium hickeyi*** (Hickey's tree-clubmoss)

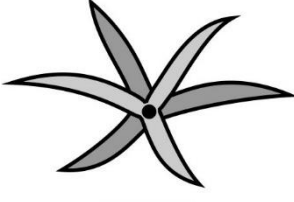

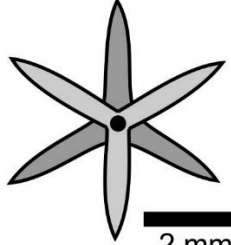

## Lycopodiaceae Comparison Chart

Genera:	<i>Dendro-lycopodium</i>	<i>Diphasiastrum</i>	<i>Huperzia</i>
	tree-clubmoss	ground-cedar	firmoss
Stems/ Shoots	horizontal stems subterranean; <b>erect stems many-branched, bushy or tree-like</b>	horizontal stems trailing; erect stems and branches usually <b>square</b> or <b>flattened</b> in x.s.	horizontal stems generally <b>absent</b> , or senescent, brown, and decumbent above ground
Leaves	linear to lanceolate, <b>6-ranked</b>	scale-like or subulate, <b>4-5-ranked</b>	narrow-triangular to oblanceolate, <b>unranked</b> , not in distinct rows
Sporangia	<b>terminal strobili with scaly sporophylls; sessile; peduncles lacking</b>	<b>terminal strobili with scaly sporophylls; sessile</b> or on scaly peduncles	<b>strobili absent, sporangia borne at base of leafy sporophylls</b> along stem
Gemmae	asexual gemmae absent	asexual gemmae absent	<b>asexual gemmae present</b>

## Lycopodiaceae Comparison Chart

Genera:	<i>Lycopodiella</i>	<i>Lycopodium</i>	<i>Spinulum</i>
	bog clubmoss	clubmoss	clubmoss
Stems/ Shoots	horizontal stems <b>flattened</b> in x.s., <b>creeping</b> ; erect shoots round in in x.s.	horizontal stems <b>trailing above ground</b> ; erect stems with few branches, usually round in x.s.	horizontal stems <b>trailing in the humus layer</b> ; erect stems with few branches, usually round in x.s.
Leaves	linear-lanceolate, <b>unranked, not in distinct rows</b>	linear subulate, <b>6-ranked; margins entire; leaf apices bristle-tipped</b>	linear to lanceolate, <b>6-ranked; margins denticulate near apex; leaf apices acute</b>
Sporangia	strobili terminal with leafy sporophylls; <b>strobili on leafy peduncles</b>	strobili terminal with scaly sporophylls; <b>strobili on scaly peduncles</b>	strobili terminal with <b>sporophylls scaly; strobili sessile</b>
Gemmae	asexual gemmae absent	asexual gemmae absent	asexual gemmae absent

## *Dendrolycopodium* (Lycopodiaceae) Comparison Chart

<i>Dendrolycopodium</i> species:	<i>D. dendroideum</i>	<i>D. hickeyi</i>
	roundleaf tree-clubmoss	Hickey's tree-clubmoss
<b>Stems</b>	horizontal stem subterranean; <b>main upright stem prickly,</b> leaves spreading	horizontal stem subterranean; <b>main upright stem not prickly,</b> <b>leaves appressed to stem</b>
<b>Branches</b>	plants bushy or 'tree-like'; <b>annual constrictions absent;</b> ultimate branches round in x.s.	plants bushy or 'tree-like'; <b>annual constrictions weak;</b> ultimate branches round in x.s.
<b>Leaves</b>	linear, with <b>2 upper, 2 lower, and 2 lateral leaves</b> (1 on either branch side)	linear, with <b>1 upper, 1 lower, and 4 lateral leaves</b> (2 on either branch side)
<b>Lateral Branch Leaf Arrangement</b>	  2 mm	  2 mm
<b>Strobili</b>	solitary, sessile, but several shoots per plant may bear strobili	

## *Diphasiastrum* (Lycopodiaceae) Comparison Charts

<b><i>Diphasiastrum</i> Chart 1</b> (of 2)			
species:	<b><i>D. digitatum</i></b>	<b><i>D. complanatum</i></b>	<b><i>D. alpinum</i></b>
	southern ground-cedar	northern ground-cedar	alpine ground-cedar
<b>Horizontal Stems</b>	on substrate surface	on substrate surface or shallowly subterranean	shallowly subterranean
<b>Erect Shoots</b>	15–50 cm tall	8–44 cm tall	6–14 cm tall, erect, clustered
<b>Sterile Branches</b>	<b>flat</b> , 2.8–3.9 mm wide, branched 2–3 times; <b>ultimate branches regularly fan-shaped</b>	<b>flat</b> , 1.8–4.0 mm wide, <b>irregular branched</b> up to 5 times, plants <b>with a straggly appearance</b>	<b>± square</b> in x.s., green, dull to faintly shiny, convex above and below, often glaucous beneath
<b>Branchlet Leaves</b>	<b>4-ranked; dimorphic;</b> 1.8–3.5 mm long, green, not glaucous; <b>lower leaves much smaller</b> than upper and lateral leaves	<b>4-ranked; dimorphic;</b> 1.2–3.2 mm long, green, not glaucous; <b>lower leaves much smaller</b> than upper and lateral leaves	<b>4-ranked; dimorphic;</b> <b>lower leaves trullate</b> (trowel-shaped) 1.3–3.3 mm long, base constricted, stalk-like
<b>Annual Constrictions</b>	<b>rare to absent</b>	abrupt & conspicuous	abrupt & conspicuous
<b>Peduncle and Strobili</b>	peduncles 4.4–12.5 cm long, <b>strobili 2–5</b> , 14–40 mm long, <b>with a sterile tip to 11 mm long</b>	peduncles 0.5–8.5 cm long, <b>strobili 1–2</b> , 8.3–32 mm long, sterile tip absent	<b>peduncles absent;</b> <b>strobilus solitary</b> , 5–30 mm long, sterile tip absent

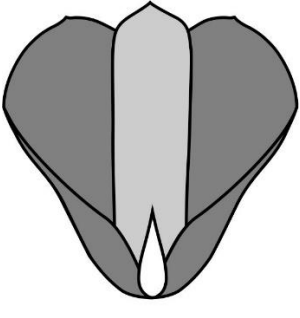
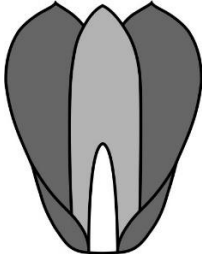
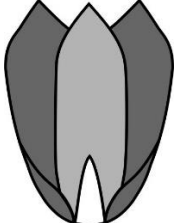


## ***Diphasiastrum* Chart 2** (of 2)

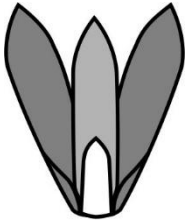

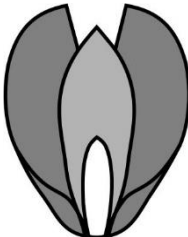



- comparing parent species and hybrid, *D. ×sabinifolium*

Species:	<b><i>D. sitchense</i></b>	<b><i>D. ×sabinifolium</i></b> <small>(<i>D. sitchense</i> × <i>D. tristachyum</i>)</small>	<b><i>D. tristachyum</i></b>
	Sitka ground-cedar	savinleaf ground-cedar	blue ground-cedar
<b>Horizontal Stems</b>	on substrate surface or shallowly subterranean	on substrate surface or shallowly subterranean	<b>deeply subterranean</b>
<b>Upright Shoots</b>	3–1.3 dm tall, erect, tufted	to 3 dm tall, erect, tufted	1.5–4 dm tall, erect, tufted
<b>Sterile Branchlets</b>	<b>round in x.s.</b> , dark green, ± shiny, 1.7–2.5 mm wide; all surfaces convex	<b>compressed to flat; green to blue-green, ± glaucous, 1.5–4 mm wide;</b> upper and lower surfaces convex	<b>flat, blue-green, glaucous,</b> 1–2.2 mm wide; upper surface convex, lower surface concave
<b>Branchlet Leaves</b>	<b>5-ranked; monomorphic;</b> all similar, leaves adnate to the branch for less than 1 mm, free portion of each blade 3.4–5.6 mm long	<b>4-ranked; lightly dimorphic;</b> upper and lower leaves slightly adnate, lateral leaves slightly larger and adnate for ± half their length	<b>4-ranked; slightly dimorphic; leaves dull, bluish-green, glaucous;</b> lower leaves slightly narrower than upper leaves, but similar in length
<b>Annual Constrictions</b>	inconspicuous	± conspicuous	<b>abrupt &amp; conspicuous</b>
<b>Peduncles and Strobili</b>	<b>peduncles absent, rarely to 1 cm tall;</b> strobilus solitary, to 3.8 cm long; strobilus base well-defined, rounded	<b>peduncles absent or 1–8 cm long;</b> strobilus solitary, 1–2+ cm long; <b>strobilus base indistinct, with scattered sporophylls on peduncle</b>	peduncles 4–15 mm long, <b>strobili usually 3–4<sup>+</sup>,</b> 1–2.8 cm long, strobilus base well-defined, rounded

## *Huperzia* (Lycopodiaceae) Comparison Charts

<b><i>Huperzia</i> (Lycopodiaceae) Chart 1</b> (of 2)			
<i>Huperzia</i> species:	<b><i>H. lucidula</i></b>	<b><i>H. selago</i></b>	<b><i>H. miyoshiana</i></b>
	shining firmoss	northern firmoss	Pacific firmoss
<b>Shoots</b>	<b>14–20 cm tall; senescent portions decumbent, trailing, to 100 cm long, brown; annual constrictions strong; juvenile growth erect</b>	<b>8–12 cm tall, decumbent only in lower half; annual constrictions weak; juvenile growth erect</b>	<b>12–18+ cm tall, decumbent portion of stems to 8 cm long; constrictions absent; juvenile growth sharply curved downward at the pointed apex</b>
<b>Leaves of Mature Shoots</b>	<b>ob lanceolate, 7–11 mm long, spreading to reflexed, dark green, lustrous; leaves margins with 1–8 teeth</b>	narrowly triangular to linear-lanceolate, <b>4–7.5 mm</b> , divergent to spreading, <b>green, lustrous</b> , margins ± entire	triangular, mainly <b>3.5–5.5 mm long</b> ; divergent to ascending, <b>light green, lustrous</b> , margins entire
<b>Gemmae</b>	<b>gemmae dark green, 4.7–4.9 mm long, in 1 pseudowhorl at end of ea. annual growth segment</b>	<b>gemmae bright green, 4.0–4.4 mm long, in 1–2 pseudowhorls at end of ea. annual growth segment</b>	<b>gemmae sea green, 3.8–4.1 mm long, in 2–3+ pseudowhorls at end of ea. annual growth segment</b>
<b>Gemmae Shape*</b>	 <p style="text-align: center;">2 mm</p>	 <p style="text-align: center;">2 mm</p>	 <p style="text-align: center;">2 mm</p>
* Diagrams of gemmae based on measurements provided in Gilman & Testo (2015).			

## *Huperzia* (Lycopodiaceae) Chart 2 (of 2)

<i>Huperzia</i> species:	<i>H. appressa</i>	<i>H. continentalis</i>	<i>H. arctica</i>
	mountain firmoss	continental firmoss	arctic firmoss
<b>Shoots</b>	<b>6–10 cm tall, decumbent portion short, to 1 cm long;</b> dichotomously branched 1–2 X; annual constrictions absent; juvenile growth erect	<b>8–11 cm tall, decumbent portion 3–8 cm long;</b> dichotomously branched 1 X; annual constrictions absent; juvenile growth erect	<b>to 10 cm tall, decumbent only in lowest 1 cm;</b> branched only at base, annual constrictions weak; juvenile growth erect
<b>Leaves of Mature Shoots</b>	narrowly-triangular, mainly <b>2–3.5 mm long</b> , ascending to appressed; <b>green, dull; arranged in vertical rows;</b> margins ± entire	ovate, <b>3–4 mm long</b> , spreading-ascending to appressed; <b>yellowish-green to yellowish-brown, lustrous;</b> margins entire	lanceolate-ovate, <b>3–5 mm long</b> , appressed, <b>yellowish-green, dull;</b> margins ± entire
<b>Gemmae</b>	<b>gemmae green, 3.0–3.4 mm long,</b> throughout mature portions of the shoot	<b>gemmae yellow, lustrous, &gt; 3 mm long,</b> throughout mature portions of the shoot	<b>gemmae yellow, lustrous, &lt; 3 mm long;</b> abundant throughout mature portions of the shoot
<b>Gemma Shape*</b>	  <b>2 mm</b>	  <b>2 mm</b>	  <b>2 mm</b>
* Diagrams of gemmae based on measurements provided in Gilman & Testo (2015).			

## ***Lycopodium and Spinulum (Lycopodiaceae) Comparison Chart***

species:	<b><i>Spinulum annotinum</i></b>	<b><i>Lycopodium clavatum</i></b>	<b><i>Lycopodium lagopus</i></b>
	bristly clubmoss	running clubmoss	one-cone clubmoss
<b>Horizontal Stems</b>	<b>usually in humus layer</b> , creeping or trailing on surface or in humus	above ground, <b>long-trailing</b> , creeping along substrate	above ground, <b>long-trailing</b> , creeping along substrate
<b>Branches</b>	annual constrictions conspicuous; upright stems simple or with 2–4 erect branches	annual constrictions conspicuous; <b>stems with 3–6 spreading branches</b>	annual constrictions conspicuous; stems with 2–3 upright branches
<b>Leaves</b>	linear-lanceolate, <b>margins denticulate near apex</b> , apices acute	linear-subulate, margins entire, <b>slender bristle tip 3.5–4 mm long</b>	linear-subulate, margins entire, <b>slender bristle tip 1–3 mm long</b>
<b>Strobili</b>	<b>solitary, sessile</b>	<b>2-6, peduncled</b>	<b>solitary, peduncled</b>