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THE FLORA OF NOVA SCOTIA

PART I

THE PTERIDOPHYTES, GYMNOSPERMS, AND  
MONOCOTYLEDONS

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ABSTRACT

Part I of "The Flora of Nova Scotia" is a revised treatment of the lower vascular plants, the Gymnosperms and the Monocotyledons. This considers a total of 514 species, 101 varieties and 85 forms. Keys are given for the families, genera and species. 57 plates of line drawings are included; and 228 dot-maps show the distribution of the various plants.

## INTRODUCTION

Extensive exploration and study of the native plants of the Province has been carried out during the more than fifteen years since the first appearance of the "Flora" of Nova Scotia. Between 40,000 and 50,000 sheets of Nova Scotian plants have been added to the herbarium of Acadia University. In addition, J. S. Erskine has spent a number of summers collecting for the N. S. Museum of Science and, while visiting many out-of-the-way areas, has added greatly to the knowledge of the distribution of our native plants. The distribution of our common plants is thus known in more detail and special attention has been paid to the more difficult groups, the aquatic plants, pondweeds, sedges and rushes. The plants of the cliffs, river valleys and plateaus of northern Cape Breton have been studied and the existence of a fairly extensive northern element confirmed. The extension of this along the Cobequids and around the head of the Bay of Fundy was examined by W. B. Schofield. Many new entities have been discovered and a wide range of herbarium collections is now available for study.

The appearance of two comprehensive treatments for the plants of north-eastern North America has resulted in up-to-date authoritative reference works and given some sort of stability to the nomenclature. The eighth edition of Gray's Manual of Botany, by M. L. Fernald, appeared in 1950; and H. A. Gleason edited the three-volume revision of the Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada which was published in 1952. The floristic study, "Plants of Prince Edward Island", by David S. Erskine gives a detailed study of the plants in an area adjacent to us and he has kindly given permission for the inclusion of his records on the maps.

The general plan of the "Flora" has not been changed, although most of the keys, maps and ranges have been revised. The order of the families, genera and species, and the abbreviations of the names of the authorities for the scientific names, follows that of the new Gray's Manual. In a few cases the interpretations of the limits of the species and varieties have differed; and the treatments have been brought into line with still more recent monographs.

The maps are based upon those of the first edition and any records added are based upon authentic published records or herbarium specimens. The herbarium records for the plants of P.E.I. have been included. New records for eastern and southern New Brunswick have also been added to give a better idea of the range of the Nova Scotian plants but no effort has been made to make these complete. The distribution of our plants is now relatively well known although the maps do not always give an indication of the relative abundance of the plants in different regions. Rarer plants are more apt to be collected than are plants that are very common.

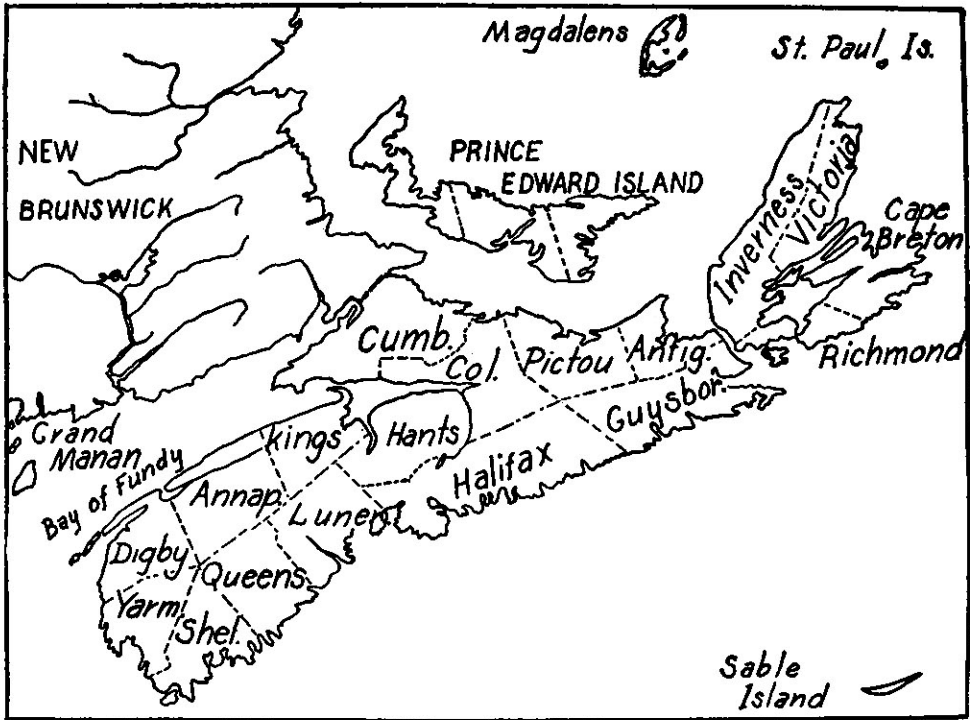
The treatment of the grasses is based upon that of Dore and Roland, published in 1942. W. G. Dore has been of special assistance over the years in identifying and commenting on the species of this most difficult group; and his permission to use this material is much appreciated. The section on *Potamogeton*, or pondweeds, was written by D. H. Webster and three new plates were drawn by him to illustrate their characteristics. The genus *Eleocharis*, the spike-rushes, is treated by W. B. Schofield. These sections have been slightly re-written to bring them within the scope and general treatment of this "Flora", so any errors or omissions must be the responsibility of the final authors. Our thanks must also be expressed to J. F. Donly for the privilege of reading in manuscript his treatise on the orchids of Nova Scotia.

Part I considers three main divisions of the vascular plants, with separate keys to the families of each one. The ferns and their allies comprise those plants reproducing by spores and belonging to the group formerly known as the Pteridophytes. The Gymnosperms are our common coniferous trees and related woody plants with needle-like leaves. The Monocotyledons comprise the grasses, sedges, rushes, many of the pond-weeds and those showy flowering plants with the leaves usually parallel-veined and the flower-parts in threes. The large group of the Dicotyledons, which comprises well over half of our flowering plants, is left for a later paper.

The number of species, varieties and forms is relatively small, although considerable variation exists in many genera and the exact number varies according to individual interpretation. Most of the introduced plants belong to the grass family, where 47 species, 6 varieties and 6 forms are not native. The following is a summary of the number of native and introduced plants, making a total of 700 different named entities, from a total flora of slightly under 2000 when the Dicotyledons are also included.

	<i>Species</i>	<i>Varieties</i>	<i>Forms</i>
Ferns and fern allies	66	15	19
Gymnosperms	12	4	5
Grasses	83	27	19
The Sedge Family	143	24	17
Rushes	27	7	5
Other monocotyledonous plants	120	18	14
	<hr/>	<hr/>	<hr/>
	451	95	79
Introduced plants	63	6	6
	<hr/>	<hr/>	<hr/>
Total	514	101	55

The keys for identifying the various groups or plants are all dichotomous: that is, each step in working through the key consists of deciding between a pair of contrasting statements about the plants concerned.



Map A.—Map of Nova Scotia showing the counties.

The two choices are designated by the same letter or, in a few cases in the longer keys, by equal indentations from the margin. When identifying a plant, determine first which of the three above groups the plant belongs to and then start at the beginning of the correct key. When one statement is chosen, the user always goes forward to the next step until finally a name is arrived at. The applicable steps of a key may often be combined to give a partial description of the plant.

Much of the field and collecting work was carried out by summer field parties in forest ecology, sponsored by the Nova Scotia Research Foundation. The herbarium of Acadia University contains the largest collection of sheets of Nova Scotian plants. Grateful acknowledgement is made to the members of these parties who explored the diverse habitats of the Province and made the many interesting discoveries and built up the collections available for study. D. S. Erskine, W. B. Schofield and D. H. Webster, in particular, have evinced a keen interest and critically studied our native plants. Thanks must also be expressed the curators of the various herbaria and to private collectors who by their help and cooperation have made possible a more complete and accurate record of our native plants and their distribution.

The bibliography is not a complete one since it lists only the more important earlier publications and the papers on Nova Scotian plants appearing since the first edition of this work was printed.

## I. PTERIDOPHYTES

### FERNS AND THEIR ALLIES

Herbaceous plants which reproduce by spores. This group comprises the ferns, club-mosses, horsetails and several related, rarer types.

- a. Stems jointed and conspicuously grooved, with a whorl of small, scale-like leaves forming a sheath at each joint (Fig. 1, 2); stems often hollow with branches in whorls. *Equisetaceae* p. 11
- a. Stems not jointed nor with conspicuous grooves, without toothed sheaths.
- b. Stem very short, corm-like, usually submersed or on exposed wet mud; leaves long, linear, in a rosette; sporangia sunken on the inner faces of the leaf-bases (Fig. 4, a, b). *Isoetaceae* p. 20
- b. Stem erect or prostrate; leaves scattered; spores not borne in the leaf-bases.
- c. Leaves small and scale-like, spreading or overlapping, numerous; sporangia in the axils of ordinary leaves on the upper part of the plant, or in the axils of reduced leaves in a terminal cone or strobilus.
- d. Plants moss-like, less than 5 cm long, rare; spores of two sizes (Fig. 3, d, e). *Selaginellaceae* p. 20
- d. Plants much larger, erect or trailing; spores of one size (Fig. 3, 4). *Lycopodiaceae* p. 15
- c. Leaves (fronds) not scale-like, growing from underground root-stocks or on short prostrate or erect stems; ferns.
- e. Sterile leaf-blade not divided, ovate or else thread-like.
- f. Plant 1-4 dm high; sterile blade ovate; fertile portion erect and spike-like, unbranched (Fig. 1, g). *Ophioglossum* p. 22
- f. Plant 4-7 cm high; sterile fronds thread-like, curly; fertile frond fern-like with a very short folded blade (Fig. 1, h). *Schizaea* p. 26
- e. Sterile leaf-blades lobed or divided.
- g. Fertile frond, or portions fertile, entirely unlike the sterile parts; sporangia not on the lower surface of green fronds.
- h. Rootstock obscure; roots fleshy; plants mostly with solitary stems up to 5 dm high and one or two toothed or divided leaves (Fig. 7, h; 1, f). *Botrychium* p. 22
- h. Rootstock conspicuous, woody; roots fibrous; plants forming beds or large clumps, 5-20 dm high.
- i. Sporangia exposed in powdery masses; veins of the smallest divisions of the frond forked (Fig. 7, c, f, g). *Osmundaceae* p. 25
- i. Sporangia enclosed in bead-like or tube-like inrolled segments of the frond; veins unforked or else net-like (Fig. 5, b, c). *Polypodiaceae* p. 26
- g. Fertile fronds more or less similar to the sterile ones; sporangia borne on the lower surface of green fronds. *Polypodiaceae* p. 26

## II. GYMNOSPERMS

### CONIFERS AND RELATED PLANTS

The Gymnosperms are plants which reproduce by seeds but which do not form flowers. The seeds are not borne enclosed in an ovary but are formed exposed either on the upper side of the scales of a cone or, in the Yew, in the bottom of a fleshy cup-shaped structure. In

Juniper the scales are fleshy and coalesce to form a sort of berry. All our native gymnosperms have the characteristic needle-like leaves and are familiarly known as "Evergreens".

- a. Seed formed in cones; erect trees with a central leader. *Pinaceae* p.40
- a. Seed formed in berry-like structures; much-branched low, usually spreading, shrubs.
  - b. Berry green, becoming bluish, of 3-6 fleshy scales, with several seeds (Fig. 9, g, h). *Juniperus* p. 45
  - b. Berry bright red, cup-shaped, with one seed in the bottom of the cup. (The sharp point to the leaves together with the long green base adherent to the twig will separate this species from prostrate young growth of other Gymnosperms (Fig. 9, a). *Taxaceae* p. 39

### III. ANGIOSPERMS

#### FLOWERING PLANTS

##### CLASS 1. MONOCOTYLEDONS

The Monocotyledons comprise about a fifth of all the flowering plants and in general are readily recognized. All our plants are herbaceous, except for the Cat-brier in southwestern N. S.; and the wood of the stem is broken up into scattered strands which do not have a cambium and therefore do not grow in thickness. Jack-in-the-pulpit is our only plant with compound leaves; and the leaves, with the exception of those of *Trillium*, and the *Araceae* are all parallel-veined. The petals and sepals tend to be in 3's, although many plants have their flowers so reduced in size and number of parts that this character is often of little use. The grasses and sedges have specialized flowers but their long parallel-veined leaves readily identify them as monocots. The seed has only one seed-leaf, or cotyledon.

- a. Plants less than 2 cm long, with flattened stems but without true leaves, floating free in or on the water (Fig. 47, d-f). *Lemnaceae* p. 189
- a. Plants much larger, differentiated into stems and leaves.
  - b. Perianth absent, or else scale - or bristle-like.
  - c. Flowers enclosed, or partly so, by scales; plants grass-like with jointed stems, sheathing leaves and 1-seeded fruits.
    - d. Stem hollow, round or flattened; leaf-sheaths usually split; anthers attached by the middle; grasses (Figs. 16). *Gramineae* p. 67
    - d. Stem solid, usually more or less triangular, with the leaves in three ranks; leaf-sheaths not split; anthers attached at the base. *Cyperaceae* p. 129
  - c. Flowers not enclosed nor closely subtended by scales, although sometimes they are in heads with scales around or below them.
  - e. Plants aquatic, submerged, floating or stranded, not normally erect.
  - f. Flowers and fruits in heads or short spikes.
    - g. Flowers unisexual, the upper heads staminate, the lower pistillate with stout style bases and forming a densely packed, round bur (Fig. 10, d). *Sparganium* p. 47
    - g. Flowers with both stamens and pistils, forming a loose cluster of fruits, or a short erect spike (Fig. 11-13). *Potamogeton* p. 51
  - f. Flowers solitary or only a few together, often inconspicuous or absent.

- h. Leaves elliptical, to 3 cm long, closely arranged along the long branching stems. *Elodea* p. 66
- h. Leaves long and linear, or else very thin and delicate.
- i. Stem very short, anchored in mud at the bottom of the water; leaves basal, long; flowers solitary, rising to the surface on a long coiled peduncle. *Vallisneria* p. 67
- i. Stem branched, with numerous leaves along its length.
- j. Leaves opposite; fruits scarcely stalked, in the axils of the leaves.
- k. Leaves 1-3 cm long; fruit solitary (Fig. 14, d). *Najas* p. 62
- k. Leaves 3-10 cm long; fruits usually 4 in each group, curved and coarsely toothed on one side (Fig. 14, b). *Zannichellia* p. 61
- j. Leaves alternate; fruit not in the leaf-axils. *Zosteraceae* p. 50
- e. Plants terrestrial or of marsh habitats, or growing erect in shallow water.
- l. Leaves petioled, the blades wide and pinnately veined (Fig. 46). *Araceae* p. 187
- l. Leaves linear or sword-shaped; blades parallel-veined.
- m. Flowers in a long spike-like raceme; ovaries 3-6, separating, at least when ripe (Fig. 15, a, b). *Juncaginaceae* p. 63
- m. Flowers in dense short spikes, or in heads.
- n. Flowers in dense short spikes, the fruiting spike solitary on the scape.
- o. Pistillate spike erect on the round scape, with the staminate one above it; fruits with downy hairs; cat-tails (Fig. 10, a). *Typhaceae* p. 46
- o. Pistillate spike lateral near the summit of the two-edged scape; fruits not hairy (Fig. 46, d). *Acorus* p. 189
- n. Flowers clustered or in round heads.
- p. Head button-like, whitish, solitary at the summit of the scape; plants of shallow water, leaves basal and tufted, roots with prominent cross-markings (Fig. 47, b). *Eriocaulaceae* p. 192
- p. Head globose, green to brownish, usually several; roots without cross-banding; leaves along the stem.
- q. Flowers dioecious, the staminate and pistillate ones in separate heads; pistils prominent, forming a round bur; fruit 1-2 seeded (Fig. 10). *Sparganium* p. 47
- q. Flowers perfect, with 3 bract-like sepals and 3 similar petals; pistil with 3 carpels and numerous seeds; rushes. *Juncus* p. 193
- b. Perianth always present, herbaceous or colored, neither scale-like nor bristle-form; plants erect, not floating in water; flowers often showy.
- r. Pistils numerous in a head or ring (Fig. 15, c-f); flowers showy, white. *Alismataceae* p. 65
- r. Pistil 1, compound, with mostly 3 cells.
- s. Ovary superior, or with the calyx only partly joined to it.
- t. Flowers very small, greenish to purple-brown.
- u. Flowers in erect racemes; ovaries becoming nearly separate in fruit (Fig. 14, c; 15, a). *Juncaginaceae* p. 63
- u. Flowers crowded in loose heads or short spikes, or in open umbel-like clusters; perianth parts rather papery. *Juncaceae* p. 193
- t. Flowers larger, white or colored.
- v. Flowers in dense heads; bluish or yellow.
- w. Flowers on a long-stalked cone-like, scaly head, yellow; leaves thick and firm, linear; (Fig. 47, c). *Xyridaceae* p. 190

- v. Flowers in a thick dense spike, 2-lipped, violet blue; leaf-blades to 10 cm wide, petioled; pickerel-weed (Fig. 47, a). *Pontederiaceae* p. 192
- u. Flowers not in dense heads.
  - w. Perianth and upper branches of the inflorescence woolly; ovary partly inferior; flowers yellow (Fig. 54, d); leaves linear. *Lophiola* p. 214
  - w. Perianth and upper branches not woolly; ovary superior. *Liliaceae* p. 203
- s. Ovary inferior, so that the fruit is formed below the sepals.
  - x. Flowers regular or nearly so; stamens 3 or 6.
  - y. Flowers loosely woolly, dingy-yellow; plants rare; stem hairy near the top (Fig. 54, e). *Lachnanthes* p. 213
  - y. Flowers not woolly; stem smooth. *Iridaceae* p. 214
  - x. Flowers very irregular; stamens 1 or 2; lowest-placed petal forming a conspicuous lip. *Orchidaceae* p. 216

## 1. EQUISETACEAE HORSETAIL FAMILY

Rush-like plants with harsh, jointed, often hollow stems, with a sheath at each joint with many short teeth. The spores are borne in short, complex terminal spikes.

### 1. EQUISETUM L. HORSETAIL

- a. Aerial stems pale-colored, with very little chlorophyll, unbranched at first or permanently so; cones present, without a sharp point.
- b. Sheaths not reddish-brown nor translucent, the teeth not cohering in three or four lobes.
  - c. Fertile stem not developing branches; teeth of the sheaths yellowish-brown with dark-brown teeth (Fig. 1, a). 1. *E. arvense*
  - c. Fertile stem soon developing whorls of 3-angled green branches; sheaths pale and with white-margined teeth (Fig. 1, d). 2. *E. pratense*
- b. Sheaths reddish-brown, translucent, the teeth long and cohering in three or four broad lobes; fertile stem with whorls of compound green branches (Fig. 1, b). 3. *E. sylvaticum*
- a. Aerial stems green or with green branches, with or without a cone.
  - d. Cones peduncled above the uppermost sheath, without a prominent tip at the top; stems annual, in many cases with regularly whorled branches.
  - e. Teeth of the sheaths cohering in 3 or 4 broad lobes, bright reddish-brown, persistent; branches numerous, compound. 3. *E. sylvaticum*
  - e. Teeth of the sheaths not cohering in lobes, not reddish-brown; branches mostly simple.
  - f. Central cavity of the main stem small, half or less the diameter of the stem, with side cavities often nearly as large; sheaths rarely with more than 10 teeth.
  - g. Sheaths of the branches with 3-4 teeth; cone-bearing stems different from the sterile ones; branches solid.
  - h. Sheaths with the teeth usually longer than wide, with long subulate tips (Fig. 1, c); fertile stems soon withering, not becoming green. 1. *E. arvense*



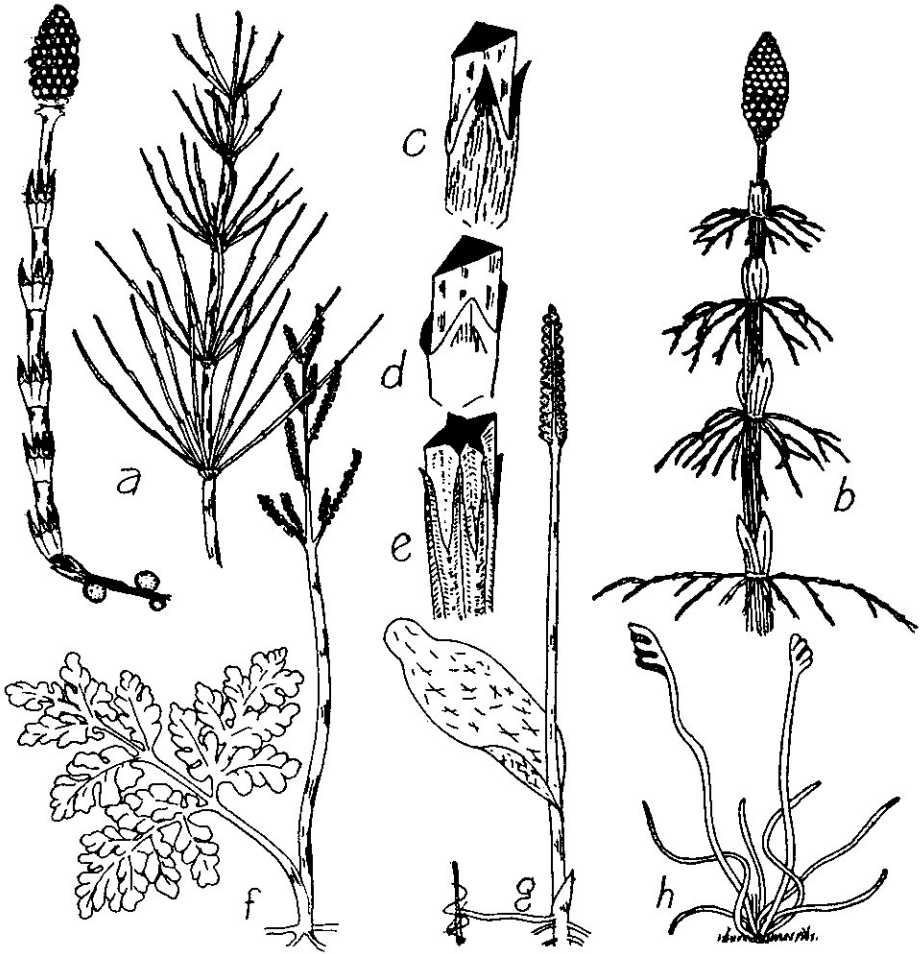


Figure 1.—*Equisetum*. a, *E. arvense*, x  $\frac{1}{2}$ . b, *E. sylvaticum*, x  $\frac{1}{2}$ . c,d,e, sheaths and teeth of *E. arvense*, *E. pratense* and *E. litorale*. *Botrychium*. f, *B. multifidum*, x  $\frac{1}{2}$ . *Ophioglossum*. g, *O. vulgatum*, x  $\frac{1}{2}$ . *Schizaea*. h, plant x  $\frac{1}{3}$ .

h. Sheaths with the teeth usually about as wide as long, not long-tipped but thin and papery (Fig. 1, d); fertile stems with branches.

2. *E. pratense*

g. Sheaths of the branches with 5 or more teeth; cone-bearing stems similar to the sterile ones, with the central cavity about half the stem diameter; branches with a small cavity (Fig. 1, e; 2, a); cones undeveloped.

4. *E. litorale*

f. Central cavity of the main stem at least four-fifths the diameter of the stem, with outside cavities very small; sheaths with 15-20 teeth (Fig. 2, a,c); cones normal.

5. *E. fluviatile*

d. Cones short-peduncled so that the base appears surrounded by a nodal sheath, with a prominent point at the tip; stems evergreen, unbranched or at least without regularly whorled branches.

i. Stem erect, unbranched, with a central cavity, more than 1 mm thick.

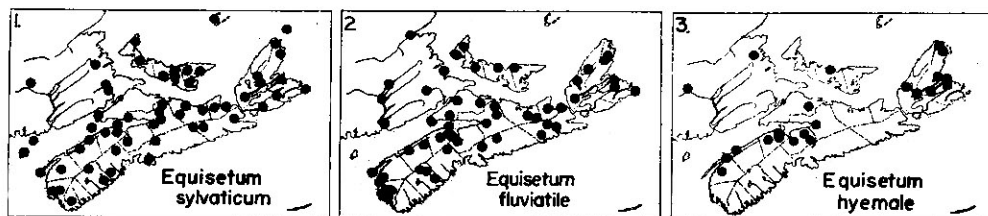
j. Stem with 15-40 low rounded ridges; teeth of sheath soon falling away; plants large and coarse, to 1 m high.

6. *E. hyemale*

- j. Stem with 1-12 deeply furrowed lines with sharp ridges; teeth with wide white borders, persistent; plants rather wiry, to 5 dm high.
- k. Stem with 4-8 angles; teeth soon losing the bristle-like tips; plants 2-3 dm high.
- k. Stem with 8-12 angles or ridges; teeth retaining the bristle-like tips; plants more robust and taller.
- i. Stem spreading and wiry, diffusely branched, at least near the base, without a central cavity, less than 1 mm thick (Fig. 2, b).

7. *E. variegatum*  
 Var. *Jesupi*

8. *E. scirpoides*



1. *E. arvense* L. Fig. 1, a, c. FIELD HORSETAIL

Common throughout; low areas, wet fields, along roadside embankments and railroads, often a bad weed in poorly-drained areas and even in heavy fertile soils. Many plants have the branches 3-angled instead of 4-angled, but this seems variable. This variety, var. *boreale* (Bongard) Rupr., may be more northern but is as yet of dubious value. The species is very variable and a large number of ecological forms have been named.

Widely distributed in the Northern Hemisphere.

2. *E. pratense* Ehrh. Fig. 1, d. MEADOW HORSETAIL

Very doubtful; earlier records seem to be in error. The differences between this and the related species are still left in the key but this plant has not been collected in Nova Scotia in recent years and the nearest record we have seen is from northern New Brunswick.

Nfld. to Alaska south to N.B., n. N.J. and B.C.

3. *E. sylvaticum* L. Fig. 1, b. Map 1. WOOD HORSETAIL

Common throughout; wet meadows, slopes, open damp woods and banks of streams. The plant of eastern N.A., with the green branches smooth and but slightly branching, is known as var. *paucirammosum* Milde. The more common form in N.S. is its forma *multirammosum* Fern. with the branches copiously branched again. Plants with the green branches rough or scabrous are also found and these show a transition to the typical species of northern N.A. and Eurasia.

Nfld. to Alaska south to Penn., Ohio and Iowa.

4. *E. litorale* Kuhlewein

Very abundant on the wet lower gravelly beach of Shubenacadie Grand Lake (Fernald, 1921); local and to be expected in similar locations

elsewhere. This plant is generally thought to be a hybrid of *E. arvense* and the following species and may show various combinations of the characters of the parents. The cones may be poorly developed and the spores sterile but the plant may propagate by vegetative means and form large colonies.

Local; N.S. to B.C. south to Penn., Minn. and Ore.

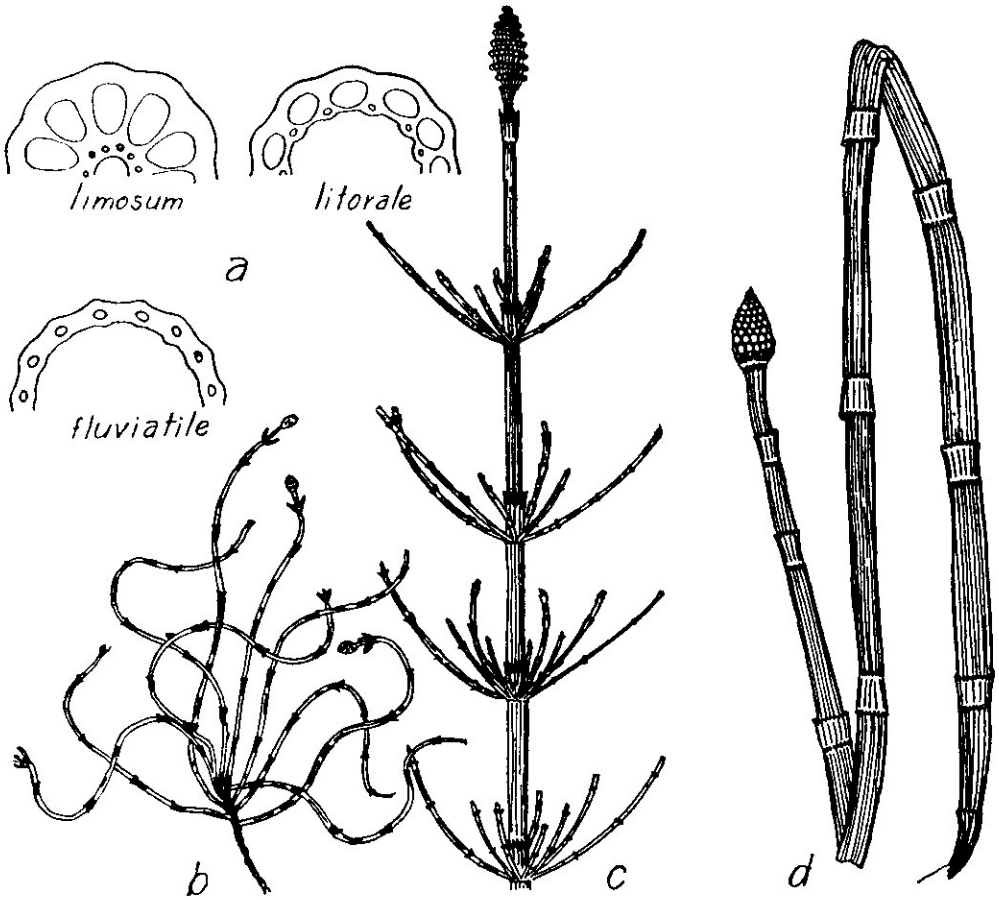


Figure 2.—*Equisetum*. a, cross-sections of the main stem. b, *E. scirpoides*,  $\times \frac{1}{2}$ . c, *E. fluviatile*,  $\times \frac{1}{2}$ . d, *E. hyemale*,  $\times \frac{1}{2}$ .

5. *E. fluviatile* L. Fig. 2, a, c. Map 2. WATER HORSETAIL

Common throughout; in ditches, along the edges and in the bottoms of shallow slow-moving streams, edges of lakes, at the heads of salt marshes and in low areas on the dyke-lands. The most conspicuous form is forma **polystachyum** (Bruckn) Broun, in which a number of cones terminate strongly-ascending branches. Various ecological forms have been named which have little value and may be found in the proper habitats. Forma **typica** has numerous branches at each node; forma **natans** (Vict.) Broun has the branches reduced to 1-2 at a node,

turned all one way as a response to growing in running water. Forma **Linnaeanum** (Doll) Broun has unbranched stems.

Nfld. to Alaska southward; Eurasia.

6. *E. hyemale* L., var. *affine* (Engelm.) A.A. Eat. Fig. 2, d. Map 3.  
SCOURING RUSH

Light sandy or gravelly banks, railroad embankments, shaded banks, and low areas in calcareous places; scattered through the northern counties; common near Truro, and occasional west to the banks of the Sissiboo R., Digby Co.; scattered to Cape Breton, very conspicuous when growing in large colonies. In most parts of its range in the Province the plant is associated with calcareous soil or marly areas.

Nfld. to Alaska south to Ala.

7. *E. variegatum* Schleich.

Collected near Cape North Village, Victoria Co. by E. C. Smith et al., July 3, 1954.

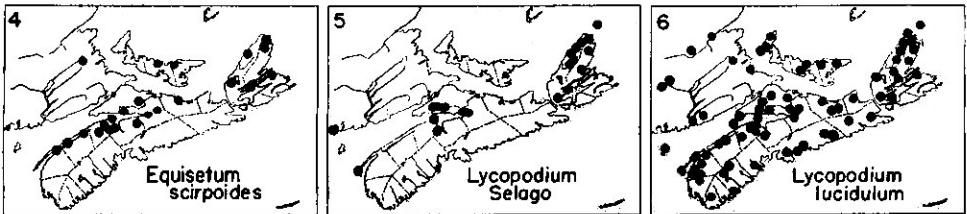
Var. **Jesupi** A. A. Eat. was collected later in August from a mucky roadside at Elmsdale and from a damp gravelly area near the bridge of the Shubenacadie River at Milford, both in Hants Co. Other collections from the Salmon River Valley above Truro probably belong here. The species seems to be the more northern, smaller extreme; although some consider the variety to be a hybrid with *A. hyemale*.

Nfld. to Penn. and Wisc.; Alaska to Colo.; Eurasia.

8. *E. scirpoides* Michx. Fig. 2, b. Map 4. DWARF SCOURING RUSH

Rich wooded banks and mossy slopes from northern C.B. to Cumberland Co., and along the North Mt. to Annapolis Co.; rather scattered and typical of alkaline areas, most often found on mossy knolls or seepy banks where the plants are inconspicuous and often partly buried in the vegetation.

Nfld. to Alaska south to Mass., Wisc. and Wash.



## 2. LYCOPODIACEAE CLUB-MOSS FAMILY

Low, erect or trailing, coarse moss-like plants which reproduce by spores borne in yellow sporangia. These sporangia in some species are borne singly in the axils of the upper leaves; or in other species

they are in the axils of reduced leaves or scales arranged to form a spike, or strobilus.

## 1. LYCOPODIUM L. CLUB-MOSS

- a. Sporangia in the axils of ordinary leaves, not in terminal spikes; plants ascending from a prostrate base or tufted.
  - b. Stems erect, in tufts; leaves all the same length, pale, ascending, attenuate and not obviously toothed; rare in rock crevices. 1. *L. Selago*
  - b. Stems erect and ascending from a prostrate base; leaves dark green, spreading to deflexed, toothed, in alternate zones of shorter and longer ones; common in rich woods (Fig. 3, g, h). 2. *L. lucidulum*
- a. Sporangia in the axils of reduced or scale-like leaves, in a terminal spike.
  - c. Leaves of the spike green, but slightly reduced; spike sessile, greenish; plant small, the prostrate base superficial on the surface of the ground (Fig. 3, f).
    - d. Plants dwarf, 3-10 cm high; spikes 1-3 cm long. 3. *L. inundatum*
    - d. Plants stout, 1-3 dm high; spikes 2-5 cm long. Var. *Bigelovii*
  - c. Leaves of the spike scale-like and yellowish, very different from the stem-leaves; spike yellow; leaves long.
  - e. Leaves in 6 or more ranks; ultimate branches not flattened or but obscurely so.
  - f. Spikes sessile, terminal on leafy branches.
    - g. Plants creeping on the surface; ascending branches similar to the prostrate stem, but little forked.
      - h. Leaves toothed, spreading to reflexed (Fig. 3, b). 4. *L. annotinum*
      - h. Leaves not toothed, rigid, rather narrow.
        - i. Leaves 5-10 mm long, firm, spreading. Var. *acrifolium*
        - i. Leaves 3-5 mm long, ascending to appressed, narrow and pointed, often incurved. Var. *pungens*
    - g. Plants from scaly underground rootstocks; upright stems much branched; bushy or tree-like in appearance.
      - j. Branches loose and spreading; leaves over 1 mm wide, the upper and lower ranks reduced so that the leafy branches appear flattened. 6. *L. obscurum*
      - j. Branches ascending, crowded; leaves less than 1 mm wide, all alike so that the branches appear terete, often appressed. Var. *dendroideum*
  - f. Spikes on long, bracted peduncles; leaves soft, linear, with long tips.
    - k. Spikes normally 2-4 on each stalk (Fig. 3, a). 5. *L. clavatum*
    - k. Spikes mostly solitary. Var. *megastachyum*
- e. Leaves in 4-5 ranks, small, scale-like, joined to the branch by half their length or more.
  - l. Leaves nearly alike, spreading with incurved tips, joined by half their length; peduncles mostly less than 10 mm long; spikes mostly solitary (Fig. 4, e). 7. *L. sabinaefolium*
  - l. Leaves of two kinds, the upper and lower rows much reduced, making the branches flattish, appressed, joined by more than half their length.
  - m. Branching regular, the main branches almost opposite upon the axis, the secondary ones arranged fan-like; constrictions not marking the ends of the year's growth; rootstock superficial (Fig. 4, f). 8. *L. flabelliforme*
  - m. Branching very irregular; constrictions present on the branches marking the end of each year's growth.

- n. Rootstocks superficial; ventral leaves reduced, free only at the points. 9. *L. complanatum*  
 n. Rootstalk very deeply buried; ventral leaves scarcely reduced; branches stiff, narrow and erect (Fig. 4, g). 10. *L. tristachyum*

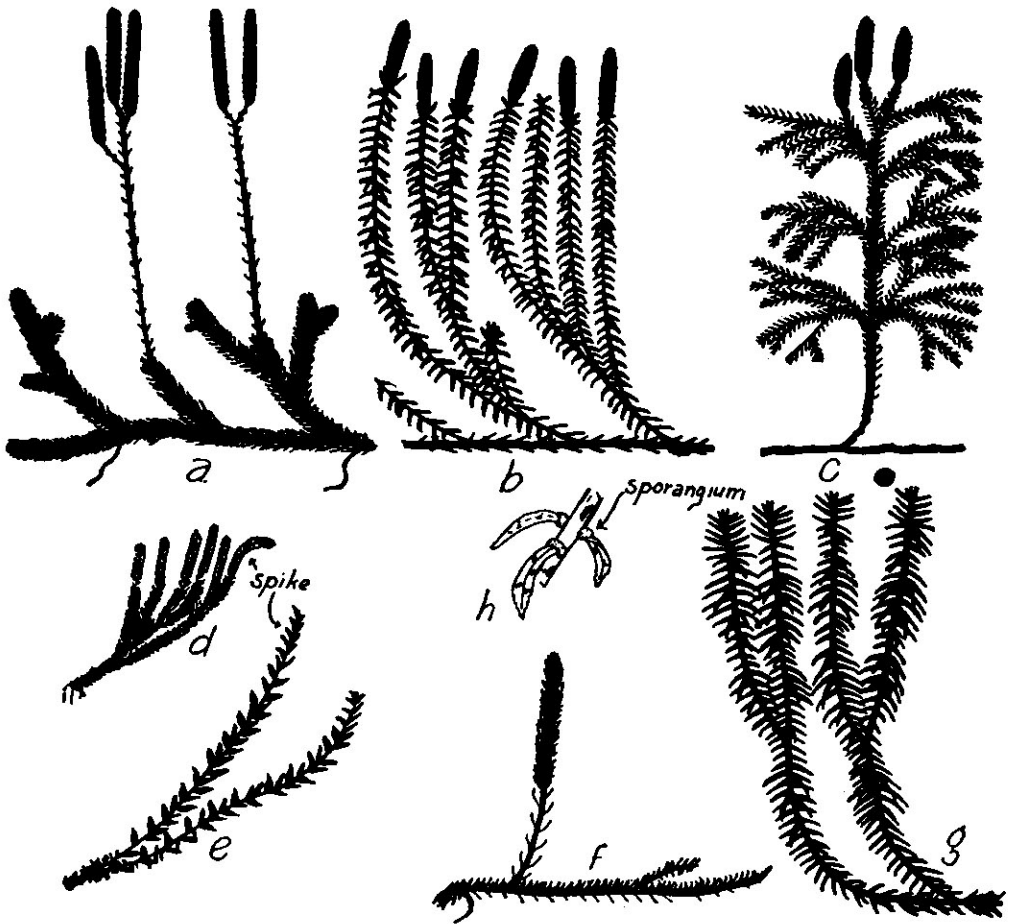


Figure 3.—*Lycopodium*. a, *L. clavatum*. b, *L. annotinum*. c, *L. obscurum*. f, *L. inundatum*. g, *L. lucidulum*. h, *L. lucidulum* leaves and sporangia. Selaginella. d, *S. rupestris*,  $\times \frac{1}{2}$ . e, *S. selaginoides*,  $\times \frac{1}{2}$ .

### 1. *L. Selago* L. Map 5. FIR CLUB-MOSS.

Scattered on stream cliffs and in moist ravines in northern C.B.; scattered in similar situations along streams on the south slope of the Cobequids from north of Truro to Parrsboro, and on Cape Blomidon (J. S. Erskine, 1953); Isle Haute, cliff-top, south side (Schofield, 1955); and on Brier Island at the tip of Digby Neck on bank of run, Seal Cove, and occasional to rare on moss hummocks bordering small runnel through bog near Seal Cove (Smith and Erskine, 1954).

Nfld. to Alaska south to Conn., Va., Wisc. and Ore.

2. *L. lucidulum* Michx. Fig. 3, g, h. Map 6. SHINING CLUB-MOSS.

Throughout; common in the northern and hardwood region from Annapolis to northern C.B.; scattered elsewhere. It is characteristic of rich hardwoods, damp hillsides in deciduous woods, and intervale forests.

Nfld. to B.C. south to S.C., Ind. and Wash.

3. *L. inundatum* L. Fig. 3, f. Map. 7. BOG CLUB-MOSS.

Common throughout in its habitat; swamps, bog-meadows, poorly-drained depressions, sandy beaches and acid areas which remain moist for considerable lengths of time; somewhat general in the wet dune hollows on Sable Island.

Nfld. to Alaska south to W. Va., Ind. and Ore.

Var. *Bigelovii* Tuckerman Map 8. This giant form is common from Digby Neck and Yarmouth around to Shelburne; scattered eastward to Grand Lake in Halifax Co.; collections from North Sydney and Louisburg are intermediate between the species and the variety. It is found on sandy and peaty beaches, boggy savannahs, and wet depressions, passing into the typical *L. inundatum* as, apparently, do also the plants in Nfld.

Fla. to Tex. north to N.H. and N.S.

4. *L. annotinum* L. Fig. 3, b. BRISTLY CLUB-MOSS

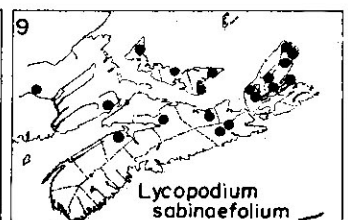
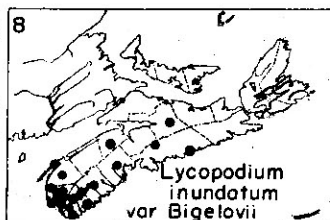
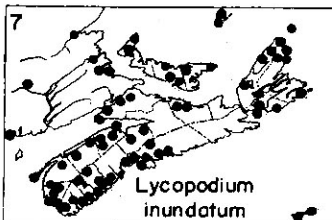
Common throughout; open dry hardwoods. Nfld. to Alaska south to Penn., Wisc. and Colo.

Var. *acrifolium* Fern. is less common than the species and occurs in drier or more acid habitats. Scattered throughout, common on dry hillsides and in drier woods such as beech woods. Nfld. to B.C. south to Va.

Var. *pungens* (LaPylaie) Desv. is more northern; characteristic of the grass-sedge heath association of northern C.B. (Nichols); headlands and other exposed locations, especially near the coast, grading into the species inland. Nfld. to Sask. south to mts. of N. Eng.

5. *L. clavatum* L. Fig. 3, a. CLUB-MOSS.

Common throughout; light soil on hillsides, pastures and in dry open bush. Cosmopolitan.



Var. **megastachyon** Fern. & Bissell is likewise common throughout in dry soils and open sandy areas. Other minor forms and varieties of little significance have been named.

6. **L. obscurum** L. Fig. 3, c. GROUND PINE

Common throughout; dry hillsides and open woods. Nfld. to Alaska south to Ala.

Var. **dendroideum** (Michx.)D.C.Eat. is frequent in dry open woods, pastures and clearings, often found in sandy areas or pine country. This appears to be more like a sun form, while the species resembles a more lax form found growing in the shade. With the same range as the species.

7. **L. sabinaefolium** Willd. Map 9. Fig. 4, e.

Characteristic of the grass-sedge association in northern C.B. (Nichols); scattered to Guysborough and Cumberland Cos. and northward through P.E.I. and N.B.; exposed places, on wet hillsides and clayey ill-drained soils with little competing vegetation.

Var. **sitchense** (Rupr.)Fern. is a smaller plant with the branches more ascending and the leaves more spirally arranged so that the branches are cylindrical. This is the northern form which grows under more unfavorable conditions and in full sunlight. Erskine notes that at Souris on P.E.I. the two forms grew side by side.

Nfld. to Alaska south to Penn. and Mich.

8. **L. flabelliforme** (Fern.)Blanchard Fig. 4, f.

Common throughout; mixed woods, pastures, sometimes on sandy soil or even in spruce woods. Forma **ambiguum** Vict., Contrib. Inst. Bot. Univ. Montreal, no. 3: 65, 1925, shows a transition to the following species in that some of the branches show constrictions marking the point between one year's growth and the next. Plants with the spikes having a few more or less normal leaves at the summit are named forma **proliferum** Vict. Both these variations are commonly seen.

Nfld. to Minn. south to Ga.

9. **L. complanatum** L.

Rare; hardwoods or on hillsides under bush or spreading out into neglected fields, rarely under conifers; scattered in the Cobequids and south along the Annapolis Valley, and east to C.B. It is rarely seen fruiting. The very open, loose branching of the plants of this species may be quite different from *L. flabelliforme*, although plants of intermediate types are seen.

Greenland to Alaska south to N. Eng., Minn. and Wash.

10. **L. tristachyum** Pursh Fig. 4, g.

Dry barrens, sandy woods and gravelly embankments; scattered throughout in light soils but common on the sandy soils of Shelburne,



Kings and Cumberland Cos. Plants intermediate between this species and *L. complanatum* were found in the Cobequids and in C.B. and may be called var. *Habereri* (House) Vict., l.c. page 51.

Nfld. to Alta. south to N.C.

### 3. SELAGINELLACEAE

#### 1. SELAGINELLA Beauv.

This genus in N.S. comprises two moss-like species each less than 5 cm high, with spores of two sizes, the larger borne in the axils of slightly-reduced leaves and visible to the naked eye.

- a. Plant prostrate or creeping, often solitary, green; leaves spreading, or the two lower ranks smaller and appressed, soft, bristly-margined, not bristle-tipped.
  - 1. *S. Selaginoides*
- a. Plant densely tufted, grayish green; leaves rigid and appressed, minutely ciliate and bristle-tipped.
  - 2. *S. rupestris*

#### 1. *S. Selaginoides* (L.) Link Fig. 3, e.

Borders of tussocks, overhanging the margin of a stream, St. Paul Is. (Perry, 1931); common in bog, center of Brier Island, Digby Co.; rare in bog at West L'Ardoise, Richmond Co. and scattered in the bogs of northern C.B. (Smith and Erskine, 1954).

Greenland to Alaska south to N.S., Mich. and s. B.C.

#### 2. *S. rupestris* (L.) Spring Fig. 3, d.

Long known from basalt ledges at the summit of Shobel's Mt., Sandy Cove, Digby Neck, where it forms extensive patches in low depressions on the bare rocks; found on rock outcrops east of Centreville, Digby Neck, by J. S. Erskine in 1955.

Dry exposed rocks and sandy sterile soil; N.S. to Man. south to Ala.

### 8. ISOETACEAE QUILLWORT FAMILY

#### 1. ISOETES QUILLWORT

Small tufted plants with a fleshy corm-like axis and grass-like leaves, growing on the bottom in shallow water or exposed on wet mucky shores; spores borne in the inner face of the enlarged bases of the leaves. *Isoetes* is general in shallow water throughout; identification depends upon a microscopic examination of the large spores.

- a. Megaspores spiny, 420-580 microns in diameter.
  - 1. *I. muricata*
- a. Megaspores with a network of ridges or projections.
  - b. Megaspores 600-1000 microns (averaging .700 mm) in diameter.
    - 2. *I. macrospora*
  - b. Megaspores 460-600 microns (averaging .550 mm) in diameter.
    - 3. *I. Tuckermani*

1. *I. muricata* Dur. Fig. 4, a, c. Map 11. QUILLWORT

Scattered, probably throughout; well-drained lakes and ponds in C.B. (Nichols); gravelly and muddy bottoms of brooks in southwestern N.S. (Fernald, 1921); scattered elsewhere. (*I. Braunii* Dur.)

Greenland to Alaska south to N.J., Ohio, Minn. and west.

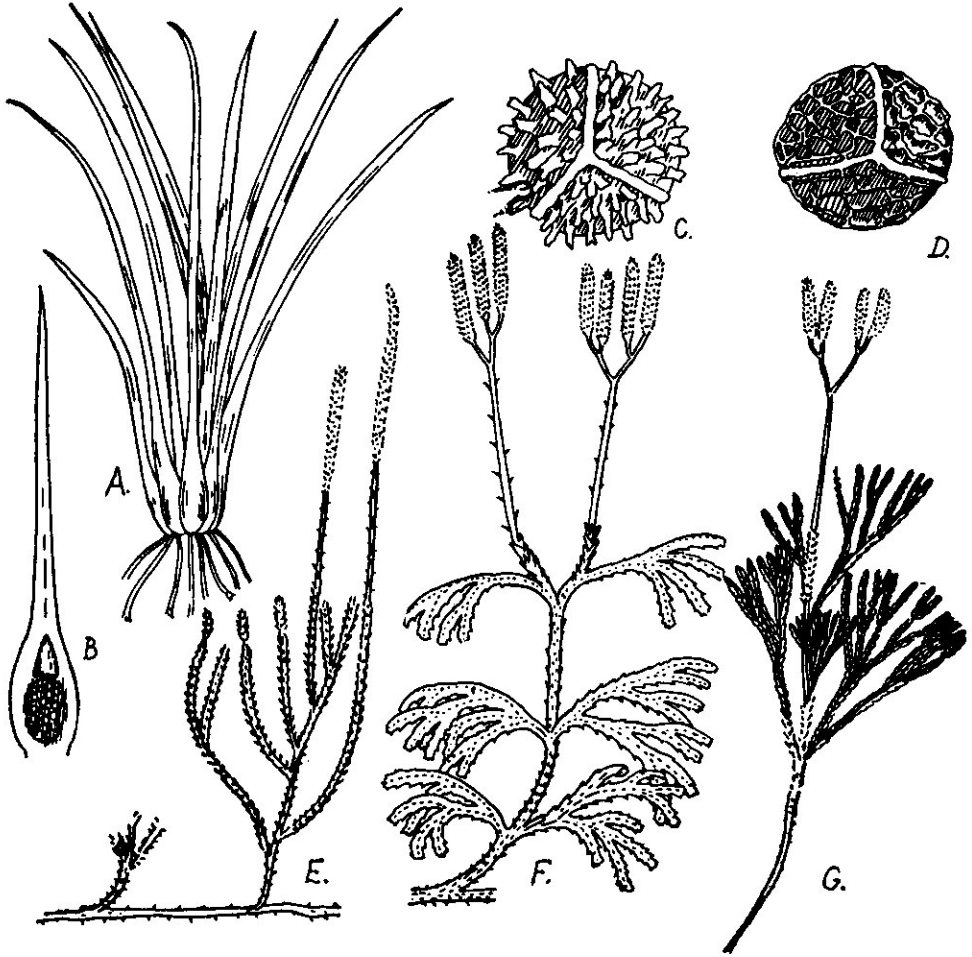
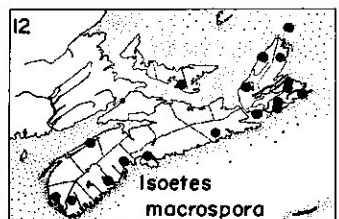
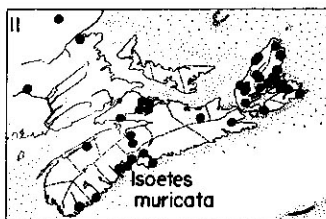
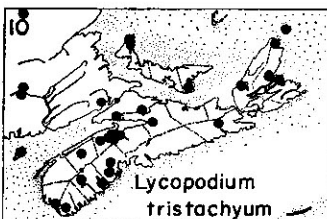


Figure 4.—*Isoetes*. a, habit sketch, x 1. b, inner view of a single sporophyll c, spore of *I. muricata*, x 40. d, spore of *I. Tuckermanni*, x 40. *Lycopodium*. e, *L. sabinaefolium*, x  $\frac{1}{2}$ . f, *L. flabelliforme*, x  $\frac{1}{4}$ . g, *L. tristachyum*, x  $\frac{1}{2}$ .



## 2. *I. macrospora* Dur. Map 12.

Abundant in Ethel Lake on St. Paul Is.; sandy soil in a lake at North Sydney and at Warren Lake at Ingonish; cobbly margins of east branch of the Tusket R. and gravelly bottom of the Clyde River; scattered elsewhere, probably throughout although no collections exist for north-central N.S.

Nfld. to Minn. south to N.Y.

## 3. *I. Tuckermanni* A. Br. Fig. 4, d.

Shallow water of brooks, quiet pools and lakes on sandy, peaty or muddy margins; scattered throughout the Atlantic region from Digby and Yarmouth Cos. to Sydney.

Lab. and Que. to N.Y.

## 5. OPHIOGLOSSACEAE ADDER'S TONGUE FAMILY

Clausen, Robert T. A monograph of the Ophioglossaceae. Mem. Torrey Bot. Club **191**: 1-77. 1938. All the ferns of this group are rare, with an expanded sterile blade and a separate fertile spike or panicle.

a. Sterile part more or less lobed or divided, often 3-parted, with forking veins; fertile part paniculate, often nearly separate from the leafy part.

1. *Botrychium*

a. Sterile portion ovate with a smooth margin and netted veins; fertile part a simple spike arising from the base of the blade.

2. *Ophioglossum*

### 1. BOTRYCHIUM Sw. GRAPE-FERN

a. Sterile blade joined to the fertile portion near the base of the plant or, if attached near the middle, then small and oblong to triangular with only a few segments.

b. Sterile blade long-stalked, large, triangular and joined to the sterile portion near the base of the plant.

c. Chief terminal divisions of the sterile part mostly ovate to oblong, not elongate, rather fleshy.

1. *B. multifidum*

c. Chief terminal divisions elongate, more than twice as long as broad, often deeply dissected.

2. *B. dissectum*

b. Sterile blade small, sessile or short stalked, attached to the middle or near the top of the plant.

d. Sterile blade oblong or ovate, usually with a short stalk, the segments obtuse.

e. Sterile blade once-divided, with three or more pairs of fan- or spoon-shaped pinnae, borne at or below the middle of the plant.

3. *B. Lunaria*

e. Sterile blade variously cut, with pinnae of different shapes; if the pinnae fan- or spoon-shaped, the plants then very small with not more than two pairs of pinnae.

f. Sterile blade simple with the sides at the base curving inward, or if once-divided with fan-shaped pinnae, or twice-divided with the pinnules smooth-margined.

4. *B. simplex*

f. Sterile blade usually larger and more divided; if undivided then with the sides at the base curving outward; if once-divided, with the pinnae ovate; if twice-divided, with the pinnules toothed.

5. *B. matricariaefolium*

- d. Sterile blade triangular, sessile with acute lobes. 6. *B. lanceolatum*  
 a. Sterile blade joined near the middle or upper part of the stalk, not stalked, thin  
 and finely divided; plant 3-5 dm high. 7. *B. virginianum*

1. *B. multifidum* (Gmel.)Rupr. Fig. 1, f. Map 13. GRAPE-FERN

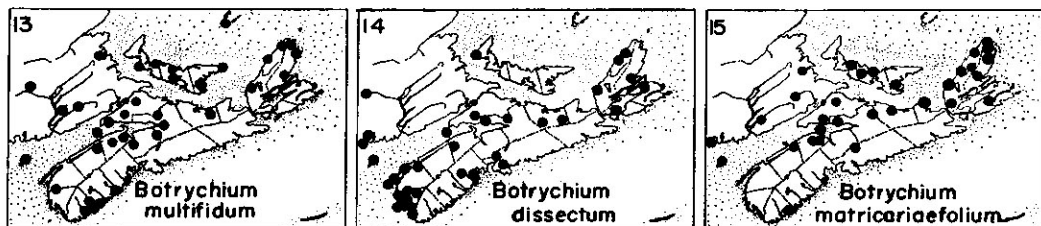
Rare in Shelburne and Yarmouth Cos., scattered from Digby Co. to northern C.B.: grassy pastures, old fields, exposed hillsides, occasionally in open woods. Luxuriant forms approach var. *intermedium* (D. C. Eat.)Farw. but the rather thick, crowded segments of the blade are more typical of the species.

Nfld. to B.C. south to N.Y. and Wisc.; Eurasia.

2. *B. dissectum* Spreng. Map 14.

Frequent to common in sandy or gravelly, either open or turfy soils of Digby, Yarmouth and Shelburne Cos.; scattered east to northern C.B. Forma *obliquum* (Muhl.)Fern. is of similar range but has the segments of the blade smooth or lobed at the base and merely finely toothed. Common with the species in the southwestern counties; and rarer east to Colchester and C.B. (Smith and Schofield, 1952). Both the species and the form occur in a wide range of habitats from dry fields to woodland.

N.S. to Minn. south to N.C. and Mo.; Eurasia.



3. *B. Lunaria* (L.)Sw. MOONWORT

The only collections of this species are those reported by Clausen from New Campbellton and by Smith from Indian Brook, both in Victoria Co. The former collection is referred by Clausen to forma *minganense* (Vict.)Clute, a slightly fleshier form with toothed pinnae and larger spores.

Nfld. to Alaska south to n. N. Eng. and south in the Rockies; Eurasia.

4. *B. simplex* E. Hitchc.

Rare and very similar to small plants of the next species; Clausen reports it as common in Me. and from Cumberland, Lunenburg and Yarmouth Cos. in N.S. with no mention of N.B. nor P.E.I. Fernald (1921) says "Rare, a small colony of extremely dwarf plants, sandy and gravelly beach of Cedar Lake", on the border of Yarmouth and Digby Cos. Very rare, wet moss, margin of waterfall, tributary of North

Aspy R. in Inverness Co., and a small colony in wet mossy shaded bank of Clyburne Brook, Victoria Co. (Smith and Schofield, 1952). Later collected in other scattered locations: West Berlin, Queens Co. by J. F. Donly; Petpeswick by D. S. Erskine; and in Victoria and Antigonish Cos.

Nfld. to B.C. south to N.J. and Calif.; Eurasia.

5. *B. matricariaefolium* A. Br. Map 15. Fig. 7, h.

Scattered from Annapolis Co. to C.B.; usually in rich alluvial soil or leaf mold in hardwoods where the plants are small and delicate. Nichols states that it is commonly encountered on bleak, exposed headlands around northern C.B. A field was noted on Beech Hill south

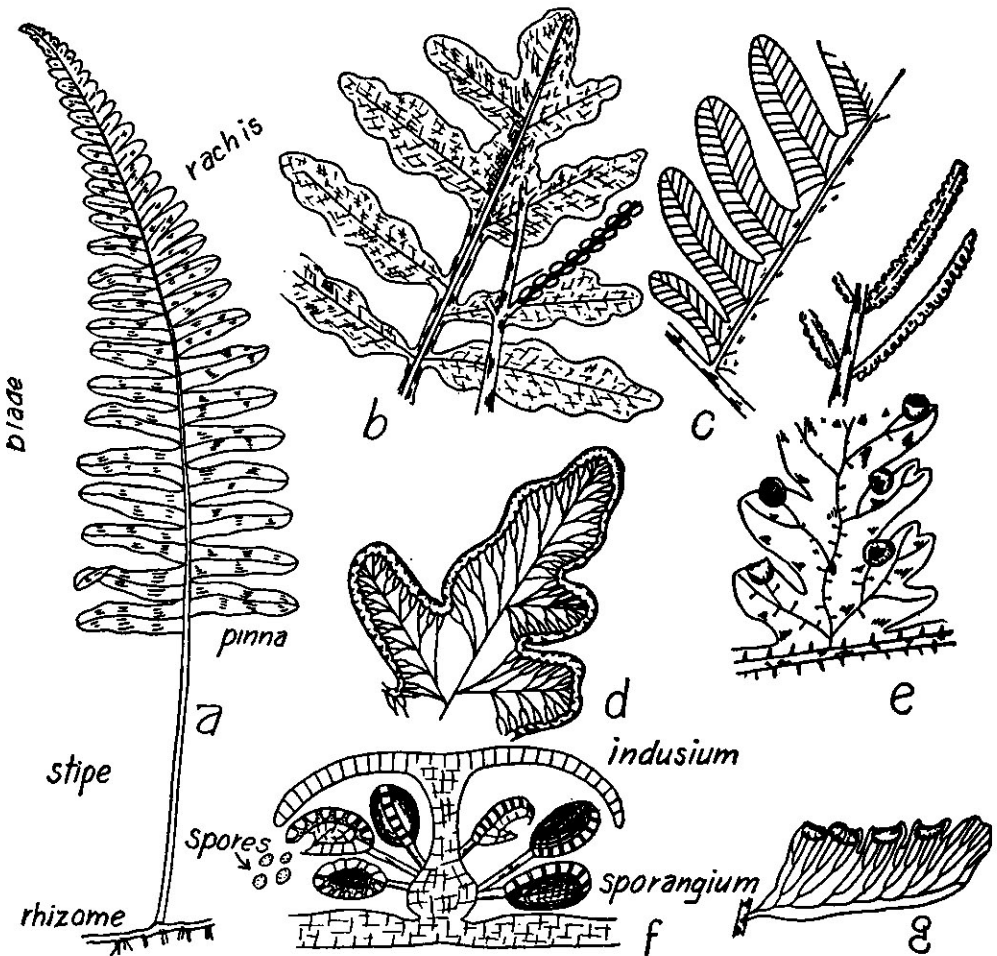


Figure 5.—*Polypodium*. a, plant  $\times \frac{1}{2}$ . *Onoclea*. b, parts of fertile and sterile fronds  $\times \frac{1}{2}$ . *Pteretis*. c, detail of pinna and part of fertile frond  $\times 3$ . *Pteridium*. d, small part of frond,  $\times 2$ . *Dennstaedtia*. e, part of pinnule showing sori,  $\times 3$ . Fern: cross-section through a sorus such as that of *Dryopteris*, highly magnified. *Adiantum*. g, pinna  $\times 1\frac{1}{2}$ .

of Kentville during the dry summer of 1942 with thousands of plants growing on it.

Nfld. to Alta. south to Md. and Ohio; northern Eurasia.

6. **B. lanceolatum** (Gmel.)Angstr. LANCE-LEAVED GRAPE-FERN.

Rare; rich wooded hillsides in Colchester and Cumberland Cos. and in northern C.B. at Indian Brook, Cheticamp River and Grand Anse. Our plants are the southern extreme, var. **angustisegmentum** Pease and Moore.

Nfld. to Wisc. south to Va. & Ohio; Alaska south; Eurasia.

7. **B. virginianum** (L.)Sw. Map 16. RATTLESNAKE FERN

Scattered from Annapolis Co. and Cumberland Co. to northern C.B.; rich hardwoods and calcareous slopes, usually occurring as individual plants.

Nfld. to B.C. south to Fla. and Calif.

## 2. OPHIOGLOSSUM L.

1. **O. vulgatum** L., var. **pseudopodium** (Blake)Farw. Fig. 1, g. Map 17.

Frequent in Yarmouth and Digby Cos.; scattered east to Halifax and Amherst; George River in C.B. Co.; damp sandy and cobbly beaches of lakes, sterile meadows or grassy swamps. It is very difficult to distinguish and is probably often overlooked.

N.S. and P.E.I. to Wash. south to Dela., Ind. & Mex.

## 6. OSMUNDACEAE

### FLOWERING-FERN FAMILY

#### 1. OSMUNDA L.

Large ferns with the fertile fronds or fertile portions of the frond much reduced and bearing naked sporangia with a structure quite different from those of the *Polypodiaceae*.

- a. Fertile frond with only a few of the pinnae modified to bear sporangia; fronds without a tuft of cinnamon wool at the base of each pinna.
- b. Modified fruiting pinnae at the top of the frond; pinnae large, with widely separated pinnules (Fig. 7, f).
  1. *O. regalis*
- b. Modified fruiting pinnae only in the middle of the frond; pinnae deeply lobed with the small divisions not separated (Fig. 7, g).
  2. *O. Claytoniana*
- a. Fertile fronds with the pinnae all modified, cinnamon-colored; fronds with a tuft of wool at the base of each pinna.
  3. *O. cinnamomea*

1. **O. regalis** L., var. **spectabilis** (Willd.) Gray ROYAL FERN. Fig. 7, f.

Common throughout; in wet places, usually along streams next to running water but often also on the shores of lakes, in marshes or in openings in wet woods.

Nfld. to Sask. south to Fla. and Tex. and into S.A.

2. **O. Claytoniana** L. Fig. 7, c, g. INTERRUPTED FERN

Throughout, not as common as the next species; moist thickets, margins of swamps and wooded poorly-drained swamps.

Nfld. to Man. south to Ga.

3. **O. cinnamomea** L. Fig. 7, g. CINNAMON FERN

Common throughout; swamps, bogs, wet pastures, low fields and roadsides everywhere; often a weed in poorly drained areas where the stout rootstocks are extremely difficult to eradicate. Forma **frondosa** (T. & G.) Britt. is not uncommon. This has the fronds intermediate between fertile and sterile ones. Other variations may occur.

Nfld. to Minn. south to the Gulf States; S.A. & Eurasia.

## 7. SCHIZAEACEAE CURLY GRASS FAMILY

### 1. SCHIZAEA Sm. CURLY GRASS FERN

1. **S. pusilla** Pursh Fig. 1, h. Map 18.

This very small elusive fern is found in sphagnous bogs, peaty borders of lakes, sphagnous hollows and in wet, undrained depressions, often abundant very near the coast as on the southern end of Brier Island, and at Comeau Hill in Yarmouth Co. Scattered to local along Digby Neck and from southern Yarmouth to Queens Co.; scattered around Halifax, as at Peggy's Cove and at Grand Lake; rare in bog by Half Island Cove, Guysborough Co.; rare in Big Bog on Scatari Island in northeastern C.B., and frequent in the bogs of the interior of the northern Cape Breton plateau (Smith and Schofield, 1952).

Nfld.; N.S.; southern N.J.; Bruce Peninsula, Ont.

## 8. POLYPODIACEAE FERN FAMILY

This family comprises the majority of the plants familiarly known as ferns. The stems may form long creeping rhizomes or may be very short and erect when the ferns grow in clumps. The leaf, known as a *frond*, consists of a *stipe* or stalk and an expanded *blade*. The blade may be once-divided into *pinnae*; and these pinnae may be further lobed or divided into *pinnules*. The mid-rib of the blade is the *rachis*. A group of minute sporangia makes up a fruiting dot or *sorus* (plural, *sori*). This may be covered by a protective membrane or structure called an *indusium*.

- a. Fronds of two distinct types; sterile ones flat and expanded with the divisions narrow, or else inrolled, tube- or berry-like, brownish when mature.
- b. Sterile fronds 1 m high or more, in clumps in rich ground, twice divided, the divisions with unforked straight veins (which easily distinguishes this genus from *Osmunda*); fertile fronds with the divisions tube-like and strongly ascending.
3. *Pteretis*
- b. Sterile fronds about 5 dm high; in beds in wet ground, once-divided, the divisions with netted veins.
- c. Fertile fronds with divisions berry-like (Fig. 5, b); sterile frond with wide, coarsely-toothed divisions with the margin without fine teeth.
4. *Onoclea*
- c. Fertile fronds with narrow lobes and linear sori; sterile frond with a very finely serrulate margin.
10. *Woodwardia*
- a. Fronds all greenish, sometimes of varying aspect but not of two distinctly different types; plants with part of the frond very reduced and fertile belong to the genus *Osmunda* or *Botrychium*.

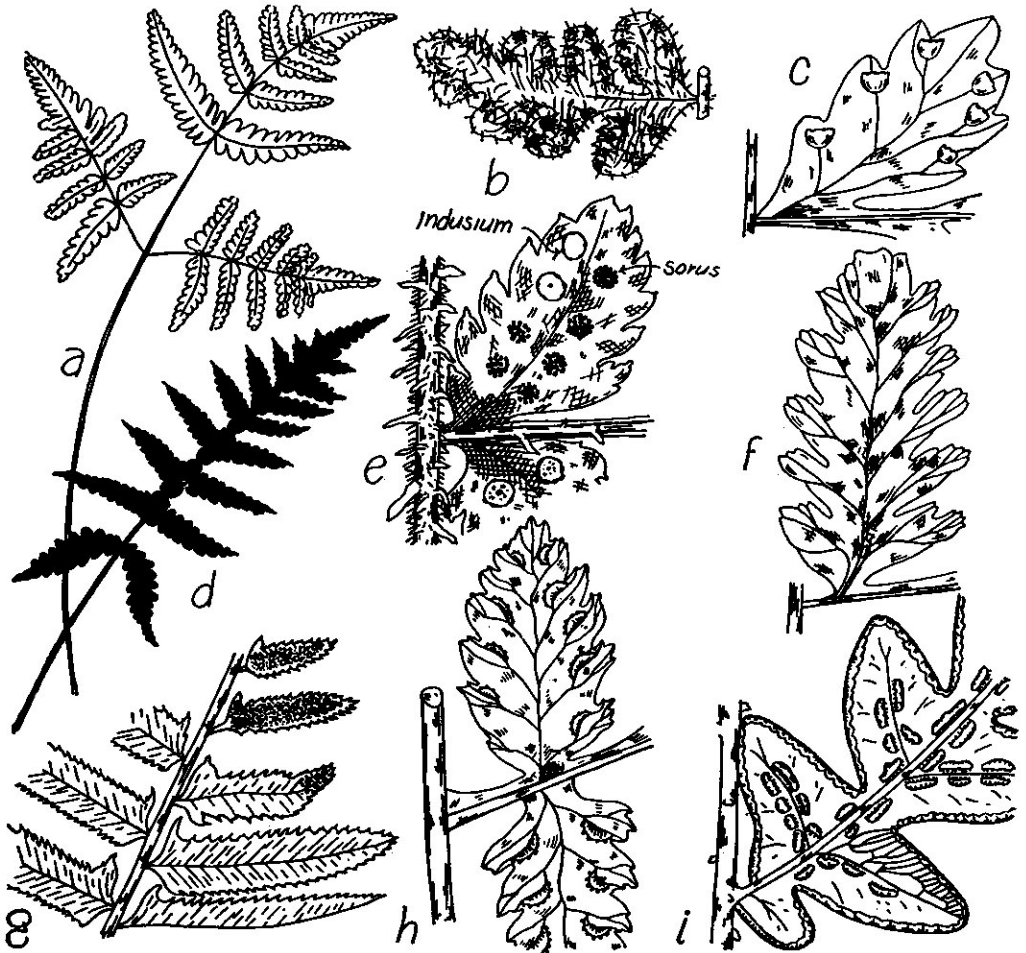
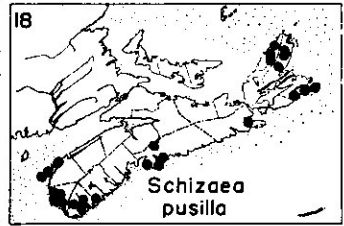
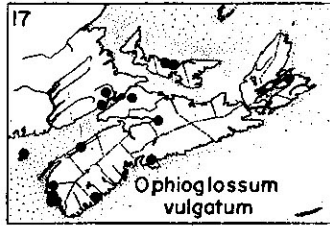
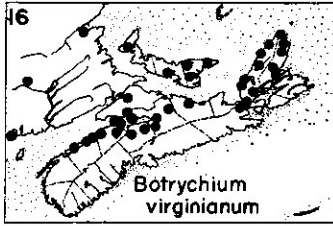


Figure 6.—*Dryopteris*. a, frond of *D. disjuncta*, x 1/3. d, *D. Phegopteris*. *Woodsia*. b, pinna of *W. ilvensis*, x 3. *Cystopteris*. c, pinnule of *C. fragilis*, x 5. f, pinnule of *C. bulbifera*, x 2. *Polystichum*. e, pinnules of *P. Braunii*, x 2½. g, part of frond of *P. acrostichoides*, x ½. *Athyrium*. h, pinnules of *A. Filix-femina*, x 3. *Woodwardia*. i, part of pinna of *W. virginica*, x 2.





- d. Fronds deeply lobed or once-divided only. Sterile fronds of *Woodwardia areolata* and *Onoclea* may be looked-for here. Both of these are very coarse and have netted veins.
- e. Pinnae not toothed, attached by a wide base and touching each other; sporangia without indusia (Fig. 5, a). 14. *Polypodium*
- e. Pinnae toothed, narrowed to the base and separated; sporangia covered with indusia when young.
- f. Plants 30-100 cm long, with elongated pinnae; indusia and sori round (Fig. 6, g). 6. *Polystichum*
- f. Plants 5-15 cm long, with rounded pinnae; indusia and sori elongated; cliffs, rare. 9. *Asplenium*
- d. Fronds twice-divided or even more finely cut.
- g. Sporangia protected by an indusium associated with or consisting of the inrolled edge of the frond.
- h. Sporangia forming a continuous line around the whole edge of the frond, covered by the inrolled edge or modified margin.
- i. Frond large and conspicuously three-parted, our common bracken; appearing singly from a long rootstock (Fig. 5, d). 13. *Pteridium*
- i. Frond delicate, not three-parted, to 15 cm high; rare on cliffs in C.B. 11. *Cryptogramma*
- h. Sporangia associated with reflexed teeth of the margin.
- j. Frond lanceolate, finely divided and glandular-hairy, without scales; sporangia in minute, green, cup-like indusia (Fig. 5, e); very common. 7. *Dennstaedtia*
- j. Frond repeatedly forking, glabrous; stipe and branches shining purplish-brown; sporangia covered by a membranous inturned lobe (Fig. 5, g). 12. *Adiantum*
- g. Sporangia naked, or else covered by an indusium not associated with the edge of the frond.
- k. Sori and indusia elongated, oblong to linear, often curved.
- l. Sori and indusia not parallel to mid-veins (Fig. 6, h); common in woods or in the open; veins not netted. 8. *Athyrium*
- l. Sori and indusia parallel to the mid-rib of the pinnae or the mid-veins of the segments (Fig. 6, i); of wet locations; veins of sterile pinnae netted. 10. *Woodwardia*
- k. Sori, and indusia when present, more or less round.
- m. Indusium absent; common woodland ferns (Fig. 6, a, d). 5. *Dryopteris*
- m. Indusium present, obscure in *Woodsia* and in older plants.
- n. Indusium round, attached by a dot at the center, or by a line from the center to the margin.
- o. Indusium attached by its center; stipe very chaffy; frond thick, evergreen (Fig. 6, e). 6. *Polystichum*
- o. Indusium attached at a notch; stipe smooth, or chaffy chiefly near the base (Fig. 7, a, b, d, e). 5. *Dryopteris*
- n. Indusium not as above.

- p. Indusium of several jagged lobes or thread-like divisions attached below the sporangia and curving over them; fronds 3-15, rarely to 30, cm long, the veins not reaching the margin (Fig. 6, b); stipe jointed near the base. 1. *Woodsia*
- p. Indusium delicate, attached at its base and arching over the sporangia; fronds delicate, with veins to the margin (Fig. 6, c, f). 2. *Cystopteris*

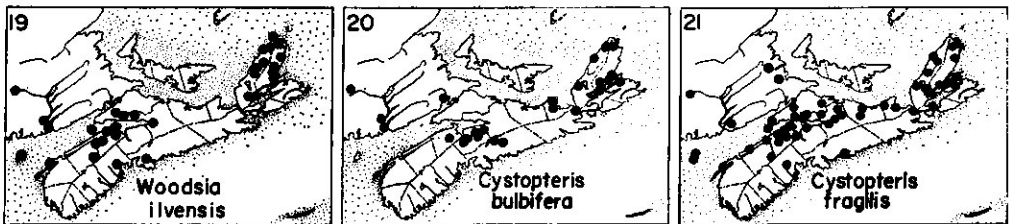
## 1. WOODSIA R. Br.

- a. Stipes and lower part of the rachises brown, often chaffy; blades 15-35 mm wide, firm; persistent leaf-bases 1-3 cm long. 1. *W. ilvensis*
- b. Stipes stout; rachis and midribs of the pinnae more or less permanently chaffy; pinnae with 4 or more pairs of pinnules. 1. *W. ilvensis*
- b. Stipes slender; rachis and midribs of the pinnae hairy but scarcely chaffy; pinnae with mostly 2-3 pairs of pinnules. 2. *W. alpina*
- a. Stipes and lower part of the rachises green to straw-colored, not scaly nor hairy above the joint; blades 8-20 mm wide, glabrous. 3. *W. glabella*

### 1. *W. ilvensis* (L.)R. Br. Map 19. Fig. 6, b. RUSTY WOODSIA

Local, often abundant where found; basaltic cliffs, slate ledges, talus slopes and rocky ravines from Digby Neck and Cumberland Co. east to Truro and Halifax; characteristic of cliff associations in northern C.B.

Nfld. to Alaska south to N.C., Iowa and Calif.



### 2. *W. alpina* (Bolton)S. F. Gray ALPINE WOODSIA

Rare and local: abundant on dry cliff, brook, North Aspy River near the Cabot Trail (Smith and Schofield, 1952); cliff crevices and ledges, Indian Brook, Victoria Co.; LeBlanc Brook, Cheticamp River and Big Southwest Brook, Inverness Co.

Arctic regions south to C.B., northern N.B., Gaspé, n. Ont. and Minn.

### 3. *W. glabella* R. Br. SMOOTH WOODSIA

Very rare; the record of Robinson, 1904, from near the summit of a hill, 1300 feet high, near Cheticamp, probably belongs here; occasional in shaded crevices of limestone cliffs, Big Southwest Brook and occasional on cliff, Grand Anse River, south branch, both in Inverness Co. (Smith and Schofield, 1952); very rare on damp north-facing cliff wall, Indian Brook and very rare in crevices of dry cliff,

Lockhart Brook, Salmon R. in Victoria Co. (Smith and Erskine, 1954); found by D. Webster on Skye Glen Mt. in Inverness Co.; and growing with *Asplenium viride* on a vertical cliff up Jeffer's Brook in Cumberland Co.

Arctic regions south to C.B., n. N.E. and n. Minn.

The record for *W. obtusa* in Macoun's list "In the gorge through which Dr. Hamilton's road winds up to the summit of the North Mountain near Canning", Kings Co. seems very doubtful. No recent collections are known and this report seems to be the only basis for the inclusion of N.S. in the range of this fern.

## 2. CYSTOPTERIS Bernh. BLADDER-FERN

- a. Frond lanceolate but not attenuate; veins of the pinnules ending mostly in a tooth or on the un-notched margin.
- b. Pinnules, at least the basal, orbicular to triangular, rounded to the base; indusium to 1 mm long, more or less cleft at the apex.
- c. Indusium without glands; fronds up to 3 dm long. 1. *C. fragilis*
- c. Indusium glandular on the back; fronds 3.8-4.8 dm long.

*C. fragilis* var. *laurentiana*

- b. Pinnules oblong to nearly lanceolate, wedge-shaped at the base; indusium about 0.5 mm long, shallowly or not at all toothed.

*C. fragilis* var. *Mackayii*

- a. Frond lanceolate, usually long-attenuate, often bearing bulblets beneath; veins of the pinnules ending mostly in a notch. 2. *C. bulbifera*

### 1. *C. fragilis* (L.) Bernh. Fig. 6, c. Map 21. COMMON BLADDER FERN

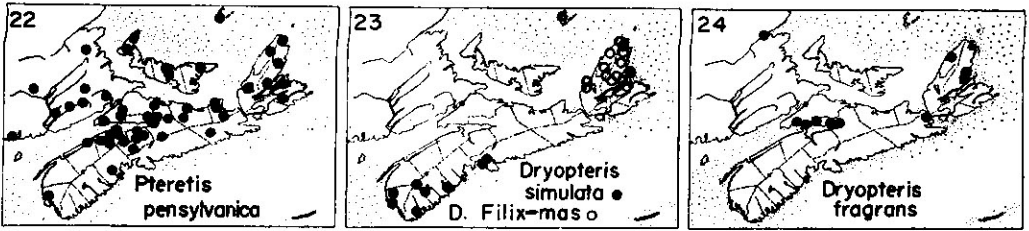
Common throughout the northern parts of the Province; shaded cliffs, rich moist woods and rocky crevices from Digby Neck and Cumberland Co. to northern C.B.; not found in southwestern N.S. and very rare in Halifax and Guysborough Cos. Intermediate forms between this and var. *Mackayii* often occur. Forma *cristata* (Lowe) Weath. has the fronds and their divisions much forked. This was reported from Whycomagh by Macoun and Burgess. Nfld. to Alaska south to N.Eng., the mts. of Va., Tex. and southern Calif.

Var. *laurentiana* Weath. grows on dolomitic ledges west of Dingwall and in moist sinkholes in plaster, South Ingonish (Weatherby, *Rhodora* 28: 128-131. 1926). Other collections are from shaded ledges, Big Southwest Brook, and on conglomerate, Skye Glen Mt. in Inverness Co. This is one of a number of plants found about the Gulf of St. Lawrence and sparingly westward to Ont. and Wisc.

Var. *Mackayii* Lawson is found on shaded ledges, damp cliffs and occasionally in rich woods; frequent but never abundant. N.S. & southern Que. to Minn. south to N.C.

### 2. *C. bulbifera* (L.) Bernh. Fig. 6, f. Map 20 BULBLET FERN

Found only in rich or calcareous areas; Moore's Falls, south of Kentville; common on the gypsum outcrops in Hants Co.; and scattered



on rich hillsides from Colchester Co. to northern C.B. It is often locally abundant on the shady gypsum areas, sometimes covering the ground or carpeting the sides of ravines.

Nfld. to Man. south to Ga. and Ariz.

### 3. PTERETIS Raf.

#### 1. *P. pensylvanica* (Willd.) Fern. Fig. 5, c. Map 22. OSTRICH FERN

Common from Annapolis to northern C.B.; rare in the southwestern counties and absent from the more acid regions; in rich soil, alluvial ground, about limestone and gypsum outcrops; characteristic of the higher parts of the flood plains in northern C.B. A very large fern growing in clumps, often forming pure stands.

Nfld. to Alaska south to Va. and Mo.

### 4. ONOCLEA L.

#### 1. *O. sensibilis* L. Fig. 5, b. SENSITIVE FERN

Common throughout; in mucky soil, around streams, pools and in ditches, wet woodlands or low open areas. Forma *obtusilobata* (Schkuhr) Gilbert, produced when the early fronds are injured, has the fronds intermediate between the sterile and the fertile ones. A coarse, unattractive fern, sensitive to frosts.

Nfld. to Man. south to Fla. and Tex.

### 5. DRYOPTERIS Adans.

A large genus with the plants here represented often distributed among three genera.

- a. Indusium absent or present; fronds thin, not evergreen; the smallest divisions of the frond obscurely toothed or with a smooth margin; veins simple or but once-forked; stipe smoothish.
- b. Blade glabrous or nearly so; lower pair of pinnae not deflexed; indusia present or absent.
- c. Fronds lanceolate in outline, the pinnae not stalked.
- d. Blade with the lower pinnae as long as the middle ones.
- e. Veins of the sterile fronds mostly forked; indusium ciliate.

#### 1. *D. Thelypteris*

- e. Veins of the sterile fronds mostly un-branched; indusium glandular margined.
  - 2. *D. simulata*
- d. Blade with the lower pinnae gradually decreasing in size to mere auricles (Fig. 7, b).
  - 3. *D. noveboracensis*
- c. Frond triangular in outline with three almost equal divisions; lower pinnae stalked (Fig. 6, a).
  - 4. *D. disjuncta*
- b. Blade finely chaffy; lower pair of pinnae deflexed; indusium absent (Fig. 6, d).
  - 5. *D. Phegopteris*
- a. Indusium always present; fronds thick, often evergreen, the divisions toothed or cut; veins twice-forked or more; stipe more or less chaffy with scales near the base.
  - f. Fronds more than 25 cm long, not resinous; plants large and common.
    - g. Fronds tri-pinnate, the segments with spinulose teeth, firm but not leathery in texture, semi-evergreen.
    - h. Upper and lower inside pinnules of the basal pinnae nearly opposite, not more than 4 mm apart.
    - i. Inner pinnule on the lower side of each basal pinna as long or longer than the one next to it; pinnae oblique to the rachis; stipe-scales light brown.
    - j. Indusium and frond glabrous.
      - 6. *D. spinulosa*
    - j. Indusium, and often the frond, glandular.
      - D. spinulosa* var. *fructuosa*
    - i. Inner pinnule shorter than the one adjacent to it; pinnae mostly at right angles to the rachis and lanceolate; stipe-scales with a dark center; indusia and fronds glandular.
      - D. spinulosa* var. *intermedia*
    - h. Upper and lower inside pinnules of the basal pinnae widely separated; blade widely-triangular; indusium glabrous, or rarely with a few marginal glands.
      - D. spinulosa* var. *americana*
    - g. Fronds bipinnate, or only partly tri-pinnate near the base, firm, mostly evergreen and leathery in texture.
      - k. Scales at the base of the stipe ovate or oblong.
        - l. Indusium glandular-pubescent; plants rare, hybrids between the last and the next species; fronds more divided and thinner than the next species.
          - 7. *D. Bootii*
        - l. Indusium glabrous; fronds leathery, firm, the fertile considerably taller and narrower than the sterile ones (Fig. 7, a).
          - 8. *D. cristata*
      - k. Scales at the base of the stipe numerous and linear.
        - m. Sori not marginal; pinnules minutely and sharply toothed towards the tip; C.B.
          - 9. *D. Filix-mas*
        - m. Sori placed near the margin of the pinnules; pinnules not sharply toothed; throughout.
          - 10. *D. marginalis*
    - f. Fronds small, to 25 cm long and 5 cm wide, glandular and resinous, with the teeth of the pinnules blunt; indusia large and membranous.
      - 11. *D. fragrans*

1. *D. Thelypteris* (L.) Gray, var. **pubescens** (Lawson) Nakai MARSH FERN.

Common throughout; along ditches, in meadows and on bog hummocks. Forma **suaveolens** (Clute) A. R. Prince is a fragrant form reported from N.H. and from near Baddeck (Fernald, 1921). Our variety is one of a wide-ranging species.

Nfld. to Man. south to Ga. and Okla.

2. *D. simulata* Davenp. Map 23. BOG FERN

Scattered in Yarmouth and Shelburne Cos., becoming rarer east to Lunenburg and Halifax Cos.; swales, wet thickets, knolls in peaty barrens and in sphagnous spruce bogs, growing in situations too shady for the marsh fern and too wet for the New York fern.

Va. north near the coast to N.S. and sporadically inland to southern Que., N.Y. and W. Va.

3. *D. noveboracensis* (L.) Gray Fig. 7, b. NEW YORK FERN

Common throughout; dry woodlands, along shady roadsides and fences, not vigorous either in open sunlight or in wet locations. Nfld. to Mich. south to Ga. and Ark.



Figure 7.—*Dryopteris*. a, *D. cristata*. b, *D. noveboracensis*. d, pinnule of *D. marginalis*,  $\times 1\frac{1}{2}$ . e, pinnule of *D. cristata*,  $\times 1\frac{1}{2}$ . *Osmunda*. c, *O. Claytoniana*. f, upper part of frond of *O. regalis*,  $\times \frac{1}{2}$ . g, detail of *O. Claytoniana* or *O. cinnamomea*,  $\times 1\frac{1}{2}$ . *Botrychium*. h, *B. matricariaefolium*,  $\times \frac{1}{2}$ .

4. *D. disjuncta* (Ledeb.)C. V. Mort. Fig. 6, a. OAK FERN

Common throughout; dry woodlands, rocky or open hardwoods. Forma *erecta* (Lawson)Roland, Proc. N.S. Inst. Sci. 20: is a taller form with the frond rigid and erect, the lower pinnae little larger than the upper one. Lawson states that this form grows around the shores of Bedford Basin, the Basin of Minas and in Ont.

Nfld. to Alaska south to Va. and N.M.

5. *D. Phegopteris* (L.)Christens. Fig. 6, d. BEECH FERN

Common throughout; rich cool woods, shaded hillsides, and especially on damp, dripping cliffs and in ravines near running water.

Nfld. to Alaska south to N.C., Mich. and Ore.

6. *D. spinulosa* (O. F. Muell.)Watt WOOD FERN

Scattered; in swamps, wet thickets and rich alluvial soil through the center of the Province; Nfld. to Alta. south to Va. and Mo.; Greenland and Eurasia.

Var. *fructuosa* (Gilbert)Trudell is found growing with the species and it probably occurs wherever the species is found. It is considered to be a variety by some; and by others a hybrid between the species and var. *intermedia*.

Var. *intermedia* (Muhl.)Underw. is common throughout; woods, rocky slopes and swamp hummocks. Nfld. to Wisc. south to Ala. and Mo. (*D. intermedia* Gray).

Var. *americana* (Fisch.)Fern. is luxuriant along the Bay of Fundy, scattered in rich woods in the southwestern counties and common along the Cobequids to northern C.B. Miss Perry (1931) states that both this and var. *intermedia* were common on St. Paul Is. and about as common was a form transitional between the two. Greenland to Alaska south to N.C., Wisc. and Wash. (*D. campyloptera* Clarkson).

7. X *D. Boottii* (Tuckerm.)Underw. BOOTT'S SHIELD FERN

This hybrid of *D. cristata* and *D. spinulosa* var. *intermedia* has the characters of the two parents in varying proportions. Frequent in the swampy woods of Yarmouth Co.; found at various places east to Shelburne and Lunenburg; scattered elsewhere. Most abundant where the ranges of the parents overlap.

8. *D. cristata* (L.)Gray Fig. 7, a, e. CRESTED WOOD FERN

Common throughout; well-drained swamps, swales, boggy ground and wet thickets, usually in shady situations but persisting for some time in open sunlight.

Nfld. to Alta. south to Va.; Eu.

9. *D. Filix-mas* (L.)Schott Map 23. MALE FERN

Known only from C.B.; rich woods and ravines in the central part of the Island, becoming commoner northwards and there characteristic

of the hardwood forest. Around Cape North and Bay St. Lawrence it is frequent in thickets and along open roadsides. Forma *incisa* (Moore)Hayek is an European form found also in Nfld. and N.S. It is characterized by the coarsely toothed pinnules tapering somewhat to a rounded or slightly pointed tip. This luxuriant form is common near Cape North.

Nfld. to Vt. and northern Mich.; B.C. to Calif.; Greenland, Iceland and northern Eu.

#### 10. *D. marginalis* (L.)Gray Fig. 7, d. MARGINAL FERN

Common through the center and eastern part of the Province; apparently in the southwestern counties; rocky woods, shady slopes, ravines and characteristic of hardwood forests of C.B. Forma *tripinnatifida* (Clute)Weath. is a luxuriant form with the pinnules deeply toothed and very narrow at the tips to acute. Found on gypsum at Antigonish Harbour and near Newport, Hants Co.

N.S. to B.C. south to Ala. and Okla.

#### 11. *D. fragrans* (L.)Schott, var. *remotiuscula* Komarov Fig. 7, e. Map 24. FRAGRANT FERN

Local; Nichols records it as characteristic of the cliff crevices along streams in northern C.B.; reported from Hartley's Waterfall on the Strait of Canso; scattered on dripping or protected cliff crevices in ravines along the rivers between Earltown and Parrsboro in Colchester and Cumberland Cos.; rare. Our variety is the more southern type; a small, very distinctive fern.

Arctic America and eastern Asia, south to N.S. and the mts. of N.Y. and Wisc.

### 6. POLYSTICHUM Roth

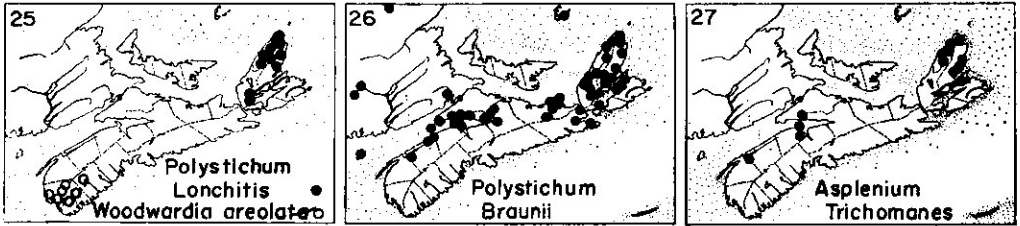
- a. Fronds once-divided; stipe and rachis chaffy only near the base.
  - b. Fruiting pinnae similar to the sterile ones; sori separated; pinnae about twice as long as wide, scythe-shaped. 1. *P. Lonchitis*
  - b. Fruiting pinnae smaller than the sterile ones; sori very crowded; pinnae lanceolate, not curved (Fig. 6, g). 3. *P. acrostichoides*
- a. Fronds twice-divided with the divisions lobed or cut; stipe and rachis very chaffy (Fig. 6, e) 2. *P. Braunii*

#### 1. *P. Lonchitis* (L.)Roth Map 25. HOLLY FERN

Known only from C.B. It was reported first by Macoun from the Aspy Bay region; from along the roadside near the top of Glencoe Mountain (Robinson, 1904); and from River Deny's Cave. It is rather common along the sides of the gypsum sinkholes in the region between Cape North Corner and Dingwall; and Nichols collected it in similar locations west of Ingonish.

Nfld. and Greenland south to N.S. and west around the Great Lakes; Alaska south to Calif.; Eurasia.





2. *P. Braunii* (Spenner)Fee, var. *Purshii* Fern. Fig. 6, e. Map 26.

Typical of rich woods, ravines and seepy hillsides from Annapolis Co. along the North Mountain to Cape Blomidon; and from Cumberland Co. east along the Cobequids to Guysborough Co. and northern C.B. It is rather rare in the western part of its range but in northern C.B. it is common and luxuriant with clumps exceeding four feet in height.

Nfld. to Wisc. south to the mts. of Penn.; Alaska and Eurasia.

3. *P. acrostichoides* (Michx.)Schott Fig. 6, g. CHRISTMAS FERN

Common throughout; in moist woods, cool ravines, thickets and on wooded banks. More luxuriant forms have the pinnae deeply toothed. This is named forma *incisum* (Gray)Gilbert. Intergrading forms are found in the same woods.

N.S. to Ont. and Wisc. south to Fla. and Tex.

## 7. DENNSTAEDTIA Bernh.

1. *D. punctilobula* (Michx.)Moore Fig. 5, e. HAY-SCENTED FERN

Dry hillsides and slopes throughout, especially around rock piles and hummocks; typical of upland pastures from Annapolis to northern C.B.; frequent also in open or dryish woods, along roadsides and rarely in swamps, often a weed in pastures and blueberry fields.

Nfld. to Minn. south to Ga. and Mo.

## 8. ATHYRIUM Roth

a. Sori and indusia straight, silvery when immature; pinnules rounded at the tip, with blunt teeth. 1. *A. thelypteroides*

a. Sori and indusia often curved, not silvery; pinnules pointed at the tip with irregular sharp teeth. 2. *A. Filix-femina*

1. *A. thelypteroides* (Michx.)Desv. SILVERY SPLEENWORT

Common in rich woods, on seepy slopes and along stream alluvium, rarely in the open; from Annapolis to northern C.B.; rare in the Atlantic counties but occasionally found wherever the proper habitat occurs.

Forma *acrostichoides* (Sw.)Gilbert is a luxuriant form characteristic of the richest locations; the pinnules have more curved sides with slightly pointed tips, and with the margins coarsely toothed. Collected in a rich run on the slope of Cape Blomidon; and plants from the Cobequids approach it.

N.S. and Gaspe to Minn. south to Ga. and Ala.; Asia.

2. *A. Filix-femina* (L.)Roth, var. *Michauxii* (Spreng.)Farw. Fig. 6, h.  
LADY FERN

A rather variable species. Our variety is considered distinct from the plants of Europe and several forms are proposed which seem to be little more than ecological variations. The typical variety seems to be the sun form with the fertile fronds more thick and leathery than the sterile ones and with the sori running together at maturity and covering the lower surface of the frond. The more luxuriant form with the longest pinnae of the fertile frond 1-2 dm long instead of 5-12 cm, and with the pinnules 12-15 mm long, somewhat pointed, strongly toothed or lobed is forma *elatus* (Link) Clute. Forma *rubellum* (Gilbert)Farw. has the fronds all alike, the fertile ones almost membranous; sori separate at maturity; and with the pinnules pointed and often strongly toothed. Best examples of this occur in shady woods and thickets. Forma *laurentianum* (Butters)Fern. has very short lower pinnae and rachises of the pinnules are winged.

The plant in general is scattered to common throughout: along roadsides, in pastures, moist thickets, swamps and open woods. Nfld. to Man. south to Va. and Colo.

## 9. ASPLENIUM L.

a. Rachis green throughout; fronds thin and delicate.

1. *A. viride*

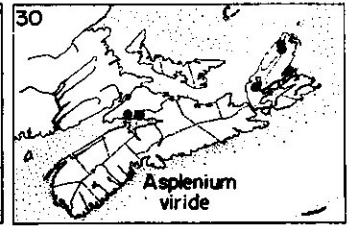
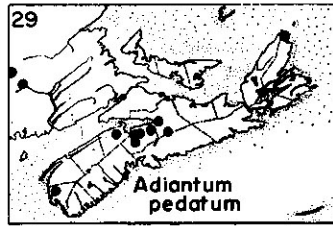
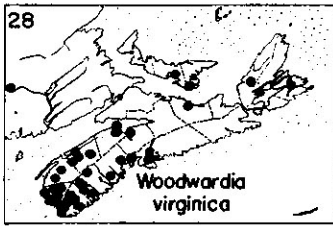
a. Rachis and stipe shining blackish-purple; fronds more wiry and stiff.

2. *A. Trichomanes*

1. *A. viride* Huds. Map 30. *GREEN SPLEENWORT*

This small, delicate green fern with roundish pinnae is one of the rarest plants of the Province. Collected by Macoun at Big Intervale, Inverness Co. in July 1898; it has since been found on shaded cliffs at several other locations in Inverness Co.: mossy cliffs below the waterfall, south branch of Grand Anse Brook, Pleasant Bay; rock outcrops on Bridgend Brook; shaded cliff face at Skye Glen, along the Grand Anse River and Big Southwest Brook. There is an old record of MacKay's from Moose River, Cumberland Co. It has not been found here again but it does grow along Jeffer's Brook in rock crevices, two miles above the road; and it was found in crevices of slate on seepy slopes in full sun along the east branch of the Five Island's River in Colchester Co.

N.S. and Nfld. to Wisc. and Colo. northwest to Alaska; Greenland and Eurasia.



## 2. *A. Trichomanes* L. Map 27. MAIDENHAIR SPLEENWORT

Rare and local; damp shaded cliffs. Specimens have been seen from Kings and a small adjacent area in Cumberland County, Guysborough, and from northern C.B., where it is sometimes abundant, as on talus slopes in the upper Margaree Valley.

N.S. to Alaska south to Ga. and Ariz.; Eurasia.

## 10. WOODWARDIA Sm. CHAIN FERN

- a. Fronds twice-divided, the fertile and the sterile ones similar. 1. *W. virginica*  
 a. Fronds once-divided only, the fertile ones much narrowed, more erect, with narrow divisions. 2. *W. areolata*

### 1. *W. virginica* (L.)Sm. Fig. 6, i. Map 28. CHAIN FERN

Scattered in swampy woods, boggy shores, swamps and cobbly lake-shores from Yarmouth Co. east to Halifax; rare north to Kings Co. and east to Cape Breton. It is abundant in sphagnum in black spruce swamp, West Lake Ainslie; and was collected by G. C. Warren at Hillside, Mira, in C.B. County. Known also from Pictou.

Fla. to Tex. north to N.S. and inland to s. Ont. and Mich.

### 2. *W. areolata* (L.)Moore Map 25. DWARF CHAIN FERN

Local in the Tusket Valley; abundant and well-developed along the upper limits of the Clyde and Roseway river systems where it is found in swamps, wet woods and at the margins of bogs; along the Shelburne River; head of Sand Lake, Queens Co. and along a river's edge near Lake Rossignol.

Fla. to Tex. north to Mass. and N.S.; rare inland to Mich.

## 11. CRYPTOGRAMMA R. Br.

### 1. *C. Stelleri* (Gmel.)Prantl SLENDER CLIFF BRAKE

Abundant on shaded limestone cliff, Hillsborough; and abundant in shaded crevices of conglomerate cliff face near Whycocomagh. These records, both for Cape Breton, are the first for the Province (Smith and Erskine, 1954).

Lab. to Alaska south to C.B., n. N.Eng. and W.Va. to Colo.

## 12. ADIANTUM L.

1. *A. pedatum* L. Fig. 5, g. Map 29. MAIDENHAIR FERN

Rare; this is one of the least collected ferns with the locations known only to local collectors. Most of the records are from the center of the Province, along the borders of rich woods, in gypsum areas or in rather alkaline soils. The northern C.B. record was from along a brook just back of St. Margaret's Village.

N.S. to Minn. south to Ga. and Okla.

## 13. PTERIDIUM Gleditsch

1. *P. aquilinum* (L.)Kuhn, var. *latiusculum* (Desv.)Underw. Fig. 5, d. BRACKEN

Common throughout; in pastures, barrens, waste land and burned-over areas; often associated with sweet fern and wire birch and characteristic of light soils. Scattered plants have the blade ovate instead of ternate, with the segments of the frond minutely hairy near the margin and beneath. This form may be the result of burning or other adverse growing conditions. A cosmopolitan species.

Nfld. to Alta. south to Ga. and Ark.

## 14. POLYPODIUM L.

1. *P. virginianum* L. Fig. 5, a. ROCK POLYPODY

Common throughout; on damp cliffs, boulders, wooded banks, preferring a rocky substratum with shallow leaf-mold. In very moist regions it is even found sometimes on the trunks of trees. Very close to the Eurasian *P. vulgare* L.

Nfld. to Alta. south to Ga. and Ark.

## 9. TAXACEAE YEW FAMILY

We have but one native species. This resembles semi-prostrate fir branches but the needles are sharp and have a green base adherent to the twig. The fruit is a bright red berry. Both the seeds and the wilting twigs are deadly poisonous.

## 1. TAXUS L. YEW

1. *T. canadensis* Marsh. Fig. 9, a, f. GROUND HEMLOCK, YEW

Rather common throughout; cool damp woods, ravines, coniferous climax forests and wooded swamps; occasionally it forms a dense ground cover which excludes other plants.

Nfld. to Man. south to Va. and Iowa.

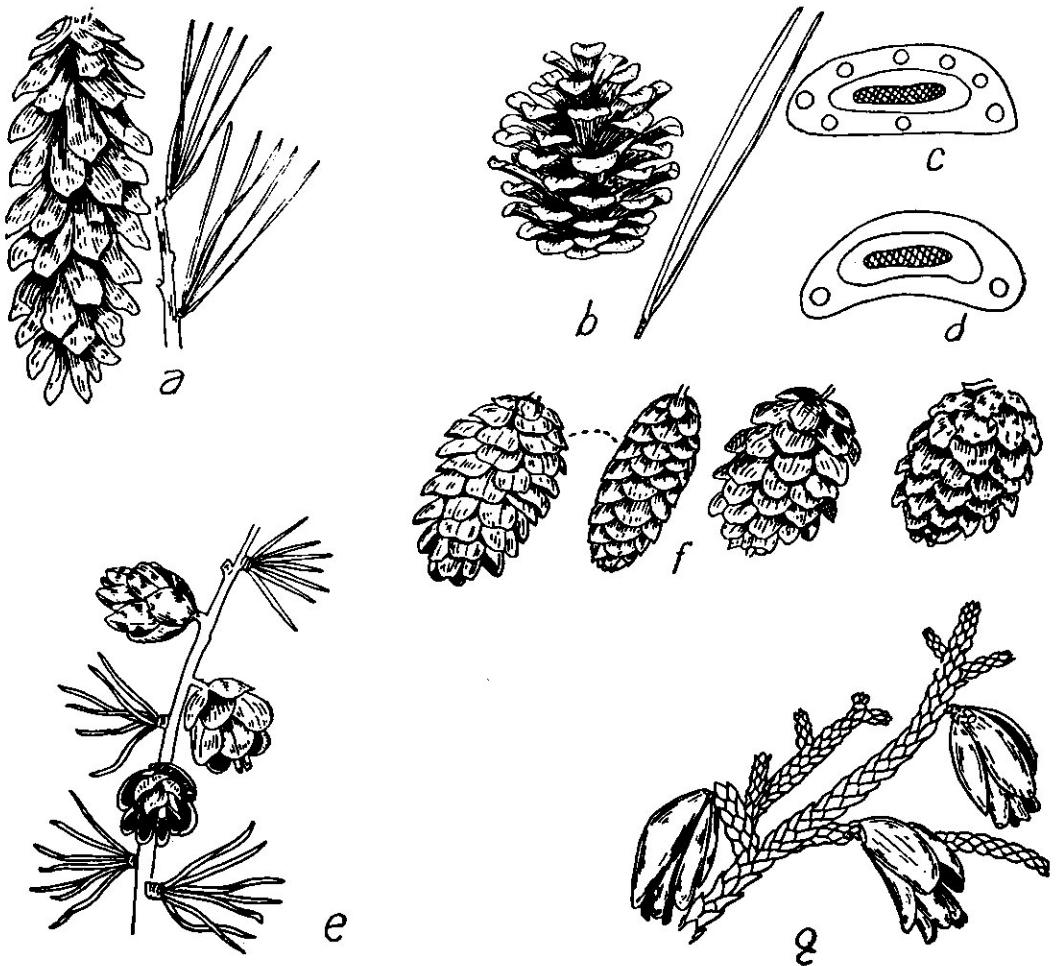


Fig. 8.—*Pinus*. a, *P. strobus*, cone and leaves,  $\times \frac{1}{2}$ . b, *P. resinosa*, cone and leaves,  $\times \frac{1}{2}$ . c *P. sylvestris*, cross-section of leaf. d. *P. Banksiana*, cross-section of leaf. *Larix*. e, *L. laricina*,  $\times \frac{1}{2}$ . *Picea*. f, cones of *P. glauca*, *P. rubens*, and *P. mariana*. *Thuja*. g, twig,  $\times \frac{1}{2}$ .

## 10. PINACEAE PINE FAMILY

Trees and shrubs; all our conifers belong here. Juniper is a low or prostrate shrub with green to blue berry-like structures instead of typical cones.

- a. Leaves short, linear or scale-like, solitary.
- b. Leaves all linear; seeds in a woody cone.
- c. Leaves flattish in cross-section, whitened along the lower side, in two ranks so that the twigs appear flattened, rounded on the ends.
- d. Cone 5-10 cm long, erect, the scales readily falling away from the axis; leaves 1-3.2 cm long, leaving a smooth circular scar upon the twig (Fig. 9, b, d).

1. *Abies*

- d. Cone 1.5-2.5 cm long, hanging, the scales not falling away from the axis; leaves 8-13 mm long, attached to the twigs by hard, raised woody bases, leaving raised scars (Fig. 9, c, e). 2. *Tsuga*
- c. Leaves squarish in cross-section, not in two ranks. (Spruce). 3. *Picea*
- b. Leaves shorter, overlapping and often scale-like, if long then with sharp tips; seeds in an ellipsoid cone of 8-12 scales or in a bluish, berry-like structure.
  - e. Seeds in a cone; leaves scale-like, blunt, more or less 2-ranked (Fig. 8, g); trees; cedar. 6. *Thuja*
  - e. Seeds in the axils of 3-6 fleshy scales which coalesce to form a round, bluish, berry-like structure; leaves not two-ranked (Fig. 9, g, h); low shrubs. 7. *Juniperus*
- a. Leaves linear, in bundles of 2 or 5; evergreen.
  - f. Leaves in 2's or 5's; evergreen; pine. 5. *Pinus*
  - f. Leaves on short spurs, many in each cluster, or scattered along the more rapidly-growing terminal growth, deciduous; larch. 4. *Larix*

## 1. ABIES Mill. FIR

### 1. *A. balsamea* (L.) Mill. Fig. 9, b, d. BALSAM FIR

This is one of the commonest trees of the Province, gradually replacing many of the more valuable hardwoods and evergreens. The interior of the plateau of C.B. is largely covered with fir; elsewhere fir frequently comes in whenever deciduous woods are opened up; and it often establishes itself in open bush before spruce and other conifers.

Nfld. to the Yukon south around the Great Lakes and in the mts. to Va.

Var. *phanerolepis* Fern. is similar to the species but with the cones shorter and the mature scales sub-orbicular or reniform, with a conspicuous exerted awn which gives a peculiar whitish appearance to the cones. Scattered along the Atlantic Coast; growing with the typical form at Argyle, Yarmouth Co.; rather common at Musquodoboit Harbour and Jeddore (Rousseau); and the commonest form on St. Paul Is. (Perry); common elsewhere in eastern C.B.; pastures, Rockland, Kings Co.; and on Isle Haute in the Bay of Fundy; rare or absent in northern central N.S.

Nfld. to Ont. south to the coast of Maine and the mts. of N.H.

## 2. TSUGA (Endl.) Carr. HEMLOCK

### 1. *T. canadensis* (L.) Carr. Fig. 9, c, e. HEMLOCK

Hemlock is rather local throughout, sometimes being the predominant tree but often scattered. It prefers northern slopes, ravines, or sandy soil with subsurface water. Annapolis has been called the hemlock county; but the tree is most common in southwestern N.S. and gradually gives way to spruce and fir eastward, being rarest in eastern and southern C.B.

N.S. to Minn. south along the mts. to Ga.

3. *PICEA* Dietr. SPRUCE

- a. Native and common; cones 2-5 cm long; branches usually spreading.
- b. Twigs smooth; cones cylindrical, 2-5 cm long, with 60-90 scales which are flexible and smooth-edged; leaves blue-green, sharp (Fig. 8, f). 1. *P. glauca*
- b. Twigs finely hairy; cones ovoid to roundish, with about 30 scales which are often wavy- or ragged-edged; leaves blunter, rigid at maturity (Fig. 8, f).
- c. Leaves yellowish-green, rather long and blunt, not shiny; cones mostly falling the first autumn and confined to the top of the tree; scales of the cones smooth-to wavy-edged; branches often drooping; bark reddish-tinged. 2. *P. rubens*
- c. Leaves grayish or bluish-green; cones persisting 2-5 years on the branches; scales of the cones ragged-edged; branches stiff; bark usually dark. 3. *P. mariana*
- a. Introduced, occasionally planted or escaped; cones 10-15 cm long; branches drooping; leaves sharp-pointed, 12-25 mm long. 4. *P. Abies*

1. *P. glauca* (Moench)Voss WHITE, PASTURE or CAT SPRUCE

This tree was probably not common in the original forest except near the coast and in northern Cape Breton. It is now commonly found throughout, often forming pure stands on abandoned farm lands. (*P. canadensis* (Mill.) BSP).

Forma *parva* (Vict.)Fern. & Weatherby, *Rhodora* 34: 187. 1932, is a prostrate form found in exposed places, upon head-lands, sand beaches and bogs in the northern or exposed locations in the Province.

Nfld. and Lab. to Alaska south to Mass., Wisc. and Mont.

2. *P. rubens* Sarg. RED SPRUCE

Most common on the mainland, rarer in northern C.B.; frequently occurring with *P. glauca* and fir as a pioneer tree species on abandoned farms and burnt-over land; throughout in good soils and in well- to medium-drained situations.

N.S. to Que. south to N. Eng. and in the mts. to N.C.

3. *P. mariana* (Mill.)BSP. BLACK or BOG SPRUCE

Common throughout in swamps, bogs and poorly-drained areas, rarely found in dense forests or on the uplands, except on the C.B. plateau where it is common. In many places it is difficult, or impossible, to distinguish this from the previous species and it is possible that crossing takes place between the two. The prostrate form found on the exposed bogs and sterile headlands is forma *semiprostrata* (Peck)Blake, *Rhodora* 15: 200. 1913. This is common along the Atlantic Coast from Halifax eastward.

Nfld. to N.J. west along the Great Lakes and northward.

4. *P. Abies* (L.)Karst. NORWAY SPRUCE

Occasionally planted as an ornamental or for windbreaks. Its very large cones are quite distinctive.

Intro. from Eu. into many parts of N.A.



Fig. 9.—*Taxus*. a, *T. canadensis*, x  $\frac{1}{2}$ . *Abies*. b, twig, x  $\frac{1}{2}$ . *Tsuga*. c, twig, x  $\frac{1}{2}$ . d, *Abies*. e, *Tsuga*. f, *Taxus*. *Juniperus*. g, *J. communis*, twig, x  $\frac{1}{2}$ . h, *J. horizontalis*, twig, x 2.

#### 4. LARIX Mill. LARCH

- a. Leaves 10-25 mm long; cones 12-16 mm long, with scales smooth; branchlets stiff; native. 1. *L. laricina*  
 a. Leaves 20-40 mm long; cones 20-40 mm long, with scales finely hairy; branchlets slender and pendulous. 2. *L. decidua*

1. *L. laricina* (DuRoi)K. Koch TAMARACK, LARCH, HACKMATAK, "JUNIPER". Fig. 8, e.

Common in bogs and poorly-drained soils throughout; one of the few tree-forms in peat bogs, where stunted individuals a few feet high may be almost 100 years old. Nichols stated that it is rare in northern C.B., but this may have been due to an earlier insect infestation; for the tree is now commonly present.



Depressed forms of the tree which grow on exposed and sterile places may be called forma **depressa** Rousseau. Common, according to Rousseau, on exposed headlands at Canso.

Lab. and Nfld. to the mouth of the Mackenzie and northern C.B. south to Penn.

## 2. *L. decidua* Mill. EUROPEAN LARCH

Occasionally seen along roadsides, and planted as windbreaks. Introduced from Eu.; throughout eastern N.A.

## 5. PINUS L. PINE

- a. Leaves 5 in each bundle; cones 10-15 cm long, several times longer than wide.
  - 1. *P. Strobus*
- a. Leaves 2 in each bundle; cones 2-6 cm long, almost round when open.
- b. Leaves (needles) 9-16 cm long, stiff; stout tree with reddish bark.
  - 2. *P. resinosa*
- b. Leaves less than 8 cm long; bark not reddish.
  - c. Leaves 4-6 cm long, not widely divergent; resin ducts many in each leaf, nearly peripheral (Fig. 8, c); bark of the upper branches and trunk yellowish; introduced.
    - 3. *P. sylvestris*
  - c. Leaves 1-4 cm long, widely divergent; resin ducts mostly 2 in each leaf, deeply imbedded (Fig. 8, d); bark of the upper branches and trunk dark.
    - 4. *P. Banksiana*

### 1. *P. Strobus* L. Fig. 8, a. WHITE PINE

Common on the sandy or gravelly well-drained or thin soils of the Province; formerly reaching its best development on the glacial granitic sands of Shelburne Co., on the sands of the Annapolis Valley and on the lowlands of Cumberland and north Colchester Cos.; scattered elsewhere and a valuable timber tree in deep soils, becoming rarer east to C.B.

Nfld. along the mts. to Ga. west to Man. and Iowa.

### 2. *P. resinosa* Ait. Fig. 8, b. RED PINE

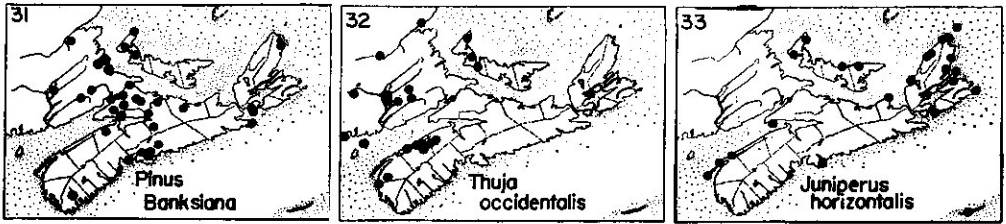
Common in the Annapolis Valley and on the lowlands of Colchester and Cumberland Cos. on sandy or rocky soils; scattered in other parts of the Province. It is occasionally found in poorly-drained areas, as on heath-bogs. The Austrian or Black Pine, *P. nigra* Arnold, is much more satisfactory as an ornamental tree and is frequently planted.

Nfld. to Man. south to Penn. and Wisc.

### 3. *P. sylvestris* L. SCOTCH PINE

Frequently planted both as an ornamental and in reforestation; rarely found as an escape.

Introduced from Eu.



#### 4. *P. Banksiana* Lamb. Map 31. Fig. 8, d. JACK PINE

Rock outcrops, shallow gravelly soils or sand plains, more rarely on clay soils, consistently on highly acid soils. Jack Pine occurs mainly in the central portion of the Province: most common in Cumberland County; on sandy areas in Colchester Co., as at Debert and back of Stewiacke; and in rocky locations in Halifax Co. Two areas are known in the Annapolis Valley: at Cambridge and east of Centreville in Kings Co. Elsewhere it occurs in rather small stands from Shelburne Co. to northern C.B. where it is known from Black Brook and New Haven in Victoria Co. (Bentley and Smith, 1958).

Forma *procumbens* Rousseau, Nat. Canad. 65: 301. 1938, is a shrubby form 0.5-2 m high, with the branches procumbent. Found on the exposed rocky headlands in the vicinity of Canso. Known also from Que.

N.S. to the Mackenzie south to northern N.Y. and Minn.

#### 6. THUJA L. CEDAR

##### 1. *T. occidentalis* L. Fig. 8, g. Map 32. ARBOR VITAE, WHITE CEDAR

Found in two types of habitat, the lake-side or swamp type and the old-field or old-pasture type. The first occurs at Cedar Lake, Annapolis Co.; and Cedar Lake and Cedarwood Lake in Digby Co., where the trees tend to occur in a band near the water's edge. Scattered stands of the second type occur mainly on the north-facing slope of the Annapolis Valley and in general these appear to have originated from native occurring trees (Bentley and Smith, 1958).

N.S. to Sask. south to N.Y. and in the mts. to N.C.

#### 7. JUNIPERUS L. JUNIPER

- a. Leaves needle-like, flat and sharp, more or less whorled, 7-22 mm long (Fig. 9, g).
- b. Shrub, erect or low but not strictly depressed with age; leaves narrow, sharp and straight.
- c. Shrub erect, 1-2 m high; leaves 7-22 mm long.
- c. Shrub depressed with the branches erect or decumbent, forming large mats 2-4 m in diameter; leaves 8-18 mm long; fruits 6-10 mm in diameter.

1. *J. communis*

Var. *depressa*

- b. Shrub decumbent with the branches completely pressed against the ground; leaves abruptly short-pointed and relatively broad.
- d. Fruit 6-9 mm in diameter with seeds around 5 mm long. Var. *saxatilis*
- d. Fruit larger, 9-13 mm in diameter with seeds about 6 mm long. Var. *megistocarpa*
- a. Leaves scale-like, generally opposite, 1.5-3 mm long, much over-lapping (juvenile forms may have the leaves sharp and spreading, 4-5 mm long); Fig. 9, h. 2. *J. horizontalis*

### 1. *J. communis* L. Fig. 9, g. COMMON JUNIPER

Erect bush-like forms occur near Halifax which may be placed with the species. See Sommers, Trans. N.S. Inst. Sci. 9: 2: 175-179. 1896. Such transitional forms, which resemble to some extent the European plant, occur from N.S. and Me. south to Ga. and west to Illinois.

Var. *depressa* Pursh is scattered to common throughout, in sandy areas, hillside pastures, poorly-drained soil or even in bogs and on heaths. It is especially common in the Annapolis Valley and around Parrsboro. Nfld. to Alta. south to N.J., N.C. and Minn.

Var. *saxatilis* Pallas is rare around the coast; bogs near Canso, on the heaths of northern C.B. and scattered on St. Paul Is. (Var. *montana* Ait.). Greenland to Alaska south to N.S., northern Maine and Wisc.

Var. *megistocarpa* Fern. & St. John is a large-fruited form found near the coast. It was originally described from Sable Island; and is reported from St. Paul Is., Nfld., Magdalen Islands, eastern N.B. and Hudson Bay.

### 2. *J. horizontalis* Moench Fig. 9, h. Map 33. CREEPING JUNIPER

Rocky headlands, or on cliffs, pastures or beaches near the coast; scattered along the Bay of Fundy; rare on the North Shore; common in northern C.B. and on Sable Is. Plants reported by Rousseau from Guysborough have the leaves needle-like and sharp like the juvenile branches. This has been named forma *alpina* (Loud.) Rehd., Journ. Arnold Arb. 6: 203. 1925.

Nfld. to Alaska south to southern Maine, Mich. and Wyo.

## 11. TYPHACEAE CAT-TAIL FAMILY

### 1. *TYPHA* L. CAT-TAIL

- a. Leaves flat, 12-24 mm wide; staminate and pistillate spikes usually touching; pistillate spikes in fruit 2-5 cm thick; pollen grains in 4's. 1. *T. latifolia*
- a. Leaves usually slightly rounded, 3-7 mm wide; staminate and pistillate spikes separated by an interval at least 5 mm long; pistillate spike in fruit 10-17 mm thick; pollen grains single. 2. *T. angustifolia*

1. *T. latifolia* L. Fig. 10, a. BROAD-LEAVED CAT-TAIL

Common throughout; in swamps, shallow ponds, wet areas in fields, ditches, edges of rivers and streams, in estuaries above salt water, and occasionally in floating-bog associations. Local on Sable Is., growing on the borders of the fresh-water ponds; very rare on the highlands of C.B.

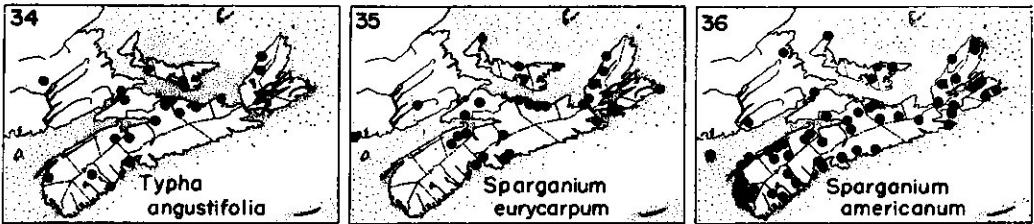
Forma *ambigua* (Sonder)Kronf. has the staminate and pistillate spikes separated. This form is scattered and possibly common; Hants, Colchester and Inverness Cos. (Smith and Schofield, 1952).

Throughout N.A.

2. *T. angustifolia* L. Map 34. NARROW-LEAVED CAT-TAIL

Scattered and local, the colonies often conspicuous from a distance because of their bluish aspect. More often near the coast in brackish swales, but occasionally inland also in swamps, ditches or along streams; local around some of the small lakes south of Amherst and scattered along the coast to Cheticamp. (Smith, 1959). Large colonies of the two species may often be found growing next to each other.

N.S. to Ont. south to N.C. and Mo.; Calif.; Eurasia.



## 12. SPARGANIACEAE BUR-REED FAMILY

Floating or erect aquatic plants with the staminate and pistillate flowers separate in dense globose heads. The family, which comprises about 20 species, is easily recognized by the rough, bur-like fruiting heads.

### 1. SPARGANIUM L. BUR-REED

- a. Stigmas 2; fruits large, over 4 mm thick, sessile and abruptly rounded and flattened across the top; plants large and stout (Fig. 10, b). 1. *S. eurycarpum*
- a. Stigma 1; mature fruit tapering about equally at each end, often stipitate, 1.2-3 mm thick (Fig. 10, e).
- b. Beak of the fruit long and slender; staminate heads 2 to many.
- c. Beak of fruit slender, straight or nearly so; leaves erect or floating; sepals attached near the top of the stipe.
- d. Pistillate heads or branches borne directly in the axils of the leaves or bracts; achenes not ribbed at the summit (Fig. 10, c). 2. *S. americanum*

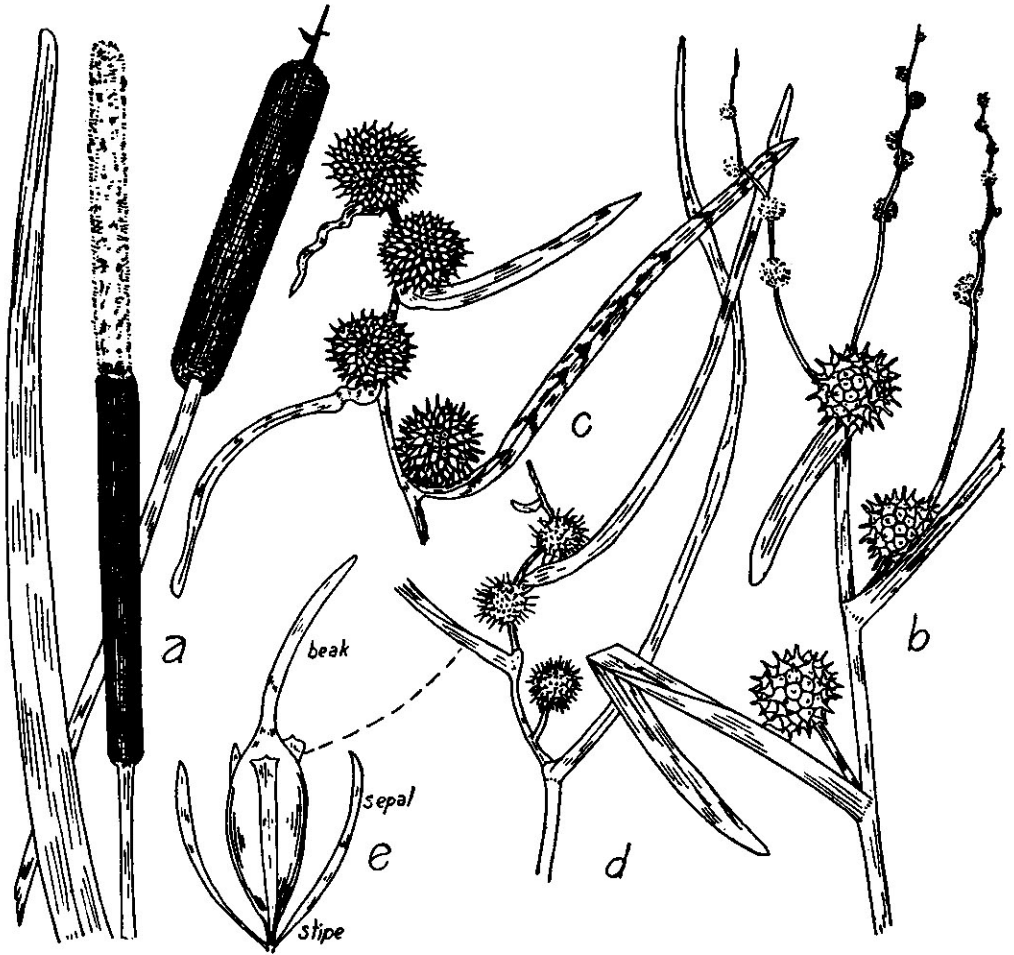


Figure 10.—*Typha latifolia*, a, plant,  $\times \frac{1}{2}$ . *Sparganium*. b, *S. eurycarpum*, top of plant,  $\times \frac{1}{2}$ . c, *S. americanum*,  $\times \frac{1}{3}$ . d, *S. fluctuans*,  $\times \frac{1}{3}$ . e, single floret of *S. fluctuans*,  $\times 8$

- d. Pistillate heads or branches usually borne some distance above the leaf axils (Fig. 10, d); achenes ribbed or angled above the middle.
- e. Plants usually with erect leaves; achenes ribbed plainly at the summit, with beaks about the length of the body.
- f. Pistillate heads 2-4, well separated, 1.5-2.7 cm in diam; staminate part of inflorescence 2-10 cm long, of 4-9 heads. 3. *S. chlorocarpum*
- f. Pistillate heads 1-3, the upper touching each other, 1-2.2 cm in diam.; staminate part of the inflorescence 1-4 cm long, of 2-5 heads.
- S. chlorocarpum* var. *acaule*
- e. Plants with usually floating leaves; achenes obscurely or not ribbed, with the beak shorter than the body.
- g. Leaves 1.5-4 mm wide, rounded on the back; pistillate heads 1.3-2 cm in diam.; nerves on the underside of the leaf 0.2-0.8 apart.
4. *S. angustifolium*
- g. Leaves 5-10 mm wide, flat on both sides; pistillate heads 2-2.5 cm in diam.; nerves on the underside of the leaf 0.8-2 mm apart.
5. *S. multipedunculatum*

c. Beak of the fruit long and curved; leaves all floating, flat, thin and translucent; sepals attached near the base of the flower stipe (Fig. 10, d, e).

6. *S. fluctuans*

b. Beak of the fruit short or none; staminate head one; plants small and very slender, usually with leaves floating.

h. Beak short and conical, 0.5-1.5 mm long; pistillate heads all borne directly in the axils of the leaves; leaves 2-7 mm wide. 7. *S. minimum*

h. Beak none; pistillate heads a short distance above the leaf axils; leaves 1-4 mm wide. 8. *S. hyperboreum*

1. *S. eurycarpum* Engelm. Fig. 10, b. Map 35. GIANT BUR-REED

Common in rich swampy areas, on mucky shores, borders of sloughs and sink-holes from Kings and Cumberland Cos. east to western C.B.; absent from southwestern N.S. and rare to eastern C.B.

N.S. to B.C. south to Fla. & Calif.

2. *S. americanum* Nutt. Map 36. Fig. 10, c.

Common throughout; muddy shores of lakes and slow-moving streams; probably more abundant in southwestern N.S. than elsewhere, where it forms extensive areas with *Pontederia* around the shallow edges of the lakes.

Nfld. to N.D. south to Fla. & Mo.

3. *S. chlorocarpum* Rydb.

Common throughout on wet mucky shores, and in shallow muddy water. Nfld. and Ont. to Iowa south to N.J. and Ind.

Var. *acaule* (Beeby) Fern. is also frequent throughout in much the same habitats.

Nfld. to N.D. south to Va.

4. *S. angustifolium* Michx.

Common throughout the Atlantic region, scattered elsewhere; sandy shores of ponds, edges of lakes and marshy places.

Lab. to Alaska south to Penn. & Mich.

5. *S. multipedunculatum* (Morong) Rydb. Map 38.

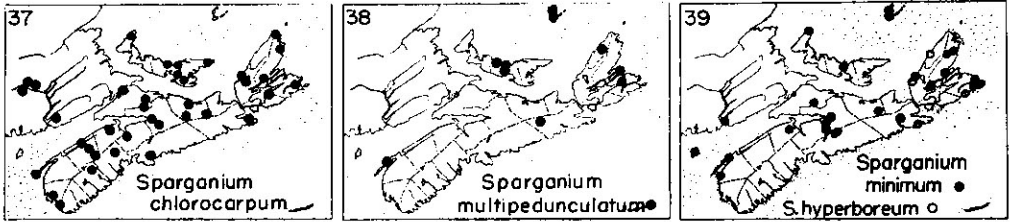
Rather rare; Sable Island, Sandy Cove and from several stations in northern C.B. (Smith and Erskine, 1954). It is found at the edge of fresh or brackish lakes or ponds, as in the pond at Sandy Cove, Digby Co., or in the pond near Presque Isle in Inverness Co.

Southern Lab. to Alaska south to N.S., N.H. and Calif.

6. *S. fluctuans* (Morong) Robins. Fig. 10, d, e.

Scattered to rare; found in shallow to deep water at the edge of ponds from Yarmouth and southern Annapolis Cos. to C.B., where the only collection is from a pond back of the beach, Main-a-Dieu (Smith and Erskine, 1954). In shallows, Big Lake, Cumberland Co.

Nfld. to Alta. south to N.S., mts. of Penn. & Wisc.



### 7. *S. minimum* (Hartm.) Fries Map 39.

Rare and widely scattered; shallow water of pools, edges of ponds, lagoons along rivers and alkaline ponds. Rare in C.B. and scattered west through northern and central N.S. to Digby Neck (Smith and Erskine, 1954; Schofield, 1955).

Nfld. to Alaska south to n. N.J., Wisc. & Ore.; Eurasia.

### 8. *S. hyperboreum* Laestad. Map 39.

Rare in C.B.: collected by Macoun in a ditch at Louisburg, later found abundant there in a bog ditch and occasionally fruiting, abundant in bog pool, N.W. Cove, Scatari Island, and in bog pools at French Mountain, Inverness Co. and in alkaline pond at Mabou. It has been collected but once on the mainland, by J. S. Erskine in bog pools near New Harbour, Guys. Co. (Erskine, 1953).

Greenland to Alaska south to C.B., n. Que. & Man.; Eurasia.

## 13. ZOSTERACEAE PONDWEED FAMILY

A very diverse family of aquatic plants of either fresh or salt water, with the following genera showing very little relationship to each other.

- a. Leaves alternate, or occasionally the uppermost opposite.
  - b. Flowers of two kinds, of sessile anthers, or pistils attached in 2 vertical rows on the inner side of a leaf-like spadix; leaves very long and grass-like, the bases sheathing the short, jointed rootstock, 1.5-6 mm wide; salt water only; eel grass.
    1. *Zostera*
  - b. Flowers perfect, in spikes or clusters; leaves widely scattered along the stem.
    - c. Fruits sessile, in spikes or heads; floating leaves often present; fresh to brackish water.
      2. *Potamogeton*
    - c. Fruits more or less stalked in an umbel-like cluster on a long, often coiled, peduncle; leaves about 0.5 mm wide; brackish to salt water (Fig. 14, c).
      3. *Ruppia*
- a. Leaves opposite, linear and entire; fruits in clusters of 3-5, on short stalks in the leaf axils, flattened and toothed along one side; brackish water (Fig. 14, b).
  4. *Zannichellia*

### 1. *ZOSTERA* L. EEL-GRASS

#### 1. *Z. marina* L., var. *stenophylla* Aschers. & Graebn.

Common around the coast in salt water and washed up on the beaches; abundant in salt lakes and ponds in C.B.; abundant in Wallace

Lake on Sable Is. Eel grass became rare for some time due to a fungus disease but has now recovered to a considerable extent. Our plant is separated from the typical plant of Europe because of its narrower leaves.

Greenland to N.C.; James Bay; Alaska to Ore.

## 2. POTAMOGETON L. PONDWEED

This group comprises our most common water plants. Many of these produce floating and submersed leaves of a different shape; others produce only the submersed type. The linear-leaved species are difficult since the vegetative characters are of uncertain value and sterile specimens are the rule. Hybrids, especially between the broad-leaved species, are not uncommon so that definite identification is often impossible.

The stem anatomy of most of the broad-leaved species is distinct and may be used to help identify sterile or unusual material. Anyone specializing in this group should consult the treatment by Ogden.

The basis for this revised treatment, and the three plates, have been prepared by D. H. Webster. His paper (1956) also gives further information on the distribution of hybrids and other unusual collections for N.S.

St. John, H. A revision of the North American species of *Potamogeton* of the Section *Coleophylli*. *Rhodora* 18: 121-138. 1916. Fernald, M. L. The linear-leaved North American species of *Potamogeton*, Section *Axillares*. *Mem. Amer. Acad. Arts and Sci.* 17: 1-183. 1932. Ogden, E. C. The broad-leaved species of *Potamogeton* of North America north of Mexico. *Rhodora* 45: 57-105; 119-163, 171-214. 1943. Webster, D. H. Notes on the distribution of *Potamogeton* species and hybrids in Nova Scotia. *Proc. N.S. Inst. Sci.* 24: 16-24. 1956.

- a. Stipules joined by the edges to the leaf bases (Fig. 13, e).
- b. Leaves bristle-like or linear-filiform, rarely more than 2 mm wide; floating leaves absent; peduncles and spikes flexuous; spikes strongly interrupted in fruit.
- c. Leaves of the branches sharply acute (those of the main stem often obtuse); lateral branches often short, divergent and much branched (Fig. 11, d).
  - 2. *P. pectinatus*
- c. Leaves with a shallow notch at the blunt end, or merely blunt or with a short point; branches relatively few, mostly long and ascending to form a compact tuft (Fig. 11, b).
  - d. Leaf-blades 0.2-0.5 mm wide. 1. *P. filiformis* var. *borealis*
  - d. Leaf-blades 0.7-2.0 mm wide. Var. *Macounii*
- b. Leaves linear, if less than 2 mm wide then flattened, flaccid and ribbon-like.
  - e. Leaves of sterile stems 3-8 mm wide, stiffly two-ranked and auricled at the base (Fig. 11, a). 3. *P. Robbinsii*



- e. Leaves of submersed stems 0.5-2 mm wide, flattened and flaccid; floating leaves sometimes present; spikes borne in axils of both submersed and floating leaves (Fig. 12, e). 11. *P. Spirillus*
- a. Stipules not joined to the leaf base.
- f. Submersed leaves linear or nearly bristle-like, if more than 3 mm wide then ribbon-like and tapering abruptly to the tip and base.
- g. Stem and leaves flaccid; the linear, bristle-like leaves 0.1-0.5 mm wide; tufts of freely-forking, filiform lateral branches often remote on the ascending stem (Fig. 11, e). 4. *P. confervoides*
- g. Stems and leaves less flaccid; submersed leaves 0.3-8 mm wide; lateral branches of ascending stem not borne in remote tufts.
- h. Submersed leaves 1-10 cm long with 5-7 nerves, often strongly two-ranked and crowded on the sterile shoots; the broad spaces between the inner nerves loosely cellular-reticulate (Fig. 12, d); floating leaves often present and mostly opposite. 12. *P. epihydrus*
- h. Submersed leaves not strongly two-ranked, if strongly cellular-reticulate then with only three nerves and without floating leaves.
- i. Floating leaves never present; submersed leaves with a well-defined ribbon-like blade less than 50 times as long as wide.
- j. Primary leaves with more than three nerves.
- k. Primary leaves 5-7 nerved, 1.5-3.5 mm wide; stem compressed; stipules strongly fibrous, at first united near the base; peduncles flattened towards the apex, 1.5-5 cm long (Fig. 11, c). 7. *P. Friestii*
- k. Primary leaves more than 7-nerved (up to 35), 2-5 mm wide; stem flattened with wings, constricted at the nodes. 5. *P. zosteriformis*
- j. Primary leaves with 3 nerves.
- l. Primary leaves 2-4 mm wide, warm green or reddish and very translucent; fruit 3-4 mm long; glands at base of leaves 0.6-1.2 mm wide; winter buds 2-4 cm long. 9. *P. obtusifolius*
- l. Primary leaves rarely more than 2 mm wide; fruits 2-2.8 mm long; glands smaller or absent; winter buds 7-18 mm long.
- m. Glands present at the base of many or all leaves (Fig. 13, a, d); spikes on filiform peduncles; fruit with the back rounded, without a dorsal keel.
- n. Stipules with margins united to above the middle (Fig. 13, a); spikes elongate, strongly interrupted with 3-5 distant whorls. 8. *P. pusillus*
- n. Stipules flat or inrolled with the margins not united (Fig. 13, d); spikes subglobose or but slightly interrupted, of 1-3 few-flowered whorls. 10. *P. Berchtoldi*
- m. Glands at the base of the leaves absent; spike short with two or three whorls of 2 flowers each with the whorls close together, the peduncle club-shaped and often arched, mostly 3-10 mm long; fruit with a thin, undulate to dentate dorsal keel (Fig. 11, f). 6. *P. foliosus*
- i. Floating leaves usually present; submersed leaves with no differentiation of blade and petiole, more than 50 times as long as broad (Fig. 12, a).
- o. Stem 0.8-2 mm in diameter; submersed leaves 0.8-2 mm wide; floating leaves 4-9 cm long, 2.5-6 cm wide, usually cordate at base, the petioles 1-2.5 mm thick; peduncles as thick as the stem. 18. *P. natans*
- o. Stem 0.5-1 mm in diameter; submersed leaves 0.25-1 mm wide; floating leaves 1.5-5.5 cm long, 1-3 cm wide, rounded or wedge-shaped at the base, with petioles 0.2-1 mm thick; peduncles thicker than the stem. 19. *P. Oakesianus*

- f. Submersed leaves mostly not linear, more than 3 mm wide.
- p. Submersed leaves petioled or tapering to a sessile base, not strongly clasping; floating leaves present or absent.
- q. Floating leaves (often absent) delicate, translucent and tapering without sharp distinction into the petiole; stem often pressing out very flat; submersed leaves oblong-linear to linear-lanceolate, 4.5-18 cm long, 1-2 cm wide; fruits with exocarp hard and smooth, tawny-olive (Fig. 13, c).
13. *P. alpinus*
- q. Floating leaves leathery, opaque, cordate to wedge-shaped at base, blade distinct from the petiole; fruits with exocarp soft and porous, greenish, brownish or reddish.
- r. Submersed leaves on middle and upper part of stem 2.5-7.5 cm wide, 8-20 cm long, arcuate; floating leaves 5-10 cm long, 2.5-5 cm wide with 30-50 nerves (Fig. 12, b).
15. *P. amplifolius*
- r. Submersed leaves 0.1-2.5 cm wide (rarely to 3.5), 1-18 cm long, not arcuate.
- s. Lateral branches short, much branched, ascending to divergent, often densely clustered on the lower half of the main ascending shoots; submersed leaves 0.1-1 cm wide, 5-50 times as long as wide, sharp-pointed to mucronate, stiff, the margins with early-disappearing 1-celled translucent denticles (Fig. 12, c).
17. *P. gramineus*
- s. Lateral branches, if present, not short nor much branched; submersed leaves 0.5-2.5 or rarely to 3.5 cm wide, their margins without denticles.
- t. Fruit reddish with a minute or obsolete beak; submersed leaves (often absent) 3-10 cm long, 0.5-1.5 cm wide, with 7-11 nerves; floating leaves 3-8 cm long, 1-4 cm wide with 11-21 nerves; Sable Is.
14. *P. oblongus*
- t. Fruit brown to olive with a prominent beak; submersed leaves 8-14 cm long, 1-2.5 cm wide, with 9-21 nerves; floating leaves 2-7 cm long, 1.5-4 cm wide, with 19-35 nerves.
16. *P. pulcher*
- p. Submersed leaves cordate to rounded at the base, clasping one-half to two-thirds the circumference of the stem; floating leaves never present.
- u. Leaves mostly 1-2.5 dm long, entire, hooded at the apex; fruit 4-5 mm long, 3.2-4 mm wide (Fig. 13, b).
20. *P. praelongus*
- u. Leaves 1-10 cm long, margins with fugacious 1-celled denticles, the apex not hooded; fruits 2.3-3.5 mm long, 1.7-3 mm broad.
- v. Leaves narrowly lanceolate to lance-ovate, 1.5-10 cm long, coarsely nerved; stipules coarse, soon disintegrating into strong white fibers; peduncles usually enlarged upward, 0.15-2.5 dm long; fruits 2-3 mm broad.
21. *P. Richardsonii*
- v. Leaves orbicular to ovate-lanceolate, the principal ones 1-6 cm long, delicately nerved; stipules delicate, soon disappearing; peduncles slender to the summit, 1-9 cm long; fruits 2-2.3 mm broad (Fig. 13, f).
22. *P. perfoliatus*

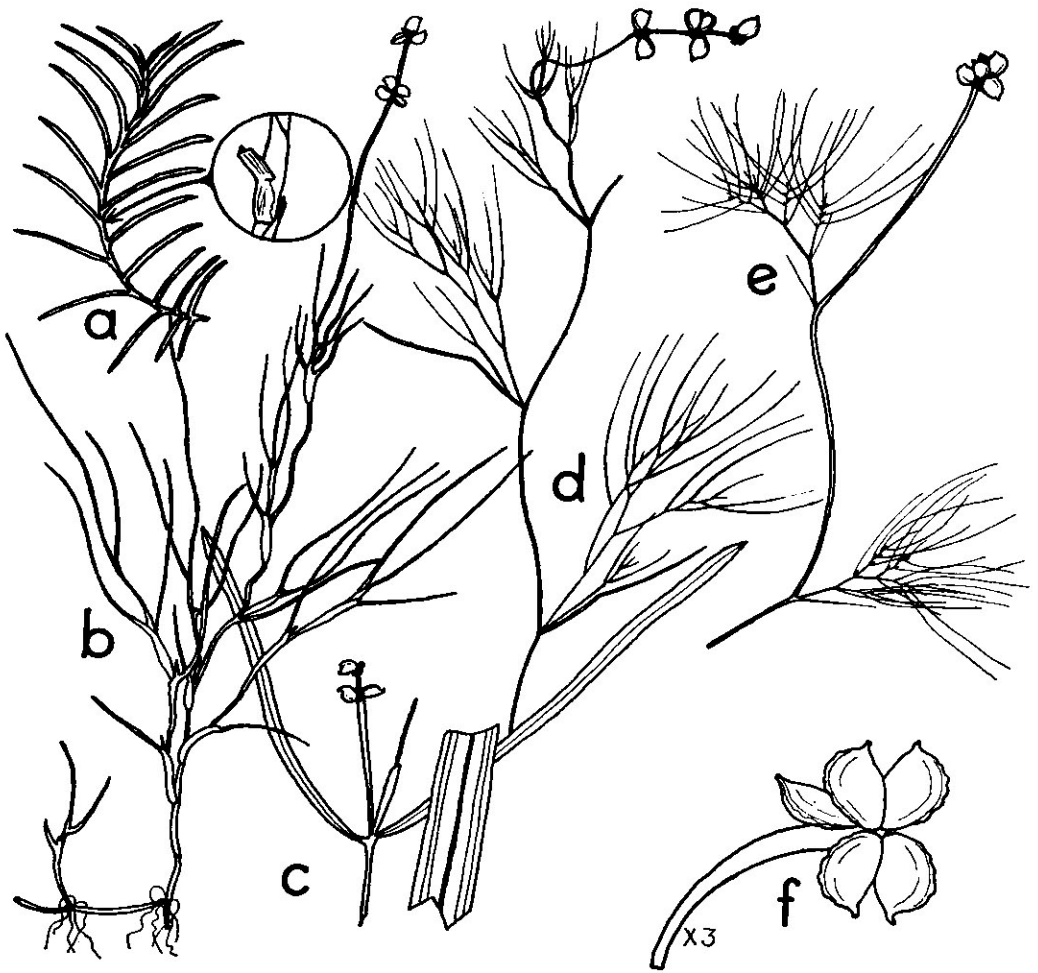
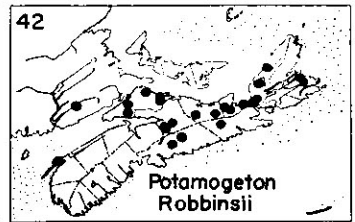
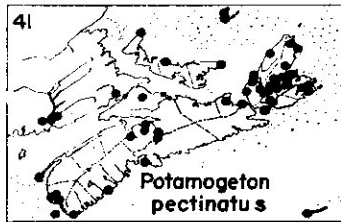
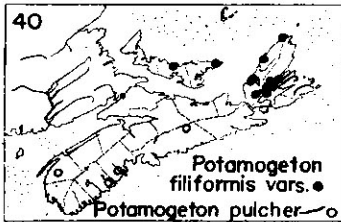


Fig. 11.—*Potamogeton*. a, *P. Robbinsii*, habit of the plant, with one node and leaf base enlarged. b, *P. filiformis*, showing the rhizome. c, *P. Friesii*, with part of a 5-veined leaf. d, *P. pectinatus*. e, *P. confervoides*. f, *P. foliosus*, fruiting spike. Plants  $\times \frac{1}{4}$ .



1. *P. filiformis* Pers. Map 40. Fig. 11, b.

Var. *borealis* (Raf.) St. John is found in shallow, often cold water of less acid lakes and ponds or slightly brackish pools; usually on a substrate of sand, gravel or shingle; on the Inverness side of Cape

Breton Island from Mabou to Cape St. Lawrence, with one station in a sinkhole east of Baddeck. Nfld. to Alaska south to Penn. and Utah; Asia.

Var. *Macounii* Morong is characteristic of gypsum sink-holes and alkaline water of slow streams and backwaters along the northern shore of Bras d'Or Lake. Some of the colonies near Baddeck have rather unusual material which appears to be either an edaphic variant of *P. filiformis* var. *Macounii* or a hybrid. Fernald's record of *P. vaginatus* Turez. would seem to belong to this group. Macoun's record of *P. vaginatus* from Big Intervale, Inverness Co., is also in question. Magdalen Is. and P.E.I.; Ont. to Alta. south to Colo. and Calif.; Sweden.

2. *P. pectinatus* L. Fig. 11, d. Map 41. SAGO POND-WEED

Characteristic of brackish water; occasional in sink-holes and alkaline water inland; common in ponds on Sable Is.; forming, with *Ruppia*, the bulk of the vegetation in brackish ponds around C.B.; less common in general on the mainland but common in the salt lake at Oxford. Bennett, Jour. Bot. 39: 199. 1901, names a forma *pseudomarinus* Benn. and credits it to Sable Is.

Alkaline, brackish or sometimes fresh water; Nfld. to northern B.C. southward; widely distributed throughout the world.

3. *P. Robbinsii* Oakes Fig. 11, a. Map 42.

Occasional in lakes and slow-flowing rivers in less acid areas; Digby Neck and from Cumberland and Colchester Cos. to northern C.B. It is found often in dense, widespread stands; no fruiting material is known from the Province.

N.S. to n. Ont. south to Ala.; Wyo. to B.C. and Ore.

4. *P. confervoides* Reichenb. Fig. 11, e. Map 43.

Characteristic of bog-pools and runnels; not uncommon in the more acid lakes and their associated slow-flowing streams; rare to absent in north-central N.S.; frequent in Yarmouth Co.; occasional in Shelburne; eastward and mostly near the coast in C.B.

Acid or siliceous regions; Nfld. to Penn. and southern N.J.; also in Mich. and Wisc.

5. *P. zosteriformis* Fern. Map 44.

Rare; lakes and deep rivers in less acid areas; Kings Co.; Colchester and Halifax Cos.; and in northern C.B.

In quiet waters; N.S. to s. B.C. south to Va. and Calif.

6. *P. foliosus* Raf., var. *macellus* Fern. Fig. 11, f.

Occasional in ponds and pools in the less acid areas, rarely in lakes and rivers, usually in habitats with a finely-divided substrate; Digby Neck to Colchester and Cumberland Cos.; central Cape Breton.

N.S. to Mackz. south to Fla., Kans. and Calif.

7. *P. Friesii* Rupr. Fig. 11, c.

Rare and known only from: Inverness Co., slightly brackish pond, West Mabou Harbour; Colchester Co., Salmon River and quiet water of ponds near the river, Truro; and in the Habitant and the Canard Rivers in Kings Co.

Nfld. to B.C. south to Va. and S.D.; Eu.

8. *P. pusillus* L. Fig. 13, a. Map 50.

Following European usage, this and number 10 have been separated by a technical and difficult character, as to whether the stipules are joined to each other or not. Webster considers that in N.S. the species are normally quite distinct. Some specimens were found by him which resemble *P. pusillus* in all characters except the stipules, which appear to be convolute. Basic to alkaline water; scattered mostly in the northern part of the peninsula; more common in C.B.

N.S. to B.C. southward; Azores and Eurasia.

9. *P. obtusifolius* Mert. & Koch Map 46.

Rare and known from only six stations; ponds, lakes and slowly-flowing streams, often with a substrate of deep muck, from Pictou Co. to north-central C.B. Material from three of these stations also suggest a hybrid origin with *P. Berchtoldi*; and plants from the river near a lake at St. Joseph, Antigonish Co. presents a series between the hybrid and *P. Berchtoldi* (Webster, 1956).

Nfld. to Ont. south to N.J. and Minn.; s. B.C.; Eurasia.

10. *P. Berchtoldi* Fieber Fig. 13, d.

Fresh, alkaline or brackish pools and quiet waters throughout but less common in the southwestern and Atlantic areas. Five variable varieties have been reported from N.S. These are indefinite in separation and may be a result of response to ecological conditions. Var. *polyphyllus* (Morong) Fern. has the principal leaves with the tips rounded and the leaves only 0.8-2.5 cm long. This seems to be more northern in its distribution and in N.S. has been found only in central C.B. Several varieties are common in fresh and brackish pools on Sable Island.

Greenland and Nfld. to Alaska southward; Eurasia.

11. *P. Spirillus* Tuckerm. Fig. 12, e. Map 47.

Common in quiet waters and shallow or slow-moving streams; throughout except possibly for northern C.B.

Nfld. to Man. south to Va. and Ohio.

12. *P. epihydrus* Raf., var. *Nuttallii* (C. & S.) Fern. Fig. 12, d.

Shallow water of pools, streams and ponds, our most common species and found throughout; rare in brackish water.

Nfld. to Man. south to Ga.; Alaska to Calif.; Eu.

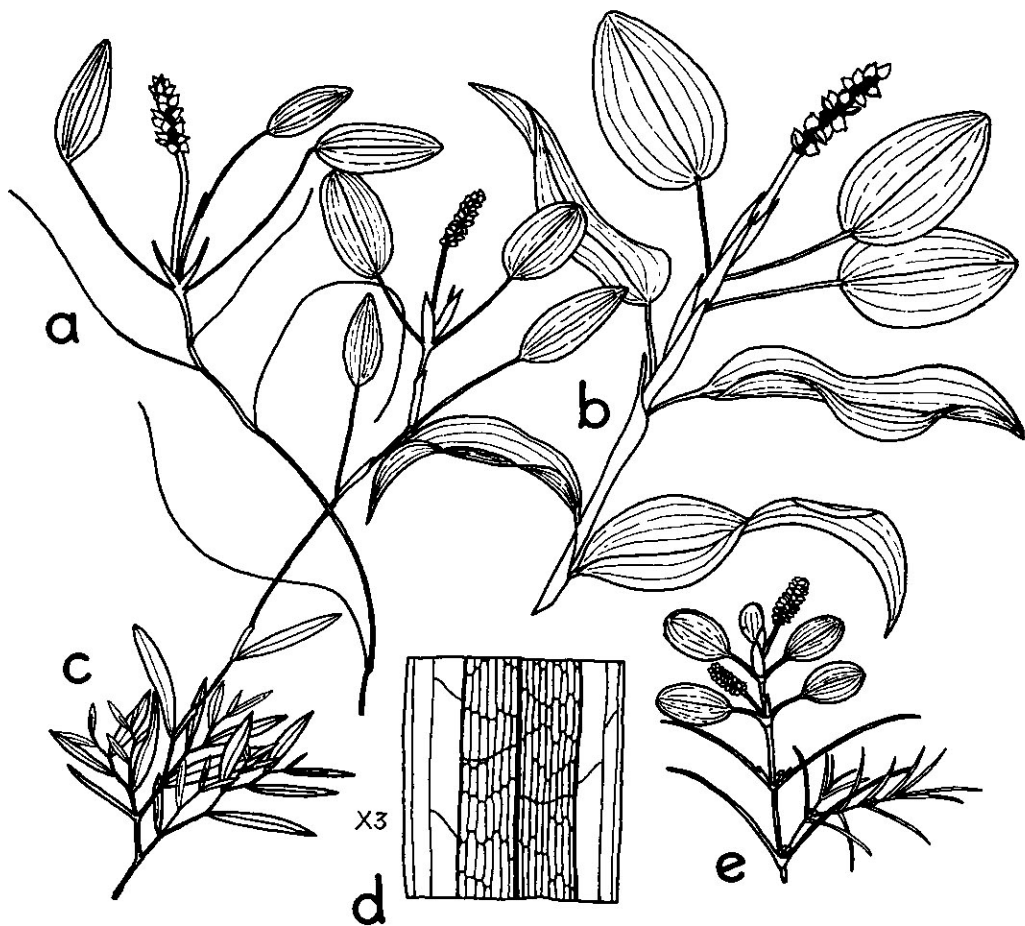
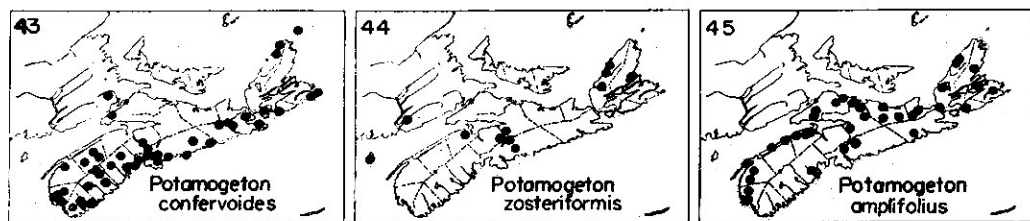


Fig. 12.—*Potamogeton*. a, *P. Oakesianus*. b, *P. amplifolius*. c, *P. gramineus*. d, *P. ephydrus*, section of leaf showing the cellular reticulations near the mid-rib. e, *P. Spirillus*. Plants  $\times \frac{1}{4}$ .



13. *P. alpinus* Balbis Fig. 13, c. Map 51.

An European and West Asian plant represented with us by two varieties.

a. Submersed leaves oblong-linear to linear-lanceolate, 7-25 cm long, usually more than 8 times as long as wide, tapering to an obtuse or acutish apex.

Var. *tenuifolius*

a. Submersed leaves oblong to ovate-oblong, 4-10 cm long, usually less than 8 times as long as wide, apex rounded and sometimes slightly hooded.

Var. *subellipticus*

Var. *tenuifolius* (Raf.)Ogden is occasional in ponds, small streams and inlets to lakes or bays in the less acid regions. Its high incidence in small ponds and small streams is unusual for an infrequent species. Hybrids of *P. alpinus* with *P. epihydrus* and *P. amplifolius* seem to occur. Greenland to Alaska south to Penn., Wisc. and Calif.; E. Asia.

Var. *subellipticus* (Fern.)Ogden is rare in similar habitats; known only from South Haven and Baddeck in Victoria Co.; River Denys and Eden, Inverness Co.; and New Canaan in Kings Co.

Nfld. to B.C. south to northern N.Eng., Wisc. and Idaho.

14. *P. oblongus* Viviana

Found in fresh-water ponds on Sable Island (*P. polygonifolius*). Abundant, even in ponds that dry up for part of the summer. This is a plant of Europe, north Africa, the Madeira and the Azores with a very restricted range in N.A.

Eastern Nfld., St. Pierre and Miquelon, and Sable Is.

15. *P. amplifolius* Tuckerm. Fig. 12, b. Map 45.

Throughout, but less common along the southwestern and eastern shores of the mainland: lakes and streams, rivers and ponds, never found in bog or brown-water lakes.

Nfld. to B.C. south to Ala. and Calif.

16. *P. pulcher* Tuckerm. Map 40.

Rare; known from Upper Musquodoboit, Halifax Co.; Rhodenizer Lake, Lunenburg Co.; Medway River, Queens Co.; and Sears Lake at New Tusket in Digby Co.: runnels, muddy margins of lakes or brook beds. The record from Sandy Cove doubtfully refers to this species.

Fla. to Texas north to N.S., Ohio and Minn.

17. *P. gramineus* L. Fig. 12, c. Map 48.

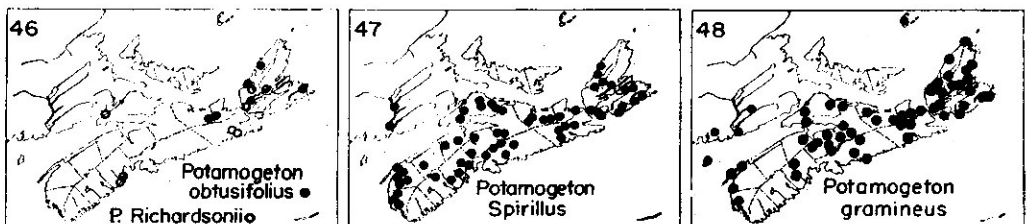
a. Principal submersed leaves 1.5-4.5 cm long, 0.2-0.6 cm wide, with 5-7 nerves.

Var. *typicus*

a. Principal submersed leaves 6-9 cm long, 0.6-1 cm wide, with 7-9 nerves.

Var. *maximus*

Common in the less acid areas in the northern two-thirds of the Province; lakes, ponds and rivers, often in swiftly-flowing water and on wave-swept shingle. The two varieties may be partly genetic and partly response to ecological conditions, as the plant is very variable.



Hybrids with *P. amplifolius* have been found in Kings, Pictou and Cumberland Cos.: lagoons and in current of Gaspereau River from Melanson to above Gaspereau. The most common hybrid is treated separately as the next entity.

Lab. to Alaska south through Nfld. to N.J., Wisc. and Calif.

**X *P. subnitens* Hagster.**

*P. gramineus* x *perfoliatus* var *bupleuroides*. Plants reported by Fernald as *P. gramineus* var. *spathulaeformis* belong here. The progeny of these two comparatively unrelated plants are extremely variable and often very odd. The floating leaf-blades gradually taper into the petiole and the clasping submersed leaves often have sharp-pointed aspices. The anatomy of the stem shows a blend between the two parents, with all possible combinations.

Digby Neck and Cumberland Co. through the northern region to northern C.B.; ponds, lakes, rivers and brackish water; our most common hybrid and known from 20 stations.

**18. *P. natans* L.**

Common throughout, sometimes approaching and difficult to distinguish from *P. Oakesianus*.

Lakes and streams; Greenland to Alaska south; Eurasia.

**19. *P. Oakesianus* Robbins Fig. 12, a.**

Characteristic of bog pools; occasional in lakes and slowly-flowing water. Frequent to scattered throughout.

Nfld. to Ont. south to N.J., Mich. and Wisc.

**20. *P. praelongus* Wulfen Fig. 13, b. Map 49.**

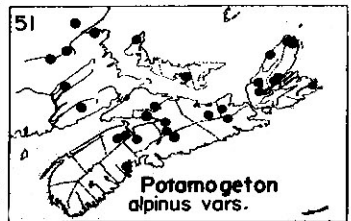
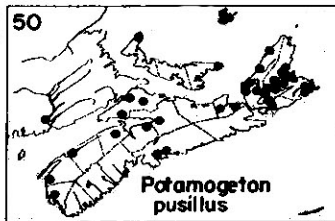
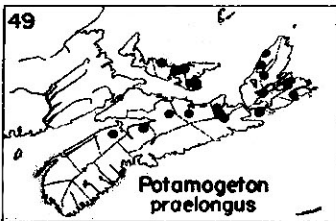
Usually in deep water and rarely fruiting: Cornwallis R., Kentville, Kings Co.; Hants and Colchester to C.B., rather rare. Material from St. Joseph, Antigonish Co. may belong to a hybrid with *P. perfoliatus* var. *bupleuroides*; as may also that from Blakett Lake, C.B. County.

Nfld. and Lab. to Alaska south to N.J., Wisc. and Calif.; Eurasia.

**21. *P. Richardsonii* (Ar.Benn.)Rydb. Map 46.**

Abundant in water near the mouth of Hay's River, West Lake Ainslie, Inverness Co. The plant is characterized by numerous coarsely-nerved perfoliate submersed leaves with the stipules persistent as white fibers.

Lab. to Alaska south to Penn., Ind. and Calif.





22. *P. perfoliatus* L., var. *bupleuroides* (Fern.)Farw. Fig. 13, f.

Typical of brackish water and inland in alkaline lakes, and in ponds and rivers. It is very variable; and the true nature of some of the inland material, which approaches *P. Richardsonii*, is uncertain. Common in brackish ponds on Sable Is.; often growing above tide level near the mouth of streams or rivers. Fernald (1921) reports it from fresh water only from Midway Lake, Digby Neck.

Nfld. to Ont. south to N.C., Fla. and Ohio.

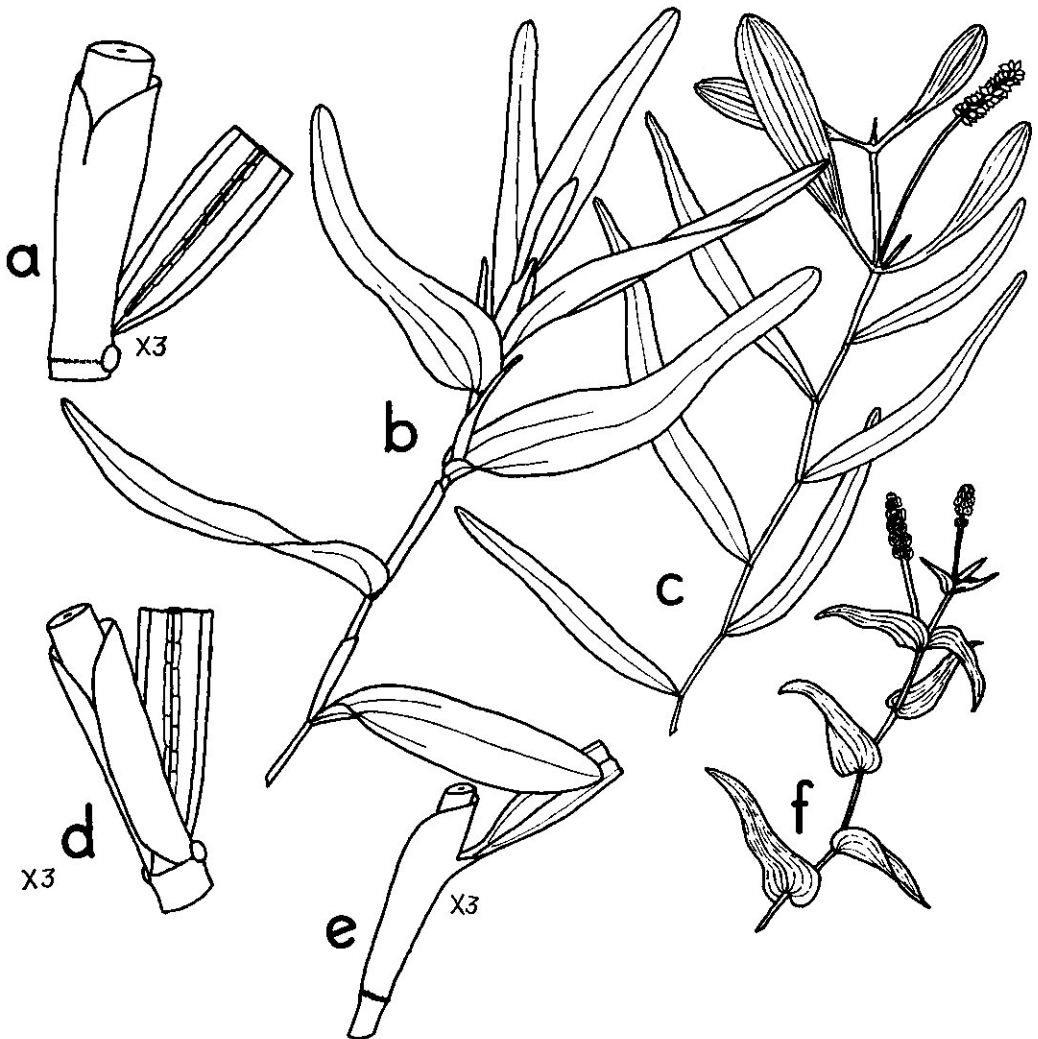


Fig. 13.—*Potamogeton*. a, *P. pusillus*, node of stem showing stipules and leaf base. b, *P. praelongus*. c, *P. alpinus*. d, *P. Berchtoldi*, node of stem showing stipules and leaf base. e, *P. filiformis*, node of stem. f, *P. perfoliatus*. Plants  $\times \frac{1}{4}$ .

## 3. RUPPIA L. DITCH-GRASS

1. *R. maritima* L. Fig. 14, c.

One variable, nearly world-wide species. Various varieties have been proposed on the shape of the fruit and the length of the peduncle and pedicels (podogynes).

- a. Carpels ovoid, slightly oblique but not strongly eccentric nor curved, bluntish or not tapering to a conspicuous beak; pedicels 6-25 mm long. var. *obliqua*
- a. Carpels strongly eccentric and distinctly beaked, or very strongly curved.
- b. Mature pedicels (podogynes) 1-3 cm long.
- c. Peduncles at maturity 3-30 cm long, spiraling or flexuous. var. *longipes*
- c. Peduncles at maturity 0.5-3 cm long, not spiraling. var. *rostrata*
- b. Mature pedicels 2-6 mm long; peduncles short, 0.5-1.5 cm long. var. *subcapitata*

Common around the Province in salt pools on the tidal marshes, brackish ponds or stagnant salt water, as in ditches. Var. *obliqua* (Schur)Aschers. & Graebn. occurs from Nfld. to the mouth of the St. Lawrence River and to Maine. This variation has been found in N.B., P.E.I., and in N.S. at the head of the Bay of Fundy and on Brier Island. Var. *subcapitata* Fern. was reported by Rousseau from Point Pleasant, Halifax Co. and collections were made from Hackett's Cove in the same county.

Var. *rostrata* Agardh is common around the coast, as is also var. *longipes* Hagstrom. It may be that the length of the peduncles depends upon the depth of the water, since a great variation occurs in this respect. Sometimes the peduncle may be nearly straight and at times may show two or three complete coils along its length.

Nfld. to Fla.; worldwide.

## 4. ZANNICHELLIA L. HORNED PONDWEED

1. *Z. palustris* L., var. *major* (Boenn.)Koch Fig. 14, b. Map 52.

Frequent in brackish or in saline waters and on saline mud; often found in streams at or just above the head of the tide; around the coast and scattered wherever its habitat occurs. The variety is the coastal form.

Nfld. and the Gulf of St. Lawrence to Fla.

