

MONILOPHYTA – Ferns and Allies

Several Fern and Fern Allies have been reported for Prince Edward Island but remain unconfirmed. Those that would key out in the Ferns and Allies key (i.e. families or significantly different genera) are included here in square brackets. *Selaginella selaginoides* (L.) P. Beauv. ex Schrank & Mart. (Selaginellaceae) and *Asplenium viride* Huds. (Aspleniaceae) are reported for PEI (Flora of North America ed. comm. 1993+) but no supporting specimens have been seen. Erskine (1960) mentions previous reports of *Cryptogramma stelleri* (S.G. Gmel.) Prantl (Pteridaceae) from cliffs along the Dunk River, however no supporting specimens are known. Authorities are provided in the checklist.

1a. Leaves scale-like or linear

2a. Plants with corms, bearing sporangia at the bases of leaves

ISOETACEAE

2b. Sporangia borne in cones (strobili)

3a. Plants roughly moss-sized (< 5 cm long)

[*Selaginella selaginoides*, SELAGINELLACEAE]

3b. Plants much larger

4a. Stems with joints and grooves; leaves reduced to thin sheath around stem

EQUISETACEAE

4b. Stems not jointed; scale-like leaves thicker, herbaceous

LYCOPODIACEAE

1b. Leaves frond-like, relatively broad and flattened

5a. Plants dimorphic: sterile fronds and fertile fronds or sterile pinnae and fertile pinnae highly-differentiated

6a. Small plants (< 50 cm tall) with sterile part of frond branching from fertile part

OPHIOGLOSSACEAE

6b. Plants mostly larger than 50 cm tall or fertile portion on separate fronds or differentiated pinnae

7a. Fertile fronds or portions densely covered with soft, cinnamon- or brown-coloured hairs

OSMUNDACEAE

7b. Fertile fronds or portions completely or mostly hairless

8a. Fertile fronds or portions evergreen

9a. Fertile fronds hard, dark green or brown

ONOCLEACEAE

9b. Fertile portions on contracted pinnae at apex of the frond

DRYOPTERIDACEAE

(*Polystichum acrostichoides*)

8b. Fertile fronds herbaceous, delicate

[*Cryptogramma stelleri*, **PTERIDACEAE**]

5b. Plants monomorphic: fertile and sterile fronds relatively similar

10a. Fronds arising singly from branching rhizomes

11a. Fronds ternately compound

12a. Small ferns, fronds to 23 cm; sori round, naked (without indusia)

CYSTOPTERIDACEAE

(*Gymnocarpium dryopteris*)

12b. Large ferns, fronds to 1.5 m; sori continuous along revolute margins of pinnae

DENNSTAEDTIACEAE

(*Pteridium aquilinum*)

11b. Fronds pinnatifid to tripinnate

13a. Fronds simple, once pinnatifid

POLYPODIACEAE

13b. Fronds at least once pinnately compound

14a. Large plants with relatively tough fronds; sori lining either side of midrib, resembling train tracks

BLECHNACEAE

14b. Smaller plants with more herbaceous fronds; sori circular

15a. Underside of frond covered in small hairs; fronds highly divided, at least bipinnate-pinnatifid

DENNSTAEDTIACEAE

(*Dennstaedtia punctilobula*)

15b. Fronds mostly glabrous; fronds less divided, at most pinnate-pinnatifid

THELYPTERIDACEAE

10b. Fronds densely clustered, if not then rhizomes mostly unbranched

16a. Small ferns growing on rock

17a. Fronds densely divided, at least pinnate-pinnatifid with many pinnules per pinna

CYSTOPTERIDACEAE

(*Cystopteris*)

17b. Fronds sparsely divided, at most bipinnate with few pinnules per pinna

18a. Fronds dimorphic: sterile fronds pinnate-pinnatifid with fan-shaped segments, fertile fronds bipinnate with narrow lanceolate segments; sori continuous along recurved margin

[*Cryptogramma stelleri*, **PTERIDACEAE**]

18b. Frond monomorphic, once pinnate; sori discrete, not on margins of pinnae

[*Asplenium viride*, **ASPLENIACEAE**]

16b. Larger ferns growing in various other habitats

19a. Indusia elongate; scales at base of rachis black, dark or light brown

ATHYRIACEAE

19b. Indusia round; scales at base of rachis golden-brown

DRYOPTERIDACEAE

LYCOPODIACEAE

- 1a. Sporangia borne in the axils of unmodified leaves; plants also reproducing vegetatively through gemmae

Huperzia

- 1b. Sporangia borne on differentiated leaves, clustered into strobili; plants not producing gemmae

- 2a. Stems mostly horizontal; aerial stems simple or with sparse ascending branches

- 3a. Leaves of strobili much reduced

Lycopodium

- 3b. Leaves of strobili similar in size to branch leaves

Lycopodiella

- 2b. Aerial stems with spreading tree-like branches or dense ascending branches

- 4a. Strobili sessile; leaves spreading to ascending from stem, greater than 3.5 mm long

Dendrolycopodium

- 4b. Strobili pedicelled or sessile; leaves appressed tightly to the stem, if spreading to ascending then less than 3.2 mm long

Diphasiastrum

Dendrolycopodium A. Haines

1a. Leaves at base of aerial stem spreading to ascending

D. dendroideum

1b. Leaves at base of aerial stem appressed to strongly ascending

2a. Lateral branches round in outline; all branch leaves of roughly the same size and orientation

D. hickeyi

2b. Lateral branches flattened in outline; spreading lateral leaves longer than the appressed abaxial leaves

D. obscurum

Diphasiastrum Holub

Diphasiastrum \times *sabinifolium* (Willd.) Holub is the fertile hybrid between *D. tristachyum* and *D. sitchense*. It combines the morphological characters of its parents and can be found in the absence of one or both. Formerly treated as a full species, *D. \times sabinifolium* had a conservation rank of S1S2 on Prince Edward Island.

- 1a. Strobili sessile; leaves fused with branches for less than 50% of their length; branches dense and ascending, inserted near ground or on inconspicuous main axis

D. sitchense

- 1b. Strobili pedicelled; leaves fused with branches for greater than 50% of their length; branches more tree-like, inserted on main axis well above ground

- 2a. Plant glaucous (with a waxy-blue bloom); branches squarish in cross section; leaves all of equal size

D. tristachyum

- 2b. Plant not glaucous, green; branches flattened in cross section; abaxial leaves greatly reduced

- 3a. Plants with conspicuous annual constrictions; strobili often with sterile, finely pointed tips

D. complanatum

- 3b. Plants with inconspicuous annual constrictions; strobili tips usually rounded to blunt

D. digitatum

Huperzia Bernh.

In addition to sexual reproduction, *Huperzia* may also reproduce asexually via gemmae. These vegetative propagules consist of a ring of six leaves arranged in a cup-like shape and are readily detached. Reports of *H. selago* (L.) Bernh. ex Schrank & Mart. on Prince Edward Island are unconfirmed, though this species is known from both New Brunswick and Nova Scotia, and its presence is possible. Reports of *Huperzia arctica* (Gross. ex Tolm.) Sipliv. also need confirmation, however the southernmost North American record is from the Hudson Bay Lowlands in Ontario and it seems unlikely to be on Prince Edward Island. This northern species has yellow gemmae that are distributed throughout the annual shoot increment. *Huperzia lucidula* (Michx.) Trevis. and *H. selago* have green gemmae found only at the tips of annual increments (Gilman and Testo 2015).

- 1a. Plants with annual constrictions; leaves widest beyond the middle, 7-12 mm long, shallowly toothed

H. lucidula

- 1b. Plants with annual constrictions inconspicuous; leaves widest below the middle, 4.0-7.5 mm long, entire or minutely toothed

[*H. selago*]

Lycopodiella Holub

Lycopodiella appressa is a species of the Atlantic Coastal Plain Flora, restricted in the Maritimes to Nova Scotia, where it is found on acidic peaty lakeshores from Yarmouth to Guysborough Counties. It has been reported for PEI, however no supporting specimens have been seen.

- 1a. Leaves 0.8-1.0 mm wide, with minute teeth; leaves of strobili appressed to ascending; strobili 3-4 mm wide

[*L. appressa*]

- 1b. Leaves 0.5-0.7 mm wide, without teeth; leaves of strobili widely spreading; strobili 2.5-5.5 mm wide

L. inundata

***Lycopodium* L.**

Stiff Clubmoss (*L. annotinum* L.) is sometimes segregated as *Spinulum annotinum* (L.) A. Haines (as in Haines 2011).

1a. Leaves without hair-like tips

L. annotinum

1b. Leaves with white-haired tips

2a. Strobili 2-5 with loose pedicels

L. clavatum

2b. Strobili mostly 1, if 2 then nearly sessile

L. lagopus

ISOETACEAE

This family contains one extant genus.

Isoetes L.

The Quillworts (*Isoetes*) are a cryptic and variable group of plants. Identification is only reliably determined through examination of the megaspores (the larger spores which will produce the female gametophyte). Microspores are also produced, which resemble a white to gray to brown powdery mass. *Isoetes echinospora* Durieu is the most common Quillwort species in both New Brunswick and Nova Scotia. Reports for Prince Edward Island are unconfirmed but possible. Erskine (1960) initially included the more southern species *Isoetes riparia* Engelm. ex A. Braun, however supporting specimens were revised to *I. lacustris* L.

1a. Megaspores 600-800 μm , covered by low mounded to distinct ridges

I. lacustris

1b. Megaspores 400-550 μm , densely covered with sharp or blunt spines.

[*I. echinospora*]

EQUISETACEAE

This family contains one extant genus.

Equisetum L.

The hybrid *Equisetum* ×*litorale* Kühlew. ex Rupr. (= *E. arvense* x *E. fluviatile*) has been reported, but no substantiating specimens have been seen. Hybrid plants resemble large green *E. arvense* shoots, but with terminal cones and a central cavity about ½ - ¾ the width of the stem (Voss & Reznicek 2012). Reports of *E. hyemale*, *E. palustre*, and *E. pratense* are also unconfirmed; however their presence is possible, and the species are included in the key below.

- 1a. Stem easily flattened, with thin walls (very large central cavity)

E. fluviatile
- 1b. Stem with stiffer walls, less easily flattened (cavity smaller); or stems whitish to brown
 - 2a. Stems green, unbranched
 - 3a. Large, stout, upright plants; sheath with two dark rings

[*E. hyemale*]
 - 3b. Relatively small, narrow-stemmed plants; sheath not as above
 - 4a. Stems small, contorted, without central cavity

E. scirpoides
 - 4b. Stems straight, with central cavity

E. variegatum
 - 2b. Stems green and branched, or whitish to brown and without branches
 - 5a. Branches regularly whorled, with even secondary branching

E. sylvaticum
 - 5b. Stems branched or not, if branched then branches simple or with irregular secondary branching
 - 6a. Stems dimorphic (white to brown stems in early spring and green stems in summer); branch sheaths with 3 teeth only
 - 7a. Sheath teeth dark, often sticking together in pairs; first branch internode longer than adjacent main stem sheath

E. arvense

7b. Sheath teeth with broad hyaline margin; first branch internode shorter than or as long as adjacent main stem sheath

[*E. pratense*]

6b. Stems monomorphic; branch sheaths with more than 3 teeth

[*E. palustre*]

OPHIOGLOSSACEAE

Members of Ophioglossaceae may produce fronds that are either entirely sterile, or with distinct sterile and fertile segments (dimorphic). The fertile segment (sporophore) is borne apically, while the sterile portion (trophophore) branches off below. In the broad sense, *Botrychium* Sw. is monophyletic, however recent opinion (e.g. Kato 1987; Hauk et al. 2003) has been to subdivide the very large genus into smaller practical units. In PEI and the Maritimes, the segregate genera are *Sceptridium* Lyon and *Botrypus* Michx.

- 1a. Trophophore simple, unlobed

Ophioglossum pusillum

- 1b. Trophophore lobed to pinnately or ternately divided

- 2a. Trophophore ternately compound

- 3a. Trophophore evergreen, on long stalks branching near or below ground

Sceptridium

- 3b. Trophophore not evergreen, sessile or nearly so and branching well above ground

Botrypus virginianus

- 2b. Small plants with less-divided fronds: trophophore less than 9 cm, and at most once pinnate

Botrychium

***Botrychium* Sw.**

Erskine (1960) lists *B. lunarioides* (Michx.) Sw. as an erroneous identification by MacSwain and Bain (1891) for *B. multifidum* (= *Sceptrifium multifidum*). *Botrychium lunaria* (L.) Sw., *B. minganense* Vict., and *B. spathulatum* W.H. Wagner – have all been reported for PEI by Wagner and Wagner (1993), but no supporting specimens have been seen.

- 1a. Trophophore broadly triangular in outline or broadest below middle, ultimate segments narrow-ovate and lobed
- 2a. Trophophore sessile, the basal pinnae elongate and sparsely lobed
B. lanceolatum ssp. *angustisegmentum*
- 2b. Trophophore short-stalked, the basal pinnae regularly lobed
B. matricariifolium
- 1b. Trophophore usually narrow in outline, ultimate segments orbicular to fan-shaped and entire or with few lobes
- 3a. Trophophore with stalk 1/2 the length of the blade or greater, frond simple or with up to 7 pairs of fan-shaped pinnae; usually terminal segment broad and rounded
B. simplex
- 3b. Trophophore with stalk 1/4 the length of the blade or less, frond pinnate; usually terminal segment small and narrow
- 4a. Pinnae overlapping or nearly so; pinnae of mid trophophore 6-18 mm wide
[B. lunaria]
- 4b. Pinnae more distant, not overlapping; pinnae of mid trophophore 1-9 mm wide
- 5a. Trophophore narrowly oblong, firm to herbaceous; pinnae nearly spheric to fan-shaped; margins shallowly crenate
[B. minganense]
- 5b. Trophophore narrowly deltate, leathery; pinnae spatulate to linear-spatulate; margins entire to very coarsely and irregularly dentate
[B. spathulatum]

Sceptridium Lyon

Erskine (1960) treated old reports of *Botrychium ternatum* (Thunb.) Sw. (= *Sceptridium rugulosum*) under *B. multifidum* (S.G. Gmel) Rupr. (= *Sceptridium multifidum*). It is unclear if he was lumping the taxa or if the earlier reports were incorrect. No confirming specimens have been seen for *S. rugulosum*.

- 1a. Ultimate apical segments much longer than the lateral segments; or plants with deeply lacerate trophophores, the sinuses cut more than halfway to the midrib

S. dissectum

- 1b. All ultimate segments roughly the same size; never lacerate as above

- 2a. Ultimate segments symmetrically tapered to a broadly obtuse to rounded apex; margins entire to very finely dentate

S. multifidum

- 2b. Ultimate segments asymmetrically wedge-tapered to the apex; margins finely dentate

[*S. rugulosum*]

OSMUNDACEAE

This family contains two genera on Prince Edward Island. Both are included in the following key to facilitate the comparison of *Osmunda claytoniana* and *Osmundastrum cinnamomeum*, which are superficially similar when entirely sterile. Traditionally placed in *Osmunda* L., molecular work by Metzgar et al. (2008) showed Cinnamon Fern (*Osmundastrum cinnamomeum*) to be sister to the remainder of the family (including two Australasian genera, *Todea* C. Presl and *Leptopteris* Willd. ex Bernh.). This supported placement in its own genus *Osmundastrum* C. Presl.

- 1a. Fronds completely bipinnate; fertile segment borne at apex of sterile frond

Osmunda regalis var. *spectabilis*

- 1b. Fronds pinnate-pinnatifid

- 2a. Pinnae quickly tapering to rounded or acute apex; sporangia borne in modified pinnae in the middle of the frond

Osmunda claytoniana

- 2b. Pinnae long-tapering to acute apex; sporangia borne in small, cinnamon-haired fertile fronds; sterile fronds with tufts of cinnamon hair at junction of pinnae and rachis

Osmundastrum cinnamomeum

POLYPODIACEAE

Polypodium L.

Our two species hybridize to produce *P. ×incognitum* Cusik. Suspected hybrids of intermediate morphology can be confirmed with the presence of aborted spores.

- 1a. Fronds usually widest at or near base; pinnae tips acute to narrowly rounded; spores usually less than 52 μm

P. appalachianum

- 1b. Fronds usually widest near middle; pinnae tips rounded to obtuse; spores usually greater than 52 μm

P. virginianum

DENNSTAEDTIACEAE

This family contains two species in two genera on Prince Edward Island:

1a. Fronds at least bipinnate-pinnatifid

Dennstaedtia punctilobula

1b. Fronds ternately compound

Pteridium aquilinum var. *latiusculum*

THELYPTERIDACEAE

Thelypteris noveboracensis (L.) Niewl. is sometimes placed in the segregate genus *Parathelypteris* (H. Itô) Ching as *P. noveboracensis* (L.) Ching.

- 1a. Fronds lanceolate to elliptic-lanceolate; rachis not winged; sori not naked, with indusia

Thelypteris

- 1b. Fronds triangular; rachis winged except between basal pinnae; sori naked (without indusia)

Phegopteris connectilis

Thelypteris Schmidel

Roland (1947) reported *T. simulata* (Davenp.) Nieuwl., however this record was dropped from later editions. Catling et al. (1985) could find no supporting specimen.

- 1a. Frond broadest around the middle, strongly tapering to each end

T. noveboracensis

- 1b. Frond broadest below the middle, not or weakly tapering to base

- 2a. Most lateral veins of pinnules branching; fronds glandless

T. palustris

- 2b. Lateral veins of pinnules not branching; fronds with sessile glands abaxially

[*T. simulata*]

ATHYRIACEAE

This family contains two genera on Prince Edward Island, each with one species. Both are included in the following key.

- 1a. Fronds highly divided, at least bipinnate with acute to rounded pinnule tips; base of rachis with dark brown to black scales

Athyrium filix-femina var. *angustum*

- 1b. Fronds less divided, once pinnate-pinnatifid with rounded pinnule tips; base of rachis with light brown scales

Deparia acrostichoides

CYSTOPTERIDACEAE

This family contains two genera on Prince Edward Island, each with one species. Both are included in the following key, along with *Cystopteris fragilis* (L.) Bernh. which has yet to be confirmed for the province.

- 1a. Fronds ternately compound; growing in a variety of habitats

Gymnocarpium dryopteris

- 1b. Fronds pinnately divided; growing on rock

- 2a. Pinnules of basal pinnae with a short stalk, usually cuneate-tapering to base; pinnule margins with rounded or crenate teeth

Cystopteris tenuis

- 2b. Pinnules of basal pinnae +/- sessile, broadly tapering to rounded at the base; pinnule margins with sharp serrate teeth

[*Cystopteris fragilis*]

DRYOPTERIDACEAE

- 1a. Pinnae stocking-shaped, with a pronounced basal lobe; indusia peltate (shield-shaped), attached centrally

Polystichum

- 1b. Pinnae not as above; indusia kidney-shaped, attached in the sinus

Dryopteris

***Dryopteris* Adans.**

Hybrids in this genus are frequent and can be identified by intermediate morphology and aborted spores. Two hybrids are confirmed for Prince Edward Island: *D. xtriploidea* Wherry (= *D. carthusiana* × *D. intermedia*), and *D. xuliginosa* (Kunze) C. Chr. (= *D. carthusiana* × *D. cristata*). A third hybrid, *D. xboottii* Underw. (= *D. cristata* × *D. intermedia*), is common in New Brunswick and Nova Scotia, and is to be expected on PEI.

1a. Fronds less divided, mostly pinnate-pinnatifid in middle

2a. Basal pinnae relatively long, with parallel sides; rachis distinctly short, less than 1/4 length of frond

D. filix-mas ssp. *brittonii*

2b. Basal pinnae relatively short, triangular tapering from base; rachis longer, usually at least 1/4 length of frond

D. cristata

1b. Fronds more divided, at least bipinnate-pinnatifid

3a. Rachis and indusia glandular; basiscopic pinnules of basal pinnae shorter than adjacent pinnules

D. intermedia

3b. Rachis and indusia glabrous; basiscopic pinnules of basal pinnae longer than adjacent pinnules

4a. Basiscopic pinnules of basal pinnae 3-5 times longer than opposing acroscopic pinnule, originating near-opposite the second acroscopic pinnule

D. campyloptera

4b. Basiscopic pinnules of basal pinnae 2-3 times longer than opposing acroscopic pinnule, originating near-opposite the first acroscopic pinnule

D. carthusiana

***Polystichum* Roth**

Hybrids between our two species (= *P. ×potteri* Barrington) are reported from New Brunswick and Nova Scotia, but not Prince Edward Island.

1a. Fronds once pinnate; fertile pinnae modified, strongly contracted

P. acrostichoides

1b. Fronds bipinnate; fertile pinnae not modified

P. braunii

ONOCLEACEAE

This family contains two genera on Prince Edward Island, each with one species. Both are included in the following key.

- 1a. Sterile fronds relatively tough, large, pinnate-pinnatifid; fertile fronds with relatively elongate pinnae

Matteuccia struthiopteris var. *pennsylvanica*

- 1b. Sterile fronds delicate, relatively small, pinnatifid; fertile fronds with small, globular pinnae

Onoclea sensibilis

BLECHNACEAE

This family contains one genus on Prince Edward Island. Formerly placed in the genus *Woodwardia* Sm., phylogenetic work determined that the Virginia Chain Fern should instead be placed in the genus *Anchistea* C. Presl (Gasper et al. 2016).

Anchistea C. Presl

Anchistea is a monotypic genus.

A. virginica