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HALIFAX, NOVA SCOTIA

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Editor: H. S. Heaps

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VOL. 26 - PART I

A STUDY OF BARACHOIS PONDS IN THE BRAS D'OR LAKE AREA OF CAPE BRETON, NOVA SCOTIA

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and

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(Received for Publication, January 1963)

INTRODUCTION

Artificial and natural freshwater ponds and small lakes in the Atlantic provinces of Canada have been managed to provide good crops of the native brook trout (*Salvelinus fontinalis*) and the introduced rainbow trout (*Salmo gairdneri*) to anglers (Smith, 1951, 1955, 1961). Estuaries and other partially enclosed saltwater areas are coastal topographical features of the Atlantic provinces. The use of such saltwater areas to produce trout with measures of control of both habitat and fish has received little attention (Smith, 1946). Some advances in this direction have been made by Danish trout farmers (Anon., 1962). Both the brook and rainbow trout run to saltwater from our streams, and their growth in marine habitats is good (White, 1941; Smith and Saunders, 1958; Leim and Day, 1959).

A number of fresh and brackish water ponds border the shores of Bras d'Or Lake, Cape Breton, N. S. The purpose of this study was to assess these ponds as trout habitats with respect to such conditions as temperature, dissolved oxygen,

and salinity. Suitable ponds might be used for the production of rainbow or brook trout depending on the measures of habitat control possible.

The ponds are generally small in size, few exceeding 30 to 40 acres in area (2.47 acres = 1 hectare). They are also separated from the salt water of Bras d'Or Lake by sand and gravel barriers. Although not peculiar to the area, they are numerous.

According to Johnson (1925), ideal conditions exist in the Bras d'Or Lakes for the formation of bars "since the vigorous wave attack is limited to two directions, opposed to each other, with the result that beach drifting is from opposite directions toward inequalities in the shore, shoals, or protected areas back of islands or in the lee of points projecting from the other shore." Ponds are formed when these bars emerge and cut off heads of inlets.

Considerable variation exists between individual barriers holding ponds, with respect to height, width, consistency, and permanency. Few of the barriers appear to be of a stable nature and conditions of high wind or tide, particularly those of the winter and spring seasons, tend to alter them. Some of the barriers completely cut off the ponds from Bras d'Or Lake and any exchange of water is apparently by percolation through the sand and gravel. Other barriers have openings of varying sizes through which an exchange of water is continuous.

The ponds are sometimes locally known as "barachois ponds". The word "barachois" is of French origin and may be defined as "an extension of water of little depth, separated from the sea by a sandbank, and surrounded by natural grassland. The barachois is generally connected with the sea by a narrow gully. The sandbank itself is also called barachois" (Translated from Savard, 1959, p. 199).

PRELIMINARY SURVEY

A reconnaissance of the area was made during the early part of June, 1961, and the majority of the ponds located and casually observed. Their general features are recorded in Table I. The locations of the ponds are shown on the accompanying map (Figure 1).

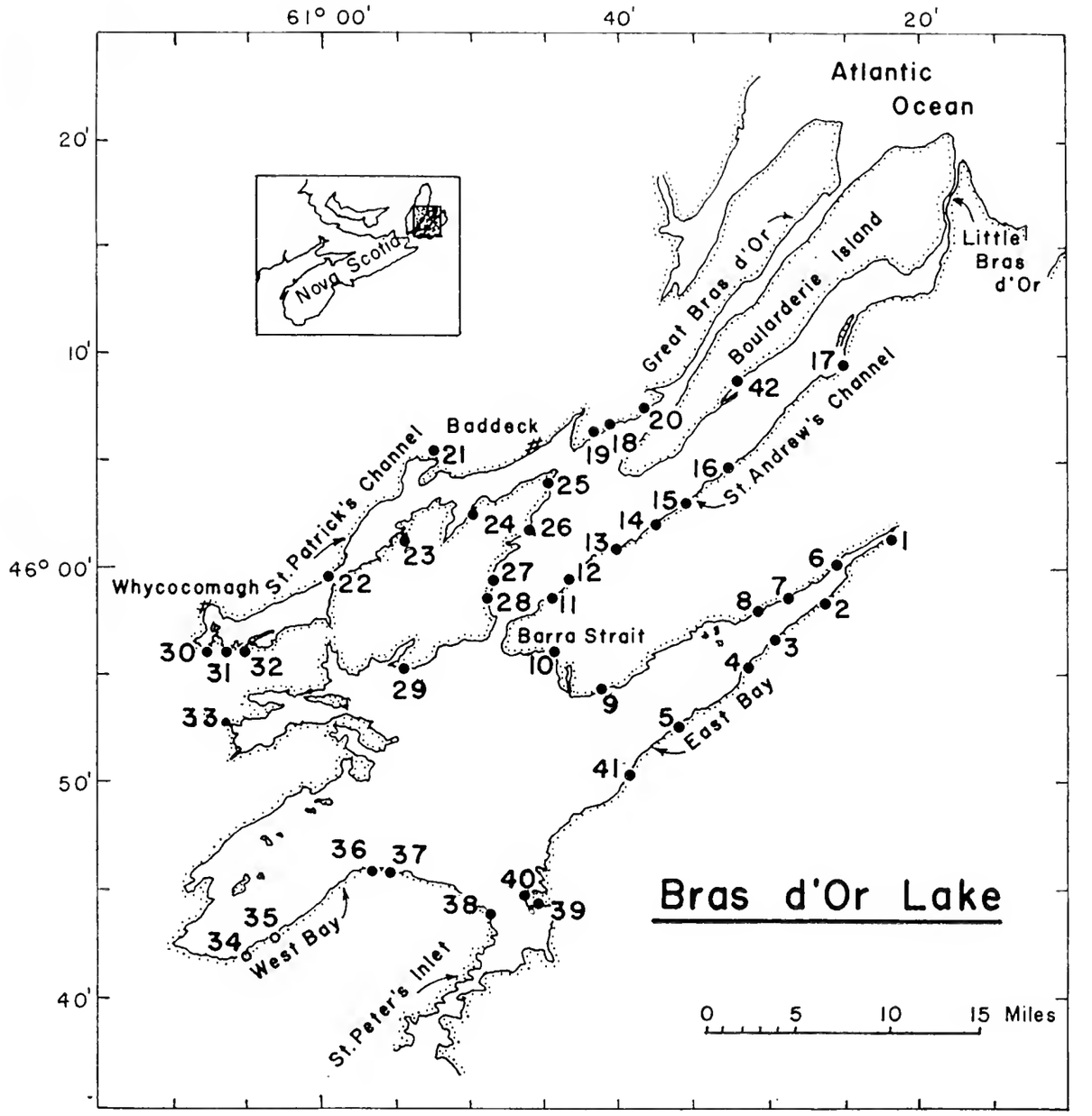

Figure 1. Outline map of Bras d'Or Lake illustrating the location of barachois ponds.

From the information gained, the ponds were classified into four general types. These types are based on the situation as observed during the summer of 1961. The conditions as observed then are not regarded as being permanent.

Type I —Ponds which are completely cut off from the Lake by the barrier—

(a) without a freshwater tributary stream.
(b) with freshwater tributary stream(s).

Type II—Ponds which have an opening through the barrier, allowing an exchange of water with the Lake—

(a) without a freshwater tributary stream.
(b) with freshwater tributary stream(s).

Following the preliminary survey, twelve ponds were selected for more detailed hydrological investigation. Sketches were made of the ponds and approximate bottom contour determined. Approximate areas were calculated from the sketches. Temperature, dissolved oxygen, and salinity conditions were observed and the results recorded in Table II.

SUITABILITY OF WATER IN THE PONDS FOR TROUT

Good brook trout, or rainbow trout, water has temperatures in the range of 14°C to 20°C during the summer, and a dissolved oxygen content of at least 5 parts per million (Fry 1951; Graham 1949). There is considerable evidence, however, that brook trout, at least, will live and do well in water of higher temperature and lower oxygen content where there is little or no competition from other fishes.

The surface water of the ponds becomes warm during the summer months and this warm water becomes deeper as the summer progresses (see data for Jarman's Ponds, number 1 and number 2, in Table II). Cool water is found only in the bottom of the deeper ponds.

Salinity in the ponds obviously varies with the amount of exchange of water through the opening in the barrier, and the amount of freshwater entering from tributary streams. The salinities encountered would probably have little direct effect on yearling, or older, trout which might be introduced into the ponds. In several ponds a marked halocline was noted, resulting also in a stratification of temperature and oxygen. Under these conditions, oxygen content may become low below the halocline. Salinity of the surface water of Bras d'Or Lake, as measured by G. H. Geen in the summer of 1960 (unpublished data), ranged from 6.6 to 24.9 parts per thousand. Much of the surface water has a salinity of about 21 parts per thousand. Surface water of the ponds was usually below this value.

CONTROL OF THE PONDS

The value of the ponds as trout habitats depends, in good part, on the degree of control that could be exercised on the water exchange and fish movements. Many of the barriers are sandy and change readily, particularly under storm conditions of wind and tide. It is possible that some of these barriers could be strengthened by the addition of sand and gravel. Trout might be held in the ponds by anchoring screens across the openings in the barriers. However, spring tide and ice conditions, and heavy storms remain a hazard for year-round control.

Local residents report good spring trout angling in many of the ponds. Summer angling is carried on to a limited degree in the same ponds, but little success is reported. Opinion is that sea-trout move into many of the barachois ponds in the early spring, but it would appear that they leave with the onset of the unfavourable summer conditions of temperature and oxygen.

CONCLUSION

Several of the ponds that were studied appear to have possibilities for use and improvement as trout habitats, since they present favourable temperature and dissolved oxygen conditions, at least during the summer months. A brief description of those ponds which appear most suitable follows:

Castle Bay Pond - number 9, Figure 1

This pond is large but has a small, spring-fed stream flowing in. The pond is bounded along one side by a long, curved spit. This barrier is reported to be open during the winter and spring seasons, allowing an exchange of water between the pond and Lake. It would appear difficult to control during these seasons, although it is closed for most of the summer and fall seasons.

Campbell's Pond - number 30, Figure 1

There is the possibility here of setting up both a freshwater and a saltwater pond. The largest freshwater inlet could be blocked off by completing a partial dam already there and hence form a freshwater pond.

Lieutenant Pond - number 27, Figure 1

A permanent opening in the barrier allows a continual exchange of salt water throughout the summer. Salinities throughout the pond correspond closely to that of the surface water of Bras d'Or Lake in this region.

Jarman's Pond, "one" - number 18, Figure 1

This pond appears to be permanently enclosed by its barrier although some exchange of water may take place through the barrier by seepage. There are numerous freshwater springs draining into this pond.

MacLeod's Ponds, "two" and "three" - number 22, Figure 1.

As the situation exists here, there is a freshwater pond ("three") and a brackish water pond ("two") connected by a small stream. Pond "two" is also open to salt water through a narrow channel.

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REFERENCES

ANON. 1962.
Salt water used experimentally for Danish trout culture. U. S. Trout News, 7(2) : 8.

FRY, F. E. J., 1951.
Some environmental relations of speckled trout (*Salvelinus fontinalis*). Proc. N.E. Atlantic Fish Conference, 29 pp. (mimeo.).

GRAHAM, J. M., 1949.
Some effects of temperature and oxygen pressure on the metabolism and activity of the speckled trout (*Salvelinus fontinalis*). Canadian J. Res., D, 27 : 270-288.

JOHNSON, D. W., 1925.
The New England-Acadian shore line. John Wiley & Sons, New York. XX, 608 pp.

LEIM, A. H., and L. R. DAY, 1959.
Records of uncommon and unusual fishes from eastern Canadian waters, 1950-1958. J. Fish. Res. Bd. Canada, 16(4) : 503-514.

SAVARD, F. A., 1959.
Le Barachois, Fides Publishers, Montreal and Paris, 207 pp.

SMITH, M. W., 1946.
A biological reconnaissance of ponds in the Prince Edward Island National Park. Acadian Naturalist, 2(6) : 81-101.
———————— 1951.
The speckled trout fishery of Prince Edward Island. Canadian Fish. Cult., No. 11, pp. 1-6.
———————— 1955.
Fertilization and predator control to improve trout angling in natural lakes. J. Fish. Res. Bd. Canada, 12(2) : 210-237.
———————— 1961.
Fish ponds in Canada—a preliminary account. Canadian Fish. Cult., No. 29, pp. 3-12.
SMITH, M. W., and J. W. SAUNDERS, 1958.
Movements of brook trout, *Salvelinus fontinalis* (Mitchill), between and within fresh and salt water. J. Fish. Res. Bd. Canada, 15(6) : 1403-1449.
WELCH, PAUL S., 1948.
Limnological Methods. The Blakiston Company. Philadelphia and Toronto, 381 pp.
WHITE, H. C., 1941.
Migrating behaviour of sea-running *Salvelinus fontinalis*. J. Fish. Res. Bd. Canada, 5(3) : 258-264.

TABLE I. General Features of Cape Breton Barachois Ponds.

Map location	Type (See text)	Approx. acreage	Barrier	Remarks
1 East Bay Barachois Pond	2(b)	25	Sandy	Large opening in barrier.
2 Ben Eoin Pond	2(a)	10	Low sand bar	
3 MacDougall Pt. Pond	2(b)	15	Sandy	
4 Marble Pt. Pond	2(a)	10	Sand and gravel	
5 Lochnan Fad	2(a)	25	Low sand bar	Barrier open to salt water in several places.
6 MacGillivary's Pond	2(b)	2	Sand and gravel	Pond is shallow.
7 New Aberdeen Camp Pond	2(a)	5	Sandy—covered with grass	Barrier appears stable.
8 MacIntosh's Pond	2(b)	5	Sand and gravel	Opening in barrier closed during summer
9 Castle Bay Pond	2(b)	25	Long, sand and gravel	Barrier reported open during winter and spring.
10 Piper's Cove Pond	2(b)	10	Sandy	Opening subject to change readily.
11 Christmas Island Pond	2(a)	30–40	Sandy	Barrier low and broken.
12 Goose Pond	2(a)	10	Sandy; low	Pond is shallow.
13 Black Pt. Pond	2(b)	30	Sand and gravel	Barrier stable. Pond appears deep.

14	Shunacadie Pond		2(a)	10–15	Sandy and low	Ponds shallow; barriers broken and appear unstable.
15	MacLean's Beach Pond		2(a)	10–15	Sandy and low	
16	Beaver Cove Pond		2(a)	10–15	Sandy and low	
17	Barachois Ponds:	(1)	2(b)	20	Sand spit	
		(2)	2(b)	10	Sand spit	Branch of above pond.
18	Jarman's Pond, No. 1		1(a)	15	Sand and gravel appears permanent	Water level in pond is approx. 2 ft. above Lake level.
19	Jarman's Pond, No. 2		2(b)	10	Sand and coarse gravel	Pond appears quite productive.
20	MacDonald Pt. Pond		2(a)	10	Sand and gravel	Pond shallow. Abundance of aquatic vegetation.
21	Indian Bay Pond		2(b)	10	Formed by highway	Some surface drainage into pond.
22	MacLeod's Pond:	"one"	2(b)	150	No barrier	Connected to St. Patrick's Channel by narrow channel.
		"two"	2(b)	3	No barrier	Pond is connected to "one" by narrow channel.
		"three"	—	3	No barrier	Pond about 8 ft above level of "two". Small stream joins "two" and "three".
23	Maccrutchie Cove Pond		2(b)	8	Sandy. Forms road bed	Two openings to salt water.
24	MacIvor Cove Pond		2(a)	10	Sandy	Pond is shallow.

TABLE I. General Features of Cape Breton Barachois Ponds. (continued)

Map location		Type (See text)	Approx. acreage	Barrier	Remarks
25 MacKay Pt. Pond		2(a)	7	Sandy	Pond is shallow and has a sandy bottom.
26 Russell's Pond (Pony Pt.)		1(a)	5	Sand and gravel appears permanent	Pond is privately owned. Some surface drainage from springs.
27 Lieutenant Pond		2(b)	7	Sand and gravel	Large opening to salt water.
28 Maccrutchie Pond		2(b)	10	Sandy. Serves as road bed	Salt water enters pond only with very high tides.
29 MacKinnon's Pt. Ponds	(1)	2(b)	10	Sandy	Barriers variable. Surface seepage into ponds.
	(2)	2(b)	10	Sandy	
	(3)	2(b)	30	Sand and gravel	Ponds appear deep. Deep opening through barrier to salt water.
30 Campbell's Pond		2(b)	12	Sandy. Two openings	A large part of pond is shallow.
31 MacDonald's Pond		2(a)	10	Sandy and variable	Shallow pond.
32 MacIvor Pond		2(a)	5–8		Appears shallow.
33 Ashfield Sta. Pond		2(b)	7	Formed by railway beds	Pond is part of Seal Cove.
34 Dundee Pond		2(b)	10	Sandy. Forms road bed	Pond has outlet into Black River.

35	Big Pond	2(b)	7	Two sandy barriers	Pond has sand and mud bottom.
36	Olson Pond	2(b)	5	Sand and gravel	Salt water enters ponds only with very high tides.
37	Urquart's Pond	2(b)	30	Sandy	Large freshwater stream enters pond. Pond has been stocked with hatchery trout.
38	Cape George Pond	2(a)	20–30	Sandy on two sides	Appears shallow. Has been stocked with trout.
39	Bar Point Pond	2(a)	20–30	Sandy	Open to salt water on two sides.
40	Evans Island Pond	2(a)	20	Gravel	Water appears deep.
41	Irish Vale	2(a)	20–30	Low sand bar	
42	MacEachern's Pond	2(b)	10	Gravel	Two streams enter the pond, both persisting during summer.

TABLE II. Vertical distribution of temperature, oxygen, and salinity in 12 barachois ponds, from analyses made during summer, 1961. All temperatures were taken with a Whitney Electric Thermometer to nearest tenth of a degree Centigrade. Dissolved Oxygen was determined by standard Winkler Method (Welch, 1948); salinities were measured with a hydrometer. Field tables for conversion of hydrometer readings to salinities, abbreviated from Knudsen: Hydrographical Tables, 1901, were used. +The water in these ponds had a salinity below 1 part per thousand.

Pond, pond number on map, date and maximum depth	Depth in meters	Temperature °C	Oxygen p.p.m.	Salinity parts per thousand
Olson Pond	Surface	19.9	7.9	1
Map Number: 36	1	—	—	—
Date: June 14, 1961	2	19.6	8.5	1
Maximum Depth: 2 meters				
Jarman's Pond, No. 1	Surface	21.0	10.6	
Map Number: 18	1	20.9	—	+
Date: June 21, 1961	2	20.8	—	
Maximum Depth: 7 meters	3	19.0	—	
	4	15.9	2.1	
	5	12.3	—	
	6	9.4	0	
	7	7.8	—	

Jarman's Pond, No. 1	Surface	24.1	8.1	
Map Number: 18	1	24.0	8.1	+
Date: Aug. 9, 1961	2	23.0	8.1	
Maximum Depth: 7 meters	3	22.8	7.8	
	4	22.5	6.6	
	5	19.2	4.6	
	6	15.1	3.8	
Jarman's Pond, No. 2	Surface	23.4	8.6	21
Map Number: 19	1	22.9	9.3	—
Date: June 26, 1961	2	22.4	10.8	16
Maximum Depth: 5.5 meters	3	17.2	8.5	—
	4	13.6	—	—
	5	13.1	6.7	—
Jarman's Pond, No. 2	Surface	23.6	7.9	13
Map Number: 19	1	26.1	8.1	13
Date: August 10, 1961	2	27.1	7.8	18
Maximum Depth: 5.5 meters	3	24.4	5.7	20
	4	20.4	4.1	20
	5	13.4	0	20
MacLeod's Pond, No. 2	Surface	20.9	8.0	7
Map Number: 22	1	23.2	—	—
Date: July 4, 1961	2	21.0	7.5	—
Maximum Depth: 3 meters	3	19.1	4.8	13

Table II. (continued)

Pond, pond number on map, date and maximum depth	Depth in meters	Temperature °C	Oxygen p.p.m.	Salinity parts per thousand
MacLeod's Pond, No. 3	Surface	22.8	8.9	
Map Number: 22	1	20.4	—	+
Date: June 30, 1961	2	18.6	—	
Maximum Depth: 11.5 meters	3	14.4	11.5	
	4	11.0	—	
	5	7.3	12.8	
	6	6.6	—	
	7	6.3	—	
	8	6.0	0.5	
	9	5.9	—	
	10	5.9	—	
	11	5.9	0	
Campbell's Pond	Surface	20.2	9.7	17
Map Number: 30	1	18.6	—	—
Date: July 7, 1961	2	18.1	—	—
Maximum Depth: 3 meters	3	18.0	8.7	18
Piper Cove Pond	Surface	22.2	7.9	3
Map Number: 10	1	22.0	—	—
Date: July 22, 1961	2	21.4	5.2	4
Maximum Depth: 3 meters	3	17.5	2.0	10

Castle Bay Pond	Surface	22.6	8.1	3
Map Number: 9	1	—	—	—
Date: July 25, 1961	2	22.6	8.3	3
Maximum Depth: 4 meters	3	22.6	8.2	3
	4	17.1	6.1	10
MacIntosh Pond	Surface	24.5	8.0	
Map Number: 8	1	—	—	+
Date: July 27, 1961	2	23.4	7.8	
Maximum Depth: 3 meters	3	21.8	6.0	
Maccrutchie Pond	Surface	21.8	8.9	4
Map Number: 28	1	22.1	8.8	4
Date: August 1, 1961	2	26.3	8.6	5
Maximum Depth: 3 meters	3	22.6	4.9	11
Lieutenant Pond	Surface	20.6	7.8	21
Map Number: 27	1	21.0	8.1	21
Date: August 3, 1961	2	20.3	7.5	22
Maximum Depth: 3.5 meters	3	19.0	6.6	22
Russell's Pond	Surface	23.4	8.2	
Map Number: 26	1	23.4	8.3	+
Date: August 12, 1961	2	23.3	8.2	
Maximum Depth: 6 meters	3	22.8	8.3	
	4	22.5	6.2	
	5	21.6	6.5	

101ST ANNUAL MEETING
PRESIDENTIAL ADDRESS

W. J. Archibald

October 15, 1962

The Institute has completed the formal program arranged to celebrate its centennial year. The planning of this program started in earnest about a year ago; at that time we were quite unable to draw up an elaborate and detailed schedule of events as we had only about $600 to spend and even this was more than we could afford. If a rich man plans to travel around the world he can choose any itinerary he likes, arrange to be at a certain point at a certain time, and if events and people prove uncooperative he can draw and aim his cheque book. Not being rich we could not emulate the well-heeled globe trotter - however our resources were ample to carry us to our destination by hitch hiking. Now hitch hiking is dangerous and nerve wracking but it is also exciting especially if one gets good "lifts", that is if one gets amiable and stimulating company going in the same direction as oneself. We did get good company, and stimulating. Dr. Newcombe's address engaged the particular interests of that large section of our Institute concerned with the biological sciences, and he possessed the unique gift of being able to communicate his ideas with precision and clarity, to all in his audience (which included a large number of students and people from the city). His address was repeated at Acadia, under the auspices of the Valley Chapter, to an equally large and enthusiastic audience. Sir Bernard Lovell's subject, Radio Astronomy, drew a crowd of about six or eight hundred people. On this occasion we were privileged to hear an interesting lecture delivered by an artist in words. You will recall that he spoke without notes and yet without hesitation or rambling, that his use of the English language was that of a master, the apt word always available, and the style varied and engaging. In addition to these special lectures we had a large number of extraordinary meetings which were well received. In arranging this varied program your Council did not, like the rich traveller, make elaborate long range plans; rather like the hitch hiker we adopted an attitude of alert passivity. The thumb was perpetually in the traditional position but the head was shaken to several offers of a "lift". I would recommend this attitude of alert passivity to future Councils of the Institute. It will provide one or two excellent public

lectures a year and this is perhaps the most useful extra thing we can do.

In enumerating the activities of the year we must not omit the part taken by Dr. Bruce Fergusson who was the speaker at our family dinner. On that occasion he gave us an account of the early history of the Institute. Since then he has completed the survey of our hundred years of active existence and his manuscript is in the hands of our Editor, Professor Heaps. In due time it will be published in the Journal along with other pertinent and interesting facts about the Institute.

It is natural on a birthday to look to the future. Some planning for the future is essential in all endeavours but it is a great mistake to make plans that are too elaborate and detailed. It is not right to plan for everything that it may seem necessary to do; it is wiser to plan to do everything that is necessary as it arises. This leaves a person or an organization in a state of perpetual readiness to take advantage of whatever means are available to meet his or its immediate needs. To this end it is helpful to be flexible in attitude, every ready to respond to the necessity for change. This is one aspect of the true scientific spirit and we should bring this spirit to our Council meetings.

Just as science has a goal so must our Institute have a goal. The goal of science is to understand and make sense of human experience. Science best achieves this goal when it acts in an essentially selfish manner; that is when it resolutely turns its back on all allurements to take part in any other activities and the allurements are many. There is for example the allurement of wealth to be gained by turning aside to exploit known truth; there is the allurement of power to be executed by turning aside to exploit known terror. Science must never forget that the surest way to wealth, power, prestige, etc. (if these are desirable) is to pursue its single aim (the intellectual understanding of nature and its ways) with selfish and complete devotion. This is an example of the principle "Seek ye first the Kingdom of Truth and all these things shall be added unto you".

In this there is a lesson for our Institute; but first we have to seek clearly what our goal is before we can pursue it with selfish devotion. We must discover our essential self, lay it

bare, and then foster it delicately and with loving care. The fact that our Institute has an essential self, and that this self has in some measure been well served, is indicated by observing that we have survived for one hundred years. No institution that fails to meet a need will last this long. It is not too easy to cut away cant and pomposity and see the true basis on which our permanence lies. Sometimes we claim that we are fostering this, promoting that, pursuing the other thing, and such meaningless phrases; however I suspect that what really keeps us going is that we enjoy each other's company, we respect each other's ability, we are proud of each other's success, and that we value the chance to talk to each other about our work, to have it criticized and discussed in a friendly spirit. This is a perfectly sound basis for a successful society provided the topics discussed are important and relevant to a certain number of those present at each meeting.

If we accept the thesis that our central purpose is to hold meetings as we do at present then several things follow, mostly of a negative nature. The first is that we should be very cautious about changing the form of the Institute. It works very well as it is. In particular it would seem to me unwise to respond to the pressure to split into two or three sections. Apart from the question of whether or not our numbers warrant this there remains the possibility that our diversity of interests may be one source of our strength. Any act which cuts us off from our true source of vitality is bound to be disastrous.

Another question we have to settle is this: Do we conceive education to be a part of our role? Would it be wise for us to adopt a more aggressive policy in making the ideas and discoveries of science more widely known to the people of Halifax and in particular to the students in High School. My own view is that we perform this function when fate gives us an opportunity but that it should always be regarded as a peripheral interest. There are other organizations that administer to this need and most of us are members of these other organizations. There are many good things to be done and we all see things that need doing but our society has a restricted and narrow path to tread and it should restrict its roaming on broader roads if it is to have a central sense of purpose.

A problem of real concern to the Society is the status of its Journal. We have never had a very clear cut idea about the

role it should fill. It has been used recently for recording rather long detailed studies of local flora and fauna, studies that would probably not be received elsewhere because of their length and limited interest. This is a very useful thing to do and a real purpose has been served; articles of this sort should be published in the future in ever increasing numbers. But the time may be upon us when we should widen the scope of our acceptances. Perhaps we should become very systematic, publish accurately on time, accept a number of shorter articles for each issue, encourage the local Institutes and Universities to submit a larger fraction of their research output and give them a generous supply of reprints at a nominal cost. This should be a serious consideration of future Councils if we manage to solve our financial problems.

PROCEEDINGS OF MEETINGS

Session of 1962 - 1963

(Meetings were held in the Medical Sciences Building of Dalhousie University, the Bedford Institute of Oceanography, and Elliot Hall of Acadia University.)

101st Annual Business Meeting: October 15, 1962.

The meeting was presided over by the President, Dr. W. J. Archibald. His address appears on page 18 of the Proceedings. The Officers presented their reports.

The Treasurer, J. E. Stewart, reported:

Receipts	$2,496.02
Expenditures	3,730.26
Permanent Fund	422.50
Bank Balance, October, 1962	$ 112.95

The Librarian, Miss E. M. Campbell, reported:

More use has been made of the material in the Institute's library during the year 1961 - 1962, than in any previous year. This trend will continue with the growth of scientific research in the area and the increasing number of graduate students at Dalhousie University. There has also been an increase in the interlibrary loan work done with the universities in Canada and the United States. With the publication of revised editions of the Union list of scientific serials in Canada and the United States we may expect to make more such loans from the Institute's collection. Over 150 volumes were bound in the year 1961 - 1962, including the complete set of the American Midland Naturalist. The Nova Scotia Research Foundation continues to finance the subscriptions to the journals that are no longer coming to the library on an exchange basis.

The checking and entering of all the exchange periodicals is continuing, and any new exchange is reported to the National Research Council for inclusion in its revised edition of the Union List of Scientific Serials. The Proceedings of the Institute have been mailed to the societies that have exchange agreements with the Institute. The library also reports any correction of addresses for the general mailing list. The correspondence has dealt mainly with the problems relating to the exchanges, missing numbers, requests for copies of proceedings, etc.

The necessity to obtain storage space with facilities to allow proper handling of the Institute's material is still urgent. There is some doubt as to how long we may continue to use the attic of the Nova Scotia Technical College for storage of our exchange periodicals.

The Editor, H. S. Heaps, reported:

Volume 25, Part 2, of the Institute Proceedings was published during the year. It was dated 1959 - 1960 and contained a paper entitled "A Forest Classification for the Maritime Provinces" by O. L. Loucks. The next issue, Volume 25, Part 3, dated 1960 - 1961, is ready for the printer and will contain a paper entitled "Land Mollusca in the Vicinity of Wolfville, Nova Scotia by R. G. Moore. The following issue will be the anniversary volume dated 1961 - 1962. For this issue C. B. Fergusson has prepared an account of the early history of the Nova Scotian Institute of Science.

Officers elected for the year 1962 - 1963 were:

President	Dr. J. A. McCarter
First Vice-President	Dr. C. R. Masson
Second Vice-President	Dr. W. J. Dyer
Treasurer	Dr. J. E. Stewart
Secretary	Dr. E. H. Anthony
Editor	Professor H. S. Heaps
Librarian	Miss E. M. Campbell
Council	Dr. W. J. Archibald
	Professor E. L. Cameron, Dr. H. B. S. Cooke, Dr. A. MacDonald, Dr. A. C. Neish, Dr. J. G. Retallack,
Auditors	Dr. J. R. Dingle
	Dr. A. E. Cameron

New Members:

During the year the following new members were proposed and were elected by Council: Ordinary: F. Langstroth, W. E. Jones, L. C. Vining, G. H. N. Towers, G. S. Maddrell, J. D. Dawson, W. N. English, R. A. Cameron, N. Damberg, R. Peters, R. D. Burgher, H. A. Stewart, R. T. Kanai.

Student Members: J. H. Blakeley, S. Batoosingh, R. Thomasson, Verma, V. B. Hargreaves, J. Newman, Gibson, D. McEwen, D. R. Grant, D. W. Clark, D. E. Lawrence, K. Halcrow.

Extraordinary Meeting, October 26, 1962.

Dr. D. J. Crisp, Director of the Marine Sciences Laboratories at Menai Bridge, Anglesey, addressed the Institute on "Biology of Marine Fouling". Dr. Crisp was visiting Dalhousie University as a Nuffield Lecturer.

1*st Ordinary Meeting*, November 12, 1962.

Papers: 1. "An X-Ray Study of Some Nova Scotia Zeolites", by F. Aumento; 2. "A Diuretic Hormone in Rhodnius prolixus Stal," by S. Maddrell; 3 "The Antipeptic and Antithrombic Properties of Carrageenin", by W. W. Hawkins and Verna G. Leonard.

2*nd Ordinary Meeting*, December 10, 1962.

Papers: 1. "Pebble Associations in Southern Nova Scotia Moraine", by D. R. Grant; 2. "The Nature of Acetylcholine-Like Activity Released from Brain in Vivo", by J. C. Szerb; 3. "The Influence of Pulse Wave Velocity and Peripheral Resistance on Ballistic Stroke Volume Determination", by W. T. Josenhans.

3*rd Ordinary Meeting*, January 14, 1963.

Papers: 1. "Solid State Chemistry of Some AMO_3 Compounds", by M. Sweeney and W. R. Trost; 2. "The Utilization of Marine Oils", by P. M. Jangaard; 3. "Magnetic Anomalies at Sea", by M. J. Keen; 4. "Barachois Ponds of Bras d'Or Lakes, Cape Breton, Nova Scotia", by M. W. Smith and D. K. Rushton.

4*th Ordinary Meeting*, February 11, 1963.

Papers: 1. "Predicting the Influence of Dredging on the Salinity of Lake Maracaibo", by L. A. E. Doe; 2. "Solubility Measurements From Light Scattering", by R. F. Platford; 3. "Behaviour of Cellular Organelles in Regenerating Moss Leaves", by K. E. von Maltzahn.

5*th Ordinary Meeting*, March 11, 1963.

Papers: 1. "Gas-liquid Chromatography of Polar Compounds", by R. C. Ackmann and R. D. Burgher; 2. "Behavioural Ecology of Two Microtine Rodents in Nova Scotia", by G. C. Clough; 3. "Tanganyika Volcanoes", by J. B. Dawson.

Extraordinary Meeting, March 18, 1963.

Sir Rudolph Peters, F.R.S., formerly Professor of Biochemistry at the University of Oxford, addressed the Institute on "Hopkins and His Times". Sir Rudolph Peters, visiting Dalhousie University under the auspices of the Medical Research Council of Canada, was introduced by Dr. E. G. Young.

Extraordinary Meeting, April 5, 1963.

Dr. Roger Revelle, Dean of Research at the University of California at Berkeley and Director of Scripps Institute of Oceanography at La Jolla, California, addressed the Institute on "Oceanography".

6*th Ordinary Meeting*, April 22, 1963.

Papers: 1. "Interaction of Acridines with Nucleic Acid", by J. A. McCarter; 2. "Cytotaxonomic Investigations of Native Blackberries in Nova Scotia", by L. E. Aalders and I. V. Hall; 3. "Characterization of Fish Species by Vertical Starch Gel Electrophoresis of Various Tissue Proteins", by P. Odense and W. Shinners.

7*th Ordinary Meeting*, May 13, 1963.

Papers: 1. "Primary Production in the Bras d'Or Lakes, Cape Breton Island", by G. H. Geen; 2. "Positron Annihilation in Liquid Helium", by P. Gracii; 3. "Protein Synthesis in Cell Free Extracts of Neurospora Crassa", by Sandra McFarlane.

PROCEEDINGS OF MEETINGS

(Valley Chapter)

Session of 1962 - 1963

The Valley Chapter had forty-two members, plus two life members, during the year 1962 - 1963. The Chapter held six meetings during the year.

Annual Business Meeting, November 5, 1962.

Officers elected for the year 1962 - 1963 *were:*

President . . . . . Dr. R. G. Ross
Vice-President . . . . . Dr. R. G. Moore
Treasurer . . . . . Dr. H. B. Specht
Secretary . . . . . Dr. L. E. Aalders
Council Member . . . . . Dr. E. C. Smith.

Paper: "Activities of the Atlantic Regional Laboratory", by A. C. Neish.

1*st Ordinary Meeting*, December 3, 1962.

Papers: 1. "A Report on the Standardization of Terminology and Survey Procedures in Geology and Engineering", by R. H. MacNeil; 2. "Physiology of Cereal Rusts", by F. R. Forsyth.

2*nd Ordinary Meeting*, January 7, 1963.

Papers: 1. "Problems in the Sampling of Insect Predator Population on Apple Trees", by F. T. Lord; 2. "Space Photography and its Applications to Earth Science", by H. L. Cameron.

3*rd Ordinary Meeting*, February 4, 1963.

Papers: 1. "Partial Synthesis of Potentially Physiologically Active Compounds from Podocarpic Acid", by J. Wilson; 2. "A Laboratory Evaluation of Fungicides for Use in Smoke Generators", by C. L. Lackhart; 3. "Further Studies on Mushrooms in Nova Scotia", by K. A. Harrison.

4*th Ordinary Meeting*, March 4, 1963.

Papers: 1. "Prescalene Fat Pad Biopsy in Thoracic Disease", by J. J. Quinlan; 2. "Pheasants in Nova Scotia, Their Introduction, Distribution and Population Dynamics", by N. van Nostrand; 3. "Intermittent Positive Pressure Breathing in Diagnosis and Treatment of Lung Disease", by G. A. Kloss and E. W. Crosson.

5*th Ordinary Meeting*, April 22, 1963. (Joint meeting with parent chapter)

Papers: 1. "Interaction of Acridines with Nucleic Acid", by J. A. McCarter; 2. "Cytotaxonomic Investigations of Native Blackberries in Nova Scotia", by L. E. Aalders and I. V. Hall; 3. "Characterization of Fish Species by Vertical Starch Gel Electrophoresis of Various Tissue Proteins", by P. Odense and W. Shinners.

ABSTRACTS

(Papers read before the Institute but not published in the Proceedings).

An X-Ray Study of Some Nova Scotia Zeolites. By F. Aumento, Dalhousie University. (Read November 12, 1962). A precise X-Ray diffractometer study was made on a series of Zeolites, namely stilbite, heulandite, analcite, apophyllite, chabasite, natrolite, mesolite and laumontite from the Triassic basalts of Nova Scotia in order to identify them and their intergrowths, and to determine as accurately as possible their respective "d" spacings and intensities of reflection. Results so obtained were compared with values given in previously published literature for samples from other localities.

Physical, chemical, morphological and optical studies were also carried out on the same specimens and results were related to the X-Ray data. This showed intergrowths between natrolite and mesolite, and that stilbite and heulandite were never found free from each others' intergrowths; minerals definitely identified as heulandite by optical methods showed microscopic intergrowths with stilbite, and the X-Ray diffraction patterns obtained identified them as mixture of predominantly stilbite with a little heulandite very similar to the patterns obtained from optically determined stilbite. A probable sequence of crystallization was also suggested.

To account for the variation in "d" spacings for different samples of the same mineral, X-Ray diffraction measurements were made with the sample at different steady temperatures to study the effect of heating and dehydration on the crystal structure; cell dimensions generally decreased with temperatures up to 200°C and on cooling did not completely revert to pre-heating values.

Theoretical calculations supported by experimental results were also made with the aid of an electronic computer to determine possible indices for the various "d" spacing reflections obtained; finally unit cell dimensions were calculated on the computer by the solution of a series of simultaneous equations relating the "d" spacings with the cell parameters and the indices of reflection.

A Diuretic Hormone in Rhodnius Prolixus Stal. By S. Maddrell, Dalhousie University. (Read November 12, 1962). The larvae of Rhodnius take very large meals of blood of up to twelve times their own weight. To avoid the difficulties of remaining this size, they produce a copious flow of urine which goes on until about 45% by weight of the meal has been lost. The digestion of the blood corpuscles does not begin until later and so no valuable part of the food is lost.

A preparation of the isolated Malpighian tubules was kept under liquid paraffin in a drop of haemolymph continue secretion. The rate of secretion can be estimated by measuring the size of the drop of secretion at different times. The rate is at first high but soon falls to a very low level. If haemolymph from a freshly fed insect is now added to the haemolymph bathing the tubules a further burst of secretion follows. Haemolymph from an unfed insect has no effect.

To identify the source of the factor responsible, the activity of breis of various tissues in insect Ringer was tested using the tubule preparations. Only the central nervous system was shown to possess such diuretic activity. The fused ganglionic mass in the mesothorax (which comprises the meso- and metathoracic and all the abdominal ganglia) was by far the richest source.

Ligating the intact fed insect anterior to the ganglionic mass had no effect on the diuresis, but it could be cut short by placing a ligature between the mass and the Malpighian tubules. Testing for diuretic activity the haemolymph samples taken from in front of and behind ligatures at various positions on the insect's body showed that only those parts of the insect that included the ganglionic mass contained active haemolymph.

The ganglionic mass contains several groups of neurosecretory cells. The diuretic activity, as estimated with tubule preparations, was shown to be confined to the cells of the two hindmost groups.

It is concluded that the factor responsible for the diuresis of fed Rhodnius is a neurohormone liberated from the posterior neurosecretory cells of the fused ganglionic mass to be found in the mesothorax.

The Antipeptic and Antithrombic Properties of Carrageenin. By W. W. Hawkins and Verna G. Leonard, Atlantic Regional Laboratory. (Read November 12, 1962). Carrageenin is a sulphated galactan present in the red seaweeds Chondrus and Gigartina. It has been separated into two components designated K- and λ-carrageenins, by precipitating the former with KCl in about 0.2 M concentration. λ Carrageenin has the higher sulphate content. It has been shown that carrageenin has an antipeptic action. There are conflicting reports concerning an anticoagulant action in blood. Experiments were done to define the possible anticoagulant activity, and to compare K- and λ-carrageenin in this respect and as antipeptic agents.

The antipeptic activity of carrageenin was demonstrated *in vitro*, and the λ -fraction was shown to be about twice as active as the K-fraction.

An anticoagulant action was demonstrated in human blood *in vitro*. It was three to five times as effective against the thrombin time as against the prothrombin time. The carrageenins thus resemble heparin by inhibiting principally the terminal stage of clotting, the transformation of fibrinogen to fibrin. The λ -fraction was about 10 times as active as the K-fraction. In the same tests on dog blood λ -carrageenin was also more potent than the K-fraction.

Carrageenins were given to dogs intravenously. When the doses were above about 3 mg. per Kg. of body weight there was a demonstrable anticoagulant action. It affected principally the thrombin time. λ-Carrageenin was more active than K-carrageenin.

For each carrageenin, and for heparin, there was a certain range of concentrations in dog plasma that showed an approximately linear relationship to the thrombin time. From the slopes of such lines the antithrombic activities of λ-carrageenin, the unfractionated material, and K-carrageenin appeared to be respectively about 1/13, 1/24, and 1/34 that of heparin.

In plasma from both dogs and human subjects there were certain concentrations of the carrageenins above which larger amounts did not proportionately affect the thrombin time. These concentrations were lower in the case of human plasma, so that estimation of comparative activities was more difficult. On the basis of amounts required to double the thrombin time, however, the carrageenins, in the order stated above, were 1/17, 1/50 to 1/70, and 1/100 to 1/200 as potent as heparin in human blood plasma.

PEBBLE ASSOCIATIONS IN SOUTHERN NOVA SCOTIA MORAINE. By D. R. Grant, Dalhousie University. (Read December 10, 1962). A reconnaissance survey of pebble lithology in glacial ground moraine was carried out over a 5,000 square mile area along the Atlantic Coast of Nova Scotia. Its purpose was twofold: 1. To test the applicability and techniques of this aspect of Pleistocene geology, before initiating a province-wide survey, and, 2. To provide information for the current sedimentological investigation of the Scotian Shelf.

One hundred and sixty bulk samples of clayey till were collected. The 5mm to 22mm gravel fraction was retained by washing in a specially constructed apparatus. The percentage composition was determined by number frequency analysis of 300 - 700 grain random samples. Each sample contained an average of eight different types, and altogether fifty rock types were common. These were derived from six major source areas, namely: 1. The Cobequid Mountains: granite, syenite, tuff; 2. North Mountain: amygdaloidal basalt; 3. Minas Basin: red sandstones; 4. Batholiths of southern Nova Scotia: grey granite; 5. Southern Nova Scotia: quartzite, slate, schist of the Meguma; 6. New Brunswick massif: metamorphics.

Four till types were recognized. These developed over granite, quartzite and slate were lodge tills containing 70 percent to 100 percent of the underlying rock type. Overlying these in the form of drumlins was a till consisting chiefly of Minas and Cobequid types. Distribution maps for each component showed: 1. transport depended on erodability, areal extent and topographic prominence; 2. a distinct lobate pattern of dispersal for the content of Minas and Cobequid types in the lodge tills; 3. well-defined lateral boundaries for North Mountain and Cobequid types; 4. evidence in the Yarmouth area of an east to west movement.

The results obtained from this rather limited sampling and evaluation are very encouraging. A broader program would supply information of far-reaching significance.

THE NATURE OF ACETYLCHOLINE-LIKE ACTIVITY RELEASED FROM BRAIN IN VIVO. By J. C. SZERB, Dalhousie University. (Read December 10, 1962). It has been reported recently that brain contains, besides acetylcholine, the coenzyme A esters of γ-butyrobetaine; crotonbetaine and carnitine. These betaines have been claimed to possess the same biological effects as acetylcholine but differ from acetylcholine by having higher Rf values when chromatographied in a water-n-butanol system. The purpose of this investigation was to obtain evidence for the release of these betaine esters from the cortex of anesthetized cats. The somatosensory cortex was perfused, at the location of maximum evoked potentials following the stimulation of the contralateral limb, with Locke's solution by means of Gaddum's push-pull cannula. Samples were collected after irreversible inhibition of local cholinesterase by diisopropylfluoro-phosphonate. The activity of a 3.0 ml sample collected during two hours, under continuous stimulation of the contralateral fore-paw, was assayed against acetylcholine on leech muscle suspended in a microbath and on the blood-pressure of an eviscerated cat. Whilst the relative activity of the perfusate on the two preparations differed only by a factor of 1.26, the relative activity of γ-butyrobetaine ethyl ester, the betaine ester most closely related to acetylcholine, differed by a factor of 29.2.

Another sample collected from the brain during continuous stimulation was chromatographied in water saturated n-butanol and showed an Rf of 0.1, the same as acetylcholine, while γ-butyrobetaine ethyl ester had an Rf of 0.4. Therefore no evidence for the release of betaine esters was found. The findings rather confirm the earlier opinion that the cholinergic transmitter in the brain is acetylcholine or a very similar ester.

The Influence of Pulse Wave Velocity and Peripheral Resistance in Ballistic Stroke Volume Determinations. By W. T. Josenhans, Dalhousie University. (Read December 10, 1962). Ballistocardiography (BCG) since its discovery by Henderson, and its revival by Starr, 1939, was frequently tried as a single means of measuring cardiac stroke volume. With the introduction of the ultra low frequency longitudinal BCG, new attempts in this direction were made by Nickerson, and independently by Klensch, and formulae for the calculation of the stroke volume from BCG data are in clinical use.

This paper deals with an investigation of the influence of peripheral resistance and pulse wave velocity changes on the BCG of a specifically developed hydrodynamic circulation model. It was found that stroke volume determinations from ULF BCG depend mainly on the sum of volume changes in aorta and larger arteries produced by the systolic emptying of the heat ventricles on the one hand and the resistance to diastolic outflow on the other hand. Changes in peripheral resistance, as well as changes of the aortic wall elasticity, (pulse wave velocity) result in different ballistic amplitudes at a constant stroke volume. The importance of this finding for any ballistic stroke volume determination is obvious.

Solid State Chemistry of Some AMO_3 Compounds. By M. Sweeney and W. R. Trost, Dalhousie University. (Read January 14, 1963). The change in energy and the change in mass of an iso-electronic iso-structural group of compounds has been studied at temperatures up to 1400°C with, and without, the presence of the solid diluents, alumina and magnesia. With, or without, diluents in both DTA and TGA, the nitrate decompositions were more complex than the carbonates. The thermal stabilities decreased in the order $CO_3 > NO_3$ and Ba > Sr > Ca and K> Na > Li. Dilution was accompanied by lower reaction temperatures. The lowering was up to 50°C in decompositions and 15°C in transitions. Dilution in some cases did, and in some cases did not, alter the heat of decomposition.

The Utilization of Marine Oils. By P. M. Jangaard, Fisheries Experimental Station. (Read January 14, 1963). The studies on the utilization of marine oils at the Technological Station have been chiefly concerned with segregating and chemically modifying methyl ester fractions produced from the oils. The following steps have been investigated: A continuous pilot-plant reactor for the production of methyl esters has been constructed and operated. Glycerol has been recovered in U.S.P. purity. The countercurrent extraction of methyl esters with nitromethane has been studied using gas-liquid chromatography. Fatty alcohols have been prepared from the oils and the various methyl ester fractions.

MAGNETIC ANOMALIES ON THE EASTERN SEABOARD OF CANADA. By M. J. KEEN, Dalhousie University. (Read January 14, 1963). Analysis of aeromagnetic data has shown that large magnetic anomalies are present over the continental shelf and slope off the Maritimes. The trend of anomalies northeast of Labrador and Newfoundland is curious in that it is possible that the trend is across the continental slope and the continental shelf, although measurements must be made at sea before this can be stated with confidence. The large anomalies south of Newfoundland were investigated from CNAV Sackville in 1962 and a preliminary examination of the results suggests that they run parallel to the margin of the continental shelf, which in this region is across the trend of the Appalachian structures known on land in Nova Scotia and Newfoundland. It is interesting to see that a body of rock of the shape of the edge of the continental shelf and slope could in some circumstance produce the field which is observed.

PREDICTING THE INFLUENCE OF DREDGING ON THE SALINITY OF LAKE MARACAIBO. By L. A. E. DOE, Bedford Institute of Oceanography. (Read February 11, 1963). Lake Maracaibo, the site of the Venezuela great oilfields, has a tidal connection with the Gulf of Venezuela and a chlorinity which is of the order of 2,000 p.p.m. In the past the modal value has been some 750 p.p.m. and variations on a range of 400 to 1200 were explainable in terms of rainfall and run-off.

In 1955 the entrance channel was deepened from 22 to 35 ft., and in 1960 to 45 ft. Plans are now contemplated to deepen it to 50 ft. It is shown that this deepening may be expected to result in increased density currents carrying saline water along the bottom of the channel into the lake, and that the consequent increase in the long term mean salinity should be exponential function of channel depth. The observed increase seems to be of the same order as that predicted, but specific testing of the figures must await computation of the water balance of the lake for recent years and sampling over a longer term.

SOLUBILITY MEASUREMENTS FROM LIGHT SCATTERING. By R. F. PLATFORD, Bedford Institute of Oceanography. (Read February 11, 1963). It is found that the addition of base to solutions of ferric salts results in no changes in turbidity until a definite pH is exceeded which is characteristic of the initial ferric ion concentration. Increases in pH above this value lead to a steady increase in turbidity which is presumably due to the formation of increasing amounts of colloidal ferric hydroxide. It is then possible to calculate the solubility product of ferric hydroxide from a knowledge of the initial Fe^{+++} concentration and from the pH at which precipitation just begins to occur.

GAS-LIQUID CHROMATOGRAPHY OF POLAR COMPOUNDS. By R. G. ACKMAN and R. D. BURGHER, Fisheries Experimental Station. (Read March 11, 1963). The gas-liquid chromatography of polar compounds may be rendered difficult by association between polar groups in the molecules, or by reversible or irreversible absorption on the support medium or liquid substrate. As an example of how these effects may be offset a new method of analysing dilute aqueous solutions of volatile fatty acids is presented, involving addition of formic acid to the carrier gas in vapour form in conjunction with the flame ionization detector.

Behavioral Ecology of Two Microtine Rodents in Nova Scotia. By G. C. Clough, Dalhousie University. (Read March 11, 1963). The local distribution of *Clethrionomys gapperi*, the red-backed vole, and *Microtus pennsylvanicus*, the meadow vole, was studied in southern Nova Scotia. Results from 2789 trap nights at 15 locations and from two introduction experiments showed that the two species usually occupy distinct habitat types but they may both live in some types. The two species seldom co-exist in the same microhabitat which they are capable of occupying alone.

General activity and climbing behaviour of 12 adult *Microtus* taken from grassland and 12 adult *Clethrionomys* taken from spruce woods was measured in a standard test apparatus in order to examine the relationships of behavior and habitat preference. Individuals were tested for ten minutes at four weekly trials. The duration and frequency of six behavior patterns and the individual's location in four parts of the apparatus was recorded on a 10-channel continuous operations recorder. *Microtus* scored higher in total movement, number and duration of returns to shelter, grooming frequency, rearing on hind legs, investigating, falling off post and in defecation and urination. *Clethrionomys* scored higher in time spent motionless, number climbing to platform, speed of climbing and in emergency latency. Thus, *Clethrionomys* appears better able to utilize the third dimension of the forest habitat and seems more inhibited by the open-field situation than *Microtus*. The tendency to climb did not change with trials whereas the length of time spent in movement and and the frequency of rearing decreased with trials in both species. Further work is planned to ascertain the roles played by differences in heredity and by learning and experience in the determination of the species specific behavior demonstrated here.

Tanganyika Volcanoes. By J. B. Dawson, Dalhousie University. (Read March 11, 1963). The volcanoes of northern Tanganyika are divided into two main groups, the Older Extrusives and the Younger Extrusives. The two groups are morphologically and petrologically different and are separated by a major phase of faulting. The Older Extrusive volcanoes are composed mainly of olivine basalts and trachytes, and their broad shield-like morphology is due to the quiet extrusion of lavas with little explosive activity. In contrast the Younger Extrusive volcanoes, which post-date the faulting, are relatively small cone-shaped structures and represent the products of violent explosive eruptions; at many of these centres there are dykes of magmatic calcium carbonate, and the associated lavas are alkali-rich and silica-poor. Of all the volcanoes only Oldoinyo Lengai is really active, and during 1960 and 1961 unique lavas consisting mainly of sodium carbonate were erupted from the volcano.

PROCEEDINGS

OF THE

Nova Scotian Institute of Science

HALIFAX, NOVA SCOTIA

VOL. 26 1963-1964 PART 2

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Editor: H. S. Heaps

Editorial Board: Dixie Pelluet, J. A. McCarter and J. R. Dingle

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VOL. 26 - PART 2

THE FLORA OF NOVA SCOTIA

PART I

THE PTERIDOPHYTES, GYMNOSPERMS, AND MONOCOTYLEDONS

A. E. ROLAND

Nova Scotia Agricultural College, Truro, Nova Scotia

and

E. C. SMITH

Perry Biological Laboratories, Acadia University,
Wolfville, Nova Scotia

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 editionof 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.

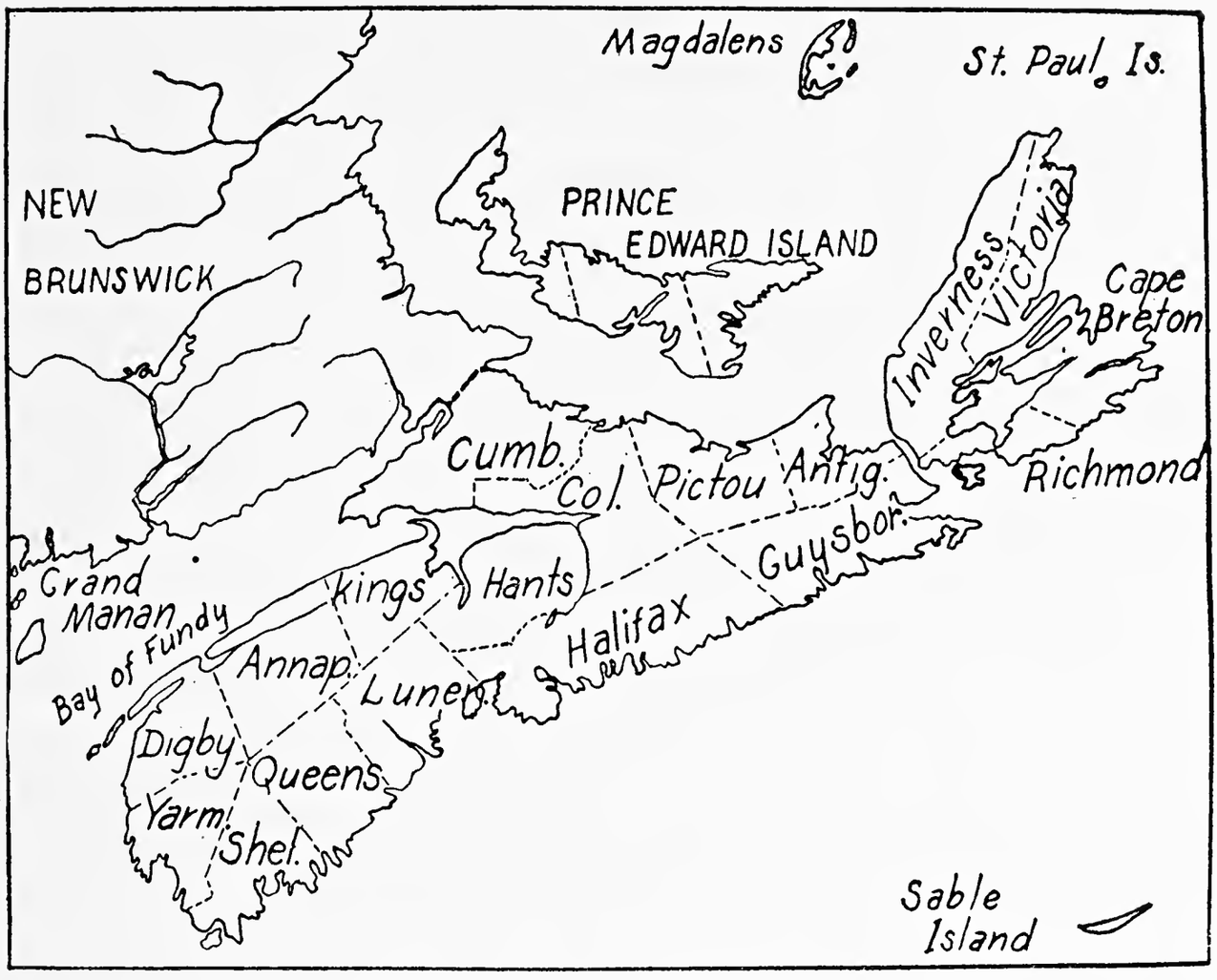
The treatment of the grasses is based upon that of Dore and Roland, published in 1942. W. G. Dore has been of special assistance over the years in identifying and commenting on the species of this most difficult group; and his permission to use this material is much appreciated. The section on *Potamogeton*, 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.

	Species	*Varieties*	*Forms*
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
	451	95	79
Introduced plants	63	6	6
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). *Taxaxeae* 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*

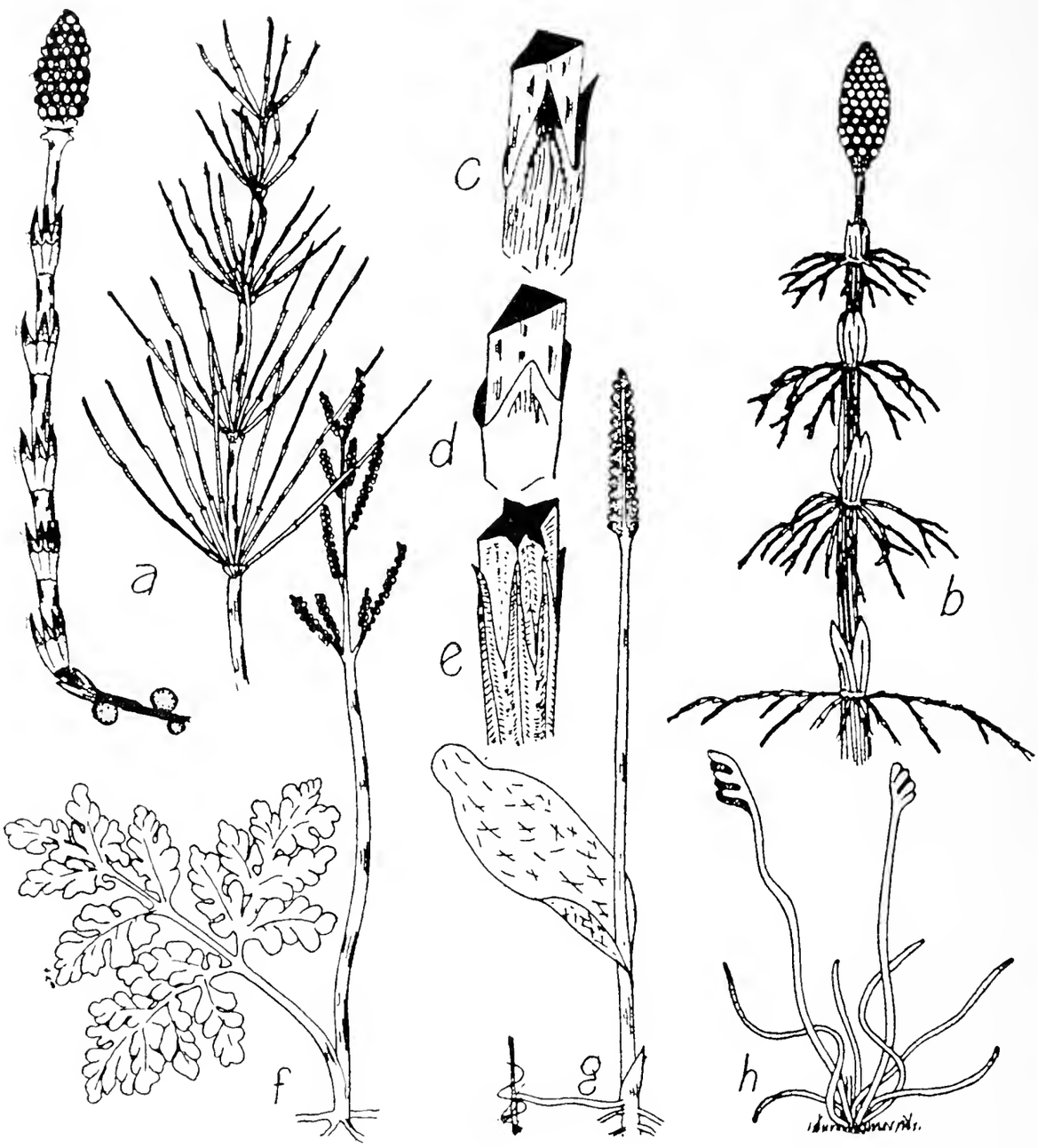


Figure 1.—**Equisetum.** a, **E. arvense,** x $\frac{1}{2}$. b, **E. sylvaticum,** x $\frac{1}{2}$. c.d.e, sheaths and teeth of **E. arvense, E. pratense** and **E. litorale. Botrychium.** f, **B. multifidum,** x $\frac{1}{2}$. **Ophioglossum.** g, **O. vulgatum,** x $\frac{1}{2}$. **Schizaea.** h, plant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

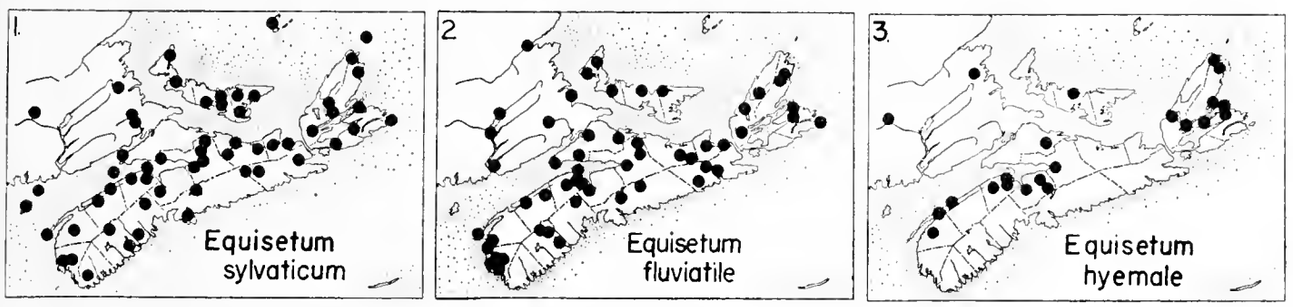
f. Central cavity of the main stem at least four-fifths the diameter of the stem, with outside cavities very small; sheaths with 15-20 teeth (Fig. 2, a,c); cones normal. 5. *E. fluviatile*

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. 7. *E. variegatum*
k. Stem with 8-12 angles or ridges; teeth retaining the bristle-like tips; plants more robust and taller. Var. *Jesupi*
i. Stem spreading and wiry, diffusely branched, at least near the base, without a central cavity, less than 1 mm thick (Fig. 2, b). 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. **pauciramosum** Milde. The more common form in N.S. is its forma **multiramosum** 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.

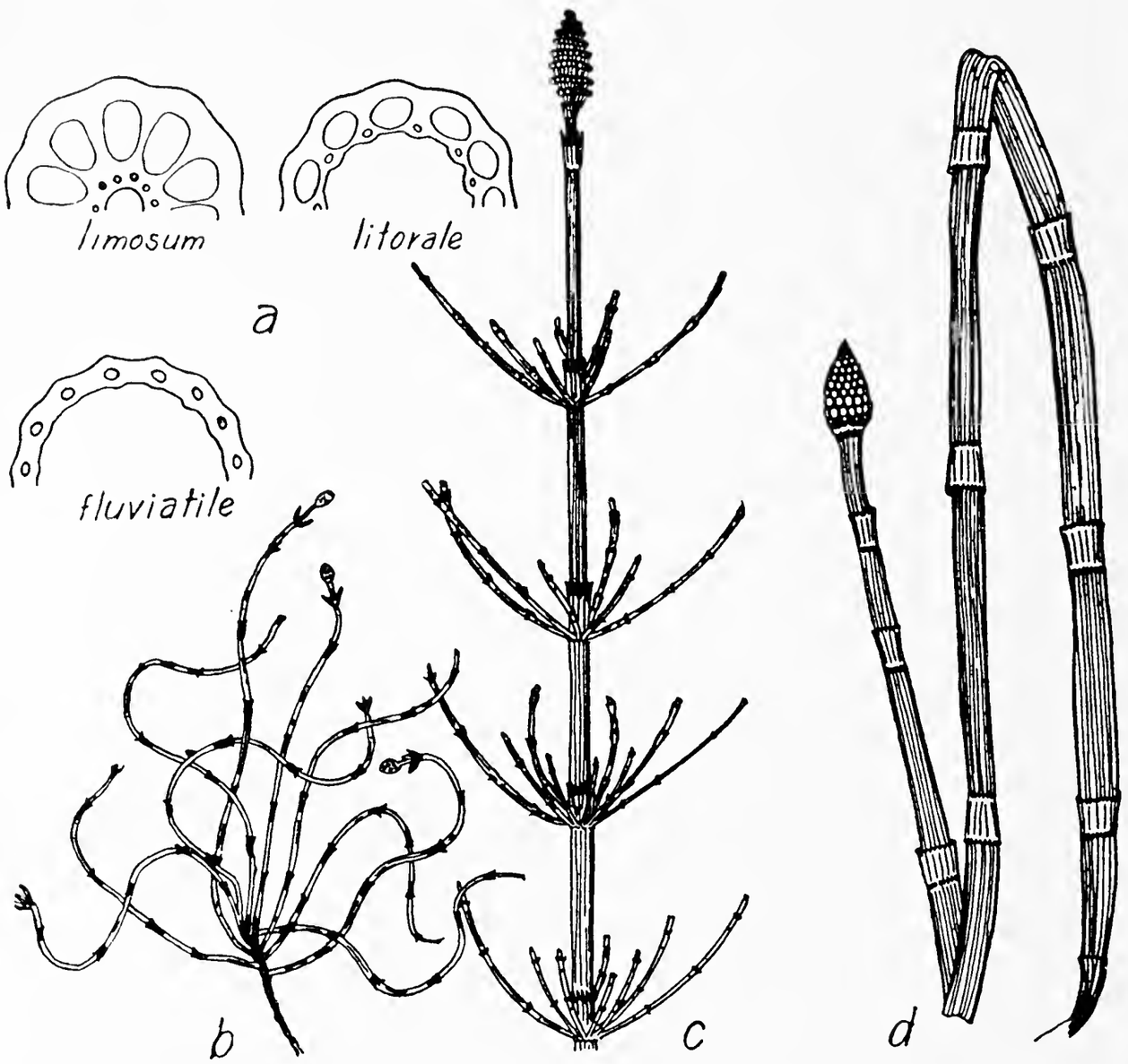


Figure 2.—**Equisetum.** a, cross-sections of the main stem. b, **E. scirpoides,** x $\frac{1}{2}$. c, **E. fluviatile,** x $\frac{1}{2}$. d, **E. hyemale,** x $\frac{1}{2}$.

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.

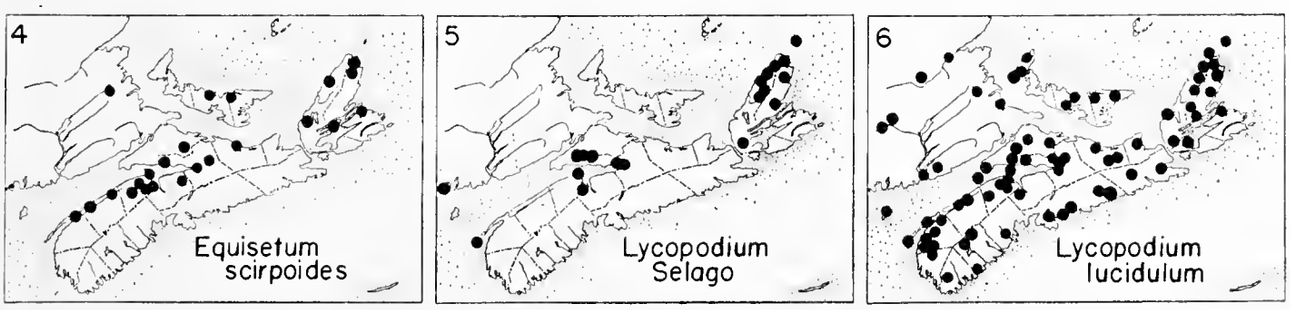
Var. **Jesupi** A. A. Eat. was collected later in August from a mucky roadside at Elmsdale and from a damp gravelly area near the bridge of the Shubenacadie River at Milford, both in Hants Co. Other collections from the Salmon River Valley above Truro probably belong here. The species seems to be the 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*

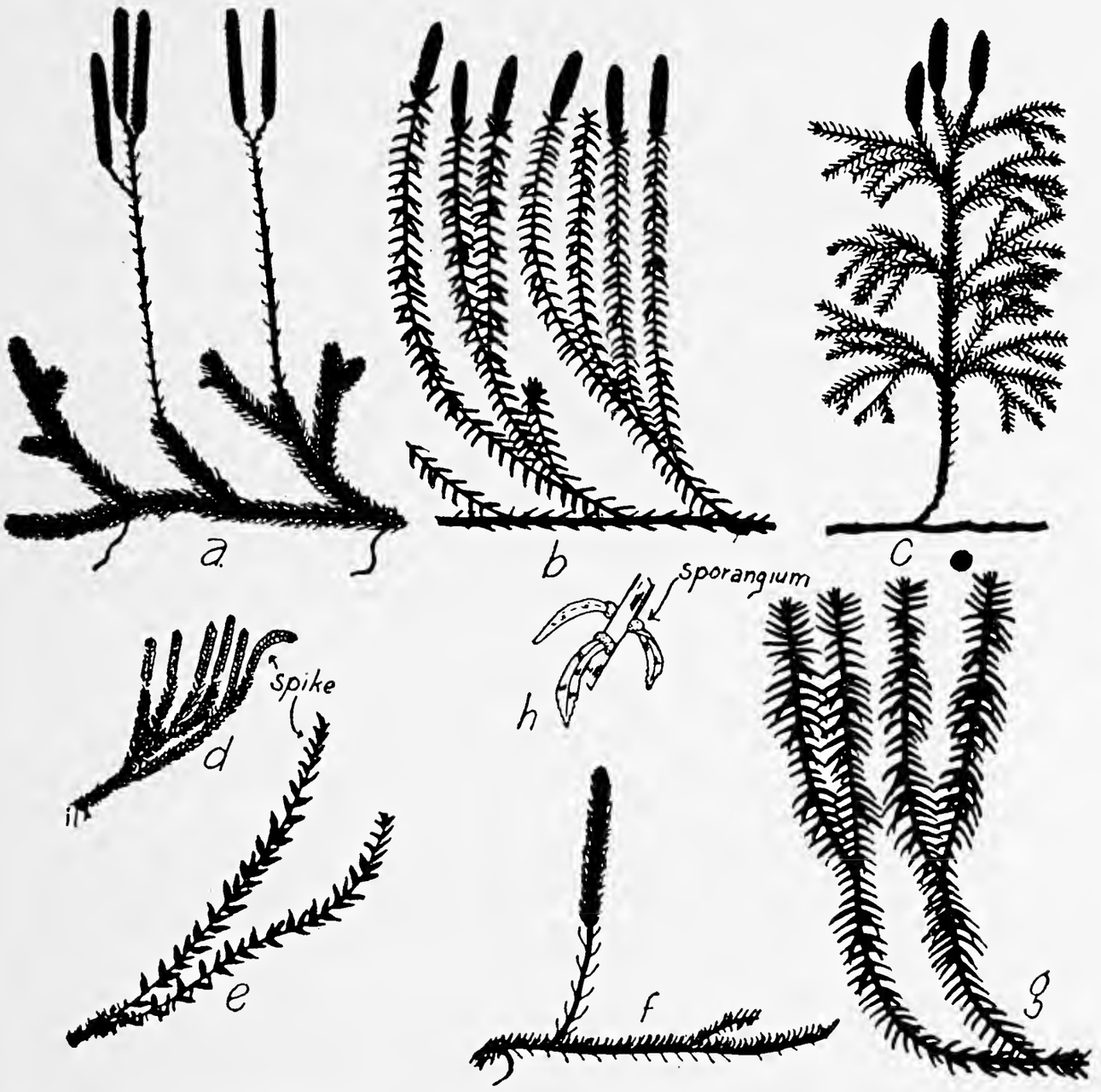


Figure 3.—**Lycopodium.** a, **L. clavatum.** b, **L. annotinum.** c, **L. obscurum.** f, **L. inundatum.** g, **L. lucidulum.** h, **L. lucidulum** leaves and sporangia. **Selaginella.** d, **S. rupestris,** x $\frac{1}{2}$. e, **S. selaginoides,** x $\frac{1}{2}$.

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

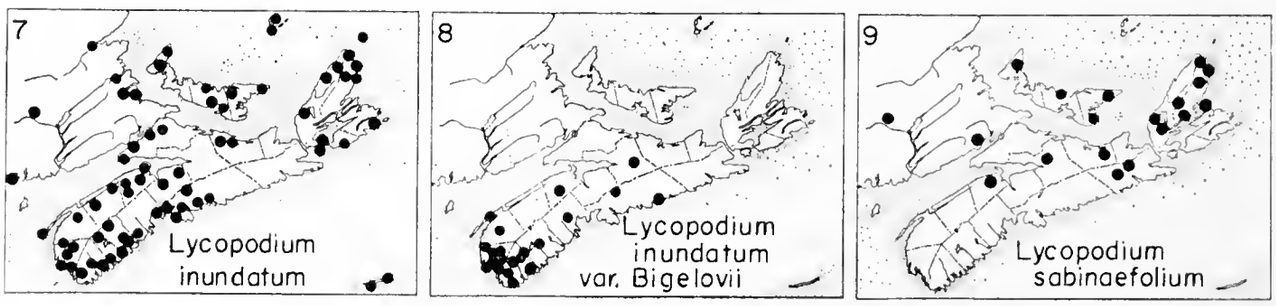
Common throughout; open dry hardwoods. Nfld. to Alaska south to Penn., Wisc. and Colo.

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 cylindric. 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.

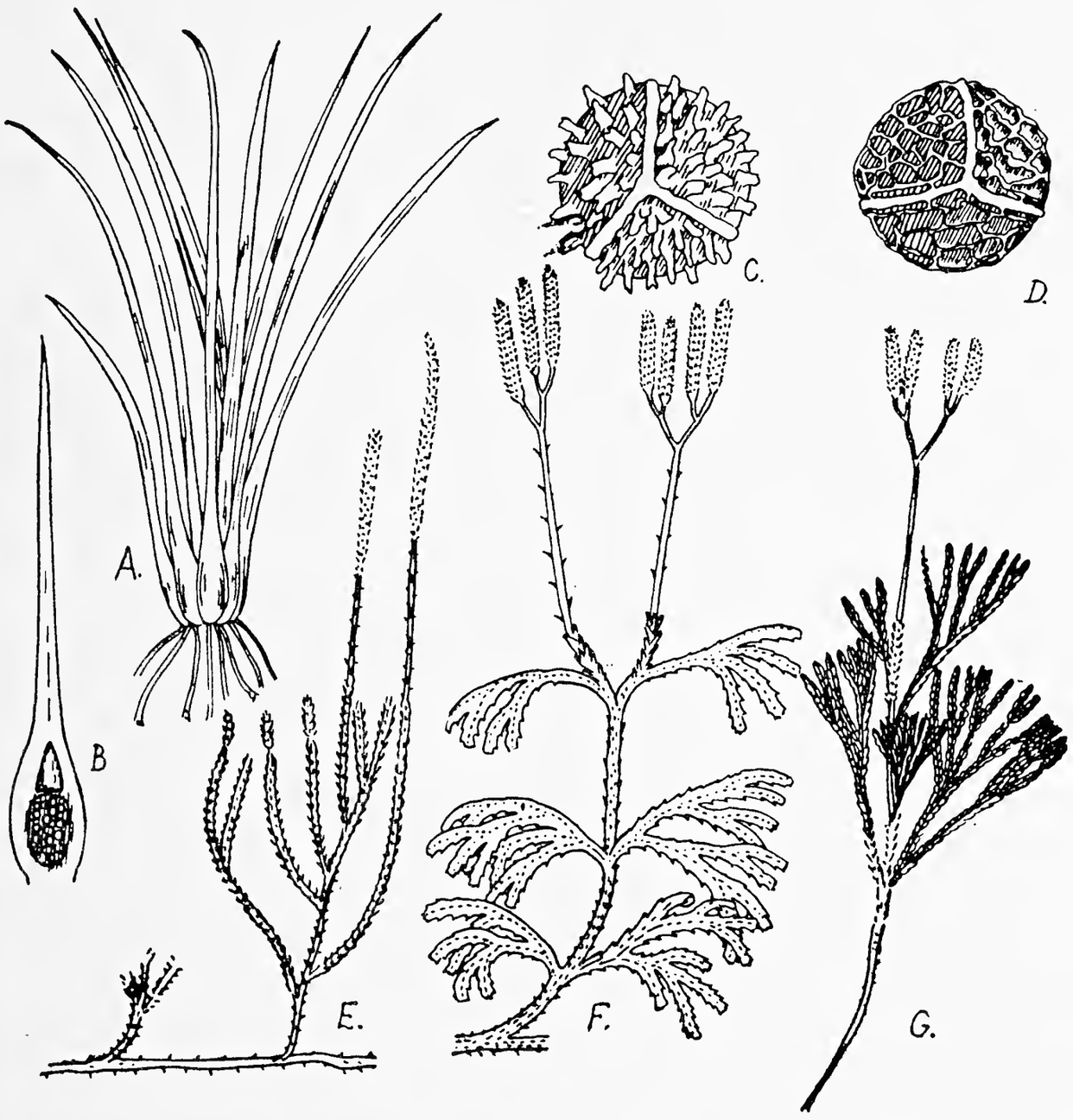
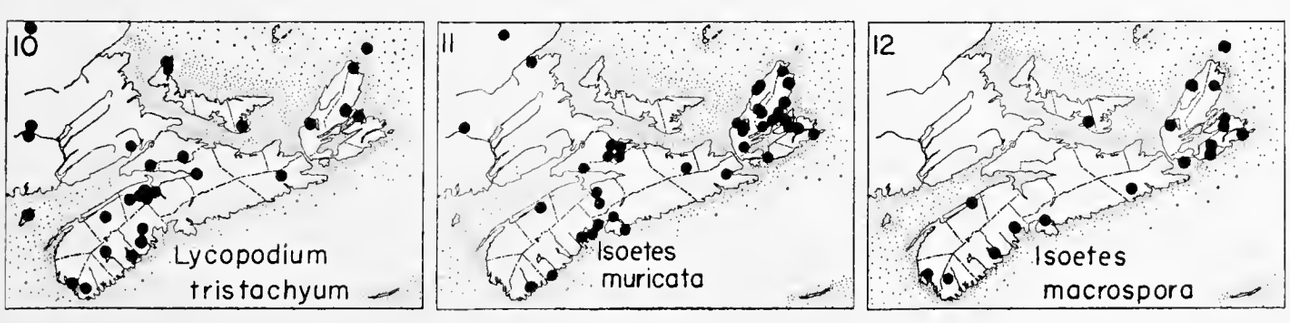


Figure 4.—**Isoetes.** a, habit sketch, x 1. b, inner view of a single sporophyll c, spore of **I. muricata,** x 40. d, spore of **I. Tuckermani,** x 40. **Lycopodium.** e, **L. sabinaefolium,** x $\frac{1}{2}$. f, **L. flabelliforme,** x $\frac{1}{4}$. g, **L. tristachyum,** x $\frac{1}{2}$.



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. Tuckermani** 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

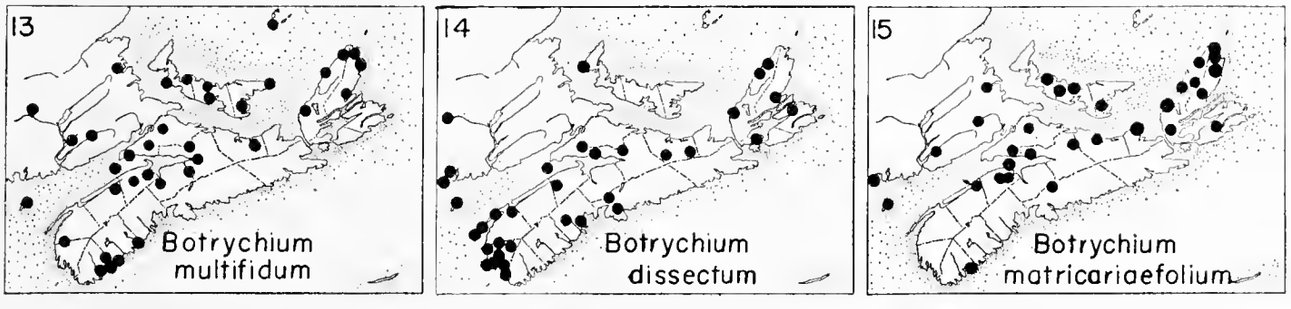
Rare in Shelburne and Yarmouth Cos., scattered from Digby Co. to northern C.B.: grassy pastures, old fields, exposed hillsides, occasionally in open woods. Luxuriant forms approach var. *intermedium* (D. C. Eat.)Farw. but the rather thick, crowded segments of the blade are more typical of the species.

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

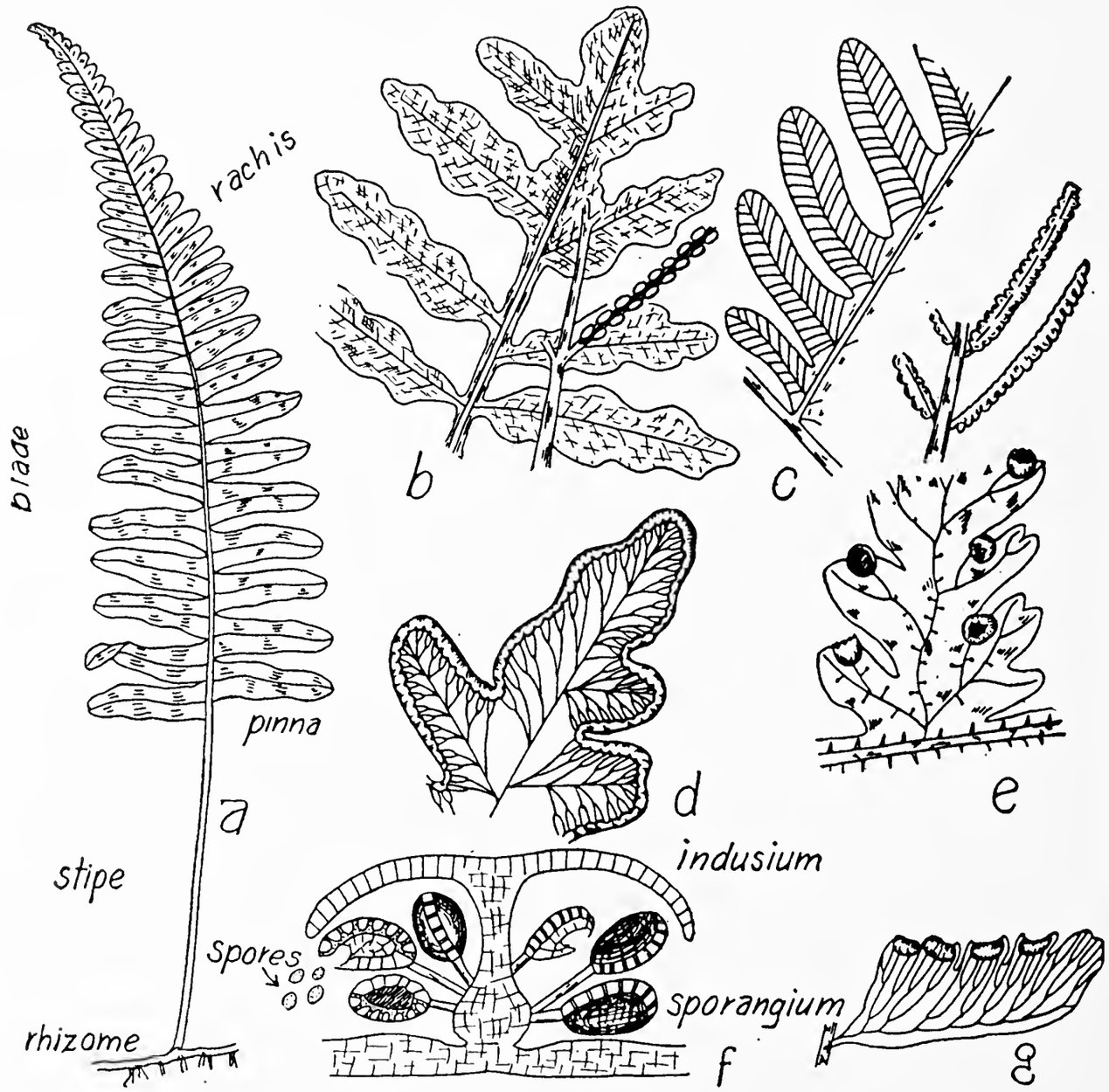


Figure 5.—**Polypodium.** a, plant x $\frac{1}{2}$. **Onoclea.** b, parts of fertile and sterile fronds x$\frac{1}{2}$. **Pteretis.** c, detail of pinna and part of fertile frond x3. **Pteridium.** d, small part of frond, x2. **Dennstaedtia.** e, part of pinnule showing sori, x3. Fern: cross-section through a sorus such as that of **Dryopteris,** highly magnified. **Adiantum.** g, pinna x1$\frac{1}{2}$.

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. **pseudopodum** (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*.

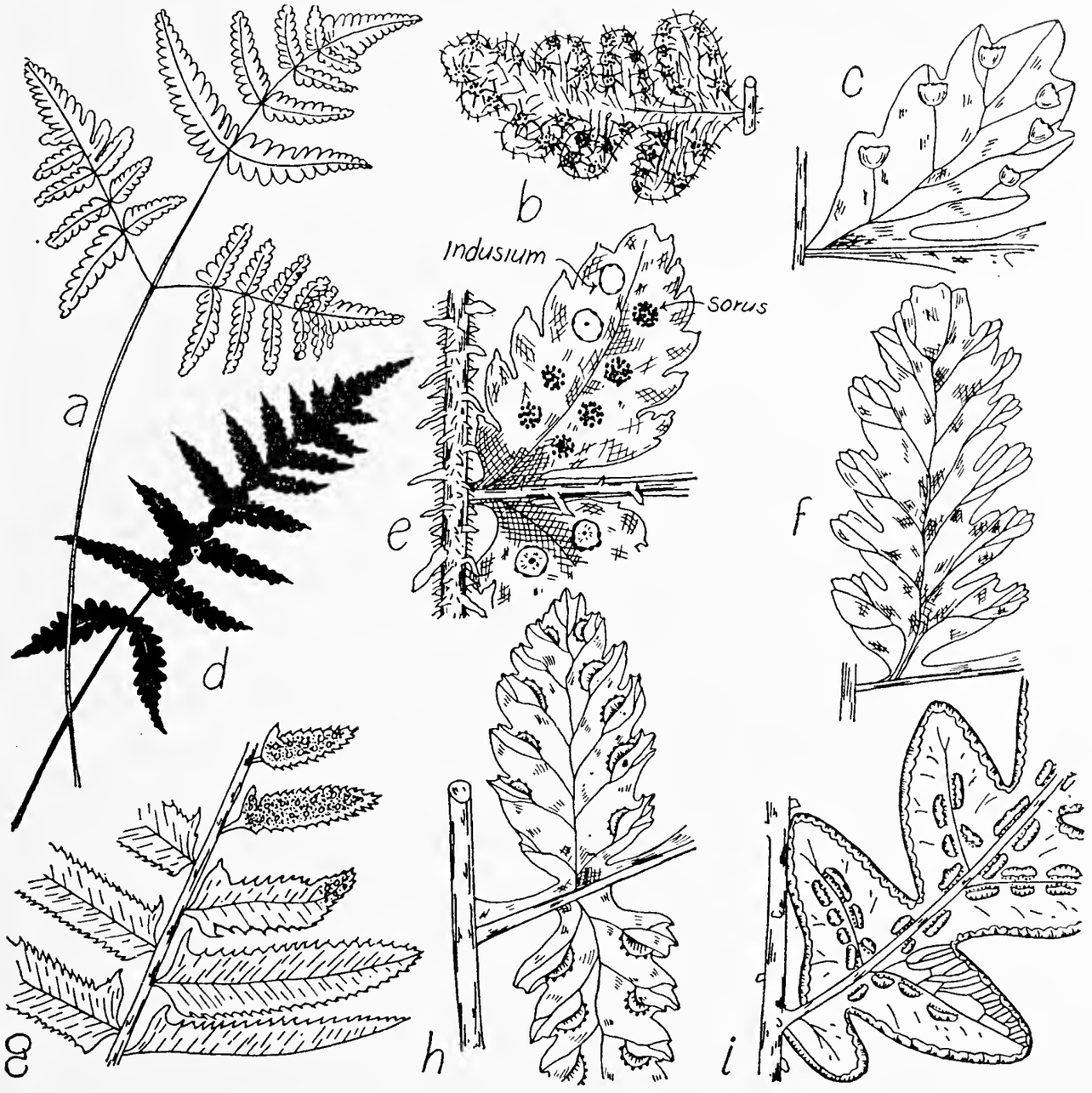
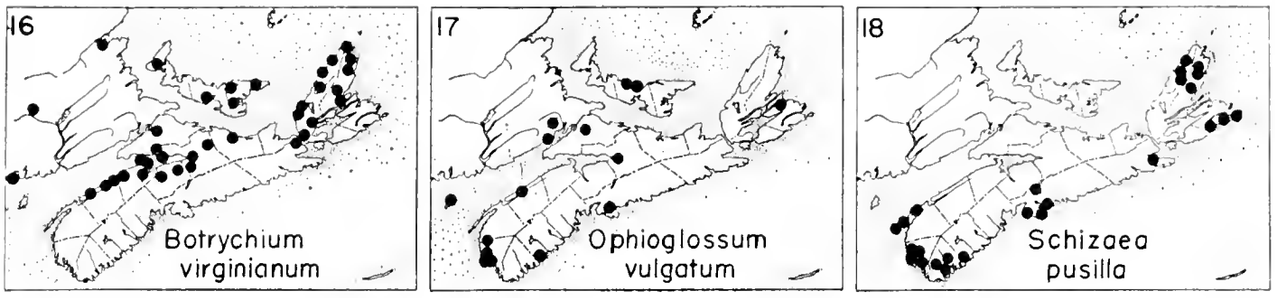


Figure 6.—**Dryopteris.** a, frond of **D. disjuncta,** x 1/3. d, **D. Phegopteris. Woodsia.** b, pinna of **W. ilvensis,** x 3. **Cystopteris.** c, pinnule of **C. fragilis,** x 5. f, pinnule of **C. bulbifera,** x 2. **Polystichum.** e, pinnules of **P. Braunii,** x $2\frac{1}{2}$. g, part of frond of **P. acrostichoides,** x $\frac{1}{2}$. **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.

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*

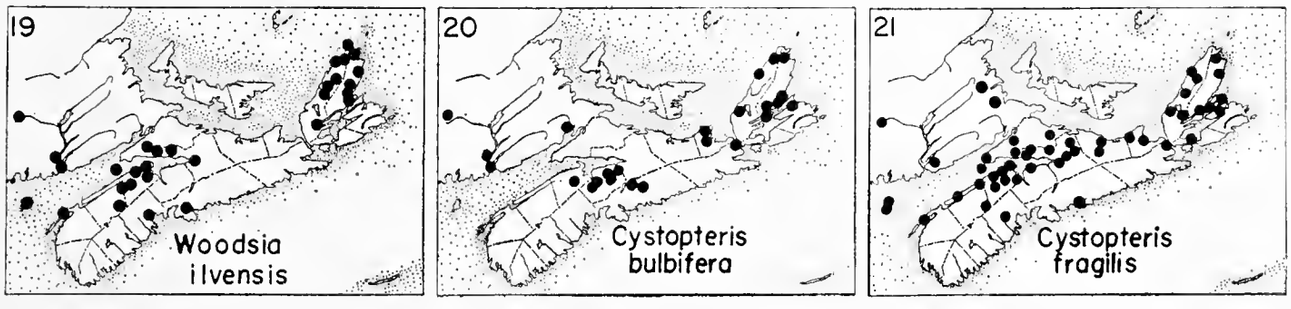
b. Stipes slender; rachis and midribs of the pinnae hairy but scarcely chaffy; pinnae with mostly 2-3 pairs of pinnules. 2. *W. alpina*

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., Gaspe, 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

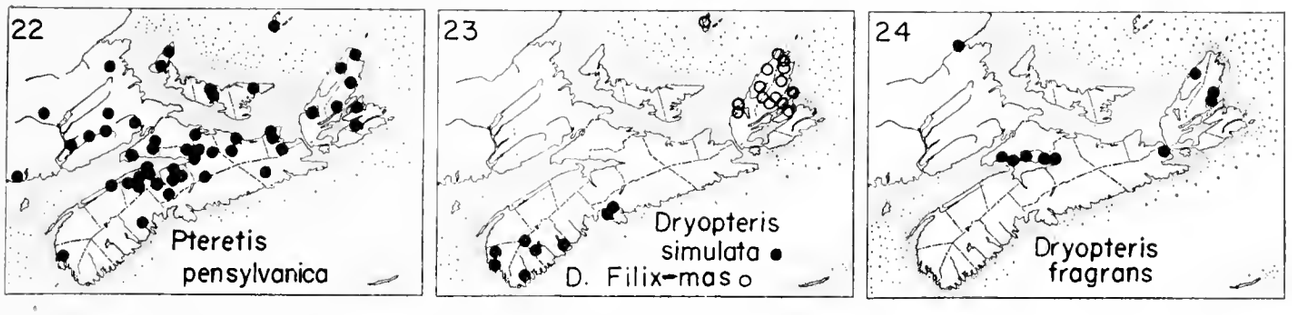
Common throughout the northern parts of the Province; shaded cliffs, rich moist woods and rocky crevices from Digby Neck and Cumberland Co. to northern C.B.; not found in southwestern N.S. and very rare in Halifax and Guysborough Cos. Intermediate forms between this and var. *Mackayii* often occur. Forma **cristata** (Lowe) Weath. has the fronds and their divisions much forked. This was reported from Whycocomagh 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,** x $1\frac{1}{2}$. e, pinnule of **D. cristata,** x $1\frac{1}{2}$. **Osmunda.** c, **O. Claytoniana.** f, upper part of frond of **O. regalis,** x $\frac{1}{2}$. g, detail of **O. Claytoniana** or **O. cinnamomea,** x $1\frac{1}{2}$. **Botrychium.** h, **B. matricariaefolium,** x $\frac{1}{2}$.

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.

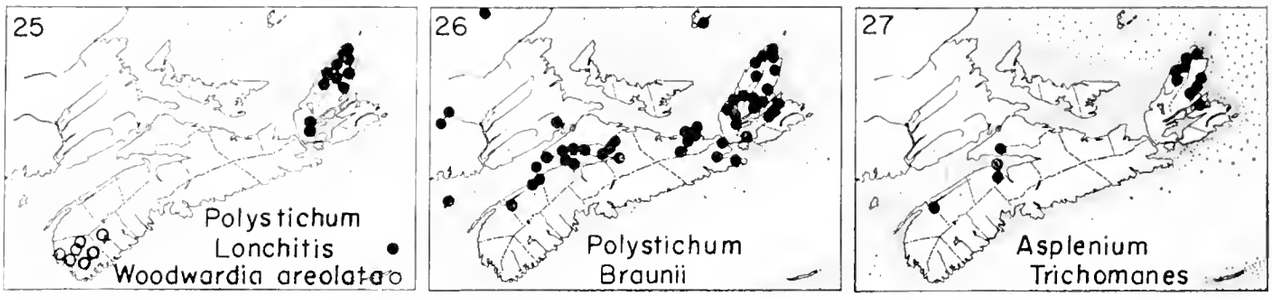
6. **POLYSTICHUM** Roth

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. thelypterioides*

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

1. **A. thelypterioides** (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 **elatius** (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.

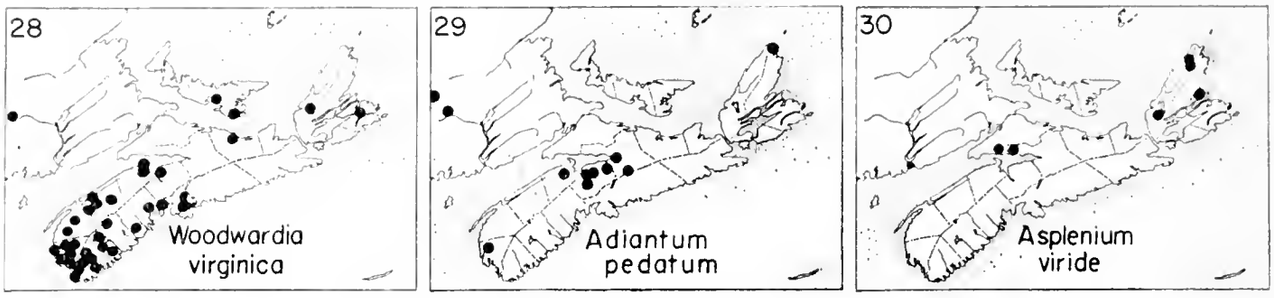
9. ASPLENIUM L.

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.

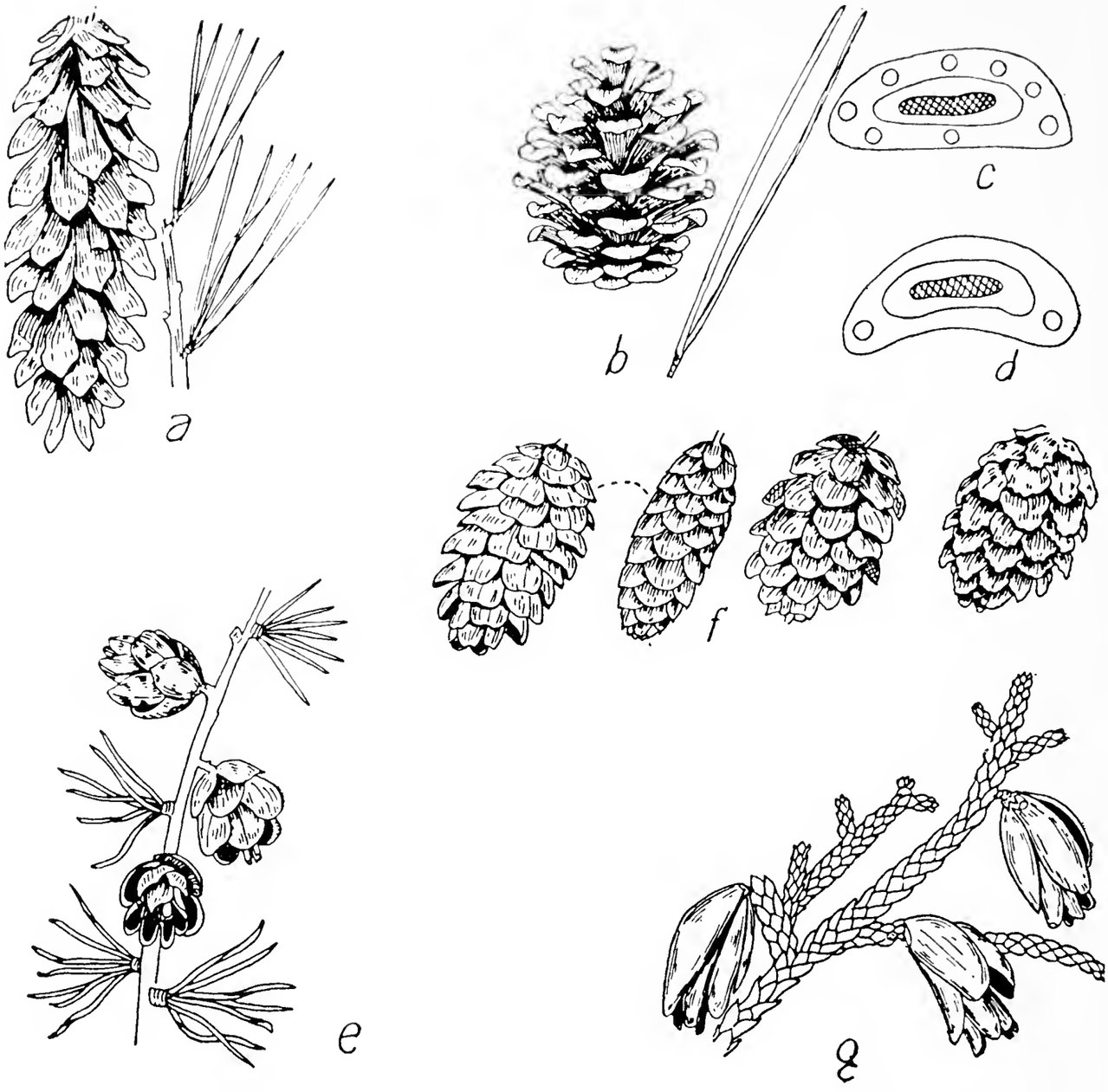


Fig. 8.—**Pinus.** a, **P. Strobus**, cone and leaves, x $\frac{1}{2}$. b, **P. resinosa**, cone and leaves, x $\frac{1}{2}$. c **P. sylvestris**, cross-section of leaf. d. **P. Banksiana**, cross-section of leaf. **Larix.** e, **L. laricina**, x $\frac{1}{2}$. **Picea.** f, cones of **P. glauca**, **P.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

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 exserted 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 peristing 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.

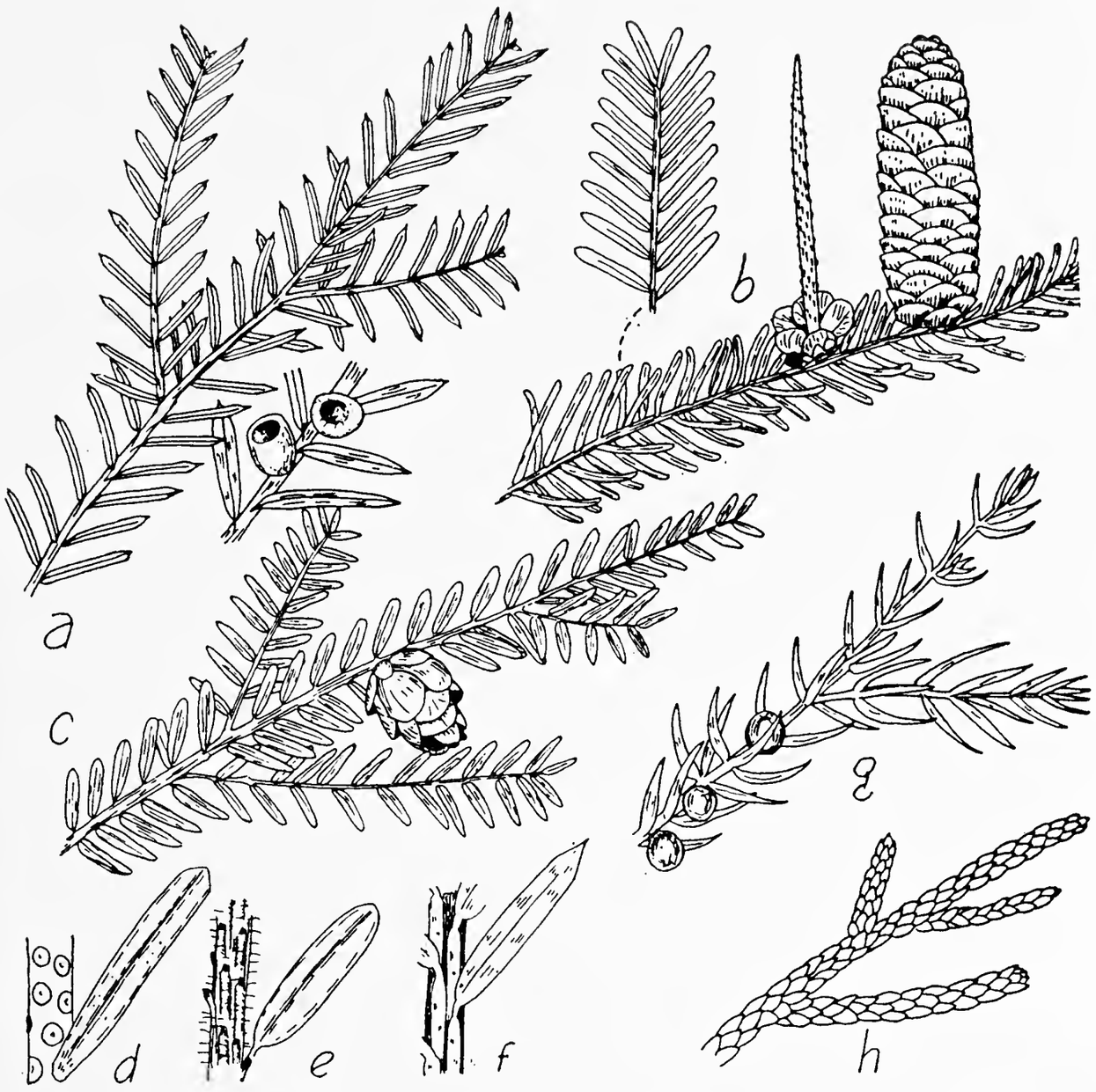


Fig. 9.—**Taxus.** a, **T. canadensis**, x $\frac{1}{2}$. **Abies.** b, twig, x $\frac{1}{2}$. **Tsuga.** c, twig, x $\frac{1}{2}$. d, **Abies.** e, **Tsuga.** f, **Taxus.** **Juniperus.** g, **J. communis**, twig, x $\frac{1}{2}$. h, **J. horizontalis**, twig, x 2.

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, HACKMATACK, "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

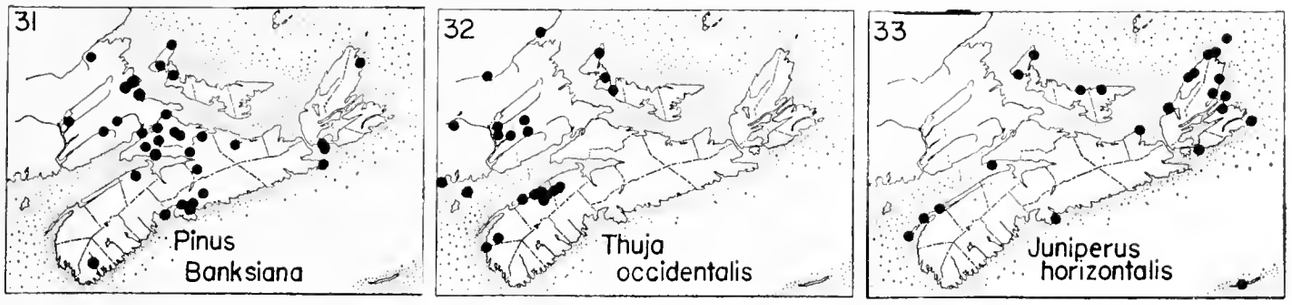
Common in the Annapolis Valley and on the lowlands of Colchester and Cumberland Cos. on sandy or rocky soils; scattered in other parts of the Province. It is occasionally found in poorly-drained areas, as on heath-bogs. The Austrian or Black Pine, *P. nigra* Arnold, is much more satisfactory as an ornamental 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. 1. *J. communis*
    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. 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.

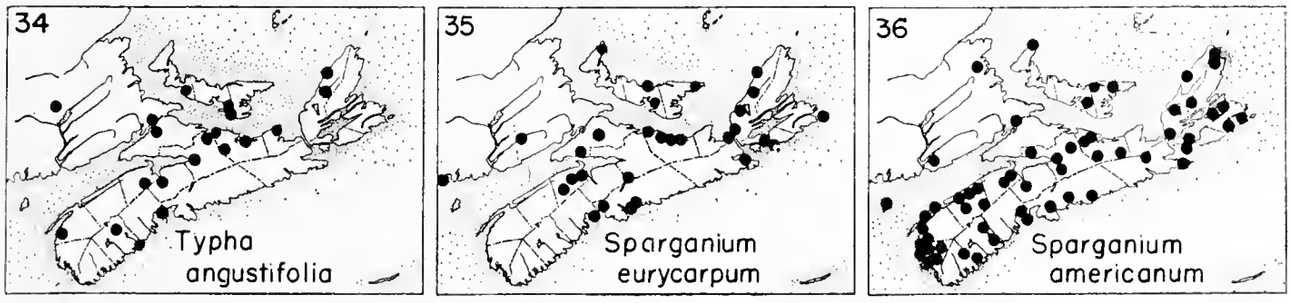
Forma **ambigua** (Sonder)Kronf. has the staminate and pistillate spikes separated. This form is scattered and possibly common; Hants, Colchester and Inverness Cos. (Smith and Schofield, 1952).

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*

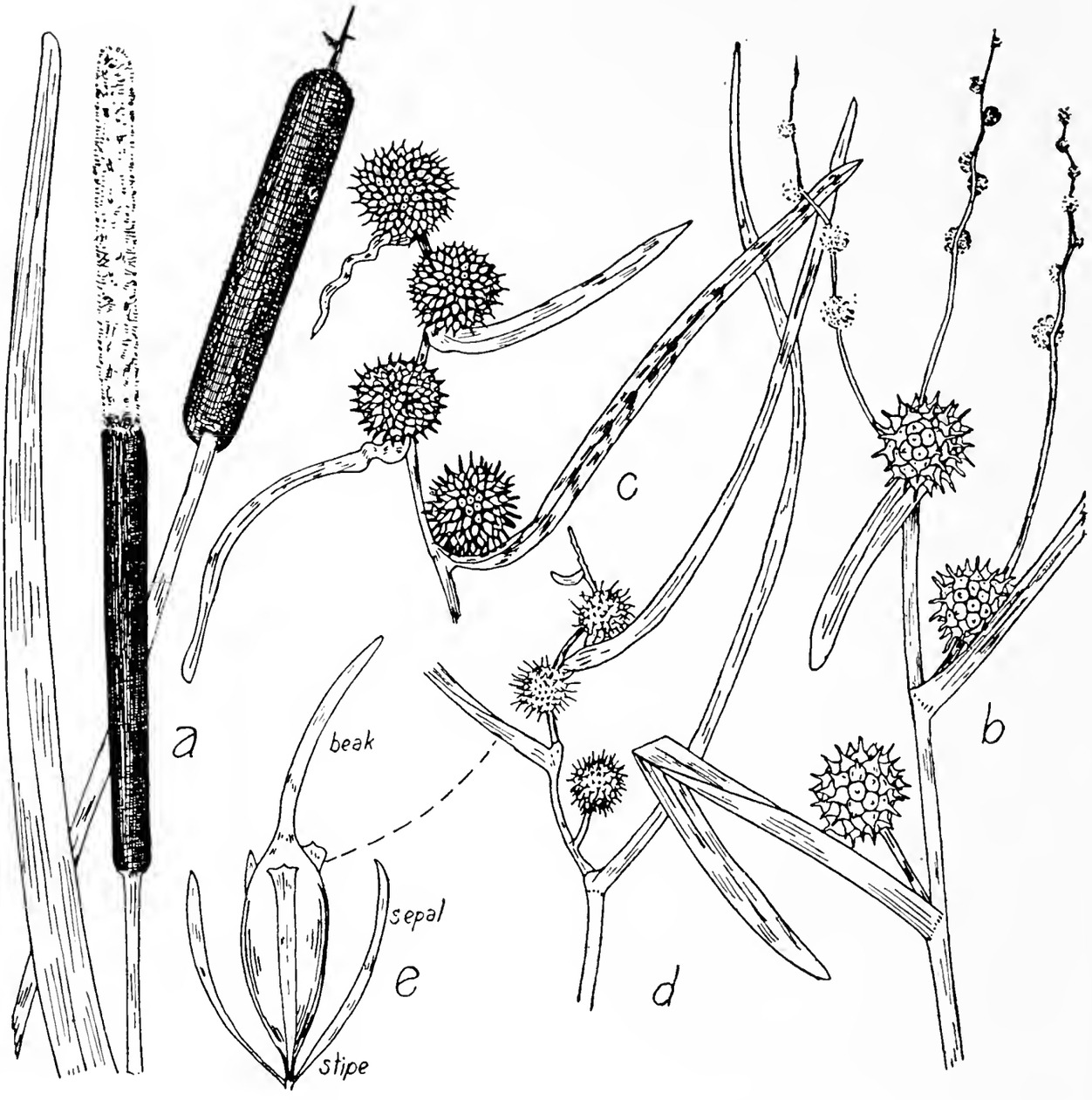


Figure 10.—**Typha latifolia,** a, plant, x $\frac{1}{4}$. **Sparganium.** b, **S. eurycarpum,** top of plant, x $\frac{1}{4}$. c, **S. americanum,** x 1/3. d, **S. fluctuans,** x 1/3. e, single floret of **S. fluctuans,** x 8

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.

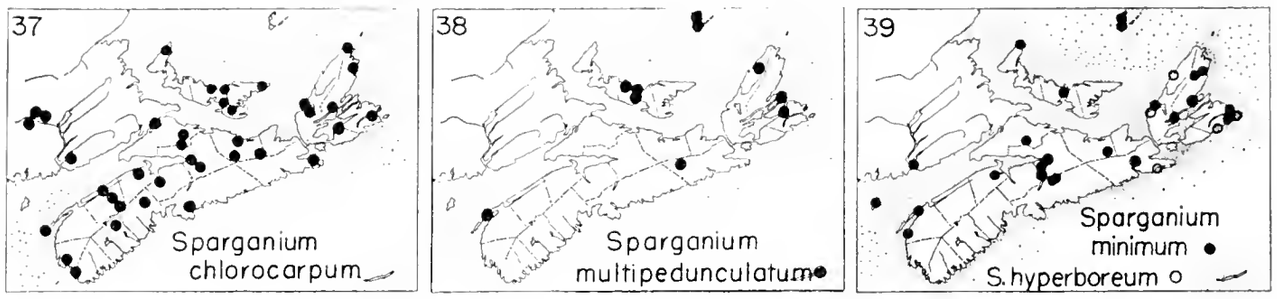
Rather rare; Sable Island, Sandy Cove and from several stations in northern C.B. (Smith and Erskine, 1954). It is found at the edge of fresh or brackish lakes or ponds, as in the pond at Sandy Cove, Digby Co., or in the pond near Presque Isle in Inverness Co.

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. Friesii*

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*

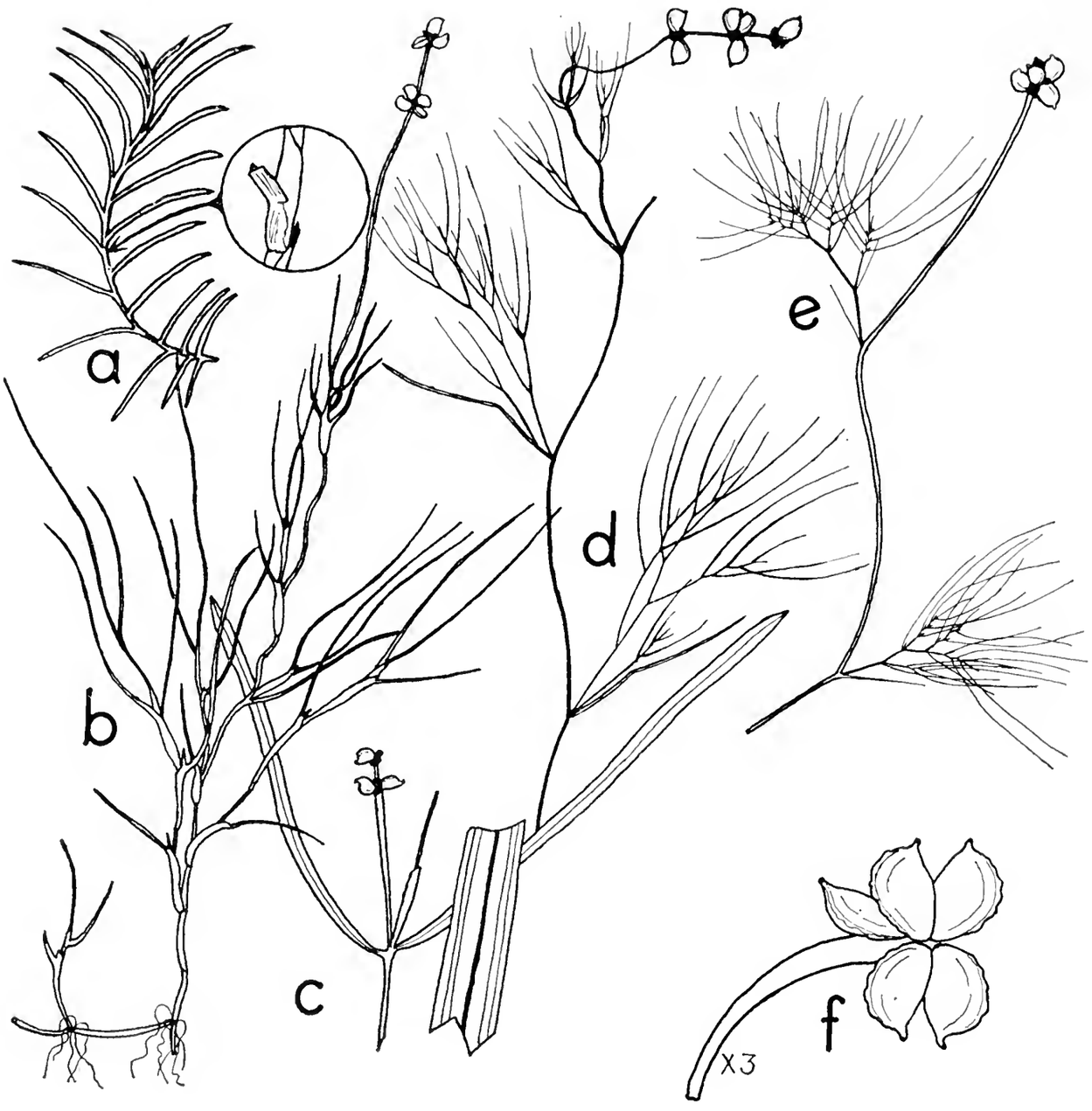
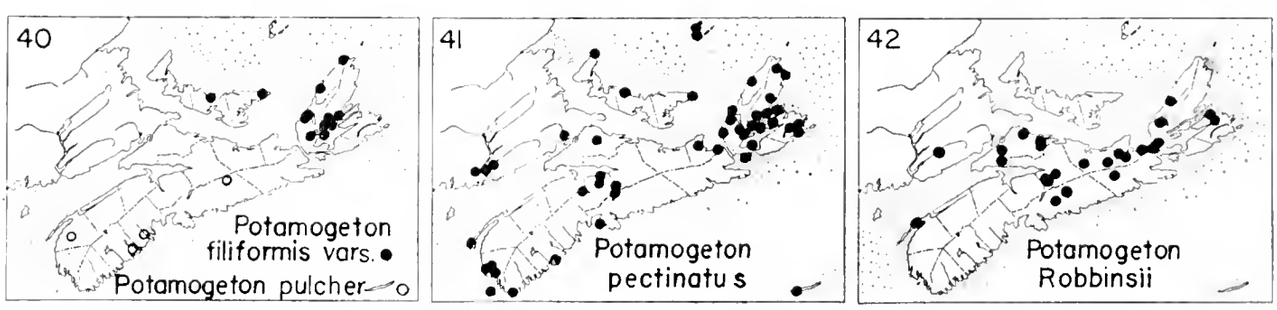


Fig. 11.—**Potamogeton.** a, **P. Robbinsii,** habit of the plant, with one node and leaf base enlarged. b, **P. filiformis,** showing the rhizome. c, **P. Friesii,** with part of a 5-veined leaf. d, **P. pectinatus.** e, **P. confervoides.** f, **P. foliosus,** fruiting spike. Plants x $\frac{1}{4}$.



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 *pseudo-marinus* 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.

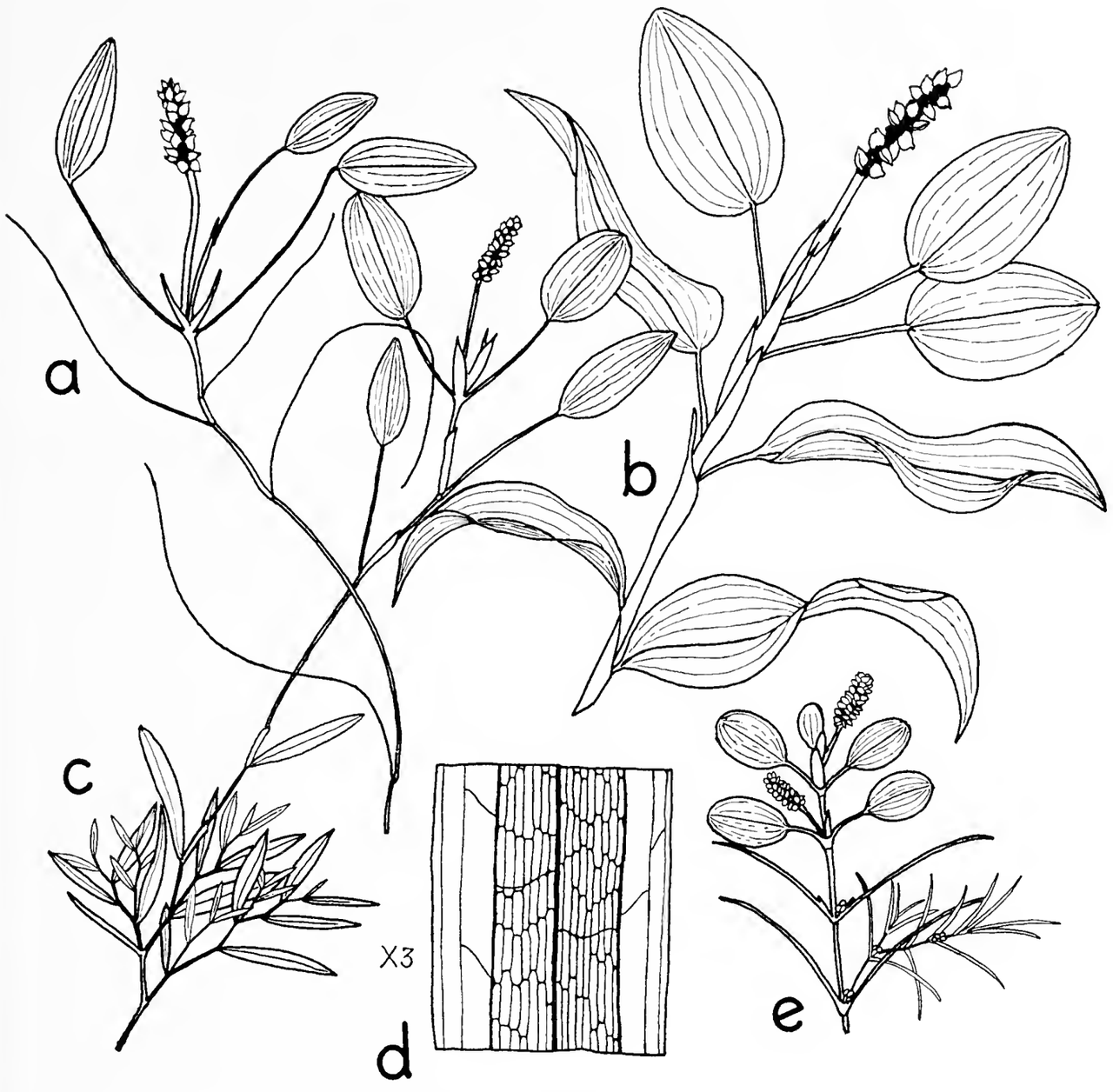
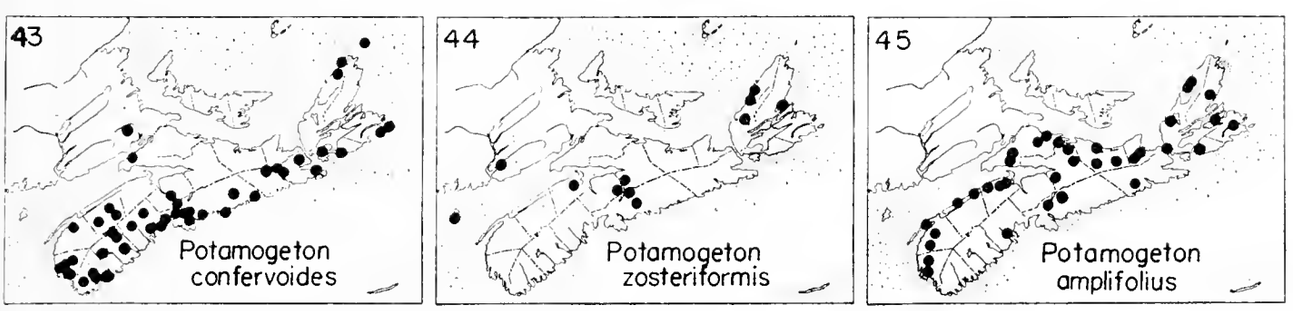


Fig. 12.—**Potamogeton.** a, **P. Oakesianus.** b, **P. amplifolius.** c, **P. graminеus.** d, **P. epihydrus,** section of leaf showing the cellular reticulations near the mid-rib. e, **P. Spirillus.** Plants x $\frac{1}{4}$.



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.

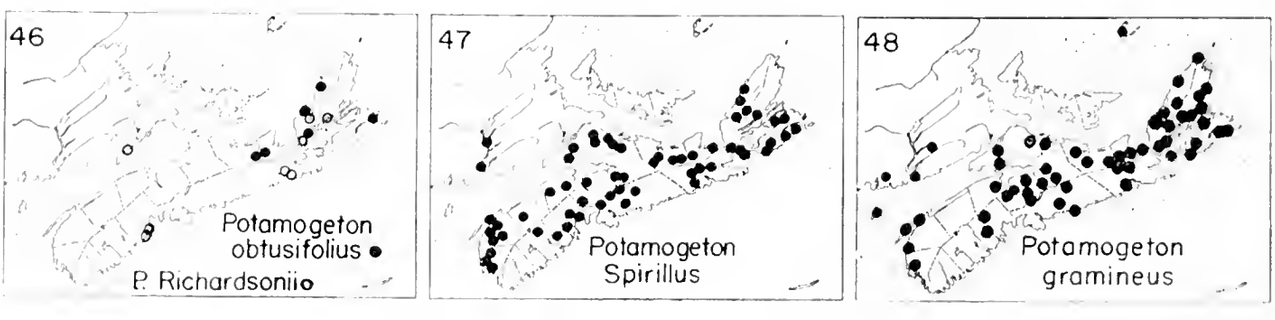
Fla. to Texas north to N.S., Ohio and Minn.

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.

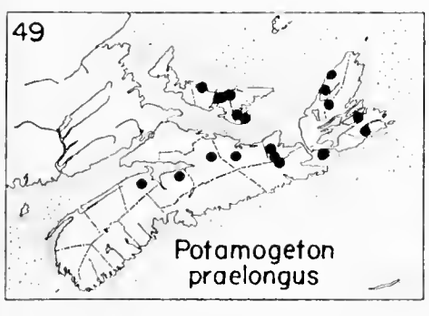
Usually in deep water and rarely fruiting: Cornwallis R., Kentville, Kings Co.; Hants and Colchester to C.B., rather rare. Material from St. Joseph, Antigonish Co. may belong to a hybrid with *P. perfoliatus* var. *bupleuroides*; as may also that from Blackett Lake, C.B. County.

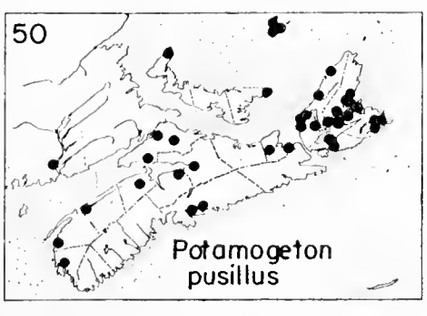
Nfld. and Lab. to Alaska south to N.J., Wisc. and Calif.; Eurasia.

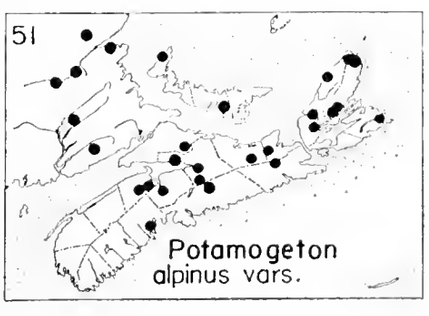
21. **P. Richardsonii** (Ar.Benn.)Rydb. Map 46.

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.

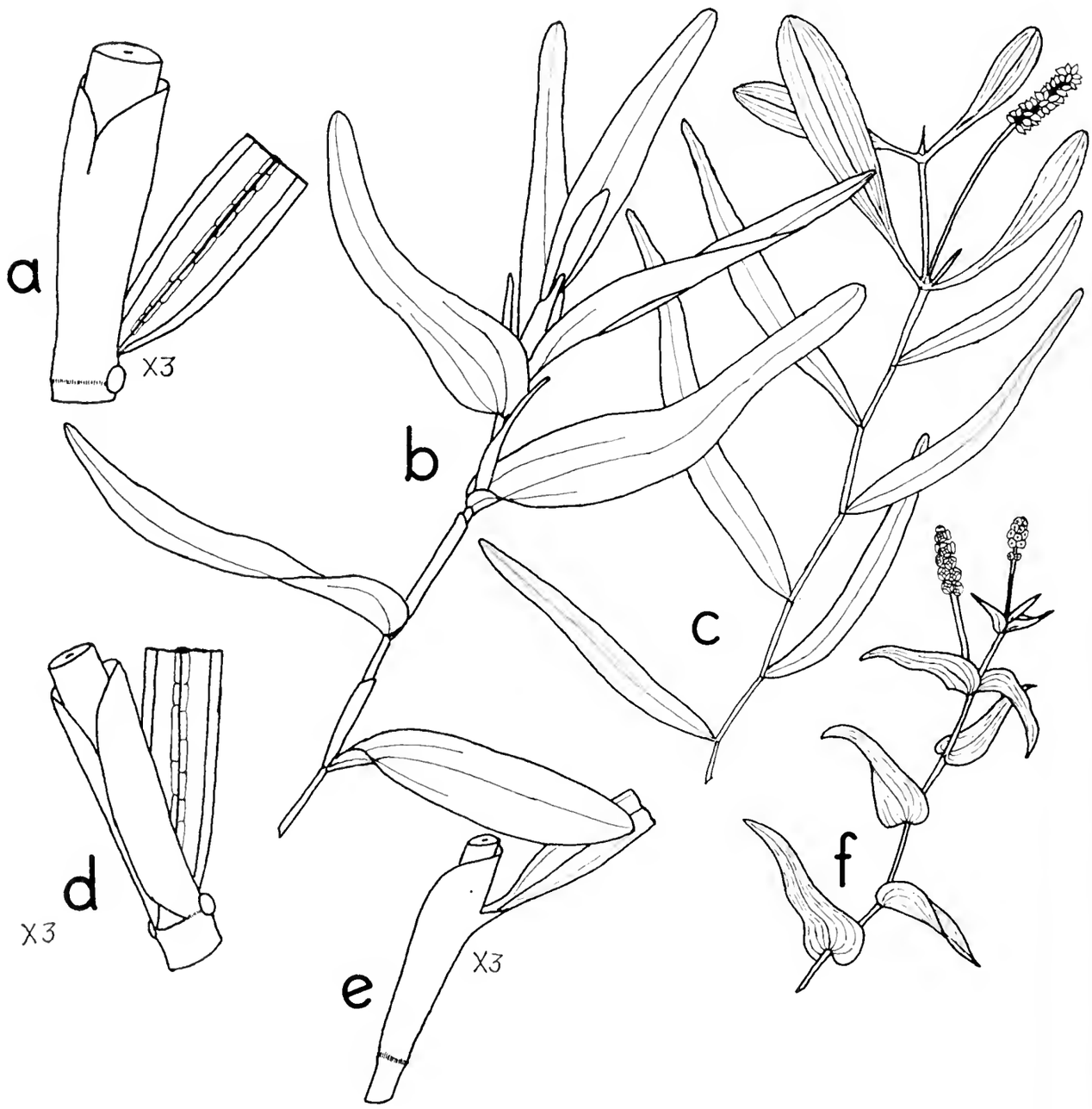


Fig. 13.—**Potamogeton.** a, **P. pusillus,** node of stem showing stipules and leaf base. b, **P. praelongus.** c, **P. alpinus.** d, **P. Berchtoldi,** node of stem showing stipules and leaf base. e, **P. filiformis,** node of stem. f, **P. perfoliatus.** Plants x $\frac{1}{4}$.

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.

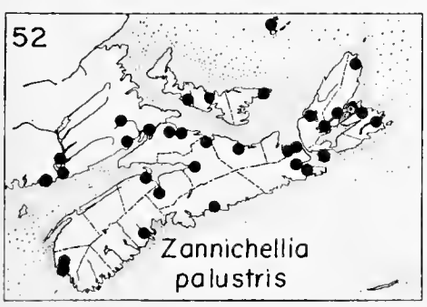
Nfld. to Fla.; worldwide.

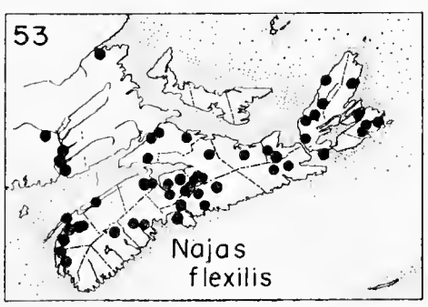
4. **ZANNICHELLIA** L. HORNED PONDWEED

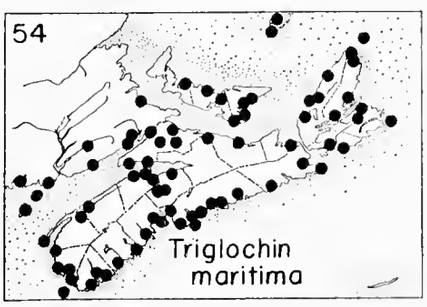
1. **Z. palustris** L., var. **major** (Boenn.)Koch Fig. 14, b. Map 52.

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.







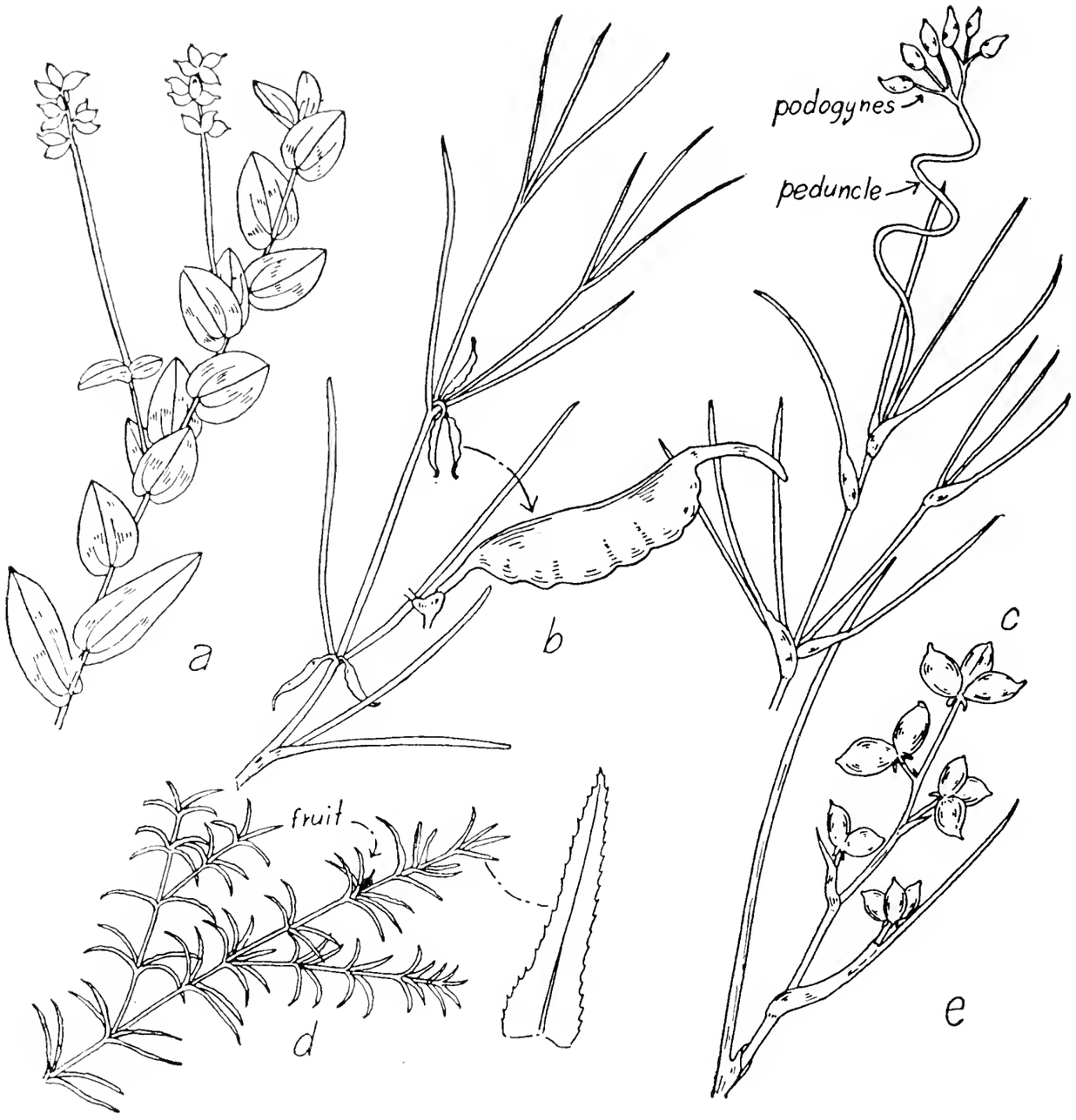


Figure 14.—**Potamogeton.** a, **P. bupleuroides,** x $\frac{1}{2}$. **Zannichellia.** b, part of plant, x 1. **Ruppia.** c, fruiting part of plant, x 1. **Najas.** d, branches, x $\frac{1}{2}$. **Scheuchzeria.** e, upper part of plant showing fruits, x 1.

14. NAJADACEAE NAIAD FAMILY

1. NAJAS L. NAIAD

Rather tufted plants of fresh water, with fine, opposite leaves; female flower consisting only of a pistil in the axil of a leaf and forming a small elongated achene.

a. Leaves 0.2-2 mm wide, each margin with 20-40 one-celled denticles; fruit 3-5 mm long, pointed at the tip. 1. *N. flexilis*

a. Leaves almost capillary, less than 0.5 mm wide, each margin with only 3-5 denticles on the upper half; fruit 2.3 mm long, rounded at the tip, slightly curved. 2. *N. gracillima*

1. **N. flexilis** (Willd.)Rostk. & Schmidt Fig. 14, d. Map 53.

Marginal water of ponds, lakes, and in the shallows and on mud bottoms of rivers: common in C.B. and the north-central counties, rarer in the southeastern and southwestern counties (Smith, 1959).

Nfld. to Minn. south to Va.; B.C. to Ore.; Eu.

2. **N. gracillima** (A.Br.)Magnus

Collected from but two locations in the Province; marginal shallows of Cameron Lake in Hants Co.; and from marginal shallows of Charlotte Lake in Queens Co. These collections are the first from north of southern Maine.

N.S.; Me. to Minn. south to Va.

15. JUNCAGINACEAE ARROW-GRASS FAMILY

Erect herbs of salt or fresh marshes and peat bogs; flowers small and greenish.

a. Flowers numerous in a long linear raceme; ovaries united until maturity; rootstock but little developed. 1. *Triglochin*
a. Flowers 3-8, in a loose short raceme; ovaries 3, nearly separate; rootstock creeping. 2. *Scheuchzeria*

1. TRIGLOCHIN L. ARROW-GRASS

a Fruit oblong, with a rounded base, separating into 6 sections; scape stout, 2-4 mm in diameter. 1. *T. elata*
a. Fruit linear or club-shaped, with a tapering base, separating into 3 sections; scape slender, 1 mm in diameter. 2. *T. palustris*

1. **T. elata** Nutt. Map 54. Fig. 15, a. ARROW-GRASS

Scattered to common in salt marshes, especially on the older or mown areas; occasionally found in highly acid peat around lakes or pools; throughout. June-July. (See Löve. Nat. Can. **85**: 162. 1958).

Lab. to Alaska south to N.J. and Mex.; Eurasia, Patagonia.

2. **T. palustris** L. Fig. 15, b. Map 55. MARSH ARROW-GRASS

Characteristic of the inner brackish marshes or on brackish sand flats, in swampy marshes, open springy or damp areas along streams or more rarely in acid peat; scattered throughout but rather rare and little noticed. July-Aug.

Greenland to Alaska south to R.I., Ill. and Calif.; Eurasia and southern S.A.

2. SCHEUCHZERIA L.

1. **S. palustris** L., var. **americana** Fern., Rhodora **25**: 178. 1923. Fig. 14, e. Map 56.

Quagmires of Shelburne Co. (Fernald, 1922); reported by Nichols as associated with the sphagnum mat of undrained swamps on the Cape

Breton plateau. Since that time it has been found to be scattered but rather rare in quaking bogs, floating mat or edges of lakes from Yarmouth to northern C.B. (Smith, 1959). June. The American variety of the Eurasian plant.

Nfld. to Alaska south to Penn., Wisc. & Calif.

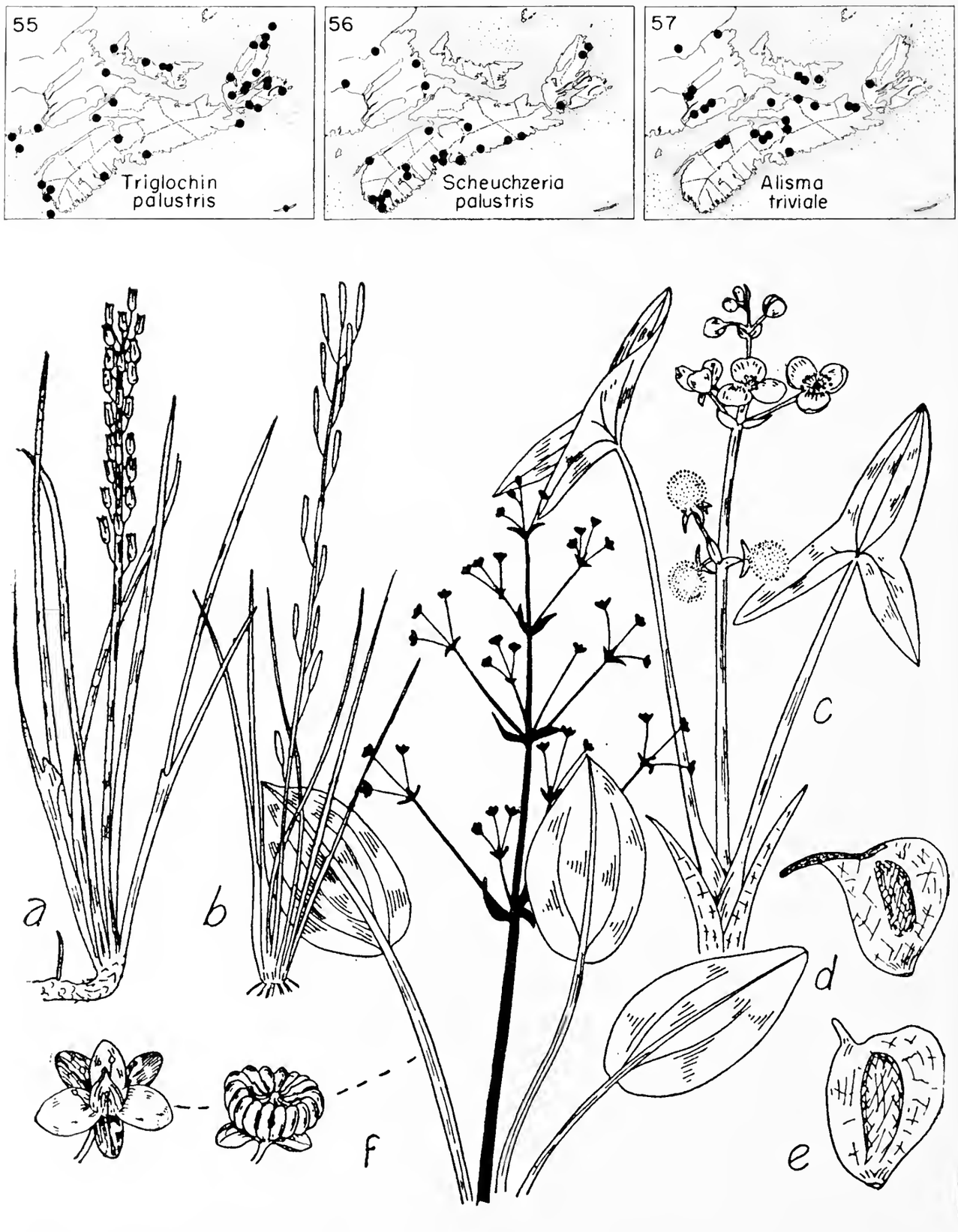


Fig. 15.—**Triglochin elata.** a, plant, x $\frac{1}{4}$. **T. palustris.** b, plant, x 1/3. **Sagittaria cuneata.** c, plant, x $\frac{1}{4}$; e, achene, x 8. **S. latifolia.** d, achene, x 8. **Alisma.** f, plant, x $\frac{1}{4}$; flower and fruit.

16. ALISMATACEAE WATER-PLANTAIN FAMILY

Marsh plants, usually growing in shallow water, with small showy white flowers; pistils many so that the fruits are in a dense head or ring.

a. Leaves usually ovate or oblong, never sagittate; lower flowers all perfect; stamens usually 6; achenes in a thick dense ring (Fig. 15, f). 1. *Alisma*
a. Leaves sagittate or lanceolate; lowest flowers with stamens only or carpels only; stamens many; achenes forming a dense spherical head. 2. *Sagittaria*

1. ALISMA L. WATER-PLANTAIN

1. **A. triviale** Pursh Fig. 15, f. Map 57. See Fernald, Rhodora **48:** 86-88. 1946.

Muddy ditches, pond and stream edges; rather common from Annapolis to Cumberland and Pictou Counties; Bayfield and Monastery, Antigonish Co., and common at the edge of a gypsum sink-hole at Hillsborough, Inverness Co. (Smith, 1959); and northward into N.B.

N.S. to B.C. south to Md., Mich. & Calif.

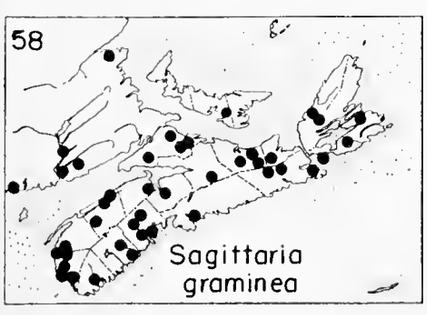
2. SAGITTARIA L. ARROW-HEAD

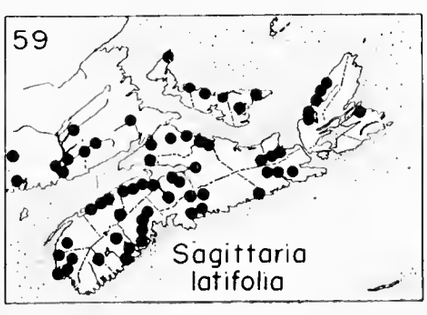
a. Blades all elliptical to lanceolate, without basal lobes; bracts at the base of each whorl of flowers united, the uppermost for over half their length; filaments pubescent. 1. *S. graminea*
a. Blades sagittate; bracts separate; filaments smooth. (Submersed forms may have the blades of the leaves lacking).
b. Beak of the achene 0.5-2 mm long, arising from the inner margin of the top and pointing inward, making the fruiting head smoothish (Fig. 15, d); flower bracts 1 cm long or less; leaf blades 10-30 cm long.
c. Tip of the leaf sharp; body of the leaf blade usually narrower than long; pedicels of the fruiting head less than twice as long as the heads. 2. *S. latifolia*
c. Tip of leaf obtuse or rounded; leaves with body as wide as long; pedicels more than twice as long as the heads. *S. latifolia* var. *obtusa*
b. Beak of the achene short, less than 0.5 mm long, erect so that the fruiting heads are roughened (Fig. 15, e); leaves with blades mostly 4-15 cm long. 3. *S. cuneata*

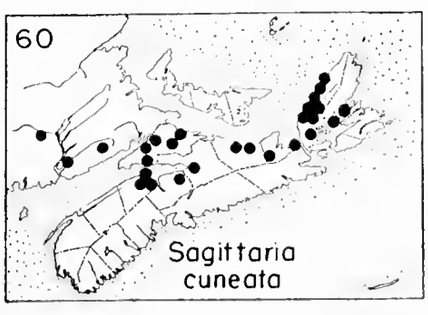
1. **S. graminea** Michx. Map 59.

Sandy or silty margins of ponds or on fresh tidal mud at various places from Yarmouth Co. to C.B.; relatively common in the central and eastern counties and in C.B. on muddy lake shores, in shallow ponds or more rarely along rivers. (Smith, 1959).

Nfld. to Sask. south to Fla. and Tex.







2. **S. latifolia** Willd. Fig. 15, c, d. Map 59. COMMON ARROWHEAD.

Common throughout the mainland, found around the margins of lakes, in mucky stream-bottoms and around pools; rarer eastward. The leaf-blade is very variable in proportions. The narrow extreme, forma **gracilis** (Pursh)Robins., with the leaves and their lobes less than 1 cm wide, is often seen in running water. N.S. to B.C. south to Fla. & Calif.

Var. **obtusa** (Muhl.)Wieg. is not as common as the species but is occasionally seen growing with it, as at St. Andrews, Antigonish Co. and south of Maitland, Hants Co.

N.S. to Minn. south to La.

3. **S. cuneata** Sheldon Fig. 15, c. e. Map 60.

Shallow water at the edges of ponds and brooks, marshes, usually in muck and occasionally in alkaline ponds; Kings and Cumberland Cos. east to Inverness Co. and central C.B. (Smith, 1959) where it appears to be a common species. It is common around the sink-holes in the gypsum area and in rich alluvial areas as at Grand Pre, Truro and Pictou.

Nfld. to Sask. south to Fla. and Tex.

17. HYDROCHARITACEAE FROG'S-BIT FAMILY

A small family with one rare and one introduced aquatic species, both with rarely-present and inconspicuous flowers.

a. Stem elongate, branched, floating or attached, growing in masses with leaves small and in whorls of threes. 1. *Elodea*

a. Stem basal or very short; leaves long, ribbon-like and submersed; flowers on long spiral peduncles reaching to the surface of the water. 2. *Vallisneria*

1. ELODEA Michx. ELODEA

1. **E. canadensis** Michx.

Common in pond and along brook south of Camp Debert, masses in gravel-pit pools in west end of Truro, several large colonies in marginal waters of Earltown L., all in Colchester Co. Introduced at Wolfville, and undoubtedly originally introduced as a food plant for wild fowl.

Que. to Sask. and B.C. south to N.C. and Ky.

2. VALLISNERIA L. TAPE-GRASS

1. **V. americana** Michx.

Growing on the bottom of quiet waters, to be expected in the northern part of the Province; in a small lake at Sydney (Macoun); and Friar's Head, C.B. (Robinson, 1906); locally abundant in marginal water, Shortt's Lake, Brookfield, Colchester Co. and collected in the Musquodoboit River at Gibralter by D. S. Erskine.

N.S. and s. N.B., south to Fla. and west to S.D. and Tex.

18. GRAMINEAE GRASS FAMILY

The grasses are among the most difficult of all the flowering plants to classify. This is due to their great variety, variability and the relatively small size of the reproductive parts. They are annual or perennial herbaceous plants with fibrous roots and slender, jointed stems called culms. The leaves alternate in two ranks up the culm and have long sheaths which envelop the culm for some distance above the nodes. At the junction of the sheath and blade is a small appendage, the ligule, which projects upward around the culm and may be scale-like and membranous or represented by a row of hairs.

The inflorescence is composed of spikelets which may be arranged in a panicle, a spike, or a raceme of spikes on the axis, or rachis, of the inflorescence. Each spikelet consists of two lower scale-like bracts called glumes, and enclosed within these one or more florets arranged in alternating manner on opposite sides of the axis of the spikelet, the rachilla. Each floret has a membranous or indurated scale on the outside called the lemma, in the axil of which is a generally membranous, two-nerved scale, the palea, which is greatly reduced in size or even lacking in a few species. The lemma and palea enclose the three stamens and the pistil with its plumose stigmas; or, in a few cases, the stamens, pistil, or both, may be reduced in number or absent. To a great extent this treatment follows that of: The Grasses of Nova Scotia, W. G. Dore and A. E. Roland, Proc. N.S. Inst. of Sci. **20:** 4: 177-288. 1942.

KEY TO TRIBES

a. Spikelets 1- to several-flowered; spikelets generally break apart just above the glumes and between the florets at maturity; spikelets usually flattened from the sides.

b. Spikelets arranged in true spikes, that is, sessile on the axis of the inflorescence.

c. Spike solitary and terminal on the culm; spikelets single, or in groups of 2 or 3, alternating along opposite sides of the axis (Fig. 21).

TRIBE II. *Hordeae* (p. 89)

c. Spikes several; spikelets attached singly, flattened and closely overlapping along one side of the axis of the spike (Fig. 26).

TRIBE V. *Chlorideae* (p. 113)

b. Spikelets in open, contracted, or occasionally spike-like panicles but not in true spikes, the individual spikelets having a short or long stalk.

d. Spikelets unisexual in different portions of the same panicle, the staminate pendent on the lower spreading branches, the pistillate on the upper erect branches and long awned; tall aquatic grasses (Fig. 25, c).

TRIBE VIII. *Zizanieae* (p. 119)

d. Spikelets bisexual, although some florets in the spikelet may lack stamens, pistils or both (if spikelets unisexual their appearance not greatly different)

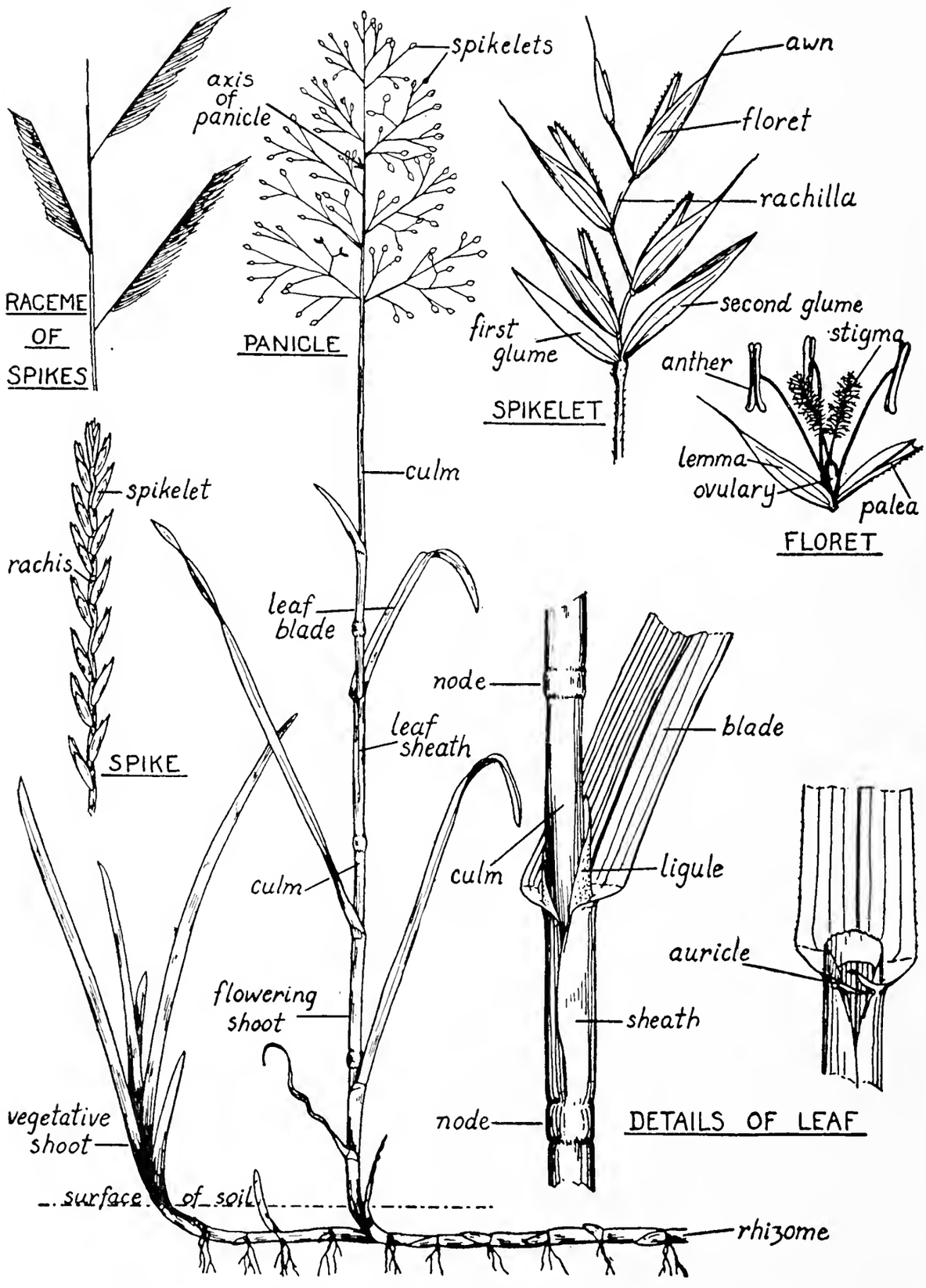


Fig. 16.—The Grass Plant, Inflorescence and Flower.

e. Spikelets with 2 or more florets which produce fruit.
f. Glumes shorter than the body of the first lemma; lemmas, if awned, with the awn arising from the tip or from between the two terminal teeth (Fig. 17-20). TRIBE I. *Festuceae* (p. 69)
f. Glumes as long as the body of the lemma or longer, frequently enclosing all the florets; the awn of the lemma, if present, arising from the back below the tip (Fig. 22). TRIBE III. *Aveneae* (p. 96)
e. Spikelets with only 1 fruit-producing floret; sterile or staminate florets, if present, being below the pistillate floret.
g. Glumes present, one may be greatly reduced in size.
h. Spikelets with only one floret, this perfect; glumes longer or shorter than the spikelet (Fig. 23-24). TRIBE IV. *Agrostideae* (p. 101)
h. Spikelets with 1 fruit-producing floret, the 2 florets below it being staminate or represented by lemmas only; glumes longer than the spikelet (Fig. 27, a-c). TRIBE VI. *Phalarideae* (p. 116)
g. Glumes absent; lemmas broad and flattened; plant very rough, retrorse-scabrous (Fig. 27, d). TRIBE VII. *Oryzeae* (p. 118)
a. Spikelets with 1 fruit-producing floret, the lemma of the sterile floret beneath it similar to the second glume in size and texture, the lemma and palea of the fertile floret being smooth and hard, encasing the fruit at maturity; the spikelets fall away entire, sometimes with a cluster of bristles attached; spikelets usually flattened from the back (Fig. 28-29). TRIBE IX. *Paniceae* (p. 119)

TRIBE 1. FESTUCEAE

This tribe contains a large number of our most common grasses. Those with diffuse panicles and with spikelets containing many florets and rather short glumes belong here.

a. Plants slender, generally less than 1.7 m high; inflorescence not plume-like; spikelets without conspicuous silky hairs at maturity.
b. Panicle open or contracted, but not spike-like.
c. Ligule membranous; top of the sheath free from pilose hairs.
d. Sheath closed in the throat to near the top, round in cross-section; awns generally present and arising between the two teeth terminating the lemma, or just below the tip; spikelets 2 cm long, or longer.
e. Callus of the lemma not fringed with hairs; ligule not sheathing the culm; sheaths and blades generally short-pubescent; grain pubescent at the summit (Fig. 17). 1. *Bromus*
e. Callus of lemma with a ring of short stiff hairs; ligule encircling the culm and continuous with the membranous front of the sheath (Fig. 17); sheaths and blades glabrous; grain glabrous. 2. *Schizachne*
d. Sheaths open in the throat or splitting readily down the front; awns generally absent, if present then merely continuations of the tips of the lemmas; blades and sheaths glabrous or, at least, not conspicuously hairy.
f. Spikelets diffuse in the inflorescence, not crowded in dense-one-sided clusters.
g. Lemmas rounded on the back, at least below, usually glabrous, and lacking a cottony tuft at the base.
h. Lemmas acute, awned from the tapering tip in most species; nerves converging towards the tip (Fig. 17, e). 3. *Festuca*
h. Lemmas obtuse, rounded or acutish at the apex, never awned; nerves not strongly converging towards the tip of the lemma.

i. Lemma not as broad as long, the margins extending little, if at all, beyond the margins of the palea; florets ascending to spreading in the spikelet; common.
j. Nerves of lemma faint, generally 5; plants of saline or brackish soils only (Fig. 18). 4. *Puccinellia*
j. Nerves of lemma prominent and sometimes raised, generally 7; plants of moist or wet, but not of saline, soils (Fig. 19). 5. *Glyceria*
i. Lemma as broad as long, the margins produced far beyond the palea; florets spreading horizontally in the spikelet; rare, introduced grasses. 7. *Briza*
g. Lemmas keeled on the back along the mid-rib; awns always absent.
k. Spikelets 4-6 mm, rarely to 8 mm long, on slender pedicels in erect or spreading panicles; lemma with a cottony pubescence generally present at the base, and frequently pubescent also on the keel and other nerves; ligule membranous with no hairs at the top of the leaf-sheath (Fig. 20). 6. *Poa*
k. Spikelets 6-10 mm long in ereet elusters; lemmas entirely free of hairs; ligule less than 1 mm long with a few hairs present at the top of the sheath; plants of salt or braekish plaees, with firm narrow blades and scaly rhizomes (Fig. 20, e). 13. *Distichlis*
f. Spikelets on very short pedicels, crowded in dense one-sided elusters at the ends of stiff, naked panicle-branches (Fig. 20, d). 8. *Dactylis*
c. Ligule a row of hairs less than 1 mm long; tufts of hairs present at the top of the sheath.
l. Annual grass with lead-eolored spikelets of more than 10 florets; lemmas strongly 3-nerved; minute glands present in a ring at the nodes, and on the keels of the glumes and lemmas. 9. *Eragrostis*
l. Perennial grasses; spikelets with fewer than 10 florets; lemmas faintly nerved; glands absent.
m. Glumes nearly equalling to slightly exeeeding the spikelets; lemmas bluntly toothed at the apex. 11. *Sieglingia*
m. Glumes much shorter than the spikelets; lemmas not toothed, acute.
n. Spikelets with 2-4 florets; lemmas 3-nerved; florets loosely arranged, smooth and shiny; plants with tough fibrous roots, growing in tussocks in peaty-acid soils; C.B. 10. *Molinia*
n. Spikelets with 5 to 9 florets; lemmas with 5 or more faint nerves; florets unisexual, staminate and pistillate inflorescenees on separate plants; plants with scaly rhizomes, forming zones in salt or brackish areas (Fig. 20, e). 13. *Distichlis*
b. Spikelets in pairs in a slender one-sided spike-like infloreseence, a sterile and a fertile spikelet together, the sterile one short-stalked, the fertile one sessile. 12. *Cynosurus*
a. Plants stout and reed-like, 2 m or more tall; inflorescence large and plume-like; silky hairs from the raehilla of the spikelet long and eonspieuous at maturity; leaves broad. 14. *Phragmites*

1. BROMUS L. BROME GRASS

The large, 5- to 10-flowered spikelets will generally serve to identify these plants; in addition the leaf sheaths are also closed to near the top.

a. First glume 1-nerved, the seeond 3-nerved; lemmas 10-12 mm long.
b. Plants perennial; awns mueh shorter than the lemmas.

c. Rhizome absent, the plants growing singly or spaced with the branches of the panicle flexuous and drooping; lemmas awned, densely villous along the margins but glabrous up the middle of the back; native. 1. *B. ciliatus*

c. Rhizomes present, the plant growing in dense leafy masses with an erect inflorescence; lemmas not awned or with the rudiments of awns less than 2 mm long, appressed-hispid across the back especially towards the base; introduced. 2. *B. inermis*

b. Plants annual; awns about as long as or exceeding the lemmas in length. 7. *B. tectorum*

a. First glume 3- to 5-nerved; plants annual.

d. Panicle contracted with erect or ascending branches with the spikelets usually borne singly.

e. Lemmas glabrous, about 7 mm long. 4. *B. racemosus*

e. Lemmas softly pubescent. 6. *B. mollis*

d. Panicle open, with the branches, the lower at least, spreading widely.

f. Sheaths glabrous, or the lowest slightly pubescent; lemmas 5-8 mm long. 3. *B. secalinus*

f. Sheaths pubescent; lemmas about 9 mm long. 5. *B. commutatus*

1. **B. ciliatus** L. Fig. 17, c. Map 61.

Found in all parts of the Province; common in open cut-over areas, stream banks and old meadowlands, but never in cultivated ground. Most of our plants are var. *genuinus* Fern. with glabrous sheaths. A specimen of Macoun's from Bridgewater, 1910, having strongly pubescent sheaths is var. **intonsus** Fern. *Bromus Dudleyi*, described by Fernald as having much the same range, is doubtfully distinct and is included with this species.

Nfld. to B.C. south to N.C.

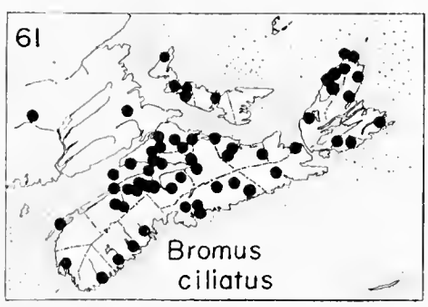
2. **B. inermis** Leyss. Fig. 17, a. SMOOTH BROME-GRASS

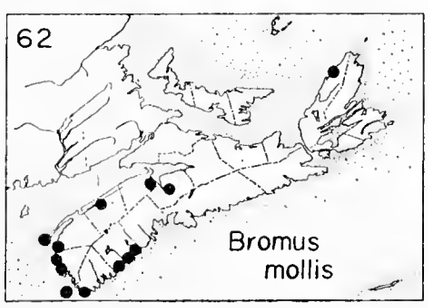
A valuable forage grass now extensively cultivated and planted on running dykes. The plant has been noticed to persist and spread into large colonies at many widely scattered locations. Found in waste ground or along roadsides. All these plants appear to be the forma **villosus** (Mert. & Koch)Fern., with pubescent lemmas.

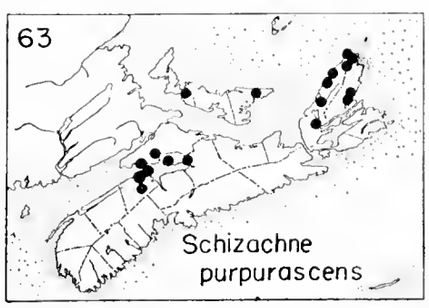
Introduced from Eu.; Nfld. to B.C. south to Va.

3. **B. secalinus** L. CHESS

This has been found only on "Railroad gravel along Five-Mile River, Hants Co. (Fernald, 1921); and in meadow grass at Sable Island in 1899 by Macoun. It has not been collected in recent years. A weed introduced from Europe and very troublesome in some parts of North America.







4. **B. racemosus** L.

Rare; scattered plants collected from Grand Pre, Brooklyn, Windsor, Woodville and Cape George. Specimens collected by Macoun at Bridgewater and by Groh at Kentville and Yarmouth were referred to *B. commutatus*, since depauperate plants of this species greatly resemble *B. racemosus* and it may be that the two plants are not distinctly different.

Adventive from Eu.; N.S. to Minn. south to N.C.

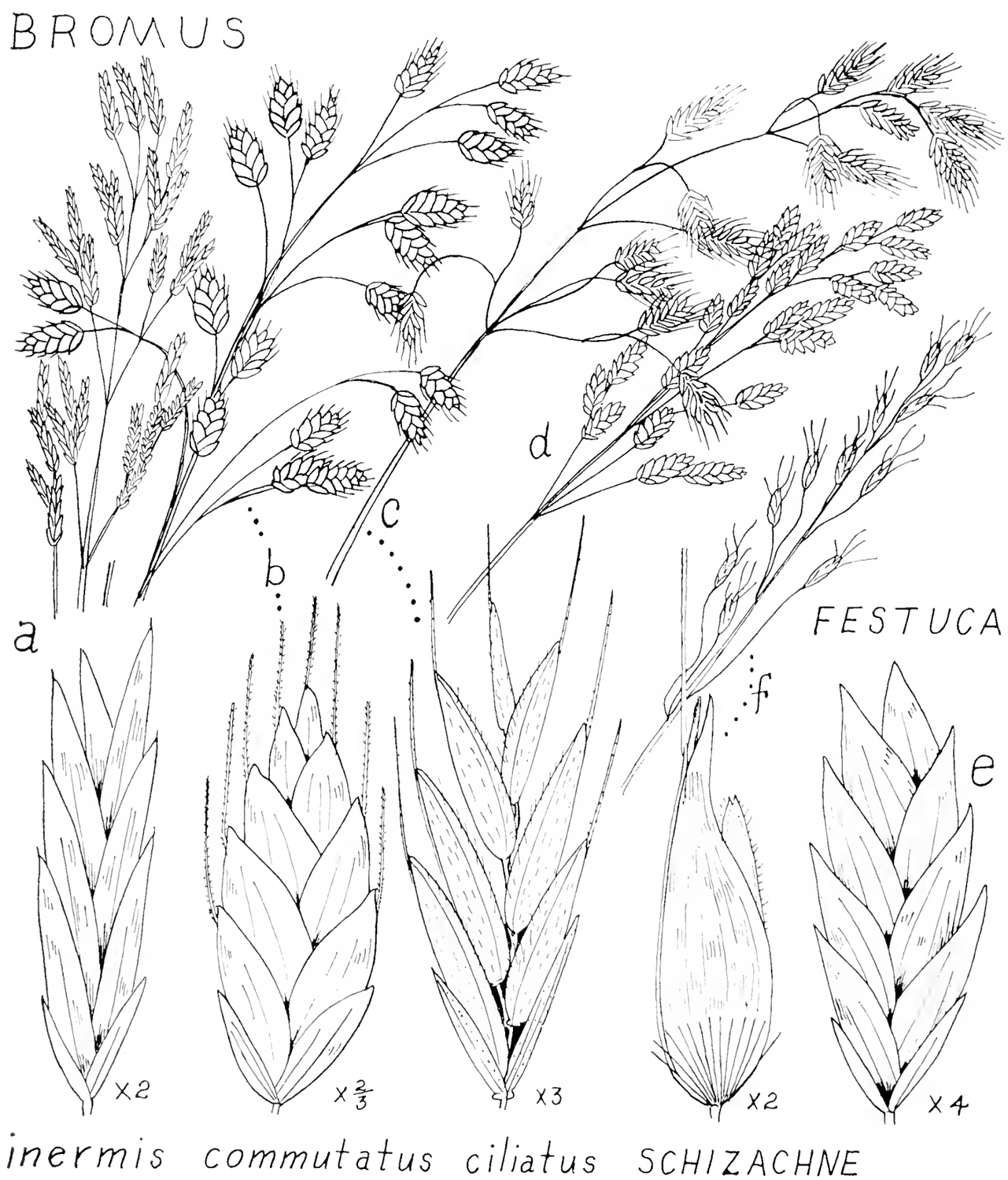


Fig. 17.—a, **Bromus inermis.** b, **Bromus commutatus.** c, **Bromus ciliatus.** d, e, **Festuca elatior.** f, **Schizachne purpurascens.** Inflorescences x 1/3.

5. **B. commutatus** Schrad. Fig. 17, b. HAIRY CHESS

A common weed in vacant lots in towns, along roadsides and in waste places in all sections of the Province. Along some roads in meadows and dykelands it may form large patches. The spikelets shatter very readily.

N.S. to B.C. south to La.

6. **B. mollis** L. Map 62. SOFT CHESS

Found in open soil, gardens, along roadways and railroad embankments mainly in the southern and western counties. No plants that could be definitely placed with the forma *leiostachys* (Hartm.) Fern., which has smooth spikelets, have been seen from the Province so that the softly pubescent spikelets is a distinguishing mark.

Introduced from Eu.; Nfld. to B.C. south to N.C.

7. **B. tectorum** L.

First collected by J. S. Erskine: "common on railway ballast around the railway station at Berwick, King's County. Confirmed by W.G. Dore of the Dominion Experimental Farm, Ottawa who says: 'This approaches var. *glabratus* Spenner in its glabrous glumes and scabrous lemmas. . . . It would appear that your collection, which is the first I know of from Nova Scotia, has been an introduction from a source not in the interior of Canada. Our two collections from New Brunswick (St. Andrews 1936 and Fredericton 1934) are both of the typical hairy kind.' " Later collections are by D. S. Erskine from a gravelly parking lot in Halifax; and by D. H. Webster from an old chicken range at Cambridge, Kings Co.

N.S. to B.C. south to Calif. and Va.

2. SCHIZACHNE Hack. FALSE MELIC

1. **S. purpurascens** (Torr.)Swallen Fig. 17, f. Map 63.

Locally abundant in northern C.B. and south to Whycocomagh on dripping cliffs or ledges; occasionally on a wet river bank, in rich woods or even in open clearings; Moore's Falls near Kentville, Kings Co.; occasional on Cape Blomidon and Cape Split (Schofield, 1955); rare along West Moose River and Five Island's River in Cumberland and Colchester Cos.

Forma **albicans** Fern., which is whitish in color, forms a large percentage of the plants along Salmon River and Big Southwest Brook in northern C.B.; also found north of Cheticamp in clearing in the woods at 500 feet altitude.

Nfld. to Alaska south to W. Va.

3. FESTUCA L. FESCUE

Perennials with several-flowered spikelets in panicles, glabrous, or with a minute pubescence on lemmas or lower sheaths only; lemma firm, rounded on the back, obscurely nerved, tapering to a sharp or awn-tipped point; ligules less than 1 mm long and sometimes obsolete.

a. Blades narrow and permanently folded; claw-like auricles absent at the top of the sheath; lemmas usually awned.
  b. Basal leaf sheaths split to near their base, whitish and cartilaginous, glabrous; dead sheaths whitish or light brown, not readily breaking up into fibrillose material. Plants densely tufted, without spreading off-shoots.
    c. Lemmas more than 3.0 mm long, awned or mucronate-tipped; leaves coarser and stiffer, often glaucous. 1. *F. ovina*
    c. Lemmas 2.5-3.5 mm long, awnless or with sharp tips less than 0.5 mm long; leaves very slender, hair-like, flexuous and green. 2. *F. capillata*
  b. Basal sheaths closed to near the top, often purplish, generally reflex-hirsute; dead sheaths at base of plant dark brown or reddish brown, becoming fibrillose due to the splitting of tissue between the tough veins. Plants generally forming a dense uniform sod by growth from short spreading basal off-shoots in the surface soil.
    d. Spikelets bearing only normal florets; common. 3. *F. rubra*
    d. Spikelets with florets largely replaced by leafy tufts; inflorescence simple and flexuous; plants northern and rare. 4. *F. prolifera*
a. Blades flat, 3 mm or more wide; claw-like auricles present at the top of the leaf-sheaths; lemmas awnless.
    e. Spikelets 6- to 10-flowered, about 10 mm long, borne throughout the panicle; lemmas 5-7 mm long, thin with membranous margins; rich meadows and pastures. 5. *F. elatior*
    e. Spikelets 3- to 5-flowered, about 6 mm long, borne on the panicle-branches only above the middle; lemmas 4 mm long, firm and shining; rich woodlands. 6. *F. obtusa*

1. F. **ovina** L. SHEEP FESCUE

Scattered in the Province; it persists and forms clumps on sterile, sandy and poor dry soils: Kentville, Wolfville,Truro, Antigonish and undoubtedly elsewhere. Naturalized from Europe; sometimes appearing as a lawn weed.

Forma **hispidula** (Hack.)Holmb., with hispid lemmas, has been found at Kentville, Wolfville and Antigonish Harbour growing with typical plants and with plants with pubescence of an intermediate type.

Nfld. to Minn. south to W. Va.

2. F. **capillata** Lam. Fig. 18, b. HAIR FESCUE

Growing in tufts in dry or sterile soils of pastures, lawns, along roadsides and old fields. This weedy grass has increased very rapidly and is now common in most areas; on the sandy soils of Kings Co., in the interior of Lunenburg, and on poorly-drained soils in Cumberland. This grass is so short and wiry that it has no commercial value. It matures early and whole fields may then be a reddish-brown color.

Nfld. to Mich. south to S.C.; mostly nat. from Eu.

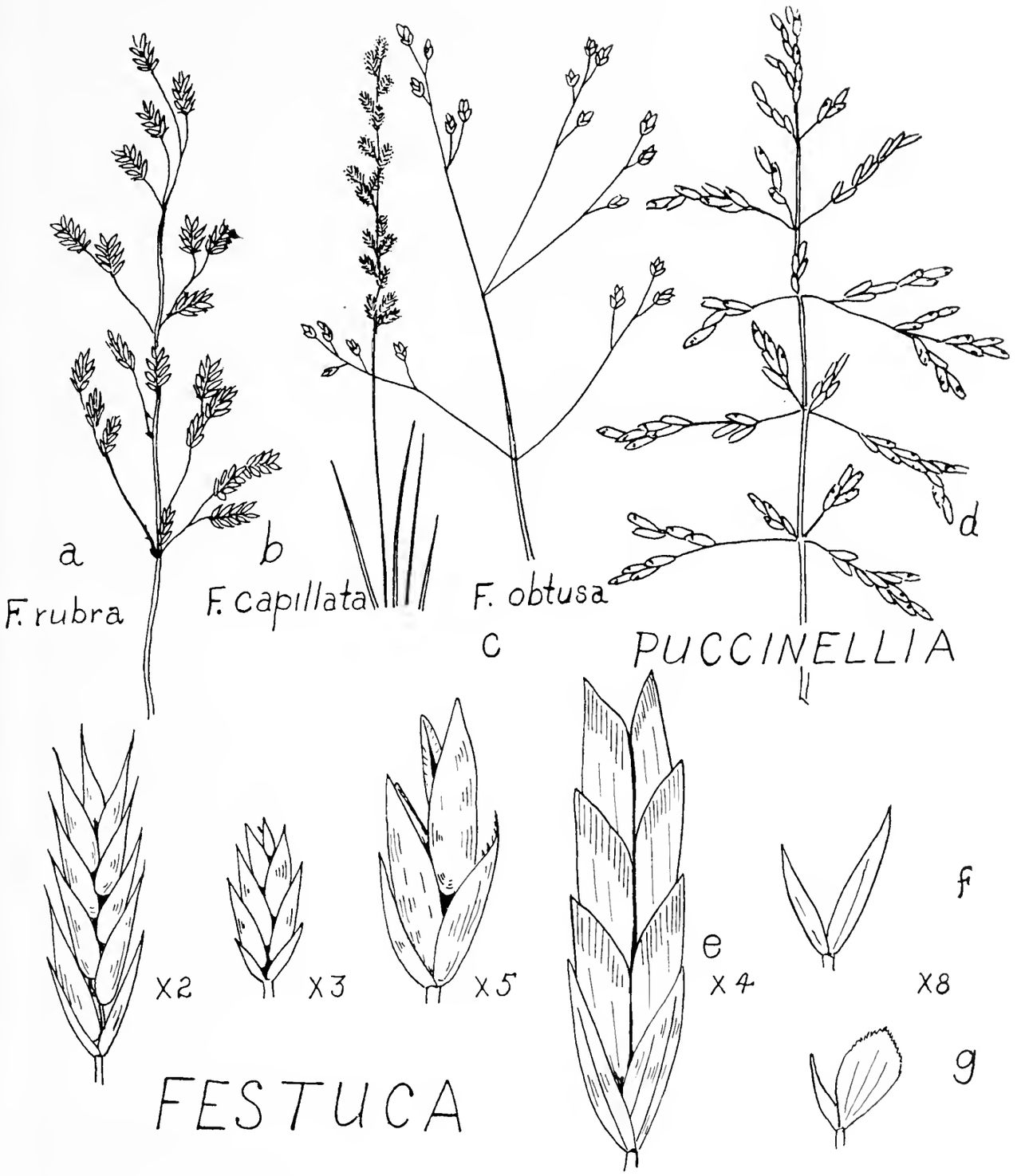


Fig. 18.—a, **Festuca rubra.** b, **Festuca capillata.** c, **Festuca obtusa.** d, e, **Puccinellia americana.** f, glumes of **P. pumila.** g, glumes of **P. distans.** Inflorescences x 1/3

3. **F. rubra** L. Fig. 18, a. RED FESCUE

A common grass throughout, along roadsides, in pastures particularly those in exposed situations and close to the coast, in sand and gravel along sea beaches, the upper zone of salt marshes, and sometimes even in boggy soils. The plant shows as great variability in its morphological characters as in the habitats in which it grows. Many subspecific types have been described by various authors; coastal types may be native, many inland types are introduced. The following, with their distinctive characteristics as given in Fernald's key (Rhodora **35:** 132, 1933), are represented in the Province.

Typicql variety, spikelets 7-10 mm long, 3- to 7-flowered; second glume 3.0-4.5 mm long; body of first lemma 4.0-6.0 mm long, glabrous; foliage green. Common throughout. Forma **glaucescens** (Hartm.) Holmb. is similar but the leaves are whitish. Found mainly on dry soil, sandy or gravelly areas by sea beaches. Forma **megastachys** (Gaudin.) Holmb. differs from the typical form in having spikelets over 10 mm long, 6- to 10-flowered, second glume 4-6 mm long, lemma 6-8 mm long. Found particularly in the tidal marshes. Forma **squarrosa** (Fries) Holmb. has pubescent lemmas. Located in many places and reported from St. Paul Island (Perry, 1931) under var. **arenaria** (Osbeck)Fries.

Var. **multiflora** (Hoffm.)Aschers. & Graebn.: blades flat; spikelets 10-17 mm long, 6- to 10-flowered; body of lowest lemma 5.5-7.0 mm long. Reported from Dartmouth (Fernald, 1922).

Var. **juncea** (Hack.)Richter, leaves stiff and strongly whitened; spikelets 9-20 mm long, 6- to 10-flowered; body of first lemma 5-7.5 mm long. Found along the sea coast, mainly on dry beach and dune sand.

Greenland to Alaska south to N.C.; Eurasia.

4. **F. prolifera** (Piper)Fern.

A viviparous northern form; very rare on wet slope near large waterfall, Big Southwest Brook, south-west branch, Inverness Co. (Smith and Schofield, 1952); and on dripping cliffs, LeBlanc Brook on the Cheticamp R., growing with the variety.

Var. **lasiolepis** Fern. has the lemmas pilose; very abundant in cliff crevices near waterfall, Gray Glen Brook, north branch, Victoria Co. (Smith and Schofield, 1952).

Nfld., Gaspe and Lake Mistassini south to N.S. and Mt. Katahdin and Mt. Washington.

5. **F. elatior** L. Fig. 17, d, e. MEADOW FESCUE

An important forage grass frequently included in meadow and pasture seedings. It readily becomes established and persists in rich soil in fields, along roadsides and in meadows in most parts of the Province.

Var. **arundinacea** (Schreb.)Wimm. is a much taller and stouter plant with tough, strongly-ridged blades, the spikelets only 4- to 5-flowered and the lemmas awn-tipped. Two records are known: collected by Macoun at Baddeck in 1898; rare in rock crevices along brook, Glendyer, Inverness Co., 1951 by Smith et al. for the second record.

Nat. from Eu.; Nfld. to B.C. south to La.

6. **F. obtusa** Biehler Fig. 18, c. Map 64. NODDING FESCUE

Alluvial woods, Five-Mile River, Hants Co. (Fernald, 1921); abundant on hardwood slope, New Prospect; very abundant on rich hardwood slope about one mile east of Refuge Cove, Cumberland Co.

(Schofield, 1955); occasional among small trees at base of high cliff, Cape Blomidon, where it was collected by Schofield and Webster.

N.S. to Man. south to Fla.

4. **PUCCINELLIA** Parl.

Annual or perennial salt-marsh grasses, often with narrow involute leaves. This genus has a distinctive habitat and appearance but the distinguishing characteristics are rather technical or difficult to describe. The number of species here is kept to a minimum but further careful study will be necessary in order to adequately understand the variation and distribution, particularly around the Gulf of St. Lawrence. Fernald, M. L. and C. A. Weatherby, The genus *Puccinellia* in eastern North America. Rhodora **18:** 1-23. 1916.

a. Plant coarse, 2-8 dm high; spikelets 5-11-flowered, 5-12 mm long; anthers 1.5-2.5 mm long; lemmas 3.5-4.5 mm long, often pubescent towards the base. 1. *P. americana*

a. Plants usually smaller and more slender; spikelets 3-6-flowered; anthers 0.5-1.2 mm long; lemmas glabrous or nearly so.

b. First glume 1.5 mm long or longer, the second 2-4 mm long; lemmas 2.6-3.5 mm long, pointed and not ciliolate.

c. Glumes about 1.5 and 2.0 mm long; spikelet firm, with reddish coloration on the lemmas. 3. *P. pumila*

c. Glumes about 2.5 and 3.0-3.7 mm long; spikelets and inflorescence soft, light green to straw-colored. 4. *P. ambigua*

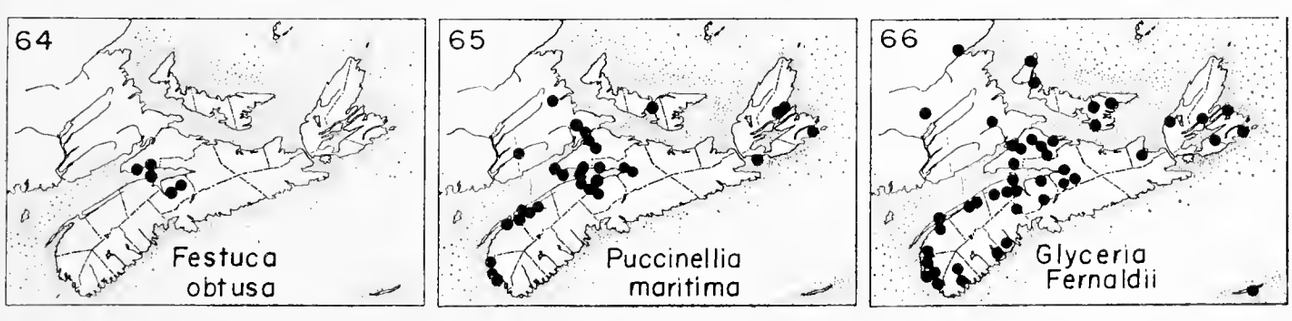
b. First glume about 1 mm long; second glume 1.3-2.0 mm long; lemmas 2.0-2.5 mm long.

d. Panicle stouter, dense, the branches ascending, with spikelets nearly to the base; glumes and lemmas minutely serrulate towards the tip, but not ciliolate. 2. *P. fasciculata*

d. Panicle slender, the spreading or reflexed branches with spikelets mostly above the middle; glumes and lemmas erose-ciliolate, the lemmas truncate. 5. *P. distans*

1. **P. americana** Sorensen Fig. 18, d. Map 65.

Saline and brackish marshes, and one of the first plants to colonize bare areas on new dykelands and running dykes; common from Shelburne County up along the shore of the Bay of Fundy and about the marshes at its head; not found along the Atlantic shore or else very rare and no collections exist from along the North Shore; there is a record from Louisburg (Macoun, 1888); and it has been found also at Petit



de Grat and Englishtown Ferry in Cape Breton. This is the American relative of *P. maritima* of Europe (Sorensen, Medd. om Gronl. **136:** 67. 1953).

Bonaventure Co. Que. to R.I. along the sea-shores.

2. **P. fasciculata** (Torr.)Bickn.

A smaller, more densely-flowered species found rarely at the heads of salt marshes or dykelands on the Fundy side of the Province. Collected at Kentville and at Grand Pre.

Sandy seashores, N.S. to Va.; Utah; Eu.

3. **P. pumila** (Vasey)Hitchc. Fig. 18, f.

Widespread along the sea-shores and also found inland around salt marshes, as at Oxford, Cumberland Co. This is our most common species and it is quite variable in the size of the spikelets and florets. Var. **longiglumis,** described as a variety of *P. paupercula* (Holm)Fern., is a form with the glumes about three times longer than normal. This was common on the salt marshes at Louis Head, Shelburne Co. This was first described from P.E.I. Erskine (1960) suggests that it may be due to nematode infection.

Nfld. south to Conn.; Alaska to B.C.

4. **P. ambigua** Sorensen, Medd. on Gronl. **136:** 64. 1953.

Described from plants originally collected by M. L. Fernald on a salt marsh at Alberton, P.E.I. Plants growing on the salt marsh near the road at Port Howe, Cumberland Co. are thought to be this new species.

5. **P. distans** (L.)Parl. Fig. 18, g.

Scattered and appearing in waste places as well as on salt or brackish mud around the towns of Sydney, Pictou, Windsor, and near Port Howe, growing with the previous species. This plant is somewhat weedy, appearing as if introduced from the Old World in ballast.

N.S. to Dela. and occasionally inland; nat. from Eu.

5. GLYCERIA R. Br. MANNA-GRASSES

One or more of the following characteristics will distinguish these grasses from related genera; the several-flowered spikelets with glumes shorter than the lemmas; the 7, often prominently raised, nerves of the round-backed lemmas; and the moist but never brackish habitats (Fig. 19).

a. Spikelets elongate, 10 mm long or longer, lying closely along the branches of the panicle on short pedicels.
  b. Leaves 2-4 mm wide, rarely to 6 mm; lemmas 3-4 mm long, smooth or nearly so between the slightly roughened nerves. 1. *G. borealis*
  b. Leaves 4-8 mm wide; plant coarser; lemmas 5.0-6.5 mm long, minutely roughened between the nerves. 2. *G. fluitans*

a. Spikelets ovate or oblong, less than 7 mm long, on more diffused branchlets.
  c. Panicle contracted with closely ascending branches.
    d. Panicle linear, rather open and often nodding, 15-25 cm long; lemmas 2.0-2.3 mm long. 3. *G. melicaria*
    d. Panicle oblong and dense, erect, 12 cm long or less; lemmas 3-4 mm long. 4. *G. obtusa*
  c. Panicle loose with more or less spreading or drooping branches.
    e. Nerves of the lemmas not prominently raised; edges of the bowed-out palea visible beyond the edges of the lemma.
      f. Spikelets with 5-10 florets; lemma 3-4 mm long. 5. *G. canadensis*
      f. Spikelets with 3-6 florets; lemma 2.0-2.5 mm long. *G. canadensis* var. *laxa*
    e. Nerves of the lemmas prominent; palea not bow-shaped.
      g. Stem usually stout, erect.
        h. Panicle mostly less than 20 cm long; spikelets 3-4 mm long, with the first glume 1 mm long or less.
          i. Leaves flat, to 7 mm wide; panicle 10-30 cm long; spikelets mostly greenish, with the smaller lemmas mainly 1.5-1.8 mm long and merely scarious-tipped. 6. *G. striata*
          i. Leaves mostly folded, to 4 mm wide; panicle 5-15 cm long; spikelets mostly purplish with the larger lemmas 2.0-2.2 mm long and rounded with broad rounded tips. *G. striata* var. *stricta*
        h. Panicle large and ample, 15-40 cm long; leaves 7-12 mm wide; spikelets 5-6 mm long, with the first glume 1.2-1.5 mm long. 7. *G. grandis*
      g. Stems soft and weak, lying partly on the ground; spikelets pale green and scabrous.
        j. Plant 3-10 dm high; leaves mostly 4-8 mm wide; spikelet 4- to 7-flowered, 6-7 mm long; anthers 1 mm long. 8. *G. pallida*
        j. Plant 2-4 dm high; leaves 1-3 mm wide; spikelet 3-5-flowered, 4-5 mm long; anthers 0.4-0.6 mm long or less. 9. *G. Fernaldii*

1. **G. borealis** (Nash)Batchelder Fig. 19. NORTHERN MANNA-GRASS

Growing in quiet shallow water in pools and streams, around the margins of lakes, in ditches, the long narrow leaves often floating on the surface of the water; also in very wet soil. Common throughout.

A plant with larger stalks and broader spikelets collected in a shallow ditch at Meteghan, Digby Co. (Dore, no. 745) has been found by G. L. Church of Brown University to have 40 chromosomes, twice the number of *G. borealis*, but the same as *G. septentrionalis* Hitchc. The specimen, however, lacks the distinct scarbridity of the lemmas which typifies *G. septentrionalis*.

Nfld. to Alaska south to Penn., Ill. and Calif.

2. **G. fluitans** (L.)R. Br. FLOATING MANNA-GRASS

Abundant in swales, ditches and wet meadows around the marshes near Truro; above Tatamagouche, five miles up the Waugh's River, Colchester Co.; dry sand of the lake shore at Kenloch, Inverness Co. (Smith and Schofield, 1952). Also at Bass River, N.B.

Nfld.; Gaspe; and Nantucket Is. in Mass.; possibly native; Eurasia.

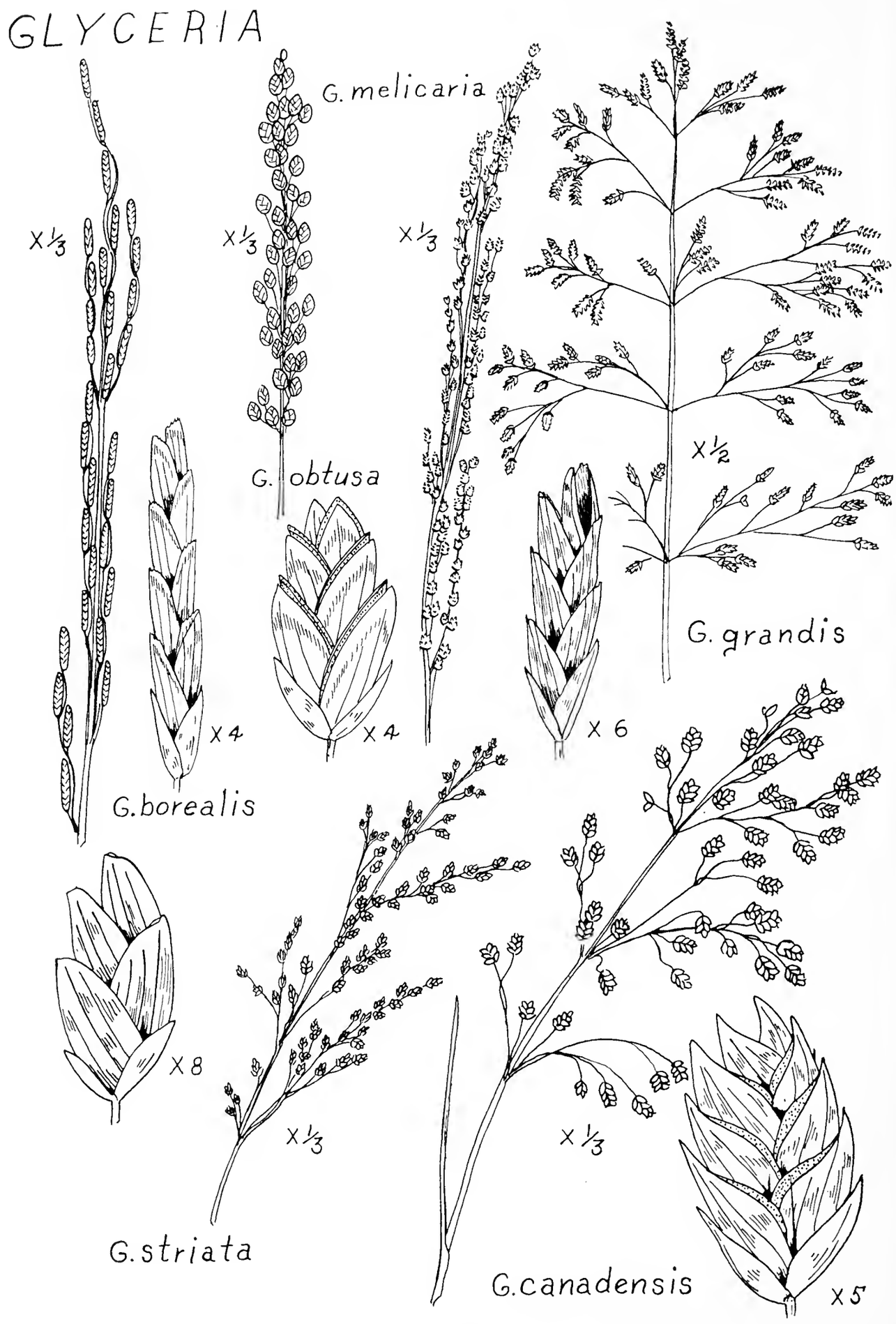


Fig. 19.—Glyceria.

3. **G. melicaria** (Michx.)F. T. Hubbard Fig. 19. Map 67.

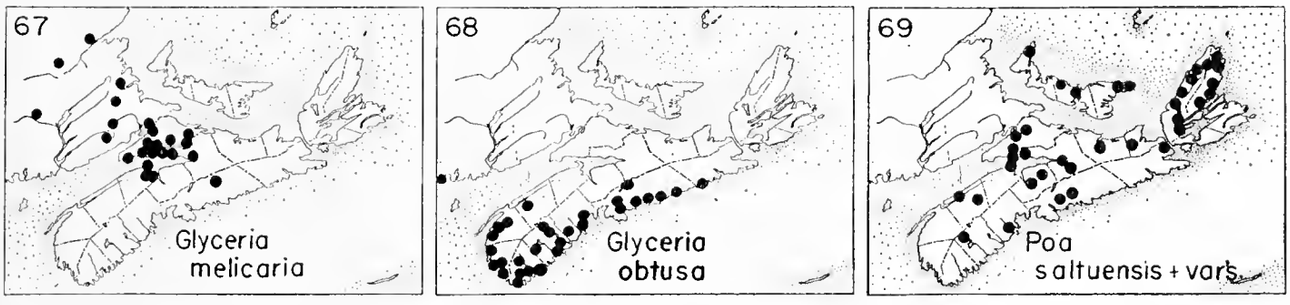
Dominant in small areas in rich wet woods, damp thickets and along shady brooksides; Cape Blomidon and along the Cobequids to north of Truro; throughout Cumberland Co. It is very rare outside this area and unknown in the southwestern counties. This plant is rather distinctive, since it usually grows in pure stands with bright-green leaves and long, narrow erect panicles.

N.S. south to the mts. of N.C. and Tenn. and to Ohio.

4. **G. obtusa** (Muhl.)Trin. Fig. 19. Map 68.

Common in Yarmouth and southern Digby Counties, east at least to Lunenburg Co. and scattered and local to Grand Lake and Musquodoboit Harbour in Halifax Co.; Marie Joseph in Guys. Co. Swales, wet mucky soils, on floating mat of lake-edge and boggy margins of streams and lakes. This is another distinctive species because of its stiffly-erect compact panicles of large spikelets.

Near the coast from N.S. south to N.C.



5. **G. canadensis** (Michx.)Trin. Fig. 19. RATTLESNAKE-GRASS

Common throughout, in swamps, boggy land, springy woods and ditches, wet meadows and grassy borders of streams and ponds, sometimes even in sphagnous bogs. Nfld. to Minn. south to N. Eng. and Tenn.

Var. **laxa** (Scribn.)Hitchc. is much taller than the species with more ample panicles and smaller spikelets. The stout plants are usually erect and it may grow in large pure colonies. Scattered from Digby and Yarmouth Counties to Hants and Guysborough; dry roadside, French Mt., Inverness Co. This plant appears distinct in southwestern N.S. but northward it occurs much more sporadically and is difficult to separate from luxuriant stands of *G. canadensis*.

P.E.I. to Md. and W. Va.

6. **G. striata** (Lam.)Hitchc. Fig. 19. FOWL MANNA-GRASS

Common throughout in moist rich soils in meadows, ditches, along streams and in wet open woods. Nfld. to Alta. south to Fla.

Var. **stricta** (Scribn.) Fern. is a smaller and stiffer form with a purplish tinge to the sheaths and panicle. Found in similar or more open and drier situations than the species, often more common and general in moist meadows and wet pastures.

Lab. to Alaska south to N. Eng. and along the Rocky Mts.

7. **G. grandis** S. Wats. Fig. 19. REED MANNA-GRASS

Found throughout in wet meadows, banks of streams and in marshes, often conspicuous in swales and along ditches, particularly in the northern counties. This plant is the largest of the genus and may grow up to 2 m high. Forma **pallescens** Fern., with yellowish spikelets instead of purplish ones, has been reported from Yarmouth (Fernald, 1921); and has since been found in numerous places in Kings and Colchester Cos.

Nfld. to Alaska south to Va.

8. **G. pallida** (Torr.)Trin. PALE MANNA-GRASS

A pale green, lax, medium-sized grass known at present only from collections from "boggy swales and savannahs of the Tusket River, Yarmouth Co. "(Fernald, 1921). A collection from near Amherst is intermediate in some respects between this and the next species.

N.S. and s. Me. to southern Ont. south to Tenn.

9. **G. Fernaldii** (Hitchc.)St. John Map 66. SMALL MANNA-GRASS

Found often reclining in the bottom of cat-tail marshes, swales, margins of ponds and ditch bottoms; abundant in its proper habitats throughout. These last two species are now usually separated off from *Glyceria* under the name *Torreyochloa.* The more southern plant found in eastern N.A. and in a small area in Japan is then *Torreyochloa pallida* (Torrey)Church; and the smaller more northern plant is *T. pallida* var. *Fernaldii* (Hitchc.) Dore, Can. Jour. Bot. **42:** 874. 1964. This reference contains a discussion by Koyama and Kawano of the Asiatic and North American varieties.

Nfld. to Minn. south to Penn.

6. POA L. BLUEGRASS

This group includes a number of our most common and valuable forage grasses in addition to the native species. Many of the members are very variable and extremely difficult to classify. The main more constant characters are found in the spikelets. The glumes and lemmas are flattened so that there is a keel along the mid-nerve. The lemmas are always awnless and generally have a coiled tuft of long, webby hairs arising from the callus.

a. Low annuals or winter-annual, less than 25 cm high, with light-green leaves; webby hairs at base of lemma lacking or, rarely, short and scant; panicle branches arising singly or in pairs; keel and marginal nerves of lemma pubescent; common weed. 1. *P. annua*

a. Perennial, usually much taller; webby hairs present at the base of lemma in all our common species.

b. Plants with long running rhizomes, not forming a clump or a sod; culms flattened, 2-edged; leaf-blades short and a bluish or glaucous green color; webby hairs at base of lemma scant; panicle branches usually in pairs. 2. *P. compressa*

b. Plants tufted and lacking rhizomes or else with short numerous rhizomes so that they form a sod.

c. Lemmas with long cobwebby hairs at the base.

d. Marginal nerves of the lemma, and the keel, pubescent.

e. Ligule shorter than wide, less than 1.5 mm long.

f. Lemmas distinctly 5-nerved, the intermediate nerves strong and glabrous. 3. *P. pratensis*

f. Lemmas appearing 3-nerved, with the intermediate faint and obscure. 7. *P. nemoralis*

e. Ligule longer than wide, 2.0-5 mm long. 8. *P. palustris*

d. Marginal nerves of the lemma not pubescent, the keel glabrous or pubescent.

g. Ligule of lower leaves 2-6 mm long; spikelets numerous; panicle branches several at each node; sheaths of leaves usually scabrous, clinging when drawn through the hand. 4. *P. trivialis*

g. Ligule 1 mm long or less; spikelets few at the ends of slender nodding branches of the panicle; sheaths not scabrous.

h. Keel of the lemma glabrous; panicle branches in pairs or solitary. 5. *P. saltuensis*

h. Keel of the lemma pubescent; panicle branches more than 2 at each node; panicle very diffuse with very long, spreading capillary branches. 6. *P. alsodes*

c. Lemmas not webbed at the base, keel and marginal nerves pubescent; rare, or northern species, not in open fields.

i. Plant stiff with panicle tending to be pyramidal; first glume ovate, more than half as wide as long; leaves 2-6 mm wide. 9. *P. alpina*

i. Plant usually slender with the panicle narrow, the whole plant with a bluish tinge; first glume lanceolate; leaves narrow, up to 2.5 mm wide. 10. *P. glaucantha*

1. **P. annua** L. Fig. 20, c. ANNUAL BLUEGRASS

This weedy species, easily recognized by its light green foliage, low-growing habit and abundant panicles, is common in gardens, lawns, dooryards, along pasture roads and in areas where heavy trampling keeps down the taller-growing species. Common throughout.

Intro. from Eu.; Nfld. to Alaska south to Fla.

2. **P. compressa** L. CANADA BLUEGRASS

Restricted to aerated soils such as can be found in sod over-hanging a ditch or road-cut, in pockets on rocks where frost-heave has loosened up the ground, or on sands and gravels. The sheaths soon become whitish and become conspicuous against the green culms and blades. This, together with the distinctly flattened culms, longer ligule, later flowering and more open growth readily distinguishes this from *P. pratensis*. Found in most regions but not nearly as common as the next species.

Intro. from Eu.; Nfld. to Alaska south to Ga.

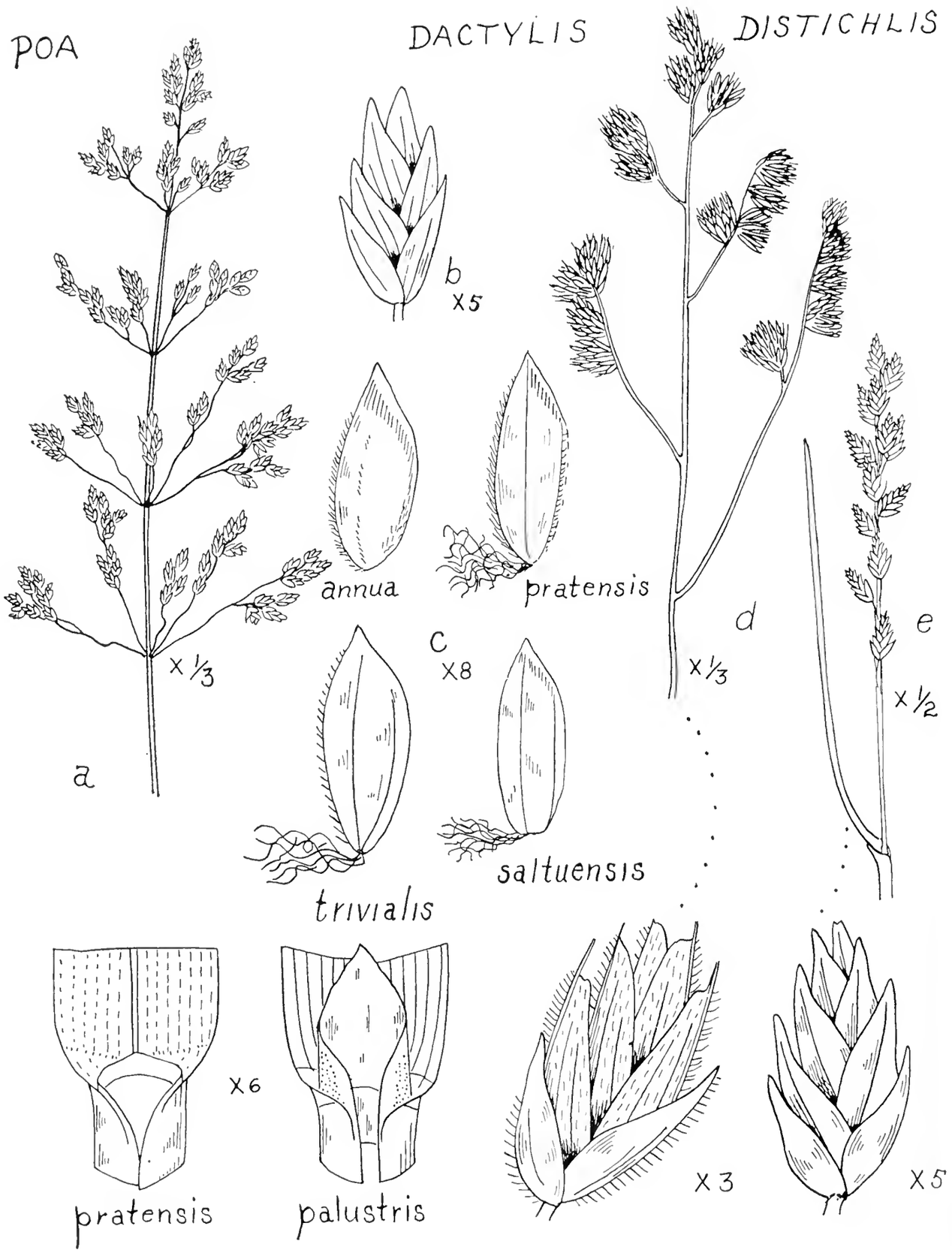


Fig. 20.—a, b, **Poa pratensis,** inflorescence, spikelet and leaf sheath. c, **lemmas** of **Poa annua, pratensis, trivialis** and **saltuensis.** d, inflorescence and spikelet of **Dactylis glomerata.** e, inflorescence and spikelet of **Distichlis spicata.**

3. **P. pratensis** L. Fig. 20, a, b. KENTUCKY BLUEGRASS

One of the commonest species in pastures, meadows, lawns and roadsides throughout.

There is a great variation in the habit and morphology of this species. Development of the seed is known to take place asexually

so as to preserve the same combination of genetic characters unchanged from generation to generation. A great variety of habit types have therefore been preserved as races or forms, their appearance showing some correspondence to ecological conditions. Many types have narrow blades. (var. *angustifolia* (L.)Sm.). Large coarse plants in bogs and humid uplands are related to the northern variety *alpigena* Fries. Plants with abnormally large spikelets due to nematodes were earlier reported as *P. costata*. *Poa subcaerulea* appears to be a native, coastal type with bluish-tinged spikelets.

Intro. from Eu.; Lab. to Alaska south.

4. **P. trivialis** L. Fig. 20, c. ROUGH-STALKED BLUEGRASS

An abundant species in moist soil throughout; often appearing as if native to the Province. Individuals in shaded or excessively moist situations are weak and sprawling with 1- or 2-flowered spikelets and narrow glumes, appearing very different from the typical plants. Meadows, along brooks and moist runs, in the bottom of cat-tail marshes. The culms are usually rough below the panicle.

Intro. from Eu.; Nfld. to Ont. south to Ga.

5. **P. saltuensis** Fern. & Wieg. Fig. 20, c. Map 69.

Plants typical of the species have panicles 10-20 cm long, spikelets 3-flowered, 4.5-5 mm long, and lemmas 3.5-4.0 mm long. Plants with smaller panicles 6-10 cm long, spikelets 2-flowered, 3.5-4.0 mm long, and lemmas about 3.0 mm long have been segregated as var. **microlepis** Fern. & Wieg. Much of the Nova Scotian material appears to be this variety but the separation is not clear-cut. Scattered in rich and mossy hardwoods, in brookside thickets and on rocky shaded banks; rarer in southwestern N.S.

Nfld. to Minn. south to W. Va.

6. **P. alsodes** Gray Map 70.

One of the rarer grasses of the Province: river banks and thickets on rich alluvial soil. Damp margin of McGahey Brook, near Parrsboro, Cumb. Co. (Schofield, 1955), where it grows abundantly on the shaded flood plain; St. Andrew's River, and along the Salmon River at Kemptown in Colchester Co.; rich thicket, Judique, MacIntosh Brook, and by the Cheticamp River in Inverness Co.; and by a brook in a meadow at Cape North Village in Victoria Co. (Smith and Schofield, 1952; Smith and Erskine, 1954). The very large panicle with the long capillary branches presents an appearance quite different from that of any other *Poa*.

St. Pierre and Miq. to Ont. south to N.C.

7. **P. nemoralis** L. Map 70. WOOD BLUEGRASS

Scattered from Annapolis Co. to C.B., probably widely distributed; collected by Dore from a shady lawn at Antigonish and dry wooded

bank at Kentville; now known from woods on Cape Split, Kings Co.; talus slope at New Prospect near Parrsboro, Cumb. Co.; Truro, Pictou and under trees at Sydney.

Introduced from Eu.; Nfld. to Minn. south to Dela.

8. **P. palustris** L. Fig. 20. MEADOW-GRASS

The extreme variations that occur in this species due to habitat and stage of growth have led to much taxonomic confusion. The plant is best developed in moist meadows and along stream banks. In drier sites and pastures it has a stricter growth with sparser panicles; in deep shade the plant is weak and the panicle reduced to a few small spikelets; autumnal forms are decumbent, sending up numerous flowering tillers. The spikelets are frequently 3-flowered with the tips of the lemmas bronze-tinged. Common in all parts of the Province.

Nfld. to Alaska south to N.C.; Eurasia.

9. **P. alpina** L.

Reported in Britton and Brown from "calcareous shores and ledges, Cape Breton Island", but it does not seem to be common. A collection from Cibaux Island, Victoria Co. has been identified as this species.

Local, Nfld. to Oregon; Eurasia.

10. **P. glaucantha** Gaudin. Map 71.

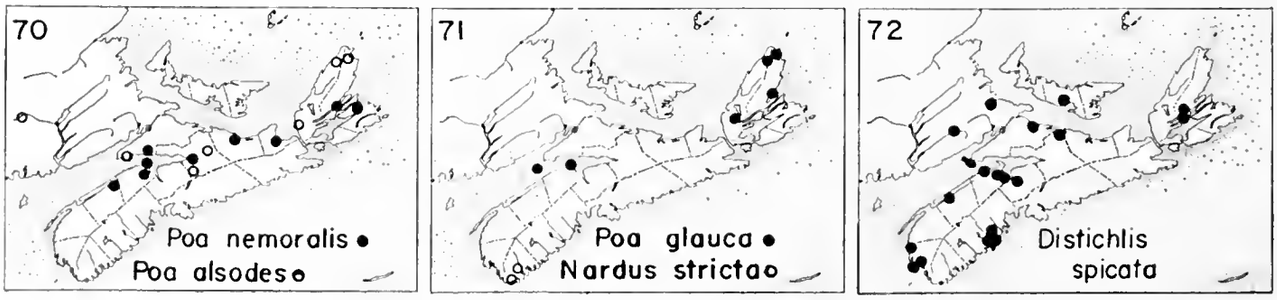
Closely related to the more northern *P. glauca* Vahl.; cliffs and talus slopes, rare in northern C.B.; found in cliff crevices, Amethyst Cove, on the outer edge of Cape Blomidon (Smith and Erskine, 1954); and common Isle Haute (Schofield, 1955), for the only records west of C.B. This grass is rather slender with narrow leaves and the whole plant has a decidedly bluish tinge.

7. BRIZA L.

1. **B. media** L. QUAKING-GRASS

Small perennial with open panicle and large orbicular spikelets pendulous from the ends of flexuous capillary branches. Reported by Macoun in 1910 from ditches at Digby; abundant around King's College School, Windsor (Erskine, 1951); boggy road-edge, Pubnico, collected by J. F. Donly.

Intro. from Eu.; local in N.S. and from N.Eng. to Ont. and Mich.



8. **DACTYLIS** L. ORCHARD-GRASS

1. **D. glomerata** L. Fig. 20, d.

This grass may be found in most parts growing wild in fields around towns, along roadsides and in orchards. Numerous varieties have been proposed by European workers. In N.S. the *typical* variety, with the backs of the glumes and the lemmas essentially glabrous, is the most common. Var. **ciliata** Peterm., with pubescent glumes, lemmas and sheaths; and var. **detonsa** Fries, with the keels of the glumes and lemmas merely scabrous rather than long-ciliate, are also found.

Widely introduced from Eurasia as a forage grass.

9. **ERAGROSTIS** Beauty.

Introduced annuals with erect neat panicles or rather lead-colored spikelets; spikelets elongated, many-flowered.

a. Glumes and lemmas glandular-warty on the keels; leaf blades glandular-warty along the margins.
  b. Spikelets 2-3.5 mm wide; lemmas 2-2.6 mm long. 1. *E. megastachya*
  b. Spikelets 1.5-2 mm wide; lemmas 1.7-1.9 mm long. 2. *E. poaeoides*
a. Glumes, lemmas and leaves not warty; spikelets only 1-1.5 mm wide. 3. *E. pectinacea*

1. **E. megastachya** (Koel.)Link STINK-GRASS

A weedy annual; collected in 1938 in waste land about Halifax Harbour and in 1951 at the edge of the beach, Hall's Harbour, Kings Co. (Smith and Erskine, 1954). To be expected in similar places elsewhere. (*E. cilianensis*).

Introduced from Eu. and becoming a common weed.

2. **E. poaeoides** Beauv.

Very similar to but more slender than the preceding; found growing in railway ballast at Truro, Windsor and Wolfville (Erskine, 1953).

Introduced from Eu. and widely distributed.

3. **E. pectinacea** (Michx.)Nees

Very abundant in cinders around wharves and railway, Pictou; and a railway-yard weed at Kentville.

A weed throughout much of N.A.; introduced.

10. **MOLINIA** Schrank

1. **M. caerulea** (L.)Moench Map 74. MOOR-GRASS

A common grass of the upland moors of northern Eu.; introduced into North America in only a few locations in the eastern U.S. and

Nfld. Collected for the first time in Canada in 1940 around the town of Louisburg where the extensive stands indicate its establishment there for a long time (Roland and Dore, 1942). The plant grows in large tussocks with extremely tough and persistent fibrous roots.

11. **SIEGLINGIA** Bernh.

1. **S. decumbens** (L.)Bernh. Map 74. HEATH-GRASS

Rather common in old pastures, peaty swales and moist soils in Digby, Yarmouth and Shelburne Counties. This is a common species of the upland heaths in Eu. It has been considered native but is undoubtedly introduced from Eu. It is closely related to *Danthonia* which it resembles in many vegetative and reproductive characters.

Southeastern Nfld. and N.S.

12. **CYNOSURUS** L.

1. **C. cristatus** L. CRESTED DOG'S-TAIL

Collected by H. Groh on a roadside at Baddeck in 1936; later found abundant in an old pasture field west of Kentville; and in fields at Glendyer and at Sydney in C.B. The spikelets are nearly sessile so that the inflorescence is tail-like.

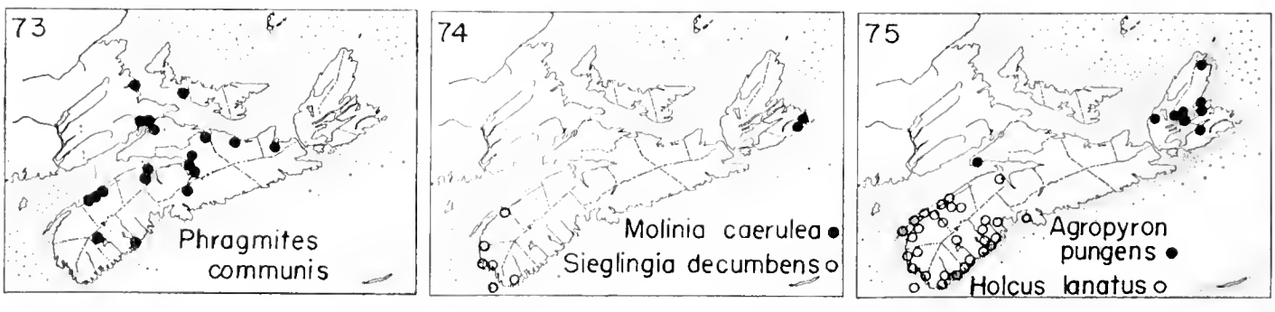
Introduced from Eu.; Nfld. to Ont. south to N.C.

13. **DISTICHLIS** Raf.

1. **D. spicata** (L.)Greene Fig. 20, e. Map 72. SEASHORE SALT-GRASS.

Found only along the coast where the soil is affected by salt or brackish water, generally forming extensive colonies in the upper parts of the marshes or just above high-tide on the sandy shores. Not common but scattered and local along the coast from Lunenburg Co. around the southwest and up to Hants Co.; salt marsh at Brule and near Pugwash in Cumberland Co.; MacKinnon Harbour and near Baddeck in Victoria Co.

Around much of the coast of North and South America and inland around salt springs or in saline soil.



14. **PHRAGMITES** Trin.

1. **P. communis** Trin. Map 73. COMMON REED.

This is the largest grass in the Province with an average height of 6 to 7, and sometimes attaining as much as 10 feet. The American plants, including all those found in N.S., have been separated as var. **Berlandieri** (Fourn.)Fern.

Found along the upper borders of salt marshes, or just behind them in wet partly brackish situations or in boggy areas: an extensive stand has been known just west of Annapolis Royal for a long time; heads of the marshes around Amherst along ditches or in boggy situations, also rather common in similar situations along Cobequid Bay. On the North Shore it is found at the head of a salt marsh at Brule, and on a marsh behind the beach at Abercrombie. One station inland in the vicinity of Heatherton, Antigonish Co., is found in a swampy spot marked on the geological map as a salt spring. An extensive stand exists at Indian Point, Northwest Bay, in the Medway Estuary where it was found by J. F. Donly.

Known around the world on all continents.

TRIBE II. **HORDEAE** BARLEY TRIBE

The *Hordeae* comprise all the grasses in which the spikelets are arranged in a single spike at the top of the culm. Those plants with several spikes or with the spikelets crowded with very short pedicels will be found elsewhere. (Fig. 21).

a. Leaves involute, tough, slender and bristle-like, arising from a tuft of whitened, hard sheaths; spikelets turned to one side forming a slender one-sided spike; glumes absent or obsolete. 15. *Nardus*

a. Leaves not tough and bristle-like; spikelets two-ranked forming a two-sided to a cylindrical spike.

b. Spikelets occurring singly at each node of the axis, sometimes in pairs at the lower nodes.

c. Perennials; spikes slender, with spikelets 4- to 12-flowered.

d. Spikelets with the edges of the florets towards the axis of the spike; both glumes present (Fig. 21, a). 16. *Agropyron*

d. Spikelets with the back of one row of florets towards the axis of the spike; lower glume in each spikelet absent, except in the terminal spikelet (Fig. 21, d). 17. *Lolium*

c. Annual or winter-annual cultivated cereals; spikes denser and stouter, with the spikelets 2- to 5-flowered.

3. Glumes broad, 3-nerved; lemmas awnless or long-awned; spikelets generally 3- to 5-flowered; wheat. 18. *Triticum*

e. Glumes narrow, bristle-like, 1-nerved; lemmas long-awned; spikelets generally 2-flowered; rye. 19. *Secale*

b. Spikelets more than one at each node.

f. Spikelets 3 at each node, the lateral pair short-stalked and sometimes reduced to awns (Fig. 21, e). 20. *Hordeum*

f. Spikelets two at each node of the axis, both alike.
g. Glumes well-developed; spike dense with appressed or ascending spikelets (Fig. 21, b, c). 21. *Elymus*
g. Glumes obsolete, or present as slender bristles; spike very open, with spikelets spreading horizontally at maturity. 22. *Hystrix*

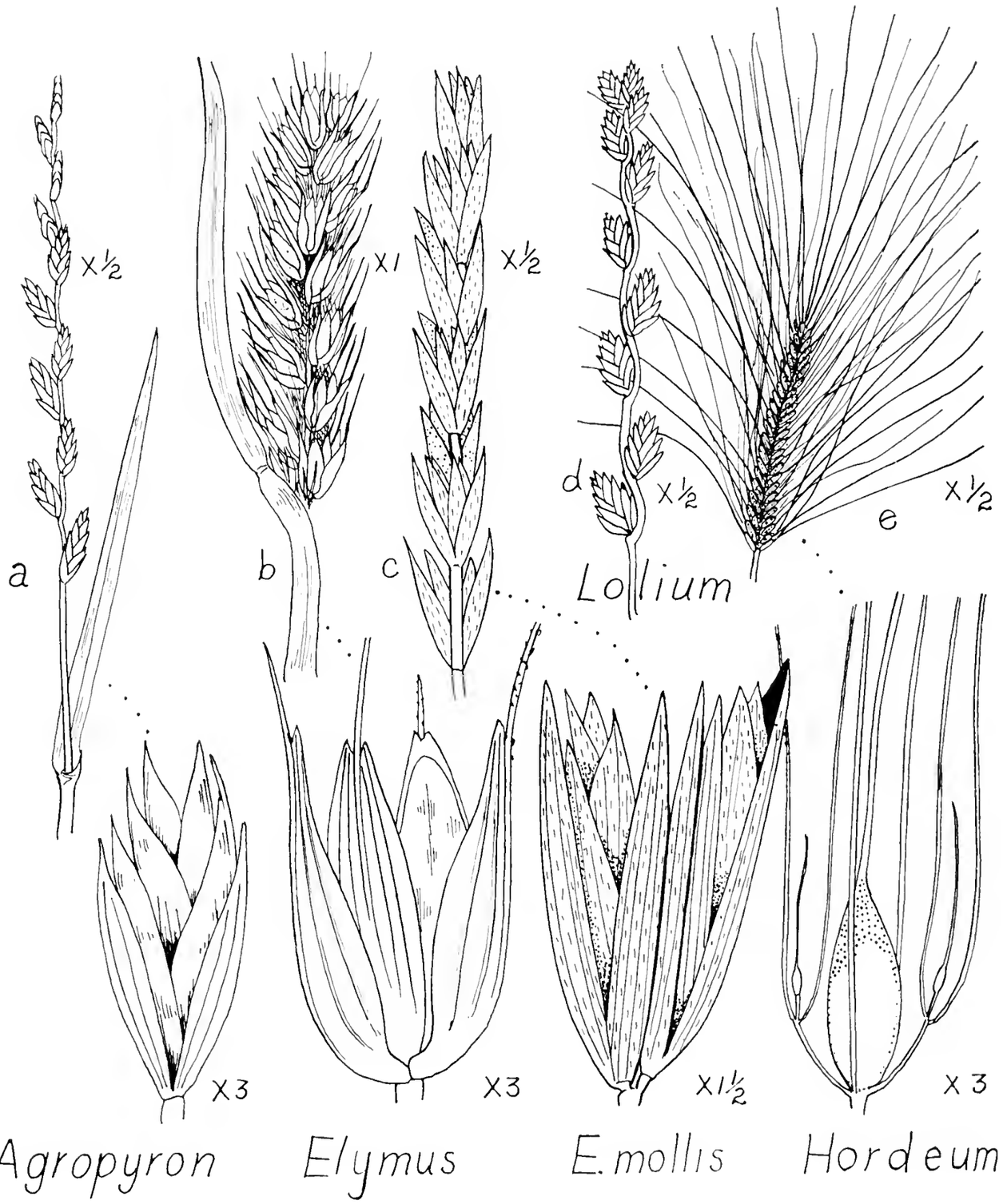


Fig. 21.—a, inflorescence and spikelet of **Agropyron repens.** b, **Elymus virginicus.** c, **Elymus mollis.** d, **Lolium perenne.** e, **Hordeum jubatum.**

15. NARDUS L.

1. N. stricta L. MOOR MAT-GRASS

Rare in southwestern N.S.: in an old pasture at Clyde River, Shelburne Co. and probably also at Tusket in Yarmouth Co.

Northern Eu. and southeastern Nfld.; introduced at scattered places west to Mich.

16. AGROPYRON Gaertn.

Tall grasses with erect, narrow spikes and the many-flowered spikelets alternating along and pressed flat against the axis of the spike. *A. repens* is a very troublesome weed. Other species from western Canada have been planted on the running dykes and may possibly persist.

a. Spikelets breaking up readily at maturity, leaving the glumes attached to the rachis; rachilla pilose; anthers 1-2 mm long; rhizomes absent. 1. *A. trachycaulum*

a. Spikelets not separating readily between the florets at maturity but dropping from the rachis intact with the glumes; rachilla not pilose; anthers 3-7 mm long; long creeping rhizomes present.

b. Blades firm, stiff, glabrous and glaucous, with a few broad ribs; culms completely or almost filled with pith towards the top; spike nearly square in cross-section; internodes of rachis thick and usually 4-angled. 2. *A. pungens*

b. Blades softer, flat, generally sparsely pilose on the upper surface, green or sometimes somewhat glaucous, with many narrow ribs; culms hollow at the top; spike not conspicuously 4-angled; internodes of rachis thin and rounded on the back. 3. *A. repens*

1. A. trachycaulum (Link)Malte SLENDER WHEAT-GRASS

This is a very variable species represented in N.S. by the following varieties as according to Fernald, M. L. *Agropyron*, Sect. *Goularda* in eastern North America. Rhodora **35:** 161-182. 1933.

a. Awns wanting or very short.

b. Glumes (excluding awns) 10-16 mm long, averaging 12.5 mm; fruiting spikes narrow, 5-12 mm thick. Var. *majus*

b. Glumes (excluding awns) 7-10 mm long, averaging 8 mm; fruiting spike narrower, 3-6 mm thick. Var. *novae-angliae*

a. Awns nearly equalling to much longer than the body of the lemma. Var. *glaucum*

Var. **majus** (Vasey)Fern. Found on gravelly beaches of lakes or bordering marshes in Shelburne, Yarmouth and Digby Cos.; around the Bras d'Or Lakes and on St. Paul Island. Lab. to B.C. south to Maine.

Var. **novae-angliae** (Scribn.)Fern. is found in a variety of habitats: along dry or gravelly beaches of brackish lakes or sea shores, gypsum talus, rocky flood plains or turfy mats on sea cliffs. Queens,

Halifax and Hants Cos. and around the coast on Cape Breton Island. Lab. to B.C. south to Conn. and Wisc.

Var. **glaucum** (Pease and Moore)Malte Thickets, along gravelly beaches of brackish or salt shores, or on drier banks along streams. Nfld. to B.C. south to Penn. and Calif.

2. **A. pungens** (Pers.)R. & S. Map 75.

Closely related to *A. repens*; found in the Province along the brackish shores in Cape Breton, mainly along the Bras d'Or Lakes, with specimens from a number of areas around the northern parts of the lakes, at Englishtown and Ross ferries and at Aspy Bay. One collection by Schofield from Burke Brook, Advocate, Cumberland Co. has been placed here.

Some of the plants of this species have fewer, only 3-5, florets in the spikelets and shorter and more involute leaves and more open inflorescences. These are known as var. **acadiense** (F. T. Hubbard) Fern. Known only from the beaches of Cape Breton and growing with the typical species, and grading into it.

Sandy coast, C.B. to Cape Cod.

3. **A. repens** (L.)Beauv. Fig. 21, a. COUCH-GRASS, QUACK-GRASS

Very variable and many varieties and forms have been described. The following segregations based on characters of the flowering parts may be found throughout. Each is represented by numerous collections which show no correlation with habitat or geographical regions. Fernald, M.L. The American variations of *Agropyron repens*. Rhodora **35:** 182-185. 1933.

The typical variety has the glumes oblong, rounded or abruptly narrowed to the tip, with broad scarious margins; rachis glabrous except for the ciliate edges; glumes and lemmas not definitely awned. Forma **aristatum** (Schum.)Holmb. differs in having the glumes and lemmas awned. Forma **trichorrachis** Rohlena differs in having the rachis pilose. Forma **pilosum** (Scribn.)Fern. has both the glumes and lemmas awned, and also the rachis pilose.

Var. **subulatum** (Schreb.)Reichenb. in its typical form has the glumes lanceolate, tapering gradually from near the middle to near the apex; the margin narrow or inrolled; rachis glabrous except for the ciliate margins; glumes and lemmas not awned. Its forma **Vaillantianum** (Wulf. & Schreb.)Fern. differs in having the glumes and lemmas awned. Forma **heberachis** Fern. has the rachis pilose. Forma **setiferum** Fern. has awned glumes and lemmas, and the rachis pilose.

Native along the coast from Nfld. to Maine; and intro. from Eu.; N.S. to N.J. westward.

17. LOLIUM L.

Easily identified since the spikelets are edge-wise to the axis of the spike.

a. Lemmas awnless; rachis glabrous on the back; leaves folded in the bud. 1. *L. perenne*

a. Lemmas usually awned; rachis rough on the side opposite the spikelet; leaves rolled in the bud. 2. *L. multiflorum*

1. **L. perenne** L. Fig. 21, d. PERENNIAL RYE-GRASS

Found in numerous places, particularly in new lawns sown to English seed mixtures. It gives rapid growth the first year but is susceptible to winter-killing.

Introduced from Eu.

2. **L. multiflorum** Lam. ITALIAN RYE-GRASS

An annual grass; collected at Wolfville and Windsor, and on ballast at Halifax (Smith and Erskine, 1954).

Eu.; widely introduced in fields and roadsides.

18. TRITICUM L.

1. **T. aestivum** L. WHEAT

Cultivated to some extent; also found growing as an escape in farm yards, city dumps, around grain elevators, railroad stations, wharves, etc.

19. SECALE L.

1. **S. cereale** L. COMMON AND WINTER RYE

Cultivated but volunteering in waste places or in fields the year following cropping. Scattered clumps of rye are often very conspicuous in new hay-fields in early summer since the rye is much taller and matures earlier than the grasses.

20. HORDEUM L.

Spikelets arranged three at each node, sometimes the two lateral ones reduced and abortive; glumes and lemmas with long awns.

a. Body of lemma about 10 mm long; rachis not breaking up at the joints; annual cultivated cereal. 1. *H. vulgare*

a. Body of lemma less than 8 mm long; rachis disarticulating readily at maturity; slender biennial or perennial grasses.

b. Lateral spikelets abortive and represented by three awns; central spikelet 1-flowered without a prolongation of the rachilla; awns 4-8 cm long. 2. *H. jubatum*

b. Lateral spikelets well-developed; central spikelet 2-flowered, or with a reduced second floret at the tip of the rachilla; awns 1-4 cm long. 3. *Elymordeum*

1. **H. vulgare** L. CULTIVATED BARLEY

This common cereal, extensively cultivated in the Province is generally of the 2-rowed type. Found as a casual weed on dumps, in waste places, farm yards and along roadsides.

Origin unknown; introduced from Eu.

2. **H. jubatum** L. Fig. 21, e. FOX-TAIL BARLEY

A weedy grass, easily recognized by its squirrel-tail type of spike with the long green or purplish awns. Scattered throughout around farm-yards or along roadsides; common to locally abundant along the upper limits of the salt marshes and along roads on the dyke-lands, usually growing where competition from other vegetation is weak.

Lab. to Alaska south to Va. and Mexico.

3. X **Elymordeum montanense** (Scribn.)Bowden, Canadian Journ. of Botany. **36:** 109. 1958.

A single colony of this plant was located in 1941 on the bank of a brook near the dykeland at Lower Onslow, Colchester Co. Living plants from this colony were sent to Ottawa in 1951 and were found by Bowden to be a hybrid between *Hordeum jubatum* and typical *Elymus virginicus*. A cross was also made by Bowden between plants of the two parents collected in the vicinity and one plant identical to the original colony was obtained.

Scattered natural hybrids where the two parents are found growing together; mostly in western N.A.

21. ELYMUS L.

Perennial native grasses with the spikelets found in pairs at each node of the spike; most near the sea-shore.

a. Glumes not awned, 2-4 mm wide, lanceolate, not thickened nor bowed-out at the base; blades broad, coarse and glaucous; culms densely short-pubescent towards the top. Stout plants with tough rhizomes, growing only on sandy or gravelly sea-beaches. 1. *E. mollis*

a. Glumes less than 2 mm wide, slender, stiff and long-awned; plants without underground rhizomes.

b. Glumes conspicuously indurated and bowing-outward at the base; awns straight, mostly the length of the glumes and lemmas or shorter. 2. *E. virginicus*

b. Glumes not indurated nor bowed-out at the base; awns much longer than the lemmas and glumes, bowed outward and twisted. 3. *E. Wiegandii*

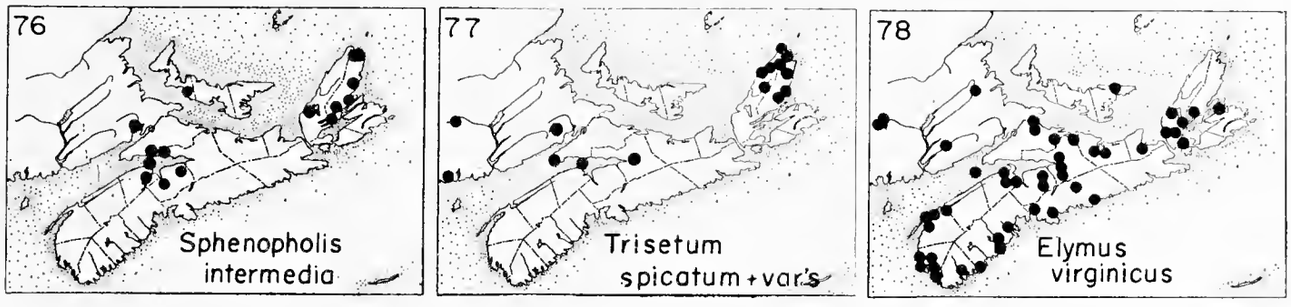
1. **E. mollis** Trin. Fig. 21, c. Map 79. AMERICAN DUNE-GRASS

Bowden, Wray M. Cytotaxonomy of Section *Psammelymus* of the genus *Elymus*. Can. Jour. Bot. **35:** 951-993. 1957.

Found on sandy beaches all along the coast. The plants are now considered to be specifically distinct from the European *E. arenarius* L. The habit and general appearance is very similar to the American Beach-grass, *Ammophila breviligulata*, which grows in similar locations.

Forma **scabrinervis** Bowden differs from the species in the almost glabrous glumes, with only short scabrous hairs on the midrib and often on the lateral nerves. Common on the shores of P.E.I. and the adjacent coasts.

Cape Cod northward; Lake Superior, Hudson Bay; south to Calif. and to Japan and Korea.



2. **E. virginicus** L. Fig. 21, b. Map 78. WILD RYE

Common, showing great variability in the size of the spikes, their exsertion above the uppermost sheath, the length of the awns and the pilosity of the lemmas. Various forms and varieties based on such characteristics have been named.

a. Upper sheath inflated, enclosing the base of the spike; spikes coarse and green; leaves flat, to 12 mm wide.
  b. Lemmas and glumes glabrous or scabrous-ciliate. Var. *virginicus*
  b. Lemmas and glumes hairy. Forma *hirsutiglumis*
a. Upper sheath not inflated with the spike normally well exserted; spikes pale; leaves often involute, 3-8 mm wide.
  c. Lemmas and glumes glabrous or scabrous-ciliate. Var. *halophilus*
  c. Lemmas and glumes hairy. Forma *lasiolepis*

The typical variety is found in moist or shaded places in various parts of the Province, usually growing in wet runs, often with other tall grasses, as is forma **hirsutiglumis** (Scribn.)Fern.

Var. **halophilus** (Bickn.)Wieg. is found around estuaries in western N.S. along with forma **lasiolepis** Fern.

Nfld. to Alta. south to N.C.

3. **E. Wiegandii** Fern.

Collected near Sydney by G. C. Warren; beside river at Alma in Pictou Co. (Smith and Erskine, 1954); found abundant, growing up to six feet high, on river banks at River John. This appears to be a northeastern segregate of *E. canadensis*.

N.S. and Gaspe south to Penn. and west to Mo.

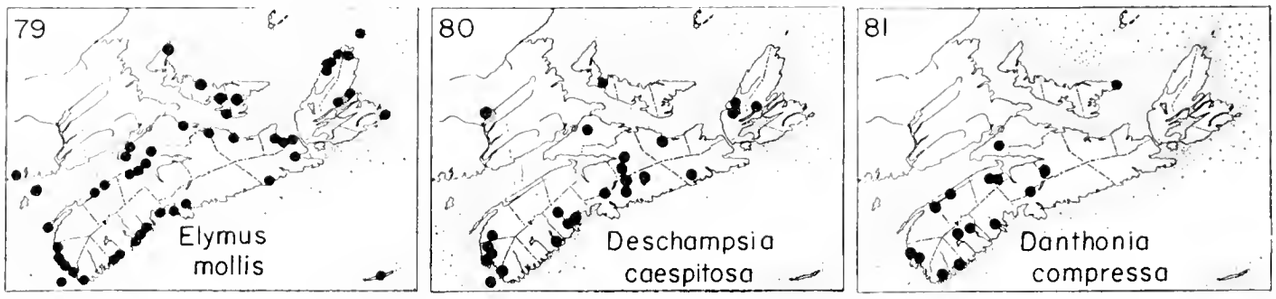
22. **HYSTRIX** Moench

1. **H. patula** Moench BOTTLE-BRUSH GRASS

A rare grass of wooded bottom-lands. Collections from along the Five-Mile River, Hants Co. (Fernald, 1921); and by St. John in

the valley of the East River at Charcoal, Pictou Co. are the only ones recorded to date from the Province. They belong to the more northern var. **Bigeloviana** (Fern.)Deam with pilose lemmas.

N.S. to N.D. south to Georgia.



TRIBE III. AVENEAE

The *Aveneae*, or Oat Tribe, includes the grasses with the spikelets in panicles and each spikelet generally 2-flowered, with the glumes as long as the lowest lemma. The awns, when present, are borne on the backs of the lemmas and in many species they are twisted and exserted sideways (Fig. 22).

a. Ligule membranous; no tuft of hairs at the top of the sheath.
 b. Perennial, or small annual grasses with the spikelets less than 10 mm long.
  c. Awns absent; glumes very unequal in width, the second much broader than the first; slender grasses on gypsum or limestone. 25. *Sphenopholis*
  c. Awns usually present; glumes essentially of equal widths.
   d. Panicle very strongly contracted, spike-like; or else with the branches very short and ascending to form a dense, contracted, velvety inflorescence.
    e. Plants 1-4 dm high; panicle spike-like; each lemma with a straight slender awn.
     f. Perennial native grasses, northern, on rock outcrops and cliff faces; more or less hairy; spikelets 4-5 mm long. 26. *Trisetum*
     f. Annual introduced, rare coastal in Yarmouth Co.; slender and slightly scabrous; spikelets 2.5-3.3 mm long. 29. *Aira*
    e. Plants 5-10 dm high, velvety grass of open fields; panicle crowded, more elliptical, velvety; only the upper lemma awned, with a short, hooked awn (Fig. 22, a). 24. *Holcus*
   d. Panicle not spike-like nor very strongly contracted.
    g. Florets not alike, the lower staminate and long-awned, the upper perfect and not awned; second glume longer than the first; spikelets 7-9 mm long; blades 5-10 mm wide. 23. *Arrhenatherum*
    g. Florets alike and both perfect.
     h. Lemmas with awns arising from near the base; leaves mostly less than 3 mm wide, in one species involute. 28. *Deschampsia*
     h. Lemmas with awns from near the apex, or else awnless; leaves flat, 3-8 mm wide. 26. *Triticum*
 b. Annual cultivated grasses with large spikelets more than 12 mm long; lemmas awned or awnless; oat. 27. *Avena*
a. Ligule a row of fine hairs; tufts of hairs present at the top of the sheath.
     i. Lemma with a twisted awn arising from between the two sharp teeth. 30. *Danthonia*
     i. Lemma awnless, with three small teeth at the apex. 11. *Sieglingia*

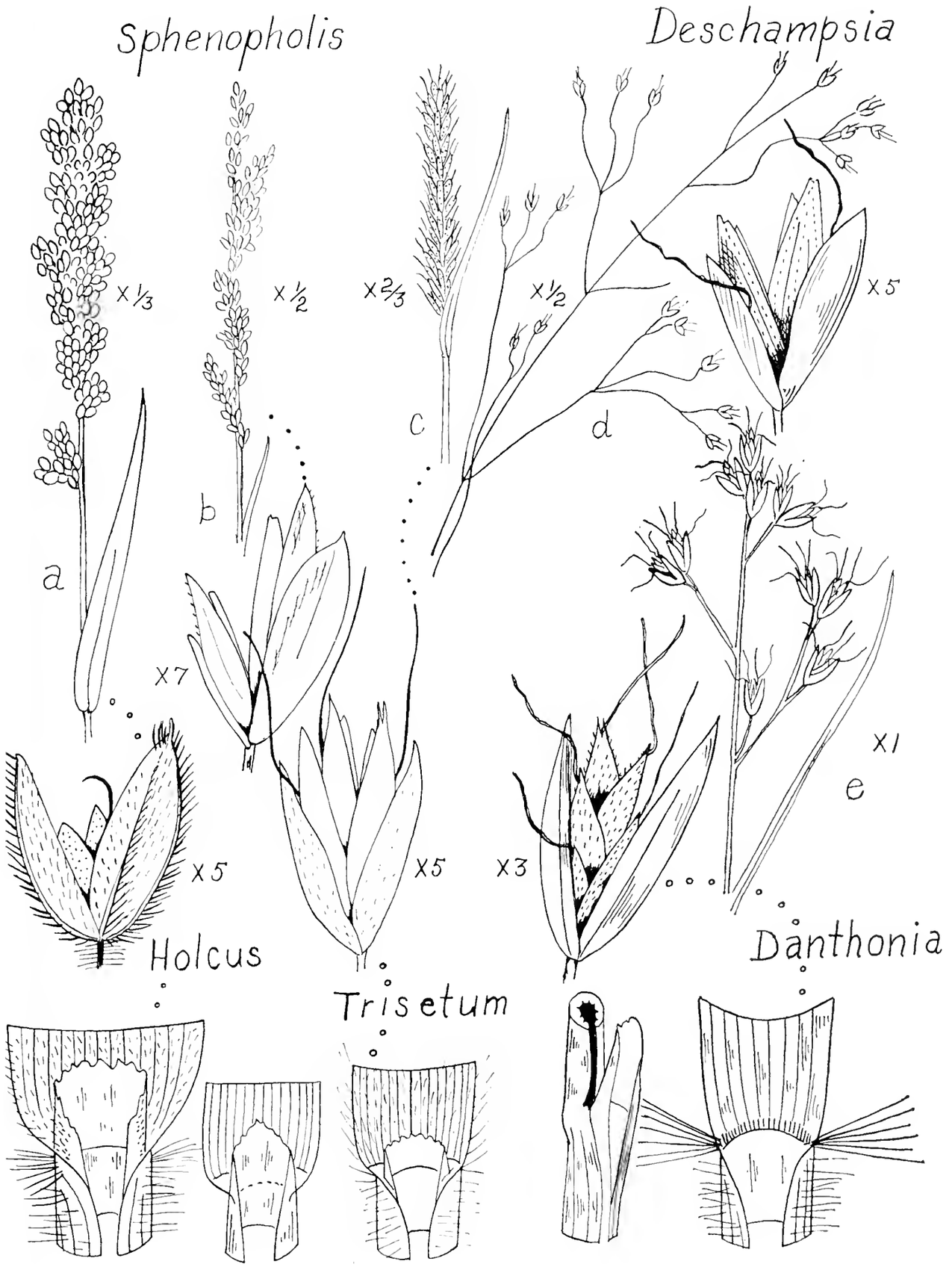


Fig. 22.—a, **Holcus lanatus,** inflorescence, spikelet and leaf sheath. b, **Sphenopolis intermedia.** c, **Trisetum spicatum.** d, **Deschampsia flexuosa.** e, **Danthonia spicata.**

23. **ARRHENATHERUM** Beauv.

1. **A. elatius** (L.)Mert. & Koch TALL OAT-GRASS

Occasionally found as an escape or established around the edges of fields where it has been introduced: Sydney; East River, Lunenburg

Co.; Lake George, Kings Co.; and near the North Light, Brier Island, Digby Co.; to be expected widely scattered elsewhere.

Introduced from Eu. and escaped from cultivation.

24. HOLCUS L.

1. **H. lanatus** L. Fig. 22, a. Map 75. VELVET-GRASS

Conspicuous on account of its striking pale or purplish appearance and soft felted pubescence; one of the more abundant grasses throughout Shelburne, Yarmouth and Digby Counties in meadows, pastures, roadsides and waste places; scattered east near the coast to Halifax and Kings Cos.

Intro. from Eu.; abundant also in southern coastal B.C. but not well-established elsewhere in Canada.

25. SPHENOPHOLIS Scribn.

1. **S. intermedia** Rydb. Fig. 22, b. Map 76. SLENDER WEDGE-GRASS

Collected at scattered sites, in every case growing on cliff-faces or in locations where its roots were in contact with limestone, basalt or gypsum; central Hants Co.; Cape Blomidon, Kings Co. and Moose Island, Cumberland Co. (Schofield, 1955); upper falls on Jeffer's Brook, Cumberland Co. where it is abundant on the vertical cliffs; and more common in central and northern C.B.

Nfld. to Alaska south to Fla.

26. TRISETUM L.

a. Panicle dense and spike-like; spikelets grayish-green; awns prominent, nearly straight and not twisted.
  b. Glumes glabrous except for the ciliolate keels. 1. *T. spicatum* var. *molle*
  b. Glumes pubescent. *T. spicatum* var. *pilosiglume*
a. Panicle looser and somewhat open with the spikelets on elongate branches.
  c. Lemmas 2-toothed, with long, strongly-twisted awns; panicle rather compact, tinged with brown or purple. 2. *T. flavescens*
  c. Lemmas entire, without awns; panicle loose and silvery-green. 3. *T. melicoides*

1. **T. spicatum** (L.)Richter Fig. 22, c. Map 77.

Var. **molle** (Michx.)Beal is generally distributed across Arctic and temperate N.A. This has been found only in northern C.B.: Lockhart Brook, Big Southwest Brook, Barrachois River, Cheticamp R., and at Cape St. Lawrence and on gypsum at Cape North Village (Smith and Schofield, 1952).

Var. **pilosiglume** Fern. is more wide-ranging in N.S.: in cliff crevices and on ledges, Amethyst Cove, Cape Blomidon, Kings Co. (Smith and Erskine, 1954); frequent on exposed cliff headlands, Cape d'Or, Cumberland Co. (Schofield, 1955); abundant on a rock-cut along the railway east of Truro, Colchester Co.; and in numerous locations in northern C.B.; usually found on rocky outcrops along streams, on dripping cliffs or rock crevices as at Cheticamp R., Clyburne Brook, and Salmon River (Smith and Schofield, 1952).

Lab. to Lake Superior south to N.S. and the alpine regions of northern N. Eng.

2. **T. flavescens** (L.)Beauv.

An introduced forage grass found persisting in old pastures in the town of Meteghan, Digby Co.

Naturalized from Eu.; scattered west and south.

3. **T. melicoides** (Michx.)Vasey

This has been found at only one station: occasional on damp shaded ledges of Indian Brook, Victoria Co.

Nfld. to Mich. south to central Me. and northern N.Y.

27. AVENA L. OAT

a. Lemmas with long, slender and twisted hairs on the back, and a ring of stiff, brown, bristle-like hairs from around the callus; awns strong and stiff, the lower part twisted and extending beyond the tip of the lemma, upper part about twice as long as the lower part; florets readily separating from the spikelet. 1. *A. fatua*

a. Lemmas glabrous; awns entirely absent, or, if present, not twisted or twisted but a few times at the base; florets not separating readily from the spikelet nor from each other. 2. *A. sativa*

1. **A. fatua** L. WILD OAT

Very similar to the cultivated oat in appearance; sometimes found as a weed in fields of cultivated oats, arising from impurities in seed; or in waste places around farms or towns.

Intro. from Eu.; and brought in from Western Canada.

2. **A. sativa** L. CULTIVATED OAT

Common cereal plant grown extensively in the Province for grain or for green fodder; frequently found as an escape but not persisting.

28. DESCHAMPSIA Beauv.

Perennial grasses with ample, open panicles and shining spikelets with a bronze or purplish tinge.

a. Leaves filiform, involute, less than 1 mm in diameter; awns twisted, extending well beyond the glumes; lemmas and sheaths scabrous. 1. *D. flexuosa*

a. Leaves flat or folded, 1-5 mm wide; awns straight, not much longer than the lemmas, not conspicuously exserted; lemmas and sheaths glabrous.
c. Culms stout, in large tufts, 7-15 dm high; spikelets 2-3.3 mm long; introduced. 2. *D. caespitosa* var. *parviflora*
c. Culms slender, 1-7 dm high; spikelets 3-4.5 mm long; native on wet shores. Var. *glauca*

1. **D. flexuosa** (L.)Trin. Fig. 22, d. HAIR-GRASS

Common throughout, in dry barren soils such as on the top of exposed granitic hills, on sandy plains in Kings and Annapolis Counties, sea-cliffs and barren headlands. This is a common and very conspicuous grass in more sterile locations.

A northern variation of this plant (var. *montana* (L.)Ledeb.), with slightly larger spikelets, has been reported (Perry, 1931) from St. Paul Island off the tip of Cape Breton. This variation, however, does not seem to be distinct. Both our species of *Deschampsia* exhibit great variation in their stature, size and shape of leaves, panicles and spikelets and are decidedly polymorphous.

Greenland to Alaska south to Ga.; Eurasia.

2. **D. caespitosa** (L.)Beauv. Map 80.

Var. **parviflora** (Thuill.)Richter is scattered as an occasional introduction from Europe about towns: near the railroad at Stewiacke and by fair grounds, New Glasgow (Erskine, 1951); and also reported from St. John, N.B. This plant is much coarser and taller than our native variety and grows with basal tufts of stiff coarse leaves.

Var. **glauca** (Hartm.)Lindm. is rather local, growing on riverbanks in moist rocky soil, on lake shores and in damp soil in various places from Yarmouth to C.B. Common along the Salmon River above Truro.

Nfld. to the Yukon south to Va. and Calif.

29. **AIRA** L.

1. **A. praecox** L. HAIRGRASS

J. S. Erskine (1958) mentions that the most interesting introduced plant of Seal Island, off the southwestern coast of N.S., was *Aira praecox*. This grass was not uncommon on the Island. "The explanation of its presence is probably that its seeds came ashore in the sand-ballast of ships driven up on the beach."

Intro. from Eu.; dry sandy soils from N.S., and N.Y. to Va.; also on the Pacific Coast.

30. **DANTHONIA** DC.

Tufted perennial grasses, the most common being the poverty-grass, wire-grass or wild oat-grass of old fields and sterile areas. The

ligule consists of a row of hairs; and there is a tuft of long hairs on each side at the top of the sheath. The spikelets are 3- to 8-flowered, with a long twisted awn on the back of the lemma between the two long teeth.

a. Basal leaf-blades usually less than 15 cm long; ligule less than 1 mm long at the center but 2-3 mm long at the edges; sheaths, at least the lower, spreading-pilose; teeth of lemma sharply acute, but without long slender points, generally less than 2 mm long; branches of panicle ascending except during anthesis, giving a spike-like appearance. 1. *D. spicata*

a. Basal leaf-blades 15-50 cm, averaging 30, cm long, not curling greatly when dry; ligule of long silky hairs, 3-5 mm long; sheaths, except for the tuft of hairs at the throat, and blades glabrous; teeth of lemma slender and awn-like, 2 mm long or longer; lower branches of panicle spreading and generally reflexed during and after anthesis. 2. *D. compressa*

1. **D. spicata** (L.)Beauv. Fig. 22, e. WIRE-GRASS

One of the most abundant grasses, found everywhere on poor and sterile soils; common in dry cliff crevices and in cut-over areas; depleted pastures may have a matted covering of this species. It shows considerable variation in stature, pubescence of leaves, and in other characters and it probably reproduces to a large extent by the closed-fertilized grains that are borne inside the sheaths, especially at the base of the clums.

Fernald in Rhodora **45:** 239-245. 1943, separates off a wide-ranging northern form as var. *pinetorum* Piper. This is marked by wider glumes with obscure lateral nerves, with the glumes covering all but the summit of the column of florets; throughout N.S.

Quite different-appearing plants with larger spikelets, over-stimulated growth, stiff erect habit and more crowded autumnal inflorescences are grouped together as *D. Alleni* Aust. Canso, Bridgewater, Digby Neck and elsewhere when late, wet autumn growing conditions exist.

Nfld. to B.C. south to Fla. and N.M.

2. **D. compressa** Aust. Map 81.

Rather rare; found in thickets, borders of woods, along woodland paths, generally in moister soils than the preceding and sometimes difficult to distinguish from luxuriant specimens of it. Most common in southwestern N.S., becoming scattered north and east to Cumberland, Kings and Halifax counties.

N.S. to Que. and Ohio south to N.C. and Ga.

TRIBE IV. AGROSTIDEAE

The Agrostis tribe comprise those grasses which have one fertile floret only, which readily separates and falls away from the glumes. Many of the plants have ample panicles or crowded spike-like inflorescences with a large number of very small spikelets. (Fig. 23, 24).

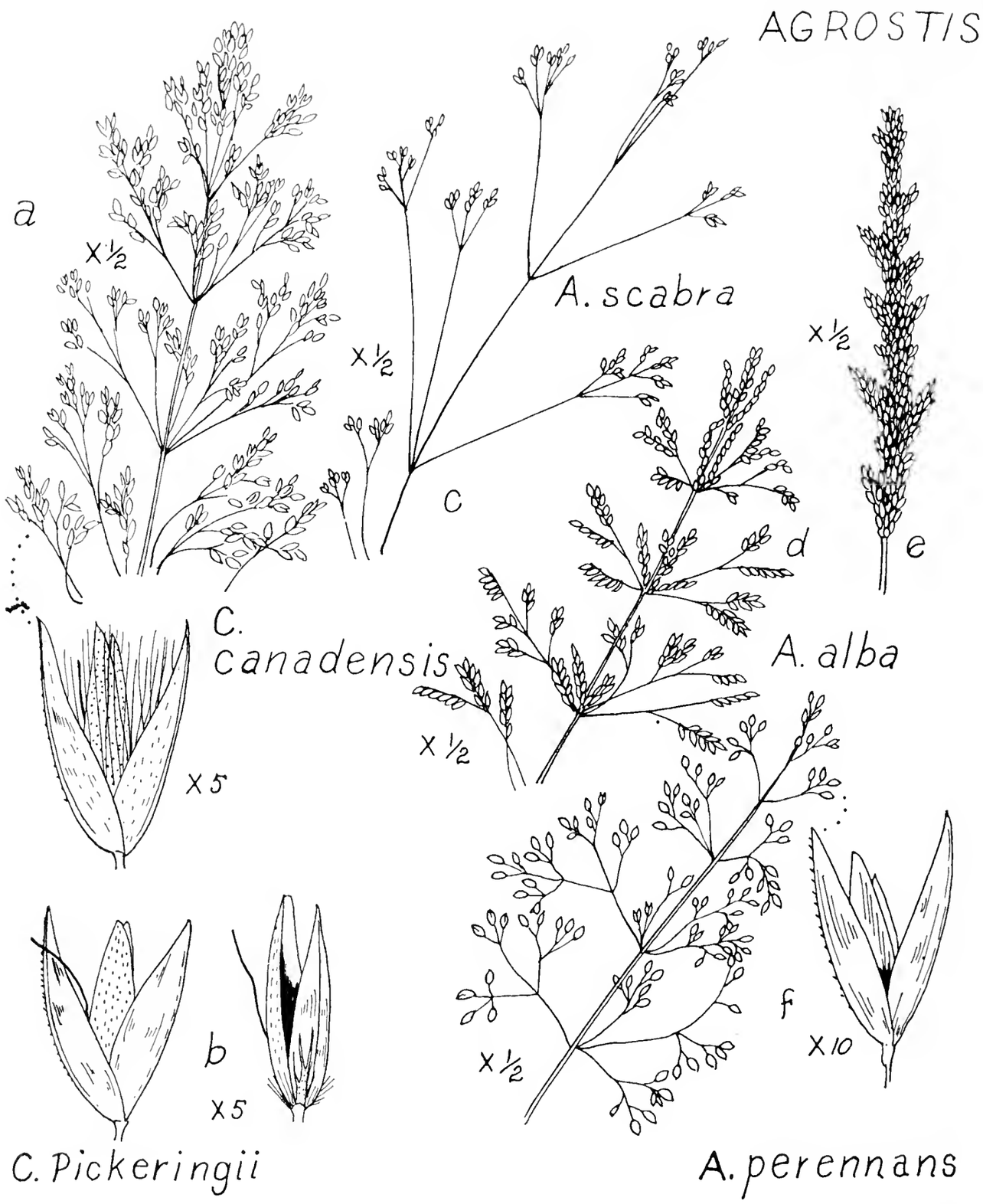


Fig. 23.—a, **Calamagrostis canadensis,** inflorescence and spikelet. b, spikelet and floret of **Calamagrostis Pickeringii.** c, **Agrostis scabra.** d, **Agrostis alba.** e, **Agrostis palustris.** f, **Agrostis perennans,** inflorescence and spikelet.

a. Lemma as thin or thinner than the glumes; spikelets laterally compressed or sub-terete.
  b. Spikelets, exclusive of the awns, 1-7 mm long.
    c. Inflorescence an open or contracted panicle, if very contracted and spike-like then with the spike more or less interrupted.
      d. Spikelet disarticulating above the glumes, the empty glumes remaining on the branches after maturity; floret (not the spikelet) not stalked; palea 2-nerved; stamens 3.

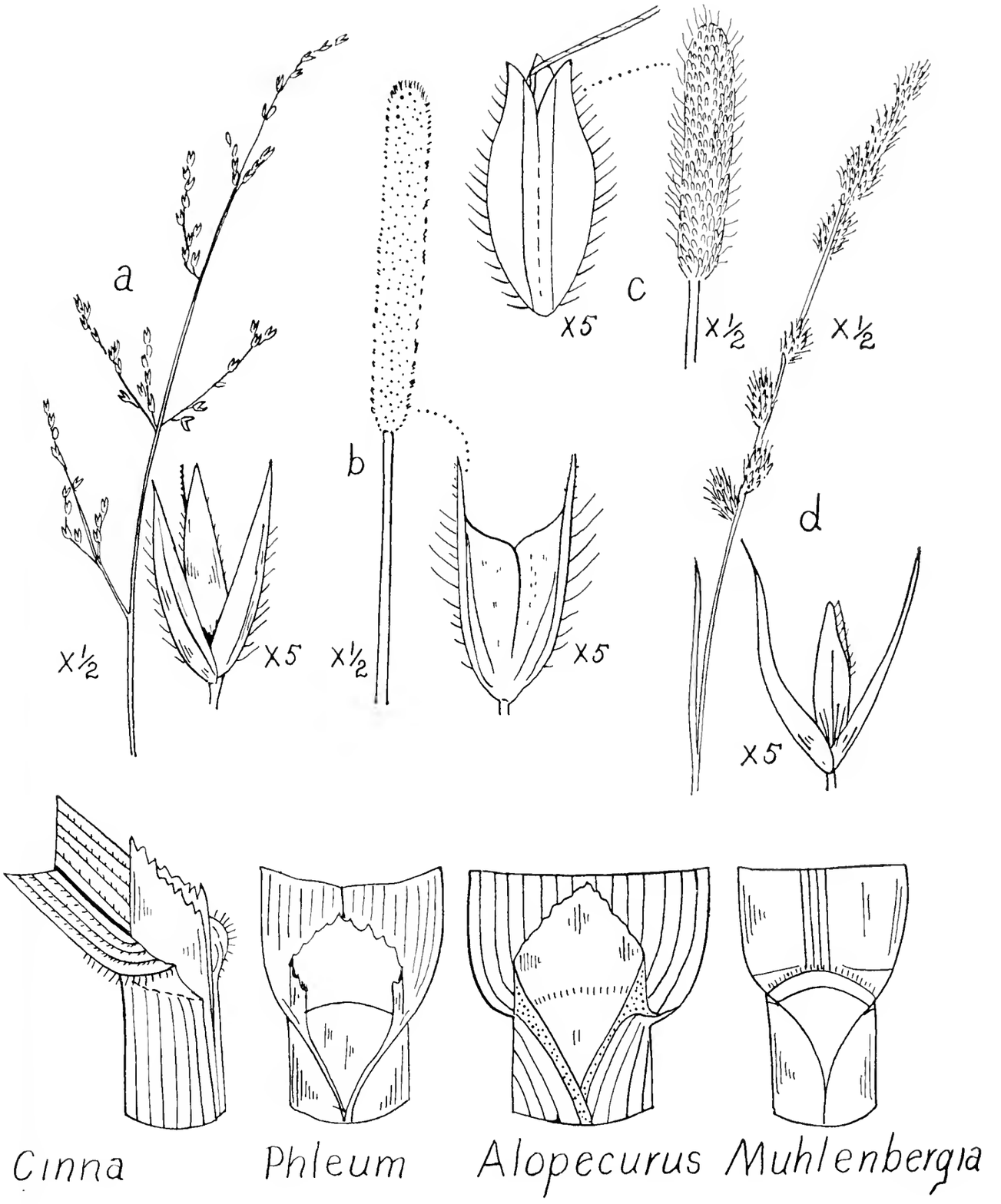


Fig. 24.—a, **Cinna latifolia,** inflorescence, spikelet and leaf-sheath. b, **Phleum pratense.** c, **Alopecurus pratensis.** d, **Muhlenbergia glomerata.**

e. Callus of floret with a tuft of fine hairs at least one-fourth as long as the lemma; rachilla hairy, prolonged behind the palea; second glume 3-nerved (Fig. 23). 32. *Calamagrostis*

e. Callus of floret glabrous or with very short hairs; rachilla not prolonged; second glume 1-nerved.

f. Perennials; blades glabrous; ligule membranous.

g. Rhizomes not short and scaly (underground rhizomes or long leafy stolons may be present); glumes equal or longer than the lemma, not awn-tipped; lemma awnless or awned from the back. (Fig. 23).

34. *Agrostis*

g. Rhizomes short, shallow, branching, scaly and knotty (absent in *M. uniflora*); body of glumes shorter than the lemma, the long-awned tip, if present, surpassing the lemma (Fig. 24, d). 38. *Muhlenbergia*

f. Annuals; margin of blade long-ciliate; ligule a row of short hairs. 31. *Sporobolus*

d. Spikelets disarticulating below the glumes, falling away entire; floret short-stalked; palea appearing 1-nerved; stamen 1 (Fig. 24). 35. *Cinna*

c. Inflorescence a dense, cylindrical spike-like panicle with the spikelets on very short stalks.

h. Inflorescence harsh to the touch; glumes long-pointed; lemmas awnless; timothy (Fig. 24). 36. *Phleum*

h. Inflorescence soft to the touch; glumes not long-pointed; lemmas awned from the back, the awns often conspicuous (Fig. 24). 37. *Alopecurus*

b. Spikelets, exclusive of the awns, 8 mm or more in length.

i. Lemma awnless or very short-awned; glumes as long as the lemma; panicle densely-flowered and spike-like; sandy sea-shores and dunes. 33. *Ammophila*

i. Lemma tapering into a long awn; glumes minute or absent; panicle lax with a few early-deciduous spikelets; damp woodlands (Fig. 25, b). 39. *Brachyelytrum*

a. Lemmas thicker and firmer than the glumes, hard and shining, firmly enclosing the palea and grain; spikelets dorsally compressed or terete.

j. Lemma awned but the awn deciduous, pubescent at the base and generally over much of the back; spikelet almost terete; culms tufted, with fibrous roots (Fig. 25, d). 40. *Oryzopsis*

j. Lemma awnless, glabrous, smooth; spikelets dorsally compressed; culms tall, in patches from spreading rhizomes. 41. *Milium*

31. **SPOROBOLUS** R.Br.

1. **S. vaginiflorus** (Torr.)Wood SHEATHED DROP-SEED

This grass has been collected only in a dry, sandy pasture at Nictaux, Annapolis Co.; and in an old pasture north of Aylesford, Kings Co. It is probable that these specimens belong to var. **inaequalis** Fern., which has a slightly more northern range than has the typical species.

N.S. to N. Dak. south to Ga.

32. **CALAMAGROSTIS** Adans.

Tall plants of meadows, swales and bogs; the distinguishing feature is the tuft of hairs on the lemma.

a. Awn slightly twisted, curved so that the tip sticks out from between the glumes; callus hairs scant and short; lemma firm and scabrous.

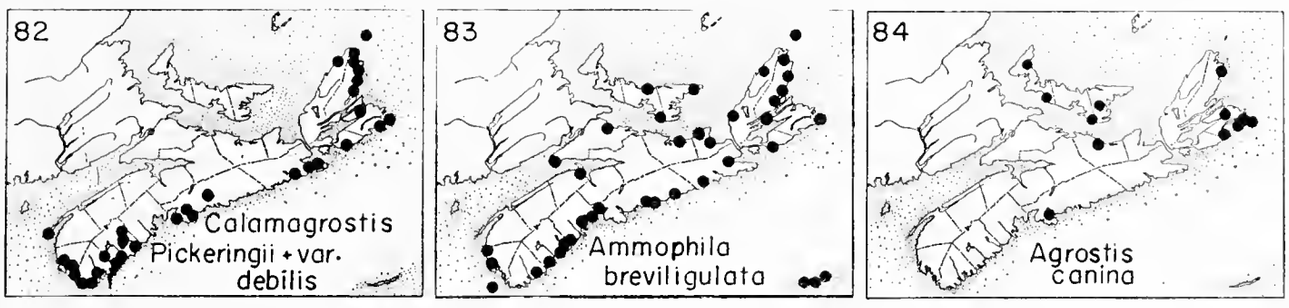
b. Spikelets 4-5 mm long. 1. *C. Pickeringii*

b. Spikelets 2.8-3.6 mm long. Var. *debilis*

a. Awn straight; callus hairs abundant and about as long as the lemma; lemma thin and transparent.

c. Panicle loose and open, particularly at flowering time although the branches ascend later; lemma translucent in the upper part; callus hairs about as long as the lemma, copious; leaves 4-8 mm wide. 2. *C. canadensis*

c. Panicle with short branches, more or less contracted into a narrow inflorescence; leaves often involute or rolled, 2-4 mm wide.
d. Spikelets 6-7 mm long; rachilla conspicuously prolonged with a tuft of hairs at the top; awn inserted well above the middle of the lemma. 3. *C. cinnoides*
d. Spikelets less than 5 mm long; rachilla prolongation short; awn attached near the middle of the lemma.
e. Leaves hard and scabrous, flat or involute; ligule 3-7 mm long. 4. *C. inexpansa*
e. Leaves smooth, involute; ligule 1-2.5 mm long. 5. *C. neglecta*



1. **C. Pickeringii** Gray. Fig. 23, b. Map 82.

This plant is found at numerous stations at widely separated points, mainly along the Atlantic coast in bogs, boggy barrens, swales, and heathy meadows in the highlands of Cape Breton.

Var. **debilis** (Kearney)Fern. & Wieg., with smaller spikelets, is much more common in similar habitats. Plants growing in bogs have a glaucous appearance, while along some damp river-bottoms the plants may be green and grow in colonies. It is doubtful if this is a true variety.

Nfld. to Mass., N.J. and the mts. of N.Y.

2. **C. canadensis** (Michx.)Nutt. Fig. 23, a. BLUE-JOINT

A common grass of ditches, swales and fresh-water marshes throughout. The size of the spikelets has been taken as the basis for the segregation of several varieties but this variation does not seem to be discontinuous and it is not correlated with other morphological characteristics. It seems best to consider the varieties as intergrading components of a highly polymorphous species.

Var. **Macouniana** (Vasey)Stebbins has spikelets 2.2-2.8 mm long; found on Lark Hill barren, Port Medway by J. F. Donly.

Var. **typica,** with spikelets 2.8-3.8 mm long, is common in the Province and grades into var. **robusta** Vasey with spikelets 3.5-4.5 mm long. This also is common throughout. Specimens which might be classed definitely as var. **scabra** with spikelets 4.5-6 mm long and scabrous glumes, have not been found.

Nfld. to Alaska south to W. Va. and Calif.

3. **C. cinnoides** (Muhl.)Bart.

There is but one report in the literature (Stebbins, G. L. Rhodora **32:** 35-57. 1930) of a collection of this species: at Halifax, by Lunt, 1912.

N.S.; southern Me. to Ga. and Ala.

4. **C. inexpansa** Gray, var **brevior** (Vasey)Stebbins

Only one station known, from Victoria Co., C.B.: glaucous in appearance, single plants scattered on the wet cliff face of Lockhart Brook, Salmon River; collected by Smith et al.

This species ranges from Greenland to Alaska south to northern N. Eng. and N.M.

5. **C. neglecta** (Ehrh.)Gaertn.

Rare; collected at Beaver Lake, Yarmouth Co. (Rhodora **46:** 297-8. 1944); in a larch bog, Big Baddeck in Cape Breton; swales south of Amherst. It is common around some of the lakes just across the N.B. border and Erskine reports it as local in fresh to brackish marshes near the coast in P.E.I.

Greenland to Alaska south to N.S., Wisc. and Calif.

33. **AMMOPHILA** Host.

1. **A. breviligulata** Fern. Map 83. AMERICAN BEACH-GRASS

Common around the shores of the Province wherever sandy beaches or low dunes occur; frequently growing with *Elymus mollis* and *Agropyron repens.* Common on Sable Island.

Along the coast; Nfld. to N.C. and around the Great Lakes.

34. **AGROSTIS** L. BENTGRASS

Perennial grasses with many small one-flowered spikelets; glumes almost equal, longer than the membranous lemmas. Malte, M.O. The commercial bent grasses (*Agrostis*) in Canada, Nat. Mus. Can. Bull. 50, Ann. Rpt. 1926: 105-126, 1928 Philipson, W. R. A revision of the British species of the genus Agrostis Linn. Linn. Soc. Journ. Bot. LI: 73-151, 1937.

a. Palea at least one-third as long as the lemma; panicle-branches more rigid; rhizomes or stolons present.
  b. Ligule longer than broad, generally 2-4 mm long on the lower leaves, frequently whitish and translucent, membranous, pointed or rounded at the apex; spikelets on short branchlets, numerous towards the axis of the panicle, the branchlets appressed or ascending after flowering.
    c. Introduced forage grass; culms stout, erect; rhizomes usually present; panicle ovoid, reddish, with branches 3-10 cm long, spreading to sub-erect in fruit. 1. *A. alba*
    c. Grasses of native habitats; culms slender, decumbent at the base, usually with abundant leafy stolons; panicle long-cylindrical, greenish to purplish, densely compact with branches short, crowded and less than 4 cm long; branches densely contracted in fruit. 2. *A. palustris*
  b. Ligule broader than long, generally 0.5-1 mm long on the lower leaves, transparent, brownish or somewhat hyaline, truncate; spikelets not more crowded at the base of the branches, the branches divaricate-spreading after flowering. 3. *A. tenuis*

a. Palea obsolete or absent; panicle-branches slender or capillary; rhizomes or stolons absent.
  d. Panicle diffuse, the capillary branches re-branching at or above the middle. 4. *A. scabra*
  d. Panicle not diffuse, or the branches re-branching below the middle.
    e. Panicle somewhat lax; several culm-leaves present; lemmas awnless, or rarely with a straight short awn; culms upright from the base; stolons absent. 5. *A. perennans*
    e. Panicle branches more rigidly spreading; leaves mainly in a basal tuft; lemmas with a twisted geniculate, but sometimes short and straight, awn; stolons and basal decumbent part of the culm rooting at the nodes. 6. *A. canina*

1. **A. alba** L. Fig. 23, d. RED-TOP

This is rather inappropriate name for the common red-top of cultivated fields and roadsides but there is such a diversity of opinion regarding the status of this plant that each treatment gives a different scientific name. This species and the next are often regarded merely as extremes of one very variable species, *A. stolonifera*. Red-top is often sown as a forage grass and it is found also along roadsides and in waste areas, or persisting for a short time in well-drained soil.

Introduced from Eu. throughout N.A., perhaps native northwards.

2. **A. palustris** Huds. Fig. 23, e. CREEPING BENT-GRASS

Common in moist fields and pastures, in ditches, and on the upper part of salt and brackish marshes as well as in fresh-water marshes and swales. Along the margins of pools and streams the stolons often grow out a considerable distance into the water. This plant shows a great variation in the habit of growth, length of stolons, form of panicle, color of spikelets and in other characteristics. On exposed sand and gravel-flats along the sea-shore occur somewhat dwarfed plants with broad and short (about 1.8 mm long) glumes and short leaves with purplish sheaths. These have been called *A. maritima* Lam.

Greenland to B.C. south to Va. and Calif.; Eu.

3. **A. tenuis** Sibth. BENT-GRASS, BROWN-TOP

A very abundant grass species, making up the majoriity of the cover in pastures, meadows and lawns. Forma **aristata** (Sincl.)Wieg., with most of the lemmas awned, has been found at Lawrencetown, Halifax Co. and at Purcell's Cove. Plants with enlarged floral parts due to infection with nematodes are abundantly found in western N.S.

It is a plant naturally suited to maritime and cool humid climates. Going westward it tends to run out in Quebec in the lowlands about Quebec City and in the uplands about the Champlain Valley; in Ontario it does not persist well, even after seeding; abundant again on southeastern Vancouver Is. All our plants belong to var. **hispida** (Willd.) Philipson, according to Philipson.

Lab. to B.C. south to N.C.

4. **A. scabra** Willd. Fig. 23, c. TICKLE-GRASS, HAIR-GRASS

The typical variety has spikelets 2.0-3.0 mm and lemmas 1.3-2.0 mm long. This is a weedy plant common throughout in a variety of soils, but particularly in places which have been laid bare by cultivation, burning, or flooding. The very diffuse panicle with the long capillary branches makes this plant easy to identify. Forma **Tuckermani** Fern., with awned lemmas, is said to occur throughout the range of the typical awnless plants. Most of the N.S. specimens show the lemmas awnless. Lab. to Alaska south to N.C. and Ariz.

Var. **septentrionalis** Fern. is a northeastern form with larger spikelets; spikelets 3.2-4.3 mm long with the lemmas 2.0-2.5 mm long. Found at many places, especially in the southern and south-western areas. Forma **setigera** Fern., with awned lemmas, is reported from St. Paul Island, Canso and Markland (Rhodora **35:** 210. 1933).

Lab. to Que. and south to N.S.

5. **A. perennans** (Walt.)Tuckerm. Fig. 23, f.

Probably common throughout in woodlands, thickets, moist roadsides, lake margins and along the banks of streams. Considerable variation occurs and our plants seem to resemble more closely the woodland variety with a more diffuse panicle and spikelets on longer, more divergent pedicels, named var. **aestivalis** Vasey. Awned forms have not been seen.

N.S. to Minn. south to Fla.

6. **A. canina** L. Map 84. VELVET BENT-GRASS

Rare in natural habitats; known from Sydney, Louisburg, Forchu and Scatari Island in northeastern C.B., scattered to Yarmouth Co. Certain strains may be found throughout in special locations such as golf greens, for owing to its fine, bright green dense growth it has excellent turf qualities. Plants at Louisburg show the lemmas awnless, or occasionally with a short awn in some of the spikelets, mixed with typical long-awned plants. Plants without purple coloration were also found at New Glasgow and may be named var. **varians** Asch. & Graebn. (Erskine, 1951).

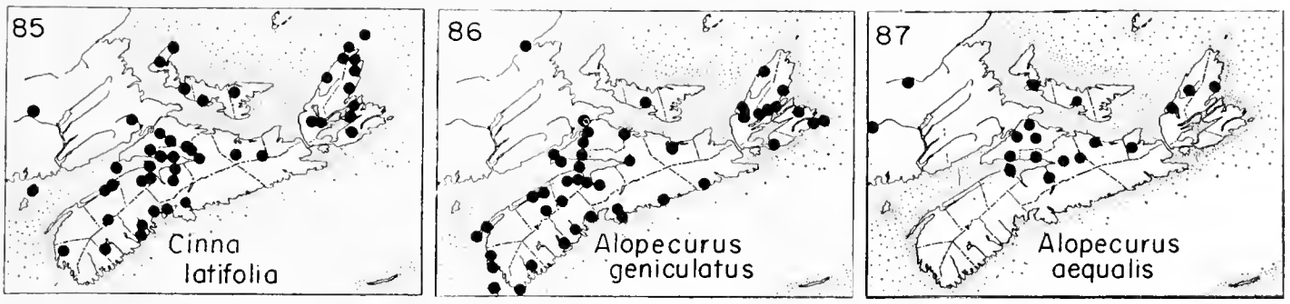
Nfld. to e. Me.; and introduced to Minn. and Tenn.; Eu.

35. **CINNA** L.

1. **C. latifolia** (Trev.)Griseb. Fig. 24, a. Map 85. WOOD-REED

Scattered to common in wet woods, wooded swamps and along alluvial ground throughout, usually growing as single plants up to 1.5 m high. The floret is short-stalked within the glumes.

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



36. PHLEUM L. TIMOTHY

a. Panicle cylindrical, normally 5-10 cm long; awns about half as long, or less, than the bodies of the glumes; plants stout, widely cultivated. 1. *P. pratense*

a. Panicle oval to short-cylindrical, 1-3 cm long; awns two-thirds to three-quarters the length of the lemma body; plant low and slender, northern. 2. *P. alpinum*

1. P. pratense L. Fig. 24, b. TIMOTHY

A most abundant and valuable hay grass, grown extensively in fields and meadows and found equally abundant along roadsides and in waste places; grading into a more slender form, often with leafy tufts at flowering time, which has been named var. **nodosum** (L.)Huds.

Nat. from Eu.; Nfld. to James Bay south to N.C.

2. P. alpinum L. MOUNTAIN TIMOTHY

This slender, more northern species is rare in northern Cape Breton; collected as locally abundant, river ledges along the Cheticamp River and a tributary, LeBlanc Brook, Inverness Co.

Greenland to Alaska south to alpine regions of Me. and N.H.

37. ALOPECURUS L. MEADOW FOX-TAIL

Perennials with densely-flowered spike-like panicles very similar to those of timothy, but differing in being softer and by having conspicuous exserted awns.

a. Panicle large, 7-10 mm thick; spikelets about 5 mm long; awns long and conspicuous. 1. *A. pratensis*

a. Panicle smaller, 2-6 mm thick; spikelets 2-3.5 mm long.

b. Awns arising from near the base of the lemmas, extending 2-3 mm beyond the glumes; plants decumbent. 2. *A. geniculatus*

b. Awns arising from near the middle of the lemma, barely extending beyond the glumes; plants erect. 3. *A. aequalis*

1. A. pratensis L. Fig. 24, c. MEADOW FOX-TAIL

Extensively naturalized and common in rich meadow lands and along roadsides in many parts of the Province, often making up a considerable proportion of the grasses in such locations. This is one of our earliest grasses and the panicles are conspicuous in early June.

Nfld. to Ont. south to Ga.; Alaska to Ore.; Eu.

2. **A. geniculatus** L. Map 86. WATER FOX-TAIL

Common throughout in wet pastures and fields, in ditches or around the edges of ponds, sometimes growing into shallow water. It is often one of the first grasses to occupy the bare muddy areas along ditches and dyke roads, where the soil is sticky, and drainage and soil aeration is poor. The report of Var. *microstachyus* Uechtr. from roadside ditches is considered to be based on depauperate plants.

Lab. to Minn. south to N.J.; nat. from Eu.

3. **A. aequalis** Sobol. Map 87.

Rather rare and local; muddy edges of shallow ponds, spring pools, mucky river-edges or occasionally on gravel in similar locations. Isolated stations are known: top of Cape Blomidon; and from Urbania, Hants Co. and Cumberland Co. to Strathlorne and Margaree in Cape Breton.

Nfld. to Alaska south to Penn.; Eurasia.

38. **MUHLENBERGIA** Schreb.

Fernald, M. L. Rhizomatous Species of Muhlenbergia. Rhodora **45**: 221-239. 1943.

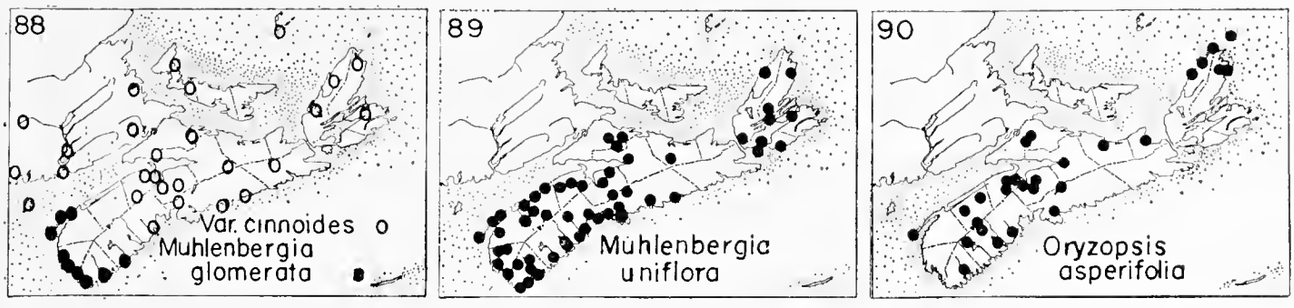
a. Rhizomes short, scaly and knotted; culms erect at the base and stouter; panicles contracted and densely-flowered, the spikelets on short pedicels; glumes about the length of the lemma or longer.
  b. Glumes acuminate, about the length of the lemmas; panicle with the lower branches 1-4 cm long and somewhat spreading; spikelets about 3 mm long. 1. *M. mexicana*
  b. Glumes with stiff awn-like tips, their tips much exceeding the awnless lemmas; panicle interrupted at the base, with the branches short and appressed; spikelets 4-6 mm long. 2. *M. glomerata*
a. Rhizomes lacking; culms slender, often decumbent at the base and rooting at the nodes; panicles loose and open, the spikelets on long capillary pedicels; glumes less than half the length of the lemmas. 3. *M. uniflora*

1. **M. mexicana** (L.)Trin.

Grand Lake, Halifax Co.; from the Gaspereau, Halfway and Ste. Croix Rivers of the Minas Basin drainage in Kings and Hants Cos.: crevices in rock cliff, Wallbrook; moist gravelly river bank at White Rock, and dryish soil along the Gaspereau River above Gaspereau (Smith and Erskine, 1954). Cumberland Co.: common at moist base of cliff and in crevices at New Prospect; and banks of Wallace River, Wentworth.

The specimens from the rocky margin of the Ste. Croix shows the lemmas with awns 4-10 mm long, typical of forma **setiglumis** (S.Wats.) Fern.

N.S. to B.C. south to N.C. and Calif.



2. **M. glomerata** (Willd.)Trin. Fig. 24, d. Map 88.

Peaty swales, cobbly shores and brook margins with rock crevices; often common in swales in the southwestern counties, rarer eastward. (*M. racemosa*).

The more slender plant with 5-8 leaves instead of 7-15 on the culm, and with the heads of the inflorescence greener and hispid, and much more separated in the panicle, has been separated as var. **cinnoides** (Link) F. J. Herm. The species shows a range from Mass. and southern Maine to southwestern N.S. while the variety ranges northward through N.S. to Anticosti and Nfld.

Nfld. to B.C. south to Va.

3. **M. uniflora** (Muhl.)Fern. Fig. 25, a. Map 89.

A delicate, neat perennial 2-4 dm high with open panicles; common in peaty swales, bogs and sandy moist sterile soils in the southern and western section of the Province east to Halifax Co. with isolated stations from Cumberland to northern C.B.

In some plants a few spikelets towards the tips of the branches may be 2-flowered. These show a transition to var. *terrae-novae* Fern., the common variety of Nfld.

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

39. **BRACHYELYTRUM** Beauv.

1. **B. erectum** (Schreb.)Beauv., var. **glabratum** (Vasey)Koyama & Kawano, Can. Jour. Bot. **42:** 866. 1964. Fig. 25, b.

A scattered but never abundant grass, usually growing in wet rocky areas, along shaded streams, in rich moist woods, or occasionally even in open places after the trees or shrubs have been cut off. It usually grows in patches from short, knotted rhizomes. Our plants belong to the northern variety. (Var. *septentrionale* Babel).

Nfld. to Minn. south to Ga.

40. **ORYZOPSIS** Michx.

Native perennial grasses growing in dry woods or in open sandy soils; lemmas awned from the tip, hard and shiny.

a. Spikelets, excluding awns, 6-8 mm long, in a narrow contracted panicle; blades mostly basal, flat when fresh, 4-8 mm wide. 1. *O. asperifolia*

a. Spikelets, excluding awns, 3-5 mm long, in small diffuse panicles; blades mainly on the stem, mostly involute, less than 3 mm wide.

b. Awn less than 3 mm long, almost straight; panicle 3-6 cm long. 2. *O. pungens*

b. Awn 8-15 mm long, twisted in two places; panicle larger, 5-10 cm long. 3. *O. canadensis*

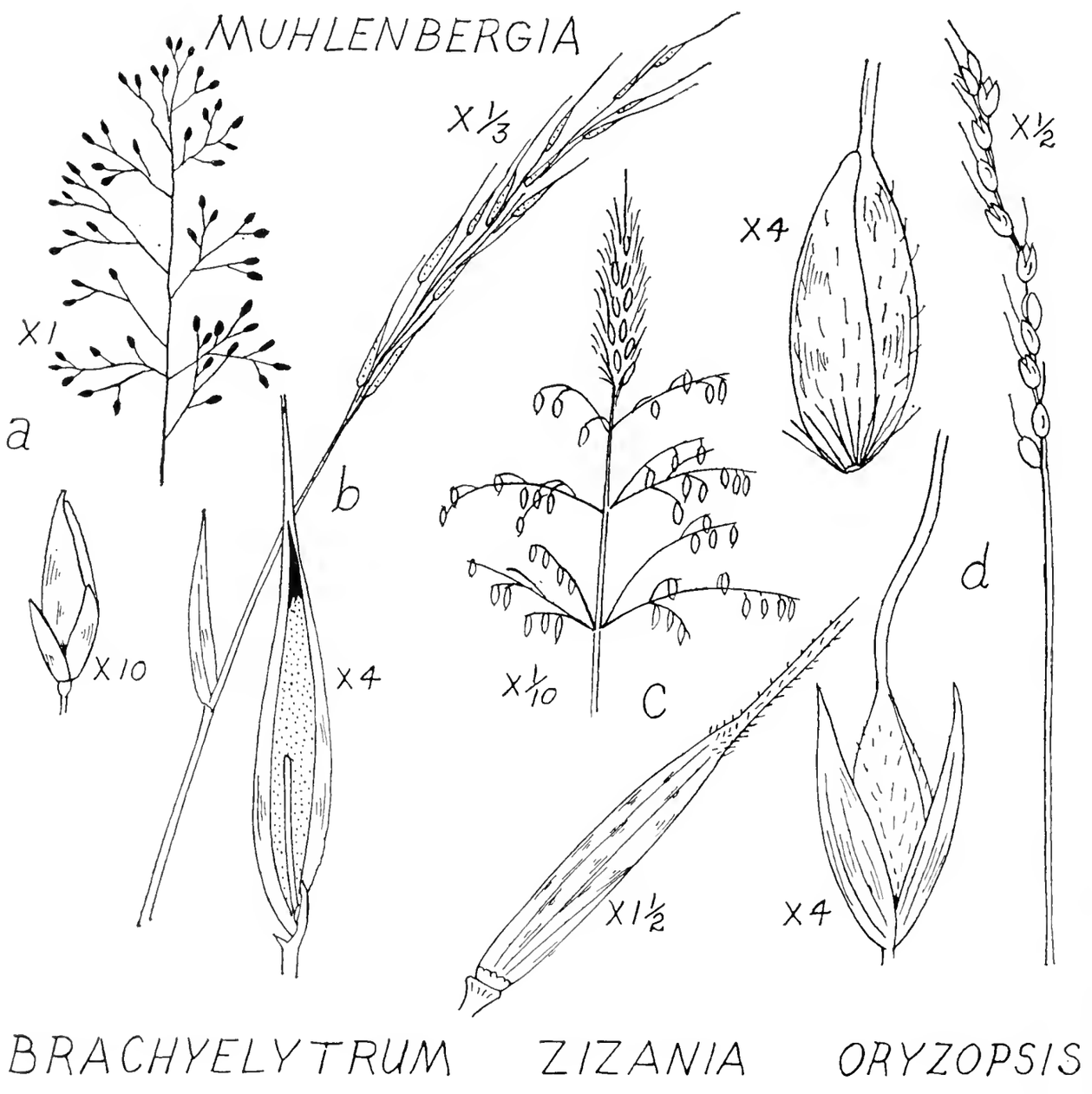
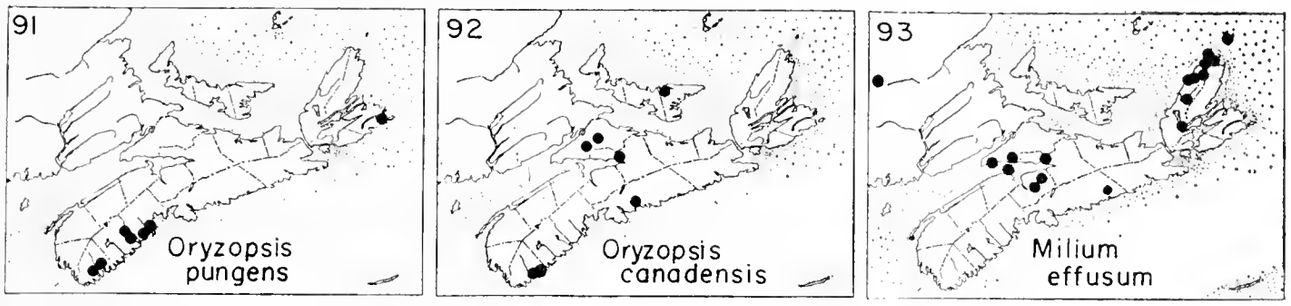


Fig. 25.—a, **Muhlenbergia uniflora**, inflorescence and spikelet. b, **Brachyelytrum erectum.** c, **Zizania aquatica.** d, **Oryzopsis asperifolia.**

1. **O. asperifolia** Michx. Fig. 25, d. Map 90. RICH-GRASS

The tufts of rigid, long broad leaves are characteristic of the dry woods or sterile bushy barrens; scattered to common but never abundant and rarer from Halifax County to northern C.B. Flowering from late May to early June.

Nfld. to B.C. south to W. Va.



2. **O. pungens** (Torr.)Hitchc. Map 91.

Characteristic of dry barrens of Shelburne and southwestern Lunenburg Counties, occasional in Queens Co.; also at Mira Bay, Cape Breton Co. This plant is smaller than the next species and very similar to it.

N.S. to B.C. south to N.J. and Ind.

3. **O. canadensis** (Poir.)Torr. Map 92.

Extending into the Province on the dry and barren soils in Cumberland and central Colchester Cos.; found also in dry pine woods near Jordan Falls, Shelburne Co. and in dry woods near Porter's Lake, Halifax Co.

Nfld. to Alta. south to N.S., N.Y. and northern Mich.

41. MILIUM L.

1. **M. effusum** L., var. **cisatlanticum** Fern., Rhodora **52:** 218. 1950. Map 93.

One of our rarer grasses, confined mainly to rich or alluvial hardwoods: top of Cape Blomidon in sugar maple woods, Kings Co.; Five-Mile River in Hants Co.; in the hardwood forests of Cape Chignecto the species flourishes, occasional under hardwoods at base of cliff, New Prospect and in damp woodland margin of McGahey Brook in Cumberland Co. (Schofield, 1955); fairly frequent in rich hardwood stands in northern C.B. The American variety.

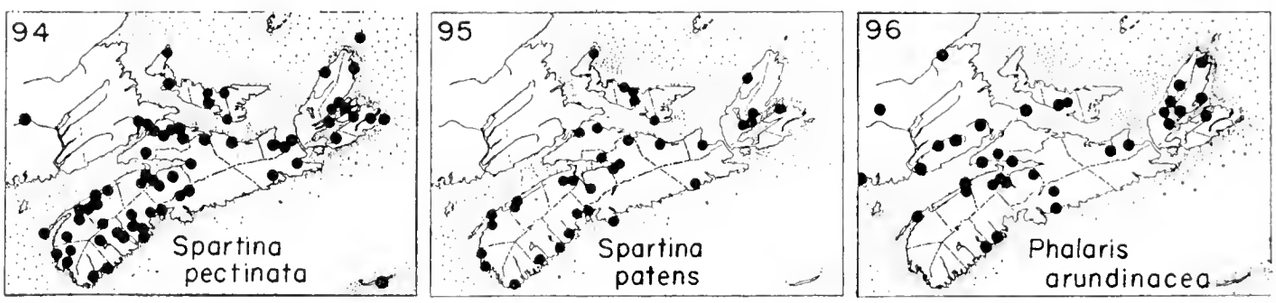
Nfld. to Minn. south to Dela.; Eurasia.

TRIBE V. CHLORIDEAE

Perennial grasses of salt marshes, or occasionally around swales, with extensively creeping, scaly rhizomes; spikelets arranged in two to many spikes, along one side of the axis, sessile, much compressed and closely overlapping; ligule a row of hairs. Represented in N.S. by only one genus.

42. **SPARTINA** Schreb.

a. Blades of leaves more than 5 mm wide, flat towards the base and inrolled towards the tip when fresh; plants with stout upright culms 3 or more mm in diam., 10-20 dm high.
  b. First glume as long as the lemma, very rough-ciliate on the keel; second glume tapering to an awn-like tip as long again as the lemma; inflorescence open, purplish and slender-waving; brackish to fresh water. 1. *S. pectinata*
  b. First glume about half as long as the lemma, rarely smooth; second glume without the long awn-like tip, barely exceeding the lemma; inflorescence erect, crowded, yellowish; growing only next to salt water or in very brackish soil. 2. *S. alterniflora*
a. Blades less than 3 mm wide, and involute even when fresh; plants with slender decumbent culms less than 2 mm in diam., growing in dense leafy mats, mostly 3-6 dm high. 3. *S. patens*



1. **S. pectinata** Link Fig. 26. Map 94. BROAD-LEAF

This, the tallest of our cord-grasses, is not restricted to saline soils but is also common bordering salt marshes or along the ditches and drains where fresh water has carried away most of the salts; very common around the heads of the salt marshes, often dominant over extensive areas; scattered elsewhere wherever open ditches, streams and sloughs occur.

The extreme variation with narrow, slender spreading spikes and appressed awns, var. **Suttiei** (Farw).Fern., is reported as ranging from P.E.I. and N.S. southward and westward. Most of the N.S. collections appear intermediate between this variety and the typical species.

Across the continent; along salt marshes from Nfld. south.

2. **S. alterniflora** Loisel. Fig. 26. CORD-GRASS

This is the characteristic grass of our salt marshes and it is frequently the single seed-plant colonizing the inter-tidal zone.

Var. **pilosa** (Merr.)Fern, with lemmas sparsely pilose, is reported by Fernald to occur "apparently frequently on salt marshes from Yarmouth County to Annapolis County and presumably beyond". Although this is undoubtedly distinct, since it differs also in certain cytological characteristics, the lemmas show all degrees of pubescence from a sparse pilosity to a scabrous or glabrous condition even in the same inflorescence. Var. *pilosa* is a taller, more robust plant with more spikes composing the inflorescence and flowering later than the typical

form. It seems to be confined to brackish flats rather than to saline tidal marshes.

Nfld. and Que. along the tidal marshes to Tex.; locally introduced into Eu.

3. **S. patens** (Ait.)Muhl. Fig. 26. Map 95.

A low grass forming dense matted dark-green patches on parts of the salt marshes above the *Spartina alterniflora* zone; found around the coast wherever suitably protected shore areas are present. When cut for hay, the *Spartina* is replaced by a more sparse vegetation of *Puccinellia* and *Limonium*.

Along the coast from Que. and Nfld. to Texas and in saline marshes inland.

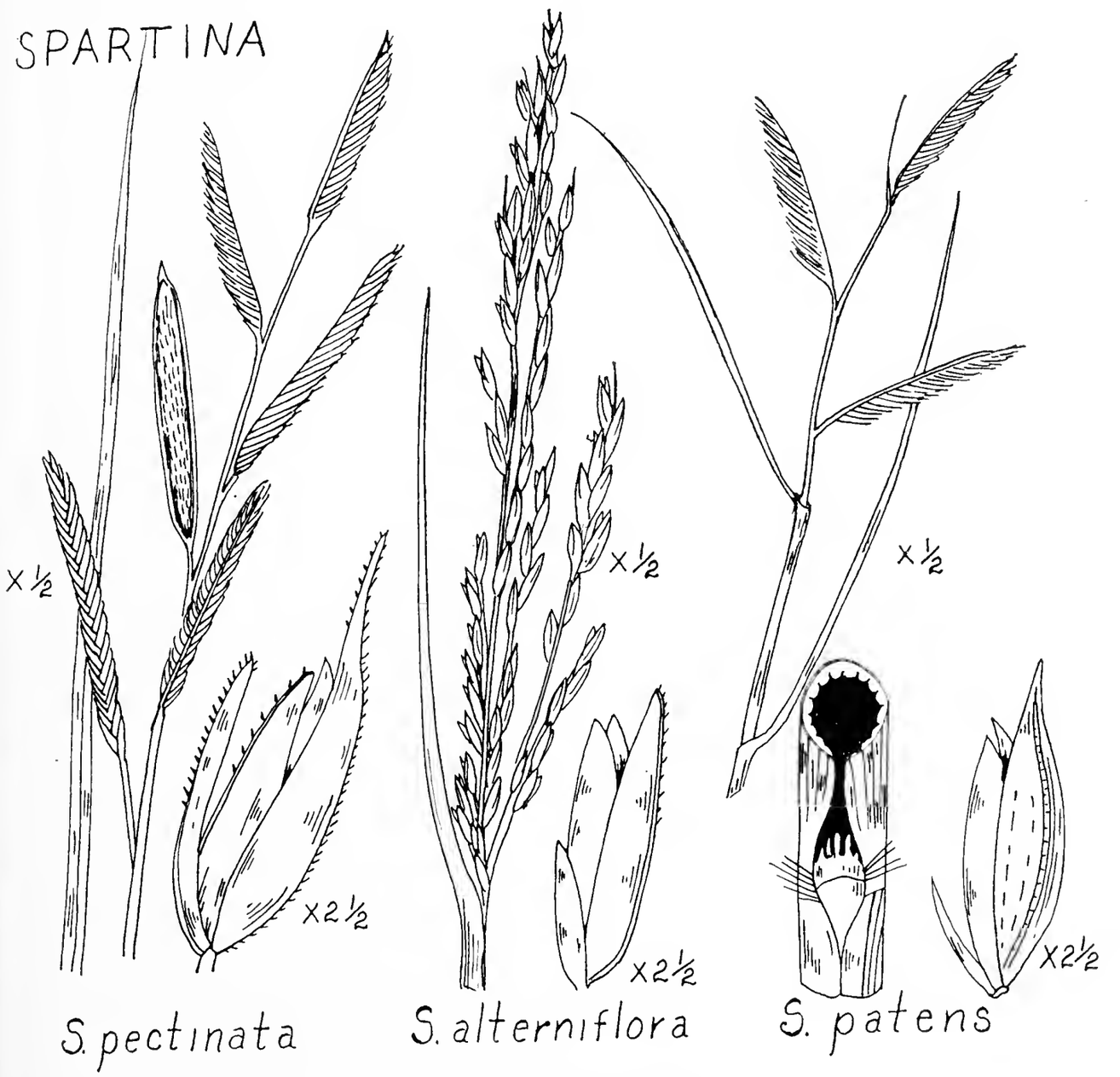


Fig. 26.—**Spartina**, inflorescence, spikelet and leaf-sheath.

TRIBE VI. PHALARIDAE

Grasses with the spikelets containing one fertile, fruit-producing floret and two sterile florets below the fertile one; glumes longer than the florets (Fig. 27).

a. Lemmas of the sterile florets much shorter than the fertile floret, or reduced to hairy scales; plants not bitter nor scented; inflorescence greenish, appearing in middle or late summer; to 2 m high. 43. *Phalaris*

a. Lemmas of the sterile florets larger than the fertile one; plants bitter-tasting and sweet-scented when dry; inflorescence brownish; flowering early in the summer; low.

b. Glumes very unequal, the second much longer and broader, generally enclosing the floret; lower florets neuter, their lemmas awned, slender and 2-lobed at the apex; inflorescence spike-like, borne on leafy culms. 44. *Anthoxanthum*

b. Glumes equal in size and shape; lower florets staminate, their lemmas awnless, broad and acute; inflorescence an open panicle; long tough basal leaves appear much after flowering. 45. *Hierochloe*

43. PHALARIS L.

a. Plants annual; panicle oval, dense and spike-like; lemmas broad-winged, white with green stripes. 1. *P. canariensis*

a. Plants perennial; panicle elongated, branched, contracted after flowering; lemmas pale, not broad-winged. 2. *P. arundinacea*

1. P. canariensis L. CANARY-GRASS

Introduced in the form of canary and bird-seed, this attractive species is sometimes encountered along roadsides, on ballast or on city dumps: Pictou, Wolfville and Halifax. It does not persist nor become weedy.

Adventive from Eu.; widely distributed.

2. P. arundinacea L. Fig. 27, a. Map 96. REED CANARY-GRASS

This tall, broad-leaved species of mucky soils, wet meadows and along streams is not of common occurrence, although it has been found at widely-separated points and in its proper habitat, as along the rivers above Kentville and Parrsboro, it may form a considerable part of the grass in the wetter areas. It tends to form large clumps and may grow in shallow water. An European form is being introduced and sown in poorly-drained soils and this may occasionally appear along wet roadsides.

Forma **variegata** (Parnell)Druce is the Ribbon Grass of gardens, where it is frequently grown for its white-striped ornamental leaves; common and persistent but only rarely seen as an escape.

Nfld. to Alaska south to N.C.

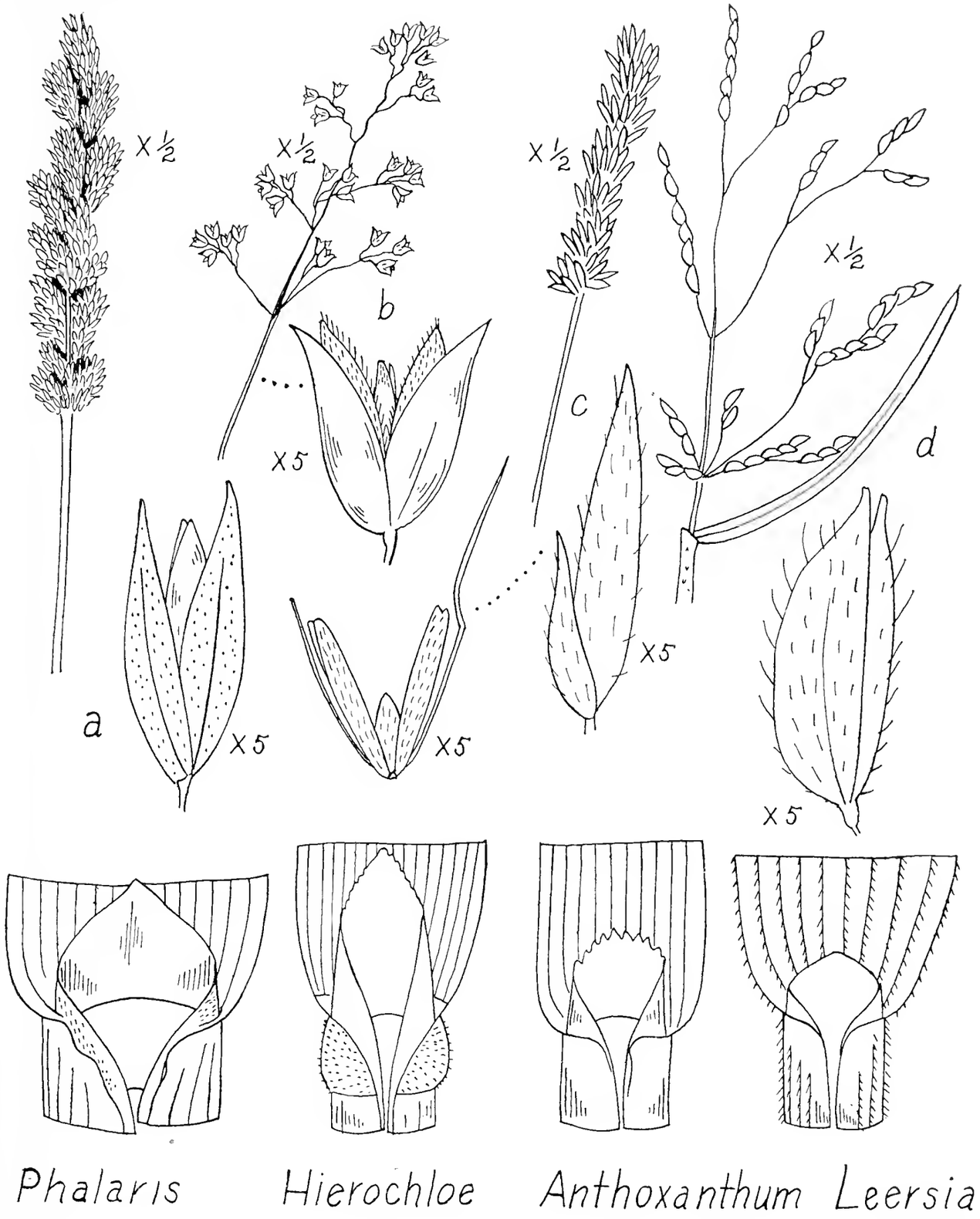


Fig. 27.—a, **Phalaris arundinacea,** inflorescence, spikelet and leaf-sheath. b, **Hierochloe odorata.** c, **Anthoxanthum odoratum.** d, **Leersia oryzoides.**

44. ANTHOXANTHUM L.

1. **A. odoratum** L. Fig. 27, c. SWEET VERNAL-GRASS

An early-maturing grass common in old fields, along roadsides, in waste places and widely distributed elsewhere throughout. This grass is short and flowers early in June. Its short, spike-like yellowish-green to brown panicles are distinctive.

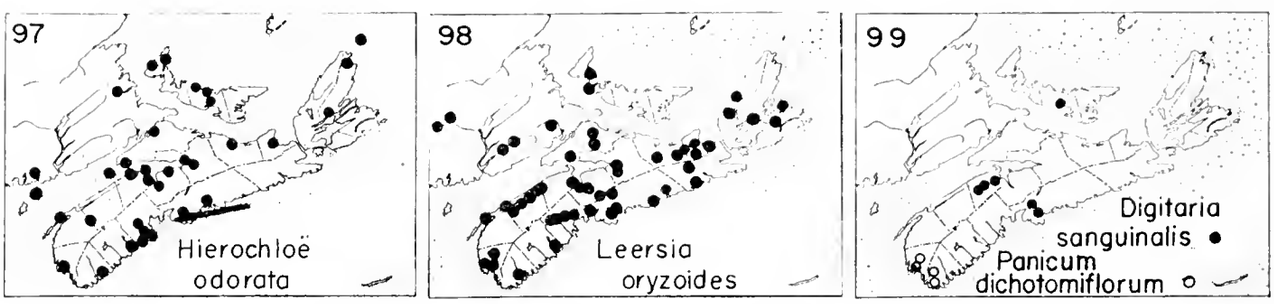
Widely introduced from Eurasia.

45. HIEROCHLOË R.Br.

1. **H. odorata** (L.)Beauv. Fig. 27, b. Map 97. SWEET-GRASS

One of the earliest flowering grasses, with the panicles becoming conspicuous in early May and flowering before June. The long green leaves arise later from separate basal off-shoots. They contain coumarin which tastes bitter and later gives the persistent pleasant fragrance for which the plant is noted. The plant is found in many places, growing on low-lying, moist, heavy soil, generally in the proximity of or on the upper areas of the tidal marshes around the entire coast; occasionally introduced inland.

Lab. to Alaska south to Penn., Eurasia.



TRIBE VII. ORYZEAE

46. LEERSIA Sw.

1. **L. oryzoides** (L.)Sw. Fig. 27, d. Map 98. RICE CUT-GRASS

Bright-green broad-leaved grasses with very rough sheaths and blades, growing in wet soil or in shallow water, sometimes forming dense, tangled, clinging masses of foliage in ditches, swamps and wet waste lands. The culms are frequently a meter or more long with the panicle exserted 10 cm or more from the upper sheath when in flower Scattered throughout but not nearly so common as the following form.

Forma **inclusa** (Wiesb.)Dörfler has part of the inflorescence enclosed in the inflated sheaths or breaking out the sides, never exserted far beyond the top of the sheath. Found in many places, frequently in shallow water or in the wet soil along the margin of lakes. It is readily identified by its sharp scabridity and the dense fringe of reflexed white hairs at the nodes of the culm. Forma **glabra** A. A. Eat. occurs when the leaves are submerged in the water and are smooth. Plants may have the submerged leaves smooth but the leaves above the waterline rough.

N.S. to Wash. south to Fla.

TRIBE VIII. ZIZANIEAE

47. ZIZANIA L.

1. **Z. aquatica** L. Fig. 25, c. WILD RICE

A grass native to North America and growing abundantly in the shallow water of lakes, streams and sloughs in the interior of the continent; now sown to some extent to attract wild ducks and geese and consequently naturalized outside the original ranges. This tall grass is distinctive since the long-awned pistillate flowers are in a brush-like group at the top of the plant while the staminate ones are on horizontal branches below.

Var. **angustifolia** Hitchc. has leaves 4-15 mm wide and ligules 3-10 mm long. This has been found at Long Lake near Amherst and at Port Hood, Inverness Co., probably introduced at both stations. Var. **interior** Fassett, with leaves 1-3 cm wide and ligules 1-1.5 cm long, is established along the Canard River in Kings Co. and is known also from the tidal banks of the St. John River at Sheffield, N.B. This is not known as native from east of Indiana. (Erskine, 1951).

N.B. to Minn. southward.

TRIBE IX. PANICEAE

The *Paniceae* have spikelets which do not separate above the glumes but which fall off entire. These spikelets are rather complex, being closely enclosed by the second glume and sterile lemma of about equal length. The lower glume is usually only one-fifth to one-half the length of the spikelet and thus gives to the spikelet a one-sided appearance with apparently only one glume.

a. Spikelets not surrounded by bristles from below the base; inflorescence a diffuse panicle, or of several spike-like racemes.
  b. Spikelets not crowded, longer-pedicelled; glumes and sterile lemma not awned, often pubescent but never stiffly hispid with coarse hairs.
    c. Spikelets in pairs in two rows along one side of an axis; inflorescence of several racemes radiating out like fingers at the top of the culm (Fig. 29) 48. *Digitaria*
    c. Spikelets in diffuse panicles. 49. *Panicum*
  b. Spikelets crowded along one side of the numerous panicle-branches, almost sessile, with the glumes or sterile lemma awned and stiffly hispid. 50. *Echinochloa*
a. Spikelets with one to many long bristles from below the base; inflorescence a dense spike-like panicle, like a bottle-brush. 51. *Setaria*

48. DIGITARIA Heist. CRAB-GRASS

a. Lower blades and sheaths glabrous; plants usually widely spreading and close to the ground; panicle-branches 2 to 4, more or less separated; second glume nearly as long as the spikelet. 1. *D. Ischaemum*

a. Lower blades and sheaths pilose; plants erect; panicle-branches 4 to 6, joined at nearly the same point to the main axis; second glume only half the length of the spikelet, the first one very tiny. 2. *D. sanguinalis*

1. **D. Ischaemum** (Schreb.)Muhl. Fig. 29. SMALL CRAB-GRASS

Rather scattered and local as yet but becoming a weed in gardens around town, in waste places, and found more commonly on the sandy soil of the Annapolis Valley.

Introduced from Eu.; and widespread.

2. **D. sanguinalis** (L.)Scop. Fig. 29. Map 99. CRAB-GRASS

Occasionally found in lawns, gardens and waste places, as around Halifax, Bedford, Sydney, Liverpool, and in the Annapolis Valley. As yet, the weed is only of sporadic occurrence and there is little indication as to how aggressive it may be here.

Introduced from Eu. throughout the U.S. and southern Canada.

49. PANICUM L. PANIC-GRASS

This large genus is very common with a number of species in southwestern N.S., but it becomes rarer to northern Cape Breton where *P. boreale* is the only one as yet found (Fig. 28).

a. Basal leaves similar to the stem-leaves, not forming a winter rosette; spikelets mostly longer than 2.0 mm; plants relatively large, 2-20 dm high.

b. Plants annual, without rootstocks but arising from fibrous roots; sheaths pilose or glabrous.

c. Sheaths glabrous; panicle diffusely branched; spikelets 2.5-3.0 mm long; first glume blunt, one-quarter the length of the spikelet (Fig. 28). 1. *P. dichotomiflorum*

c. Sheaths densely pilose.

d. Spikelets 3 mm or less in length, not smooth and shining.

e. Panicle about half the length of the plant or more and as wide as long, with capillary branches; spikelets 2.3-3.0 mm long.

f. Panicle-branches erect and crowded, only at length spreading; leaves scattered on the stem; spikelets up to 2.5 mm long (Fig. 29). 2. *P. capillare*

f. Panicle branches more exserted, the lower reflexed; leaves mostly near the base of the plant; spikelets pointed, about 3 mm long. *P. capillare* var. *occidentale*

e. Panicle generally less than one-third the length of the plant; spikelets 1.8-2.0 mm long. 3. *P. philadelphicum*

d. Spikelets 4-5 mm long, smooth and shining; panicle drooping, one-third or less the length of the plant; plants tall and erect. 4. *P. miliaceum*

b. Plants perennial, growing in tufts from short rootstocks or from a knotty crown; first glume half the length of the spikelet or longer; sheaths glabrous; southwestern N.S. only.

g. Plants stout, 10-20 dm high; spikelets 3.2-4.0 mm long, short-pedicelled in diffuse panicles (Fig. 28). 5. *P. virgatum*

g. Plants more slender, 2-8 dm high; spikelets short-pedicelled along one side of the nearly unbranched panicle-branches.

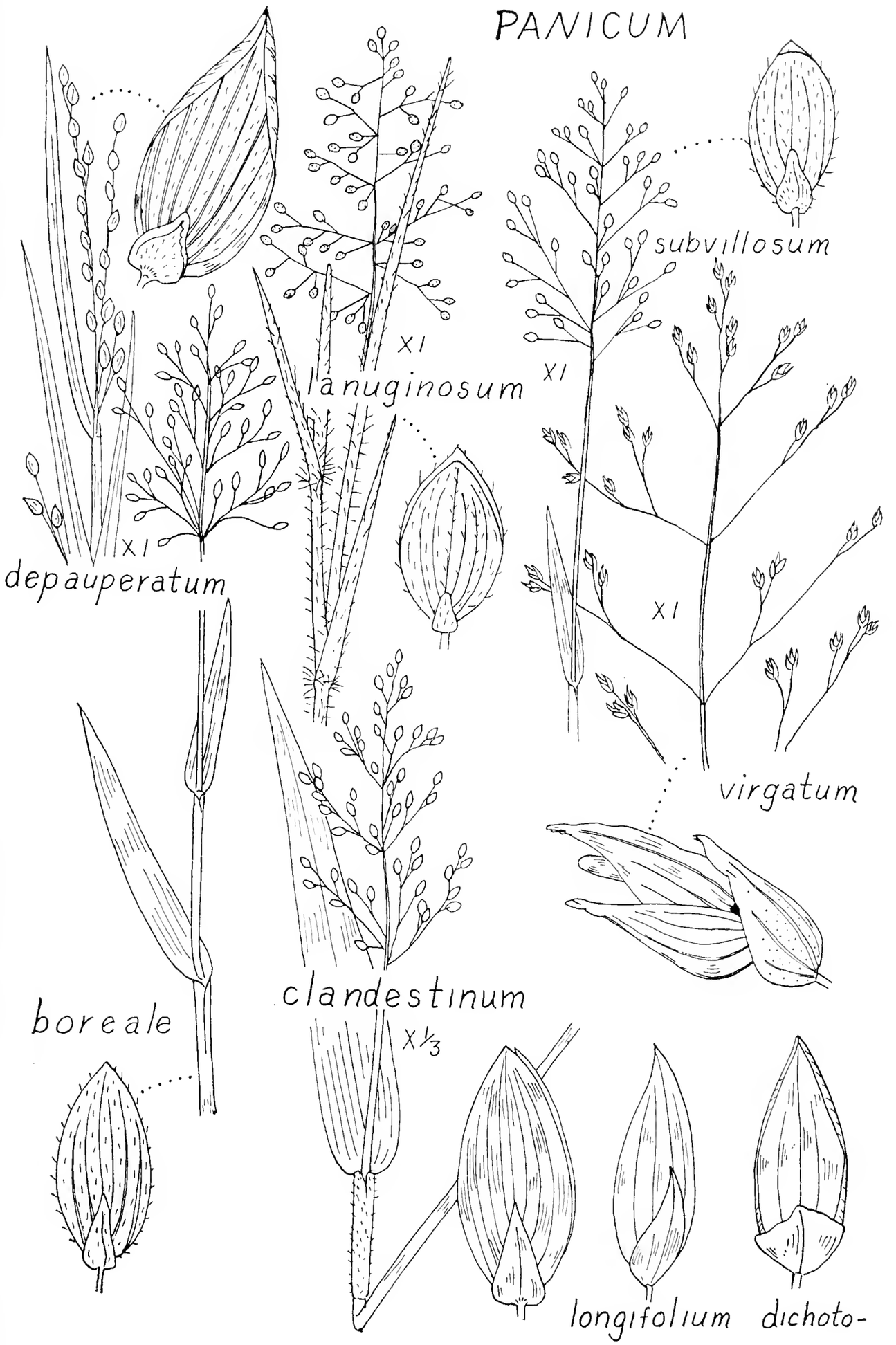


Fig. 28.—**Panicum**, inflorescence and spikelet.

h. Paniele 1.0-2.5 dm long; spikelets 2.4-2.7 mm long, with the upper glume equalling or longer than the sterile lemma (Fig. 28).
6. *P. longifolium*

h. Paniele 0.3-1.5 dm long; spikelets 2.7-3.4 mm long, with the upper glume shorter than the sterile lemma. *P. longifolium* var. *tusketense*

a. Basal leaves different from those of the stem, shorter and stouter, forming a winter rosette; all our smaller native *Panicums* belong here

i. Leaves narrow, often 20 times as long as wide, exeeeding the panicles; nodes bearded; ligule less than 1 mm long

j. Spikelets about 3.5 mm long, sharp-pointed or beaked (Fig. 28); on sand. 7. *P. depauperatum*

j. Spikelets 2.2-2.4 mm long, blunt and not beaked.
8. *P. linearifolium*

i. Leaves not nearly so elongate.

k. Leaf-blades less than 1 em wide, not heart-shaped at the base; spikelets less than 2.5 mm long.

l. Ligule less than 1 mm long; spikelets 2.2-2.4 mm long; eulms, leaves and sheaths glabrous exeept at the nodes, often with a purplish tinge, the whole plant having a smooth appearance (Fig. 28).
9. *P. boreale*

l. Ligule of eonspicuous hairs 2-5 mm long; spikelets less than 2.1 mm long.

m. Sheaths glabrous; plants 3-9 dm high, with the paniele mueh longer than wide with strongly-aseending branehes; lateral panieles common; spikelets about 1.5 mm long. 10. *P. spretum*

m. Sheaths more or less pubeseent.

n. Spikelets 1.3-1.5 mm long; small plants, rarely over 4 dm high.

o. Axis of the paniele puberulent to glabrous; lower paniele-branehes aseending, little branehed, not tangled; ligule barely 1 mm long; sheaths and eulms not papillose -pubeseent.
11. *P. meridionale*

o. Axis of paniele usually pilose; lower branehes spreading or reflexed, tangled; ligule 2-5 mm long; papillose pubescent.
12. *P. lanuginosum* var. *implicatum*

n. Spikelets 1.6-2.1 mm long.

p. First glume less than one-third the length of the spikelet, acute or obtuse; paniele-branehes slender, spreading, the lower often reflexed; sheaths glabrous or with spreading hairs.

q. Axis of panicle spreading pilose, at least on the lower internodes; blades mostly pilose above and pubeseent below.
P. lanuginosum var. *fasciculatum*

q. Axis of paniele smooth or with at most a few appressed hairs; blades glabrous to sparsely pilose above and minutely pubescent beneath. *P. lanuginosum* var. *septentrionale*

p. First glume nearly one-half the length of the spikelet, acute; paniele-branehes stout, aseending; sheaths with appressed or aseending hairs; blades long-pilose on both sides (Fig. 28).
13. *P. subvillosum*

k. Leaf-blades 1-3 cm wide, glabrous, rounded or heart-shaped at the base; spikelets 2.5-3.8 mm long.

r. Blades of leaves rounded at the base, mostly 1-2.2 em wide; spikelets few on strongly-aseending branches of the narrow paniele, 3.7-4 mm long, the first glume half the length of the spikelet. 14. *P. xanthophysum*

r. Blades clasping-cordate at base, 1-3.5 cm wide; spikelets numerous on flexuous spreading branches, 2.5-3 mm long; first glume one-fourth the length of the spikelet (Fig. 28).
15. *P. clandestinum*

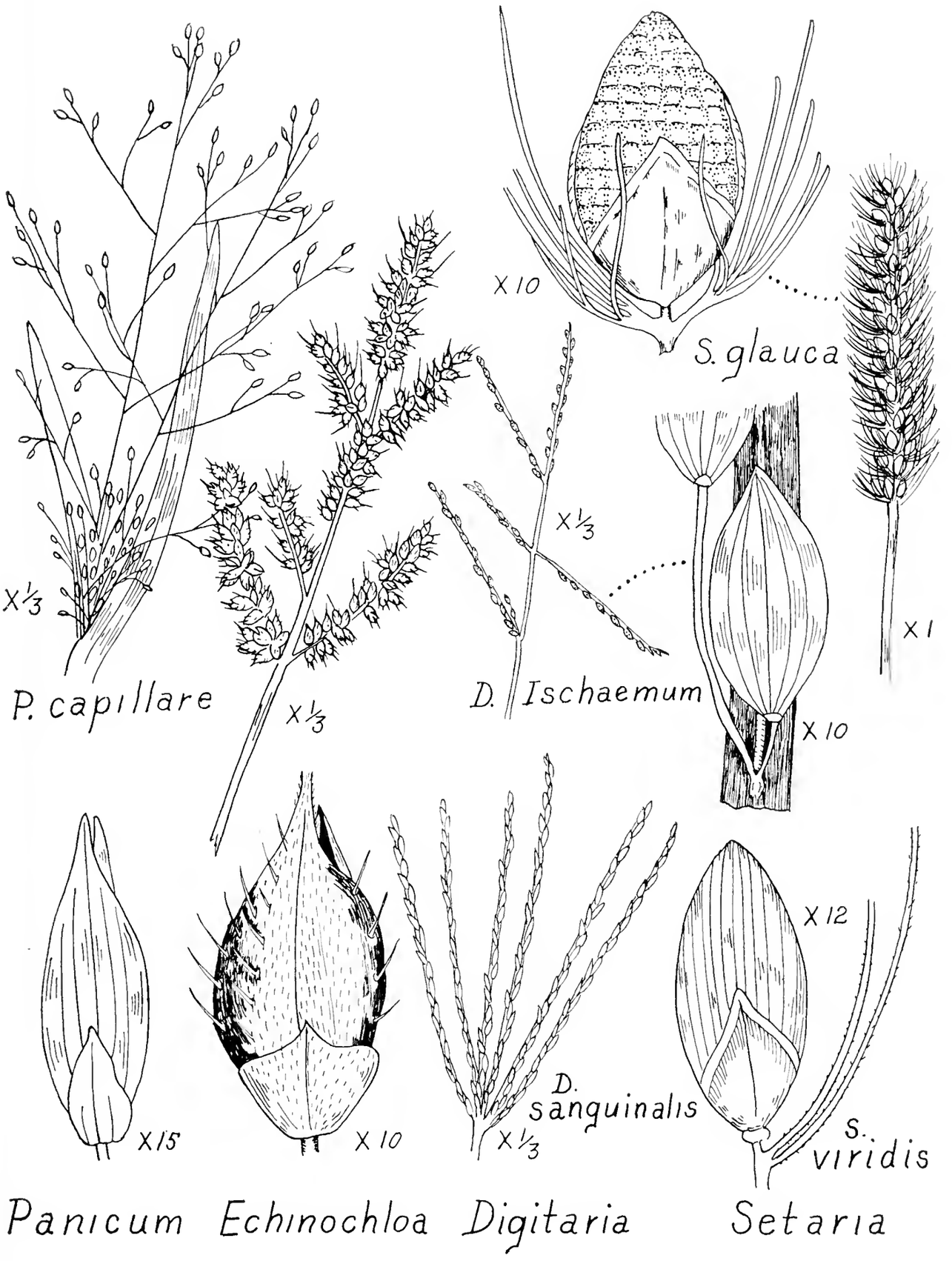


Fig. 29.—Grass inflorescences and spikelets.

1. **P. dichotomiflorum** Michx. Fig. 28. Map 99.

Scattered and rather rare, in the Tusket Valley, Yarmouth Co., on sandy and gravelly shores of lakes and borders of savannahs; found in similar places beside Harper and Welshtown Lakes, Shelburne Co. All of our native plants apparently belong to var. **geniculatum** (Wood) Fern., the coastal extreme. Inland, the typical plant may become weedy and a plant found in the railroad yard at Halifax was probably introduced from central Canada.

Fla. north to N.S. and inland to Minn.

2. **P. capillare** L. Fig. 29. WITCH-GRASS

Scattered in sandy fields, along roadsides and in waste places, occasionally becoming a weed in gardens. Maine southward and westward, probably introduced into N.S.

Var. **occidentale** Rydb. is a smaller plant with more exserted panicles and larger spikelets. Occasionally seen about railroad yards, as at Windsor Junction, Halifax and Sydney; occasionally elsewhere around farms and obviously introduced. Widely distributed and more common westward.

N.S. to B.C. south to W. Va., Texas and Calif.

3. **P. philadelphicum** Bernh.

Known by one collection from the Province: cranberry bog, Bridgewater, (McLellan, Sept. 11, 1939). This collection belongs to var. **Tuckermani** (Fern.)Steyermark & Schmoll (Rhodora **41:** 86-90. 1939).

N.S.; Que. to Minn. south to Va.

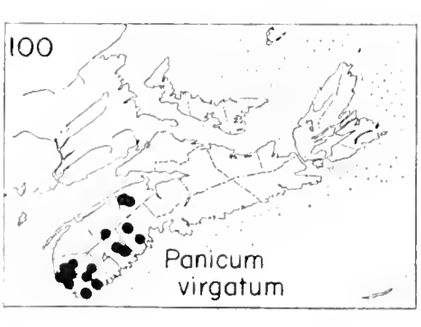
4. **P. miliaceum** L. MILLET

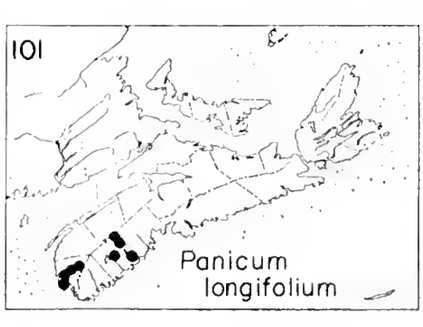
Plants large, 2-10 dm high, with large, usually drooping panicles. Occasionally planted in the Province and sometimes found along roadsides and in waste places; not persisting. Cultivated strains and varieties of diverse appearance may be found. Eurasia.

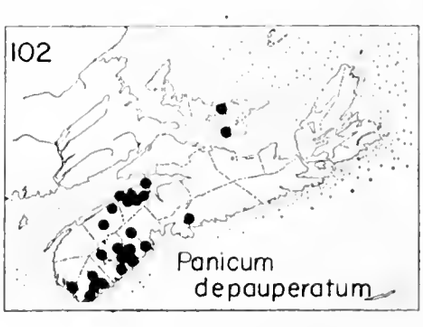
5. **P. virgatum** L., var. **spissum** Linder Fig. 28. Map 100.

A large coarse species found on sandy, gravelly or cobbly beaches, in thickets, bogs and on peaty borders of lakes; scattered throughout the southwestern part, becoming rarer to the lakes of Kings and Lunenburg Cos. This eastern variety, with short, ascending, rather than long creeping rootstocks, grows from N.S. to Penn. and reaches its best development in N.S. and eastern Mass.

N.S. to Sask. south to the Gulf States; Bermuda; S.A.







6. **P. longifolium** Torr. Fig. 28. Map 101.

Found in two places in the interior of Queens Co. by Weatherby; and along the Tusket River in Yarmouth Co. The plants occurring on the sandy or gravelly beaches and peaty margins of lakes in the Tusket River Valley have been referred to a separate indigenous variety, var. *tusketense* Fern. The distinctions given between the two are included in the key. However, later collections from Queens Co., and even from the Tusket Valley, seem to be more typical of the species than of the variety.

A coastal-plain plant; Fla. to Tex. north to Ohio, Mass. and N.S.

7. **P. depauperatum** Muhl., var. **psilophyllum** Fern. Fig. 28. Map 102.

Very common on the sandy soils of the Annapolis Valley, and scattered on sandy, gravelly or sterile soils elsewhere from Shelburne to Halifax County. All our plants belong to this northern variety, characterized by the glabrous sheaths. Its forma **cryptostachys** Fern. is a dwarfed form growing in very sterile locations and bearing only reduced basal panicles of 1-4 spikelets. The type specimens are from dryish, open sandy plains, Middleton. Scattered throughout the range of the variety.

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

8. **P. linearifolium** Scribn., var. **Werneri** (Scribn.)Fern.

Represented by collections from sandy soils in the vicinity of Coldbrook, Kings Co. This northern variety, with essentially glabrous sheaths, is known from Maine to Minn. south to Va. and Texas. These plants, found by Roland and Dore, are rather small and very difficult to distinguish among the other grasses. Its distribution in N.S. may therefore be much wider.

9. **P. boreale** Nash Fig. 28.

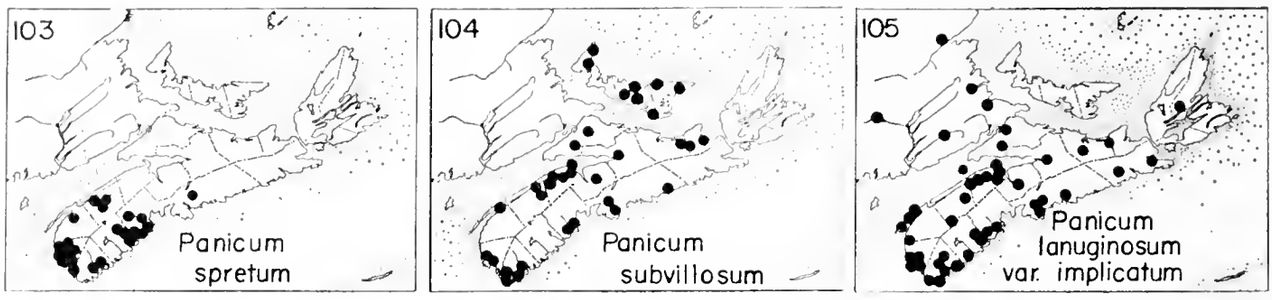
Common in damp or moist situations throughout. This neat grass, around 3-4 dm high, is the main *Panicum* in the northern and eastern part of the Province, where it can usually be found in moist situations either in the sun or in shade.

Nfld. to N.J. and Ind.

10. **P. spretum** Schultes Map 103.

A tall, erect plant 3-9 dm high with a rather diffuse manner of bearing the panicles; wet or peaty swales, gravelly or sandy upper borders of lake beaches, or wet margins of pools and ditches; scattered from Yarmouth Co. east to Annapolis and Halifax Cos. and, as with most of our Panicums, much more common in the southwestern counties.

A coastal-plain plant; Fla. to Tex. north to N.S.



11. **P. meridionale** Ashe

Known from but one station east of Mass.; collected by the Gray Herbarium Expedition (1922) on the cobbly beach of Gavelton (Butler's) Lake, Gavelton, Yarmouth Co. The status of this plant is thus largely unknown; it should be looked-for further in southwestern N.S.

N.S.; Mass. to Minn. south to Ga.

12. **P. lanuginosum** Ell. Fig. 28. Map 105.

This is an extremely variable and difficult species; some combinations of characters appear more frequently than others and have been recognized as varieties. See Fernald, Rhodora **23:** 223-228. 1921.

Var. **implicatum** (Scrib.)Fern. is a small plant 2-5 dm high, generally erect but loosely branching from the middle or lower nodes. It is one of the commoner forms, abundant in the southwestern counties and becoming gradually scarcer eastward to C.B.; meadows, bogs, heavy soils and in low areas in sand, often in damp soil which is devoid of taller vegetation. Plants more nearly glabrous on the panicle axis and leaves approach var. *Lindheimeri* (Nash) Fern.

Var. **fasciculatum** (Torr.)Fern. is often a much taller and stouter plant than the preceding, although grading into it; growing on lake shores and in damp locations in southwestern N.S. and gradually becoming rarer eastward; not nearly as abundant as var. *implicatum*.

Var. **septentrionale** Fern. Rare; known from a wet sphagnous swale at the border of Beaver Lake, Yarmouth Co.; and from dry pine and oak woods on steep slopes along the LaHave River, Bridgewater (Fernald, 1921); roadside at Lowe's Landing, Queens Co.

Nfld. to Minn. south to Fla. and Texas.

13. **P. subvillosum** Ashe Fig. 28. Map 104.

This is the most common species of *Panicum* through the center of the Province and in the Annapolis Valley, extending eastward only to James River in N.S. but found by Erskine to be scattered throughout P.E.I.; dryish sandy or rocky open soils, fields, roadsides and barrens. This stiffly erect plant, 2-4 dm high, is a neat plant with usually a decidedly reddish tinge to the panicle.

N.S. to Sask. south to Penn. and Mo.

14. **P. xanthophysum** Gray

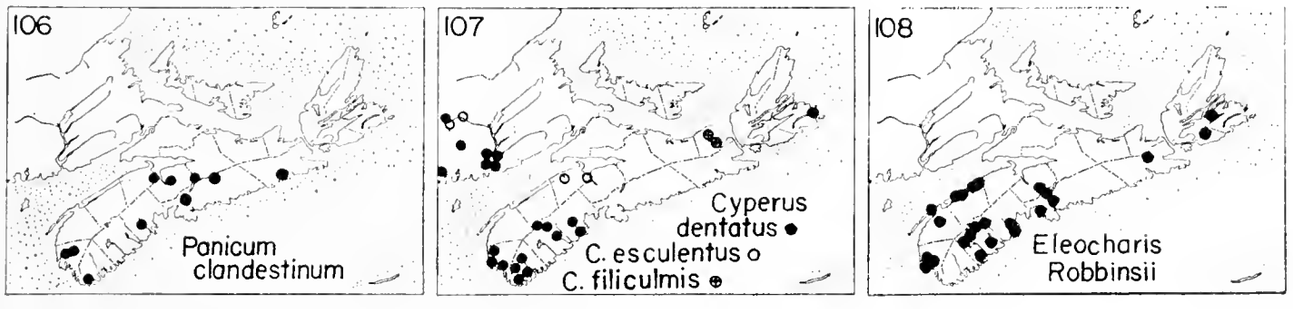
Collected by J. Macoun, 1910, in open thickets at Bridgewater, Lunenburg Co.

Found in dry, sandy or rocky soil in open or thin woods from Maine to Man. south to Penn. and Mich.

15. **P. clandestinum** L. Fig. 28. Map 106.

Plants coarse with very broad leaves, often growing in large patches where found: occasional in the Tusket Valley, Yarmouth Co.; along the Clyde River; the LaHave R. and in damp, rocky or gravelly thickets of the upper border of cobble beach, Wentzell Lake, Lunenburg Co.; scattered eastward, always along river banks, at Gaspereau in Kings Co., the Herbert River by the bridge on the Rawdon Road in Hants Co., the Shubenacadie, the Gay's River, and at Middle Musquodoboit, with the most eastern station being on the St. Mary's River above Sherbrooke in Guysborough Co. (Erskine, 1953). This tall, bright-green species makes a very handsome plant when in flower or fruit.

N.S.; central Me. to Iowa south to Fla.



50. **ECHINOCHLOA** Beauv.

1. **E. crusgalli** (L.)Beauv. Fig. 29. BARNYARD-GRASS

This is a very variable grass in all its characteristics; a common weed in waste ground, along ditches, in gardens and around dwellings, generally growing in rich or moist soil, often a bad weed in cultivated ground. Forma **mitis** (Pursh)Peterm. has the spikelets awnless or nearly so, the awns being less than 3 mm long. Forma **longiseta** (Trin.)Farw. is the opposite extreme with many of the spikelets having awns 2.5-3.5 cm long. Both variations are found in the Annapolis Valley and may be expected throughout.

Var. **frumentacea** (Roxb.)Wight has been occasionally cultivated under the name of Japanese Millet or Billion-dollar Grass. The racemes are thick with incurved, appressed branches; spikelets awnless and purplish.

Native of Europe; now almost cosmopolitan.

51. **SETARIA** Beauv. FOX-TAIL

Introduced garden weeds, the spikes short-cylindrical with long bristles.

a. Bristles below each spikelet numerous; spikelets 3 mm long, the sterile lemma transversely rugose; base of leaf-blade with a few flexuous hairs; margin of sheath glabrous. 1. *S. glauca*

a. Bristles below each spikelet 1-3; spikelets 2.0-2.5 mm long, the sterile lemma smooth or nearly so; blade glabrous; margin of sheath ciliate.

b. Spikelets articulated below the glumes, falling away entire; panicle cylindrical, not interrupted.

c. Panicle green, densely-flowered; about 6 cm long; bristles 1.0-1.5 cm long. 2. *S. viridis*

c. Panicle purplish-tinged, irregularly-flowered, generally 2-3 cm long; bristles shorter, less than 1 cm long. *S. viridis* var. *Weinmanni*

b. Spikelets articulated above the glumes, the fruit shelling out and leaving the glumes and sterile lemma behind; panicle large, usually much interrupted, green, yellow or purplish. 3. *S. italica*

1. **S. glauca** (L.)Beauv. Fig. 29. YELLOW FOX-TAIL

A weedy annual common in the Annapolis Valley on the light and sandy soils, in gardens, orchards and along roadsides; rarer throughout the rest of the Province but to be expected anywhere.

Introduced from Eu. and widely distributed.

2. **S. viridis** (L.)Beauv. Fig. 29. GREEN FOX-TAIL

In light to heavy soils, in gardens, waste places, fields, orchards and along roadsides, more general and more widely distributed than the preceeding species, often a common weed; common in the Annapolis Valley and scattered throughout the rest of the Province. Introduced from Eu.; throughout N.A.

Var. **Weinmanni** (R. & S.)Brand is a smaller plant with a purplish color, and culms more or less decumbent and bent at the base; scattered on light soils in the Annapolis Valley and occasionally around railroad yards and waste places elsewhere.

Introduced from Eu.; Nfld. to Ia. south to Va.

3. **S. italica** (L.)Beauv. FOX-TAIL MILLET

A cultivated form with robust culms, broad blades and large, often lobed panicles. Many different varieties and strains have been developed so that plants of very diverse appearance may be found. Occasionally cultivated for summer forage and found as an escape in waste places.

Eurasia; widely introduced.

19. CYPERACEAE SEDGE FAMILY

The sedge family comprises a large group of grass-like plants which are very common in wet areas and on poorly-drained soils. The leaves are often in three longitudinal rows and the stems may be triangular in cross-section. The simple flowers are borne directly in the axils of scales and are grouped to make heads or spikes. Each flower produces a dry, one-seeded fruit called an achene.

a. Stamens and pistils in the same flower; achenes in the axils of bracts of the inflorescence, not enclosed in sac-like perigynia.
  b. Spikelets with 6-many fertile flowers; or, if fewer-flowered, terminal without leafy bracts.
    c. Scales of the spikelets strictly 2-ranked, folded and keeled.
      d. Inflorescence terminal; flowers without bristles; achenes beakless; stem solid, more or less 3-angled. 1. *Cyperus*
      d. Inflorescence lateral; flowers with 6-9 bristles; achenes long-beaked; stem hollow, round (Fig. 30, b). 2. *Dulichium*
    c. Scales of the spikelet spirally arranged and overlapping.
      e. Spikelet solitary and terminal; leaves reduced to sheaths; base of the style persistent as a tubercle at the top of the achene; bristles present, little longer than the achene (Fig. 30, d, etc.). 3. *Eleocharis*
      e. Spikelets one to usually many; leaves present, or occasionally absent in *Scirpus*; base of the style not persistent, or if so not sharply delimited from the achene.
        f. Bristles 0-8, usually short, if exserted then with the spikelet solitary, or the spikelets very small and numerous (Fig. 32). 4. *Scirpus*
        f. Bristles 6, 4-6-cleft to near the base and appearing to be very numerous, long and exserted (Fig. 33). 5. *Eriophorum*
  b. Spikelets with 1-2 fertile flowers and several empty lower scales; inflorescence subtended by one to several leafy bracts.
    g. Style 2-cleft, the enlarged base forming a persistent tubercle on the achene; bristles present (Fig. 34, a-c). 6. *Rhynchospora*
    g. Style 3-cleft, the base not enlarging to form a tubercle; bristles absent (Fig. 34, d). 7. *Cladium*
a. Stamens and pistils in separate flowers, often in separate spikes; achene enclosed in a sac-like covering called a perigynium, with the style projecting from the apex (Fig. 35-45). 8. *Carex*

1. CYPERUS L. GALINGALE

This genus, after which the family is named, consists of around 40 species in northeast N.A. The plants are usually erect, 1-6 dm high, with a characteristic terminal, branching inflorescence with long spikelets. N.S. is at the northern limit of its range and the plants are rare and local.

a. Spikelets long and terete, the scales pointing forward and overlapping less than half of the next scale above, arranged along an axis. 1. *C. esculentus*
a. Spikelets flattened, with several to many attached at one point on the inflorescence (Fig. 30, a).

b. Scales of the spikelet spreading and overlapping most of the next scale above on the same side; spikelets in many sessile and stalked groups to make an open inflorescence. 2. *C. dentatus*

b. Scales of spikelet overlapping less than half their length; inflorescence usually a single semi-globose sessile group of spikelets, or occasionally one to a few groups on long slender branches. 3. *C. filiculmis*

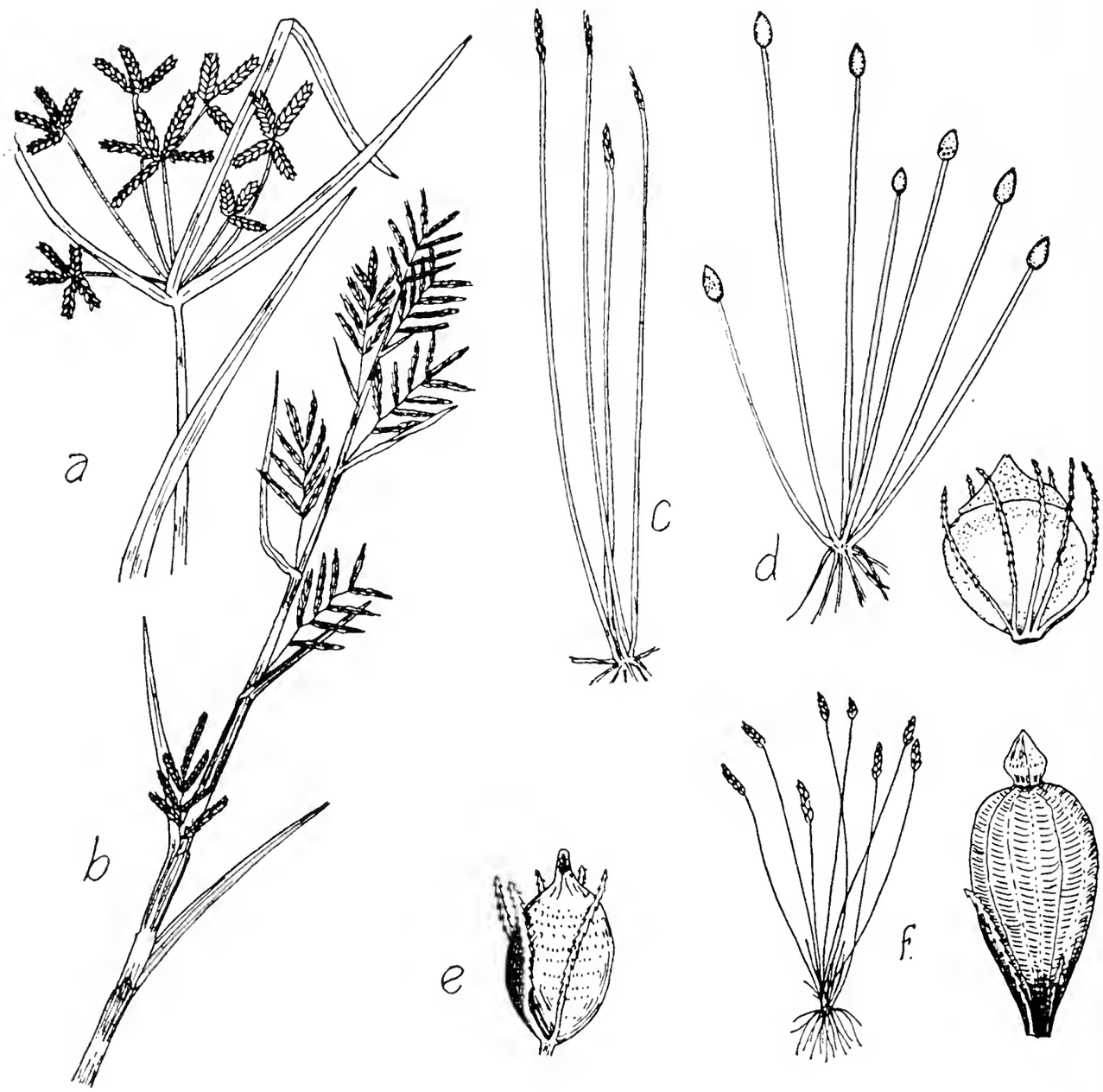


Fig. 30.—**Cyperus dentatus.** a, top of plant, x $\frac{1}{2}$. **Dulichium arundinaceum.** b, top half of plant, x $\frac{1}{2}$. **Eleocharis Robbinsii.** c, plant, x $\frac{1}{4}$. **E. obtusa.** d, plant, x $\frac{1}{4}$; achene, x 12. **E. rostellata.** e, achene, x 8. **E. acicularis.** f, plant, x $\frac{1}{4}$; achene, x 25.

1. **C. esculentus** L. Map 107. NUT-GRASS

A local introduced weed which may be aggressive since it spreads by means of many small underground nutlets or tubers; earlier found in an orchard at Starr's Point, Kings Co.; now known to be a bad weed in a low sandy field at Somerset.

N.S. to Wash. south to Mexico; tropical America; Eu.

2. **C. dentatus** Torr. Map 107.

Characteristic of many sandy and gravelly lake-shores and beaches; common in Yarmouth Co., scattered east at least to Lunenburg Co. (Fernald, 1922).

N.S. to Ind. south to W. Va.

3. **C. filiculmis** Vahl Map 107.

Collected on sand behind the beach, Pomquet, Antigonish Co. by W. G. Dore in 1940; since collected also from a sand beach at Antigonish Harbour. The plants are immature and probably belong to var. *macilentus* Fern., a smaller, more northern form with 4-8-flowered spikelets.

N.S.; Me. to Minn. south to Fla.

2. DULICHIUM Pers.

1. **D. arundinaceum** (L.)Britt. Fig. 30, b.

Muddy shores, around lakes and ponds, and occasionally in poorly-drained swamps; throughout, especially abundant in the Atlantic region of the Province; common in the dense vegetation along the bog meadows above the influence of the tide on the Fundy marshes.

Nfld. to Wash. south to Fla. and Tex.

3. ELEOCHARIS R.Br. SPIKE-RUSH

A very common group of plants with stiff, leafless culms and but one compact spike at the tip of each fertile culm. In many cases identification is possible only when mature achenes are present. Fernald, M. L. and A. E. Brackett. The representatives of *Eleocharis palustris* in North America. Rhodora **31:** 56-77. 1929. Svenson, H. K. Monographic studies in the genus Eleocharis-V. Rhodora **41:** 1-19; 43-77, 90-110. 1939.

a. Culms sharply 3-angled in cross-section; spikelet with 3-9 scales, barely broader than the culm; achenes minutely reticulate, tipped by a flattened tubercle. 1. *E. Robbinsii*

a. Culms more than 3-angled in cross-section; spikelets usually conspicuously different from the culm.

b. Achenes without conspicuous tubercles, the summit being of a slightly different texture than the body of the achene.

c. Culms slender (less than 1 mm thick), all ascending, usually less than 1 dm tall; stolons often with small tubers; spikelets flattened, 2-9-flowered.

d. Culms 1-7 cm high, often in dense mats or tiny clumps; spikelets 2-4 mm long; scales green or pale brown, 1.5-2.5 mm long; achenes 0.9-1.5 mm long; usually of saline habitats. 2. *E. parvula*

d. Culms 3-15 cm high, from creeping rhizomes; spikelets 4-7 mm long; scales purple or brown-tinged, 3-8 mm long; achenes 1.8-2.5 mm long; usually of alkaline habitats. 3. *E. pauciflora*

c. Culms coarse (more than 1 mm thick), strongly compressed, 1-5 dm tall, the lower ones arching and often rooting at the tips; stolons absent; spikelets not flattened, 0.6-2 cm long, 12-20-flowered; usually in thick clumps. 4. *E. rostellata*

b. Achene with tubercle of conspicuously different texture than the body of the achene, usually articulated with the achene.

e. Achenes with prominent straight longitudinal ridges separated by numerous slender cross-bars; scales 2-3-ranked, membranaceous; culms capillary, less than 0.5 mm thick; spikelets flattened, often reddish-purple. 5. *E. acicularis*

e. Achenes lacking prominent straight longitudinal ridges; culms various; spikelets never flattened.

f. Achenes with deep coarse regular honeycomb reticulations; tubercle nearly as large as the achene body; scales coriaceous or cartilaginous; in dense stiff tussocks. 15. *E. tuberculosa*

f. Achenes without coarse deep honeycomb reticulations; tubercle always smaller than the achene body; scales membranaceous to sub-herbaceous.

g. Plants in clumps (occasionally with soft threadlike rhizomes), without firm rhizomes and stolons.

h. Upper sheaths towards the culm-base loose with white scarious tips; plant small, tufted; outer scales of spikelet ovate-oblong with prominent green mid-ribs and brown, purplish or pale sides, round-tipped; mature achenes olive to dark brown, with tubercle green. 6. *E. olivacea*

h. Upper sheaths close with herbaceous to coriaceous orifices; plants in clumps; achenes chestnut brown, with a flattened deltoid to conic brown tubercle.

i. Base of the broadly deltoid tubercle nearly covering the summit of the achene, slightly constricted at the base. 7. *E. obtusa*

i. Base of conic tubercle covering about two-thirds of the achene, not constricted at the base. 8. *E. ovata*

g. Plants stoloniferous with firm reddish, purple or black rhizomes or stolons.

j. Achenes biconvex, plump, glossy chestnut brown, smooth or shallowly reticulate, mostly covered by sub-persistent scales; bristles usually present.

k. Basal scales of spikelet usually 2 or 3 and below the thinner fertile scales; clums 1-5 mm thick at the summit of the upper sheath; bristles commonly elongate; tubercle variously shaped, from lanceolate to truncate onion-shaped. 9. *E. Smallii*

k. Basal scale solitary, like a spathe and often encircling the base of the spikelet; culms filiform, 0.3-2 mm thick at the summit of the upper sheath.

l. Spikelet closely many (30-)flowered, linear-lanceolate to slenderly ovoid; single scale at base of spikelet to 1 mm long, pale brownish; fertile scales membranaceous, closely appressed; culms usually dull glaucous green; achenes 0.7-1 mm thick. 10. *E. erythropoda*

l. Spikelets loosely few (5-30) flowered, lanceolate to ovoid; single scale to 2 mm long and glossy; fertile scales firm, lustrous, loosely ascending; culms usually glossy dark green; achenes 1-1.5 mm thick. 11. *E. halophila*

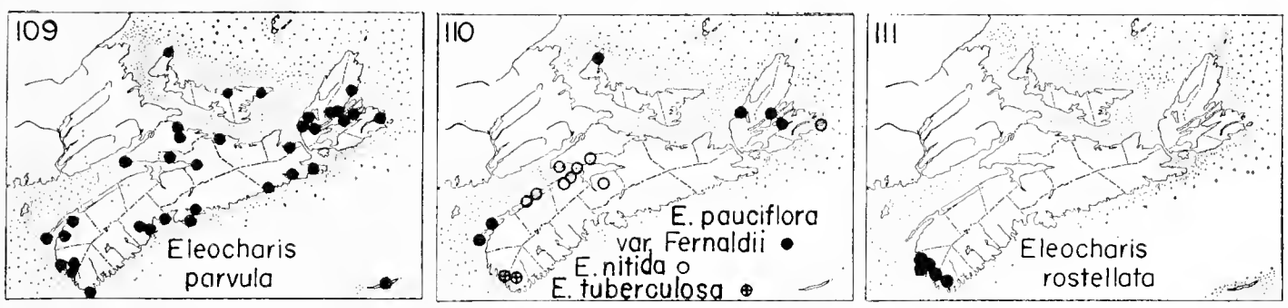
j. Achenes trigonous, yellowish to olivaceous, their surfaces granular to wrinkled or papillate, often persisting after the scales fall; bristles often absent or soon disappearing.

m. Tips of upper sheath of culm white-tipped; culms not often exceeding 9 cm high, often arching; spikelets 1.5-4.5 mm long; achenes 0.7-0.8 mm long, sharply angled; tubercle truncate, with a central apiculation; bristles absent. 12. *E. nitida*

m. Tip of upper sheath of culm dark-girdled; culms usually exceeding 8 cm, rarely arching; spikelets usually more than 5 mm long; achenes 0.9-1.5 mm long, not sharply angled; tubercle usually conic; bristles present.

n. Culms 4-5-angled; mature achene olivaceous; the reticulations usually deep and without prominent cross-bands; tubercle conic and about one-third the length of the achene; rhizomes normally 1-1.5 mm thick, soft and flexible. 13. *E. tenuis*

n. Culms 6-8-angled, usually coarse and wiry, at least 1 mm thick; mature achene yellow to orange, lacking shallow reticulations but with many prominent transverse bands; tubercle truncate-conic; rhizomes coarse, dark purple, wiry and more than 1.5 mm thick. 14. *E. elliptica*



1. **E. Robbinsii** Oakes Fig. 30, c. Map 108.

Readily distinguished from all other native species. It grows in the shallow water of peaty muck-margined lakes; most common from southwestern N.S. to around Halifax and becoming scattered to rare to central C.B.

Florida north via the coastal plain into N.S. and extending west to Mich. and Ont.

2. **E. parvula** (R. & S.)Link Fig. 31, b. Map 109.

This species can be confused with no other found in saline or brackish habitats except *E. acicularis*. *E. pauciflora* is occasionally found near the sea but its achene is smaller and the shape is different. Brackish shores, often forming an extensive turf around ponds; with a broken distribution around the whole coast except for northern C.B.

A circumpolar temperate species with disjunct populations in Cuba and Brazil.

3. **E. pauciflora** (Lightf.)Link, var. **Fernaldii** Svenson Map 110.

Its resemblance to *Scirpus cespitosus* is superficial: the *Scirpus* grows in dense cespitose clumps and has a sharply triangular achene. Rare in N.S., generally in alkaline marshes and bogs in a few stations in central C.B. and on Digby Neck; occasionally on maritime cliffs.

Circumboreal species with a disjunct population in the deserts of Chile: the variety is restricted to N.S.; Nfld. to James Bay south to N.J., Ohio and Iowa.

4. **E. rostellata** Torr. Fig. 30, e. Map 111.

This superfically resembles *E. Smallii* but the culms are strongly compressed and more wiry and it has a coarse stem-base and generally cespitose habit. The culms are often very long and arching with many rooting at the tip. The achene is characteristic (Fig. 30, e) and does not resemble that of any other N.S. species. Confined to salt marshes, presumably restricted to the southwestern area; saline or brackish marshes and swales of Yarmouth Co.; Sand Beach, Chebogue, Tusket and Argyle and along the shore up to the Yarmouth-Digby line.

Fla. to southern Me. and N.S.; West Indies; around the Great Lakes; and on alkaline regions from southern B.C. to Mexico and south.

5. **E. acicularis** (L.)R. & S. Fig 30, f.

An extremely variable species rarely found with ripe achenes. Among beach pebbles of lake-margins the plants form reddish tufts; on muddy shores they form a depressed mat of filiform green culms; and among reeds of swamp margins they form a tangled green mat. Many variants have been given formal names but most of these are ecological responses to changing environment, particularly of submergence. The submerged form is recognized by stiff-appearing tufts (that relax when removed from the water) of short green, generally sterile culms. These are generally 3-4 inches long, but may exceed 8 or 9, especially when growing in rapidly-flowing water. A form with bristles absent has been found around Cape Cod; collected at Great Pubnico Lake in Yarmouth Co. (Svenson, Rhodora **31:** 190. 1929).

Common near most freshwater bodies throughout; not noted on Sable Island.

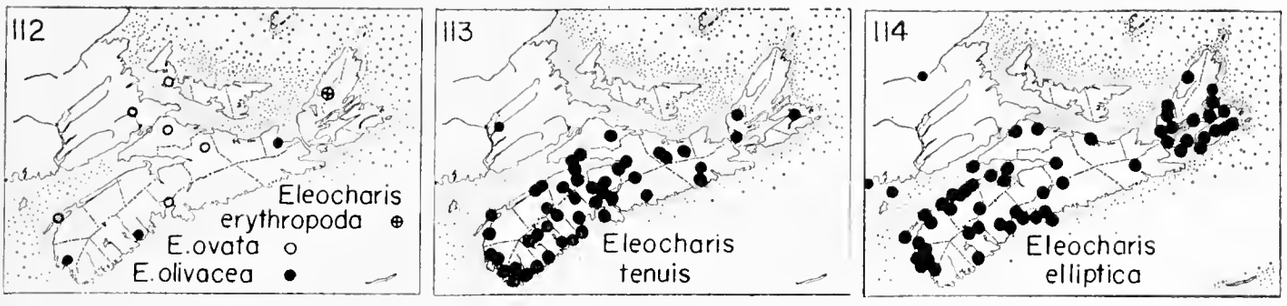
Circumboreal; Nfld. and Lab. west to B.C. southward to Fla. and Mexico.

6. **E. olivacea** Torr. Map 112.

This may be confused with small forms of *E. obtusa* or *E. ovata* but the spikelets are generally fewer-flowered, the scales are not readily deciduous, and the conical pale tubercle is conspicuously different in that it has a constriction at the base and does not resemble the somewhat flattened tubercle that merges without a perceptible constriction to the achene. The short tufts of *E. olivacea* are often joined by reclining stolons while those of the other two are not.

In peaty muck of bogs and wet sandy shores; very local in N.S. and found at Argyle Head, margin of pond-hold east of Tiddville, Italy Cross, and in a cat-tail swale at Antigonish.

N.S. to Ore. south to Michigan and thence, largely via the Coastal Plain, to Florida.



7. **E. obtusa** (Willd.)Schultes Fig. 30, d.

A fairly variable species in N.S., but its characteristic red-based cespitose clumps of soft culms, the multi-flowered ovoid, red-brown spikelets that shed the lower scales upon maturing of the achenes, and the distinctive achene all separate it from any other species—with the possible exception of *E. ovata*. The so-called "var. *jejuna* Fern." appears to be nothing more than a late season form of this species and deserves no formal name. It differs in no significant way except in size and the form appears on areas that emerge from flooding late in the season.

Throughout on muddy shores and in ditches; common.

N.S. to Minn. south to Fla. and e. Texas; southern B.C. south to Calif.; Hawaii.

8. **E. ovata** (Roth) R. & S. Fig. 30, d. Map 112.

This form most closely resembles *E. obtusa*, especially its late season forms, but the narrowly conic tubercle is plainly different and the size of the clumps is generally smaller. Very local: Truemanville, Sandy Cove, and abundant on the margin of a dried-up pond behind the barrier beach at Black Point, Halifax Co.; presumably confined to calcareous muds of lakes and ponds. The Black Point collection is particularly interesting since this is from an isolated outcrop of limestone in a country of predominantly acid rock (Schofield, 1955).

Var. **Heuseri** Uechtritz, with the culms densely crowded, arching, recurving and depressed, and the spikelets very dark, is doubtfully distinct. Abundant on a pond-margin at Truemanville, Cumberland Co. and also found at Earltown Lake in Colchester Co. and Sandy Cove.

Scattered from Nfld. to Va. west to the Great Lakes area; very local in Wash. and Ore.; Eurasia.

9. **E. Smallii** Britt. Fig. 31, a.

Including *E. palustris* (L.)R. & S. and its var. *major* Sonder. Svenson, Rhodora **49:** 61-67. 1947, considers these to belong to a single species and until more detailed study has been done this appears to be the most reasonable alternative. The culms vary dependent on the degree of submergence. Those of lake shallows, to 3 dm of water, are often very thick (to 5 mm) and the spikelets are often small. This

is *E. palustris* var. *major* of many authors. In swampy lake margins and swales they tend to be more slender and shiny with the spikelets often large in comparison to the 1.5 mm diameter of the culm. Occasionally completely emerged plants are quite small with the spikelet less than 1.5 mm broad at its widest part and the culm near 1 mm in diameter. There is also a great variation in the number of flowers per spikelet, texture and colour of the "glumes", and color, shape and texture of the tubercle. Generally within a single spikelet the achenes are essentially identical but this is by no means universal.

Scattered throughout on lake shores, meadow swales, pond margins and occasionally in peat bogs, often forming extensive stands into the shallow water of lakes.

Northern Que. and Nfld. west to the Great Lakes and south to Ala.

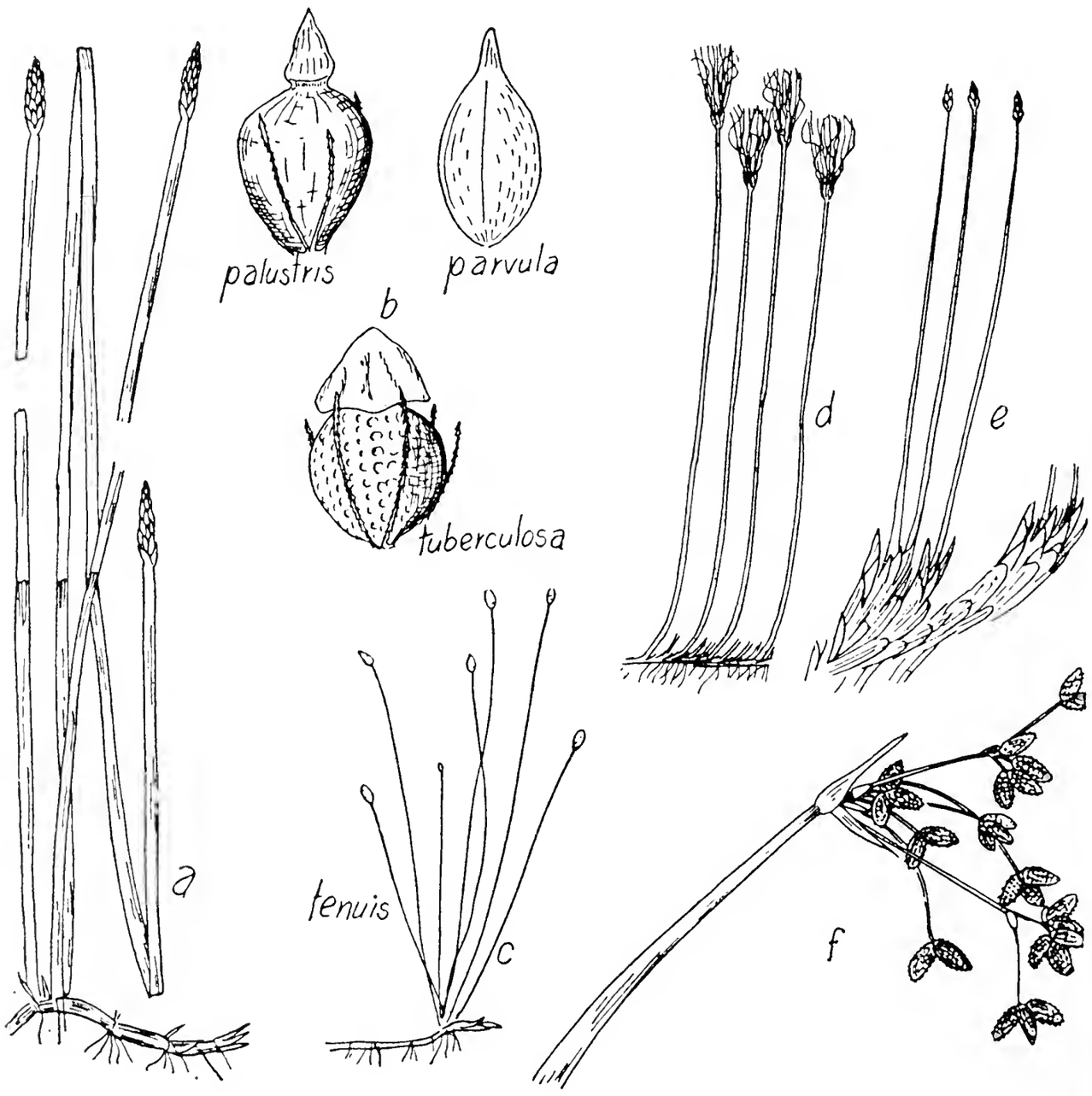


Fig. 31.—**Eleocharis.** a, **E. Smallii,** x $\frac{1}{2}$. b, achenes, x 10. c, **E. tenuis,** x $\frac{1}{4}$. **Scirpus.** d, **S. hudsonianus,** x $\frac{1}{4}$. e, **S. caespitosus,** x $\frac{1}{4}$. f, **S. validus,** top of plant, x 1/3.

10. **E. erythropoda** Steud. Map 112.

This species closely resembles *E. halophila*; and the number of flowers in a spikelet is extremely variable in both species. Very rare; known only from McDonald's Barren, Northwest Margaree, Inverness Co. where it was collected by C. B. Robinson long ago.

N.S. and Que. west to Alta. and south to Tenn. and Texas.

11. **E. halophila** (Fern. & Brack.)Fern. & Brack.

Primarily of saline or brackish shores, both scattered around the coast and inland around salt springs, in alkaline habitats and near sink holes in gypsum country.

James Bay, Nfld., and the Gulf of St. Lawrence south along the coast to Va.

12. **E. nitida** Fern. Map 110.

This species is quite different from any other in N.S. It fruits earlier so that the bright whitish-yellow achenes mature as early as mid-June. It most closely resembles depauperate plants of *E. tenuis*.

Local, generally on soils derived from volcanic rock; most collections have been made from moist soil or woods roads over basalt along the North Mountain and at Cape d'Or and Economy Mountain; also in burned-over area, north-east end of Scatari Island, Cape Breton (Schofield, 1955).

James Bay and the Ottawa Valley to Nfld. and N.S. and south to N.H.; Alaska.

13. **E. tenuis** (Willd.)Schultes Fig. 31, c. Map 113.

Mature specimens with ripe achenes are necessary to determine this species with any confidence. Even with this, it is often difficult to distinguish this species from some slender forms of *E. elliptica* since, unfortunately, this species in some environments becomes rather filiform in both stolons and clums and the tubercle of its achene may become rather conic. The cross-sectional shape of the culm is often difficult to determine in dried material.

Roadside ditches, meadows, lake margins and occasionally in bogs; apparently absent from the extreme eastern part of the mainland and in C.B.

N.S. south to Ga. and west just beyond the western flank of the Appalachian Mts.

14. **E. elliptica** Kunth Map 114.

Scattered throughout along streams and rivers, lake margins and meadows.

Nfld. to B.C. south to Penn. and around the Great Lakes.

15. E. **tuberculosa** (Michx.)R. & S. Fig. 31, b. Map 110.

Represented in N.S. by two minor forms, one known but from a single locality. Forma **retrorsa** Svenson, Rhodora **39:** 250, 1937, has the bristles around the achene downwardly barbed; known from the wet or peaty beach of Harper's Lake, Shelburne Co. Forma **pubnicoensis** (Fern.)Svenson has the bristles smooth. This is known only from the sandy and boggy border of Great Pubnico Lake, Yarmouth Co. where it was collected and described by Fernald.

This species is completely unlike any other in N.S. The stiffly cespitose clumps, large ovoid spikelets and the remarkably large tubercle surmounting the honey-comb sculptured achene immediately identify it.

Southwestern N.S.; N.H. southward chiefly on the Coastal Plain to Fla. and Texas; extending inland to n. Alabama and the Cumberland Plateau in Tenn.

4. SCIRPUS L. BULRUSH

A large and varied group, the most common and conspicuous being a number of tall species growing in swales, out into the shallow water of ponds and lakes, or around salt marshes (Fig. 31, 32).

a. Spikelets terminal, solitary; involucre none or merely an outer scale of the spikelet; plants erect, with the leaf-blades reduced to short awl-like bracts.
  b. Plants densely cespitose; culms terete, smooth above; bristles of the spikelets barely longer than the achenes (Fig. 31, e). 1. *S. cespitosus*
  b. Plants with running rootstocks; culms triangular and scabrous above; bristles 2-3 cm long, silky and conspicuous (Fig. 31, d). 2. *S. hudsonianus*
a. Spikelets not terminal, usually numerous; involucre varying from a short continuation of the stem to numerous leafy bracts; plants with definite leaf-blades (Fig. 32).
  c. Spikelet solitary; involucre green, 5-15 mm long; plant usually floating or submersed in water, with long, weak, filiform leaves. 4. *S. subterminalis*
  c. Spikelets several to many, rarely one; plants normally erect.
    d. Involucre short, appearing to be a continuation of the stem (Fig. 32, a, b).
      e. Spikelets 2-5-flowered, crowded in a 2-ranked sub-terminal spike; plant very slender, 1-6 dm high. 3. *S. rufus*
      e. Spikelets many-flowered, plainly lateral, not 2-ranked; plants 2-25 dm high.
        f. Stem sharply 3-angled, to 12 dm high; spikelets in a sessile cluster, occasionally solitary.
          g. Involucral leaf 4-15 cm long; upper sheath with a long narrow leaf; spikelets pointed (Fig. 32, a). 5. *S. americanus*
          g. Involucral leaf 1-3 cm long; the upper sheath with a short triangular leaf or none; spikelets blunt (Fig. 32, b). 6. *S. Olneyi*
        f. Stems round, 0.5-2.5 m high (Fig. 31, f).
          h. Scales of the spikelet shorter than and exposing the achenes, with reddish gummy spots scattered and usually only on and along the midvein; mature achenes usually less than 2 mm long; culm soft. 7. *S. validus*

h. Scales of the spikelet long and completely embracing the achenes, always papillose on the upper half with dense reddish gummy spots; mature achene usually longer than 2 mm; culm firm. 8. *S. acutus*

d. Involucre consisting of several to many leafy bracts.

i. Spikelets large, 1-2 cm long, 6-10 mm thick; salt-marsh plants (Fig. 32, c).

j. Scales reddish-brown, thicker and not translucent, very tightly appressed, the awn short and abruptly recurved. 9. *S. robustus*

j. Scales of spikelet pale- to chestnut-brown, never reddish-brown, thin and semi-translucent particularly on the hyaline margins, more or less loose, the awn long and gradually recurved. 10. *S. maritimus*

i. Spikelets smaller, 2-15 mm long, 1-3 mm thick, numerous in a compound inflorescence; plants of non-brackish habitats (Fig. 32, d-g).

k. Bristles retrorsely barbed, barely exserted or included within the scales; stems solitary or loosely clustered, with thick scaly stolons; spikelets in glomerules (small, compact clusters).

l. Lower leaf-sheaths reddish-tinged; bristles barbed almost to the base, longer than the achene; spikelets 4-8 mm long (Fig. 32. g). 11. *S. rubrotinctus*

l. Lower leaf-sheaths green; bristles barbed only above the middle, shorter than the achene; spikelets 2-4 mm long (Fig. 32, d). 12. *S. atrovirens*

k. Bristles smooth or sparingly barbed upward; stems loosely or densely clumped, without stolons; spikelets separate or in glomerules.

m. Spikelets nearly all in glomerules of 3-15; involucels (scales at base of branches of the inflorescence) reddish- to dull-brown. 13. *S. cyperinus*

m. Spikelets nearly all single and stalked.

n. Spikelets 3-6 mm long; base of the involucre not covered with a sticky secretion; achenes whitish to light-colored.

o. Plants stout, with leaves 5-8 mm wide; involucels and scales brownish; rare. 14. *S. pedicellatus*

o. Plants slender with leaves 3-5 mm wide; involucels and scales blackish-green; scales 1-2 mm long; common (Fig. 32, f). 15. *S. atrocinctus*

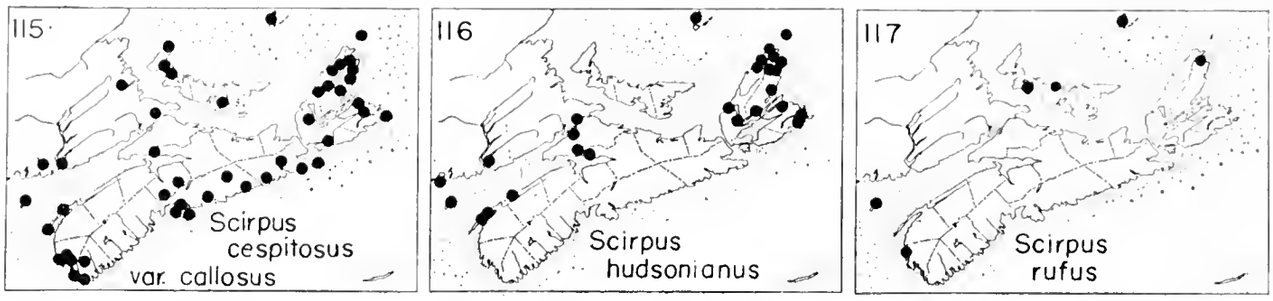
n. Spikelets 6-10 mm long; base of the involucre sticky, blackish; achenes reddish-brown; scales 2-3 mm long. 16. *S. Longii*

1. **S. cespitosus** L., var. **callosus** Bigel. See Fernald, Rhodora **23**: 21-25. 1921. Fig. 31, e. Map 115.

General on the Atlantic slope of the Province where it is often abundant on the dryish, peaty barrens from Digby Co. to northern C.B.; scattered to rare inland and in the north-central region; characteristic of bogs, poorly-drained swamps, and sedge heaths.

Var. **delicatulus** Fern. has the culms more slender, softer and flexuous; with the basal sheaths more membranous and darker, black to dark gray. Locally abundant, festooning dripping cliffs, Big South west Brook, Inverness Co. (Smith and Schofield, 1952); abundant in damp cliff crevices, McCoy's Pool, Northeast Margaree River; and cliffs on the Cheticamp River. Nfld., Gaspe, northern N.B. and Me.; and in northern Mich.

Nfld. and Lab. to Alaska south to N.Eng., and the mts. of N.C. and Utah; northern Eurasia.



2. **S. hudsonianus** (Michx.)Fern. Fig. 31, d. Map 116.

Found by Fernald on Digby Neck; abundant in wet cliff crevices, West Moose River, Cumberland Co. (Schofield, 1955) and is also local on Moose River; abundant in small bog south of Amherst (Fernald, 1921); common in Cape Breton where it is found in poorly-drained swamps and bogs and on wet cliffs. Fernald also mentions it from Lunenburg Co. but no collections have been seen from the Atlantic side of the Province.

Lab. to Alaska south to N.Y. and Mont.; northern Eurasia.

3. **S. rufus** (Huds.)Schrad., var. **neogaeus** Fern. Map 117.

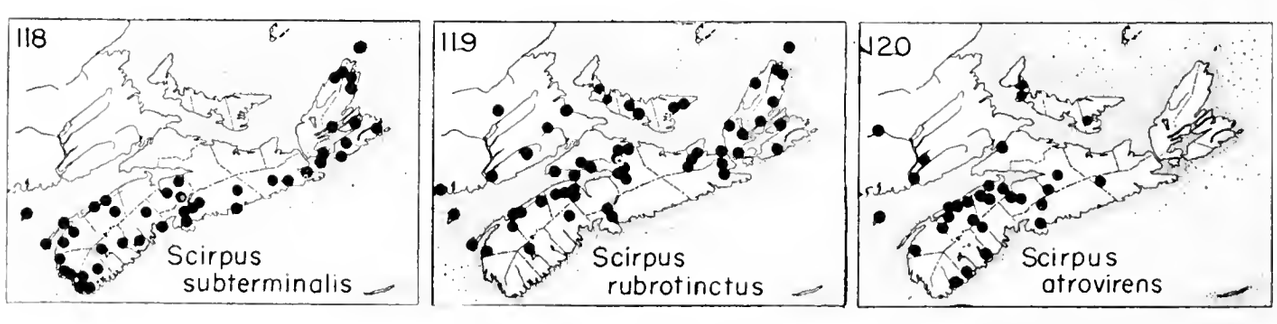
Brackish or saline marsh, Sand Beach, Yarmouth Co. (Fernald, 1921); typical of brackish marshes in northern C.B., as, for instance, on the inside of Cheticamp Island. (Not shown on map). This is the American variety of the Eurasian plant.

Rare: Nfld., Gaspe, the Maritime Provinces and Me. with isolated stations on Hudson Bay.

4. **S. subterminalis** Torr. Map 118.

Somewhat general and probably often overlooked in its area. Fernald (1923) records it from sandy and peaty pools and lake margins, Yarmouth to Hants Co.; common from Yarmouth to central and northern C.B. It is rare or absent from north-central N.S. although it has been found in P.E.I. and in neighboring N.B. Plants growing in the water tend to produce very numerous, elongate capillary leaves. Var. *cylindricus* (Torr.)Koyama, with a triangular culm and only a few flat leaves, has been found in Lac Fox Creek near Moncton, N.B. but not as yet in N.S. (*S. Torreyi* Olney).

Nfld. to B.C. south to N.J., Mo. and Idaho.



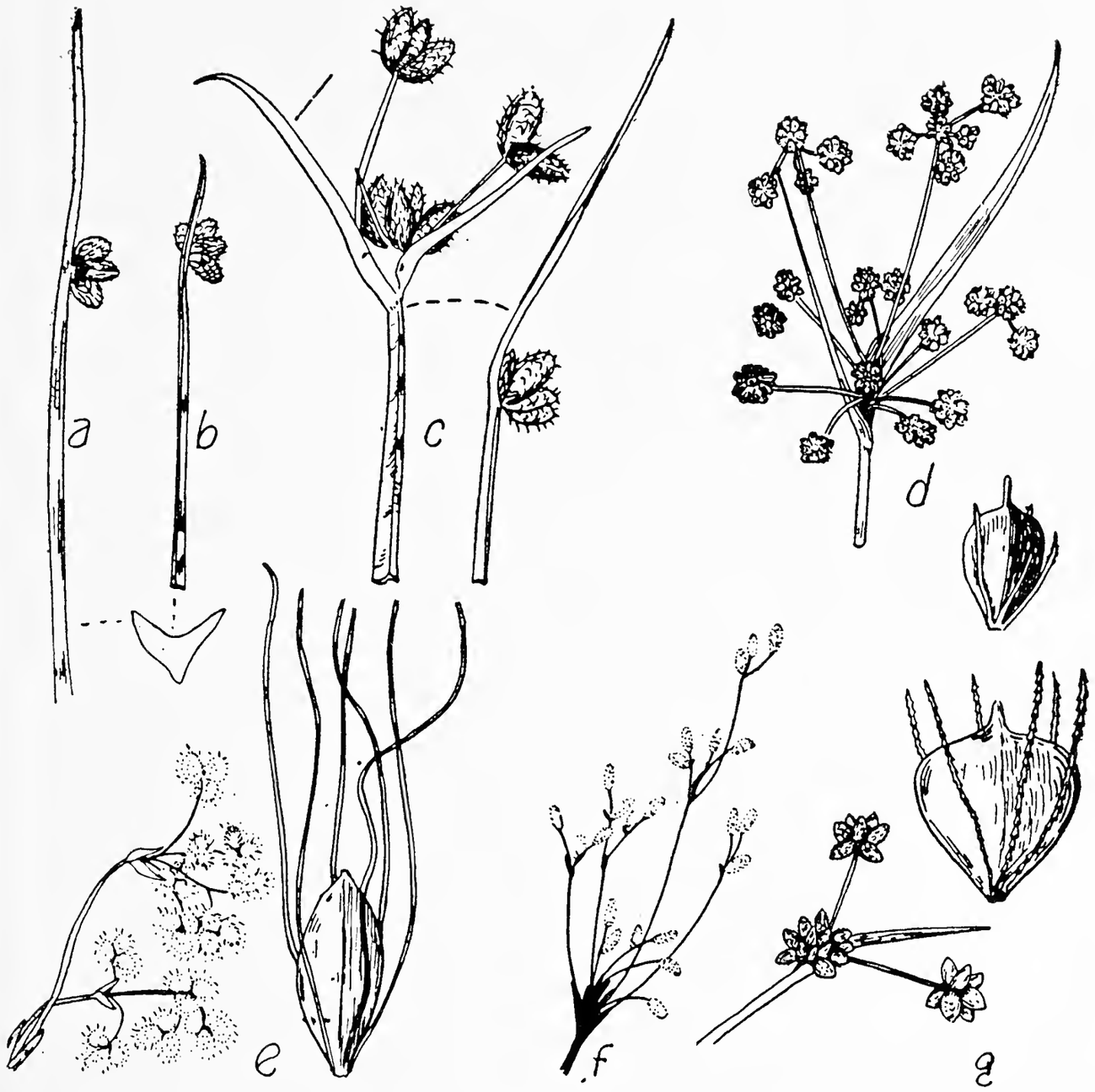


Fig 32.—**Scirpus.** a, **S. americanus,** x 1/3. b, **S. Olneyi,** x 1/3. c, **S. maritimus,** x $\frac{1}{4}$. d, **S. atrovirens,** x $\frac{1}{4}$; achene, x 10. e, **S. cyperinus;** part of the inflorescence, x $\frac{1}{2}$; achene, x 12. f, **S. atrocinctus,** part of inflorescence, x $\frac{1}{2}$. g, **S. rubrotinctus,** part of inflorescence, x $\frac{1}{2}$; achene, x 12.

5. **S. americanus** Pers. Fig. 32, a.

Common on brackish marshes and occasionally in bogs near the coast; common in the dune hollows of Sable Island; around the whole coast of the Province. This plant often forms open, almost pure colonies on wet sand around depressions where the soil is somewhat salty.

Temperate N.A., in fresh water inland; S.A. and Eu.

6. **S. Olneyi** Gray Fig. 32, b.

Recorded from Canada only from salt and brackish marshes and swales of Yarmouth Co.; Sand Beach, Chebogue, Arcadia, Tusket and Eel Lake; extensive sloughs along Abram River were full of it (Fernald, 1921).

N.S. to the Gulf of Mexico; rarely inland; on the Pacific Coast.

7. **S. validus** Vahl Fig. 31, f.

This and the following species comprise the tall, straight leafless bulrushes found in shallow water around many ponds and lakes, both in fresh and in brackish water. In some shallow lakes acres of plants may form an open pure colony with the plants 2 m high. Koyama (1962) places both this and the following species as subspecies of the almost world-wide *S. lacustris* L.

N.S. to B.C.; throughout the U.S., Hawaiian Islands, West Indies and South America.

8. **S. acutus** Muhl. See Can. Jour. of Bot. **40:** 922-928. 1962.

Rather similar in appearance to and growing in locations much like the preceding.

N.S. to Alaska south to N.C. and Calif.; Eu.

9. **S. robustus** Pursh

Collections from Baddeck have been listed here by Beetle, Amer. Jour. Bot. **29:** 86. 1942. The distribution of this coarse plant is not well known but it may be expected scattered along our coasts.

N.S. south along the coast; Calif., Mex. and S.A.

10. **S. maritimus** L. See Koyama. The *Scirpus maritimus* complex in North America. Can. Journ. of Bot. **40:** 932-937. 1962. Fig. 32, c.

This complex presents a very difficult and variable group of plants. The form with the achenes mostly lenticular, *S. maritimus* var. *Fernaldii* forma *agonus*, is considered to be identical to the species of Europe. Forma **cymosus** (Reichenb.) Koyama is about as common and has the achenes mainly trigonous. Scattered around the coast on salt marshes, upper edge of beaches, and along brackish streams and estuaries. Formerly very luxuriant along the Annapolis River above Annapolis.

Var. **paludosus** (A. Nelson)Kukenth. is also common around the coast; brackish marshes, bare areas on the marshes or dyke-lands, often dominant on the shoreward reaches of the salt meadows; brackish ponds on Sable Is. Spikelets blunt at apex, pale to light brown.

Throughout southern Canada and the northern U.S.

11. **S. rubrotinctus** Fern. Fig. 32, g. Map 119.

Locally abundant in swamps, low hayfields, meadows and along ditches and streams. It most often forms pure colonies where there is a steady seepage of fresh water. Throughout the northern region from Digby Co. to C.B.; rare or absent in southwestern N.S. and along much of the Atlantic region of the mainland. Forma **radiosus** Fern., with the spikelets linear-cylindrical, 7-13 mm long and aggregated in clusters, has been collected in swales near Aylesford, Kings Co.

Nfld. to Sask. south to Conn, N.Y. and Minn.

12. **S. atrovirens** Willd., var. **georgianus** (Harper)Fern. Fig. 32, d. Map 120.

Swales, damp thickets, wet roadsides and meadows; occasional through the Annapolis Valley to Cumberland Co.; abundant along the basaltic North Mt. from Digby Neck to Cape Blomidon; common to rather scattered from Yarmouth to Guysborough Co., growing in the moister areas.

Nfld. to Minn. south to Ga. and Ark.

13. **C. cyperinus** (L.)Kunth, var. **pelius** Fern. Fig. 32, e.

Common to abundant throughout, the woolly *Scirpus* most often observed in late summer: sandy shores, bogs, meadows, ditches and edges of streams. This is the northern variety with reddish-brown involucels without blackish bases. This passes gradually into the species southward so that all N.S. plants are placed in the variety. Forma **condensatus** (Fern.) S. F. Blake, with the panicle very condensed, is occasionally seen.

Nfld. to Minn. south to Penn. and Ohio.

14. **S. pedicellatus** Fern.

Still known from but a single collection; wooded bank of the Sissiboo R., Weymouth (Fernald, 1921).

N.S.; Que. to Minn. south to Mass., N.Y. and Iowa.

15. **S. atrocinctus** Fern. Fig. 32, f.

Very common throughout; poorly-drained soil, swamps, bogs, beside streams, in ditches and often characteristic of areas that are inundated early in the season. This species is the tallest in N.S. of this group and may often occupy the center of a swale with *S. cyperinus* more abundant around the margins.

Nfld. to Alta. south to Penn. and Iowa.

16. **S. Longii** Fern., Rhodora **13:** 6. 1911.

Rare; peaty marsh, shore of Ponhook Lake, Queens Co.; also one battered individual, probably of this species, at Moosehorn Lake in the same region (Weatherby, 1942).

N.S.; Que.; Mass. to N.J.; N.C.

5. ERIOPHORUM L. COTTON-GRASS

Bog and meadow plants with the bristles of the flowers becoming very long and conspicuous as the achenes mature, giving a cotton-like appearance to the inflorescence (Fig. 33). The smaller, slender *Scirpus hudsonianus* is the only plant that might be confused with these.

a. Spikelets solitary and terminal without a leafy involucral bract; leaves of the stem mostly reduced to bladeless sheaths (Fig. 33, a).

b. Stem solitary from underground rootstocks; spikelets with 7 or fewer empty basal scales. 1. *E. Chamissonis*

b. Stems densely tufted, without rootstocks; spikelets with 10-15 empty scales at the base; bristles shining white. 2. *E. spissum*

a. Spikelets 2-several in a head or umbel, with an involucre of 1 or more leafy bracts (Fig. 33, b-e).

c. Involucral bract 1; leaves 1-2 mm wide, triangular-channeled.

d. Plant weak and slender, with no basal leaves at flowering time; upper leaf-blade smooth and round-tipped, 1-4 cm long; base of involucre and scales of spikelets dark; achenes 1.5-2 mm long. (Fig. 33, c). 3. *E. gracile*

d. Plant stiff and erect with long, slender, pointed basal leaves; uppermost leaf-blade rough, sharp, 3-18 cm long; base of involucre and scales of spikelets brownish; achenes 2.5-3 mm long (Fig. 33, b). 4. *E. tenellum*

c. Involuvral bracts 2 or more; leaves flat, 1.5-8 mm wide.

e. Spikelets loosely umbellate; bristles white or rarely buff; scales of the spikelet with but one prominent rib; stamens 3 (Fig. 33, e).

f. Scales of the spikelets with a wide, blunt whitish tip and indistinct midrib (Fig. 33, f); upper leaf-sheaths ringed with black at the apex.

g. Leaves 1.5-4 mm wide. 5. *E. angustifolium*

g. Leaves 5-8 mm wide; plant stouter. *E. angustifolium* var. *majus*

f. Scales of the spikelet with a sharp, thick tip, and the midrib prominent to the tip (Fig. 33, g); upper leaf-sheaths usually not dark-ringed. 6. *E. viridi-carinatum*

e. Spikelets in a dense head; bristles tawny or copper-colored, rarely whitish; scales of the spikelet with several prominent ribs; stamen 1 (Fig. 33, d) 7. *E. virginicum*

1. **E. Chamissonis** C. A. Mey. Map 121. RUSTY COTTON-GRASS

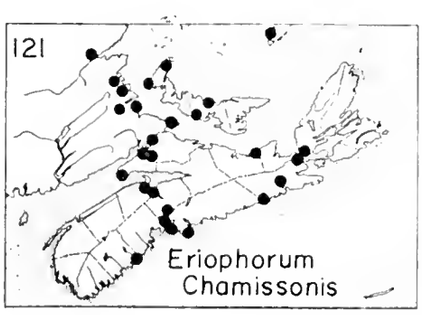
Scattered, not uncommon near the coast; bogs, muskegs and swamps; Cumberland and Hants Cos. to southern C.B. Forma **albidum** (F. Nylander)Fern., Rhodora **23:** 131. 1921, is a form with white bristles; found in many parts of the range of the species, bog south of Amherst; collected by Smith et al in a bog behind the sea-beach, West Advocate, also in Cumberland County. (*E. russeolum* Fries).

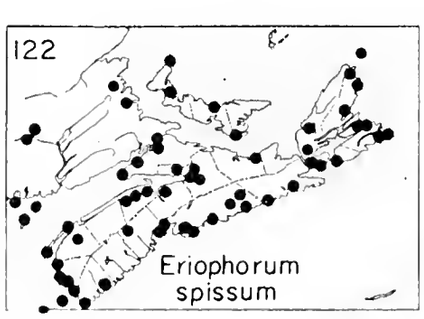
Lab. to Alaska south to N.S., Minn. and down the Rockies.

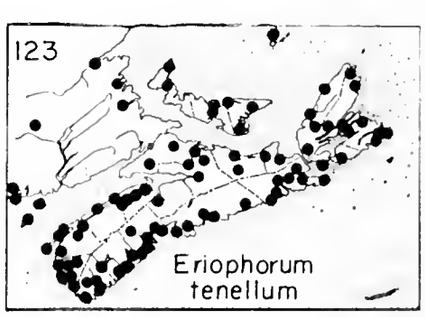
2. **E. spissum** Fern. Fig. 33, a. Map 122. HARE'S-TAIL

Throughout; flowering very early and forming white clumps before the end of May in dryish bogs, swales and muskegs; common on Sphagnum mats in wet, or high and mature bogs in northern C.B. Forma **erubescens** Fern., with reddish-brown bristles, was found growing abundantly in a bog with the typical form, near the center of Scatari Island, Cape Breton Co.

Lab. to Alaska south to Penn. and Wisc.







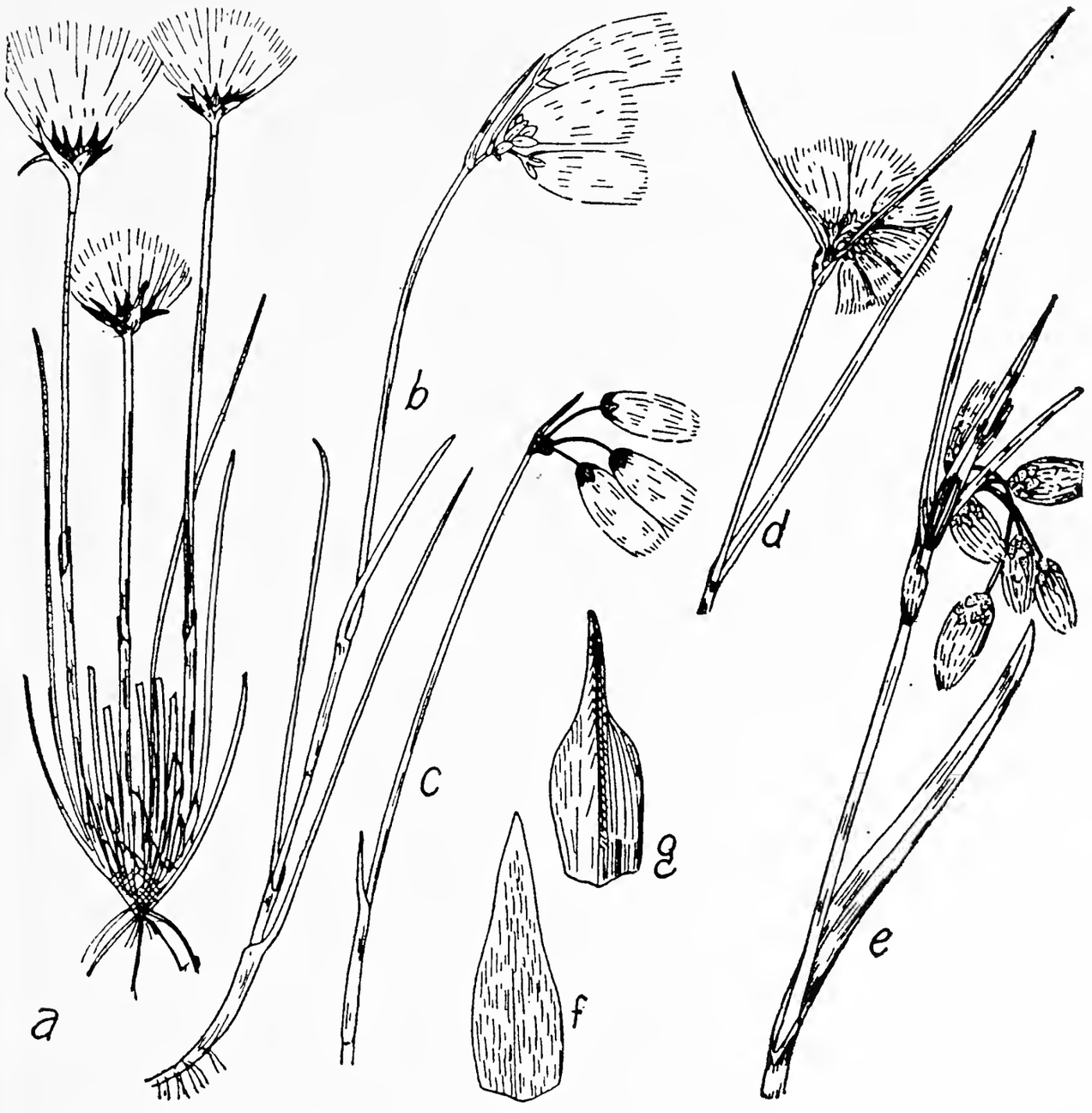


Fig. 33.—**Eriophorum.** a, **E. spissum,** x 1/3. b, **E. tenellum,** x 1/3. c, **E. gracile,** x 1/3. d, **E. virginicum,** x 1/3. e, **E. angustifolium** young plant, x $\frac{1}{3}$. f, scale of spike of **E. angustifolium.** g, scale of **E. viridi-carinatum.**

3. **E. gracile** W. D. J. Koch

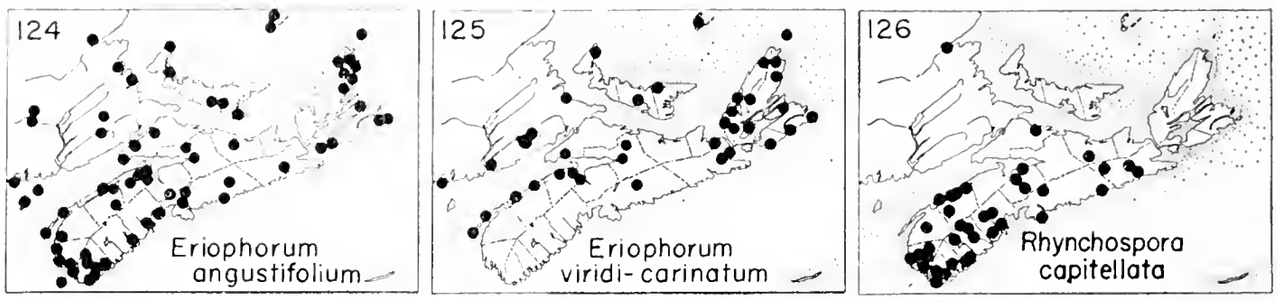
Scattered and probably the rarest member of the genus in N.S.; cold bogs and swamps, usually near the coast; near Two Rivers in Cumberland Co., Karsdale, Annapolis Co. and at Truro. June-July.

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

4. **E. tenellum** Nutt. Fig. 33, b. Map 123.

Common throughout; grassy swamps, peat bogs and swales. This is the most abundant of the late summer species and low meadows may be white with it. The plant itself is rather neat with a reddish tinge to the involucre and the scales. A collection made by J. A. Calder from a boggy field near Halifax shows a distinctly bluish color to the ends of the bristles. Mid July to August.

Nfld. to Sask. south to Penn. and Mich.



5. **E. angustifolium** Honckeny Fig. 33, e. Map 124.

Common throughout; bogs, swamps, wet meadows, cranberry bogs and sphagnous areas. Areas of the Annapolis Valley turfed for cranberry bogs often come into a dense mat of this species where it is a bad weed. Northward and in the Cobequids the following species seems to replace it to a considerable extent although *E. angustifolium* is also common in northern C.B. Flowering in early June and becoming ragged by the end of the month.

Var. **majus** is occasionally seen.

Arctic regions south to N.Y., around the Great Lakes and to N.M.; Eurasia.

6. **E. viridi-carinatum** (Engelm.)Fern. Map 125.

Common in C.B. and in the Cobequids, scattered west to Digby Neck; in bogs, wet meadows and swamps. June-July, appearing later than the preceding species; pure shining white.

Lab. to Alaska south to N.Y., Iowa and B.C.

7. **E. virginicum** L. Fig. 33, d.

Very common throughout; bogs, swamps and on the sphagnum mat around lakes and ponds. It is conspicuous in late summer and early autumn; stouter and more restricted to bogs than is *E. tenellum*. The bristles of the species are typically tawny but often verge towards white as they get older. Plants with white bristles occasionally occur and have been named forma **album** (Gray)Wieg., Rhodora **26:** 2. 1924. Bog near North Sydney and on Digby Neck. Aug.-Sept.

Nfld. to Man. south to Fla. and Nebr.

6. **RHYNCHOSPORA** Vahl BEAK-RUSH

Slender, grass-like perennials with narrow leaves and only a few flowers in small, loosely-arranged spikes (Fig. 34, a, b, c). The distinguishing feature is the beaked achene. Gale, Shirley. *Rhynchospora*, Section *Eurhynchospora* in Canada, the United States and the West Indies. Rhodora **46:** 89-134; 207-249; 255-278. 1944.

a. Scales of the spikelets white, becoming tawny when mature; spikelets usually 2-flowered, 3.5-5 mm long; stamens usually 2; bristles 9-12 (-20). (Fig. 34, a).
2. *R. alba*

a. Scales of the spikelet chestnut-colored; spikelets with several flowers and fruits; bristles 6.
  b. Bristles downwardly barbed or smooth.
    c. Spikelets 3.5-5 mm long, numerous and crowded in the inflorescence with the lower spreading or reflexed to make a hemispheric glomerule; body of the achene sub-orbicular. 1. *R. capitellata*
    c. Spikelets 5-7 mm long, 1-5-flowered, mostly erect in small fascicles so that the inflorescence is ellipsoid; leaves narrowly linear and plant slender; body of achene ellipsoid. 3. *R. capillacea*
  b. Bristles upwardly barbed; spikelets 4-6 mm long, few and ascending in the inflorescence; leaves about 1 mm wide, flat or involute (Fig. 34, c). 4. *R. fusca*

1. **R. capitellata** (Michx.)Vahl Fig. 34, b. Map 126.

Frequent on lake shores, savannahs and peaty openings in the southwestern counties, and scattered east to Antigonish and Guysborough Cos. (Smith, 1959). Abundant in flood-plain of St. Mary's

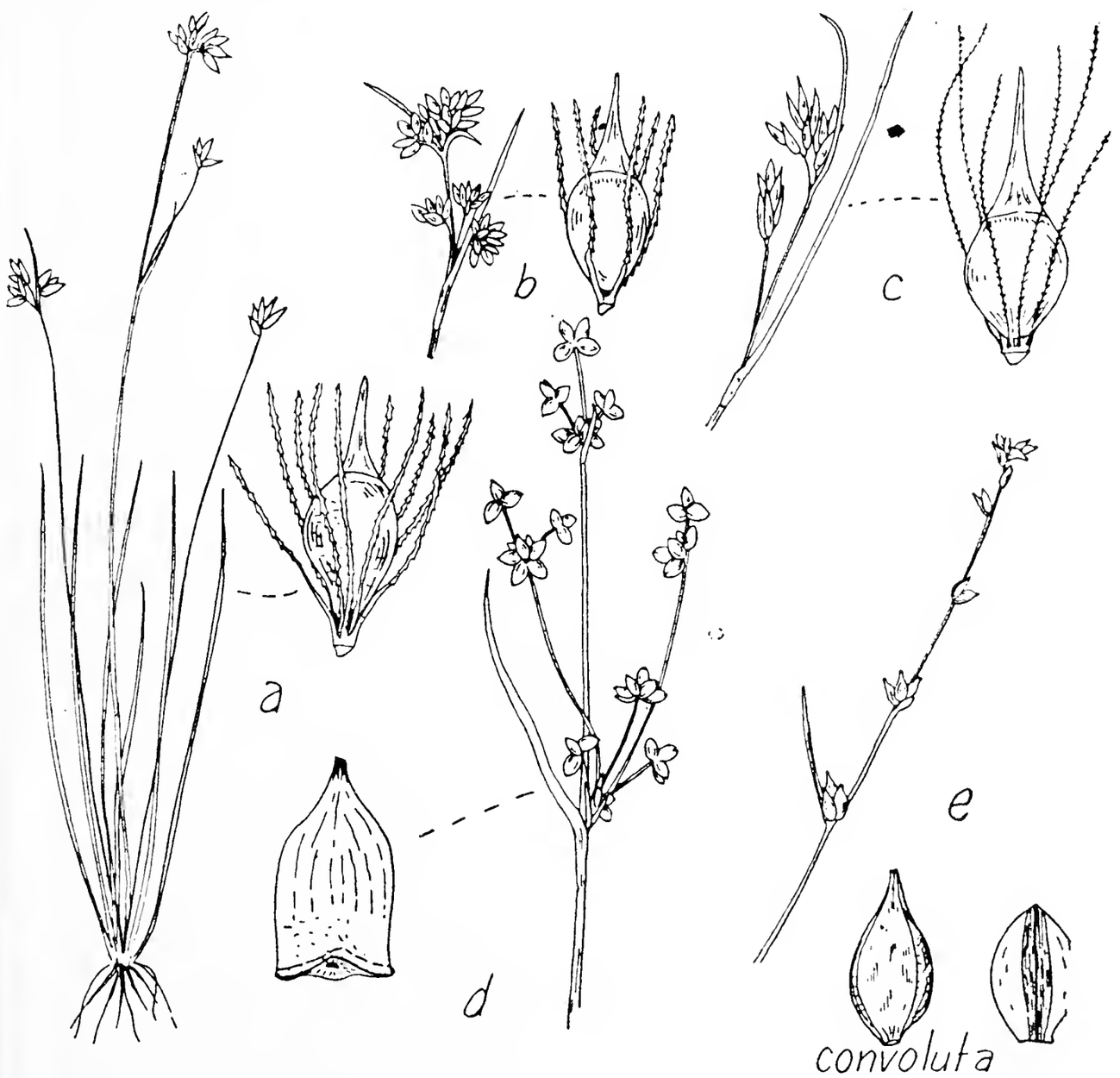


Fig. 34.—**Rynchospora.** a, **R. alba,** x ½; achene, x 10. b, **R. capitellata.** c, **R. fusca. Cladium.** d, **C. mariscoides,** plant. x ½; achene, x 10. **Carex.** e, **C. convoluta,** inflorescence, x ½; perigynium and pistillate scale, x 5.

River at Caledonia, Guys. Co. (Erskine, 1953); abundant on the swampy margin of Dewar's L., Cumberland Co. (Schofield, 1955), the plants reported as much slenderer than those from the southwestern counties. Forma **discutiens** (C. B. Clarke)Gale, with smooth bristles, is less common than the species but is local in Yarmouth, Shelburne and Lunenburg. Cos.

Fla. to Tex. north to N.S., N.B., southern Ont. and Wisc.

2. **R. alba** (L.)Vahl Fig. 34, a.

Common throughout in bogs, sphagnum mats, poorly-drained swamps or even in wet meadows in the moister areas.

Nfld. to Alaska south to Fla.; the Great Lakes and Calif.

3. **R. capillacea** Torr.

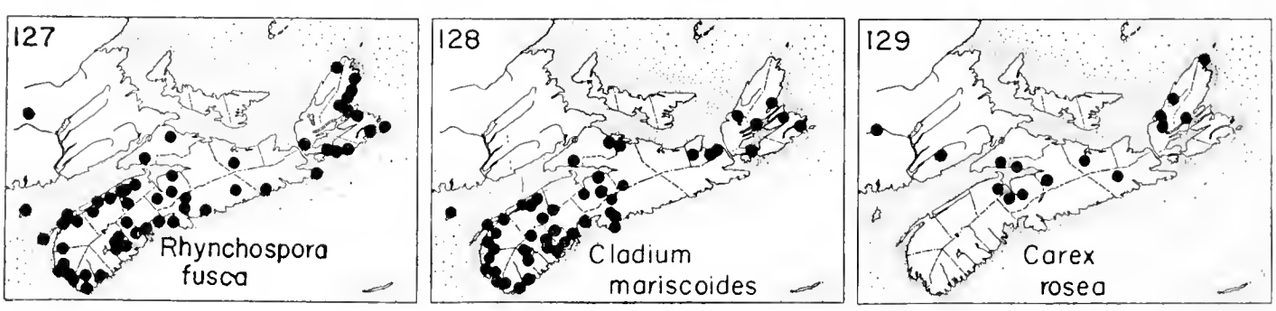
Growing abundantly in an alkaline bog in association with *Eleocharis pauciflora*, Black River at the southern end of Lake Ainslie, Inverness Co. (Smith and Schofield, 1952). The plants were all forma **leviseta** (E. J. Hill)Fern., with smooth bristles.

Nfld. to Sask. in calcareous locations south to Tenn.

4. **R. fusca** (L.)Ait. Fig. 34, c. Map 127.

Common in southwestern N.S. east at least to Lunenburg and Hants Cos. (Fernald, 1922); scattered east of Halifax (Rousseau, 1935); found in various situations in C.B. Schofield (1955) reports it as abundant on the boggy margin of Leak Lake and on the moist margin of a swamp, west end of Dewar's Lake, in Cumberland Co. Wet peaty, sandy or gravelly shores and bogs, poorly-drained swamps or sphagnum mats, much rarer than *R. alba*.

Nfld. to Ont. south to Dela. and Mich.



7. CLADIUM P.Br. TWIG-RUSH

1. **C. mariscoides** (Muhl.)Torr. Fig. 34, d. Map 128.

Rather local throughout, although often abundant where found; boggy swales, inundated lake margins, marshes or swales in the gypsum areas. Forma **congestum** Fern. has the inflorescence compacted with the branches short or suppressed. This occurs scattered with the typical form; first described from Tiddville, Digby Co. (Rhodora **23**: 234.

1921), but also common in swales and around ponds outside of Windsor in the gypsum area.

Southwest Nfld. to Fla. west to Minn. and Sask.

8. CAREX L. SEDGES

A large genus of grass-like plants with the flowers unisexual and arranged in spikes: the staminate consisting of 3 stamens in the axil of a bract or scale; and each pistillate one consisting of a single pistil with two or three styles and enclosed by a sac called a perigynium. The genus is divided up into a number of sections; within each the species are often rather similar and difficult to identify. The most recent and comprehensive treatment of Carex is K. K. MacKenzie's monograph in the North American Flora **18:** 1-478. 1931-1935, in which 535 species are described.

a. Stigmas two and achenes lenticular; spikes usually bisexual, the lateral ones sessile. Subgenus **Vignea**

a. Stigmas three and achenes triangular or, if stigmas two, the achenes lenticular and the lateral spikes stalked; spikes mostly unisexual. Subgenus **Eucarex**

SUB-GENUS VIGNEA

a. Spikes solitary on each culm; perigynia about 3-3.5 mm long.
  b. Plants loosely stoloniferous, 4-30 cm high; pistillate spike without empty scales at the base; perigynia spreading to reflexed, finely nerved dorsally. 1. *C. gynocrates*
  b. Plants densely cespitose, 15-70 cm high; spikelet with empty scales at the base; perigynia ascending to spreading, coarsely 3-5-ribbed on the back. 16. *C. exilis*

a. Spikes more than one.
  c. Spikes with the staminate flowers terminal, and the lower pistillate; perigynia not sub-terete.
    d. Spikes few, usually less than 10, green even at maturity.
      e. Spikes crowded in a short terminal inflorescence. 4. *C. spicata*
      e. Spikes few, small, widely separated.
        f. Perigynia strongly flattened, usually more than 4 to a spike. Sect. 2. **BRACTEOSAE**
        f. Perigynia nearly terete, usually 1-3 in scattered spikes; plant very delicate (Fig. 36). 9. *C. disperma*
    d. Spikes numerous, often more than 10, closely crowded into a terminal spike-like inflorescence.
      g. Perigynia 2.0-2.75 mm long, olive to brown, abruptly narrowed to the beak; culms not weakly cellular; leaves 1-4 mm wide.
        h. Inflorescence 3-10 cm long, with many very narrow bracts; spikes more or less separated and oblong-ascending; perigynia yellowish-green (Fig. 36). 5. *C vulpinoidea*
        h. Inforescence 2-5 cm long, without setaceous bracts; spikes densely crowded, spreading-orbicular; perigynia shining-brown to dark. Sect. 4. **PANICULATAE**

g. Perigynia 4-5 mm long, straw-colored, gradually narrowed from the base to the end of the beak; culms weakly cellular, flattening in drying; leaves 4-8 mm wide (Fig. 36). 8. *C. stipata*

c. Spikes with the pistillate flowers terminal; if otherwise, with the perigynia sub-terete and the spikes 1-3-flowered.

i. Perigynia without winged margins, at most thin-edged, the lower part of the body spongy-thickened; culms not hollow.

j. Perigynia with rounded edges, membranous, appressed to diverging, green.

k. Perigynia 2-4 mm long, ascending to reflexed, the beak short and delicate, not serrate. Sect. 6. **HELEONASTES**

k. Perigynia 4-4.5 mm long, closely appressed, with a long serrate beak nearly the length of the body (Fig. 37, a). Sect. 7. **DEWEYANAE**

j. Perigynia with thin edges, flattened, very spongy at the base, diverging or reflexed at maturity, usually brownish (Fig. 35, d). Sect. 8. **STELLULATAE**

i. Perigynia winged, the lower part not spongy-thickened; spikes oval with the perigynia usually closely appressed; culms hollow (Fig. 37, b-d). Sect. 9. **OVALES**

SUB-GENUS EUCAREX

a. Spikes appearing to be solitary on each culm.

Perigynia 1-10, glabrous.

Perigynia oval, rounded at the tip, appressed-ascending, greenish (Fig. 37). 36. *C. leptalea*

Perigynia tapering to a long acute tip, strongly reflexed, yellowish (Fig. 43). 85. *C. pauciflora*

Perigynia many, pubescent, in a dense cylindrical spike 1.5-3 cm long; staminate with one spike only. 37. *C. scirpoidea*

a. Spikes more than one per culm.

b. Stigmas 2; achenes lenticular; lateral spikes stalked, or if sessile, elongate; terminal spike usually staminate.

Lowest bract long-sheathing; perigynia orbicular, becoming golden-yellow at maturity (Fig. 42). 49. *C. aurea*

Lowest bract sheathless, or very rarely short-sheathing; perigynia not orbicular.

Achenes not constricted in the middle; pistillate scales not long-awned, shorter or about the same length as the perigynia, 1-nerved (Fig. 39). Sect. 18. **ACUTAE**

Achenes constricted in the middle; scales long-awned, or acute and much longer than the perigynia, 3-nerved. Sect. 17. **CRYPTOCARPAE**

b. Stigmas 3; achenes trigonous.

c. Perigynia pubescent or scabrous (*C. tonsa*, with short and crowded basal spikelets, may be nearly glabrous).

d. Beak of the perigynia absent or nearly so.

Upper sheath of the fertile culm bladeless; spikes with 1-8 perigynia; plant glabrous; lowest bract long-sheathed. 46. *C. pedunculata*

Upper sheath of the fertile culm with long blades; perigynia numerous; lowest bract sheathless or nearly so.

Perigynia 10-30; culm and leaf-blades finely pilose. 68. *C. Swanii*

Perigynia 50-100; culms and leaves glabrous and glaucous (Fig. 40). 62. *C. flacca*

d. Beak of the perigynia prominent, or if short then the lower bract is sheathless.

e. Leaf-blades glabrous; or if soft-hairy (*C. hirta*) the teeth of the beak long, widely spreading and hispidulous.

Perigynia strongly ribbed; the teeth long, spreading, and hispid or scabrous within (Fig. 40, a; 41, e). Sect. 23. **HIRTAE**

Perigynia more obscurely nerved, the teeth small, erect, short, smooth within.

Culms 0.2-4 dm high, about equalled by the leaves; of dry situations (Fig. 38). Sect. 12. **MONTANAE**

Culms 3-12 dm high, the leaves 2-5 dm long; of bogs and swamps. Sect. 23. **HIRTAE**

e. Leaf-blades hirsute or scabrous above; teeth of the perigynia short, not spreading.

Bracts leafy, at least twice as long as the inflorescence; perigynia and blades scabrous; perigynia strongly nerved (Fig. 40). 63. *C. scabrata*

Bracts not exceeding the inforescence; perigynia and blades hirsute; perigynia nerveless (Fig. 38). 48. *C. hirtifolia*

c. Perigynia glabrous.

f. Style articulated with the achene, at least deciduous; perigynia membranous, with beak absent or if present with the teeth small and erect; spikes either long and slender, or else up to 1.5 cm wide and barely longer than wide; plants average in size.

g. Perigynia 2-6, 2 mm long, very persistent; lower sheath bladeless; pistillate spikes 3-8 mm long (Fig. 38); leaves short, filiform. 47. *C. eburnea*

g. Perigynia more numerous and spikes larger; lower blade present.

h. Beak of the perigynium absent, or very short and lacking teeth.

i. Bract at base of inflorescence sheathless or nearly so.

j. Terminal spikes half pistillate or more; pistillate scales deep brown or with deep brown margins. Sect. 19. **ATRATAE**

j. Terminal spikes mostly or wholly staminate.

Plants of acid bogs; spikes pendulous on slender peduncles; roots covered with dense felt-like pubescence; scales longer than the perigynia. Sect. 20. **LIMOSAE**

Plants of fields and meadows; spikes firm and erect; roots without pubescence.

Leaves glabrous and very glaucous below; perigynia nerveless, pale; spikes several times longer than wide. 62. *C. flacca*

Leaves softly pubescent below: spikes short-cylindric; perigynia ellipsoid green and finely nerved. 67. *C. pallescens*

i. Bract at the base of the inflorescence with a prolonged closed or tubular sheath.

k. Plants tall and lax, growing in clumps; pistillate spikes long and linear, on long slender peduncles.

Terminal spike partly fertile; spikes drooping; perigynia beakless (Fig. 42). 69. *C. gracillima*

Terminal spike staminate. Sect. 30. **LAXIFLORAE**

k. Plants lower; pistillate spikes 1-2 cm long, erect.

Plants from elongated rootstocks, often with stolons, glaucous or bluish-green; edges of lower sheath smooth. Sect. 29. **PANICEAE**

Plants green, in clumps; edges of lower sheath serrulate upwardly on margin; perigynia oblong, tapering to the tip, with prominent impressed nerves (Fig. 42). 74. *C. conoidea*

h. Beak of the perigynia conspicuous and toothed.
Plant low, densely clumped, leaves mostly basal; spikes 5-15 mm long, nodding; rock crevices in northern C.B. 73. *C. capillaris*
Plant larger, erect and leafy.
Spikes loosely flowered, oblong to linear on long peduncles (Fig. 42). Sect. 26. **SYLVATICAE**
Spikes dense, short-cylindrical to globose, sessile (Fig. 41, c, d). Sect. 31. **EXTENSAE**

f. Style continuous with the achene and of the same texture, persistent; perigynia with beak conspicuous, toothed, the teeth stiff and 0.3-1 mm long or longer, often spreading; spikes 5-25 mm thick; plants stout, 4-12 dm high.
l. Pistillate spike ovoid to cylindrical with 20-75 or more perigynia.
m. Scales of fertile spikes with rough or barbed awns longer than their body; pistillate spikes elongate, dense. Sect. 34. **PSEUDO-CYPEREAE**
m. Scales of fertile spikes blunt or with awns that are short and smooth.
n. Pistillate spikes ovoid, 3-6 cm long; perigynia 13-20 mm long, tapering evenly into a serrulate beak (Fig. 45). 94. *C. lupulina*
n. Pistillate spikes cylindrical to elongate.
Perigynia coriaceous, closely overlapping, elliptical, the beak rather short and with weak teeth; plant large and stout from creeping rhizomes, to 1 m high (Fig. 44). 86. *C. lacustris*
Perigynia membranous, more spreading, contracted to a beak with prominent teeth. Sect. 37. **VESICARIAE**
l. Pistillate spikes globose with 1-15 perigynia.
o. Leaves 1-3 mm wide, involute; pistillate spikes 7-9 mm thick, sessile, widely separated (Fig. 45). 98. *C. oligosperma*
o. Leaves 2-15 mm wide; pistillate spikes over 1 cm thick, peduncled, or sessile on the plant having wide leaves.
Beak of the perigynia serrate; pistillate spikes short-cylindrical, with the mature perigynia straw-colored (Fig. 43). Sect. 35. **FOLLICULATAE**
Beak of the perigynia smooth; pistillate spikes dense, ovoid or round, with the mature perigynia green (Fig. 45). 93. *C. intumescens*

SECT. 1. **DIOICAE**

1. **C. gynocrates** Wormsk.

Two collections are known from the Province: bog on St. Paul's Is., northern C.B. (Perry, 1931) and sphagnum of bog, Black River, Inverness County (Smith, 1959).

Greenland to Alaska south to N.Y. and B.C.; in Eurasia.

SECT. 2. **BRACTEOSAE**

a. Perigynia with the lower third to half corky-thickened; spikes separated in a slender inflorescence 3-6 cm long; scales of pistillate spike about half as long as the perigynia.

b. Stigmas short, stout, strongly twisted or contorted; perigynia 3.25-4.5 mm long; leaf-blades 1.5-3 (averaging 2.5) mm wide (Fig. 34, e). 2. *C. convoluta*
b. Stigmas long, slender, usually not twisted, light-reddish; perigynia 2.5-3.5 mm long; leaf blades 1-2 mm wide. 3. *C. rosea*
a. Perigynia with the body inconspicuously corky-thickened, often spongy at the base, 4-4.5 mm long; spikes aggregated in a head 1.5-3 cm long; scales acuminate, nearly as long as the perigynia. 4. *C. spicata*

2. **C. convoluta** Mackenz. Fig. 34, e.

Scattered from Annapolis to Pictou and Cumberland Cos.; grassy intervales, rich open woods, near gypsum cliffs, etc.; intergrading with *C. rosea* and considered by some as merely a variation of it. *C. radiata* (Wahlenb.)Dew. has been reported from N.S. but these plants are probably merely smaller plants of *C. rosea*.

Woods and thickets: N.S. to Man. south to Ala. and Ark.

3. **C. rosea** Schkuhr Map 129.

Alluvial woods and damp thickets, rare; known from 12 locations scattered from Annapolis and Kings Co. to Cape North. Abundant under hardwoods of slope near base of cliff, New Prospect, Cumb. Co. (Schofield, 1955).

Rich woodlands and thickets: N.S. to N.D. south to Ga.

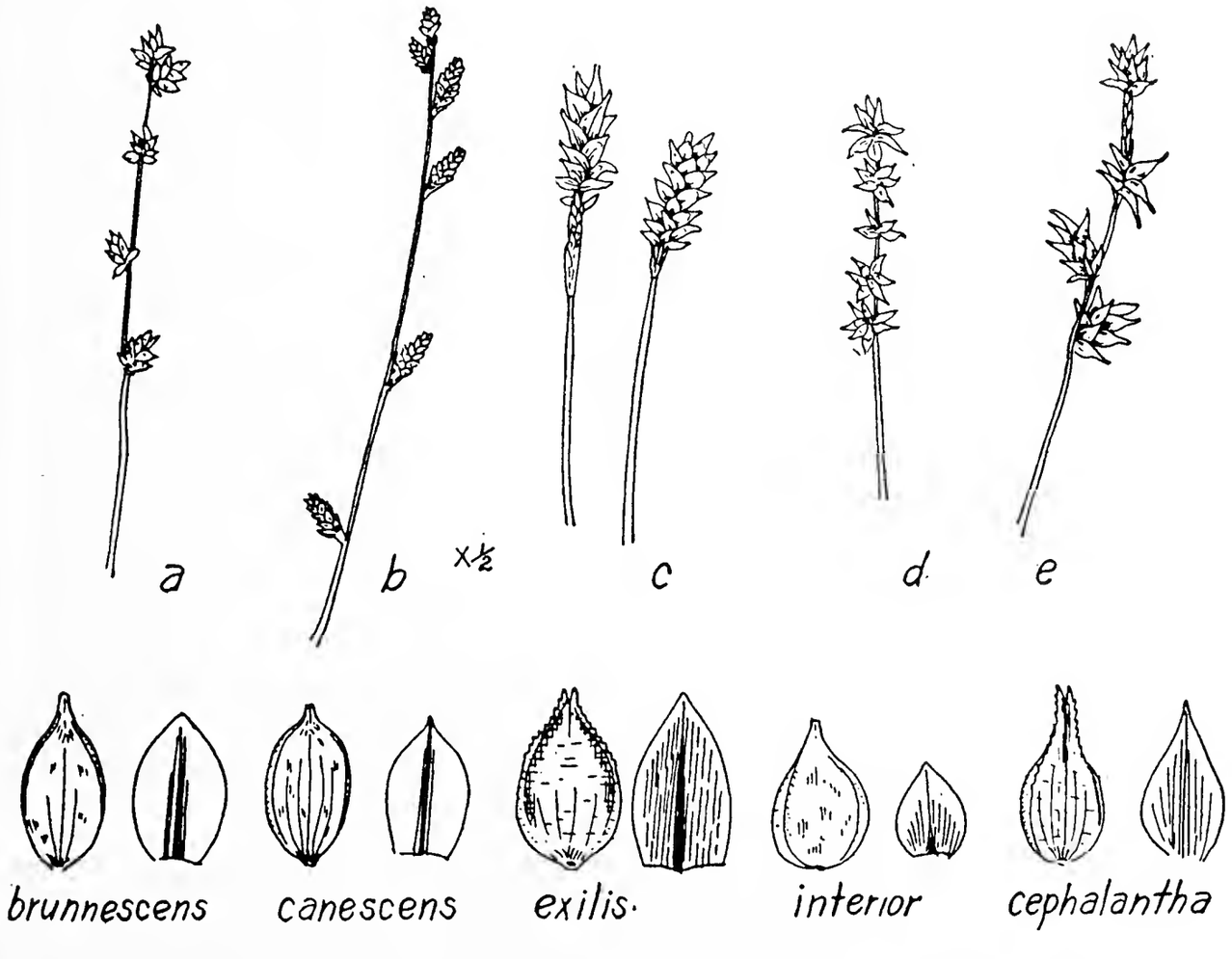


Fig. 35.—**Carex**: inflorescences, x 1; perigynia and scales, x 5.

4. **C. spicata** Huds.

Common along the roadsides in the gypsum area around Windsor, Newport and Brooklyn in Hants Co., growing in large stools (Fernald, 1922); Liverpool; rare on margin of pool at Louisburg, C.B. County (Smith and Schofield, 1952); and a garden weed at Pictou.

Locally naturalized from Eu.; N.S. to s. Ont. south to Va. and Ohio.

SECT. 3. **MULTIFLORAE**

5. **C. vulpinoidea** Michx. Fig. 36. Map 130.

Common along roadside ditches between Berwick and Middleton in the Annapolis Valley; often abundant on damp slopes along the North Mt. in the same area; a few stools in moist ground in an abanddoned saw-mill clearing, Lake Rossingnol Reservoir, Queens Co. (Weatherby, 1942); found by Schofield on moist slopes above a cliff at Cape d'Or; damp areas about Economy; and along the banks of the Shubenacadie River at Milford; roadside ditch, middle Musquodoboit.

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

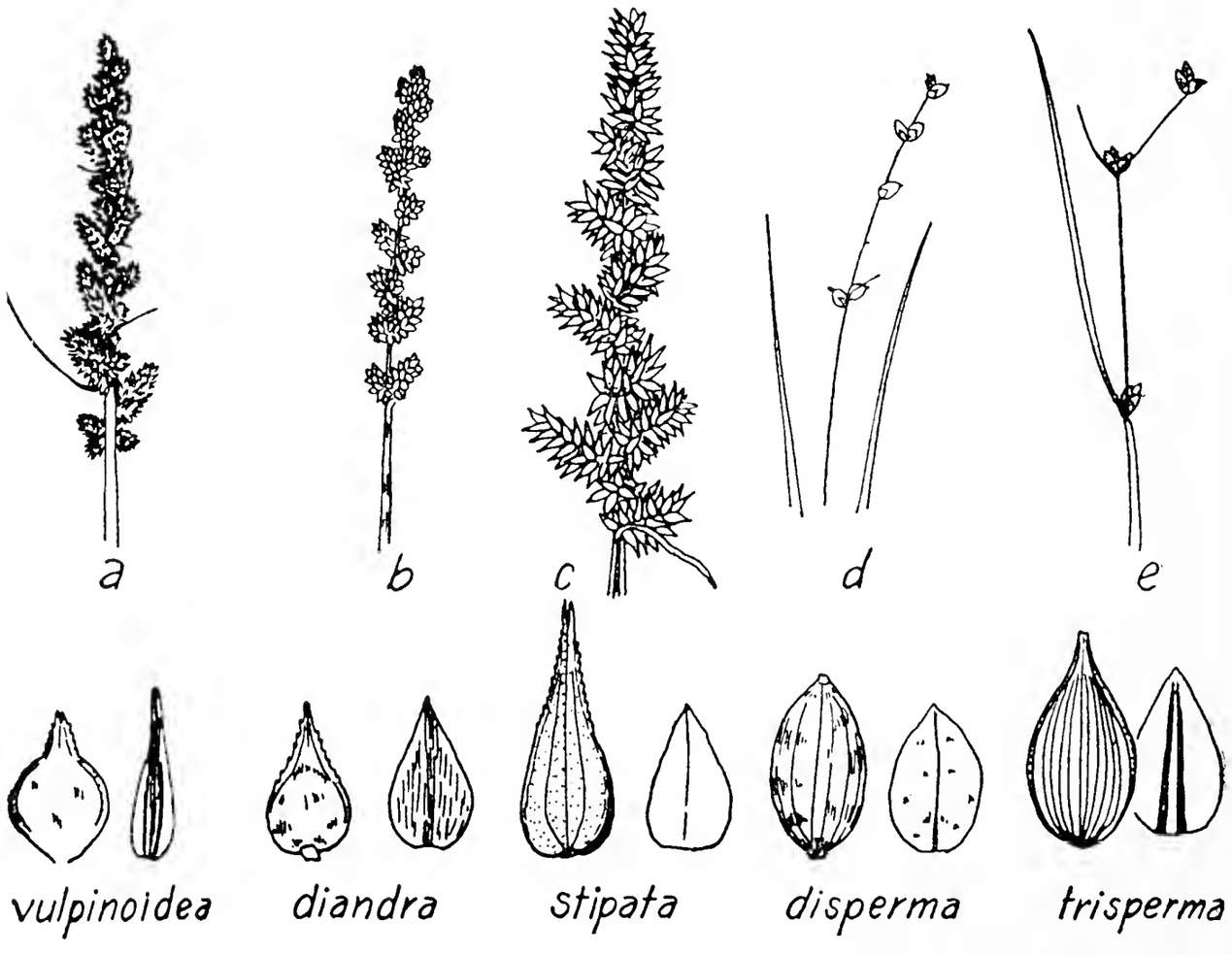
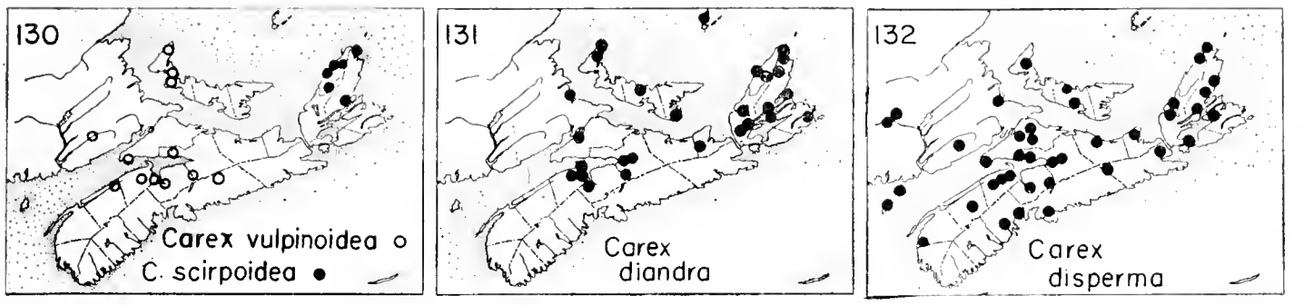


Fig. 36.—**Carex**: inflorescences x 1; perigynia and scales x 5.



SECT. 4. PANICULATAE

a. Spike dense, crowded, rather stiff; mature perigynia nearly black, the two veins on the lower side enclosing a lighter, often depressed area; summit of leaf sheath pale. 6. *C. diandra*

a. Spike open and lax; mature perigynia brownish, the principal veins not enclosing an area of different texture; summit of leaf sheath bronze. 7. *C. prairea*

6. **C. diandra** Schrank Fig. 36. Map 131.

Common and locally abundant in bogs, cat-tail swales, and marshes along the northern part of the Province; common in the extensive areas above Kentville, near Truro, at Amherst and to northern Cape Breton.

Nfld. to Yukon south to N.J., Ind. and Calif.; Eurasia.

7. **C. prairea** Dew.

In standing water of *Typha* swamp, Centreville, Kings County (Erskine, 1951).

Bogs and meadows: N.S. and Quebec to Alta. south to Penn. and Iowa.

SECT. 5. VULPINAE

8. **C. stipata** Muhl. Fig. 36.

Swamps, swales, damp meadows, roadside ditches; general throughout and often abundant.

Nfld. to N.C. and N.M.; eastern Asia.

SECT. 6. HELEONASTES

a. Spikes with the staminate flowers terminal, mostly with 1-3 fertile flowers; perigynia unequally biconvex, almost terete (Fig. 36). 9. *C. disperma*

a. Spikes with the staminate flowers basal; perigynia flattened and plano-convex.

b. Lowest bract of the inflorescence bristle-like, many times exceeding the 1-5-flowered spike, spikes widely separated.

c. Leaves 1-2 mm wide; spikes 2-3, 2-5-flowered; perigynia 3.3-4.8 mm long (Fig. 36). 10. *C. trisperma*

c. Leaves 0.3-0.5 mm wide; spikes 1-2, 1-3-flowered; perigynia 2.5-3.5 mm long. *C. trisperma* var. *Billingsii*

b. Lowest bract of the inflorescence lacking or to about twice as long as the spike; spikes several to many-flowered, the upper close together.
d. Scales reddish-brown, larger than the perigynia; culms smooth; perigynia stalked, coriaceous, obscurely beaked, enveloped by the scales; salt marshes. 11. *C. Mackenziei*
d. Scales light-colored, smaller than the perigynia; culms rough above; perigynia not stalked, membranous, distinctly short-beaked, not enveloped by the scales; not of salt marshes.
e. Perigynia appressed-ascending, 10-30 to a spike; leaves glaucous, 2-4 mm wide (Fig. 35).
f. Spokes ovoid to cylindric, 6-12 mm long; perigynia 2-3 mm long.
g. Inflorescence 2-7 cm long, the spikes all close together. 12. *C. canescens*
g. Inflorescence 6-15 cm long, with the lower spikes separated and 2-4 cm apart. *C. canescens* var. *disjuncta*
f. Spikes short and nearly subglobose; perigynia barely 2 mm long; and the inflorescence small and short. *C. canescens* var. *subloliacea*
e. Perigynia loosely spreading, 5-10 to a spike; leaves green, 1-2.5 mm wide (Fig. 35). 13. *C. brunnescens*

9. **C. disperma** Dew. Fig. 36. Map 132.

Moist woods, shaded swamps and wet to sphagnous shaded areas: Annapolis and Lunenburg Cos. to C.B. A common and distinctive woodland species.

Nfld. to Alaska south to N.J. and Calif.; Eurasia.

10. **C. trisperma** Dew. Fig. 36.

Mossy woods and wet thickets, throughout and usually growing in large loose clumps. Nfld. to Sask. south to N.C. and Minn.

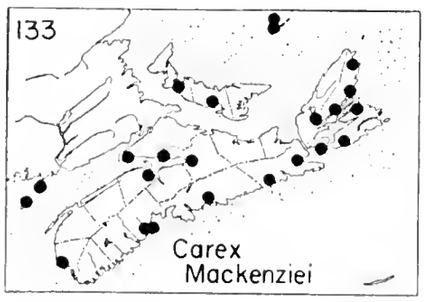
Var. **Billingsii** Knight is characteristic of dryish knolls in bogs and peaty barrens throughout; often abundant and sometimes cover the ground in open woods or cut-over areas near the coast.

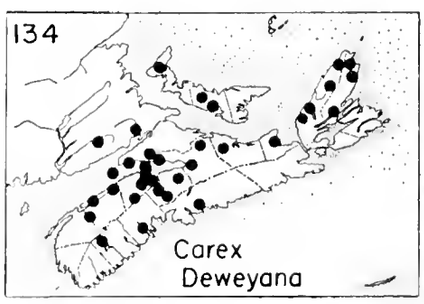
Acid soils, Nfld. to Ont. south to N.J. and Penn.

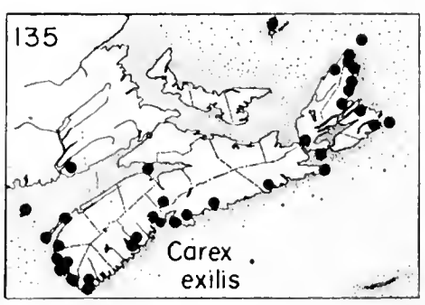
11. **C. Mackenziei** Krecz. Map 133.

Scattered around the coast; brackish soil, sometimes forming a band with other plants about the heads of the marshes or about salt ponds; little collected but probably general. Quaking areas on salt marsh, Five Islands, Colchester Co. and mucky areas of salt marsh, Advocate (Schofield, 1955).

Lab. to Me.; Hudson Bay; Alaska; Eurasia.







12. **C. canescens** L. Fig. 35.

Common throughout and very variable; grading into and represented mostly by the following variety.

Var. **disjuncta** Fern. Common throughout; lake margins, marshes, swamps, sphagnum mats and wet meadows.

Var. **subloliacea** Laestad. is a smaller variety known from a few collections from northern C.B., but to be expected also around the Bay of Fundy.

Greenland to Alaska south to Va., Ariz. and Calif.; Eurasia.

13. **C. brunnescens** (Pers.)Poir, var. **sphaerostachya** (Tuckerm.) Kukenth. Fig. 35.

Common from Cape Breton to Kings and Halifax Cos. and scattered west to Yarmouth. This species is characteristic of open moist woods and thickets in acid soil. The variety is the more southern variation.

Nfld. to B.C. south to N.J., N.C. and Wash.; Eurasia.

SECT. 7. DEWEYANAE

a. Culms very rough above, with the spikes close together, terminal and closely appressed, the lower bracts much shorter than the spikes; perigynia narrowly lanceolate, with the achenes linear-lanceolate. 14. *C. bromoides*

a. Culms smooth to more or less roughened above, with the spikes separated, spreading, the lower bracts much longer than the spikes; perigynia oblong-lanceolate with the achenes sub-orbicular. 15. *C. Deweyana*

14. **C. bromoides** Schkuhr

Known from a marsh near Truro; specimens were collected by Macoun and identified by Mackenzie; in large clumps in damp woods, Strathlorne, Inverness Co. (Smith and Erskine, 1954); under alders, Five Mile River, Hants Co.

Swampy woods; N.S. to Wisc. south to Fla. and La.

15. **C. Deweyana** Schwein. Fig. 37. Map 134.

Annapolis and Queens Cos. to northern C.B.; rich woods, more frequent in gypsum or limestone areas; common in hemlock woods on gypsum near Windsor.

Open rich woods and banks, Nfld. to B.C. south to Penn. and Colo.

SECT. 8. STELLULATAE

This group, with the exception of the easily identifiable *C. exilis*, consists of multitudes of small plants growing in every damp, poorly-drained area. The perigynia early become widely spreading or reflexed so that the small heads have an irregular star-shaped outline, hence the name of the section.

a. Spikes one to a culm; leaves narrow, involute and rigid (Fig. 35).
16. *C. exilis*

a. Spikes more than one; leaf-blades not rigid, 0-5-4 mm wide.
b. Perigynia 2.25-3.25 mm long, the teeth very shallow and barely visible; the beak one-quarter to one-third the length of the body; scales one-half to two-thirds the length of the perigynium body (Fig. 35, d).
c. Perigynia nerveless ventrally or few-nerved at the base, yellowish-brown, the beak with the ventral false suture obscure; scales obtuse; leaves 1-3 mm wide.
17. *C. interior*

c. Perigynia strongly nerved ventrally, deep green, the beak with the ventral false suture conspicuous; scales subacute; leaves 0.25-1 mm wide.
18. *C. Howei*

b. Perigynia 2.75-4.75 mm long, the beak deeply bidentate with the teeth 0.3-0.5 mm long.
d. Pistillate scales obtuse, one-half to two-thirds the length of the perigynia; perigynia ovate to widely heart-shaped.
e. Scales about half as long as the perigynia; perigynium body 2-2.5 mm wide, the inner face prominently nerved, green. 19. *C. atlantica*
e. Scales about two-thirds as long as the perigynia; body of perigynia 1.2-2 mm wide, nerveless or nearly so. 20. *C. Wiegandii*

d. Pistillate scales acute, as long or longer than the perigynia; body of perigynia mostly lanceolate. 21. *C. muricata*

16. **C. exilis** Dew. Fig. 35. Map 135.

Bogs and peaty barrens; scattered throughout; a tall and rather distinctive species.

Lab. to James Bay south to N.Y. mostly near the coast.

17. **C. interior** Bailey Fig. 35.

Spruce swamps, wet or swampy meadows, widely distributed throughout and our common small species.

Nfld. to B.C. south to Penn., Ind. and n. Calif.

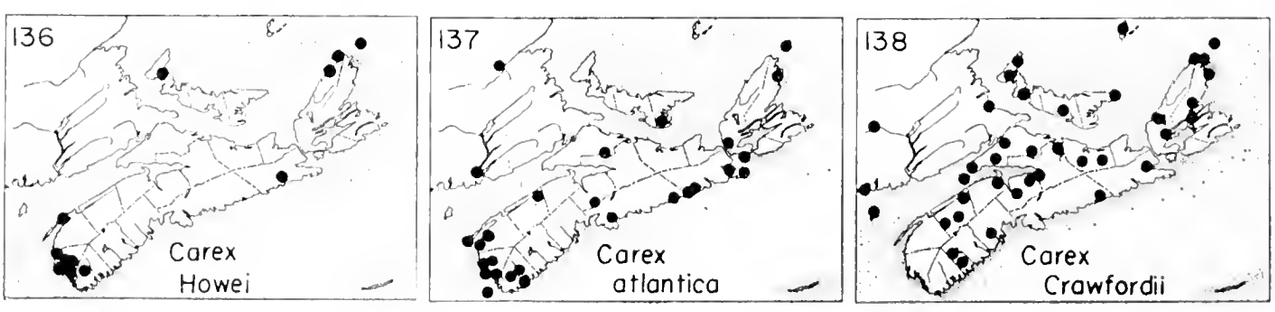
18. **C. Howei.** Mackenz. Map 136.

Swamps, wet woods, thickets and boggy swales; abundant in Yarmouth and Digby Cos. (Fernald, 1921); peat bog on St. Paul's Island (Perry, 1931); one station in Guysborough Co. and three in n. Cape Breton.

Fla. to La. north to s. Me. and N.S. and locally west to Ohio and Mich.

19. **C. atlantica** Bailey Map 137.

Common in swamps, bogs and peaty barrens; Yarmouth to Annapolis and Guysborough and characteristic of the *Polytrichum*-areas in



the sand-barrens near Middleton. It is common along the Atlantic coast and is found scattered in Cape Breton.

Near the coast Fla. to Tex. and north to N.S. and e. N.B.

20. **C. Wiegandii** Mackenz.

This species, which is reported in Gray's Manual from N.S. and has its range surrounding N.S., is not well known here. Further study should establish it as at least scattered.

Boggy and peaty soils; Nfld. to Ont. south to Mass. and N.Y.

21. **C. muricata** L. Fig. 35, e.

This highly variable and conspicuous species is found everywhere throughout the Province in bogs, peaty soils, swamps and ditches. Two variations have been reported as species. These seem to intergrade in their characteristics and are here treated as varieties.

Var. **angustata** Carey has the perigynia lanceolate and nerveless on the inner face, 2.5-3.5 mm long; with the achenes longer than wide. (*C. angustior* Mackenz.).

Var. **cephalantha** Bailey is very common throughout; perigynia ovate, 3.5-4.5 mm long, strongly nerved on the inner face; with the achenes about as long as wide.

Swampy woods, meadows, shores and bogs across the continent; Eurasia.

SECT. 9. OVALES

The members of the Ovales all have oval heads or spikes, usually with the scales closely appressed. They are very common on poorly-drained areas bare or partly bare of other vegetation. *C. scoparia* is by far the most common species of this section.

a. Scales of the pistillate spikes shorter than the perigynia, lanceolate and tapering above to expose the tops of the perigynia (Fig. 37, b).
  b. Perigynia lanceolate, 3.5-6.5 mm long, 0.5-2 mm wide, widest near the base; scales acute to acuminate (Fig. 37).
    c. Spikes separated in a flexuous moniliform inflorescence; culms slender and up to 5-10 dm high.
      d. Leaves 3-7 mm wide, those of the sterile culms widely spreading, well developed and numerous, not clustered; perigynia loosely spreading, 3-5 mm long, one-fourth to one-third as wide as long, sharply nerved beneath. 24. *C. projecta*
      d. Leaves 1-3 mm wide; perigynia ascending, without spreading tips, 2.6-4 mm long, about half as wide as long. 27. *C. tenera*
    c. Spikes usually crowded; perigynia appressed.
      e. Leaves 3-7 mm wide, as in *C. projecta*; perigynia 3-5 mm wide, obscurely nerved on both sides. 23. *C. tribuloides*
      e. Leaves 1-3 mm wide, those of the sterile culms ascending, usually clustered at the apex, the sterile culms poorly developed.
        f. Winged margin of the perigynia plainly visible to the base; plant 1.5-10 dm high, leaves 5-50 cm long; perigynia 4-6.5 mm long (Fig. 37, b).

g. Plant to 10 dm high; spikes 4-12; scales and the perigynia both straw-colored to pale brown. 22. *C. scoparia*

g. Plant 2-4.5 dm high; spikes 3-6; scales dark brown, contrasting with the pale perigynia. *C. scoparia* var. *tesselata*

f. Winged margin of the perigynia (not the whole area outside of the achene) nearly obsolete at the base; plant 1-6 dm high, leaves 7-15 cm long; perigynia 3.5-4 mm long. 25. *C. Crawfordii*

b. Perigynia elliptical to obovate, at most twice as long as they are wide (Fig. 37, c).

h. Upper leaf-sheath strongly white-hyaline ventrally; perigynia wide, often obovate and widest above the middle; sand or fresh-water marshes.

i. Perigynia less than 4 mm long and 2 mm wide, the body elliptical; spikes brownish, densely aggregated. 26. *C. Bebbii*

i. Perigynia more than 4 mm long or more than 2 mm wide.

j. Perigynia 3.5-4.2 mm long, almost orbicular; culms stiff and rigid, the spikes firm, crowded and rounded at the base, often greenish.

k. Pistillate scales nearly as long as the perigynia; perigynia nerved on the upper face, 3.5-4.2 mm long; plant coarse. 28. *C. albolutescens*

k. Pistillate scales much shorter than the perigynia; perigynia nerveless on the upper face, 3.3-4 mm long; plant more slender. 29. *C. cumulata*

j. Perigynia 4-5.2 mm long, appressed, elliptical; culms flexuous, the spikes club-shaped at the base, widely separated, silvery; on sandy sea-shores. 30. *C. silicea*

h. Upper leaf-sheath green and strongly nerved ventrally nearly to the mouth; perigynia widely lanceolate; bracts often several times the length of the spikes; on or near salt marshes. 31. *C. hormathodes*

a. Scales of the pistillate spikes about the length of the perigynia and the same width above so that they hide the tips of the perigynia; perigynia widely lanceolate to ovate (Fig. 37, d).

l. Perigynia widely lanceolate, serrulate above, with a long terete beak, the upper 1-2 mm of which are little if at all serrulate, concealed by scales of the same shape; leaves 2-4 mm wide. 32. *C. leporina*

l. Perigynia with the beak flattened, margined and serrulate to the apex.

m. Pistillate scales about as wide as the perigynia; inflorescence stiff, the spikes close together to aggregated; lower bract dilated and longer than the inflorescence. 33. *C. adusta*

m. Pistillate scales narrower than the perigynia and exposing their edges above.

n. Plant stiff with crowded spikes in an inflorescence 2-6 cm long; body of perigynium widest at or above the middle, suborbicular 28. *C. albolutescens*

n. Plant with a more flexuous or moniliform inflorescence; lower bract shorter than the spike.

o. Scales and perigynia dull or yellowish-brown; perigynia shortly or obscurely nerved on the upper side, the beak reddish-brown tipped. 34. *C. aenea*

o. Scales and perigynia permanently silvery tinged; perigynia strongly 5-7-nerved above, the beak hyaline-tipped. 35. *C. argyrantha*

22. **C. scoparia** Schkuhr Fig. 37.

Very common throughout; in ditches and poorly-drained soil. The typical form has the spikes all ascending. The form with the spikes slightly thicker, 1.3-2.5 cm thick, and some of the crowded spikes divergent, is forma **condensa** (Fern.)Kukenth. Forma **moniliformis** (Tuckerm.)Kukenth. has the heads in a flexuous loose inflorescence. A similar form with the heads more top-shaped is forma **subturbinata** (Fern. & Wieg.)Fern. Forma **peracuta** Fern. has slender acuminate spikes. Nfld. to B.C. south to S.C., N.M. and Ore.

Var. **tesselata** Fern. & Wieg. is known from southwestern N.S. to L.I. Wet sandy and gravelly swales and roadsides, Belleville, Yarmouth Co. (Fernald, 1921).

23. **C. tribuloides** Wahlenb.

Scattered in much of the Province; collections are known from Kings, Queens and Guysborough Cos. This should occur throughout.

Swales and wet woods: N.S. to Minn. south to Fla. and La.

24. **C. projecta** Mackenz.

Meadows, damp thickets and shaded swamps; rather common, and probably throughout.

Nfld. to Man. south to D.C. and Mo.; southern B.C.

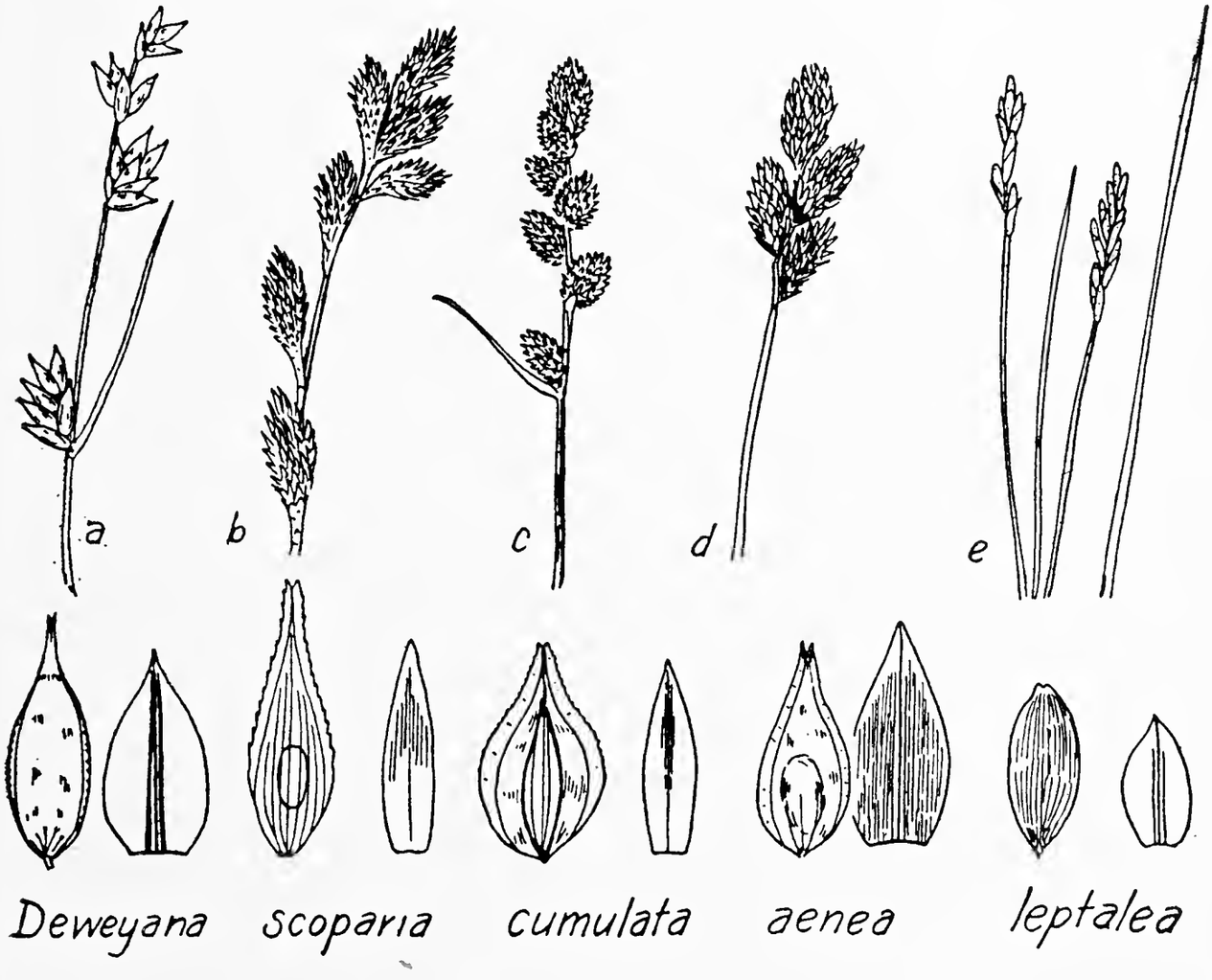


Fig. 37.—**Carex:** inflorescences x 1; perigynia and scales x 5.

25. **C. Crawfordii** Fern. Map 138.

Swales and damp peaty barrens; Annapolis and Queens Cos. to C.B. (Fernald, 1921). The favorite habitat for this and some others of this group is on damp sand or gravelly soils around ponds and lakes.

Nfld. to B.C. south to Conn., W. Va. and Wash.

26. **C. Bebbii** Olney

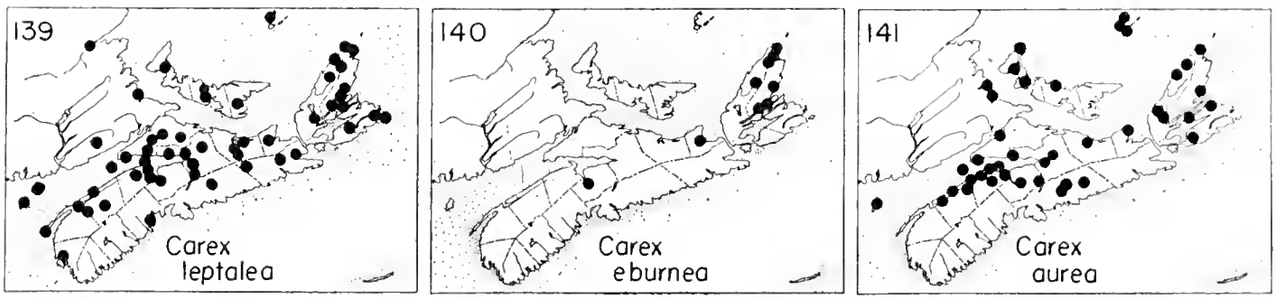
Local; boggy swale on a hillside near limestone quarries, George R., C.B. Co. (Fernald, 1921); dryish swales near the Wentworth gypsum quarries, Windsor (Fernald, 1922); near salt springs, Glendyer, Inverness Co.; and in marshy pasture northeast of Mantua, Hants Co.

Swales and meadows, Nfld. to Alaska south to N.J.

27. **C. tenera** Dew.

Scattered: swale at Linwood, Antigonish Co.; Salt Springs, Pictou Co.; and from a hardwood slope in Cumberland Co.

Meadows and woodlands: N.S. and Que. to Alta. south to N.C.



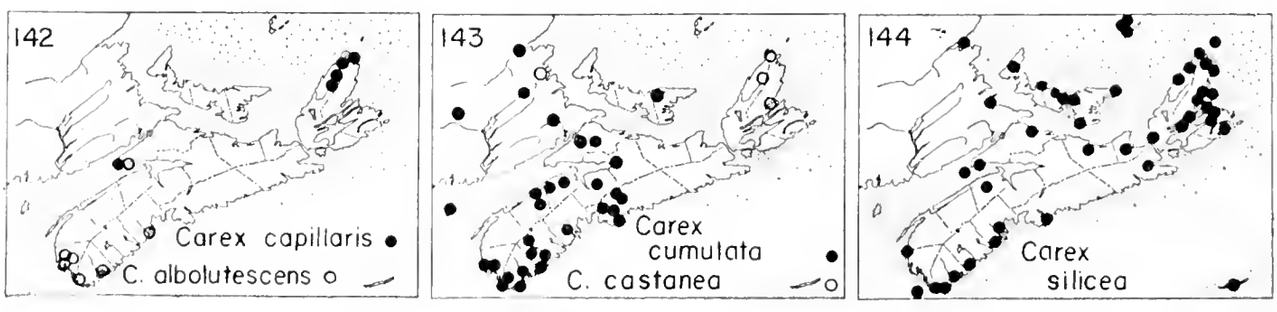
28. **C. albolutescens** Schwein. Map 142.

Somewhat general on the borders of the savannahs along the east branch of the Tusket R., Yarmouth Co.; rare in low woods and thickets by Butler's L., Gavelton; thicket bordering salt marsh, Villagedale, and moist *Polytrichum*-covered barrens near Clement Pond, Barrington, Shelburne Co.; dry areas near Lake Rossignol, Queens Co.

La. north near the coast to Mass., southern N.H. and N.S.; scattered inland.

29. **C. cumulata** (Bailey)Mackenz. Fig. 37. Map 143.

Dry or moist open barrens; frequent from Yarmouth to Halifax and Cumberland Cos.; common on the cranberry bogs of the Annapolis Valley. A collection from Broad R., Queens Co., with the spikes



7-20 mm apart, has been named forma **soluta** Fern. A hybrid with *C. scoparia* was found on damp *Polytrichum*-covered plains at Middleton, Annapolis Co.; growing with the parents and more abundant than either of them (Fernald, 1921).

Acid soils; P.E.I. to Sask. south to N.J. and Ohio.

30. **C. silicea** Olney Map 144.

Sands, barrier beaches and rocks of the outer coast from Yarmouth to northern C.B.; seldom absent on the shingle beaches in C.B.; common on the dunes and drier sand flats of Sable Is. The leaves are often stiff and involute and the whole plant has a whitish-silvery appearance.

Near the coast; Nfld. and the Gaspe south to Dela.

31. **C. hormathodes** Fern.

Common near the coast on poorly-drained soils and around the salt marshes where it may usually be found; around the Province.

Salt marshes and their borders; lower St. Lawrence and Nfld. to Va.; Ind.

32. **C. leporina** L.

Common in springy or seepy fields or along roadsides; Digby, Yarmouth and Shelburne Cos. (Fernald, 1921).

Naturalized from Eu.; Nfld. and P.E.I. to Penn. and N.C.

33. **C. adusta** Boott

A single plant growing among disturbed rocks by the roadside, Armdale, Halifax Co. (Fernald, 1922); Truro; dry roadside, Black Brook and at Warren Brook, Victoria Co.; Liscomb Mills, Guysborough Co.

Dry acid soils; Nfld. to Mackenzie south to N.Y., Wisc. and Sask.; adv. in B.C.

34. **C. aenea** Fern. Fig. 37.

Scattered; dry *Polytrichum*-covered barren near the head of Abram R., Yarmouth Co.; dry open barrens, Springhill Junction, Cumberland Co.; and collected by Macoun in Point Pleasant Park, Halifax (Fernald, 1921). It has since been found in similar dry open or shaded locations from Queens Co. to northern C.B. Island.

Dry places; Nfld. to Alaska south to N.Y. and Mont.

35. **C. argyrantha** Tuckerm.

Rathered scattered; sandy thickets, dry woods and clearings and occasionally in damp areas or woodland swamps, from Annapolis and Cumberland Cos. to C.B. Island. The heads of this species also have a silvery appearance.

N.S. to Ont. south to N.C. and Minn.

SECT. 10. **POLYTRICHOIDEAE**

36. **C. leptalea** Wahlenb. Fig. 37. Map 139.

Common throughout the northern half of the Province from Yarmouth to northern C.B.; rarer on the Atlantic side. Often frequent in wooded swamps and on seepy slopes of ravines, sometimes in meadows.

Nfld. to Alaska south to Fla. and Calif.

SECT. 11. **SCIRPINAE**

37. **C. scirpoidea** Michx. Map 130.

A specimen in the Canada National Museum was collected by Macoun on the "coast of northern C.B. near Glace Bay". Locally abundant in damp cliff crevices and on ledges, Lockhart Brook, Salmon River (Smith and Erskine, 1954) and cliff ledges and crevices, Indian Brook, Victoria Co.; seepy ledges of cliff, Cheticamp River; damp cliff ledges, Corney Brook; damp cliff ledges, Big Intervale of the Margaree River; and along LeBlanc Brook, Inverness Co.

Greenland to Alaska south to N.Y., Colorado and B.C.; rare in arctic Eurasia.

SECT. 12.. **MONTANAE**

Rather slender plants growing in clumps, with small erect pistillate spikes and a terminal staminate one; at times the pistillate flowers may be hidden around the bases of the culms. The perigynia are long-beaked and are more or less pubescent or scabrous. Common on sterile soils.

a. Staminate and pistillate spikes at most moderately separate, both near the top of the erect culm (Fig. 38, a).
  b. Plant very loosely cespitose, the clump often a tangle with scaly leafless stolons and runners.
    c. Plants coarse, leaves 1-3 mm wide; perigynia subglobose; spikes often crowded and sessile.
      d. Perigynia 2-3 mm long, the beak one-fourth to one-fifth as long as the body. 38. *C. pensylvanica*
      d. Perigynia 3-4 mm long, the beak two-thirds as long as the body or longer. *C. pensylvanica* var. *distans*
    c. Plant very delicate with leaves 0.7-1.5 mm wide; perigynia ellipsoid, longer than thick; spikes usually separate, the staminate and lowest pistillate one often short-peduncled. 41. *C. novae-angliae*
  b. Plants densely cespitose, growing in dense tight clumps.
    e. Culms 15-50 cm high, erect; leaves 3-7 mm wide, shorter than the culms; lower sheaths not fibrillose. 39. *C. communis*
    e. Culms 3-25 cm high, slender; leaves 0.2-3 mm wide, often longer than the culms.

f. Perigynia about the length of the sharp scales; basal heads not present; lowest bract of the inflorescence shorter or about the length of the inflorescence; spikes crowded. 40. *C. Emmonsii*

f. Perigynia much exceeding the scales; most plants with pistillate heads among the basal leaves; lowest bract usually exceeding the staminate spike. 42. *C. deflexa*

a. Lowest pistillate spikes much below the upper one, their peduncles arising from near the base of the culm; or all the spikes crowded near the base of the plant (Fig. 38, c).

g. Bract of the lowest non-basal pistillate spike leaf-like, normally exceeding the staminate spike; leaves thin and narrow; perigynia 2.5 mm long, short-beaked. 42. *C. deflexa*

g. Bract of the lowest non-basal pistillate spike scale-like and shorter than the staminate spike, if rarely longer then auriculate and reddish-brown tinged at the base.

h. Perigynia membranous, the body short-pubescent above; leaf-blades thinnish, light-green, erect or ascending, not stiff, 1.5-3 mm wide.

i. Perigynia 3.2-4.7 mm long, their beaks 0.9-1.7 mm long, about three-fourths as long as the body; pistillate scales lance-ovate, tapering to a long tip. 43. *C. umbellata*

i. Perigynia 2.2-3.3 mm long, their beaks 0.5-1 mm long, about half as long as the body; scales wider with merely an acute tip. 44. *C. abdita*

h. Perigynia subcoriaceous, the body glabrous to very sparsely short-pubescent above; beak about three-fourths the length of the body; leaf-blades short, thick, stiff and deep-green, 2.0-4.5 mm wide. 45. *C. tonsa*

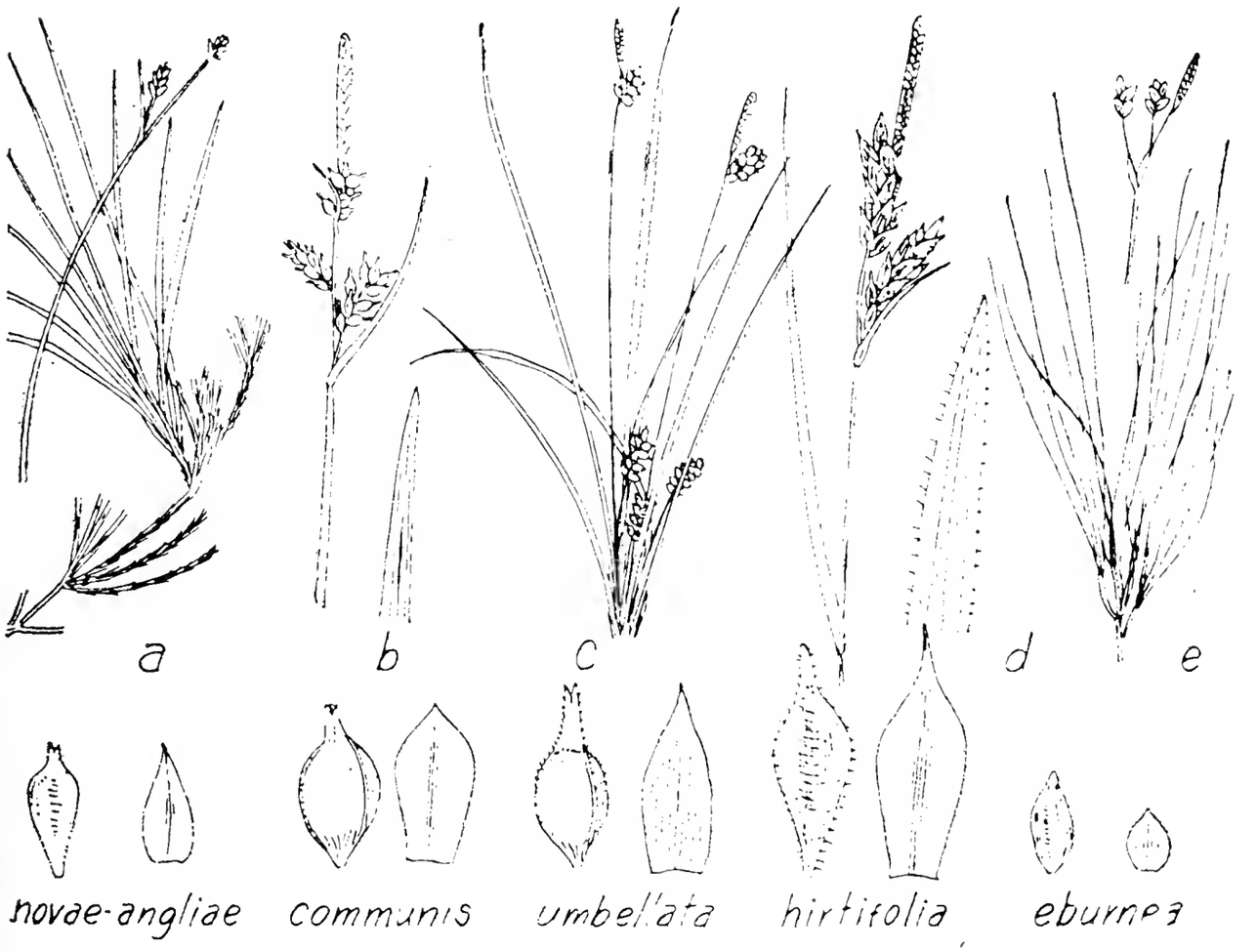


Fig. 38.—**Carex:** inflorescences x 1; perigynia and scales x 5.

38. **C. pensylvanica** Lam.

Apparently rare; a specimen from Bridgewater collected by Macoun and determined by Mackenzie is in the National Museum, Ottawa. Que. to N.D. south to Mass. and Iowa.

Var. **distans** Peck is more common. Dry rock and gravelly soil west of Bridgewater (Fernald, 1921); dry roadside at Mahone Bay; dry open woodlands in Queens Co.; Cape Blomidon in Kings Co. and from northern Inverness Co. (*C. lucorum* Willd.).

39. **C. communis** Bailey Fig. 38.

Very common throughout; dry woodlands, roadsides and clearings; often found on cliff faces and in crevices in northern C.B.

N.S. to Minn. south to Ga., Ky. and Ark.

40. **C. Emmonsii** Dew.

Abundant in dry or moist peaty soil, even on knolls in sphagnous bogs; Yarmouth and Shelburne Cos. (Fernald, 1921); scattered eastward at least to Halifax and Antigonish Cos. (*C. albicans* Willd.).

Dry woodlands and acid soils; Fla. to Ala. north to N.S., P.E.I. and around the Great Lakes.

41. **C. novae-angliae** Schwein. Fig. 38.

Scattered to common throughout; damp woods, pasture knolls and recent clearings.

Nfld. to Ont. south to Penn. and Wisc.

42. **C. deflexa** Hornem.

Although not considered rare only scattered collections have been made from Yarmouth to northern C.B.; it has not been collected from Cumberland Co. to Antigonish but it should occur there since it is found in eastern P.E.I. Dry sandy, mixed or coniferous woods and in northern C.B. abundant in rock crevices, tributary of the North Aspy River (Smith and Schofield, 1952).

Greenland to the Yukon south to N.Y., Wisc. and B.C.

43. **C. umbellata** Schkuhr Fig. 38.

Sterile, sandy fields and roadsides in the center of the Province; Queens, Lunenburg and Halifax Cos.; in the Annapolis Valley and on the lighter soils of Cumberland Co.; Truro.

N.S. and P.E.I. to Minn. south to Md. and Mo.

44. **C. abdita** Bickn.

Rare; one collection from Queens Co.; and wet run in old field, south of North Point, Brier Island (Smith and Erskine, 1954).

Nfld. to Sask. south to Va., Ill. and Minn.

45. **C. tonsa** (Fern.)Bickn.

A specimen from Truro was identified by Mackenzie. It is scattered to common in the Annapolis Valley and in Colchester and Cumberland Cos. in sandy areas and neglected fields. Found in Queens and Lunenburg Cos.; and one report for C.B. Island; locally abundant on gravelly road embankment, near mouth of Warren Brook, Victoria Co. (Smith and Schofield, 1952). It is perhaps merely an extreme of *C. umbellata* growing in the open sun, for intermediate forms are found.

N.S. to Minn. and Alta. south to Va. and Ind.

SECT. 13. **DIGITATAE**

46. **C. pedunculata** Muhl. Map 166.

Rare and local; it was first collected on the North Mt. north of Annapolis and on the talus slopes of Cape Blomidon. Now known from Digby to Hants Co.; rich hardwood slope east of Refugee Cove and Moose Island in southern Cumberland Co. (Schofield, 1955); and from a number of stations in northern C.B.

Calcareous areas; Nfld. to Alta. south to Va., Iowa and S.D.

SECT. 14. **ALBAE**

47. **C. eburnea** Boott Fig. 38. Map 140.

Scattered but may be abundant locally on cliffs, talus slopes, or slopes under coniferous woods on gypsum; and on cliff ledges, apparently found wherever gypsum exists in any amount; Hants Co. and from Antigonish Co. to northern C.B.

Nfld. to Alaska south to Va. and Tex.

SECT. 15. **TRIQUETRAE**

48. **C. hirtifolia** Mackenz. Fig. 38.

Scattered to common on the intervales, rich alluvial meadows and grassy thickets in the calcareous districts near Shubenacadie and near Brookfield, Colchester Co.

N.S. to Minn. south to D.C. and Kans.

SECT. 16. **BICOLORES**

49. **C. aurea** Nutt. Fig.42. Map 141.

Common in the northern, more alkaline districts of the Province from Annapolis Co. and Cumberland Co. to northern C.B. It is common along the basaltic North Mt.; often abundant in fields and low

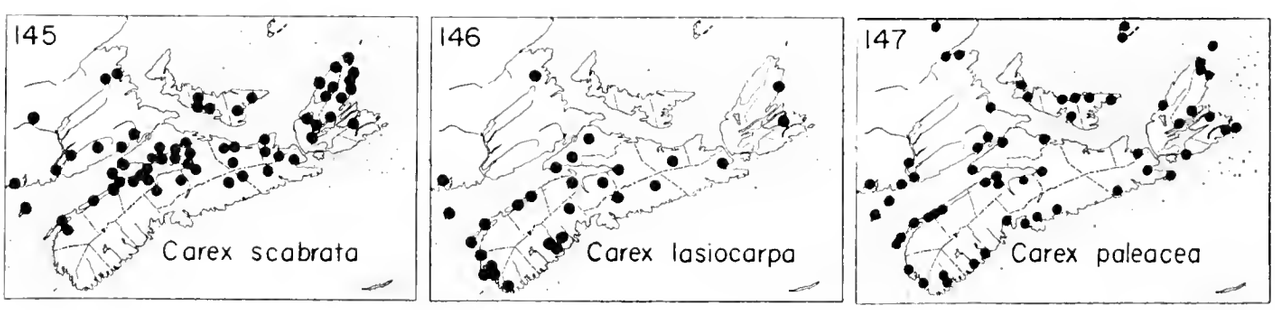
areas in Cumberland Co.; and in intervales and on hillsides eastward.

Wet meadows and banks; Nfld. to Alaska south to Penn., Ohio and Calif.

SECT. 17. **CRYPTOCARPAE**

Large coarse plants growing in beds or in tall clumps. The achenes are lenticular and constricted in the middle; and the pistillate scales are much longer than the perigynia and often long-awned. Very common around salt marshes; and characteristic around shaded streams.

a. Plants of tidal flats, and on or near saline marshes; with elongate leafless stolons, scattered or in small clumps.
  b. Spikes usually pendulous, stout, often elliptical, long-stalked; scales of pistillate heads with awns longer than their blades. 50. *C. paleacea*
  b. Spikes erect, sessile or nearly so, long and slender; scales acute to short-awned, much longer than the perigynia. 51. *C. salina*
a. Plants of damp, fresh-water habitats, growing in large clumps.
  c. Sheaths of the leaves smooth and glabrous on the ventral side.
    d. Culms 3-15 dm high; spikes moderately separated, spreading to drooping, 3-10 cm long; pistillate scales exceeding the perigynia. 52. *C. crinita*
    d. Culms 3-6 dm high; spokes aggregated towards the top of the culm, ascending to spreading, not over 3.5 cm long; scales not exceeding the upper perigynia and commonly less than twice as long as the lower. Var. *minor*
  c. Sheaths of leaves rough-hispidulous on the ventral side; staminate spikes often pistillate at the tip.
    e. Culms 5-15 dm high with leaves 4-12 mm wide; pistillate spikes 2.5-10 cm long, drooping; perigynia 3.5 mm long. Var. *gynandra*
    e. Culms 3-8 dm high, with leaves 4-6 mm wide; pistillate spikes 1-3.5 cm long, sub-erect; perigynia 2.5-3 mm long. Var. *simulans*



50. **C. paleacea** Wahlenb. Fig. 43. Map 147.

Common around the coast; growing in large pure areas around the heads of the salt marshes, or scattered with other salt marsh plants where the soil is more brackish; occasionally growing in swales or in pockets of the cliffs near the salt water.

An extreme form with very short, and short-stalked, pistillate spikes which are erect instead of drooping, has been named forma **erectiuscula** Fern.

Salt or brackish meadows and shores; Greenland and Lab. south to Mass.; Hudson Bay and scattered southward.

51. **C. salina** Wahlenb., var. **kattegatensis** (Fries)Almq.

Common in parts of the Province and possibly around the whole coast; brackish meadows, heads of the salt marshes and coastal swales, usually growing in locations less brackish than that of the preceding species. It may hybridize with *C. paleacea* and *C. stricta* and actually rather resembles *C. stricta* in appearance. The variety has a more southern distribution than the species. (*C. recta*).

Lab. and Hudson Bay to Mass.; n. Eu.

52. **C. crinita** Lam. Fig. 43.

Scattered from Kings and Cumberland Cos. to northern C.B.; wet meadows, flood plains, along brooks and streams and in ditches. Nfld. to Man. south to Ga. and Mo.

Var. **minor** Boott is a smaller extreme, found in the southwestern counties and extending east at least to the middle of the Province; found in Victoria Co. Most of the specimens northward, however, are luxuriant in size and long-spiked. N.S. to N.Y. east to Minn.

Var. **gynandra** (Schwein.)Schwein. & Torr. General throughout; ditches, moist places, as clumps by streams and in swampy woodlands. Swampy woodlands, Nfld. to Wisc. south to N.C. and Tenn.

Var. **simulans** Fern. was collected in a woodland on St. Paul Island (Perry, 1931); and on Big Southwest Brook, Inverness Co. It is a northern variety ranging from Nfld. to Ont. south to N.S. and Mass.

SECT. 18. **ACUTAE**

The *Acutae* have lenticular achenes with the perigynia flattened and without pubescence. The spikes are cylindrical and tend to be erect, with the scales usually shorter and narrower than the perigynia. Several kinds are among our most common species in swales and meadows.

a. Spikes erect or stiffly ascending; perigynia with the beak usually not twisted.
  b. Lower sheath at the base of the stem not conspicuously fibrillose.
    c. Perigynia nerveless ventrally or only obscurely impressed-nerved; plants tall, in small tufts with horizontal rootstocks; leaves 2-8 mm wide.
      d. Plant slender, 2-8 dm high; spikes 1-4 cm long; upper part of the culm obtusely angled and smooth; perigynia mostly elliptic and broadest below the apex. 53. *C. aquatilis*
      d. Plant coarse, to 1.5 m high; spikes to 10 cm long; upper part of culm sharply angled, smooth or scabrous; perigynia mostly obovate and broadest towards the apex. *C. aquatilis* var. *altior*
    c. Perigynia conspicuously nerved ventrally; leaves 1-3 mm wide.
      e. Spikes not closely aggregated at the top of the culm; scales of pistillate spikes with the green mid-rib very narrow or absent (Fig. 39, b).
        f. Plants loosely cespitose and usually growing in beds, to 6 dm high; pistillate spikes crowded, densely-flowered, 1-4 cm long. 54. *C. nigra*
        f. Plants densely cespitose, forming erect clumps, to 10 dm high; pistillate spikes separated, relatively loosely flowered, about 4 cm or more in length. *C. nigra* var. *strictiformis*

e. Spikes aggregated close to the summit of the culm, the lower progressively longer, producing a broom-like effect; plants in dense clumps without stolons; green mid-rib of scales about as wide as the brown margins (Fig. 39, a).
g. Spikes dense with the perigynia 1.75-2 mm long, with the terminal spike staminate or mostly so. 55. *C. lenticularis*
g. Spikes more open with perigynia 2.0-2.8 mm long, the terminal spike staminate only at the base. *C. lenticularis* var. *Blakei*
b. Lower sheaths on the culm without leaf-blades, conspicuously fibrillose with a network of fibrous lines across the ventral sides; plants tall (Fig. 39, c). 56. *C. stricta*
a. Spikes widely spreading or drooping; staminate spike solitary, the pistillate ones slender, 2-7.5 cm long; beak of the perigynium usually prominent and twisted (Fig. 39, d). 57. *C. torta*

53. **C. aquatilis** Wahlenb.

Swamps and edges of bogs on the plateau of northern C.B., grading into the following variety. Arctic America south to Nfld., C.B., Gaspe and in the mts. to Calif.

Var. **altior** (Rydb.)Fern. is found in ditches, on flood-plains, and around lakes and ponds; rather common, especially in the northern counties and at higher altitudes.

Nfld. to B.C. south to N.J., Ind. and Ore.

54. **C. nigra** (L.)Reichard Fig. 39.

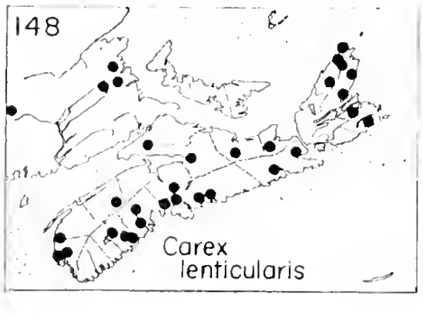
Common throughout; poorly-drained soil, near the coast, in meadows, along streams and in low areas in fields, often growing in large pure colonies in cut-over meadows where the taller grasses or sedges have been eliminated. Greenland to R.I. near the coast; Eurasia.

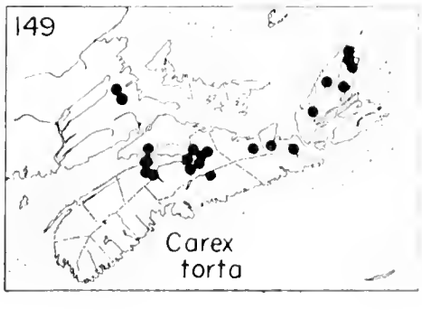
Var. **strictiformis** (Bailey)Fern. is the larger American extreme; widely distributed in brackish or fresh habitats in the Province. Nfld. and the lower St. Lawrence south to R.I.

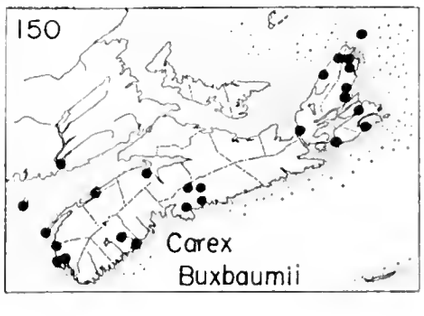
55. **C. lenticularis** Michx. Fig. 39. Map 148.

Gravelly and sandy lake shores; throughout wherever the proper habitat occurs. Most common from Yarmouth to Halifax Co., Lab. to Mackenzie south to Mass. and Minn.

Var. **Blakei** Dewey is known in Canada from scattered areas in N.S. and N.B.: cobbly beach of Wentzell L., Lunenburg Co. and at Ingonish, C.B. (Fernald, 1921); stony strand of First Christopher Lake, South Brookfield, Queens Co. (Weatherby, 1942). Lab. south to N.Y. and west to Minn.







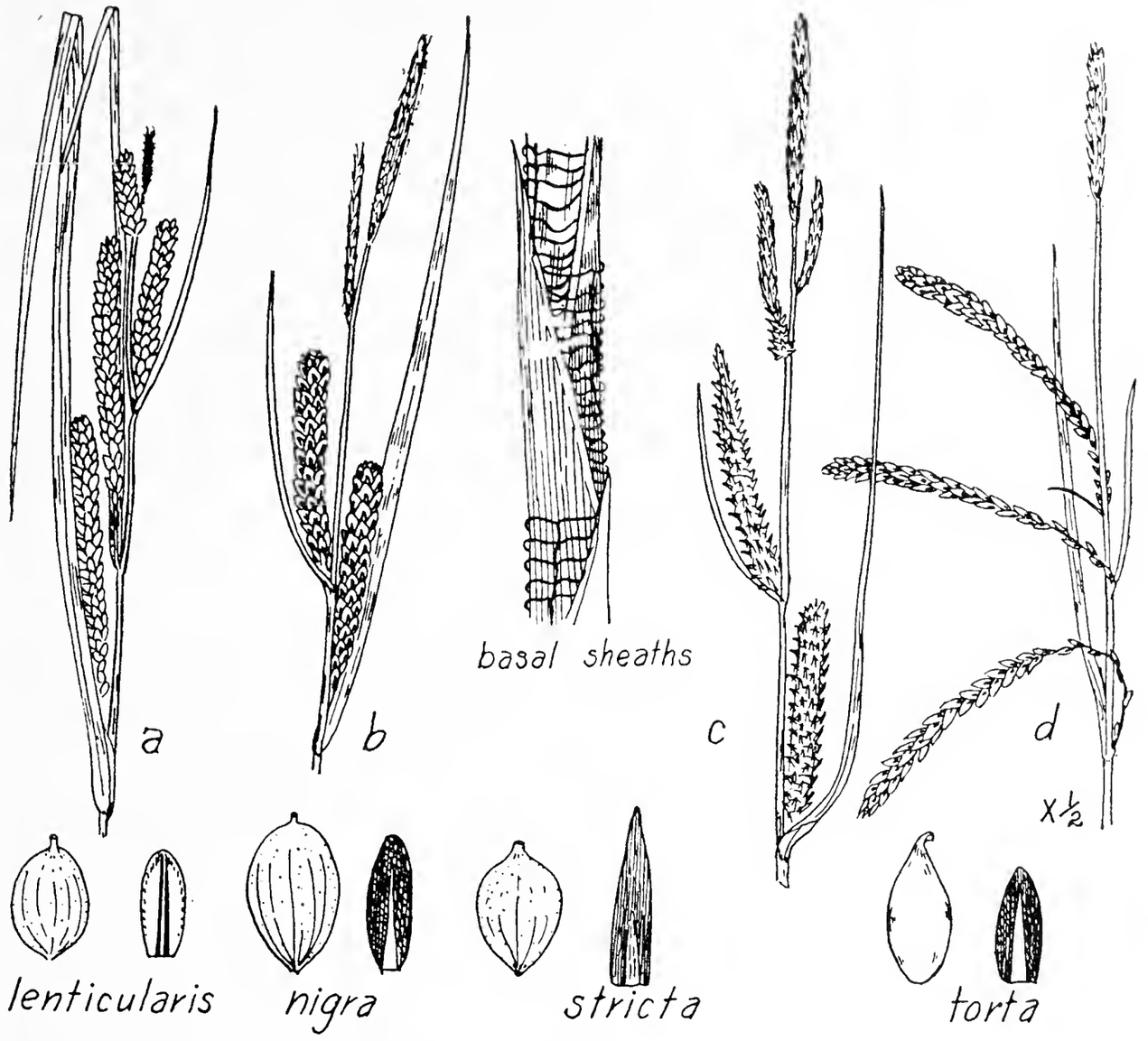


Fig. 39.—**Carex:** inflorescences, x 1 and ½; perigynia and scales, x 5.

56. **C. stricta** Lam. Fig. 39.

Common, particularly in the north-central counties, often being the dominant vegetation over large areas of poorly-drained depressions, in bogs and swales.

Var. **strictior** (Dew.)Carey is a more glaucous form with horizontal stolons so that numerous smaller tussocks are formed; leaf-sheaths hispidulous ventrally with the basal sheaths sparingly fibrillose. Grading insensibly into the species.

N.S. to Minn. south to Fla. and Tex.

57. **C. torta** Boott Fig. 39. Map 149.

Common from Annapolis Co. to northern C.B.; characteristic of brooksides, margins of rivers, on boulder plains, occasionally beside lakes. The habitat is widely different from that of most other members of this section. It flowers very early and often forms pure bands along mountain brooks.

N.S. to Minn. south to N.C. and Ark.

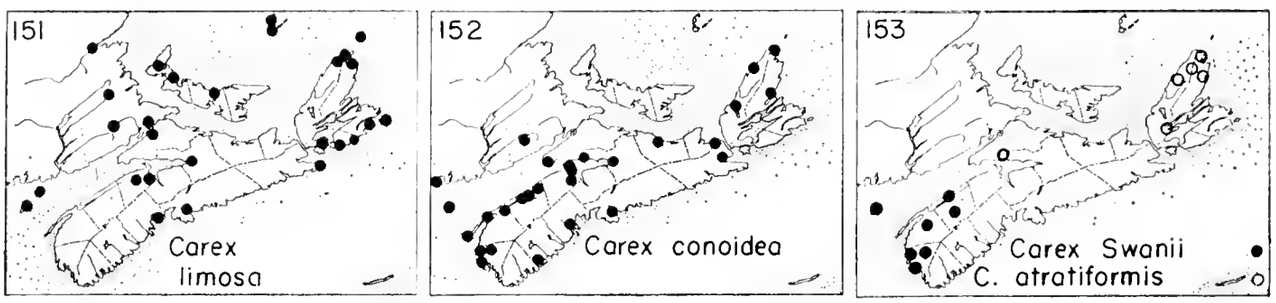
SECT. 19. **ATRATAE**

a. Pistillate spikes on slender peduncles 1-4 cm long. 58. *C. atratiformis*
a. Pistillate spikes sessile or nearly so. 59. *C. Buxbaumii*

58. **C. atratiformis** Britt. Map 153.

Rock crevices, Salmon R., Victoria Co. (Erskine, 1951); fairly common in northern Cape Breton in rock crevices of brook and river banks and moist cliff faces: Big Southwest Brook, Cheticamp River and Skye Glen Mountain, Inverness Co.; Clyburne Brook, Victoria Co. (Smith and Schofield, 1952); the only location on the peninsula is on a moist cliff facing a waterfall, McAlese Brook, New Prospect, Cumberland Co. (Schofield, 1955).

Lab. to Yukon south to N.S., Mich. and Sask.



59. **C. Buxbaumii** Wahlenb. Map 150.

Local and scattered throughout; swamps, swales and in marshes, mostly near the sea.

Swamps and meadows in calcareous areas: Nfld. to Alaska south to N.C. and Calif.; Eurasia.

SECT. 20. **LIMOSAE**

a. Plants strongly stoloniferous; leaves glaucous, 1-3 mm wide; pistillate scales ovate to sub-orbicular, equalling the perigynia and largely hiding them. 60. *C. limosa*
a. Plants loosely cepitose; leaves deep green, 2-4 mm wide; pistillate scales lanceolate, longer and narrower than the perigynia. 61. *C. paupercula*

60. **C. limosa** L. Fig. 40. Map 151.

Common in Cape Breton and scattered west to Cumberland, Kings and Lunenburg Cos.; floating mat at the edge of ponds, in sphagnous swamps or in poorly-drained bogs.

Lab. to Alaska, south to Dela. and Calif.; Eurasia.

61. **C. paupercula** Michx. Fig. 40.

Common throughout; swampy areas, bogs and wet Sphagnum; often in spruce or open bogs about the heads of the salt marshes near the sea. The typical species has been considered to be a northern plant and two more-southern varieties have been proposed: var. *irrigua*

(Wahlenb.)Fern. with smooth culms and var. *pallens* Fern. with the culms scabrous-serrulate on the angles below the inflorescence and with paler scales.

Lab. to Alaska south to Penn., Minn. and Utah; Eurasia.

SECT. 21. PENDULINAE

62. **C. flacca** Schreb. Fig. 40.

This species, reported by Macoun in 1888 from dry, clay banks on the railway cutting just outside of Windsor, is now a very abundant and variable species throughout this gypsiferous region, often growing in grassy pastures near the gypsum cliffs. It has now also been collected from Kings Co.; Avonport and below Arlington.

Naturalized; N.S., Que. Ont. and Mich.; Eurasia and Afr.

SECT. 22. ANOMALAE

63. **C. scabrata** Schwein. Fig. 40. Map 145.

Throughout the northern part of the Province from Digby Co. to northern C.B.; alluvial woods, rich thickets, along woodland streams, and in mucky soil or seepage areas. This rough scabrous plant is most often found in shaded areas on seepy muck soil.

N.S. to Mich. south mostly in the mts. to S.C. and Tenn.

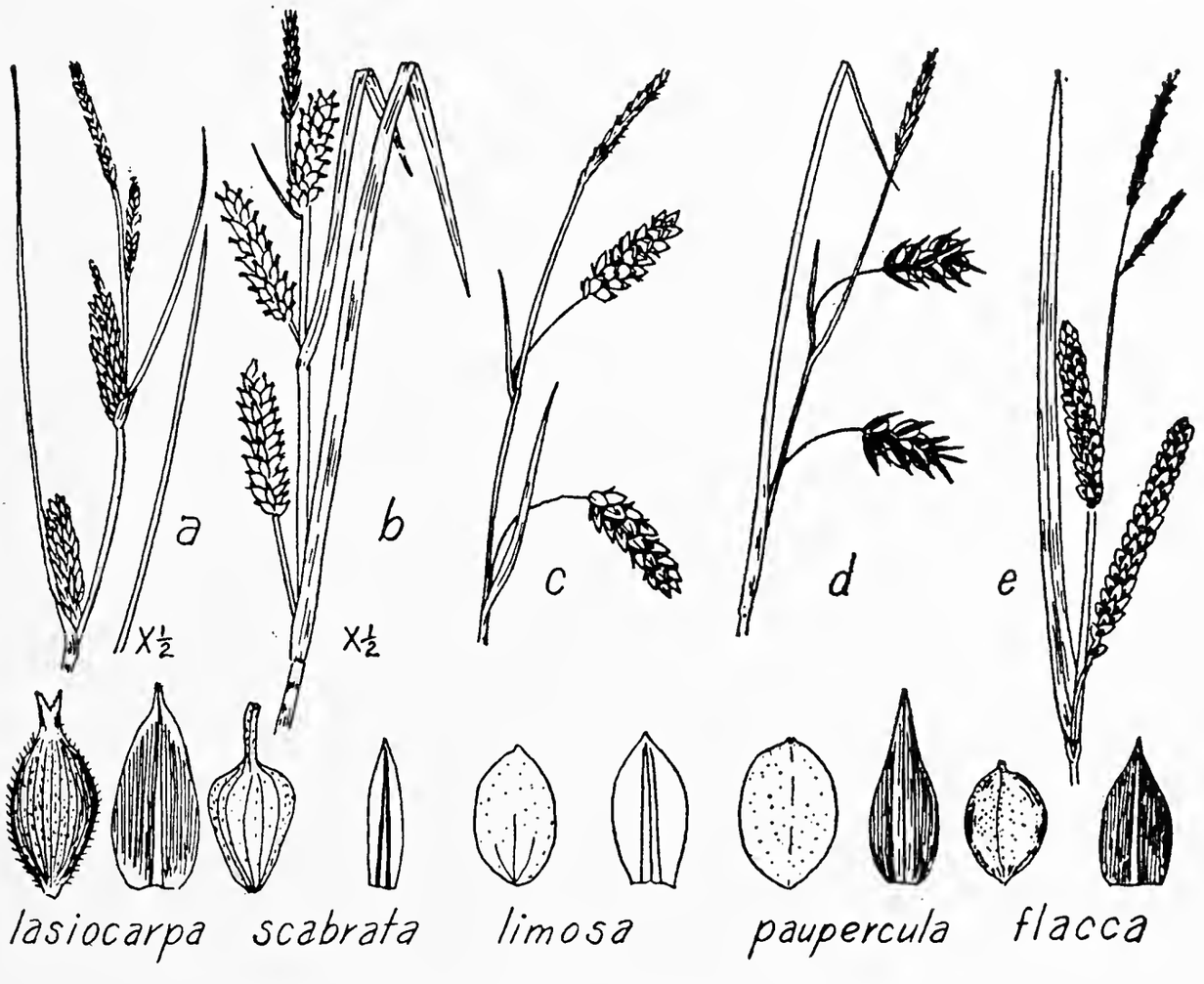


Fig. 40.—**Carex**: inflorescences, x 1 and ½; perigynia and scales, x 5.

SECT. 23. HIRTAE

Three tall, rather coarse species with the perigynia densely hairy or hirtellous.

a. Foliage glabrous with the leaf-sheaths not pilose at the mouth; staminate scales not long-ciliate.
  b. Perigynia 5-6 mm long, conspicuously 15-20-ribbed, with the beak half as long as the body; teeth prominent, strongly pubescent within; leaves 2.5-4 mm wide; sandy soils. 64. *C. Houghtonii*
  b. Perigynia 3-4.5 mm long, the ribs obscured by dense pubescence; teeth of the short beak erect, glabrous within; leaves less than 2 mm wide, involute; wet or swampy areas. 65. *C. lasiocarpa*
a. Foliage usually soft-hairy with the leaf-sheaths pilose at the mouth; perigynia 5-9 mm long, thinly pubescent; staminate scales long-ciliate. 66. *C. hirta*

64. **C. Houghtonii** Torr. Fig. 41.

Sandy soil or on gravelly roadside embankments; once common along new pavement near Alton south of Truro; common on sandy soil around Oxford in Cumberland Co.; and roadside at Caledonia, Queens Co.

N.S. to Sask. south to N.Y., Mich. and Minn.

65. **C. lasiocarpa** Ehrh., var. **americana** Fern. Fig. 40. Map 146.

Common throughout; peaty meadows, swales, borders of lakes and bogs; characteristic of bog-marsh formations about the head of the Fundy marshes (Ganong); typical of lakes, ponds and swamps in northern C.B. The American variety.

Nfld. to B.C. south to N.J., Iowa and Wash.

66. **C. hirta** L.

Abundantly naturalized on a sandy railway bank, Annapolis Royal; formerly collected in a pastured field at Charlottetown, P.E.I. (Fernald,) 1922).

Introduced from Eu.; locally established N.S. to Mich. south to D.C.; Ore.

SECT. 24. VIRESCENTES

a. Terminal spike staminate; perigynia glabrous. 67. *C. pallescens*
a. Terminal spike pistillate above and staminate at the base; perigynia white-hirsute. 68. *C. Swanii*

67. **C. pallescens** L. var. **neogaea** Fern. Fig. 41.

Common throughout; grassy meadows, sunny banks, fields and open thickets. This small neat species with the green spikes is very characteristic of damp fields. The American variety.

Nfld. to Wisc. south to N.J. and Ohio.

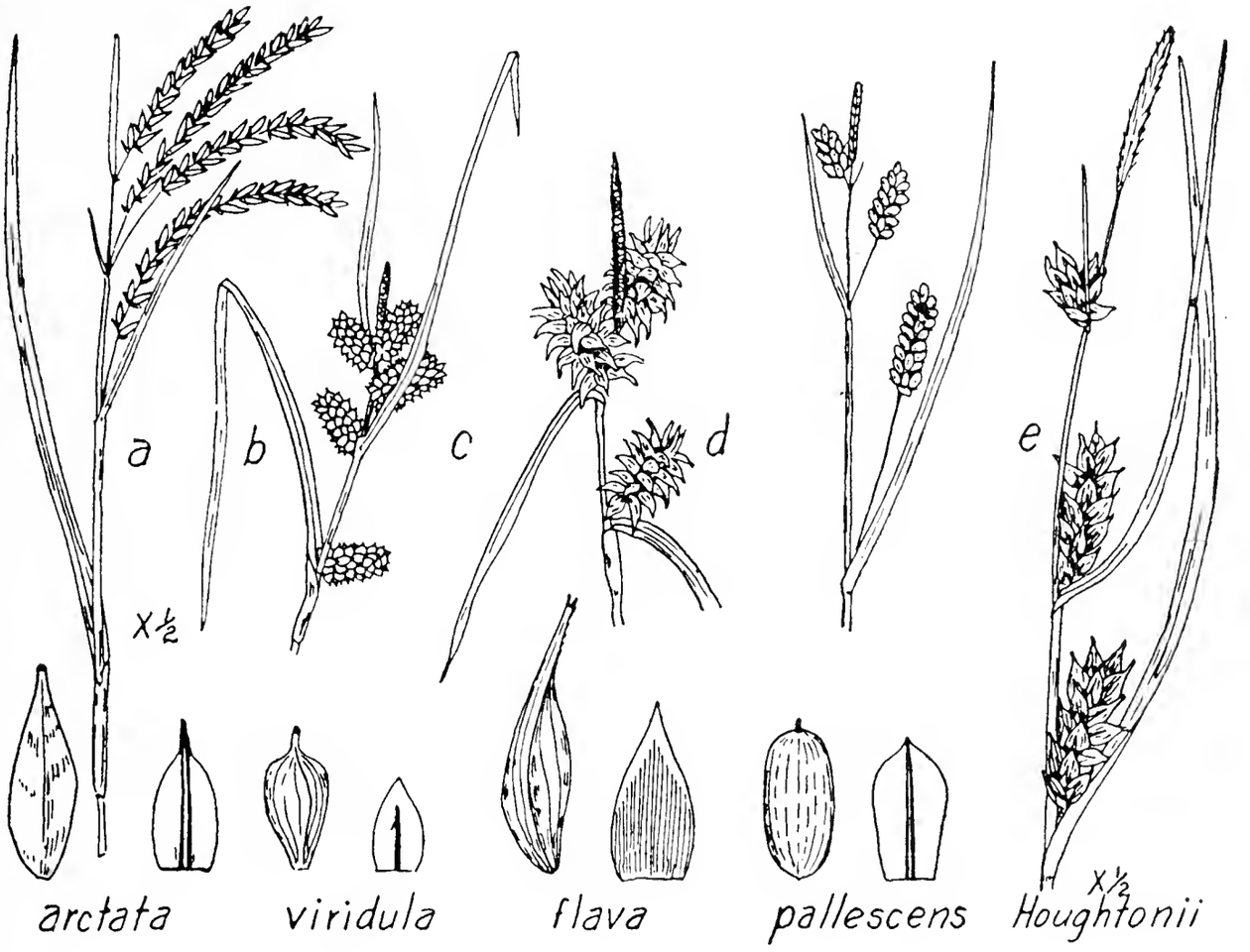


Fig. 41.—**Carex:** inflorescences, x 1; perigynia and scales, x 5.

68. **C. Swanii** (Fern.)Mackenz. Map 153.

Local in Yarmouth Co.; dryish peaty barrens, Yarmouth; boggy pasture, Central Chebogue; scattered east to Annapolis Co.

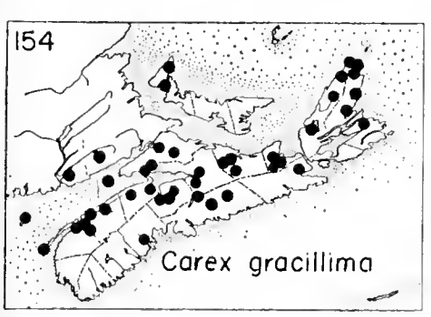
Dry woodlands and thickets; N.S. to Wisc. south to Tenn.

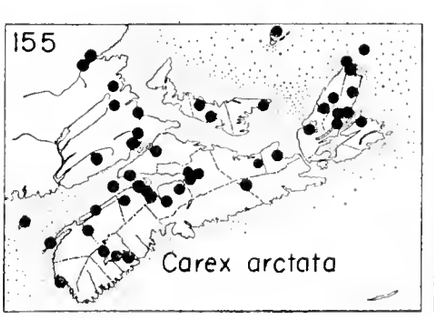
SECT. 25. GRACILLIMAE

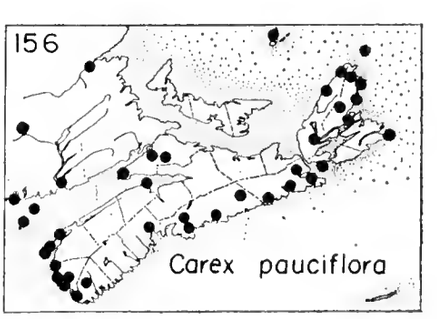
69. **C. gracillima** Schwein. Fig. 42. Map 154.

Dry to moist woods and thickets, wet meadows and along roadsides throughout. It is common in the northern counties, becomes rarer southwestward and is absent in southwestern N.S. This species is usually distinguished in the field from similar species by the terminal spike being pistillate for the upper half.

Nfld. to Man. south to Va., Ky. and Mo.







SECT. 26. SYLVATICAE

The preceding species and the two common ones of this section are common woodland plants with long, drooping, linear spikes. *C. gracillima* does not have the perigynia beaked and the terminal spike is usually partly pistillate.

a. Pistillate spikes oblong-cylindric, 8-25 mm long; leaves soft-hairy; pistillate scales light chestnut-brown. 70. *C. castanea*

a. Pistillate spikes linear, the larger 2.5-8 cm long; leaves not pubescent except sometimes towards the base and at the mouth of the sheaths; pistillate scales greenish (Fig. 41, a).

b. Achenes sessile or barely stalked; pistillate scales with the mid-rib extending to and projecting at the tip, usually more than half the length of the perigynia; basal leaves 6-10 mm wide. 71. *C. arctata*

b. Achenes slenderly stalked; pistillate scales mostly obtuse, the mid-vein not extending to the tip, about half as long as the perigynia; basal leaves 2-7 mm wide. 72. *C. debilis*

70. **C. castanea** Wahlenb. Map 143.

A specimen was collected by Macoun near Black Brook, C.B.; known now from a number of stations in northern C.B.; swamp at pond edge, Cape St. Lawrence (Smith and Schofield, 1952); damp cliff crevices, Indian Brook, Big Intervale, and cliff ledges, Big Southwest Brook.

Nfld to Minn. south to Conn., N.Y. and the Great Lakes.

71. **C. arctata** Boott Map 155. Fig. 41.

Common from Digby and Cumberland Cos. to C.B.; rare in Digby and Yarmouth Cos.; almost absent from Halifax to Richmond Co. Characteristic of woods, rich thickets and shaded banks.

Nfld. to Minn. south to Penn. and Ohio.

72. **C. debilis** Michx., var. **Rudgei** Bailey

Scattered to common throughout in open thickets and on meadows. The variety is the more northern form. (*C. flexuosa* Muhl.).

Dry woods and acid soils; Nfld. to Wisc. south to Penn.

SECT. 27 CAPILLARES

73. **C. capillaris** L. Map 142.

Tiny plants forming rounded cushions on seepy exposed slope at cliff-top, Cape d'Or, Cumberland Co. The typical variety is readily distinguished from var. *major* by its possession of darker-green leaves, shorter stature and in its formation of very dense tussocks rather than single erect clumps (Schofield, 1955). Arctic America south to Mt. Washington, Colo. and Utah.

Var. **major** Blytt is characteristic of calcareous rocks, in cool shaded locations on the upper reaches of the northern brooks in C.B.: crevices

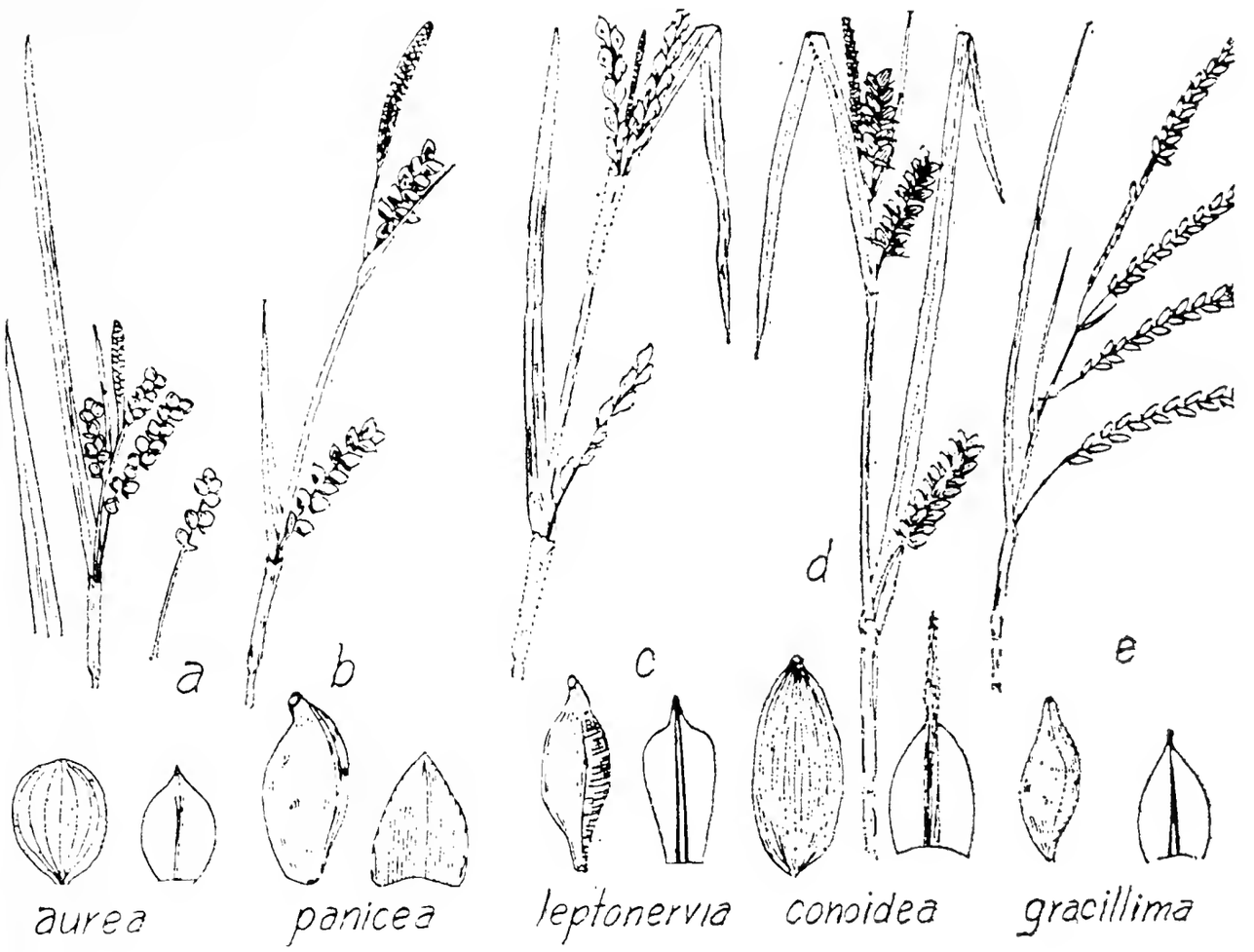


Fig. 42.—**Carex**: inflorescences, x ½; perigynia and scales, x 5.

in rock cliff, South Blair River; and abundant on damp mud and wet ledge of calcareous cliff, Gray Glen Brook, north branch; abundant in rock crevices of cliff, Big Southwest Brook.

Nfld. to Sask. south to N.Y. and Mich.

SECT. 28. **OLIGOCARPAE**

74. **C. conoidea** Schkuhr Fig. 42. Map 152.

Sterile or peaty fields and meadows, often near the coast; frequent from Yarmouth to Antigonish and Pictou Cos. Abundant in meadow, Strathlorne; wet meadow, Iona (Smith and Schofield, 1952) and at Breton Cove, Corney Brook and Bay St. Lawrence in northern C.B.

Nfld. to Minn. south to N.C., Ohio and Iowa.

SECT. 29. **PANICEAE**

a. Leaves and perigynia strongly glaucous; leaves quickly becoming folded or involute; perigynia without a beak, filled by the achene. 75. *C. livida*

a. Leaves and perigynia not glaucous, bluish-green; leaves flat; perigynia with a minute beak, loose over the achene. 76. *C. panicea*

75. **C. livida** (Wahlenb.)Willd., var. **Grayana** (Dew.)Fern.

Mackenzie lists it from Louisburg and from near Windsor; collected in a bog by Point Michaud Road, Richmond Co. (Erskine, 1951). The main American variety.

Calcareous bogs and meadows; Lab. to Alaska south to N.J., Mich. and Calif.; Eu.

76. **C. panicea** L. Fig. 42.

Damp, grassy or peaty slopes; local and perhaps introduced; abundant in Yarmouth Co.; scattered in other places east to Antigonish and Cape Breton Cos. Var. *microcarpa* Sonder (Fernald, 1922) with small perigynia is included here with the species.

Nat. from Eu.; Nfld. to Conn.; Minn.

SECT. 30. LAXIFLORAE

Tall woodland species with the perigynia rather spaced in the short erect spikes.

a. Culms without green leaves but with numerous purplish sheaths; basal leaves evergreen, 15-30 mm wide, the new ones appearing after the fruits are ripe. 77. *C. plantaginea*

a. Culms with green leaves; leaves not evergreen.

b. Leaves 7-20 mm wide; sterile shoots merely a tuft of leaves; perigynia 3-4.25 mm long, the beak conspicuous and nearly straight, strongly 25-45-nerved. 78. *C. laxiflora*

b. Leaves 3-10 mm wide; sterile shoots forming short culms; beak of the perigynia very short, usually twisted; perigynia not strongly nerved, 2.5-4 mm long.

c. Lower leaf-sheaths almost smooth on the edges; perigynia 15-20-nerved. 79. *C. ormostachya*

c. Lower leaf-sheaths serrulate on the edges; perigynia with the nerves absent or very faint. 80. *C. leptonervia*

77. **C. plantaginea** Lam.

Scattered on dry, hardwood hillside, Brookside, near Truro, Colchester Co. This is the only known location.

Rich hardwoods: N.S.; N.B. to Man. south to Ala.

78. **C. laxiflora** Lam.

Annapolis Co.; damp clearings and open rocky woods, North Mt., Granville; the first authentic record from east of southern Maine (Fernald, 1922). Earlier records belong to *C. leptonervia.*

N.S.; Me. to Wisc. south to N.C.

79. **C. ormostachya** Wieg.

Scattered in beech woods, South Mt. west of Kentville, Kings Co.

Dry woods: N.S. to Minn. south to Mass. and Penn.

80. **C. leptonervia** Fern. Fig. 42.

Throughout, but rarer southwestward; rich woods and thickets, and often one of our more common woodland species.

Nfld. to Minn. south to N.J., N.C. and Wisc.

SECT. 31. EXTENSAE

The *Extensae* comprises two groups of plants found in wet and poorly-drained soil, each of which is quite variable and difficult to classify. Each group is very common and readily recognized (Fig. 41 c, d). For a discussion of this section see: Raymond, Marcel. Cyperacees de l'Ile Anticosti. Can. Jour. Res. **28**, Sect. C. 425. 1950.

a. Perigynia 3.5-6 mm long, at least the lower conspicuously reflexed, the beak about as long as the body (Fig. 41, d).; plants relatively large, mostly 20-40 cm high.
  b. Staminate spike sessile or nearly so; pistillate spikes clustered at the tip; lowest bract twice to four times the length of the inforescence.
    c. Beak of the perigynium serrulate, reddish-tinged at the tip; perigynia yellowish, conspicuously reflexed, 4-6 mm long; scales conspicuous and brown. 81. *C. flava*
    c. Beak of perigynium smooth or nearly so, whitish or with age slightly tawny-tinged at the tip; perigynia greenish, little deflexed, 3.5-4 mm long. *C. flava* var. *fertilis*
  b. Staminate spike conspicuously long-peduncled; lowest bract one-half to one and one-half times the length of the inflorescence; pistillate spikes separated, the lowest often widely spaced; perigynia about 4 mm long, greenish and little deflexed. 82. *C. lepidocarpa*
a. Perigynia 2-3.5 mm long, not at all or but little deflexed, the beak small, smooth or nearly so; plants small, mostly under 20 cm high, often decumbent.
  d. Stems often decumbent; leaves 2-4.5 mm wide; beak of perigynium as long as the body; female spikes usually in two groups, three surrounding the staminate one and one much lower on the culm. 83. *C. demissa*
  d. Stems erect; leaves narrow, 1-3 mm wide; beak of the perigynium about half the length of the body. 84. *C. viridula*

81. **C. flava** L. Fig. 41, d.

Frequent to common throughout; swamps, bogs, meadows, around the inner parts of salt marshes and in ditches and on poorly-drained soil. Meadows, swales and shores, Nfld. to Alaska south to N.J. and Ohio. Including *C. laxior.*

Var. **fertilis** Peck is scattered at the edges of bogs, ponds and swales; Lunenburg and Kings Co. east to Guysborough Co. (*C. cryptolepis* Mackenz.).

Wet meadows, Nfld. to Minn. south to N.J.

82. **C. lepidocarpa** Tausch

Mentioned by Mackenzie from N.S. It is probably characteristic of alkaline bogs. The only specimens which fit this species are from the

Black River Bog, near West Lake Ainslie, where it is very common and conspicuous.

Calcareous bogs and swamps; Nfld. St. Pierre and the Magdalens to Eastern Que. and N.S.

83. **C. demissa** Hornem.

Boggy and peaty acid soils; rare or the distribution not well known; collections are reported by Raymond from near the coast in Annapolis and Halifax Cos. and from St. Paul Island. The plants of this group are quite variable and difficult and it may be that intergrading occurs.

Nfld., the Magdalens, eastern Que. and south to N.S. and Maine.

84. **C. viridula** Michx. Fig. 41, c.

Sphagnous swales, gravelly and rocky shores, low pastures near the sea, often at the borders of rather brackish ponds or inlets; scattered to rather common around the Province. A long-spiked form has been collected at Margaretsville, Annapolis Co., along the Bay of Fundy, and by Macoun at Baddeck (Fernald, 1921).

N.E. North America; Eu.

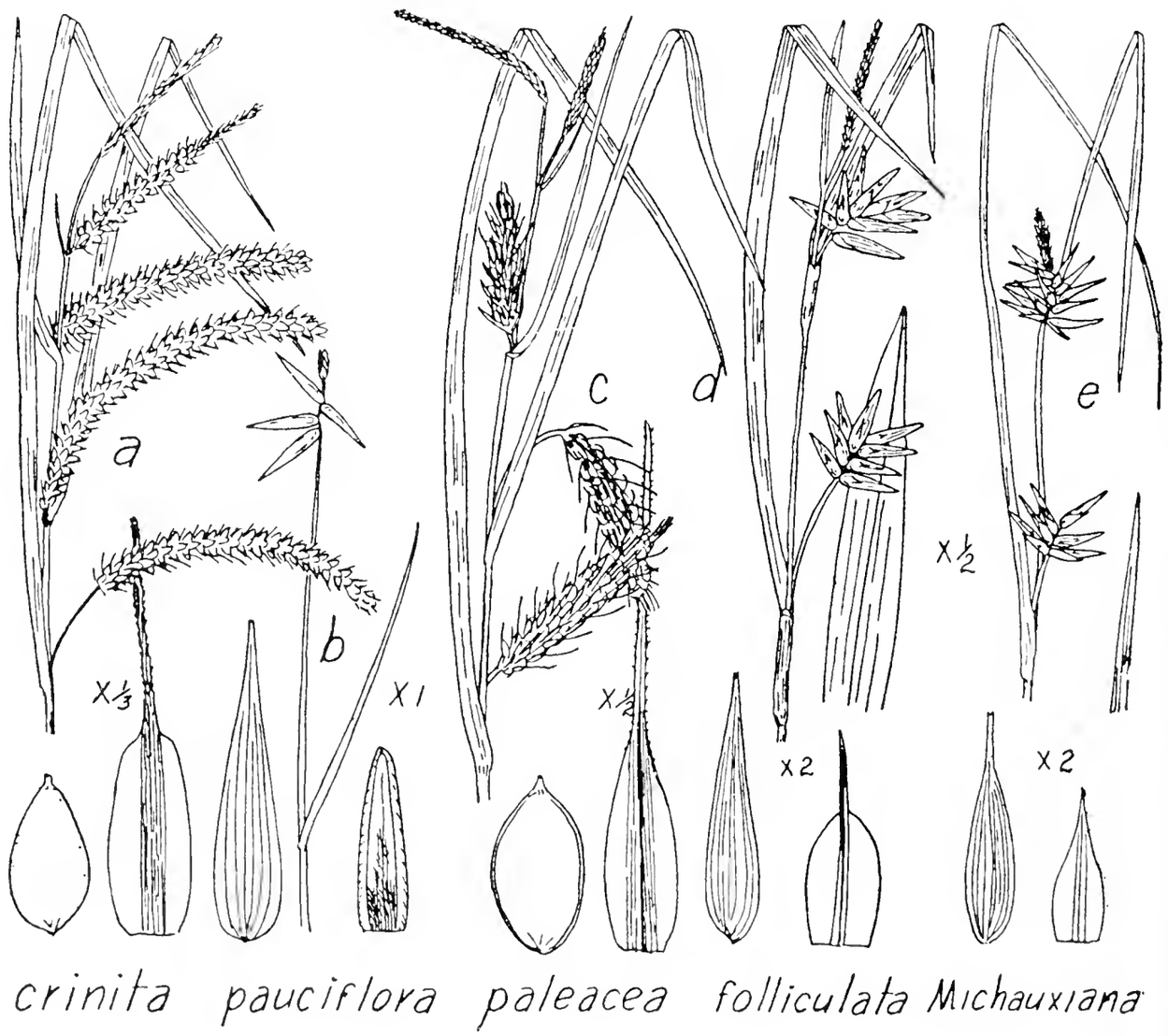


Fig. 43.—**Carex**: inflorescences; perigynia and scales, x 5 and x 2.

SECT. 32. ORTHOCERATES

85. **C. pauciflora** Lightf. Fig. 43, b. Map 156.

Common throughout in its habitat; characteristic of sphagnum bogs, especially near the coast; common in northern C.B. in bogs, or even out on dryish heaths and barrens.

Nfld. to Alaska south to Penn. and Wash.; Eurasia.

SECT. 33. PALUDOSAE

86. **C. lacustris** Willd. Fig. 44.

Local, growing between the brackish marshes and the cat-tail zone bordering the upland; border of brackish marsh near Yarmouth; often growing in large pure colonies around the estuaries at the head of the Bay of Fundy.

N.S. to Man. south to D.C. and Iowa.

SECT. 34. PSEUDO-CYPEREAE

Rather coarse plants of wet meadows and swales; with the perigynia having rather conspicuous toothed beaks and the scales in the pistillate spikes with long, rough or barbed awns.

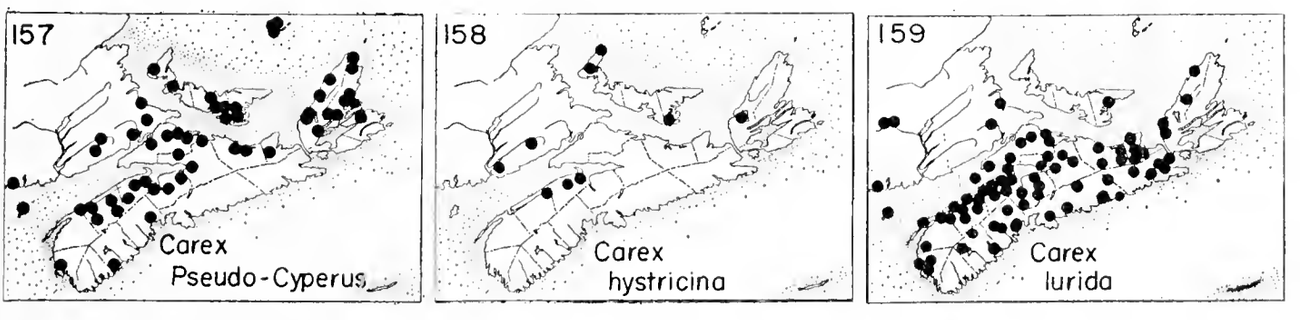
a. Perigynia leathery in texture, reflexed and very numerous in long, pendulous cylindrical spikes (Fig. 44, a).
  b. Perigynia 3-5 mm long; the teeth nearly straight and parallel, 0.5-1 mm long. 87. *C. Pseudo-Cyperus*
  b. Perigynia 5-7 mm long; the teeth curved-divergent, 1.3-2 mm long. 88. *C. comosa*

a. Perigynia relatively thin in texture, spreading or ascending at maturity, inflated (Fig. 45, b).
  c. Culms scabrous; perigynia 15-20-nerved, but slightly inflated, 1.5-2 mm thick. 89. *C. hystricina*
  c. Culms smooth; perigynia 8-10-nerved, strongly inflated, 2.5-4 mm thick. 90. *C. lurida*

87. **C. Pseudo-Cyperus** L. Fig. 44, a. Map 157.

Rare in the southwestern counties (Fernald, 1921); scattered from Annapolis and Queens Cos. to C.B., never abundant; wet meadows, around undrained ponds, swampy thickets and grassy swales. Conspicuous and readily identified by its long rather spiny heads with reflexed perigynia.

Nfld. to Sask. south to Penn. and Minn.



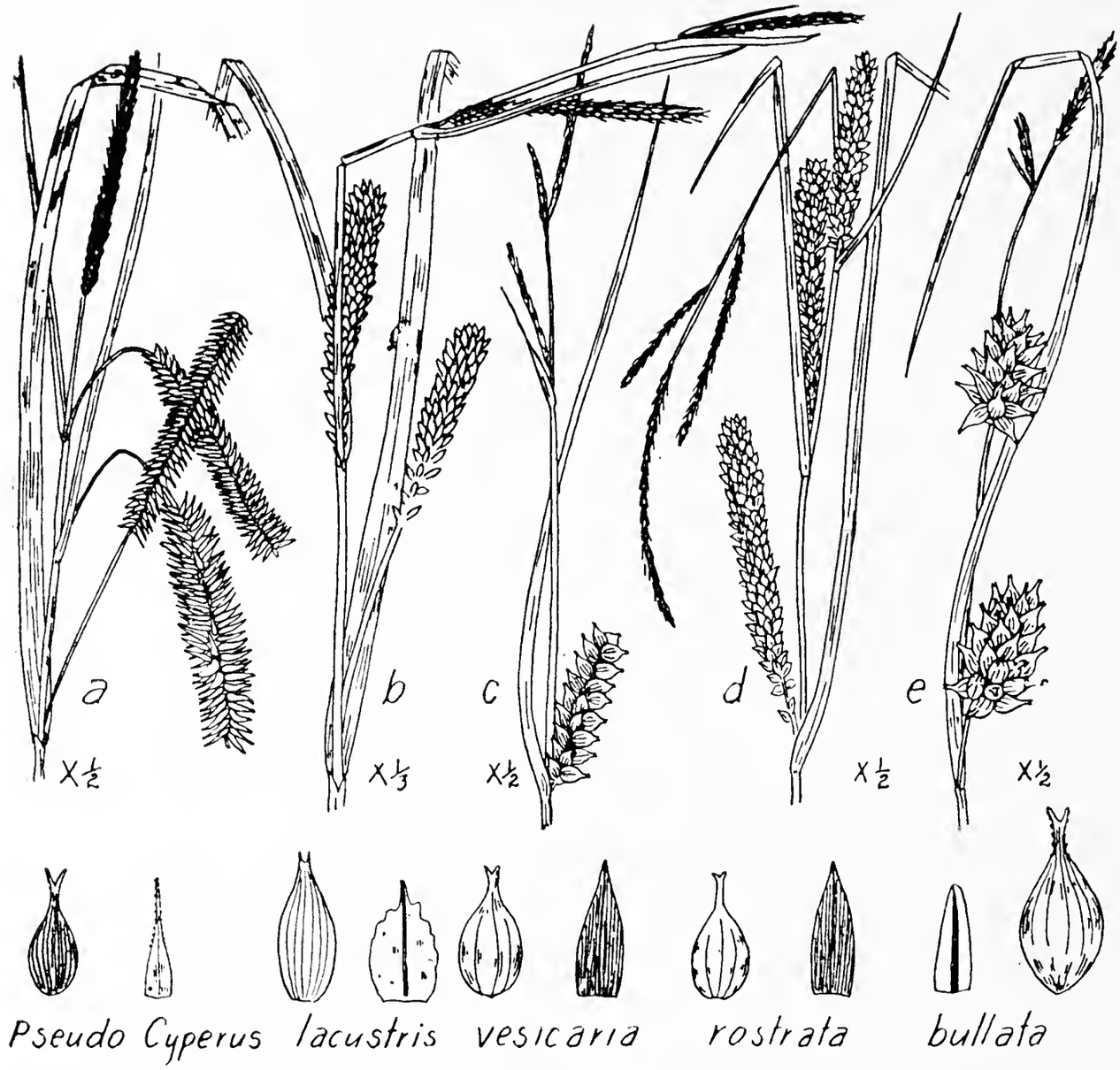


Fig. 44.—**Carex:** inflorescences; perigynia and scales, x 2.

88. **C. comosa** Boott

An examination of some specimens of *C. Pseudo-Cyperus* collected in swales east of Aylesford near the Caribou Bog showed one plant of the closely allied *C. comosa.* This plant has also been collected in other parts of the Valley by David Erskine. Cumberland Co.; behind dyke, Advocate; abundant in clumps in swamp, Truemanville (Schofield, 1955).

N.S. to Nebr. south to Fla. and La.; Wash. to Calif.

89. **C. hystricina** Muhl. Map 158.

Rather similar in appearance to the next; Kings Co., swale along brook, North Mountain above Delhaven; Arlington; abundant in swamp north of the Cornwallis River, Cambridge (Erskine, 1951); one station at the south end of Lake Ainslie in C.B.

Gaspe south to N.S. and Tenn. west to Alta. and Calif.

90. **C. lurida** Wahlenb. Fig. 45, b. Map 159.

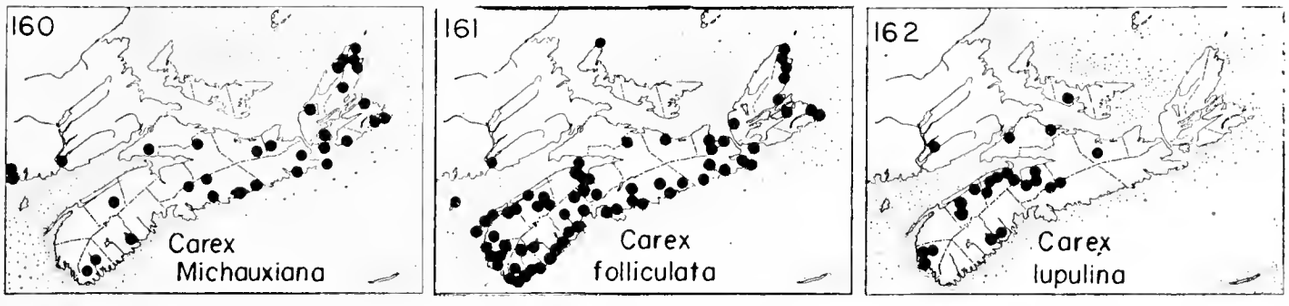
Common throughout, especially from Annapolis east; swamps, wet meadows, ditches and damp thickets.

N.S. to Minn. south to Fla. and Tex.

SECT. 35. FOLLICULATAE

Plants of swales or shaded wet areas, with perigynia 10-15 mm long loosely arranged in short spikes.

a. Leaves 2-4 mm wide; bract-sheaths concave at the mouth; staminate spikes 5-15 mm long, sessile or very short-stalked. 91. *C. Michauxiana*
a. Leaves 3.5-16 mm wide; upper or all bract-sheaths prolonged at the mouth; staminate spikes 12-30 mm long, long-stalked. 92. *C. folliculata*



91. **C. Michauxiana** Boeckl. Fig. 43, e. Map 160.

Rare in the southwestern counties, becoming commoner east to C.B.; boggy savannah, Sable R., Shelburne Co. and swale bordering Grand Lake, Halifax Co. (Fernald, 1921); characteristic of mountain swamps, sandy or rocky beaches and in poorly-drained swamps in C.B.

Nfld. to Ont. south to Penn.; Asia.

92. **C. folliculata** L. Fig. 43, d. Map 161.

Throughout; wet woods, swales and damp thickets; scattered in Kings Co.; common on the quartzitic or granitic areas; characteristic of wooded swamps in C.B.

Nfld. to Wisc. south to N.C.

SECT. 36. LUPULINAE

a. Pistillate spikes globose with 1-15 perigynia; perigynia spreading to reflexed' the sides of the beak usually smooth, the teeth hispid within.
  b. Achenes ellipsoid, broadest near the middle and tapering to the beak; perigynia ovoid and distended, 5-8 mm wide. 93. *C. intumescens*
  b. Achenes obovoid, broadest near the summit and gradually tapering to broadly rounded to the beak. *C. intumescens* var. *Fernaldii*
a. Pistillate spikes oblong to cylindrical with 20-75 perigynia; perigynia closely appressed, the teeth smooth within. 94. *C. lupulina*

93. **C. intumescens** Rudge Fig. 45, c.

Scattered to frequent throughout; wet, usually deciduous, woods, in swamps and at the edges of intervales. Var. **Fernaldii** Bailey is

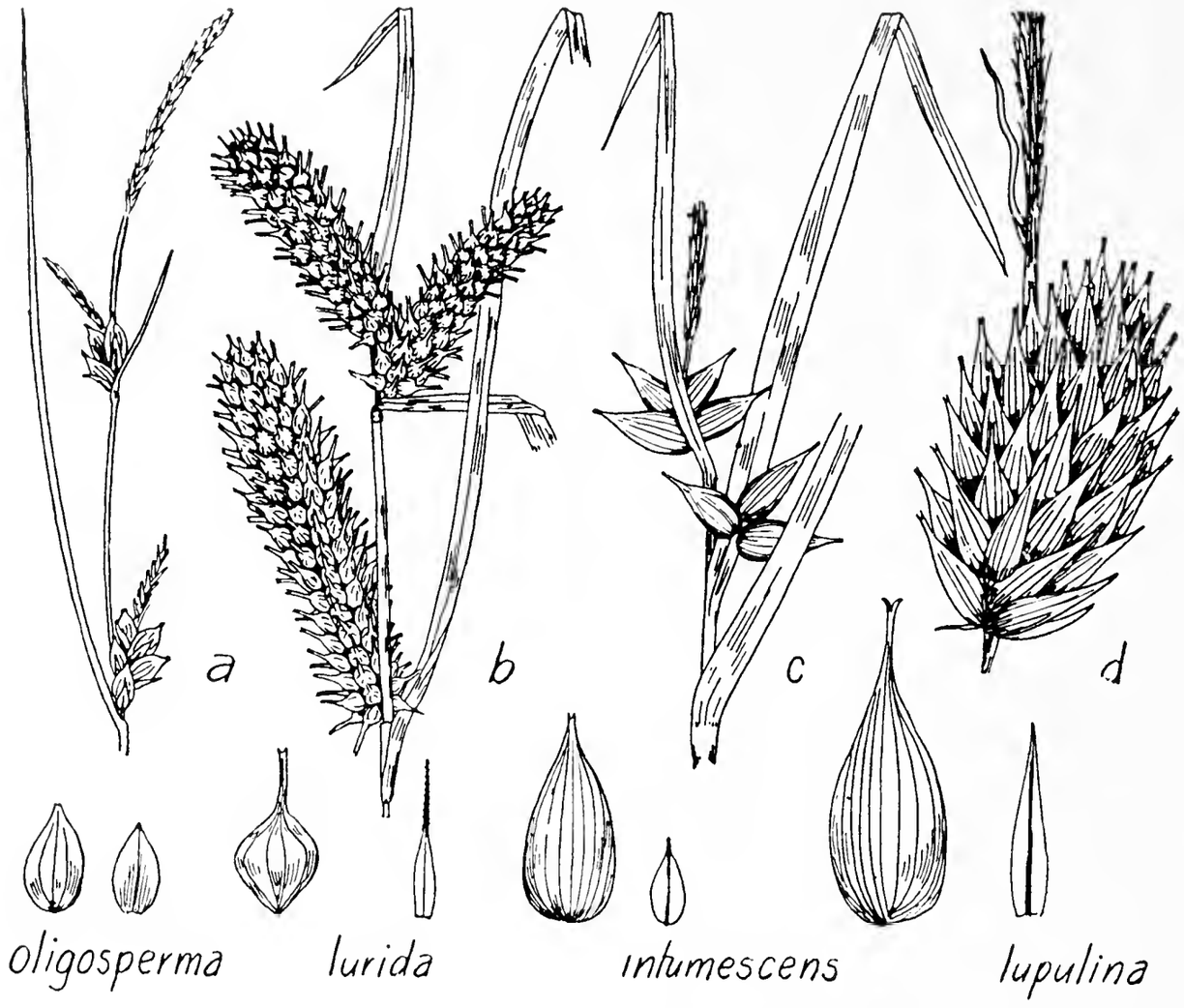


Fig. 45.—**Carex**: inflorescences, x 1; perigynia and scales, x 2.

doubtfully distinct and seems more common than the species. This is also occasionally found with inflated perigynia and this variation is called forma **ventriosa** Fern.

Nfld. to Wisc. south to N.C. with the species ranging south to Fla. and Tex.

94. **C. lupulina** Muhl. Fig. 45, d. Map 162.

Scattered to local; local in Yarmouth Co.; occasional in Kings and Cumberland Cos.; Musquodoboit Valley and in central Pictou Co.; mucky meadows, along intervales and in rich swales.

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

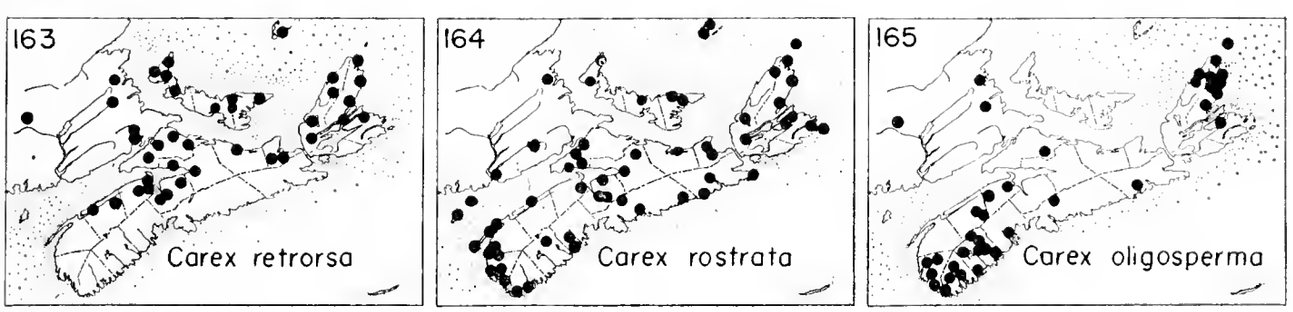
SECT. 37. VESICARIAE

Coarse plants with mostly cylindrical spikes with numerous perigynia, the scales blunt or with short smooth awns.

a. Perigynia reflexed to widely spreading; culms in clumps, without long horizontal stolons; pistillate spikes thick-cylindric, to 2 cm thick; bracts of inflorescence several times the length of the inforescence. 95. *C. retrorsa*

a. Perigynia very rarely reflexed; plants with creeping stolons.

b. Culms thick and spongy at base, scattered from long running rootstocks; leaves prominently marked with cross-lines and nodulations when dry, 3-12 mm wide (Fig. 44, d).
c. Plant 3-6 dm high; leaves channelled, 3-4 mm wide; pistillate spikes 6-8 mm thick; scales short, blunt acute; perigynia 3-5 mm long. 96. *C. rostrata*
c. Plant 4-12 dm high; leaves flat, 4-12 mm wide; pistillate spikes denser, 10-20 mm thick, the scales acuminate to aristate; perigynia 4-10 mm long. *C. rostrata* var. *utriculata*
b. Culms slender and usually not spongy at the base; leaves not prominently marked.
d. Lowest bract several times longer than the inflorescence; perigynia 5-7 mm thick; achene deeply indented in the middle of one angle. 97. *C. Tuckermani*
d. Lowest bract usually not much longer than the inflorescence; achenes not deeply indented.
e. Pistillate spikes widely separated, small and very short with only 3-15 perigynia; leaves filiform and rolled; culms tall and very slender (Fig. 45). 98. *C. oligosperma*
e. Pistillate spikes oval to cylindrical with many perigynia; leaves flat when fresh.
f. Perigynia with rough beaks, 20-40 in a short, oval spike, with sharp, prominent teeth (Fig. 44, e). 99. *C. bullata*
f. Perigynia with beaks smooth; spikes usually long cylindrical.
g. Stigmas three; achenes trigonous.
h. Spikes long-cylindrical; teeth of perigynia 0.5-1 mm long, scales two-thirds the length of the perigynia. 100. *C. vesicaria*
h. Spikes oval; beak of perigynium short with teeth less than 0.25 mm long; scales about half the length of the perigynia. X *C. mainensis*
g. Stigmas two, achenes lenticular; plant slender with pistillate spikes to 3 cm long and 6 mm thick, dark; scales about half the length of the perigynia. 101. *C. miliaris*



95. **C. retrosa** Schwein. Map 163.

Annapolis and Cumberland Cos. to C.B., scattered to rather rare; forming clumps in swales, on mucky stream banks and in wet meadows.

N.S. to B.C. south to N.J., Ohio and Ore.

96. **C. rostrata** Stokes Fig. 44, d. Map 164.

Rare; swamp on St. Paul Is., northern C.B. (Perry, 1931). This is the northern plant which barely reaches south to N.S.

Var. **utriculata** (Boott)Bailey is common throughout; wet meadows, open wet pastures, in ditches and swales and around boggy pond margins, a rather coarse rough sedge.

Lab. to B.C. south to N.S., Tenn. and Calif.; Eurasia.

97. **C. Tuckermani** Boott

Rather similar in appearance to Fig. 44, e; and with thick loose perigynia. This was first discovered in Hants Co.: small swale by woods road northeast of Sweet's Corner (Smith and Erskine, 1954); local in meadow swale, Wallace River, Wentworth, Cumberland Co. (Schofield, 1955).

N.S. to Minn. south to Penn. and Iowa.

98. **C. oligosperma** Michx. Fig. 45, a. Map 165.

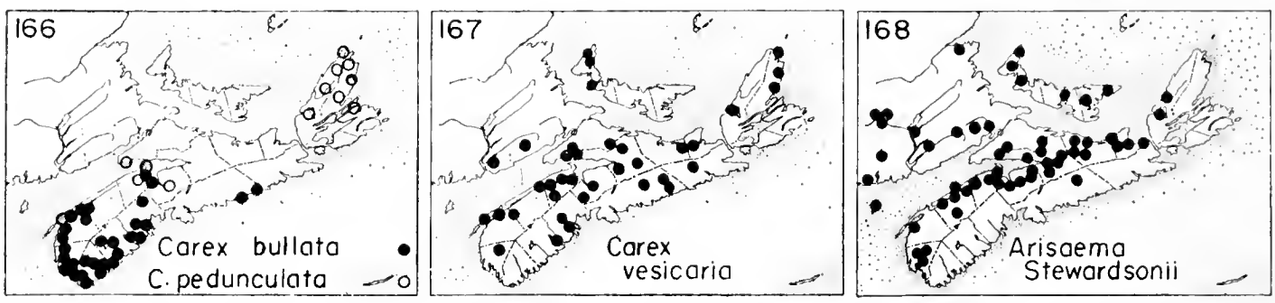
Common near the coast from Yarmouth to northern C.B.; scattered inland, and abundant in northern C.B.; boggy swales, barrens, swamps, and occasionally in peat bogs.

Nfld. to the Mackenzie south to Mass., Penn. and Ind.

99. **C. bullata** Schkuhr Fig. 44, e. Map 166.

Abundant in the southwestern counties and scattered east to Annapols and Luenenburg Cos.; swales, boggy meadows, wet woods and edges of streams and lake shores. Plants with the perigynia approaching the maximum size have been named var. *Greeni* (Boeckl.)Fern.

Georgia north to Me.; N.S.



100. **C. vesicaria** L. Fig. 44, c. Map 167.

This plant is found throughout, although it is rather rare in southwestern N.S.; meadows, intervales, along streams and ditches and the edges of swales. The plants are very variable in the width of the leaves and the dimensions and shape of the perigynia.

a. Perigynia slenderly ovoid, gradually tapering to the beak; pistillate spikes 1-1.5 cm thick. *C. vesicaria*

a. Perigynia with sub-globose to globose-ovoid bodies, obviously inflated, abruptly rounded to the beak.

b. Spikes 1-1.5 cm thick.

c. Spikes cylindrical, 2-7 cm long. var. *monile*

c. Spikes elliptical, 1-2 cm long. var. *distensa*

b. Spikes 5-8 mm thick; perigynia smaller, only 3-5 mm long. var. *jejuna*

The typical Eurasian species seems to be rare in the Maritime Provinces; plants with the slender tapering perigynia, are shown in collections from Wellington, P.E.I. and James River, Antigonish Co., N.S. Most of our plants show the globose, inflated perigynia abruptly contracted to the beak, and with the smaller size of perigynia and spikes belonging

to var. **jejuna** Fern. Var. **monile** (Tuckerm.)Fern. are the large forms of this and occasionally is found; while the short-spiked var. **distensa** Fries is European and northern, ranging south to N.S., rare.

Nfld. to B.C. south to Penn., Wisc. and Calif.; Eurasia.

101. **C. miliaris** Michx.

Only one location has been found; collections by Smith et al. were made from a wet beach at Warren Lake, Victoria Co. in northern Cape Breton, and from along Warren Brook near its mouth.

Nfld. and Lab. south to central Maine and N.S.

X **C. mainensis** Porter

This is a hybrid between *C. vesicaria* and the last species. The small oval spikes have a conspicuous green and purplish pattern; sterile and not developing achenes. It was found associated with the last species at Warren Lake and along Warren Brook.

Frequently found where the two parents are growing together.

20. ARACEAE ARUM FAMILY

A small family of four distinctive plants growing in bogs, swamps or wet woods. The flowers are in a thick fleshy spike called a spadix, partly enclosed or subtended by a leafy bract called the spathe.

a. Leaves compound, with three leaflets; spadix with the upper part not flowering; spathe longitudinally striped with white, hooded. 1. *Arisaema*

a. Leaves simple.

b. Stem short or trailing; leaves wide and heart-shaped; spathe wide and protecting the flowers.

c. Spathe shining white, behind the flowers; leaves almost orbicular, glossy green. 2. *Calla*

c. Spathe greenish-purple, almost enclosing the spadix, present in early spring as the leaves appear; leaves large and rugose, basal. 3. *Symplocarpus*

b. Stem tall, erect, the spathe appearing like a continuation of the stem; spadix cylindrical, borne on the side of the two-edged stem; leaves narrow and sword-like. 4. *Acorus*

1. ARISAEMA MART.

1. **A. Stewardsonii** Britt. JACK-IN-THE-PULPIT Fig. 46, a. Map 168.

Rich low woods, mucky areas usually in thickets or along the edges of intervales; rather common from Yarmouth east along the northern half of the Province to the Margaree Valley. Early June.

N.S. and P.E.I. to Minn. south to N.J. & N.C.

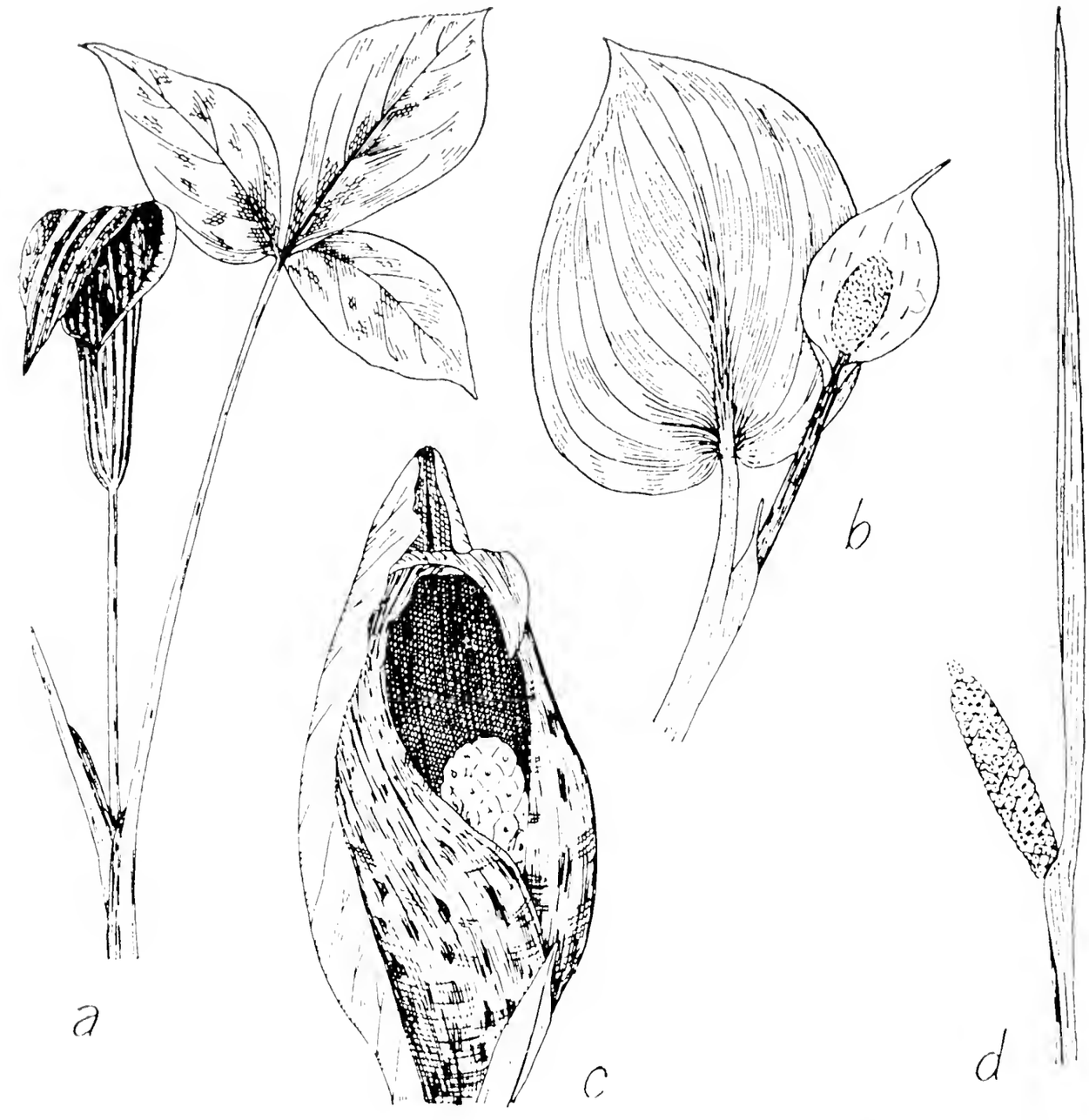


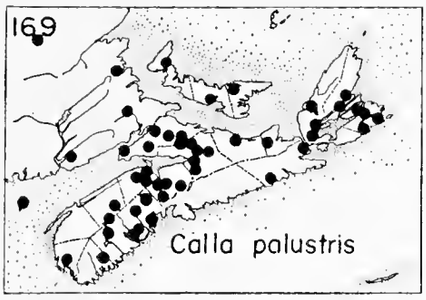
Fig. 46.—**Arisaema.** a. plant, x $\frac{1}{2}$. **Calla.** b, plant, x $\frac{1}{2}$. **Symplocarpus.** c, flowering plant, x $\frac{1}{2}$. **Acorus.** d, upper third of plant, x $\frac{1}{2}$.

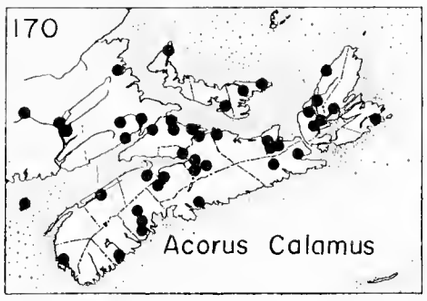
2. CALLA L.

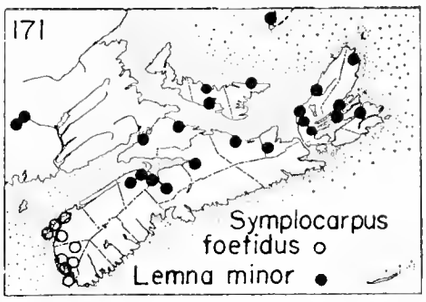
1. **C. palustris** L. WATER ARUM, WILD CALLA. Fig. 46, b. Map 169.

Rare in the southwestern counties; becoming more common from Yarmouth Co. east; scattered in bogs in the Annapolis Valley and in Cumberland Co.; scattered to north-central C.B. It is found in cold bogs and swampy pond, lake and stream edges, usually localized in small areas and can easily escape detection. (Smith, 1959). June 15-July.

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







3. **SYMPLOCARPUS** Salisb.

1. **S. foetidus** (L.)Nutt. Fig. 46, c. Map 171. SKUNK CABBAGE

Found only in the southwest from Digby Neck, southern Digby and Yarmouth Cos.; springy swales, open bogs, mossy sphagnum woods and wet thickets. Early May.

N.S. to Man. south to Ga. and Iowa.

4. **ACORUS** L.

1. **A. Calamus** L. Fig. 46, d. Map 170. SWEET FLAG, CALAMUS.

Throughout; most abundant in the northern counties; often abundant in marshes, along rivers, shallow edges of ponds and wet meadows where the bases of the plants are continually submersed; always in open sunlight, often mixed with a growth of cat-tails, which prefer much the same habitats. It is often abundant in marshes just above high tides. July-Aug.

N.S. to Ore. south to Fla. and Tex.; intro. into Eu.

21. **LEMNACEAE** DUCKWEED FAMILY

Minute plants floating on or in the water, not differentiated into stems and leaves but flattened and reproducing by budding; flowers consisting of a single anther or pistil, usually not present.

a. Plants with several roots, reddish beneath, almost round, 3-8 mm long. 1. *Spirodela*

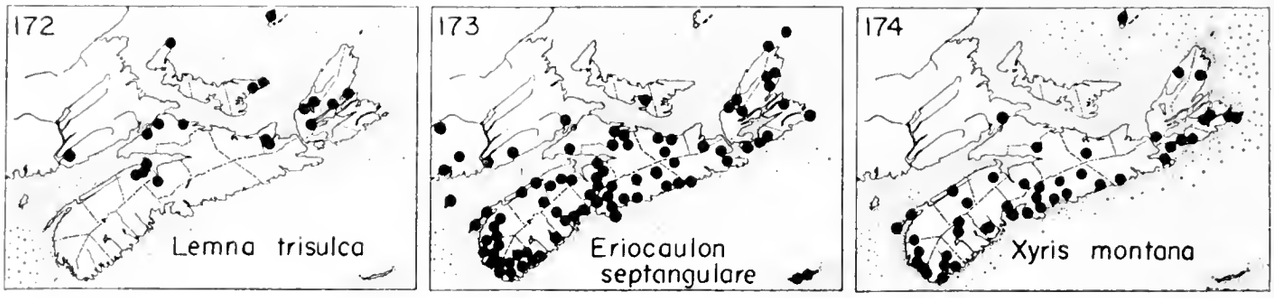
a. Plants with a single root, oval or elongated, green beneath. 2. *Lemna*

1. **SPIRODELA** Schleid.

1. **S. polyrhiza** (L.)Schleid. Fig. 46, d. Map 175.

Common on the surface of water in streams and in ponds, in Kings and Cumberland Cos., scattered elsewhere through northern N.S. to Mabou and Baddeck Forks.

N.S. to B.C. south to Fla. and Mex.; tropical America and Eurasia.



2. LEMNA L. DUCKWEED

a. Plants long and narrow, with the new plants stalked, 6-10 mm long, forming tangled masses and often sinking beneath the surface of the water. 1. *L. trisulca*

a. Plants oval, 2-5 mm long, floating on the surface. 2. *L. minor*

1. **L. trisulca** L. Fig. 47, f. Map 172. SUBMERSED DUCKWEED

Often abundant in ponds, lake shallows and slow-moving rivers in the more alkaline regions: Kings and Cumberland Cos., rather common in Antigonish Co. and through Inverness and Victoria Cos. to central C.B.

N.S. and M.I. to B.C. south to Fla. and Calif.; Eu. to Australia.

2. **L. minor** L. Fig. 47, e. Map 171. LESSER DUCKWEED

Common in stagnant pools, running brooks and ponds, often forming a greenish cover over the surface of the water; Kings Co. to northern C.B., often found until late October.

Throughout the world except in the colder regions.

22. XYRIDACEAE YELLOW-EYED GRASS FAMILY

Plants with stiff, erect, grass-like leaves; flowers yellow, appearing at intervals from between the stiff scales of the small, oval spikes.

1. XYRIS L. YELLOW-EYED GRASS

a. Plants 0.5-3 dm high; leaves to 2 dm long and 4 mm wide, more than half the length of the flowering scape; fruiting heads 8-10 mm thick, with the scales having a greenish area in the center. 1. *X. caroliniana*

a. Plants rarely as much as 3 dm high; leaves 2-6 cm long and 1-2 mm wide, one-third the length of the flowering scape; scales of the head dark brown; fruiting heads 3-6 mm thick. 2. *X. montana*

1. **X. caroliniana** Walt. Map 175.

Common from Annapolis south to Shelburne Co., scattered east to southern Kings Co. and Musquodoboit Harbour in Halifax Co.; wet, sandy, gravelly or peaty lake-margins, and sloughs in peaty barrens, often growing with the following species. Aug.

Fla. to La. north to N.S. and central Me., west to Wisc.

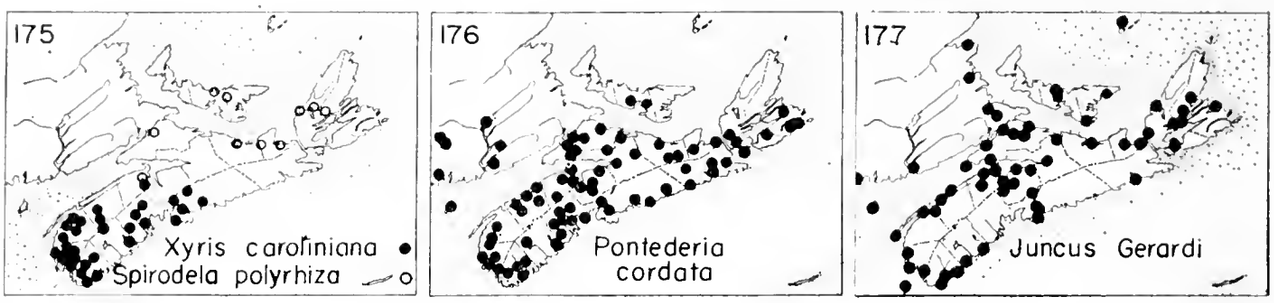
Fig. 47.—**Pontederia.** a, plant x $\frac{1}{2}$. **Eriocaulon.** b, plant, x 1. **Xyris.** c. **X. montana**, x $\frac{1}{2}$. **Spirodela.** d, plants, x 2. **Lemna.** e, **L. minor**, x 2. f, **L, trisulca**, x 2.

2. **X. montana** Ries Fig. 47, c. Map 174. YELLOW-EYED GRASS

Characteristic of peaty hollows, boggy barrens, and flats and lake margins; common in the southwestern areas and east along the coast to Scatari Island in C.B.; scattered and becoming rare northward and inland; bog between Amherst and Sackville. July-Aug.

Forma **albiflora** Boivin has its type station in a bog in Shelburne Co., where it was first collected by W. G. Dore. Flowers white instead of yellow.

Nfld. to Ont. south to Penn. and Mich.



23. ERIOCAULACEAE PIPEWORT FAMILY

Tufted plant with thin, sharp-pointed leaves; flowers in a lead-colored button, at the top of a naked scape which varies in length according to the depth of the water.

1. ERIOCAULON L. PIPEWORT

1. **E. septangulare** With. Fig. 47, b. Map 173.

Throughout on sandy lake shores, rarely in running water; common in the southwestern and Atlantic regions. Sterile plants often form a green growth on the bottoms of lakes, as much as 2 meters below the surface. The plant may be readily identified by its whitish, banded roots. July 15-Sept.

Nfld. to Minn. south to N.J. and Ind.; western Scotland and Ireland.

24. PONTEDERIACEAE PICKEREL-WEED FAMILY

Vigorous perennial of shallow water, with cordate bright glossy leaves and thick spikes of bright blue flowers.

1. PONTEDERIA L. PICKEREL-WEED

1. **P. cordata** L. Fig. 47, a. Map 176.

Abundant in the southwestern area, frequent in lakes on the mainland and southern C.B.; absent from northern C.B. It usually grows in large pure colonies around the mucky margins of ponds and lakes, along slow-moving streams or at the edge of pond-holes. Forma *angustifolia* (Pursh)Solms is a narrow - leaved form which is found throughout the range of the species. July-Sept.

Forma **albiflora** (Raf.)House is a white-flowered form found among typical plants at the edge of a runnel west of the Lequille R. in Annapolis Co. A clump of plants with pale flowers was found at Beaver Dam Lake, Guys. Co.

N.S. to Minn. south to the Gulf of Mexico.

25. JUNCACEAE RUSH FAMILY

Annual or perennial sedge-like plants with grass-like leaves, but distinguished from these two groups by having flowers with 6 perianth parts and forming a capsule. Two genera are found in our region.

a. Capsule many-seeded; plants never hairy; plants characteristically of damp or wet areas; rushes. 1. *Juncus*
a. Capsule 3-seeded; plants more or less hairy, usually of woodlands and open fields; woodrushes. 2. *Luzula*

1. JUNCUS L. RUSH

These plants should be collected in mature fruit, when the persistent stamens are still present. Many kinds have two extra bracts at the very base of the perianth. These should not be confused with the bract at the base of each pedicel, or flower stalk.

a. Individual flowers with two tiny bracts at their base; leaves, when present, without cross-partitions.
b. Inflorescence appearing lateral, the involucral leaf like a continuation of the stem (Fig. 48); sheaths at base of the stem without blades.
c. Stems in dense clumps, with fine longitudinal lines; stamens 3; plant 0.5-2 meters high. 11. *J. effusus*
c. Stems in rows from underground rootstocks; stamens 6.
d. Stem with the part above the inflorescence about equalling that below; flowers greenish to light-brown, 2-3 mm long; anthers shorter than the filaments; seeds about 0.5 mm long. 10. *J. filiformis*
d. Stem with the part above the inflorescence much shorter than that below; flowers with bands of dark-brown, 3.5-5 mm long; anthers several times the length of their filaments; seeds about 1 mm long (Fig. 48). 12. *J. balticus*
b. Inflorescence terminal, subtended by an involucral leaf which may or may not exceed the inflorescence. Leaf-blade flat, or round and channeled; never hollow nor partitioned by cross-walls.
f. Plant annual, low and spreading; inflorescence about one-half the total height.
g. Sepals and petals long-attenuate, exceeding the greenish or pale capsule; flowers scattered singly along the branches (Fig. 48). 1. *J. bufonius*
g. Sepals and petals rather blunt and about the length of the brownish capsule; flowers often in 2's or 3's; plants of halophytic habitat, usually more fleshy. Var. *halophilus*
f. Plants perennial; inflorescence less than one-quarter the total height of the plant.
h. Inflorescence 1-4-flowered; plants densely tufted, the bases surrounded by dry stems; the stems filiform with very narrow leaves; arctic-alpine. 2. *J. trifidus*
h. Inflorescence many-flowered.
i. Stems from a horizontal root-stock, with leaves on the upper part; sepals blunt, green with lateral bands.
j. Plants of halophytic habitats; anthers twice as long as the filaments or more; capsule equalling or but slightly exceeding the perianth. 3. *J. Gerardi*

j. Plants not halophytic; anthers about as long as the filaments; capsule rather globose, distinctly longer than the perianth. 4. *J. compressus*

i. Stems tufted, with no leaves on the upper part; sepals without lateral dark brown bands; leaves all basal or nearly so with sheaths covering one-quarter of the stem at most.

k. Leaf blades terete, channeled on the upper side.

l. Inflorescence and capsule greenish; sepals 3.5-4.5 mm long; seeds with long white tails. 8. *J. Vaseyi*

l. Inflorescence and capsule brownish; sepals 2.5-3.5 mm long; seeds with only short projections. 9. *J. Greenei*

k. Leaf blades flat.

m. Lobe or auricle at the base of the leaf-blade whitish and delicate, prolonged 1-4 mm beyond the base of the blade. 6. *J. tenuis*

m. Auricles at the top of the leaf-sheath rounded, firm, and not prolonged beyond the base of the blade.

n. Involucral leaf shorter than the inflorescence; inflorescence dense with the flowers crowded on the upper sides of the widely-arching branches. 5. *J. secundus*

n. Involucral leaf stronger than the inflorescence; flowers chiefly clustered at the tips of the branches of the inflorescence. 7. *J. Dudleyi*

a. Individual flowers without tiny bracts at their base.

o. Leaf-blades flat, never cross-septate.

p. Leaves filiform, 1-3; heads 1 or 2, 1-4-flowered; capsule 6-7 mm long, much exceeding the perianth; bogs. 13. *J. stygius*

p. Leaves 1-4 mm wide; capsule rounded, 3.5 mm long, barely exceeding the perianth; heads more than 2, many-flowered. 14. *J. marginatus*

o. Leaf-blades terete and hollow, partitioned by cross-walls (to show this, dissection may be necessary in the two distinctive species, *J. bulbosus* and *pelocarpus*).

q. Stems creeping, densely matted, forming several capillary leaves and a flowering branch from each slightly bulbous node; Sable Island. 20. *J. bulbosus*

q. Stems erect and coarse

r. Flowers solitary or in pairs along the branches of the inflorescence; inflorescence much branched and diffuse.

s. Stem erect; inflorescence often bearing tufts of reduced leaves (Fig. 49). 24. *J. pelocarpus*

s. Stem prostrate; plant much reduced in all parts; inflorescence not bearing tufts of reduced leaves. Var. *sabulonensis*

r. Flowers grouped in heads or glomerules.

t. Seeds 0.7-2.0 mm long, with definite white appendages on each end; stamens 3.

u. Capsule little if at all exserted; seeds 1.2-2 mm long, with long white tails two-thirds to fully as long as the body. 16. *J. canadensis*

u. Capsule much exserted and brownish; seeds 0.7-1.2 mm long, with the tails one-half or less the length of the body.

v. Inflorescence with erect branches, 3-6 times longer than wide; heads 2-7-flowered; seeds with tails half as long as the body. 18. *J. brevicaudatus*

v. Inflorescence with spreading branches, forming an open or diffuse cyme; sepals and petals lance-linear, pointed; heads 5-20-flowered; seeds with tails one-third the length of the body. 17. *J. subcaudatus*

t. Seeds 0.3-0.6 mm long, without whitish tails.

w. Stamens 3; seeds very small, 0.3-0.4 mm long; plant erect, 2-8 dm high with hemispherical heads on ascending branches. 19. *J. acuminatus*

w. Stamens 6; seeds 0.5-0.6 mm long.

x. Heads mostly spherical, many-flowered; root-stock often bearing tubers; capsule subulate, exceeding the perianth (Fig. 49). 15. *J. nodosus*

x. Heads not spherical; tubers absent.

y. Stem stout, to 1 m high; elongate thread-like leaves sometimes borne in dense tufts on the root-stocks; lower stem-leaf large and erect, overtopping the rather narrow inflorescence; capsule equalling the sepals, anthers longer than the filaments. 21. *J. militaris*

y. Stem to 5 dm high; leaves not over-topping the inflorescence.

z. Branches of the inflorescence spreading; heads compact.

Capsule tapering, shiny, dark brown to nearly black, 3-4 mm long; flowers brown, 2.5-3.0 mm long (Fig. 49). 22. *J. articulatus*

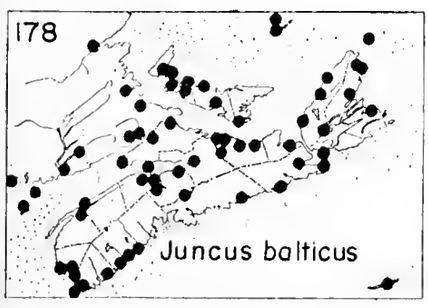
Capsule abruptly mucronate, 2.5-3.0 mm long, often duller and paler; flowers often greenish, smaller. Var. *obtusatus*

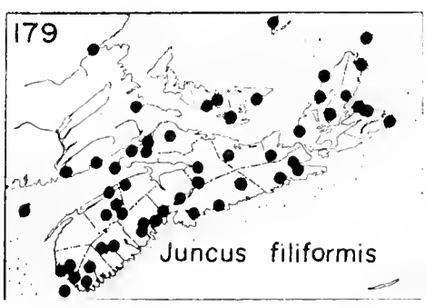
z. Branches of the inflorescence 1-4, slender and strongly ascending; some flowers of the head often raised above the others on slender pedicels; northern and rare. 23. *J. alpinus*

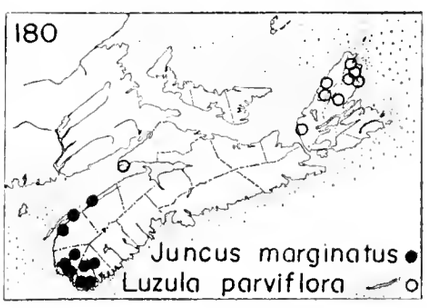
1. **J. bufonius** L. Fig. 48. TOAD-RUSH

Common throughout; open areas, especially along road-sides, farm yards and beaten paths; scattered in wet land, lake-margins or boggy places. Widely distributed.

Var. **halophilus** Buchenau & Fern. is scattered near the coast from the Gulf of St. Lawrence around C.B. and along the Atlantic Coast south to Mass.; James Bay and western N.A.







2. **J. trifidus** L. Map 181.

The first collections for the Province of this arctic-montane species are from cliff faces overhanging the Northeast Margaree River; rare on cliff ledges near the mouth of the Cheticamp River; dry crevices of north-facing cliff, Lockhart Brook, Salmon River; and dry cliff crevices, Gray Glen near Cape North Village in Victoria Co. (Smith and Erskine 1954).

Arctic regions south to the bare mts. of Nfld., Que., New England and n. N.Y.

3. **J. Gerardi** Loisel. Fig. 48. Map 177.

Common around the coast; on the upper limits of the salt marshes, often forming darker pure colonies on the flat brackish dykelands or in fields overflowed by the sea; forming a narrow band just below the area occupied by cultivated grasses and legumes.

Salt marshes from Nfld. and Gaspe to Fla.; more rarely inland around the Great Lakes; Pacific Coast, Eurasia and Africa.

4. **J. compressus** Jacq.

Recorded by Rousseau (1938); brackish meadow at Guysborough. Other collections probably should be considered as collections of *J. Gerardi* from drier soils and more inland locations. This is a European species occasionally introduced at various places in North America.

5. **J. secundus** Beauv.

Two collections with crowded flowers secund, or placed strongly along one side, along the branches of the inflorescence are placed in this species. The first collection is from a ditch, Brookfield Mines, Queens Co.; the second is a collection by W. B. Schofield from a damp area in a field, Cambridge, Kings Co.

Maine to Indiana south to N.C.

6. **S. tenuis** Willd. Fig. 48.

Abundant throughout; fields, roadsides, open thickets and moist places. Most, if not all, of the plants may be considered to be the typical variety and the forms found here may be considered merely variations.

Throughout N.A.; widely adventive elsewhere.

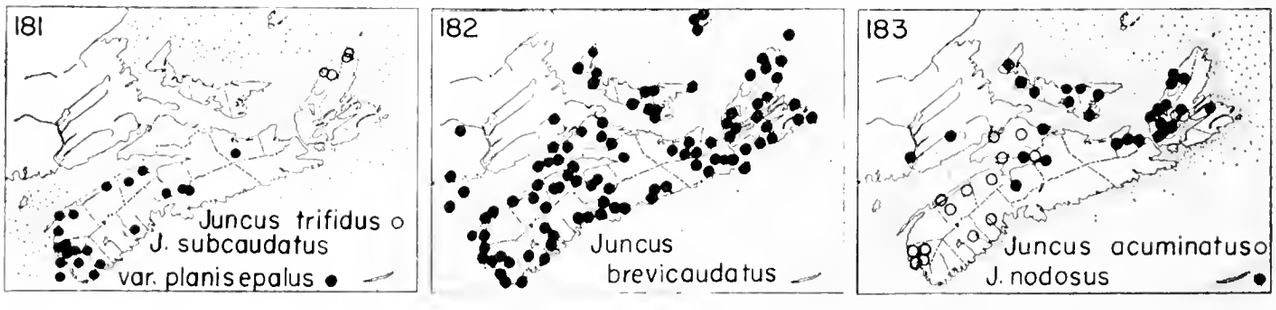


Fig. 48.—**Juncus.** Inflorescences, x ½.

7. **J. Dudleyi** Wieg.

Rare; swale at the southern base of the North Mt., Middleton, Annapolis Co. (Fernald, 1921). Scattered other collections have been made from Hants, Lunenburg and central Cape Breton. The plant is not easily distinguished from the common *J. tenuis* but nevertheless seems to be rare. Scattered also in N.B. and throughout P.E.I.

Nfld. to B.C. south to Va., Kans. and Mexico.

8. **J. Vaseyi** Engelm.

Cespitose clumps in cranberry bog at Linden, Cumberland Co. (Schofield, 1955); also near Pugwash. This is an extension of range southward from New Brunswick.

Northern Que. to Alberta south to N.S., N.Y. and Utah.

9. **J. Greenei** Oakes & Tuckerm.

Reported by Fernald (1921) from but one station: dunes at Villagedale, Shelburne Co. It is more widely distributed since it has now been found on sandy soils near Halifax, east to Pomquet in Antigonish Co. where it was frequent in hollows among the dunes; also from near Pugwash in Cumberland Co.

N.S. to northern Ont. south to N.J., Ohio and Minn.

10. **J. filiformis** L. Fig. 48. Map 179.

Scattered throughout; swales, bogs, edges of lakes, low meadows and sandy-shores.

Lab. to Alaska south to Penn., Wisc. and Colo.

11. **J. effusus** L. Fig. 48. SOFT RUSH

Abundant throughout, marshes, wet meadows, around ponds and in ditches; it is a common weed in wet grazed pastures. The plant is highly variable and seven varieties have been reported from N.S. but their ranges here and elsewhere are largely confluent. They are here placed in two groups, each of which is common throughout.

a. Inflorescence compact with the flowers crowded; flowers small, 2-2.7 mm long, with the perianth segments relatively soft in texture and about the length of the capsule. Var. *compactus*

a. Inflorescence open and diffuse; flowers larger, 2.2-4.3 mm long, with the perianth relatively firm and longer than the capsule. Var. *solutus*

Var. **compactus** Lej. & Court. is common throughout but perhaps more abundant in the northern and eastern parts of the Province. This includes var. *conglomeratus*, a variation which in Europe is often maintained as a species but here does not seem to be too clearly marked.

Var. **solutus** Fern. & Wieg. is also common throughout, sometimes growing two meters high in swales and swamps. This includes varieties *decipiens*, *Pylaei* and *costulatus*, which may appear perfectly distinct at times but which have many intergrading forms. Var. *Pylaei* (Laharpe) Fern. & Wieg., a form with firm, non-wrinkling sepals and the perianth 3-4.3 mm long, may possibly be distinct since its range is more northern and it is found in the cooler parts of the Province.

The species is very variable and is almost cosmopolitan.

12. **J. balticus** Willd., var. **littoralis** Engelm. Fig. 48. Map 178.

Common around the coast, dominant sometimes in the shoreward reaches of the salt marshes; occasionally found in wet meadows or dykelands near the coast, and rarely in bogs in the same zone. Forma dissitiflorus Engelm. has the flowers remotely scattered to make an inflorescence 5-10 cm long. This has been reported from a sphagnous hill-side at Truro (Rhodora **25:** 208. 1923). The American variety.

Lab. to B.C. south to Penn. and Mo.

13. **J. stygius** L., var. **americana** Buchenau

First collected by J. A. Allen in 1882 from a bog thicket, Isle Madame, Richmond Co. It was next found in a bog at the head of MacGregor Brook, North Aspy River, Inverness Co.; and later found to be abundant at the edge of bog-pools on French Mt.; in shallow thickets through bog near Fort Louisburg and occasional in damp hummocks and hollows of bog at Gracieville in Richmond Co. (D. S. Erskine, 1951; Smith and Schofield, 1952). The variety is the American variant of the Eurasian plant.

Lab. south to C.B., N.Y. and Minn. west to Sask.

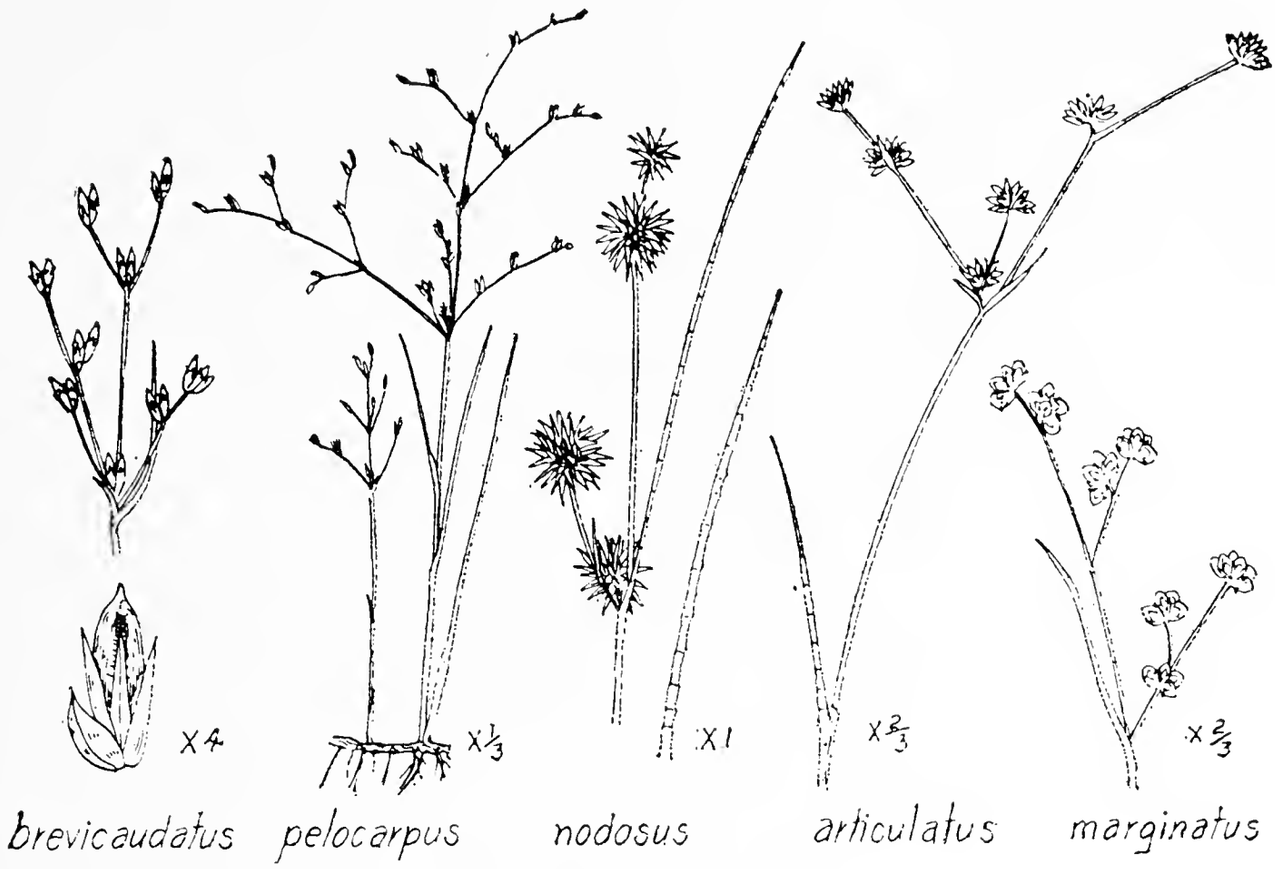


Fig. 49.—Juncus.

14. **J. marginatus** Rostk. Fig. 49. Map 180.

Local in Yarmouth and Shelburne Cos., north to Belle Isle on the North Mt.; clayey brooksides, spring ditches, wet roadsides and damp fields.

N.S.; central Maine to Fla. and Tex. west to Kans.

15. **J. nodosus** L. Fig. 49. Map 183.

Swales near Wentworth gypsum quarries; scattered and rather rare from Windsor and Cumberland Co. to northern Cape Breton.

Bogs, swales and wet shores; Nfld. to Alaska south to Va. and N.M.

16. **J. canadensis** J. Gay Fig. 50.

Common to abundant throughout; wet, sandy or peaty soils, marshy places and shallow water. Two varieties have been named (Fernald, Rhodora **47**: 127-131. 1945).

a. Perianth 2.5-3.3 mm long; cyme with spreading-ascending branches, to 3 dm high. *J. canadensis*

a. Perianth 3.5-4 mm long; cyme with stiffly erect branches, to 1.5 dm high. Var. *sparsiflorus*

The typical variety has the heads densely flowered with 8-20 flowers in a sub-globose head. Forma **apertus** Fern. has only 2-7 flowers more erect in the head: Windsor and probably scattered. Forma **conglobatus** Fern. has the heads, or many of them, densely crowded into irregular masses. Mira, C.B. County. N.S. to Minn. south to Ga. and La.

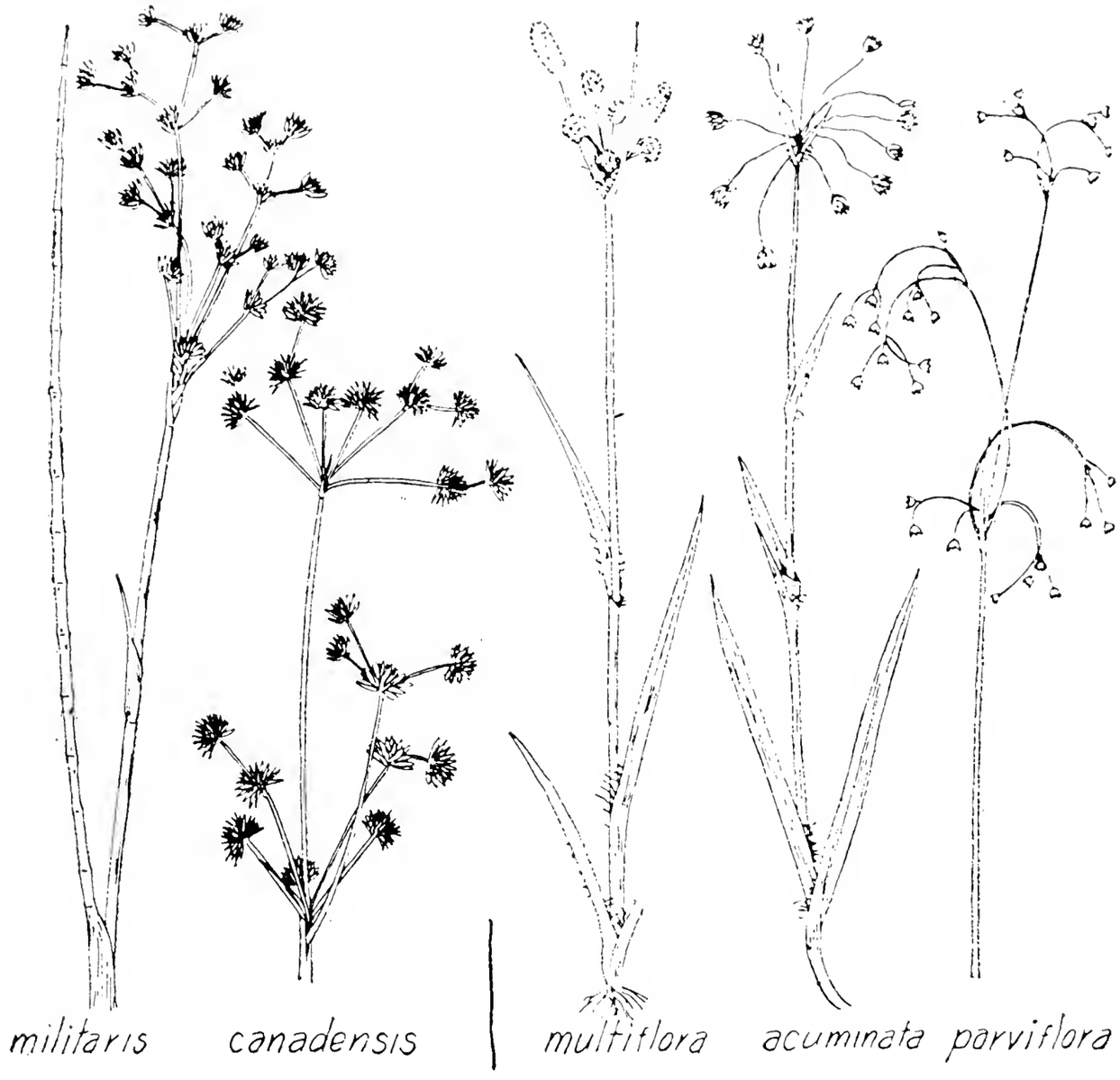


Fig. 50.—**Juncus, x ½, Luzula; x ½.**

Var. **sparsiflorus** Fern. is found around some of the lakes in the Tusket River Valley, sparingly elsewhere in the southwestern counties and scattered through Kings to Hants Co. Nfld. to N.S.; eastern Me. and Mass.

17. **J. subcaudatus** (Engelm.)Coville & Blake, var. **planisepalus** Fern. Map 181.

Characteristic of wet boggy woods and openings in spruce swamps in southwestern N.S.; found east to Kings and Halifax Cos., with one collection known from Pictou. This is an endemic N.S. variety of the southern species which ranges northward to Cape Cod.

18. **J. brevicaudatus** (Engelm.)Fern. Fig. 49. Map 182.

Common in damp places throughout; ditches, periodic ponds, swamps, estuaries and sandy or rocky lake and pond beaches.

Lab. to Alberta south to N.C. and Minn.

19. **J. acuminatus** Michx. Map 183.

Local in Yarmouth Co. as on the sandy and muddy flats of the Tusket R.; wet clayey soils, sterile meadows and in ditches, scattered eastward to Lunenburg and Kings Cos., rare north to Cumberland Co.; and at Baddeck.

N.S. and central Me. to Minn. south to Ga. and Mex.; B.C.

20. **J. bulbosus** L.

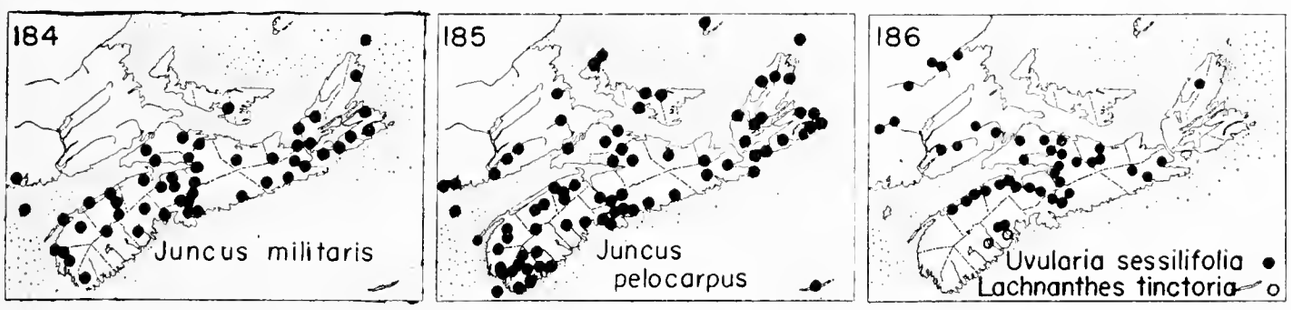
Common along the marshy borders of fresh-water ponds on Sable Island; not known on the mainland.

Southeastern Nfld.; St. P. and Miq.; Sable I.; Eu. and northern Africa.

21. **J. militaris** Bigel. Fig. 50. Map 184.

Sandy and peaty lake-margins in the siliceous region from Yarmouth to northern C.B.; rather rare in the northern counties; common at Shortt's Lake, Brookfield, Colchester Co.; and along many rivers in eastern N.S. Two minor forms of little significance have been described. Forma **bifrons** Fern. has two leaf-blades on the culm, with no upper bladeless leaf-sheath; forma **subnudus** Fern. has one leaf-blade and no bladeless sheath; while the typical form has one leaf-blade near the middle of the culm and a bladeless sheath nearer the top.

Nfld. to N.Y. and Dela., west to Ont. and Mich.



22. **J. articulatus** L. Fig. 49.

One of the commonest species throughout; wet ditches and muddy shores, low areas in fields, swamps and boggy land. Nfld. to B.C. south to N.J., Ind. and Ore.; Eurasia.

Hybrids with *J. brevicaudatus* (X.**J. fulvescens** Fern, Rhodora **35:** 236. 1933) are abundant in peaty swales at Yarmouth, at Argyle and on a savannah near Tiddville, in every place failing to set fruit (Fernald, 1921). Hybrids with *J. nodosus* were noticed in a brackish swale at Baddeck; and with *J. canadensis* at Tiddville, Digby Co. and at Lower Argyle, Yarmouth Co. (Fernald, 1921).

Var. **obtusatus** Engelm. is rarer throughout, and in brackish soil it may largely replace the typical variety. Nfld. to Mich. south to N.J.

23. **J. alpinus** Vill., var. **rariflorus** Hartm.

Rare; plants found in a bog on the plateau near the coast north of Cheticamp, Inverness Co. may belong to this species. In P.E.I. (Erskine, 1960) it is found in damp open sites and fresh marsh, often bordering on brackish marsh in the eastern half of the Island but not on the sides bordering N.S.

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

24. **J. pelocarpus** Mey. Fig. 49. Map 185.

Sandy and muddy shores, bogs and wet areas; common to abundant in the western counties, scattered elsewhere to northern C.B. Nfld. to Dela. west to northern Ont. and Wisc.

Var. **sabulonensis** St. John is a much reduced, prostrate variety that is known only from Sable Island: shallow ponds and wet dune hollows.

2. LUZULA DC. WOODRUSH

Fernald, M.L. Notes on eastern American *Luzula*. Rhodora **47:** 265-271. 1945. Fernald and Wiegand. The variations of *Luzula campestris* in North America. Rhodora **15:** 38-43. 1913.

a. Flowers solitary at the tips of the ultimate branches of the inflorescence.
  b. Inflorescence an umbel, the rays unbranched; spikelets 3-4.5 mm long; plants 2-4 dm high; seeds appendaged (Fig. 50). 1. *L. acuminata*
  b. Inflorescence compound, with many of the branches again branched; plants 6-12 dm high; seeds not appendaged. 2. *L. parviflora*
a. Flowers aggregated into heads or spikes.
  c. Flowers 3-6 in each cluster; perianth whitish; inflorescence open and diffuse. 3. *L. luzuloides*
  c. Flowers several to many in each cluster; perianth straw-colored to blackish-brown; inflorescence often crowded.
    d. Perianth 2.5-3.5 mm long, equalling or usually shorter than the mature capsule; seeds 1.5-2.0 mm long, with a round-tipped bulbous caruncle; inflorescence more or less open with rays of varying lengths.
      e. Leaves longer and flexuous, to 5 mm wide; sepals and capsules pale or straw-colored. 4. *L. multiflora*
      e. Leaves stiff and narrow; sepals dark brown to fulvous; capsules dark chestnut to blackish; plant low, found near the coast. Var. *fusconigra*
    d. Perianth 3-4 mm long, exceeding the capsule; seeds 1.5-1.7 mm long, with a conically tapering caruncle; inflorescence more condensed with the spikes sessile or subsessile. Var. *acadiensis*

1. **L. acuminata** Raf. Fig. 50.

Scattered to common throughout; banks, thickets and in deciduous or mixed woods. This is one of the first plants flowering in the spring; and the young flowering shoots are conspicuous in early May.

Nfld. to Sask. south to N.J., Ga. Ind. and Minn.

2. **L. parviflora** (Ehrh.)Desv., var. **melanocarpa** (Michx.)Buchenau Fig. 50. Map 180.

Scattered in intervale forests and along rocky stream-banks in northern C.B. where it has been widely collected; rare on the mainland, known only from the western tip of Cumberland County: damp edge of McGahey Brook, West Advocate; banks of Soldier's Brook (Schofield, 1955); and woods road, Three Sisters (Erskine, 1951). Our variety is the more southern extreme of the species.

Lab. to Alaska south to N.S., the mts. of New Eng. and south in the Rockies; Eurasia.

3. **L. luzuloides** (Lam.)Dandy & Wilmott

The only record is from Pictou where it was collected by Fernald and St. John; forming mats in a lawn, sterile but with typical base and foliage.

A weedy species from Eu. scattered westward to Ont. and Minn. and south to Penn.

4. **L. multiflora** (Retz.)Lejeune. Fig. 50. COMMON WOODRUSH

Abundant throughout; fields, thickets, barrens and open woods; along practically every roadside and in every field or pasture in the Province. Nfld to Alaska south to Penn., Ill. and Calif.

Var. **fusconigra** Celak is a more dwarf, stiffer form with blackish inflorescence and capsules; common, usually near the coast. From the coast along the Strait of Belle Isle to Mass. and inland on the mts. of N.Y.

Var. **acadiensis** Fern. was originally described from P.E.I. (Rhodora **19:** 39. 1917). This plant is common and the only variety on Sable Island; rather rare in the northern part of the Province, scattered throughout P.E.I. A collection from St. Paul Island, originally referred to var. *comosa*, is considered to belong here.

Nfld. and Gaspe south to southeastern Maine.

26. LILIACEAE LILY FAMILY

The lily family comprises over 200 genera and 3500 species. The flowers are mostly regular, with 6 stamens, 3 petals, 3 sepals and a superior ovary. Trillium is the only plant without parallel-veined leaves; and Smilax is our only woody species. The tulip, hyacinth, lily and aloe are common ornamental plants. The Narcissus, or daffodil, belongs to the closely-related Amaryllis family.

a. Leaves all basal or nearly so, or absent at flowering time.
  b. Flowers 8-11 cm long, orange; leaves linear, 5-20 dm long (Fig. 51, d). 5. *Hemerocallis*
  b. Flowers much smaller, not orange; leaves less than 3 dm long.
    c. Flowers solitary, yellow, 2-3 cm long; leaves elliptical, mottled with purple (Fig. 51, f). 7. *Erythronium*

c. Flowers several to many, less than 2 cm long; leaves not mottled.
d. Leaves linear or else absent at flowering time.
e. Plants with a strong onion-like odor and taste; leaves fleshy; flowers numerous, in umbels. 4. *Allium*
e. Plants without a strong odor or taste; leaves grass-like; flowers not in umbels.
f. Flowers crowded in a short narrow raceme; top of the scape glutinous with dark glands. 1. *Tofieldia*
f. Flowers 3-8 in an open corymb; top of the scape smooth. 8. *Ornithogalum*
d. Leaves oval to elliptical, present at flowering time.
g. Flowers yellow, in a 3-6-flowered umbel; perianth parts separate (Fig. 51, e). 10. *Clintonia*
g. Flowers white, several in a one-sided raceme; perianth parts united (Fig. 53, c). 15. *Convallaria*
a. Leaves whorled or alternate upon the stem.
h. Plants herbaceous, not trailing or climbing.

Fig. 51.—**Uvularia.** a, plant, x 1/3. **Streptopus.** c, **S. roseus** x $\frac{1}{3}$. b, **S. amplexifolius,** x 1. **Hemerocallis.** d, flower, x $\frac{1}{4}$. **Clintonia.** e, plant, x 1/3. **Erythronium.** f, plant, x 1/3.

i. Leaves in one or more whorls upon the stem.
j. Whorls numerous; flowers 4-10 cm in diameter, orange spotted with brown (Fig. 52, a). 6. *Lilium*
j. Whorls one or two; flowers much smaller.
k. Leaves in two whorls, each whorl with 5-9 leaves; flowers yellow, incurved beneath the upper leaves (Fig. 52, b). 16. *Medeola*
k. Leaves 3, in a single whorl; flowers white to purple (Fig. 52, d-f). 17. *Trillium*

i. Leaves alternate upon the stem.
l. Flowers numerous, in a terminal inflorescence.
m. Flowers green; inflorescence 1-4 dm long; leaves oval, 1-3 dm long, plaited, clasping the stem; rare. 2. *Veratrum*
m. Flowers white; inflorescence rarely to 1 dm long; leaves much smaller, not plaited; common.
n. Perianth parts 6; leaves tapering to the base, 3-many (Fig. 52, c: 53, b). 11. *Smilacina*
n. Perianth parts 4; leaves heart-shaped at the base, 1-3 (Fig. 53, b). 12. *Maianthemum*
l. Flowers solitary or in 2's, terminal or scattered.
o. Flowers solitary to few on each plant, 15-45 mm long, yellowish, at first terminal then becoming lateral (Fig. 51, a). 3. *Uvularia*
o. Flowers numerous, much smaller.
p. Plants erect, 1-2 m high; stem finely branched, the smaller branches thread-like; leaves scales; flowers small, greenish-white. 9. *Asparagus*
p. Plants arching, 2-8 dm high; stem unbranched or forking; leaves lanceolate to oval, over 10 mm wide.
q. Flowers bell-like, borne singly on a jointed stalk or rarely in pairs from just below each leaf; root-stock without prominent scars (Fig. 51, b, c). 13. *Streptopus*
q. Flowers cylindrical, the parts joined, in pairs upon a forked peduncle from the leaf axils; root-stocks with prominent oval scars (Fig. 53, a). 14. *Polygonatum*
h. Plants trailing or climbing, woody and spiny; southwest N.S. only (Fig. 54, f). 18. *Smilax*

1. **TOFIELDIA** Huds.

1. **T. glutinosa** (Michx.)Pers. FALSE ASPHODEL

Collected but once, by W. G. Dore in peaty and boggy soil from the region of Cheticamp, Inverness Co.

Nfld. to Man. south to N.Y. & Ga.

2. **VERATRUM** L.

1. **V. viride** Ait. GREEN HELLEBORE

Reported but once, no specimen seen: west Halifax Co. (MacKay. N.S. Inst. Sci. 1904: 287).

Swamps, wet woods and low pastures; N.B. to Minn. south to Ga.

3. UVULARIA L.

1. **U. sessilifolia** L. Fig. 51, a. Map 186. BELLWORT

Rich woodland or alluvial soils, usually in shade but often growing out into open meadows and hay-fields in the center of the Province; Annapolis and Cumberland Cos. to Guysborough; not collected in C.B. in recent years. May 20-June 15.

N.S. to N.D. south to Ga.

4. ALLIUM L.

a. Flowers rose-colored; leaves linear and hollow, present at flowering time. 1. *A. Schoenoprasum*

a. Flowers white; leaves elliptic, 2-5 cm wide, appearing early and disappearing before flowering time. 2. *A. tricoccum*

1. **A. Schoenoprasum** L., var. **laurentianum** Fern. CHIVES

Prest reports it along wet, low land near the sea-shore or rivers; Macoun found it in meadows near the sea at Yarmouth. It is now rare and our specimens are from the shores of the Bay of Fundy and northern Inverness Co.: DeLap Cove on Brier Island, and Cap Rouge and Corney Brook. The garden plant is the introduced Eurasian species.

Var. **laurentianum** occurs from Nfld. to northern Ont. south to northern N.Y., on the West Coast, and in eastern Asia.

2. **A. tricoccum** Ait. WILD LEEK

Very local; luxuriant in large crowded beds in sugar maple woods on the top of Cape Blomidon and on intervales at Cambridge and Brooklyn Corner in Kings Co.; in a rich sugar maple intervale at Kemptown, Colchester Co.

N.S. to Minn. south to Ga.

5. HEMEROCALLIS L.

1. **H. fulva** L. Fig. 51, d. TAWNY DAY-LILY

An occasional escape from gardens; it is found in large clumps along rocky roadsides, especially in the Annapolis Valley; scattered throughout. It does not appear to be spreading by seed.

Intro. from Eurasia; N.S. to Ont. south to N.C.

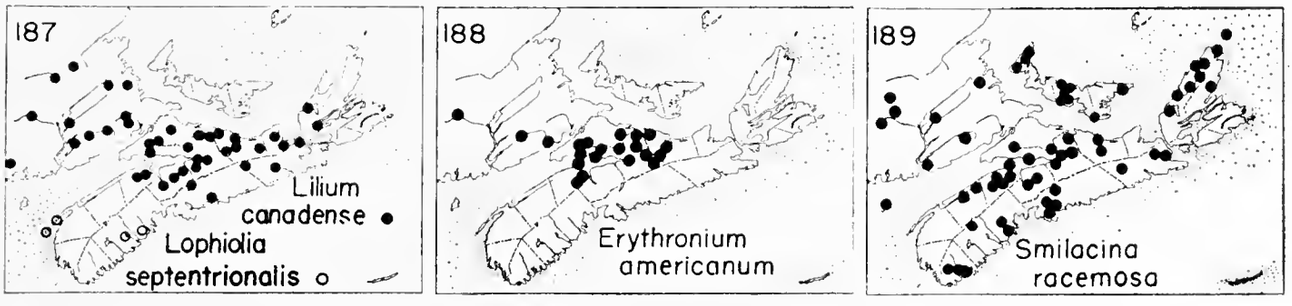
6. LILIUM L.

1. **L. canadense** L. Fig. 52, a. Map 187. CANADA LILY

Meadows and stream-banks from Kings and Cumberland Cos. to around Mabou in Inverness Co. This plant is now rare in most

parts of its range but may be common locally on some of the richer, less disturbed intervales.

N.S. to Minn. south to Ga.



7. ERYTHRONIUM L.

1. **E. americanum** Ker Fig. 51, f. Map 188. DOG'S-TOOTH VIOLET

Upland woods of beech and maple and along the edges of the intervales: Kings and Cumberland Cos. to the intervales of Pictou Co.; not yet found further east. It is local in eastern Kings Co. where it is best known around the Gaspereau Valley and on the North Mt.; very abundant on most of the intervales in north-central N.S. Mid May.

N.S. to Minn. south to Ga.

8. ORNITHOGALUM L.

1. **O. umbellatum** L. STAR-OF-BETHLEHEM

This slender garden perennial shows a tendency to escape around Yarmouth and neighboring regions; scattered around old dwellings. Early July.

Native of Eu.

9. ASPARAGUS L.

1. **A. officinalis** L. ASPARAGUS

Occasionally escaping to roadsides. In the Annapolis Valley it will persist for years in fields or orchards where it was once cultivated.

Native of Eu. and widely introduced.

10. CLINTONIA Raf.

1. **C. borealis** (Ait.)Raf. Fig. 51, e. CLINTONIA

Common throughout; deciduous or mixed woods. Early June. This is one of the most distinctive and best known plants of our spring flora.

Lab. to Man. south to Ga.

Fig. 52.—**Lilium.** a, top of plant, x $\frac{1}{4}$. **Medeola.** b, top of plant, x $\frac{1}{2}$. **Smilacina.** c, **S. racemosa**, x $\frac{1}{4}$. **Trillium.** d, **T. erectum**, x $\frac{1}{4}$. e, **T. cernuum**, x $\frac{1}{4}$. f, **T. undulatum**, x $\frac{1}{4}$.

11. **SMILACINA** Desf.

a. Flowers numerous, minute, in a panicle; divisions of the perianth 1-2 mm long; plants 4-8 dm high, arching from stout rootstocks; leaves numerous. 1. *S. racemosa*

a. Flowers few, larger, in a raceme; divisions of the perianth 3.5-5.5 mm long; plants 2-5 dm high, erect, from slender rootstocks.

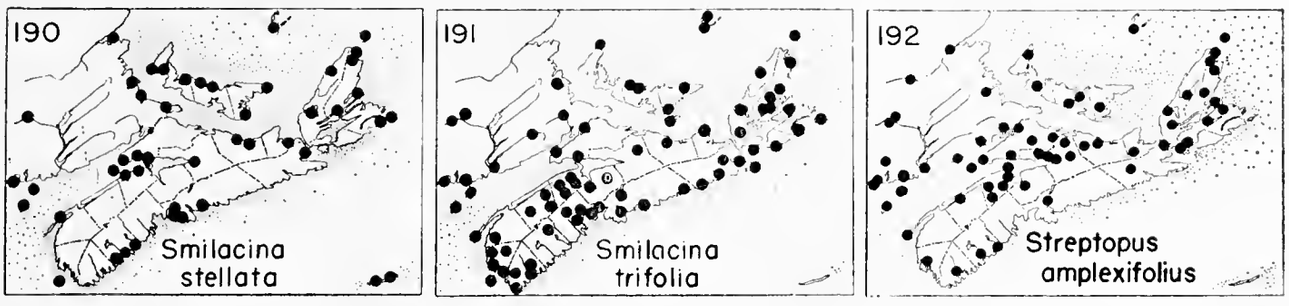
b. Leaves 7-12, glaucous, broad and sub-clasping at the base, raceme sessile or nearly so. 2. *S. stellata*

b. Leaves 2-4, not glaucous, tapering to a sheathing base; raceme stalked. 3. *S. trifolia*

1. **S. racemosa** (L.)Desf. Fig. 52, c. Map 189. FALSE SOLOMON'S SEAL

Scattered in open deciduous woods, along the edges of thickets and in clearing; rare in southwestern N.S., frequent northward. Forma **foliosa** Vict., Contrib. Inst. Bot. Univ. Montreal **14:** 15. 1929, is a minor form with the lower branch of the panicle in the axil of the upper leaf. Bridgewater, and probably throughout the range of the species.

N.S. to B.C. south to Tenn. & Ariz.



2. **S. stellata** (L.)Desf. Map 190. STARRY FALSE SOLOMON'S SEAL

Rather rare around the coast on headlands or in marshes and wet meadows. Early July.

Var. **crassa** Vict. is a stiff plant 1-4 dm high with very thick, heavy, more or less oval leaves closely crowded upon the stem. Occasional from Sable Is. and Queens Co.; northern C.B. on exposed headlands and slopes near the sea; around Bay St. Lawrence; at N. E. Cove on Scatari Island it grows on an exposed headland with the typical variety (Smith and Schofield, 1952). This variety is found from Southern Lab. and the lower St. Lawrence to Long Island Sound.

Lab. to B.C. south to Va. & Calif.; Eu.

3. **S. trifolia** (L.)Desf. Fig. 53, b. Map 191. THREE-LEAVED FALSE SOLOMON'S SEAL

Common in sphagnous bogs or wet meadows throughout; swamps, wet bogs and sphagnum mats in northern C.B., usually with the base of the plant buried in Sphagnum moss. June-July 15.

Lab. to B.C. south to N.J. & s. Alta.; Siberia.

12. **MAIANTHEMUM** Weber

1. **M. canadense** Desf. Fig. 53, d. WILD LILY-OF-THE-VALLEY

Common throughout in a great variety of habitats, one of the first plants to appear under conifers. Early June.

Lab. to Minn. south to the mts. of N.C. & Ga.

13. **STREPTOPUS** Michx.

Fassett, Norman C. A study of *Streptopus*. Rhodora **37**: 88-113. 1935.

a. Nodes glabrous; leaves clasping at the base, the margin of the blade smooth; flowers greenish-white; peduncles and pedicels smooth.
1. *S. amplexifolius*

a. Nodes fringed; leaves not clasping, the margins finely ciliate; flowers rose-purple; peduncles and pedicels ciliate.
2. *S. roseus*

Fig. 53.—**Polygonatum.** a, top of plant, and rootstock, x $\frac{1}{4}$. **Smilacina.** b, **S. trifolia,** x $\frac{1}{2}$. **Convallaria.** c, plant, x $\frac{1}{2}$. **Maianthemum.** d, plant, x $\frac{1}{2}$.

1. **S. amplexifolius** (L.)DC., var. **americanus** Schultes Fig. 51, b. Map 192. GREEN TWISTED-STALK

Scattered in moist deciduous or mixed woods, in ravines or on wooded intervales; rare in the southwestern counties, common from Annapolis to northern C.B. June. This is a variety of the southern European plant.

Greenland to N.Y. west to the Great Lakes; Alaska to N.M.

2. **S. roseus** Michx., var. **perspectus** Fassett Fig. 51, c. Map 193.

Scattered to common throughout; acid soils, coniferous and mixed woods and thickets. June. This is the northern variety.

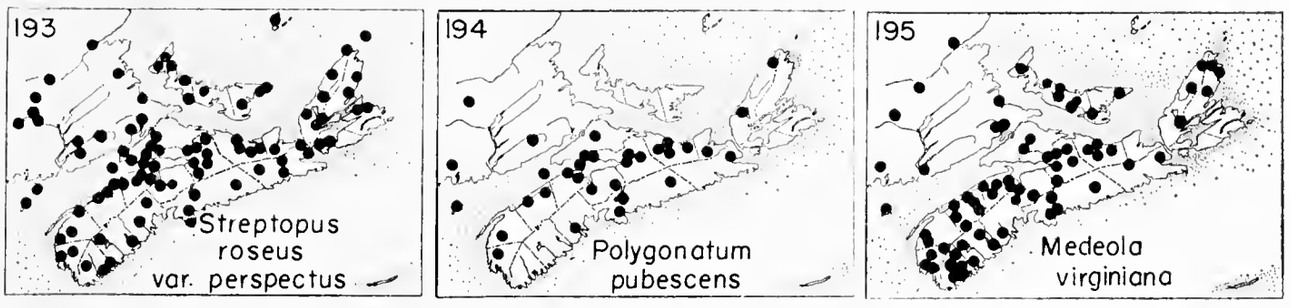
Lab. and Nfld. to Mich. south to Penn. & N.C.

14. **POLYGONATUM** Mill.

1. **P. pubescens** (Willd.)Pursh SOLOMON'S SEAL. Fig. 53, a. Map 194.

Rich deciduous wood; common from Annapolis to northern C.B. where two stations are known in Inverness Co.; absent in southern C.B. and rare in the southwestern counties, scattered elsewhere. It is found only in the richest woods, along the margins of intervales or in ravines. June.

N.S. to Man. south to S.C. & Ga.



15. CONVALLARIA L.

1. **C. majalis** L. Fig. 53, c. LILY-OF-THE-VALLEY

This introduced garden plant persists or spreads in patches near old houses, cemeteries, or occasionally along the roadsides in the southern parts of the Province. May.

Naturalized from Eu.

16. MEDEOLA L.

1. **M. virginiana** L. Fig. 52, b. INDIAN CUCUMBER-ROOT. Map 195.

Open deciduous woods, usually scattered and on well-drained slopes but areas have been seen with thousands of plants. It is common from Annapolis and Cumberland Cos. to northern C.B.; characteristic of rocky woods in the southwestern counties, rare from Halifax to Guysborough, and absent from southern Cape Breton Island.

N.S. to Minn. south to Fla.

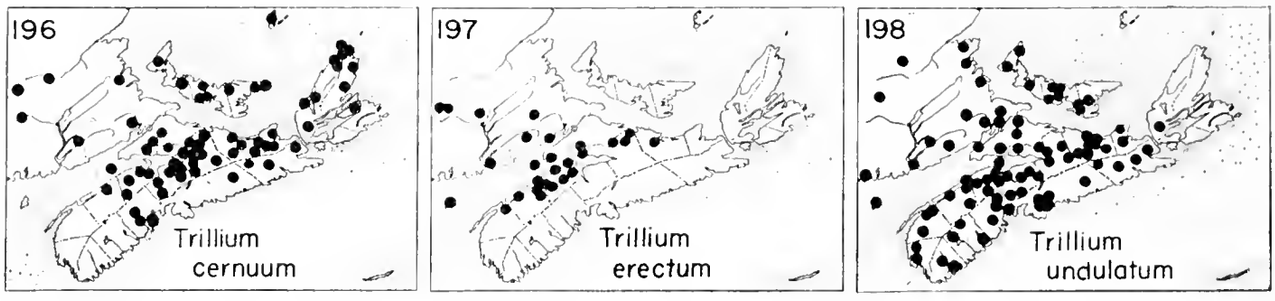
17. TRILLIUM L.

a. Leaflets tapering to the base and sessile, rounded at the tip and abruptly short-pointed.
  b. Flowers erect; dark-purple; ovary and fruit purplish. 2. *T. erectum*
  b. Flowers recurved down under the leaves on a short stalk, pale pinkish; ovary and fruit pale. 1. *T. cernuum*
a. Leaflets with definite petioles about 1 cm long, rounded at the base and tapering to a slender tip; flowers erect, the petals white with pink-striped bases. 3. *T. undulatum*

1. **T. cernuum** L. Fig. 52, e. Map 196. NODDING TRILLIUM

Alluvial soils, flood plains and deciduous climax forest; Annapolis and Lunenburg Cos. to Cumberland Co. and northern C.B. It is common on the rich intervales of Colchester and Pictou Cos., rare on the Atlantic side of the Province, and absent from the four southwestern counties. May 20-June 15.

Nfld. to Wisc. south to Ga.



2. **T. erectum** L. Fig. 52, d. Map 197. PURPLE TRILLIUM

Common along the hardwood slopes of the Annapolis Valley and east at least to Pictou Co. It is not found west of Digby nor has it been seen east of Pictou Co.

Forma **albiflorum** R. Hoffm. with whitish petals was reported by Macoun from the North Mt., Annapolis. Occasional among typical plants, alder thicket, North Side, Isle Haute (Schofield, 1955); and collected by J. S. Erskine at White Rock, Kings Co. A Halifax station is probably introduced.

N.S. to Ont. south to Ga.

3. **T. undulatum** Willd. Fig. 52, f. Map 198. PAINTED TRILLIUM

Open dryish to rather rich woods and intervales, often found on cut-over land. This plant is scattered throughout peninsular N.S. but there is only one collection from C.B.; hardwood forest north of Melford. May 20-June 20.

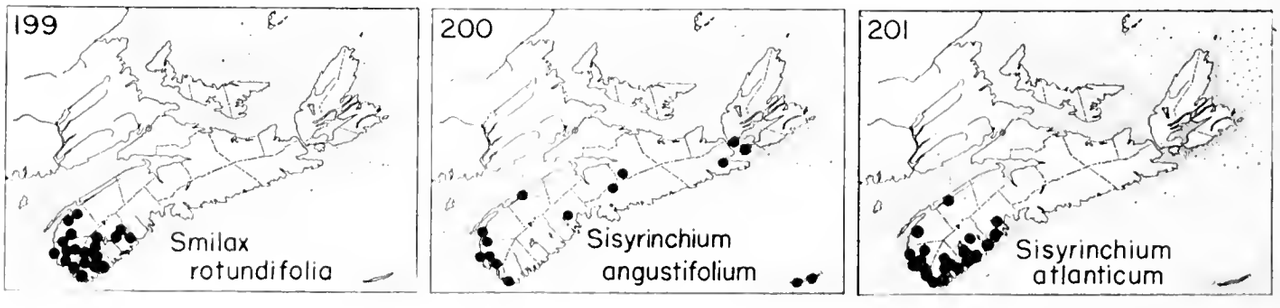
N.S. to Man. south to Ga.

18. SMILAX L.

1. **S. rotundifolia** L. Fig. 54, f. Map 199. GREEN or CAT BRIER

Thickets, bordering lakes and rivers, often growing in dense tangles over shrubs; frequent from Weymouth south through Yarmouth Co.; around the lakes and rivers of Shelburne County and along the Medway River in Queens. Var. *quandangularis* (Muhl.)Wood has the margins of the leaf minutely ciliate-spinulose, but this variety is probably not well-enough marked to recognize. Late June.

Fla. to Tex. north to N.S. and southern Mo.



27. HAEMODORACEAE BLOODWORT FAMILY

A small group of the southern hemisphere with only two species in the northern one; marsh plants to 8 dm high, with leaves long and narrow and flowers dingy-yellow, small and woolly, in a terminal repeatedly branched inflorescence.

a. Stamens 3, exserted; ovary inferior; inflorescence crowded, hemispherical, 3-6 cm wide. 1. *Lachnanthes*
a. Stamens 6, included; ovary mostly superior; inflorescence loosely cymose, 5-10 cm wide, usually longer than wide. 2. *Lophiola*

1. LACHNANTHES Ell.

1. **L. tinctoria** (Walt.)Ell. Map 186. Fig. 54, e. REDROOT

Very local; known only from the shores of Ponhook and Beartrap Lakes, Queens Co., where it was discovered by Weatherby (Rhodora **44:** 233. 1942). On the peaty shores or lake-side marshes on the

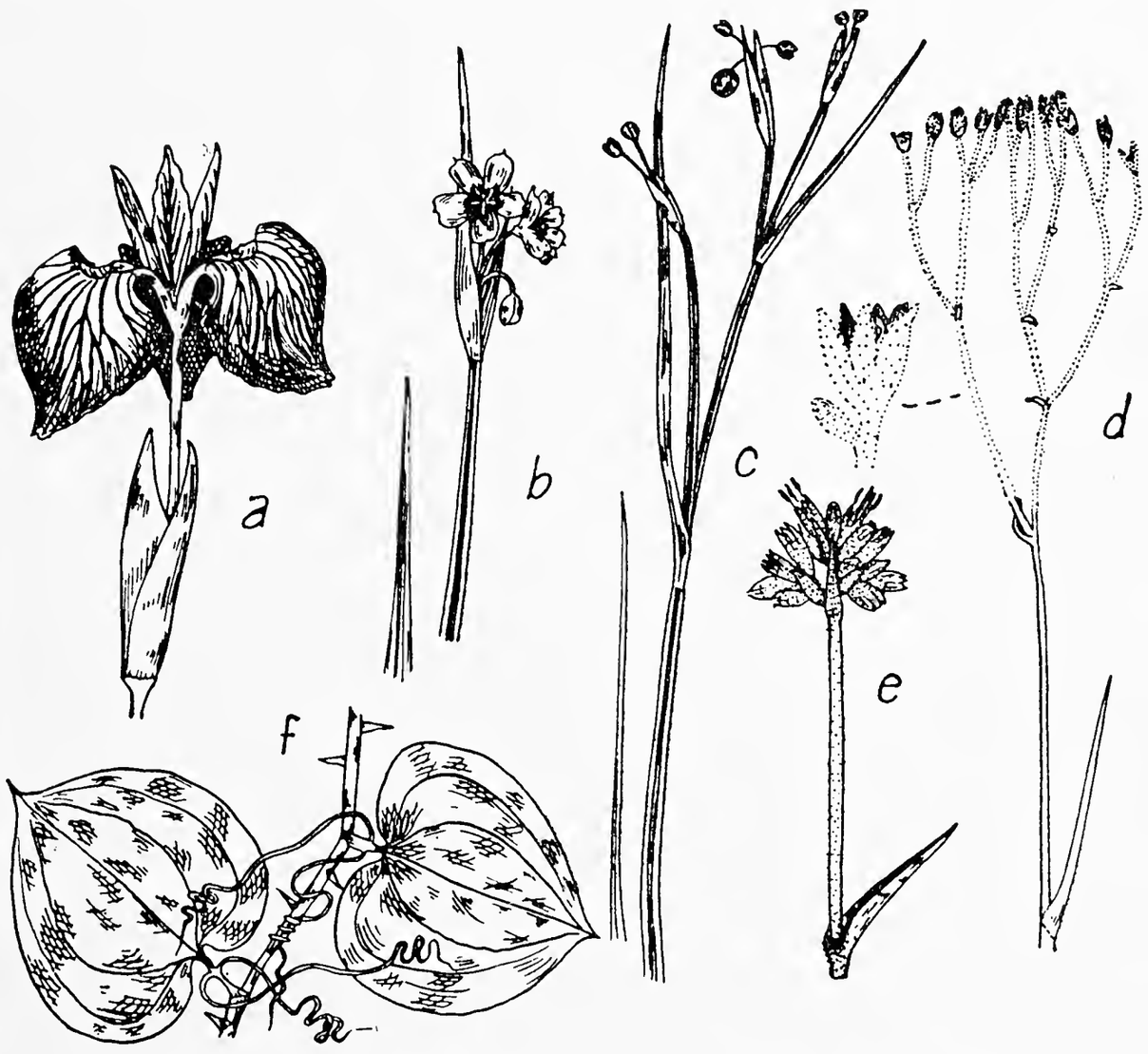


Fig. 54.—**Iris.** a, **I. versicolor,** flower, x 1/3. **Sisyrinchium.** b, **S. montanum,** top of plant, x ½. c, **S. atlanticum.** x ½. **Lachnanthes.** e, top of plant, x ½. **Lophiola.** d, top half, x ¼. **Smilax.** f, part of plant, x ½.

north side of Ponhook Lake it grows associated with *Scirpus Longii*. July-Sept.

Near the coast; N.S. and Mass. south to Fla., La. and Cuba.

2. LOPHIOLA Ker

1. **L. americana** (Pursh)Wood Map 187. Fig. 54, d. GOLDEN CREST

Rare and known from but four stations: common in wet savannahs along Little River, west of Tiddville, Digby Neck; scattered in a meadow, southern end of Brier Is.; scattered for miles along the shore of Ponhook L. in Queens Co.; and common in a sphagnous boggy swale bordering Fancy Lake in Lunenburg Co. Aug.-early Sept. The plant of Nova Scotia is sometimes considered a separate species under the name *L. septentrionalis* Fern. (See Rhodora **24:** 167. 1922; and **45:** 512. 1943).

N.S. and bogs in the pine barrens of N.J.

28. IRIDACEAE IRIS FAMILY

About 60 genera and 1400 species; widely distributed and best developed in South Africa. The cultivated Iris, Crocus and Gladiolus are members of this family. The showy flowers are regular and differ from those of the lily family in having an inferior ovary. The flowers of our species, except for the Yellow Iris, are a clear blue, although other colors prevail elsewhere.

a. Stem 1-5 dm high, winged; flowers less than 1 cm wide; plants with fibrous roots only. 1. *Sisyrinchium*

a. Stems 4-10 dm high, terete or nearly so; flowers 6-12 cm wide; plants with thick rootstocks. 2. *Iris*

1. SISYRINCHIUM L. BLUE-EYED GRASS

a. Spathe generally solitary and sessile on the culm; bracts composing the spathe unequal, the outer 2-6.5 cm long, the inner 1-3 cm long; stem 1.5-3 mm wide; pedicels the length of the inner bract or shorter (Fig. 54, b). 1. *S. montanum*

a. Spathes generally 2 or more, peduncled from the axil of a leafy bract; bracts of the spathe nearly equal; pedicels longer than the inner bract.

b. Old leaf-bases persisting as tufts of brownish, fibrous bristles; plant stiff, usually blackening on drying; stem 1-3 mm wide. 2. *S. arenicola*

b. Old leaf-bases, if persistent, not forming tufts of fibrous bristles; plants not so stiff, not blackening on drying.

c. Inner bract of the spathe 15-30 mm long; stem 2-4 mm wide, broadly winged; capsule 4-6 mm long. 3. *S. angustifolium*

c. Inner bract of the spathe 10-15 mm long; stem slender and narrowly winged, 1-3 mm wide, tall, flexuous and usually branched; capsule 2-4 mm long. 4. *S. atlanticum*

1. **S. montanum** Greene, var. **crebrum** Fern., Rhodora **48:** 159-160. Fig. 54, b. BLUE-EYED GRASS

Very common throughout; fields, meadows, roadsides and open woods. The stem may be occasionally branched. Late May-June. (*S. angustifolium* Mill. of earlier authors). The species is dubiously present in N.S.; this variety is more southern.

N.S. to Ont. and Minn. south to W. Va.

2. **S. arenicola** Bickn.

Rare; sandy plains or banks; Yarmouth, on sandy areas near Middleton and collected by J. S. Erskine at Parker's Cove in Annapolis Co.; on the shore of Grand Lake, Halifax Co.

Sandy areas near the coast; Fla. north to Mass. & N.S., rarely inland.

3. **S. angustifolium** Mill. Map 200.

Common from Yarmouth and Shelburne Cos. and scattered eastward in moist areas to Annapolis Co. and to southwestern C.B. It is abundant and the only member of the genus on Sable Is. Occasionally the plant may have quite simple scapes, thus appearing like *S. montanum*, but with paler blue flowers. (*S. gramineum* of earlier authors; *S. graminoides* Bickn.).

Tex. to Fla. and north to southeastern Nfld.; inland to Que. and Kans.

4. **S. atlanticum** Bickn. Fig. 54, c. Map 201.

Damp peaty, sandy or gravelly soil in grassy woods or in the open; common from Yarmouth and Shelburne Cos. and scattered eastward in moist areas to Annapolis Co.: North Mt., Belle Isle. This plant is often common in its area and is most easily recognized by its tall, branching, flexuous habit.

Miss. to Fla. and north to N.S. and southern Me.; rarely inland to Ohio.

2. **IRIS** L. IRIS

Some 200 species occur in the northern hemisphere; most abundant in Asia. The common garden bearded Iris is *Iris germanica* L.

a. Flowers blue; plant 1-8 dm high; capsule about 50 cm long.
  b. Capsule and ovary sharply angled; leaves long and linear, 3-7 mm wide; stem very slender, terete. 1. *I. prismatica*
  b. Capsule and ovary obtusely angled; leaves 5-30 mm wide; stem stout.
    c. Leaves 5-10 mm wide; stem slender, terete; petals tubular-pointed and one-quarter as long as the sepals; capsule blunt or barely tipped; seeds 2-3.5 mm wide, plump, with a prominent raphe or line up one side. 2. *I. Hookeri*

c. Leaves 5-30 mm wide; stem stout, angled on one side; petals flat, half as long as the sepals; capsule stout-beaked; seeds 4-6 mm wide, flattened on the side, the raphe not apparent. 3. *I. versicolor*

a. Flowers yellow; plant 10-15 dm high; capsules 50-70 mm long. 4. *I. Pseudacorus*

1. **I. prismatica** Pursh SLENDER BLUE FLAG

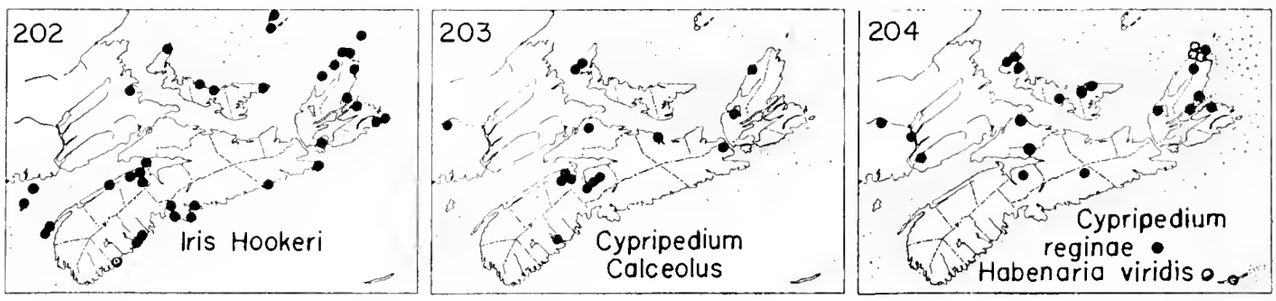
Reported by Macoun as abundant in meadows at Louisburg; not collected there in recent years and unknown elsewhere.

Wet ground near the coast: N.S.; southern Me. to Ga.

2. **I. Hookeri** Penny Map 202.

Found around the coast on beaches, exposed headlands and cliffs; common around C.B. and along the Bay of Fundy; scattered along the South Shore; very rare or absent on sandy shores as from the Strait of Canso to the N.B. border. (*I. setosa* Pall., var. *canadensis* Foster).

Lab. and Nfld. to the St. Lawrence R. and along the coast to Knox Co., Maine.



3. **I. versicolor** L. Fig. 54, a. BLUE FLAG

Common throughout; meadows, swamps, along streams and especially common in wet grazed pastures where it is a weed.

White-flowered plants are rare and are known as forma **Murrayana** Fern.: growing with typical plants in a swale at Auld's Cove, Guysborough Co. (Schofield and Smith, 1953); collected also by J. S. Erskine on Seal Island off southwestern N.S. June-July.

Lab. to Man. south to W. Va.

4. **I. Pseudacorus** L. YELLOW IRIS

Well naturalized about pools and ditches near Yarmouth; found at Arcadia about 50 years ago; Brier Island; and N.E. Margaree in Inverness Co.; to be expected elsewhere as a casual introduction. Late June-July.

Intro. from Europe; Nfld. to Minn. southward.

29. ORCHIDACEAE ORCHID FAMILY

This is a family of about 15,000 species widely distributed throughout the world. It is distinguished by the irregular flowers and inferior ovary. The three outer sepals are usually of the same texture as the

petals. One petal differs from the rest in shape and is termed the lip; this may also be prolonged behind as a spur.

a. Flowers showy with the lip moccasin-shaped, 2-5 cm long; fertile anthers 2 (Fig. 55, a). 1. *Cypripedium*
a. Flowers smaller; lip not moccasin-shaped, often fringed; fertile anther 1.
b. Flowers with spurs more than 2 mm long, numerous in erect loose or dense racemes (Fig. 55, b-d). 2. *Habenaria*
b. Flowers without conspicuous spurs.
c. Flowers showy, pink or rarely whitish, 1.5-4.5 cm long, 1-several on a stem.
d. Leaves elliptical or oval; flowers solitary and terminal (Fig. 56, e). 3. *Pogonia*
d. Leaves linear or reduced to sheaths only.
e. Flowers several in a raceme; perianth-parts separate; leaf solitary, linear (Fig. 56, d). 4. *Calapogon*
e. Flower solitary, terminal; perianth-parts joined at the base; leaves reduced to scales (Fig. 56, c). 5. *Arethusa*
c. Flowers less than 1 cm long, few to many, not normally solitary.
f. Leaves reduced to bracts; plant reddish or yellowish, without chlorophyll (Fig. 56, a, b). 9. *Corallorhiza*
f. Leaves linear to oval; plant with green chlorophyll.
g. Flowers in a narrow, spiral or one-sided raceme, greenish or white; sepals and petals, except for the lip, erect and forming a tube.
h. Lip not sac-shaped; leaves not variegated, oval and basal or linear and on the stem (Fig. 57, a, b). 6. *Spiranthes*
h. Lip sac-shaped; leaves basal, ovate to elliptical, variegated with white and green (Fig. 57, c). 7. *Goodyera*
g. Flowers very small, greenish to pale purplish, in a short open raceme; sepals and petals separate, usually spreading.
i. Leaves two, opposite and conspicuous.
j. Leaves near the top of the stem (Fig. 57, f, g). 8. *Listera*
j. Leaves basal, sheathing the stem (Fig. 57, e). 11. *Liparis*
i. Leaves solitary on the stem, ovate-elliptical (Fig. 57, d). 10. *Malaxis*

1. CYPRIPEDIUM L. LADY'S-SLIPPER

a. Plants leafy-stemmed; flowers 1-2, rarely several; lip of slipper with a roundish opening at the top.
b. The three sepals separate; lip almost triangular in side view, strongly netted with pink. 1. *C. arietinum*
b. The lower two sepals united; lip oval, not strongly netted.
c. Lip yellow, shorter than the sepals; sepals and petals linear-lanceolate, brownish and acute.
d. Lip 2-3 cm long; sepals purplish-brown. 2. *C. Calceolus* var. *parviflorum*
d. Lip 3.5-5 cm long; sepals paler and shorter. *C. Calceolus* var. *pubescens*
c. Lip white, flushed with purple; sepals and petals greenish-white, broad and obtuse. 3. *C. reginae*
a. Plant with two basal leaves only; flowers solitary; lip white or pink, split along the top. 4. *C. acaule*

1. C. arietinum R. Br. RAM'S-HEAD LADY'S-SLIPPER

Discovered by J. S. Erskine growing in clumps in broken country of gypsum sinkholes and thin poplar scrub one-quarter mile south of

the gypsum quarries at Wentworth, Hants Co. (Erskine, J. S., 1954). Later found by J. S. and D. S. Erskine on the shaded top of a gypsum cliff at Ste. Croix. In full bloom May 24.

N.S. and s. Que. to Man. south to Mass. & Wisc.

2. **C. Calceolus** L., var. **parviflorum** (Salisb.)Fern. Map 203. YELLOW LADY'S-SLIPPER

This is an Eurasian plant with three eastern N.A. varieties. Var. *parviflorum* is rather rare: rich or calcareous soil, often near outcrops of gypsum or limestone in the Windsor-Brooklyn area, sparingly east to C.B. and west to Kings Co., occasionally in rich woods. Nfld. to B.C. south to Ga. & N.M.

Var. **pubescens** (Willd.)Correll is a larger extreme scarcely separable from the species. Most of the specimens seen seem to belong to the smaller variety but collections from Gore and Sweet's Corner, Hants Co. and Chipman Brook in King's Co. are placed here. June 1-June 20.

N.S.; Me. to Minn. south to Ga.

3. **C. reginae** Walt. Map 204. SHOWY LADY'S-SLIPPER

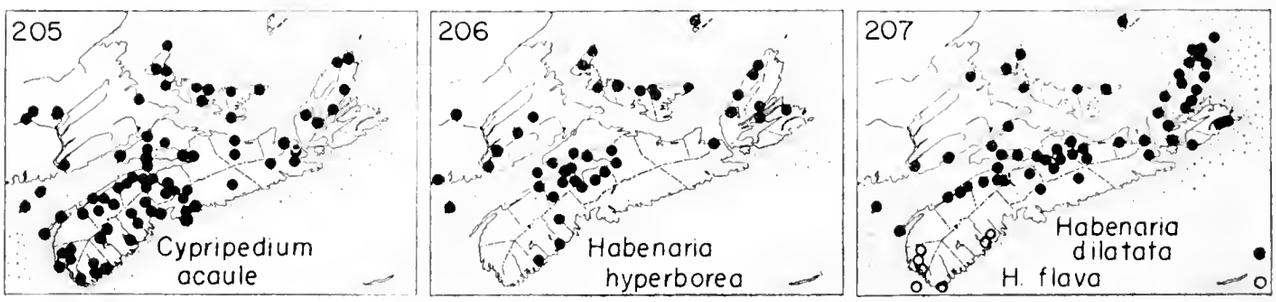
Rare and local but widely scattered from Hants Co. to northern C.B.; reported by MacKay as often abundant in tamarack swamps, Pictou; swamps and alkaline bogs in western and central C.B. where it is occasionally very abundant (Smith and Erskine, 1954); occasionally found or said to occur elsewhere in alkaline areas in central N.S. and C.B.

Nfld. to Man. south to Ga. and Mo.

4. **C. acaule** Aito. Map 205. Fig. 55, a. COMMON LADY'S-SLIPPER

Scattered throughout; often abundant in acid soil in dry or moist woods. It is characteristic of the pine woods in the Annapolis Valley where scattered individuals are usually present. The white-flowered form has been named forma **albiflorum** Rand & Redfield. This is often found growing with the pink-flowered plants. Early June.

Nfld. to n. Alta. south in the mts. to N.C. & Tenn.



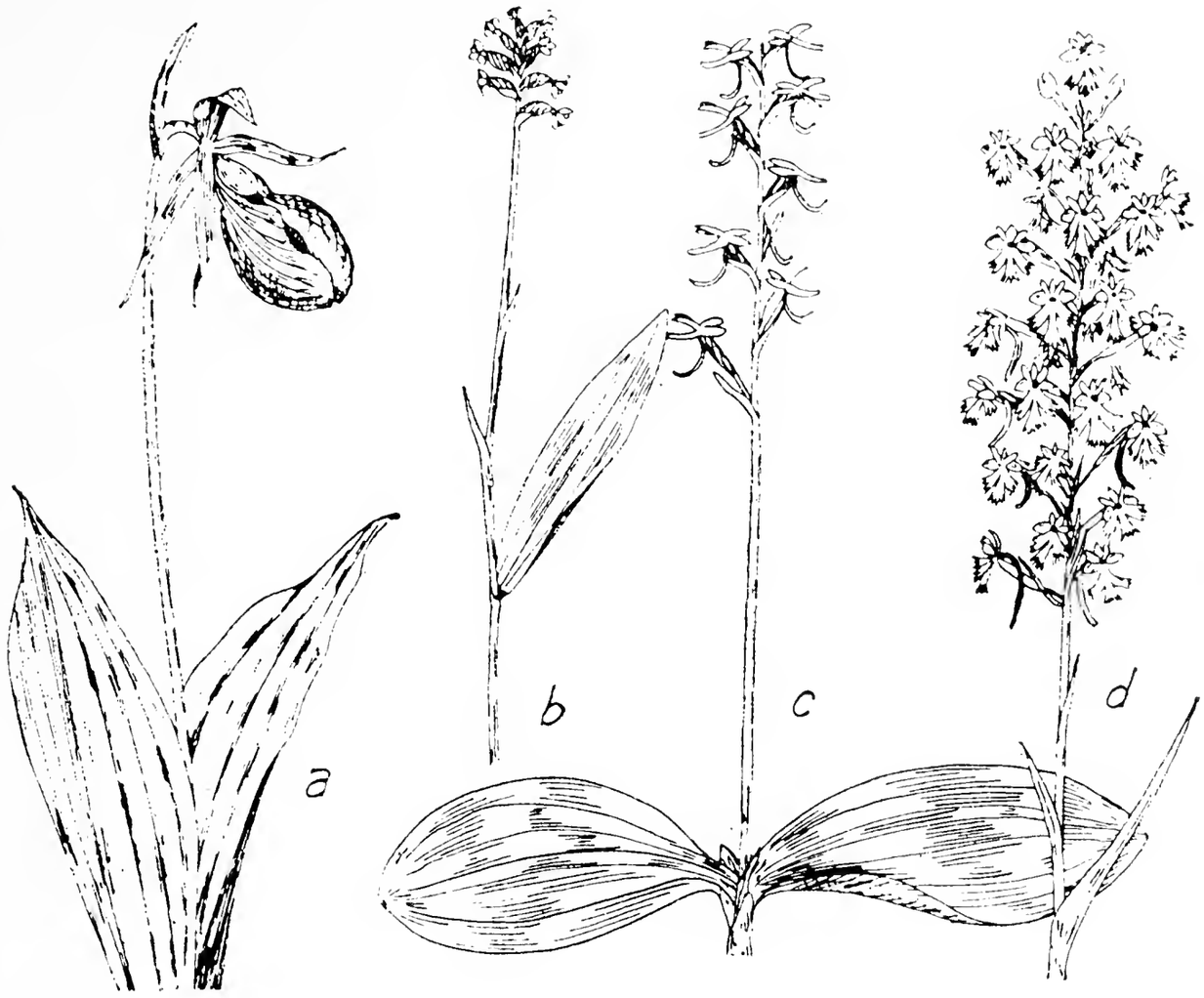


Fig. 55.—**Cypripedium.** a, **C. acaule,** x 1/3. **Habenaria.** b, **H. clavellata,** x 1/3. c, **H. Hookeri,** x 1/3. d, **H. psycodes,** x 1/3.

2. **HABENARIA** Willd. FRINGED ORCHID

This is a nearly world-wide genus with some 400 species. The erect, unbranched plants with the racemes of numerous greenish, white or purple flowers are common during the summer in a variety of habitats.

a. Lip not fringed.
  b. Leaves scattered on the stem.
    c. Leaves several to numerous, at least more than 2.
      d. Lip oblong, truncate, the apex with 2 or 3 terminal teeth or smooth.
        e. Lip 3-toothed at the apex; spur 1-3 mm long, shorter than the lip; lower bracts of the inflorescence greenish and much longer than the flowers. 1. *H. viridis*
        e. Lip truncate; spur slender, 4-6 mm long, longer than the lip.
          f. Leaves narrow and mostly elliptic, rapidly reduced in size upwards on the stem; raceme rather open with only the lowest bracts exceeding the flowers. 3. *H. flava*
          f. Leaves wider and stouter, scarcely attenuate, gradually reduced in size up the stem; raceme more compact with the floral bracts longer, the lower often much exceeding the flowers. *H. flava* var. *herbiola*
      d. Lip lanceolate to linear, the apex entire, subacute or rounded; bracts little, if at all, longer than the flowers.

g. Flowers greenish-white, scarcely fragrant; lip not dilated at the base. 4. *H. hyperborea*

g. Flowers white, fragrant; lip widened at the base abruptly. 5. *H. dilatata*

c. Stem-leaves 1 or 2; lip truncate, 2-3-toothed at the apex; bracts shorter than the 3-16 flowers; raceme short and cylindrical with yellowish-white flowers. 2. *H. clavellata*

b. Leaves basal, oblong to orbicular, spread flat on the ground or rising from the base of the plant.

h. Leaves 2, oval or orbicular; spur nearly twice as long as the lip.

i. Lip lanceolate, 1 cm long; spur 18-20 mm long; scape bractless. 6. *H. Hookeri*

i. Lip linear, 1.5-2 cm long; spur 18-40 mm long; scape bracted; leaves large.

j. Spur 1.8-2.5 cm long; leaves orbicular, 6-19 cm broad. 7. *H. orbiculata*

j. Spur 2.5-4 cm long; leaves larger and more elliptical, the whole plant generally larger. 8. *H. macrophylla*

h. Leaf solitary, obovate or oblong, erect with the base clasping the stem; spur about 6 mm long, equal in length to the lip. 9. *H. obtusata*

a. Lip fringed.

k. Body of the lip oblong and fringed along the sides and apex; flowers pure white. 10. *H. blephariglottis*

k. Body of the lip 3-parted.

l. Flowers greenish or whitish, rarely with a tinge of purple; divisions of the lip cut into capillary segments or finely fringed. 11. *H. lacera*

l. Flowers purple or lilac; divisions of the lip fan-shaped, fringed at the truncate ends.

m. Inflorescence 2.5-4 cm wide; lip 1-1.3 cm wide; flowers deep purple; lip cut less than one-third their depth 12 *H. psycodes*

m. Inflorescence 5-8 cm wide; lip 1.8-2.5 cm wide, more deeply fringed; flowers paler, lilac. 13. *H. fimbriata*

1. **H. viridis** (L.)R.Br., var. **bracteata** (Muhl.)Gray Map 204.

Rare, found in boggy spots on Sable Is.; characteristic of only the richest hardwoods on the mainland and on C.B. Island where it is rarely abundant but is found in scattered stations: abundant in deciduous forest, Lockhart Brook; and occasional in rich intervale forest at N. Aspy River and in fir forest at Cape St. Lawrence (Smith and Erskine, 1954).

Nfld. to Alta. south to S.C. and Iowa; eastern Asia.

2. **H. clavellata** (Michx.)Spreng., var. **ophioglossoides** Fern. Fig. 55, b.

Common in bogs, poorly- or well-drained swamps, and damp soil throughout. Late July-Aug.

Nfld. to Minn. and, as the typical variety, south to Fla.

3. **H. flava** (L.)R.Br. Map 207.

Restricted so far as known to the river systems of the Tusket in Yarmouth Co. and the Medway in Queens; pebbly, sandy or gravelly

beaches or wet peaty margins of lakes and rivers in the Tusket Valley (Fernald, 1921); scattered on the pebbly strand of the Medway (Weatherby). Tex. and Fla. north to N.J. & N.S.

Var. **herbiola** (R.Br.) Ames & Correll is the wide-ranging inland plant; scattered, Boylston, Guys. Co.; Cheticamp, Inverness Co.; low ground by the Gaspereau R., Kings Co.; and field near Middleton (D. S. Erskine, 1951).

J. F. Donly has noted a few plants of the species around a little lake near Italy Cross, Lunenburg Co. and mentions specimens collected from the vicinity of Sable River by H. F. Lewis. His interesting observation is that the plants of the Tusket are consistently smaller in size than those of the Medway and that a series of plants collected along the Medway shows plants typical of both the typical species and the variety.

N.S. to Ont. south to N.C. & Mo.

4. **H. hyperborea** (L.)R.Br., var. **huronensis** (Nutt).Farw. Map 206. GREEN HABENARIA

Intervales, wet meadows, bogs and swamps from Annapolis and Queens Cos. to C.B.; not seen by the Gray Herbarium Expedition in the southwestern counties; never as common as the next species. The variety is the more southern type.

Greenland to Alaska south to N.Y., Ill. & Ore.

5. **H. dilatata** (Pursh)Hook. Map 207. WHITE BOG-ORCHID

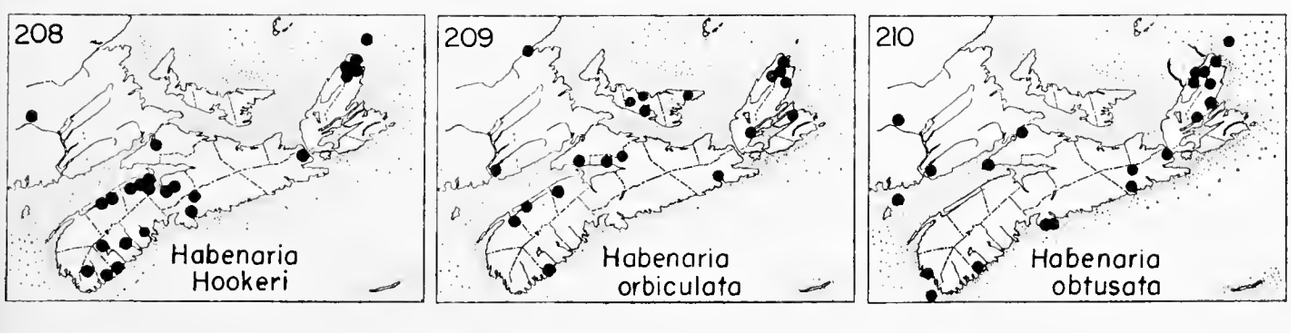
Common and often abundant from Digby Neck to northern C.B. where it is characteristic of wet cliff shelves; elsewhere growing in situations similar to that of the preceding species. It shows a wide variety of habitats, both in sun and shade, often growing up through the grasses and sedges along streams and rivers where there is an open soil and adequate moisture. July-Aug.

Lab. to Alaska south to N.J., Mich. & Calif.

6. **H. Hookeri** Torr. Fig. 55, c. Map 208.

Scattered in many part of the Province, rarer and more local in the southwestern counties; mixed woods or more frequently under conifers. June-July.

N.S. to Minn. south to Penn. and Iowa.



7. **H. orbiculata** (Pursh)Torr. Map 209.

Scattered in the northern parts of the Province, either under coniferous or deciduous forest; characteristic of the coniferous forest in C.B.; spruce woods, Port L'Herbert (Donly).

Nfld. to Alaska south to Penn. and the mts. of N.C.

8. **H. macrophylla** Goldie

Rich deciduous or mixed woods; rare and scattered along the northern part of the Province from Hants and the Cobequids to northern C.B.; perhaps merely a larger, long-spurred extreme of the preceding species, with the large size of the plant due to the favorable environment in which it grows. Aug.

Nfld. to Wisc. south to Conn.

9. **H. obtusata** (Pursh)Richards. Map 210.

Damp mossy coniferous woods in the coastal forest and at higher altitudes; scattered to common in eastern N.S., becoming rarer to the southwestern counties where it is local and often very rare. July-Aug.

Nfld. to Alaska south to N.Y., Minn. and Colo.

10. **H. blephariglottis** (Willd.)Hook. WHITE FRINGED-ORCHID Fig. 56. Map 211.

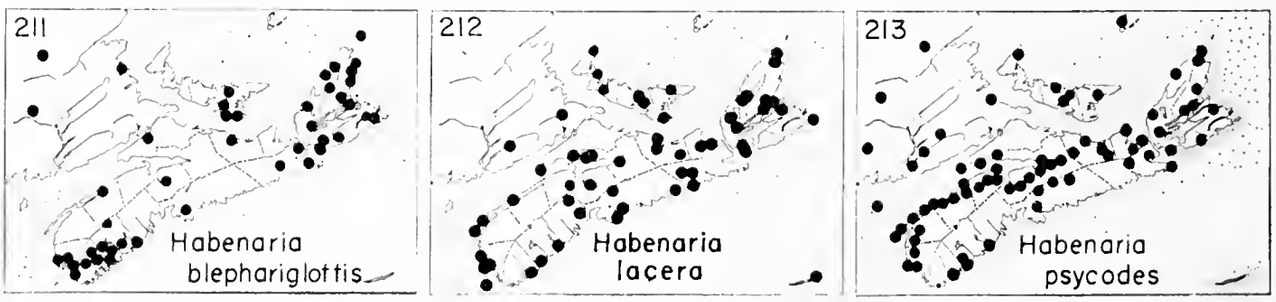
This is one of our most attractive smaller plants. It grows on boggy or even dryish barrens and in peaty hollows: common to abundant in Yarmouth and Shelburne Cos.; rare throughout the rest of the mainland; characteristic of mature bogs in C.B. Fernald (1921) states that it occurs over the gold-bearing series or strata but not on the granitic areas. July-Aug.

Nfld. to Minn. south to S.C.

11. **H. lacera** (Michx.)Lodd. Fig. 56. Map 212. RAGGED FRINGED ORCHID.

Common throughout; meadows, damp fields, bogs and poorly drained clay soils; occasional in the damp dune hollows and turfy banks on Sable Is. July-Aug. Nfld. to Mich. south to Ala. & Tex.

Var. **terrae-novae** Fern. is described as a smaller plant with smaller flowers with the lip to 1 cm long and shallowly fringed and with the color varying from a yellow-white through bronze to pinkish or even



purple. According to the author it is the only form on Sable Is. (Rhodora **48:** 185. 1946) and the pinkish tinge of some Cape Breton plants indicates an intermediate characteristic. This variety does not seem to be too distinctive.

X. **H. Andrewsii** M.White is a hybrid between *H. lacera* and *H. psycodes*. J. F. Donly notes that: "A short stretch of roadside ditch at West Berlin, Queens County, in the summer of 1962 supported the following plants; both typical specimens of the ragged and small purple fringed, pure white plants of the latter and plants with all degrees of intermediate shades and extent of lip laceration, as above. Also one plant of a most beautiful deep claret color".

Fig. 56.—**Corallorhiza.** a, **C. maculata,** x 1/3. b, **C. trifida,** x ½. **Arethusa.** c, plant, x ½. **Calapogon.** d, plant, x ½ **Pogonia.** e, plant, x ½. **Habenaria.** flowers, x 2.

12. **H. psycodes** (L.)Spreng. Fig. 55, d. Map 213. PURPLE FRINGED ORCHID

Common in damp meadows and hummocks in or along the edges of bogs throughout, often growing in dense masses. Late July-Aug. Intermediate forms between this and the next species occur and the following one is sometimes treated as a variety of *H. psycodes* as var. *grandiflora* (Bigel.)Gray. Forma **albiflora** (Bigel.)Hoffm., with white flowers, has been found growing among typical individuals in an alder swamp near Cape North Village and a roadside ditch, West Berlin, in Queens Co. Plants intermediate between the typical magenta-flowered and white-flowered plants were frequent (Schofield and Smith, 1953).

Nfld. to northern Ont. south to Ga.

13. **H. fimbriata** (Ait.)R.Br. Fig. 56. Map 214. FRINGED-ORCHID

Often found growing with the preceding species and with some collections difficult to identify. It is more restricted to rich intervale soils, wet meadows, borders of swamps and along streams, mostly in the north-central part of the Province and very rare in the southwestern region.

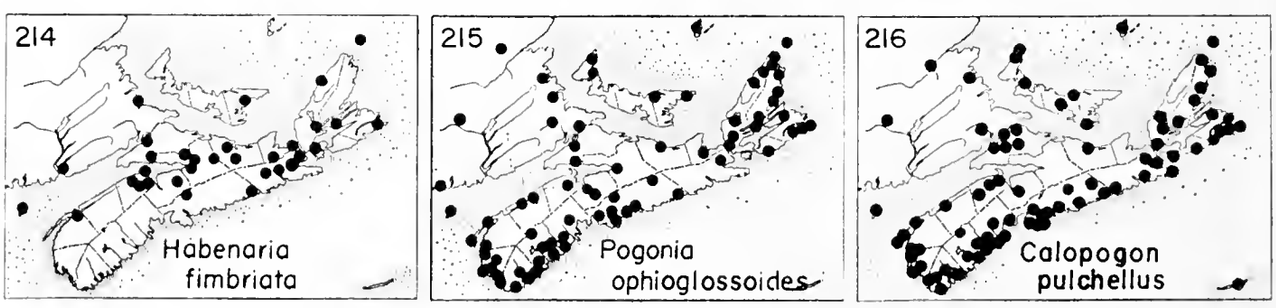
Nfld. to n. Ont. south to Ga.

3. POGONIA Juss. ROSE POGONIA

1. **P. ophioglossoides** (L.)Ker Fig. 56, e. Map 215.

Mature peat bogs, old meadows, river-banks and lake shores; often growing in profusion along the Atlantic Coast and in northern C.B.; scattered elsewhere. Var. **brachypogon** Fern., Rhodora 23: 245. 1921, is described as having the fringe of the lip almost absent or of very short knobs, the segments of the perianth scarcely divergent, and as growing more or less in clumps: around the gravelly shores of lakes in southern Yarmouth and Digby Cos., in many cases transitional to the typical form as are also some of the plants of Nfld. and the Magdalens. July.

Nfld. to Minn. south to Fla.



4. CALAPOGON R. Br.

a. Leaves linear, grass-like, shorter than the flowering stalk. 1. *C. puchellus*
a. Leaves oblong- or elliptical-lanceolate, 7-11 cm long, 1.3-2.8 cm wide, equalling or over-topping the scape; plant to 2 dm high. *C. puchellus* var. *latifolius*

1. **C. puchellus** (Salisb.)R.Br. Fig. 56, d. Map 216. CALAPOGON

Mature bogs and swamps; one of the most characteristic plants of bogs in the western part of the Province, even those at the edge of the sea; frequent in dune hollows on Sable Is.; scattered elsehwhere and in cranberry bogs in the Annapolis Valley. July. Forma **albiflorus** (Britt.)Fern. has the flowers white instead of magenta-crimson. Rare: sandy and peaty margin of Lake Annis, Yarmouth Co., a single plant (Fernald, 1921); since found at Mooseland, Halifax Co., wet bog at Goldboro, Guysborough Co., and rare in a bog north of Arichat, Richmond Co., in several cases growing with the typical form and pale-flowered intermediates (Schofield and Smith, 1953). Nfld. to Minn. south to Fla.

Var. **latifolius** (St. John)Fern. is found in wet dune hollows on Sable Island; Peggy's Cove; and also on the Magdalen Islands.

5. ARETHUSA L.

1. **A. bulbosa** L. Fig. 56, c. Map 217. ARETHUSA

Much less common than the two preceding species; bogs, generally in more acid peat; around the coast of the Province and rarely very far inland. The white form, forma **albiflora** Rand & Redfield, was collected by Smith et al.: a single colony among typical plants in a bog on Brier Island. July-Aug.

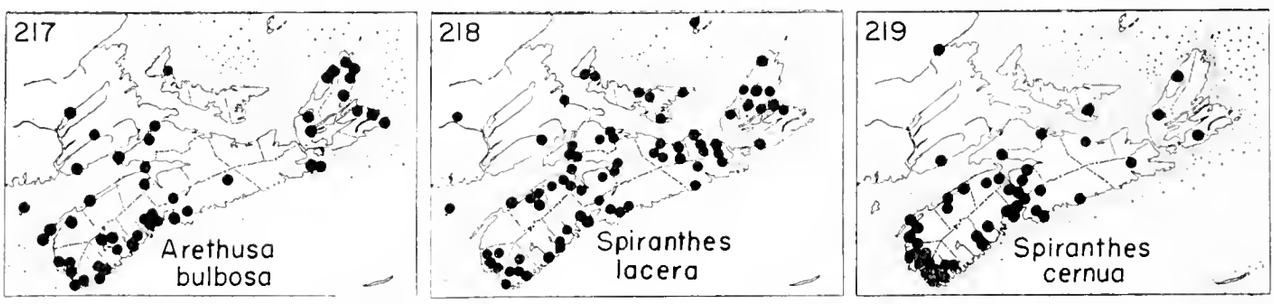
Nfld. to Minn. south to Penn. and the mts. of S.C.

6. SPIRANTHES Richard LADIES'-TRESSES

Small, erect plants with tubular flowers arranged in one or three spirals around the stalk (Fig. 57, a, b).

a. Stem slender, leafless; leaves basal and ovate, soon disappearing; flowers 5 mm long; raceme slender and often one-sided, the flowers in one row. 1. *S. lacera*
a. Stem stout, leafy, at least towards the base; leaves linear to widely lanceolate; flowers 5-12 mm long, in three rows so that the raceme is not one-sided.
b. Lip squarish, blunt, yellow, with small oblong growths on the margin at the base; leaves lanceolate to oblong, about 1 cm wide; flowering early July. 3. *S. lucida*
b. Lip ovate-oblong, scarcely squarish and less blunt; growths at the base round or nipple-shaped or wanting; leaves linear or linear-lanceolate.

c. Lip not constricted below, with the growths at the base prominent and about 0.5 mm long; lateral sepals not joined to the hood and not upturned so that the flower-parts are not plainly tubular; beak of the stigma very long and slender; flowering late summer.
  d. Flowers white; floral bracts exceeding the ovary by about half the length of the perianth; odor fragrant. 2. *S. cernua*
  d. Flowers whitish-yellow to greenish; floral bracts elongated; odor disgusting; flowering slightly later. *S. cernua* var. *ochroleuca*
c. Lip constricted below the apex so that there is a round terminal lobe at the tip; growths at base minute or lacking; lateral sepals upturned and joined with the petals and upper sepal so that the perianth parts are tube-like; beak of stigma short; flowering late August. 4. *S. Romanzoffiana*



1. **S. lacera** Raf. Fig. 57, a. Map 218. LADIES'-TRESSES

Scattered throughout, more common in sandy or gravelly soil, barrens, railroad cuttings, edges of woods and open coniferous or mixed woods or brush. (*S. gracilis* (Bigel.)Beck). Late July-Aug.

N.S. to the MacKenzie south to N.C., Tenn. & Okla.

2. **S. cernua**(L.)Richard Fig. 57, b. Map 219. NODDING LADIES'-TRESSES

Boggy meadows, low hayfields, and seepy slopes and pastures, sandy shores of lakes; throughout, generally scattered, often abundant on seepy slopes of the Annapolis Valley, rare in eastern N.S. Late Aug.-Oct.

Var. **ochroleuca** (Rydb.)Ames is often difficult to separate from the species; characteristic of the driest of siliceous barrens in southwestern N.S. (Fernald, 1921); Donly states that he finds it in Queens Co. generally near river or stream banks. It is found in the same general range as the species.

N.S. to Minn. and Nebr. south to Fla .& Tex.

3. **S. lucida** (H. H. Eat.)Ames SHINING LADIES'-TRESSES

Rare; mentioned by Lindsay from Windsor and Halifax. Robinson found it between Margaree and Cheticamp; and it was found on the grassy hillsides along Cape George, Antigonish Co. in flower July 11, 1941. More recent locations are: muddy lake shore, Loch Lomond, Richmond Co., and river bank, River John, Pictou Co.

N.S. to Wisc. south to Va.

Fig. 57.—**Spiranthes.** a, **S. lacera,** x $\frac{1}{2}$. b, **S. cernua,** x $\frac{1}{2}$. **Goodyera.** c, **G. tesselata,** x $\frac{1}{2}$. **Malaxis.** d, plant, x $\frac{1}{2}$. **Liparis.** e, plant, x 1/3. **Listera.** f, **L. cordata,** x $\frac{1}{2}$. g, **L. convallarioides,** part of plant, x $\frac{1}{2}$.

4. **S. Romanzoffiana** Cham. Map 220. HOODED LADIES'-TRESSES

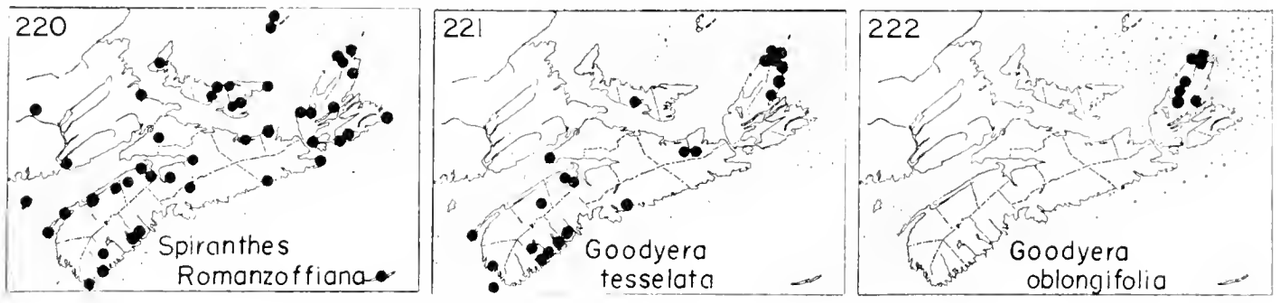
Scattered in wet fields, bogs, damp hollows and seepy banks throughout the whole Province; rare in damp boggy spots on Sable Island. Late July-Sept. X *Spiranthes Steigeri* Correll is a supposed hybrid between this species and *S. cernua,* with one of two records being from Yarmouth Co.

Nfld. to Alaska south to Penn., Ia. and Calif.

7. GOODYERA R.Br. RATTLESNAKE-PLANTAIN

The wide leaves in a basal rosette are veined with white to give a snakeskin-like appearance.

a. Inflorescence loose, often one-sided; plants rarely over 25 cm high, with leaves 1-7 cm long and plainly reticulate-veined with white; perianth 4.5 mm long.
b. Flowers in a 1-sided raceme 3-7 cm long; perianth about 4 mm long; leaves small, 1-3 cm long, widest near the base and often with the sides straight to an acute tip; lip deeply saccate with a strongly downward recurved tip. 1. *G. repens*
b. Flowers in a loose spiral raceme 6-8 cm long; perianth 5 mm long; leaves usually rounded-tapering from the middle to each end; lip less deeply saccate, the tip nearly straight. 2. *G. tesselata*
a. Inflorescence dense; plants large, usually 20-40 cm high, with leaves green, often with the midrib lined with white, 5-10 cm long; perianth 8-10 mm long. 3. *G. oblongifolia*



1. **G. repens** (L.)R.Br., var **ophioides** Fern. CREEPING RATTLESNAKE-PLANTAIN

Mostly rare and local although possibly of wider distribution: collections were seen from Isle Haute in the Bay of Fundy, and from Moose Island and Three-Sisters in Cumberland Co., by Schofield; two stations in Inverness Co., Glendyer and St. Paul Island; and two collections by Donly in Queens Co. It is reported by Rousseau as rather frequent in dry woods of eastern Halifax and Guysborough Cos. Its distribution seems to be near the coast in damp mossy woods.

This more southern variety of the American-Eurasian species ranges from Nfld. to Alaska south to N.Y. and N.C.

2. **G. tesselata** Lodd. Fig. 57, c. Map 221.

Local and scattered; Greenville, Yarmouth Co. (Fernald, 1921); coniferous or pine woods of the Annapolis Valley; scattered in moist coniferous woods and more common in northern C.B. Aug.

Nfld. to Man. south to N.Y.

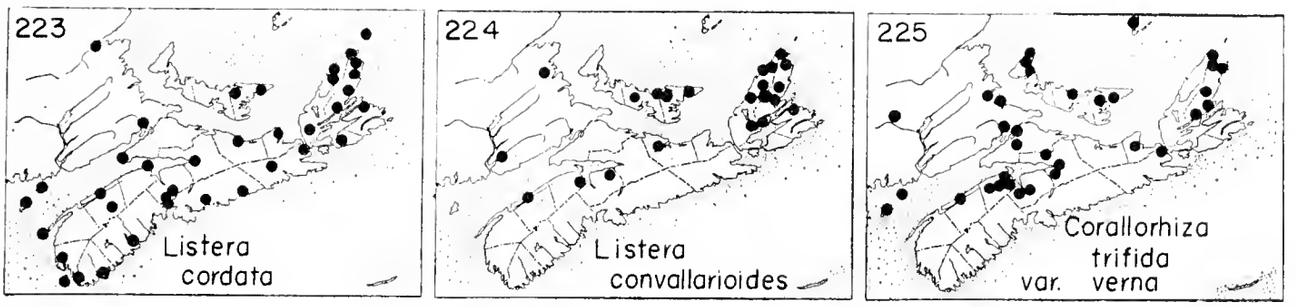
3. **G. oblongifolia** Raf., see Fernald, Rhodora 48: 11. 1946. Map 222. WESTERN RATTLESNAKE-PLANTAIN

Known here only from northern C.B. where it is scattered in the deciduous climax or damp mixed forests on slopes and in ravines. (*E. decipiens*).

C.B. to Gaspe and n. Maine; head of Lake Superior; B.C. to Calif.

8. **LISTERA** R. Br. TWAYBLADE

a. Flowers small, the lip 3-5 mm long and deeply cleft into two spreading prongs; pedicel shorter than the ovary; leaves 12-25 mm long. 1. *L. cordata*
a. Flowers larger, the lip 9 mm long, narrowed at the base and shallowly cut into wide-spreading rounded lobes; leaves 20-60 mm long. 2. *L. convallarioides*



1. **L. cordata** (L.)R. Br. Fig. 57, f. Map 223.

Occasional in damp woods, in coniferous forests or in wet ravines throughout, becoming commoner near the coast and characteristic of northern C.B.; inconspicuous and often overlooked. Early June-Sept.

Greenland to Alaska south to N.J., N.C. and Calif.

2. **L. convallarioides** (Sw.)Nutt. Fig. 57, g. Map 224.

Rare from Annapolis to C.B. Island; common in northern C.B.; rich hardwood slopes, intervales, mixed woods and deciduous climax forest; moist areas or along wet runs. It is abundant around Pleasant Bay, Inverness Co. July.

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

9. **CORALLORHIZA** Chatelain CORAL-ROOT

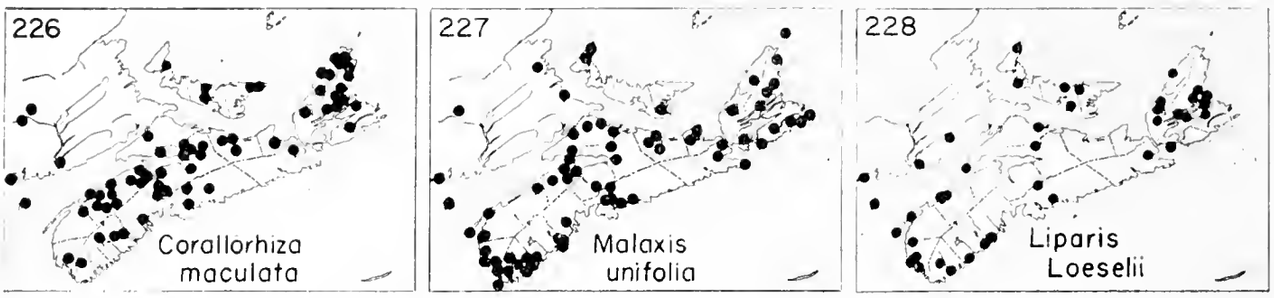
Saprophytic plants devoid of chlorophyll; with inconspicuous flowers and reflexed fruits.

a. Plants slender, yellowish, 4-15 cm high, flowering in early summer; lateral lobes of the lip small; spur none or obscure. 1. *C. trifida*
a. Plants larger and stout, 2-4 dm high; lateral lobes of lip prominent; spur conspicuous; flowering late July. 2. *C. maculata*

1. **C. trifida** Chatelain var. **verna** (Nutt.)Fern. Fig. 56, b. Map 225. EARLY CORAL-ROOT

Scattered in the northern part of the Province from Annapolis and Cumberland Cos. to northern C.B.: in coniferous woods, often under dense young growth in little light; in pine woods in the Annapolis Valley. June-July. A southern variety of the American-Eurasian plant.

Nfld. to B.C. south to Penn., N.C. and Minn.



2. **C. maculata** Raf. Fig. 56, a. Map 226. SPOTTED CORALROOT

Common from Annapolis to northern C.B.; not seen by the Gray Herbarium Expedition west of Annapolis; but scattered in Queens Co. and elsewhere; rather rich soil in deciduous woods, although it is occasionally found under conifers; mentioned by Nichols as characteristic of the climax forest in northern C.B. Late July on.

Various color forms occur. The typical plants are brownish to a brownish-purple. Forma **flavida** (Peck)Farw. is a yellow form with an unspotted lip; found during the summer of 1942 to be common on the wooded slopes of the Annapolis Valley, usually growing in mixed woods. This form grew in dense colonies with the roots of many plants tangled together; while the species in the same woods grew as solitary plants or in groups of several plants. A yellow form has been found in widely scattered locations. Forma **punicea**(Bartlett)Weath. & Adams, reddish-purple with spotted lip, has been found in Kings and Annapolis Cos.

Nfld. to B.C. south to Penn., N.C. and Calif.

10. MALAXIS Sw. ADDER'S-MOUTH

Inconspicuous plants with small greenish flowers and a single leaf clasping the base of the stem.

a. Flowering raceme long and narrow, with the flowers on pedicels 1-2 mm long; lip of flower not lobed, with a slender tapering tip. 1. *M. brachypoda*

a. Flowering raceme oval or flattened with the flowers on slender pedicels 4-8 mm long; lip of flower broad and deeply lobed at tip. 2. *M. unifolia*

1. **M. brachypoda** (Gray)Fern.

But three locations are known: rare in wet area beside trickle near Indian Flats, Isle Haute (Schofield, 1955); moss cushion on east-facing rock face, Cape Blomidon; and wet mossy cliff-edge along Five-mile River in Colchester Co.

Lab. and Nfld. to N.S. and northern N.J. westward.

2. **M. unifolia** Michx. Fig. 57, d. Map 227.

Scattered throughout and probably rather common, since it is relatively inconspicuous; wet meadows, damp upland pastures and fields, bogs near the coast, poorly-drained clay soils, and occasionally in cranberry bogs. July-Aug.

Nfld. to Sask. south to Fla. and Tex.

11. **LIPARIS** Richard TWAYBLADE

1. **L. Loeselii** (L.)Richard Fig. 57, e. Map 228.

Occasional in peaty meadows and cobbly lake shores in Yarmouth and Digby Cos. (Fernald, 1921); scattered usually near the coast behind barrier beaches and along edges of ponds; rather frequent in the bogs from Halifax to C.B. (Rousseau); Isle Haute, springy area on a roadside near Folly Lake and railroad ditch, Conn's Mills in northern N.S. (Schofield, 1955); alkaline bog at West Lake Ainslie, C.B. and in many other similar locations. July-Aug.

N.S. to Sask. south to Ala. and Mo.

GLOSSARY

Achene. Dry one-celled one-seeded fruit.
Acuminate. Gradually tapering to a point or end.
Acute. Quickly tapering to a sharp point.
Aggregated. Crowded into a dense cluster.
Anther. Pollen-bearing part of the stamen.
Anthesis. The time during which the flower is fully expanded.
Appressed. Lying close or flat against.
Approximate. Closely situated without running together.
Arcuate. Curved or arching.
Aristate. Tipped by a bristle.
Blade. Expanded portion of a leaf.
Bract. Modified or scale-like leaf.
Capillary. Hair-like.
Capsule. Dry fruit of more than one carpel, opening when ripe.
Carpel. A single pistil, or the equivalent of one in a compound pistil.
Caruncle. Growth or appendage near the hilum of the seed.
Castaneous. Dark-brown.
Cespitose. Growing in tufts or clumps.
Ciliate. Fringed with hairs.
Ciliolate. Minutely ciliate.
Clasping. Of the base of a leaf, partly surrounding the stem.
Clavate. Club-shaped.
Cordate. Heart-shaped with the point at the apex.
Corm. Enlarged base of stem, bulb-like but solid.
Coriaceous. Leathery.
Corymb. Flat-topped or convex flower-cluster with the outer flowers opening first.
Culm. Stem of grasses and sedges.
Cuneate. Wedge-shaped.
Cyme. Flat-topped flower-cluster with the central flowers opening first; cymose.

Deciduous. Quickly falling; not persistent.
Decumbent. Reclining with the tips ascending.
Dentate. Toothed with outwardly directed teeth.
Denticle. A minute tooth.
Dorsal. Relating to the back or the outer surface.
Ellipsoid. Solid with an elliptical outline, like a football.
Exocarp. Outer layer of the fruit coat.
Exserted. Prolonged beyond the surrounding parts.
Fascicle. A close bundle.
Fertile. Capable of bearing fruit; or pollen in connection with anthers.
Fibrillose. With or broken up into fine fibers.
Filament. Stalk of the stamen.
Filiform. Thread-like.
Fimbriate. Fringed.
Floret. A small flower, usually one of a dense cluster.
Frond. Leaf of a fern.
Fulvous. Tawny.
Geniculate. Bent abruptly, like a knee.
Glabrous. Without hairs.
Glaucous. Covered with a bluish-white or grayish bloom.
Glomerule. A small compact cluster.
Glume. One of the two bracts at the base of the spikelet of grasses.
Glutinous. Covered with a sticky substance.
Grain. The one-seeded fruit of grasses.
Halophyte. Plant growing on brackish or salty locations.
Herbaceous. Not woody; leaf-like in color and texture.
Hilum. Scar or point of attachment of the seed.
Hirsute. With coarse or stiff hairs.
Hispid. With rigid or bristly hairs.
Hispidulous. Minutely hispid.
Hyaline. Transparent or translucent.
Indusium. Covering over the fruiting dot or sorus in the ferns.
Inferior ovary. One joined to or below the calyx.
Inflorescence. Flowering part of the plant.
Involucel. Small or secondary whorl of bracts.
Involucre. A sheath or collection of bracts about a flower or inflorescence.
Involute. Rolled inwardly.
Irregular. Having the members of a whorl of flower-parts unequal in shape, size or union.
Keel. A sharp longitudinal ridge, as with the keel of a boat.
Lanceolate. Several times longer than wide, widest below the middle and tapering to the apex.
Leaflet. A single division of a compound leaf.
Lemma. The lower of the two bracts enclosing the floret of a grass spikelet.

Lenticular. Lens-shaped.
Ligule. A projection from the summit of the sheath in grasses.
Linear. Long and narrow with parallel sides.
Megaspore. The larger size of spore in *Selaginella* or *Isoetes.*
Moniliform. Resembling a string of beads.
Mucronate. With a short, small abrupt point.
Nerve. Unbranched vein or simple slender rib.
Obcordate. Inverted heart-shaped.
Oblanceolate. Lanceolate but with the widest part above the middle.
Oblong. Longer than broad, with nearly parallel sides.
Obovate. Inverted ovate, the broadest part above the middle.
Obovoid. Egg-shaped, the widest part uppermost.
Obsolete. Not evident; extinct.
Obtuse. Blunt or rounded at the end.
Ovary. Part of the pistil containing the ovules; the enlarged base.
Ovate. Having an outline like that of an egg, the broadest part basal.
Palea. The upper of the two bracts surrounding the floret of a grass.
Panicle. A loose irregular flower-cluster with stalked flowers.
Paniculate. Resembling a panicle.
Papillose. Bearing minute nipple-like projections.
Pedicel. Stalk of an individual flower.
Peduncle. Stalk of an inflorescence or a solitary flower.
Perianth. Calyx and corolla together.
Perigynium. Inflated sac which encloses the ovary in *Carex.*
Persistent. Long-continuous or lasting.
Petiole. Stalk of a leaf.
Pilose. With soft hairs.
Pinna. One of the main divisions of a frond or leaf.
Pinnule. A division of a pinna.
Puberulent. Minutely pubescent.
Pubescent. Covered with hairs, especially short soft ones.
Raceme. Inflorescence with stalked flowers upon an elongated axis.
Rachilla. The axis of the spikelet of a grass, along which the floret or florets are arranged.
Rachis. Axis of a spike or of a compound leaf.
Raphe. A ridge where the stalk is fused with the coat of a seed.
Reticulate. In the form of a network.
Rhizome. Prostrate or underground stem; rootstock.
Saccate. Sac-shaped.
Sagittate. Arrow-head shaped, the lobes directed downwards.
Scabrous. Rough to the touch.
Scape. Peduncle rising from the ground, without leaves or nearly so.
Scarious. Thin, dry and papery, not green.
Sepal. Division of the calyx.
Serrate. With sharp teeth pointing forward.
Sessile. Without a stalk or petiole.

Sorus. Fruiting dot of a fern.
Spadix. Spike with a fleshy axis.
Spathe. Large bract or pair of bracts enclosing or lying behind an inflorescence.
Spike. Inflorescence with the flowers sessile or nearly so upon an elongated common axis.
Spikelet. A small secondary spike in the inflorescence of a grass or in the sedge family.
Sporangium. The structure in which the microscopic spores are borne in the ferns and their allies.
Sterile. Flower without a pistil or stamen without an anther.
Stigma. Tip of the pistil, for reception of the pollen.
Stipe. Stalk of the frond of a fern.
Stipule. Appendage, often leaf-like, at the base of the petiole or on each side.
Stoloniferous. Producing runners or stolons.
Strobilus. A cone-like structure, composed of bracts bearing sporangia.
Style. Upper part of the pistil, connecting the ovary and the stigma.
Subtended. Enclosed in an axil, as by a bract.
Superior ovary. One free from the calyx.
Suture. Line of union or splitting.
Terete. Having a circular cross-section.
Trigonous. Three-angled, as a buckwheat seed.
Truncate. Ending abruptly as if cut off transversely.
Umbel. Inflorescence with the pedicels or peduncles arising from the same point.
Ventral. Belonging to the front or inner surface of a part or organ.
Villous. Bearing long soft hairs.

BIBLIOGRAPHY

Bentley,, P. A. and E. C. Smith. A Study of Northern White Cedar and Jack Pine in Nova Scotia. Proc. N.S. Inst. Sci. **24:** 376-398. 1958.

Donly, J. F. The Orchids of Nova Scotia. Privately printed. Mill Village. 1964.

Dore, W. G. and A. E. Roland. The Grasses of Nova Scotia. Proc. N.S. Inst. Sci. **20:** 177-288. 1942.

Erskine, D. S. Species newly or rarely reported from Nova Scotia and Cape Breton Island. Rhodora **53:** 264-270. 1951.

Erskine, J. S. Additions and extensions to the Flora of Nova Scotia. Rhodora **55:** 17-20. 1953.

Erskine, J. S. The ecology of Sable Island. Proc. N.S. Inst. Sci. **23:** 120-145. 1954.

Erskine, J. S. Additions to the Flora of St. Paul Island. Rhodora **58:** 245-249. 1956.

Erskine, J. S. A study of the Tusket Islands. Proc. N.S. Inst. Sci. **24:** 271-296. 1958.

Fernald, M. L. The Gray Herbarium Expedition to Nova Scotia, 1920. Rhodora **23:** 89-111, 130-152, 153-171, 184-195, 223-246, 257-278, 284-301. 1921.

Fernald, M. L. Notes on the Flora of western Nova Scotia. Rhodora **24:** 157-164, 165-180, 201-208. 1922.

Fernald, M. L. Gray's Manual of Botany, Eighth Edition. American Book Company, New York. 1950.

Gleason, Henry A. The new Britton and Brown. Illustrated Flora 3 Vols. Lancaster Press. 1952.

Nichols, G. E. The vegetation of northern Cape Breton Island. Trans. Conn. Acad. Arts and Sci. **22:** 249-467. 1918.

Perry, L. M. Vascular flora of St. Paul Island, Nova Scotia. Rhodora **33:** 105-126. 1931.

Roland, A. E. The Ferns of Nova Scotia. Proc. N.S. Inst. Sci. **20:** 64-120. 1941.

Roland, A. E. The Flora of Nova Scotia. Proc. N.S. Inst. Sci. **21:** 95-642. 1947.

Rousseau, Jacques. Notes floristiques sur l'est de la Nouvelle-Ecosse. Contrib. Inst. Bot. Univ. Montreal **36:** 13-62. 1938.

Schofield, W. B. Contributions to the Flora of Nova Scotia, V. Results of Explorations in Cumberland County. Rhodora **57:** 301-310. 1955.

Schofield, W. B. and E. C. Smith. Contributions to the Flora of Nova Scotia, III: Some interesting white forms. Can. Field Nat. **67:** 93-94. 1953.

St. John, Harold. Sable Island, with a catalogue of its vascular plants. Proc. Boston Soc. Nat. Hist. **36:** 1-103. 1921.

Smith, E. C. Contributions to the Flora of Nova Scotia, VII. Distribution of some Aquatic and Paludial Species. Rhodora **61:** 275-290. 1959.

Smith E. C. and J. S. Erskine. Contributions to the Flora of Nova Scotia IV. Rhodora **56:** 242-252. 1954.

Smith, E. C. and W. B. Schofield. Contributions to the Flora of Nova Scotia I and II. Rhodora **54:** 220-228. 1952.

Smith, E. C. and W. B. Schofield. Contributions to the Flora of Nova Scotia VI. Notes on the Vegetation of Bird Islands. Can. Field-Nat. **73:** 155-160. 1959.

Weatherby, C. A. Two weeks in southwestern Nova Scotia. Rhodora **44:** 229-236. 1942.

Webster, D. H. Notes on the Distribution of *Potamogeton* Species and Hybrids in Nova Scotia. Proc. N.S. Inst. Sci. **24:** 16-24. 1956.

Webster, D. H. A Study of the Genus *Potamogeton* in Nova Scotia. M. Sc. Thesis, Acadia University, 1954.

102ND ANNUAL MEETING

PRESIDENTIAL ADDRESS

J. A. McCarter

(October 21, 1963)

At the annual meeting the president has the duty of reviewing the work of the Institute during the past year and forecasting the aims for the future. The secretary and the other officers will report on various phases of the work of the Institute. It would be redundant for me to review these and I shall confine my remarks to some comments about the work of the Institute.

The Institute continues to serve science in this area by making available a forum for the presentation of the results of original research. The idea behind this function is a good one and has stood the test of time. Those who use this forum, because of the nature of the audience, have to present their subjects so that people trained in other fields can follow and appreciate the work which was done. This is a challenge which not all research workers are equally adept at meeting. We have listened to some brilliant lecturers who had the ability to give a clear account of their work without talking down to us, and we have listened to others whose papers, though they might have had real worth, were obscure or lost on most of us. I think it is too easy to say that the reason for the difference is to be found in the different skills of the lecturers. I think that part of the difference is due to the fact of specialization in science.

Specialization in science is inevitable. We are called upon by the advance of science to spend a longer time getting to the frontiers where original research is carried on and this process takes us, naturally, away from other fields of specialization. It is all very well to say that each science as it delves deeper into its fundamentals reveals a unity which pervades all science, as if this were going to make understanding science easy, but how many of us really know and understand these fundamentals. For those of us engaged in research, it is a full time job keeping up with our specialties. Under the circumstances, it is quite probable that someone trying to tell me about his work in another specialty may fail to get me to understand what he did and why except at a superficial level. This is not a very satisfactory state of affairs for either of us because most of us I think are not interested in superficiality. I lose interest in listening to the man because to really understand what he did and why would require me to spend more time and effort learning about his specialty than I can afford to take from my own and he loses interest in telling me because he knows that I cannot take the time to understand him and he cannot spare the time to instruct me in the fundamentals of his subject.

I am consciously exaggerating to make the point that what I have been talking about explains why, despite the enormous growth of research activity in many fields in this area, the Institute is not attracting to its active membership many of those most active scientists. This is a difficult problem which the Institute has to face.

This past year your council was forced to review the functions, aims and successes and failures of the Institute when we were required to justify to the government of the Province of Nova Scotia our request that the annual grant be raised from $500 to $2000. The question, "What does the Institute do to deserve this expenditure by the people of Nova Scotia" was entirely justified.

There is no doubt whatever that the publishing of the Proceedings is an extremely valuable service to the Province. For years the policy of the Institute has been to publish papers on the geology, flora, and other natural sciences of the Maritime area. This policy has paid dividends in education and economics which alone justify the increased grant. The problem "what does the Institute do for science?" is the one which has been most troublesome.

Your council decided to try to do something about the situation which leads some of us to come to the Institute Meetings more out of duty than interest. Because there are now many first rate scientists in the area with maturity in their subjects and skill as lecturers, we decided to ask them to address the Institute at length, telling us about their work. This will not necessarily interfere with the usual program and should result in increased interest in the ordinary meetings. I believe that colleagues who have given up coming to our meetings may return to them, at least several people have told me so.

To return to the increase in the grant. This was easily the most important event of the last year. It was accomplished as the combination of the work of many councils over the number of years although I should like particularly to pay a tribute to last year's council for their work on behalf of the Institute. Your council felt that it could not approach the government unless the Institute was willing to adopt an increased share of responsibility in the costs of publication. Accordingly your council recommended an increase in fees to become effective during the coming year.

It is my earnest hope that the Institute will solve the problems that face it. Your council hopes that the Institute will be able during this year and those ahead to keep on fulfilling its traditional functions while striving for a more lively part in serving science.

PROCEEDINGS OF MEETINGS

Session of 1963-1964

102nd Annual Business Meeting: October 21, 1963

The meeting was presided over by the President, Dr. J. A. McCarter. His address appears on page 239 of the Proceedings. The Officers presented their reports.

The Treasurer, J. E. Stewart, reported:

Receipts	$2,659.70
Expenditures	328.93
Permanent Fund	489.62
Bank Balance, October, 1963	2,518.62

The Librarian, Miss E. M. Campbell, reported:

The Institute library, together with the library of the Nova Scotia Research Foundation, has been moved to what was formerly the T. Eaton Building. Storage is still a serious problem.

The Editor, H. S. Heaps, reported:

Volume 25, Part 3, of the Institute Proceedings was published during the year. It was dated 1960-1961 and contained a paper entitled "Land Mollusca in the Vicinity of Wolfville, Nova Scotia" by R. G. Moore. The next issue of the Proceedings will be Volume 25, Part 4, for the Session 1961-1962. It will be the anniversary number and will contain a paper entitled "The Nova Scotian Institute of Science" by C. B. Fergusson. It will also contain a list of the three hundred scientific societies which exchange publications with the Nova Scotian Institute of Science and whose publications are available through the Library of the Institute.

It is hoped to publish Volume 26, Part I in the Spring of 1964. This issue will contain a paper entitled "A Study of Barachois Ponds in the Bras d'Or Lake Area of Cape Breton" by M. W. Smith and D. K. Rushton. The number will be dated 1962-1963 and our publication schedule will then be up to date.

Officers elected for the year 1963 - 1964 *were*:

President	Dr. J. A. McCarter
First Vice President	Dr. C. R. Masson
Second Vice President	Dr. W. J. Dyer
Treasurer	Professor E. L. Cameron
Secretary	Dr. E. H. Anthony
Editor	Professor H. S. Heaps
Council	
Dr. H. B. S. Cooke, Dr. W. E. Jones, Dr. A. MacDonald	
Dr. A. C. Neish, Dr. J. G. Retallack	
Auditors	Dr. A. E. Cameron
	Dr. J. R. Dingle

1st Ordinary Meeting, November 18, 1963

Papers: "High Frequency Electrical Breakdown in the Atmosphere", by A. D. MacDonald; 2. "Biochemical Evolution of Woody Tissue in Plants", by A. C. Neish.

2nd Ordinary Meeting, December 9, 1963

Papers: 1. "Factors Affecting the Distribution of a Marine Worm on a Muddy Shore", by J. D. George; 2. "The Minimization of Non-linear Distortion of Vacuum Tube and Transistor Amplifiers", by G. W. Holbrook.

3rd Ordinary Meeting, January 13, 1964

Papers: 1. "Cyto-Taxonomy of Violets", by M. J. Harvey; 2. "Geological Evolution of African Mammals", by H. B. S. Cooke.

4th Ordinary Meeting, February 10, 1964

Papers: 1. "The Peat Mosses (Sphagna) in the Atlantic Provinces of Canada", by W. S. G. Maass; 2. "Reactions at the Mud-Water Interface of the Lake and Sea", by F. R. Hayes.

5th Ordinary Meeting, March 9, 1964

Papers: 1. "Acoustic Observations of a Scattering Layer of Biological Origin Deep in the Ocean", by R. P. Chapman and Jr. R. Marshall; 2. "Biochemical and Metabolic Disorders in Mental Retardation and Convulsions in Children", by W. A. Cochrane.

6th Ordinary Meeting, April 13, 1964

Papers: "Identification of Fatty Acid Ester Peaks in Gas-Liquid Chromatography: Analysis of an Oil of the Leatherback Turtle", by R. G. Ackman and R. D. Burgher; 2. "Studies on the Enzymic and Non-Enzymic Browning of Apple Fruit. I. Sub-Strate Levels", by F. R. Forsyth; 3. "The Distribution of Phenolic Compounds in Plants in Relation to Chemical Taxonomy", by G. H. W. Towers.

7th Ordinary Meeting, May 11, 1964

Papers: 1. "Structural Geology of the Cobb's Arm Area, New World Island, Northern Newfoundland", by I. M. Harris; 2. "Bacteria on the Surface of Marine Pebbles", by E. Batoosingh; 3. "Purification of Messenger RNA from *Neurospora Crassa* via Sequence Complementarity with Denatured DNA", by E. Martin.

ABSTRACTS

(Papers read before the Institute but not published in the Proceedings)

HIGH FREQUENCY ELECTRICAL BREAKDOWN IN THE ATMOSPHERES. By A. D. MacDonald, Dalhousie University. (Read November 18, 1963). A knowledge of the power level at which high frequency electrical fields cause the atmosphere to ionize sufficiently is of great importance in communication with, and guidance of, high flying vehicles. This paper reports on an extensive series of measurements of the electric fields required to initiate breakdown in air, in nitrogen, and in oxygen, at frequencies in the L, X, and K bands, in a number of resonant cavities. The size of the cavities varied greatly so that the relative roles of diffusion and attachment in the breakdown process could be studied. The pressures at which measurements were made varied from approximately 0.01 mm-Hg to 100 mm-Hg corresponding to atmospheric breakdown at altitudes from 15 to 80 km. Pulsed power measurements were made at all frequencies and C W measurements were made at X and L bands. A theoretical analysis provides a scheme for predicting pulsed and C W breakdown in air for frequencies from 100 mc/sec to 100 knc/sec for pressures corresponding to altitude variations from 0 to 100 km.

FACTORS AFFECTING THE DISTRIBUTION OF A MARINE WORM ON A MUDDY SHORE. By J. D. George, Dalhousie University (Read December 9, 1963). A survey at Hamble Spit mudflat in Southampton Water showed that the cirratulid polychaete, *Cirriformia tentaculata* (Montagu), was less abundant near the high water mark than further down the shore. The influence of various environmental factors on the worms' distribution was investigated and it was concluded that temperature, salinity, oxygen content, and water content, were of minor importance. Both the particle size of the mud and its carbon content showed some correlation with the abundance of the worm. However, periodic strong wave action seemed to have the most influence on the distribution of the worm.

CYTO-TAXONOMY OF VIOLETS. By M. J. HARVEY, Dalhousie University. (Read January 3, 1964). An attempt to find out the relationships between two very similar violets growing in a wood in England led to the realisation that their connection could only be found by studying other violets outside the British Isles. This larger study of the violets of the Northern Hemisphere has now included all the European, and most of the North American, members of the group and is being extended to the Asiatic species. Many facts concerning the evolution of the violets have been found but the original problem is still unsolved.

ACOUSTIC OBSERVATIONS OF A SCATTERING LAYER OF BIOLOGICAL ORIGIN DEEP IN THE OCEAN. By R. P. CHAPMAN and J. R. MARSHALL, Naval Research Establishment (Read March 9, 1964). The acoustic properties of a deep scattering layer located north of Bermuda were examined over the frequency range from 0.4 to 6.4 kc/s. Octave band scattering strengths were measured in the two octaves from 1.6 to 6.4 kc/s. A broad peak in scattering strength was observed. Its centre frequency decreased over the sunset period from an average daytime value of 5.4 kc/s to an average nighttime value of 4.8 kc/s. The variations in measured scattering strengths, resonant frequencies of scattering strength peaks, and layer depths were consistent with those expected from a migrating layer of bathypelagic fish possessing swim bladders of constant volume.

IDENTIFICATION OF FATTY ACID ESTER PEAKS IN GAS-LIQUID CHROMATOGRAPHY: ANALYSIS OF AN OIL OF THE LEATHERBACK TURTLE. By R. G. ACKMAN and R. D. BURGHER, Fisheries Technological Station. (Read April 13, 1964). The popular polyester substrates normally employed in the analysis of fatty acid methyl esters suffer from one drawback, the

overlapping of chain lengths. This leads to peak superposition and difficulties in identification of component fatty acids. The linear log plot and separation factor procedures permit the identification of most minor components once the identities of a few major components are established. The use of two polyesters of differing polarities then solves the chain length overlap problem. The application of these procedures to the dermal oil from the leatherback turtle indicates, in addition to typical marine lipid fatty acids, high proportions of dodecanoic, of 5, 8, 11, 14-eicosatetraenoic and of 7, 10, 13, 16-docosatetraenoic acids.

PROCEEDINGS

OF THE

Nova Scotian Institute of Science

HALIFAX, NOVA SCOTIA

VOL, 26 1964-1968 PART 3

CONTENTS

Editor: E. Gordon Young
Editorial Board: H. B. S. Cooke, M. J. Harvey, I. A. McLaren
Printed for the Institute by Rolph-Clark-Stone-Eastern Ltd.
Date of Publication: December, 1968

INSTRUCTIONS TO AUTHORS

This journal is designed to publish the proceedings of the Institute and such original articles as pertain to the natural resources of the Atlantic Provinces, especially in biology and geology.

Manuscript should be typewritten on one side only, doublespaced, on paper 8½ X 11 inches with margins of at least 1 inch. Only the original copy is required. A desirable order of the manuscript is (1) Abstract or Summary, (2) Historical documented introductory statement, (3) Methods, (4) Results, (5) Discussion, (6) References, but in some cases a combination of these sections may be more effective. The first page should contain the title, name of author(s), institution of origin, address and any relevant footnotes. Tables and legends for illustrations should be on separate pages and placed after the text. All tables should have captions and be numbered in sequence with Roman numerals and lined vertically and horizontally as required. Type footnotes to tables under the tables designated by * † ‡ § ‖ ¶ ** etc. in that order. Pages should be numbered in sequence except for tables and illustrations. The approximate position of the latter in the text should be indicated in the margin of the MS. Abbreviations and symbols should conform to standard usage.

References may be arranged alphabetically at the end of the article and cited in the text by name of author and year, or arranged serially and designated by a number in parenthesis on the line. Abbreviations of titles of journals should conform to the World List of Scientific Periodicals. Sequence of author(s) and journal should follow the example (Smith, A. B. and C. D. Jones, *J. Biol. Chem.* **243**, 1-15 (1968)). Material in press, with the name of the journal, may be used as a reference but personal communications and reports not yet accepted for publication should be referred to in parentheses in the text, or as a footnote. References to books should be in the form of the following example – Dixon, M. and E. C. Webb, *Enzymes*, Longmans, London, 2nd ed. pp. 10-15 (1964).

Illustrations, single or composite, numbered consecutively in Arabic numerals, should be planned to fit, after reduction, into the dimensions of the printed page, 11 X 18 cm., or a fraction of it. The original should not be more than three times the size of the final reproduction. For identification the author's name and title of the article should be written in pencil on the back. Line drawings should be made with India ink on plain white paper, Bristol board, or tracing cloth. All lines should be sufficiently thick and letters or numerals sufficiently large to be legible after reduction and a minimum of 1 mm. high. Captions for illustrations should be typed together in sequence on a separate sheet placed after the text. Photographs should be made on glossy paper with as sharp contrast as possible and mounted on white cardboard with no space between those in groups.

Authors are responsible for reading the galley proof. Orders for reprints, in addition to the 15 supplied gratis, must be received when the galley proof is returned. All manuscripts should be mailed to The Editor, N. S. Institute of Science, 1411 Oxford St., Halifax, N. S., Canada.

PROCEEDINGS

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PROCEEDINGS OF MEETINGS

Session 1964 – 1965

103rd Annual Business Meeting, October 19, 1964

The meeting was presided over by the President, Dr. J. A. McCarter, who delivered the following address.

The annual meeting of the Institute allows us to take time to look back over the preceding year to see what has been accomplished and what remains to be accomplished. It also provides a time for looking forward.

During the past year, perhaps the most notable achievement was that the financial position of the Institute was made secure due to the fact that the Province of Nova Scotia increased its annual grant from $500 to $2,000. I am happy to report that the grant has been renewed for this year. These grants will be used chiefly for the publication of the Proceedings. While we rejoice that the grant has been renewed, we must at the same time remain aware that renewal is not automatic but depends on an annual application to the government stating the financial needs of the Institute. We must, therefore, retain a vigorous program of publication of articles of high quality in order to justify the continued support of the provincial government.

In this connection it may not be amiss to recall that Dr. W. J. Archibald in his address to the 101st annual meeting stated "the time may be upon us when we should widen the scope of our acceptances. Perhaps we should become very systematic . . . publish accurately on time, accept a number of shorter articles for each issue, encourage the local Institutes and Universities to submit a larger fraction of their research output and give them a generous supply of reprints at a nominal cost". These suggestions have not received the serious consideration that they should have been given, largely because funds were so limited that it was difficult for the Council to see how to deal effectively with present problems. Now, the situation has changed and new policies and projects can be considered.

It is, of course, a difficult thing that the Institute does in publishing a journal. Many societies with much larger membership never take on the large responsibility that the Institute accepted long ago, yet it is probably true to say that the Proceedings represent the work of the Institute that is of the greatest and most lasting value.

The other notable achievement was that the format of the ordinary meetings was changed. At each of six meetings, we were privileged to hear an invited speaker review his particular research problem and his work in relation to it at somewhat greater length than was customary.

These presentations were found to be of such interest that your Council decided to continue the program for another year. Shortly, a list of invited speakers for the present year will be circulated to all

members. We hope that interest in the program will grow and that a larger number of persons interested in science will take advantage of these opportunities to hear about studies now in progress in various laboratories in Nova Scotia.

These invited papers have not supplanted shorter, submitted papers. It must be admitted, however, that the number of the latter was smaller last year than usual, and it was more difficult to obtain such submissions. This difficulty seems to reflect the lack of enthusiasm for the work of the Institute which has, I think, become evident as the number of research workers in the area has increased. This anomaly was commented upon last year. One would have thought that the Institute was providing a forum where an investigator might derive considerable benefit from presenting his data for critical and helpful comment. However, the specialized nature of research, and the fact that our members come from a variety of disciplines, apparently lie at the root of the reluctance of investigators to submit their work to us. Most of us would agree that there is a need for a forum, but it seems that many do not regard the Institute's meetings as suitable for this purpose. Instead, one finds other groups being organized where experts can talk with experts without having to spend time and effort in preparing the background for broader comprehension. This is a fact of modern life which must be considered by the Institute, and somehow solved if it is to survive. The recruitment of new members depends upon offering something valuable to the recruits, and the Institute must look carefully at its functions and duties so as to continue to serve science effectively.

It is sad to report that the Institute lost by death, Dr. G. O. Langstroth, Superintendent of the Naval Research Establishment, Dartmouth.

Lastly, I wish to thank the members of Council for their support during my term as President, and I know that you thank them for their continued service to the Institute.

The Treasurer, E. L. Cameron, reported

Receipts	3,338.71
Expenditures	1,856.03
Permanent Fund	489.62
Total assets as of Nov. 6, 1964	$4,501.30

The Editor, H. S. Heaps, reported Volume 25, Part 4, was published in March, 1964, and Volume 26, Part 1, in October, 1964. Volume 26, Part 2, will be dated 1963-64 and will contain Part I of the "Flora of Nova Scotia" by E. C. Smith and A. E. Roland. *The Librarian, Miss E. M. Campbell, reported* about 500 copies of the current number of the Proceedings have been mailed to addressees on our list of exchanges. Work on a complete index of the Proceedings is in progress.

Officers elected for the year 1964-65 were

President	C. R. Masson
First Vice-president	W. J. Dyer
Second Vice-president	J. G. Retallack
Secretary	E. H. Anthony
Treasurer	P. Odense
Editor	H. S. Heaps
Council – H. B. S. Cooke, W. E. Jones, A. D. MacDonald, C. R. Mann, A. C. Neish	
Auditors	A. E. Cameron, J. R. Dingle

Meetings and communications during the year were as follows.

1st Ordinary Meeting, November 9, 1964

(1) "Marginal sediment facies of the Minas Basin" by D. J. P. Swift, (2) "Adrenocortical hormones in fish" by D. R. Idler.

2nd Ordinary Meeting, December 14, 1964

(1) "Some studies in the syntheses of pyrrole derivatives" by D. M. McKinnon, (2) "Biogenesis of two antibiotics: chloramphenicol and actinomycin" by L. C. Vining.

3rd Ordinary Meeting, January 11, 1965

(1) "Viscosimetric study of the denaturation of deoxyribose nucleic acid" by J. A. McCarter, (2) "Research in low-temperature physics" by E. W. Guptill.

Extraordinary Meeting, January 27, 1965

"Alumina to metal" by M. Coll-Palagos.

4th Ordinary Meeting, February 8, 1965

(1) "The preparation and properties of thin electro-deposited foils of nickel-iron alloys" by E. M. Levy, (2) "The corrosion of aluminum alloys in high temperature water" by J. H. Greenblatt.

5th Ordinary Meeting, March 8, 1965

(1) "The chemistry of an unusual phenolic constituent of the red alga, *Polysiphonia lanosa*" by J. H. Hodgkin, (2) "Thermal decomposition of barium titanyl oxalate" by F. Brisse. (3) "Association, distribution and number of micro-organisms in marine environments" by E. H. Anthony.

6th Ordinary Meeting, April 12, 1965 (with Valley Chapter)

(1) "Studies of lobster physiology and defense against disease" by J. E. Stewart, (2) "Alkaloids from *Nuphar variegatum*" by R. Barchet, (3) "Diet and cardiovascular disease" by J. M. R. Beveridge.

7th Ordinary Meeting, May 10, 1965

(1) "Kinetics of the copper-catalysed hydrogenation of ethylene" by Diana T. Messervey, (2) "Some observations on Hudson's Isorotation Rules" by T. McEwan, (3) "Some aspects of the catalytic decomposition of nitrous oxide" by T. E. C. Hogan.

PROCEEDINGS OF MEETINGS

(Valley Chapter 1964-1965)

1st Ordinary and Annual Business Meeting: October 5, 1964

Officers elected for the year 1964-65 were

President	I. Hall
Vice-President	F. Bent
Treasurer	H. Specht
Secretary	H. T. Stultz
Councillor	E. Hiltz

(1) "Lithofacies in the Miller limestones" by R. G. Moore, G. Crowell, D. MacDonald and M. Waring, (2) "Bryozoa from the intertidal zone of the Minas Basin and Minas Channel, King's County, N. S." by G. D. Crowell, (3) "A study of the basal members of the Horton bluff formation, King's County, N. S." by R. G. Moore, J. Amos, P. Brown, G. Crowell, T. Hennigar, P. von Bitter and M. Waring, (4) "The Foraminifera of the intertidal zone of the Minas Basin at Kingsport, N. S." by M. Waring, (5) "The copper (2) syn-phenyl-2-pyridyl ketoxime system" by T. Meek, Jr.

2nd Ordinary Meeting, November 2, 1964

(1) "Impressions of horticultural research in Scotland" by D. L. Craig, (2) "Observations on the fungus flora of Idaho" by K. A. Harrison.

3rd Ordinary Meeting, December 7, 1964

(1) "Groundwater hydrology potential of the Annapolis Valley" by T. Hennigar, (2) "Some observations of bird behaviour in Australia" by R. MacLellan.

4th Ordinary Meeting, January 4, 1965

(1) "Beavy studies in Nova Scotia" by N. Van Nostrand, (2) "Present trends in Meteorology" by L. Foster.

5th Ordinary Meeting, February 1, 1965

(1) "Nutritional studies with pitch pine" by R. Blatt, (2) "Studies of the economic status of Nova Scotian wildcats, foxes and racoons" by H. F. Lewis.

6th Ordinary Meeting, March 1, 1965

(1) "Pigment production in pathogenic and non-pathogenic mycobacteria" by A. Patterson, (2) "Biopsy of the pleura: a new diagnostic aid" by E. W. Crossan, (3) "Lung cancer at the N. S. Sanatorium" by J. J. Quinlan.

PROCEEDINGS OF MEETINGS

Session 1965 – 1966

104th Annual Business Meeting: October 12, 1965

The meeting was presided over by the President, Dr. C. R. Masson, who delivered the following address.

Members of the Institute were grieved this month to learn of the loss of one of our most distinguished members. Professor H. L. Cameron, head of the Geology Department at Acadia University, died on October 3, 1965. Professor Cameron was educated at Acadia University and McGill, where he received his M.Sc. degree in 1945. He was later associated with the Nova Scotia Department of Mines and was for a time assistant inspector of mines for the Province. He joined the staff of Acadia University as an assistant professor in 1946 and later became head of the department.

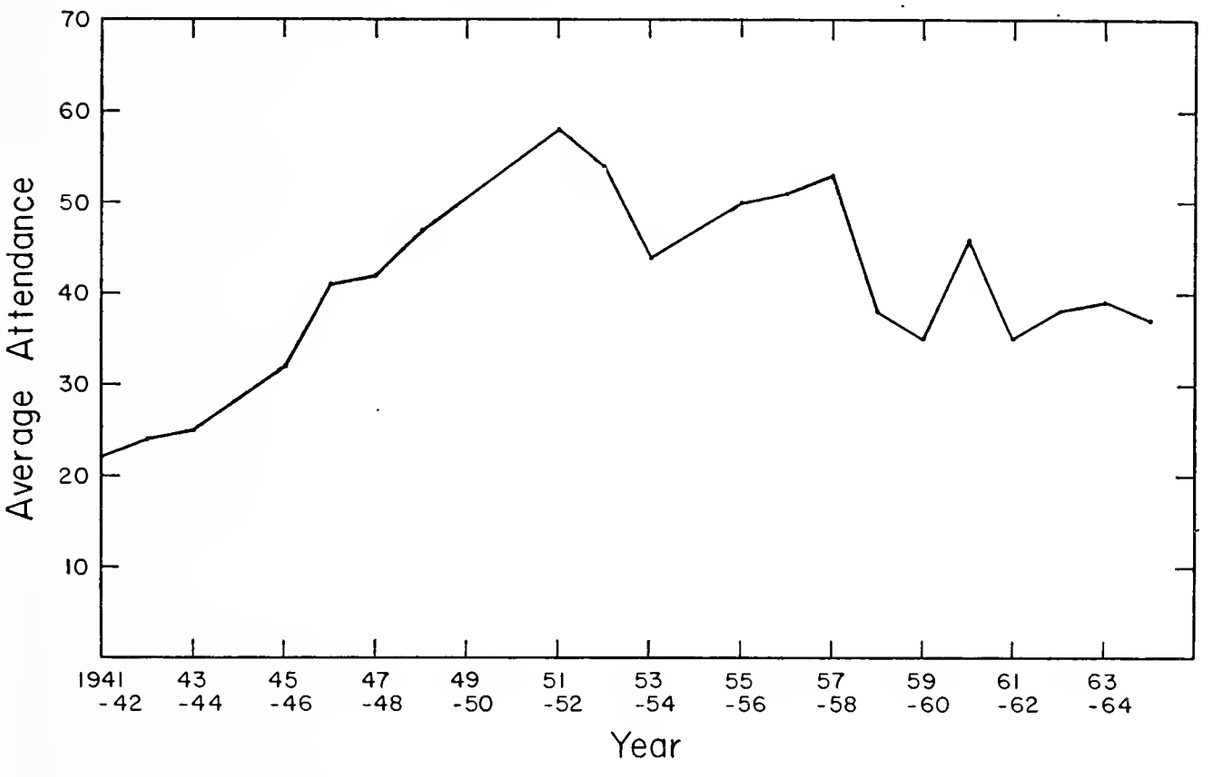
Professor Cameron performed extensive work in the photogrammetry department of the Nova Scotia Research Foundation. He was closely associated with aerial magnetometric surveys of the Province and pioneered in the application of certain scientific devices in this field. In recent years he had been interested in high-level aerial photography, with particular emphasis on meteorological applications. He was the author of numerous scientific papers and frequently attended scientific conferences at both the national and international levels. The Institute is saddened by his loss and extends its deepest sympathy to his wife and family.

I am pleased to report that, at its meeting this evening, the Council elected Miss Evelyn M. Campbell to Honourary Life Membership in the Institute. Miss Campbell has been a member of the Institute for many years and has acted as our Librarian since 1936. It is fitting that her services to the Institute should be recognized in this manner.

It will be recalled that the practice of inviting speakers to address the Institute was instigated by the previous Council in an attempt to stimulate greater interest in the meetings by raising the general level of presentation as well as providing more adequate time for the speaker to develop his subject. In spite of the high standards of the papers presented at these meetings it is doubtful whether this experiment has led to any marked increase in the level of interest. The average attendance at ordinary meetings has remained about the same for the past four years.

In this context I wish to present a slide which shows the average attendance at ordinary meetings of the Institute over the period 1941-1965. For the preparation of the graph I am indebted to Dr. E. Gordon Young. The most interesting feature is the steady increase in average attendance up to the year 1951-2 and the levelling off, or irregular decline thereafter. The graph shows that the average attendance at ordinary meetings today is just about the same as it was twenty years ago. Paradoxically, the peak in the

curve at 1951-2 corresponds to a time when new research institutes were being planned or established in the Halifax area and the tempo of scientific activity in this region was accelerating. As a physical chemist, I have had to exercise considerable restraint in avoiding the obvious temptation to extrapolate the downward trend to zero! A rough projection of the ascending portion suggests that if the growth exhibited during the decade 1941-51 had continued, the average attendance at our meetings today would be of the order of 100.



Although numerical attendance at meetings is not the only criterion of success, it has nevertheless been of concern to successive Councils that attendances have continued to diminish during a period of scientific growth, so that today the Institute is supported actively by only a small proportion of its total membership. It was partly this situation which prompted a resolution at the last Annual Business Meeting that a committee be formed to consider the role of the Institute in the scientific community. The members appointed to this committee were Drs. R. G. Ackman, E. Blanchard, A. G. McInnes, W. R. Trost, and E. G. Young. The report of this committee is on the agenda this evening and will be presented by Dr. Ackman. I wish to take this opportunity of thanking the members of the committee for their valuable cooperation and for their time and effort in producing a constructive and thoughtful analysis of this matter. I hope this report will stimulate discussion and lead to further constructive comments from the members present at this meeting.

Without wishing to anticipate the views expressed in this report, I should like to elaborate on several points which seem

especially worthy of comment. The main problem which an organization such as ours has to face is associated with the diversity of interests of its members. As a previous President has remarked, this diversity may actually be a source of strength, although I doubt if we are at present utilizing this aspect of ourselves to the best advantage. With the multitude of specialized groups which now exist in the Halifax area, as well as at the national level, for the discussion of scientific research, it seems logical that the Institute should concentrate its main effort towards the presentation of papers which have a broader scientific appeal, or which cut across the boundaries of scientific disciplines. By this I do not mean to imply that we should attempt to sponsor what are commonly referred to as "popular lectures", but that rather we should provide a forum for scientists whose work has broad implications or is of such a nature that it has an intrinsic appeal to scientists in various fields. The Institute has a useful function here, which is at present served in some measure by the holding of extraordinary meetings. Perhaps we should enlarge this aspect of our activities by using both local and outside speakers, at the expense, if necessary, of a decrease in the number of our "Ordinary" meetings. The concept of invited speakers was a step in this direction, but some of the subjects were rather specialized. It is not surprising that our most successful meeting last year, at least from the standpoint of numerical attendance, was addressed by Dr. J. M. R. Beveridge of Acadia University on the subject "Diet and Cardiovascular Disease" – a reflection on both the reputation of the speaker and the general interest in his topic.

If the Institute is to expand its activities in this direction, particularly by introducing more speakers from outside the Province, it will be necessary to make arrangements for some of these meetings well in advance, probably during the summer months. With this in mind, it would seem desirable to hold the Annual Business Meeting in the late spring, rather than during the fall, so that the new Council may have an opportunity of arranging the fall programme in advance.

A further point which deserves comment, and which has been stressed by various Presidents from time to time, concerns the style of presentation of papers at our ordinary meetings. It is essential for speakers to bear in mind that papers presented at meetings of the Institute should differ in style from papers given before more specialized groups. At Institute meetings, the speaker is faced with the task of interpreting his work to a cross-section of the scientific community and in general this requires more skill, experience and judgment than is required for presentation of the same material elsewhere. It would be difficult, if not presumptuous, to attempt to define too closely the qualities required in the presentation of a lecture at meetings such as ours, but we can each recall good and sometimes outstanding examples of the kind of presentation which is desirable. Presentation of a paper at a meeting of the Institute should be regarded as a challenge by the individual concerned and he should make every effort to ensure that the essense of his material is conveyed to his audience in as clear and concise a manner as is consistent

with the nature of his subject. This should not be construed to mean that, in striving for simplicity, the speaker should compromise the scientific content or quality of his work. Many of the greatest ideas in science are, after all, simple in nature.

The Proceedings of the Institute have been the subject of discussion from time to time. I feel that the practice of publishing articles which deal with the natural history of the province and which, because of their local significance, might not be readily acceptable elsewhere, is logical and should be continued. I feel also that articles on the geology and mineral resources of the province should be encouraged. Perhaps we should solicit contributions on certain oceanographic topics. The publication of our Proceedings is intimately associated with our finances, so that care is required before any change in policy is advocated.

In conclusion, I wish to thank the members of the Council, who have carried on the work of the Institute during the year. It has been a privilege to have been associated with them.

The Treasurer, P. Odense, reported

Receipts	769.90
Expenditures	900.78
Permanent Fund	489.62
Total assets as of Oct. 12, 1965	$4,370.42

The Editor, H. S. Heaps, reported it had not been possible to issue Volume 26, Part 2, of the Proceedings during the year but that it would be published in the near future.

The Librarian, Miss E. M. Campbell, reported an increased use of the Institute's journals by libraries and that an inventory of the Library was desirable before it was moved.

Officers elected for the year 1965-66 were

President	C. R. Masson
First Vice-president	W. J. Dyer
Second Vice-president	J. G. Retallack
Secretary	W. D. Jamieson
Treasurer	P. Odense
Editor	H. S. Heaps
Council – M. L. Cameron, H. B. S. Cooke, W. E. Jones, C. R. Mann, A. C. Neish	
Auditors	A. E. Cameron, J. R. Dingle

Meetings and communications during the year were as follows. *Extraordinary Meetings* in conjunction with Dalhousie University and the International Co-operation year, UNESCO. "The world's ocean basins" by Prof. J. Tuzo Wilson, Professor of Geophysics, University of Toronto.

Oct. 19, "The unknown half of the world"
Oct. 20, "Are they permanent?"
Oct. 21, "Scene of international co-operation"

1st Ordinary Meeting, November 15, 1965

"The mineral resources of Nova Scotia in relation to the geological history" by J. P. Nowlan.

2nd Ordinary Meeting, December 13, 1965

(1) "Reactions in non-aqueous solvents" by M. E. Peach, (2) "Liquid water: broken-down ice or distorted ice?" by M. Falk.

3rd Ordinary Meeting, January 10, 1966

"Malthus revisited: the growth of theoretical populations" by P. J. Wangersky.

Extraordinary Meeting, January 31, 1966

"The international hydrological decade" (1) "Atmospheric water" by C. E. Stevens, Regional Meteorologist, Moncton, N. B., (2) "Surface waters" by E. F. Durrant, Department of Mines and Technical Surveys, Ottawa, (3) "Groundwater problems" by J. F. Jones, Department of Mines, Halifax.

4th Ordinary Meeting, February 14, 1966

"Molecules and the mind" by R. A. Heacock.

5th Ordinary Meeting, March 14, 1966

(1) "Amitosis and cytogenetics of lower organisms" by A. Ruthmann, (2) "The use of reflectance spectroscopy in the identification of amino acids" by R. W. Frei, (3) "The effects of darkening on host plant susceptibility to virus infection" by W. C. Kimmins.

Extraordinary Meeting, March 17, 1966

"The cell membrane" by Prof. J. Dainty, School of Biological Sciences, University of East Anglia, Norwich, England.

6th Ordinary Meeting, April 18, 1966 (with Valley Chapter)

(1) "Perturbation theory in quantum mechanics" by W. J. Archibald, (2) "10,000 Years of Nova Scotian pre-history" by J. S. Erskine.

7th Ordinary Meeting, May 9, 1966

(1) "Domain structure of piezoelectric ceramics" by R. F. Brown and R. Y. Nishi, (2) "Isoenzymes in fish" by P. H. Odense, T. M. Allen and T. C. Leung.

PROCEEDINGS OF MEETINGS

(Valley Chapter 1965 – 1966)

1st Ordinary and Annual Business Meeting, October 4, 1965

Officers elected for the year 1965-66 were

President	J. S. Erskine
Vice-President	H. T. Stultz
Treasurer	Miss J. Herbert
Secretary	F. R. Forsyth
Councillor	J. Basaraba

"Climate and agricultural research – some observations from visitations to Northern European Research Institutions" by A. D. Crowe.

2nd Ordinary Meeting, November 1, 1965

(1) "Sea turtles" by J. S. Bleakney, (2) "Mucopolysaccharides of animal tissue" by D. Wood.

3rd Ordinary Meeting, December 6, 1965

(1) "Callose and translocation" by D. Webster, (2) "Moose disease – history and present status of the problem" by G. Parker, (3) "Bryozoa – marine invertebrates" by G. D. Crowell.

4th Ordinary Meeting, January 10, 1966

(1) "Dipole moments in molecular structure" by J. Roscoe, (2) "Stability of five boundary layers" by R. H. Magarvey.

5th Ordinary Meeting, February 7, 1966

(1) "Arctic alpine flora of Nova Scotia" by R. W. Hounsell, (2) "Mendel Centennial in Czechoslovakia" by W. Lamoreux.

6th Ordinary Meeting, March 7, 1966

(1) "Nontuberculous lung disease" by J. J. Quinlan, (2) "Chronic bronchitis and emphysema" by E. W. Crossan, (3) "The role of potassium in human health" by H. M. Quinlan.

7th Ordinary Meeting, April 18, 1966 (jointly with parent society)

(1) "Perturbation theory in Quantum Mechanics" by W. J. Archibald, (2) "10,000 years of Nova Scotian pre-history" by J. S. Erskine.

PROCEEDINGS OF MEETINGS

Session 1966 – 1967

105th Annual Business Meeting, May 16, 1966, by resolution of Council of December 13, 1965. The meeting was presided over by the President, Dr. C. R. Masson, who delivered the following address (abbreviated).

The past year has seen a number of changes in the affairs of the Institute. The Medical Sciences Building of Dalhousie University was finally abandoned in favour of the Sir James Dunn Science Building as our regular place of meeting.

The practice of reading minutes of a routine nature at ordinary meetings was discontinued; unless special business is transacted, these minutes are now read and approved in Council. The availability of coffee at the meetings has further served to promote informality and to stimulate discussion.

The most important single change has been in the selection of papers presented at ordinary meetings. An attempt has been made to choose papers which have been considered of interest to a reasonably broad cross-section of the membership. The selection of such papers, as distinct from papers of a more specialized nature, was regarded as being in keeping with the interdisciplinary character of the Institute and with our aim of promoting discussion and interchange of ideas between scientists in various fields.

The response of the members to this type of programme has been encouraging. The average attendance at Ordinary meetings was 49 and at Extraordinary meetings 128. Of the five Extraordinary meetings which were held, three were sponsored jointly with Dalhousie University as part of the University's programme for the commemoration of International Co-operation Year. These meetings were addressed by Prof. J. Tuzo Wilson and attracted an average audience of 175 persons.

Seven Ordinary meetings were held, at which 12 papers were presented. The fields of research and the affiliations of the various speakers are summarized as follows:

Biology 3	Dalhousie University 6
Chemistry 3	National Research Council 2
Physics 2	Fisheries Research Station 1
Biochemistry 2	Naval Research Establishment 1
Geology 1	Department of Mines 1
Archaeology 1	Valley Chapter 1

As in previous years, our meeting in April was held jointly with the Valley Chapter. This meeting was preceded by an informal buffet supper in the Men's Residence, Dalhousie University. Approximately 50 members and guests attended.

A further innovation during the year was the decision to hold the Annual Business Meeting in May, rather than October. In line with this change the financial year now terminates on April 30th.

At the last Annual Business Meeting it was recommended by the Committee of Past Presidents that a change be made in the method of bringing in a new slate of officers. This recommendation was accepted by Council and a further change in the By-Laws was made whereby this duty will in future be performed by a Nominating Committee chosen by Council at least two weeks before the annual business meeting. This committee shall consist of three members who shall be life members or ordinary members in good standing, and it shall be the responsibility of the committee to ensure that those nominated are prepared to accept office.

The decision was made by Council to draw up a list of members of the Institute as of April 30, 1966, and to incorporate this as part of the next issue of the "Proceedings". It was agreed that this list be distributed to the membership in the form of a preprint. This list will be available to all members in the near future.

Twelve ordinary members were elected to the Institute during the year. No new student members were proposed. It is unnecessary to comment that this is a cause for concern and that every effort should be made to encourage the participation of students in our activities.

Before concluding this brief survey of the year's activities, I wish to revert for a few moments to the main activity of the Institute, which is the holding of our regular monthly meetings. The experience of the past year has indicated that, if the topics selected for these meetings are sufficiently broad in character and of seemingly general scientific interest, a good attendance is assured and discussion is stimulated. The conclusion which seems to emerge is that we should aim primarily towards the more general type of presentation with, perhaps, an agenda which is not too heavily loaded.

The selection of papers which suit our purpose, however, is by no means an easy task and involves a degree of judgment on the part of Council which is to a large extent subjective. Every effort should be made to maintain a high standard of scholarship and scientific quality in the papers presented at our meetings. This is not incompatible with clarity of presentation and with the policy of selecting papers of broad significance. The presentation of a paper at a meeting of the Institute should imply, in some degree at least, a measure of recognition for the author by his colleagues in the community.

Last year, the Council made provision in the By-Laws to allow expenses for visiting speakers. The number of papers available locally this year was such that the holding of further meetings was not considered advisable.

Several of the changes which have been adopted during the current year have stemmed, directly or indirectly, from the proposals introduced last year by the Committee on the Role of the Institute in the Scientific Community. We are indebted to the members of this Committee for their valuable advice. I particularly wish, in conclusion, to express my thanks to the members of the Council who have carried on the work of the Institute during the year and whose cooperation and support have made my own duties so pleasant and easy to perform during the past twelve months.

The Treasurer, P. Odense, reported

Receipts	2,814.14
Expenditures	675.62
Permanent Fund	529.62
Total assets as of May 2, 1966	$6,508.94

The Editor, H. S. Heaps, reported Volume 26, Part 2, inclusive of "The Flora of Nova Scotia" Part I, was in page proof and would cost about $4700.

The Librarian, Miss E. M. Campbell, reported that interlibrary loans have doubled in the past two years. Moving the library has been deferred for a year.

Officers elected for the year 1966-67 were

President	W. J. Dyer
First Vice-president	J. G. Retallack
Second Vice-president	H. B. S. Cooke
Secretary	W. D. Jamieson
Treasurer	P. H. Odense
Editor	H. S. Heaps
Council – E. L. Cameron, M. L. Cameron, W. L. Ford, W. E. Jones, A. C. Neish	
Auditors	J. R. Dingle
	J. E. Stewart

Meetings and communications during the year were as follows.

1st Ordinary Meeting, October 24, 1966

"Carbon and the oceans" by G. A. Riley and P. J. Wangersky.

2nd Ordinary Meeting, November 14, 1966

"The role of the microfungi in diseases of animals" by A. Taylor.

3rd Ordinary Meeting, December 12, 1966

"A talk about talk" by M. W. Thistle, National Research Council, Ottawa.

4th Ordinary Meeting, January 9, 1967

"Enzymes in virus-infected cells" by C. W. Helleiner.

Extraordinary Meeting, January 26, 1967 (in conjunction with the Royal Astronomical Society of Canada)

"The Mount Kobau National Observatory" by J. H. Hodgson, Director, Observatories Branch, Department of Energy, Mines and Resources, Ottawa.

5th Ordinary Meeting, February 13, 1967 (in conjunction with the Canadian Society of Microbiologists)

"25 Years of antibiotics or are new antibiotics needed?" by D. Perlman, Department of Biochemistry, University of Wisconsin.

Extraordinary Meeting, March 7, 1967 (jointly with the Mining Society of Nova Scotia)

"Element three" – a film prepared by the National Film Board for the International Hydrological Decade, 1965-1974.

6th Ordinary Meeting, March 13, 1967

(1) "Direct investigation of thin-layer chromatograms by ultraviolet reflectance spectroscopy" by R. W. Frei, (2) "Production, measurement and analysis of the electronic spectra of the NF and NCl radicals" by W. E. Jones.

7th Ordinary Meeting, April 10, 1967 (with Valley Chapter)

(1) "The Flora of Nova Scotia" by R. E. Roland, (2) "Fossil elephants from the continental shelf off Nova Scotia" by F. C. Whitmore Jr., K. O. Emery, H. B. S. Cooke and D. J. P. Swift.

8th Ordinary Meeting, May 8, 1967

(1) "Aspects of insect neuro secretion" by J. Percy, (2) "Bonding in transition metals" by S. R. Baig, (3) "Transport properties of metals at low temperatures" by A. M. Simpson.

106th Annual Business Meeting, May 15, 1967

The meeting was presided over by the President, Dr. W. J. Dyer, who delivered the following address (abbreviated).

> It is customary for the President to report briefly on the year's progress. I am happy to welcome 12 new members. Unhappily, we have lost two of our members by death, Dr. C. M. Goethe and Dr. J. McPherson. Dr. Goethe, who died at the age of 91, was an

Honorary Life Member from California, a well known philanthropist and conservationist, who in later years took a considerable interest in various scientific societies, of which our Institute was one. Dr. James McPherson, a promising young research worker, died on June 14 at the age of 33. He was a graduate of Imperial College, London, a National Research Council postdoctorate Fellow at Dalhousie University, and was head of the Acoustics section at the Naval Research Establishment in Dartmouth. His research interests were in acoustic propagation and reverberation in shallow water.

At the 7 ordinary meetings the average attendance was 36. There were 3 papers each in Chemistry and in Biochemistry, 2 each in Biology and in Oceanography, and one each in Physics, Geology and the Philosophy of Science. There was also an Extraordinary meeting dealing with Astronomy and one with Aristotle's Element Three. The Valley Chapter is flourishing and the tradition of a Joint Meeting was continued. In most meetings there has been very animated discussion and experience this year favors continuance of the policy of programs of general interest with one or two specialists exploring an area in a particular field including its relation to other sciences and to the welfare of society. The philosophical aspects of scientific endeavor should not be neglected, nor should the machinery of putting scientific knowledge to use in society.

I wish to thank the Officers, Council and Members for their support during the year and wish the Institute every success in the years ahead.

The Treasurer, P. Odense, reported

Receipts	838.90
Expenditures	4,345.29
Permanent Fund	529.62
Total assets, as of May 6, 1967	$3,002.55

The Librarian, Miss E. M. Campbell, reported approximately 500 copies of the current number of the Proceedings have been mailed to institutions on our exchange list. This number has been included in the Cumulative Book Index as of wide significance. The scientific journals in the Library will be listed in the revised edition of the Union List of Scientific Serials in Canadian Libraries to be issued shortly by the National Research Council.

Officers elected for the year 1967-68 were

President	H. B. S. Cooke
First Vice-president	J. H. Greenblatt
Second Vice-president	A. C. Neish
Secretary	N. Cuthbertson

Treasurer.....M. Falk
Editor.....E. G. Young
Council – R. G. Ackman (replaced by W. L. Ford), M. L. Cameron, C. W. Helleiner, W. E. Jones, A. G. McInnes, P. J. Wangersky
Auditors.....W. J. Chute
J. E. Stewart

PROCEEDINGS OF MEETINGS

(Valley Chapter 1966 – 1967)

1st Ordinary and Annual Business Meeting, October 3, 1966

Officers elected for the year 1966-67 were

President.....H. T. Stultz
Vice-President.....F. R. Forsyth
Treasurer.....D. Webster
Secretary.....Miss H. J. Herbert
Councillor.....D. Grund

"Attenuation of sound over a snow-covered field" by J. G. Tillotson.

2nd Ordinary Meeting, November 7, 1966

(1) "Strawberry nutrition studies" by R. Blatt, (2) "Heteroaromatic boron compounds" by B. Robinson.

3rd Ordinary Meeting, December 5, 1966

(1) "Studies in the physiology of plant pathogens with special reference to tomato leaf mold" by T. Curren, (2) "Pollution – symbolic of our times" by N. Van Nostrand.

4th Ordinary Meeting, January 9, 1967

(1) "Research leading to the safe use of herbicides" by M. T. Ragab, (2) "A solid-state electron spin resonance study of photolyzed H_2S, D_2S and H_2S_2" by D. Stiles.

5th Ordinary Meeting, February 6, 1967

(1) "Activity of free-ranging Rhesus monkey" by W. Draper, (2) "Diseases of insect pests of apple in Nova Scotia" by R. P. Jaques·

6th Ordinary Meeting, March 6, 1967

(1) "Lactation following thoracotomy: a report of this rare complication" by J. J. Quinlan, (2) "Erythema nodosum: an unusual manifestation of various diseases" by H. M. Holden, (3) "Staphylococci in the patient's nose and throat pre-operatively related to post-operative staphylococcal wound infection" by J. J. Quinlan.

7th Ordinary Meeting, April 10, 1967 (jointly with parent society)

(1) "The flora of Nova Scotia" by A. E. Roland, (2) "Fossil elephants from the continental shelf off Nova Scotia" by F. C. Whitmore Jr., K. O. Emery, H. B. S. Cooke and D. J. Swift.

PROCEEDINGS OF MEETINGS

Session 1967 – 1968

Meetings and communications during the year were as follows.

1st Ordinary Meeting, October 12, 1967 (jointly with the Chemical Institute of Canada)

"C^{14} Dating as applied to archaeology and geology" by K. J. McCallum, Professor of Chemistry, University of Saskatchewan.

2nd Ordinary Meeting, November 6, 1967

"Reverberation from biological scatterers in the ocean" by R. P. Chapman.

3rd Ordinary Meeting, December 11, 1967

(1) "Allelopathy, phytotoxins and phytoncides: some aspects of ecological chemistry" by O. Hutzinger, (2) "Food and growth in fish" by L. Dickie.

4th Ordinary Meeting, January 15, 1968

"The use and cultivation of seaweeds in Japan" by Miss C. MacFarlane.

5th Ordinary Meeting, February 12, 1968

(1) "An inherited biochemical deficiency in Nova Scotian Negroes" by G. R. Langley, (2) "An epidemiological survey of fractures of the hip in the Halifax area" by P. Gordon.

6th Ordinary Meeting, March 11, 1968

(1) "Evaluation of pharmaceutical products by chromatographic, spectroscopic and biological techniques" by G. Pataki, University of Basle, (2) "The factors affecting the internal stress in electrodeposited iron" by E. Levy.

7th Ordinary Meeting, April 8, 1968 (with the Valley Chapter).

(1) "Memory – why we forget" by P. R. H. James, (2) "The moss flora of Nova Scotia" by J. S. Erskine.

8th Ordinary Meeting, May 6, 1968

(1) "Light perception in the simple eye of a crustacean" by P. Eaton, (2) "Slumping and other sedimentation features in

the Whangaparaoa Peninsula, Northland, New Zealand" by M. Gregory, (3) "Measuring the deformation of the Earth caused by the Bay of Fundy Tides" by T. Lambert.

107th Annual Business Meeting, May 13, 1968

The meeting was presided over by the President, Dr. H. B. S. Cooke, who delivered the following address (abbreviated).

In reporting on the events of the year, I am happy to say that we have welcomed to the Institute 10 ordinary members and one associate member. Regrettably, we have also lost by death two former members – Dr. Harold Skinner King, a former editor of the Proceedings and a past president of the Institute, who died in September, 1967, and Dr. H. L. Bronson, who died in March, 1968. Dr. Bronson was a past president and a very distinguished member of the scientific community.

During the year we have had 6 ordinary meetings, one meeting with the Valley Chapter, and one meeting jointly with the Chemical Institute of Canada. The attendance has fluctuated between 23 and 68 with an average of 42.

There has been quite a range in the papers presented – 14 in all – and a rough analysis shows that these are divided as follows: 2 in the general area of Chemistry /Biochemistry, 4 in Marine Biology and Biology, 2 in Geology /Archaeology, 3 in Physics and Geophysics, 2 in Medicine, and one general survey of recent advances in Experimental Psychology.

Other activities during the year have centered in the Council, which has been involved, through a Committee, with detailed consideration of the constitution of the Institute. A draft revision will be tabled this evening. The library has also been the subject of discussion as a considerable portion is in rather perilous storage in the attics of the Technical College and Nova Scotia Museum. This has not only been a danger to the material itself, but has also provided considerable inconvenience. Furthermore, a request has been received for this material to be evacuated and a problem has arisen regarding its storage. A suggestion by Miss Evelyn Campbell that Dalhousie University might be able to provide storage space has led to the further suggestion that Dalhousie might undertake the task of looking after the library *in toto*. This has led to the preparation of a draft of an agreement between the Institute and Dalhousie University regarding the effective transfer of the Institute's holdings to Dalhousie's control and responsibility.

During the course of this year and, indeed, many times before that, I have wondered whether the Institute was fulfilling its proper role. It seems to me that in an area with some dozen major scientific institutions and with some hundreds of active scientists, an attendance of an average of 42 does not suggest that the Institute is really meeting the need that led to its first establishment. As a matter of

interest, I have looked through some of the early volumes of our Proceedings to try to feel the kind of atmosphere in which it came into being.

As I infer from their early documents, the founders were concerned with the existence in Halifax of a small isolated community with a very small but alert learned population. They recognised that there was no other forum in which these people could meet. The establishment of the Nova Scotian Institute of Natural Science was, as I see it, the creation of a single learned society concerned with all the many disciplines which at that time could be grouped as natural science. They also realised that this was a relatively unexplored region in which the natural history was little known. Many of the early members were amateur natural philosophers – at a time when there were no national publications in Canada. The Transactions of the Nova Scotian Institute of Natural Science, therefore, are filled with documents recording the development of the geology, the biology, the meteorology and other features of this region.

There is, however, another element which I found interesting; this is the feeling amongst members of the Institute of the need to review from time to time the current status of various disciplines. There are a number of papers in the early volumes which do not present original material on the natural history of the region but try to convey to a varied group of learned men and amateurs an understanding of what was going on in various branches of science in the outside world. I found, for example, a long discourse by the secretary of the Institute in 1864, Mr. W. Gossip, on speculations regarding the origin of man. This kind of review of the standing of a particular discipline must have been of great value to the community at that time.

I believe that what is really needed in the Nova Scotian Institute of Science in the latter half of the 20th century is to attempt to get back to the kind of atmosphere which was created for people in a wide variety of disciplines so that they may learn what is going on in the many facets of the world of science. In 1863 or 1864 it was indeed possible for one man in his own head to carry the knowledge of most scientific disciplines of the time. This is no longer possible. Just as many of the amateurs of that time were laymen in the strict sense of the word, yet were learned in one branch of knowledge in proportion to the scientific knowledge of the time, so today the average scientist is a layman in all sciences other than his own. It seems to me then that we should concentrate very much more on well-organized interdisciplinary discussion which might try to break across the artificially created barriers of narrow specialization.

I also found in the early volumes of the Proceedings and Transactions that it was the view of the members that one of their functions was to make the community around them aware of scientific progress and of the need for scientific development. Here again is a role which is totally unfilled at the present time.

I feel that the Institute could play a valuable role if it were willing to attempt to cater for the need to inform the public at large of the work of science. I think, for example, of the possibility of organizing regular showings of up-to-date, authoritative, scientific films. I believe that if the public – and especially the schools – were invited to come to regularly scheduled meetings at which addresses were given on developments in new branches of science, or new films were shown, we would in fact begin to arouse some kind of interest in the community. This may be more in keeping with a modern interpretation of the objectives for which the Institute was founded.

I am sure that these views will be regarded by many as heretical and unacceptable. I wish that I could offer more concrete suggestions as to how we should move forward. All I can offer as my slender contribution is the thought that we should concern ourselves less deeply with details of the past constitution and more with a study of the things that are lacking today in our region. We should try to find the gaps which now exist and reframe our programme to fill those gaps – which are no longer the same gaps that led to the founding of the Institute.

I should like to conclude my remarks by expressing to the Council my very deep appreciation for their support during the year. We are particularly indebted to our Secretary, who has done a great deal of work, and to the active members of sub-committees. Thank you all very much for giving me an enjoyable year which, I hope, has not been entirely unproductive and not entirely unsuccessful.

The Treasurer, M. Falk, reported

Receipts	1,159.90
Expenditures	668.38
Permanent Fund	529.62
Total assets as of May 1, 1968	$3,494.07

The Editor, E. G. Young, reported that the statutory Editorial Board has been revived and its members are serving in the review of manuscripts submitted for publication. The ms of Part II of The Flora of Nova Scotia by A. E. Roland and E. C. Smith has been received in greater part and should be completed in the summer of 1968. Special financing will be required because of its length.

The Librarian, Miss E. M. Campbell, reported systematic binding of periodicals has been continued inclusive of several new sets. The disposition of the whole library in its many localities at present is under active consideration by the Council.

Officers elected for the year 1968-69 were

President.....J. H. Greenblatt
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J. E. Stewart

Editorial Board – H. B. S. Cooke, M. J. Harvey, I. A. McLaren and the Editor.

PROCEEDINGS OF MEETINGS

(Valley Chapter 1967 – 1968)

1st Ordinary and Annual Business Meeting, October 2, 1967

Officers elected for the year 1967-68 were

President.....D. Grund
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"A year at East Malling Research Station" by R. G. Ross.

2nd Ordinary Meeting, November 6, 1967

"Mushroom poisoning" by D. Grund.

3rd Ordinary Meeting, December 4, 1967

(1) "The plasticity of instinct in insects" by M. E. Wilczek, (2) "Report on a trip to the 1st Symposium on highbush blueberry culture held in Venlo, The Netherlands" by I. V. Hall.

4th Ordinary Meeting, January 17, 1968

"Some new aspects of food preservation – observations made at the International Congress of Refrigeration, Madrid, 1967" by C. A. Eaves.

5th Ordinary Meeting, February 5, 1968

"Land use and resource problems in Eastern Zambia" by D. Dodds.

6th Ordinary Meeting, March 4, 1968

(1) "Farmer's lung" by J. J. Quinlan, (2) "Mycobacteriosis at the N. S. Sanatorium" by G. A. Kloss and J. E. Hiltz, (3) "The Clare district high school Tb epidemic" by V. K. Rideout.

7th Ordinary Meeting, April 8, 1968 (jointly with parent society) (1) "Memory – why we forget" by P. R. H. James, (2) "The moss flora of Nova Scotia" by J. S. Erskine.

HOWARD LOGAN BRONSON

1878 – 1968

by W. J. Archibald

Howard Bronson, whose death occurred on March 7th, 1968, was born in the small town called Washington, in Connecticut, on July 12th, 1878. He graduated from Yale with the A. B. degree in 1900 and the Ph.D. in physics in 1904. For a year, 1900-1901, he was an instructor in physics at Lehigh University. From 1901 to 1904 he held an appointment as an assistant in physics at Yale. Attracted by the presence of Lord Rutherford he then went to McGill and remained there until 1910, holding in succession the posts of demonstrator (1904-1907), lecturer (1907-1909), and assistant professor (1909-1910). In 1910 he became Head of the Physics Department at Dalhousie University and stayed in that department until his retirement in 1946. On retirement he was made Professor Emeritus and awarded the honorary degree of LL.D. His election to Fellowship in the Royal Society of Canada occurred in 1916. Professor Bronson maintained a lively interest in the proceedings of the Institute throughout his active career in Halifax and served as President from 1918 to 1920 and in several other capacities.

These are the bare statistics, which show that his career can be divided into two epochs, before and after 1910. In that year he had to make a choice between McGill and Dalhousie, and he decided to go to Dalhousie where he remained the rest of his life. The Department of Physics at Dalhousie was an old one even in 1910, having had very distinguished professors since about 1870.

His skill in research was very great and he always had a small group of students "making measurements". Most of these "measurements" were worthy of publication and for many years it was the pattern for candidates for the Master's degree at Dalhousie to have their experimental work published. The excellent experimental work which led to Bronson's election to the Royal Society was done mostly at McGill when he was involved with a group who were trying to make sense of the signals coming out of the nucleus of the atom. Dr. Bronson may thus be placed in that small group of distinguished scientists who worked with Lord Rutherford in fashioning the model

of the nucleus. His chief contributions consisted of accurate observations of the half lives of active nuclei and their decay schemes and the development of more precise and faster methods of measuring very small ionization currents.

From 1910 and for the next thirty years Bronson and his students at Dalhousie published papers on a wide variety of topics. These include the electrical properties of ice, X-rays, radioactivity, and a very careful series of measurements on the specific heats of metals. The work on specific heats is as accurate as that currently achieved by solid state physicists.

His old students remember Dr. Bronson chiefly for his qualities as a teacher and the strength and integrity of his character. His classroom methods were peculiarly his own; one could hardly say that he lectured. He did not believe in doing for a student anything that the student could reasonably be expected to do for himself. He asked far more questions than he answered but his questions were penetrating, and forced the student to face squarely the central point of any issue. A favourite, and oft repeated principle of Dr. Bronson's was that in science as in life the individual should pay far more attention to process than to outcome. This attitude of concentration on sound methods was central to everything that he did and determined his attitude to how students should be treated, how education should be pursued, how the university should be run, how the country should be governed, and how a life should be lived.

The impression Dr. Bronson has left on thousands of students and colleagues was that of an able scientist and a "good" man.

PROCEEDINGS

OF THE

Nova Scotian Institute of Science

HALIFAX, NOVA SCOTIA

VOL. 26. 1969 PART 4

CONTENTS

Editor: E. Gordon Young

Editorial Board: H. B. S. Cooke, M. J. Harvey, I. A. McLaren

Printed for the Institute by Rolph-Clark-Stone-Eastern Ltd.

Date of Publication: September, 1969

INSTRUCTIONS TO AUTHORS

This journal is designed to publish the proceedings of the Institute and such original articles as pertain to the natural resources of the Atlantic Provinces, especially in biology and geology.

Manuscript should be typewritten on one side only, doublespaced, on paper $8\frac{1}{2} \times 11$ inches with margins of at least 1 inch. Only the original copy is required. A desirable order of the manuscript is (1) Abstract or Summary, (2) Historical documented introductory statement, (3) Methods, (4) Results, (5) Discussion, (6) References, but in some cases a combination of these sections may be more effective. The first page should contain the title, name of author(s), institution of origin, address and any relevant footnotes. Tables and legends for illustrations should be on separate pages and placed after the text. All tables should have captions and be numbered in sequence with Roman numerals and lined vertically and horizontally as required. Type footnotes to tables under the tables designated by * † ‡ § || ¶ ** etc. in that order. Pages should be numbered in sequence except for tables and illustrations. The approximate position of the latter in the text should be indicated in the margin of the MS. Abbreviations and symbols should conform to standard usage.

References may be arranged alphabetically at the end of the article and cited in the text by name of author and year, or arranged serially and designated by a number in parenthesis on the line. Abbreviations of titles of journals should conform to the World List of Scientific Periodicals. Sequence of author(s) and journal should follow the example (Smith, A. B. and C. D. Jones, *J. Biol. Chem.* 243, 1-15 (1968). Material in press, with the name of the journal, may be used as a reference but personal communications and reports not yet accepted for publication should be referred to in parentheses in the text, or as a footnote. References to books should be in the form of the following example – Dixon, M. and E. C. Webb, *Enzymes*, Longmans, London, 2nd ed. pp. 10-15 (1964).

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Authors are responsible for reading the galley proof. Orders for reprints, in addition to the 15 supplied gratis, must be received when the galley proof is returned. All manuscripts should be mailed to The Editor, N. S. Institute of Science, 1411 Oxford St., Halifax, N. S., Canada.

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VOL. 26, PART 4, 1969

THE FLORA OF NOVA SCOTIA

PART 2

THE DICOTYLEDONS

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and

E. C. SMITH

Perry Biological Laboratories, Acadia University,
Wolfville, Nova Scotia

CONTENTS

INTRODUCTION

The aim of this work is to give a treatment of the native and introduced plants growing without cultivation in Nova Scotia, to bring up to date the nomenclature, and to provide a means of identification for the various species, varieties and forms that have been found in this region.

The order of the families, genera and species is that used in Gray's Manual of Botany (8th ed. Fernald, 1950-a). Specific and subspecific names derived from proper nouns are capitalized. Abbreviations of authorities for the scientific names follow that of Gray's Manual. An X in front of the scientific name denotes that the plant is a hybrid. The chromosome number is given only when it has been determined for collections from our area and for each case the number is the sporophytic (2n) number. The general ranges of the plants have been obtained from recent monographs or floras, with the Canadian ranges checked with that given by Boivin (1966, 1967).

Keys to the families, genera and species have been revised and somewhat amplified so as to give a better description and provide an easier means of identification; short descriptions of families and genera have been added as space permits. It is hoped that this will make this treatment more useful for those who do not have other manuals available.

The distribution maps have been based upon those appearing in the first edition and are brought up to date with the new dots representing recent herbarium collections. In general those species have been mapped which show an unusual or interesting range. Only a few maps show a general distribution and these have been included to show how many collections have been made. Additional maps have been added in cases where the ranges of the rarer plants have become better known. In some maps the relative abundance of the plants in different parts of the Province has been obscured because of the tendency to make more collections in a region where a plant is rather rare. The distribution of the plants in Prince Edward Island has been added to the maps from data of D. S. Erskine (1960) but no special effort has been made to give the distribution in New Brunswick and this is shown only when the data were easily available.

The tendency in respect to the scientific names is to consider each kind of plant as a species when, in some cases at least, it might be better to regard them as subspecies or even as varieties of plants with continental or circumboreal ranges. In most cases this relationship is mentioned in the text.

The general references to the flora of Nova Scotia and the publications of local botanists are given in the bibliography at the end of the book. Those concerned with a single group, genus or species are cited where the plants are described. No attempt has been made to give all

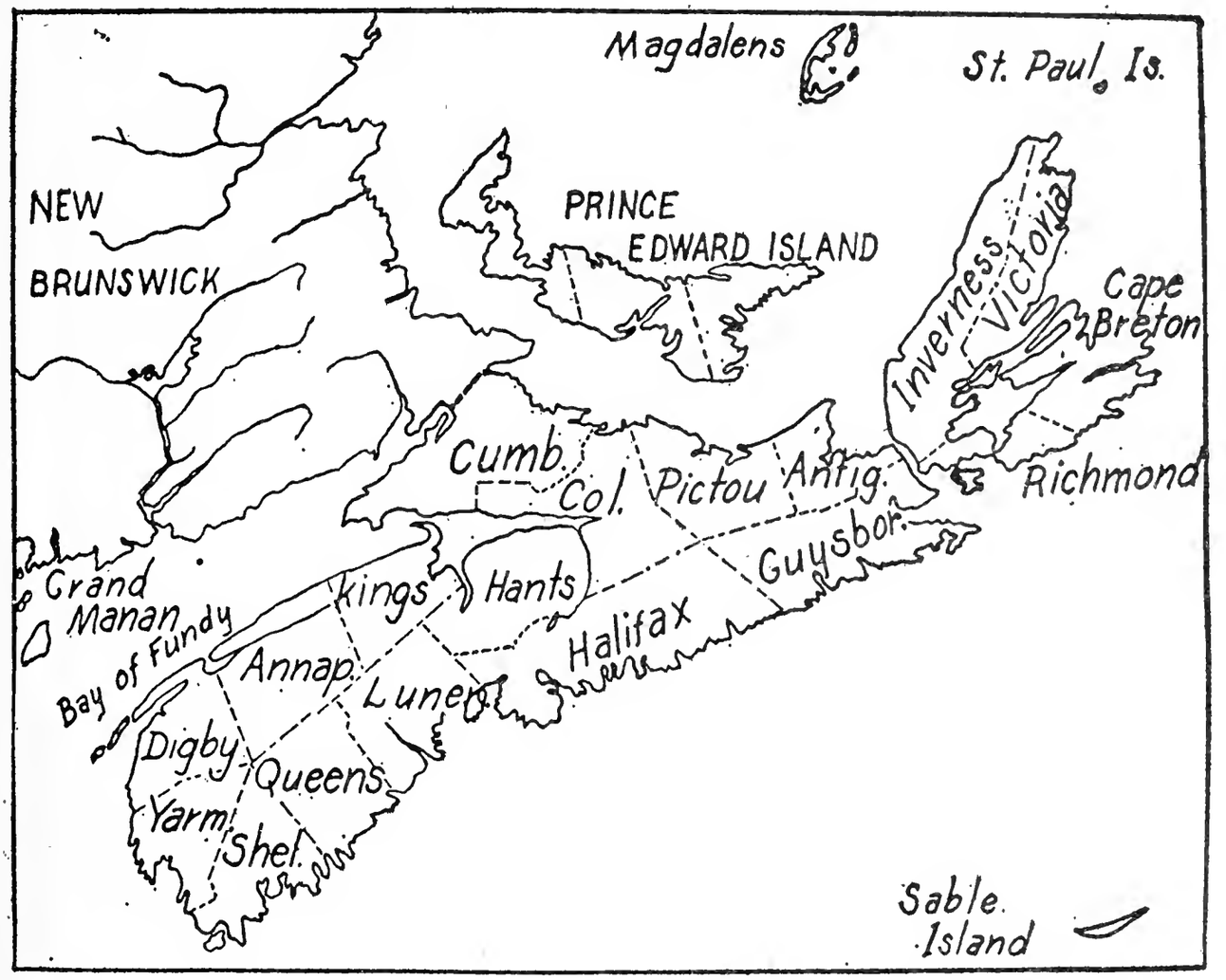
the references but the principal ones concerning local plants and the ones which have been found useful in compiling keys and in revising the taxonomy have been included. Rhodora, the journal of the New England Botanical Club, has been found particularly useful.

Appreciation must be expressed to the Nova Scotia Department of Agriculture, and to the Nova Scotia Research Foundation, whose continual support made much of the field work possible and provided the time to make the maps and drawings and to complete the text. A grant from the National Research Council of Canada provided assistance for the final checking and writing. The acknowledgements in the introduction to Part I apply even more to Part II. The herbarium of the Nova Scotia Museum at Halifax provided much information on the distribution of our plants and special reference must be made to Mr. J. S. Erskine who collected in many out-of-the-way parts of the Province and provided so many new and interesting records of our native plants. Finally, the authors would like to express their appreciation to the Nova Scotian Institute of Science for providing a means of publication, without which much of their work would have little permanent value.

We dedicate this work to Dr. Muriel V. Roscoe of Acadia University and to the late Professor H. P. Bell of Dalhousie University for their inspiration, interest and help during and since our student days.

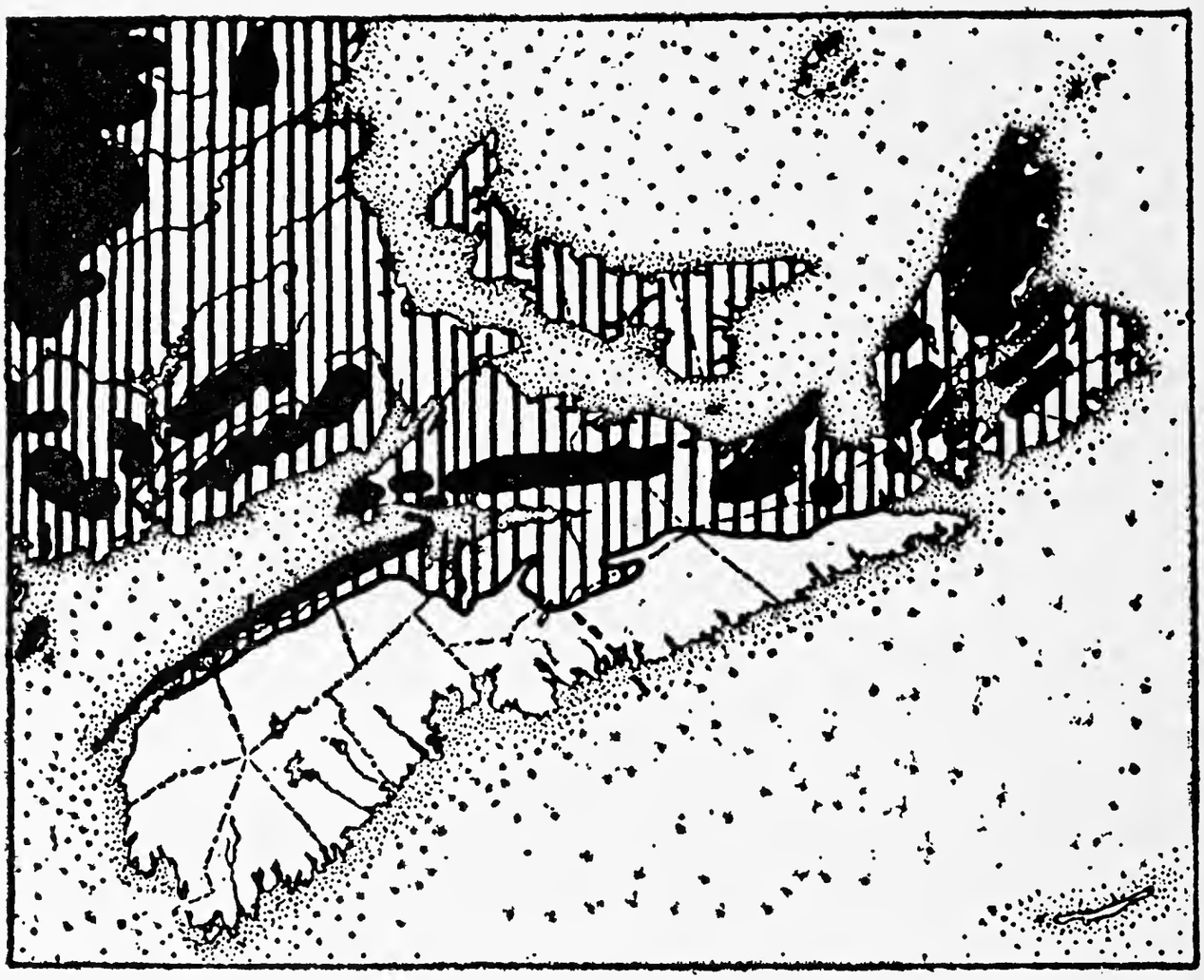
THE PHYSICAL BACKGROUND

Nova Scotia lies between 43° and 47° north latitude with the axis running in a general north-east south-west direction. It has a length of about 340 miles and an average width of 50 miles; it consists of a peninsula joined to the mainland by the low swampy Isthmus of Chignecto, and the Island of Cape Breton separated from the eastern end of the peninsula by the narrow Strait of Canso. Two small islands, extensively explored botanically, lie off Cape Breton. St. Paul Island is a few miles north of the northern tip; and Sable Island, a narrow sandy bar 20 miles long, is one hundred miles to the southward. The province is divided into 18 counties as shown in map A.



Map A—Map of Nova Scotia showing the counties.

Geologically the province is the up-tilted and eroded surface of an old Cretaceous peneplain. This dips below the surface of the Atlantic Ocean to produce the drowned and very irregular coast-line, and rises gradually and evenly to the northward to attain in the highlands of northern Cape Breton and southern New Brunswick a height of 1200 feet. The weaker rocks and structures of the northern area have worn away so that the province, which is flat, sterile and poorly-drained along the Atlantic Coast, becomes increasingly hilly and irregular inland.



Map B—Physiographic features as explained in text.

Map B shows the main physiographic areas of the province. The unshaded area comprising nearly the southern half of the area is called the Atlantic Upland. This is composed of very resistant rocks, slates, quartzites and granites and it is not essentially an upland but rather gently rises from sea-level at the southern edge to a height of 100 to 500 feet at its northern boundary. The western half of this upland has the three main types of rocks in about equal proportions, with the areas of slate appearing in southern Yarmouth, central Queens and in Lunenburg counties while the eastern half is mainly granites and quartzites. The topography is of slight relief, and innumerable lakes, streams, bogs, barrens and stillwaters occur.

The shaded areas comprise the true uplands of the province. The long range, or North Mountain, from Kings County to Digby County, is composed of basalt or trap rock which gradually falls from a height of nearly 600 feet at its eastern end until it dips beneath the sea at the southern end of Digby Neck. From western Cumberland County to northern Cape Breton occur ranges of hills and highlands composed of igneous rocks, syenites, diorites, and granites. Those occurring from Cumberland County to Pictou County, known as the Cobequid Mountains, rise to 1000 feet and are covered mostly with deciduous forest;

the broad plateaus of northern Cape Breton, often attaining a height of 1400 feet, have a much poorer drainage, a more severe climate, a shorter growing season, and are covered with bogs, swamps, and coniferous trees.

The vertically hatched areas are lowlands of Carboniferous to Triassic age very diverse in character. The Annapolis Valley from Digby County to Kings County is carved from Triassic sandstone; the northern and eastern lowlands have various mixtures of sandstones, shales, conglomerates, limestones and gypsum. Extensive intervales occur; deep valleys and rugged cliffs are found next to the uplands; and lakes and ponds are relatively few.

The climatic data are given in Putnam (1940). The southwestern part of the province shows a longer frost-free period, lower July temperatures, more foggy days per year, and a higher minimum winter temperature than the other regions. The Island of Cape Breton differs markedly in having a shorter growing season. The temperature and the number of fog-free days, of the coastal regions at least, are also low throughout the year.

The soils of the province have now been studied in detail. Although the region has been wholly glaciated they show close correlation with the underlying rocks. The soils of the granitic and quartzite areas are thin and rocky. Extensive sand areas occur in the Annapolis Valley and in Cumberland County. The undulating or hilly areas are usually well-drained with deep soils; but much of the lowlands of northern and eastern Nova Scotia have soils heavy in texture and of poor drainage. Near the coast extensive peat bogs and swamps occur and raised *Sphagnum* bogs are common in Guysborough County and in Cape Breton.

HISTORICAL ASPECTS AND HERBARIA

Recorded knowledge of the flora of Nova Scotia started with the first number of the Transactions of the N. S. Institute of Science published in 1863. Before this time there had been only general observations and scattered lists. Haliburton's Historical and Statistical Account of Nova Scotia of 1829 contained a section on our native plants; and Titus Smith included observations on the vegetation of western Nova Scotia in an unpublished manuscript in 1801, as well as writing the text for a book on flowers illustrated by colored plates painted by Maria Morris (see Gorham, 1955). However, no comprehensive work on the plants had been undertaken. The publication of the Transactions provided, for the first time, a medium of publication to bring together the scattered information for general reference.

About this time several workers in different parts of the Province began to make systematic collections of plants, — H. How at Windsor, A. H. MacKay in the neighborhood of Pictou, A. W. H. Lindsay in the

eastern part of the Province, and E. H. Ball at various places where he held pastorates. Many of these collections are still preserved in the Provincial Museum at Halifax. In general they consist of the common plants of the Province, usually correctly named, but in some cases misidentified.

The results of this early work were gathered together by Lindsay (1875–6) in his Catalogue of the Flora of Nova Scotia. This remained as the only attempt to bring together a comprehensive list of the plants of the Province until the "Flora of Nova Scotia" was printed (Roland, 1944–6).

Most of the papers published subsequent to Lindsay's catalogue have been lists of plants collected in scattered localities throughout the Province or they have been notes upon rare or unusual plants. How (1876-7) compiled additions to Lindsay's list; Lawson (1882-3, 1890-1) noted the occurrence of other rare plants; Campbell, (1884-5, 1885-6) listed the plants found in the vicinity of Truro; Cox (1893-4) did likewise for Shelburne; Robinson (1901-2, 1907) noted plants collected in eastern Nova Scotia, and especially intervale plants; Fowler (1902-5) reported on the plants of Canso; Barbour (1905-6) listed some plants of MacNab's Island in Halifax Harbour; and Prest (1904-5) discussed the edible plants of the Province. Many of the discoveries of these early botanists, as well as the numerous collections from northern and eastern Nova Scotia of John Macoun himself, were reported or listed in Macoun's Catalogue of Canadian Plants (1883-1902).

The ferns were perhaps the most intensively studied. Ball (1875-6) early studied this group and his information was later supplemented by the work of Lawson. Lawson's Fern Flora of Canada (1889) was used extensively in the common schools of the Province.

Two ecological works published during this period may also be mentioned as they add to the distributional knowledge of the plants. These were the only attempts to study the vegetation instead of the individual species, and were based on the successful concepts developed by Cowles in his study of the vegetation about Lake Michigan. Ganong (1903) discussed in detail the vegetation about the head of the Bay of Fundy, the ecological factors, and the various plant associations of the salt and dyked marshes to be found in that region. Transeau (1909) made a study of the littoral vegetation of the rocky coast at the southern end of the Province.

By 1907 the plants of Nova Scotia as a whole were still imperfectly known, and the enthusiasm of the earlier workers had largely died down. To be sure, the repeated visits of the Dominion Botanist, John Macoun, to the Province had resulted in extensive collections being made of the plants of the northern and eastern parts of the province, but the flora of the southwestern counties was almost entirely unknown. Little collecting had been done between Halifax and northern Cape Breton and

many other counties were represented by only occasional specimens. Plants now known to be dominant or common over much of the western area of the Province were discarded or believed to be rare. The grasses and sedges especially were very imperfectly known.

The second period in this history includes the forty years following the publication of the seventh edition of Gray's Manual in 1907. During this period the plants of the Province were studied mostly by outside workers and few additions were made to the local herbaria. Several publications gave a much more comprehensive picture of the flora and vegetation, and laid a firm foundation for future work. Fernow, Howe and White (1912) were called in to study the forest conditions of the Province. The vegetation of northern Cape Breton was studied in detail by Nichols (1918) and this resulted in an important ecological study of this area in northeastern North America, as well as an increased knowledge of the flora in general. St. John (1921) studied the flora of Sable Island, and reviewed the earlier collections made by Macoun and Gussow; the reports of Fernald (1921, 1922) are indispensable to anyone studying our plants. The study of the estuarine plants by Fassett (1928), although it does not deal in much detail with the plants of Nova Scotia, gives us a further background to our knowledge of plant distribution. Perry (1931) described the vascular flora of St. Paul Island, and the studies of Weatherby (1942) have enlarged our knowledge of a little-known region in central Queens County.

During this period the plants of northeastern North America in general were intensively studied and the taxonomy revised. Much of this work was carried out by Fernald and his students at the Gray Herbarium of Harvard University. The geographical setting of the flora and its relation to that of other regions is given by Fernald (1918, 1921). The distribution of many of the northern plants and their bearing on the problem of glaciation has been discussed by Fernald (1925).

The earlier collections of Nova Scotian plants are mainly in the Provincial Museum at Halifax including those of How from Windsor between 1862 and 1866, Ball from Springhill, Westville, Mahone Bay and other localities, and the Lindsay collections mainly between 1869 and 1873. The Museum has also a duplicate set of the plants collected by C. D. Howe and W. F. Lang in Nova Scotia and Newfoundland during the summer of 1901.

A historic collection exists at the Gray Herbarium of Harvard University. This is composed of the extensive collections made by the Gray Herbarium Expedition to the Province in 1920 and 1921. It also includes duplicate sets of collections made by Howe and Lang, by Fowler at Canso in 1901, by C. A. Hamilton at Boylston, Guysborough County in the 1890's, and many of the collections of Macoun. St. John collected in Pictou County and on Sable Island in 1913. Many of Nichols' collections from northern Cape Breton, obtained mainly during the

summers of 1914 and 1915, are here, as are also J. G. Jack's collections of woody plants made in the Province in 1924. Other more limited collections were made by botanists on shorter visits.

While the Gray Herbarium is especially rich in the plants of southwestern Nova Scotia, the National Herbarium at Ottawa has a good representation of the plants of the eastern region. These are mainly the collections of Macoun, but comprise also the plants collected by Rousseau in eastern Halifax County and Guysborough. Duplicates of many plants of the Gray Herbarium Expedition are found here, so that in general there is a good representation of the plants of this Province. The weed flora is best represented by the many collections made by Groh and Adams in the herbarium of the Plant Research Institute at the Central Experimental Farm, Ottawa. A set of the estuarine plants of northeastern North America collected by Fassett and the herbarium of Dr. G. U. Hay of New Brunswick are found at Acadia University.

The first edition of the "Flora of Nova Scotia" by Roland was published in 1947. This summarized the information scattered in numerous publications, brought up to date the taxonomy of our plants and gave some idea of the distribution of the plants in the Province. The eighth edition of Gray's Manual of Botany appeared in 1950 (Fernald, 1950); and the New Illustrated Flora of Britton and Brown in 1952 (Gleason, 1952). These books stimulated interest in the flora of the region and gave a modern review of the plants involved along with a more accurate means of identification.

The plants and the vegetation of Nova Scotia have been intensively studied since 1947 and particular attention has been given to northern Cape Breton. Numerous species new to the Province have been discovered and the ranges of all the plants have been further detailed. A large herbarium of the plants of Nova Scotia and adjacent areas has been built up at Acadia University so that for the first time ample specimens of our local plants are available for records and study. In addition the Nova Scotia Museum of Science has accumulated a large and representative collection.

The acknowledgements made in the introduction to Part I of this Flora also apply to this section. Reference is made again to the field and collecting work carried out by summer field parties in forest ecology, sponsored by the Nova Scotia Research Foundation. In addition, assistance has been given by the National Research Council of Canada in completing this work and allowing further study. Among our local botanists mention should be made of Mr. J. F. Donley, who collected and studied the orchids of Nova Scotia and also made many interesting collections of other plants in Queens County. Mr. J. S. Erskine collected a number of seasons for the Nova Scotia Museum of Natural Science and visited and described the flora of a number of areas, including the Tusket Islands in Yarmouth County, Sable Island, and St. Paul Island.

Numerous other records from the surrounding areas are shown upon the distributional maps, in addition to those of the Nova Scotian collections. Thus, collections made by Fernald, Bartram, Long and St. John in Prince Edward Island in 1912, and by Macoun in 1888, give a representative sample of the flora of that province; and a more complete record is that of D. S. Erskine (1960). Collections by Fernald, Long and St. John, supplemented later by those of Marie Victorin and others of the Botanical Institute of the University of Montreal, exist for the Magdalen Islands. F. T. Hubbard made extensive collections at Shediac Cape, N. B., during the summer of 1914; C. A. and Una Weatherby repeatedly visited the island of Grand Manan and compiled information on its plants; S. F. Blake collected on the Gulf of St. Lawrence coast of New Brunswick; and A. R. Hodgdon and R. Pike have many records for the Wolf Islands in southern New Brunswick. No particular attempt, however, has been made to get other than published records for such areas.

THE FLORA OF THE REGION

The trees, shrubs and herbaceous plants that compose our flora have a long history. Although the present composition is a very recent development, the individual genera and species are often very old. According to the continental drift theory the continents of North America, Europe and Africa were adjacent to each other in early Tertiary times, fifty million years or more ago, and formed a large continental land mass in the northern hemisphere which is called Laurasia. This land mass was possibly thirty to forty degrees further south than its divisions are today. The middle part of this area is therefore presumed to have been subtropical but, further north, covering most of what is now northern Canada and extending east through Europe to eastern Asia, was a cool temperate or mixed mesophytic forest. Fossil deposits of this flora occur in Spitzbergen, Greenland, Alaska, and across Siberia. The Greenland fossil flora, for example, contains nearly 300 species, including many of our genera of trees and shrubs, 5 species of maple and 15 species of oak.

During the Tertiary period the land mass of Laurasia drifted northward and a rift slowly developed to form the Atlantic Ocean and separate America from Europe and Africa. As the climate became cooler, the rich deciduous forests migrated southward along both sides of the new continents to eastern and western North America, to Europe and to eastern Asia. The hardier plants left behind form our present-day boreal and arctic floras; and south of the Arctic the coniferous trees may have been able to expand their territories and form the nucleus of the vast evergreen forests that developed later. There was undoubtedly a climatic zonation from south to north as it exists today so that plants with a more northern distribution would still have a continuous range

around the northern hemisphere long after the deciduous forests which moved south were divided into separate populations.

Most species of plants are relatively stable and change very slowly. Many of the plants found as fossils for the middle Tertiary, some 50 million years ago, can be classified in the genera of today. Most of the ones found at the end of the Tertiary, over a million years ago, can be recognized as belonging to modern species. The plants changed very slowly, with perhaps a million years being required for the micro-evolution of a new one to occur; and even after a period of ten million years not all the plants of two separated areas may diverge enough to be recognized as separate species.

When the plants of the north temperate zone are examined the species of eastern North America show the greatest change from those of western Europe, an indication of a longer separation between them. The rift separating North and South America from Europe and Africa gradually extended northward until Europe and North America were virtually separated and only island stepping-stones such as Iceland and Greenland provided any pathway between them. The deciduous areas of these two continents have been separated since some time in the early Tertiary and now not a single tree species is common to the two areas. The isolated populations over a long period of time evolved into a number of pairs of species which still resemble each other: *Acer saccharum* and *A. plantanoides*, *Sorbus americana* and *S. Aucuparia*, *Pinus Banksiana* and *P. sylvestris*, *Viburnum trilobum* and *V. Opulus*, along with such herbaceous species as *Polypodium virginianum* and *P. vulgare*, *Oxalis montana* and *O. Acetosella*. Some common American plants still persist as relics in scattered areas in the British Isles, as for example *Eriocaulon septangulare* in western Ireland and western Scotland. An even earlier disjunct population is shown by *Corema Conradii* which has but one related species which grows in Spain, Portugal, the Canary Islands and the Azores.

The flora of the deciduous forests of the eastern United States shows a much closer relationship to that of eastern Asia, since until some time late in the Tertiary the climate may have been mild enough to allow a belt of deciduous forest to stretch continuously from the eastern United States, across Canada to Alaska, and down eastern Asia. The genus *Epigaea*, (trailing arbutus) for example, has but two known species; one is in eastern North America, and one in eastern Asia. The genus *Hydrangea* is found in eastern North America and in Asia; *Clintonia*, on the other hand, has one species in our area, two in western North America and two in eastern Asia. Our blue cohosh, *Caulophyllum thalictroides*, is a species which is common to the eastern side of both continents. A number of our eastern North American species show characteristics found in related plants growing in Japan and Kamchatka.

The plants which have their habitats further north do not show such disjunct ranges but tend to be distributed generally around the boreal zone of the northern hemisphere. Sometimes no difference can be discerned between the plants of Europe, Asia and America. In many cases the American plants were described as separate species but as further work is done in the northern areas the tendency is to classify the American, Asian and European plants as three subspecies or even as three varieties of the same species.

By the close of the Tertiary, a million years ago, our forests probably had a more deciduous nature than they have now and our present species were fairly well defined. There were undoubtedly differences in composition due to altitude and latitude but there is no evidence to indicate any wide band of coniferous trees in the region where the boreal or northern evergreen forest occurs today. Some of our evergreen trees were undoubtedly present further north and probably also along the coast; others were found in alpine areas or on the mountains to the south as they are today, but the development of a widespread evergreen forest is considered to be a recent development in the history of our vegetation.

The most significant event influencing the plants and their distribution in this area is the series of glaciations during the Pleistocene period. The climate became cooler during the Pliocene age, which marks the end of the Tertiary period about one million years ago. During the succeeding period all of eastern Canada and part of the northern United States were repeatedly covered by ice. Four main glaciations are indicated, with warm interglacial periods between them. The ice overran the continent as far south as Kansas, Illinois, and even into northern Kentucky. The last glaciation was the Wisconsin glaciation during which Nova Scotia appears to have been completely covered by ice. The glacier crossed over the Province from a northwestern direction and out into the Atlantic Ocean on to the coastal plain to the vicinity of Sable Island; and further south it extended as far as Cape Cod and northern Pennsylvania.

As the ice became thicker and more water was held in the great continental glaciers, the sea-level became lowered and exposed the outer edge of the coastal plain from Newfoundland southward. Freshwater peats have been dredged up in many places, especially off the coast of New England, and their age determined by radioactive-carbon dating. Data from this and other sources suggest that the sea-level was as low as -123 meters about 19,000 years ago and that it was still 30-40 meters below its present level 8-9,000 years ago. The coastal shelves thus became seaward extensions of the present land areas and extended beyond the limits of Wisconsin glaciation.

The final withdrawal of the ice occurred rather recently and the post-glacial history of Nova Scotia extends back only ten to fifteen thousand years. It is to be expected that the ice may have disappeared

from southwestern Nova Scotia first and withdrawn northwestward towards Cape Breton. There is some evidence that local advances occurred in Cape Breton 10,700 years ago and perhaps at the same time from the South Mountain northward across the Annapolis Valley. The camps of the first hunters of Caribou, found near Truro, have been dated at around 10,000 years ago. At this time the ice had disappeared, or nearly so, from most of Cape Breton except possibly in parts of the plateau. The indications are that the sea-level at this time was still some 40 meters below its present level so that some of the coastal-plain would still be above water and the present area of Nova Scotia, being further from the open ocean, may have had a more continental climate.

Towards the Bay of Fundy and northward the land was lowered by the weight of the ice. Raised beach-lines occur from Digby County north and the Isthmus of Chignecto was partly submerged. Recovery apparently was fairly rapid once the ice retreated so that in the area around the Minas Basin and in Cumberland Bay a band along the coast was covered by trees, including white pine and oak. A wider, more-elevated connection then existed between Nova Scotia and New Brunswick as a migration route for plants. These trees were later submerged by the rising sea-level, as the glaciers further retreated, to form the sunken forests at various places around this part of the coast; and the deposits of silt laid down to form the tidal marshes about the head of the Bay of Fundy covered them. Stumps of this buried forest are now exposed where the marshes have eroded away due to the changing coast line and they appear on a sandy soil when the tide is low.

The expansion of the northern coniferous forests may have occurred during the interglacial stages of the Pleistocene. Trees must have repeatedly migrated back and forth as the ice advanced and retreated. Some would be better adapted to spread and survive on the glaciated poorly-drained soils left after each glacial retreat. The exposed soils would be raw and devoid of organic matter; clays and rock flour would make the soil texture heavy and drainage poor; and the surface drainage systems would be disturbed so that innumerable swamps, pools, lakes and ponds existed. Soils in the northern regions would be frozen to some depth for a considerable time so that species with a shallow root-system would be able to become established more quickly than most of the deciduous species.

There is no reason to think that the vegetation just before the last glaciation was substantially different from that existing at the present time. The climate may have been more temperate at times but from the fossil record in Ontario there appears to have been such species as *Acer spicatum*, *Taxus canadensis*, *Thuja*, *Picea* and *Larix*, all species common at the present time. One result of the repeated glaciations may have been the progressive loss of many of the less adaptable species and the loss of considerable genetic variation in others. On the other hand,

various species which were pushed southward and then expanded northward again still retain evidence of having crossed with more southern species and acquiring some of their characteristics. *Fagus grandifolia*, beech, shows evidence of being derived from two separate species; *Acer saccharum*, sugar maple, shows some of the characteristics of *A. nigrum;* and the variety *phanerolepis* of the balsam fir indicates introgression with the southern *Abies Fraseri* of the Appalachians.

The last glaciation eradicated the plants so far as our present land areas of the Maritime Provinces are concerned, as it is now believed that the entire area was covered by ice. All the plants found in our present vegetation must have migrated into Nova Scotia after the ice receded. The advance of the ice may have been relatively rapid and it is doubtful if northern plants retreated too far south in advance of the ice sheet. There appears to have been no broad tundra belt south of the ice as it advanced although Pleistocene records do indicate that northern trees did range far south and pockets in the south probably expanded their area. The exposed coastal plain would offer a better escape route outward and southward since here the plants would be colonizing bare soil instead of competing with an already established closed vegetation.

As the ice receded from Nova Scotia, around 10,000 years ago, the plants migrated inland and northward onto the newly-exposed land areas. Data from pollen analyses of peat bogs suggest that tundra and steppe conditions prevailed for a considerable time, perhaps a thousand years or more. Grasses, sedges and pteridophytes became common. The trees gradually increased in abundance, probably poplars and aspens first, then birches, fir, spruce and pines. The Alleghenian species such as sugar maple, elm, beech and oak would follow with their typical herbaceous flora. The climate has fluctuated but apparently it has not changed drastically since the first trees appeared. There was probably a period when the climate was warmer and drier, with more oak and perhaps hickory in the eastern regions. A thousand years ago it may have been cooler and moister.

The individual species differ in their genetic variation and their ecological requirements. Thus they would move in at different rates and occupy different habitats. Some would rapidly colonize the exposed territories and be later crowded out as soil and climatic conditions changed or other plants began to compete with them, leaving only relic colonies behind. Heath plants would become common as the soils became leached and more acid. In general the plants would distribute themselves according to the ecological conditions to which they were best adapted. Plants of richer habitats may possibly be still moving into the Province as the deciduous forests become longer established and conditions become more suitable for them to develop.

Botanically, much of Nova Scotia now lies within the hemlock - white pine - northern hardwood region of eastern North America

(Nichols, 1935). The dominant trees are the hemlock, sugar maple, beech, yellow birch, white and red pine, white ash, red and white spruce, balsam fir and red maple. Sugar maple is found on the better well-drained soils, beech on the drier ridges, and hemlock and yellow birch mixed with spruce on lower ground and on more poorly-drained soils. Sandy soils formerly supported good stands of pine. Red maple is found in swampy areas or near lake borders and is characteristic of southwestern Nova Scotia while larch and black spruce predominate in bogs and swamps. In general, the better hardwoods are more common in the northern half of the Province, while the spruces, fir and red maple are dominant in the southern and eastern regions. Basswood, silver maple and butternut have never penetrated into Nova Scotia, although they are found in central and southern New Brunswick. Red ash and white cedar are very local; jack pine is found only on the poorest soils and originally in small amounts. See map C (1-7).

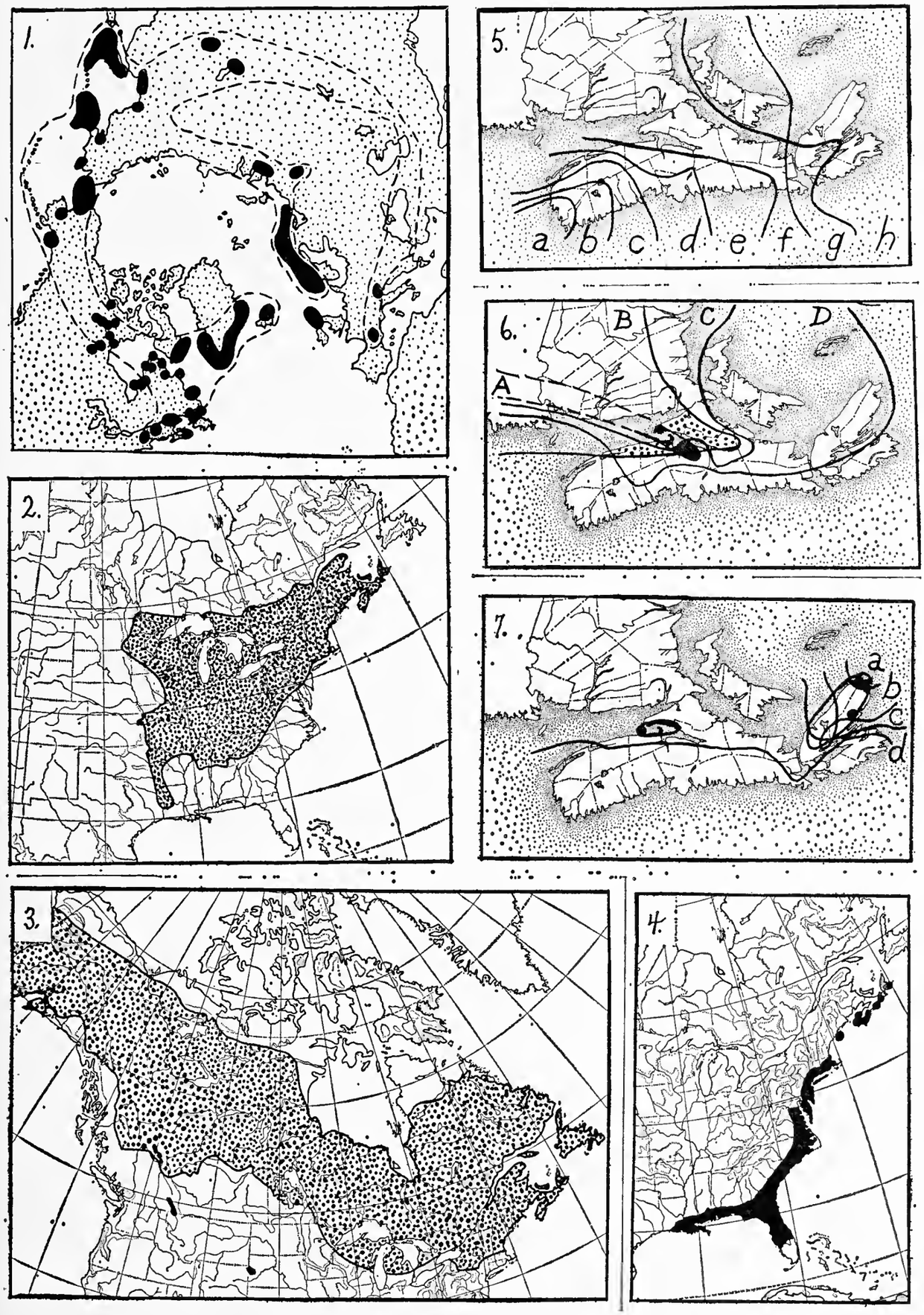
Eastward toward Cape Breton, and to some extent along the Bay of Fundy, white birch, fir and mountain ash increase in amount. Yellow birch does not occur on the plateau of northern Cape Breton above an elevation of 1000-1100 feet. The top of the plateau is covered with a boreal fir forest where the dominant species is balsam fir, mixed with white birch.

The plants of Nova Scotia may be divided into a number of groups called floral elements, with each floral element composed of those plants which have more or less the same distribution outside the area and therefore somewhat the same phytogeographic history. All of our floral elements may be considered extraneous as they have migrated into the area from outside the Province, although their earlier evolution undoubtedly occurred in a northern climate before glaciation occurred.

The main centers from which plants radiated into the newly-exposed areas are those immediately outside of the glacial front, either from reservoirs of plants south of the terminal limits of the ice advance, from plants pushed southward by the advancing glaciers, or from the exposed areas on the outer limits of the coastal plain.

The first plants which established themselves northward on the newly-exposed moraines and glacial debris may have been similar to the more northern plants of bogs and barrens. Rapidly-spreading annuals and perennials such as grasses, sedges, low shrubs and pteridophytes, may have created an open vegetation. Many of these retreated northward as the climate improved. Others diminished in numbers and area as later plants competed with them. These exist now only in bogs and barrens or as isolated relic-colonies on cliff-faces and talus slopes or in isolated valleys and ravines. These arctic and alpine disjunct species may be called the *Arctic-alpine element.*

The northern element, now mainly the plants of the northern evergreen forest which probably first followed the retreating ice northward,



Map C—**1. Phyllodoce caerulea**, circumboreal range of a relic species in **N. S.** (after Hulten and Cody). **2. Acer saccharum. 3. Picea glauca**, a tree with a boreal range. **4.** *Ilex glabra*, a coastal-plane plant (after Fernald). **5. Panicum**, northeastern limits, (a) *P. dichotomiflorum*, (b) *P. longifolium*, (c) *P. virgatum*, (d) *P. spretum*, (e) *P. clandestinum*, (f) *P. subvillosum*, (g) *P. lanuginosum*, (h) *P. boreale*, all common in southwestern N. S. **6.** Alleghenian species in N. S., (a) **Festuca obtusa**, (b) **Trillium erectum**, (c) **Erythronium americanum**, (d) **Trillium cernum. 7.** Northern species, the greatest concentration within the two circles, (a) numerous species, (b) **Polystichum Lonchitis**, (c) **Dryopteris Filix-mas**, (d) **Polystichum Braunii.**

is called the *Boreal element*. The range of these plants is from Nova Scotia and Newfoundland to Alaska and often Siberia or throughout northern Eurasia. Closely following and becoming the common plants from Newfoundland and Nova Scotia to Manitoba southward is an element confined to eastern North America which we will call the *Canadian element*, although the larger part of the present ranges of most of these plants will be further south. The plants associated with the hardwoods, sugar maple and beech in our area, which have migrated northward from the rich Appalachian forests is called the *Alleghenian element*, although here again this is merely a reduced northward extension. The true *Coastal-plain element* consists of plants which are common on the coastal plain further south and which moved northward on the exposed coastal plain during glacial times. The *Weed element* consists of plants introduced by man and now common in cultivated areas and elsewhere, mainly introduced from Europe and western Asia, or coming indirectly by way of western Canada in grains and feeds.

Each of these floral elements may be further subdivided as their history is followed further into the past. One of the most interesting groups consists of those plants which are found in eastern North America and then on the islands off western Europe or in relic areas in the northeastern part of that continent. A few plants belonging to this amphi-Atlantic element are mentioned in connection with our coastal plants.

ARCTIC-ALPINE AND BOREAL DISJUNCT ELEMENTS

The first plants which might be expected to migrate into this area under the cool climatic conditions following glaciation are those which show the most northern distribution at the present time. The distribution of arctic-alpine and boreal disjunct species in Nova Scotia has been summarized by Hounsell and Smith (1966). They list 58 species which show a disjunct or scattered distribution in our area, to which may be added three more found on St. Paul Island. The fact that these plants show such a scattered distribution, often being known from but a single or a few locations in our area, and that a number sometimes grow together in a suitable location, suggests that they are relic elements of a flora that was widespread immediately following glaciation and which is now represented better further north in Gaspé, Newfoundland and northern Quebec.

The centers from which these plants spread into our area following glaciation is difficult to determine. The presence of many of them on the higher mountains in New England and northern New York indicates that they were present further south and moved northward following the retreat of the ice. On the other hand their present distribution in eastern North America is almost entirely north of the glacier's southern boundary, which suggests that they were either more abundant southward

before glaciation or else must have moved south as the climate became more severe and their former areas were overrun by ice. One would expect our northern flora to be reduced in number of species during the successive glaciations, with the surviving ones as those best able to migrate.

There is also the possibility that some of these plants survived on the exposed coastal plain, as the presence of a few along the Atlantic coasts now suggest. They would be free to move east or west along the terminal moraines as the ice retreated. It seems dubious that any late migration occurred from the far north or the northwest, both on account of the distance involved and the warm post-glacial period; in many cases our plants do differ from the more northern plants and are described as separate varieties.

In any case these surviving plants may have found conditions suitable for a rapid expansion in the early stages of colonization. Soil and climatic conditions following the last glaciation were quite different from those existing in this area at the present time. The soils would be more alkaline before extensive leaching took place; competition would be less on the large newly-exposed areas; and the climate may have been more severe than at the present time. Groups of northern plants, sedges, grasses, pteridophytes and many herbaceous plants may have become abundant over a wide area, spreading somewhat as many of our weedy species do today and occupying the various habitats as they became available. *Artemisia*, for example, is now very rare and exists here only as a relic species but Livingstone and Estes (1967) found its pollen abundantly represented in the lower part of a profile in a lake on the plateau of Cape Breton.

Their present distribution suggests that these plants were migrating through this area rather than permanently colonizing it. They may have become abundant in the earlier stages. Then, as the climate became warmer, the soils more acid and competition developed from a more vigorous vegetation, these plants survived only in the locations most favorable to them. Some retreated to the north or survived only in cool areas or on headlands around the coast; a few are known only from the top of the Cape Breton plateau or around its edges. A small number of our rarer plants are now found only in deep ravines or on shaded cliffs along the rivers in northern Cape Breton, where they tend to grow in a few restricted locations.

Two or more floral elements may be mentioned, although the individual species are not classified here. The plants which are found on the mountains further south in New England and northern New York are alpine or arctic-alpine plants while those known from only further north are northern boreal, subarctic or arctic. Many of these plants have a circumpolar distribution and are found throughout northern Eurasia, or occasionally persisting only as relic species in Europe.

Three are known only from about the Gulf of St. Lawrence and adjacent areas, of which *Primula laurentiana* is a good example. *Oxytropis johannensis* exists in a number of scattered locations to James Bay; and *Astragalus Robbinsii* seems related to the plants at the type area in Vermont. Such plants have barely survived the rigorous competition and they still have a very tenuous hold on existence. A somewhat similar example is *Pedicularis palustris* which may have survived on the coastal plain and now is known only from southeastern Newfoundland, the Magdalen Islands and eastern Quebec, and from around Cape North and in eastern Guysborough County in Nova Scotia.

The distribution of these plants in the Province varies, with the largest number found in the cooler or more northern regions. Several are found at sea-level around the coast and the six following ones are all found on Brier Island. *Sedum Rosea* and *Claytonia fontana* are rare on rocks on the Atlantic shore, while *Lycopodium Selago* has only been found on Brier Island in this habitat, although both it and the *Sedum* are common on cliffs northward. *Betula Michauxii* is found in coastal bogs in Guysborough Co. and on Brier Island; and *Geum Peckii*, an alpine species of the White Mountains, is found in abundance in the large bog on the same island. *Selaginella Selaginoides* and *Schizaea pusilla* are also found in the bogs near sea-level, and at over 1000 feet altitude on the plateau of Cape Breton.

A few of the plants are widespread in Nova Scotia. *Woodsia ilvensis* is found on cliffs or talus slopes in many locations in the central and northern parts of the Province, becoming more common northward; and *Dryopteris fragrans* is rather typical of rock faces along the Cobequids and has been reported from the Strait of Canso area. In general, however, the most suitable habitats for the survival of these plants seems to be about the head of the Bay of Fundy and on the cliffs, ravines, headlands and high bogs of northern Cape Breton.

Over 20 species are found in the Bay of Fundy-Cobequid area, of which only one variety is not also found in northern Cape Breton. Several are found on the cliffs and on the outer wall of Cape Blomidon; and Schofield, (1955) found a number, including *Saxifraga Aizoon*, *Astragalus Robbinsii*, *Oxytropis johannensis*, *Sedum Rosea* and *Trisetum spicatum*, on the wind-swept crest of Cape d'Or on the Cumberland shore. Others are scattered along the cliffs or near streams on the south side of the Cobequid Mountains in Cumberland and eastern Colchester Counties, where they are found in the lower parts of the valleys and not on the older rocks at higher altitudes. The following are examples of this group.

Lycopodium Selago
Woodsia ilvensis
Woodsia glabella
Asplenium Trichomanes
Schizachne purpurascens
Carex capillaris
Carex atratiformis
Luzula parviflora

Asplenium viride
Dryopteris fragrans
Poa glaucantha
Draba hirta
Arabis hirsuta
Arabis Drummondii

These and additional species occur in the highlands of northern Cape Breton Island where they occupy suitable niches, usually along moist, steep-walled river gorges in Inverness and Victoria Counties or less frequently in more southern parts of the Island. Three species are plants of the high barrens and bogs: *Betula glandulosa*, *Betula borealis* and *Vaccinium uliginosum*. The region between this center of distribution and the Bay of Fundy-Cobequid area, about 170 miles in a straight line, has less suitable habitats and is apparently devoid of these species. The following are further examples of this group which are relatively rare, often known from but a single location and found in Nova Scotia only in northern Cape Breton.

Woodsia alpina
Cryptogramma Stelleri
Poa alpina
Festuca prolifera
Phleum alpinum
Carex scirpoidea
Juncus trifidus
Luzula spicata
Tofieldia glutinosa
Salix cordifolia
Silene acaulis
Saxifraga aizoides
Parnassia parviflora
Phyllodoce caerulea
Diapensia lapponica
Vaccinium ovalifolium
Pinguicula vulgaris
Artemisia canadensis
Arnica chionopappa
Solidago multiradiata

Another group of plants is mainly restricted to northern Cape Breton, or at least its members are much more common there. These plants are found in wooded ravines or damp, cool, deciduous and mixed woods and seem to be more characteristic of what may formerly have been boreal deciduous woods rather than one of a coniferous type. Their distribution is circumboreal but often quite disjunct. In North America they may occur from Newfoundland to scattered locations in New England, New York and southern Quebec, to a limited area around the head of the Great Lakes, and then be common from Alaska to Colorado or California. Most are found in eastern Siberia and many in Eurasia, with two ferns common in the northern part of the British Isles, Iceland and Greenland. In general, these are the plants that give the distinctive character to the cooler deciduous or mixed woods of northern Cape Breton.

This group, or part of it, may be called the *Cordilleran element* of our flora, as these plants are common in a somewhat similar cool moist habitat on the Pacific Coast or along the Rocky Mountains. The lack of suitable areas in central North America for the more southern forms leads to their disjunct distributions, while rather similar plants which are

more northern, may have a more general distribution across the continent. The following plants are found often growing together in northern Cape Breton.

Cystopteris fragilis
Dryopteris Filix-mas
Polystichum Lonchitis
Polystichum Braunii
Luzula parviflora
Goodyera oblongifolia
Epilobium Hornemanni
Osmorhiza chilensis
Galium kamtschaticum

Epilobium Hornemanni is northern and is found in cool ravines towards the top of the plateau. *Cystopteris fragilis* is more general in northern Nova Scotia, but in Cape Breton is also represented by variety *laurentiana*, which is found only about the Gulf of St. Lawrence. *Polystichum Braunii*, *Luzula* and *Osmorhiza* are also found scattered about the head of the Bay of Fundy in rich woods or in ravines. *Dryopteris Filix-mas* is confined to northern Cape Breton but it is often luxuriant, with plants at the northern end of the Island growing out onto the open roadsides. *Galium kamtschaticum* is rare in eastern Canada and then is found only in northern British Columbia, the Aleutian Islands and in eastern Siberia. *Osmorhiza*, on the other hand, is found from British Columbia to Arizona and reappears again in Chile and Patagonia.

THE BOREAL ELEMENT

The boreal forest stretches from Nova Scotia and Newfoundland to Alaska and is the most extensive forest type in Canada. The present widespread distribution and significance probably developed during Pleistocene time when the repeated advance and withdrawal of the ice led to extensive climatic changes and created wide expanses of poorly-drained soils. While the dominant tree varies, the white spruce, with black spruce, American larch, trembling aspen, balsam poplar and paper birch are all characteristically present. Jack pine and balsam fir are associated species in eastern North America.

The latitudinal width of this forest was undoubtedly much compressed in advance of the various glacial advances. However, the various species probably expanded their areas at higher altitudes further south; fossil records show their Pleistocene distribution as far away as the Gulf States.

The typical plants of this element in Nova Scotia are now associated with the evergreen forest and are found in the coniferous woods and the swamps, swales and bogs associated with it. Because they are relatively northern, their ranges do not show such a broken distribution as those of more southern plants and they often occur around the northern hemisphere. The following list gives a number of the representative plants of

this element, all of which are also found, or have close relatives, in eastern Siberia and often throughout northern Eurasia.

Lycopodium annotinum
Selaginella Selaginoides
Typha latifolia
Scheuchzeria palustris
Alopecurus aequalis
Eriophorum angustifolium
Eriophorum Chamissonis
Carex diandra
Carex disperma
Carex canescens
Calla palustris
Luzula multiflora
Habenaria hyperborea
Smilacina trifolia
Streptopus amplexifolius
Listera cordata
Myrica Gale
Alnus crispa
Nuphar variegatum
Ranunculus Gmelini
Coptis groenlandica
Mitella nuda
Ribes triste
Potentilla palustris
Geum rivale
Rubus pubescens
Viola Selkirkii
Circaea alpina
Hippuris vulgaris
Moneses uniflora
Pyrola secunda
Chamaedaphne calyculata
Vaccinium Oxycoccos
Menyanthes trifoliata
Utricularia intermedia
Galium triflorum
Viburnum edule
Linnaea borealis
Anaphalis margaritacea

Several plants are found in Prince Edward Island and in northern Cape Breton which have not been found on the peninsula of Nova Scotia. *Caltha palustris*, ranging from Newfoundland to Alaska and Eurasia and south to South Carolina and Tennessee, is common through Prince Edward Island but in Nova Scotia is found only in coastal swales along Inverness County from Mabou Harbour north to Pleasant Bay. *Betula pumila* is rare in Prince Edward Island but in Nova Scotia is found only on the plateau of northern Cape Breton. A plant with a somewhat similar distribution is *Sanguisorba canadensis*. This is widespread in eastern North America and separated from a variety from Alaska to British Columbia. It is not found in Prince Edward Island but it is found in northern New Brunswick and in Gaspé and is common in Inverness County in northern Cape Breton. It would appear that these plants were once more common but have now retreated northward and exist only in the most suitable or cooler locations. Several others, such as *Comandra Richardsiana* and *Anemone canadensis*, are found along the coast in eastern Nova Scotia but are very rare.

Plants with a more northern, or Hudsonian range, are found chiefly on headlands or barren areas in the cooler regions. Typical example of this is the bakeapple berry, *Rubus Chamaemorus*, which is found far north around the northern hemisphere. This fruits fairly well around

the coast but is practically sterile inland. The *Euphrasias* are very common on headlands and around the coast but it is difficult to know whether these are native or largely introduced. Other plants which are northern and found in our most exposed habitats are:

Scirpus cespitosus
Juniperus communis
Juniperus horizontalis
Arenaria lateriflora
Empetrum hermaphroditum
Vaccinium Vitis-Idaea
Halenia deflexa

Many of the plants which are most typical of our coniferous woods do not actually belong to this boreal element, even though some of them now extend northward to the Arctic. These plants which are more confined to eastern North America, or have been longer isolated from their Eurasian relatives, are placed in the following element.

THE CANADIAN ELEMENT

The background flora of northeastern North America may be called the Canadian element. These plants are the ones which range from Nova Scotia and Newfoundland to Manitoba, south to Pennsylvania, and in the mountains to North Carolina and Tennessee. Further south they exist at higher altitudes; or they may be common in the earlier stages of succession and on the poorer sites south of the glacial boundaries. There thus existed a reservoir of plants available to recolonize more northern areas as the glaciers receded.

As with each element, species of different ecological amplitudes are present. White pine, hemlock, sugar maple and beech make up much of the mixed northern hardwood forest. The yellow birch and fir extend to the plateau of northern Cape Breton; along the Atlantic coast red maple is mixed with the evergreen forests; red spruce is a common tree; and the large-toothed poplar is found on lighter soils.

The shrub types are likewise widespread. Wire birch occurs on the lighter soils and barely reaches Cape Breton; choke-cherry occurs along the intervales, mountain maple in the cooler regions and along ravines, and lower shrubs, such as false honeysuckle, witherod, hardhack and Canada honeysuckle, are typical. The ericaceous or heath plants are abundant in the earlier stages of succession and are particularly common on the acid soils near the Atlantic coast. Rhodora, lambkill and various blueberries are found throughout.

A large number of our plants show this general distribution in eastern North America and the following list presents a number of the more common ones.

Polypodium virginianum
Dennstaedtia punctilobula
Dryopteris Thelypteris
Rubus canadensis
Impatiens capensis
Viola cucullata

Onoclea sensibilis
Scirpus rubrotinctus
Carex arctata
Carex gynandra
Pontederia cordata
Luzula acuminata
Maianthemum canadense
Streptopus roseus
Clintonia borealis
Trillium undulatum
Habenaria psycodes
Chrysosplenium americanum
Circaea canadensis
Aralis nudicaulis
Hydrocotyle americanum
Epigaea repens
Gaultheria procumbens
Trientialis borealis
Galium palustre
Houstonia caerulea
Mitchella repens
Eupatorium perforatum
Solidago puberula
Aster lateriflorus

Most of these plants are found in open woods, pastures, barrens or old fields throughout the Province. Some are restricted to the richer habitats; a few are found only in the northern part of the area and are rare or absent along the Atlantic coast. Some, *Maianthemum canadense* for example, seem adapted to our coniferous woods; *Chiogenes hispidula* and *Mitchella repens* are also often found on mossy hummocks in this habitat. In general, these plants are the common ones of our flora and thus are the most familiar and unexciting to one looking for rare species.

THE ALLEGHENIAN ELEMENT

The plants that are here included in the Alleghenian floral element are those restricted to rich habitats or our best deciduous woods and which have a distribution mainly far to the south in the deciduous forest. The maximum northern range is usually more restricted than that of the sugar maple, from Nova Scotia to Minnesota south to the Gulf States. In Nova Scotia they are usually found only on the better soils in the northern part of the Province from Annapolis County to Cape Breton in the region of rich woodlands and along the river intervales. Many of the species are among our rarest plants, found in only a few scattered locations from the Annapolis Valley and central Nova Scotia eastward. Some are widespread and general in their habitats and thus approach the plants of the Canadian element. A few are rare or scattered on the intervales of central Nova Scotia and become general only along the rich flood-plains of northern Cape Breton.

They have presumably entered the Province by the narrow neck of land connecting Nova Scotia with New Brunswick when this area was more elevated above the sea than it is at present. The center of their distribution seems to be in the Cobequid Mountains of Cumberland and Colchester Counties or on the intervales about the head of the Minas Basin, from where they have migrated eastward to northern Cape Breton and to a lesser degree westward along the Annapolis Valley and the North and South Mountains bordering it.

The following are examples of plants with this restricted range in the Province and included in this element.

Athyrium thelpyterioides
Adiantum pedatum
Festuca obtusa
Glyceria melicaria
Hystrix patula
Carex torta
Carex plantaginea
Uvularia sessilifolia
Allium tricoccum
Erythronium americanum
Polygonatum pubescens
Trillium erectum
Polygonum arifolium
Ostrya virginiana
Hepatica americana
Caulophyllum thalictroides
Sanguinaria canadensis
Dicentra Cucullaria
Dentaria diphylla
Tiarella cordifolia
Desmodium glutinosum
Sanicula gregaria
Triosteum aurantiacum

None of the above plants has been found on Prince Edward Island. A few plants of this type have crossed the Northumberland Strait. These include *Carex scabrata*, *Clematis virginiana*, *Viola eriocarpa*, *Aralia racemosa* and *Osmorhiza Claytoni*. A few others occur both on Prince Edward Island and in Newfoundland: *Trillium cernuum*, which perhaps belongs more to the Canadian element, *Claytonia caroliniana* and *Ranunculus recurvatus*. *Impatiens pallida*, on the other hand, is found in Newfoundland but not in Prince Edward Island.

The greatest concentration of this element is along the Cobequid Mountains east to Truro, where a number of them grow in the sugar maple woods or in the valleys between the hills. Some are found also on the top of Cape Blomidon or in the surrounding areas. The greatest concentration is on a small intervale at Kemptown in Colchester County where under relic sugar-maple woods the ground is white with bloodroot in early May, followed later by a mat of wild leek. Yellow violets and spring-beauty are common; Dutchman's breeches, blue cohosh, *Osmorhiza*, and *Sanicula* are also present. *Uvularia* is less common and *Tiarella* is common in the neighborhood. *Lilium canadense* grows along the river.

The Alleghenian element is thus characteristic of sugar-maple woods or richer intervale soils; it is a much reduced sample of the type of vegetation found further south or more inland in the deciduous forests.

THE SOUTHWESTERN FLORA

The southwestern part of the Province exhibits a floristic picture quite different from that of the more northern counties. This region comprises that part of the old Atlantic upland in the southwestern part of the Province, particularly that part of it formed from slates. Roughly this area is that south of a line from Digby Neck east through central

Annapolis and Hants Counties to Musquodoboit Harbour in Halifax County, with parts of eastern Cape Breton showing some similarities in climate and habitat. The plants typical of this region are largely lacking in the quartzite and granitic areas northward and eastward.

It is a region of lakes and barrens, of innumerable pond-holes and sloughs, with rather level topography, high humidity and acid soils. Plants which are absent or rare in the northern regions often grow here in great luxuriance and abundance. At the same time many of the heaths, sedges and bog plants of the more northern range are also common. This intermingling of northern and southern plants is often very conspicuous.

Fernald (1921) commenting upon Merriam's life zones remarks: "In a region where the Louisianian *Lycopodium inundatum*, var. *Bigelovii* (*L. adpressum*) and the Louisianian and Carolinian *Utricularia subulata* creep among the bases of *Carex Goodenowii* (Greenland and arctic America, south to Nova Scotia and eastern Massachusetts) or of *Juncus filiformis* (Greenland to Massachusetts and the mountains of Pennsylvania); where the Louisianian and Carolinian *Eleocharis tuberculosa* vies with *Carex oligosperma* (Labrador to Great Bear Lake, etc.) for the possession of the edge of a savannah; when the dominant undergrowth in the spruce, fir and larch swamps includes the Louisianian and Carolinian inkberry, and such a distinctly southern plant as *Solidago Elliottii;* inkberry makes tall thickets with *Ledum groenlandicum* or pushes its branches through the carpet of arctic crowberry, *Empetrum nigrum*, or the arctic cloudberry or bakeapple (*Rubus Chamaemorus*); in a region where these comminglings are met at every turn, one is certainly perplexed to make Merriam's zones fit the facts."

The general impression of the flora of this region, at least near the coast, is quite different from that of the more inland and northern regions. Red maple is a common and characteristic deciduous tree. The bayberry is one of the most common shrubs; highbush blueberries are common; inkberry may be expected in a variety of habitats; and there is a multitude of forms of *Rubus*. Various species of *Sisyrinchium* are abundant in the ditches; *Gerardia* is found on any moist ground, with the delicate grass *Sporobolus uniflorus* and various *Panicums* ubiquitous. The conspicuous weedy species are *Holcus lanatus*, velvet grass, and the introduced *Alchemilla* or lady's mantle. The conditions favorable for these plants exist near the coast, along the river valleys and around the lakes where high moisture conditions occur and suitable bogs, pools, rills and strand-lines are found.

The plants of the southwestern flora are believed to have persisted during the last glaciation in a refugium off the Atlantic Coast or to have moved northward over the exposed coastal plain during the time when the glacier was retreating. The glaciation at its maximum extended to Sable Island, which marks the terminal moraine, south to and along

Cape Cod and Long Island inland across Pennsylvania. Outside and south of this limit the coastal plain was exposed due to the lowering of the ocean level to as much as 65-70 meters. Recent investigations have revealed the presence of layers of fresh-water peat, teeth of mammoths and other evidence of plant and animal life during the last glacial period.

The vegetation on this exposed coastal plain may have presented a mixture of plants such as we find today in southwestern Nova Scotia or further south in Cape Cod and New Jersey. The common coastal plants may have moved outward as the glacier advanced; the exposed land with its ponds, sandy or peaty soils and stream edges would present a suitable area for colonization by more southern plants; while in exposed locations the more northern plants pushed southward or outward could persist. As the glacier retreated and the sea-level rose, these plants again moved back or, in the case of more southern plants, extended their range northward to southwestern Nova Scotia and finally became isolated from their ranges further south as they are absent from Massachusetts, along the coast of Maine and New Brunswick and around northern Nova Scotia.

Members of different floral elements moved into southwestern Nova Scotia because, presumably, there was a varied vegetation on the exposed coastal plain. Plants of the Canadian element may have moved into the southwestern area first and only later invaded northern Nova Scotia as they migrated up through Maine and New Brunswick. Plants of the strictly *Coastal-plain element* are those confined almost entirely to the plain further south, or with minor extensions inward along the rivers and lakes. The following are members of this element now found from Florida to Louisiana or Texas and some to Mexico or the West Indies, and north along the coast to eastern New Jersey, to New England, or then jumping to southwestern Nova Scotia.

Lycopodium indundatum Bigelovii
Woodwardia areolata
Potamogeton pulcher
Panicum dichotomiflorum
Panicum spretum
Panicum longifolium
Carex Howei
Carex atlantica
Eleocharis tuberculosa
Rhynchospora capitellata
Juncus marginatus
Lachnanthes tinctoria
Xyris caroliniana
Smilax rotundifolia
Sisyrinchium atlanticum
Habenaria flava
Polygonum hydropiperoides
Polygonum punctatum majus
Ilex glabra
Proserpinaca pectinatus
Hydrocotyle umbellata
Bartonia virginica
Utricularia radiata
Utricularia subulata

Others are confined to the northern part of the coastal plain. They show the same disjunct range but in the United States range southward only to Cape Cod, to the New Jersey pine barrens, or to Virginia.

Dryopteris simulata
Glyceria obtusa
Lophiola aurea
Myriophyllum humile
Coreopsis rosea
Sabatia Kennedyana
Polygonum puritanorum
Solidago Elliottii
Solidago galetorum

These plants often exhibit a relationship to tropical genera or families, which might be expected for plants which range so far south. Many of them may have originated long ago in the eastern part of the United States when the climate was warmer, and moved out onto the newly-exposed coastal plain when the land rose in late Tertiary time a few million years ago. Others, such as variety *majus* of *Polygonum punctatum* and a number of our coastal plants, may have originated in South or Central America and then moved later gradually northward along the coastal plain.

Other plants which are distinctly coastal-plain in nature but which have developed a wider distribution are very common in southwestern Nova Scotia and occur also inland and in Cape Breton, and often also in southern or southwestern Newfoundland.

Juncus militaris
Xyris montana
Calopogon pulchellus
Habenaria blephariglottis
Myrica pensylvanica
Drosera intermedia
Aronia arbutifolia
Rosa palustris
Hudsonia ericoides
Bartonia paniculata
Gratiola aurea
Rhexia virginica
Viola lanceolata
Gaylussacia dumosa

A few plants have practically moved off the coastal plain entirely but are obviously of this origin since they have their close relatives on the coastal plain or far southward. *Utricularia cornuta* is found from Florida to Texas and in the West Indies but is common in bogs from Newfoundland to Minnesota. *Pogonia ophioglossoides* grows from Florida to Texas and from Newfoundland to Minnesota. Our Nova Scotia variety resembles closely the only other species, found in Japan. *Sarracenia purpurea* is characteristic of bogs in the boreal zone as far west as the Mackenzie. It is common in southwestern Nova Scotia and occurs to New Jersey. Further south it is represented by a variety which grows to Florida and Louisiana; and all the other species of *Sarracenia* are in the southeastern United States. Our most interesting plant of this group is *Schizaea pusilla*, the curly-grass fern. This species is far isolated from the other species in the tropics and the southern hemisphere. It is now found only in local areas in the New Jersey pine barrens, one station on Long Island, and then is common in southwestern Nova Scotia, along the coast to and on the plateau of Cape Breton and in Newfoundland. Its range now seems like a disjunct one of a northern species with the

southern stations being only relics of a formerly more widespread southern distribution.

The vegetation on the now-submerged coastal plain was apparently varied. Therefore many plants with a wider range in the northern States and Central Canada spread into southwestern Nova Scotia but, due to climatic or edaphic factors, they have never migrated along the Maine coast as far north as New Brunswick. Species, such as *Symplocarpus foetidis*, *Decodon verticillatus* and *Cephalanthus occidentalis*, are confined to southwestern Nova Scotia. Their local range is much like that of a coastal-plain element plant, but they have a general range in the United States far to the westward. *Vaccinium corymbosum*, the highbush blueberry, is common in the extreme southwestern Nova Scotia but has a more general range further south. *Cyperus dentatus* is scattered on sandy and gravelly lake shores in southwestern Nova Scotia, but inland it reaches up to southeastern New Brunswick, southern Quebec and Indiana.

Many plants may have migrated into the Province by two routes, by southwestern Nova Scotia over the coastal plain and also southward from New Brunswick, with the southwestern plants differing slightly or sometimes with characteristics of more southern species. For example, Aalders and Hall found that diploid plants of *Rubus* were almost entirely confined to southwestern Nova Scotia while the inland and northern plants were triploid or higher. The varieties of *Juncus effusus* are also quite different, at least in relative abundance, in the two areas. Our common alder in the southwest seems to have characteristics of *Alnus serrulata;* and the sugar maple on Digby Neck has apparently introgressed with *A. nigrum* to a considerable extent.

Sable Island presents a remnant on the coastal plain, formed apparently from material in the terminal moraine. The island is subjected to frequent fogs, wind is always present and variations in temperature are rather less than on the mainland. At high tide it has a length of about 20 miles and a width of up to three-quarters of a mile, consisting mainly of two lines of dunes with a low undulating central valley with ponds of fresh or brackish water and a great salt lake.

The flora has been treated in detail by Harold St. John (1921); and the island has since been visited by J. S. Erskine (1954). In general the flora is an attenuated one consisting of plants capable of existing in open situations, mostly of herbaceous plants with a few low shrubs. About 150 native species and varieties are known, with an additional number of weedy introduced plants.

The flora, as might be expected from the unfavorable habitat, has a rather boreal nature. Many of the coastal plants are present such as *Arenaria lateriflora*, *Potentilla tridentata*, *Empetrum hermaphroditum*, *Mitchella repens* and even *Linnaea borealis* and *Smilacina stellata*. *Juniperus communis* is variety *megistocarpa*, found in western Newfoundland, eastern Nova Scotia and the Magdalen Islands; the *Fragaria*

virginiana is var. *terrae-novae;* and the *Thalictrum polygamum* is the more northern var. *hebecarpum.* Some plants of the ponds, such as *Potentilla palustris*, *Menyanthes trifoliata* and *Nuphar variegatum*, are also boreal in nature.

The coastal-plain species are those belonging to the more widespreading group such as *Calopogon pulchellus*, *Myrica pensylvanica*, *Drosera intermedia*, *Viola lanceolata*, *Gerardia neoscotica*, *Utricularia cornuta*, and *Rosa virginiana*. *Polygonum hydropiperoides* was separated as variety *psilostachyum* by St. John; and Fernald ascribes this also to Shelburne County on the mainland. The one species found on Sable Island and not elsewhere in eastern Canada seems to be *Centunculus minimus*, which elsewhere occurs locally north only to Delaware.

A number of varieties have been described from Sable Island material. A prostrate form of *Juncus pelocarpus*, var. *sabulonensis*, is now also known from southwestern Newfoundland. *Hieracium scabrum* var. *leucocaule* and *Potentilla Anserina* var. *lanata* are forms with woolly stems and are apparently endemic. Variety *latifolius* of *Calopogon pulchellus* and the doubtful variety *retusus* of *Lathyrus palustris* are also reported for St. Pierre and Miquelon or on the Magdalen Islands.

Another indication that the flora of Sable Island may have survived in a refugium on the northern part of the coastal plain is the presence of two species restricted in North America to southwestern Newfoundland and Sable Island. These are *Juncus bulbosus* and *Potamogeton oblongus* and both also occur in western Europe, North Africa and in the Azores.

The evidence in respect to two grasses, *Nardus strictus* and *Sieglingia decumbens*, found on the Avalon Peninsula of Newfoundland and in southwestern Nova Scotia, is more dubious. Neither one has been found on Sable Island. It is tempting to regard these as further examples of European plants native to a corner of North America, but the possibilities of their being recent introductions in Nova Scotia, as is undoubtedly the case with the grasses *Holcus lanatus* and *Molinia caerulea*, is very great.

The true coastal-plain flora does not seem to be spreading further inland and there are indications that to a large extent it too is a relic of a more widespread flora once growing on the now submerged northern coastal plain. Many of these plants probably had a wider distribution when more of the coastal plain was exposed. As the sea-level rose they would survive only in a few favorable locations around the inland fringe of their range. Widely isolated stations may thus occur. The goldencrest, for example, survives only on Digby Neck and Brier Island, along Ponhook Lake in Central Queens County, and at Fancy Lake in Lunenburg County. Many of the plants are known from only along the Tusket River system in Yarmouth County; others may be found along the Clyde River, the area about Barrington, or along the Medway. The ecological conditions are quite different in the southwestern area and even such common genera as *Rubus* and *Panicum* become progressively more restricted further east.

PLANTS OF THE SEASHORE

Some 50 of our plants are restricted to the sea-shore, growing on sandy or gravelly beaches, rocky cliffs or the salt marshes. Many are common around the whole Province and form a typical open vegetation with a limited number of species. These plants often have a wider general distribution than the more inland plants because of the uniformity and continuity of the habitat; they may occur along the sea-shores for great distances. Further, most of our sea-shore plants are found in western North America on the alkaline soils. A number which are coastal in our area are found around the Great Lakes and elsewhere near fresh water. A few, such as *Zannichellia palustris*, *Phragmites communis* and *Potamogeton pectinatus*, have a distribution that can almost be called cosmopolitan as they occur on several continents. As with the inland flora, these plants have different histories and various present distributions; and they thus may be classified into different floral elements. Three main ones are mentioned here.

A few of these plants have a more southern origin and range and thus comprise the sea-shore section of the coastal-plain flora. These originated far to the south. They are now found in Mexico, the West Indies and sometimes in South America; or they occur along the Gulf of Mexico and extend north to Nova Scotia or beyond. In some cases the northern and southern plants have developed to form separate varieties. Four of these plants reach only to the southwestern tip of Nova Scotia.

Distichlis spicata
Spartina patens
Eleocharis rostellata
Scirpus Olneyi
Euphorbia polygonifolia
Lilaeopsis chinensis
Samolus parviflorus
Limonium Nashii
Gerardia maritima
Solidago sempervirens

The *Distichlis* reaches Prince Edward Island and Cape Breton, while the sea-shore goldenrod is common around the whole coast and reaches southern Newfoundland.

The northern plants are found from Newfoundland to Alaska, on the Pacific Coast, and usually also in Eurasia. They have a circumboreal or circumpolar distribution of wide range, sometimes represented by different varieties in different areas. These plants are representatives of an old coastal flora across northern North America when the climate was presumably warmer. In most cases they are sufficiently hardy now to extend at the present time far to the northward. Their distribution is therefore much like our boreal floral element, extending southward in the interior and along our coast to Nova Scotia, Cape Cod and Virginia. Such a plant as *Spergularia canadensis* now has a disjunct range, occurring only on the northern Atlantic and the northern Pacific coasts. One Asiatic species, *Artemisia Stelleriana*, native from Kamtchatka to Japan,

has escaped from cultivation and rapidly spread along our seacoast from Quebec to Virginia. It is now a common coastal plant around Nova Scotia. In our area these plants extend southward to Cape Cod or Virginia; and many of the most common seaside plants belong in this group.

Elymus mollis
Hierochloe odorata
Scirpus rufus
Carex Mackenziei
Carex salina
Juncus balticus
Juncus Gerardi
Atriplex patula
Salicornia europaea
Suaeda maritima
Spergularia marina
Arenaria peploides
Ranunculus Cymbalaria
Potentilla Anserina
Lathyrus japonicus
Mertensia maritima
Glaux maritima
Plantago maritima
Senecio Pseudo-Arnica

A smaller number of species is found only in eastern North America and in Europe. These are called amphi-Atlantic or North Atlantic species. In general they appear to have a less northern range about the warmer areas of the Gulf of St. Lawrence southward. *Najas* is a freshwater species.

Najas flexilis
Ammophila breviligulata
Puccinellia americana
Agropyron pungens
Carex paleacea
Polygonum Raii
Polygonum oxyspermum
Atriplex sabulosa
Cakile edentula
Ligusticum scothicum

In Europe *Agropyron* and *Polygonum oxyspermum* are mainly plants of the Baltic. *Cakile edentula* seems to be a plant able to spread by salt water and it occurs in such widely scattered locations as the Azores, Iceland and southern Labrador to South Carolina. The *Ammophila* and *Puccinellia* have been separated from closely-related European species, suggesting again that the two floras have been separated for a considerable time. Two freshwater species may also be mentioned. *Potamogeton epihydrus* is found in lakes on the outer Hebrides; and *Eriocaulon septangulare* is found in western Ireland and western Scotland.

There are, in addition, species confined to the eastern coast of North America. *Carex silicea* of the sandy dunes and bars occurs from Newfoundland to Maryland; and *Rumex pallidus* is found from Newfoundland to Long Island. Such species are relatively few in number. As with many of the other more wide-ranging plants, they also often extend inland to the Great Lakes and sometimes to James Bay, to where they have perhaps migrated along old shore-lines following a partial submergence of the land immediately following the last glaciation.

INTRODUCED PLANTS AND WEEDS

The number of introduced plants in the Province is high relative to that of the total flora and over 400 are known, with a number of others belonging to the doubtful list. The common weeds are found throughout; others, such as the mustards and many hawkweeds, are still rapidly spreading. Many of the small plants are found mainly as railroad weeds; and numerous plants of European origin are being repeatedly introduced from western Canada in grains and feeds. Nova Scotia, as it is a coastal province, also has had numerous foreign plants brought in around the ports where they are merely adventive or have become locally established. Some old fashioned garden plants tend to persist for a long time around habitations; others tend to be weedy and spread out, at least temporarily, from the gardens where they are grown.

It is difficult to know whether some plants are introduced or not. The various *Euphrasias* around the coast are often considered introduced; and *Sieglingia decumbens* and *Nardus stricta* in southwestern Nova Scotia are two more dubious native plants. In a number of cases two varieties have been described; one is supposed to be native to North America and the other to be introduced from Europe. *Agropyron repens*, *Prunella vulgaris* and *Veronica officinalis* are examples of this type and it is doubtful if the native and the introduced plants can now be distinguished. The chromosome number in some cases serves to help clarify their history. The introduced *Achillea Millefolium* seems to have a different number from our native plants; while in some cases different introductions have different numbers. For example, Mulligan has pointed out that *Matricaria maritima* introduced into Prince Edward Island has one more chromosome than do the plants of Nova Scotia and New Brunswick.

The role of prehistoric man may also be important in some cases; and there is evidence that he came to the Province soon after it was first free of ice. The erratic distribution of *Crataegus*, in particular, may be due to sporadic introductions. Different types are characteristic of different areas and they are especially common and varied along the Margaree River in northern Cape Breton. To a lesser degree the same seems to be true of *Amelanchier*.

More recent introductions are linked with the French settlement. *Inula Helenium* and *Daphne* are scattered around areas such as Annapolis and Grand Pré. *Molinia caerulea*, *Succisa pratensis* and *Angelica sylvestris* are common about Louisburg; while the tiny *Millegrana Radiola*, first noticed at Louisburg by Macoun, has now spread along the Atlantic coast as far as Brier Island.

Some recent introductions are now a very conspicuous part of our flora. *Holcus lanatus* and *Alchemilla xanthochlora* are very common in southwestern Yarmouth County; the cuckoo flower, *Cardamine pratensis*, is very common in early summer and turns the meadows white in the

Annapolis Valley; and later the same meadows may be pink with *Lychnis Flos-Cuculi*. *Senecio Jacobaea* is everywhere in eastern Nova Scotia.

A few potentially very troublesome weeds are recent introductions or are still rapidly spreading. *Amaranthus retroflexus*, *Portulaca oleracea*, *Cyperus esculentus*, and *Barbarea vulgaris* are a few examples and others undoubtedly will be introduced in the future.

IV. ANGIOSPERMS

FLOWERING PLANTS

CLASS 2. DICOTYLEDONS

The Dicotyledons are the largest group of flowering plants and comprise over 250 families. The leaves are typically net-veined and there is seldom sheathing at the base; the flower-parts are mostly in 4's or 5's; a cambium is usually present so that the wood of the stem increases in thickness; and the embryo of the seed has two seed-leaves or cotyledons.

Four divisions are recognized. The *Amentiferae* include woody forms having some or all of their flowers in catkins, or aments, and without a corolla. The *Floriferae* include the families with apetalous flowers in various other types of inflorescences. The *Polypetalae* have separate petals; while in the *Sympetalae* the petals are more or less united. Occasional genera or species of the last two groups are exceptions and may have the petals absent.

a. Corolla absent; calyx absent, or when present in a single whorl, sometimes quite petal-like.
  b. Shrubs or trees; plants woody at least at the base.
    c. Flowers either pistillate or staminate, one or both types in catkins or catkin-like heads (*Amentiferae*).
      Fertile flowers 1-3, in a cup or involucre; fruit a nut (Fig. 63, a-c): oak and beech. *Fagaceae* p. 340
      Fertile flowers in catkins or catkin-like heads; or, in *Corylus*, from a scaly bud.
        Ovules many; fruit a many-seeded capsule; seeds hairy-tufted (Fig. 59); willow and poplar. *Salicaceae* p. 320
        Ovule one; fruit one-seeded; seeds not hairy-tufted.
          Fertile flowers 2-3 at each scale of the catkin; shrubs or trees; leaves not resinous-dotted beneath (Fig. 61, 62). *Corylaceae* p. 333
          Fertile flowers solitary in the axils of the scales; low shrubs; leaves resinous-dotted beneath and often aromatic (Fig. 60). *Myricaceae* p. 331
    c Flowers not in catkins.
      Shrubs, less than 3 dm high, low or trailing; leaves evergreen, needle-like (Fig. 95, a, b). *Empetraceae* p. 494
      Shrubs to 1 m high or more, or trees.
        Leaves opposite; trees.
          Leaves pinnately compound with 7-11 leaflets, the terminal one not lobed; fruit a one-seeded samara; ash (Fig. 112). *Fraxinus* p. 577
          Leaves palmately lobed or divided, if compound then with the terminal leaflet lobed; fruit of two united winged halves; maples (Fig. 98). *Aceraceae* p. 501
        Leaves alternate.
          Leaves silvery-downy beneath and scurfy; fruit a yellowish berry; flowering in early May; shrubs (Fig. 97, f). *Shepherdia* p. 524
          Leaves not silvery-downy beneath.
            Leaves pinnately-compound, the terminal leaflet not lobed; flowers in elongated or oval spikes, the calyx petaloid, 4-parted. *Sanguisorba* p. 464
            Leaves neither lobed nor compound.

Tree; fruit a single winged nutlet, mature in late May; leaves toothed with the base oblique; elm (Fig. 63, d, e). *Ulmus* p. 342

Shrubs; fruit a berry.

Flowers appearing in late April before the leaves appear; calyx-lobes 4; leaves entire; fruit reddish or yellowish (Fig. 97, g). *Thymelaeaceae* p. 523

Flowers greenish, June; calyx-lobes 5; leaves often serrate; fruit black (Fig. 97, c-e). *Rhamnus* p. 506

b. Plants herbaceous.

d. Plant less than 3 dm high, parasitic and forming witches' brooms on the branches of conifers (Fig. 64, e). *Arceuthobium* p. 346

d. Plant larger, not parasitic on conifers.

e. Pistils several to many; stamens numerous.

Calyx-tube constricted at the mouth, enclosing the pistils, 4-lobed. *Rosaceae* p. 429

Calyx-tube not enclosing the pistils. *Ranunculaceae* p. 386

e. Pistil one.

f. Leaves, at least the lower, deeply lobed or divided.

Leaves 5-10 cm wide, with a few wide lobes, and palmately veined.

Plants with leaves orbicular with shallow rounded lobes; low; flowers yellowish, very numerous, with the calyx-tube enclosing the fruit and 4-lobed (Fig. 87, d). *Alchemilla* p. 461

Plants vine-like or twining; leaves usually with 3 pointed lobes; pistillate flowers forming a short oval spike; hops. *Humulus* p. 343

Leaves with capillary division; plants aquatic.

Leaves repeatedly forked, the divisions toothed along one side. *Ceratophyllum* p. 383

Leaves pinnately divided, not toothed along one side of the divisions (Fig. 104). *Haloragaceae* p. 535

f. Leaves entire or merely toothed, or absent.

g. Leaves reduced to scales or absent.

Leaves small, scale-like, alternate; fresh-water habitats (Fig. 104, a). *Myriophyllum* p. 535

Leaves absent; branches opposite, very fleshy; salt marshes and shores (Fig. 69, a). *Salicornia* p. 368

g. Leaves green, prominent.

Leaves opposite or whorled.

Leaves whorled, 3-12 in a whorl.

Plants of sandy soils; flowers 4-5 mm wide, whitish-green on long pedicels, 2-5 at a node; prostrate weed. *Mollugo* p. 370

Water plant, erect and unbranched; leaves 6-12 at a node, linear and acuminate; flowers inconspicuous, without sepals. *Hippuris* p. 538

Leaves opposite.

Staminate and pistillate flowers separate, small, in clusters.

Stinging hairs abundant; stamens 4; nettles. *Urtica* p. 343

Stinging hairs absent; stamens 5-8. *Mercurialis* p. 491

Staminate flowers in the same involucre as the pistillate, or flowers perfect.

Leaves nearly round, obscurely and crenately lobed; plants low and matted, in wet locations (Fig. 81, f). *Chrysosplenium* p. 425

Leaves linear to oblong, entire.

Plants erect; calyx bell-shaped, pinkish, petal-like; of sea-shores (Fig. 113, a). *Glaux* p. 575

Plants prostrate; calyx small, greenish.

Plants with milky juice; staminate and pistillate flowers in an urn-shaped involucre; fruit triangular, 3-seeded (Fig. 93, e-f). *Euphorbia* p. 491

Plants without milky juice; flowers perfect, generally solitary in the leaf-axils.
Flowers pedicelled; ovary superior, forming a capsule with many seeds; rare chickweeds. *Stellaria* p. 377
Flowers sessile in the leaf-axils.
Ovary superior; fruit minute, flattened, separating into 2 portions; lower leaves linear, sessile (Fig. 94, c, d). *Callitriche* p. 494
Ovary inferior; fruit 4-sided with the 4 calyx-lobes at the tip; leaves lanceolate, short-petioled (Fig. 103, h). *Ludwigia* p. 526
Leaves alternate.
Stipules present, sheathing the stem above the nodes; calyx often corolla-like, 4-6-lobed (Fig. 65-67). *Polygonaceae* p. 347
Stipules not sheathing the stem, or absent.
Flowers included in a large palmately-lobed bract, axillary, both staminate and pistillate kinds; plant 2-6 dm high with ovate-lanceolate toothed leaves. *Acalypha* p. 491
Flowers not included in a lobed bract.
Fruit 3-angled and 3-seeded; flowers in a terminal and umbel-like compound inflorescence; juice milky. *Euphorbia* p. 491
Fruit 1- or 2-seeded; juice not milky.
Plant about 1 dm high, from running rootstocks; ovary inferior, forming a dryish or fleshy berry-like fruit. *Santalaceae* p. 345
Plants various, without running rootstocks, weedy.
Flowers in a terminal raceme; fruit roundish, flattened, 2-celled and 2-seeded; basal leaves often deeply lobed (Fig. 77, b). *Lepidium* p. 406
Flowers in large inflorescences; fruit a small achene.
Stinging hairs abundant; rare wood-nettle. *Laportea* p. 344
Stinging hairs absent; plants weedy.
Calyx-lobes papery; flowers surrounded by scarious bracts (Fig. 68, c). *Amaranthaceae* p. 370
Calyx-lobes fleshy; bracts absent (Fig. 68, 69). *Chenopodiaceae* p. 362

a. Calyx and corolla both present.
h. Corolla of separate petals (*Polypetalae*).
i. Stamens numerous, more than 10, and more than twice as many as the petals.
Plants aquatic; leaves mostly floating, large, peltate or deeply cordate; water-lilies (Fig. 72). *Nymphaeaceae* p. 384
Plants terrestrial; submersed forms may be found.
Filaments numerous, united into a tube about the pistil; pistils several, united in a ring or to form a several-celled ovary (Fig. 94, e, f). *Malvaceae* p. 508
Filaments not united in a tube; pistils not in a ring.
Leaves trumpet-shaped; insectivorous bog plants (Fig. 80, f). *Sarracenia* p. 419
Leaves flattened, not trumpet-shaped.
Sepals 2.
Juice milky or colored; petals 4-12, showy. *Papaveraceae* p. 398
Juice watery; prostrate garden weed with wedge-shaped, thick fleshy leaves; flowers yellow, very small (Fig. 69, e). *Portulaca* p. 371
Sepals more than 2.
Leaves punctate with translucent dots, entire, opposite; pistil one, stamens many (Fig. 99). *Hypericaceae* p. 510
Leaves not punctate, alternate. (check for Basswood).
Pistil 1, 1-celled, opening by 3-5 valves; low wiry herbs or shrubs; flowers minute, or else large and yellow; leaves simple, narrow. *Cistaceae* p. 514

Pistils several; or else one without several valves.
Stamens inserted on the receptacle; calyx usually colored or petal-like; stipules absent. *Ranunculaceae* p. 386
Stamens inserted on the calyx or on a raised disk; sepals green; stipules usually present. *Rosaceae* p. 429

i. Stamens 10 or fewer, rarely more than twice the number of the petals.
j. Shrubs, trees or vines.
k. Leaves compound or palmately lobed.
Leaves compound.
Leaves pinnately compound.
Leaflets entire, smooth; branches thorny; tree. *Leguminosae* p. 470
Leaflets serrate, downy beneath, lanceolate (Fig. 97, a). *Rhus* p. 498
Leaves palmately once or twice compound.
Leaflets 3-5, simple; ovary superior.
Leaflets mostly 3; tendrils absent; berries whitish, 1-seeded; short shrubby or low trailing plants (Fig. 97, b). *Rhus* p. 498
Leaflets mostly 5; tendrils present; berries becoming purplish, usually 4-seeded; long trailing vines. *Vitaceae* p. 507
Leaflets again divided into many divisions; ovary inferior; plant with a spiny, woody base (Fig. 105). *Aralia* p. 539
Leaves not compound, palmately lobed only.
Low shrubs; ovary inferior; fruit a berry; currants and gooseberries (Fig. 82). *Ribes* p. 426
Tall shrubs or trees; ovary superior; fruit a winged samara; maples (Fig. 98). *Aceraceae*. p. 501
k. Leaves neither lobed nor compound.
Introduced thorny shrubs, with the simple or 3-parted spine just below the leaves at each node; flowers with sepals, petals and stamens in 6's (Fig. 76, a); fruit a reddish berry. *Berberis* p. 398
Shrubs or trees without thorns or with the thorns in the axils of the leaves as in the hawthorns.
Flowers very irregular; ovary superior; fruit a capsule, persistent on the heath-like plants. *Ericaceae* p. 559
Flowers regular; fruit few-seeded.
Flowers in late autumn, with 4 narrow crinkled petals; fruit a persistent capsule; leaves ovate with wavy edges (Fig. 83, a). *Hamamelis* p. 428
Flowers in early summer; fruit berry-like.
Flowers few or clustered in the leaf-axils; ovary superior.
Stamens alternate with the petals; petals slightly joined at the base, or else linear and free; fruit 4-9-seeded (Fig. 96). *Aquifoliaceae* p. 499
Stamens opposite the petals and enclosed by the small rolled petals; fruit black, 2-4-seeded (Fig. 97). *Rhamnus* p. 506
Flowers numerous in a large flattish inflorescence; ovary inferior.
Petals large and conspicuous; thorns present,; hawthorns (Fig. 84, d, e). *Crataegus* p. 439
Petals minute; thorns absent; leaves not toothed, the veins curving toward the tip of the blade (Fig. 108). *Cornus* p. 552
j. Plants herbaceous.
l. Flowers extremely irregular; ovary superior.
Leaves compound.
Leaves but once divided; flowers with flaring lateral petals; fruit a pod or legume. *Leguminosae* p. 470

Leaves very finely divided, glaucous beneath, thin; petals not widely flaring (Fig. 76, d, e). *Fumariaceae* p. 400

Leaves not compound.

Petals 3; the two lateral sepals petal-like; neither sepals nor petals spurred (Fig. 92, g). *Polygala* p. 490

Petals 2 or 5, the flower conspicuously spurred.

Petals 5, the lower one spurred; flowers on long erect peduncles; violets (Fig. 100-101). *Violaceae* p. 516

Petals 2, each 2-lobed; lower sepal forming a large spurred sac; flower pendant on slender pedicels, often yellowish and spotted (Fig. 94, a, b). *Impatiens* p. 505

l. Flowers regular or but slightly irregular.

m. Leaves deeply-lobed, or compound.

n. Leaves compound with 3 leaflets (occasionally 4 or 5).

Leaflets heart-shaped, the margins untoothed; flowers yellow, or white veined with pink (Fig. 92, e, f). *Oxalis* p. 486

Leaflets widely lanceolate, coarsely toothed; flowers whitish.

Plants from a superficial thick root-stock; flowers in a short raceme; pistil superior; petals 4 (Fig. 80, b). *Dentaria* p. 417

Plant from a deep, globular tuber; flowers minute, in a simple umbel; ovary inferior; petals 5 (Fig. 102, d). *Panax* p. 540

n. Leaves finely divided or deeply lobed.

Plants aquatic; submersed leaves finely divided (Fig. 104). *Haloragaceae* p. 535

Plants terrestrial, or at least not floating.

Ovary superior.

Leaves pinnately divided; stamens 6.

Sepals and petals in 4's; petals white or yellow. *Cruciferae* p. 402

Sepals and petals in 3's; petals white, shorter than the sepals; flowers minute, on long pedicels in the leaf axils, solitary. *Floerkea* p. 498

Leaves palmately lobed or divided; sepals 5-6; petals 5-6.

Leaves ternately tri-compound, sessile; flowers greenish-yellow; styles 2. *Caulophyllum* p. 398

Leaves deeply lobed, petioled; ovary deeply lobed; style conspicuous (Fig. 93, a-c). *Geraniaceae* p. 487

Ovary inferior.

Plant a vine with tendrils; leaves palmately lobed (Fig. 125, e). *Cucurbitaceae* p. 647

Plant not vine-like, without tendrils; flowers in umbels, very small.

Styles 2; fruit dry, splitting at maturity into two halves. *Umbelliferae* p. 540

Styles more than 2; fruit berry-like, resinous-aromatic. *Araliaceae* p. 539

m. Leaves entire or but shallowly toothed.

o. Leaves mostly basal; plants often tufted.

Leaves provided with long gland-tipped bristles; plant insectivorous (Fig. 80, d, e). *Droseraceae* p. 420

Leaves without such bristles; plants not insectivorous.

Plants of salt marshes only; corolla bluish, papery (Fig. 111, a). *Limonium* p. 576

Plants never growing on brackish soil; corolla cream to white, not papery.

Ovary 1 or 2-celled; stamens inserted on the calyx; leaves thin; petals delicate, often lobed (Fig. 81, e-g).
Saxifragaceae p. 424

Ovary 5-celled; stamens 10, free from the calyx; leaves leathery; petals fleshy, never lobed. *Pyrolaceae* p. 554

o. Leaves scattered along the stem.

Pistils 3-5, separate; leaves thick and succulent (Fig. 81, a-d).
Crassulaceae p. 422

Pistil 1; leaves not succulent, or absent.

Leaves reduced to hollow thickened petioles; flowers white, small, in umbels; dwarf creeper near salt water in sw. N.S.
Lilaeopsis p. 548

Leaves with an expanded blade.

Ovary plainly inferior.

Flowers small, in a close cluster surrounded by usually 4 white or purplish large petal-like bracts (Fig. 108).
Cornus p. 552

Fiowers not surrounded by petal-like bracts.

Leaves orbicular; flowers minute, in umbels; plants trailing and delicate; petals and stamens in 5's (Fig. 106, g).
Hydrocotyle p. 542

Leaves ovate to linear; flowers various, often large, the parts in 2's or 4's.

Leaves bristly along the margin and the 3 prominent veins, opposite, sessile (Fig. 103, g). *Rhexia* p. 525

Leaves not bristly, various. *Onagraceae* p. 525

Ovary superior; flowers not in umbels.

Middle and upper stem-leaves alternate.

Leaves thick, leathery, evergreen; plant woody near the base and usually trailing; petals 5; stamens 10. *Ericaceae* p. 559

Leaves not leathery, the upper not evergreen.

Petals 4; sepals 4; stamens 6. *Cruciferae* p. 402

Petals 3 or 5; sepals 5; stamens 3 to many.
Cistaceae p. 514

Middle and upper stem-leaves opposite.

Leaves with punctate translucent dots (Fig. 99).
Hypericaceae p. 510

Leaves without punctate translucent dots.

Flowers sessile, axillary, the parts in 2's; seeds visible through the capsule wall, with rounded pits; plants small (Fig. 94, h). *Elatinaceae* p. 514

Flowers not sessile.

Stamens equal in number to the petals, opposite them and adherent to the petal base.

Sepals 2; stamens 3 or 5; styles 3, or 1 and 3-cleft.
Portulacaceae p. 371

Sepals 5; stamens 4-8; style 1. *Primulaceae* p. 571

Stamens not of the same number as the petals, or alternate with them if so.

Flowers whorled in the leaf-axils or in a tall interrupted spike (Fig. 103, a). *Lythraceae* p. 524

Flowers not whorled.

Ovules and usually seeds several to many in each cell; plants succulent; petals often 2-lobed; chickweeds and pinks. *Caryophyllaceae* p. 372

Ovules and seeds 1 or 2 in each cell; plants slender and wiry; petals not lobed (Fig. 92, c, d). *Linaceae* p. 485

h. Corolla with the petals more or less united (*Sympetalae*).
p. Stamens more numerous than the corolla lobes.
Leaves compound.
Leaves finely divided, thin, glaucous beneath; flowers very irregular (Fig. 76, d, e). *Fumariaceae* p. 400
Leaves but once compound.
Flowers regular, bell-like; leaflets 3, obcordate; fruit a capsule (Fig. 92, e, f). *Oxalidaceae* p. 486
Flowers very irregular; leaflets not as above except in the clovers; fruit a pod. *Leguminosae* p. 470
Leaves simple, sometimes deeply-lobed palmately.
Filaments very numerous, united in a tube about the pistil; leaves palmately lobed; herbs. *Malvaceae* p. 508
Filaments not united in a tube; leaves simple; plants shrubby. *Ericaceae* p. 559
p. Stamens not more numerous than the corolla lobes.
r. Stamens of the same number as the lobes and opposite them; flowers regular; ovary superior.
Style 1; plants of non-brackish habitats *Primulaceae* p. 571
Styles 5; plants of salt marshes; inflorescence much branched with small papery lavender flowers; fruit a one-seeded sac (Fig. 111, a). *Limonium* p. 576
r. Stamens alternate with the corolla lobes or fewer.
s. Flowers not in a dense head on a common receptacle nor surrounded by a scaly involucre.
t. Shrubs.
Leaves alternate, or linear and crowded.
Style absent; flowers clustered in the leaf-axils, regular; fruit berry-like, 3-8-seeded; tall shrubs (Fig. 96). *Aquifoliaceae* p. 499
Style 1; flowers mostly in a terminal inflorescence or solitary.
Flowers mostly numerous in a terminal inflorescence, often irregular; low heath-like plants. *Ericaceae* p. 559
Flowers solitary, white; plant densely matted with crowded linear leaves; rare alpine. *Diapensia* p. 571
Leaves opposite. (Lilac keys out here).
Flowers in a dense spherical head, white, small, regular; sw. N.S. only (Fig. 126, a); corolla with 4 lobes. *Cephalanthus* p. 638
Flowers not in a dense head, irregular if crowded; corolla 5-lobed (Fig. 126-7). *Caprifoliaceae* p. 640
t. Herbaceous plants.
u. Plants parasitic, without green color or nearly so.
Plants twining, attached to the stems of other plants and forming a mass of intertwined slender threads; capsule 1-4-seeded (Fig. 114, f). *Cuscuta* p. 587
Plants stout, erect, rooted in the soil or parasitic on roots; capsule many-seeded (Fig. 123, a, b). *Orobanchaceae* p. 624
u. Plants not markedly parasitic, green.
v. Flowers quite irregular.
Aquatic plants or rooting in wet mud; leaves absent or finely divided; bladders present, sometimes in the wet substrate; insectivorous plants (Fig. 122). *Utricularia* p. 625

Terrestrial; bladders absent, leaves not finely divided.
Ovary superior; anthers not united in a tube.
Ovary deeply 4-lobed; fruit of 4 small nutlets.
Leaves alternate, often rough-hairy; inflorescence coiled when young, gradually uncoiling as the flowers progressively open; flowers often blue.
Boraginaceae p. 589
Leaves opposite; inflorescence not coiled; plants often aromatic; mint family. *Labiatae* p. 594
Ovary not deeply lobed, the style coming from the apex; fruit a capsule.
Leaves scattered on the stem; ovary and fruit 2-celled with many seeds. *Scrophulariaceae* p. 609
Leaves all basal; plants small and rare.
Leaves linear; corolla nearly regular, not spurred (Fig. 119, d). *Limosella* p. 615
Leaves elliptical or wider; flowers solitary, with the corolla very irregular and spurred.
Pinguicula p. 629
Ovary inferior; anthers 5, united in a tube about the pistil; fruit a many-seeded capsule; flowers very irregular (Fig. 129, d, f). *Lobelia* p. 649

v. Flowers regular or nearly so.
w. Leaves in a basal rosette; flowers solitary or in dense spikes, small and insignificant. *Plantaginaceae* p. 630
w. Leaves usually scattered along the stem.
x. Ovary superior.
y. Leaves opposite, or else all basal.
Filaments united in a tube, covered with a crown of 5 hooded and spurred bodies; juice milky; fruit of 2 follicles (Fig. 114, g). *Asclepias* p. 585
Filaments not united; a crown not present.
Juice milky; ovaries 2, forming follicles (Fig. 114, a, b, e). *Apocynaceae* p. 583
Juice not milky; ovary 1; fruit not a follicle.
Ovary 3-celled; capsule 3-celled; corolla rolled in the bud, with a slender tube and flaring limb (Fig. 115, a). *Phlox* p. 589
Ovary not 3-celled.
Leaves deeply lobed or palmately divided near the base of the plant; flowers small, blue, in a long spike (Fig. 115, g). *Verbena* p. 594
Leaves entire, or toothed only.
Ovary deeply 4-parted, with the style arising between the lobes; fruit of 4 nutlets; plants often aromatic; mint family. *Labiatae* p. 594
Ovary not deeply lobed; fruit a many-seeded capsule.
Flowers regular; capsule 1-celled.
Gentianaceae p. 579
Flowers usually slightly irregular; capsule and ovary 2-celled. *Scrophulariaceae* p. 609
y. Leaves alternate or lily-like and floating.
Leaves floating, lily-like; flowers white, borne near the surface, small, in an umbel (Fig. 113, g).
Nymphoides p. 583

Leaves not lily-like nor floating.
Leaves with 3 thickish leaflets; flowers in an erect raceme; bogs (Fig. 113, d). *Menyanthes* p. 583
Leaves entire, or finely divided, or lobed.
Plants long-trailing; leaves sagittate or hastate; flowers large, funnel-form (Fig. 114, c, d). *Convolvulus* p. 586
Plants not long-trailing, or if slightly so then woody.
Ovary deeply 4-lobed, with the style arising between the lobes; inflorescence coiled when young and uncoiling as the flowers open. *Boraginaceae* p. 589
Ovary not deeply lobed; inflorescence not coiled when young.
Ovary 3-celled; capsule 3-celled. *Polemoniaceae* p. 588
Ovary 2-celled; fruit 2-celled.
Fruit a capsule; flowers less than 1 cm wide, usually slightly irregular. *Scrophulariaceae* p. 609
Fruit a berry or rarely a capsule; flowers over 1 cm wide, perfectly regular. *Solanaceae* p. 606

x. Ovary inferior.
Plant a vine; leaves deeply and palmately 5-lobed; corolla-lobes 6; tendrils present; wild cucumber (Fig. 125, e). *Echinocystis* p. 647
Plant not a vine; leaves not palmately lobed.
Leaves deeply and pinnately lobed (Fig. 125, f). *Valeriana* p. 546
Leaves entire.
Leaves alternate. *Campanulaceae* p. 647
Leaves opposite or whorled.
Leaves opposite, without stipules; corolla 5-lobed. *Caprifoliaceae* p. 640
Leaves whorled and the corolla 5-lobed. *Rubiaceae* p. 633

s. Flowers in a dense head on a common receptacle, surrounded by an involucre of bracts, the outer of which may be leafy.
Stamens 4, not united; heads subglobose; flowers bright blue; chaff or bracts mixed with the flowers and of about the same length (Fig. 129, e). *Succisa* p. 646
Stamens 5, their filaments united in a tube about the style. *Compositae* p. 650

30. SALICACEAE WILLOW FAMILY

The Willow Family includes the willows and the poplars. The flowers are in pistillate and staminate catkins, usually on separate shrubs. Each pistillate flower consists of a single ovary without a perianth, subtended by a simple or lobed bract. The staminate flowers consist of one to many stamens. The fruit is a many-seeded capsule,

each seed with a tuft of long silky hairs. Trees and shrubs, flowering in early spring.

a. Buds with a single scale; bracts of the catkin entire or merely toothed; stamens few, generally 1-5; flowers with one or two small glands at the base of the stamens or pistil; willows. 1. *Salix*
a. Buds with several scales; bracts of the catkins deeply cut with sharp lobes; stamens many, generally more than 5; flowers without glands; poplars. 2. *Populus*

1. SALIX L. WILLOW

Willows, in general, comprise one of the more difficult groups to name correctly. Their variability, tendency to hybridize, and their similarity in appearance make considerable field work essential. In most cases pistillate and staminate catkins can be found on neighboring bushes.

Only a few species make up the majority of the types found in our area. In early spring *S. discolor* and *S. humilis* are the common pussy-willows. Later, *S. Bebbiana* will comprise the majority of the willows seen in the open country and is probably the most common willow of the Province. *S. pyrifolia* will shortly follow, growing mostly in wet ground and swales, conspicuous because of its bright twigs and yellow-reddish leaves. *S. rigida* is everywhere along our brooks and rivers; *S. lucida*, with numerous stamens and large, glossy, long-tailed leaves, is more restricted to sand-bars. By far the commonest tree-willow is the introduced *S. alba*. The best time to study the willows is in the spring and early summer before the pistillate catkins mature. The mature leaves are so variable that it is almost impossible to make a key that will separate all the various forms.

a. Depressed creeping shrubs with small rounded leaves; very rare in northern C.B.
Stamen 1; ovary and capsule glabrous or nearly so; young branches and leaves sparingly pubescent to glabrous. 5. *S. Uva-ursi*
Stamens 2; ovary and capsules densely pubescent; young branches and leaves silky-villous. 6. *S. cordifolia*
a. Upright shrubs or trees.
b. Low shrubs to 1 m high; very rare in bogs or wet meadows; capsules on leafy-bracted peduncles.
Young twigs and lower surfaces of the leaves densely whitish-woolly even when fully mature; capsules 6-8 mm long, subsessile. 15. *S. candida*
Young twigs, leaves and catkins entirely glabrous; leaves small, without teeth, the smaller elliptical to oval and rounded on the tip. 11. *S. pedicellaris*
b. Larger shrubs or trees.
c. Large introduced trees; younger growth erect and fast-growing.
d. Leaves ovate-lanceolate, about 3 times as long as wide, shining glossy above; stamens 5; catkins on leafy peduncles, long-persisting; capsule glabrous. 1. *S. pentandra*
d. Leaves lanceolate, more than 3 times longer than wide.
e. Leaves glabrous or nearly so beneath, even when young.
f. Ovary pubescent and sessile; stamens with the filaments and sometimes the anthers fused together; anthers red; catkins appearing just before the leaves; leaves sub-opposite, bluish-green, entire or with teeth only near the tip. 19. *S. purpurea*

f. Ovary glabrous; stamens separate, 2, yellow; catkins appearing with the leaves, the peduncles leafy-bracted; leaves finely toothed.
Leaves with 4-6 serrations per cm; twigs very brittle at the base; ovary short-stalked, the staminate flower with 2 glands; leaves promptly glabrous. 3. *S. fragilis*
Leaves with 7-9 serrations per cm, usually slightly silky-pubescent beneath; ovary almost sessile, the flower with 1 gland; twigs not brittle and do not snap off at the base. 4. *S. alba*

e. Leaves densely hairy beneath; ovary and capsule minutely pubescent.
Leaves small and narrow, mostly under 1 cm wide; hairs on the lower surface silvery-silky and closely appressed; filaments glabrous; capsules sub-sessile. 17. *S. viminalis*
Leaves up to 2.5 cm wide, the sides rounded at the middle, softly pubescent above and beneath; capsules with the pedicels about 0.5 mm long and much shorter than the long lanceolate scales. 18. *S. Smithiana*

c. Shrubs over 1 m high, sometimes with a single trunk but not becoming large trees.

g. Catkins appearing before the leaves; ovaries and capsules pubescent with dark, often black, scales.

h. Stamens united up to the anther or more; anthers red; ovary sessile with 2 glands at the base; buds sub-opposite; catkins small and dark. 19. *S. purpurea*

h. Stamens separate, 2; flowers with 1 gland; buds alternate

i. One-year old twigs more or less dirty grayish-pubescent; staminate catkins oval, with red anthers; ovary gray-pubescent. 13. *S. humilis*

i. One-year old twigs glabrous or essentially so; anthers yellow.

j. Stamens with pubescent or pilose filaments; ovary long-tapering with pedicel 1.5-3 mm long; catkins very early; common. 12. *S. discolor*

j. Stamens with glabrous filaments or only pilose at the base; ovary minutely to densely silky-pubescent; rare or introduced.

k. Stamens pilose at base; ovary short and blunt, with practically no style, short-silky, with pedicel around 1 mm long. 14. *S. sericea*

k. Stamens with glabrous filaments; ovary sessile or nearly so, rather densely silky-pubescent; styles long, 1 mm or more.
Twigs slender, yellowish, without a bloom; introduced, becoming a tree. 17. *S. viminalis*
Twigs stout, olivaceous to reddish, often with a whitish bloom; native shrub of wet areas, rare. 16. *S. pellita*

g. Catkins appearing after the leaves or at the same time, or earlier and now with expanded leaves present.

l. Leaves closely glandular-serrate or serrulate (very young leaves and bracts may not show this characteristic).

m. Ovary glabrous; staminate flowers often with 2 glands; leaves not silky-lustrous beneath.

n. Stamens 3-7, usually 5; leaves quickly glabrous, bright green and glossy above, widely lanceolate or obovate, distinctly glandular at the top of the petiole and on the lower teeth.
Cultivated, or roadside escape; stalk of the staminate catkin 2 cm long, the bracts more than 1 cm wide; pedicels of the ovaries twice as long as the glands; leaves short acuminate, paler beneath; branches brownish-green. 1. *S. pentandra*
Native on river-shores; stalks of staminate catkins 1 cm long, the bracts less than 1 cm wide; pedicels of the ovaries 2-4 times as long as the glands; leaves very long-pointed; branches yellowish-brown. 2. *S. lucida*

n. Stamens 1-2 (rarely 3-5 in *S. alba*); leaves not bright green and glossy above.

o. Staminate flowers with 2 glands at the base; pistillate bracts pale yellowish, early deciduous; catkins long and slender, to 8 cm long and about 5 mm thick; leaves narrowly lanceolate, tapering to the very short petioles; becoming trees.

See earlier key to *S. alba* and *S. fragilis*

o. Staminate flowers with 1 gland; pistillate bracts persistent; catkins shorter and denser, usually 1 cm thick or more; much-branched shrubs.

p. Leaves short-oval to oblong-lanceolate, rugose when young and very veiny beneath, often cordate at the base, with a reddish-yellow tinge and glabrous from the first; stipules absent or quickly so; branches deep brown. 7. *S. pyrifolia*

p. Leaves narrowly to widely lanceolate; stipules often present; young twigs and leaves pubescent.

Leaves broad, $\frac{1}{2}$ to $\frac{1}{3}$ as wide as long, rounded to cordate at the base, greenish and more permanently woolly beneath; capsules crowded on short pedicels much shorter than the bracts. 8. *S. cordata*

Leaves lanceolate, $\frac{1}{8}$ to $\frac{1}{3}$ as broad as long, reddish and woolly when young, becoming glabrous; capsules on pedicels usually longer than the small bracts. 9. *S. rigida*

m. Ovary with silky appressed hairs; leaves lanceolate and lustrous beneath with silky hairs; capsule 3-4 mm long, blunt with practically no style; catkins early with blackish scales. 14. *S. sericea*

l. Leaves sparingly dentate, wavy-margined, or entire; capsules pubescent.

q. Leaves glabrous; catkins appearing before the leaves, with black scales.

r. Leaves oblanceolate, sub-opposite; fruiting catkins small and cylindric with capsules sessile and only 2-3 mm long. 19. *S. purpurea*

r. Leaves alternate or in a spiral; capsules over 6 mm long; leaves widely lanceolate to elliptic or obovate, green above and whitish beneath; fruiting catkins large, over 1 cm wide, naked at the base, with capsules long-pointed and 7-12 mm long. 12. *S. discolor*

q. Leaves pubescent beneath.

s. Leaves widely lanceolate to obovate, up to $3\frac{1}{2}$ times as long as wide, rough-pubescent beneath.

t. One year twigs usually grayish-pubescent; catkins before the leaves, without leafy bracts at the base, dense with the capsules short-pedicelled; bracts black. 13. *S. humilis*

t. One-year old twigs glabrous; catkins with leafy bracts at base, open; bracts pale yellow in the catkins.

u. Fast-growing introduced small tree; branches olive; leaves bright green, tapering to both ends; catkins dense with capsules having pedicels much shorter than the bracts. 18. *S. Smithiana*

u. Much-branched and our most common native shrub willow; leaves dull, becoming rugose above; young branchlets reddish; catkins short and loose, with the pedicels of the capsules much longer than the scales and 2-4 mm long. **10. *S. Bebbiana***

s. Leaves narrowly lanceolate, less than 2 cm wide, 5-10 times longer than wide; shining silky-pubescent beneath.
v. Hairs on lower surface silky and closely appressed; margin of leaf not strongly inrolled; leaves small, to 7 cm long and 5-7 mm wide; introduced tree. 17. *S. viminalis*
v. Hairs on lower surface tangled and erect; margin of leaf strongly inrolled; leaf larger and coarser, to 10 cm long; coarse shrub with the branches often with a whitish bloom. 16. *S. pellita*

1. **S. pentandra** L. Fig. 58. BAY-LEAVED WILLOW

Named because of its five stamens and distinguished by its thick, bright-green, glossy leaves. This willow is occasionally planted as a hedge plant or tree; the pistillate catkins remain on the tree until autumn.

Introduced from Eu. and sparingly escaped in eastern Canada and the U.S.A.

2. **S. lucida** Muhl. Fig. 58. Map 229. SHINING WILLOW

Scattered and sometimes common along wider streams, sand bars, and sandy edges of lakes, even occasionally in wet ground or ditches; most common from Digby to northern C.B., and scattered elsewhere. The bright-glossy leaves with acuminate tips are quite distinctive.

Var. **angustifolia** Anderss. is a smaller bush with rather narrowly lanceolate leaves 3-8 cm long and up to 2 cm wide. This is sparingly found in the northern part of the range from Lab. to Man. and ranging south to N. S. and New Eng. Occasionally seen, as at South River, Victoria Co.

Lab. to B.C. south to Del., Ind. and Iowa.

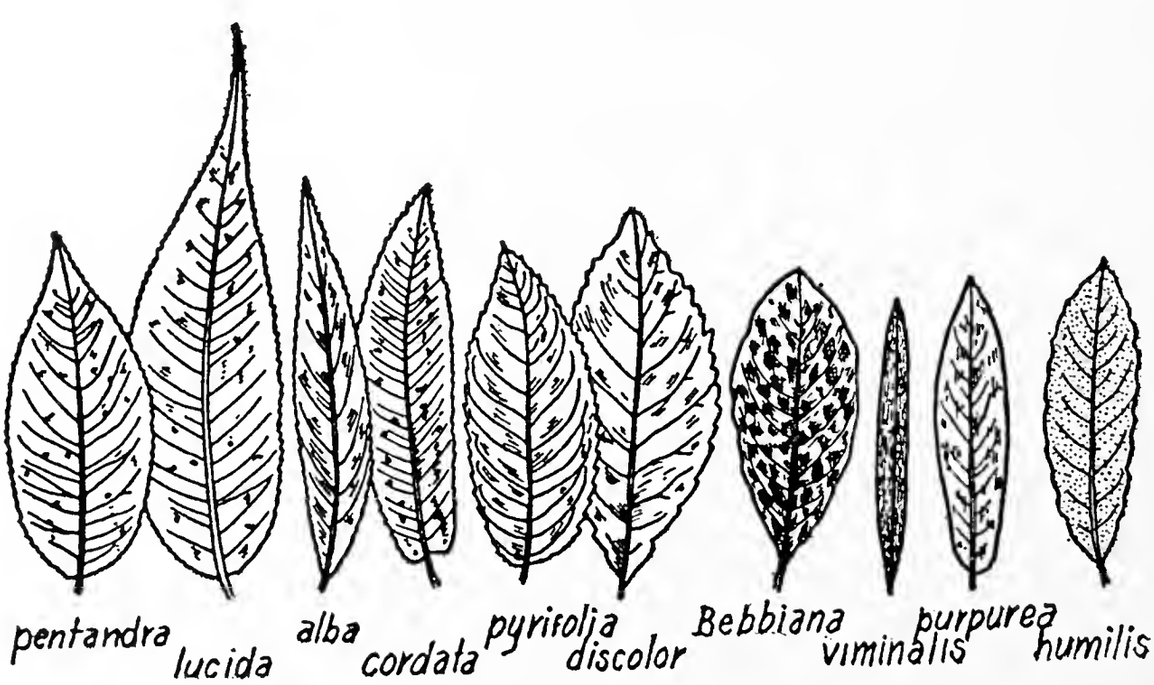


Fig. 58.—**Salix** spp., typical leaves x ½.

3. **S. fragilis** L. CRACK-WILLOW

This willow, which forms a large tree, is occasionally planted in the Province and seems to be more common in the eastern counties. It is very similar to *S. alba* in appearance but the branches are very brittle at the base so that they snap off very readily when bent backwards. Many of our trees are probably hybrids with this species and it is difficult in many cases to separate them satisfactorily from *S. alba*. It is usually found as old trees along roadsides or in neglected areas.

Eu. and western Asia; long cultivated.

4. **S. alba** L. WHITE WILLOW

The "French willow" is another fast-growing willow which reaches the stature of a large tree. Varieties exist which differ slightly in pubescence of the leaves or color of the branches. The typical form has branches olive-brown and the leaves are finely silky beneath. The most common variety is var. **vitellina** (L.) Stokes, which has yellow branches and leaves only slightly silky beneath. This is considered to be a hybrid of *S. alba* and *S. fragilis*. Var. **calva** G. F. W. Mey has the dark brown branches with leaves practically glabrous beneath. *S. alba* was formerly much planted as an ornamental and in parts of the Province, as about Truro and in the eastern part of the Annapolis Valley, it frequently escapes and vigorous young bushes may be seen.

Early introduced from Eu. and widely grown.

5. **S. Uva-ursi** Pursh BEARBERRY WILLOW

Collected by Perry and Roscoe on a wind-swept barren St. Paul I. off northern C. B., 1930.

Greenland and Baffin I. south to the barrens of Nfld., N. S. and the alpine areas of Que., New Eng. and N. Y.

6. **S. cordifolia** Pursh var. **callicarpaea** (Trautv.) Fern.

As with the last, this species is known only from a barren on St. Paul I.

Greenland and arctic Canada south to Nfld., N.S. and Gaspé.

7. **S. pyrifolia** Anderss. Fig. 58. Map 230. BOG-WILLOW

Swampy thickets, poorly-drained areas, bogs and heavy soils throughout the northern region from Digby Co. to C.B. but not generally common; rare near the Atlantic coast; not known from northern C.B. This is one of our most distinctive and conspicuous species, especially in early spring.

Lab. to northern B.C. south to New Eng., n. N.Y. and Wisc.

8. **S. cordata** Michx. Fig. 59, c. HEART-LEAVED WILLOW

This willow is not common but does occasionally occur in central and eastern N.S. and to northern C.B., gravelly or sandy shores of rivers

or on sandy beaches of lakes. It is difficult to separate from the following species and may hybridize with it. The leaves are usually larger, wider and more cordate at the base.

Var. **abrasa** Fern. has the branchlets, petioles and leaf-blades glabrous or promptly so. This occurs from Nfld. south to N.S. and n. Me.

Lab. to northern Ont. south to Mass., n. N.Y. and n. Mich.

9. **S. rigida** Muhl.

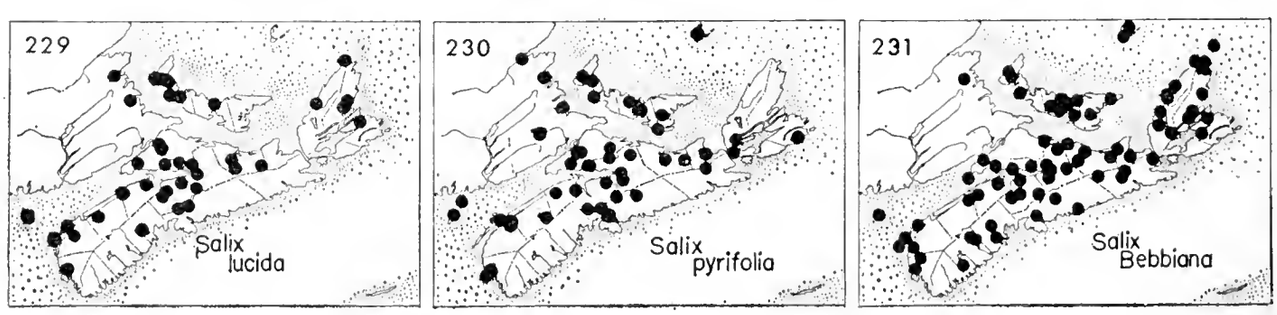
Scattered throughout and especially common in central and eastern N.S. where it grows along every stream and river both on the banks and out onto the bars, varying from slightly over 1 m high on new bars to a very tall shrub on old riverbanks. This species is very variable in pubescence, width and shape of the leaves, and length of pedicel so that neighboring bushes may look rather unlike. Plants with leaves gradually tapering or rounded to the base and up to about 2 cm wide have been designated var. **angustata** (Pursh) Fern. It is doubtful if this narrow-leaved form is more than a variation here.

Nfld. to Ont. south to N.C., Miss. and Kans.

10. **S. Bebbiana** Sarg. Fig. 59, a, b. Map 231. BEAKED WILLOW

This most common willow of the Province is found throughout in many habitats from wet to open, dryish soils. Occasionally large shrubs or small trees may be found with the leaves and twigs nearly glabrous and the leaves smooth instead of rugose. This approaches var. *perrostrata* (Rydb.) Schneid. which is a northern and western variety. The opposite extreme with leaves densely tomentose or cinereous-tomentose beneath and with the twigs densely pubescent to the second year is var. **capreifolia** Fern. This was reported as small trees in woods and thickets at the margin of Lily L., Sandy Cove (Fernald, 1921). (*S. rostrata* Richards).

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



11. **S. pedicellaris** Pursh var. **hypoglauca** Fern. Map 239.

Common in a sphagnous swale north of Middlefield, Queens Co., found by C. A. Weatherby in the summer of 1941; now known to be common on the flood-plain of the Medway River at Charleston and in 18-Mile Bog in the same county; also found in 1944 in a meadow at Upper Musquodoboit; occasional in a wet meadow along Sharpe Brook

at Cambridge, Kings Co. The variety is the more common form, with the leaves whitish and glaucous beneath.

Lab. to B.C. south to Nfld., N.S., Penn. and Iowa.

12. **S. discolor** Muhl. Fig. 58. PUSSY-WILLOW

Common throughout on low ground, in wet pastures, along the edges of swamps and in damp open woods. It is the earliest of our willows and is conspicuous in early spring. The leaves are ordinarily smooth and glaucous beneath. The species is rather variable and hybridizes to a considerable extent when it is growing in the same local area as *S. humilis*. The twigs then may be slightly grayish pubescent and the stamens of intermediate colors between yellow and red. Bushes have also been found with leaves finely pubescent beneath, which seem to be hybrids with *S. Bebbiana*. Under suitable conditions this species forms a small tree.

Lab. to B.C. south to Nfld., N.S., Del., Ky. and Mo.

13. **S. humilis** Marsh. Map 232. SMALL PUSSY-WILLOW

Widely distributed on clay soils, low ground and in sterile areas, generally smaller and on poorer soils than the preceding species. Typical plants have a dirty appearance, with grayish-woolly young shoots and undersides of the leaves; anthers reddish. On sandy soil at Debert, Colchester Co., the species seemed to hybridize freely with *S. discolor*, giving various combinations and shades of anther color with pubescent and smooth twigs.

Scattered from sw. N.S. to Antigonish Co. are shrubs with wider leaves, the lower almost orbicular, having the lower surface densely covered with a velvety or satiny lustrous pubescence, and often with a reddish tinge. This variation has been referred to as var. **keweenawensis** Farw.; it is scattered in the eastern part of the range of the species.

Nfld. to Alta. south to N.C., and Kans.

14. **S. sericea** Marsh. SILKY WILLOW

Rare in western N.S.; scattered east to Grand Lake in Halifax Co. in low thickets and along the banks of streams. This plant is rare and little collected in N.S. Our only collection is from thickets along the LaHave R., at Pinehurst in Lunenburg Co.

N.S. and s. Que. to Wisc. south to S.C., Tenn. and Mo.

15. **S. candida** Flügge HOARY WILLOW

Rare, a low shrub in Black River Bog, Inverness Co., recognizable because of the dense white tomentum on the younger branches. Even in this alkaline bog the shrubs are small and very scarce.

Lab. to B.C. south to Nfld., Penn. and Iowa.

16. **S. pellita** Anderss.

Stated by Rousseau (1938-a) to be common in the region of Canso; seen occasionally elsewhere in the interior where it is scattered and the distribution poorly known; north of Five Islands and above Parrsboro along the Halfway R., and its lakes in Cumberland Co.; along the Stewiacke R.; and at Ball's Creek in C.B. Co. It is easily confused with luxuriant shoots of the next species and care must be taken to separate these two.

Nfld. and Lab. to northern Ont. south to N.S., n. New Eng. and n. Mich.

17. **S. viminalis** L. Fig. 58. COMMON OSIER

Scattered, usually found as a large tree, also as an occasional escape from cultivation, more or less throughout. A rather similar-appearing small shrub named *S. incana* Schrank, with linear-lanceolate small leaves which are inrolled on the margins, and with fruiting catkins only 1-2 cm long, has been reported from N.S. in Gray's Manual but no specimens have been seen.

Spread from cultivation from Nfld. to Ont. and New Eng.; introduced from Eu.

18. X **S. Smithiana** Willd.

This hybrid willow is occasionally planted and may occur as an escape. Fernald (1921) reports it as naturalized on a clay bank by the sea, Baddeck, Victoria Co. It is now a common and handsome large shrub or small tree about the town.

P.E.I. and N.S. to New Eng. and Wisc.

19. **S. purpurea** L. Fig. 58. PURPLE OSIER

Abundantly naturalized about Yarmouth, Wolfville and probably other towns of the Province; rare in the country. This large bush or small tree was formerly planted as an ornamental but recent introductions are not known. It is rather distinctive both in flower and in leaf; it is our only species with the filaments fused so that there is apparently only one stamen.

Eurasia and Africa; long cultivated.

2. POPULUS L. POPLAR, ASPEN

Trees producing elongate catkins in early spring and maturing seed before the leaves are fully expanded. Staminate flower of 5-many stamens on short filaments; the pistillate one an ovary producing many silky-tufted seeds; each type of flower subtended by a deeply-toothed or lobed bract.

a. Leaves permanently whitish woolly beneath, often palmately lobed; petioles terete; buds tomentose. 3. *P. alba*

a. Leaves glabrous or becoming so, or lightly pubescent only.
b. Petioles flattened; buds neither very large nor viscid.
c. Leaves without a translucent border, the teeth mostly rounded at the summit.
d. Leaves usually wider than long, finely toothed or crenate-serrate; winter-buds glossy and shiny (Fig. 59, e). 1. *P. tremuloides*
d. Leaves ovate, coarsely toothed; winter buds white-pubescent (Fig. 59, g). 2. *P. grandidentata*
c. Leaves with a clearly defined translucent border and the teeth terminating in an inturned calloused point, glabrous.
e. Leaves wedge-shaped at the base, rather small, 4-6 cm wide; branches strongly ascending; columnar introduced tree. 4. *P. nigra*
e. Leaves truncate or broadly cuneate at the base, larger; branches spreading. 5. *P. canadensis*
b. Petioles terete, not flattened; leaves whitish beneath; buds very large and viscid (Fig. 59, f).
f. Twigs glabrous; leaves rounded to slightly cordate at the base, rather narrow, glabrous beneath. 6. *P. balsamifera*
f. Twigs pubescent; leaves cordate, slightly pubescent on both sides and densely so on the veins beneath, wide and often slightly cordate. 7. *P. gileadensis*

1. **P. tremuloides** Michx. Fig. 59, e. TREMBLING ASPEN

Common throughout, mixed with or often growing on wetter land than the following species. Aspen rarely occurs in large stands except in burnt-over areas but most frequently occurs scattered with other trees. There is considerable variation in the size and the shape of the leaves. The extreme with leaves slightly cordate at the base and with the blades as wide or wider than long is probably best considered as a form, forma *reniformis* Tidestr. This is occasional in Kings and Colchester Co. eastward and probably throughout eastern Canada.

Lab. to Alaska south to Tenn. with other varieties westward.

2. **P. grandidentata** Michx. Fig. 59, g. Map 233. LARGE-TOOTHED POPLAR

Common throughout the mainland, rather rare in C.B.; this species formed only a small part of the original forest but is now common on light soils or burnt-over areas; especially abundant in the Annapolis Valley and in northern Colchester Co. This species suckers or becomes established by seed readily after fires and has frequently covered large areas on the lighter soils. It rarely crosses with *P. tremuloides*. One such cross was found by J.S. and D.S. Erskine at the foot of a gypsum slope by Ellerhouse Brook, St. Croix in Hants Co.

N.S. to Man. south to N.C. and Mo.

3. **P. alba L.** WHITE POPLAR, SILVER POPLAR

Commonly planted around buildings and along roadsides in the past, almost impossible to eradicate when once established since it produces an abundance of root-suckers. Most of the trees recently planted as ornamentals belong to var. **nivea** Ait., with the leaves silvery-tomentose beneath and the blades lobed like a maple leaf.

Eurasia; widely introduced.

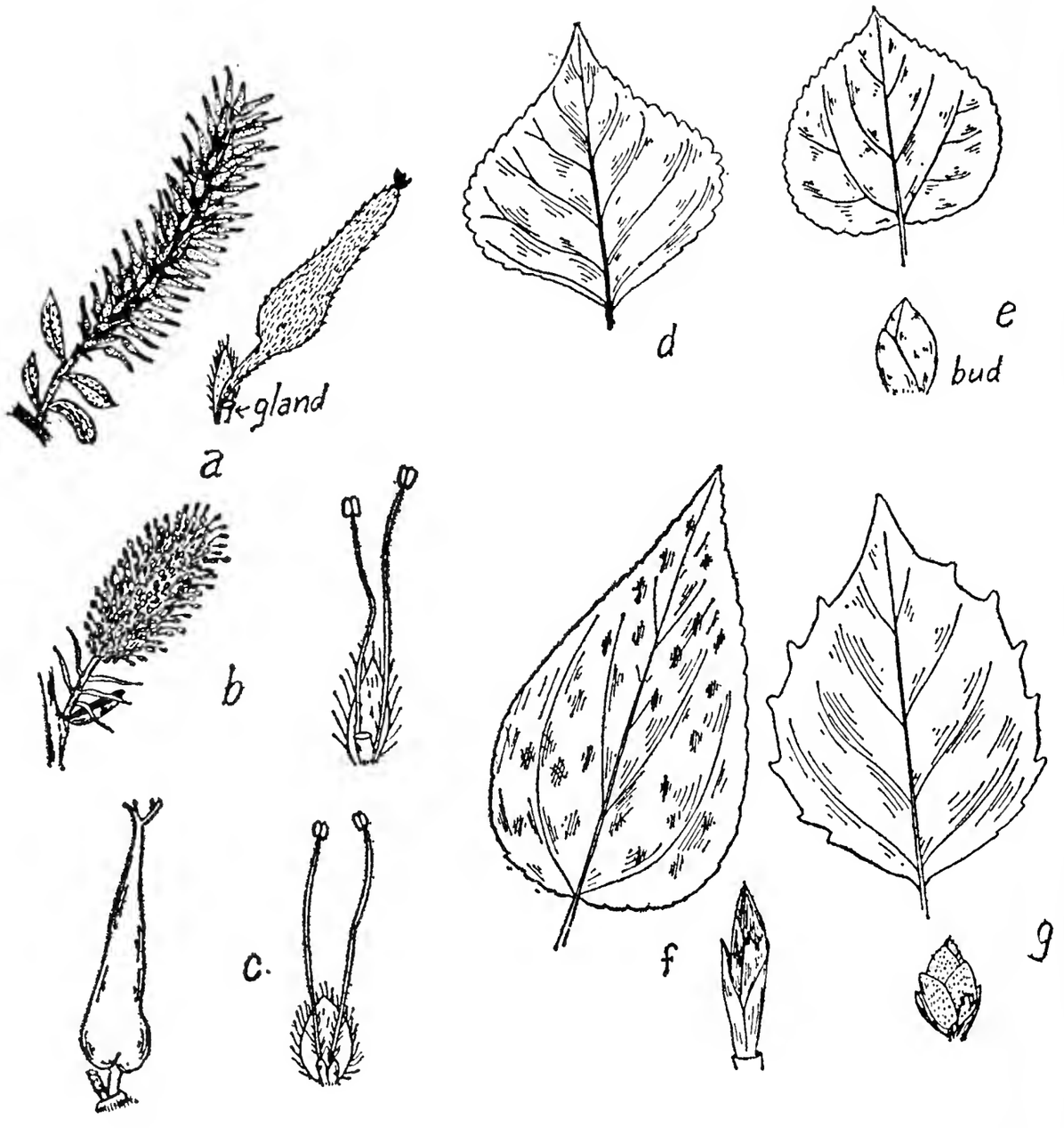


Fig. 59.—**Salix**: (a) *S. Bebbiana*, pistillate catkin x $\frac{1}{2}$, flower x 5, (b) staminate catkin x $\frac{1}{2}$, flower x 5, (c) *S. cordata*, pistillate and staminate flowers x 5. — **Populus**: (d) *P. nigra*, leaf, (*e*) *P. tremuloides*, (f) *P. balsamifera*, (*g*) *P. grandidentata*.

4. **P. nigra** L., var. **italica** Muenchh. Fig. 59, d. LOMBARDY POPLAR

This tall columnar tree is occasionally seen along roadsides and about buildings, probably gradually dying out and only infrequently escaping. This is reported to be an infertile clone which is spread only by cuttings or sprouts. The species itself does not have the strict columnar form.

Native of Eu. and early introduced into N.Amer.

5. X **P. canadensis** Muenchh. HYBRID POPLAR

Various forms and varieties of these hybrid poplars are now being planted in the Province along roadsides and especially about towns where they excel because of their fast-growing habit and good foliage; subject to cankers.

6. **P. balsamifera** L. Fig. 59, f. Map 234. BALSAM POPLAR

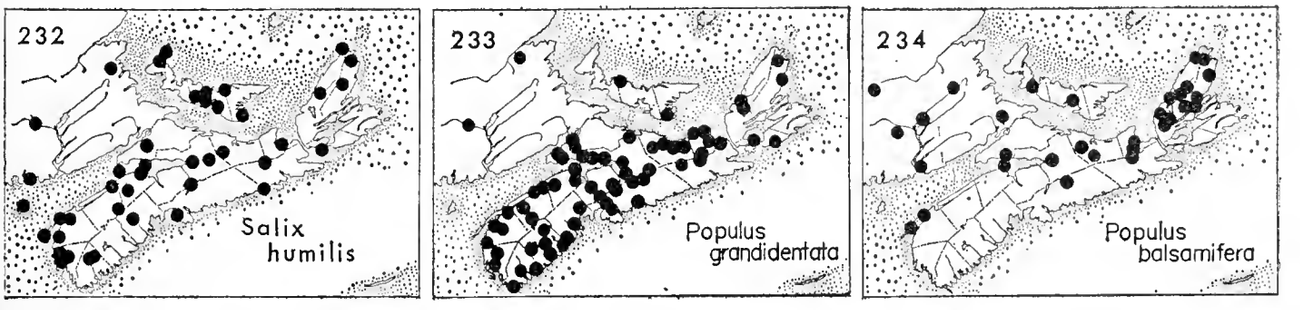
Common along streams and open intervales, occasionally seen in the original forest, in central and northern C.B.; formerly planted as a shade tree so it has become more scattered. Young trees are occasionally found on the mainland as far as Cumberland, Digby and Halifax Co, in native habitats but where it is difficult to be certain whether they are introduced or not. The trees are conspicuous in early summer because of the dark shade of the foliage. The species in the east has wider, more ovate leaves which may even be subcordate at the base. This variation has been given various names but may be called var. **subcordata** Hylander (Var. *Fernaldiana* Rouleau; var. *Michauxii* (Dode) Henry). See Rouleau (1946, 1948) for a discussion of the nomenclature.

Lab. to Alaska south to Conn., Ind. and Nev.

7. X **P. gileadensis** Rouleau BALM-OF-GILEAD

Rare, probably throughout, and scattered collections have been made from Shelburne and Queens Co. east to Pictou. It is rather similar in appearance to the last species, and, like it, in the past was planted as an ornamental, and now survives as isolated trees or occasionally as clumps around old houses, deserted cellars or on roadsides. Both these species make inferior shade trees and are now being replaced by newer hybrids. Its origin is unknown but it may possibly be a hybrid with the last species, apparently originating in Eu. (*P. candicans* Ait.).

Nfld. to Sask. south into the U.S.A.



31. MYRICACEAE SWEET GALE FAMILY

Low much-branched wiry shrubs with alternate, simple leaves which are resinous-dotted beneath and often fragrant; flowers unisexual, in globose to cylindric catkins.

a. Leaves merely toothed; bracts at base of the ovary 2-4, deciduous in fruit; fruit not surrounded by a bur. 1. *Myrica*

a. Leaves deeply and pinnately lobed; bracts at base of the ovary 8, elongate and forming a bur-like fruit. 2. *Comptonia*

1. MYRICA L.

a. Leaves dull on both sides; nutlets small, with 2 wing-like bracts; flowers at the ends of last year's branches, appearing before the leaves (Fig. 60, b). 1. *M. Gale*

a. Leaves glossy above; nutlets orbicular, covered with a white wax, 2.5-3 mm in diam.; flowers on the current year's wood, appearing after the leaves. (Fig. 60, c). 2. *M. pensylvanica*

1. **M. Gale** L. Fig. 60, b. Map 235. SWEET GALE

Common throughout; edges of streams, along stillwaters, in old ditches and well-drained swamps, or on heaths.

Var. **subglabra** (Chev.) Fern. has the leaves glabrous or nearly so beneath, instead of pubescent. This is found in the northeastern part of the range of the species; in N.S. a number of more glabrous collections have been made from Annapolis and Lunenburg Co. to Pictou and Antigonish, although none has been seen from the extreme southwest nor from C.B.

Lab. to Alaska south to N.C. and Tenn.; Eurasia.

2. **M. pensylvanica** Loisel. Fig. 60, c. Map 236. BAYBERRY

Abundant in the southwestern counties; found around the coast on headlands, beaches and occasionally in bogs; scattered in the center of the Province on the heavier soils, rarely heavily fruiting. June.

N.C. north to N.S. and Nfld. and locally inland to Ohio.

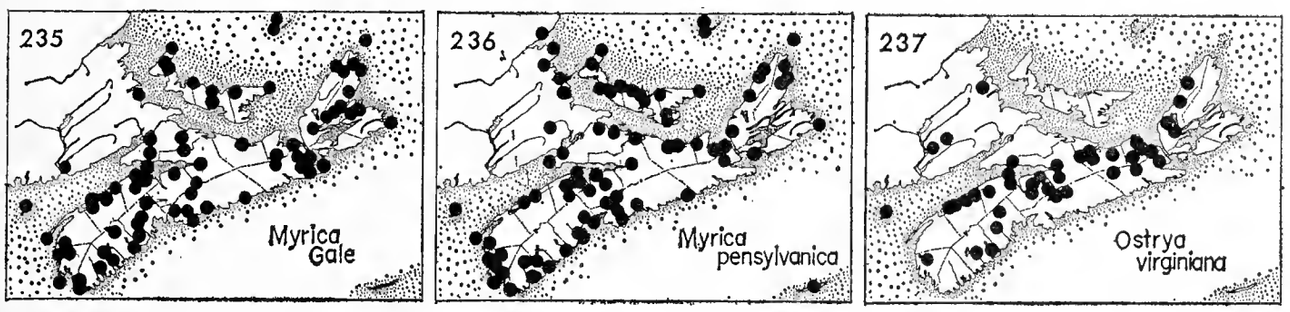
Fig. 60.—**Comptonia,** (a) fruiting branch x $\frac{1}{2}$. — **Myrica:** (b) *M. Gale* x $\frac{1}{2}$, (c) *M. pensylvanica* x $\frac{1}{2}$.

2. COMPTONIA L'Her.

1. **C. peregrina** (L.) Coult. Fig. 60, a. SWEET-FERN

One of the most common ground shrubs over much of the open sandy or barren soils of the Province; a bad weed in wild blueberry fields; abundant on the sands of Kings and Cumberland Co. and throughout the granitic and quartzite areas elsewhere, often associated with pine and wire birch. May. (*Myrica peregrina* (L.) Coult.).

N.S. to Ont. south to Va. and northern Ga.



32. CORYLACEAE HAZEL FAMILY

Trees and shrubs; staminate flowers in long catkins, with 2-10 stamens; pistillate flowers in long catkins or several from a scaly bud, forming small nutlets (often winged) or a single enclosed nut.

a. Bark of older twigs and trunk without elongated lenticels and not peeling readily; leaves softly pubescent beneath; nut or nutlets not winged, enclosed in a papery or leathery involucre.
  b. Shrub, wiry and stoloniferous; pistillate flowers minute and one to several from the bud in early spring, the mature fruits one or two, to 1 cm thick and the involucre with a long beak; leaves with 5-8 pairs of veins, doubly serrate; hazelnut (Fig. 62, d). 1. *Corylus*
  b. Tree, small and not stoloniferous; flowers and fruit in hanging catkins, the nutlets enclosed in bladdery sacs like a bunch of hops; leaves with 9 or more pairs of veins, rather evenly serrate, (Fig. 62, c); staminate catkins abruptly reflexed in fall and winter. 2. *Ostrya*

a. Bark of older twigs with conspicuous elongated lenticals, rather easily peeling off, or not peeling off and the plants low wiry shrubs; nutlets small, exposed in the axils of the scales of the catkin or spike; alders and birches.
  c. Scales of the pistillate catkins thin and papery, soon falling, usually 3-lobed; bark of taller shrubs and trees whitish to yellowish, often peeling; birches (Fig. 61); stamens 2; fruit with thin wings. 3. *Betula*
  c. Scales of the pistillate catkins woody, 3-5-lobed at the tip and long-persistent; stamens 4; nutlets with thick wings (Fig. 62, a, b); alders. 4. *Alnus*

1. CORYLUS L. HAZEL

1. **C. cornuta** Marsh. Fig. 62, d. HAZELNUT

Dry and open woods, generally distributed and often abundant as an understory shrub. In northern C.B. it is found in the climax forest; and

it is likewise common under pines in the Annapolis Valley. It is scattered in roadside thickets, along edges of fields or margins of woods.

Nfld. to B.C. south to Ga. and Colo.

2. **OSTRYA** Scop. HOP-HORNBEAM

1. **O. virginiana** (Mill.) K.Koch Fig. 62, c. Map 237
Hop-Hornbeam

Scattered from Annapolis Co. to C.B., often seen in the center of the Province, growing along the intervales and in alluvial soil; very rare elsewhere, especially so in the acidic areas and the southwestern counties. Plants which bear stalked glands on the new branchlets are known as forma **glandulosa** (Spach) Macbr.

N.S. to Man. south to Fla. and Tex.

3. **BETULA** L. BIRCH

Three series of birches occur in the Province: yellow birch is one; the white birch and its relatives form a second; and the third comprises our dwarf birches which are often only 1-2 m high or less (Boivin, 1967-b)

a. Leaves with 9-11 pairs of veins; pistillate catkins oval, 2-3 cm long, sessile, the bracts persistent; staminate catkins stout, several in a group; wing of fruit narrower than the body; bark yellowish (Fig. 61, c). 1. *B. alleghaniensis*

a. Leaves with 7 or fewer prominent veins; pistillate catkins cylindrical, distinctly stalked in the larger forms, the bracts readily falling away.

b. Erect trees or coarse shrubs; wing of fruit as broad or broader than the body; leaves mostly over 5 cm long, ovate or acuminate at the tip.

c. Leaves wide, ovate to deltoid in shape with long acuminate tips, glabrous except occasionally in the axils of the veins beneath; staminate catkins usually single; young branchlets glabrous.

d. Bark chalky- or ash-white, not flaking off in layers; twigs slender and wiry; staminate catkins mostly borne singly; bracts of pistillate catkins 1.5-4 mm long; native (Fig. 61, a). 2. *B. populifolia*

d. Bark lustrous, cream to pinkish-white, often flaking off in thin layers.

e. Introduced tree with much the aspect of *B. populifolia*; branchlets pendulous. 3. *B. pendula*

e. Native hybrids between *B. populifolia* and *B. cordifolia* with the leaf-shape varying and intermediate between them, much more acuminate than in our common white birch; bracts of pistillate spikes 5-7 mm long; staminate catkins often borne singly; scattered and rare. 4. X *B. caerulea-grandis*

c. Leaves ovate, acute but not long-acuminate, pubescent beneath, at least when young; staminate catkins 2-several.

f. Trees; wings of fruit usually much broader than the body; bark exfoliating, white to brownish.

g. Buds very resinous; leaves rather small, acute, 2-5 cm long; fertile catkins up to 3 cm long; introduced tree; rare. 5. *B. alba*

g. Buds scarcely resinous; leaves acute to mostly short-acuminate, 3-10 cm long (Fig. 61, b); fertile catkins up to 6.5 cm long; common native trees.

h. Leaves ovate to widely lanceolate, tapering to truncate at the base; bracts of fruiting catkins with sub-quadrangular or sub-rhomboidal side-lobes, the median lobe tapering to the tip; young twigs pubescent. 6. *B. papyrifera*

h. Leaves cordate at the base and wider; bracts of fertile catkins erect with smooth curving outer margins, the median lobe long with parallel sides and rounded at the tip; young twigs glabrous. 7. *B. cordifolia*

f. Shrubs of northern C.B.; wings of fruit barely as wide as the body; bark dark, not exfoliating; twigs puberulent; leaves ovate, rather bluntly double-serrate. 8. *B. occidentalis*

b. Low much-branched shrubs with dark close bark; leaves round to slightly elliptical, rounded at the tip, mostly 0.5-2.5 cm long.

i. Leaves round to elliptical, 1-2.5 cm long, short-petioled; bracts of pistillate scales 3-lobed; nutlets definitely winged.

j. Young twigs and undersides of the leaves coarsely pubescent; leaves whitish beneath; twigs without glands. 9. *B. pumila*

j. Young twigs finely pubescent with numerous conspicuous warty glands. 10. *B. glandulosa*

i. Leaves fan-shaped, essentially sessile, about 0.5 cm long, with deep rounded teeth; bracts of pistillate scales unlobed; nutlets wingless; shrub less than 1 m high. 11. *B. Michauxii*

1. **B. alleghaniensis** Britt. Fig. 61, c. YELLOW BIRCH

Throughout; scattered in the southwestern counties and common to dominant in the deciduous forests eastward (see Dansereau and Pageau, 1966). Yellow birch is found on a variety of soils from moist lowlands to drier mountain slopes. In C.B. it extends upward to an elevation of about 1100 feet, beyond the range of sugar maple. This species has been severely affected by disease. 2n = 84 in our area. (*B. lutea* Michx. f.).

Var. **macrolepis** Fern. (Brayshaw, 1966-a) is described as having the scales of the pistillate catkins 8-13 mm long, instead of 5-8 as in the typical variety; and with the wedge-shaped basal portion 2.5-6 mm long instead of 1-2.5 mm. This variety may be more common northwards; it does not seem to be general in N.S. Fernald records it from Comeauville in Digby Co., Argyle in Yarmouth Co. and from Armdale in Halifax Co. Of our collections, one specimen from C.B. approaches this variety, the rest have rather small scales.

Southern Nfld. and Gaspé to se. Man. south in the mts. to Ga., around the Great Lakes and in Wisc. and Minn.

2. **B. populifolia** Marsh. Fig. 61, a. WIRE or GRAY BIRCH

Very common in western and central N.S. on light soils, in pastures, barrens and burnt-over land, where it is a characteristic shrub in the early stages of succession in pastures and barrens. Eastward it becomes replaced by *B. papyrifera* and is known on the mainland only to Monastery in Antigonish Co.; in C.B. only three small locations are known in Richmond and Cape Breton Co.

N.S. to Rimouski west to Ont. and south to Del.

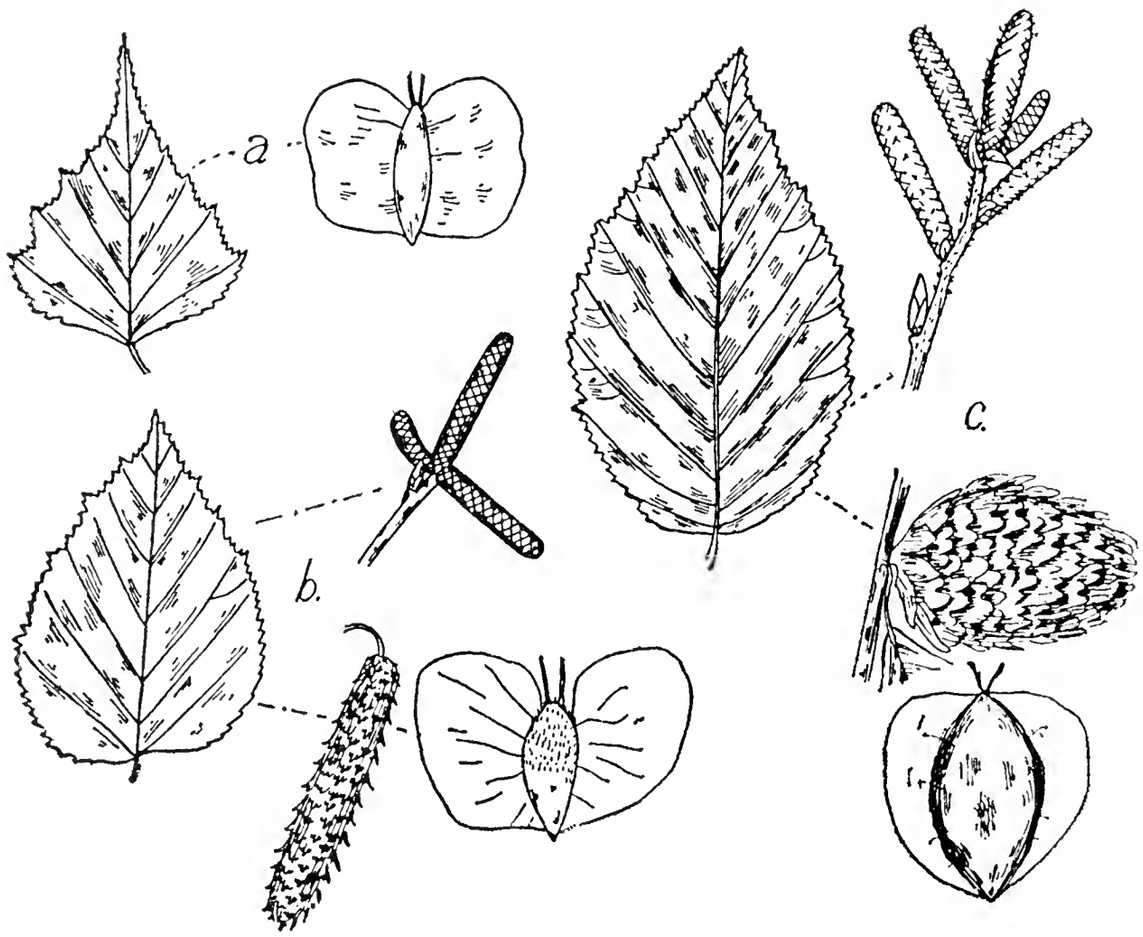


Fig. 61.—**Betula**: (a) *B. populifolia*, leaf x $\frac{1}{2}$; fruit x 3, (b) *B. papyrifera*, leaf x $\frac{1}{2}$, fruiting catkin x $\frac{1}{2}$; staminate catkins in winter x $\frac{1}{2}$; fruit x 5, (c) *B. allegheniensis*, leaf, fruiting catkin, staminate catkins and fruit.

3. **B. pendula** Roth

Commonly planted about towns and dwellings because of its size and weeping habit; rarely persisting or escaping to road-sides. The cut-leaf variety is forma *dalecarlica* (L.f.) Schneid.

N.S. to Ont. south to Penn., Mich. and Iowa; introduced.

4. X **B. caerulea-grandis** Blanch. BLUE BIRCH

Numerous collections of this birch have been made in the Maritime Provinces in recent years (see Brayshaw, 1966-b): Noel Shore in Hants Co., Brier I., Guysborough Co., Jackson in Cumberland Co., and in north-central C.B. It is apparently scattered in southern N.B. and is also found in P.E.I. The chromosome number is 2n = 28; and Brittain and Grant (1967) suggest that it is a hybrid with *B. populifolia* as one of the parents and *B. cordifolia*, instead of *B. papyrifera* as usually presumed, as the other. A back-cross with *B. populifolia* would give an intermediate representing *B. caerulea* Blanch.; while a collection from Frizzleton in Inverness Co. is considered to represent the back-cross to *B. cordifolia*. The scattered trees are found in our area along roadsides, in pastures and other open or disturbed areas where both the parents are found. The leaves are often bluer in color than those of *B. papyrifera*.

N.S. to Que. south to New Eng.

5. **B. alba** L. WHITE BIRCH

An introduced tree which may be planted along roadsides or about dwellings. Erskine reports this for Brackley Point Road in P.E.I. but no collections have been made in N.S. although it probably occurs here. (*B. pubescens* Ehrh.).

Introduced from Eu.; Nfld. to Mich. and New Eng.

6. **B. papyrifera** Marsh. Fig. 61, b. WHITE, PAPER or CANOE BIRCH

For a discussion of our white birches see Fernald (1922, 1945-b) and Brittain and Grant (1965-a).

The white birch is one of the most variable trees of eastern Canada with the shape of the leaves, color of bark, and the size and shape of the bracts of the fertile catkins all very diverse. The tree is common throughout; scattered in the original forest but more common eastward and near the Bay of Fundy. It sometimes forms almost pure stands after a fire. Chromosome numbers for our material, determined by Brittain and Grant (1967), are 56, 70 and 84, with apparently little barrier to hybridization between the different types.

Various varieties have been proposed by Fernald. Var. **pensilis** Fern. has the leaves nearly lanceolate and the branches pendulous. Trees of this type seem to represent merely extreme variations or abnormal forms and do not seem to represent a good variety.

Trees with the bark brownish, the outer layers only tardily flaking off have been referred to the western variety **commutata** (Regel) Fern. This type is found in northern C.B. from Scatari I. to Margaree; and on Brier I. off Digby Neck. Brittain and Grant (1966) review the B.C. type and compare it with the plants of Brier I. They conclude that there are small but constant differences between the two. There is still a question as to whether our dark-barked type deserves a formal name. $2n = 70$ and 84.

Large-fruited trees with the mature fertile bracts 7-10 mm long and the catkins 6-8 mm wide have been named var. **macrostachya** Fern. The type collection is from dry mixed woods, Hectanooga, Digby Co.; spruce woods, Brier I. and on Isle Haute in the Bay of Fundy. Specimens from Mackenzie Mt., northern Inverness Co., also have very wide pistillate catkins. The chromosome count on material from West LaHave, Lunenburg Co., was found to be $2n = 84$. Northern Nfld. south to n. Me. and N.S.

Lab. to Alaska south to Penn. and W.Va.

7. **B. cordifolia** Regel. Map 238. (Brittain and Grant, 1965-b).

This tree is now generally considered to be a separate species. The chromosome number is usually $2n = 28$, although outside our area two triploids and a tetraploid were found. This tree is scattered throughout near the coast; occasional in Yarmouth Co.; Cape Blomidon; becoming more common eastward and in C.B.

Lab. to w. Ont. south to N.Y. and Wisc.

8. **B. occidentalis** Spach Map 239.

This northern representative of the white-birch group has been found only in a few locations in northern Inverness and Victoria Co.; along a path on top of Cape North and on high barrens above Lockhart Brook; St. Paul I.; and fields on Mt. Young near Mabou. The type of *B. borealis* Spach, the name formerly used for this plant, is said by Boivin to belong to *B. pumila.*

Nfld. to Alaska south to northern Vt. and N.S., often montane.

9. **B. pumila** L. Map 240. BOG-BIRCH

Casual on St. Paul's I. (Perry, 1931); C.B. where it is found only in northern Victoria and Inverness Co.; bogs, bog-meadows, and mixed with alders, rather local but sometimes covering large areas on the higher parts of the plateau; not found at lower altitudes.

Var. **renifolia** Fern. The smaller, or more prostrate, extreme with the leaves round or wider than long and rounded at the base and more persistently pubescent beneath, grows in more exposed situations and at higher altitudes. This is reported from St. Paul's I., on P.E.I. and the Magdalens northward. A collection from the edge of an alder thicket, margin of a bog at the top of French Mountain, Inverness Co., shows these characteristics. A hybrid between *B. cordifolia* and *B. pumila* is reported for French Mountain, Inverness Co.

This species is quite variable and is said to present in North America a continuous series of variations to the more northern *B. nana* L. and to the next species. *B. pumila* could thus be classified as *B. nana* var. *renifolia* (Fern.) Boivin; and the following species as *B. nana* var. *sibirica* Led.

Nfld. and Lab. to Mich. south to N.J. and Ohio.

10. **B. glandulosa** Michx.

This is a small species with bright, glossy leaves and twigs covered with large sessile glands. Victoria Co.: near the margin of Twin Island L., Ingonish Barrens, at an elevation of 1300 ft. Here it was luxuriant in a colony of considerable extent (Smith and Schofield, 1952).

Nfld. to Alaska south to the mts. of Me., N.H. and N.Y.

11. **B. Michauxii** Spach Map 240. See Rousseau and Raymond (1950).

This is a neat, dwarf species with very small, fan-shaped leaves. Only three stations are known in N.S.: first collected by E. R. Faribault in 1884, near the Liscomb R. in Guysborough Co.; a single colony in grassy sphagnous bog, near the mouth of Gaspereau Brook in the same county; locally abundant in wet parts of a peat bog, Big Meadow, Brier I., Digby Co. (Smith and Erskine, 1954).

Lab. and northern Que. south to Nfld. and the coast of N.S.

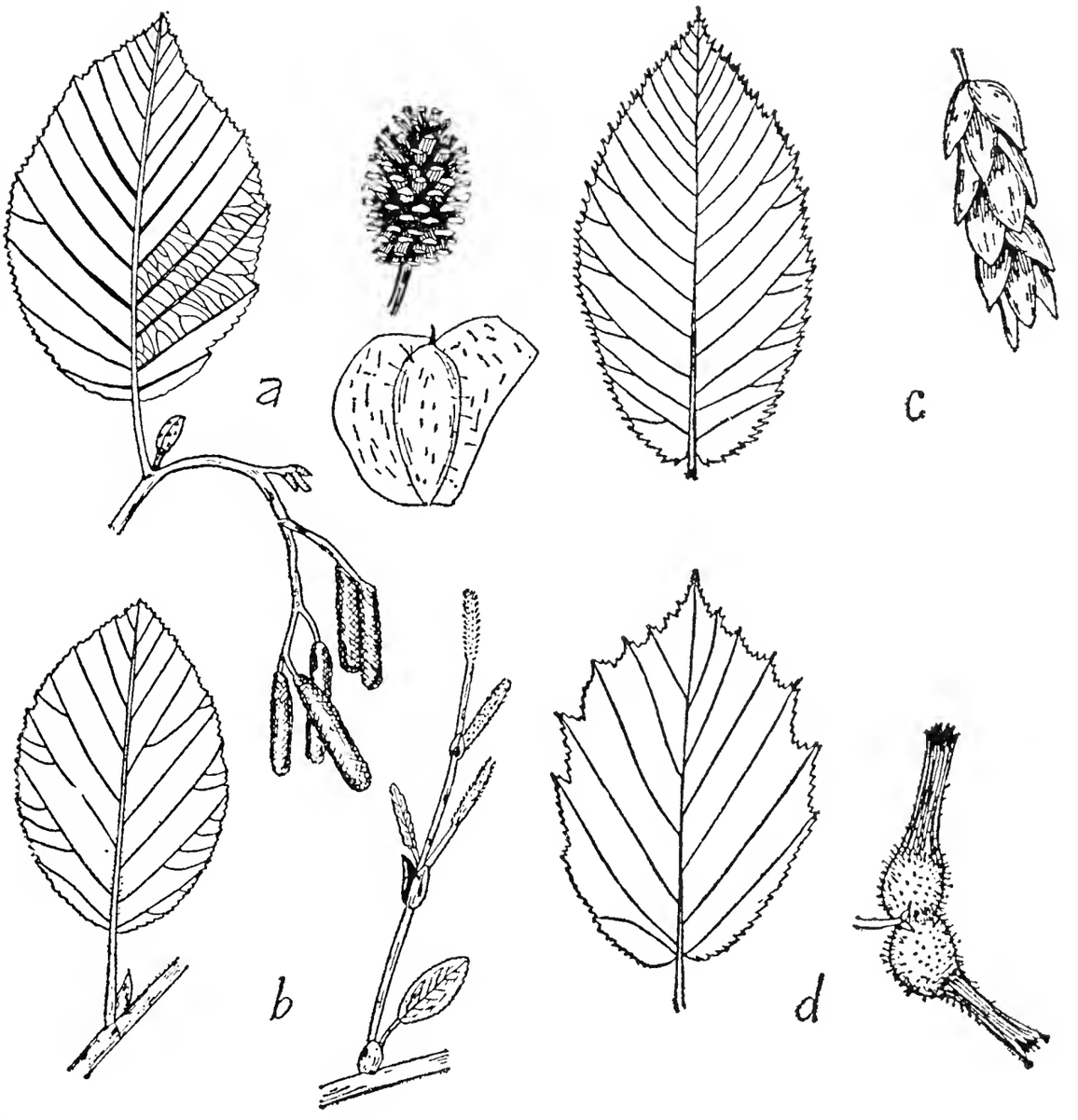
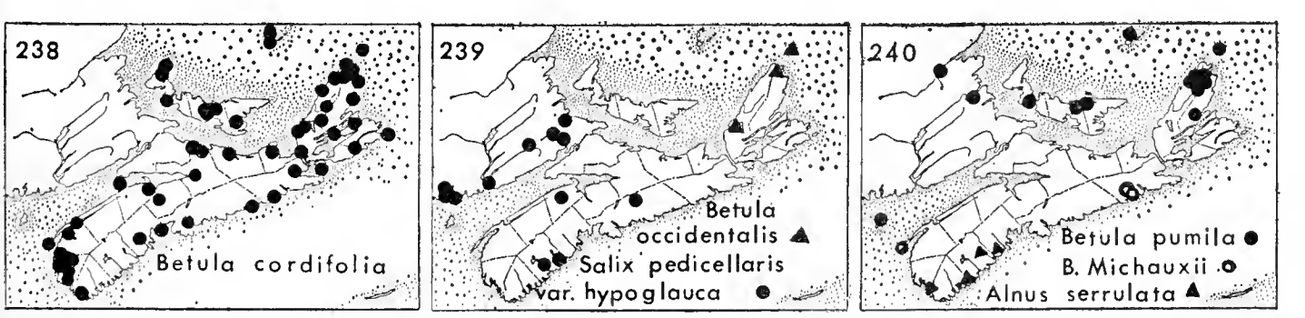


Fig. 62.—**Alnus**: (a) *A. rugosa*, branch in autumn with leaf, stalked bud, and naked overwintering staminate and pistillate cones x $\frac{1}{2}$; mature cone x $\frac{1}{2}$, fruit x 5, (b) *A. crispa*, leaf and opening bud with pistillate cones x $\frac{1}{2}$. — **Ostrya**, (c) leaf and fruit cluster x $\frac{1}{2}$. — **Corylus**, (d) leaf and fruit x $\frac{1}{2}$.



4. **ALNUS** B. Ehrh. ALDER

Our alders are tall shrubs with pendulous staminate catkins and erect pistillate ones which become woody and persistent when mature (Fernald, 1945-c; Steele, 1961).

a. Buds sessile, with 3-6 unequal scales; pistillate catkins enclosed in the bud during winter; leaves with 6-8 pairs of main veins (Fig. 62, b). 1. *A. crispa*

a. Buds stalked, with 2-3 scales of equal length; pistillate catkins naked over winter; leaves with 8-11 pairs of main veins.
b. Leaves broadest near or below the middle, with rounded or cordate bases, often doubly serrate, the mature blades with prominent cross-veins between the main ones (Fig. 62, a), becoming glaucous beneath. 2. *A. rugosa*
b. Leaves broadest above the middle, wedge-shaped or but slightly rounded at the base, sharply and almost regularly serrulate, glutinous when young, the mature leaves finely reticulated with only weak cross-veins, greenish beneath. 3. *A. serrulata*

1. **A. crispa** (Ait.) Pursh Fig. 62, b. Map 241. DOWNY ALDER

Common throughout, abundant northwards and in C.B.: poorly-drained soils, mountain slopes, sea-shores, bluffs, headlands, deserted pastures on heavier soils and in heath associations. Closely related to *A. viridis* of Eurasia; our southern, more pubescent extreme of a species ranging from Lab. to Alaska has been separated as var. *mollis* Fern.

Nfld. to Lake Winnipeg south to Mass. and N.Y.

2. **A. rugosa** (DuRoi) Spreng. Fig. 62, a. SPECKLED ALDER

Found in low ground throughout and our common alder in alluvial soils. The plants in the northern part of the range have the leaves whitish-glaucous beneath, instead of green, and are named var. **americana** (Regel) Fern. Considerable variation exists in the pubescence and the extreme with the lower surface of the leaves soft hairy or pilose is forma **hypomalaca** Fern.

Plants with the leaves greenish and not glaucous beneath have been reported from Yarmouth Co. east to Bridgewater and Italy Cross in Lunenburg Co. These may belong to the more southern typical variety but the probability is that they are due to introgression between this and the following species. Our plants are closely related to *A. incana* (L.) Moench of Europe.

Lab. to Sask. south to W.Va.

3. **A. serrulata** (Ait.) Willd. Map 240.

First found by Weatherby (1942) in thickets on the banks of Cameron and First Christopher L. and along the shores of Ponhook L. by the side of the road in the center of Queens Co.; now known also from a lake-edge at Hibernia in Queens Co., along the swampy edge of French L., Middle West Pubnico L., Yarmouth Co. and along the south edge of a lake at Italy Cross and at Wallace L. in Lunenburg Co. At this latter station the shrubs grow over 3 m high and the leaves are more elliptical and rounded at the base.

Fla. to La. north to central Me. and Mo.; western N.S.

33. FAGACEAE BEECH FAMILY

Trees, producing large nuts partly or wholly surrounded by a scaly involucre; staminate flowers in catkins, as the leaves unfold; the pistillate, solitary, or a few in a cluster.

a. Leaves coarsely serrate to nearly entire (Fig. 63, c); nuts triangular, surrounded by a 4-parted involucre. 1. *Fagus*
a. Leaves deeply lobed (Fig. 63, a, b); nut round, surrounded at the base by a cup-like involucre. 2. *Quercus*

1. FAGUS L. BEECH

1. **F. grandifolia** Ehrh. Fig. 63, c. BEECH

Very common throughout the northern hardwood area from Annapolis to northern C.B., mixed with sugar maple or occurring in pure stands on the drier ridges and hilltops; scattered elsewhere, very variable as to flowers and fruit. All the beech in N.S. is severely affected by the Nectria beech canker. Forma **pubescens** Fern. & Rehd. has the leaves more or less pubescent beneath, especially on the veins; frequently found. Late May. The European beech, *F. sylvatica* L., is commonly planted.

N.S. to Ont. and Wisc. south to Va.

2. QUERCUS L. OAK

Large trees with thick, pinnately lobed leaves. Other species are occasionally planted as ornamental trees.

a. Lobes of the leaf rounded, not bristle-tipped; acorn oblong to elliptical, (Fig. 63, b). 1. *Q. robur*
a. Lobes of the leaf acute, bristle-tipped; acorns about as wide as long. 2. *Q. borealis*

1. **Q. robur** L. Fig. 63, b. ENGLISH OAK

Scattered as a roadside tree, at least from Annapolis to Halifax and Truro where it spreads out into surrounding bushes, particularly at Falmouth, Mt. Uniacke and at Rawdon; leaves remaining on the trees until early winter.

Introduced from Eu.

2. **Q. borealis** Michx. f. Fig. 63, a. RED OAK

Throughout in light or well-drained soils; scattered in the granitic areas, local on the sands of the Annapolis Valley where it was apparently much more common in the past; and scattered or local eastward to C.B. In some localities, as at Pleasant Bay and in the vicinity of Cape North, it forms a locally important constituent of the forest; in other regions it may be absent. (*Q. rubra* L., var. *borealis* (Michx. f.) Farw.).

Var. **maxima** (Marsh.) Ashe is a generally more southern form with a wider, shallower cup and larger acorns; the cup 2.5-3 cm wide and flattened at the base and the acorn or nut up to 3 cm long, while the typical variety has the cup only 1.5-2 cm wide and tending to be conical at the base, with the nut up to 2.5 cm long. Fernald(1922) reports this as scattered in southwestern N.S.; dry woods near Canoe L., Yarmouth Co.

and woods bordering Boot L., Annapolis Co. There may be an intergradation here with these two varieties of oak as there is on Digby Neck with sugar and black maples (*Q. rubra* L.).

N.S. to Minn. south to Penn. and Iowa.

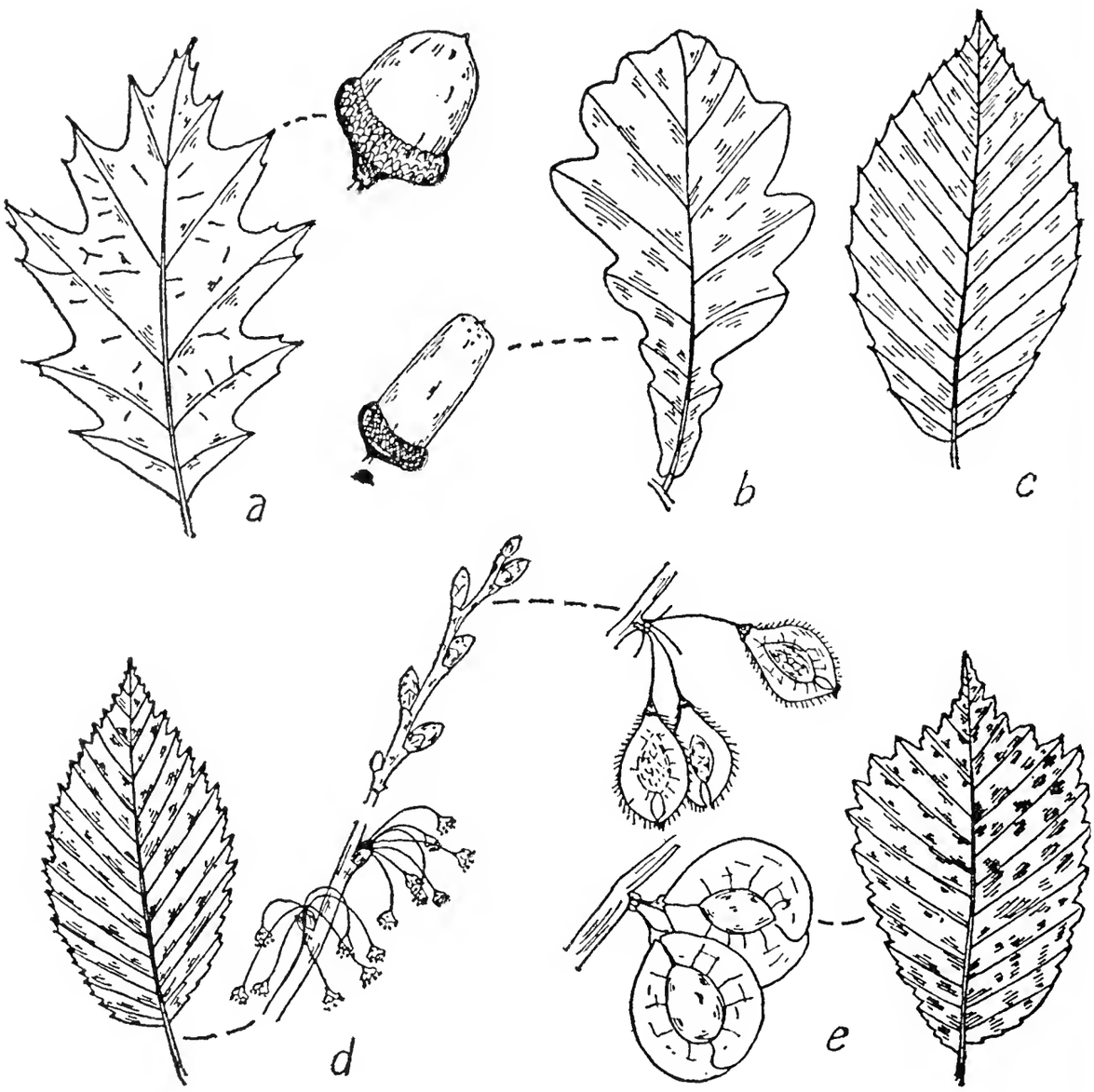


Fig. 63.—**Quercus:** (a) *Q. borealis*, leaf x $\frac{1}{2}$, acorn x $\frac{1}{2}$, (b) *Q. robur*, leaf and acorn x $\frac{1}{2}$. — **Fagus:** (c) leaf x $\frac{1}{2}$. — **Ulmus:** (d) *U. americana*, leaf, flowers, and winter buds x $\frac{1}{2}$, fruit x 1, (e) *U. glabra*, leaf and fruits x $\frac{1}{2}$.

34. ULMACEAE ELM FAMILY

1. ULMUS L. ELM

The elms have tufts of small, perfect flowers with the calyx 4-9-lobed, no corolla, and stamens as many as the calyx lobes; flowering early in the spring and forming fruit in May before the leaves fully unfold. The leaves can usually be identified because of the unequal sides at the base of the blade.

a. Branches soon rough and corky; petioles 5-8 mm long; flowers on pedicels 1-2 cm long, with 7-8 stamens; fruit about 1 cm long, fringed. 1. *U. americana*
a. Branches long remaining smooth, yellowish; petioles 3-6 mm long; flowers in clusters, with 5-6 stamens; fruit broad, 2-2.5 cm long, smooth. 2. *U. glabra*

1. **U. americana** L. Fig. 63, d. AMERICAN ELM

Scattered throughout on the intervales, best developed along the river valleys of the central and northern counties. Most elms now are growing close to cultivated fields or meadows but they are undoubtedly native. It is extensively planted as a shade tree; and elms in general are very variable in the shape of the tree and in the leaves.

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

2. **U. glabra** Huds. Fig. 63, e. SCOTCH ELM

Very common in the towns and villages where it was formerly much planted as an ornamental tree. It does not show any tendency to escape. The very large orbicular fruits are conspicuous in early June. The small-leaved Chinese elm is also planted to some extent, but does not seem too hardy.

35. CANNABINACEAE HEMP FAMILY

1. HUMULUS L. HOPS

1. **H. Lupulus** L. Fig. 64, d. HOPS

Formerly planted; occasionally found around old dwellings in waste places and rarely as an escape. This plant is probably gradually disappearing. The native plants are sometimes separated from introduced European ones as *H. americanus* but the differences are said to be evasive.

N.S. to Man. and Calif. south to N.C.

36. URTICACEAE NETTLE FAMILY

Herbs with clusters of small greenish flowers, the whole plant in our forms armed with stinging hairs.

a. Leaves opposite; sepals 4. 1. *Urtica*
a. Leaves alternate; sepals 5. 2. *Laportea*

1. URTICA L. NETTLE

a. Plants perennial, 1-3 m high, little or not at all branched; petiole relatively short; inflorescence long, with ascending branches.
b. Leaves rounded at the base; lower surface of blades and the upper part of the stem sparingly or not at all setulose, glabrous and finely pilose.
c. Petiole slender and elongate, 2-5 cm long; blade averaging 17 pairs of teeth, nearly glabrous beneath, rather wide and thin. 1. *U. gracilis*

c. Petiole stout, 0.5-2 cm long; blade averaging 25 pairs of teeth, cinereous-puberulent beneath, often thickish. (Fig. 64, b). 2. *U. procera*

b. Leaves plainly cordate at the base, coarsely toothed with 13-18 teeth; lower surface of blades and upper part of the stem densely setulose and very pilose (Fig. 64, a). 3. *U. dioica*

a. Plants annual, 1-4 dm high, usually much branched; petiole one-half the length of the blade or longer; inflorescence short, open, with widely divergent branches. 4. *U. urens*

1. **U. gracilis** Ait., see Fernald (1926) for discussion of this and the following species. Our first 3 species are often all included in *U. dioica.*

The status of this northern extreme, in particular, is uncertain. It may be merely an ecological variation but in general it appears distinct. In our area it is apparently confined to rich woods in the eastern counties: collected by Macoun from Big Intervale, Inverness Co., and by Hamilton from Boylston, Guysborough Co. Later collections are from rich woods, Grand Anse, and from a wooded slope above the Margaree R., both in Inverness Co.

The range is from Nfld. to northern Me. and N.Y. west to Alaska and Oreg.

2. **U. procera** Muhl. Fig. 64, b. TALL NETTLE

Open woods, damp thickets, along roadsides and edges of fields in organic and muck soils where the moisture and fertility is high; more common and perhaps confined to the northern part of the Province and rarely abundant.

N.S. and Que. to N.D. south to N.C. and La.

3. **U. dioica** L. Fig. 64, a. STINGING NETTLE

Waste places and roadsides, mostly near towns; rather common throughout and our commonest member of the genus, often appearing as if introduced. The leaves are not always plainly cordate even though they may be relatively wide. Some authors place this and the two preceding species as variations of one intergrading species.

Native of Eu.; naturalized from Nfld. to Man. south to Va.

4. **U. urens** L. BURNING NETTLE

Occasionally introduced as a weed about towns and in waste places, particularly in the eastern part of the Province; often near the shore; collected by J. S. Erskine at Candlewax and Seal I. in Yarmouth Co. and Cape Sable in Shelburne Co.

Native of Eu.; widely introduced.

2. **LAPORTEA** Gaud. WOOD-NETTLE

1. **L. canadensis** (L.) Wedd Fig. 64, c. Map 242. WOOD-NETTLE

Alluvial woods and hardwood forests, scattered from Coldbrook, Kings Co. through the north-central part of the Province to northern

Inverness Co.; characteristic of the higher parts of flood-plains in northern C.B. (Nichols, 1918), but it must be very local since recent collections have not been made in this area. This plant is rather rare and found only on the richest locations.

St. Pierre and Miq. to Man. south to Fla., Miss. and Okla.

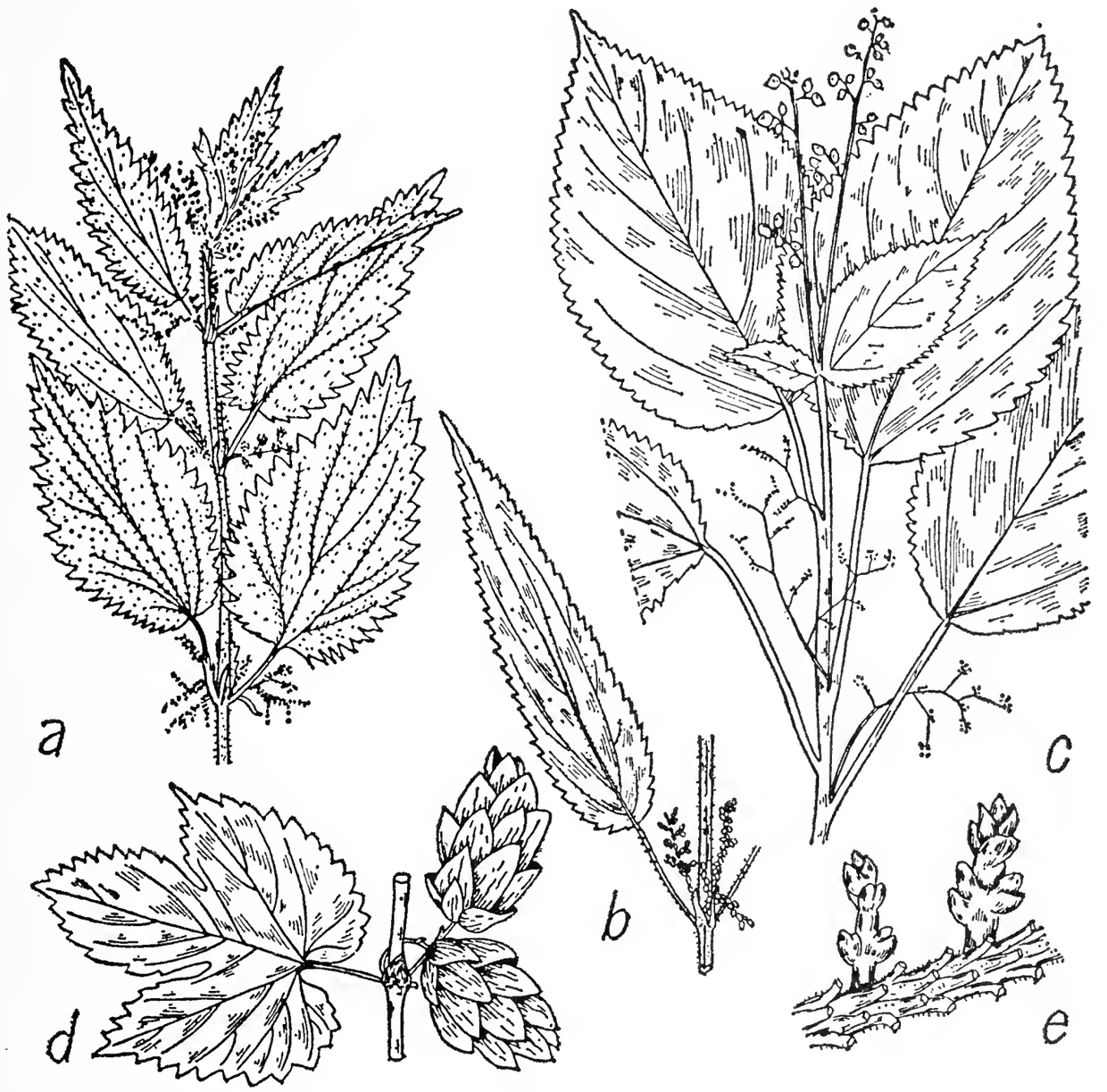


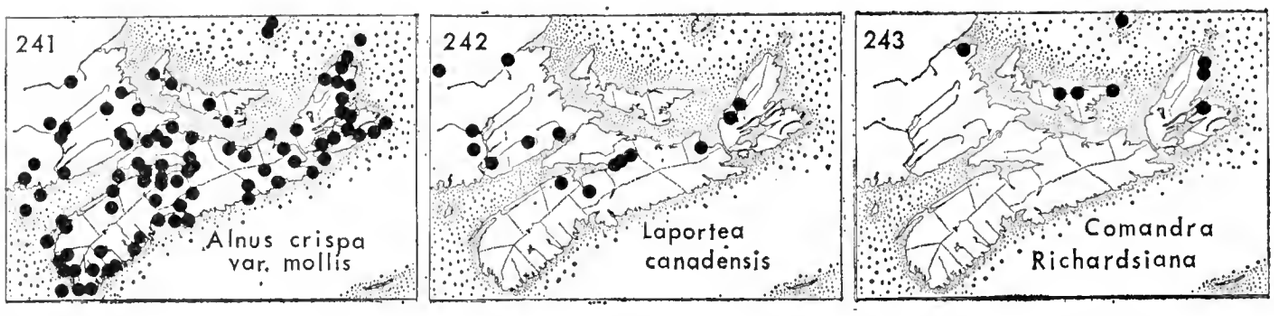
Fig. 64.—**Urtica:** (a) *U, dioica,* tip of plant x $\frac{1}{3}$, (b) *U procera* x $\frac{1}{2}$. — **Laportea:** (c) top of plant x $\frac{1}{2}$. — **Humulus:** (d) leaf and fruit x $\frac{1}{2}$. — **Arceuthobium:** (e) plants on black spruce x 3.

37. SANTALACEAE SANDALWOOD FAMILY

Small, erect, usually unbranched herbs to 3 dm high; leaves alternate and entire; sepals 5 with 5 stamens opposite them; petals absent.

a. Rootstocks corky or papery; flowers in terminal corymbs or umbels; style filiform and prolonged; fruit a dry and coriaceous nut. 1. *Comandra*

a. Rootstocks smooth and brown; flowers 1-3 in the axils of the middle leaves; style conical and very short; fruit juicy and drupe-like. 2. *Geocaulon*



1. **COMANDRA** Nutt.

1. **C. Richardsiana** Fern. Map 243. BASTARD TOADFLAX

Rare and local in northern C.B.: collected by Macoun in 1883 in damp sandy soil, Sydney Mines, Victoria Co.: abundant among grasses and *Empetrum nigrum* on an exposed headland, Black Point (Smith and Schofield, 1952); a few large clumps under spruce on sand dunes, South Pond, Aspy Bay; locally abundant at the edge of pond behind beach, one mile south of Black Brook mouth (Smith and Erskine, 1954.)

Nfld., the Magdalen Is., P.E.I. and C.B. west to n. Vt., Ky. and Kans.

2. **GEOCAULON** Fern.

1. **G. lividum** (Richards.) Fern. Map 244. NORTHERN COMANDRA

Sandy shores, Kingston, Kings Co., Macoun in 1883, and collected recently from among heaths of a moist bog, Auburn; widespread but local in C.B. (Schofield, 1955); Spicer's Cove in Cumberland Co.; usually growing in acid and peaty locations or on sterile soils and damp sands.

Lab. to Alaska south to N.S., Me. and the mts. of New Eng. and N.Y.

38. **LORANTHACEAE** MISTLETOE FAMILY

A mostly tropical family of woody parasitic plants. Our representative is only several mm high and grows on the branches of spruce trees.

1. **ARCEUTHOBIUM** Bieb.

1. **A. pusillum** Peck Fig. 64, e. Map 245, DWARF MISTLETOE

This small parasitic plant sometimes seriously injures the trees and forms irregular witches' brooms on the spruce trees along the Atlantic Coast from Yarmouth to northern C.B.; most common on coastal locations, around most of the coast, rarer inland as around Minas Basin, Monastery, Mabou Harbour and west of Whycocomagh.

Nfld. to Man. south to Penn.

39. **POLYGONACEAE** BUCKWHEAT FAMILY

Herbaceous plants with simple, alternate leaves with conspicuous sheaths formed by the stipules extending around the stem above the nodes; flowers numerous and small with no corolla; sepals 3-6, stamens 4-9, and fruit an achene. Buckwheat and the rhubarb, *Rheum Rhaponticum* L., are typical examples of the family.

a. Achenes with 2-3 broad flat wings, much exceeding the calyx; sepals 4; leaf-blade nearly round; rare, northern C.B. 1. *Oxyria*

a. Achenes lenticular, or 3-angled, mostly enclosed by the calyx, not winged; leaf-blade elongate or, if wider, then cordate at the base.

b. Sepals 6, the outer smaller and reflexed, the inner 3 erect and much enlarged in fruit (except in *R. Acetosella*); stigma tufted or star-shaped (Fig. 65). 2. *Rumex*

b. Sepals 4-6, erect, all about the same size and not enlarged in fruit; stigmas not tufted.

c. Flowers axillary or in narrow terminal panicles; leaves not hastate, or else hastate and very prickly; achenes usually enclosed by the sepals (Fig. 66, 67). 3. *Polygonum*

c. Flowers in axillary or terminal panicles; leaves hastate, not prickly; achene much exerted, 3-angled; buckwheats. 4. *Fagopyrum*

1. **OXYRIA** Hill

1. **O. digyna** (L.) Hill MOUNTAIN-SORREL

This arctic plant has been found only once in N.S. in Inverness Co.: locally abundant on shelves of dripping cliffs, Big Southwest Brook. The plants were very vigorous and differed from much arctic material in that they were almost devoid of red coloring and the leaves were relatively flaccid (Smith and Schofield, 1952).

Nfld., Gaspé and N.H.; mts. of western Amer.; Eurasia.

2. **RUMEX** L. SORRELS AND DOCKS

The genus *Rumex* consists of coarse herbs, with small greenish flowers which are whorled in a branched inflorescence. The inner sepals are often greatly enlarged so that the triangular achene becomes surrounded by 3 wings. The docks are relatively coarse plants with the unlobed leaves mild in taste while the sorrels are sour and have leaves with backward-flaring lobes (Rechinger, 1937; St. John, 1915).

a. Leaves tapering or heart-shaped at the base, not lobed; coarse large plants; docks (Fig. 65).

b. Stems tending to produce leafy shoots in the axils of the leaves; leaves long and narrow, thickish, and pale; large sepals (valves) not toothed, bearing 4 large conspicuous grains or swellings at their midribs.

c. Plants erect, not essentially maritime; width of the grains much less than half the width of the valves, the grains much surpassed by the valves at the tip. 1. *R. triangulivalvis*

c. Plant prostrate, much branched, restricted to sea-shores; width of grain over half the width of the valves, so that the valves appear very narrow; valves little longer than the grain. 2. *R. pallidus*

b. Plants erect, usually without axillary branches; leaves greenish.

d. Valves of the fruit without enlarged grains, or with one diminutive one.

e. Basal leaves lanceolate.

f. Valves rounded, often broader than long, one sometimes with a diminutive grain; pedicels of fruit with an enlarged swollen joint near the middle. 3. *R. domesticus*

f. Valves round-cordate, longer than wide, never with a suggestion of a grain; pedicels without swollen joints. 4. *R. fenestratus*

e. Basal leaves very large, the blades almost round, broadly rounded at the apex and deeply and broadly cordate at the base. 5. *R. alpinus*

d. Valves of the fruit with at least one distinct grain and usually with three.

g. Valves not toothed.

h. Leaves broad, flat, the veins nearly at right-angles to the midrib and distinct halfway to the margin; grain longer than broad; pedicel with an obscure joint (Fig. 65). 6. *R. orbiculatus*

h. Leaves lanceolate, crisped and undulate, the veins oblique and soon branching; grain 1.5 times longer than wide; pedicel with a conspicuous joint (Fig. 65). 7. *R. crispus*

g. Valves of the fruit plainly toothed.

i. Teeth of the valve shallow, much shorter than the width of the central portion; plants tall, common weeds.

j. Lower leaves broad and rather blunt. 8. *R. obtusifolius*

j. Lower leaves oblong-lanceolate, acute. *R. obtusifolius* var. *sylvestris*

i. Teeth of the valves bristle-like, several times the width of the central portion or longer; prominent grains 3; plants usually prostrate, found near salt water (Fig. 65).

k. Grains ellipsoid and rounded at the summit, nearly covering the breadth of the valve; bristles about as wide as the body of the valve; plant with leaves very crisped and undulate and with a fuzzy inflorescence. 9. *R. persicarioides*

k. Grains narrowly lanceolate and tapering to the tip, not concealing the sides of the valve; bristles up to nearly twice the length of the valve. 10. *R. maritimus*

a. Leaves with flaring or backward-pointing lobes at the base, making them hastate- or halberd-shaped; plants with a very sour taste; sorrels.

l. Leaves with the basal lobes flaring outward; plants small, slender, to 4 dm high; valves small, not larger than the achene. 11. *R. Acetosella*

l. Leaves with the basal lobes not flaring, halberd-shaped; plant to 10 dm high; valves about 5 mm wide (Fig. 65). 12. *R. Acetosa*

1. **R. triangulivalvis** (Danser.) Rech. f.

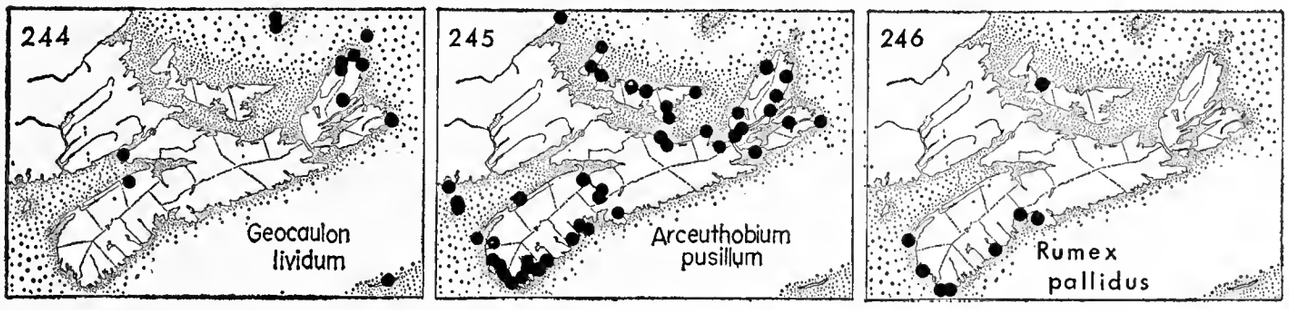
Sarkar (1958) gives the wide-ranging northern plant this name, while the closely related *R. mexicanus* Meisn. with which our plants are sometimes associated is said to be confined to the vicinity of Mexico. This plant is seldom collected but it may possibly be often overlooked. J.S. Erskine collected it at Sweets Corner, Hants Co. and from a brook-beach west of River Inhabitants in Inverness Co.; he also found it to be abundant on the river-bank below the bridge at Kentville. $2n = 20$.

N.S. to northern B.C. south to N.Y., Ind. and Mex.

2. **R. pallidus** Bigel. Fig. 65. Map 246. SEABEACH-DOCK

This sprawling easily-recognized plant is often seen on rocky or gravelly sea-beaches in Yarmouth and Shelburne Co. and along the Atlantic Coast to northern C.B. It grows on the sandy shore at Presqu'ile in Inverness Co. but is apparently rare around the Bras d'Or L. and on the shores of Northumberland Strait, although it is found in eastern P.E.I. and around the Gaspé coast. 2n = 20.

Gaspé and N.S. south to Mass.; shores of the Great Lakes.



3. **R. domesticus** Hartm. Fig. 65.

Scattered to rare throughout; about houses, in fields and waste places, or on damp ground back of beaches.

Native of western Eu.; Nfld. to Me. and sparingly west.

4. **R. fenestratus** Greene

Scattered, reported from N.S. but its distribution not well known. (*R. occidentalis* Wats.).

Wet soils, swamps and shores, Nfld. to Me.; widely distributed westward.

5. **R. alpinus** L.

Established in old fields at Rockville, Yarmouth Co.; a local introduction into Pictou Co., looking like a poor quality rhubarb; a rich colony in field, Red River, Inverness Co.

Introduced from Eu.; N.S. and s. Me.

6. **R. orbiculatus** Gray Fig. 65, Map 247. WATER-DOCK

Scattered to rather common throughout; swamps, edge of fresh-water ponds, around lake borders, often in cat-tail swales. Ganong places it among the subordinate species in the timothy fields of the dykelands; and Nichols lists it as characteristic of the estuaries of northern C.B.

Rechinger separates the stouter, lower, often thick-leaved plants with a compact short inflorescence, growing in northeastern N.S., as var. **borealis** Rech. The only N.S. plant listed is in a collection of St. John's from the swampy edge of a fresh-water pond, Sable I. (*R. Brittanica* L.).

Nfld. to Alta. south to Penn., Ohio and Nebr.

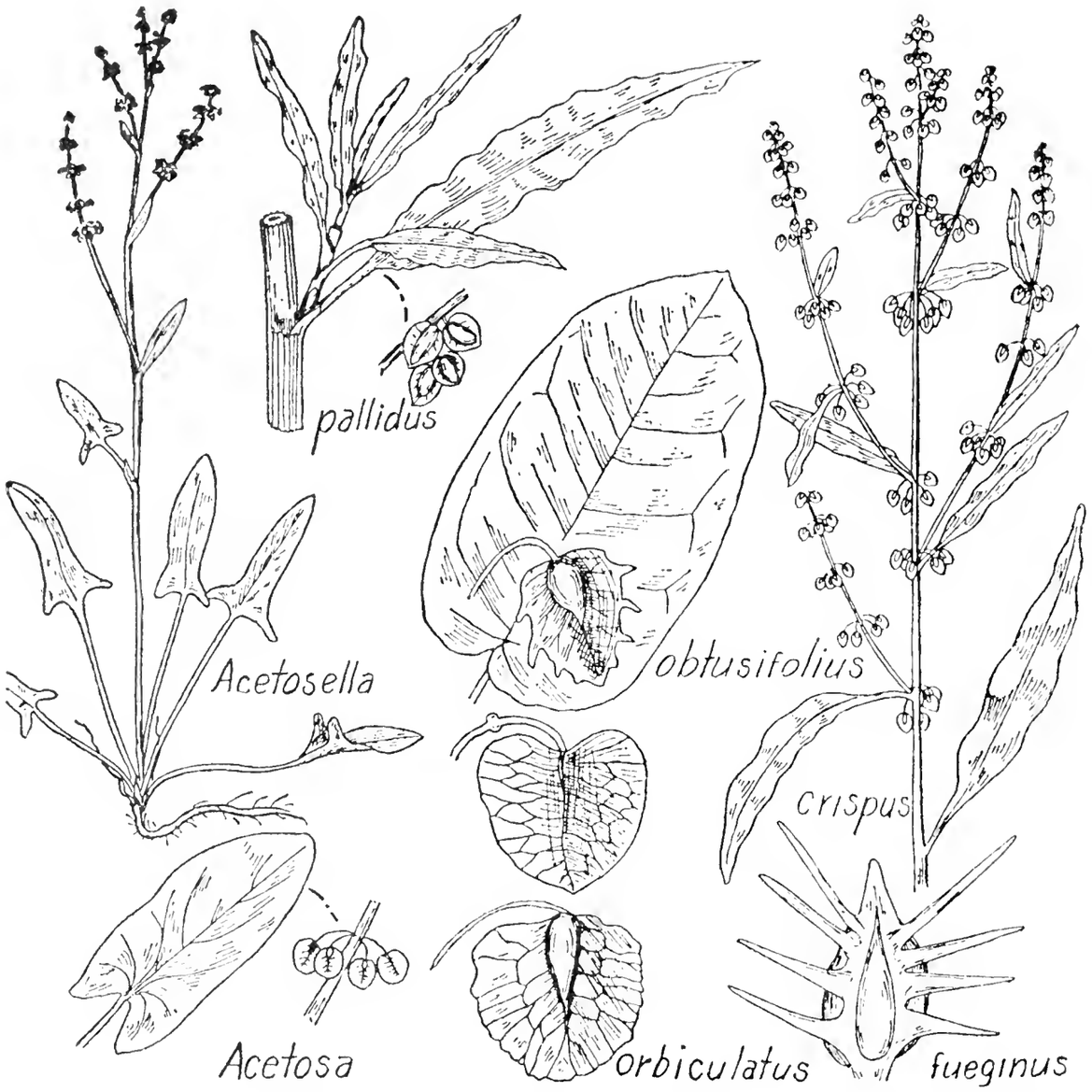


Fig. 65.—**Rumex** spp., habit sketches x $\frac{1}{2}$, large fruits x 3; *R. domesticus* is unlabelled in lower centre.

7. **R. crispus** L. Fig. 65. CURLED DOCK

Common throughout; waste places, cultivated ground, along roadsides and about dwellings. *R. elongatus* Guss. is now considered to be but a variation of this species.

Introduced from Eu.; throughout temperate Amer.

8. **R. obtusifolius** L. Fig. 65, Map 248. BLUNT-LEAVED DOCK

Rather common as a weed; roadsides, fields and waste places. Var. **sylvestris** (Lam.) Koch was reported (Fernald, 1921) from Sandy Cove, Digby Co.; and from Charlottetown, P.E.I.

Introduced from Eu.; Nfld. to B.C. south to Fla.

9. **R. persicarioides** L.

Collected by Fernald; local in Queens Co.: moist cobble-beach near the mouth of Broad R., Central Port Mouton; also found on the sea beach, West Side, Port Herbert. The plant is more slender than the

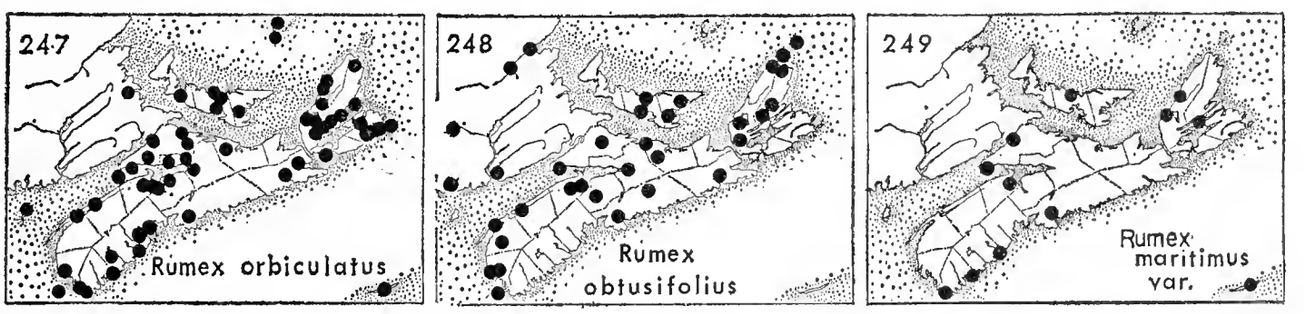
next species and has very undulate leaves.

Sandy beaches and coastal marshes; lower St. Lawrence, P.E.I., Magdalen I., sw. N.S. and ne. Mass.

10. **R. maritimus** L., var. **fueginus** (Phil.) Dusen. Fig. 65, Map 249.

Rare around the coast from Amherst and Advocate in Cumberland Co. to Lockeport in Shelburne Co., West Berlin in Queens Co., and Halifax; abundant on Sable I. on the brackish border of Wallace L., and on fields where seaweed is used as a fertilizer; scattered in western C.B.: West Mabou, Margaree Harbour, and at Iona on the Bras d'Or L.

Anticosti I. along the coast to Long I.; scattered westward to Calif.; S.Amer.



11. **R. Acetosella** L. Fig. 65. SHEEP-SORREL

Very common throughout in fields, roadsides, burnt lands and even in barrens, apparently growing wherever the competition of other plants is reduced or lacking. 2n = 42; other variations may occur as 4 different chromosome-types occur in Europe. See Löve, A., (1943).

Introduced from Eu.; throughout N. Amer.

12. **R. Acetosa** L. Fig. 65. GARDEN-SORREL, SOURDOCK

Thoroughly naturalized and abundant in fields and meadows around Yarmouth, Windsor, Truro and at many other places in the Annapolis Valley and along the South Shore; rarer eastward to C.B. where it has been collected at Ingonish and River Denys. It is a very conspicuous and rapidly spreading weed; flowering in early June.

Introduced from Eurasia; locally abundant in northeastern Amer. and scattered west to B.C. and south to Penn.

3. POLYGONUM L. KNOTWEEDS

Plants with jointed stems with a sheath at each node; flowers small with the calyx 4-6-lobed and with 3-8 stamens; fruit a triangular or lenticular achene. This is a large cosmopolitan genus with several sections. The first 6 species, belonging to the section *Avicularia*, form a difficult group subject to various interpretations. They have the flowers scattered in the axils of the leaves. Section *Persicaria*, species 8-18, has the flowers crowded in terminal racemes. Mature fruits are necessary for

satisfactory identification. (See Löve and Löve, 1956; Mertens and Raven, 1965).

a. Plants not shrubby nor woody at the base; less than 1 m high; leaves rarely cordate.
b. Stems not twining.
c. Stems not armed with prickles; leaves linear to lanceolate in outline.
d. Flowers borne in the axils of the leaves along the stem; plants often prostrate (Fig. 66, a).
e. Plants erect, greenish, with strongly ascending branches, to 1 m high; achenes lanceolate, pale green, 4-6.5 mm long, a large proportion long-exserted.
1. *P. exsertum*
e. Plants low, loosely ascending to prostrate.
f. Achenes smooth or nearly so, shining or lustrous.
g. Calyx divided to the middle or below, the 3 outer sepals usually flat and exposing the inner ones.
h. Sepals rather petaloid, narrowed at the base and exposing the tip of the achene; achene smooth and shining, green to olivaceous, 4-4.7 mm long or occasionally longer; plant usually glaucous. 2. *P. Raii*
h. Sepals not conspicuously petaloid, not narrowed towards the base, often closely appressed to the achene and hiding it, or with the achene slightly exserted; achene 2.75-3.5 mm long, slightly granular under high magnification, olivacous to dark brown, the mature ones rather wide and abruptly tapering to a short beak. 3. *P. Fowleri*
g. Calyx divided only to above the middle, the tips of the outer sepals hooded and hiding the achene, bottle-shaped and constricted just below the apex; plants erect or spreading with elliptical or oval leaves broadly rounded above; achenes olivaceous, finely granular, 3 mm long.
4. *P. achoreum*
f. Achenes dull, with the surface finely pitted or minutely striate.
i. Leaves on the branches smaller than those on the main stems; calyx divided nearly to the base; achenes 2.5-3.5 mm long, with 3 equal concave sides. 5. *P. aviculare*
i. Leaves essentially of equal size on both the branches and the main stems; calyx divided about half way to the base; achenes 1.5-2.75 mm long, with 2 convex and one shorter concave side. 6. *P. arenastrum*
d. Flowers numerous, in terminal or axillary inflorescences.
j. Leaves chiefly basal, oblong-ovate to lanceolate with broadly winged petioles; stem unbranched with a single dense raceme 1-2 cm thick.
7. *P. Bistorta*
j. Leaves scattered on the stem; stem usually branched with several to numerous racemes.
k. Plants perennial, often trailing for a dm or more; spikes 1-3, very dense, 8-14 mm thick.
l. Peduncles hairy, often glandular-tipped; leaves lanceolate, acute to long attenuate, nearly glabrous to scabrous; spikes 3-18 cm long.
m. Leaves harshly scabrous, 1-3 cm wide; petiole 0.5-1 cm long, attached near the top of the sheath; racemes conical, less than 4 cm long. 8. *P. amphibium*
m. Leaves pubescent, 3-6 cm wide; petiole 3-6 cm long, attached near the base of the sheath; racemes cylindrical, 4 cm long or longer.
10. *P. coccineum*
l. Peduncles smooth; leaves floating, elliptic, obtuse or slightly acute, tapering to the base; racemes 1-4 cm long. 9. *P. natans*
k. Plants perennial or annual, usually small and more slender; spikes several to numerous, less than 10 mm thick.

n. Peduncles with glands below the spike or panicle; sheaths not ciliate; stamens 6 (Fig. 67, b).
o. Glands stalked (Fig. 67, e); achenes 2.2-3.5 mm wide.
Leaves copiously stringose-pubescent beneath and often so above; achenes mostly 2.2-2.8 mm wide. 11. *P. pensylvanicum*
Leaves smooth or becoming so; achenes mostly 2.5-3.5 mm wide. *P. pensylvanicum* var. *laevigatum*
o. Glands not stalked, appearing gummy, often nearly absent.
Leaves glabrous or scabrous beneath; peduncles usually smooth or with a few sessile glands; spikes 1-3 cm long, erect; achenes less than 2 mm wide. 12. *P. lapathifolium*
Leaves, at least the lower ones, with woolly hairs beneath; peduncles with sessile glands; racemes 1-3 cm long, erect; achenes more than 2 mm wide. 13. *P. scabrum*
n. Peduncles without glands below the panicle or spike.
p. Sheaths not ciliate, except rarely the uppermost.
Plants erect.
Leaves glabrous or nearly so beneath; plant large, to 1 m high. 12. *P. lapathifolium*
Leaves more or less flocculose-woolly beneath; plant 2-5 dm high. Var. *salicifolium*
Plants prostrate, diffusely branched. Var. *prostratum*.
p. Sheaths ciliate with a row of bristles (except one Sable Is. variety of *P. hydropiperoides*); Fig. 67, c.
q. Sepals not dotted with dark glands.
r. Upper part of the internodes of the stem usually glabrous; spikes erect, 1-4 cm long, the flowers crowded; plants annual, not trailing.
Plants stout; spikes 7-11 mm thick; achenes 2.5-3 mm wide; mature perianth usually reticulated or strongly nerved at the base; common weed; achenes mostly flattened. 15. *P. Persicaria*
Plant slender, much branched; spikes 4-6.5 mm thick; achenes 2 mm wide; perianth smooth or barely nerved; rare; achenes mostly trigonous. 16. *P. puritanorum*
r. Upper part of the internodes more or less stiff-hairy just below the nodes; spikes more or less drooping, 5-7 cm long, the flowers loose or dense; plant long-trailing, perennial.
s. Leaves pubescent on the midrib and margins; sheaths ciliate.
Plant 3-10 dm high; leaves lanceolate, shorter; spikes slender, nearly filiform. 18. *P. hydropiperoides*
Plant 1-1.5 m high; leaves lanceolate-attenuate, 1-2 dm long; spikes dense, 5-10 mm thick, crowded at the tips of the branches. Var. *digitatum*
s. Leaves glabrous and comparatively short; sheaths smooth, without cilia; Sable Is. and Shelburne Co. Var. *psilostachyum*
q. Sepals dotted with dark glands.
t. Achene rough and dull; plant purplish, the internodes 2-4 cm long; leaves thin; ocreolae of the upper flowers usually not ciliate. 14. *P. Hydropiper*
t. Achene smooth and shining; plant with the internodes 3-8 cm long, greenish; spikes stouter and less drooping.

Plant annual, not generally prostrate at the base; stamens 3-8; achenes mostly flat on one side and rounded on the other; racemes much interrupted at the base; flowers greenish. 17. *P. punctatum*

Plant perennial, the lower nodes prostrate and rooting; stamens 8; achenes (mostly) 3-angled; racemes scarcely interrupted; flowers white. Var. *majus*

c. Stems armed with stout recurved prickles.

Leaves sagittate, the basal lobes not flaring outwards; peduncle smooth; achenes triangular (Fig. 66, f). 19. *P. sagittatum*

Leaves hastate, with wide-flaring lobes; peduncles glandular; achenes lenticular (Fig. 66, g). 20. *P. arifolium*

b. Stems slender and usually twining.

u. Calyx not prominently keeled nor winged on the fruits.

v. Seed smooth and shining; sheaths fringed at the nodes with downwardly-pointing hairs (Fig. 67, f). 21. *P. cilinode*

v. Seed dull and minutely striate; sheaths at the nodes not fringed at the base (Fig. 67, d). 22. *P. Convolvulus*

u. Calyx widely winged on the fruit; plant long-trailing; sheaths not fringed at the base; seed smooth and shining. 23. *P. scandens*

a. Plant shrubby and woody at the base, much-branched, 1-2 m high or more; leaves broadly lanceolate to round-cordate; ornamentals or escapes.

w. Leaves roundish to ovate; flowers in loose axillary clusters; calyx enlarged and winged in fruit.

x. Leaves roundish, truncate to slightly wedge-shaped at the base (Fig. 66, e). 24. *P. cuspidatum*

x. Leaves ovate, about twice as long as wide, heart-shaped at the base. 25 *P. sachalinense*

w. Leaves widely lanceolate with two rounded basal lobes; flowers in a dense terminal or sub-terminal inflorescence; calyx about 4 mm long, not enlarged nor winged in fruit. 26. *P. polystachyum*

1. **P. exsertum** Small Fig. 66, a.

This tall, erect, branched plant grows near the edge of the salt marshes and along the coast; common around the head of the Bay of Fundy and on Northumberland Strait; rare elsewhere. This plant with its long exserted achenes is one of our most distinctive species and occasionally may occur in abundance. Löve and Löve (1956) give the chromosome number as 60 and state that hybrids with other species are unknown. Other authors do not separate this plant from a similar species further south and therefore include our plants under *P. ramosissimum* Michx.

Around the coast from the St. Lawrence, N.B. and P.E.I. south to N.J.; prairies and shores in western N.Amer.

2. **P. Raii** Bab. Fig. 66, c. Map 250.

Damp sands and gravels of the coast in Shelburne and Queens Co.; through the Bras d'Or L., and one plant found on St. Paul I.; known

Fig. 66.—**Polygonum:** (a) *P. exsertum*, (b) *P. Fowleri*, (c) *P. Raii*, (d) *P. aviculare*, (e) *P. cuspidatum*, (f) *P. sagittatum*, (g) *P. arifolium*, all x $\frac{1}{2}$.

from one collection from Sable I., possibly from brackish dune hollow; probably along the coast of the Bay of Fundy although collections are inadequate to give its range.

This plant was originally described from Eu. where it has its main area from northern Scandinavia to northern Spain; and there is the tendency for it to be classified as a subspecies of *P. oxyspermum* Mey. & Bunge, a species with longer exserted achenes. This tendency is also noted in N. Amer. and Fernald (1914) described such plants from the beaches of Great Bras d'Or L. at Kidstone I. and from the original station at Grand Narrows as *P. acadiense*. The seeds may be 6-7 mm long and it lacks the glaucous appearance of *P. Raii*. Löve and Löve (1956) state that seeds from the Bras d'Or L. showed 2n = 80.

Northern Nfld. and around the Maritime Provinces to central Me.; possibly introduced.

3. **P. Fowleri** Robins.

Scattered around the coast, at least from the head of the Bay of Fundy to Yarmouth Co. and to and around C.B.; not known from Sable I. (St. John). At times this is a very distinctive plant with elliptical fleshy leaves, bluish-green in color and with a tinge of red to them. Other plants have a more yellowish-green color, with thinner, more veiny leaves which tend to be more acute at the tips. This has been named *P. allocarpum* Blake. Map 251. Fernald (1921) reports this as typical of sand flats and sea beaches from Queens Co. around the coast to the head of the Bay of Fundy. It is difficult to separate these two and recent authors do not recognize this second entity although Löve and Löve (1956) report different chromosome numbers for the two.

Lab. south to Me. on the sea-coast; James Bay; western N. Amer. from Alaska south to Oreg.; eastern Asia.

4. **P. achoreum** Blake.

Annapolis Co.: border of salt marsh, Annapolis Royal. On the saline marshes of the Annapolis R. it is an element in the regular halophytic native flora (Fernald, 1950-b).

Widely ranging westward in N. Amer., native in saline marshes.

5. **P. aviculare** L.

A common weed in disturbed ground, along roadsides and in areas with lack of competition from other weeds, such as exsiccated areas on the dykelands. This vigorous species is found throughout. This is the plant described as *P. heterophyllum* Lindm. and the distinctive feature, best seen in the earlier vigorously growing plants, is the different size of the leaves on the main stem and its branches. $2n=60$. (*P. aviculare* var. *vegetum* Ledeb.).

Widely scattered in N. Amer., probably cosmopolitan.

6. **P. arenastrum** Jord.

The majority of the rather narrow-leaved plants of this section are placed here, so that this makes one of the most common species of the Province. It grows everywhere in waste ground, on the shoulders of roadsides, in barnyards and on coastal beaches. Various varieties have been proposed and species named. Most of our collections have narrowly lanceolate to almost linear leaves, but considerable variation exists even in adjacent plants.

It is possible that our coastal plants may be different from the introduced weedy ones and these have been named *P. buxiforme* Small. These plants have fleshier leaves and the surface of the achenes tend to have shallow depressions rather than longitudinal striations. Löve and Löve (1956) state "it is perhaps most certainly identified by the white-margined sepals which completely include the broad, short, and sublustrous achenes"; they give $2n=20$.

Introduced, perhaps partly native; widespread in N. Amer.

7. **P. Bistorta** L.

Known only from several established clumps in Victoria Park, Truro; and now doubtfully present and probably only a temporary escape from cultivation.

Occasionally adventive from Eu.: N.S. and Mass.

8. **P. amphibium** L. See Stanford (1925) and Fernald (1946) for this and the following two species.

A single introduction is known in N.S.: roadside bank in rubbish, Yarmouth (Stanford, 1925) or, as in Gray's Manual, local about the harbour where it is chiefly or wholly forma **terrestre** (Leers) Blake. Collected by Fernald in 1920.

Local introduction from Eu.

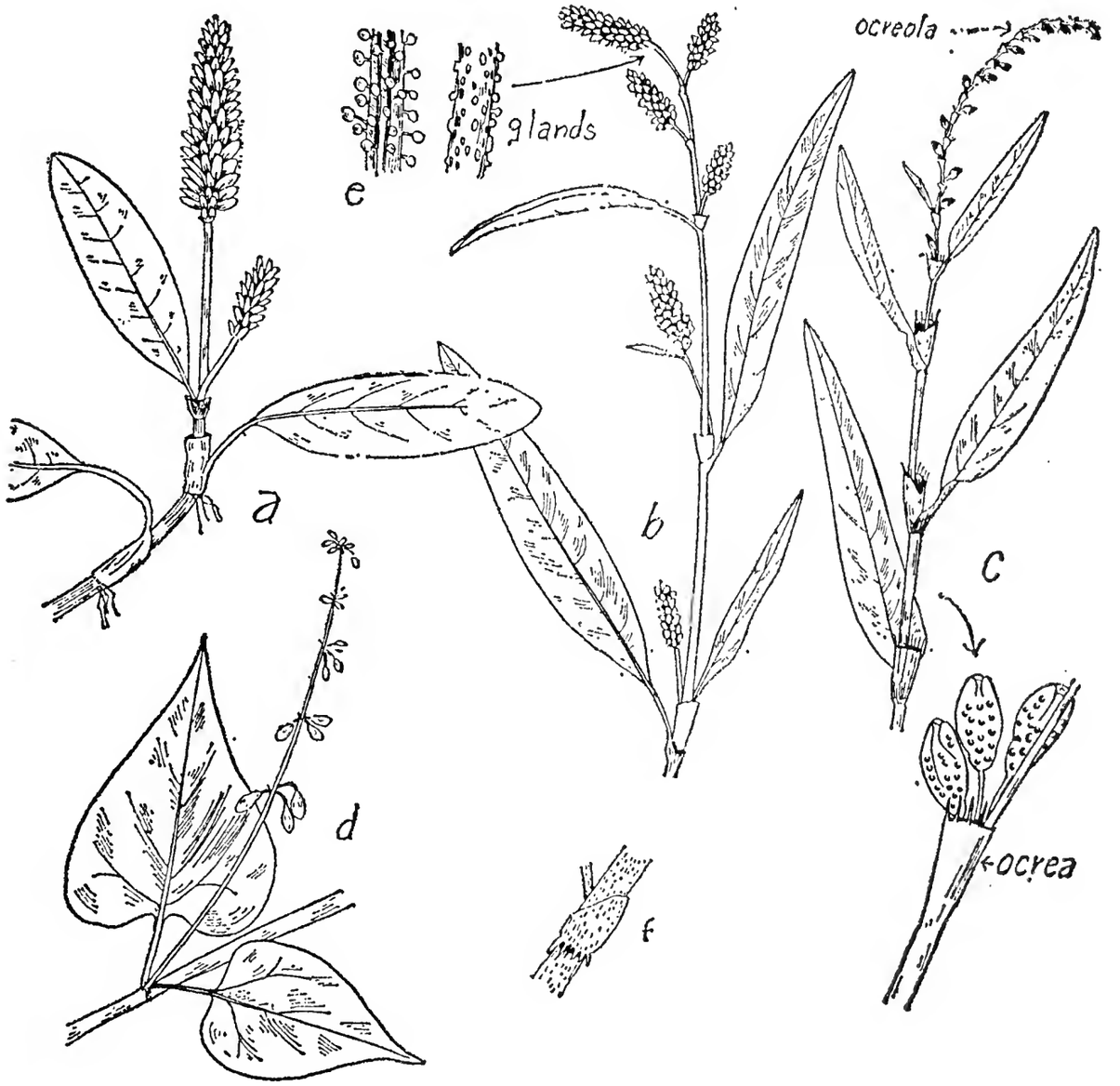


Fig. 67.—**Polygonium**: (a) *P. natans* x $\frac{1}{3}$, (b) *P. scabrum* x $\frac{1}{2}$, (c) *P. Hydropiper* x $\frac{1}{2}$, (d) *P. Convolvulus* x $\frac{1}{2}$, (e) *P. pensylvanicum*, glands of the peduncle much enlarged, (f) *P. cilinode* x 1.

9. **P. natans** Eaton. Fig. 67, a. Map 252. WATER SMARTWEED

The American plants are very similar to the European ones and are often included in *P. amphibium* as var. *stipulaceum* (Coleman) Fern. Our common form is found anchored in shallow water, in marshes, muddy borders of ponds and lakes, slow streams and cat-tail swales: Annapolis and Cumberland Co. to northern C.B.: only to Queens Co. in southwestern N. S. and becoming more common northwards where it often occurs in large pure colonies at the edges of ponds and lakes.

Forma **Hartwrightii** (Gray) Stanford is found wherever the floating form, which is the more common one, grows out on to dry land at the side of a pool or onto a river-bank. These plants show a spreading green border at the top of each leaf-sheath. Occasionally plants growing in swales or meadows do not show the spreading green border and strongly resemble the European plant. They differ, on the average, by having the leaves less harshly pubescent, the leaves lanceolate and more shortly petioled, and the flowering spikes are shorter and stouter. Plants found at the bottom of cat-tail marshes near Pugwash are of this type.

Nfld. to Sask. south to Penn.; B.C. to Calif.

10. **P. coccineum** Muhl. Map 253.

The terrestrial form of this species, forma **terrestre** (Willd.) Stanford, is the only one known in the Province, while the aquatic form is more southern and sterile. Rocky swales, mucky sloughs and wet savannahs; scattered in Yarmouth Co.; Beartrap L. and along the Medway R. system in Queens Co.; LaHave in Lunenburg Co.; and Point Pleasant in Halifax.

P.E.I. and N. S. to Wash. south to Va., Ark, and Calif.

11. **P. pensylvanicum** L. Fig. 67, e.

"Exsiccated clay roadway bordering salt marsh, Annapolis Royal; first record from east of Mass., previous records belong to var. *laevigatum*" (Fernald, 1922). Fla. to Tex. north to Mass. and Ont.; N. S.

Var. **laevigatum** Fern. is found in the Annapolis Valley and in Colchester Co. and undoubtedly elsewhere. This is a beautiful species which often occurs in masses in roadside ditches, on dyked marshes or sometimes in grain fields, as between Greenwich and Port Williams in Kings Co. and below Truro. The color of the glands and the flowers is quite variable. Forma **albineum** Farw. has white flowers instead of pinkish and the glands are yellowish.

N.S. and Que. to Colo. south to N.C.

12. **P. lapathifolium** L.

Scattered on beaches of lakes, along rivers and occasionally in cultivated fields throughout.

Var. **salicifolium** Sibth. is common in damp sands and pond-margins in Yarmouth and Shelburne Co. and scattered elsewhere. These plants

are smaller than those of the typical variety and occasionally the leaves are woolly beneath.

Var. **prostratum** Wimm. is a seaside form, known here only from brackish beaches on Sable I. Local and naturalized from Eu.

All three varieties are widely distributed throughout N.Amer.

13. **P. scabrum** Moench Fig. 67, b.

Damp fields, cultivated land and waste places, often in grain fields, a common weed throughout. (*P. tomentosum* Schrank).

Introduced from Eu.; Nfld. to B.C. south to New Eng. and Mich.

14. **P. Hydropiper** L. Map 254. Fig. 67, c. WATER-PEPPER

Dryish soils and exsiccated ground, often around farm buildings and in waste places; common. The variety *projectum*, with more-exserted flowers, is generally considered now to be undeserving of varietal rank.

Introduced from Eu. and widely distributed.

15. **P. Persicaria** L. LADY'S-THUMB

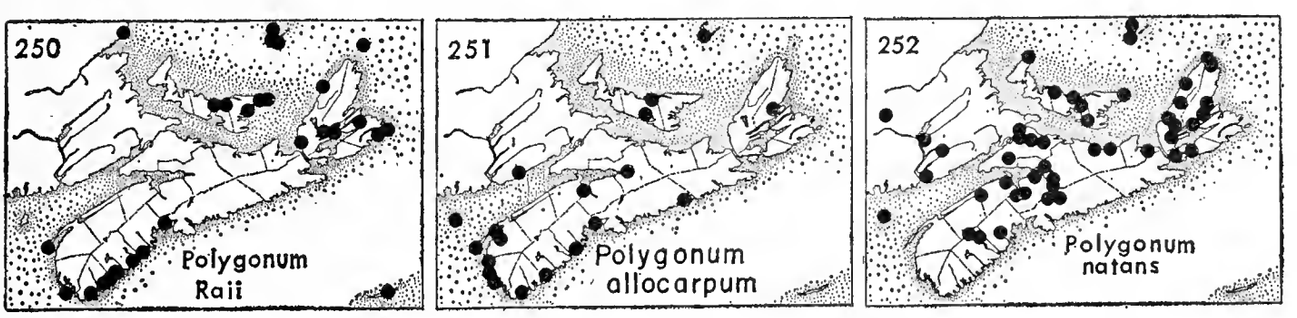
This is a common weed in fields and waste places throughout. A smaller, rather prostrate, freely-forking form with shorter, wider leaves and subglobose spikes up to 1.5 cm long, has also been freely introduced and is known as var. **ruderale** (Salisb.) Meisn.

Introduced from Eu.; throughout N.Amer.

16. **P. puritanorum** Fern.

Annapolis Co.: in sand or gravel among granite boulders, beach of Grand L.; first record outside of southwestern Mass. (Fernald, 1922).; growing in masses at the lower end of the lake.

Local; N.S., s. Me., R.I. and eastern and southern Mass.



17. **P. punctatum** E11. WATER-SMARTWEED

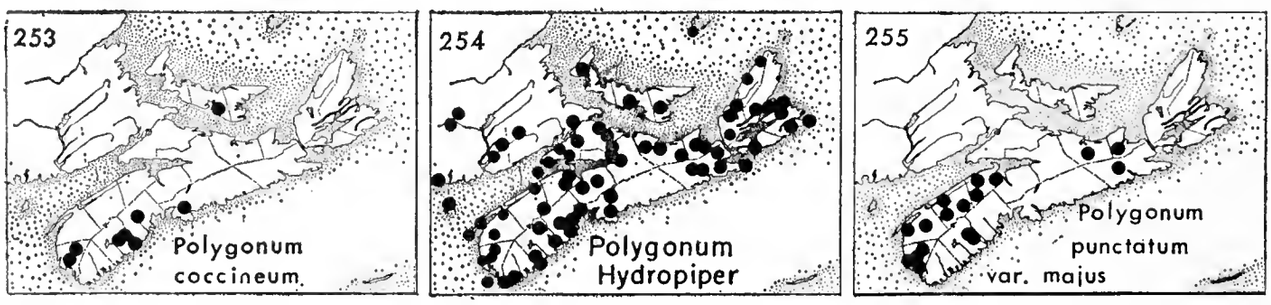
The wide-ranging *P. punctatum* has developed a number of varieties which may seem quite distinct in one part of their range yet intergrade in other areas (Fassett, 1949). Var. **confertiflorum** (Meisn.) Fassett is the northern variety found from N.S. and the Gulf of St. Lawrence to southern B.C., south to Va., Ark. and Oreg. Common throughout N.S.: marshes, edges of lakes, along streams, perennial and rooting from the nodes.

Var. **parvum** Vict. & Rousseau is a post-Pleistocene derivative of the first variety, now persisting only on tidal river-mouths where the water is still fresh. It has 30 or fewer obscure glands on the calyx instead of 50 or more well-developed ones as in var. *confertiflorum;* the achene is nearly always exserted. Tusket Falls, Yarmouth Co.; scattered from the estuary of the St. Lawrence to Me. and Md.

Var. **majus** (Meisn.) Fassett (Map 255) is set off from the first variety by its larger size, white flowers and late flowering, although an occasional intermediate does occur. Scattered in the southwestern counties at the edges of lakes and streams; common in the Annapolis Valley along the rivers; scattered in Antigonish and central Guysborough Co. It is often found growing in large patches with conspicuous white flowers. Fassett considers this as the variety which has migrated up along the Coastal Plain. (*P. robustius* (Small) Fern.).

Fassett also mentions a collection of Macoun's from Louisburg as having the dull achenes of *P. Hydropiper* with the long internodes of *P. punctatum*, presumably representing a hybrid between them.

N.S. to Fla., locally inland to Ind. and Mo.; West Indies to northern S.Amer.



18. **P. hydropiperoides** Michx. Map 256.

Common in the southwestern counties east to Annapolis and Lunenburg Co.: lake margins, beaches, and edges of rivers and streams; rare and scattered north and east to Newville L. and in the water of R. Hebert in Cumberland Co. (Schofield, 1955) and possibly to central Antigonish Co. and near Sherbrooke in Guysborough Co. July-Oct. N.S. to Minn. and Nebr. south to Fla. and Tex.

Var. **digitatum** Fern. (Fernald, 1921) is found on a boggy savannah bordering St. John Lake, Springhaven, Yarmouth Co.; peaty and boggy lake-margins, Yarmouth and Shelburne Co., N.S., beginning to flower nearly a month later than typical *P. hydropiperoides* (Fernald, 1950-b).

Var. **psilostachyum** St. John is known from Sable I. from which it was originally described and mentioned by Fernald from Shelburne Co. *P. hydropiperoides* x *P. robustius* is reported (Fernald, 1922) as occurring in great abundance in peat and granite gravel bordering the outlet of Lamb's L., Annapolis Co.

19. **P. sagittatum** L. Fig. 66, f. Map 257. TEAR-THUMB

Very common throughout, developing late in the season with masses of the rough clinging plants in rich soils or in damp ground and along ditches. July-Oct.

Fla. to Tex. north to Nfld., Que. and Sask.

20. **P. arifolium** L., var. **pubescens** (Keller) Fern. Fig. 66, g.

Scattered to local in rich thickets and marshy borders, usually under alders; Kings, Colchester and in Cumberland Co. from north of Parrsboro to R. Hebert. This plant is very distinctive but it is seldom seen and it seems to grow only in the richest alluvial soil.

N.S. and P.E.I. to Minn. south to N.J., Penn. and Ind.

21. **P. cilinode** Michx. Map 258.

Scattered throughout in clearings or occasionally in thickets, waste ground and low cultivated ground. Forma *erectum* (Peck) Fern. is a dwarf form but it seems to be merely a response to poor growing conditions.

Nfld. to Sask. south to the uplands of N.C., Mich. and Wisc.

22. **P. Convolvulus** L. Fig. 67, d. Map 259. WILD BUCKWHEAT

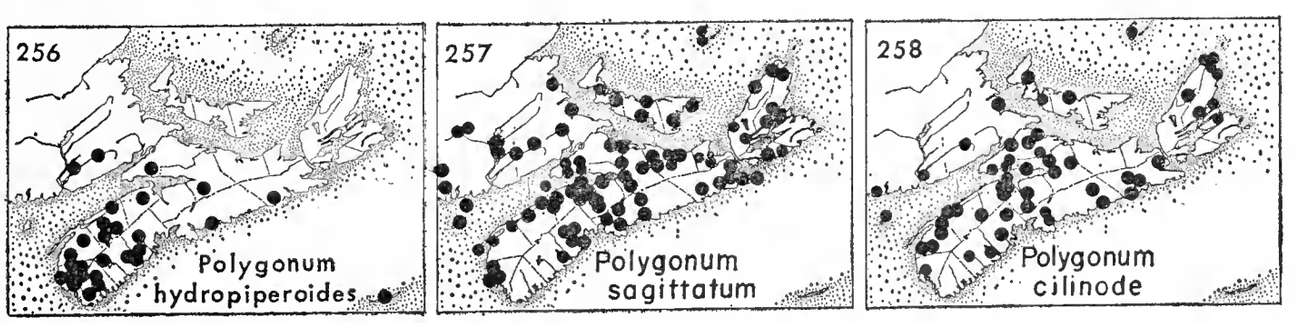
A common weed in fields, clearings and waste places, often a troublesome weed in gardens.

Naturalized from Eu. and widespread.

23. **P. scandens** L.

Local in low thickets along river-intervales, often becoming luxuriant after the woods have been cleared or the ground disturbed. This plant is apparently rare in the north-central part of the Province since it has been collected in only a few places. Late Aug.-Oct.

N.S. to Alta. south to Fla. and Tex.



24. **P. cuspidatum** Sieb. & Zucc. Fig. 66, e. JAPANESE KNOTWEED

Roadsides and waste ground around towns throughout and occasionally found about older houses and along fences. This tall, rapidly-growing plant has apparently been frequently planted in the past. Once established, it is almost impossible to eradicate. It does not seem to be spreading in the open, but frequents mostly waste ground and dumps.

Introduced from Asia; widely planted as an ornamental.

25. **P. sachalinense** F. Schmidt GIANT KNOTWEED

This large plant closely resembles the previous one but the leaves are more ovate and cordate at the base. It has been planted as an ornamental and is spreading or still persists; occasionally seen from Yarmouth to C.B.

Introduced from e. Asia; N.S. to Mass., N.Y. and Md.

26. **P. polystachyum** Wall.

This garden perennial, with its very long caudate-tipped and truncate-based leaves, is beginning to spread to waste lands about Yarmouth (Fernald, 1921). It has not been observed outside of this area.

Introduced as an ornamental from e. Asia: N.S. and New Eng.

4. FAGOPYRUM Mill. BUCKWHEAT

Erect plants with alternate, broadly triangular leaves, and 3-angled achenes much longer than the calyx. These plants are native to central Asia, formerly much grown in cultivation but declining in importance.

a. Flowers crowded in clustered, terminal racemes; perianth divisions 2-3 mm long, whitish, conspicuous; achenes shining and smooth on the angles. 1. *F. esculentum*

a. Flowers in scattered, elongated, loose racemes; perianth divisions 1-2 mm long, greenish; achenes dull and roughish or with protuberances on the angles. 2. *F. tataricum*

1. **F. esculentum** Moench BUCKWHEAT

Occasionally planted in the Annapolis Valley and elsewhere, often as a cover crop; persisting for a short time or found as an escape about farm-yards, railroad stations and in waste ground (*F. sagittatum* Gilib.).

Introduced from Asia; widespread.

2. **F. tataricum** (L.) Gaertn.

Scattered and probably introduced along with seed and in grain as with the preceding species; formerly common but now much rarer as most of the varieties grown are *F. esculentum;* not persisting nor becoming really weedy.

Introduced from Eurasia; becoming more rarely adventive.

40. CHENOPODIACEAE GOOSEFOOT FAMILY

Mostly annual weedy plants with insignificant flowers; corolla absent, the calyx usually 5-parted and with 1-5 stamens opposite the calyx lobes; fruit a small, often shiny achene. The beet, swiss chard and spinach are cultivated members of this family.

a. Plants with wide greenish leaves.
 b. Leaves thickish, fleshy; calyx or fruiting bracts not villous or pilose; common.
  c. Calyx 3-5 parted; leaves not often hastate (Fig. 68, a); common weeds. 1. *Chenopodium*
  c. Calyx of pistillate flowers absent, the fruit enclosed by two large bracts; leaves often hastate (Fig. 68, b); plants mainly of sea-shores. 2. *Atriplex*
 b. Leaves thin, green, not toothed; inflorescence much branched; calyx segments villous; rare. 3. *Axyris*
a. Plants with the leaves extremely fleshy, bract-like or absent.
  d. Flowers sunken in the fleshy, watery stem; leaves absent; branches opposite; salt marshes (Fig. 69, a). 4. *Salicornia*
  d. Flowers placed in the axils of the leaves.
   e. Leaves, stem and calyx-lobes very fleshy (Fig. 69, b). 5. *Suaeda*
   e. Leaves bract-like or linear, much reduced; stem and calyx-lobes not fleshy.
    f. Calyx-lobes appendaged by broad membranous horizontal wings; plants coarse, stiff, much branched (Fig. 69, c) 6. *Salsola*
    f. Calyx-lobes not appendaged; plants branched only at the base, low, the stems slender and angled. 7. *Polycnemon*

1. CHENOPODIUM L. PIGWEEDS

About 100 species, many of which are cosmopolitan weeds. Mature fruit is necessary for adequate identification. (See Aellen and Just, 1943; Wahl, 1952).

a. Seeds all horizontal in the calyx; plants annual.
 b. Plants not glandular; flowers not pubescent.
  c. Leaves wide and green on both sides, the upper surface lustrous, with long irregular teeth; sepals not ridged on the back; style-branches short. 1. *C. urbicum*
  c. Leaves often mealy beneath, the upper surface dull; sepals strongly ridged or thickened on the back along the midrib so that the calyx is almost pentagonal in outline.
   d. Leaves lanceolate to broadly ovate or rhombic, with some secondary veins developed, green to lightly mealy beneath.
    e. Seeds 1-1.5 mm in diameter, smooth and shining with only minute striations. 2. *C. album*
    e. Seeds 2-2.5 mm in diameter, deeply pitted, dull. 3. *C. macrocalycium*
   d. Leaves narrowly lanceolate to linear, without teeth and with no secondary veins, densely and heavily white-mealy beneath; seeds about 1 mm wide. 4. *C. leptophyllum*
 b. Plants, including the calyx, pubescent with short glandular hairs, more or less aromatic; seeds 0.6-0.8 mm wide; leaves sinuate to deeply pinnate. 5. *C. Botrys*
a. Seeds vertical in the calyx, or the terminal ones occasionally horizontal.
  f. Flowers at maturity not fleshy or confluent.
   g. Leaves densely white-mealy beneath, green above, their margins deeply undulate; seeds in small clusters, many prominently in a vertical position. 6. *C. glaucum*
   g. Leaves bright green, glabrous on both sides, from rhombic to deltoid-hastate in outline; glomerules of flowers almost without bracts; seeds smooth.
    h. Style not evident in fruit; leaves wide with a few coarse teeth; seeds 0.8-1 mm wide, shiny; plant annual. 7. *C. rubrum*

h. Style enlarged, long and slender in fruit; leaves widely triangular-hastate, without teeth; seeds almost spherical, about 1.5 mm wide; plant perennial. 8. *C. Bonus-Henricus*

f. Flowers at maturity in red fleshy clusters and becoming berry-like; leaves wide and triangular to triangular-hastate, entire to coarsely toothed. 9. *C. capitatum*

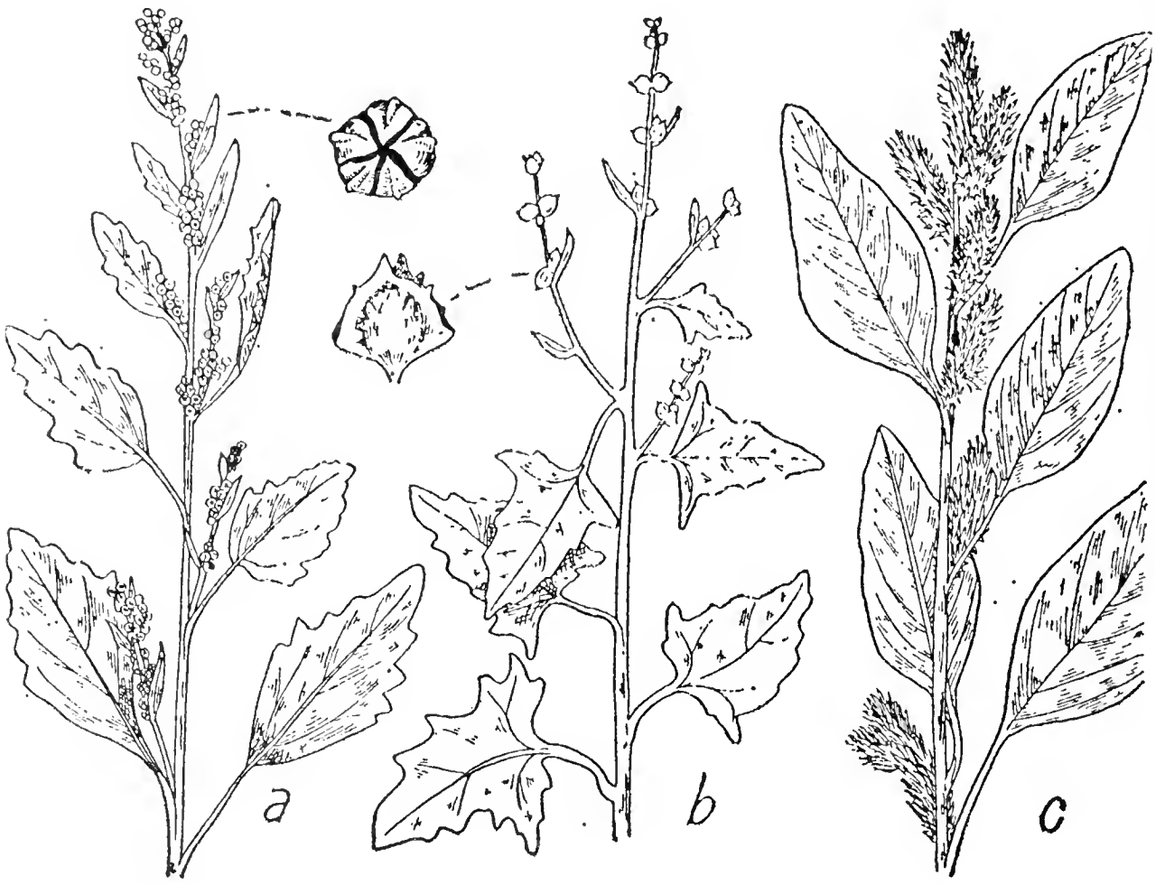


Fig. 68.—**Chenopodium**: (a) *C. album* x $\frac{1}{2}$. — **Atriplex**: (b) *A. patula* x $\frac{1}{2}$. — **Amaranthus**: (c) *A. retroflexus* x $\frac{1}{2}$.

1. **C. urbicum** L.

Rare; collected by Burgess on ballast heaps at Pictou in 1883. This and other Chenopodia are often casual adventives and may be introduced around railroad-yards and ports. Very few have been noticed here as yet although adequate collections have not been made.

Adventive from Eu.; N.S. to Ont. south to Md. and Ill.; B.C.

2. **C. album** L. Fig. 68, a. LAMB'S-QUARTERS, PIGWEED

Very common throughout and quite variable; waste places, gardens, cultivated fields and roadsides, one of our most common weeds. Our species is probably both native and introduced. Numerous species and varieties have been named, based on the shape of the leaves, size of keels of the calyx and the size and surface of the seed. Plants with narrow leaves which are nearly glabrous on both sides have been named *C. lanceolatum* Muhl. This type is common. Plants with large, deeply pitted seeds have been separated as the next species.

Naturalized from Eu.; throughout N. and S. Amer.

3. **C. macrocalycium** Aellen

Reported by Aellen and Just (1943) from Sable I. where it is a weed at the Main Station; one of the forms of *C. album* mentioned by St. John. Collections from Pembroke Shore, Yarmouth Co., and from various beaches along Lunenburg Co. to Halifax are placed here. The plants are rather densely branched with rather thin, green leaves. Similar to or closely related to *C. Bushianum* Aellen.

N.S. and Que. to N.D. south to N.C. and Ark.

4. **C. leptophyllum** Nutt.

The only collection seen of this tall, narrow-leaved species is from around Steele's Pond, Point Pleasant Park in Halifax, where it was collected by J. S. Erskine. This species is known only from N.S. in the Maritime Provinces.

Sea-beaches, Mass. to N.J.; Que. to B.C. southward.

5. **C. Botrys** L. JERUSALEM-OAK

A collection, made at Pictou by J. Macoun, July 25, 1883 was misidentified. As with the first species, this may be a casual adventive at any time but, as it is distinctive and seldom seen, it must be rare. In 1967 plants were sent to the Agricultural College which were grown from seed bought for those of water-cress. Railroad weed near Fancy L. in Lunenburg Co., in flower Aug. 22, 1954.

Widely introduced from Eurasia.

6. **C. glaucum** L. OAK-LEAVED GOOSEFOOT

Occasionally introduced; in one garden near Mira, C.B., it was an aggressive and troublesome weed; found also at Shearwater in Halifax Co. The clusters of erect achenes are very conspicuous as is also the undulate outline of the leaves.

Introduced from Eu.; N.S. to Ont. south to Va.

7. **C. rubrum** L. COAST-BLITE

Common on the brackish beach of Wallace Lake, Sable Island; presumably scattered around the mainland, often luxuriant on newly-reclaimed dykelands. Very few collections are made of these sea-shore Chenopodia, possibly since they mature and seed so late in the season.

Salt marshes and saline soils, Nfld. to B.C. south to N.J. and N.Mex.

8. **C. Bonus-Henricus** L. GOOD KING HENRY

Occasional about towns; locally abundant at Annapolis and Sydney.

Introduced from Eu.; local from N.S. to Ont. and Iowa south to Penn.

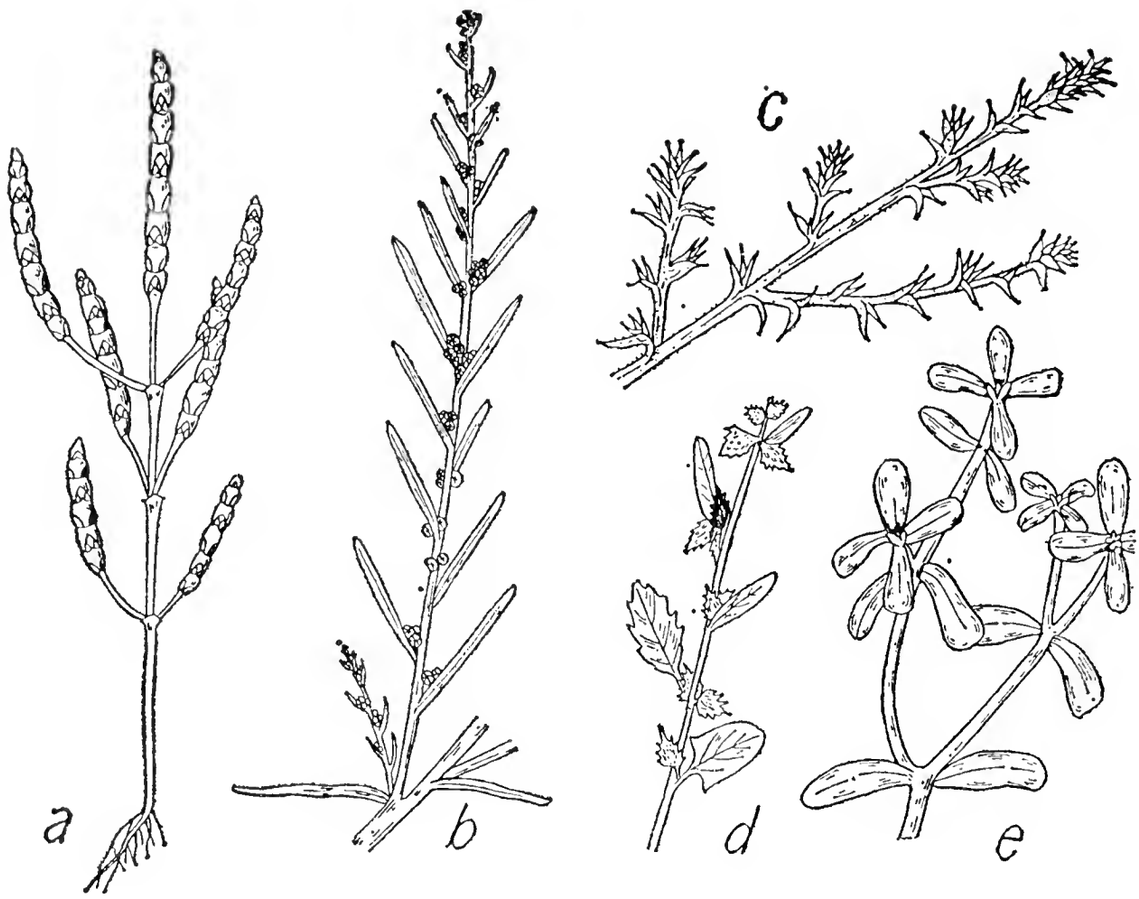


Fig. 69.—**Salicornia**: (a) *S. europaea* x $\frac{1}{2}$. — **Suaeda**: (b) *S. maritima* x $\frac{1}{2}$. — **Salsola**: (c) *S. Kali* x $\frac{1}{2}$. — **Atriplex**: (d) *A. glabriuscula*, tip of branch x $\frac{1}{2}$. — **Portulaca**: (e) *P. oleracea* x $\frac{1}{2}$.

9. **C. capitatum** (L.) Aschers. STRAWBERRY-BLITE

The seeds of this plant must occasionally be introduced in gardens since the plants are occasionally sent in to the Agricultural College for identification; garden at Yarmouth (Smith and Erskine, 1954).

Woodland clearings and waste places, Que. to Alaska south to Penn.; widely distributed westward; Eurasia.

2. ATRIPLEX L. ORACH

Common seashore plants rather similar to *Chenopodium* in habit and appearance but with separate staminate and pistillate flowers, the pistillate ones without a calyx and enclosed within two broad bracteoles.

a. Foliage green or greenish on both sides, sparsely mealy, sometimes grayish when young, the lower leaves sub-opposite; bracteoles herbaceous to succulent. 1. *A. patula*

b. Inflorescence without leafy bracts except at the base; seeds 1-2 mm wide.

c. Leaves lanceolate or oblong to linear, not hastate; bracts mostly narrowly rounded or broadly cuneate at the base.

d. Bracteoles surrounding the flower 1-6 mm long.

e. Blades of the leaves lanceolate to oblong; bracteoles usually smooth on the inner face. Var. *patula*

e. Blades of the leaves lanceolate to linear; bracteoles tubercled on the inner face. Var. *littoralis*

d. Bracteoles surrounding the flowers up to 10-15 mm long. Var. *bracteata*
c. Leaves in part triangular-hastate or squarish, with basal angles or lobes; bracteoles truncate or broadly rounded at the base. Var. *hastata*
b. Inflorescence leafy, each glomerule in the axil of a well-developed leaf; leaves small, usually oblanceolate and without teeth; seeds 2-4 mm wide; fruiting bracteoles 5-12 mm long. Var. *oblanceolata*
a. Foliage very gray or whitish, with a fine scurf on at least the lower surfaces; plants depressed or prostrate; fruiting bracteoles 6-9 mm long, the central part over the seed hard and bony; seeds large, 3-4 mm wide. 2. *A. sabulosa*

1. **A. patula** L. Fig. 68, b. Map 260. ORACH

This variable and poorly-understood species is common around the coast, with the different varieties tending to intergrade in appearance. The typical variety **patula** is more common westward but is reported from our area. 2n = 36.

Var. **hastata** (L.) Gray is common around the whole coast and on Sable I., on the shoreward reaches of salt marshes, headlands beyond the reach of the waves, flooded areas on the dykelands and on the upper edges of sea-beaches, occasionally in gardens and waste places near the coast. 2n = 18. Var. **littoralis** (L.) Gray is more confined to the beaches and is tall and erect, with ascending branches and nearly linear leaves. Var. **bracteata** Westlund is an extreme variation described from northern Europe; collected by Fernald (1921), a single specimen in brackish or saline marsh near the mouth of the George R., C.B. Co. Plants from Margaree Harbour show the long herbaceous bracts and this tendency will probably show up in many C.B. collections.

Var. **oblanceolata** (Vict. & Rousseau) Boivin is scattered around the coast, at least from Digby Co. around Yarmouth to Guysborough; in the Bras d'Or L.; on sandy or gravelly sea-shores and on sand or barrier beaches. This plant has been associated with *A. glabriuscula* Edmonston of northern Eu. but in many cases it is difficult to separate from *A. patula* and is apparently a variety of it.

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

2. **A. sabulosa** Rouy

This European plant is found along Northumberland Strait, at Wood I. in P.E.I. and very locally on the N.S. side of the Strait on gravelly or sandy sea-shores. Its full distribution is not yet known. (*A. laciniata* L. possibly).

Gulf of St. Lawrence from N.S. to northern N.B. and eastern Que.

3. AXYRIS L.

1. **A. amaranthoides** L. UPRIGHT AXYRIS

A single plant, roadside at Windsor, July 21, 1921, collected by Fernald, Bartram and Long.

Man. to N.D. and Mo.; introduced and rapidly spreading eastward.

4. SALICORNIA L.

1. **S. europaea** L. Fig. 69, a. GLASSWORT, SAMPHIRE

Common around the coast on salt marshes and tidal flats, usually occupying ground bare of other vegetation. It is one of the first pioneers on mud flats and inundated dykelands, on salt areas and about salt springs. Var. **prostrata** (Pall.) Fern. is a decumbent, spreading or matted form with numerous branches and rather short flowering spikes up to 3 cm long. This is likewise widely distributed and often conspicuous when growing with the typical upright form, although numerous transitional plants can often be found. Var. **simplex** (Pursh) Fern. is an intermediate form with the weak or decumbent habit but with the spikes long and tapering, up to 10 cm long and 5 mm thick.

Nfld. and the lower St. Lawrence R. south to Ga.; Pacific Coast and saline soils inland; Eu. and Africa.

5. SUAEDA Forsk. SEA-BLITE

Common, fleshy halophytic plants with nearly terete leaves and groups of 1-3 fleshy flowers in the axils of the reduced upper leaves.

a. Plants usually erect, sometimes decumbent, green and more or less glaucous; sepal-lobes rounded or obscurely keeled on the back; seed 2 mm wide. 1. *S. maritima*

a. Plant prostrate to procumbent; seeds 1-1.5 mm wide.
  b. Lower leaves 1.5 cm or less in length, dark green, not glaucous; sepals all rounded on the back. 2. *S. Richii*
  b. Lower leaves 2 cm long, becoming a rich purplish-red in color; sepals very irregular, one or two of them more or less keeled on the back. 3. *S. americana*

1. **S. maritima** (L.) Dumort. Fig. 69, b. SEA-BLITE

Common near the coast on salt marshes, muddy saline shores, and around salt ponds or springs, usually associated with *Salicornia.* These two plants are the characteristic ones on saline soils wherever competition is reduced. *S. Fernaldii* Stanley, described from near Truro, is considered to be merely a variation.

Anticosti to Conn. and locally to Va.; Eurasia.

2. **S. Richii** Fern.

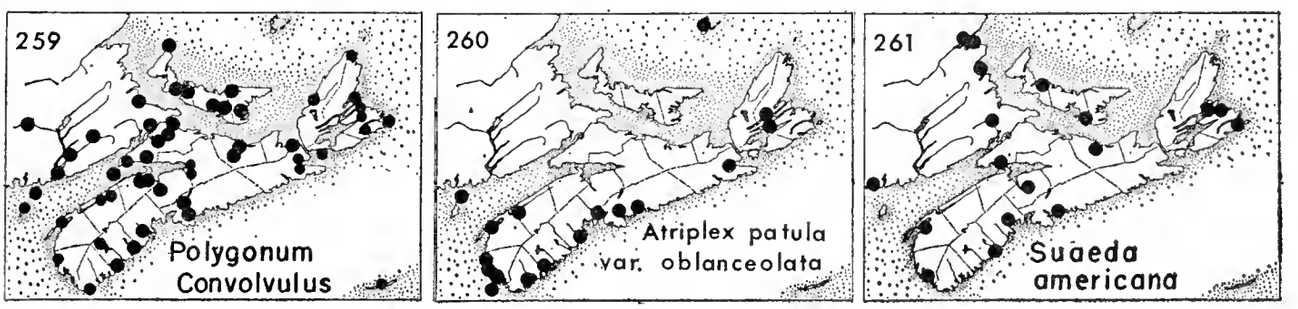
This small, dark species of *Suaeda* is rare and, as far as is known, is confined to the Atlantic Coast. Plants from Bridgewater and other scattered places along the Atlantic shore are placed here.

Scattered from se. Nfld. along the Atlantic Coast of N.S. to s. Me. and Mass.

3. **S. americana** (Pers.) Fern. Map 261.

This species is the most common one on the eastern coast of N.B.; rare on P.E.I.; sometimes luxuriant along the Northumberland Strait of N.S., as near Pictou; elsewhere scattered except on the Fundy coast where it is rare or absent.

Salt marshes and sandy beaches from the lower St. Lawrence to southern Me.



6. SALSOLA L.

Rather woody annuals with reduced leaves and small axillary flowers.

a. Plants stout and woody, nearly prostrate; leaves awl-shaped, stiff and prickly, those of the inflorescence much reduced; sea-shores. 1. *S. Kali*

a. Plants slender, much branched and erect or ascending; leaves linear, 3-7 cm long, those of the inflorescence similar; waste places. *S. Kali* var. *tenuifolia*

1. **S. Kali** L. Fig. 69, c. Map 262. COMMON SALTWORT

Scattered on the west and south coasts and on sandy and gravelly seashores along the Northumberland Strait to C.B., Nfld. to Ga. and saline places inland; Eurasia.

Var. **tenuifolia** Tausch Map 263. RUSSIAN THISTLE

This inland form of the plant is occasionally found in towns, waste places and along railroads; found at Kentville and Port William by H. Groh, 1926 and 1930; Halifax; usually on light soils.

Naturalized from Eu. and introduced from western Canada.

7. POLYCNEMON L.

1. **P. verrucosum** Lang

Collected by A. H. McKay near Halifax and sent to J. Macoun for identification. This specimen is in the National Herbarium at Ottawa and is dated Oct., 1896. Introduced from Eu.; no other record for N. Amer.

41. AMARANTHACEAE AMARANTH FAMILY

Weedy plants with inconspicuous greenish flowers surrounded by green or scarious bracts; flowers in a brushlike terminal inflorescence or in clusters in the leaf-axils. Each flowers produces one shiny lenticular achene.

1. AMARANTHUS L.

a. Plants large, erect, 4-10 dm high; flowers in large terminal inflorescences; seeds 1 mm or more wide.
  b. Leaves green beneath; inflorescence with few lobes, the terminal long and cylindrical; flowers with long aristate bracts, the sepals acute. 1. *A. hybridus*
  b. Leaves whitish beneath; inflorescence crowded and much lobed; flowers with bracts up to twice the length of the flowers, with sepals truncate at the apex. 2. *A. retroflexus*
a. Plants slender and diffusely branched; flowers chiefly in small clusters in the axils of the leaves; seeds small, about 0.8 mm wide. 3. *A. albus*

1. **A. hybridus** L. GREEN AMARANTH

This weedy plant has been found at only a few locations: abundant and well established in a garden at Morristown. Here the plant has much the aspect of the next species and seems to be equally well adapted to its habitat. Several other locations are known in Kings Co. and this plant seems destined to be a common weed.

Native of tropical Amer., now widely spread in N.Amer. and elsewhere; rare in eastern Canada.

2. **A. retroflexus** L. Fig. 68, c. RED-ROOT PIGWEED

Recently introduced and still rapidly spreading in gardens, waste ground and cultivated fields. This coarse weed is troublesome when once established. The red tap root is an identifying characteristic.

Introduced from tropical Amer.; becoming widespread.

3. **A. albus** L. TUMBLEWEED

Rare, appearing only as a garden or railroad weed: Kentville, Windsor, Truro and Wentworth (*A. graecizans* of earlier reports).

Western Canada to Mex.; now throughout much of N.Amer. and semi-cosmopolitan.

42. AIZOACEAE CARPET-WEED FAMILY

1. MOLLUGO L. CARPET-WEED

Our single representative is a chickweed-like plant, but with the leaves in whorls, no petals, and 3-4 stamens; often prostrate and much branched.

1. **M. verticillata** L.

Collected in a sandy orchard at Waterville, Kings Co. by C. E. Atwood in 1929; occasional and sometimes abundant about the railroad yards in Kings Co.; also at Mount Uniacke and Truro.

Fla. to Tex. and Mex.; migrating northward to N.S., N.B. to Ont.; B.C.

43. PORTULACACEAE PURSLANE FAMILY

Small herbaceous plants with succulent leaves and flowers with but two sepals; flowers perfect with 3-11 stamens; capsule circumscissile. This small family of about 500 species is best developed in western N. Amer.

a. Introduced garden weed; leaves wedge-shaped; flowers yellow with 7-11 stamens; seeds small and numerous (Fig. 69, e). 1. *Portulaca*
a. Native plants of undisturbed habitats; leaves not wedge-shaped; flowers whitish, with 3-5 stamens; seeds 2-6. 2. *Claytonia*

1. PORTULACA L. PURSLANE

1. **P. oleracea** L. Fig. 69, e. COMMON PURSLANE

Becoming common in gardens in towns; widespread weed on the lighter soils in the Annapolis Valley, rapidly spreading to other fields and parts of the Province; very difficult to eradicate. The flowers are insignificant and seeds often mature after plants are pulled from the ground.

Introduced from Eu.; widespread in N.Amer.

2. CLAYTONIA L.

Recent studies have indicated that part of the genus *Montia* should also be included in this genus.

a. Flowers minute and white; seeds 2-3; plants chickweed-like, with numerous opposite leaves, from fibrous roots. 1. *C. fontana*
a. Flowers 1-2 cm wide, pink-veined; seeds 3-6; plants with 2 opposite stem-leaves only, from a small deep tuber; spring-flowering woodland plant. 2. *C. caroliniana*

1. **C. fontana** (L.) R. J. Davis Map 274. (See Walters, 1953)

Collected on a grassy bank above the sea, Northwest Arm, Halifax, 1883, by Macoun and Burgess; Digby Co.: rather rare, in wet crevices of sea-cliff between North Point and Seal Cove, Brier I.; one plant floating in a hillside trickle, Port Hawkesbury, Inverness Co. (Smith and Erskine, 1954); abundant on cold trickle margin, upper salt marsh, east side of Burke Brook, Advocate, Cumberland Co. (Schofield, 1955). (*Montia*

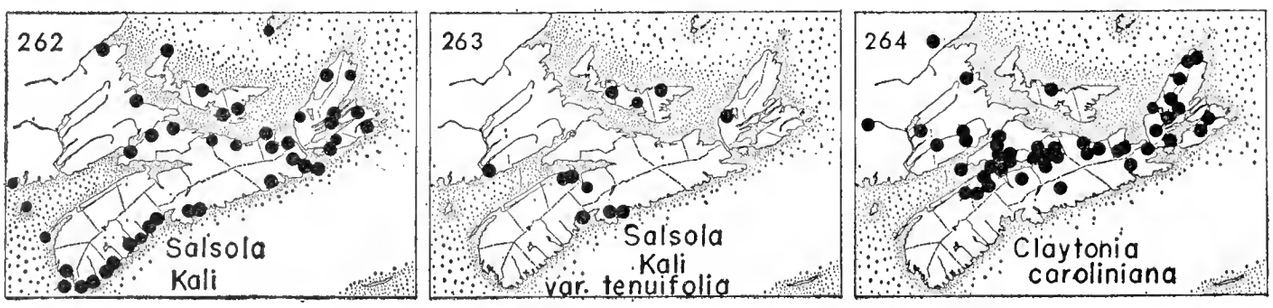
lamprosperma Cham.). Our plants are considered to belong to one of the four subspecies of the European and North American *C. fontana*.

Arctic regions south to Que. and along the coast to Me.; Ont.; B.C.; Eu.

2. **C. caroliniana** Michx. Fix. 73, a. Map 264. SPRING-BEAUTY

Rich woods from Annapolis and Cumberland Co. east to northern C.B.; local in the western part of its range in the richest hardwoods, general in the Cobequids and on the hardwood hills in central and eastern N.S. May 20-June 15.

Nfld. to Ont. south to the mts. of Tenn. and N.C.



44. CARYOPHYLLACEAE CHICKWEED OR PINK FAMILY

Small annual to perennial herbs with opposite or whorled leaves; flowers variable, but usually with 5 petals which are often 2-lobed, 10 stamens, and fruit a dehiscent capsule. One main subfamily includes the chickweeds; and the other, the pinks and their relatives. About 2000 species are known around the world.

a. Fruit one-seeded, indehiscent; petals none; low spreading, much-branched tufted annual. 1. *Scleranthus*

a. Fruit few- to many-seeded capsules; petals usually present.

b. Sepals separate, more or less spreading; plants small, often prostrate; flowers less than 1 cm wide; chickweed subfamily.

c. Stipules present; petals not lobed.

d. Leaves opposite; styles 3 (Fig. 70, a). 2. *Spergularia*

d. Leaves whorled, filiform; styles 5 (Fig. 70, b). 3. *Spergula*

c. Stipules lacking.

e. Capsule splitting into valves; plant nearly smooth or with a line of hairs present on the stem.

f. Leaves linear-filiform; plants low and tufted; petals entire; styles 4 or 5 Fig. 70, e, f). 4. *Sagina*

f. Leaves linear or broader; plants larger, styles mostly 3.

g. Petals not divided; stems wiry, round, usually erect (Fig. 70, c). 5. *Arenaria*

g. Petals 2-lobed or absent; stems softer, sometimes 4-angled, diffusely spreading (Fig. 71, a, b). 6. *Stellaria*

e. Capsule cylindrical and slightly curved, opening by a row of small teeth at the summit; petals deeply 2-lobed; plants hairy (Fig. 70, d). 7. *Cerastium*

b. Sepals united and the calyx tubular; plants large and erect with flowers mostly over 1 cm wide; pink subfamily.

h. Calyx without an involucre of bracts at the base.

i. Styles 3 or 5; calyx 10-nerved; flowers 2 cm wide or less.

j. Flowers solitary, rose-purple; sepals with long herbaceous tips; styles 5, opposite the petals. 8. *Agrostemma*

j. Flowers in a branching cluster; sepals with tips short, less than 2 cm long; styles alternate with the petals.

k. Styles 5; capsule with 5 two-lobed teeth; staminate and pistillate flowers present in *L. alba* (Fig. 71, c, d). 9. *Lychnis*

k. Styles 3; capsule 6-toothed; flowers all perfect (Fig. 71, e). 10. *Silene*

i. Styles 2; calyx obscurely nerved; flowers showy, 3 cm wide, usually double, growing singly or in dense heads; capsule 4-toothed (Fig. 71 f). 11. *Saponaria*

h. Calyx with an involucre of bracts surrounding the base; styles 2; pinks. 12. *Dianthus*

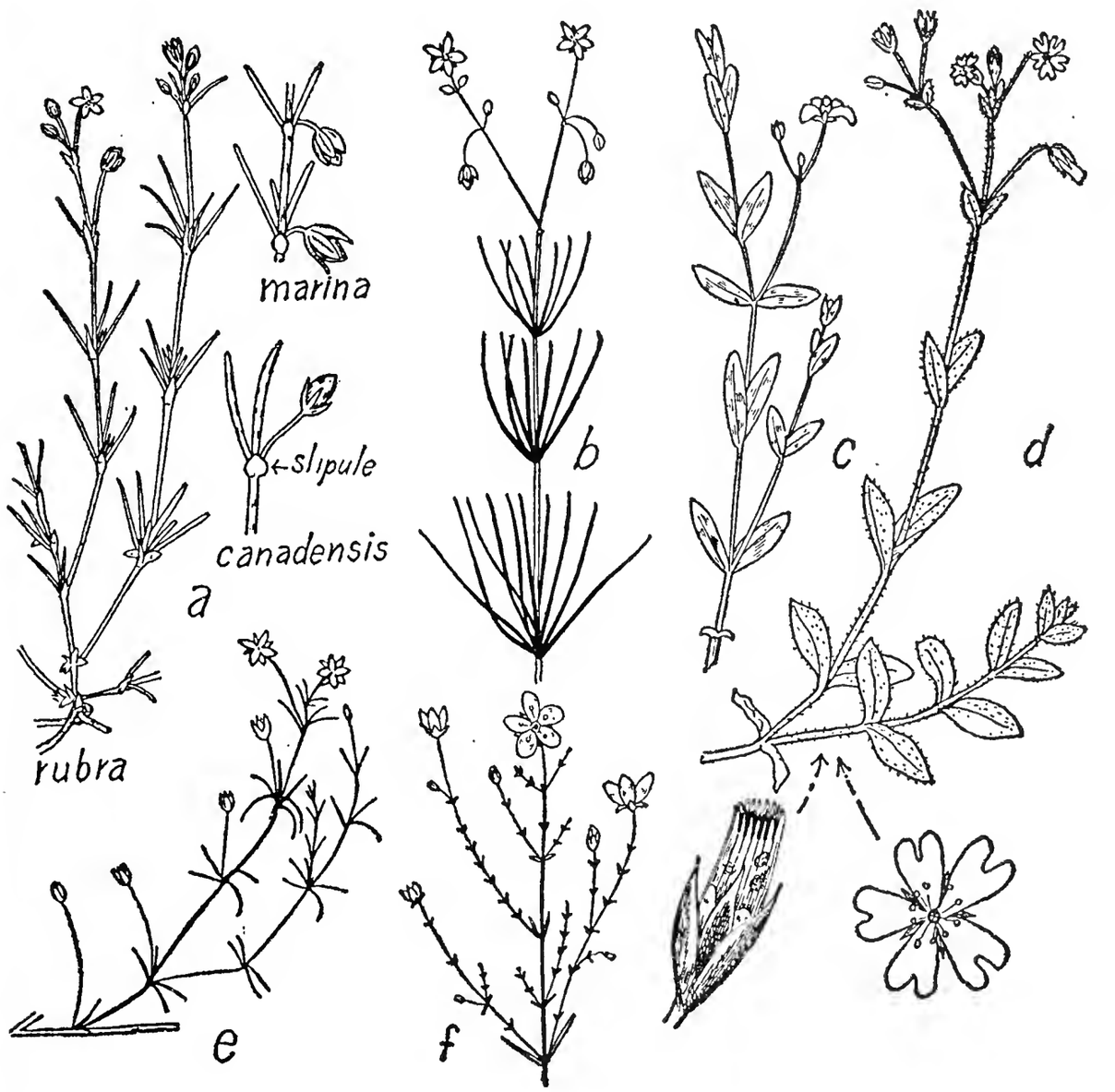


Fig. 70.—**Spergularia:** (a) *S. rubra* x ½, *S. marina* and *S. canadensis* x 1. — **Spergula:** (b) *S. arvensis* x ½. — **Arenaria:** (c) *A. laterifolia* x ½. — **Cerastium:** (d) *C. vulgatum* x ½, flower and capsule x 2. — **Sagina:** (e) *S. procumbens* x 1, (f) *S. nodosa*, part of plant x ½.

1. SCLERANTHUS L. KNAWEL

1. **S. annuus** L.

Waste places and along railroads in Canada, gradually spreading eastwards; reported by H. Groh in 1945 from Waterville, Kings Co.; collected along the railroad at Windsor, Hants Co. (Erskine, D. S. 1951); Berwick; Grand Etang, Inverness Co.; scattered in P.E.I.

Naturalized from Eu.; N.S. to Minn. south to Fla.

2. SPERGULARIA J. & C. Presl

See Rossbach, R. P., *Spergularia* in North and South America (1940).

a. Stamens 6-10, usually 10; leaves scarcely fleshy, with long mucronate tips; stipules membranous and conspicuous. 3.5-5 mm long. 1. *S. rubra*

a. Stamens 2-5; leaves fleshy, blunt, or with a short tip; stipules 1-3.5 mm long; plants restricted to near the coast.

b. Capsule equaling or a little exceeding the calyx; sepals at maturity 2.4-5 mm long; seeds 0.6-0.8 mm long. 2. *S. marina*

b. Capsule subglobose to ovoid, about twice the length of the calyx; sepals at maturity 2.2-3.2 mm long; seeds 0.8-1.4 mm long. 3. *S. canadensis*

1. **S. rubra** (L.) J. & C. Presl Map 265. Fig. 70, a. SAND-SPURREY

Scattered throughout in sandy or gravelly soil in farmyards, and in waste places and towns; flowers pink, June-Sept.

Nfld. to Minn. south to Va.; Vancouver I. to Calif.; introduced from Eu.

2. **S. marina** (L.) Griseb. Fig. 70, a. Map 266.

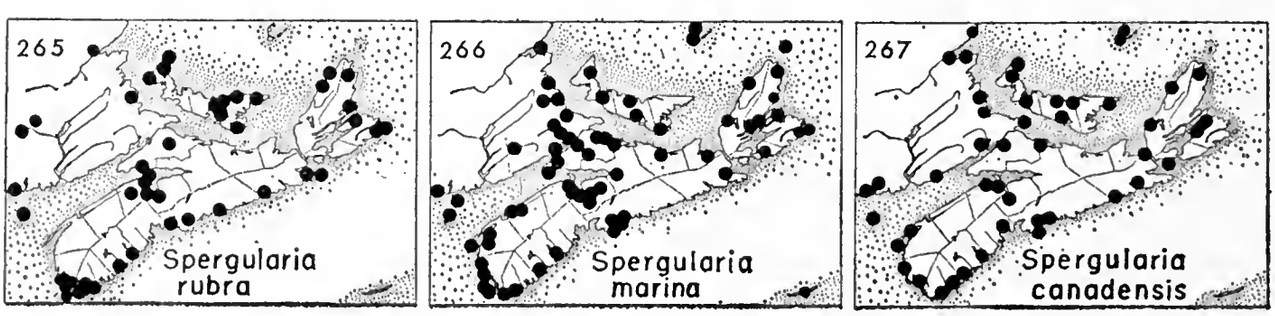
Characteristic of sea-shores, open areas on the salt marshes and upper muddy borders of beaches near the coast, about as common as the next species and often growing with it. The flowers vary from white to rose color. This includes *S. salina* J. & C. Presl with papillose seeds, and *S. leiosperma* Kindb. with smooth seeds, as these appear to be minor forms with intermediates between them.

Que. to Fla.; lower Calif. to B.C.; alkaline inland areas.

3. **S. canadensis** (Pers.) Don Map 267. SEASIDE SAND-SPURREY

Common around the coast near the upper tide level on muddy shores, brackish marshes and on pans on the salt-flats. July-Sept.

Nfld. and Que. to L. I.; southern Alaska to B.C.



3. SPERGULA L.

1. **S. arvensis** L. Fig. 70, b. SPURREY, PINEWEED, THOUSAND-JOINT

One of our most common weeds throughout; flowers white, from early June to October. This weed is characteristic of grain fields, but it may also occur in damp cultivated soil and in waste places.

Introduced from Eu.; throughout N.Amer.

4. SAGINA L.

a. Flower parts mostly in 4's, the petals shorter than the sepals; upper leaves without reduced leaves in their axils. 1. *S. procumbens*
a. Flower parts generally in 5's, the petals much longer than the sepals, showy; upper leaves with fascicles of reduced leaves in their axils. 2. *S. nodosa*

1. **S. procumbens** L. Fig. 70, e. PEARLWORT

Abundant throughout; rock crevices near the coast, damp fields, lawns, golf greens and roadsides, dripping cliffs; frequent in wet dune hollows on Sable I. May-Oct.

Greenland to Penn. mostly near the coast; scattered inland near the Great Lakes; B.C.

2. **S. nodosa** (L.) Fenzl Map 268. Fig. 70, f.

Local on the sea-cliffs of the Bay of Fundy from Annapolis Co. to Digby Neck and Brier I.; sand flats of Shelburne and Queens Co. in hollows and slopes of dunes as at Villagedale and Port Mouton; scattered to Guysborough Co., always on or near the coast. July-Sept.

Var. **pubescens** Mert. & Koch has the pedicels and especially the lower internodes of the stems glandular-pubescent. This occurs from eastern Nfld. and N.B. to Mass. In our area the plants along the Atlantic Coast are usually very pubescent, while those along the Bay of Fundy are often nearly glabrous although even here scattered glandular hairs often occur on the lower internodes.

Nfld. to Alta. south to the coast of Me. and Lake Superior; Eurasia.

5. ARENARIA L. SANDWORT

a. Plants of sea-beaches where it often forms wide, dense colonies; leaves elliptical, extremely fleshy. 3. *A. peploides*
a. Plants not essentially maritime; leaves not fleshy.
  b. Leaves lanceolate to roundish in shape; capsule dehiscent by 6 teeth.
    c. Leaves with blades 1-3.5 cm long, blunt; petals exceeding the blunt sepals; seeds smooth with appendages at the scar or hilum; erect perennial with wiry, little-branched stems from slender rhizomes. 1. *A. lateriflora*
    c. Leaves with blades less than 1 cm long, acute; petals shorter than the acute sepals; seeds papillose, not appendaged; lax to prostrate spreading annual, in clumps from a taproot. 2. *A. serpyllifolia*

b. Leaves linear and obtuse; petals about twice the length of the nerveless sepals; capsule dehiscent by 3 teeth. 4. *A. groenlandica*

1. **A. lateriflora** L. Map 269. Fig. 70, c. SANDWORT

Very common throughout; damp thickets, meadows, exposed headlands, etc. June-Sept.

Arctic Amer. southward.

2. **A. serpyllifolia** L. THYME-LEAVED SANDWORT

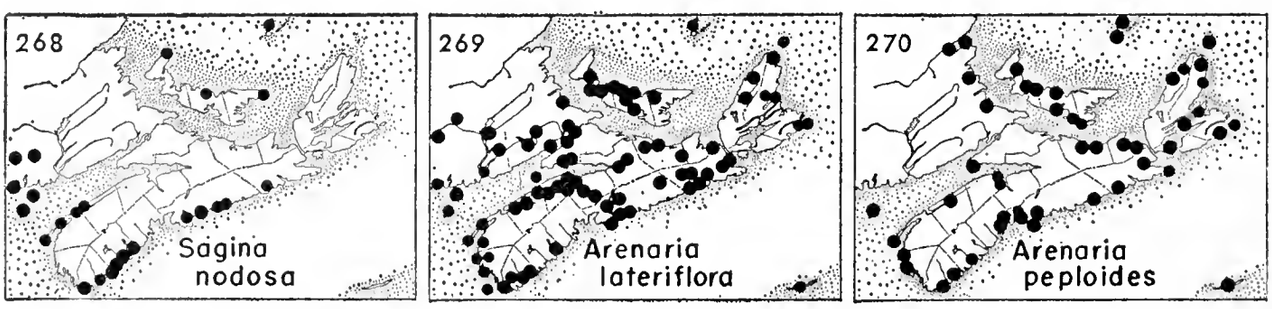
Reported earlier from both N.S. and P.E.I., possibly erroneously. Along the railroad track, Summerville, Queens Co.; under alders at Five Mile R., Hants Co.; rare on an old chicken range, Cambridge, Kings Co. A collection from gravelly soil, Kentville, by Fernald in 1902, and labelled var. **tenuior** Mert. & Koch, is in the Gray Herbarium. This variety is a more delicate plant with smaller leaves and flowers.

Introduced from Eurasia into most parts of N.Amer.

3. **A. peploides** L., var. **robusta** Fern. Map 270. SEABEACH-SANDWORT

Sandy beaches, scattered along the entire coast, growing in patches and very conspicuous because of its very thick leaves and stems. This distinctive plant may be placed in a separate genus as *Honkenya peploides* (L.) Ehrh.

Strait of Belle Isle along the coast to Md.; a variety of a very wide-ranging plant.



4. **A. groenlandica** (Retz.) Spreng. MOUNTAIN-SANDWORT

A record of this arctic plant is from "rocks, North West Arm, Halifax". Fernald (1919) states that this material is not exactly typical. Collected by Bidwell and Mason on exposed granite, Flagmast Hill west of Geizer Hill and by P. A. Bentley in 1956 from among lichens, top of Gibralter Rock, both in Halifax Co.

Lab. to northern New Eng. and N.S. with a glabrous variety south to the mts. of Ga.

6. **STELLARIA** L. CHICKWEED

Low matted, annual to perennial herbs with small white flowers; the petals divided, often almost to the base, occasionally lacking; very common.

a. Leaves ovate, the lower and middle distinctly petioled; stems weak with a line of hairs on one side; calyx often pilose; seeds 1-1.2 mm long, coarsely tuberculate. 1. *S. media*

a. Leaves linear to lanceolate, or smaller and elliptic-oblong, essentially sessile; stems and calyx usually glabrous.

b. Flowers in well-developed cymes with small, usually scarious bracts.

c. Cymes ample, usually with many flowers on spreading branches; petals conspicuous, as long or longer than the sepals.

d. Leaves lanceolate, widest below the middle; stem smooth; seeds coarsely tuberculate; inflorescence large and more commonly appearing terminal; petals showy. 2. *S. graminea*

d. Leaves narrowly lanceolate, widest above the middle; stem often rough-angled; seeds essentially smooth; inflorescence soon becoming lateral; petals small, barely exceeding the sepals. 3. *S. longifolia*

c. Cymes usually few-flowered; petals very small and shorter than the sepals, or absent.

e. Cymes appearing lateral with few flowers and small scarious bracts; seeds papillate; plants of wet habitats with stems decumbent and often rooting at the nodes. 4. *S. Alsine*

e. Cymes terminal, some flowers appearing in the axils of the upper leaves or of only scarious-margined bracts; seeds smooth; plants weak and often decumbent but not usually rooting at the nodes. 7. *S. calycantha*

b. Flowers solitary or in 2's, in the axils of the leaves.

f. Leaves fleshy, linear to oblong, 1 cm long or less; plants matted, of wet habitats; capsule equalling or slightly longer than the calyx; petals slightly longer than the sepals.

g. Leaves very fleshy, oval to elliptic, to 1 cm long; seeds smooth. 5. *S. humifusa*

g. Leaves slightly fleshy, linear to elliptic-lanceolate, to 1.5 cm long; seeds wrinkled or rugose. 6. *S. crassifolia*

f. Leaves thin, not fleshy, linear to widely lanceolate, up to 5 cm long; capsule much exceeding the sepals; seeds reddish-brown, smooth; petals shorter than the sepals, often absent. 7. *S. calycantha*

1. **S. media** (L.) Cyrillo Fig. 71, a. COMMON CHICKWEED

Common throughout in moist or shady areas, near buildings and in shade, in rich gardens and near the coast; very variable and often a bad weed. April-Nov.

Introduced from Eu. and widely distributed in N. Amer.

2. **S. graminea** L. Fig. 71, b. STITCHWORT

One of our most common weeds in fields, lawns and gardens, often abundant in hay-lands where the grass is a poor catch. The appearance of this plant varies considerably during different times of year, from the open vigorous growth of midsummer to the matted growth with smaller, more oval leaves of early spring and autumn.

Introduced from Eurasia; Nfld. to Minn. south to Md. and Mo.

Fig. 71.—**Stellaria:** (a) *S. media* x ½, (b) *S. graminea* x ½. — **Lychnis:** (c) *L. Loveae* x ½, (d) *L. Flos-cuculi* x ½. — **Silene:** (e) *S. Cucubalus* x ½. — **Saponaria:** (f) *S. officinalis* x ½.

3. **S. longifolia** Muhl. Map 272. LONG-LEAVED CHICKWEED

Damp or wet grassy places in sandy to mucky soil; common in large areas on the meadows along the Salmon R., Truro, and in neighboring gardens; also found in the Musquodoboit and Stewiacke Valleys and at Kemptown. Both Lindsay and Macoun report this species as common, but their records are apparently based on the introduced *S. graminea.*

Nfld. to B.C. south to Va. and N. Mex.; Eurasia.

4. **S. Alsine** Grimm Map 271. MARSH-CHICKWEED

Wet sand, springy areas, margins of ponds, ditches and wet banks; common at least from Digby and Lunenburg Co. to northern C.B., rarer on the acidic soils or near the Atlantic coast. Forma **ovalifolia** (Peterm.) Fernald (1950-d) has the leaves oval or broadly elliptic instead of the

usual lanceolate-elliptic leaves: seepy clay bank near Great Bras d'Or, Iona, Victoria Co. (*S. uliginosa* Murr.).

Nfld. to Del. and western N.Y.; B.C.

5. **S. humifusa** Rottb. Map 272.

Around salt marshes; Nichols records this as characteristic of the shoreward reaches of the salt marshes in northern C.B., although this is not indicated by recent collections. Guysborough Co.: salt meadow, Marie Joseph (Erskine, D.S. 1951); brackish marsh near Cape d'Or, Cumberland Co., forming mats near the upper part of the salt marsh, Advocate; salt marsh, Five Islands, Colchester Co. (Schofield, 1955). This plant has been but seldom collected and is probably much more common than the map shows.

Greenland to Alaska south on brackish shores to Me.; also on the Pacific Coast.

6. **S. crassifolia** Ehrh.

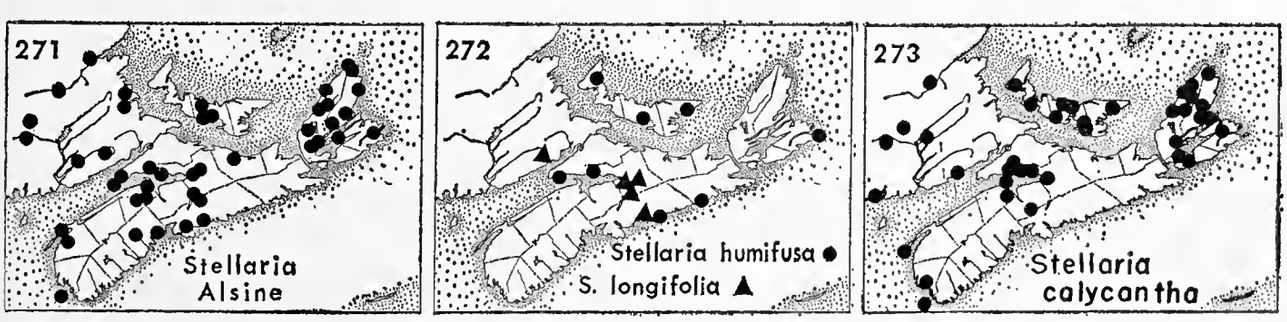
Spring rills and edges of ponds; found in P.E.I. and eastern N.B. and probably scattered in northern N.S. This weak matted plant with short, narrow leaves has not been studied in N.S. but plants from Tannery Pond near Wolfville apparently belong here and the species has been ascribed to N.S.

Nfld. to Alaska south to the Maritime Provinces and Mich.

7. **S. calycantha** (Ledeb.) Bong. Map 273. NORTHERN STARWORT

Scattered in damp thickets, wet woods and ravines in C. B.; about the Minas Basin, and to Digby and Yarmouth Co. Various varieties have been described which grade into each other. The typical variety *calycantha* has the flowers singly or few in the axils of the branches and the leaves are shorter and ovate to elliptic-lanceolate. Its general distribution is more northern. Many of our plants have the leaves lanceolate to linear-lanceolate. These have been named var. **isophylla** Fern. but since many plants are transitional to the typical variety it is doubtful if this should be a distinct variety. In richer locations the flowers are more numerous and tend to form a terminal inflorescence. This is var. **floribunda** Fern.; it is sometimes common in rich habitats. (*S. borealis* Bigel.).

N.S. to B.C. and Alaska south to Penn., Utah and Calif.



7. CERASTIUM L.

Plants perennial with the petals plainly 2-lobed. In addition to the species listed below, two commonly cultivated plants may occasionally be found along roadsides where they may spread from rockeries or borders. The common Snow-in-Summer is *Cerastium tomentosum* L. *C. Biebersteinii* DC. has slightly larger flowers, and larger leaves averaging 2.5-4 cm long and 0.5 cm wide. This was reported from Yarmouth Co. by Klawe (1955). Both species are whitish with clearly twisted hairs and have large showy white flowers.

a. Petals about the length of, or shorter than, the sepals; capsules up to 10 mm long. 1. *C. vulgatum*

a. Petals 10 mm long, much longer than the sepals, showy. 2. *C. arvense*

1. **C. vulgatum** L., var. **hirsutum** Fries Fig. 70, d. MOUSE-EAR CHICKWEED

A very common weed throughout, often as a lawn weed. The plants are usually rather densely hirsute. A glabrescent or smooth form with dark-green blunt leaves is adventive from Eu. and is reported in Gray's Manual from e. Va. and ne. N.S. This is var. **holosteoides** Fries. However, all our C.B. collections examined are hirsute.

Throughout temperate N. Amer.

2. **C. arvense** L. FIELD-CHICKWEED

Scattered and often abundant locally in fields or meadows, where it may be introduced. It is common at Truro and is scattered in the Annapolis Valley, around Port Williams and Canard. Rarer elsewhere as at Lismore, Pictou Co., Parrsboro and Windsor.

Lawson (1890-1) states that the true indigenous form of the plant was collected on the trap cliffs at Blomidon. It was collected by Schofield: abundant in cliff crevices, Cape Blomidon, 1954; and by Webster and Erskine, 1956, as common on cliffs and scree beyond Indian Springs. Plants collected there are densely glandular but other collections also show this glandular condition to some extent. Early June.

A collection of compact very glandular plants made by Perry and Roscoe from edge of Granite Cliffs, St. Paul I., has been placed by Fernald in the western var. *viscidulum* Gremli, for the only station known from east of N. Dak. (Fernald, 1948).

This variable species and its variations are found in the northern hemisphere around the world.

8. AGROSTEMMA L.

1. **A. Githago** L. CORN-COCKLE

Occasionally introduced into fields in grain seed; not a permanent weed, and becoming increasingly rare as cleaner seed is used.

Introduced from Eu.; widely spread.

9. LYCHNIS L. CAMPION

Tall biennial or perennial plants, much like those of the next genus but with 5 styles and the capsule opening with 5 or 10 teeth.

a. Each petal with two shallow lobes.
  b. Stems glandular-pubescent, loosely branched; fruiting calyx much enlarged, ovoid or globose.
    c. Flowers red, opening in the morning; calyx-teeth triangular and acute. 1. *L. dioica*
    c. Flowers white or rarely pinkish, opening in the evening; calyx-teeth longer and attenuate. 2. *L. alba*
  b. Stem villous, stout and little branched; fruiting calyx scarcely inflated; inflorescence dense and hemispherical with the flowers scarlet. 3. *L. chalcedonica*
a. Each petal divided into 4 linear lobes, reddish; fruiting calyx tubular, not inflated; plant nearly glabrous. 4. *L. Flos-Cuculi*

1. **L. dioica** L. RED CAMPION

Lawson (1890-1) reports this plant from Annapolis and Kentville and states that it is probably a remnant of the French occupation. No recent collections have been made and the plant may now be extinct in the Province.

Introduced from Eu. and widely distributed.

2. **L. alba** Mill. Fig. 71, c. WHITE CAMPION, WHITE COCKLE

Scattered around towns, waste places and along railroads; occasionally becoming a bad weed in fields locally, as near Pictou and Port Williams. It is perennial and difficult to eradicate once it has become established. Our plant is now considered to be a possible hybrid between true *L. alba* and *L. rubra* and has been given the name *L. Loveae* Boivin (Boivin 1966-c, 1967-a).

Introduced from Eurasia; N.S. to B.C. south to N.C.

3. **L. chalcedonica** L. MALTESE-CROSS

Grown in gardens and occasionally escaping to roadsides or waste places; escaped along roadside, Noel L., Hants Co., collected by D. and J. S. Erskine.

N.S. to Minn. south to N. Eng.

4. **L. Flos-Cuculi** L. Fig. 71, d. RAGGED-ROBIN

Local; abundant in meadows in parts of Kings Co., especially about Berwick, where some fields and meadows may be red when it is in flower in late May; swale near Yarmouth; low field near Brookfield and at Londonderry in Colchester Co. When once it is introduced into a meadow it is persistent but it spreads rather slowly.

Introduced from Eu.; N.S. and Que. to Penn.

10. SILENE L. CATCHFLY

a. Dwarf, tufted plant of n. C.B.; flowers solitary. 1. *S. acaulis*
a. Large, erect plant; flowers several to many in each inflorescence; weedy species.
b. Calyx more or less inflated, papery and obscurely-ribbed with a network of delicate veins; plants glabrous, perennial. 2. *S. Cucubalus*
b. Calyx not inflated except by the enlarging capsule; plant hairy and glandular; annuals.
c. Flowers small, in a one-sided raceme, with very short pedicels; petals very shallowly bilobed; capsule 6-8 mm long. 3. *S. gallica*
c. Flowers larger, in a terminal much-branched cluster; capsule 15-18 mm long; petals deeply bilobed. 4. *S. noctiflora*

1. **S. acaulis** L., var. **excapa** (All.) DC. MOSS-CAMPION

St. Paul I.; abundant at the southwest end of the island, and also south of N. E. Channel practically at sea-level (Perry, 1931). Lawson (1890-1) says that *S. acaulis* is reported from St. Paul I. and C.B. and this record is in Macoun's Catalogue.

Nfld. south to N.S. and the mts. of N.H.; w. N. Amer.

2. **S. Cucubalus** Wibel Fig. 71, e. BLADDER-CAMPION

Not uncommon in fields and waste places and scattered around towns and roadsides; introduced mostly in grain seed or scratch grains and becoming widely distributed in the Province, probably destined to be a common weed.

N.S. to B.C. south to Va. and Mo.

3. **S. gallica** L.

Local; well established around Digby and Deep Brook, where it was known as early as 1902; Karsdale, Annapolis Co.

Adventive from Eu.; local in N. Amer.

4. **S. noctiflora** L. NIGHT-FLOWERING CATCHFLY

Common, at least around towns, in waste places, gardens and along roadsides; rare in the country. This plant is very similar in appearance to *Lychnis alba* but is an annual and more common; very sticky to the touch and often dirty.

Naturalized from Eu.; and widely distributed.

11. SAPONARIA L.

a. Perennial, in large clumps; leaves tapering to the base; flowers in dense clusters, usually double, the calyx not winged. 1. *S. officinalis*
a. Annual, mostly growing singly; leaves clasping at the base; flowers in a loose corymbose cyme, single, the calyx strongly 5-winged. 2. *S. Vaccaria*

1. **S. officinalis** L. Fig. 71, f. BOUNCING-BET

Large clumps of this garden escape may be seen along roadsides, near old houses or in waste places in most parts of the Province, and

especially from Digby to Pictou. It is very persistent, but not aggressively spreading. Late July-early Aug.

Throughout N. Amer.; introduced from Eu.

2. **S. Vaccaria** L. SOAPWORT

Occasional; collected by Groh at Halifax, Aug. 1926; Italy Cross, Lunenburg Co., in 1910; Berwick, Windsor, and Halifax. (*Vaccaria segetalis* (Neck.) Garcke).

Native of Eu.; widely distributed in N. Amer.

12. DIANTHUS L. PINKS

More than 300 species are known. *D. plumarius* L. is the common Garden Pink; and *D. barbatus* L. is the garden Sweet William.

a. Plants perennial, smooth or roughened; flowers solitary on long pedicels, with two ovate bractlets less than half as long as the calyx. 2. *D. deltoides*

a. Plants annual, more or less hairy; flowers in dense terminal clusters, subtended by numerous hairy bracts equal to the calyx in length. 1. *D. Armeria*

1. **D. Armeria** L. DEPTFORD PINK

Scattered as a garden escape; Kentville, Wolfville, Sandy Cove, Auburn, Canard, Centreville, and probably occurring sparingly elsewhere.

Introduced from Eu.; N.S. to Ont.; B.C.; south to Ga.

2. **D. deltoides** L. MAIDEN-PINK

Rare and inconspicuous; Meteghan, Digby Co. to the Annapolis Valley, occasionally on the sand plains and scattered along the North Mt. slope; Mill Village, Queens Co. and Truro.

Introduced from Eu.; N.S. to Mich. south to N.J.

45. CERATOPHYLLACEAE HORNWORT FAMILY

This is our only aquatic plant with whorled, palmately dissected leaves. The flowers are minute and sessile in the leaf-axils.

1. CERATOPHYLLUM L.

1. **C. demersum** L. Map 274. HORNWORT

In Kings Co. rather common in the rivers flowing into Minas Basin; scattered from Cumberland to Antigonish and Guysborough Co.; rarer on the Atlantic side: Queens Co., in wrack of lake, Hibernia; Lunenburg Co., fragments in wrack, Oakland Lake; Cape Breton Co., abundant at *Chamaedaphne*-edge of small lake near Albert Bridge, Mira. Edges of small lakes and ponds, mucky bottom, marsh or backwaters of rivers (Smith, 1959).

Slow streams and ponds across the continent.

46. NYMPHAEACEAE WATER-LILY FAMILY

Aquatic plants with large floating leaves; flowers regular, with many stamens.

a. Petiole attached at the summit of a deep notch in the blade; stem horizontal under the mud, 5 cm thick; pistil one.
  b. Flowers yellow; leaves much longer than wide, with the veins coming from the mid-rib (Fig. 72, b, c). 1. *Nuphar*
  b. Flowers white or pinkish; leaves rotund, with the veins mostly radiating from the summit of the petiole (Fig. 72, a). 2. *Nymphaea*
a. Petiole attached to the middle of the small un-notched blade, covered with gelatinous slime when young; stem slender and trailing in water; flowers small with many pistils (Fig. 73, b). 3. *Brasenia*

1. NUPHAR Sm. YELLOW POND-LILY

Beal (1956) considers all the yellow pond-lilies to be subspecies of the European *N. luteum.*

a. Anthers shorter than the filaments; leaf-blades to 20 cm long and 15 cm wide.
  b. Flowers 2 cm or less wide; leaf-blades 3-10 cm long, with the notch 2/3 or more the length of the midrib; young fruit without a ring of decaying stamens. 1. *N. microphyllum*
  b. Flowers 3 cm or more in width; leaf-blades 7-20 cm long, with a notch about 1/2 the length of the midrib; young fruit with a ring of decaying stamens. 2. *N. rubrodiscum*
a. Anthers equalling or longer than the filaments; leaf-blades 17-26 cm long, 11-22 cm wide, with a narrow notch less than half as long as the midrib; flowers 4.5 cm wide. 3. *N. variegatum*

1. N. **microphyllum** (Pers.)Fern. Fig. 72, b. Map 275. SMALL POND-LILY

Ponds, slow-flowing streams and rivers, edges of lakes, sink-holes in gypsum country, often in ox-bow ponds. This small yellow lily is probably scattered throughout although it is most common from Kings and Cumberland Co. to Antigonish; only a few collections exist from near the Atlantic coast; and only two collections are known in C.B. August.

N.S. to Man. south to Penn.

2. X N. **rubrodiscum** Morong Map 276. YELLOW POND-LILY

Lakes and quiet streams, Yarmouth to Pictou and Inverness and probably throughout wherever the other two species occur together. Now accepted as a hybrid between the last and the next species, its characteristics are intermediate between those of its presumed parents. As with the preceding species, it is rare on the Atlantic half of the Province.

N.S. to Minn. south to Penn.

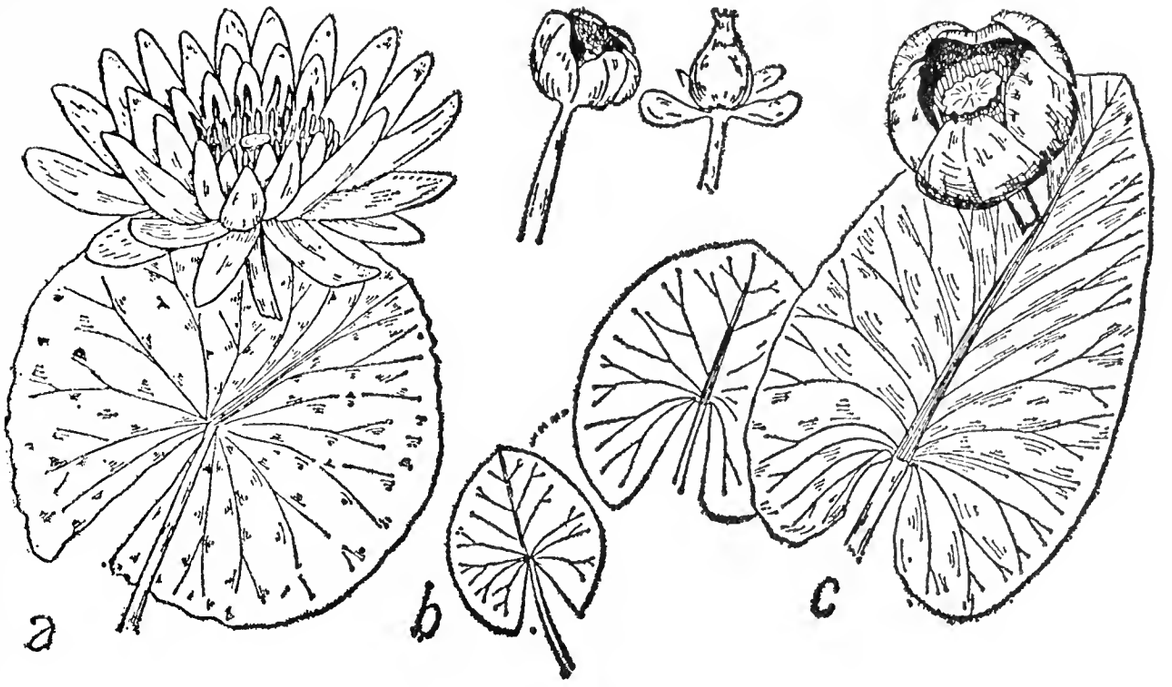
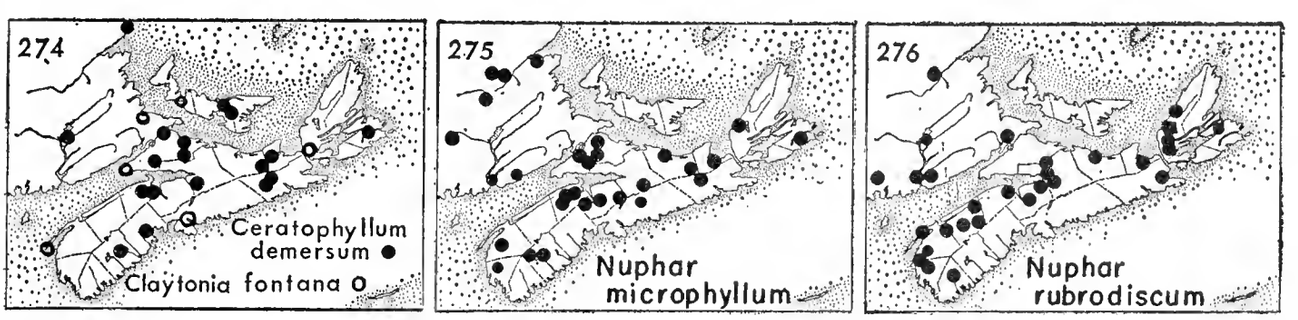


Fig. 72.—**Nymphaea:** (a) *N. odorata* x $\frac{1}{4}$. — **Nuphar:** (b) *N. microphyllum* x $\frac{1}{2}$, (c) *N. variegatum* x $\frac{1}{2}$.

3. **N. variegatum** Engelm. Fig. 72, c. Map 277. COW-LILY

Common throughout, also on Sable I.; lakes, ponds, quiet streams and still-waters. It is characteristic of bog-pools and when shallow pools disappear during a dry summer the leaves may emerge and grow erect. July-Aug.

Lab. to Yukon south to Del., Ohio and Nebr.



2. NYMPHAEA L. WATER-LILY

1. **N. odorata** Ait. Fig. 72, a. Map 278 WATER-LILY

Bog pools, lake margins, shallow muddy ponds and slow-flowing rivers; very common in the southern regions from Yarmouth to C.B.; rarer northwards and in the sandy areas; often transplanted into small ponds. (*Castalia* Salisb.).

Var. **rosea** Pursh is reported common in bog-pools and lake margins of Digby and Yarmouth Co. (Fernald, 1921); in Halifax Co. (Rousseau, 1938-a); and on St. Paul I. This variety, with smaller, often pinkish petals, is more of an ecological form and occurs when the plants are growing under dryish conditions.

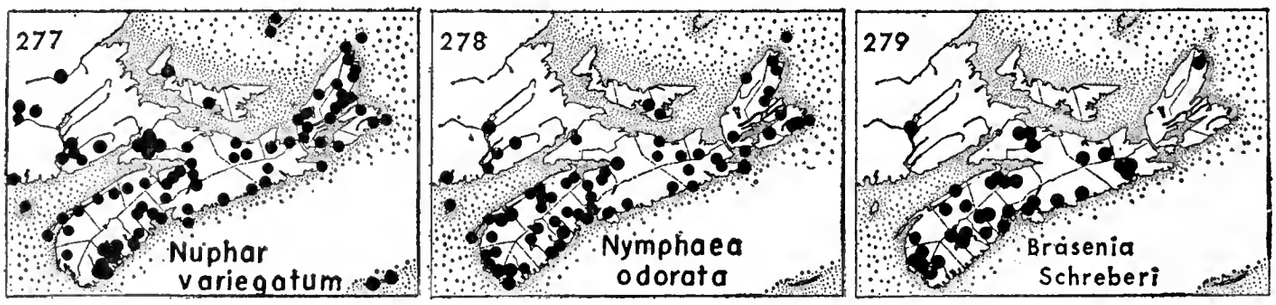
Nfld. to Man. south to Fla. and La.

3. **BRASENIA** Schreb

1. **B. Schreberi** Gmel. Fig. 73, b. Map 279. WATER-SHIELD

Local; in various lakes of Yarmouth and Shelburne Co. (Fernald, 1921, 1922); scattered in lakes in Halifax Co. (Lawson, 1890-1); reported from various places east to Guysborough Co. (Rousseau, 1938-a) and Millstream, Pictou Co. (Robinson, 1907). Now known to be local but widely distributed in the western and southern counties, rare northeastward. The only known station in C.B. is in the Aspy Bay region. July-Sept.

Fla. to Tex. north to N.S., across Canada and world-wide.



47. RANUNCULACEAE BUTTERCUP FAMILY

A large family with about 1500 species of wide distribution. Flowers regular, except in *Aconitum*, with the sepals present, often petal-like, the petals present or absent; stamens usually numerous and pistils 1-many forming many achenes, a follicle or a berry. Stipules absent.

a. Plant a vine, climbing by the bending of the petioles; leaflets 3; flowers numerous in panicles (Fig. 75, a). 5. *Clematis*
a. Plants herbaceous, not climbing.
 b. Leaves reniform or orbicular, toothed or very shallowly lobed.
  c. Leaves mostly basal, 0.5-5 cm wide, the stem-leaves reduced; fruit of many achenes; buttercups. 1. *Ranunculus*
  c. Leaves scattered along the stem, reniform, 5-20 cm wide; fruits of many-seeded follicles; flowers yellow (Fig. 75, d). 6. *Caltha*
 b. Leaves deeply lobed or compound.
  d. Leaves all basal; plant less than 10 cm high.
   e. Leaves with 3 lobes cut half or two-thirds to the base; flowers blue, subtended by tiny leafy bracts (Fig. 74, d). 3. *Hepatica*
   e. Leaves with 3 toothed leaflets; flowers white, without leafy bracts; rootstocks bright yellow (Fig. 75, c). 7. *Coptis*
  d. Leaves both basal and scattered along the stem, or all scattered on the stem.
   f. Stem leaves 2 or 3, opposite or whorled; flowers one to several on long pedicels; petals absent. 4. *Anemone*
   f. Stem-leaves alternate.
    g. Leaves deeply cut, or palmately-compound, but once divided. 1. *Ranunculus*
    g. Leaves large, ternate, with 3 large leaflets again once or twice divided.
     h. Flowers very irregular, blue to whitish; fruit 3-5 follicles; plant tall with leaves palmately divided into narrow lobes. 9. *Aconitum*

h. Flowers regular.
i. Leaves numerous, sessile or nearly so, the final divisions with 3-5 teeth at the apex; flowers often staminate or pistillate only; fruit of many achenes (Fig. 74, c). 2. *Thalictrum*
i. Leaves long-petiolate.
j. Leaves mostly basal, those on the stem reduced, the ultimate divisions with rounded teeth or lobes; fruit of 5 follicles; flowers large, few, the petals long-spurred (Fig. 75, b). 8. *Aquilegia*
j. Leaves 1-2, on the stem only, much-divided with the lobes sharply and acuminately pointed; fruit a berry; flowers small and crowded in short racemes; not spurred (Fig. 75, f). 10. *Actaea*

1. RANUNCULUS L. BUTTERCUPS

The buttercups present an interesting group with a different type of plant for each habitat (Benson, 1940, 1941; Drew, 1936).

a. Leaves finely cut into thread-like or capillary division; plants aquatic or sometimes stranded; flowers white; achenes wrinkled (Fig. 73, c).
b. Receptacle densely hairy, the hairs more or less tufted; achenes 1-1.5 mm long, sometimes hairy. 1. *R. trichophyllus*
b. Receptacle smooth or sparsely hairy, the hairs not tufted; achenes 1.5-1.8 mm long, usually smooth. Var. *calvescens*
a. Leaves entire, or divided with flattened lobes; flowers yellowish; achenes not wrinkled.
c. Plants of brackish soil, small, the leaves from the base of the stem, spreading by runners; achenes striate; leaves fleshy, merely toothed, rectangular to reniform; fruiting axis very elongate; flowers small (Fig. 73, d). 2. *R. Cymbalaria*
c. Plants not usually in brackish locations; achenes smooth.
d. Leaves linear to broadly lanceolate, entire or nearly so; plants rooting at the nodes, sub-aquatic or on wet sand.
e. Stem stout, ascending; leaves 5-10 mm wide; petals 4-8 mm long; stamens 25-50; achenes 20-25. 4. *R. Flammula*
e. Stem very fine, creeping; leaves filiform, 0.5-1.5 mm wide; petals 2-4, rarely to 7 mm long; stamens 5-25; achenes 5-15 (Fig. 73, f). 5. *R. reptans*
d. Leaves orbicular to elliptical, crenate or cut into numerous lobes.
f. Plants weak and slender, aquatic or on wet mud; leaf-blades round and radially cut into numerous segments; flowers about 1 cm wide, the petals slightly exceeding the sepals (Fig. 73, e). 3. *R. Gmelini*
f. Plants vigorous, erect or creeping; the leaves not floating, irregularly divided and lobed, or round and merely crenate.
g. Achene turgid, without a sharp or wing-like margin; petals 1.5-4 mm long, shorter than the sepals: plants glabrous or nearly so.
h. Basal and stem leaves deeply and palmately lobed or divided; marshes and swamps. 6. *R. sceleratus*
h. Basal leaves round to reniform, crenate; the lower stem leaves occasionally 3-lobed; rich deciduous woods. 7. *R. abortivus*
g. Achenes strongly flattened, with a border; leaves irregularly and much divided.
i. Flowers inconspicuous, the petals about 4 mm long or less; plants bristly or hirsute with stout spreading hairs; plants erect.
j. Styles hooked in fruit; heads sub-globose; leaf-divisions sessile; petals nearly equalling the sepals (Fig. 74, b). 8. *R. recurvatus*

j. Styles straight or nearly so; heads about 3 times as long as wide; petals half as long as the sepals; terminal divisions of the leaf stalked. 9. *R. pensylvanicus*

i. Flowers showy, with petals to 10 mm long; plants smooth or with light, soft pubescence.

k. Base of the plant not bulbous; sepals appressed.

l. Plant usually rooting at the lower nodes, often creeping; divisions of the leaf stalked, the stalks of different texture from the blade; flowers rather orange in color; style less than 1 mm long. 10. *R. repens*

l. Plants erect; divisions of the leaf all sessile; style more than 1 mm long (Fig. 74). 11. *R. acris*

k. Base of the plant thickened and bulbous; leaves with the lateral divisions sessile, the terminal ones stalked; sepals reflexed. 12. *R. bulbosus*

Fig. 73.—**Claytonia**: (a) *C. caroliniana* x $\frac{1}{2}$. — **Brasenia**: (b) *B. Schreberi* x $\frac{1}{2}$. — **Ranunculus**: (c) *R. trichophyllus*, (d) *R. Cymbalaria*, (e) *R. Gmelini*, (f) *R. reptans*, all x $\frac{1}{2}$.

1. **R. trichophyllus** Chaix. Map 280. Fig. 73, c. WHITE WATER-CROWFOOT

Slow-moving streams, lagoons, shallow pools and occasionally in ditches in meadows, associated with mucky soils; scattered from Annapolis Co. to northern C.B.; unknown in southwestern N.S. and along the Atlantic Coast. July-Aug.

Lab. to Alaska south to N.Y. and Calif.; Eurasia.

Var. **calvescens** W. B. Drew is much rarer than the preceding variety. The best example is from a brook west of Whycocomagh, possibly also from Great Village in Colchester Co. N.S. to Ont. and Mich. south to New Eng. and Penn.

Var. **eradicatus** (Laestad.) W. B. Drew is a slender form with the stems less than 1 mm in diameter and with round leaf-blades up to 2.5 cm across. This slender northern form is best represented from the wrack at the edge of Gillie Lake, C.B. Co., Greenland to Alaska south to N.S. and Que.

The two recent students of this section differ in their interpretations of the status of this plant. Benson prefers to keep the American and the European plants together as *R. aquatilis* L. Drew believes the American plants are sufficiently distinct to warrant giving them the specific name *R. trichophyllus*.

Certain collections from near Truro seem to be near to *R. subrigidus* Drew, because they have short petioles and the leaf-divisions are stout and rigid. Benson considers this species to be merely plants intermediate between *R. aquatilis* and plants found further west. A collection from Earltown Lake north of Truro has a very orbicular leaf-outline and rigid divisions quite different from other collections.

2. **R. Cymbalaria** Pursh Fig. 73, d. Map 281. SEASHORE-BUTTERCUP

Characteristic of open salt marshes and flooded dykelands throughout; found only near or on saline soil and often abundant in local areas. Smaller plants with leaves 4-10 mm long and 3-toothed at the apex have been named var. *alpina* Hook. This arctic variety is not well marked in N.S. although intermediates occur on Sable I.

Lab. south to N.J.; across the continent in saline soils.

3. **R. Gmelini** DC., var. **Hookeri** (D. Don) Benson Fig. 73, e. Map 282. YELLOW WATER-CROWFOOT

Common in marshes at Kentville, Windsor and Truro and from there to Amherst and C.B.; abundant where found, in slow-flowing streams and ditches, shallow pools, and ponds in the more alkaline areas (Smith, 1959); often growing in shallow water among the bases of swamp plants, or sometimes out on sandy shores or dried-up ditches. The American plants differ slightly from the Asiatic ones and have been given various varietal names. (*R. Purshii* Richards).

Nfld. to Alaska south to Me. and N.Mex.

4. **R. Flammula** L.

Known from but two areas in the Province; from a cold spring brook, Tusket, Yarmouth Co. (Fernald, 1921); collected by C. E. Atwood in a grassy bog at Mt. Uniacke, Hants Co. in 1927; gravelly shore of Mount Uniacke Lake by Schofield and Webster in 1954.

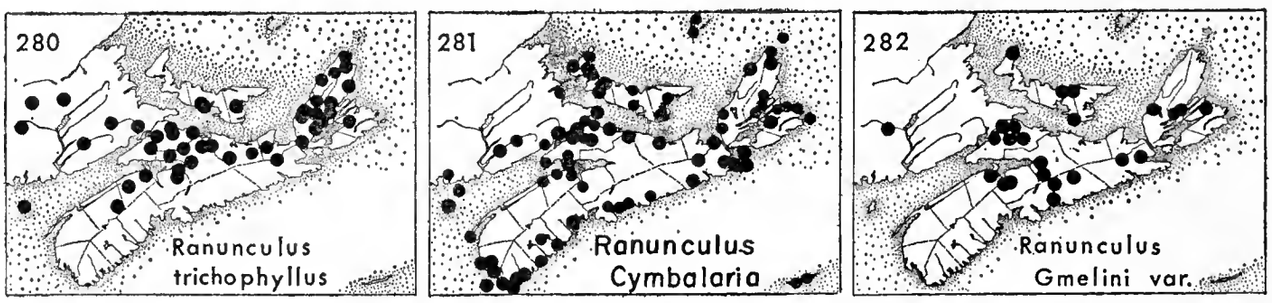
Nfld., St. Pierre and Miq., N.S., B.C. to Oreg.; Eurasia.

5. **R. reptans** L. Fig. 73, f. SMALL SPEARWORT

Along the sandy beaches and rocky shores of rivers, wet margins of rivers and lakes; scattered throughout but most common from Annapolis and Cumberland Co. to northern C.B.

Most of our plants have the leaves filiform but in southwestern N.S., in Queens and Yarmouth Co. a wider-leaved extreme occurs with a flattened blade. These plants are placed in var. **ovalis** (Bigel.) T. & G. (*R. Flammula*, var. *filiformis* (Michx.) Hook.).

Greenland to Alaska south to Penn. and Minn.; Eurasia.



6. **R. sceleratus** L. CURSED CROWFOOT

Local and rare; Halifax Co.: damp roadside, Barrie Beach, collected by H. P. Bell in 1935; MacNab I. at edge of a salt marsh; sand beside brackish pond, Eastern Passage (Erskine D. S., 1951); C.B. Co.: abundant in water of swampy pond, Main-à-Dieu; Queens Co.: beach at West Berlin.

Nfld. to Alaska south to Fla. and Calif.

7. **R. abortivus** L., var. **acrolasius** Fern. Fig. 74, a. Map 283. WOOD BUTTERCUP

Common on rich wooded hillsides and along intervales from Digby and Cumberland Co. to northern C.B. The common form in N.S. has the leaf-blades of the basal leaves merely cordate at the base and with an open sinus; the stems and pedicels are minutely pilose. Diminutive plants may bloom in early May.

Var. **eucyclus** Fern., with the leaves orbicular and with a closed or overlapping sinus, is occasionally seen along the intervales about Truro. This seems to be a form of richer habitats.

Lab. to B.C. south to Conn., Minn. and Colo.

8. **R. recurvatus** Poir. Fig. 74, b. Map 284.

Rich woods, along intervales and on seepy hillsides usually in shady habitats, and preferring rather rich moist soil; not abundant but widely distributed; Annapolis and Cumberland Co. to northern C.B.; very rare on the Atlantic side.

Nfld. to Ont. south to Fla. and Tex.

9. **R. pensylvanicus** L. f. BRISTLY CROWFOOT

Lindsay lists this species from Pictou, collected by A. H. McKay. A specimen was seen from Cumberland Co. This plant, although collected by Erskine in western P.E.I., has not been seen in N.S. recently.

Meadows and moist ground, Lab. to Alaska south to Penn., Ind., and Oreg.

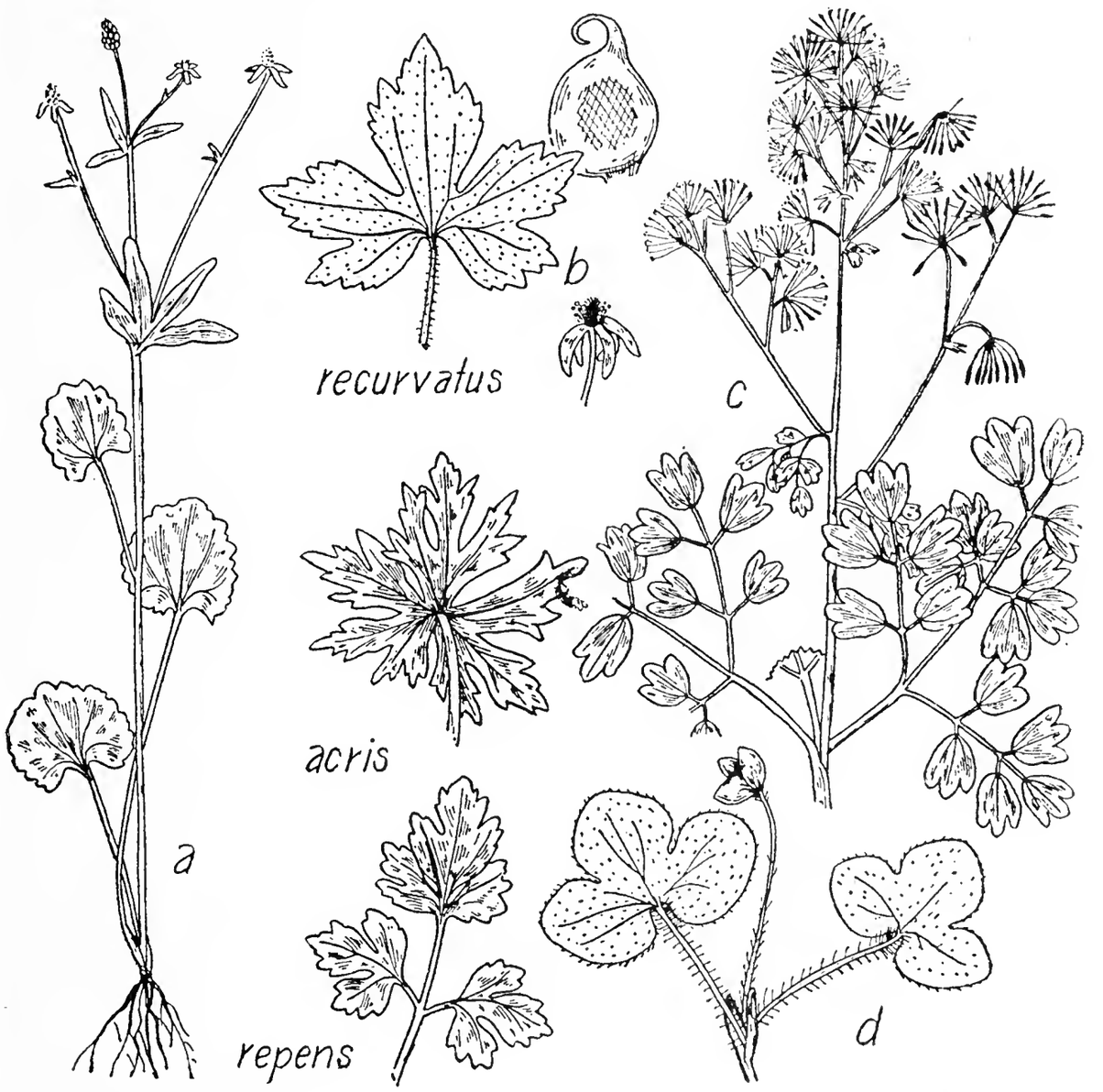


Fig. 74.—**Ranunculus:** (a) *R. abortivus* x $\frac{1}{2}$, (b) *R. recurvatus*, leaf x $\frac{1}{2}$, flower x 2, achene x 5. — **Thalictrum:** (c) *T. polygamum* x $\frac{1}{2}$. — **Hepatica:** (d) *H. americana* x $\frac{1}{3}$.

10. **R. repens** L. Fig. 74. CREEPING BUTTERCUP

Common throughout in ditches, low ground, meadows, wet woods and about towns; very variable in appearance and especially in pubescence. The typical plants of the species are trailing with appressed pubescence. 2n = 32. Extreme forms with dense and wide-spreading pubescence on the stems may be designated var. **villosus** Lamotte. Var. **erectus** DC., with the plants erect, without trailing branches, and with sparse appressed pubescence, is introduced and local from Nfld. to New

Eng.; shallow pools in hardwoods at Pleasant Bay and Big Intervale, Margaree, in Inverness Co.; Digby Co.; old wet field, road to North Point, Brier I. June 20-Aug.

Introduced from Eu.; Nfld. to Minn. south to N.C., also on the West Coast.

11. **R. acris** L. Fig. 74. TALL BUTTERCUP

Common throughout; fields, meadows and roadsides, chiefly in heavy or moist soils, often a bad weed in low ground and wet pastures.

Var. **latisectus** (G. Beck) has, according to Boivin(1951), a distinct range in France and southeast Eu. and a much later flowering date, mainly in Aug. and early Sept. The basal leaves are velvety with the wide lobes obovate to rhomboid, cleft only half-way to the base and the rhizome tends to be horizontal.

The double form is forma **multiplicipetalus** Boivin, occasionally escaped from culture to roadsides. The type is from the Experimental Station at Kentville.

Introduced from Eu.; Nfld. to B.C. south to Va.

12. **R. bulbosus** L. BULBOUS CROWFOOT or BUTTERCUP

Common from Barrington to Shelburne; scattered along the South \$hore in light soils from Yarmouth to east of Bridgewater; Lawson (1890-1) reports it as perfectly naturalized in Point Pleasant Park, Halifax; Windsor. Probably less common than formerly.

Introduced from Eu.; dry fields and roadsides, Nfld. to B.C. southwards.

2. THALICTRUM L. MEADOW-RUE

The American Thalictra and their old world allies are described by Boivin (1944).

a. Terminal leaflets with 4 or more teeth or lobes; stigmas 2.5-4 mm long; anthers 3-4.5 mm long; stem-leaves below the inflorescence petioled. 1. *T. confine*

a. Terminal leaflets usually with 3 teeth; stigmas 1-2.5 mm long; anthers 0.7-2 mm long; stem-leaves below the inflorescence sessile. 2. *T. polygamum*

1. **T. confine** Fern.

This plant was reported from Grand Lake, Halifax Co., based on a collection made by M.O. Malte in 1934 (Smith and Erskine, 1954). These plants have been reidentified by Boivin as the next species so it is doubtful if any collections of this species exist for our Province. Scattered across N.B. to P.E.I.

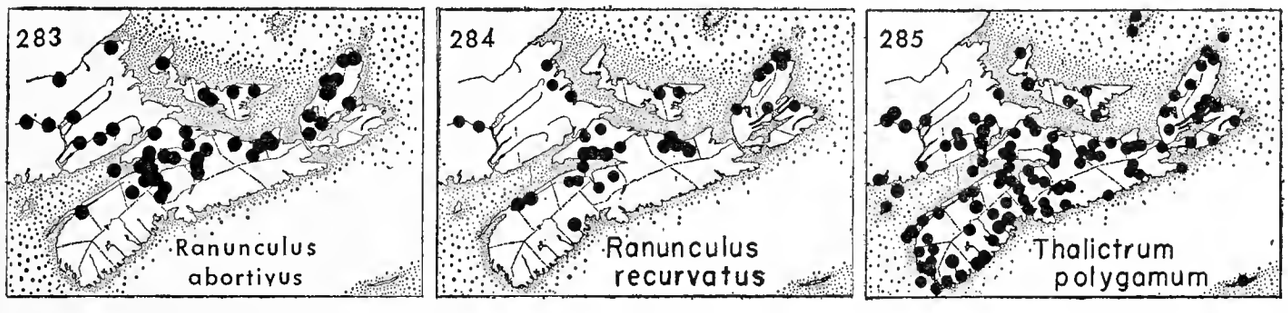
Gaspé to Ont. south to N.S., N.B., and N.Y.

2. **T. polygamum** Muhl. Fig. 74, c. Map 285. MEADOW-RUE

Common throughout in marshes, meadows, ditches and thickets, or even in the climax forest along the flood plains in C.B., one of the most conspicuous of our late summer plants. (*T. pubescens* Pursh).

Var. **hebecarpum** Fern. seems to be a form found in the cooler areas of the Province. The inflorescence is more compact and strongly corymbose, instead of open and paniculate; anthers slightly longer with the filaments 5-6.5 mm long as opposed to 3.5-5 mm in the species; and the stigmas 2-3.5 mm instead of 1.2-2.5. St. Paul I., Tusket, Brier I. It is said to be the only form on Sable I. (*T. Zibellium*). Its range is from Lab. south to N.S. and northern New Eng. July-early Aug.

The species ranges from Nfld. to Ont. south to Ga. and Tenn.



3. HEPATICA Mill.

Steyermark and Steyermark (1960) consider our two eastern N. Amer. plants to be varieties of the European species.

1. **H. americana** (DC) Ker. Fig. 74, d. HEPATICA

Local and very rare: records exist for Bridgewater, Windsor, Pictou, Stewiacke and Antigonish. It formerly grew in a dry pasture at St. Croix, Hants Co., and at Wolfville. Two locations exist east of Stewiacke near the St. Andrew's R. (*H. nobilis* Schreber, var. *obtusa* (Pursh) Steyermark. Mid-May.

N.S. to southern Man. south to Fla.

4. ANEMONE L. ANEMONE

The Anemones are among our rarer plants; erect with palmately divided basal leaves and with a whorl of two or more involucral leaves on the stem, with 1 - several long-pedicelled flowers above them.

a. Plants coarse, 3-12 dm high; basal leaves several; flowers usually several, in mid-summer.
  b. Involucral leaves usually several, distinctly petioled.
    c. Segments of the leaves narrow, wedge-shaped with straight sides; styles at maturity upwardly curved. 1. *A. riparia*
    c. Segments of leaves more ovate, the outer edges outwardly curved; styles at maturity widely divergent. 2. *A. virginiana*

b. Involucral leaves two, sessile. 3. *A. canadensis*
a. Plants 1-2 dm high, delicate and slender, with a solitary basal leaf from a horizontal rootstock; flower solitary, around the first of June. 4. *A. quinquefolia*

1. **A. riparia** Fern. Map 286.

Scattered on talus and cliff ledges, Lockhart Brook, Salmon River, Victoria Co.; Hillsborough in Inverness Co. and other scattered stations in northern C.B. and near Windsor and Truro.

Calcareous and slatey ledges, shores and thickets, N.S. to Que. and Ont. south to N.Y. and Minn.

2. **A. virginiana** L. THIMBLEWEED

Rare, restricted to intervales or banks of rivers; along the Meander R., Hants Co.; occasional in Colchester and Pictou Co.; scattered in western C.B. Early July.

N.S. to B.C. south to Ga.

3. **A. canadensis** L. Map 287.

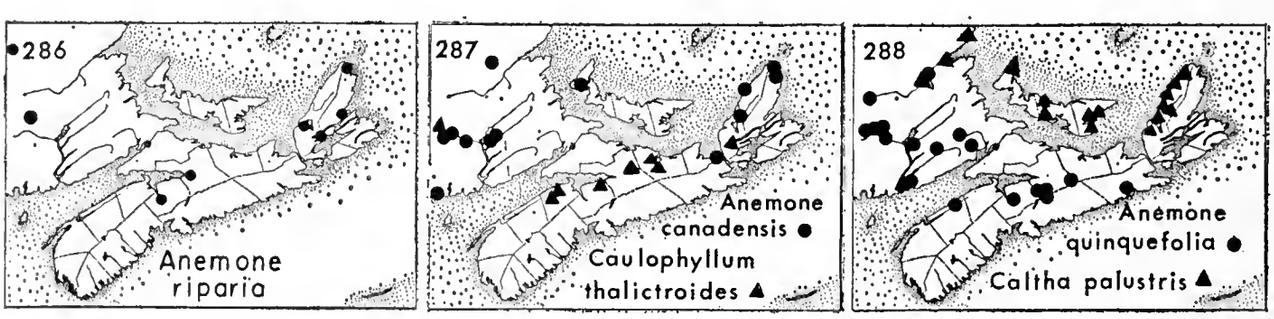
Cape Jack and near Havre Boucher near the sea in Antigonish Co.; Inverness Co.: meadow, Cheticamp; in meadow at the end of a pond at Presqu'ile; Cape North and Bay St. Lawrence. This is another of our rarer plants found growing in P.E.I. where Erskine reports it from damp clay soil of railway ditch and bank at edge of swampy woods halfway between O'Leary and Coleman.

Gaspé to B.C. south to N.S., N.J. and Mo.

4. **A. quinquefolia** L. Map 288. WOOD-ANEMONE

Rare and local; north of Bridgetown, Annapolis Co.; Newport, Hants Co.; Middle Stewiacke and rather common along the St. Andrew's R., Stewiacke and east of Shubenacadie in Colchester Co.; wooded bank of river two miles north of Sherbrooke, Guysborough Co. This, like each of our Anemones, is one of our rarer species and is found on wooded banks of rivers or on shaded intervales. Late May to early June.

N.S. to Ont. south to N.C. and Ohio.



5. **CLEMATIS** L.

1. **C. virginiana** L. Map 289. Fig. 75, a. VIRGIN'S-BOWER

This is one of our few vines, climbing by the bending of the petioles of the leaves. It is scattered throughout, most common in the north-central counties: banks of streams, stony banks, ravines and climbing over thickets. It is one of the more common intervale plants in eastern N.S.; characteristic of the higher parts of the flood plains in northern C.B. Aug. 1-Aug. 15.

N.S. to Man. south to Ga. and La.

6. **CALTHA** L.

1. **C. palustris** L. Fig. 75, d. Map 288. MARSH-MARIGOLD

This plant has a sharply restricted range on marshy places along the coastal plain of northern Inverness Co. The collection of Macoun from Whycocomagh and the record in Lindsay's list from Mahone Bay have not been substantiated in recent years although several attempts have been made to relocate them. Inverness Co.: swale back of beach near Mabou; wet meadow, Northeast Margaree; wet river edge, Margaree River near Margaree Harbour; wet places Terre Noire; wet places, St. Joseph du Moine; swamp, Cheticamp; occasional in marsh near the mouth of the Grand Anse Brook, Pleasant Bay (Smith and Erskine, 1954). Early June.

Lab. to Alaska south to S.C.

7. **COPTIS** Salisb.

1. **C. trifolia** (L.) Salisb. Fig. 75, c. GOLDTHREAD

Common throughout; coniferous forests, swamps, bogs, roadside banks, etc. One colony of plants growing in a spruce wood at Bay St. Lawrence was found to have the leaflets finely dissected. The N. Amer. plants have larger follicles and other minor characters and may be designated as subspecies *groenlandica* (Oeder) Hulten.

Lab. to Alaska south to Md. and in the mts. to N.C.

8. **AQUILEGIA** L.

1. **A. vulgaris** L. Fig. 75, b. GARDEN-COLUMBINE

A garden-escape established in many parts of the Province where it has spread to roadsides, fields and damp hollows, especially in rich, shady locations. Double forms and various colors are occasionally seen. Late May-early June.

Introduced from Eu. and widely established.

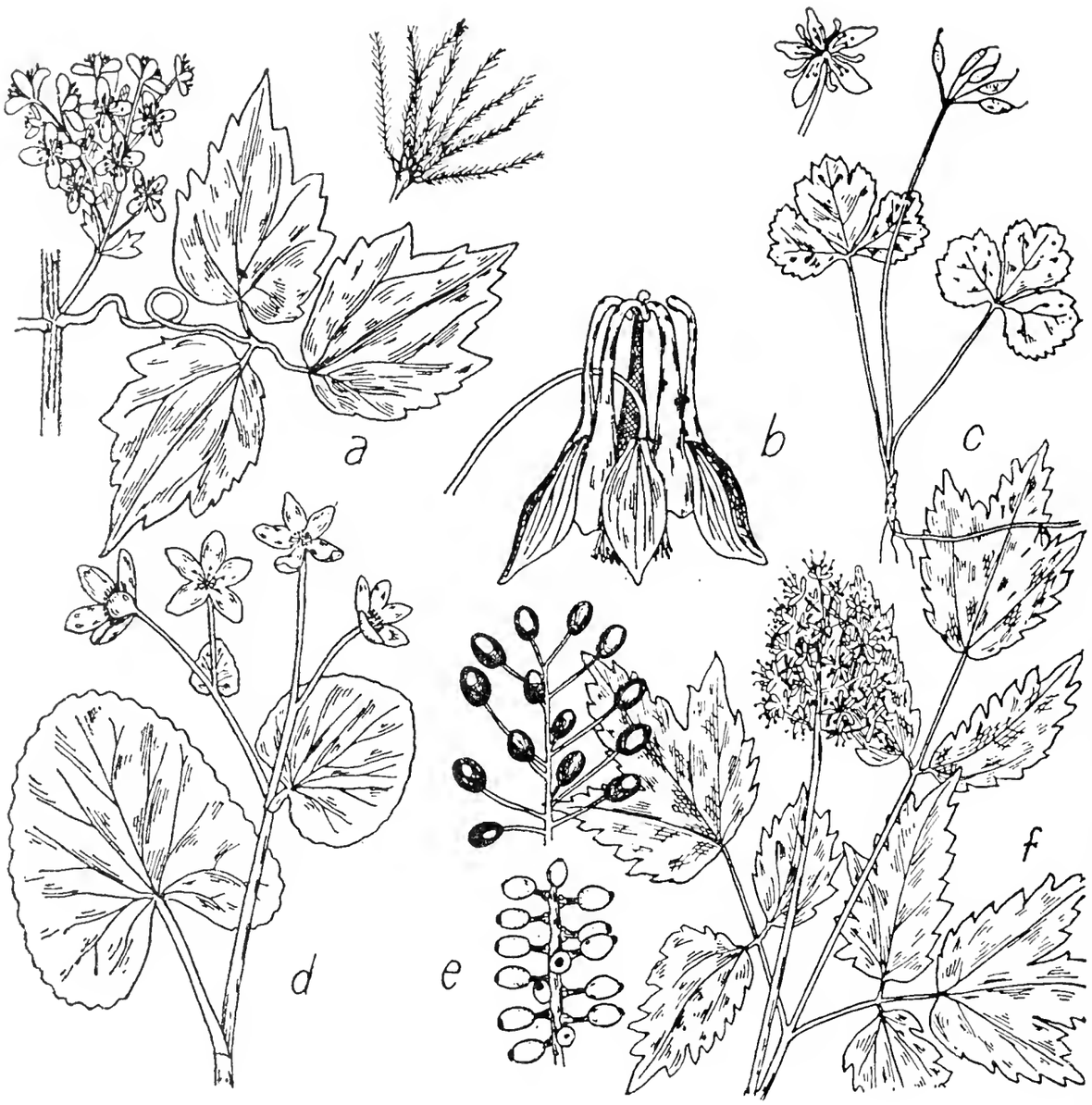


Fig. 75. **Clematis:** (a) *C. virginiana* x $\frac{1}{2}$, achenes x 1. — **Aquilegia:** (b) flower x $\frac{1}{2}$. — **Coptis:** (c) fruiting plant and flower x $\frac{1}{2}$. — **Caltha:** (d) *C. palustris* x $\frac{1}{3}$. — **Actaea:** (e) *A. pachypoda*, fruiting raceme x $\frac{1}{2}$, (f) *A. rubra*, plant and fruiting raceme x $\frac{1}{2}$.

9. ACONITUM L. MONKSHOOD

See "The Cultivated Aconites" (Munz, 1945).

1. A. Napellus L. MONKSHOOD

This genus is very variable and many of the plants sold under this name belong to different species. *A. Napellus* has the leaves divided into a number of linear segments; and the inflorescence is spike-like with the pedicels often pubescent. The two following species, both with glabrous pedicels, have been occasionally found about old house-sites or rarely escaping to roadsides. *A. bicolor* Schultes has the segments of the leaves $\frac{1}{4}$ inch wide, with the flowers mostly white with purple margins and the helmet strongly arched and gaping with a short beak. *A. variegatum* L. has the leaves palmately 3-lobed, the helmet wider than long and without a prominent beak.

Nfld. to Ont. and N.Y.; introduced from Eu. and spreading from cultivation.

10. ACTAEA L. BANEBERRY

Perennial woodland plants with large 2-3-compound leaves and with small flowers in a long-stalked terminal raceme; fruit a several-seeded berry which is poisonous.

a. Ovary wider than the stigma; leaves pubescent over the whole lower surface; fruit usually red, with slender pedicels 8-15 mm long. 1. *A. rubra*
a. Ovary narrower than the cap-like stigma; leaves glabrous beneath except for a few hairs on the veins; fruit glossy white, on thick stout pedicels 3-10 mm long. 2. *A. pachypoda*

1. **A rubra** (Ait.) Willd. Fig. 75, f. Map 290. RED BANEBERRY

Characteristic of hardwood forests in the richer soils and along the edges of intervales; most common from Annapolis Co. to northern C.B., rare to absent in the southwestern counties and along the Atlantic Coast. May 15-May 30.

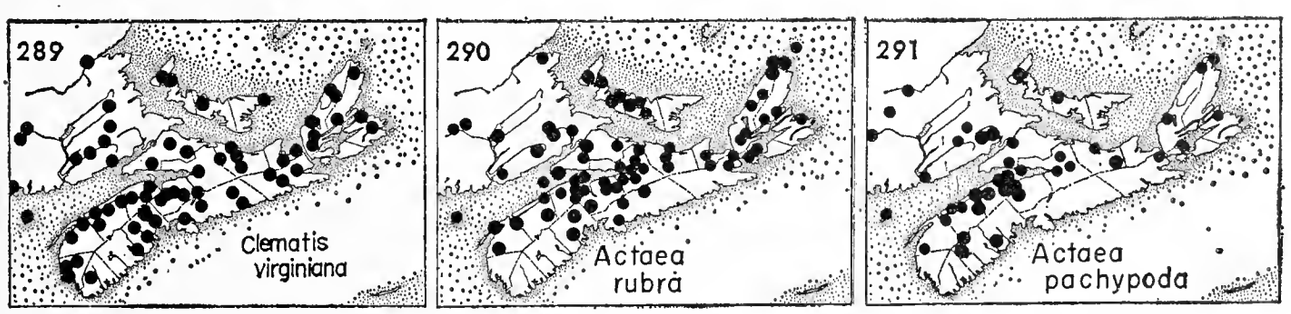
Forma **neglecta** (Gillman) Robins. has pure white berries. This form is common on many of the intervales of Kings and Colchester Co.; Jeffers Brook, Cumberland Co.; and scattered in central and northern C.B.

Lab. to Alaska south to N.J. and Nebr.

2. **A. pachypoda** Ell. Fig. 75, e. Map 291. WHITE BANBERRY

Characteristic of hardwood climax forests and intervales, rocky or open woodlands, around the edges of woods, generally in loamy or somewhat light soils. Annapolis and Cumberland Co. to northern C.B.; absent or very rare in the counties along the Atlantic Coast and in southwestern N.S. Late May-early June. (*A. alba* (L.) Mill of other authors). See Fernald (1940).

N.S. to Ont. south to Ga. and Mo.



48. BERBERIDACEAE BARBERRY FAMILY

A small family with the species most numerous in eastern Asia. The sepals, petals and stamens are in 6's; sepals petal-like and the petals smaller or reduced to small gland-like bodies. The May-apple, *Podophyllum peltatum* L., has been planted and persists, as at Wittenburg in

Colchester Co., but scarcely spreads. This is a low herb with peltate, deeply-lobed leaf and one flower per plant forming an ovoid pulpy fruit.

a. Plants herbaceous with blue, berry-like fruits; leaves 3- parted and divided, bluish-green and glaucous when young; flowers greenish-purple. 1. *Caulophyllum*
a. Plants shrubby, spiny; berries red; introduced shrubs. 2. *Berberis*

1. CAULOPHYLLUM Michx.

1. **C. thalictroides** (L.) Michx. Map 287. BLUE COHOSH

This is a rare but distinctive plant. The fertile stem has one large sessile 3-ternate leaf part way up and a smaller one just below the panicle. A few plants are present under sugar maples on the intervale at Kemptown, Colchester Co. and it is scattered in hardwoods a few miles north; found by Schofield in woods at the edge of intervales at Brooklyn Corner and at Cambridge, Kings Co.; very rare in a meadow thicket, Melford, Inverness Co.

N.S. to Man. south to the mts. of S.C.

2. BERBERIS L. BARBERRY

a. Leaves with spiny-toothed edges; thorns mostly in 3's; berries in hanging racemes as with currants. 1. *B. vulgaris*
a. Leaves with smooth edges; thorns mostly solitary; berries in small clusters as with gooseberries. 2. *B. Thunbergii*

1. **B. vulgaris** L. Fig. 76, a. COMMON BARBERRY

Formerly much planted as an ornamental around drive-ways and buildings. Scattered bushes still persist, and occasional escapes may be found. This shrub is the alternate host of the black stem-rust of cereals and should be exterminated when found. Similar-appearing rust-resistant species are now being planted.

Native of Eu.; widely introduced.

2. **B. Thunbergii** DC. JAPANESE BARBERRY

Commonly planted as an ornamental shrub or for hedges; occasionally found as an escape or waif. Native of Japan and widely distributed as an ornamental.

49. PAPAVERACEAE POPPY FAMILY

The plants of this family exude a milky or brightly-colored juice; sepals 2, soon falling; petals 4 to numerous; stamens many.

a. Perennial, stemless; juice bright red; leaves large and palmately lobed; petals 4-12, white (Fig. 76, b); native. 1. *Sanguinaria*

a. Biennial, tall and branched; juice orange; leaves coarsely pinnatifed; petals 4, yellow (Fig. 76, c). 2. *Chelidonium*
a. Annual, low; juice whitish; leaves pinnately lobed; petals 4, large, reddish to scarlet; poppies. 3. *Papaver*

1. SANGUINARIA L.

1. **S. canadensis** L. Fig. 76, b. Map 292. BLOODROOT

Low ground near streams and in rich intervales, usually in shade; often growing just above high-water level along the rivers. Kings Co.: rare in rich thicket at Cambridge (Schofield, 1949); Hants Co.: rather rare; common around Truro and along many of the streams and rivers, abundant on the wooded intervale at Kemptown; scattered in Cumberland Co., as at Mapleton and Waugh's River; to Middle River, Big Baddeck and N.E. Margaree in C.B. where it may form a carpet covering large areas. This plant is variable and several dubious varieties have been proposed. Early May.

N.S. to Man. south to Fla.

2. CHELIDONIUM L.

1. **C. majus** L. Fig. 76, c. CELANDINE

Fairly common about towns and villages in southern Digby, Yarmouth and Shelburne Co.; scattered eastward, Port Medway, Milton and Halifax. July-Aug.

Introduced from Eu.; N.S. to Ont. south to N.C.

3. PAPAVER L. POPPY

a. Leaves merely toothed, rounded at the base and prominently clasping; peduncle smooth or with but a few scattered hairs. 1. *P. somniferum*
a. Leaves deeply toothed to pinnately lobed, tapering to the base; peduncle bristly hairy, at least below.
b. Capsule subglobose to broadly obovoid, rays on the upper surface of the stigma 8-14, usually 10. 2. *P. Rhoeas*
b. Capsule club-shaped, twice as long as wide or more; rays of the stigma 5-9. 3. *P. dubium*

1. **P. somniferum** L. POPPY

Occasional on rubbish dumps and in waste places; Sydney, Bridgewater, Yarmouth, and scattered elsewhere.

Introduced from Eurasia; an ornamental flower.

2. **P. Rhoeas** L. CORN-POPPY, SHIRLEY POPPY

Occasional on rubbish dumps, rarely as an escape in fields. Collected by H. Groh from Amherst, Pictou and Sydney; reported by others from near different ports in the northern counties. July-Aug.

Introduced from Eu. and widely distributed across Canada.

3. **P. dubium** L.

Very similar to the preceding species; sparingly introduced and known from N.S. and N.B.

N.S. to N.C. west to Mo.; native of Eu.

50. FUMARIACEAE FUMITORY FAMILY

Glabrous herbs with thin, finely divided or dissected leaves and watery juice; flowers irregular, with two small sepals; petals 4, one or both of the two outer ones spurred or saccate at the base; stamens 6.

a. Corolla with the two opposite petals spurred at the base; fruit several-seeded.
b. Plant climbing; petals firmly united and the corolla spongy; seeds not crested. 1. *Adlumia*
b. Plant low, leaves all basal; petals slightly united, not spongy; seeds crested (Fig. 76, e). 2. *Dicentra*
a. Corolla with but one of the petals spurred or saccate at the base.
c. Fruit oblong, several-seeded; flowers purplish-green or rose colored with yellowish tips, 10-15 mm long (Fig. 76, d). 3. *Corydalis*
c. Fruit round, 1-seeded; flowers deep purple, tipped with crimson, 5-7 mm long. 4. *Fumaria*

1. ADLUMIA Raf.

1. **A. fungosa** (Ait.) Greene CLIMBING FUMITORY

Formerly planted about gardens and grounds where it may be very persistent, with the seeds retaining their vitality for years; rare, and now seldom seen, collected by J. S. Erskine, among weeds, Point Pleasant Park, Halifax.

Eastern Que. to Wisc. south to N.C.

2. DICENTRA Bernh. DUTCHMAN'S-BREECHES

1. **D. Cucullaria** (L.) Bernh. Fig. 76, e. Map 293.

Rich woods, intervales and hardwood hillsides; Cape Blomidon, Kings Co. and Moose R. in Cumberland Co.; common in the Cobequids and around Truro, east to central and northern C.B. at Cape North. It is best developed on the intervales and hardwood slopes in Colchester and Pictou Co., more restricted to intervales eastward. May 20-June 10.

N.S. to N.D. south to Ga. and Mo.

3. CORYDALIS Medic.

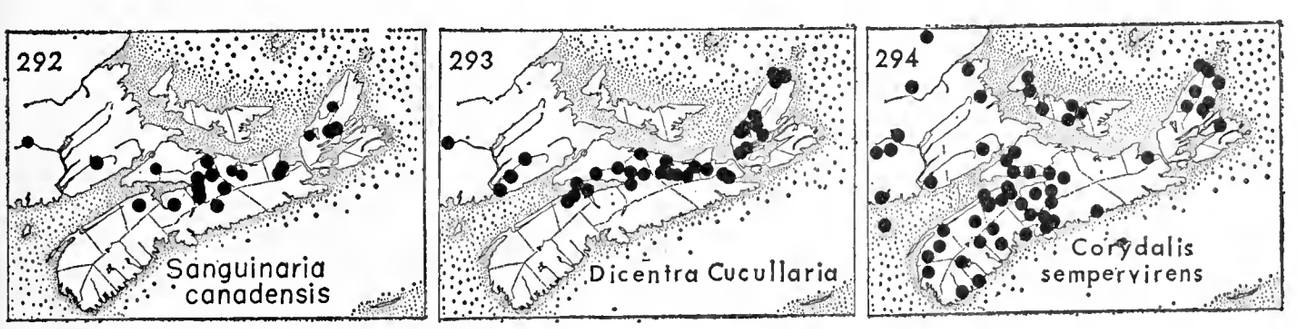
1. **C. sempervirens** (L.) Pers. Fig. 76, d. Map 294. PINK CORYDALIS

Common in the Annapolis Valley and Cumberland Co. to northern C.B.; probably scattered throughout although it seems rare along the

Fig. 76.—**Berberis:** (a) *B. vulgaris* x $\frac{1}{2}$. — **Sanguinaria:** (b) flowering plant x $\frac{1}{3}$. — **Chelidonium:** (c) top of plant x $\frac{1}{2}$. — **Corydalis:** (d) part of plant x $\frac{1}{2}$. — **Dicentra:** (e) *D. Cucullaria* x $\frac{1}{3}$.

Gulf of St. Lawrence and Guysborough Co.; rocky places where leaf mould has washed into hollows and pockets; most noticeable the first year on newly-burnt land and in new-cleared areas where it grows from seeds that have lain dormant. June-Sept.

Nfld. to Alaska south to Ga., Minn. and Kans.



4. FUMARIA L.

a. Flowers 4-6 mm long; fruit without a sharp point; leaf-segments flat and not channelled. 1. *F. officinalis*
a. Flowers 4 mm long or less; fruit with a sharp point; leaf-segments very narrow and channelled. 2. *F. parviflora*

1. F. officinalis L. COMMON FUMITORY

Scattered; occasionally about gardens where it is cultivated or persisting; Lawson (1890-1) records it as sparingly spontaneous in gardens in Halifax; now more often seen as a ballast weed or on gravelly or rocky beaches, as at Mill Village, Westport, Windsor, Guysborough and Havre Boucher. In one field in Cumberland Co. the farmer reported it as a bad weed. July-Aug.

Introduced from Eu.; scattered and widespread.

2. F. parviflora Lam.

Formerly sparingly introduced around some of the seaports of the New World (Lawson, 1890-1); Macoun records it from waste heaps at Bedford, Pictou and North Sydney. No recent collections have been made and it is doubtful if this plant persists in the Province.

51. CRUCIFERAE MUSTARD FAMILY

A large and distinctive family with flowers normally with 4 sepals, 4 petals, 6 stamens and a superior ovary with two cells. All our plants are herbaceous and the majority are common introduced weeds. Many members commonly have flowers and developing fruits on the plant at the same time.

a. Flowers white, creamy-white, greenish or purplish.
b. Fruit transversely divided into two cells; plants fleshy, found only on sea-shores (Fig. 78, e). 11. *Cakile*
b. Fruit longitudinally divided into two cells.
c. Fruit short, less than 4 times as long as wide.
d. Fruit flattened parallel to the partition.
Plant low; leaves toothed; stems and pods green, almost smooth; petals not lobed; rare native plants. 1. *Draba*
Plants much branched and higher; leaves entire; stem and pods whitish-hairy; petals deeply 2-lobed; weed of sandy soil. 2. *Berteroa*
d. Fruit flattened at right angles to the narrow partition or nearly round or terete.
e. Leaves deeply and irregularly pinnately lobed.
Fruit two nutlets placed side by side (Fig. 77, e). 6. *Coronopus*
Fruit wedge- or purse-shaped (Fig. 77, c). 8. *Capsella*
e. Leaves entire or merely toothed.
f. Fruit roundish in outline, flat, often with a margin extending at the tip.
g. Fruit 10-12 mm wide; plants rarely branched (Fig. 77, a). 3. *Thlaspi*
g. Fruit 2-4 mm wide; plant usually much branched at the apex.

Fruits round to oval, notched at the summit, readily dehiscing (Fig. 77, b). 4. *Lepidium*

Fruits heart-shaped, pointed at the summit with a prominent style, indehiscent or nearly so; perennial with rhizomes; stem-leaves sagittate-clasping. 5. *Cardaria*

f. Fruit orbicular or oblong-cylindrical.

h. Fruit perfectly orbicular; leaves widely clasping at the base (Fig. 77, d). 10. *Neslia*

h. Fruits oval or oblong in outline; leaves linear or wide, not clasping at the base.

i. Plants found on sandy or gravelly lake-bottoms, 2-8 cm high; leaves basal and thread-like (Fig. 78, a). 7. *Subularia*

i. Plants growing on dry land; leaves flat or lobed.

j. Leaves clasping, not toothed. 9. *Camelina*

j. Leaves not clasping, toothed, 15-30 cm long at the base of the plant. 23. *Armoracia*

c. Fruits 4 to many times as long as wide.

k. Stem-leaves 2, opposite, each with 3 leaflets; woodland plants (Fig. 80, b). 25. *Dentaria*

k. Stem-leaves many, entire or pinnately-cleft.

l. Petals 15-20 mm long, purplish or rarely white; leaves not divided, 8-13 cm long; seeds in one row in each cell. 19. *Hesperis*

l. Petals very small, or if 12 mm long then the leaves pinnately-compound.

m. Leaves lanceolate, finely toothed or entire. 27. *Arabis*

m. Leaves all finely pinnately-lobed.

n. Stems often floating on or in water, much branched, leafy; pods terete and curved; seeds in 2 rows in each side or cell (Fig. 78, f). 22. *Nasturtium*

n. Stems erect, unbranched or branched only near the top, the leaves chiefly basal; pods straight, flattened, the seeds in 1 row in each cell (Figs. 79, e; 80, a). 26. *Cardamine*

a. Flowers yellow or creamy-yellow.

o. Fruit not more than 3 times as long as wide, less than 6 mm long.

p. Leaves not toothed, usually clasping.

Fruit ovate, smooth. 9. *Camelina*

Fruit globose, roughened (Fig. 77, d). 10. *Neslia*

p. Leaves pinnately lobed or finely divided.

Fruit two nutlets placed side by side, the surface rough; leaves finely divided; rare (Fig. 77, e). 6. *Coronopus*

Fruit not double, oblong; lower leaves with wide lobes.

Fruits with wall thin and dehiscent, oblong, the surface smooth; common weeds (Fig. 80, c). 21. *Rorippa*

Fruits indehiscent, tapering to a beak, the surface coarsely warty, 7-10 mm long. 19. *Bunias*

o. Fruit 4 to many times as long as wide.

q. Fruits not opening, the wall fleshy and becoming hard, forming many 1-seeded sections; sepals erect and appressed to the petals (Fig. 78, d). 12. *Raphanus*

q. Fruits splitting when ripe into 2 longitudinal halves.

r. Seeds in two rows in each side or cell; rare. 15. *Diplotaxis*

r. Seeds in one row in each cell.

s. Leaves pinnate, or more or less pinnately-lobed.

t. Flowering racemes with leafy bracts; leaves not clasping; pedicels 5 mm long or longer, with the fruit spreading. 14. *Erucastrum*

t. Flowering racemes without bracts.
u. Fruits closely appressed to the stem; flowers 3 mm wide (Fig. 79, a). 17. *Sisymbrium*
u. Fruits not closely appressed, or if appearing so then with the flowers much larger.
v. Fruits extremely long and slender, not thicker than their pedicels (Fig. 79, b). 17. *Sisymbrium*
v. Fruits wider than the diameter of their pedicels.
w. Leaves extremely finely divided; pods long, slender and curved; plants with 2-pronged or stellate hairs. 18. *Descurainia*
w. Leaves widely lobed or pinnate; plants with simple hairs, or glabrous.
x. Leaves thin, often hairy, with toothed lobes; flowering late June to Nov.; beak of the fruit 8-15 mm long; sepals spreading in flower (Fig. 78, c). 13. *Brassica*
x. Leaves mostly glossy and smooth above with mostly rounded lobes; flowering May and early June; beak of fruit less than 4 mm long (Fig. 79, d). 24. *Barbarea*
s. Leaves entire or merely toothed.
y. Leaves smooth and glabrous, sagittate-clasping at the base, the edges with no teeth. 16. *Conringia*
y. Leaves not sagittate-clasping at the base, dull, often toothed.
z. Leaves more than 1.5 cm wide, oval, coarsely toothed (Fig. 78, c); plants with simple hairs. 13. *Brassica*
z. Leaves linear or lanceolate, rarely more than 1.5 cm wide (Fig. 79, c); plants with 2-pronged or stellate hairs. 20. *Erysimum*

1. DRABA L.

Native low herbs of northern regions, ours with basal rosettes of leaves and small erect racemes of white flowers.

a. Lower part of the stem and the basal leaves, especially when young, with numerous simple and forking, occasionally a few stellate, long hairs; fruits 7-9 mm long with pedicels 1-5 mm long. 1. *D. norvegica*
a. Lower part of the stem and the basal leaves closely and minutely stellate-pubescent.
b. Fruits strongly flattened, often twisted, 7-12 mm long and 1/3 to 1/4 as wide; petals 4-6 mm long. 2. *D. hirta*
b. Fruits plump, 4-6.5 mm long and 1/2 as wide; petals about 3 mm long. *D. hirta* var. *pycnosperma*

1. **D. norvegica** Gunn.

First found by Macoun in crevices of rocks, Big Intervale, Margaree, C.B. A second station for Inverness Co. was reported by Smith and Schofield (1952): locally abundant on dry exposed shelves of limestone cliffs, Big Southwest Brook. The latter collection has the racemes

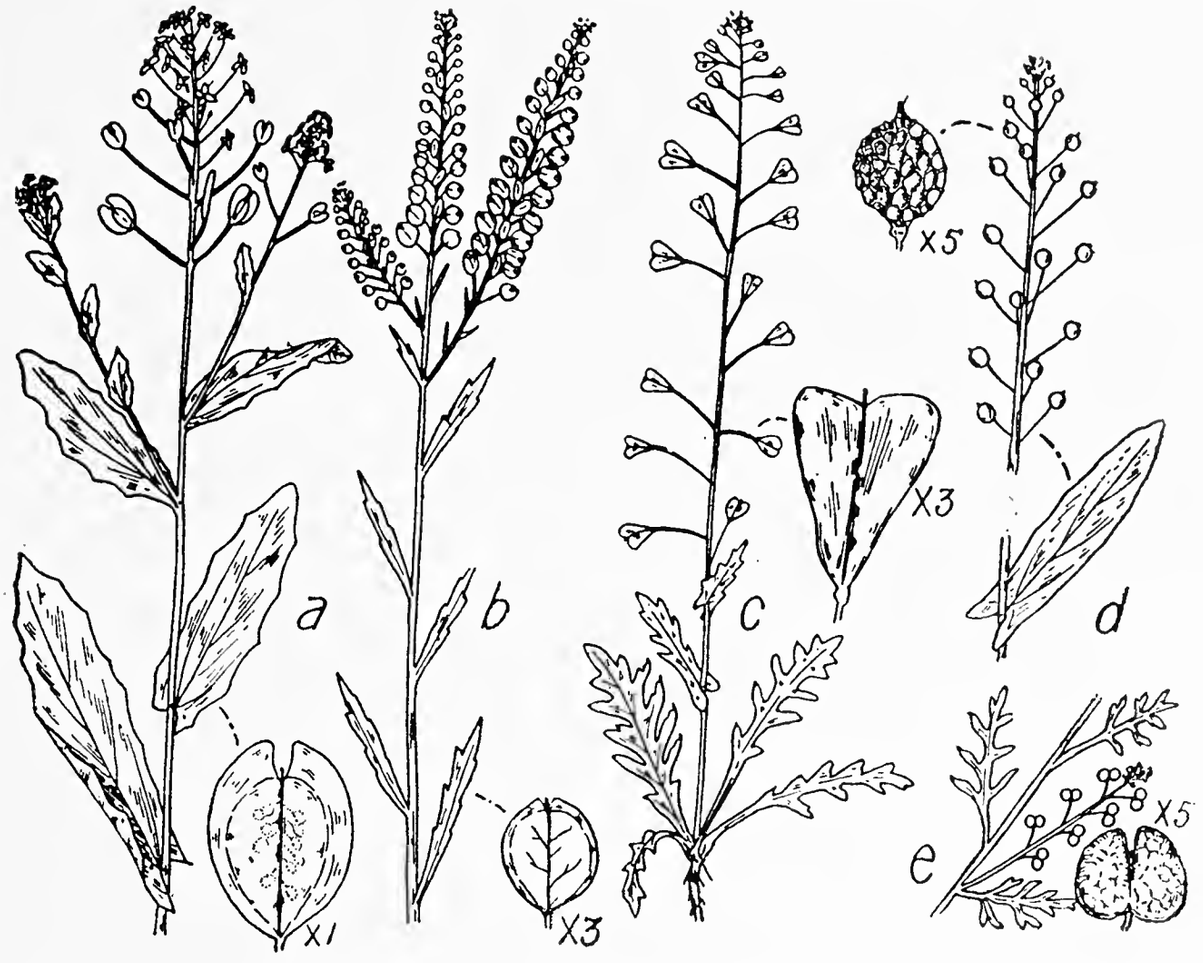


Fig. 77.—**Thlaspi**: (a) plant x $\frac{1}{2}$. — **Lepidium**: (b) *L. densiflorum* x $\frac{1}{2}$. — **Capsella**: (c) small plant x $\frac{1}{2}$. — **Neslia**: (d) leaf and inflorescence x $\frac{1}{2}$. — **Coronopus**: (e) *C. didymus*, small part of plant **x $\frac{1}{2}$.**

rather open, the fruits narrow and only about 1.5 mm wide, and the leaves narrowly lanceolate. This is typical of var. **clivicola** (Fern.) Boivin, a plant also known from the Shickshock Mt. of e. Que.

Northern Canada and Eu. south to N.S. and Que.

2. **D. hirta** L. Map 295.

Local and sometimes abundant around the head of the Bay of Fundy and in eastern and northern C.B. in crevices of high cliff-ledges and on talus slopes: coniferous slope of Cape Blomidon; relatively common on the cliffs of Isle Haute (Schofield, 1955); rare on cliff crevices and on exposed cliff top at Cape d'Or, small moist rock outcrop east of Refugee Cove, and abundant on a high cliff at New Prospect, in Cumberland Co. It is rather characteristic of cliff-ledges and talus slopes in northern C.B., as at Lockhart Brook, Salmon River, at Indian Brook and at Burnt Mt., Gray Glen (Smith and Erskine, 1954).

The plants of N.S. are variable and seem to have combinations of the characters of *D. glabella* Pursh and *D. arabisans* Michx. The fruits are often rather short and not twisted; and occasionally the stem-leaves are rounded at the base and rather wide. In its wider sense *D. hirta* ranges from Nfld. to Alaska south to northern N.Y.; Eurasia.

Var. **pycnosperma** (Fern. & Knowlt.) Boivin is found at only one location in the Province: Victoria Co., locally abundant and diseased, dry cliff ledges, Lockhart Brook, Salmon R. (Smith and Erskine, 1954).

Northeastern Nfld. and Gaspé Co., Que.; N.S.

2. BERTEROA DC. HOARY ALYSSUM

1. **B. incana** (L.) DC.

Local; abundant near Aylesford, Kings Co., and locally spreading in the same county on the sandy soils. This is an aggressive weed on light soils and in some fields it is a troublesome plant. Very local 20 years ago but probably destined to spread throughout the Valley.

Naturalized from Eu.; N.S. to B.C. south to W. Va.

3. THLASPI L.

1. **T. arvense** L. Fig. 77, a. PENNY-CRESS, STINKWEED

Introduced and scattered mostly about dwellings, along roadsides and in waste places about towns or along railroads. It seems to be introduced mostly in western grain or feed and is invariably seen about chicken-runs. It does not seem to persist although it is sometimes found in oat fields. July-Sept.

Naturalized from Eu.; widely distributed in N. Amer.

4. LEPIDIUM L. PEPPERGRASS

Annual or biennial, weedy plants with numerous racemes of insignificant white flowers and flat, rounded fruits. See Mulligan (1961-a).

a. Stem-leaves sessile, cordate clasping at the base; plant densely short pubescent. 1. *L. campestre*

a. Stem-leaves tapering to the base, not clasping.
  b. Fruits 5-7 mm long, on thick erect pedicels, widely winged around both sides; leaves generally all narrowly pinnately-lobed; stamens 6. 2. *L. sativum*
  b. Fruits 2-3.5 mm long, on spreading pedicels; stamens reduced to 2, or rarely 4.
    c. Petals present, up to 2 mm long, equalling or exceeding the sepals; the radicle of the seed bent back along the edges of the cotyledons; fruit glabrous. 3. *L. virginicum*
    c. Petals absent or shorter than the sepals; the radicle in the seed bent back along the flat side of one of the cotyledons.
      d. Lower leaves bi-pinnately lobed, the upper stem-leaves obtuse or rounded at the tip; fruits entirely wingless, narrowed to the tip so as to appear slightly elliptic, glabrous. 4. *L. ruderale*
      d. Lower leaves coarsely toothed to lobed, the upper stem-leaves acute at the tip; fruits strongly rounded at the tip, and slightly winged above. 5. *L. densiflorum*

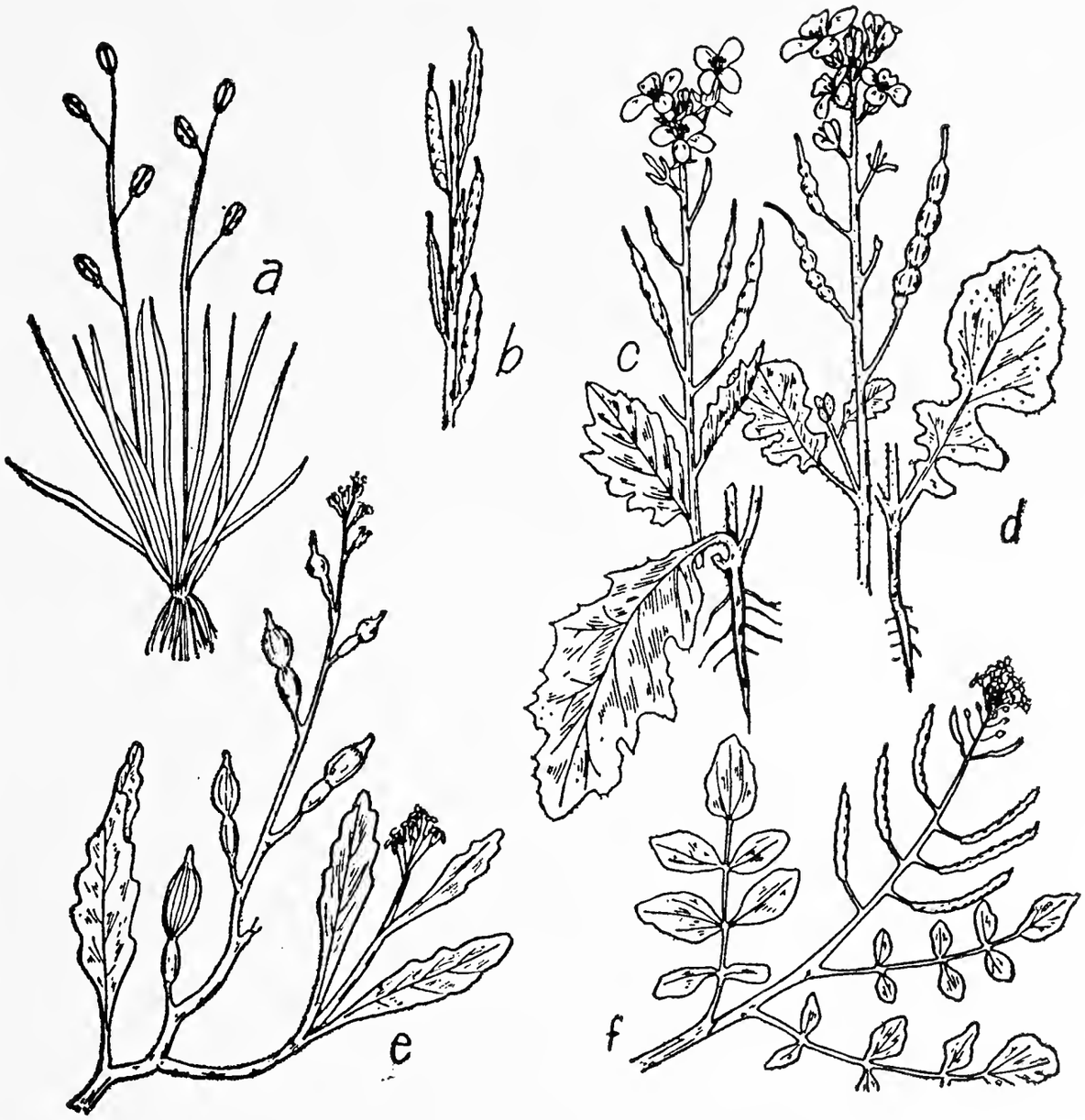


Fig. 78.—**Subularia:** (a) whole plant x 1. — **Brassica:** (b) *B. nigra*, fruits x 1, (c) *B. Kaber* x $\frac{1}{3}$. — **Raphanus:** (d) part of plant x $\frac{1}{3}$. — **Cakile:** (e) branch x $\frac{1}{2}$.— **Nasturtium:** (f) branch x $\frac{1}{2}$.

1. **L. campestre** (L.)R. Br. Map 295. FIELD-PEPPERGRASS

Waste places, roadsides and about towns, scattered now more or less throughout although not yet a common weed.

Introduced from Eu. and widespread in N. Amer.

2. **L. sativum** L. GARDEN CRESS

Occasionally found as a weed in gardens, or persisting where once grown; not spreading to native habitats.

Introduced from Eu., commonly cultivated and as a casual escape.

3. **L. virginicum** L. PEPPERGRASS

Scattered throughout, often becoming a bad weed in lighter soils, where the plant often grows as a biennial. This species and *L. densiflorum* are very similar and the only certain distinction is said to be the

position of the radicle and the cotyledons in the seeds. This can be seen best by making a thin cross-section of the seed with a razor-blade. May-Sept.

Nfld. to S.D. south to Fla.

4. **L. ruderale** L. NARROW-LEAVED PEPPERGRASS

Old records show the plant to be found from Windsor to Sydney; collections have been seen from Windsor, Pictou and Sydney. It is rare.

Introduced from Eu.; Nfld. to Sask. south to La.

5. **L. densiflorum** Schrad. Fig. 77, b.

Becoming a common weed, especially on the lighter soils of the Annapolis Valley; scattered by roadsides, towns and railroads elsewhere. May-Sept. This plant is very similar to *L. virginicum* and is probably often confused with it.

N.S. to B.C. southward; probably introduced in N.S.

5. CARDARIA Desv.

1. **C. Draba** (L.) Desv. HOARY CRESS

Roadsides, waste places and ballast; Yarmouth, where it is scarce (Fernald, 1921); occasionally elsewhere, usually about railroads or in waste places. The species introduced into N. Amer. are discussed by Mulligan and Frankton (1962).

Native of central Asia and the Balkans; widely distributed and a bad weed elsewhere.

6. CORONOPUS Trew

Much-branched plants with finely divided leaves and small, roundish nutlet-like fruits in pairs; flowers minute and white.

a. Fruit notched at the summit so that two nutlets are nearly distinct, rough-wrinkled. 1. *C. didymus*

a. Fruit not notched at the summit so that the two nutlets seem like two halves of a sphere, tubercled. 2. *C. procumbens*

1. **C. didymus** (L.) Sm. Map 296. Fig. 77, e. SWINE or CARPET-CRESS

Occasional in waste ground, railroad yards and about seaports; rather common in such situations in Digby and Yarmouth Co. Very seldom found far from the sea-shore. May-Aug.

Introduced from Eurasia; Nfld. south to Fla. and Tex.

Fig. 79.—**Sisymbrium:** (a) *S. officinale* x $\frac{1}{2}$, (b) *S. altissimum*, leaf and fruit x $\frac{1}{2}$. — **Erysimum:** (c) *E. cheiranthoides* x $\frac{1}{2}$. — **Barbarea:** (d) whole plant x $\frac{1}{4}$. — **Cardamine:** (e) *C. pensylvanica* x $\frac{1}{2}$.

2. **C. procumbens** Gilib.

Rare; infrequently introduced and probably not persisting; known from Pictou where it was first recorded by Lawson (1890-1) as being collected on ballast in 1883. Not recently collected.

Adventive from Eu.; N.S. to Fla.

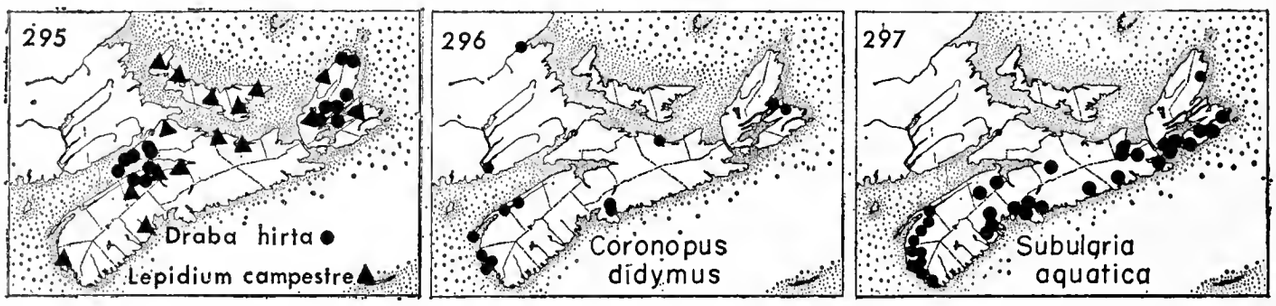
7. SUBULARIA L. AWLWORT

Only two species are known, one around the northern hemisphere and one in central Africa. Our northern species can be divided into two populations, one in Eurasia and one in N. Amer. (Mulligan and Calder, 1964; Boivin, 1966-c).

1. **S. aquatica** L., var. **americana** (Mull. & Calder) Boivin. Fig. 78, a. Map 297. AWLWORT.

Usually submersed and scattered on the gravelly bottoms of lakes and at the margins of slow streams; occasionally in great abundance, forming mats on the bottoms of lakes. It appears to be most common in the extreme southeast and southwest portions of the Province, with scattered stations elsewhere. No collections have been made from the north-central area from Cumberland to eastern Pictou Co.

Greenland to Alaska south to n. N.Y. and Calif.



8. **CAPSELLA** Medic.

1. **C. Bursa-pastoris** (L.) Medic. Fig. 77, c. SHEPHERD'S-PURSE

Common throughout in gardens, cultivated fields and waste places, and easily recognized by the purse-shaped pods. Very variable; early May to Nov., often growing as a winter annual.

Introduced from Eu.; throughout N. Amer.

9. **CAMELINA** Crantz FALSE FLAX

Scattered, introduced coarsely-branched plants with small yellow flowers and racemes with the fruits smooth and ovoid or pear-shaped.

a. Leaves and stems sparsely pubescent, with minute stellate hairs and scattered short straight ones; fruits 7-9 mm long. 1. *C. sativa*

a. Leaves and stems roughly pubescent with the simple hairs 1-2 mm long and exceeding the stellate ones; fruits 5-7 mm long. 2. *C. microcarpa*

1. **C. sativa** (L.) Crantz FALSE FLAX

Fields and waste places, very occasionally introduced. Older records were made before *C. microcarpa* was recognized as a separate species, so that the status of this plant in N.S. is dubious; not persisting.

Adventive from Eu.; scattered from N.S. to B.C. south to Va.

2. **C. microcarpa** Andrz.

Occasional in grain fields and as a casual weed around farm-yards and railroad yards; more common than the preceding species but still rarely seen.

Introduced from Eu.; N.S. to B.C. southward, in our area mostly introduced from further west.

10. **NESLIA** Desv.

1. **N. paniculata** (L.) Desv. Fig. 77, d. BALL-MUSTARD

Scattered in grain fields, about railroad yards and in waste places, probably also mainly introduced in western seed and feed, easily recognized by the spherical, hard fruits.

Introduced from Eu.; Nfld. to B.C. south to Penn., more common westward.

11. **CAKILE** Hill

1. **C. edentula** (Bigel.) Hook. Fig. 78, e. Map 298. SEA-ROCKET

Common near the coast on sandy beaches, dunes and cliffs, and on shingle beaches; in brackish lakes on Sable I. July-Sept., the flowers pale purple.

Atlantic Coast from Lab. to S.C.; on the Pacific Coast, and a variety about the Great Lakes.

12. **RAPHANUS** L.

1. **R. Raphanistrum** L. Fig. 78, d. WILD RADISH, CHARLOCK

A common and troublesome weed, especially in the Annapolis Valley, but now scattered more or less throughout. It is still actively spreading and increasing in abundance in many areas although the use of chemical sprays has become general where it is troublesome. Distinguished from wild mustard by its paler flowers and its upright, instead of spreading, sepals. June-Oct.

Introduced from Eu.; Nfld. to Man. south to Ky.

13. **BRASSICA** L. MUSTARDS

About 50 species, with many in cultivation as highly specialized forms. Cabbage, Brussel Sprouts, Cauliflower, Broccoli, Kohlrabi, Rape, Rutabaga and Turnip are occasionally found flowering. The forms considered here are introduced weeds.

a. Upper stem-leaves tapering to the base, little or not clasping.
  b. Beak of the fruit flattish, about as wide as the pod, often with a seed at the base, each half with 3 veins of about equal size.
    c. Fruiting pedicels about 10 mm long; fruits about 4 mm thick, stiff-hairy, with the beak as long as the body or longer. 1. *B. hirta*
    c. Fruiting pedicels 3-7 mm long; fruits slender, about 2 mm thick, smooth or sparingly hairy, with the beak a third to nearly as long as the body. 2. *B. Kaber*
  b. Beak of the fruit terete, slender, much narrower than the body, without seeds at the base, each half of the fruit with a more-prominent mid-vein.
    d. Fruits 3-7 cm long, 2-3.5 mm thick, spreading, the beak 6-12 mm long; pedicels 7-10 mm long. 3. *B. juncea*

d. Fruits 1-2 cm long, about 1 mm thick, appressed to the axis of the inflorescence, the beak 1.5-3 mm long; pedicels 3-5 mm long. 4. *B. nigra*
a. Upper stem-leaves clasping; plant glabrous. 5. *B. campestris*

1. **B. hirta** Moench WHITE MUSTARD

Sparingly introduced in seed, not persisting and no specimens have been seen. Earlier records of *B. alba* belong here. July-Aug.

Introduced from Eu. and appearing locally.

2. **B. Kaber** (DC.) L. C. Wheeler, var. **pinnatifida** (Stokes) L. C. Wheeler (also known as *Sinapis arvensis* L.) Fig. 78, c. WILD MUSTARD, CHARLOCK

Occasional in orchards and fields; scattered in towns and about ports. Wild mustard is becoming much more common in grain fields and the clear yellow color of its flowers is in marked contrast to the paler yellow of wild radish. (*B. arvensis* (L.) Ktze). June-Oct.

Widely introduced in N. Amer. from Eu.

3. **B. juncea** (L.) Coss. INDIAN MUSTARD

Becoming a common weed about towns and spreading out into the country, often found about farm buildings where it has presumably been introduced in feed grains. This plant is much larger than the other species, up to 15 dm high, and it is therefore conspicuous when in flower. June-Sept.

Naturalized from Eurasia and rather common from N.S. to Sask. south to Va. and N.Mex.

4. **B. nigra** (L.) Koch Fig. 78, b. BLACK MUSTARD

Common about towns, often a troublesome weed in fields and orchards, but as yet rather local. June-Oct.

Widely introduced from Eurasia; the source of table mustard.

5. **B. campestris** L.

Sparingly naturalized in waste places and occasionally found in considerable amounts in grain fields or in fields the year following grain. This is another weed, as in the case of the wild mustard, which seems to be increasing in abundance. June-Sept.

Naturalized from Eu. and widely distributed, our more recent introductions being from the west.

14. **ERUCASTRUM** Presl

1. **E. gallicum** (Willd.) O. E. Schulz DOG-MUSTARD

Reported from Coldbrook, Kings Co. by H. Groh in 1933. It is still found only as an occasional weed around railroad yards: Kentville, 1954, by J. and D. Erskine; also found at Charlottetown, P.E.I.

Common in western America and sparingly eastward; introduced from Eu. and a bad weed.

15. **DIPLOTAXIS** DC.

Two yellow-flowered species with linear fruits; sparingly introduced around ports, probably in ballast.

a. Annual; plant branched from near the base, the leaves chiefly basal; fruiting pedicels 5-15 mm long. 1. *D. muralis*
a. Perennial; stem bushy, leafy to the inflorescence; fruiting pedicels 20-30 mm long, with a short section or stipe next to the fruit. 2. *D. tenuifolia*

1. **D. muralis** (L.) DC. Map 299. SAND-ROCKET

Waste places about the ports, rather rare: ballast heaps and waste ground at Pictou and North Sydney (Macoun); Pictou Landing (Robinson, 1907); Annapolis and Digby. June-Aug.

Nat. from Eu.; N.S. to Penn. and westward.

2. **D. tenuifolia** (L.) DC. WALL-ROCKET

This species was collected long ago at Pictou and at North Sydney in company with the preceding species; found at Pictou by Fernald and St. John in 1914; not recently collected. June-Aug.

Nat. from Eu. into eastern N. Amer.; N.S. to Ont. south to Va.

16. **CONRINGIA** Link

1. **C. orientalis** (L.) Dumort. HARE'S-EAR-MUSTARD

Casual in railroad yards; Yarmouth through the Annapolis Valley to Cumberland Co.; and probably also elsewhere.

Introduced from Eu.; N.S. to B.C. southward.

17. **SISYMBRIUM** L. HEDGE-MUSTARD

Much-branched annual with small yellow flowers and long slender fruit.

a. Leaves coarsely divided with wide lobes; fruits 1-2 cm long, the pedicels 1-3 mm long, closely appressed to the stem (Fig. 79, a).
b. Racemes, pedicels and fruits pubescent. 1. *S. officinale*
b. Racemes, pedicels and fruits glabrous. Var. *leiocarpum*
a. Leaves finely divided into linear lobes; fruits 5-10 cm long, the pedicels widely ascending. 2. *S. altissimum*

1. **S. officinale** (L.) Scop. Fig. 79, a. HEDGE-MUSTARD

Common throughout; waste places about towns, scattered along roadsides, about railroad yards, farmyards, etc. Var. **leiocarpum** DC. is found in similar habitats and is perhaps more common. July-Oct.

Introduced and widely distributed in Canada and the U.S.

2. **S. altissimum** L. Fig. 79, b. TUMBLE-MUSTARD

Much larger and coarser than the preceding, up to 1 m high; common in the Annapolis Valley about towns and spreading out into the country; common in towns throughout and locally elsewhere in light soils, often introduced in western feeds and becoming one of our common weeds. July-Aug.

Introduced from Eu.; N.S. to B.C. south to Fla.

18. **DESCURAINIA** Webb & Berthelot

1. **D. Sophia** (L.) Webb TANSY-MUSTARD

Rare; occasionally seen in waste places as individual plants. It is apparently introduced as seed but does not seem to establish itself as a bad weed. (*Sisymbrium Sophia* L.).

N.S. to B.C. south to Del., Kans. and Calif.

19. **HESPERIS** L.

1. **H. matronalis** L. ROCKET, DAME'S-VIOLET

Occasional and local along roadsides and about buildings. It is an old-fashioned garden plant, formerly much more commonly grown but still persisting in many places in considerable areas. This large plant usually occurs in masses with flowers of a pale purple color. June-July.

Introduced from Eu.; Nfld. to Ga. westward.

19a. **BUNIAS** L.

1. **B. orientalis** L.

This tall biennial is rarely adventive in eastern Canada from N.S., southwestern N.B. and southern Que. The flowers are showy, about 6 mm wide and occur in long racemes

Native of southern Eu.; adventive in N. Amer.

20. **ERYSIMUM** L.

Introduced weeds, with small yellow flowers, elongated fruits and seeds in one row. Our species are more or less pubescent with 2-4-pronged hairs.

a. Annual or winter annual; hairs on the upper surfaces of the leaves mostly 3-parted; petals to 5 mm long; fruit 1-2 cm long on slender spreading pedicels 8 mm long or more. 1. *E. cheiranthoides*

a. Biennial or perennial; petals 6-10 mm long; fruits on erect or appressed pedicels up to 6 mm long.

b. Plant grayish with mostly 2-pronged hairs, to 6 dm high; pedicels thick, 3-9 mm long. 2. *E. inconspicuum*

b. Plant greenish, with mostly 4-pronged hairs, 8-15 dm high; pedicels slender, about 5 mm long for mature fruits. 3. *E. hieraciifolium*

1. **E. cheiranthoides** L. Fig. 79, c. WORMSEED-MUSTARD

A very common weed throughout, in cultivated ground and waste places, especially about farm buildings and in gardens. June-Sept.

One farm near Tatamagouche had fields severely infested with biennial plants to 10 dm high. The seeds were apparently introduced in oat seed; and the plants grew very vigorously the following spring. This may be an introduced Asiatic subspecies (see Rossbach, 1958).

Naturalized from Eurasia; throughout Canada and the U.S.

2. **E. inconspicuum** (S. Wats.) MacM.

Rare; gravelly railroad yard, Springhill Junction (Fernald, 1921). Earlier records of *E. parviflorum* probably belong here.

Ont. westward; sparingly introduced eastward.

3. **E. hieraciifolium** L. (see Frankton, 1954).

Scattered collections have been made in eastern Ont. and adjacent Que. since 1941. Common on gypsum, Heatherdale, near Little Narrows, Victoria Co.

Sparingly introduced; widely distributed in Eu. and Asia.

21. **RORIPPA** Scop.

Much branched, weedy plants with small yellow flowers and short, slightly curved fruits on short pedicels. (Marie-Victorin, 1930; Butters and Abbe, 1940; Fernald, 1940).

a. Plants perennial with long rhizomes; petals exceeding the sepals; fruits 10-15 mm long. 1. *R. sylvestris*

a. Plants annual or biennial with tap roots; petals shorter than the sepals; fruits stouter, mostly 3-8 mm long. 2. *R. islandica*

1. **R. sylvestris** (L.) Bess. CREEPING YELLOW CRESS

This introduced weed promises to become pernicious. It is now known from a number of places in the center of the Province and is persistent once established in fields or gardens: Truro, Wolfville, and common at Port Williams. July-Aug.

Nfld. to N.S. south to N.C. and westward.

2. **R. islandica** (Oeder) Borbas Fig. 80, c. MARSH CRESS

A circumboreal species represented with us by three intergrading types which at times may appear quite different.

a. Upper leaves, as well as the lower, deeply and pinnately lobed; leaves thin and glabrous. Var. *islandica*

a. Upper leaves merely toothed or irregularly and shallowly lobed; plant generally stout with firm leaves.

b. Stem and leaves glabrous or nearly so; fruits commonly 4-6 mm long. Var. *Fernaldiana*

b. Stem and leaves more or less stiff hairy; fruits commonly 3-4 mm long. Var. *hispida*

Both the typical and var. **hispida** (Desv.) Butt. & Abbe are scattered and rather uncommon in ditches, on wet mud, along streams, and in fields and waste places.

Var. **Fernaldiana** Butt. & Abbe is widely introduced in many parts of the Province and is often common. Scattered in Kings and Cumberland Co. and often found about towns elsewhere. It is a bad weed which may at times occupy part of an orchard or a grain field. (Var. *microcarpa* (Regel) Fern.). Forma **reptabunda** Fern., with long creeping and rooting stems with fascicles of mostly simple leaves, was collected in a shallow ditch at Coldbrook, Kings Co., by D. Erskine. July-Sept.

Var. **islandica** is common in Eurasia and ne. N.Amer.; the other two varieties occur throughout the U.S. and Can.

22. **NASTURTIUM** R. Br.

See Watercress in the New World (Green, 1962).

1. **N. officinale** R. Br. Fig. 78, f. WATERCRESS

Common in slow-moving streams on the marshes at Truro and in Pictou Co.; very common, often choking the streams above and in the dykelands in Kings Co.; scattered in cold streams or in springs elsewhere to Inverness and Cheticamp in Inverness Co. Flowers white, July-Sept.

Our common species is a diploid with 32 chromosomes, often called *Rorippa Nasturtium-aquaticum* (L.) Hayek. A tetraploid species, with 64 chromosomes, occurs from Nfld. to Ont. south but has not yet been identified in N.S. This is *R. microphylla* (Boenn.) Hyl., with slender fruits 17-26 mm long, long pedicels and seeds in one row instead of in two. Kensington, P.E.I., large stream at the western outskirts (Mulligan, 1964). X *R. sterilis* Airy-Shaw is the triploid sterile hybrid between the two, with abortive pollen grains and only an occasional seed produced.

Introduced from Eu. and originally cultivated; now widespread in N. Amer.

23. **ARMORACIA** Gaertn., Mey. & Scherb.

1. **A. rusticana** (Lam.) G. M. & S. HORSERADISH

Infrequent around old gardens in rich soils, propagating from rootstocks; rarely flowering and sterile. June. The large shallow-toothed leaves somewhat resemble those of the dock. (*A. lapathifolium* Gilib.).

Widely introduced; N.S. to B.C.

24. **BARBAREA** R. Br.

1. **B. vulgaris** R. Br. Fig. 79, d. YELLOW ROCKET

Common in rich soils, on intervales, along rivers and often in orchards in the Annapolis Valley; apparently recently introduced in grain or grass seed and appearing as scattered individuals or sometimes in quantity in seeded fields throughout the Province. Late May-early June. Widely distributed in N.A.

Var. **arcuata** (Opiz) Fries has the pedicels more lax and open and the fruits arcuate-ascending to widely spreading. This is scattered with the species and often more common.

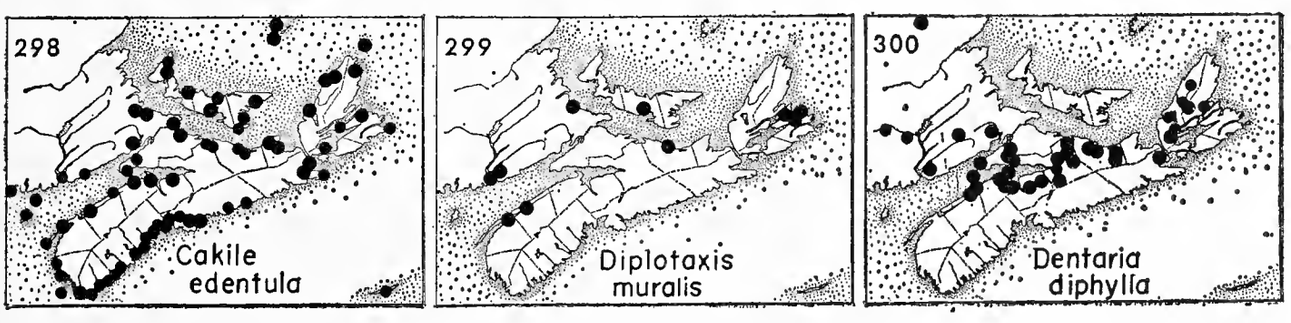
Introduced, as is the species, from Eu. and widely scattered.

25. **DENTARIA** L.

1. **D. diphylla** Michx. Fig. 80, b. Map 300. TOOTHWORT

Rich moist soil along brooksides and in low, wet or rocky mixed or deciduous woods; general but not abundant from Annapolis Co. eastward to northern C.B., one of our few native plants of this family and rather distinctive. It is found only in the northern area of the Province.

N.S. to Mich. south to S.C.



26. **CARDAMINE** L.

Flowers white or tinged with purple; with pinnately lobed or compound leaves, and long slender fruits.

a. Flowers large, 10-15 mm wide with petals 7-13 mm wide and tinged with purple; plant perennial. 1. *C. pratensis*

a. Flowers less than 5 mm wide with petals to 3 mm long; plants annual or biennial.

b. Leaves of 2-7 broad segments with the terminal one larger, the lateral leaflets commonly oval and decurrent on the axis of the leaf; moist or wet soils. 2. *C. pensylvanica*

b. Leaves of 5-9 narrow segments, the terminal ones scarcely longer than the lateral; lateral leaflets usually linear and not decurrent; of dry or rocky soils. 3. *C. parviflora*

1. **C. pratensis** L. Fig. 80, a. Map 301. CUCKOO-FLOWER

Common along the Annapolis River system in meadows, moist fields and low areas, now established in many other areas in Kings and Annapolis Co., introduced in grass seed from Eu. over 40 years ago. Scattered elsewhere and occasionally established along roadsides. Introduced from Eu.; Nfld. to N.Y. and N.J. Late May-early June.

Var. **palustris** Wimm. & Grab. is the native form, sparingly scattered in calcareous meadows in central C.B., as in a wet meadow near the Black River bog in central Inverness Co. The flowers are larger, with petals 8-12 mm long, and the flowers are nearly white when open in contrast to the strongly purplish tinge of the flowers of the typical variety. The basal leaves have most of their leaflets short-stalked; and their terminal leaflets are rarely toothed. This variety is found from Lab. to n. B.C. south to N.S., Gaspé, n. N.Y. and Minn.

2. **C. pensylvanica** Muhl. Fig. 79, e. Map 302. BITTER CRESS

Common in swamps, along streams and mucky areas throughout; often with the base rooting in mud under the surface of slow-moving streams. May-July. (*C. scutata* Thunb.).

Lab. to B.C. south to Fla.

3. **C. parviflora** L., var. **arenicola** (Britt.) O. E. Schulz

Scattered and rather local, probably often overlooked, along the Bay of Fundy, in Halifax Co. and north-central C.B.: rocks back of a beach on Brier I., cliff talus on Isle Haute, Cape Blomidon and Cape d'Or; dry rocky beach west of Halifax; boulder slope at Rocky Point and on the Bird I. in Victoria Co. Our plants differ slightly from those of Eu.

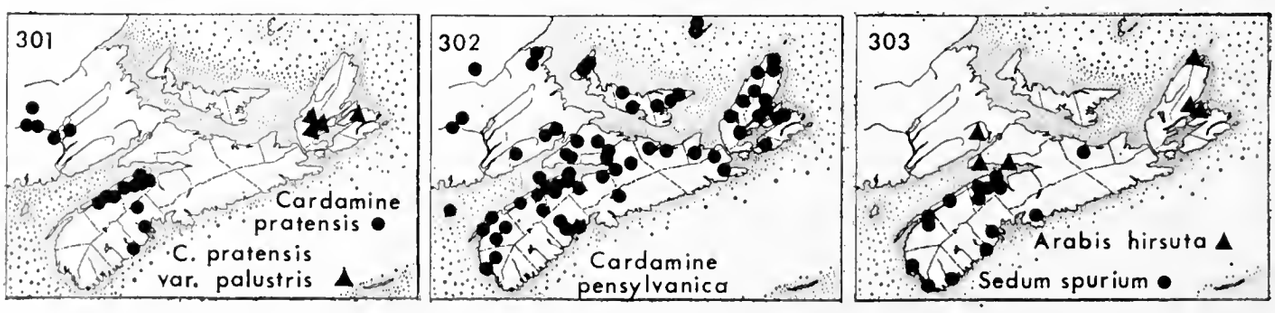
Fla. to Tex. north to N.S., Ont. and Minn.

27. **ARABIS** L. ROCK-CRESS

Erect unbranched plants with clasping leaves and whitish flowers; the conspicuous feature is the numerous long, slender, stiffly-erect fruits on short pedicels

a. Leaves and stems rough pubescent; fruits very slender, to 1 mm wide, with seeds in one row. 1. *A. hirsuta*

a. Leaves and stems practically glabrous; fruits to 1.5 mm wide, with seeds in two rows. 2. *A. Drummondi*



1. **A. hirsuta** (L.) Scop., var. **pycnocarpa** (M. Hopkins)Rollins Map 303.

Rare and local; Victoria Co.: dry cliff crevices and talus slopes, Indian Brook (Smith and Erskine, 1954); Cumberland Co.: small moist outcrop on rich hardwood slope about one mile east of Refugee Cove; talus, north-west side of Moose Island. At the latter locality it was fairly abundant (Schofield, 1955); on Boularderie Island and at Cape North.

Anticosti west to Yukon, south to N.S., New Eng., Ga. and Calif.

2. **A. Drummondi** Gray Map 304.

Rare and local, at the head of the Bay of Fundy and in northern Cape Breton, usually on dry cliffs and talus slopes but occasionally in richer locations on the lower slopes. Two locations are known from the slopes of Cape Blomidon, Kings Co., on dry slopes; talus slopes on Isle Haute (Schofield, 1955); Big Intervale, Margaree; and in Victoria Co.: dry cliffs and talus, Lockhart Brook, Salmon R.; rare on dry cliffs and talus, Indian Brook; abundant at shaded cliff base, Burnt Mt., Gray Glen (Smith and Erskine, 1954.)

Tall luxuriant plants growing in first year hay in fields at West New Annan, Colchester Co., seem to belong to this species, but their origin is unknown.

Nfld. and Lab. to B.C. south to N.S., New Eng., Ohio and Calif.

51a. RESEDACEAE MIGNONETTE FAMILY

1. RESEDA L.

1. **R. Luteola** L. DYER'S ROCKET

Formerly cultivated as a source of yellow dye, rarely adventive in waste ground, found along roadside in Halifax northeast of Point Pleasant Park by D. S. Erskine. This is a tall plant with small greenish-yellow flowers in a long terminal spike; petals 4, each with a flattened base and one or more projecting appendages or lobes. July.

N.S.; Mass. to Penn.

52. SARRACENIACEAE PITCHER-PLANT FAMILY

Carnivorous plants with the leaves modified to make water-holding pitchers; flowers large, solitary and nodding with the style forming an umbrella-like structure. About 15 species.

1. SARRACENIA L. PITCHER-PLANT

1. **S. purpurea** L. Fig. 80, f. Map 305.

Bogs, bog meadows and sphagnous lake margins throughout; most common in the southwestern counties and in northern C.B.; rather rare in the north-central counties where fewer suitable habitats exist. June 15-July.

Forma **heterophylla** (Eat.)Boivin, with greenish-yellow flowers and foliage, and with no purple veins in the leaves, was reported by Fernald (1922) from Young's L., North Mt., Belle Isle, Annapolis Co. It has been found to be frequent in northern C.B., occasionally outnumbering the typical plants in some of the bogs of the plateau. Occasional intermediate forms are seen in populous colonies of the species. The following two collections represent single plants found among the typical form: Queens Co., swamp, Shelburne River near L. Rossignol; bog, Long L. (Smith and Schofield, 1952).

Forma **plena** D.S. Erskine is a double form with the carpels and stamens transformed into petals. *Sphagnum* bog, Wedgeport, Yarmouth Co., one plant (Klawe, 1955).

Nfld. to Alta. south to Md. and Ill.

53. DROSERACEAE SUNDEW FAMILY

Small insectivorous plants of bogs and wet soils; leaves reddish and in rosettes, with the blades covered with long glandular hairs tipped with dew-drops of clear glandular secretion; flowers small and white, in a slender inflorescence nodding at the tip.

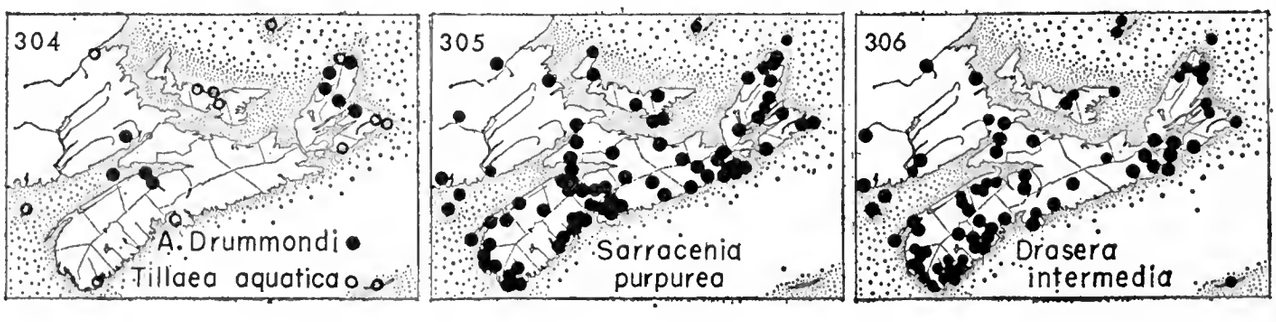
1. DROSERA L. SUNDEW

a. Leaf-blades several times longer than wide; petioles smooth. 1. *D. intermedia*

a. Leaf-blades round, or broader than long; petioles hairy. 2. *D. rotundifolia*

1. **D. intermedia** Hayne Fig. 80, d. Map 306. NARROW-LEAVED SUNDEW

Rather common throughout; in boggy depressions and wet, peaty soil. It is very rare on Sable I., while the next species is abundant. Fernald (1921) records a hybrid of these two species, and intermediate



between them, from a knoll in a wet peaty slough in the barrens at Lower Argyle, Yarmouth Co. July 15 — Aug. 15.

Nfld. south to Fla. and Tex., around the Great Lakes; B.C.; Eurasia.

2. **D. rotundifolia** L. Fig. 80, e. Map 307. ROUND-LEAVED SUNDEW

Abundant throughout; bogs, barrens, lake margins, ditches and swamps. Plants growing in bog water may be strung out with stems several feet long. July 15 - Aug. 15.

Lab. to Alaska south to Fla. and Calif.; Eurasia.

Fig. 80.—**Cardamine:** (a) *C. pratensis* x $\frac{1}{3}$. — **Dentaria:** (b) top of plant x $\frac{1}{2}$. — **Rorippa:** (c) *R. islandica*, small part of plant x $\frac{1}{2}$. — **Drosera:** (d) *D. intermedia*. leaf x 1, (e) *D. rotundifolia* x $\frac{1}{3}$. — **Sarracenia:** (f) plant x $\frac{1}{4}$.

54. CRASSULACEAE ORPINE FAMILY

Succulent herbs with numerous small regular flowers that have 3 to 5 pistils in the center, the sepals and petals the same in number, and the stamens the same or twice as many.

a. Plants on mud in or near brackish water, 1-8 cm high; flowers solitary, nearly sessile, greenish white, with the sepals, petals, stamens and pistils 3-4. 1. *Tillaea*

a. Plants of dryish habitats, erect or spreading; flowers in a stalked inflorescence, yellow or rose, with 8-10 stamens. 2. *Sedum*

1. TILLAEA L. PIGMYWEED

See history of *Tillaea aquatica* (*Crassulaceae*) in Canada and Alaska (Cody, 1954).

1. **T. aquatica** L. Map 304.

Restricted to brackish muddy shores or sand flats near the coast; forming pure mats on the wet borders of the fresh-water ponds on Sable I.; scattered along the Atlantic Coast. Shelburne Co.: sand flats back of the beach at Villagedale (Fernald, 1921); near Peggy's Cove, Halifax Co.; Richmond Co.: abundant on flat area near brackish pond, Point Michaud; C.B. Co.: muddy pond behind beach, Catalone (Erskine, D.S., 1951), sandy edge of pond, N.W. Cove, Scatari I. (Smith and Schofield, 1952).

Locally near the coast from Que. and Nfld. to Md. and southward; Pacific Coast; Eu. and N. Africa.

2. SEDUM L. STONECROP

About 500 species, many of which are grown in rock gardens.

a. Leaves nearly terete, small and short; flowers yellow. 1. *S. acre*

a. Leaves broad and flat.

b. Flowers purplish or rose, with both stamens and pistils, the parts mostly in 5's; weedy.

c. Stem-leaves opposite or whorled; plants decumbent with the flowering branches ascending, forming large patches. 2. *S. spurium*

c. Stem-leaves alternate or spirally arranged; plants large and erect, in clumps or growing singly. 3. *S. Telephium*

b. Flowers greenish-yellow or turning purplish, with stamens and pistils on separate flowers, the parts in 4's; rocky sea-shores and cliffs. 4. *S. Rosea*

1. **S. acre** L. Fig. 81, b. MOSSY STONECROP

Occasional on ledgy roadsides or roadside banks in the southwestern counties and scattered east to Kings and Halifax Co.; elsewhere a persistent garden flower or roadside escape, sometimes rather weedy. July.

Naturalized from Eu.; N.S. to B.C. south to Va.

2. **S. spurium** Bieb. Map 303.

Spreading to rocky or gravelly roadsides at many points, Yarmouth to Shelburne and Kings Co.; local east to Pictou. It usually grows in large patches with the matted, prostrate stems on the surface of the ground. A garden escape that is persistent and sometimes rapidly spreading. July. (*S. stoloniferum* Gmel.).

Introduced from Asia; local from N.S. to N.Y. and Penn.

3. **S. Telephium** L. Fig. 81, c. LIVE-FOREVER

Scattered throughout; moist areas, often at the edges of thickets or in shady places with considerable humus in the soil. Aug. - Sept. (Including *S. purpureum* Tausch).

Introduced from Eu.; Nfld. to Minn. south to Penn.; B.C.

Fig. 81.—**Sedum:** (a) flower x 3, (b) *S. acre* x $\frac{1}{2}$, (c) *S. Telephium*, top of plant x $\frac{1}{2}$, (d) *S. roseum*, leaves x $\frac{1}{2}$. — **Mitella:** (e) plant x $\frac{1}{2}$. — **Chrysosplenium:** (f) branches x $\frac{1}{2}$. — **Tiarella:** (g) plant x $\frac{1}{3}$.

4. **S. Rosea** (L.) Scop. Fig. 81, d. Map 308. ROSE-ROOT

Crevices of rocky cliffs on the colder parts of the shore-line; scattered along the Bay of Fundy and at Cape d'Or; rare on the Atlantic Coast; common on cliffs in northern C.B. In the Cobequids it is occasionally found on dripping cliffs or next to waterfalls several miles back from the coast. Late June. (*S. roseum* (L.) Scop.).

Arctic Regions south to the coast of Me.; locally inland.

55. SAXIFRAGACEAE SAXIFRAGE FAMILY

Delicate herbs or shrubs; with sepals and petals in 4's or 5's, the stamens the same number as the sepals or twice as many, and one pistil or two nearly separate ones. Our native representatives are quite diverse and are placed in three different sub-families.

a. Plants herbaceous; fruit a capsule or follicle.
 b. Leaves mostly in a basal rosette or, in one species, small and alternate; plants erect.
  c. Flowers several to numerous; stamens twice as many as the petals.
   d. Leaves small and crowded, sessile or nearly so; rare plants of cliff-faces or talus slopes. 1. *Saxifraga*
   d. Leaves mostly basal and long-petiolate, pubescent, toothed and with heart-shaped blades.
    e. Leaf blade sharply cut into hard teeth; petals not lobed; capsule unequally valved (Fig. 81, g). 2. *Tiarella*
    e. Leaf bluntly and shallowly toothed, the teeth without a hard sharp point; petals finely divided; capsule equally valved (Fig. 81, e). 3. *Mitella*
  c. Flowers solitary, white; stamens the same number as the petals; leaves in a basal rosette, not toothed, bright glossy green. 5. *Parnassia*
 b. Leaves opposite, scattered, the plant forming dense mats along cool brooks or in moist areas; flowers less than 2 mm wide, petals absent (Fig. 81, f). 4. *Chrysosplenium*
a. Shrubs, our currants and gooseberries; leaves palmately-lobed; fruit a berry; ovary inferior. 6. *Ribes*

1. SAXIFRAGA L. SAXIFRAGE

Small cliff-plants, 1-3 dm high in flower, with delicate flowers in a slender, erect, elongated cyme.

a. Stems elongated, forming loose mats; leaves scattered, to 2 cm long, linear-oblong, not serrate; flowers yellowish, spotted with orange. 1. *S. aizoides*
a. Stems producing a dense, basal rosette with stiff oblong leaves; leaves finely serrate with a lime-encrusted pore at the base of each tooth; flowers white. 2. *S. Aizoon*

1. **S. aizoides** L.

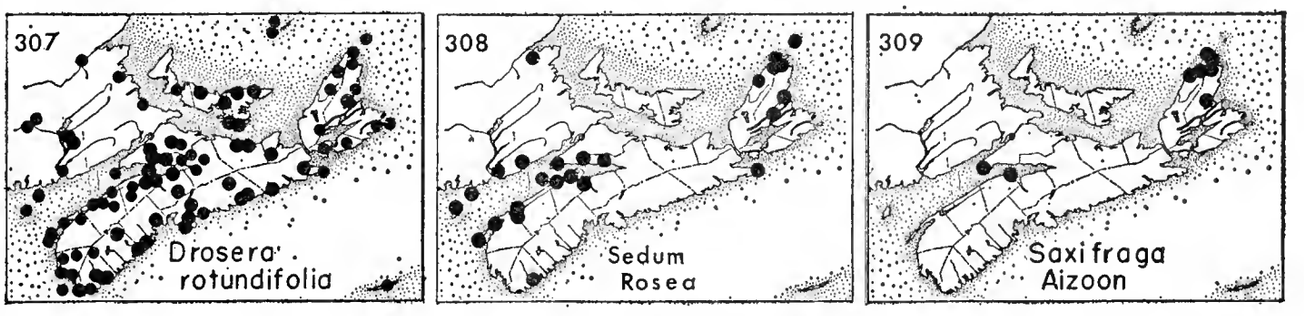
Known from but one place in the Province: Inverness Co., luxuriant on dripping cliffs, Big Southwest Brook (Smith and Schofield, 1952).

Arctic Regions south to C.B., northern Vt. and N.Y.; Alta to B.C.

2. **S. Aizoon** Jacq., var. **neogaea** Butters Map 309

Rare around the head of the Bay of Fundy and in northern C.B. Lawson notes that on one of their collecting trips they found the basalt cliffs at Blomidon hanging with dozens of plants in full bloom. A recent re-collection shows that it is still present there: scattered plants on dry soil, shelves and pockets of lower portion of cliff about 2 miles south of Cape Split (Schofield, 1955). Locally abundant on sheltered cliff shelves at Cape d'Or; Victoria Co.: very rare on shelf of cliff, Gray Glen Brook; Inverness Co.: abundant on dry, sheltered shelves of limestone cliff, Big Southwest Brook (Smith and Schofield, 1952); dry mossy hillside by the side of the Cabot Trail above Cheticamp.

Arctic regions locally south to N.S., Vt., Mich. and Ont.



2. TIARELLA L.

1. **T. cordifolia** L. Fig. 81, g. FALSE MITERWORT

Typical of the richest hardwoods and intervales in Colchester and Pictou Co.; found once at Hunting Point in Kings Co. In many cases the anthers are bright orange instead of yellow. This is forma **allanthera** Vict. & Rousseau (Marie-Victorin and Rousseau, 1940). May 15 - June 15.

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

3. MITELLA L.

1. **M. nuda** L. Fig. 81, e. Map 310. MITERWORT

Wooded swamps, rich woods, mossy thickets; common from Annapolis Co. to northern C.B., and rare on the Atlantic side on the more acid soils.

Lab. to Alaska south to Penn., Mich. and Mont.

4. CHRYSOSPLENIUM L.

1. **C. americanum** Schwein. Fig. 81, f. Map 311. GOLDEN SAXIFRAGE

Common throughout the northern region from Annapolis to northern C.B.; wet mucky woods, cold springs, over the bottom of small

trickling shady rills; rare in Yarmouth Co. and absent in the acidic areas on the Atlantic side. Early May, the flowers very small and inconspicuous.

N.S. to Minn. south to Ga.

5. **PARNASSIA** L.

1. **P. parviflora** DC. Map 315. GRASS-OF-PARNASSUS

Inverness Co.: damp grassy hollows in sand dunes, West Mabou Harbour (Erskine, D.S., 1951); wet tussocks of swamp at Broad Cove. This northern plant, which reaches its southern limits in our area in C.B. and western P.E.I. may be related to *P. palustris* L. of Eu. and nw N. Amer. as variety *parviflora* (DC.) Boivin.

Nfld. south to C.B. and westward to B.C.

6. **RIBES** L. CURRANTS AND GOOSEBERRIES

The currants and gooseberries are placed in a separate subfamily or in a separate family *Grossulariaceae*. The ovary is inferior with 2 carpels, forming a berry; the calyx-tube or hypanthium is tubular with the 5 sepals larger and more conspicuous than the 5 petals; stamens 5. The family is usually regarded as including the single genus *Ribes* with about 130 species. In addition to the species listed below, the golden currant, *R. aureum* Pursh (*R. odoratum* Wend.) is common as an ornamental; the black currant, *R. nigrum* L., of gardens has the lower surface of the leaves dotted with yellow resinous glands.

a. Flowers in clusters of 1-4; stems with spines at the base of the leaves, and often on the internodes; leaves deeply 3-5-cleft, the terminal lobe rather truncate or rounded with small, blunt teeth. 1. *R. hirtellum*

a. Flowers in hanging racemes; stems spineless, although the young stems of *R. lacustre* are densely bristly; currants.

b. Canes, at least the young ones, densely bristly, as are also the ovaries and fruit; leaves deeply 3-lobed, the terminal lobe with the base less than half its widest width. 2. *R. lacustre*

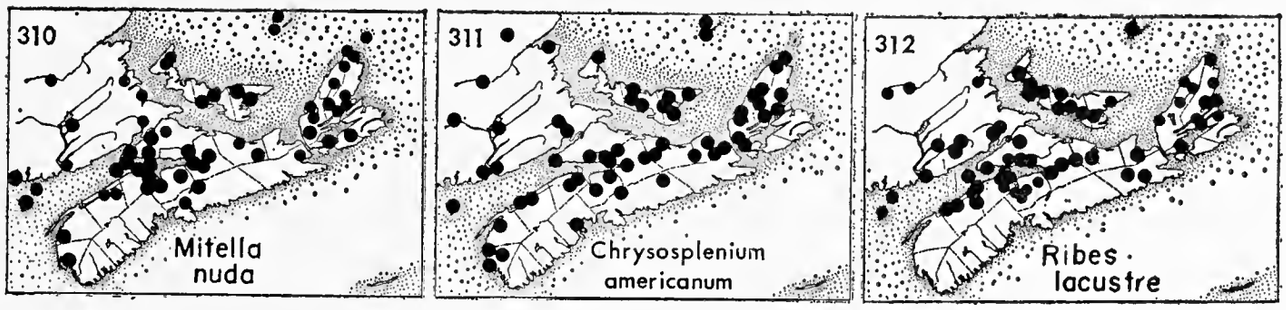
b. Canes and fruit not bristly; terminal lobe of the leaf widest at or near the base and tapering with sharp teeth to the tip.

c. Ovary and fruit glandular-hispid; leaves plainly 5-lobed, with the terminal slightly narrower at the base; plant low, reclining, strong-smelling when bruised. 3. *R. glandulosum*

c. Ovary and fruit not hispid; leaves 3-lobed or obscurely 5-lobed; plant not strong-smelling.

d. Flowers purplish; plant weak and ascending, about 5 dm high; pedicels with pale red glands; leaves with the terminal lobe triangular and as wide or wider than long, widest at the very base. 4. *R. triste*

d. Flowers greenish or greenish-yellow; plants erect and stouter; pedicels mostly smooth or with a few non-reddish glands; terminal lobe of the leaf often longer than wide, the base usually narrower than the middle; cultivated. 5. *R. sativum*



1. **R. hirtellum** Michx. Fig. 82. GOOSEBERRY

Scattered throughout; pastures, edges of woods, along stone walls, in rocky land and even occasionally in swamps and bogs. The plant is variable in leaf-shape and pubescence and Fernald has described two varieties. Typical variety *hirtellum* has the leaves tending to be cuneate at the base and thinly pubescent or becoming glabrous; var. *saxosum* (Hook.)Fern. has the leaves rounded to subcordate at the base and nearly glabrous; while var. *calcicola* Fern. has the leaves tending to be cuneate at the base but are densely and softly pubescent, with the calyx usually pubescent. All intergradations will occur but the last variety is probably more common than the glabrous plants in southwestern N.S. and about the Bay of Fundy. Closely related to *R. oxyacanthoides* L., under which our species can be placed as var. *saxosum* (Hook.)Cov. June 1 - June 15.

Nfld. to Alta. south to Penn.

2. **R. lacustre** (Pers.)Poir. Fig. 82. Map 312. BRISTLY BLACK CURRANT

Rocky or swampy woods, along stream banks and ravines, scattered in hardwood forests. Found only north of a line from Annapolis to Guysborough Co., and throughout P.E.I., presumably in more alkaline locations and never in boggy areas. It prefers a rich moist soil and is frequently common in its habitat. June.

Nfld. to Alaska south to the mts. of Penn. and Colo.

3. **R. glandulosum** Grauer Fig. 82. Map 313. SKUNK-CURRANT

Common to abundant throughout; open rocky woods, in low alluvial soils, or in sphagnous thickets and open coniferous woods in wet soil. This is our most common and widespread species of *Ribes*. (*R. prostratum* L'Her.). May 15 - June 15.

Lab. to B.C. south to New Eng., N.C., Mich. and Minn.

4. **R. triste** Pall. Fig. 82. Map 314. WILD RED CURRANT

Rare and local from northern Digby Co. and Cumberland Co. to northern C.B. where it is rather general in the upper parts of the ravines in north-central Inverness Co. in rich damp woods and alluvial soils and ravines. The plants are usually low with the few branches often reclining in the leaf mold. Variable in respect to the pubescence of the leaves; and including the glabrous var. *albinervium* (Michx.)Fern.

Nfld. to B.C. south to Penn., Wisc. and Oreg.

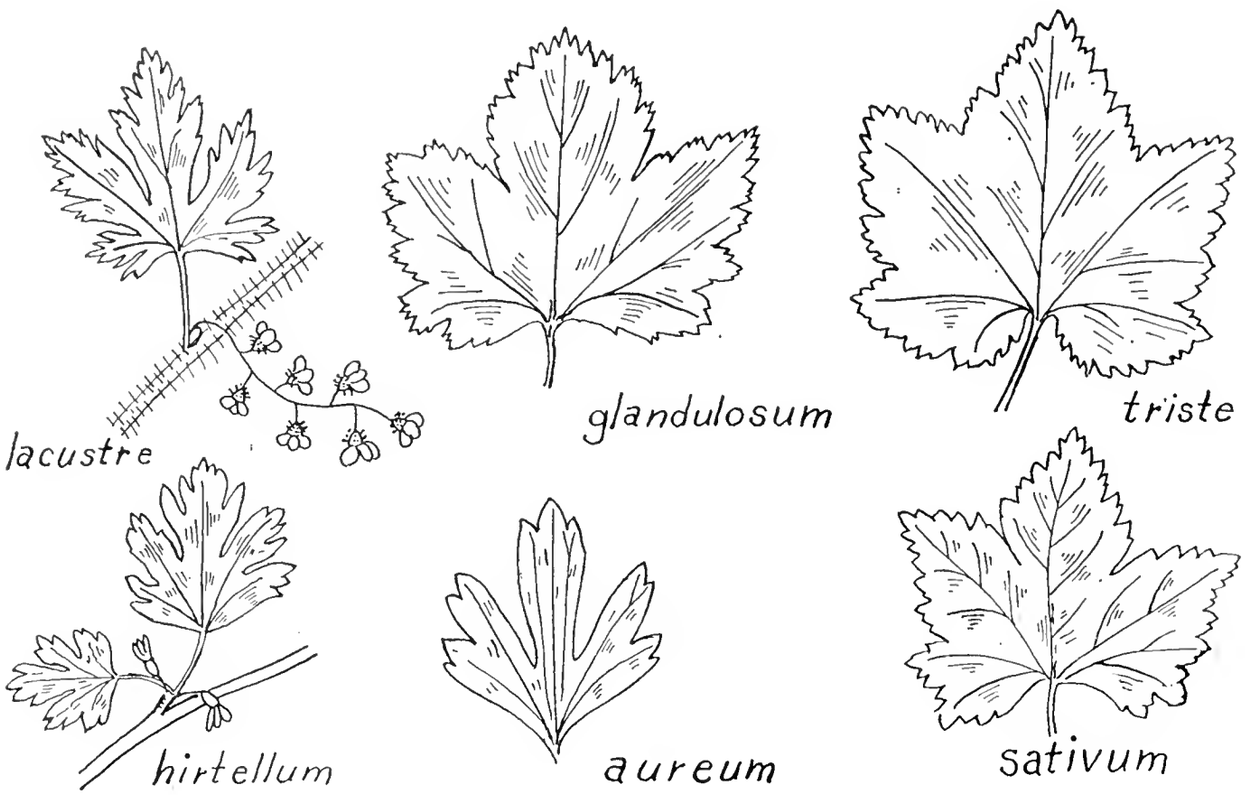


Fig. 82.—**Ribes** spp. leaves x $\frac{1}{3}$.

5. **R. sativum** Syme Fig. 82. RED CURRANT

Our cultivated red and white currants are considered to be mostly this species, or occasionally hybrids with *R. rubrum* L. Occasionally escaped or persisting in semi-domestic areas. Late May-early June.

Native of Eu.; widely cultivated.

56. HAMAMELIDACEAE WITCH-HAZEL FAMILY

About 20 genera best developed in eastern and tropical Asia; 2 of the 5 species of witch-hazel are native to N. Amer. Our distinctive shrub grows in clumps to 5 m high. The flowers appear in late autumn and have 4 yellowish, linear petals and 4 stamens; the fruit ripens a year later and is a woody capsule.

1. HAMAMELIS L.

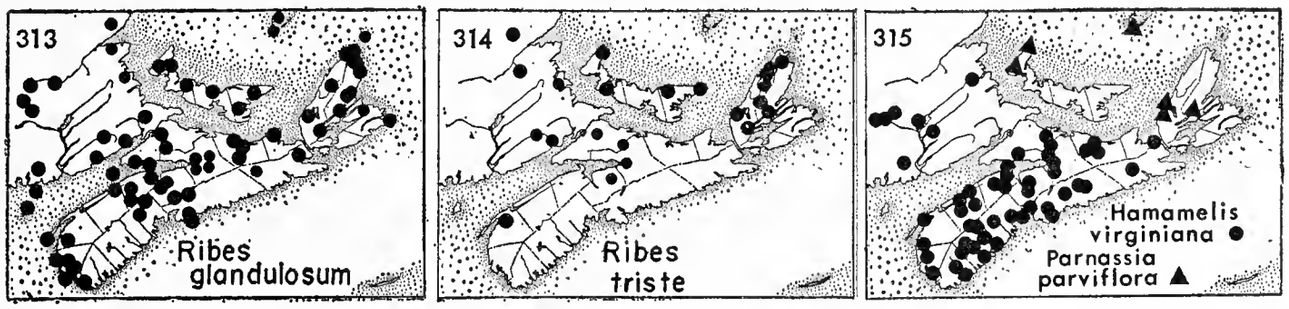
1. **H. virginiana** L. Fig. 83, a. Map 315. WITCH-HAZEL

Rocky woods, thickets and near cliffs, often where there is underground water or seepage; common from Kings and Lunenburg Co. to Colchester Co.; scattered to Yarmouth, becoming rarer eastward and found only to the Strait of Canso; apparently absent also in P.E.I. The clumps of bushes are scattered and never very abundant. Oct.-Nov.

Var. **parvifolia** Nutt. is a smaller-leaved form with the leaves up to 10 cm long, thick and densely stellate-hairy beneath. This was reported

by Fernald from thickets bordering Great Pubnico L. and the east branch of the Tusket R., Quinan, both in Yarmouth Co. (Fernald, 1921). The value of this variety is uncertain.

N.S. to Ont. and Minn. south to Ga. and Tenn.



57. ROSACEAE ROSE FAMILY

This large family includes herbs, shrubs and trees, many of which possess alternate leaves, usually with stipules, 5 separate petals and numerous distinct stamens. The members of this family also differ technically from those of the *Ranunculaceae* in having the petals, sepals and stamens inserted at or near the margin of a saucer- to vase-shaped structure called a hypanthium, and in sometimes having a whorl of tiny bractlets just outside the calyx.

a. Leaves simple, or merely lobed.
 b. Plants herbaceous, small.
  c. Leaves orbicular, shallowly toothed, all basal, to 4 cm wide; flowers solitary, white, and long-peduncled (Fig. 87, e). 13. *Dalibarda*
  c. Leaves shallowly lobed, larger, scattered on the stem.
   d. Flowers solitary, white, over 1 cm wide; fruit an aggregation of drupelets (Fig. 88). 12. *Rubus Chamaemorus*
   d. Flowers numerous, yellowish, to 3 mm wide; fruits dry and enclosed in the calyx (Fig. 87). 14. *Alchemilla*
 b. Plants woody.
  e. Leaves palmately lobed with 3-7 shallow lobes; flowers large, rose-colored. 12. *Rubus odoratus*
  e. Leaves not lobed, or else pinnately so.
   f. Plants with thorns; flowers in corymbs; fruit a berry-like pome, with 1-5 large nutlets. 7. *Crataegus*
   f. Plants without thorns; prickles sometimes present.
    g. Flowers 5 mm wide or less, very numerous in conical or narrow terminal inflorescences; pistils 5-6, partly superior; fruits small, follicles (Fig. 83, b, c). 1. *Spiraea*
    g. Flowers more than 6 mm wide, in umbels, corymbs or racemes; fruit fleshy; pistil 1.
     h. Petals several times longer than broad; ovary inferior, forming a berry-like pome with 10 seeds (Fig. 85, a-c). 6. *Amelanchier*
     h. Petals little if any longer than broad.
      i. Ovary superior in a cup-like calyx, forming a drupe with one stone; petioles with a few glands at the base of the blade; cherries and plums. 18. *Prunus*

i. Ovary inferior, forming a pome with 2 or more seeds in each of the five cells.
j. Flowers 3-7 cm wide; fruit a large fleshy pome; stout trees or shrubs; leaves without dark glands; apples. 3. *Pyrus*
j. Flowers less than 1 cm wide; fruit small, berry-like, black to red; slender low shrubs; leaves with a row of dark glands along the upper side of the midrib (Fig. 83, d). 4. *Aronia*

a. Leaves compound.
k. Plants low and herbaceous.
l. Leaves palmately divided.
m. Fruit fleshy; flowers white; plants with long runners; strawberry (*Rubus pubescens* may key here also). 8. *Fragaria*
m. Fruit dry; flowers yellow, or if white then with the plant without runners and the leaflets with 3 terminal teeth only (Fig. 86). 9. *Potentilla*
l. Leaves pinnately divided; fruits dry and hard.
n. Calyx of both the flowers and the fruit with hooked bristles; flowers yellow in long spike-like racemes (Fig. 87, f). 15. *Agrimonia*
n. Calyx without hooked bristles; flowers not in a slender raceme.
o. Flowers in a dense spike-like head; pistils 1-3, enclosed by the calyx. 16. *Sanguisorba*
o. Flowers in an open inflorescence; pistils numerous, not tightly enclosed.
p. Styles long-plumose or hairy, hooked near the middle, the upper half deciduous in fruit; terminal leaflet several times larger than the others, irregularly lobed or compound (Fig. 87, a-c). 11. *Geum*
p. Styles not plumose nor hairy, nor hooked near the middle; terminal leaflet little if any larger than the lower ones. 9. *Potentilla*

k. Plants woody, at least at the base.
q. Plants trees; flowers small in a flat large cyme; fruits of small berry-like pomes; leaves pinnately compound with toothed leaflets (Fig. 84). 5. *Sorbus*
q. Plants sub-herbaceous or else shrubby.
r. Flowers in dense globular, oval or long cylindrical spike-like heads, small. 16. *Sanguisorba*
r. Flowers in a more diffuse inflorescence.
s. Leaves palmately compound with three leaflets; plants with upright or trailing canes; fruits of numerous black drupelets upon a common receptacle; blackberries. 12. *Rubus*
s. Leaves pinnately compound, often irregularly dissected.
t. Plants erect, with seldom-branched canes; stems usually bristly; fruit of numerous red drupelets; raspberries. 12. *Rubus*
t. Plants usually much branched; fruit not composed of numerous fleshy drupelets.
u. Leaflets 3-7, not toothed, small; flowers yellow, few in each inflorescence; fruits of numerous achenes on a dry receptacle. 9. *Potentilla fruticosa*
u. Leaflets usually more numerous, toothed; flowers not a clear yellow in color; fruit not of numerous exposed achenes.
v. Flowers small and very numerous in an ample diffused inflorescence; prickles or bristles absent.

w. Leaflets irregularly cut or dissected and very uneven in size, the terminal much larger; fruit indehiscent; plant little branched (Fig. 89, b). 10. *Filipendula*

w. Leaflets 13-21, lanceolate, merely toothed and rather even in size; fruits of follicles as in *Spiraea*. 2. *Sorbaria*

v. Flowers few and showy, usually rose-colored; fruit orbicular to elliptical, fleshy, enclosing the base of the pistils and the achenes; prickles usually present. 17. *Rosa*

Fig. 83.—**Hamamelis:** (a) *H. virginiana*, fruiting twig and flowers x ½. — **Spiraea:** (b) *S. tomentosa* x ⅓, (c) *S. latifolia* x ⅓. — **Aronia:** (d) *A. prunifolia*, flowering twig, leaf and fruit x ½. — **Rosa:** (e) *R. nitida*, (f) *R. virginiana*.

1. SPIRAEA L.

About 100 species of attractive flowering shrubs, many used for ornamental plants. The 5 tiny follicles in the center of each tiny flower help to identify the small shrubs, even in the winter season. Our Bridal Wreath is *S. Vanhouttei* (Briot)Zab.

a. Leaves smooth beneath or nearly so; flowers white or pale pinkish; sepals spreading; follicles glabrous. 1. *S. latifolia*
a. Leaves densely rusty-woolly beneath; flowers rose, with reflexed sepals; follicles pubescent. 2. *S. tomentosa*

1. **S. latifolia** (Ait.)Borkh. Fig. 83, c. MEADOWSWEET, HARDHACK

Very common throughout; in wet land, ditches, swamps, meadows and low pastures, especially in wet mucky soils where it replaces the heath plants. July. (*S. alba* DuRoi var. *latifolia* (Ait.)Boivin).

The inflorescence is usually pyramidal but the branches apparently do not develop in cool weather. Such plants have been described as var. *septentrionalis* Fern. from Nfld. and Lab. south to the Mts. of New Eng. and westward. The plant is low, up to 7 dm high, with usually larger flowers densely aggregated into ovoid or cylindrical inflorescences without elongated branches. Abundant near the lake edge, Twin Island L., Ingonish barrens in Victoria Co.; collected by Smith *et al.* in flower July 23, 1951.

Nfld. to Man. south to N.C.

2. **S. tomentosa** L. Fig. 83, b. Map 316. STEEPLE-BUSH

Common in poorly drained and acid soils, low pastures and barrens with clay soils, becoming less common east to sw C.B. It is abundant along the North Shore in areas of heavy or poorly-drained soils. July-Aug.

N.S. to Minn. south to Ga.

2. SORBARIA A. Br.

1. **S. sorbifolia** (L.)A.Br. FALSE SPIRAEA

Formerly much planted as an ornamental shrub, now found about old dwellings and occasionally as an escape along roadsides or in waste ground. First reported by Macoun from along roadsides near Baddeck, C.B. Listed by Cody (1962) from Tupperville, Annapolis Co. and near Chester in Lunenburg Co.

Nfld. south to Penn.; Alta.

3. PYRUS L.

This genus is often enlarged to include the next two genera, since hybrids may occur between them. On the other hand, the Apple is sometimes separated as the genus *Malus*. The Pear is *Pyrus communis* L. Other types of apples may be expected to occur also as escapes in the future as more ornamental crab-apples are grown.

1. **P. Malus** L. APPLE

A common escape in the Annapolis Valley and scattered throughout wherever apples are grown. (*Malus pumila* L.). Late May and early June.

Eu. and Asia; long cultivated.

4. **ARONIA** Medic. CHOKEBERRY

Common shrubs with cymes of white flowers, best identified by the row of dark glands along the midrib of the upper side of the leaves. The berries are high in pectin and can be used for jellies. Our three species are very similar; the first two are separated mainly by the fruit characteristics and the last two by the amount of pubescence.

a. Twigs, pedicels and calyx and usually the lower surface of the leaves more or less white-woolly at flowering time, some of the tomentum persisting to maturity.
  b. Fruits 5-7 mm thick, maturing late in the summer, becoming cherry-red. 1. *A. arbutifolia*
  b. Fruit 8-10 mm thick, maturing in mid-summer, becoming purplish black; common throughout. 2. *A. prunifolia*
a. Twigs, leaves and calyx glabrous or nearly so at flowering time, entirely without wool at maturity. 3. *A. melanocarpa*

1. **A. arbutifolia** (L.)Ell. RED CHOKEBERRY

Scattered in Yarmouth Co.; found in thickets at Harper L. in Shelburne Co.; rather common west of Halifax; and scattered north to Lily L. in Kings Co. and about Debert in Colchester Co.; sterile meadows, thickets and near lake shores, often on rocky or sandy ground. June.

Fla. to Tex. and north mainly on the coastal plain to N.S. and s. Ont.

2. **A. prunifolia** (Marsh.)Rehd. Fig. 83, d. Map 317. CHOKEBERRY

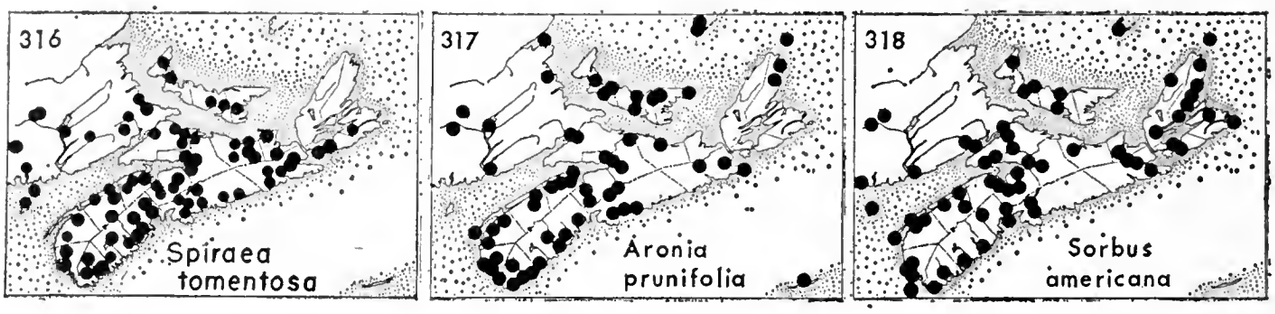
Common throughout the western half of N.S., becoming scattered to northern C.B.; meadows, swamps, barrens, sand plains and even in bogs. It flowers in mid-May and produces dark fruit by the end of July. The leaves vary greatly in pubescence and often the pedicels may be pubescent and the leaves entirely glabrous, or with only a few hairs near the midrib, thus approaching the next species. (*Pyrus floribunda* Lindl.).

Nfld. to Mich. south to Fla.

3. **A. melanocarpa** (Michx.) Ell. BLACK CHOKEBERRY

Rarer than the preceding in the Province, but scattered throughout and more common in the northern and eastern regions. Mid-June.

Nfld. to Mich. south to S.C.



5. **SORBUS** L. MOUNTAIN-ASH

Small trees with alternate, pinnately compound leaves with 11-17 serrate leaflets. The flowers are very numerous and small in a flat inflorescence. See a synopsis of the North American species of *Sorbus* (Jones, 1939).

a. Winter buds shiny and sparsely hairy; inflorescence sparsely hairy; leaflets 4-9 cm long, acute to long-pointed.
  b. Flowers 5-6 mm wide, with the petals cuneate at the base and exceeding the stamens; fruit 4-6 mm thick; leaflets 3.5-5 times as long as wide, long pointed, each with 50-75 teeth running to or nearly to the base. 1. *S. americana*
  b. Flowers about 10 mm wide, the petals nearly orbicular and shorter than the stamens; fruit 8-10 mm thick; leaflets short-pointed, 2-3 times as long as wide, each with 30-45 teeth which are found chiefly above the middle. 2. *S. decora*
a. Winter buds densely and long white-hairy; branches of the inflorescence, pedicels and calyces whitish-hairy at flowering time; leaflets small, blunt, 3-5 cm long; stamens longer than the petals. 3. *S. Aucuparia*

1. **S. americana** Marsh. Fig. 84. Map 318. MOUNTAIN-ASH

This is the most common species in N.S. and is frequent from Yarmouth to northern C.B. in open woods, on hillsides and along hedgerows. It flowers in June; and the small fruits ripen in late Aug. or Sept. and persist into the winter.

Nfld. to northern Minn. south to Tenn. and N.C.

2. **S. decora** (Sarg.)Schneid. Map 319. DOGBERRY

Scattered throughout, less common than the previous species in most areas of the Province and apparently intergrading with it. It is more typical near the shore and is common on the poorly-drained soils and swamps on the tablelands of northern C.B. Even plants that have the leaves typical of this species may not always have the flower characteristics. The clusters of bright large fruits are conspicuous in early autumn.

Hybrids are occasionally found with *Aronia prunifolia:* St. Paul I., frequent (Perry, 1931). This is known as **Sorbaronia Arsenii** (Britt.) Jones.

Greenland to B.C. south to N.Y.

3. **S. Aucuparia** L. Fig. 84. ROWAN

Often planted as an ornamental; and scattered elsewhere as an escape along roadsides, especially in the center of the Province from the Annapolis Valley to Amherst and Antigonish. June. A cultivated hybrid with *Aronia* is sometimes planted and is known as *Sorbaronia hybrida* (Moench)Schneid. This has the appearance of a *Sorbus* but the leaves are irregularly and deeply lobed.

Introduced from Eu.; and widely naturalized.

6. **AMELANCHIER** Medic. SHADBUSH, WILD PEAR

Showy trees and shrubs with simple leaves and racemes of white flowers with petals several times longer than wide. The fruits are small, edible, red to purplish, berry-like pomes. Common along roadsides and in cut-over areas. The species are difficult to define; and in disturbed areas a multitude of hybrids make satisfactory identification of many collections difficult.

a. Flowers several to many, in racemes; leaves folded when young, mostly round to cordate at the base; fruit mostly globular; ovary-summit rounded.
  b. Tall shrubs or trees, not markedly stoloniferous; leaves acute to acuminate, oblong to oval, with 11-17 pairs of primary veins, and 30-70 teeth on each side.
    c. Young leaves more or less whitish-tomentose, often still folded at the beginning of flowering; ovary-summit usually woolly but sometimes entirely glabrous; lower pedicels 10-15 mm long.
      d. Leaves folded at flowering, densely pubescent on the lower side so as to obscure the veins; ovary-summit often densely woolly. 1. *A. Wiegandii*
      d. Leaves mostly expanded at flowering, with a thin flocculent pubescence that soon disappears; ovary-summit flocculent-pubescent to glabrous; fruit succulent; leaves reddish when young. 2. *A. intermedia*
    c. Young leaves glabrous or merely with a few silky hairs beneath, mostly bronze-purple, soon opening flat; lower pedicels 15-30 mm long, with large flowers. 3. *A. laevis*
  b. Low shrubs, up to 1.5 m high, stoloniferous and forming colonies or patches; leaves oval to obovate, round at the tips or barely acute.
    e. Ovary-summit glabrous or practically so; older leaves thick and shining above; fruits small. 4. *A. lucida*
    e. Ovary-summit tomentose; fruit dark-purple and succulent when ripe.
      f. Leaves densely tomentose beneath when young, dull when older; calyx-tube 3-4 mm wide; erect much-branched shrubs to 1.5 m high; sandy soils, where stoloniferous patches may be found. 5. *A. stolonifera*
      f. Leaves glabrous and green from the first or thinly tomentose when very young; calyx-tube 5 mm wide; low shrubs up to 1 m high, loosely stoloniferous. 6. *A. Fernaldii*
a. Flowers 1-3, in the axils of the leaves; leaves flat when young, nearly glabrous, mostly tapering to the base, pale beneath; fruit ellipsoid-ovoid; ovary-summit woolly, conical. 7. *A. Bartramiana*

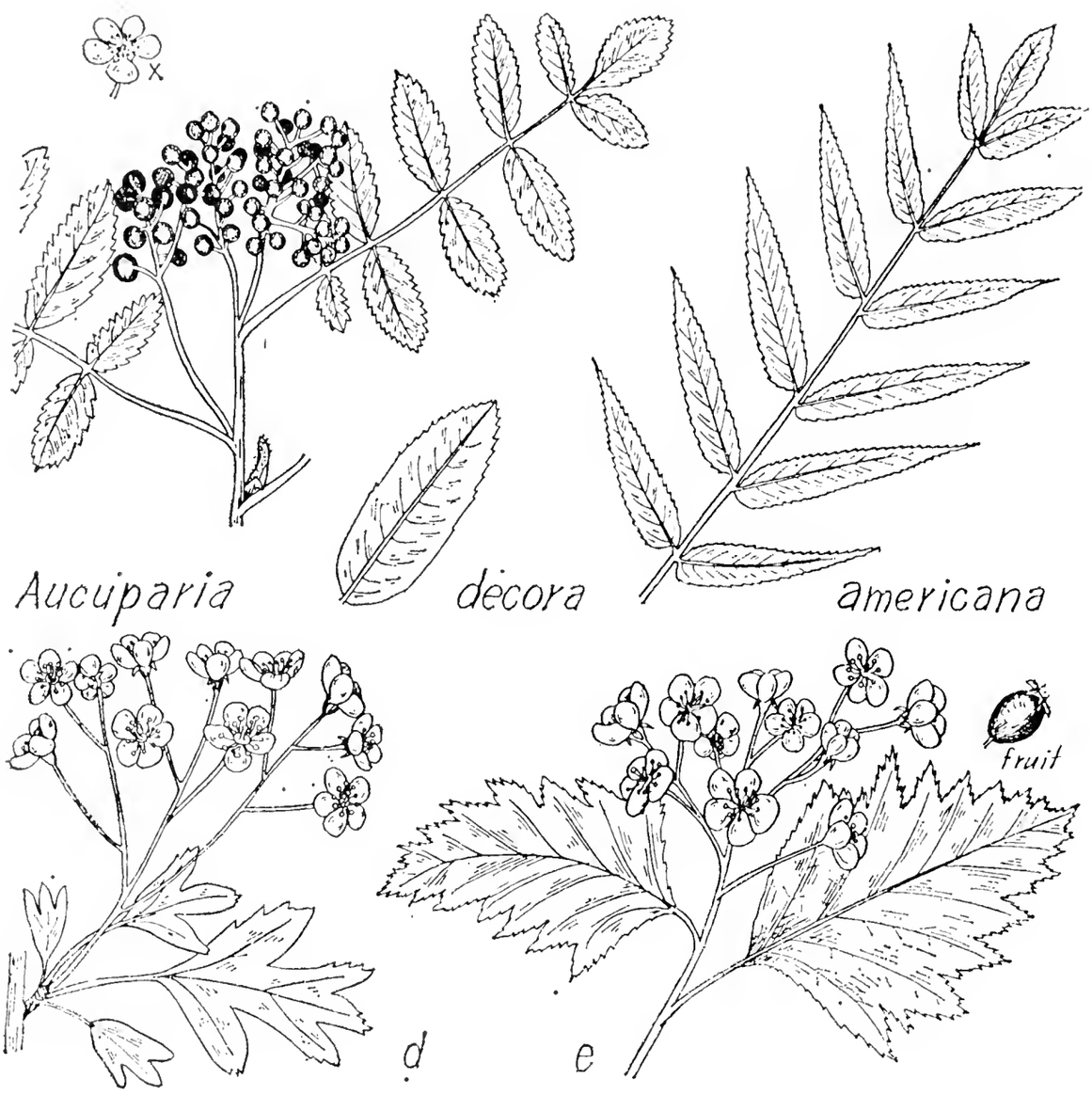


Fig. 84.—**Sorbus:** (a) *S. Aucuparia*, fruiting branch x $\frac{1}{2}$, flower x 1, (b) *S. decora*, leaflet x $\frac{1}{2}$, (c) *S. americana*, leaf x $\frac{1}{2}$. — **Crataegus:** (d) *C. monogyna* x $\frac{1}{2}$, (e) *C. macrosperma* var. *acutiloba*.

1. **A. Wiegandii** Nielsen Fig. 85, b. SHADBUSH, WILD PEAR

Common throughout, extremely variable as to pubescence, length of petals and other characteristics. Reports of *A. canadensis* are placed here. A few collections with glabrous ovaries seem to be mere variations. A number of collections from Kings Co. to northern N.S. were all identified as *A. Wiegandii* by K. M. Wiegand. Hybrids often occur with *A. Bartramiana* and show many intermediate characteristics. This species often forms rather large trees. Late May.

N.S. to Minn. south to N.Y.

2. **A. intermedia** Spach

Scattered to rather common throughout the whole Province, forming bushes up to 5 m high. The leaves have a purplish tinge when young and both leaves and inflorescences have a flocculent pubescence which later disappears. This shrub is common near Pictou and elsewhere in

the same county and these bushes bear very succulent, purplish large fruits. Swamps, heavy soils, hedge-rows and in a variety of habitats.

Nfld. to Minn. south to Va. and N.C.

3. **A. laevis** Wieg. Fig. 85, a. SHADBUSH, BILBERRY

Common throughout; conspicuous in flower by its bronze foliage and its loose racemes of large flowers. This is one of our best and most distinctive species. It also apparently hybridizes with *A. Wiegandii*, although most collections are typical. Open pastures and clearings often contain a multitude of forms that cannot be satisfactorily named. Hybrids with *A. Bartramiana* may show an elongated fruit and the woolly, conical ovary. This hybrid has been named *A. neglecta* Eggleston. A group of these shrubs were found on the north side of the Cornwallis R. just west of Kentville.

Forma **nitida** Wieg. has the leaves thicker, deep green and glossy above. Scattered in many places, although this entity does not seem to be of much importance nor is it easy to identify.

Nfld. to Mich. and Kans. south to Ga. and Ala.

4. **A. lucida** Fern.

Sandy areas, rocky barrens, roadsides and edges of thickets; common from Yarmouth to Halifax and Cumberland Co. In many areas, and especially in Cumberland Co. between Parrsboro and Springhill Junction, this plant forms stoloniferous colonies and it flowers and fruits abundantly when only 3-4 dm high. Larger shrubs have much the appearance of *A. laevis* but the leaves are more oval and the petals are much shorter, while the leaves have only 7-11 pairs of primary veins and with 20-28 teeth along one side of the leaf. The young leaves and inflorescences have abundant pubescence but this soon disappears. This species may have originated from a cross between *A. laevis* and *A. stolonifera*.

Described from N.S. and unknown elsewhere.

5. **A. stolonifera** Wieg. Map 320.

Rather local; scattered in Yarmouth Co. and becoming rather common in thickets and boggy depressions of the sand plains in the Annapolis Valley in western Kings and neighboring Annapolis Co. This species flowers a week or ten days later than the preceding one and the fruits are large, purple and of good quality, whereas those of *A. lucida* are small and reddish.

Nfld. to Me. and Va. and sparingly inland to Minn.

6. **A. Fernaldii** Wieg.

Rare; in eastern N.S. it was first reported from the margin of Ethyl L., St. Paul I. (Perry, 1931). Said to occur mostly in calcareous areas. The identity of the low, semi-stoloniferous, large-fruited bushes found in

the bogs and barrens of eastern N.S. is dubious but these shrubs may be related to this species.

Open barrens, thickets and shores from Nfld. to the lower St. Lawrence south to P.E.I. and eastern N.S.

7. **A. Bartramiana** (Tausch)Roemer Fig. 85, c. Map 320.

Scattered in southern Digby and Yarmouth counties; rather common from Cumberland and Halifax to northern C.B. It is found on acid, poorly-drained soils, bogs and wet thickets, often in shaded locations. Intermediates with the flowers in short racemes, but with the leaves resembling this species, are often found around the edges of bogs, especially in northern C.B.

Lab. to Ont. south to the mts. of New Eng., Penn. and Mich.

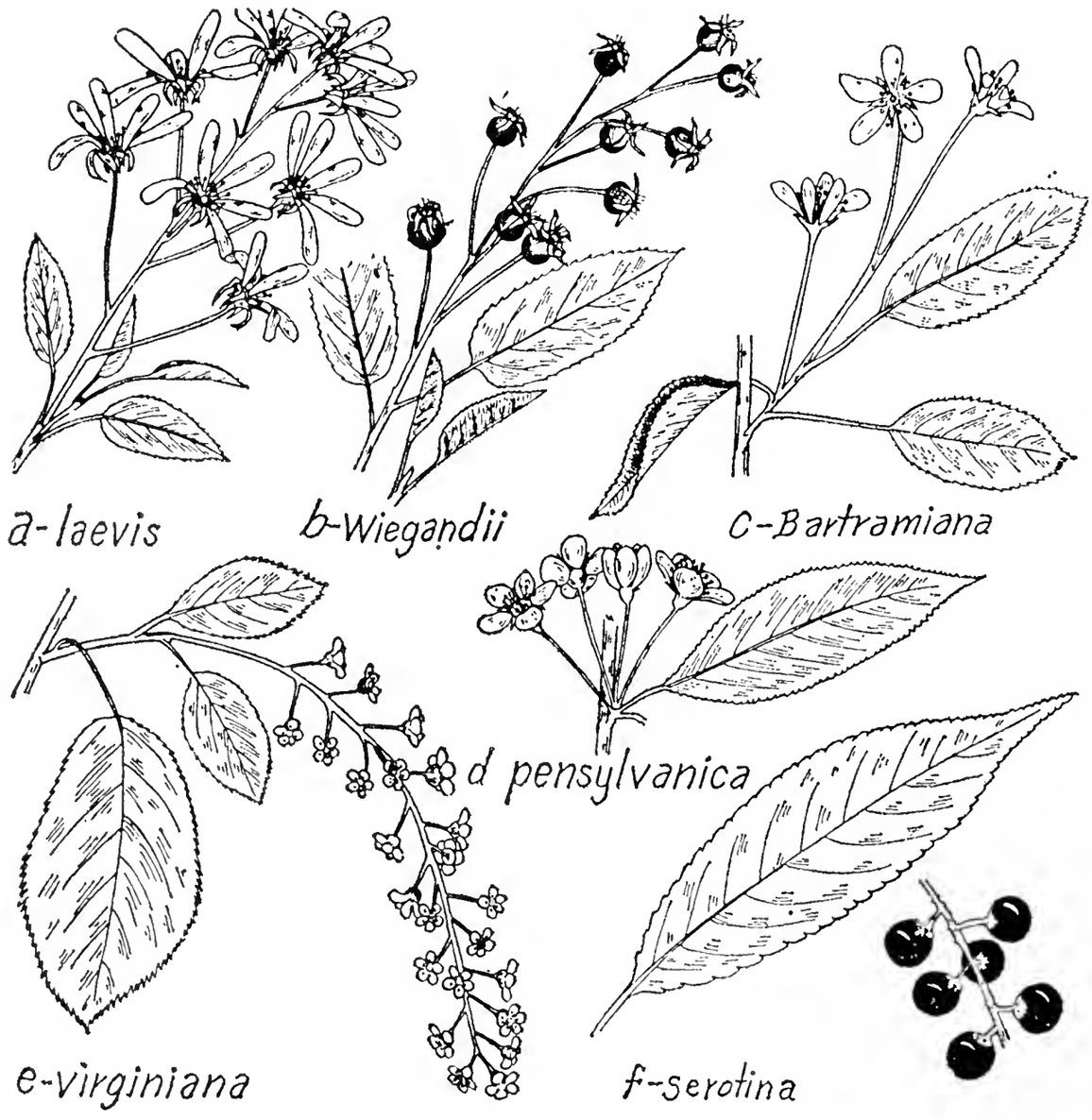
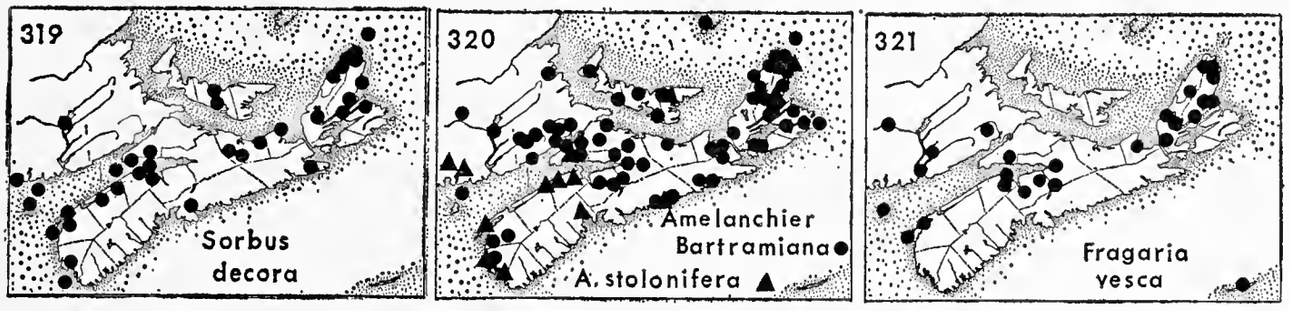


Fig. 85.—**Amelanchier** spp. (a), (b), (c) x $\frac{1}{2}$. — **Prunus:** spp. (d), (e), (f) x $\frac{1}{2}$.



7. CRATAEGUS L. HAWTHORNS

Thorny shrubs with showy white flowers in early June; fruits fleshy red berry-like pomes with 1-5 seeds. Our native species are scattered along river-valleys and at the edges of woods near sea-shores or about lakes. The species are quite similar and variable and the group is a most difficult one. Over 1000 species have been described in eastern N.Amer. No complete treatment can yet be given and the genus in eastern N.S. is rather complex. Occasional hybrids may occur and give rise to local strains which may reproduce without fertilization and form a very uniform population over a considerable area. Intermediates sometimes occur and species vary somewhat from one part of their range to another. Consequently it is difficult to make an adequate key; and the best procedure for the student is to make a number of collections for comparison and reference, taking care to obtain flowers and fruit from the same bushes.

a. Leaves deeply cut, the lowest incisions often extending more than half-way to the mid-rib; veins running both to the sinuses and to the points of the lobes; nutlets single (Fig. 84, d); introduced. 1. *C. monogyna*

a. Leaves serrate, dentate, or more or less lobed but not deeply cut; veins running only to the points of the lobes; nutlets 2-5; thorns 5-10 cm long (Fig. 84, e); native species.

b. Leaves definitely and rather regularly lobed; nutlets not pitted on the inner faces.

c. Leaf-blades cuneate or tapering to the base.

d. Leaves cuneate at the base, sometimes with the petiole slightly winged above; flowers mostly under 2 cm wide.

e. Leaves sharply and conspicuously lobed, broadly ovate to sub-orbicular or rhomboid on the terminal shoots, mostly 4-6 cm long although they may be larger on vigorous shoots; sepals glandular-serrate; fruits 1-1.3 cm thick; bush extremely thorny with long slender curved thorns.

f. Petioles and inflorescence more or less villous. 2. *C. chrysocarpa*

f. Petioles and inflorescence glabrous. *C. chrysocarpa* var. *phoenicea*

e. Leaves with small spinulose lobes, ovate to broadly oblong-ovate to nearly orbicular on the terminal shoots, dark green, variable in shape, the lower half often merely finely toothed and tapering or slightly rounded to the petiole.

g. Stamens 5-10, usually less than 10; leaves mostly entire below the middle, oval or nearly orbicular in many cases, shallowly lobed and becoming thick. 5. *C. Brainerdi* var. *Egglestoni*

g. Stamens 8-15, usually 10 or more; leaves lobed to below the middle, mostly elliptic and cuneate at the base, with short stiff hairs on the upper surface at maturity. *C. Brainerdi* var. *scabrida*

d. Leaves mostly elliptical, attenuate to the base with the upper part of the petiole widely winged.
h. Blades of the floral leaves mostly under 5 cm long; leaves rather thin and sharply lobed with forward-pointing lobes; flowers 1.5-2 cm wide; fruit to 1 cm thick; stamens about 10, yellowish; sepals glandular-serrate. 3. *C. Brunetiana*
h. Blades of the floral leaves often 6-8 cm long; flowers 2-2.3 cm wide; fruit 1-1.3 cm thick; stamens about 10, with pink anthers; sepals entire. 4. *C. Jonesae*
c. Leaf-blades rounded, squarish, or even slightly cordate at the base, widest below the middle and ovate, sharply lobed and toothed.
i. Flowering corymbs glabrous or slightly tomentose; stamens reddish; fruit glabrous; leaves rather thin and becoming glabrous.
j. Corymbs and flowers glabrous; sepals not glandular-serrate, smooth and lanceolate; thorns short and stout, 4-5 cm long.
k. Leaves rounded to the base, mostly 3-6 cm long and 2-5 cm wide, rather sharply cut. 6. *C. macrosperma*
k. Leaves larger, to 6 cm wide, truncate or slightly cordate at the base, the lobes broad and with spreading and often slightly recurved tips. *C. macrosperma* var. *acutiloba*
j. Corymbs and bases of the flowers lightly tomentose; stamens 10-20; sepals glandular-toothed. 7. *C. densiflora*
i. Flowering corymbs densely tomentose; stamens yellowish; fruit minutely pubescent near the base; leaves widely ovate with a number of sharp, shallow lobes, permanently soft-hairy. 8. *C. submollis*
b. Leaves with oval or ovate blades which are attenuate at the base, tending to be widest about the middle, very slightly or irregularly lobed, the lobes often not much more than larger teeth; flowers 1.3-1.7 cm wide, appearing slightly later than those of other species; nutlets pitted on the inner face; sepals often deeply cut and glandular-toothed. 9. *C. succulenta*

1. **C. monogyna** Jacq. Fig. 84, d. ENGLISH HAWTHORN

Commonly planted and escaping to thickets and roadsides. It is common from Yarmouth throughout the Annapolis Valley and to Truro, becoming rarer eastward. The deeply-cut leaflets, very short thorns and single nutlet separate this species widely from our native forms. Mid-June.

Eurasia; widely introduced.

2. **C. chrysocarpa** Ashe AMERICAN HAWTHORN

This is our most thorny and much-branched shrub, found in thickets and in open ground. The fruit has relatively large seeds and thin flesh and ripens late in the season, becoming dark red. The typical variety is reported only from Pictou Co., but recent collections show this to be the common form from Hants and Cumberland Co. east through Pictou Co. N.S. to N.Y. west to Man. and N.M.

Var. **phoenicea** Palmer differs in its entirely glabrous inflorescence and petioles. This was reported by Palmer from Pictou, Colchester, Hants, Lunenburg, Annapolis, Queens and Yarmouth Co. (Roland, 1944-46). The leaves are usually rather small and pale. Any hawthorn with numerous, very long curving thorns is apt to be this species. N.S. to New Eng. and Penn.

C. Robinsoni Sarg. was described from a few plants found near Loch Broom and Rustico, Pictou Co. This is said to be a distinct shrub with very small flowers and fruit, the flowers being only 0.8-1 cm wide and the fruit 1 cm or less in length. Its rarity and the characters of the leaves, flowers and fruit suggest that it may be a hybrid, possibly between *C. chrysocarpa* and *C. Brainerdi*, the common species in this area. Not collected recently.

3. **C. Brunetiana** Sarg.

The most typical collections of this species are from near the railroad station at Monastery and slightly inland along the roadsides in Antigonish Co. From here eastward along Inverness Co. and up to the Margaree Valley the shrubs seem to be predominantly this species, although the leaves are slightly larger and the flowers more showy. The elliptical, rather deeply cut leaves are characteristic.

Nfld. to Minn. south to N.S. and Me.

4. **C. Jonesae** Sarg.

A shrub or small tree growing along banks of streams or inlets, often near salt water. This is said to be a handsome and distinct species on account of its large flowers and large brightly colored fruit. Reported by Palmer from Pictou, Colchester, Kings, Queens, Yarmouth and Digby Co. The present distribution of this species eastward is unknown since we have had difficulty in separating it from other species and may be confusing it with other forms. Trees from the center of Inverness Co. seem typical.

Que. around the coast to N.B., N.S. and Me.

5. **C. Brainerdi** Sarg.

The typical variety has not been found in N.S. but the species is represented here by the following:

Var. **Egglestoni** (Sarg.)Robins. is usually shrubby with a narrow top of erect or ascending thorny branches. It is only rarely seen, found in thickets and borders of woods in Antigonish, Pictou and Colchester Co.: low pasture at the south end of Lochaber Lake and along the North River near Truro. N.S. to N.Y.

Var. **scabrida** (Sarg.)Egglest. is rather abundant in central N.S. and is the common species in Pictou Co. where it is very common from Pictou up all the rivers. In some cases it forms tall hedges and is the most common species in Pictou and Colchester Co.; scattered westward at least to Lunenburg and Annapolis Co. N.S. and New Eng. west to Mich.

6. **C. macrosperma** Ashe

A shrub or small tree with spreading or ascending branches and slightly scaly bark. The trunk and larger branches are often angular or irregular in cross-section. The small fruit becomes bright red and soft

when fully ripe. It is the most widely distributed thorn in N.S., found in thickets, borders of woods, rocky pastures and along roadsides from Yarmouth Co. eastward through Lunenburg and Halifax Co. to northern C.B. It is the most common form in the Annapolis Valley and is also common in Cumberland Co. around Nappan and Oxford. The thorns are rather short and stout. N.S. to Wisc. south to the mts. of N.C.

Var. **acutiloba** (Sarg.)Egglest (Fig. 84, e) is found in similar locations but is much less common; from Yarmouth Co. eastward to Pictou Co. and Havre Boucher in Antigonish Co. The leaves are larger and tend to be wider at the base and more deeply lobed than those of the typical variety.

Nfld. and Que. to N.Y.

7. **C. densiflora** Sarg.

Many of the shrubs of northern C.B. resemble the previous species but have the inflorescence pubescent and the sepals glandular. This form has been found near Baddeck, in the Margaree Valley, just north of Cheticamp and to Cape North Village. Variations exist in the number and color of the stamens in different locations and this group may be more complex. This name is applied for the present but further study may lead to a more exact identification.

Limestone ridges and hillsides, southern Que.; N.S.

8. **C. submollis** Sarg.

This species is well distinguished by its densely tomentose inflorescence and young leaves and by the highly-flavored, early-ripening edible fruit. The leaves are rather small with a grayish appearance. Palmer reports it from Halifax Co., location unknown. It has also been found near the road junction about a mile west of Brooklyn, Hants Co. on the Windsor road; and it is common in the river valley along the river at Heatherton in Antigonish Co. The leaves are usually so eaten by insects that it is difficult to get a good specimen except early in the summer.

N.S. and Que. south to Mass. and N.Y.

9. **C. succulenta** Link

This thorny shrub is difficult to describe since it is rather variable. It is found infrequently in thickets and along streams at least from Cumberland, Digby and Halifax Co. east to C.B., where it is very common in the Margaree Valley on the rocky land near the river. The flowers are rather small and late in opening; and the small fruit, usually with 2 or 3 nutlets, remains hard and green until late in the season, but becomes bright red and succulent when fully ripe. Different bushes in the Margaree Valley may be quite different in appearance, shape of the leaves and hairiness of the inflorescence. Usually the stamens are red. The leaves are rather thick and glossy and have the veins deeply impressed on the upper side. The plants of the central region were placed in var.

macracantha (Lodd.)Egglest. This variety often has the sepals very deeply cut or lobed. Some Margaree bushes have the sepals smooth and quite untoothed. This would be var. *integriloba* Sarg., but the species is very variable in this respect here.

N.S. to N.Y. and Penn.

8. **FRAGARIA** L. STRAWBERRY

About 35 species; freely-runnering plants with three leaflets and distinguished from *Potentilla* by the receptacle becoming fleshy and forming a berry in fruit. See taxonomic studies in the genus Fragaria (Staudt, 1962).

a. Achenes embedded in pits on the mature fruit; inflorescence and fruiting stems usually shorter than the leaves; petals usually 5-7 mm long or longer and sepals appressed; leaves firm, often rugose and with a slight bloom or bluish tinge.
  b. Native plants, slender with the petioles 1-2 mm thick; leaves flat on the upper surface; petals commonly 7-10 mm long and the fruit small. 1. *F. virginiana*
  b. Introduced and cultivated forms, stout with the petioles 2-3 mm thick; leaves with veins and veinlets impressed on the upper side; petals commonly 10-14 mm long; with large fruits. 2. *F. Ananassa*
a. Achenes borne on the unpitted surface of the fruit; inflorescence and fruiting stems usually longer than the leaves; sepals reflexed; leaves thin, often rather folded or plicate, a light green; whole plant very slender. 3. *F. vesca*

1. **F. virginiana** Duchesne WILD STRAWBERRY

Common throughout; open woodlands, pastures, barrens and fields. May-early June. Nfld. to B.C. south to Ga. and Okla.

Var. **terrae-novae** (Rydb.)Fern. & Wieg. is a common form in exposed places, about the headlands of northern C.B. and scattered east and south. This differs in having the hairs of the peduncles and petioles ascending or appressed. It seems distinct northwards but in the central part of N.S. it grades into the species and both types can often be found in the same patch or field. A collection of this species from Jeffers Brook in Cumberland Co. has the peduncle with small leaves and each branch with a small bracted inflorescence. Plants with small greenish flowers are affected by a virus disease.

Lab. and Gaspé to Ont. south to N.S. and N.Y.

2. **F. Ananassa** Duchesne CULTIVATED STRAWBERRY

This is considered to be a hybrid of *F. virginiana* and *F. chiloensis*. Commonly grown and persisting or escaping.

3. **F. vesca** L., var. **americana** Porter Fig. 86. Map 321.

Scattered from Kings and Cumberland Co. to northern C.B.; occasionally found along the sides of ravines in the Annapolis Valley;

frequent in open woods, ravines or banks in the gypsum areas, often growing in dense patches with the slender plants freely producing runners.

Plants from along the river above White Rock, Kings Co., were grown in the greenhouse at the Research Station, Kentville, and found to have white berries. This is forma **Landonii** Boivin.

The introduced species has the hairs of the petioles and peduncle spreading instead of ascending. This has not been seen except for cultivated plants, but it is said to be introduced from Nfld. to W. Va.

Nfld. to B.C. south to Va. and Mo.

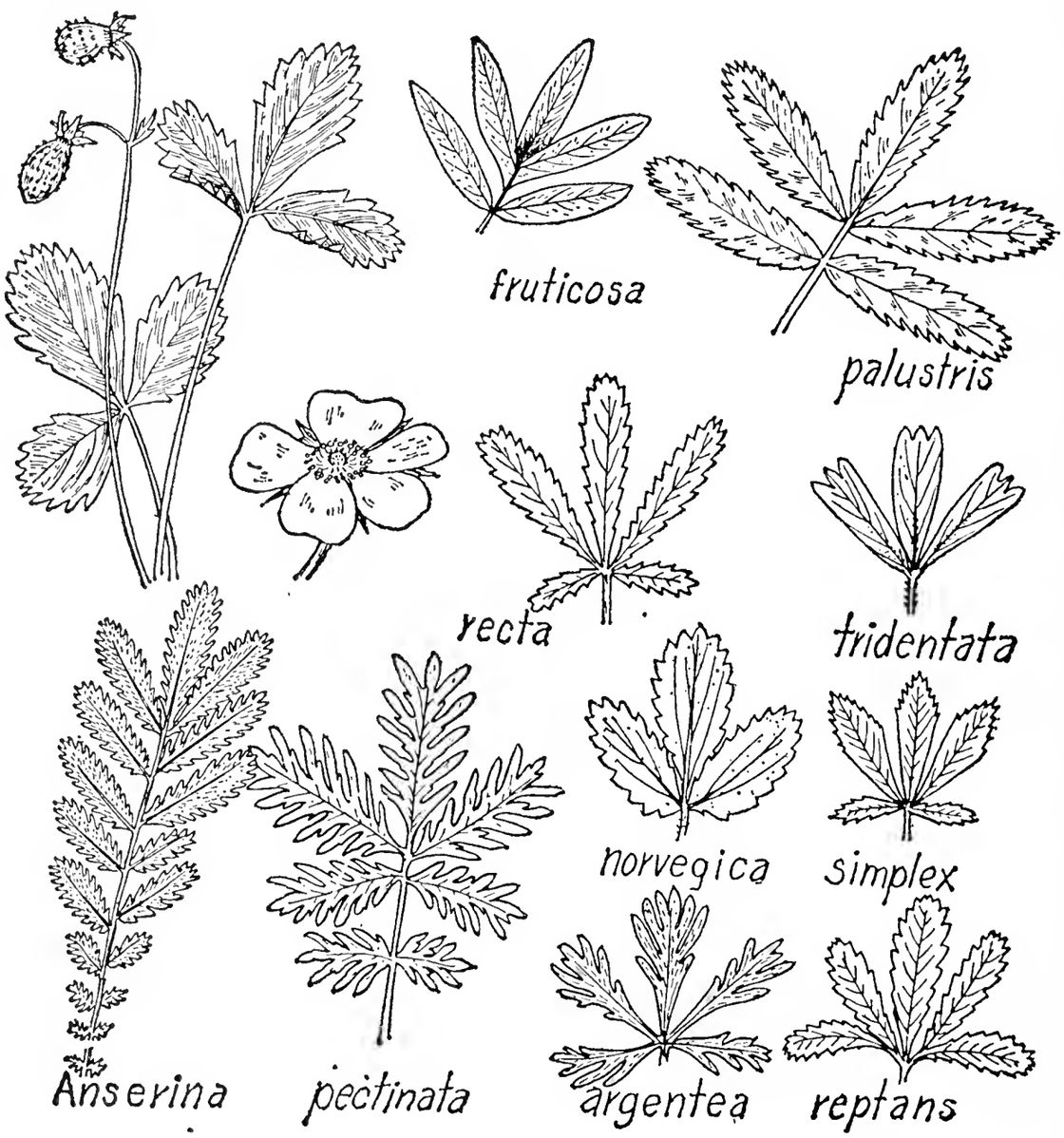


Fig. 86.—**Fragaria**: *F. vesca*, fruiting plant x $\frac{1}{2}$. — **Potentilla** spp. typical flower x 1 and leaves x $\frac{1}{2}$.

9. POTENTILLA L. CINQUEFOIL, FIVE-FINGER

Herbs or rarely shrubs, with compound leaves; about 300 species in the northern hemisphere. The flowers are much like those of the strawberry but the fruit consists of a mass of achenes on a dry receptacle.

a. Stem shrubby and diffusely branched; flowers yellow; leaves pinnately compound with 5-7 leaflets. 1. *P. fruticosa*

a. Stem herbaceous or else very low and only woody at the base.

b. Leaves pinnately compound with the leaflets attached along the short axis or rachis.

c. Flowers several to many in a cyme; leaflets 5-11, with smaller alternating leaflets few or absent.

d. Petals reddish purple, with the sepals and stems more faintly tinged; leaflets mostly 5, toothed; marshes and shallow ponds. 3. *P. palustris*

d. Petals yellow; sepals and stems not reddish tinged; plants of dry locations.

e. Leaflets 5-7, deeply lobed; style about 1 mm long, thickened and glandular at the base. 6. *P. pensylvanica*

e. Leaflets often more than 7, increasing regularly in size towards the apex of the leaf, toothed only; style 1.5-2 mm long, slender throughout. 7. *P. Hippiana*

c. Flowers usually solitary; leaflets numerous, becoming very small towards the base of the leaf and with minute leaflets between the larger ones; salt marshes.

f. Achenes grooved on the back; plants long-trailing, the leaves spreading; leaflets beneath with long straight hairs overlying the dense shiny tomentum. 15. *P. Anserina*

f. Achenes somewhat flattened and rounded on the back, not grooved; plant little-trailing, the leaves erect; leaflets beneath white-tomentose. Var. *Rolandii*

b. Leaves palmately compound with all the leaflets attached at one place.

g. Leaflets 5-9, oblanceolate, prominently toothed; flowers large, sulphur yellow; tall erect perennial. 8. *P. recta*

g. Leaflets 3 or 5.

h. Leaflets 3, or if more then with flower-parts in 4's.

i. Flower-parts in 5's; flowers numerous in a terminal inflorescence.

j. Flowers white; leaflets each with 3 teeth at the tip and wedge-shaped; achenes pubescent. 2. *P. tridentata*

j. Flowers yellow; leaflets oval, toothed around the entire margin. 9. *P. norvegica*

i. Flower-parts in 4's; flowers mostly solitary along the slender trailing stems; leaflets prominently wedge-shaped at the base with 7-8 coarse teeth mostly above the middle. 11. *P. anglica*

h. Leaflets in 5's, finely toothed to near the base.

k. Plants erect or becoming prostrate, not trailing; flowers numerous in a diffuse terminal inflorescence.

l. Leaflets long wedge-shaped at the base with the few teeth mostly on the upper part, the lower surface covered with gray or silvery tangled or matted hairs.

m. Tomentum dense and silvery; leaf-divisions narrow with the margins revolute. 4. *P. argentea*

m. Tomentum light, gray; leaf-divisions and teeth wider with the margins not inrolled. 5. *P. canescens*

l. Leaflets oblanceolate to obovate, with numerous small teeth; hairy on the lower surface but any tangled tomentum very light; plant usually erect. 10. *P. intermedia*

k. Plants long-trailing; flowers solitary in the axils of the leaves; leaves not silvery beneath.

n. Flowers 20-30 mm wide, deep yellow; stems long and trailing, often rooting at the nodes and unbranched; leaves with the pairs of lateral leaflets having their stalks united for a short distance at the base. 12. *P. reptans*

n. Flowers small, 6-16 mm wide; stems erect at first, later procumbent and long trailing, much branched; leaflets with their stalks separate to the petiole.

o. Plant small, the stems thread-like, 0.3-1 mm thick at flowering time; first flower borne in the axil of the leaf from the first well-developed node when the stem is 1-1.5 dm high.

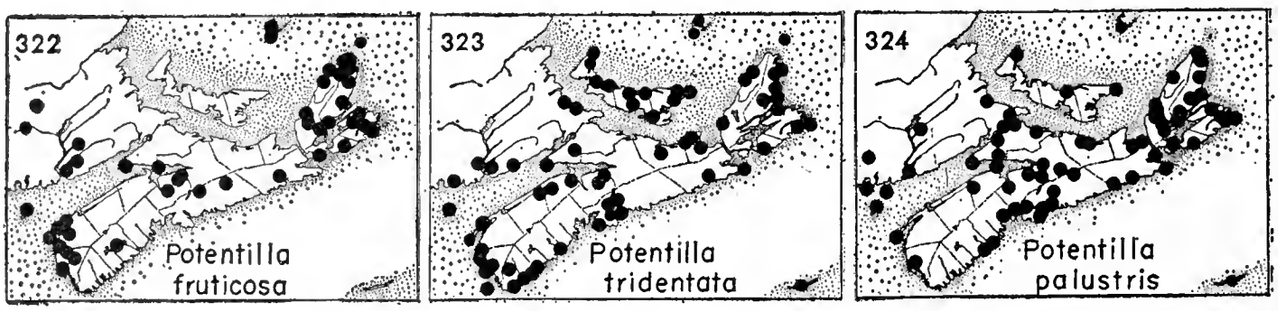
13. *P. canadensis*

o. Plant larger, the trailing stems 1-3 mm thick at the base; first flower borne from the second well-developed node when the plant is 1-4 dm high.

p. Stem, especially when young, long-hairy with spreading or somewhat appressed hairs. 14. *P. simplex*

p. Stem smooth, or with short stiff appressed hairs.

P. simplex var. *calvescens*



1. **P. fruticosa** L. Fig. 86. Map 322. SHRUBBY CINQUEFOIL

Common in southern Digby and Yamouth Co. in spruce bogs and wet savannahs; often around gypsum or limestone in the center of the Province from Cape d'Or and Hants Co.; and occasionally to Guysborough Co.; scattered throughout C.B. and more common in the northern regions on alkaline soils, in swamps or on gypsum banks and cliff-ledges. The European plants are tetraploid, 2n = 28. The North American ones, including plants from Halifax and Inverness Co., N.S. are diploid, 2n = 14 (Bowden, 1957).

Greenland to Alaska south to Penn., Iowa and Calif.; Eurasia.

2. **P. tridentata** Ait. Fig. 86. Map 323. THREE-TOOTHED CINQUEFOIL

Common around the coast in exposed and rocky situations; found on sandy soil in the center of the Annapolis Valley and about cliffs or bare rock outcrops inland; scattered elsewhere and very variable. Rousseau (1938-a) discusses this variation.

Forma **hirsutifolia** Pease has the leaves hirsute, both above and beneath, while the typical form has the leaves smooth or shining above; gravelly shore at Guysborough. June-Aug.

Lab. to Mackenzie south to New Eng. and the mts. of Ga.

3. **P. palustris** (L.)Scop. Fig. 86. Map 324. MARSH-CINQUEFOIL

Rare in the southwestern counties; scattered in the center of the Province; becoming common northward to Cumberland Co. and east to

C.B. It is found on muddy shores, in swamps above river estuaries, or in undrained ponds. The plants are rather variable. When growing on exsiccated places or towards the end of the summer the leaflets may be densely silky-hairy. This phase is designated forma **subsericea** (Becker) Wolf. Plants with the petioles, peduncles and bractlets densely hairy and glandular and the leaflets hairy, have been called var. *villosa* (Pers.) Lehm, but these occur from N.S. to B.C. and do not appear to have a distinct geographical range. They are probably better known as forma *glandulosa* Gunnarrson. Smaller northern plants ranging south to N.S. have been called var. *parvifolia* (Raf.)Fern. & Long, but it is also doubtful if these deserve varietal rank.

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

4. **P. argentea** L. Fig. 86. SILVERY CINQUEFOIL

This is a common weed in most parts of the Province; in gardens, dry fields, waste ground and along roadsides; scattered throughout but not aggressively spreading.

Introduced from Eu.; widespread in eastern N. Amer.

5. **P. canescens** Bess.

Rather similar in appearance to the preceding species; common on grassy roadside in Victoria Park, Truro. This is a member of a polymorphic group in Europe and it is the same as or is closely related to *P. collina* Wibel of other authors.

Naturalized from Eu.; scattered to Mich. and Penn.

6. **P. pensylvanica L.**, var. **litoralis** (Rydb.)Boivin Fig. 86.

Known only from a small, sandy beach north of Cheticamp in Inverness Co. where it has not been recently observed; although Boivin (1952-a) states that a specimen was examined from the Atlantic Coast of N.S. This entity is a variety of the more western *P. pensylvanica* but does not appear sufficiently distinct to be classed as a separate species. (*P. pectinata* Raf.).

Rocky or gravelly soils: Nfld., lower St. Lawrence and Baie des Chaleurs, to the coast of Me. and N.H. and west to Alta.

7. **P. Hippiana** Lehm

A casual adventive from the prairies: in a field, Brooklyn Corner, collected by W.B. Schofield in 1948.

Casual in fields eastward.

8. **P. recta** L. Fig. 86.

This tall, leafy plant is now frequently seen along roadsides, about dwellings and fields throughout. Usually only scattered plants are seen but occasionally it is found in considerable numbers. Two varieties have been introduced. Var. **sulphurea** (Lam. & DC.)Peyr. is the more common and has the middle and lower stem leaves commonly with 7 leaflets. Var. **obscura** (Nestler)Koch has 5 leaflets. June 20-July.

Introduced from Eu.; Nfld. to B.C. south to Tenn. and Kans.

9. **P. norvegica** L. Fig. 86. ROUGH CINQUEFOIL

A common weed in fields, roadsides and gardens, practically always present but rarely in any numbers. This plant is highly variable and may be partly native and partly introduced; the name var. *hirsuta* (Michx.)Lehm has been given to what some regard as the native population.

Widespread in Eurasia and in N.Amer.

10. **P. intermedia** L.

This low or sprawling plant has somewhat the appearance of the preceding species but the lower leaves usually have five leaflets; yard weed at Lowe's Landing in Queens Co.; sprawling in gravel, roadside at Crossroads, Cumberland Co.; scattered throughout central and western P.E.I.

Scattered introductions from Eu.; Nfld. to Mich. south to Va.

11. **P. anglica** Laicharding Map 325.

Along a path in spruce and alder thicket, Lower Argyle, Yarmouth Co.; grassy road through spruce and fir woods, Baddeck (Fernald, 1921). Our collections show it to be scattered throughout the center of C.B. Island. Fernald interprets the status of this plant as being native ranging from southern Labrador and se. Nfld. to C.B. Island and introduced further south in sw. N.S. and Penn. Others consider it to be introduced. (*P. procumbens* Sibth.).

N. Amer., Europe and the Azores.

12. **P. reptans** L. Fig. 86.

Sparingly found in the country and about the wharves in Yarmouth. Adventive and rare.

Adventive from Eu.; Mass. to Ont. and Va.; N.S.

13. **P. canadensis** L. Map 325.

Rare on dryish soil or barren areas; Yarmouth, Shelburne and Point Pleasant Park in Halifax.

Me. to Ont. south to S.C.; sparingly introduced northward

14. **P. simplex** Michx. Fig. 86. CINQUEFOIL, FIVE-FINGER

Rather rare; central N.S. and southern N.B. south to N.C. and Okla. The record for *P. pumila* Poir for Bridgewater belongs here (Fernald).

Var. **calvescens** Fern. is found throughout; roadside banks, on poor or leached soils, pastures, open woods and worn-out fields. This variety probably has little value as all degrees of pubescence may be found.

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

15. **P. Anserina** L. Fig. 86. SILVERWEED

This plant is found around the whole coast, seashores, damp soil, often at considerable distances from the salt marshes but usually

characteristic of sandy beaches or low areas of dunes where it often forms long stolons and runs freely over the sand; often rather weedy about inlets and ports. The pubescence is variable and forma *sericea* (Hayne)Hayek has the leaflets silvery-silky pubescent on both sides. June-Aug. Nfld. to Alaska south to N.J.; inland about the Great Lakes and westward; Eurasia.

Var. **Rolandii** Boivin (1966-c) is common on the coast, especially on the marshes about the Bay of Fundy; on sand marshes and along shorelines, generally growing in muddy or poorly-drained areas, often in large colonies. It is possible that there are two species involved here for, in N.S. at least, these two plants occupy different habitats and appear quite different. (*P. Egedei* Wormsk., and *P. pacifica* Howell). June-Aug. Nfld. and eastern Que. to Long Island, N.Y.

Var. **lanata** Boivin is a Sable Island plant very similar to the preceding variety but with the apex of the peduncles and the sepals and bracteoles of the flowers densely whitish-woolly.

10. **FILIPENDULA** Mill.

Coarse perennial herbaceous plants one to two meters high with pinnate leaves and large panicles of small flowers; fruit of 5-7 small indehiscent 1-seeded, often twisted, follicles. There are about ten species with ours all being escapes from cultivation.

a. Leaflets large and few, the terminal one much the largest and palmately lobed; follicles twisted.
  b. Flowers pink; leaves green on both sides; lateral leaflets lobed; plants low and herbaceous. 1. *F. rubra*
  b. Flowers creamy white; leaves white-woolly beneath; lateral leaflets not lobed; plants tall and rather shrubby. 2. *F. Ulmaria*
a. Leaflets of 12 or more pairs, each leaflet about 3 cm long and all similar in shape, sharply toothed; follicles straight; flowers white or pale pink. 3. *F. hexapetala*

1. **F. rubra** (Hill)Robins. QUEEN-OF-THE-PRAIRIE

Rare; planted as a garden ornamental and occasionally escaping in Yarmouth Co. Late July-Aug.

Native of Penn. and south; now found N.S. to Ont.

2. **F. Ulmaria** (L.)Maxim. Fig. 89, b. QUEEN-OF-THE-MEADOW

Abundantly naturalized in the southwestern counties and common at least to Pictou Co.; in low areas, around buildings, roadsides and in waste places. Occasionally this species may occur in masses in low neglected meadows or along the edges of fields. Late July-Aug.

Introduced from Eu.; escaped from cultivation Nfld. to Ont.

3. **F. hexapetala** Gilib. DROPWORT

Rare as a garden escape in Yarmouth Co.; introduced from Eu. and Asia.

Nfld. to Ont. south to N.Y.

11. GEUM L. AVENS

This genus comprises about 60 species of perennial plants of cool or temperate regions; with the lower leaves pinnate. Most of our species have the styles hooked or jointed in the middle with the upper part later falling away so the ripe achenes have hooked extensions at their tips. See cytotaxonomic studies of *Geum* (Raynor, 1952).

a. Lower leaves consisting mainly of a large terminal leaflet with only one to several minute leaflets below it; styles straight and not jointed; Brier I. 6. *G. Peckii*

a. Lower leaves with the terminal leaflet deeply divided, or relatively undivided but with numerous smaller leaflets below it; styles hooked in the middle with the upper part deciduous; plants widely distributed.

b. Sepals green, spreading or reflexed; petals white or yellow; upper joint of the style hairy and the lower smooth or nearly so; flowers erect.

c. Terminal segment of the basal leaves much divided, the divisions sharp-pointed and coarsely toothed; stem-leaves sharply toothed and lobed.

d. Petals whitish or greenish; stipules 7-15 mm long; some of the basal leaves usually unlobed or else 3-parted; head of fruits round.

e. Plant slender; lower part of the stem smooth or sparingly hairy with hairs 1 mm long; receptacle of the fruit and the achenes densely bristly; petals exceeding or equalling the sepals, white.

f. Achenes 30-60 in a head, broadly ovate, 2.5-3 mm long; peduncles finely velvety; leaves thin. 1. *G. canadense*

f. Achenes 60-160 in a head, narrower to wedge-shaped, 3-4 mm long; peduncles with longer hairs; leaves firmer. *G. canadense* var. *camporum*

e. Plant stout, bristly-hairy, with hairs 2 mm long; receptacle smooth or nearly so; petals cream-colored, narrow, about half the length of the sepals (Fig. 87, c).

g. Achenes smooth. 2. *G. laciniatum*

g. Achenes bristly near the apex. *G. laciniatum* var. *trichocarpum*

d. Petals bright yellow, about as wide as long, longer than the sepals; stipules 15-40 mm long; leaves all pinnate; head of the fruits obovoid with the receptacle downy; achenes hispid. 3. *G. aleppicum*

c. Terminal segment of the basal leaves much larger than the lateral lobes, heart-shaped at the base, almost round and finely toothed; lower stem-leaves 3-parted with the lobes rounded; petals yellow, longer than the sepals (Fig. 87, b). 4. *G. macrophyllum*

b. Sepals purplish, erect; petals greenish or purplish-cream colored, erect or ascending; upper joint of the style plume-like and the lower long-hairy; flowers nodding; fruits erect (Fig. 87, a). 5. *G. rivale*

1. **G. canadense** Jacq. Map 326. WHITE AVENS

Dry to moist woods, often in rich soil along the intervales from Annapolis to central C.B.; rare in the southwestern counties and very

rare or absent along the Atlantic Coast from Queens Co. to eastern C.B. June 15-July. N.S. to Minn. south to W.Va.

Var. **camporum** (Rydb.)Fern. and Weath. is a common weed around towns, at the edges of woods and along intervales throughout the area of the species.

N.S. to N.D. south to Mass., N.Y. and Ala.

2. **G. laciniatum** Murr. Map 327. Fig. 87, c.

Scattered along the intervales and at the borders of rich woods, generally growing in similar locations to the preceding species: Annapolis and Cumberland Co. east to Pictou Co. and to northern C.B.; not found in western N.S. and very rare on the Atlantic side of the Province. N.S. to Ont. south to Md. and Ind. (*G. virginianum*).

Var. **trichocarpum** Fern. is very rare in the Province and grows in the same habitats; near Windsor and along the Five Islands R. in Colchester Co.

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

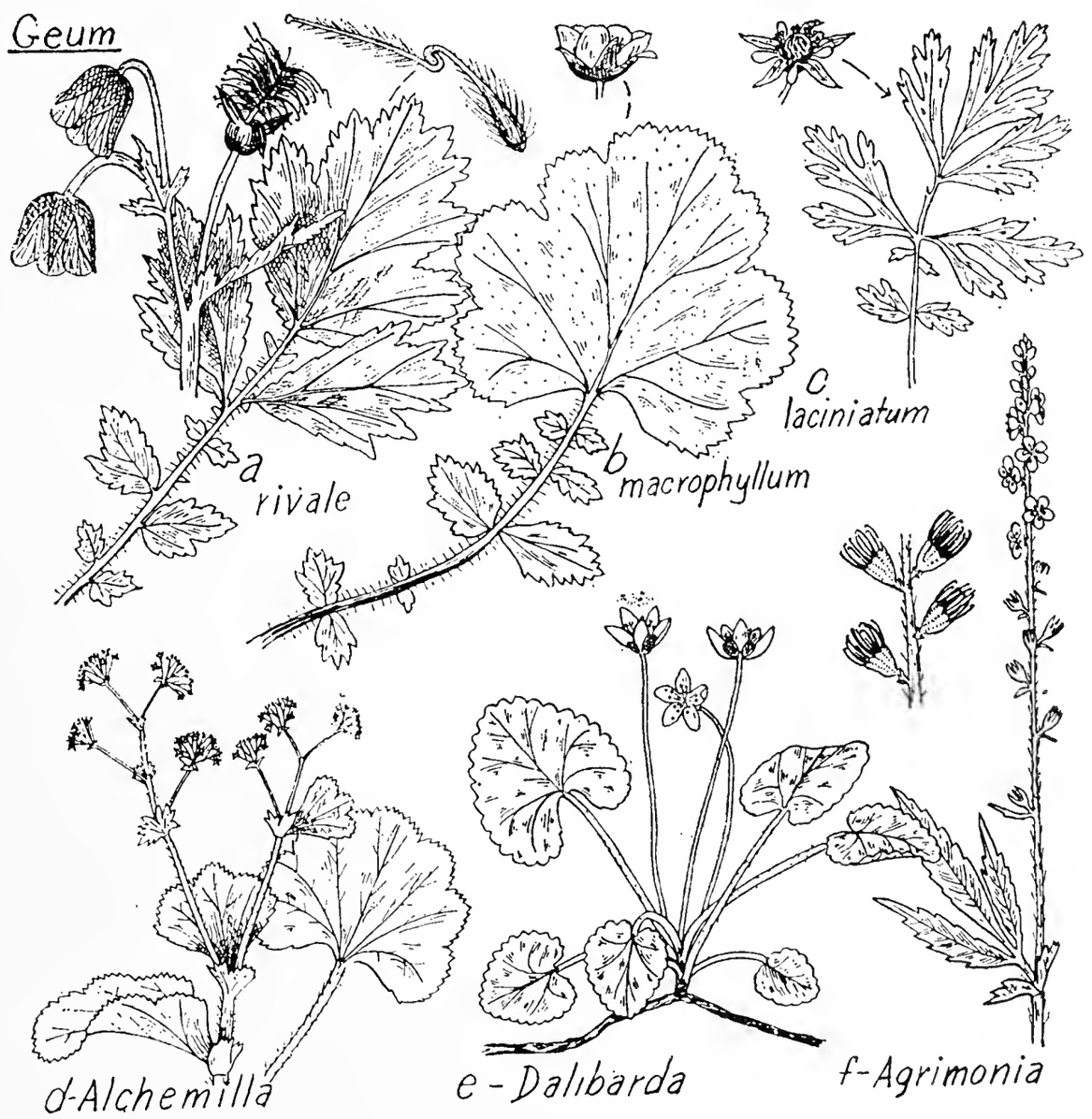


Fig. 87.—**Geum**: (a) *G. rivale*, leaf and flowers x $\frac{1}{2}$, fruit with hooked style x 3, (b) *G. macrophyllum*, basal leaf and flower x $\frac{1}{2}$. (c) *G. laciniatum*, lower leaf and flower x $\frac{1}{2}$. — **Alchemilla**: (d) *A. xanthochlora*, upper part of plant x $\frac{1}{2}$. — **Dalibarda**: (e) *D. repens* x $\frac{1}{3}$. — **Agrimonia**: (f) *A. striata*, flowers and fruit x $\frac{1}{2}$.

3. **G. aleppicum** Jacq., var. **strictum** (Ait.)Fern. Map 328.

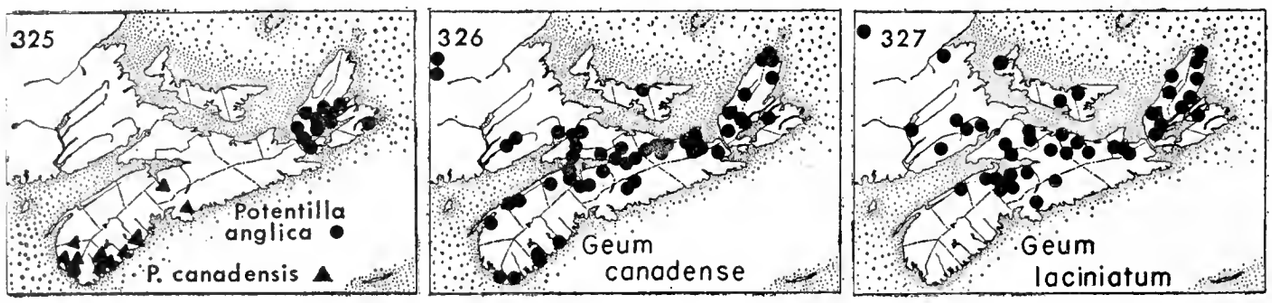
Rather common from Annapolis and Cumberland Co. east to central C.B., rare or absent elsewhere; rich soil, along river banks, waste ground, and occasionally as a weed about buildings. It is scarcely separable from *G. aleppicum* of Eurasia.

N.S. and Que. to B.C. south to Penn.

4. **G. macrophyllum** Willd. Fig. 87, b. Map 329.

Wet ground, damp woods and along streams, usually in shaded areas in rich or mucky soils: Annapolis Co. and Amherst to northern C.B. It is common eastward along the river intervales; and practically absent in the southern side of the Province.

Lab. to Ont. south to N.Y.; Alaska.



5. **G. rivale** L. Fig. 87, a. PURPLE AVENS

Common throughout; meadows, edges of swamps and springy areas. June 20-July 10.

Lab. to B.C. south to Penn.; Eurasia.

6. **G. Peckii** Pursh

Abundant and scattered over an area of several acres in a bog at the roadside and on burned areas between Westport and Big Cove on Brier I. 2n = 42. July-Aug.

This neat plant is found elsewhere only on damp slopes and alpine meadows of the higher mountains of Me. and N.H.; and it is closely related to a variety in the mountains of N.C. and Tenn.

12. RUBUS L. BRAMBLES

This large genus comprises the cloudberry, dewberry, raspberries and blackberries. The flower has many pistils on a conic receptacle and each ovary forms a small succulent drupelet; the aggregate when mature forms the characteristic thimble-like fruit.

The blackberries form a complex group where proper species are almost impossible to define. The forms hybridize with each other; various degrees of polyploidy arise and apomixis exists. Numerous populations may be found in which the members more or less resemble each other. Some 400 have been named and hundreds more may exist.

The only diploid plants found by Aalders and Hall were those typical of *R. hispidus* and *R. allegheniensis*.

While some type of classification is necessary in such a varied group, it is difficult to know how many species have contributed to our populations. Certain species seem to have a wider distribution than others and to possess distinctive characteristics, while others are quite variable. It seems preferable to keep the number low until further work has been carried out.

In collecting *Rubus* the inflorescence, either in flower or fruit, should be taken, along with a middle section of the first-year cane or *primocane* and a piece of the second-year cane or *floricane*. The habit should be noted as prostrate, ascending, mounding, arching or erect.

The key is made for the more or less typical representatives of the species. Many plants will show intermediate characteristics and may be wide variants or hybrids. The types which have been named are mentioned under the species they most closely resemble. Anyone who desires to make a more detailed study of our blackberries should consult the detailed work of Bailey (1941-45), Fernald's treatment in Gray's Manual (1950), Aalders and Hall (1966), and Hodgdon and Steele (1966).

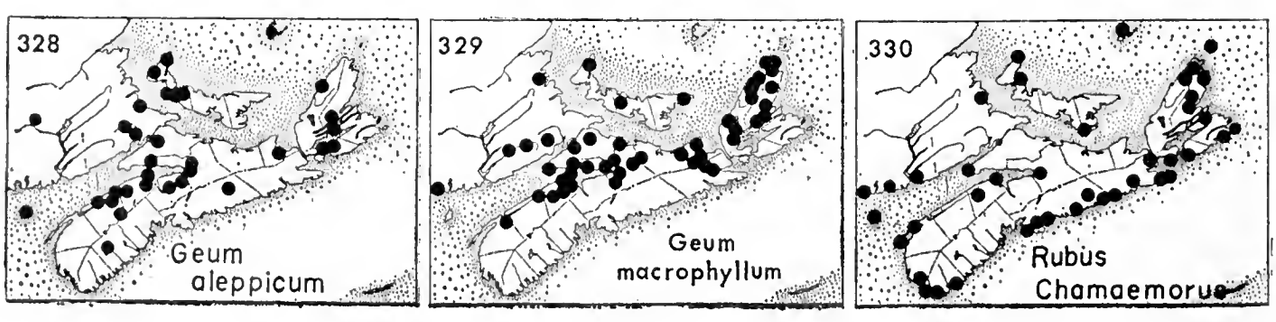
a. Leaves simple, merely 3-5-lobed; prickles absent.
  b. Herbaceous, low to 2 dm high; lobes of the leaf rounded; flowers solitary, white; fruit yellowish. 1. *R. Chamaemorus*
  b. Woody and bush-like, to 1.5 dm high; lobes of the leaf sharp; flower rose-purplish; fruit small, purplish. 2. *R. odoratus*
a. Leaves compound, with 3-7 leaflets.
  c. Plant trailing, essentially herbaceous, unarmed; leaves mostly thin with three leaflets; fruit red, not separating easily from the receptacle; dewberry. 3. *R. pubescens*
  c. Plant trailing or erect, woody, often armed with bristles or prickles.
    d. Leaves pinnately 3-7 lobed; fruit red, easily separating from the receptacle; raspberries.
      e. Corolla 3-4 cm wide; fruit oblong, to 3 cm long; petals large, as broad as long; leaves often with 7 leaflets. 4. *R. illecebrosus*
      e. Corolla smaller with the petals inconspicuous and much narrower than long; leaflets mostly 3, whitish beneath.
        f. Plant glandless; inflorescence with relatively short pedicels; drupelets firmly united in fruit, the remaining core elongated; unripe fruit commonly conic and gray-pubescent. 5. *R. idaeus*
        f. Plant with stalked glands on some or all of its axes; pedicels slender; drupelets easily separating, leaving a short, broad core on the cane; unripe fruit not conic nor pubescent. 6. *R. strigosus*
    d. Leaves palmately divided with 3-5 leaflets; petals showy; fruit black, not easily separating from the receptacle or core; blackberries.
      g. Primocanes with numerous, straight bristles or with fewer straight, acicular prickles which are not broad-based; curved prickles absent.
        h. Plants prostrate or low mounding; leaves usually with 3 leaflets, firm and deep glossy-green, persisting over winter; flowers mostly less than 16 mm wide (Section *Hispidi*). 7. *R. hispidus*

h. Primocanes erect, the second-year floricanes often prostrate or mounding, not long-running (Section *Setosi*); primocane leaflets usually 5; inflorescence usually glandular.
i. Leaves glabrous or essentially so beneath.
j. Bristles very abundant on the primocanes, 1000 or so per dm and not unpleasant to the touch, mixed with glandular hairs. 8. *R. setosus*
j. Bristles acicular and rather stiff, 50-500 per dm; primocane under 9 dm high, often rather weak, occasionally doming. 9. *R. vermontanus*
i. Leaves more or less pubescent beneath. 10. *R. semisetosus*
g. Primocanes with stout, recurved prickles which are often broad-based, or with prickles mixed with bristles. or tall and arching with more slender and often few prickles.
k. Leaves glabrous or essentially so beneath; the branches of the inflorescence without stalked glands.
l. Primocanes high-mounding or erect and arching, armed with straight acicular prickles varying to nearly unarmed.
m. Armature of 10-100 prickles per dm; primocanes often rather slender. 11. *R. elegantulus*
m. Armature of 0-10 thin prickles per dm; primocanes rather stout, erect. 12. *R. canadensis*
l. Primocanes prostrate or occasionally low-mounding and running, armed with stiff, hooked or straight retrorse prickles which are often strong and abundant. 13. *R. recurvicaulis*
k. Leaves more or less soft-pubescent on the lower surface.
n. Plants low-mounding or usually prostrate and trailing; inflorescence with few or no glands but with the axis and pedicels pubescent. 14. *R. arenicola*
n. Plants stout, usually erect and arching; sometimes high-doming with the tips reaching the ground.
o. Axis of the inflorescence pubescent, with numerous stalked glands. 15. *R. allegheniensis*
o. Axis pubescent but glandless or rarely with a few glands; leaves often lightly pubescent beneath. 16. *R. pensilvanicus*

1. **R. Chamaemorus** L. Fig. 88. Map 330. BAKEAPPLE, CLOUDBERRY

Sphagnum bogs, barrens, meadows near the coast and on headlands; common in C.B. and eastern N.S. where considerable quantities are gathered; scattered and becoming rarer westward and inland, rarely flowering or fruiting in the more inland locations; common around the whole coast except along Northumberland Strait. July.

Greenland to Alaska south to Me. and N.H.; Eurasia.



2. **R. odoratus** L. Fig. 88. FLOWERING RASPBERRY

Scattered as an old-fashioned garden plant and occasionally found along roadsides or about old houses in the Annapolis Valley; and elsewhere doubtfully native. Fernald (1922) reports a collection from a thicket, Belleville, Yarmouth Co. as the type of var. **malachophyllus** Fern. This has the leaves densely pilose or almost velvety on both surfaces, with the upper surfaces of the young leaves and the veins beneath black-glandular. However, the species is very variable in this respect.

N.S. to southern Ont. south to Ga. and Tenn.

3. **R. pubescens** Raf. Fig. 88. Map 331. DEWBERRY

Scattered in low and boggy land, swamps, mucky soils, over talus slopes and along intervales, in open sunlight or often growing luxuriantly under bushes or in open woods; scattered to common in the northern half of the Province, rare in sw. N.S. and not collected along the eastern Atlantic Coast. (*R. triflorus* Richards.). Flowering in early June and fruiting a month later.

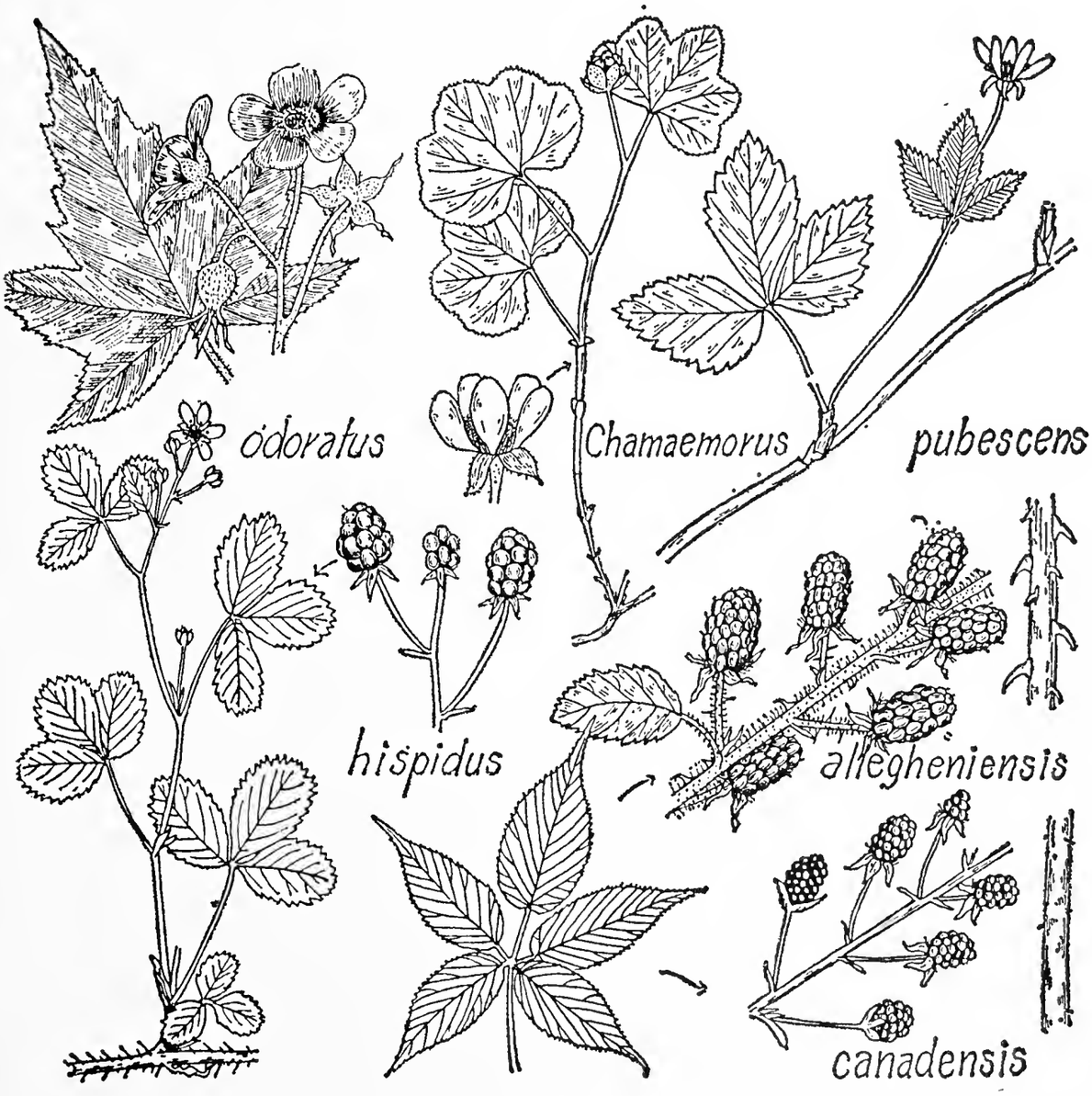


Fig. 88.—Rubus spp.

Var. **scius** Bailey is a compact plant forming mats and extensively stoloniferous, with the leaflets short and broad, 4-5 cm long and nearly as broad. The type is from Cheticamp, in great mats in open sun; also collected by Bailey from the Look-off near Cape Blomidon, Kings Co. N.S., Que. and Nfld.

Lab. to northern B.C. south to N.J., Penn. and Iowa.

4. **R. illecebrosus** Focke STRAWBERRY-RASPBERRY

An ornamental plant sparingly introduced from Japan for its large fruits; occasionally escaping. Fernald (1922) states that this plant is tending to escape from cultivation at Annapolis Royal.

N.S., New Eng. and N.Y.

5. **R. idaeus** L. EUROPEAN or GARDEN-RASPBERRY

This is the cultivated raspberry, best represented by the pomological red varieties; persisting or sometimes tending to escape; well established as a garden escape about Yarmouth (Fernald, 1921).

Introduced from Eu. and widely cultivated.

6. **R. strigosus** Michx. WILD RASPBERRY

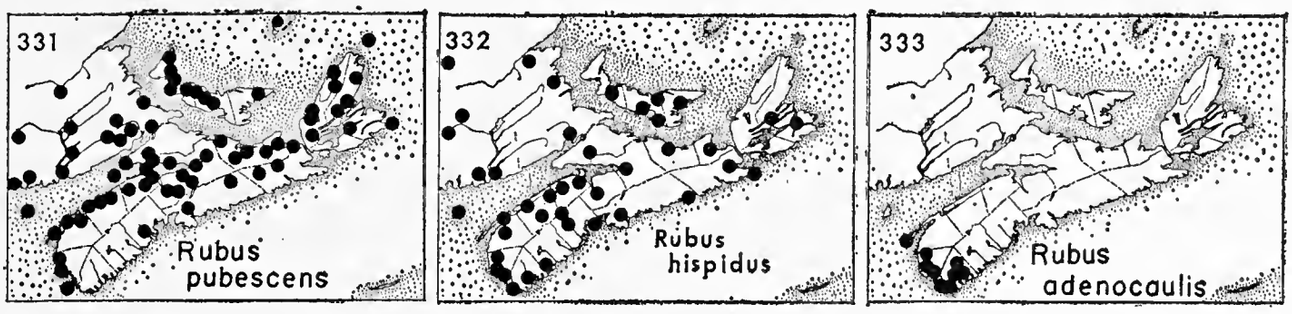
Common throughout; roadsides, barrens, clearings, after burns, on talus slopes and rocky ground. The young canes are variable in their armature, but these variations do not seem to be very consistent nor to have different geographical ranges. Forma **albus** (Fuller)Fern. is a white-fruited form collected at Cape Split, Kings Co. (Schofield and Smith, 1953). Bailey states that he has had no difficulty in distinguishing this species from the preceding one. However, judging from the various interpretations and names given to different varieties in the literature, other authors do not consider the differences so distinctive. Mid June-Aug.

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

7. **R. hispidus** L. Fig. 88. Map 332. TRAILING BLACKBERRY

This small prostrate blackberry is common in western N.S. and becomes rarer to Sydney and Baddeck. The leaflets are in 3's and are coriaceous and shining above, remaining on the plant over winter; armature of bristles and weak prickles which are not broad-based. It is the only species apt to be found in the acid peat bogs. Aalders and Hall found that 2n plants were present only in the western half of N.S. and that the more easterly-ranging plants were polyploids of various chromosome numbers. Considerable variation may thus be expected and several varieties have been named. A very slender form is often more common in the southeastern counties with only a few bristles or none. This is named var. **obovalis** Fern. Var. **culpifer** Bailey, with large flowers 18-24 mm wide, was described from the Look-off, near Cape Blomidon in Kings Co.

N.S. to Wisc. south to N.C., Ind. and Ill.



X Hispidi

This group is apparently a hybrid swarm with a great deal of variation in the number, shape and glossiness of the leaves, in the inflorescence and in the number of the bristles. The plants are low, doming to prostrate, often long-running and tending to root along the tips. They are extremely numerous and variable in southwestern N.S., with the plants becoming more scattered north and east to northern C.B. One of the parents is *R. hispidus*, accounting for any glossiness of the leaves and the tendency to have 3 leaflets. The other parent may be a member of the *Setosi* group, with the finer forms from crosses with *R. vermontanus* and the coarser ones from those with *R. setosus.*

A number of these intermediates have been named and ascribed to N.S. **R. pudens** is a very weak trailer with sparse stiff small bristles and 3 thin leaflets: to Louisburg and North Sydney in C.B. **R. trifrons** Blanch. is a trailer with the armature intermediate and the leaflets rather narrow and pointed; common from Yarmouth at least to Canso. **R. provincialis** Bailey is a stout runner with the leaflets wide and glossy and the stout primocanes shaggy with bristles; described from dry land near Pictou and noted frequently in north-central N.S. **R. segnis**, also described by Bailey from near Pictou, is a low mounding type with narrow leaves and the axis of the primocane not glandular and only sparsely setose. **R. adjacens** Fern., (see Fernald, 1940) is doming or arching with shaggy primocanes, often growing 2-3 m long, with 3-5 primocane leaflets which are abruptly pointed; including most of the earlier records of *R. jacens*. Map 334. Scattered in southwestern N.S. and into southern N.B. **R. vigoratus** Bailey is a strong mounding bramble with sharply toothed leaves and glandless primocanes. Bailey states that the material of *R. arcuans* from Sable I. belongs here. Other forms can be found which do not match any of the described types.

8. **R. setosus** Bigel.

Primocane arching to erect, about 1 m high, with an armature of very numerous soft bristles and glands. This species is scattered in north-central N.S. in open land or poorly-drained soil, waste places and cleared areas, becoming rare southward. **R. tectus** Bailey, described from near Truro, and several species described from southern N.B., seem to belong here. **R. Grautianus** Blanch. may be a hybrid of this and

the next species. Erect members and hybrids of section *Setosi* are scattered throughout in western and central N.S.

N.S. to Wisc. south to W. Va.

9. **R. vermontanus** Blanch.

Primocanes usually erect or arching up to 1 m high, less often doming or high-trailing, with acicular straightish bristle-like prickles and the floral axis often with glands. The "half-high" **R. tardatus** Blanch., which Fernald (1921) says is one of the most characteristic species of boggy thickets and lake-margins of N.S. and P.E.I., is considered, following Hodgdon and Steele, to be the smaller extreme of *R. vermontanus*. Bailey has described a number of species in this group. **R. supar,** described from near New Glasgow, is placed here; and **R. univocus,** described from elsewhere and ascribed in Gray's Manual to N.S. is also very similar. Common in sw. N.S. and scattered eastwards.

Nfld. to Minn. south to Penn., N.Y. and Mich.

10. **R. semisetosus** Blanch.

This species includes those members of the section *Setosi*, the half-high bristly forms, which have the leaves more or less pubescent beneath. **R. semisetosus** is a more southern species but some of its characters have apparently been incorporated into our species. **R. ortivus** Bailey and **R. perinvisus** Bailey have been ascribed to the three Maritime Provinces, so that the pubescent types may occasionally be found throughout the southwestern and the central regions.

N.S. and P.E.I. to N.Y. and Penn.

11. **R. elegantulus** Blanch.

Common throughout and rather variable, in many respects rather intermediate between *R. vermontanus* and *R. canadensis*, and it may hybridize with these species. Sometimes the plant is short and only one to several dm high; at other times large colonies of tall, arching, very prickly canes are found. **R. amicalis** is considered much the same plant but with the canes rather sparsely armed.

The low-arching or finally trailing, freely-branching type with lax and elongate racemes has been named **R. multiformis** Blanch. Common in sw. N.S. at least to the north-central counties; boggy thickets, river and lake margins, clearings, etc. The extreme of this type with the stems reddish and long, very freely-branching and growing usually in full sunlight is named **R. russeus** by Bailey; first described from Waverley, Halifax Co. and seen also from various places from Yarmouth to Cumberland Co. This plant at times is very distinctive but at other times, even on the same location, the plants are more erect or even arching.

Nfld. to Minn. south to Penn.

12. **R. canadensis** L. Fig. 88. Map 335.

Common throughout the central areas, becoming rarer to C.B. where it has not been found in the northern part of Inverness and Victoria Co. This high, almost smooth or slightly straight-prickly plant is one of the most characteristic and common high species of the Province. The plants of N.S. are triploid in nature and do not seem to hybridize frequently with other species. The leaves of this species and *R. elegantulus* have rather long stalks to the central leaflets and a rather hard appearance familiar in the field. The canes are usually stout with only scattered prickles.

Nfld. to Minn. south to Penn., Ga. and Tenn.

13. **R. recurvicaulis** Blanch.

This low-mounding, or prostrate and long-trailing species has the leaves glabrous beneath, the pedicels glandless, and the primocanes with stout recurved prickles. It is common in southwestern N.S. and is scattered east to northern C.B.; borders of fields, embankments, open fields and plains, lake margins, etc. **R. plicatifolius** Blanch., which has occasionally been reported from N.S., apparently refers to younger plants when the leaves are slightly plicate or folded. **R. bretonis** Bailey, described from dry land near Dingwall, Victoria Co., is a wide-leaved form with more slender prickles.

Hybrids may occur with members of the section *Setosi.* **R. arcuans** Fern. and St. John is a low-mounding and flat-running form with very shaggy-bristly, glandular primocanes with some of the retrorse hairs almost prickly. This has been interpreted as a hybrid with *R. setosus.* The type station is from Dundee, P.E.I.; collections from Kemptown, Colchester Co., N.S. are placed here. **R. severus** Brain. is a more slender form, perhaps a hybrid with *R. vermontanus,* with recurved prickles and abundant bristles and glands on the primocanes: Lunenburg Co. and central C.B.

Nfld. to Wisc. south to N.Y.

14. **R. arenicola** Blanch.

This flat trailer has long running primocanes which have stout recurved prickles; the leaves differ in being thick and rough, rather small and wide, and thinly to densely pilose beneath. This plant is scattered on the sand-plains of the Annapolis Valley; collected by Blanchard himself along a railroad embankment east of Granville, Annapolis Co.

Bailey later described **R. particeps** from sandy land at Kingston, Kings Co. This is very similar but the leaves are only thinly pubescent on the veins beneath and it has some glands on the pedicels. These characteristics could be derived from a cross with a form of *R. hispidus.*

N.S. and s. Me. to N. Eng. and N.Y.

15. **R. allegheniensis** Porter Fig. 88. Map 336.

This erect, prickly blackberry with large fruits is one of our most characteristic and common species. It is found in dry soils, along roadsides, in clearings and burns, old fields and open woodlands, often tall and arching or, on sandy soils, low and erect; common in southwestern N.S. and east to Antigonish. The stout prickly erect canes, the pubescent almost velvety foliage, and the abundantly glandular pedicels and large fruits are characteristic. However, the plant itself can be variable and hybrids, although not common, do occur. The diploid 2n plants were found by Aalders and Hall to be almost entirely in the southwestern region and most plants are polyploids.

Var. **neoscoticus** (Fern.)Bailey is a robust variety with abundant prickles on the rachis of the raceme, pedicels, petioles and petiolules. **R. pennus**, described by Bailey from dry land on Digby Neck, west of Sandy Cove, in a considerable area, is placed here.

Hybrids with members of the section *Setosi* also occur. Such plants are erect, have smaller, shorter fruit in a wider inflorescence; the leaflets are more sparsely pilose beneath; and the primocanes have both acicular prickles and abundant stalked glands freely intermixed with stouter recurved prickles. These have been named **R. glandicaulis** Blanch. and **R. acadiensis** Bailey, the second described from Hardwood Lands, Hants Co., N.S. and from south of Fredericton.

A low mounding or prostrate form with the characteristic thick pubescent leaves and with the primocanes with a mixture of stout prickles and bristles and glands seems to be a hybrid with one of the *Hispidi* group. This is named **R. biformispinus** Blanch. and is one of the most characteristic coarse trailers of the sandy roadsides and railway embankments in southern Yarmouth and Shelburne Co. (Fernald, 1921); scattered eastwards. This form ranges to Penn. and Que.

Another described species is **R. adenocaulis** Fern. (see Fernald, 1940). This is known only from southwestern N.S. (Map 333). The species appears much like a doming, low-mounding to prostrate *R. allegheniensis* but has a mixture of abundant stalked glands, bristles and stouter straight prickles on the primocane axis. Its characteristics seem intermediate between *biformispinus* and *allegheniensis*. Earlier records of *R. arcuans* and *R. abbrevians* largely belong here.

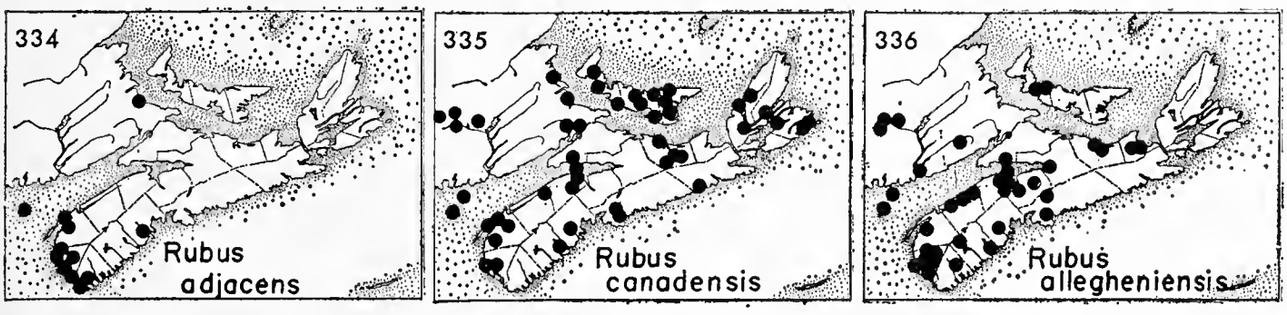
Some of the older cultivated blackberries have a shorter primary inflorescence nearly as broad as long, large flowers, and berries on long pedicels. This introduced more western type is named **R. alumnus** Bailey and may be a hybrid of *R. allegheniensis* with the next species. This will occasionally long persist where blackberries have formerly been grown.

N.S. to Minn. south to the uplands of N.C. and Tenn.

16. **R. pensilvanicus** Poir

The tall, prickly plants with the leaves more or less pubescent beneath but with glands wholly or nearly lacking on the axis of the racemes are placed here. Many of our collections show a little glandulosity and thus a slight trace of *R. allegheniensis*. The inflorescence is usually shorter than in that species and the berries are rounder and often of very good quality. Various names have been applied to variations within this species in N.S.: *canadensis* var. *pergratus*, *recurvans*, *Andrewsianus*, *orarius*, *amnicola* and *facetus*. Rather common in southwestern N.S., scattered eastward.

Lab. to Minn. south to Ala., Ark. and Okla.



13. **DALIBARDA** Kalm

1. **D. repens** L. Fig. 87, e. Map 337. DALIBARDA

This small, violet-like plant with solitary, erect, white flowers is scattered to local in open to rather moist woods. It is most common in the southwestern counties and gradually becomes rarer eastward to Pictou Co. This species is the only one in the genus. Aug.

N.S. to Ont. south to Conn. and the mts. of N.C.

14. **ALCHEMILLA** L. LADY'S-MANTLE

Aggressive weeds, often growing in large patches; flowers small and numerous, greenish yellow; sepals 4, with 4 smaller bracts between them; petals absent; very similar in both flower and fruit. Our plants are probably all introduced and all are apomictic. The last 4 species may conveniently be placed in the collective species as *A. vulgaris* L., as they are rather similar in appearance. However, many of the apomictic strains are local in our area and it seems desirable to name the different ones so their occurrence and spread may be observed in the future (Bradshaw, Dansereau and Valentine, 1964).

a. Annual, up to 1.5 dm high, with small leaves to 1.5 cm wide; flowers in sessile axillary clusters. 1. *A. arvensis*

a. Perennials, much coarser with basal leaves 5-8 cm wide; flowers numerous in terminal panicles.

b. Hypanthium of the flower (base to the point of attachment of the sepals) up to 1.5 mm long, faintly ribbed.
c. Pedicels and flowers glabrous or nearly so; leaves glabrous above or only sparsely hairy on the veins.
d. Plant slender, the stem sparsely hairy towards the base; leaves with the lobes widely overlapping across the sinus at the base; flowers yellowish, showy, to 4 mm wide. 2. *A. venosa*
d. Plant coarse, the stem often densely hairy near the base; leaves with a wide sinus and without the basal lobes overlapping; flowers greenish-yellow, up to 3 mm wide. 3. *A. xanthochlora*
c. Pedicels nearly glabrous but the flowers densely long-hairy on the hypanthium; leaves long-hairy on the upper surface. 4. *A. monticola*
b. Hypanthium of the flower 1.5-2 mm long, prominently ribbed.
e. Flowering stems hairy in the lower part only, up to the fourth internode; hypanthium nearly glabrous, usually with a few hairs; lower leaves usually only sparsely hairy beneath and with a few hairs to sparsely appressed hairy above. 5. *A. filicaulis*
e. Flowering stems hairy throughout; hypanthium hairy, often densely so; lower leaves often densely hairy on both sides. 6. *A. minor*

1. **A. arvensis** (L.)Scop.

According to Lawson this plant was introduced into N.S. No specimens have been seen and no plants collected. This plant was apparently a casual adventive and is known from no other location in N. Amer.

Native of Eu.

2. **A. venosa** Jus.

Bradshaw mentions that collections from Glendyer in Inverness Co. and from Boularderie I. in Victoria Co. may be this species. This plant is scattered about the Glendyer region where it has escaped from gardens. The overlapping bases of the leaf-blades are distinctive in the specimens collected. First flowering in late June.

Introduced from Eu.; N.S.

3. **A. xanthochlora** Rothm. Fig. 87, d. LADY'S-MANTLE

This weed is abundant and very aggressive in moist habitats from Digby around the coast to Yarmouth and Shelburne Co.; scattered east to Halifax and Sydney. It was first found in Halifax about 1884; at Digby in 1879; and Macoun and Burgess noticed it growing in great abundance at Yarmouth in 1883. It is now a serious weed in the south-western counties, especially near the sea-shore but it does not seem to spread inland to any great extent. This plant is widely distributed in the oceanic areas of western Europe and was early introduced into Australia. Known also as *A. pratensis* Schmidt and as *A. vulgaris* L. var. *vulgaris*.

N.S.; N.B. to Que. locally and south to New Eng. and N.Y.

4. **A. monticola** Opiz

A single collection, mentioned by Bradshaw, has been made from St. Peters, Richmond Co., N.S. (*A. vulgaris* L., var. *pastoralis* (Buser) Boivin).

Introduced; N.S. and very local Que. to Ont.

5. **A. filicaulis** Buser

Only scattered locations occur in N.S.; a large patch of this plant was found along the roadside just north of Boylston, Guysborough Co. This plant is frequent in northwestern Europe and is perhaps native further north in Nfld., Lab. and Greenland. Our locations seem to be scattered introductions. (*A. vulgaris* L., var. *filicaulis* (Buser)Fern. & Wieg.).

Western Nfld. and neighboring Que.; Ont.

6. **A. minor** Huds.

Grassy waste places, scattered, near the Dingle, Halifax, collected by H.P.Bell and S.M. Mason. These plants have the flowers, pedicels and upper surface of the leaves copiously stiff-hairy. The hypanthium of the flowers measures slightly over 1.5 mm. (*A. vulgaris* L., var. *vestita* (Buser)Fern. & Wieg.). Also at Chezzetcook in the same county.

Introduced from Eu.; Lab. and western Nfld.; N.S.

15. AGRIMONIA L. AGRIMONY

Tall, perennial herbs with small yellow flowers in spike-like racemes; leaves coarsely and pinnately divided. These plants are best known by their small, greenish fruits. Numerous hooked hairs around the top cause them to stick to the clothes like burs.

a. Axis of the inflorescence with open, long spreading hairs and numerous short-stalked glands, bristles of the fruit spreading, the longest over 3 mm long; hypanthium without short strigose hairs in the longitudinal furrows.
1. *A. gryposepala*

a. Axis of the inflorescence downy with appressed hairs and often with longer spreading ones also; without glands; bristles of the fruit about 2-2.5 mm long, ascending; hypanthium with short strigose hairs in the furrows.
2. *A. striata*

1. **A. gryposepala** Wallr. AGRIMONY

Scattered in rich woods and thickets along the intervales and rich slopes from Annapolis and Digby Co. to C.B.; rare in the Atlantic regions of the Province. July-Aug.

N.S. to N.D., south to N.C.; B.C. to Calif.

2. **A. striata** Michx. Map 338. Fig. 87, f.

Common throughout the northern regions from Digby to northern C.B. but becoming rare to sw. N.S. and along the Atlantic coast; thickets

along fields and roadsides, stonewalls, fences and waste places or cut-over areas. July-Aug.

Nfld. to B.C. south to Pa., Ill. and N. Mex.

16. SANGUISORBA L. BURNET

Flowers small and numerous in dense, erect spikes; without petals but with the sepals petaloid, in 4's; leaves pinnately compound with about 13 toothed leaflets.

a. Plants 5-15 dm high; leaflets 2-6 cm long; pistil and achene 1, stamens 4.
  b. Spike long and slender; flowers white, stamens long-exserted. 1. *S. canadensis*
  b. Spike ellipsoid, 1-3 cm long; flowers purplish, stamens not exserted. 2. *S. officinalis*
a. Plants 3-5 dm high; leaflets 0.8-1.5 cm long, nearly round; flowers pinkish-green in short ovoid spikes; stamens 12 or more. 3. *S. minor*

1. **S. canadensis** L. Fig. 89, a. Map 339. CANADIAN BURNET

Bogs, wet meadows and well-drained swamps; common in northern C.B. and often abundant near the coast. It has been reported from various places on the mainland but these possibly represent introductions; a moist meadow, Scots Bay in Kings Co.; Pubnico, Yarmouth Co.; and Port Mouton, Queens Co. Plants from St. Paul I., C.B., with wide leaves were erronously referred to the western var. *latifolia* Hook.

Lab. to Mich. and locally south to Long I., Del. and the mts. of Ga.

2. **S. officinalis** L. GREAT BURNET

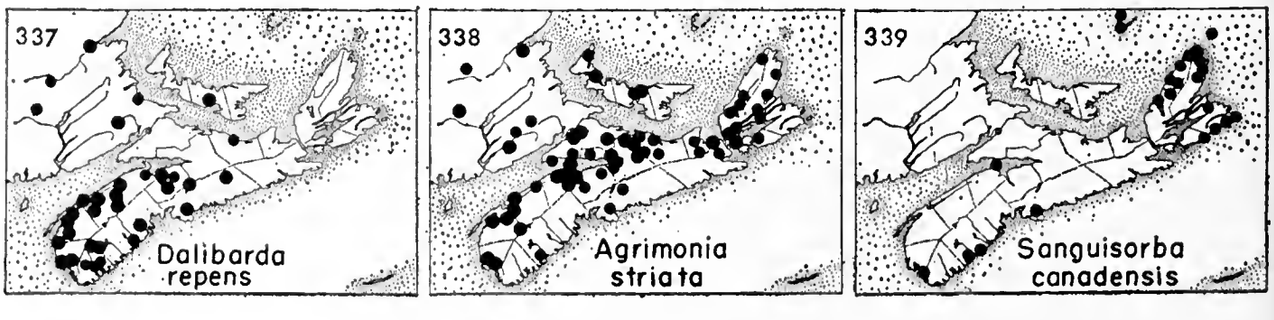
A long-established but not large station of this plant was found between a meadow and an oxbow pond beside the St. Mary's R., some 4 miles above Sherbrooke, Guysborough Co. (Erskine, J. S. 1953).

Eurasia; occasionally cultivated and rarely escaped; Alaska to B.C.

3. **S. minor** Scop. GARDEN-BURNET

Known only from near Windsor, where it may have been introduced in grass seed. (*Poterium Sanguisorba* L.).

Eurasia; locally established in fields and waste places from N.S. to Tenn.; N.B., Ont. and B.C.



17. ROSA L. ROSE

Various introduced species of roses may persist about old dwellings or occasionally escape to roadside banks. The tall, arching *R. multiflora* Thunb., a species with numerous small, white flowers, is occasionally planted for hedges or grows from the rootstocks of cultivated varieties. Our native species are extremely variable in the shape and size of the prickles, abundance of bristles, shape of the fruit, position of the achenes on the wall of the fruit and in the height and habit of the bush. Some species easily hybridize and form fertile hybrids; and progeny from the same plant may differ widely (Erlanson, 1934).

a. Twigs, prickles and bristles not pubescent.
  b. Flowers single, very rarely solitary; bracts of the peduncle not wide and ovate, green.
    c. Sepals deeply lobed or pinnatifid with several lanceolate lobes; styles shortly exserted; prickles stout and often broad-based and recurved; introduced species.
      d. Leaflets glandular beneath, often doubly serrate with gland-tipped teeth.
        e. Leaves heavily glandular on both sides; styles pubescent; sepals persistent. 1. *R. Eglanteria*
        e. Leaves only slightly glandular above; styles glabrous or nearly so; sepals soon decidous. 2. *R. micrantha*
      d. Leaves not glandular beneath except rarely on the veins, the sharp usually simple teeth glandless. 3. ***R. canina***;
    c. Sepals not lobed or divided; styles mostly included or showing only as a cap; leaves not glandular or pubescent; native species.
      f. Stem low, densely bristly throughout; flowers in 1's to 3's; leaflets about 2 cm long, rather narrow and lanceolate; bogs (Fig. 83, e). 4. *R. nitida*
      f. Stems various, with stout infrastipular prickles or smooth and without bristles; sterile canes sometimes bristly at the base.
        g. Leaflets with 5-30, averaging less than 20, teeth on each side; stamens less than 150; leaves glabrous beneath.
          h. Stem stout, up to 2 m high, much branched; suckers few, rarely flowering the first season; prickles mostly flattened, sometimes absent; bristles often at the base of the plant (Fig. 83, f). 5. *R. virginiana*
          h. Stem low and slender, under 1 m high; suckers from the ground many, often flowering the first season; prickles, if present, small, straight and terete; bristles often scattered to the tip of the plant. 7. *R. carolina*
        g. Leaflets averaging 26 teeth on each side, small and about 0.5 mm high; stamens over 200; leaflets mostly more or less finely pubescent beneath. 6. *R. palustris*
  b. Flowers double, solitary with large ovate bracts upon the peduncles; twigs slender, cinnamon-colored; leaves pale and pubescent beneath; infrastipular prickles stout and curved (Fig. 89, e) 9. *R. cinnamomea*
a. Twigs, prickles and bristles finely pubescent; twigs stout, very prickly; leaves large, thick and rugose; corymbs of flowers small, the fruit large and usually pendent; cultivated or escapes. 8. *R. rugosa*

1. **R. Eglanteria** L. Fig. 89, d. SWEET-BRIER, EGLANTINE

Scattered to rather rare around old houses, in gardens and occasionally as an escape. There is considerable variation in the characteristics of these introduced garden escapes and it is often difficult to classify them definitely. They were formerly cultivated and now occur widely, although sometimes locally, as escapes.

Naturalized from Eu. and throughout our area.

2. **R. micrantha** Sm.

Rather frequent as an escape or an ornamental, growing in situations similar to those of the last species; similar and possibly grading into it.

Naturalized from Eu.; N.S. to Wisc. south to N.C. and Tex.

3. **R. canina** L. DOG-ROSE

Rare; occasionally seen as an escape in the southwestern part of the province. Because it was earlier used as a stock for grafting, it may be expected wherever roses are grown.

Eu.; occasionally naturalized, N.S. to Va.

4. **R. nitida** Willd. Fig. 83, e. Map 340. SWAMP-ROSE

Scattered throughout, but perhaps more common in sw. N.S.; bog, spruce swamps, sphagnum mats, and swampy thickets, especially near the coast. Hybrids with other species are occasionally found. *R. nitida* x *R. virginiana* was found at the border of a spruce swamp, Markland, Yarmouth Co. (Fernald, 1922); and a collection from Tidnish is placed here. *R. nitida* x *R. palustris* is reported from a wet rocky thicket bordering Sparrel L., southwest of Hasset, Digby Co. (Fernald, 1922).

Margins of swamps; Nfld. to southern New Eng.

5. **R. virginiana** Mill. Fig. 83, f. COMMON WILD ROSE

Common throughout, extremely variable in all characteristics and grading into, or hybridizing with *R. carolina*; wet pastures, thickets and common along the heads of the salt marshes, dykelands and swamps.

Hybrids between this and *R. carolina*, intermediate in character, have been assigned to *R. obovata* Raf. by Erlanson. *R. Bicknelli* of Rydberg is a form with pyriform fruit.

Our two common roses in much of N.S. are this species and *R. carolina*. Their appearance in the field seems to be more distinctive than the characteristics seen in herbarium collections. *R. virginiana* is a coarser plant throughout, with stouter and broader-based, recurved prickles. It tends to grow more in clumps and the flowers are almost always borne on branches from the old wood. *R. carolina* is a slender form, rarely more than 1 m high. It tends to grow in lighter soils from diffusely-spreading rootstocks; and shoots from the ground will often bear flowers on the first year's growth. Considerable field work will be necessary to determine how much the characters of these two species

overlap. Fernald separates off the very small extreme as forma *nanella* (Rydb.)Fern. July.

Nfld. to southern Ont. south to Ala.

6. **R. palustris** Marsh. Fig. 89, c. Map 341.

Scattered at the edges of ponds, wet thickets and in swamps; Digby, Yarmouth and Shelburne Co., scattered east to Lunenburg Co. August.

Fla. to Ark. north to N.S., western N.B. and Ont.

7. **R. carolina** L.

Scattered, at least in the western and central counties; dry pastures, roadsides, uplands, in light or sandy soils. This is the earliest of our native roses to flower; late June-early July. *R. gemella* Willd. is placed here.

Fla. to Tex. north to N.S. southern Me., and Minn.

Fig. 89.—**Sanguisorba:** (a) *S. canadensis*, leaf and inflorescence x $\frac{1}{4}$. — **Filipendula:** (b) *F. Ulmaria*, leaf and inflorescence x $\frac{1}{4}$. — **Rosa:** (c) *R. palustris*, leaflet $\frac{1}{3}$, (d) *R. Eglantaria*, leaf, (e) *R. cinnamomea* x $\frac{1}{4}$. — **Robinia:** (f) flowers and leaf x $\frac{1}{2}$. — **Cytisus:** (g) *C. scoparius*, twigs and flowers x $\frac{1}{2}$.

8. **R. rugosa** Thunb.

This coarse, very spiny rose is commonly cultivated and often escapes; becoming established about Yarmouth; scattered elsewhere to C.B. July-Sept.

Native of eastern Asia; widely cultivated and as an escape; N.S. to Ont.

9. **R. cinnamomea** L. CINNAMON ROSE Fig. 89, e.

Common about buildings, around old houses and farmsteads, and along roadsides from Yarmouth Co. east at least to Pictou Co. This was apparently one of the most popular of the old-fashioned roses and occasionally large patches of it may be seen. *R. spinosissima* L. is probably the correct name of this species (Boivin, 1948).

Eurasia; widely introduced and escaping; N.S. to Ont.

18. PRUNUS L. PLUM, CHERRY

About 200 species, chiefly of the north temperate zone. Our wild species consist of only 3 native cherries. Various cultivated plums and cherries are found as escapes, especially in the Annapolis Valley; and the peach, *Prunus Persica* (L.)Batch., may appear occasionally from seed. The members of this genus can usually be distinguished by the small glands near the apex of the petioles (Groh and Senn, 1940).

a. Flowers few, in an umbel or short corymb.
  b. Plums; fruit large, with a bloom, and a deep groove along one side.
    c. Leaves rolled in the bud; flowers 1-2 per cluster.
      d. Shrubs or small trees, unarmed or nearly so; leaves 4-10 cm long; flowers 1-2, with the pedicels often pubescent; fruit more than 1 cm thick.
        e. Leaves 2.5-4 cm long, with closely serrate margins; flowers 0.8-1.5 cm wide, with pubescent pedicels; fruits 1.2-2 cm long. 1. *P. insititia*
        e. Leaves 5 cm long or longer, with closely and irregularly toothed margins; flowers 1.5-2.5 cm wide, with rarely pubescent pedicels; fruit 3-4 cm long. 2. *P. domestica*
      d. Shrub; very spiny; leaves 2-4 cm long; flowers usually solitary, with pedicels glabrous; fruit round, mostly less than 1 cm thick. 3. *P. spinosa*
    c. Leaves folded in the bud; flowers usually 3 or more per cluster, 2-3 cm wide, white to pinkish; branches becoming spiny when older. 4. *P. nigra*
  b. Cherries; fruit round, smooth without a bloom; leaves folded in the bud; flowers several to numerous; branches not spiny.
    f. Flowers 1-1.5 cm wide; fruit 7-8 mm thick, the involucral bracts of the inflorescence deciduous, not subtended by green leafy bracts; leaves with sharp inturned teeth; native tree. 5. *P. pensylvanica*
    f. Flowers 2-3 cm wide; fruit 15-20 mm thick; involucral bracts of the inflorescence persistent; leaves closely and bluntly toothed; flowers subtended by large green leafy bracts; cultivated trees or escapes.
      g. Leaves thin, hairy on the veins when young, with 10-14 pairs of veins; flower-spurs leafless, the bud-scales enlarged to 10-15 mm long, becoming recurved; calyx-lobes smooth edged. 6. *P. Avium*

g. Leaves firm, waxy, smooth or nearly so; flower-spurs leafy, the bud-scales erect and scarcely enlarged; leaves with 6-8 pairs of veins; calyx-lobes round-toothed. 7. *P. Cerasus*

a. Flowers numerous in an elongated, leafy, drooping raceme (Fig. 85, e, f).

h. Leaves thick and waxy, with inturned teeth, often with the mid-rib fringed with rusty hairs on the under side; sepals obscurely glandular, persisting on the fruit; trees. 8. *P. serotina*

h. Leaves thin, with sharp teeth, smooth on the mid-rib beneath; sepals plainly glandular-serrate, disappearing in fruit; shrubs. 9. *P. virginiana*

1. **P. insititia** L. BULLACE-PLUM

This form may appear when cultivated plums grow up from the rootstocks, and is to be expected wherever cultivated plums are grown in the Province. Late May.

Eurasia; long cultivated.

2. **P. domestica** L. GARDEN-PLUM

Commonly planted; occasionally escaping to roadsides and thickets.

3. **P. spinosa** L. BLACKTHORN, SLOE

Rare; collected at Wolfville and at Summerville Beach in Queens Co.; south of Kentville, Kings Co. Probably irregularly scattered. Late May.

Eurasia; introduced and long cultivated.

4. **P. nigra** Ait. CANADA PLUM

Scattered at various places in the Annapolis Valley; Wolfville, Gaspereau, Church St., Grand Pré and near Kentville; and at Landsdowne in Digby Co. This species has been introduced also in the form of rootstocks for cultivated varieties of plums. It seems to be an aggressive species and forms colonies.

Central and ne. Canada and the U.S.; introduced into N.S.

5. **P. pensylvanica** L. f. Fig. 85, d. BIRD- or PIN-CHERRY

Common throughout; barrens, sandy soil, burnt-over land, thickets and edges of fields. May 25-June 20.

Lab. to B.C. south to N.C.

6. **P. Avium** L. MAZZARD or SWEET CHERRY

Grown throughout the Annapolis Valley; occasional as an escape, especially in the western part. The black cherry, *P. Mahaleb* L. is rather similar but has the flowers in a short raceme instead of the pedicels being separate to the base. Middle and late May.

Eurasia.

7. **P. Cerasus** L. SOUR RED CHERRY

Frequently found in orchards, often persisting or as an escape along roadsides or fence-rows; most common in the southwestern counties and in the Annapolis Valley; rarer eastward. Late May.

Eurasia; escape and cultivated tree in eastern N. Amer.; B.C.

8. **P. serotina** Ehrh. Fig. 85, f. Map 342. WILD BLACK CHERRY

See "A Revision of the North American Black Cherries" by McVaugh (1951).

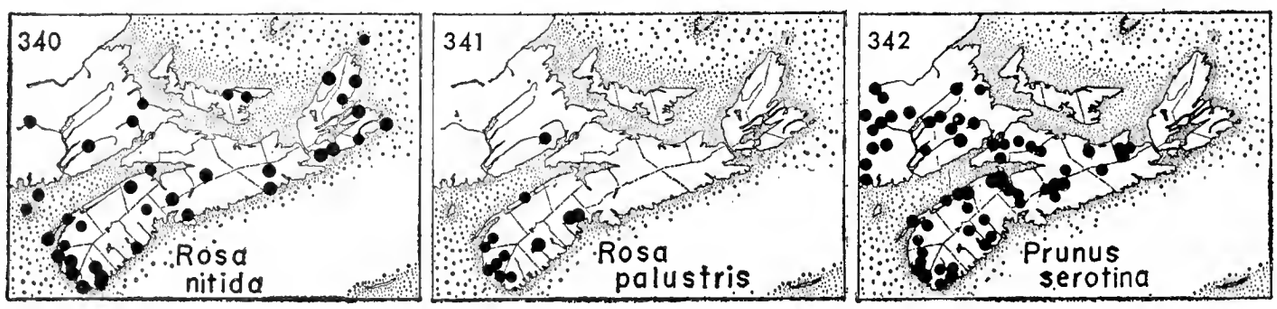
Common in the southwestern counties; characteristic of most of the rich or silty intervales from Cumberland and Halifax Co. to near Antigonish.

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

9. **P. virginiana** L. Fig. 85, e. Map 343. CHOKE-CHERRY

Common throughout the northern areas and probably scattered throughout; a weed shrub around fields, along stone walls, and in sandy, barren or waste land. It is especially common along the edges of the intervale meadows throughout the province; also along the edges of thickets near rocky lakeshores. June 10-25.

Nfld. to B.C. south to N.C.



58. LEGUMINOSAE PEA or LEGUME FAMILY

The legumes comprise a large family with perhaps 10,000 species of herbs, shrubs and trees. All our members except the honey locust, which is sometimes placed in a separate division, have typical pea-like flowers; and all have alternate compound leaves with stipules. The fruit is commonly called a pod. The garden peas, beans and soybeans are typical representatives of the family.

a. Trees or shrubs.
  b. Large trees with spines or thorns; leaves pinnately compound.
    c. Flowers regular, small, greenish, pistillate and staminate; leaves once or often twice compound; spines long and branched. 1. *Gleditsia*
    c. Flowers pea-like, whitish to pink, showy; leaves once compound only; only stipular thorns present. 9. *Robinia*
  b. Low shrubs about 1 m high, with stiff, green branches; leaves small, spines and thorns absent; flowers bright yellow.
    d. Leaves simple, lanceolate; stem terete and ridged; flowers 2-2.5 cm long, the calyx 2-lipped. 2. *Genista*
    d. Leaves with 3 leaflets or the upper simple; stem strongly 4-angled; flowers 1.2-1.5 cm long, the calyx deeply 5-lobed. 3. *Cytisus*
a. Herbaceous plants.
    e. Leaves pinnately compound.
      f. Terminal leaflet of the leaves absent or modified to a tendril.
        g. Flowers 1-3, sessile. 14. *Vicia*

g. Flowers several to numerous in a stalked inflorescence.
h. Blades of the leaflets less than 2 cm long; styles filiform with a tuft of hairs at the summit; wings of the flower coherent with the keel. 14. *Vicia*
h. Blades of the leaflets more than 2 cm long; styles flattened and bearded down the inner face; wings nearly free. 15. *Lathyrus*
f. Terminal leaflet present and not modified to a tendril.
i. Leaflets 9-31; plants low and tufted; rare; flowers in short racemes or umbels.
j. Leaves arising at the ground level from the very short stem; flowers 15-20 mm long; corolla purple; leaflets 15-30. 11. *Oxytropis*
j. Leaves scattered along the slender stem; leaflets 9-17.
k. Flowers about 10 mm long, purple, in short spikes; pods not jointed; rare. 10. *Astragalus*
k. Flowers 10-15 mm long, rose, in umbels; pods jointed; roadside planting. 12. *Coronilla*
i. Leaflets 1-7.
l. Leaflets 1, or occasionally 3; flowers small, yellow; pods very slender. 12. *Coronilla*
l. Leaflets 5-7.
m. Plant long-trailing or twining, native; flowers brownish purple. 16. *Apios*
m. Plant erect, many-stemmed; introduced field plant; flower yellow to reddish. 8. *Lotus*
e. Leaves palmately compound.
o. Leaflets numerous; lupins. 4. *Lupinus*
o. Leaflets three.
p. Plant not slender and twining, at most prostrate or creeping.
q. Leaflets not toothed; flowers purplish, in long narrow erect racemes; pod made up of separate joints which easily separate; tall and erect woodland plants. 13. *Desmodium*
q. Leaflets toothed or serrulate.
r. Flowers in a dense head, the petals turning brown and persistent on the fruit; fruit straight and membranous; clovers. 5. *Trifolium*
r. Flowers in a short spike or in long racemes, the petals deciduous after flowering.
s. Flowers in tall racemes; pods straight, 1-2 seeded; plants 1-2 m high. 6. *Melilotus*
s. Flowers in a very short spike; pods coiled, recurved or nearly straight; terminal leaflet stalked; plants 1-10 dm high. 7. *Medicago*
p. Plants very slender and twining; leaflets with a smooth edge; flowers purplish. 17. *Amphicarpa*

1. GLEDITSIA L.

1. G. triacanthos L. HONEY-LOCUST

Occasionally planted and persisting in hedges, around old habitations or along roadsides; very thorny. June.

Penn. to Iowa south to Tex.; introduced northwards.

2. GENISTA L.

1. **G. tinctoria** L. DYER'S GREENWOOD

Established in a field near North Sydney where it was considered to be a weed; flowers bright yellow and resembling the scotch broom. Early July.

Naturalized from Eu.; N.S. to Va.

3. CYTISUS L.

1. **C. scoparius** (L.)Link Fig. 89, g. SCOTCH BROOM

Long known from Shelburne Co. and still spreading in the open ground along the roadsides, into pastures and open woods between Jordan Falls and Shelburne and especially in the vicinity of Swanburg L.; recently collected in Yarmouth Co.; formerly gathered to some extent for the drug market. This plant does not seem to be able to persist in the colder regions inland or northward. July.

Locally introduced into sandy areas in N. Amer. near the east and west coasts; N.S., Me. and N.Y. to Ga.

4. LUPINUS L. LUPIN

Our lupins are garden ornamentals or escapes introduced from far-western N. Amer. where some 90 species are present.

a. Leaflets 10-17, widest nearest the middle and narrowed to each end, glabrous to slightly hairy beneath. 1. *L. polyphyllus*

a. Leaflets 6-9, widest near the tip, blunt, densely silky hairy beneath. 2. *L. nootkatensis*

1. **L. polyphyllus** Lindl. GARDEN-LUPIN

Frequently grown as an ornamental and occasionally escaping to become a weed; very common along the Salmon R. and the dykelands at Truro; common at Chebogue Point in Yarmouth Co.; frequently planted along roadsides elsewhere. June 15-July. The newer garden lupins are hybrids of mixed ancestry.

B.C. to Calif.; introduced from P.E.I. and N.S. to New Eng.

2. **L. nootkatensis** Donn

Abundantly naturalized at Chebogue Point along the Lupin Trail, Yarmouth. June 15-July.

Alaska to Vancouver I.; introduced from the Avalon Pen. to northern New Eng.

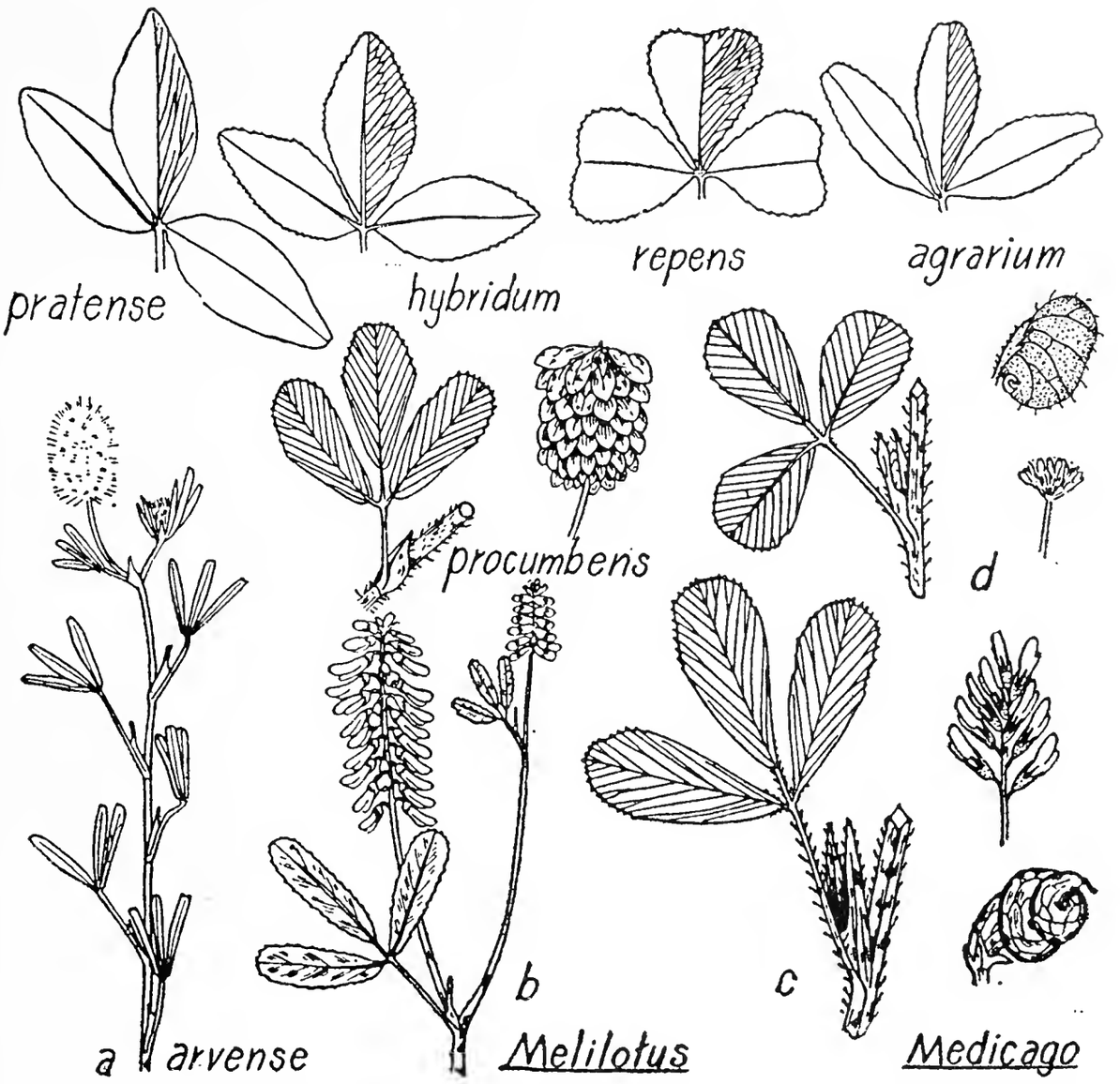


Fig. 90. **Trifolium**: (a) leaves and flowering heads of various species x $\frac{1}{2}$. — **Melilotus**: (b) *M. alba*, top of plant x $\frac{1}{2}$. — **Medicargo**: (c) *M. sativa*, leaf, flowers and fruit x 1, (d) *M. lupulina*, leaf and flowers x 1, fruit x 4.

5. **TRIFOLIUM** L. CLOVER

Our species of clover have all been introduced from Eu. The genus *Trifolium* is also common near the Pacific Coast where over 50 species are known. (Fig. 90).

a. Flowers white to pinkish or red, never yellow.
  b. Flowers sessile in the heads.
    c. Flowers 5-7 mm long in small heads which are much longer than thick; calyx-teeth silky-plumose and longer than the corolla. 1. *T. arvense*
    c. Flowers 12-20 mm long in large spherical heads; calyx-teeth ciliate-hairy or smooth, not longer than the corolla. 2. *T. pratense*
  b. Flowers conspicuously stalked in the heads.
    d. Stems loosely creeping and rooting; flower-stalks arising from the surface of the ground; flowers white; tip of the leaflets usually notched (Fig. 90). 3. *T. repens*
    d. Stems erect or ascending, not rooting at the nodes; flowers larger, pinkish-tinged; leaflets blunt to rounded at the apex. 4. *T. hybridum*

a. Flowers yellow; plants small.
  e. Terminal leaflet sessile. 5. *T. agrarium*
  e. Terminal leaflet stalked.
    f. Plants relatively large; heads densely flowered with 20-30 flowers; flowers 3.5-4.5 mm long, the corolla conspicuously striate with age. 6. *T. procumbens*
    f. Plants small and slender; heads loosely flowered with 5-15 flowers; flowers 2.5-3.5 mm long, the corolla not becoming striate. 7. *T. dubium*

1. **T. arvense** L. Fig. 90, a. RABBIT-FOOT CLOVER.

Local; a weed in sandy, stony or dry soil; known from Halifax and scattered about Wolfville; now rather frequently seen on the gravelly shoulders of roads where patches may extend for considerable distances, occasionally elsewhere and becoming common.

Introduced from Eurasia; N.S. to Fla. westward.

2. **T. pratense** L. Fig. 90. RED CLOVER

Common in fields and meadows throughout; rarely persisting except in limited amounts along roadsides or dwellings. Fernald (1943-b) separates the coarser, longer-lived cultivated plant as var. **sativum** (Mill.) Schreb. European botanists have named numerous varieties and forms which may have originated through cultivation and selection. Red clover grown from English seed has larger, paler flowers and smoother leaves. In some areas, as in Antigonish Co., this strain persists and is rather conspicuous. Var. *frigidum* Caudin, reported from Yarmouth by Fernald (1921), is probably a minor variation.

Widely naturalized from Eurasia.

3. **T. repens** L. Fig. 90. CREEPING WHITE CLOVER

Common throughout in pastures, roadsides, fields, and lawns, often in acid soils. It is the first legume found growing on acid, wet or eroded soils. In natural areas it is found mixed with brown top, *Agrostis tenuis*, in hollows or along moister places in pastures and meadows. Ladino clover is a giant form introduced from Italy and now widely grown in northeastern N. Amer.

Widely naturalized from Eu.

4. **T. hybridum** L. Fig. 90. ALSIKE CLOVER.

Extensively planted as a forage crop, especially on the wetter soils; often found naturalized in meadows and waste places. More slender plants with smaller heads, leaves and flowers have been segregated as var. **elegans** (Savi)Boiss, see Fernald (1943-b). This is said to be the more common wild form.

Widely naturalized from Eu.

5. **T. agrarium** L. Fig. 90. YELLOW or HOP-CLOVER

Occasional throughout along roadsides, in waste places and in dryish fields and meadows; generally less common than the next species. Late June-Sept.

Widely naturalized from Eu.

6. **T. procumbens** L. Fig. 90. LOW HOP-CLOVER

Common throughout; along roadsides, old fields, waste places and in towns. July-Sept.

Introduced from Eu.; N.S. to N.D. south to Ga.; Pacific Slope.

7. **T. dubium** Sibth. LITTLE HOP-CLOVER

Common in southern Yarmouth and through Digby Co., spreading into the Annapolis Valley, where it is found at Coldbrook and near Windsor.

Naturalized from Eu.; N.S. to Wisc. south to Miss.; B.C. southward.

6. **MELILOTUS** Mill. SWEET-CLOVER

About 20 species of annual or perennial plants of the Old World. The small, white or yellow flowers are in long erect racemes from the upper axils; with pods mostly 1-2-seeded.

a. Corolla yellow.
 b. Perennials; flowers 4-7 mm long; calyx-tube rounded at the base.
  c. Ovary and pod glabrous; pod strongly reticulated and cross-ribbed, 2.5-3.5 mm long. 1. *M. officinalis*
  c. Ovary and pod pubescent; pod weakly reticulated, not cross-ribbed, 4.5-6 mm long. 2. *M. altissima*
 b. Annual; flowers 2-3 mm long; fruit about 2 mm long, deeply reticulate. 3. *M. indica*
a. Corolla white; flowers 3-5 mm long; calyx-tube narrowed evenly to the base; pod 3-4 mm long, glabrous. 4. *M. alba*

1. **M. officinalis** (L.)Lam. YELLOW SWEET-CLOVER

Yellow sweet-clovers are much less common than are white species in the province. This species is abundant along roadsides near mining towns and on or near gypsum in Hants Co.; scattered elsewhere. July 15-Aug.

Introduced from Eu.; widely naturalized in N. Amer.

2. **M. altissima** Thuill.

This species is very similar in appearance to the last and is probably often confused with it. Common around Brooklyn in Hants Co.; scattered elsewhere as at Annapolis and at Port Howe in Cumberland Co. July-Aug.

Introduced from Eu.; widely naturalized, at least from C.B. to N.Y. and Ont.

3. **M. indica** (L.)All.

Ballast-heaps, Pictou. Collected by Macoun in 1883 and cited as *M. parviflora* Desf. (Fernald, 1948).

A casual adventive from Eurasia; N.S. to Minn.

4. **M. alba** Desr. Fig. 90. WHITE SWEET-CLOVER

A common weed in every town and often along roadsides in the country. It has been little grown as a forage crop, but it has nevertheless become well-established in many regions, especially about ports and in limestone or gypsum areas. Very common from Pictou to Halifax and Annapolis; scattered elsewhere. It has spread rapidly along new roadside embankments where the subsoil has been turned up. July-Aug.

Introduced from Eu. and widespread.

7. MEDICAGO L. MEDICK

About 50 species of Eurasia. The flowers are in short, axillary head-like racemes and the pods are coiled, incurved, or in one species nearly straight.

a. Perennial; flowers 6-12 mm long; plants tall and ascending.
 b. Corolla bluish-purple; pods spirally twisted; alfalfa. 1. *M. sativa*
 b. Corolla yellow; pod nearly straight. 2. *M. falcata*
a. Sprawling annual; flowers yellow, 2-5 mm long; pods curved or tightly twisted. 3. *M. lupulina*

1. **M. sativa** L. Fig. 90, c. ALFALFA

Planted as a forage crop, occasionally persisting for a time; found along roadsides and in waste places in limited amounts. As yet alfalfa is little planted except in the best locations and is rather rare on the prevailing acid or wet soils. July-Aug.

Native of Eu.; widespread.

2. **M. falcata** L.

This species is similar to alfalfa in general appearance but differs in the flowers and fruit. On the dyke of the tidal Kennetcook R., Hants Co., collected by J. S. Erskine in 1956.

Occasionally introduced from Eu.; N.S. to Del. and Mich.; Que. to B.C.

3. **M. lupulina** L. Fig. 90, d. BLACK MEDICK

Common throughout; especially in the Annapolis Valley where it is found along roadsides, in lawns, waste places, and occasionally in cultivated fields. This plant is easily confused with the clovers but the teeth of its leaves are not bristly and the stalks of the leaflets are pubescent instead of glabrous.

Var. **glandulosa** Neilr. has the peduncles and fruits with numerous small stalked glands. This seems to be as common as the species but the glands are variable in number and sometimes occur only on the fruits. June-Sept.

Native of Eu.; widely introduced.

8. **LOTUS** L. TREFOIL

About 140 species of Eurasia and western North America; clover-like plants with yellow flowers and five leaflets of which two are stipules.

a. Plants without stolons; inflorescence with fewer than 8 flowers; seeds 1.4 mm long, rich brown in color and speckled. 1. *L. corniculatus*
a. Plants with well-developed runners or rhizomes; inflorescence with 7-11 flowers; seeds about 1 mm long, uniform olive-green in color. 2. *L. uliginosus*

1. **L. corniculatus** L. BIRD'S-FOOT-TREFOIL

This plant is used as a forage plant further west and south, and it is planted experimentally in N.S. so that it may occasionally be found in semi-native habitats. A strain has been introduced, possibly at Pugwash in ballast; and it is occasionally seen along roadsides and in fields in northern Cumberland Co. July-Sept.

Introduced from Eu.; N.S. to Minn. south to Va.

2. **L. uliginosus** Schkuhr

Perennial, like the last species with conspicuous yellowish flowers in head-like umbels on long peduncles. This plant is occasionally introduced and has been reported from N.S. Plants growing in waste places should be checked as they may be this species; well-established on bank of stream, Dartmouth.

Introduced from northern and central Eu.; N.S. to Sask. and B.C. southward.

9. **ROBINIA** L. LOCUST

About 20 species of trees and shrubs from the southern U.S. and Mex. Their finely divided leaves and racemes of large flowers make them attractive as ornamental plants.

a. Branchlets, petioles and flowers smooth; flowers white. 1. *R. Pseudo-Acacia*
a. Flowers rose-purple.
b. Branchlets, petioles and flowers viscid with many sessile glands; leaflets 13-25. 2. *R. viscosa*
b. Branchlets, petioles and flowers bristly and glandular; leaflets fewer, 7-13. 3. *R. hispida*

1. **R. Pseudo-Acacia** L. Fig. 89, f. BLACK LOCUST

Formerly planted as an ornamental tree; occasionally found as an escape in the western and central counties, sometimes occurring along roadsides or on hillsides where it has spread out from the original trees. Rarely fruiting in the Province. June.

Introduced; native from Penn. to Ind. south to Ga. and Okla.

2. **R. viscosa** Vent. CLAMMY LOCUST, ROSE ACACIA

Often planted for a small ornamental tree and occasionally seen along roadsides; growing in large clumps or thickets, often like a weed in the Annapolis Valley; scattered elsewhere. June.

Introduced; native in the mts. from Va. to Ga.

3. **R. hispida** L. BRISTLY LOCUST

South of Wolfville, unlikely to spread far, but still persisting on the bank opposite the College University Avenue dump. (Erskine, D.S., 1951).

Introduced: Va. and Tenn. southward.

10. ASTRAGALUS L.

One of the largest genera of flowering plants in both North America and Asia but rare and often occurring as relic species in eastern Canada.

1. **A. Robbinsii** (Oakes) Gray

Depressed clumps on exposed cliff headlands, Cape d'Or. The treatment of Barneby in the New Britton and Brown Flora (Gleason, 1952) has been followed. The above specimens differ only superficially from the description in the manual, and have therefore been included under the typical variety. It is relatively common and easily accessible at Cape d'Or. These collections are of particular interest as they represent the rediscovery of a taxon thought to be extinct from its type area on "dry calcareous ledges, Winooski R., Vt." (Schofield, 1955).

Local in Me., Vt. and N.H. with the identities problematical.

11. OXYTROPIS DC.

About 200 species of circumboreal distribution and, like the last genus, rare and local in eastern Canada.

1. **O. johannensis** Fern. Map 344.

Abundant at the northeast end of St. Paul Island, C.B. (Perry, 1931). It was reported from the same island in Macoun's Catalogue as *O. arctica* as being collected by McKay. Frequent in cliff crevices and on exposed cliff headlands, Cape d'Or in Cumberland Co. (Schofield, 1955). Sometimes classified as a variety of the circumboreal *O. campestris* (L.)DC.

Western Nfld. to Man. south to northern Me. and the St. John Valley in N.B.

12. **CORONILLA** L. CROWN-VETCH

About 25 species of Eurasia and N. Afr. with odd-pinnate leaves, and the yellow or rose flowers in umbels on long peduncles.

a. Leaflets 1-3, the terminal elliptical to oval with the lateral, if present, much smaller; flowers yellow, small, 2-5 in an umbel. 1 *C. scorpioides*
a. Leaflets 11-21; flowers rose, the keel tipped with purple, 10-15 mm long, 10-15 in an umbel. 2. *C. varia*

1. **C. scorpioides** (L.)Koch

This is listed by Boivin for N.S. and N.B. The plant is a native of s. Eu. and is occasionally adventive in eastern N. Amer.

2. **C. varia** L. CROWN-VETCH

This perennial plant is being used to seed roadside banks to prevent erosion. It is doubtfully hardy in N.S. but in some locations, as near Glenholme in Colchester Co., it grows luxuriantly and is a pretty and very conspicuous roadside plant.

Introduced; Me. and Que. to Man. south to N.C.

13. **DESMODIUM** Desv.

A world-wide genus with numerous species. The pods are peculiar in that they are strongly constricted between the seeds and break up into one-seeded sections when mature.

a. Leaflets ovate and pointed, nearly as wide as long; leaves clustered at the top of the stem; raceme terminal and long-stalked. 1 *D. glutinosum*
a. Leaflets oblong-lanceolate and obtuse, about one-fourth as wide as long; leaves scattered on the stem; racemes not long-stalked. 2. *D. canadense*

1. **D. glutinosum** (Muhl.)Wood Map 344.

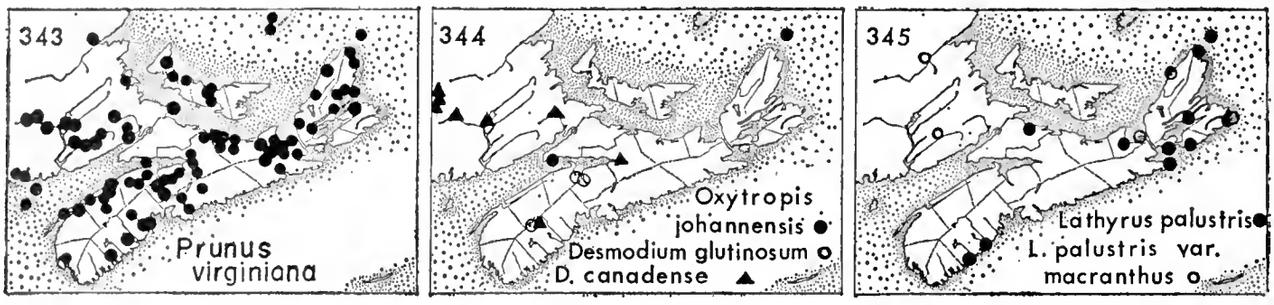
Known from the edge of beech woods along the Gaspereau R. about 2 miles above White Rock, Kings Co.; on gypsum bluff among *Rhus radicans*, Halfway R., Hants Co. (Erskine); collected by J.F. Donly along a wood-road near the fish hatchery, Grafton, Queens Co. (*D. acuminatum* (Michx.)DC.). July.

N.S., N.B. and central Me. to Minn. south to Fla. and Tex.

2. **D. canadense** (L.)DC. Map 344. CANADA TICK-CLOVER

Collections of this plant exist from along the river above Truro, where it is now either very rare or extinct. Robinson (1901-2, 1907) reports it from each of the three Pictou rivers. Occasional in clumps on the upper portions of the beach, Kedgemakoogie L., west of New Grafton, Queens Co. Late July.

N.S. to Man. south to W. Va. and Okla.



14. VICIA L. VETCH

About 200 widely distributed annuals or perennials, as cultivated plants, escapes or weeds. *V. Faba* is the cultivated Broad or Horse Bean.

a. Flowers sessile or nearly so in the axils of the upper leaves.
  b. Flowers 1-3 in one place; plants annual; calyx-teeth about equal to the tube in length and all about the same length.
    c. Flowers 2-3 cm long; pods 4-6 cm long, pubescent and pale tawny at maturity, compressed. 1. *V. sativa*
    c. Flowers 1-1.8 cm long; pods 3-4 cm long, smooth and black at maturity, terete. 2. *V. angustifolia*
  b. Flowers 2-5, in a nearly sessile raceme; plant perennial; calyx-teeth much shorter than the tube and irregular in length. 3. *V. sepium*
a. Flowers in a one-sided spike or raceme with a well-developed peduncle.
  d. Flowers 1-5, small and 2-4 mm long; pods short, with 2-4 seeds; plants delicate and very slender.
    e. Pods smooth, 4-seeded; leaf with 4-6 pairs of leaflets. 4. *V. tetrasperma*
    e. Pods hairy, 2-seeded; leaf with 6-8 pairs of leaflets. 5. *V. hirsuta*
  d. Flowers numerous, much larger and 12-15 mm long; pods with 6-10 seeds; plants coarser.
    f. Flowers about 4 times as long as broad or less; calyx-teeth short, the lower long-triangular; plant with appressed pubescence. 6. *V. Cracca*
    f. Flowers narrow, at least 5 times as long as broad; calyx-teeth with thread-like hairy lobes; plant with spreading whitish hairs. 7. *V. villosa*

1. V. sativa L. CULTIVATED VETCH

Occasional along roadsides and in fields where it has been planted, not persisting.

Naturalized from Eurasia and N. Afr.; widespread.

2. V. angustifolia Reichard Fig. 91, a. WILD VETCH

Common throughout, especially about towns, sea-shores, dykelands and railroads. It is extremely variable and is often included as a variety of the preceding species. The following three varieties are reported. The typical variety has leaflets about 5 mm wide and tapering to a pointed tip. Var. **segetalis** (Thuill.) W.D.J. Koch is very common and has leaflets of about the same width but truncate at the apex and with a tiny mucronate tip. Var. **uncinata** (Desv.) Rouy has very narrow, elongate-linear leaflets which are truncate and mucronate at the apex. In extreme

forms the leaves may be less than 1 mm wide. This is found around seaports from Nfld. to Me.

Native of Eurasia; widely introduced in eastern N. Amer.; B.C.

3. **V. sepium** L. BUSH-VETCH

Very local; reported from a field at Annapolis (Fernald, 1922).

Naturalized from Eu.; Nfld. to Ont. south to northern New Eng.

4. **V. tetrasperma** (L.) Moench Fig. 91, e. SLENDER VETCH

Frequent in the Annapolis Valley and often a bad weed in orchards, gardens, strawberry patches and fields; scattered and becoming more common elsewhere. July-Aug.

Nfld. to Ont. south to Fla.; B.C.

5. **V. hirsuta** (L.) S.F. Gray

Rare, occasionally found about the edges of the dykelands and to be expected about towns and seaports.

Introduced from Eu.; N.S. to Que. southward; B.C.

6. **V. Cracca** L. Fig. 91, b. TUFTED VETCH

This is the most common vetch of the Province and it is abundant along roadsides and railroads throughout; scattered elsewhere in waste places, cultivated ground and about towns; often common in older dykelands, as about Amherst. Forma **albida** (Peterm.) Gams has white flowers: railway embankment. Truro, R.W. Ward, 1927 (Schofield and Smith, 1952). Late June-Aug.

Nfld. to B.C. southward; introduced or perhaps partly native.

7. **V. villosa** Roth Fig. 91, c. HAIRY or WINTER VETCH

Occasionally sown and persisting for a time in open or sandy soil. Occasional throughout Kings Co.; scattered elsewhere.

Native of Eurasia; widely introduced.

15. **LATHYRUS** L. PEA

About 150 annual and perennial herbs in the northern hemisphere and South America. Our cultivated sweet pea is *L. odoratus* L. The garden pea belongs to a closely related genus and is *Pisum sativum* L. *L. Aphaca* L. is a peculiar species with the leaf reduced to a tendril; rarely appearing as a waif.

a. Leaves with 2-6 pairs of leaflets; plants native, growing near the sea-shores.
  b. Stipules like an arrow-head, with 2 basal lobes; leaflets 8-12, oval; flowers 7-25 on each peduncle (Fig. 91, f).
    c. Plants glabrous or nearly so. 1. *L. japonicus* var. *glaber*
    c. Plants densely pubescent with fine, short, erect pubescence. *L. japonicus* var. *pellitus*

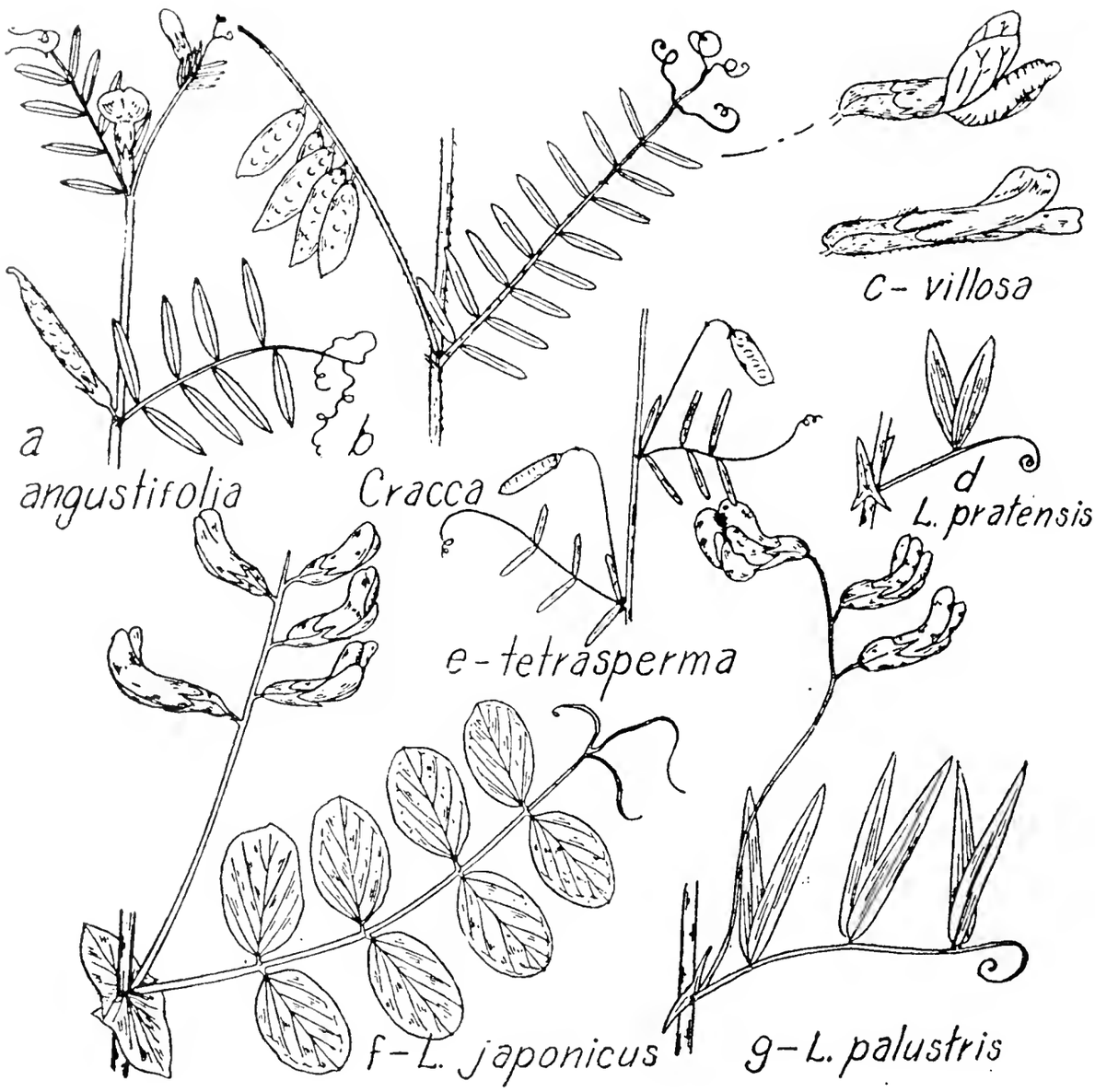


Fig. 91.—**Vicia**: (a) *V. angustifolia* x $\frac{1}{2}$, (b) *V. Cracca* x $\frac{1}{2}$, flower x 2, (c) *V. villosa* x 2, (e) *V. tetrasperma* x $\frac{1}{2}$. — **Lathyrus**: (d) *L. pratensis*, leaf and stipules x $\frac{1}{3}$, (f) *L. japonicus* x $\frac{1}{2}$, (g) *L. palustris* var. *pilosus*, leaf and flowers x $\frac{1}{2}$.

b. Stipules with but one basal lobe (Fig. 91, g).
  d. Mature leaflets 7-23 mm wide, 2-3.5 times as long as wide.
    e. Mature leaflets nearly glabrous. 2. *L. palustris*
    e. Mature leaflets finely pubescent. *L. palustris* var. *macranthus*
  d. Mature leaflets 3-9 mm wide, 5-15 times as long as broad.
    f. Plant glabrous or nearly so *L. palustris* var. *linearifolius*
    f. Plant pubescent. *L. palustris* var. *pilosus*
a. Leaves with but a single pair of leaflets above the stipules.
    g. Petiole not winged; flowers yellow (Fig. 91, d). 3. *L. pratensis*
    g. Petiole widely winged; flowers purplish; lobes of calyx unequal, the lower much the longer; seeds numerous in pod. 4. *L. latifolius*

1. **L. japonicus** Willd., var. **glaber** (Ser.)Fern. Fig. 91, f. BEACH PEA

Common around the coast, usually growing in company with the following variety; found along the strand line, mostly in light or sandy soil. Occasionally, however, as in northern C.B., it may invade fields or

grow along the waste places at considerable distances from the salt water. July-Sept. (*L. maritimus*).

Nfld. south along the coast to N.J.; inland around the Great Lakes; B.C. to Calif.

Var. **pellitus** Fern. differs only in its pubescence and the two varieties are usually found growing together. Forma **candida** Fern., with white corolla, has been collected at Whycocomagh, Inverness Co.

Nfld. to Que. and N.J.; northern N.Y. and locally around the Great Lakes.

2. **L. palustris** L. Fig. 91, g. Map 345. WILD PEA

Damp thickets or edges of marshes near the shore, southwestern N.S. and to C.B. Nfld. to Man. south to N.Y. and Mo.; B.C. and Oreg. northwards.

Var. **macranthus** (T.G. White) Fern. is found on grassy slopes, headlands and wet areas near the coast; around the Province and common on Sable Island. Nfld. to Cape Cod, scattered inland across the continent.

Var. **pilosus** (Cham.) Ledeb. (Map 346) is common around and on the dykelands, along sea-shores and in sea-side swamps and meadows, probably around most of the coastline. June 20-July. Lab. to N.Y. and scattered to the West Coast.

Var. **linearifolius** Ser. is similar to the preceding variety except that the leaves are glabrous. Found by J.S. Erskine on the Tusket I. in Yarmouth Co. and on Sable I. Local across N. Amer.

Var. **retusus** Fern. & St. John (St. John, 1921) differs from all other varieties in having the leaflets broadest near the tip and tapering to a cuneate base. This was originally described from Sable Island; now reported also from St. Pierre and Miquelon.

3. **L. pratensis** L. Fig. 91, d. YELLOW VETCHLING

Occasional; found sparingly along the North Shore at the edge of fields or along roadsides where it may be locally abundant in grassy areas: Wallace, Springhill Junction and near Merigomish, etc. July.

Nfld. to Ont. locally south to N.Y.; introduced from Eu.

4. **L. latifolius** L.

Cultivated as an ornamental; occasionally escaping to roadsides and waste places, persisting; several large perennial clumps were found at South Berwick. *L. sylvestris* L. is very similar and here is included with it. This seems like a more slender type with narrower leaflets and stipules.

Introduced from Eu.; N.S. south to Va. and west to Kans.

16. **APIOS** Medic.

About 7 species of eastern N. Amer. and China.

1. **A. americana** Medic. Fig. 92, b. Map 347. GROUND-NUT

Common in thickets in southwestern N.S.; scattered along rivers in alluvial soil in the central district east to Pictou Co. Prest (1905) says that he never saw it east of Halifax; and it does appear to be absent in Cumberland Co. and from Halifax and central Pictou Co. eastward. Late July.

N.S. to Minn. south to the Gulf of Mex.

Fig. 92.—**Amphicarpa**: (a) *A. bracteata* x $\frac{1}{2}$. — **Apios**: (b) *A. americana* x $\frac{1}{4}$. — **Linum**: (c) *L. catharticum* x $\frac{1}{2}$. — **Millegrana**: (d) *M. linoides* x 1. — **Oxalis**: (e) *O. montana* x $\frac{1}{2}$, (f) *O. europea*, leaf and flower x $\frac{1}{2}$, fruit x 1. — **Polygala**: (g) *P. sanguinea* x $\frac{1}{2}$.

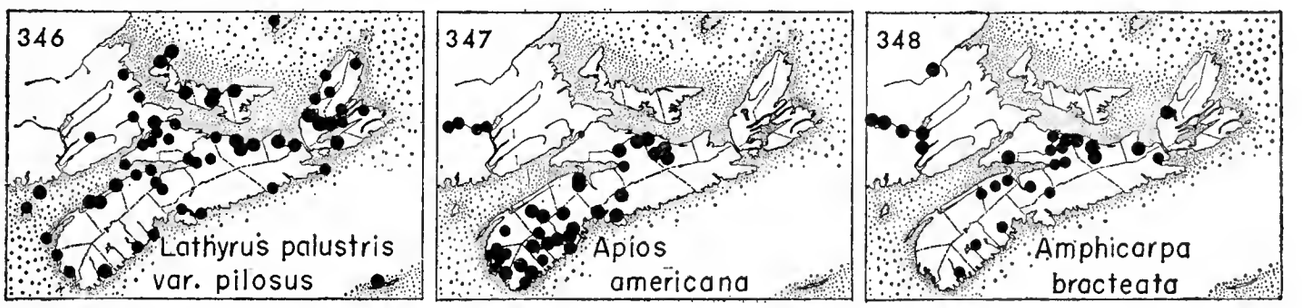
17. AMPHICARPA E11.

Seven known species; the others found in eastern Asia.

1. **A. bracteata** (L.)Fern. Fig. 92, a. Map 348.

In shaded areas and alluvial soils, moist thickets and river banks, abundant locally from Shelburne and Cumberland Co. to Guysborough and Antigonish; scattered in the Annapolis Valley and rather common along the intervales of Colchester and Pictou Co.; Southwest Mabou in C.B. August. All our plants are very slender and twining.

N.S. to Man. south to the Gulf of Mex.



59. LINACEAE FLAX FAMILY

About 150 species of wide distribution. Our representatives are rather wiry, erect herbs. The filaments of the stamens tend to be joined at the base; the fruit is a dry capsule.

a. Flower-parts in 5's; plants more than 10 cm high; capsules obscurely 10-celled with 10 seeds; flax. 1. *Linum*
a. Flower parts in 4's; plants about 3 cm high; capsules with 4 nearly 2-celled carpels, each carpel with 4 seeds. 2. *Millegrana*

1. LINUM L. FLAX

a. Petals blue, 1 cm long or longer; plants 2-6 dm high; leaves 10-30 mm long, alternate. 1. *L. usitatissimum*
a. Petals white, 4-8 mm long; plant 8-20 cm high; leaves 4-10 mm long, mostly opposite. 2. *L. catharticum*

1. L. usitatissimum L. COMMON FLAX

Formerly planted but not persisting, now rarely seen except where seeds happen to fall in waste ground or along railroad tracks. July-Aug.

Introduced from Eu.; widely distributed.

2. L. catharticum L. Fig. 92, c. Map 349. FAIRY-FLAX

Scattered on hillsides, roadside banks or in old fields or grassy areas, often on moist or seepy ground. Central and southern C.B. becoming

rarer through Antigonish to Pictou Co. It has been introduced from Eu.; or it may possibly be native to C.B.

Western Nfld.; N.S. to Ont. locally south to N.Y.

2. **MILLEGRANA** Adans.

1. **M. Radiola** (L.)Druce Fig. 92, d. Map 349. TINY ALL-SEED

Discovered at Louisburg by Macoun over 60 years ago; now scattered along the coast west to Yarmouth Co. and around to Brier I.; Cheticamp on the west side of C.B.; abundant along the shore east of Halifax, where it may grow thick as grass over some of the wet pasture slopes close to the sea. July-Aug. (*Radiola linoides* Roth).

Introduced from Eu.; known only in N.S. in N. Amer.

60. **OXALIDACEAE** WOOD-SORREL FAMILY

Low herbs with watery juice and leaves with three obcordate leaflets much like those of white clover; stamens 10, their filaments united at the base into a short tube; ovary 5-celled with 5 styles, and forming an elongated, often 5-sided, capsule. See Eiton (1963) and Wiegand (1925).

1. **OXALIS** L. WOOD-SORREL

a. Leaves all basal; petals white, veined with rose or purple; native woodland plants. 1. *O. montana*

a. Leaves scattered on erect stems or branches; petals yellow, small; weedy species.

b. Plants creeping and rooting at the nodes; leaves small and purplish or bronze; stipules ovate-oblong; seeds brown. 2. *O. corniculata*

b. Plants with leafy stems, erect or decumbent but not creeping, sometimes with rootstocks; stipules narrow or lacking.

c. Flowers umbellate or solitary with the fruiting pedicels usually horizontally deflexed with erect capsules; capsules 15-25 mm long, grayish with crisp incurved hairs which have no cross-partitions. 3. *O. Dillenii*

c. Flowers cymose, on short branching pedicels; fruiting pedicels spreading or ascending; capsules 8-12 mm long, glabrate or with soft spreading hairs which are septate and show several cross-walls under magnification. 4. *O. stricta*

1. **O. montana** Raf. Fig. 92, e. Map 350. WOOD-SORREL

Common throughout; damp woods, mossy banks, along ravines and in wooded swamps, early June to July. Our plants are very closely related to the Eurasian *O. Acetosella* L. and may be included with this species as var. *rhodantha* (Fern.)Knuth.

Southern Nfld. to Ont. and Minn. south to N.C. and Tenn.

2. **O. corniculata** L. CREEPING WOOD-SORREL

Waste places and gardens, chiefly near greenhouses and showing little tendency to persist or spread in other locations; Truro, Wolfville and Kentville. Gleason considers the application of this name to be confused and calls our plants *O. repens* Thunb.

Widely distributed southward and scattered north to Nfld.

3. **O. Dillenii** Jacq.

This includes the plants named *O. stricta* in our manuals but Eiton (1963) considers this name properly belongs to the following species. Rare, occasionally collected in the Annapolis Valley in waste places and woodland clearings from Annapolis to north of Kentville. The type of hairs on or near the capsules seems to be a definite characteristic but this is difficult to see without considerable magnification. A slender type occurring north to southern N.B. is included as subspecies *filipes* (Small) Eiton.

Fla. west to the Rocky Mts. north to N.S. and B.C.

4. **O. stricta** L. Fig. 92, f. YELLOW WOOD-SORREL

Common throughout; along roadsides, in thickets, waste ground, fields and near dwellings. Numerous forms have been described on the basis of the pubescence of the stems, leaves and pedicels but the value of these is very dubious. The typical form has the hairs of the pedicels appressed and the stem with ascending pubescence or glabrate; common. From the central part of the Province westward the hairs of the pedicels tend to be spreading and the stems densely hairy. The name *O. europaea* Jord. is usually applied to this species but Eiton considers Linnaeus to have had the N. Amer. plant when he named *O. stricta.*

N.S. to Sask. south to Va. and Ariz.; introduced in Europe.

61. GERANIACEAE GERANIUM FAMILY

This distinctive family has the leaves deeply lobed or divided; flowers with 10 stamens more or less united at the base; and the pistil has a long beak and 5 carpels which form 5 dry, one-seeded fruits which separate at maturity and remain attached by the extension to the tip of the beak of the pistil. Our cultivated geraniums and pelargoniums belong to this family.

a. Leaves palmately lobed or divided; fertile stamens 10. 1. *Genanium*
a. Leaves pinnately and finely divided; fertile stamens 5. 2. *Erodium*

1. Geranium L.

a. Flowers large, the petals 15-20 mm long, purplish, much exceeding the calyx; plant perennial with thick crown and stout rhizomes. 1. *G. pratense*
a. Flowers smaller, the petals less than 10 mm long, shorter than to slightly exceeding the calyx; plants annual or biennial with tap roots.

b. Leaves cleft but not divided into leaflets, the divisions lobed; carpel-bodies (seeds) at maturity remaining attached to the styles.
c. Leaves 4-7 cm wide, deeply cleft with the divisions narrowly divided with acute lobes; sepals 6-10 mm long, slenderly awn-tipped. 2. *G. Bicknellii*
c. Leaves mostly less than 5 cm wide, orbicular in outline, more shallowly cleft; sepals 2.5-4 mm long, blunt or with minute callous tips.
d. Style of the fruit 2-5 mm long; carpel-bodies glabrous, minutely wrinkled. 3. *G. molle*
d. Style, the slender part at the tip, practically absent; carpel-bodies smooth, minutely pubescent. 4. *G. pusillum*
b. Leaves completely divided into stalked leaflets which are again pinnately cleft, terminal leaflets stalked; seeds at maturity promptly separating from the styles, with two long hair-like appendages. 5. *G. Robertianum*

1. **G. pratense** L. Fig. 93, c. MEADOW-GERANIUM

Scattered or occasionally seen from Yarmouth to Pictou Co.; probably as an escape from gardens; along roadsides or near dwellings. June-Aug.

Nfld. to Ont. south to Mass. and N.Y.; introduced from Eu.

2. **G. Bicknellii** Britt. Fig. 93, b. Map 351. WILD GERANIUM

Rather rare, usually found in recently burned or cleared areas from Yarmouth east to Halifax and Cumberland Co.; abundant on talus overgrown with poison ivy, base of cliff, New Prospect, Cumberland Co. (Schofield, 1955). Late June-July.

Nfld. to B.C. south to Mass., N.Y. and Iowa.

3. **G. molle** L.

Rare; the only collection seen from northeastward of Mass. was one from Annapolis, collected by George Morris, July 30, 1902.

Introduced from Eu.; scattered from N.S. to B.C. southward.

4. **G. pusillum** L.

Local; becoming a weed in lawns and about gardens in Wolfville, aggressive when once established.

Naturalized from Eu.; N.S. to B.C. southward.

5. **G. Robertianum** L. Fig. 93, a. Map 352. HERB-ROBERT

Common from Digby northeastward to northern C.B.; cold ravines, rocky woods, talus slopes and rich woods. It is growing on rather rich soil or in alkaline areas; abundant along the North Mt. of the Annapolis Valley and in rich woods eastward. In sw N.S. it is found on the cobble areas back of the sea-beaches, as near Port Joli, at Roseway and Bon Portage I. in Shelburne Co., the rocky bank of the river at Tusket and on the Tusket I. June-Sept.

Nfld. to Ont. south to W. Va.; B.C.; Eurasia and Africa.

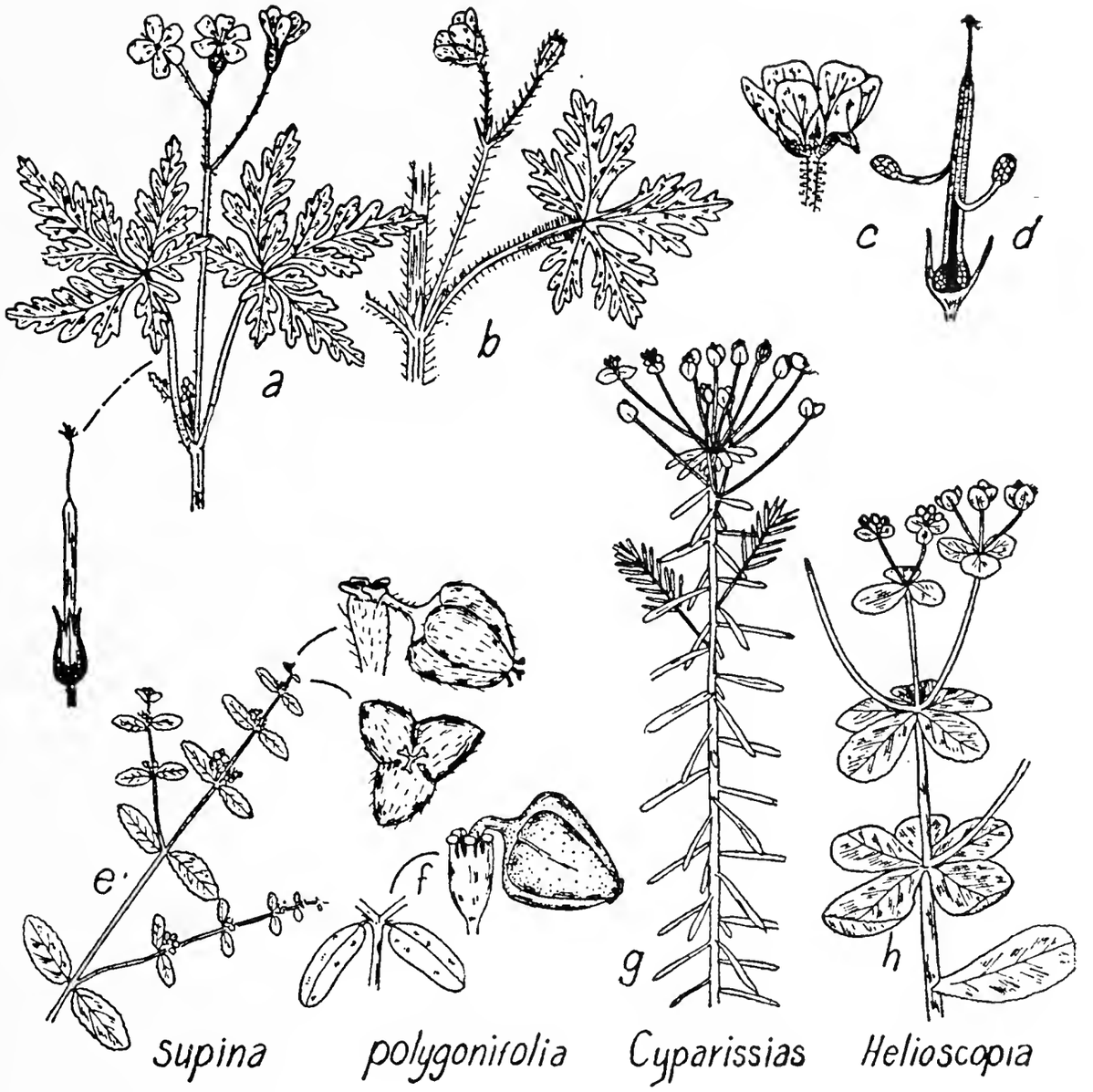
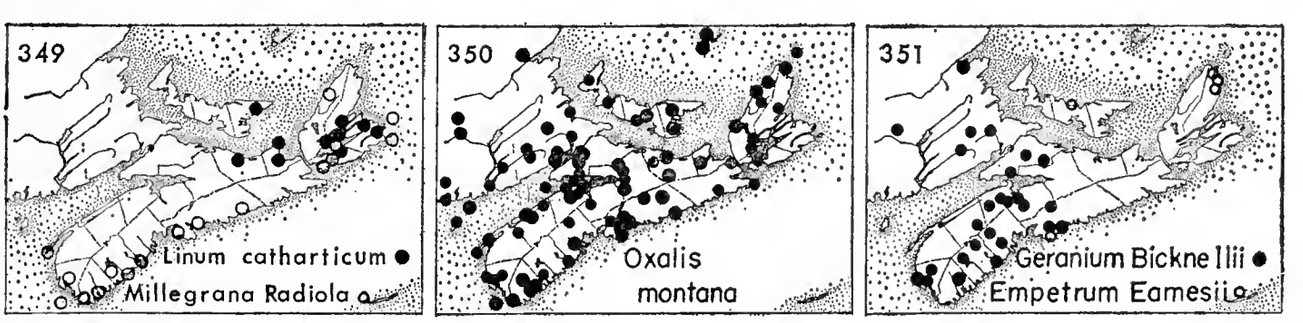


Fig. 93.—**Geranium:** (a) *G. Robertianum* x $\frac{1}{2}$, fruit x $\frac{1}{2}$, (b) *G. Bicknellii* x $\frac{1}{2}$, (c) *G. pratense*, flower, (b) mature flower to show fruits twisting off. — **Euphorbia:** (e) *E. supina* x $\frac{1}{3}$, fruits x 5, (f) *E. polygonifolia*, leaves x $\frac{1}{2}$, fruits x 5, (g) *E, Cyparissias* x $\frac{1}{2}$, (h) *E. Helioscopia*, tip of branch x $\frac{1}{2}$.



2. **ERODIUM** L'Her. STORKSBILL

1. **E. cicutarium** (L.)L'Her. STORKSBILL.

Centreville, Kings Co.; scattered in sandy ground; also at Halifax. June-Sept.

Introduced from Eu.; N.S. to B.C. southward; weedy.

62. POLYGALACEAE MILKWORT FAMILY

This family is represented in our area by only two rather small and rare herbaceous plants plus the taller woodland *P. Senega* L. in N.B. Our plants are relatively unbranched, up to 2 dm. high, and have whitish to pink irregular flowers. The 2 inner of the 5 sepals may be showy and petal-like; and the lower of the 3 petals is different from the other 2 and is keeled.

1. POLYGALA L. MILKWORT

a. Flowers separate in an erect raceme, short-pedicelled; upper part of the underground rootstocks covered with small cleistogamous flowers. 1. *P. polygama*

a. Flowers crowded in a dense globular to broadly oblong head; rootstocks without cleistogamous flowers (Fig. 92, g). 2. *P. sanguinea*

1. **P. polygama** Walt., var. **obtusata** Chodat

Very rare, probably introduced; Halifax, and Clementsvale in Annapolis Co. The variety is the northern form.

N.S., Que. and Ont. to Minn. south to Fla. and Tex.

2. **P. sanguinea** L. Fig. 92, g.

Occasional in the northern part of Hants and Cumberland Co.; poor or acid fields, damp slopes and in open woods or bush; near New Glasgow; and on the sand barren at Middleton in Annapolis Co. A collection from a nursery near Halifax may be an introduction.

N.S. to Ont. and Minn. south to N.C. and Kans.

63. EUPHORBIACEAE SPURGE FAMILY

This huge family is represented with us by a few escapes or weedy species, all of which are herbaceous plants with simple alternate or opposite leaves. The flowers are small with no petals and sometimes without even a calyx. The stamens and pistils are usually in different flowers.

a. Flowers not enclosed in an involucre, with a true calyx; plants large, erect, with thinnish leaves on long petioles; juice not milky.

b. Staminate flowers in a terminal interrupted bracted spike; leaves opposite. 1. *Mercurialis*

b. Staminate and pistillate flowers in the axils of the leaves, usually enclosed in a large palmately-lobed bract; leaves alternate. 2. *Acalypha*

a. Flowers included in a cup-shaped small involucre, the staminate consisting of a single stamen, and the pistillate of a 3-lobed pistil, the whole group often similar to a single flower in appearance (Fig. 93, e-h); juice milky. 3. *Euphorbia*

1. MERCURIALIS L.

1. **M. annua** L. HERB-MERCURY

Rare, doubtfully persisting; Pictou, ballast heaps, collected by Macoun, July 23, 1883.

Introduced from Eu.; N.S. to Ont. south.

2. ACALYPHA L.

1. **A. rhomboidea** Raf. THREE-SEEDED MERCURY

Among stones and grass along roadsides, Clearland, Lunenburg Co., the only collection known for the Province.

Abandoned fields; N.S. to Nebr. south to Fla. and Ark.

3. EUPHORBIA L. SPURGE

The spurges can usually be recognized by the insignificant flowers and fruit and by the milky juice. Many, but not all, have smooth bright green leaves which are rather thickish. *E. marginata* Pursh, or snow-on-the-mountain, is a garden annual with the upper leaves margined with white or entirely white.

a. Flowers forming a sort of umbel at the top of the erect stems; lower leaves all alternate, serrate or entire; plants 1-10 dm high.
  b. Leaves finely and sharply serrulate; glands of the involucral cup elliptic to nearly rotund without appendages (Fig. 93, h). 1. *E. Helioscopia*
  b. Leaves entire; glands crescent-shaped with 2 horn-like appendages sticking outward.
    c. Leaves linear or nearly so.
      d. Plants perennial from running rootstocks or deep roots; seeds smooth; primary rays of the umbels usually more than 5.
        e. Stem-leaves 1-3 mm wide; plants about 3 dm high, growing in dense beds (Fig. 93, g). 2. *E. Cyparissias*
        e. Stem-leaves 4-12 mm wide; plants 3-7 dm high, not densely crowded in the beds. 3. *E. Esula*
      d. Plants erect to ascending, annual; seeds tuberculate; primary rays of the umbel 3-5. 4. *E. exigua*
    c. Leaves ovate to obovate; seeds pitted on the outside face and furrowed on the inside faces. 5. *E. Peplus*
a. Flowers axillary or on short leafy branches; leaves opposite, 6-12 mm long; plants low and prostrate (Fig. 93, e).
    f. Plant glabrous throughout.
      g. Leaves not toothed, rather thick and glossy; seeds smooth (Fig. 93, f). 7. *E. polygonifolia*
      g. Leaves minutely serrulate under a lens; seeds with 3 or 4 transverse ridges. 9. *E. glyptosperma*
    f. Plant pubescent to long-hairy; leaves smooth to minutely toothed; seeds minutely roughened or wrinkled.
      h. Ovary and capsule hairy with incurved hairs; leaves sub-entire; seeds about 1 mm long, whitish-brown (Fig. 93, e). 6. *E. supina*

h. Ovary and capsule glabrous; leaves finely toothed; seeds 1.1-1.3 mm long, smooth to slightly wrinkled, grayish-brown. 8. *E. vermiculata*

1. **E. Helioscopia** L. Fig. 93, h. SUN-SPURGE

Waste places, around buildings and gardens throughout, occasional but rarely in any abundance. This weedy plant is probably not as common now as it was formerly. July-Sept.

Introduced from Eu. and widely distributed in gardens.

2. **E. Cyparissias** L. Fig. 93, g, CYPRESS SPURGE

Scattered as an escape from gardens; often seen around cemeteries, along roadsides and in waste places. Generally the plants do not set seed but on one farm near West R., Pictou Co., and near Baddeck, both staminate and pistillate plants were present. The weed had overrun the fields and was becoming almost impossible to control. This may be the tetraploid race, which Erskine mentions from Brackley Point, P.E.I. June-Aug.

Sterile, scattered infestations which are not weedy were found to have $2n = 20$, while the aggressive fertile plants have 40 (Moore and Lindsay, 1953).

Native of Eu.; widely planted and escaped in N. Amer.

3. **E. Esula** L.

Collected by H. Groh at Wilmot, June 26, 1928; and at Annapolis on the same date. Several of these species of spurge have appeared sporadically but they have not persisted. (Including *E. virgata*). June-July.

N.S. to B.C. south to Penn. and Iowa.

4. **E. exigua** L.

This plant has not been collected recently in the Province but it is reported from C.B. in Gray's Manual and the range is given in Britton and Brown as eastern Can. Like some of the other species, this may appear sporadically without becoming established.

Adventive from Eu.; C.B. to N.Y. and W.Va.; Ont. and B.C.

5. **E. Peplus** L. PETTY SPURGE

Occasional as an introduction in towns and about waste places; collected long ago in the streets of Pictou and by H. Groh at Windsor, July 8, 1930.

Native of Eu.; Nfld. to Sask., and B.C. south to Md. and Ind.

6. **E. supina** Raf. Fig. 93, e. CREEPING SPURGE

Occasionally introduced and spreading, most of the records being from the Annapolis Valley from Weymouth to Windsor; a weed at Kentville, along the Salmon R. above Truro, and occasionally elsewhere in locations where there is little competition from grass or taller-growing plants.

N.S.; Que. to s. Ont. and N.D.; general in the eastern U.S.

7. **E. polygonifolia** L. Fig. 93, f. Map 353. SEASIDE SPURGE

Sandy beaches above high tide level, damp dunes and sand flats; restricted to the neighborhood of salt water; Isle Haute and Brier I.; Yarmouth along the South Shore to Green Bay, Lunenburg Co.; scattered through C.B. and along Northumberland Strait to Pictou and Port Howe. It seems to be most common in southwestern N.S. behind the sandy beaches. July-Oct.

Magdalen I., P.E.I. and e. N.B. south to Ga.; shores of the Great Lakes.

8. **E. verminculata** Raf. HAIRY SPURGE

Sparingly introduced and mainly found in the vicinity of railroad stations; Windsor, Weymouth and North Sydney; also more recently at Curry Corner near Windsor, at Folly L.; and at Conn's Mills in Cumberland Co. Reported earlier as *E. hirsuta* (Torr.) Wieg.

N.S. to Ont. and Mich. south to Penn.; B.C. to N. Mex.

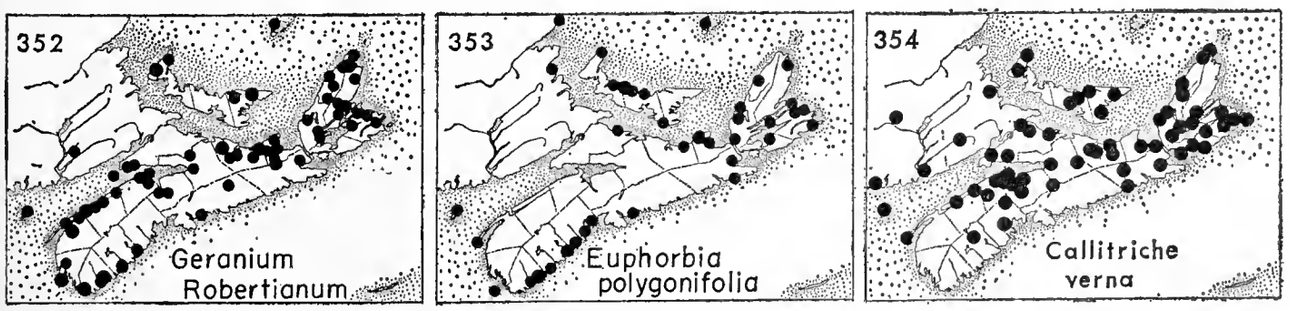
9. **E. glyptosperma** Engelm.

Collected by P.M. Tachereau from between ties of the railroad track at South Maitland, Hants Co., Aug. 1967.

Dry sandy soil, N.S. to B.C. south to N.Y., Mo. and Texas.

64. CALLITRICHACEAE WATER-STARWORT FAMILY

This family consists only of one world-wide genus. The plants are open or tufted, chickweed-like in appearance with small, entire opposite leaves. They are very common in shallow water or stranded out on wet mud. The flowers are in the axils of the leaves, the staminate one consisting of one stamen only and the pistillate of a single pistil. The fruit is indehiscent and consists of two carpels with a longitudinal furrow between them; and each carpel forms two flattish one-seeded sections called mericarps. Fruits are necessary for identification and a magnification of at least 20 times is desirable for study. See *Callitriche* in the New World by Fassett (1951).



1. CALLITRICHE L. WATER-STARWORT

The species reported from N.S. have a narrow membranous wing connecting the two opposite leaves. One other species, *C. hermaphroditica* reported from southern N.B., has linear-lanceolate leaves with the bases not connected.

a. Height of fruit exceeding the width by 0.2 mm; carpels with a wing at summit that narrows and usually disappears down the sides; reticulation on mericarps tending to run in vertical lines. (Fig. 94, d). 1. *C. verna*

a. Height of fruit exceeding the width by 0.1 mm or less, or not at all; carpels wingless or with an obscure false wing; reticulation of mericarps not running in vertical lines.

b. Foliage relatively coarse; fruit widest above the middle; linear submersed leaves with tip of vein scarcely excurrent. 2. *C. heterophylla*

b. Foliage delicate; fruit of equal width above and below the middle; linear submersed leaves with tip of vein slightly excurrent. 3. *C. anceps*

1. **C. verna** L. Fig. 94, c. Map 354.

Shallow water or stranded on mud at the edge of ponds or along streams from Annapolis Co. and Lunenburg to C.B., not seen by the Gray Herbarium expedition in the southwestern counties. Fassett considers that this species should be called *C. verna* L. instead of *C. palustris* L., following the usage of the European botanists.

Greenland to Alaska south to Ohio and Md.; Eu.

2. **C. heterophylla** Pursh

The only collection cited by Fassett from the Maritime Provinces is one from Rockville, Yarmouth Co. Much of what has been called *C. heterophylla* from Nfld. and eastern N.S. is apparently the next species; and *C. heterophylla* may be another of the species confined to sw. N.S.

N.S. and Me. to Wisc. south to the Gulf States; scattered in the Pacific States.

3. **C. anceps** Fern. Fig. 94, d. Map 355.

In shallow water and stranded on mud, probably throughout. Fassett cites collections from Springhaven, Tusket and Tusket Falls in Yarmouth Co.; Charcoal in Pictou Co.; and from Antigonish.

Nfld. and Greenland s. to n. New Eng. and N.Y. with widely scattered locations elsewhere.

65. EMPETRACEAE CROWBERRY FAMILY

Trailing or small, shrubby, evergreen plants of a heathlike aspect with leaves folded so the margins meet on the lower side. The flowers are small and inconspicuous. There are only 3 small genera in the family.

a. Plants prostrate or extensively trailing; flowers scattered, solitary in the axils of the leaves, with 3 sepals, 3 petals and 3 stamens; fruit a berry; bogs and sea coasts. 1. *Empetrum*

a. Plants bushy and erect, 1-6 dm high, in extensive mats or areas; flowers in terminal heads, corolla none, with 3-4 stamens; fruit dry, with three nutlets; sandy or rocky areas. 2. *Corema*

1. EMPETRUM L. CROWBERRY

The crowberries of N. Amer. have recently been intensively studied and the material from the Maritimes examined by Löve and Löve (1959) and D. Löve (1960). The following 3 species apparently hybridize freely and are considered as 3 closely related subspecies of *E. Eamesii* by these authors.

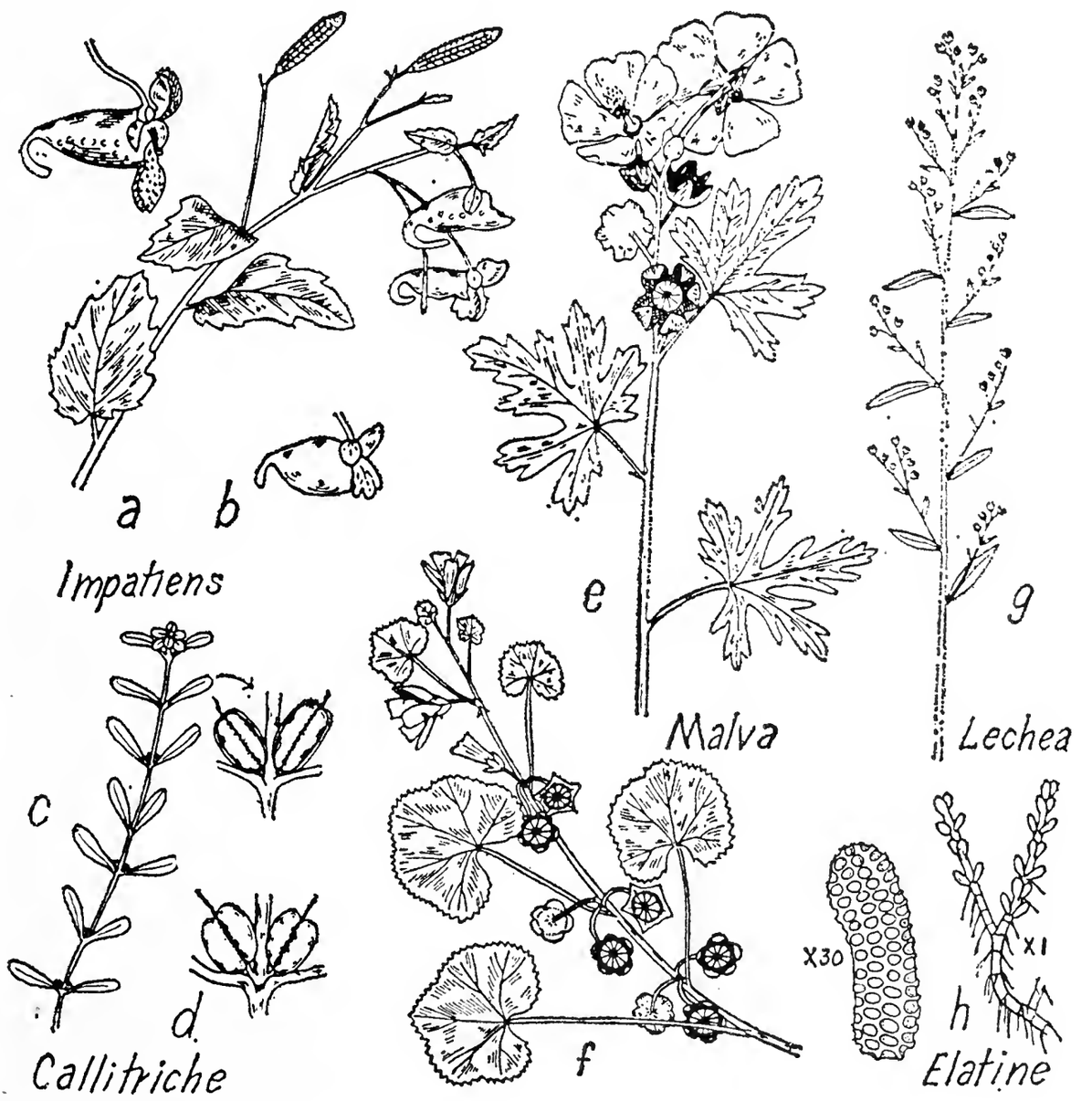


Fig. 94.—**Impatiens:** (a) *I. capensis* x ½, (b) *I. pallida*, flower x ½. — **Callitriche:** (c) *C. vera* x ½, fruits x 10, (d) *C. anceps*, fruits x 10. — **Malva:** (e) *M. moschata* x ¼, (f) *M. neglecta* x ½. — **Lechea:** (g) *L. intermedia* x ½. — **Elatine:** (h) *E. minima*, plant and seed.

a. Fruits black, often with a bloom; leaves long-linear, soon reflexed; young twigs glabrous. 1. *E. nigrum*

a. Fruits red or purplish; young twigs densely white-hairy.

b. Fruits dark red or purplish, opaque; leaves about 4-6 mm long, linear, ascending or soon divergent, not crowded. 2. *E. atropurpureum*

b. Fruits light red, nearly translucent, 3-5 mm in diameter; leaves short, about 2.5-4 mm long, oval, crowded, erect or ascending and very glossy. 3. *E. Eamesii*

1. E. **nigrum** L. Fig. 95. Map 356. BLACK CROWBERRY

Bogs, acid barrens, sea-cliffs and headlands around the whole Province; in places in the southern region of acidic rocks it is one of the predominant plants in bogs; inland and northward it is rarer and confined more to damp and exposed locations; characteristic of cliffs along the Bay of Fundy; abundant in northern C.B. and on Sable I. July-Sept.

The plants of eastern N. Amer., according to Löve and Löve (1959), have the tetraploid number of 52 chromosomes and a tendency to have the stamens and pistils on the same flower or plant. They separate these plants from the European diploid *E. nigrum*, which has the male and female flowers on separate plants, as *E. hermaphroditum* Hagerup. The plants, around Halifax at least, seem to be dioecious and it would seem desirable to have more chromosome counts on our material.

Greenland to Alaska south to alpine areas of New Eng. and N.Y., Minn. and Calif.

Fig. 95.—**Empetrum**: (a) *E. nigrum* x $\frac{1}{2}$, lower sides of leaves x 5. — **Corema**: (b) *C. Conradii* x $\frac{1}{2}$, leaf x 5. — **Hudsonia**: (c) *H. ericoides* x $\frac{1}{2}$.

2. E. **atropurpureum** Fern. & Wieg. Map 355.

Forming a loose trailing growth on exposed sand dunes, rarely around bogs, occasionally on rocky habitats, sometimes growing with the last species; along the north coast of P.E.I. and abundant in mats in

the hollows of the sand hills at Bothwell; northern Inverness and Victoria Co. in N.S.; at Canso and from near Halifax, where it was first collected by Macoun in 1883 from Point Pleasant Park. This plant seems intermediate in some ways between our two other species and in fact our plants seem to be interfertile so that various combinations of characteristics may be found.

North Shore of the Gulf of St. Lawrence; Magdalen I.; N.S. and the mts. of Me. and northern New Eng. and N.Y.; L. Mistassini westward around L. Superior.

3. **E. Eamesii** Fern. and Wieg. Map 351.

Rare, northern tip of C.B.: Lockhart Brook, Salmon R.; Ingonish Barrens, 7 miles west of Neil's Harbour, here growing with *E. atropurpureum* on hummocks in the barren (Erskine, D.S., 1951); scattered on rocky cliffs around the coast near Halifax. The habitat of this species is different from that of the first species, growing on exposed headlands, on top of rocks with thin soil and with lichens.

Much of the material from N.S. has been considered to be hybrids with the first two types. Crosses with *E. hermaphroditum* are named by Löve from St. Paul I., Ciboux I. and Lockhart Brook in northern C.B.; Spicer's Cove in Cumberland Co.; and from Sambro in Halifax Co. These have purple or darker fruit and intermediate vegetative characteristics. Hybrids with *E. atropurpureum* are indicated at Halibut Cove and from Sambro in Halifax Co.; and from Stanhope in P.E.I. In these the fruit is light pink and the leaves are longer and narrower than in typical *E. Eamesii.*

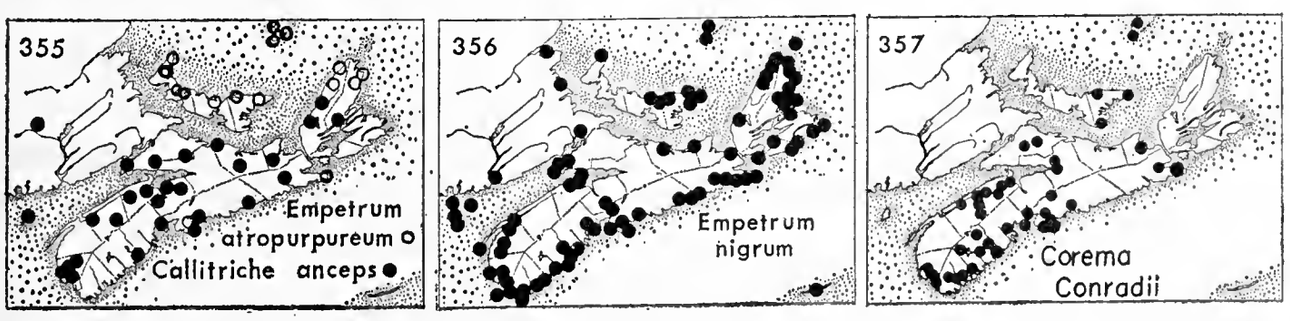
Common in southern Lab. and Nfld.; St. Pierre and Miquelon, the northern tip of C.B. and around Halifax.

2. COREMA D. Don

1. **C. Conradii** Torr. Fig. 95. Map 357. BROOM-CROWBERRY

Sandy or rocky soils; scattered in southern Yarmouth and Shelburne Co.; common on the sand plains of the Annapolis Valley, and in Colchester and Cumberland Co. on the sandiest soils; on the rocky barrens of Halifax Co. near the coast and rare to Antigonish and Guysborough. Flowering about the first of May.

Nfld.?, and P.E.I. to Que. s. to the sand barrens of N.J.



66. LIMNANTHACEAE FALSE MERMAID FAMILY

This is a small family with 2 genera and 11 species in N. Amer.

1. FLOERKEA Willd. FALSE MERMAID

1. **F. proserpinacoides** Willd. Map 360.

A weak, inconspicuous herbaceous plant 1-3 dm high with alternate, pinnately divided leaves with 3-5 narrow lobes. The small white flowers are solitary in the axils of the leaves and the flower-parts are in 3's with the petals shorter than the sepals and the 3 carpels joined only at the base.

First found by W.B. Schofield in slow-moving water at Sheffield Mills in Kings Co.; forming carpets in ravine hardwoods, Glenora Falls, Inverness Co. (Erskine, D.S., 1951); now known from several other places in north-central C.B.: locally abundant in mats in a meadow south to sw. Margaree; brook-bank near Queensville, Victoria Road, Inverness Co.; mat in low muddy depression, South R., Antigonish Co.; Salmon R., Truro.

N.S. and sw. Que. to N.Dak. south to Del. and Tenn.

67. ANACARDIACEAE SUMACH FAMILY

About 600 species of woody plants, many of which are tropical. The cultivated smoke tree is *Cotinus Coggygria* Scop. Our species have alternate, compound leaves and numerous, small regular flowers with 5 sepals, stamens and petals; pistil 1.

1. RHUS L.

a. Leaves pinnately compound, with numerous leaflets; tall erect shrubs; fruits small and reddish, hairy, in crowded terminal panicles. 1. *R. typhina*

a. Leaves with 3 leaflets; low shrubs, often prostrate; fruits smooth, grayish white, becoming ridged.

b. Stems strongly woody; plants much branched; erect, trailing or climbing, with aerial roots; leaves alternately scattered along the branches, glabrous. 2. *R. radicans*

b. Stems woody only near the creeping base, to 6 dm high; plant simple, or very sparingly branched, without aerial roots; leaves aggregated near the top of the stem, often stiffly hairy on the veins beneath. *R. radicans* var. *Rydbergii*

1. **R. typhina** L. Fig. 97, a. Map 358. STAGHORN SUMACH

Abundant in the southwestern counties, becoming rarer to northern C.B.; edges of woods, in dry or rocky soil, along roadsides or in open areas on hillsides. The pubescence is very variable and may at times be almost lacking.

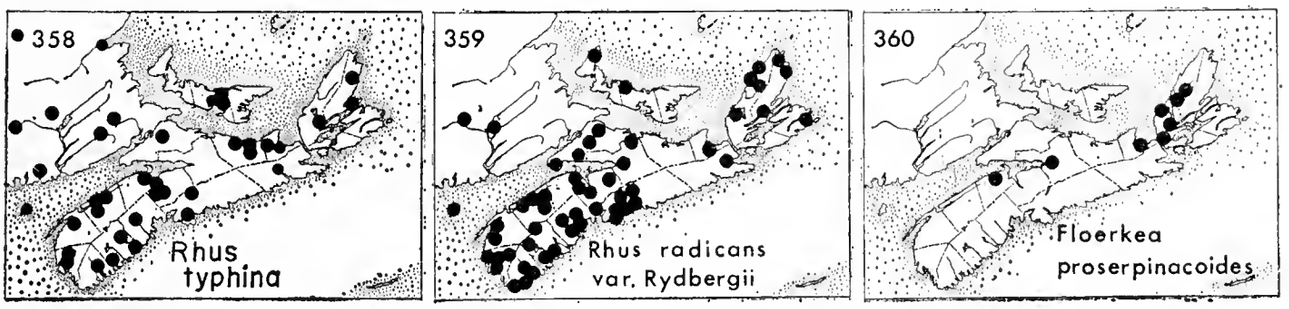
N.S. to Minn. south to N.C. and Ill.

2. **R. radicans** L. Fig. 97, b. Map 359. POISON IVY

Restricted mainly to the southwestern counties; thickets, open woods, along roadsides or damp areas, scattered and rarely becoming obnoxious (*R. toxicodendron* of earlier manuals). N.S. and southern Que. to Minn. south to Fla. and Ky.

Var. **Rydbergii** (Small)Rehd. is scattered throughout the Province on stony land, rocky woods, wet roadsides, around lakes and in damp shady spots. It is rarely common although specimens are present from most areas. The most luxuriant and best fruiting plants have been found on shaded talus slopes, often by gypsum. This plant is also sometimes found in bogs and around the edges of salt marshes or on barrier beaches.

N.S. and Gaspé south to Tex. and west to the West Coast.



68. AQUIFOLIACEAE HOLLY FAMILY

Trees and shrubs with simple alternate leaves; 3 genera and about 300 species. The flowers are small and whitish, solitary or in clusters in the axils of the leaves; fruit a red or black berry.

a. Leaves more or less toothed; petals united at the base; pedicels of the fruit less than 1 cm long; flowers mostly in clusters (Fig. 96, a, b.). 1. *Ilex*

a. Leaves entire, or rarely with a few teeth; petals not united; pedicels of fruits more than 1 cm long; flowers solitary, or a few together (Fig. 96, c). 2. *Nemopanthus*

1. ILEX L. HOLLY

a. Leaves thinnish, toothed, dull and rugose-veiny above; fruit red. 1. *I. verticillata*

a. Leaves leathery, bluntly toothed near the end, smooth and shiny-green above, turning black when pressed; fruit black. 2. *I. glabra*

1. **I. verticillata** (L.)Gray Fig. 96, b. BLACK ALDER, CANADA HOLLY

Common throughout, often fruiting abundantly with the hard red berries persisting after the leaves fall in autumn. Very variable under different environmental conditions and grading into the following varieties. Var. **tenuifolia** (Torr.)S. Wats. is a woodland form with the leaves larger and thinner, obovate, and with the flowers tending to be

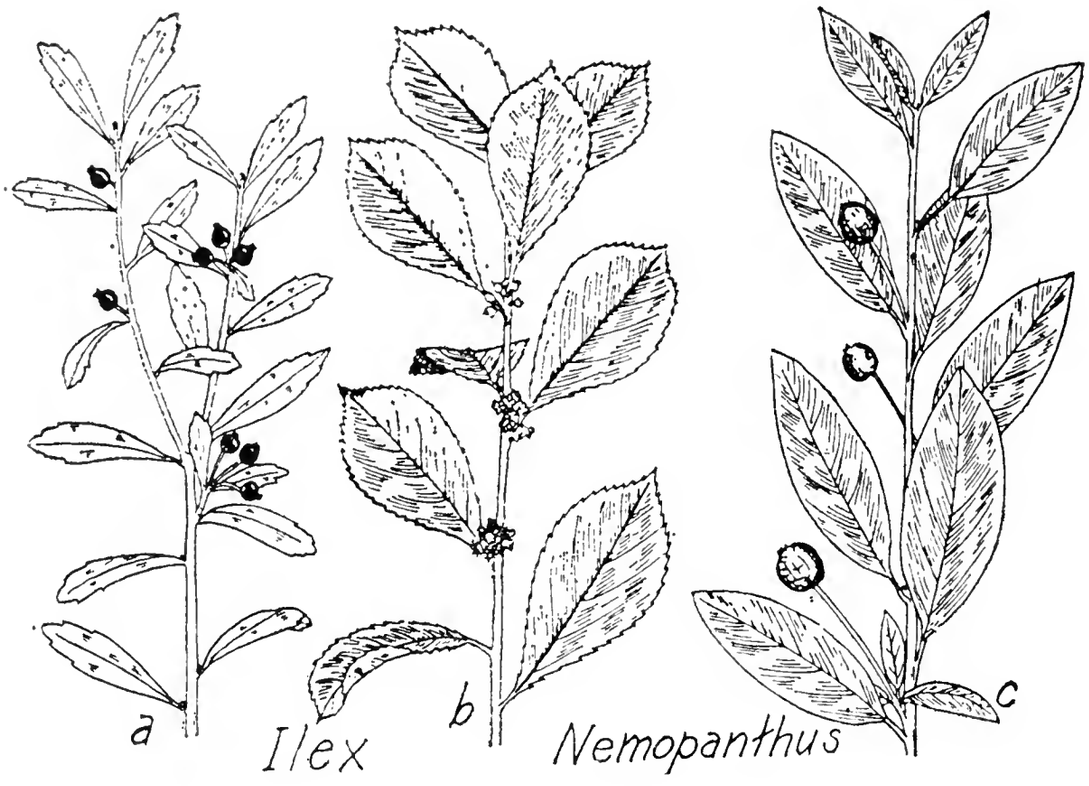


Fig. 96.—**Ilex**: (a) *I glabra* with young fruits x $\frac{1}{4}$, (b) *I. verticillata* in flower x $\frac{1}{4}$. — **Nemopanthus**: (c) *N. mucronata* x $\frac{1}{3}$.

solitary. Damp woods and moist rocky wooded slopes at various places from Yarmouth to Halifax and Kings Co. This does not seem to be a good variety. Var. **padifolia** (Willd.)T. & G. has the leaves tomentulose over the whole surface beneath. Wet, boggy thickets near Louis L., Port Joli, Shelburne Co. (Fernald, 1921).

Var. **fastigiata** (Bickn.)Fern. has dense ascending branches; leaves mostly oblong-lanceolate and only 2-4 cm long, acuminate and cuneate at the base. Spruce woods, thickets and wet woods, scattered in Yarmouth and Shelburne Co. (Fernald, 1921), to Shubenacadie Grand L. This again seems like an extreme as many collections show a tendency to the small, narrow leaves. Mid-July.

Nfld. to Minn. south to Ga. and Tenn.

2. **I. glabra** (L.)Gray Fig. 96, a. Map 361. INKBERRY

Common to local in Digby, Yarmouth and Shelburne Co., becoming rarer to the neighborhood of Halifax; rocky barrens, swamps, dense spruce woods, and even on dry hillsides. The habitat is very varied. Scattered collections have now been made further east on the Atlantic Coast: Half-Island Cove in Guysborough Co.; near Louisburg, where it was collected by G. C. Warren in 1938.

Fla. to La. north to Mass.; coast of Me. and N.S.

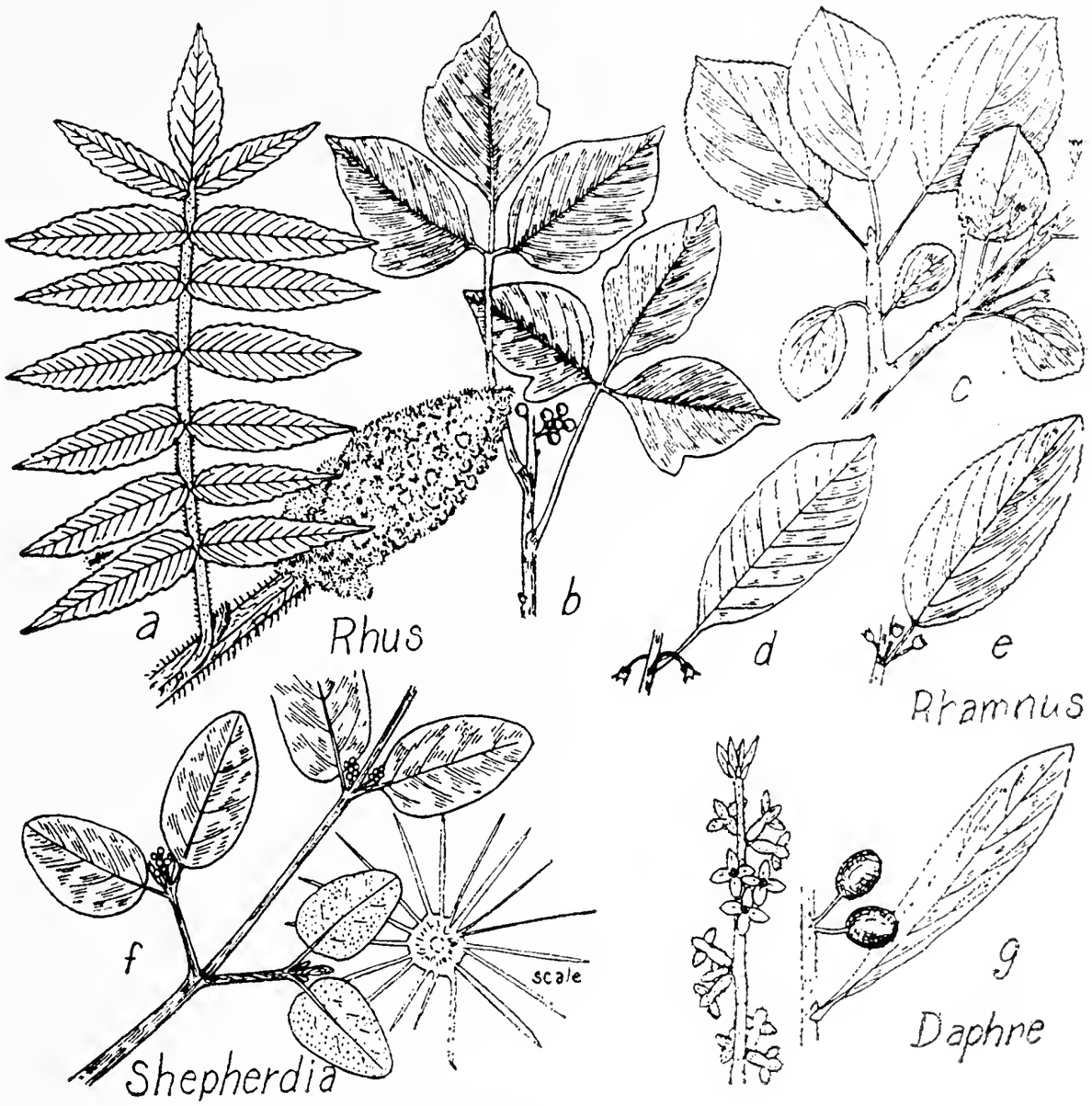


Fig. 97.—**Rhus:** (a) *R. typhina*, fruiting twig x $\frac{1}{4}$, (b) *R. radicans* x $\frac{1}{4}$. — **Rhamnus:** (c) *R. cathartica* x $\frac{1}{3}$, (d) *R. Frangula*, leaf and flowers x $\frac{1}{3}$. (e) *R. alnifolia* x $\frac{1}{3}$. — **Shepherdia:** (f) *S. canadensis*, twig and leaf-scale, much enlarged. — **Daphne:** (g) *D. Mezereum*, flowering branch x $\frac{1}{2}$, fruiting twig x $\frac{1}{2}$.

2. **NEMOPANTHUS** Raf.

1. **N. mucronata** (L.)Trel. Fig. 96, c. FALSE HOLLY

Common throughout; wet woods, edges of bogs, and in low barrens, rarely absent in damp and acid habitats. The leaves are thin and rather pale beneath, and the small greenish flowers are on long pedicels.

Nfld. to Minn. south to the uplands of Va.

69. **ACERACEAE** MAPLE FAMILY

Trees and shrubs, comprising the maples and one other genus of two species in China. This is one of the few families of shrubs or trees with opposite leaves. We have only 4 native maples, but others are exten-

sively planted as ornamentals or as roadside trees and occasionally escape. The sycamore maple, *A. Pseudo-platanus* L. is not included in the key but is shown in Fig. 98. This is planted to some extent in southwestern N.S., at Halifax and in many towns, and seems adapted to growing near salt water; the flowers are small, in long, hanging dense panicles.

1. ACER L. MAPLE

a. Leaves palmately lobed only.
  b. Leaf-margins finely toothed.
    c. Flowers in racemes, appearing after the leaves; leaves green beneath, thin, and soft hairy; small trees or shrubs.
      d. Racemes erect in flower and fruit; petals about 2 mm long; leaf coarsely serrate; bark of young branches reddish, not striped; wings of fruit scarcely spreading. 1. *A. spicatum*
      d. Racemes drooping, few-flowered; petals about 5 mm long; leaf finely serrate, almost fringed; bark of young growth striped with white; wings of fruit widely spreading. 2. *A. pensylvanicum*
    c. Flowers in dense clusters, appearing before the leaves; leaves whitened beneath, firm, not soft hairy; trees.
      e. Petals present; fruit smooth, with narrow lobes; leaves serrate around the whole margin. 5. *A. rubrum*
      e. Petals none; fruit woolly when young; leaves closely serrate only on the upper part of the long lobes; wings of fruit wide and incurved. 6. *A. saccharinum*
  b. Leaf-margins not finely toothed, with large lobes or very few teeth only; flowers before or with the leaves.
    f. Flowers erect in a stout corymb, with large petals, as the leaves unfold; wings of the fruit large and widely spreading; leaves thick, dark green, with short lobes. 3. *A. platanoides*
    f. Flowers drooping on long pedicels, without petals, just before the leaves; wings of the fruit scarcely divergent; leaves thinnish with long pointed lobes. 4. *A. saccharum*
a. Leaves pinnately divided; flowers appearing with the leaves, without petals; wings of the fruit stout and incurved, the two halves almost separate. 7. *A. Negundo*

1. **A. spicatum** Lam. Fig. 98. Map 362. MOUNTAIN MAPLE

Common throughout, forming a large, much-branched shrub; characteristic of high banks or the slopes of ravines, along river-banks, in wet thickets or in moist openings, rare in dense woods. It is especially common along the Bay of Fundy and in the highlands of northern C.B. June.

Nfld. to Sask. south to the mts. of Ga. and Tenn.

2. **A. pensylvanicum** L. Fig. 98. Map 363. STRIPED MAPLE

Widespread but rarely abundant, absent from the C.B. plateau; rocky woods, along streams, in rich hardwoods and on wooded slopes.

N.S. to Ont. south to the uplands of Ga. and Tenn.

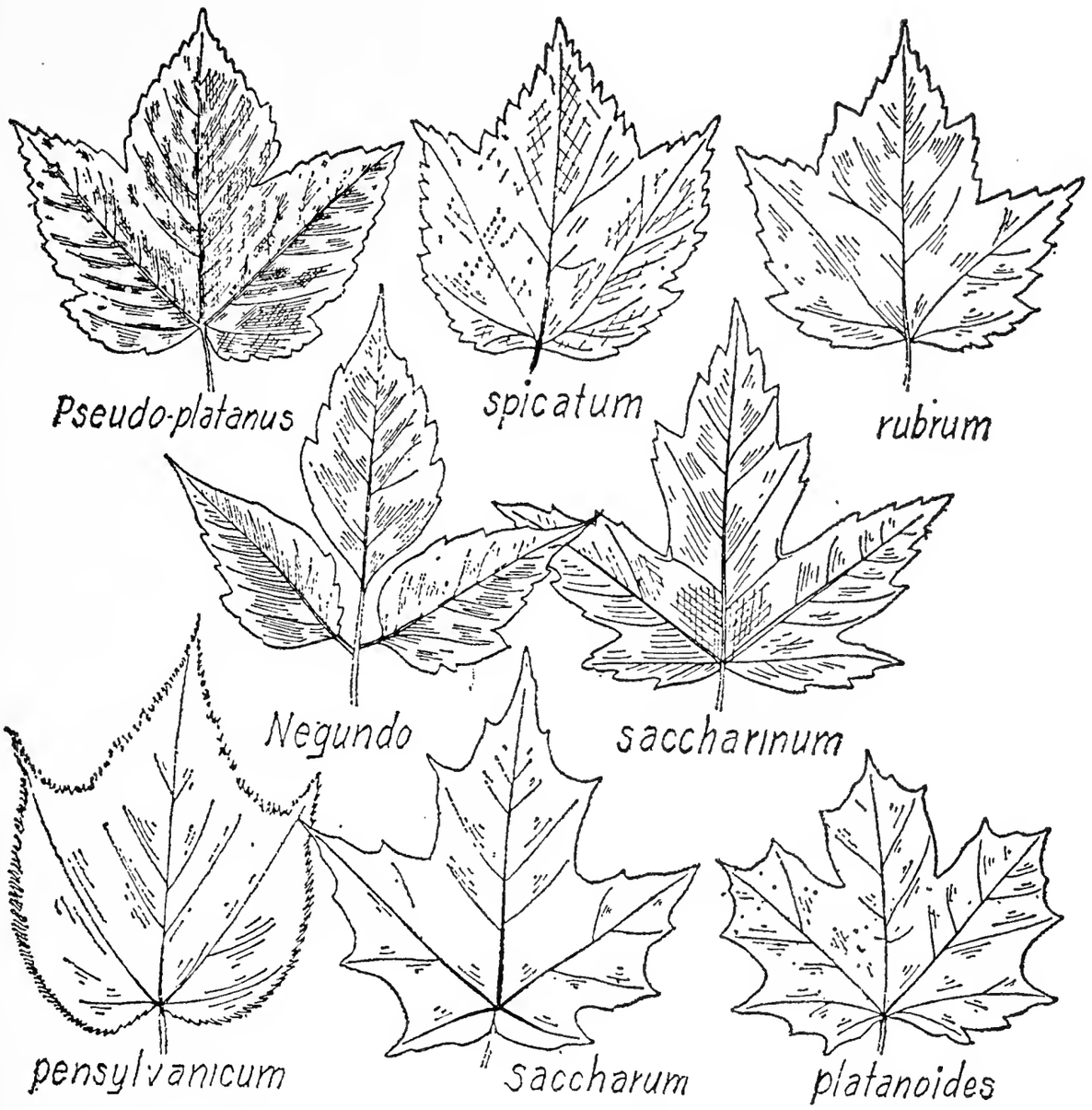


Fig. 98. **Acer** spp., leaves x $\frac{1}{3}$.

3. **A. platanoides** L. Fig. 98. NORWAY MAPLE

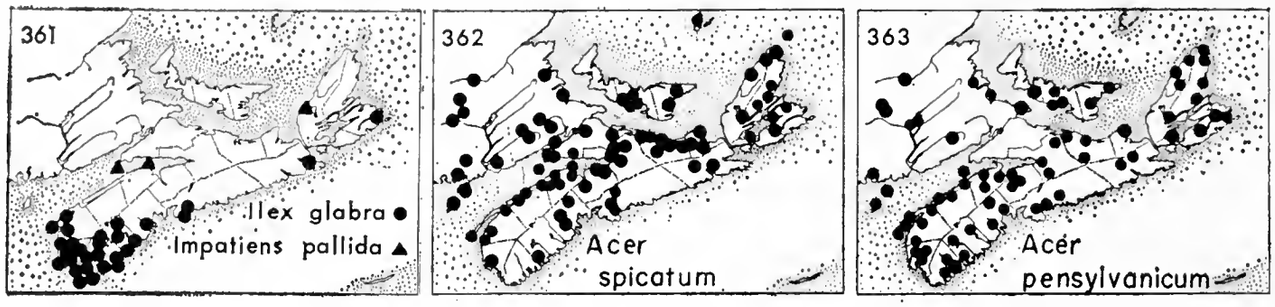
This is fast becoming our most-planted shade and ornamental tree. It is occasionally found along roadsides and will probably become more common as an escape. Forms with reddish leaves are also common, of which the older, var. **Schwedleri** Nichols., is common. Early June.

Introduced from Eu. and widely planted.

4. **A. saccharum** Marsh. Fig. 98. SUGAR-MAPLE

Found throughout; most common and best developed in well-drained soils and on the slopes of hills in the Cobequids and east to northern C.B. but absent from the plateau. Sugar maple once formed almost solid stands in many areas but these have now been heavily cut and opened up. Trees with the lower surface of the leaves softly pubescent occur more or less throughout in small numbers. This character is especially marked for all the trees on the lower part of Digby Neck and gradually disappears towards Digby. This and other characters seem to indicate an intergradation with *A. nigrum* in this area (*A. saccharophorum*).

C.B. and Gaspé west to Ont. south to Ga. and Ala.



5. **A. rubrum** L. Fig. 98. RED or SWAMP-MAPLE

Very common throughout, and becoming increasingly abundant in cut-over areas, burnt land and in barrens. The tree is rather small in general, much branched and of inferior quality. Forma **tomentosum** (Desf.)Dansereau has the leaves whitish-pubescent or soft tomentose beneath. The maples of the Province are very variable in this respect and show all the intermediates between a glabrous and a tomentose condition.

Var. **trilobum** K. Koch (Var. *tridens* Wood) has the leaves rounded at the base and with only the 3 terminal lobes. This is occasional from Yarmouth to Mabou in Inverness Co., along lake margins or wet thickets. In many places, as about Halifax, it grades into the species. Late April to early May.

Nfld. to Ont. south to Fla.

6. **A. saccharinum** L. Fig. 98. SILVER MAPLE

Occasionally planted as a shade tree, but the trees seem brittle and usually are much split and torn by the wind and snow. It is not native to the Province and earlier records usually belong to *A. saccharum.* Early May.

N.B. to Sask. south to Fla.

7. **A. Negundo** L. Fig. 98. BOX-ELDER, MANITOBA MAPLE

This rapidly-growing tree is frequently planted about towns and along roadsides. It produces a multitude of seeds, is very vigorous when young, and frequently escapes. It is well established above Bridgewater and at Tatamagouche, is often seen as an escape in the Annapolis Valley, and is now being found elsewhere.

B. Boivin (1966-b) discusses varieties of this species in Canada. The typical variety has the young branches glabrous and green. Var. **violaceum** (Kirchner)Jaeger has glaucous branches which become a deeper green or more often purplish under the glaucescence. In var. *interius* (Britt.)Sarg. the branches are densely and finely greyish puberuent. This variety has not yet been recognized in N.S. but it occurs in P.E.I. and is probably also introduced here.

Introduced from further west; Man. to Alta. southward.

70. **BALSAMINACEAE** TOUCH-ME-NOT FAMILY

A small family with about 400 species, most of which occur in India. Our genus consists of herbs with very watery juice and very distinctive, yellowish to reddish, flowers which hang on capillary pedicels with small petals at the front end and a large saccate sepal at the back which ends in an extension or spur. The name Jewel-weed is often applied to the plants because of the brightly-colored, pendent flowers. The cultivated Balsam is *I. Balsamina* L.

1. **IMPATIENS** L. TOUCH-ME-NOT

a. Leaves alternate; flowers orange to yellowish, to 3 cm long; plants much branched.
  b. Flowers with the spur bent under or reflexed; flowers 2-3 cm long, in axillary racemes.
    c. Flowers pale yellow, sparingly dotted with brown; sac about as broad as long; spur short, about 5 mm long, at right angles to the sac (Fig. 94, b). 1. *I. pallida*
    c. Flowers orange, thickly spotted with reddish-brown (color variations are often common); sac much longer than wide; spur to 8 mm long, strongly incurved (Fig. 94, a). 2. *I. capensis*
  b. Flowers with the spur straight back from the sac, small and only 8-13 mm long, many in erect racemes at the top of the stem and branches. 3. *I. parviflora*
a. Leaves whorled or occasionally opposite; flowers showy, pinkish with red spots, 3-4 cm long; plants stout, erect, and little branched. 4. *I. glandulifera*

1. **I. pallida** Nutt. Fig. 94. Map 361. PALE TOUCH-ME-NOT

Rich alluvial soil, damp thickets or along river-intervales; rather rare from Kings Co. to northern C.B., becoming more common eastward; luxuriant on slope, North Side, Isle Haute (Schofield, 1955). July-Aug.

Nfld. west to Ont. south to Ga. and Kans.

2. **I. capensis** Meerb. Fig. 94, a. Map 364. SPOTTED TOUCH-ME-NOT

Common, more or less throughout from Yarmouth to C.B.; moist open places, wet ground, along brooks and ditches and in wet thickets. It prefers alluvial ground where the organic matter and nitrogen are high. July-Aug. (*I. biflora* Walt.).

Numerous color forms have been described and variations are common, although only occasionally are plants with paler flowers seen.

From Cambridge, Kings Co., Schofield (1949) reports forma **citrina** (Weath.)Fern. & Schubert as growing in profusion among the typical form. The flowers are a rich yellow with red spots. Forma **albiflora** (Rand & Redf.)Fern. & Shubert has the flowers cream-colored with red to pinkish spots and is scattered sparingly among the other forms.

Nfld. to Alaska south to Fla. and Okla.

3. **I. parviflora** DC.

Erskine reports it as rather common at and about Charlottetown, P.E.I., from whence it may have been introduced into N.S.; Wolfville (Smith and Erskine, 1954).

Adventive from Eurasia; N.S., P.E.I. and Que.

4. **I. glandulifera** Royle

This showy garden escape is common in vacant lots at New Glasgow, Pictou Co.; common as a weed in dooryards at Westport on Brier I.; and growing with *I. capensis* in a swamp at North Sydney (Smith and Erskine, 1954); collected by E.G. Anderson at Guysborough and Ship Harbour in neglected yards, 1940. The pale form is forma **pallidiflora** (Hook. f.)Weath. Reported from N.S., N.B., Ont., and B.C. (*I. Roylei* Walp.).

Introduced from Asia; N.S. to Ont. south to n. New Eng.

71. RHAMNACEAE BUCKTHORN FAMILY

This is a large family of shrubs, trees or vines, with some 45 genera and 600 species. We have only one genus with one native and two introduced species of shrubby plants. The small whitish flowers are short-pedicelled in sessile umbels in the axils of the leaves; fruits are black berry-like drupes with 2-4 stones or "seeds".

1. RHAMNUS L. BUCKTHORN

a. Leaves serrate, with 2-5 pairs of veins curving towards the tip; flowers usually either staminate or pistillate; nutlets grooved.
  b. Flowers with parts in 4's; petals present; leaves blunt or with a short sharp point, with 2-3 pairs of main veins; erect, tall introduced shrub. 1. *R. cathartica*
  b. Flowers with parts in 5's; petals absent; leaves acute, with 4-5 pairs of main veins; low, little-branched native shrubs. 2. *R. alnifolia*
a. Leaves not toothed, with 7-8 pairs of veins straight nearly to the margins; nutlets smooth; flowers perfect. 3. *R. Frangula*

1. **R. cathartica** L. Fig. 97, c. COMMON BUCKTHORN

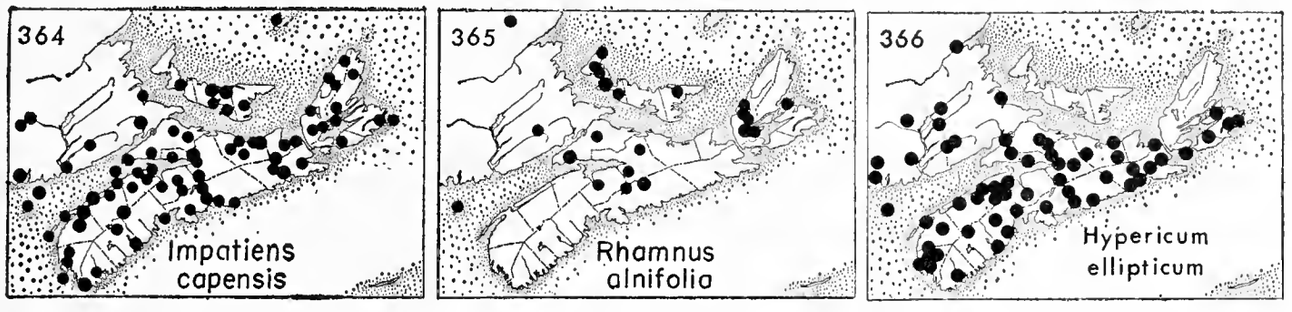
Formerly planted for hedges and as an ornamental shrub throughout the Province, now persisting in many places, or locally common as an escape. The shrub is gradually being eradicated, but it is common locally near Port Williams in Kings Co.; a considerable area exists in Pictou where it seeds and grows abundantly when the ground has sufficient organic matter. This and the next species are alternate hosts for the crown rust of oats; leaves of both species are often found with rust infection during June. Late May-early June.

Introduced from Eu.; formerly widely planted, N.S. to Sask.

2. **R. alnifolia** L'Her. Fig. 97, e. Map 365. ALDER-LEAVED BUCKTHORN

Swampy woods and boggy meadows; scattered in Cumberland Co. and central N.S.; and found again in southern Inverness Co. from Orangedale to Black River and on Boularderie I. It seems to grow largely in alkaline areas, often near limestone or in marl bogs, in rich alluvial soil. Nichols (1918) says that it is characteristic of poorly-drained swamps in northern C.B. May 15-June.

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



3. **R. Frangula** L. Fig. 97, d.

Scattered shrubs are found about some of the towns, as at Wolfville and Truro. South of Amherst it occurs along the roadside and locally has spread into a pasture where it grows like alder bushes. June.

Introduced from Eu.; widely naturalized from N.S. to Man.

72. VITACEAE GRAPE FAMILY

Woody vines with simple, lobed or compound leaves which are alternate on the stem and often have tendrils or flower-clusters produced opposite them. We have no native grapes in N.S. but *Vitis riparia* Michx. does occur in N.B. The Boston Ivy, grown ornamentally on brick walls and chimneys, is *Parthenocissus tricuspidata* (Sieb. & Zucc.) Planch. In N.S. this is apt to be called Virginia Creeper; while the two following species, known further south as Virginia Creeper, are usually called Boston Ivy, probably because they were formerly much more common than the other species. These two usually have 5 leaflets.

1. PARTHENOCISSUS Planch.

a. Tendrils with 5-8 branches, ending in adhesive tips; cymes of the flowers mostly several to many, forming terminal panicles; leaves dull above. 1. *P. quinquefolia*

a. Tendrils with 3-5 branches, rarely with an adhesive disk; cymes usually in pairs on peduncles 3-7 cm long; leaves glossy above. 2. *P. inserta*

1. **P. quinquefolia** (L.)Planch. VIRGINIA CREEPER, WOODBINE

Fernald (1939) states that all material of the genus from the Maritime Provinces belonged to *P. inserta.* The introduced form, however,

is mostly or wholly *P. quinquefolia;* it is very commonly cultivated and found around old houses and escaping or persisting along roadsides or in waste places. Late June-early July.

Fla. to Tex. n. to s. Me. and Que.; cultivated elsewhere.

2. **P. inserta** (Kerner)K. Fritsch

This species is very similar to the first one and bears the same common name. It has very rarely been collected by local botanists although it is occasional from Annapolis to Yarmouth, clambering over low shrubs and stone walls; along the roadside near the river at Stewiacke, Colchester Co., and probably elsewhere in the north-central part of the Province. It is probably confused with the first species and its status is yet to be determined.

N.S. to Que. and Mont. south to Penn., Kans. and Calif.

73. TILIACEAE LINDEN FAMILY

Mostly tropical trees and shrubs, although one genus is extensively planted as a shade tree. The genus is readily recognized since the trees have leaves widely heart-shaped with one side of the base larger than the other; and the flower peduncle is joined for half its length to an elongate papery bract. We have no native lindens in N.S. but one species, *Tilia americana* L., does occur in the St. John Valley of N.B. This has large leaves 8-15 cm long, without any axillary tufts of hairs in the axils of the veins beneath.

1. TILIA L.

1. **T. europea** L. LINDEN, BASSWOOD

Extensively planted and occasionally escaping or persisting around old buildings or in hedge-rows. This species has smaller leaves than the N. Amer. species, only 5-10 cm long; and the leaves beneath are bright green with axillary tufts of hairs. A still smaller-leaved species is *T. cordata* with leaves glaucous beneath.

Introduced from Eu. and widely planted; N.S. to Ont.

74. MALVACEAE MALLOW FAMILY

This large family is represented here only by escaped garden flowers and weedy species. The Hollyhock, *Althaea rosea* L., is a typical representative. The flowers have numerous stamens with their filaments united in a tube about the pistil; petals showy and delicate in texture.

a. Plants 1-8 dm high; leaves lobed, or rounded at the tip; involucral bracts present just below the calyx.

b. Corolla pink or white; involucral bracts 2 or 3; column of stamens with anthers only at the tip. 1. *Malva*

b. Corolla yellow with a central dark eye; involucral bracts 6 or more; column of stamens bearing anthers for a considerable part of its length. 2. *Hibiscus*
a. Plant 6-12 dm high, stout; leaves heart-shaped and acuminate at the apex; involucral bracts absent. 3. *Abutilon*

1. MALVA L. MALLOW

The flowers of the mallows and the hollyhock are distinctive in that the pistils consist of a ring of 10-20 one-seeded carpels.

a. Upper leaves rarely lobed as deeply as the middle, usually only with teeth or shallow rounded lobes; flowers small, the petals up to 2.5 cm long, not more than twice the length of the sepals.
b. Bractlets outside the calyx ovate-oblong; petals reddish-purple, up to 2.5 cm long. 1. *M. sylvestris*
b. Bractlets narrowly lanceolate to linear; petals white, often tinged with pink or purple, short, less than 2 cm long.
c. Mature carpels not netted-rugose on the back, rounded on the outer edge so that the whole ring has a crenate outline, the lateral faces not radially veined, usually softly pubescent. 2. *M. neglecta*
c. Mature carpels netted-rugose on the top surface, the outer side flat so the ring of fruits present a circular outline; the lateral faces strongly radially veined.
d. Stem stout and erect; upper leaves with progressively shorter petioles to often shorter than the blades; flower and fruits with very short pedicels. 3. *M. verticillata*
d. Stem prostrate to ascending; upper leaves with petioles several times longer than the blades; pedicels of the flowers and fruit more than twice as long as the calyx. 4. *M. rotundifolia*
a. Leaves 5-7-divided to below the middle or often nearly to the base; petals 2-3.5 cm long; flowers singly or crowded toward the top of the plant.
e. Bractlets narrowly lanceolate to linear, ciliate with simple hairs; segments of the upper leaves again deeply lobed. 5. *M. moschata*
e. Bractlets ovate to obovate, with dense stellate hairs; the 5-7 segments of the the leaves only shallowly lobed or coarsely toothed. 6. *M. Alcea*

1. **M. sylvestris** L. HIGH MALLOW

Collected as a street weed in Sydney, in flower Oct. 23, 1953, by G.C. Warren. Usually found as an escape from cultivation.

Introduced from Eu.; occasionally found in N. Amer.

2. **M. neglecta** Wallr. Fig. 94, f. DWARF MALLOW, CHEESES

Becoming a weed in many parts of the Annapolis Valley; scattered elsewhere in towns and waste places, around dooryards and in gardens. This is our most common species. June-Oct.

Introduced from Eu.; widely distributed from Nfld. to Man.; B.C.

3. **M. verticillata** L. WHORLED MALLOW

Collected at Windsor on a dump next to the plaster company. Like others of this family this plant is occasionally introduced and it is questionable if they long exist as escapes.

Adventive from Eu.; N.S. to Ont. and Iowa south to Penn.

4. **M. rotundifolia** L. ROUND-LEAVED MALLOW

Rather rare in N.S.; found at Cheticamp and at Red River in Inverness Co. in Cape Breton; street weed at Halifax. June-Sept.

Naturalized from Eu.; N.S. to B.C. southward.

5. **M. moschata** L. Fig. 94, e. MUSK-MALLOW

Scattered throughout in waste places, along roadsides and in old gardens. In the Annapolis Valley and occasionally elsewhere it may be showy along roads or in old hay-fields locally. Most plants have white flowers, although pink ones are not uncommon. There does seem to be considerable variation in the dissection of the leaves and even in their average size. Late June-July

Naturalized from Eu.; Nfld. to Man. south to Va.; B.C.

6. **M. Alcea** L.

This is another species which has occasionally escaped from cultivation in eastern Canada and which is included in the N.S. flora. No local collections have been seen although sheets are present from Woodstock and from Cape Tormentine in N.B. July-Aug.

Naturalized from Eu.; N.S. to Que. south to Penn.

2. **HIBISCUS** L.

1. **H. Trionum** L. FLOWER-OF-AN-HOUR

Rarely seen as a garden escape or about greenhouses, only as a casual adventive and not persistent; Centreville, Kings Co.

Native of southern Eu.; scattered west to Sask.

3. **ABUTILON** Mill.

1. **A. Theophrasti** Medic. VELVET-LEAF

Rare; collected near Kentville; occasionally elsewhere in the Maritime Provinces as a casual adventive.

Naturalized from India; occasionally found west to Sask.

75. **HYPERICACEAE** ST. JOHN'S-WORT FAMILY

A small family with only 2 or 3 genera, sometimes placed in the large, primarily tropical, family *Guttiferae*. Our representatives are herbaceous plants with smooth, opposite, untoothed leaves with numerous, internal translucent glands which make them rather distinctive. The flowers have 5 petals, often numerous stamens, and one pistil which forms a many-seeded capsule.

1. HYPERICUM L. ST. JOHN'S-WORT

Our species, except the last, have bright yellow flowers. This one exception has the flowers flesh-colored or pinkish with other technical differences and it is sometimes placed in a separate genus named *Triadenum* (Fig. 99). Various species are among our most common midsummer plants in damp places.

a. Flowers yellow; prominent glands between groups of stamens none; plants green.
  b. Stamens numerous, mostly 20-100; leaves pinnately veined, with veins arising at intervals from the midrib; plants perennial.
    c. Plants 4-10 dm high, stout; styles 3, separate to the base; capsule 3-celled; stamens in 3 or 5 fascicles.
      d. Branches sharply ridged below each leaf; seeds 1-1.3 mm long; petals dark-dotted on margins only, the sepals with few or no dark dots; inflorescence diffuse; leaves linear-oblong. 1. *H. perforatum*
      d. Branches terete or nearly so; seeds less than 1 mm long; petals streaked with dark dots and the sepals heavily dotted and lined with black; inflorescence rather compact; leaves elliptical to oblong. 2. *H. punctatum*
    c. Plants 3-5 dm high; styles united to make a slender beak on the capsule, splitting apart when the capsule opens; capsule 1-celled; stamens very numerous. 3. *H. ellipticum*
  b. Stamens fewer, often less than 12; leaves with 3-7 strong veins from the base, or narrow and with only a midrib; plants annual.
    e. Leaves about twice as long as broad, their bases clasping the stem.
      f. Upper flowers with reduced but rounded leaves at their bases; branches of the inflorescence appearing like continuations of the stem; sepals elliptic, much shorter than the capsule (Fig. 99,d). 4. *H. boreale*
      f. Upper flowers with narrow, pointed scale-like leaves or bracts at their bases; sepals linear-oblong, about equalling the capsule (Fig. 99,c). 5. *H. mutilum*
    e. Leaves 3 or more times longer than broad.
      g. Leaves 5-7 nerved, rounded at the base and the opposite leaves meeting around the stem, 5-10 mm wide and tapering from the base to the apex. 6. *H. majus*
      g. Leaves 1-5 nerved, tapering at the base, the opposite ones not meeting around the stem.
        h. Leaves 1-4 mm wide, 1-3-veined; sepals in fruit 4-6 mm long; mature capsules 5-6 mm long (Fig. 99,b). 7. *H. canadense*
        h. Leaves 2-6 mm wide, 3-5-nerved; sepals in fruit 2-4.5 mm long; capsules 3-5 mm long. 8. *H. dissimulatum*
a. Flowers flesh-colored or pinkish-mauve, with the whole plant having a slight reddish tinge; leaves 1.5 cm or more in width, little reduced in size toward the top of the plant; flowers few; stamens 9, in 3 groups of 3 each.
      i. Styles of mature fruits 2-3 mm long; sepals pointed and 5-7 mm long. 9. *H. virginicum*
      i. Styles of the mature fruits 0.5-1 mm long, rarely to 2 mm; sepals mostly blunt, 2.5-5 mm long. Var. *Fraseri*

1. H. perforatum L. Fig. 99, a. COMMON ST. JOHN'S-WORT

Scattered to common throughout; abundant in the Annapolis Valley and locally elsewhere to C.B.; mostly on light or sandy soils, on the gravelly borders of rivers or on well-drained fields. Occasionally it

may be so common that fields may be yellow when the plant is in flower. This species seems to be more common now than it formerly was. July 10-Aug.

Introduced from Eu.; widely naturalized.

2. **H. punctatum** Lam.

This plant has been listed for N.S. but we have made no collections of it here. It is possible that it has been often overlooked and it should be expected in the southwestern counties in dry or damp fields or along the borders of woods.

Fla. to Tex. north to Minn., southern Ont. and Que. and to N.S.

3. **H. ellipticum** Hook. Fig. 99, e. Map 366.

Common in the southwestern and central counties, absent from eastern and northern C.B.; swamps, borders of streams and lakes and in meadows. July-Aug.

Nfld. to Ont. and Iowa south to Md.

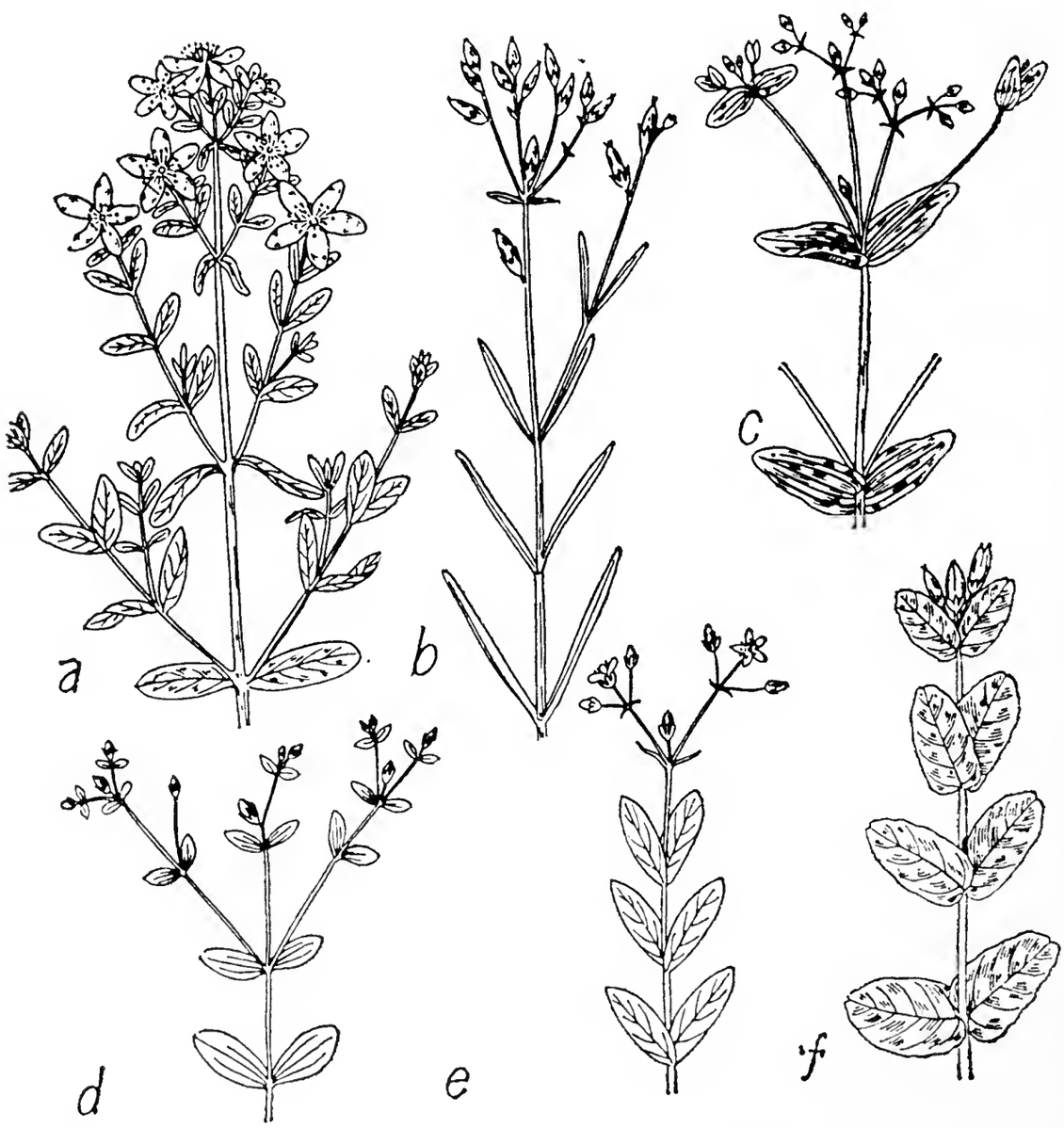


Fig. 99.—**Hypericum**: (a) *H. perforatum*, top of plant x $\frac{1}{3}$, (b) *H. canadense* x $\frac{1}{2}$, (c) *H. mutilum*, top of plant x 1, (d) *H. boreale* x 1, (e) *H. ellipticum* x $\frac{1}{2}$, (f) *H. virginicum* x $\frac{1}{2}$.

4. **H. boreale** (Britt.)Bickn. Fig. 99, d. May 367.

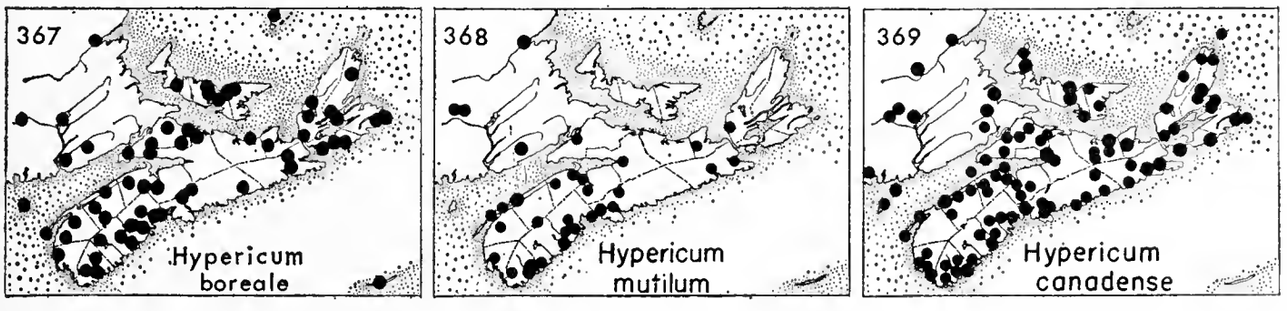
Common throughout and on Sable I.; probably our most common species in low ground, edges of lakes and ponds, on damp sands and along edges of bogs. July-Aug.

Nfld. to Ont. and Minn. south to Va. and Ind.

5. **H. mutilum** L., var. **parviflorum** (Willd.)Fern. Fig. 99, c. Map 368.

Common in southwestern N.S.; swamps, borders of ponds, river shores and wet areas; rare north and east of Colchester Co. with one collection near Judique in Inverness Co.: occasional on brook-bank (Erskine, D.S., 1955). The variety is the northern extreme.

Fla. to Tex. north to N.S., Que. and Minn.



6. **H. majus** (Gray)Britt.

Victoria Co.; mossy woods road, Big Baddeck, some plants of the collection suggest an admixture of *H. canadense* (Erskine, D.S., 1951). July-Sept.

N.S. to B.C. south to Penn., Ind. and Wash.

7. **H. canadense** L. Fig. 99, b. Map 369.

Common throughout in swamps, wet meadows, brook-sides, edges of lakes, etc. Forma *minimum* (Choisy)Rousseau seems to be merely a much-reduced ecological form. July-Aug.

Nfld. to Ont. south to Ga. and Iowa.

8. **H. dissimulatum** Bickn. Map 370.

Scattered in swales, wet moss and on lake beaches from Digby to Halifax Co., with one record near Guysborough. This species is much rarer than the preceding ones and is closely related to them, by some people considered to be a hybrid. Barney River, Pictou Co., collected by H. Groh in 1935. This collection may well be interpreted as a specimen of the hybrid *H. boreale* x *canadense* (Erskine, D.S., 1955).

N.S. south to N.C. mostly near the coast.

9. **H. virginicum** L. Fig. 99, f. Map 371.

Common on muddy shores, boggy margins of lakes, beaches and other low areas in sw. N.S. east to Halifax Co.

Fla. north to N.S., N.Y. and Ind.

Var. **Fraseri** (Spach)Fern. is rather common throughout and seems to be the only variety eastward. July-Aug. This species is quite different in appearance from the other ones and has a decidedly reddish tinge to the flowers and leaves.

Nfld. to Sask. south to southern New Eng., Ohio and Ill.

76. ELATINACEAE WATERWORT FAMILY

Tiny creeping plants with erect branches up to 5 cm long, with small, opposite, entire leaves. The small, sessile flowers are borne in the axils of the leaves and have only 2-3 small petals. The fruit is a many-seeded capsule with seeds with prominent shallow pits on their surface.

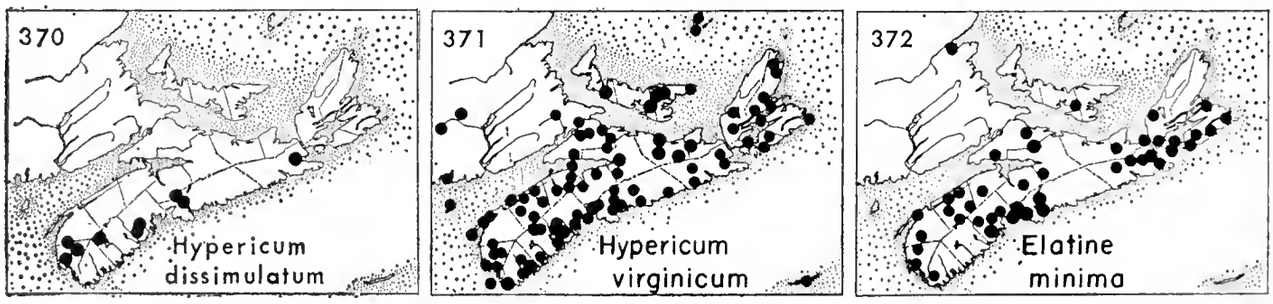
1. ELATINE L. WATERWORT

We have but one species, although a second has been found on various muddy tidal shores in the southeastern part of N.B. (Fassett, 1939).

1. **E. minima** (Nutt.)Fisch. & Mey Map 372. Fig. 94, h.

Of widespread occurrence, and found wherever a suitable habitat is present. The only area in which it has not been found is the northern plateau in C.B. (Smith, 1959). Edges of lakes, marginal shallows, sandy bottoms of lakes, and sometimes on wet sandy or rocky shores; often in about one foot of water, sometimes fruiting when only a few mm high.

Nfld. and Que. to Minn. south to Va.



77. CISTACEAE ROCKROSE FAMILY

This is a small family of low shrubby plants and wiry herbs with simple, entire, usually alternate leaves; most abundant around the Mediterranean. Two sepals are much smaller than the other three; and the stamens are indefinite in number, often numerous. The fruit is a capsule which splits lengthwise to the base.

a. Plants herbaceous and wiry; leaves 10-30 mm long, spreading.
b. Petals 5, showy, yellow; primary capsules about 6 mm long with smaller secondary ones present; pubescence stellate. 1. *Helianthemum*

b. Petals 3, minute, purplish; capsule about 2 mm long; pubescence of simple hairs. 3. *Lechea*

a. Plants low and shrubby, much-branched; leaves 1-3 mm long, awl-like, closely overlapping; flowers yellow and showy. 2. *Hudsonia*

1. HELIANTHEMUM Mill. ROCKROSE

1. H. canadense (L.)Michx. ROCKROSE

Rare and local; in small numbers on the sand plains between Aylesford and Middleton; reported by Weatherby (1942) from Queens Co.; a large colony on the border of dry mixed woods, Greenfield, associated with *Aster undulatus*. June-early July.

N.S.; Me. to s. Que. and Ont. south to N.C.

2. HUDSONIA L.

These small, evergreen, heather-like plants grow up to 3 dm high and often occur in patches. The flowers occur singly at the ends of short branches and are a showy yellow. Very local and occurring mainly on sandy or open soils.

a. Flowers on slender naked pedicels; leaves linear, 2-7 mm long, spreading to loosely appressed; plants greenish. 1. *H. ericoides*

a. Flowers nearly sessile; leaves small, closely appressed; plants densely whitish-pubescent; capsule ovoid, glabrous. 2. *H. tomentosa*

1. H. ericoides L. Fig. 95, c. Map 373. HUDSONIA

Dry, rocky and sandy barrens about Shelburne; scattered on rocky soil near Halifax; abundant on the sandy soils in the center of the Annapolis Valley on recently disturbed areas or in open bush-land, and becoming abundant in plowed areas reverting to native vegetation on sand; collected by H. Harries on barren headland near Corney Brook, Inverness Co. for the only known station in C.B.

Nfld., P.E.I. and N.S.; southern Me. to Del.

2. H. tomentosa Nutt. Map 374. WOOLLY HUDSONIA

Kings Head, Pictou; reported in Lindsay's Catalogue from the Northwest Arm, Halifax but this last record probably refers to the previous species. This plant, which is usually found near the coast, is very rare in N.S. and only occurs locally on the sandy shore near Pictou and north of New Glasgow. It is more common locally on the sand dunes in P.E.I. from Bothwell to Malpeque (Erskine, D.S., 1960). A hybrid, *Hudsonia intermedia* (Peck)Erskine, occurs between the two species. This has the capsule intermediate in length and pubescent at the summit and the flowers are on short pedicels. This is found in P.E.I., growing with the two parents.

Along the sand dunes about the Gulf St. Lawrence and south to N.C. west to Alberta. and Minn.

3. LECHEA L. PINWEED

These wiry, erect herbs with very small flowers and round capsules are common in sandy or sterile soils, with the species indefinite or difficult to identify. See Hodgdon (1938).

a. Inner sepals broader and more obtuse, equal or shorter than the depressed-globose capsule; basal leaves darker green, decidedly oblong, often purplish. 1. *L. intermedia*

a. Inner sepals narrowly ovate and acute to subacute, exceeding the globose capsule; basal leaves bright-green, narrowly lanceolate. *L. intermedia* var. *juniperina*

1. **L. intermedia** Leggett Fig. 94, g. PINWEED

Common in dry open soils, open woods and sterile fields, in rocky, siliceous or sandy regions of the Province. In the northern part and around the sea-coast it is largely replaced by the following and very similar and intergrading variety. P.E.I. and N.S. to Minn. south to Va.

Var. **juniperina** (Bickn.)Robin. intergrades and is found mostly around the coast from Halifax to northern C.B. where it becomes common in the lee of the dunes and back of the sandy beaches.

C.B. to southern N.H., mostly along the coast.

78. VIOLACEAE VIOLET FAMILY

This family of some 16 genera and 800 species is represented in our area by one herbaceous genus which comprises the violets and the pansies. In the tropics shrubby and treelike forms also occur.

1. VIOLA L. VIOLET

There are about 500 species of *Viola*. The cultivated pansy is a hybrid between *V. tricolor* and several European species. Many of our forms bear cleistogamous flowers in addition to the normal showy ones. These are flowers without petals which are self-fertilized without opening; and they are borne on short pedicels or runners near the base of the plant. See Cinq-Mars (1966).

a. Plants stemless; leaves and flower-stalks directly from the rootstocks or from runners (Fig. 100).
  b. Rootstock short and stout, 3-10 mm thick; flowers blue.
    c. Leaves heart-shaped, with the margins round-toothed.
      d. Beard of the lateral petals, or part of it, with strongly club-shaped hairs; flowers usually on peduncles longer than the leaves; spurred petal shorter than the lateral ones, glabrous. 1. *V. cucullata*
      d. Beard of the lateral petals long, not club-shaped; flowers on peduncles usually equalling or shorter than the leaves; spurred petal as long as the lateral, glabrous or hairy.
        e. Plant essentially glabrous. 2. ***V. nephrophylla***

e. Plant hairy, with the sepals and leaf-blades ciliate. 3. *V. septentrionalis*

c. Leaves ovate or widely lanceolate; plant usually densely hairy. 4. *V. fimbriatula*

b. Rootstock slender, 2-4 mm thick near the top, often long and creeping.

f. Style enlarged above and beaked at the summit in front; flowers comparatively small.

g. Flowers light blue; spur 2/3 as long as the limb of the petal; sinus of the leaf very deep, the lobes overlapping; leaf with short stiff hairs above. 5. *V. Selkirkii*

g. Flowers white; spur 1/4 as long as the limb; leaves with the basal sinus shallower, the lobes not overlapping.

h. Leaves heart-shaped or wider, with a definite sinus at the base of the blade.

i. Leaves heart-shaped, usually pointed at the tip, generally dull, relatively thin and small; stolons present; lateral petals usually bearded near the base.

j. Leaves glabrous on both sides; cleistogamous capsule green, on erect peduncles; flowers on peduncles usually longer than the leaves; seeds black, 1.0-1.4 mm long. 6. *V. pallens*

j. Leaves pubescent on one side; peduncles longer than the leaves; cleistogamous capsules ovoid, usually purplish, erect only when ripe; seeds brownish, 1.6-2.1 mm long.

k. Leaves pubescent beneath and on the petioles, glabrous above. 7. *V. incognita*

k. Leaves lightly pubescent above, usually glabrous beneath and on the petioles. *V. incognita* var. *Forbesii*

i. Leaves orbicular to reniform, large, usually rounded at the tip, waxy-glossy; lateral petals beardless; stolons absent.

l. Leaves pubescent on both sides. 8. *V. renifolia*

l. Leaves glabrous above, pubescent beneath. *V. renifolia* var. *Brainerdii*

h. Leaves truncate at the base or tapering to the petiole, glabrous.

m. Leaves lanceolate or linear-lanceolate, more than 3 times longer than wide, the summer leaves to 1.5 cm wide and gradually tapering at the base. 9. *V. lanceolata*

m. Leaves ovate, acute at the tip with a squarish or wedge-shaped base, less than 3 times as long as wide. 10. *V. sublanceolata*

f. Style scarcely enlarged above, hooked; flowers large, fragrant, blue or whitish; gardens. 11. *V. odorata*

a. Plant leafy-stemmed, with axillary flowers (Fig. 101).

n. Flowers violet-like; stipules entire or finely toothed.

o. Style capitate, beakless, bearded at the summit; spur short; stipules nearly or quite entire; plants large.

p. Petals yellow; stipules narrowly ovate, foliaceous and persistent; capsule 9-13 mm long, glabrous. 12. *V. eriocarpa*

p. Petals white within, violet without; stipules lanceolate, white, scarious and deciduous after flowering; capsule 4-6 mm long, downy or puberulent. 13. *V. canadensis*

o. Style slender, the tip bent downwards, slightly pubescent at the summit; spur twice or more as long as wide; stipules slightly toothed; petals blue; stems slender and branched.

q. Stipules ovate-lanceolate, bristly-serrate; leaves often 4-5 cm wide, acute. 14. *V. conspersa*

q. Stipules linear with a tooth or two at the base; leaves not more than 2 cm wide, blunt. 15. *V. labradorica*

n. Flowers pansy-like; stipules large, leaf-like and pinnatifid; style much enlarged above into a round hollow summit with a wide opening on the lower side.

r. Petals 2-3 times longer than the sepals; flowers large. 16. *V. tricolor*

r. Petals seldom longer than the sepals; flowers small and pale yellow. 17. *V. arvensis*

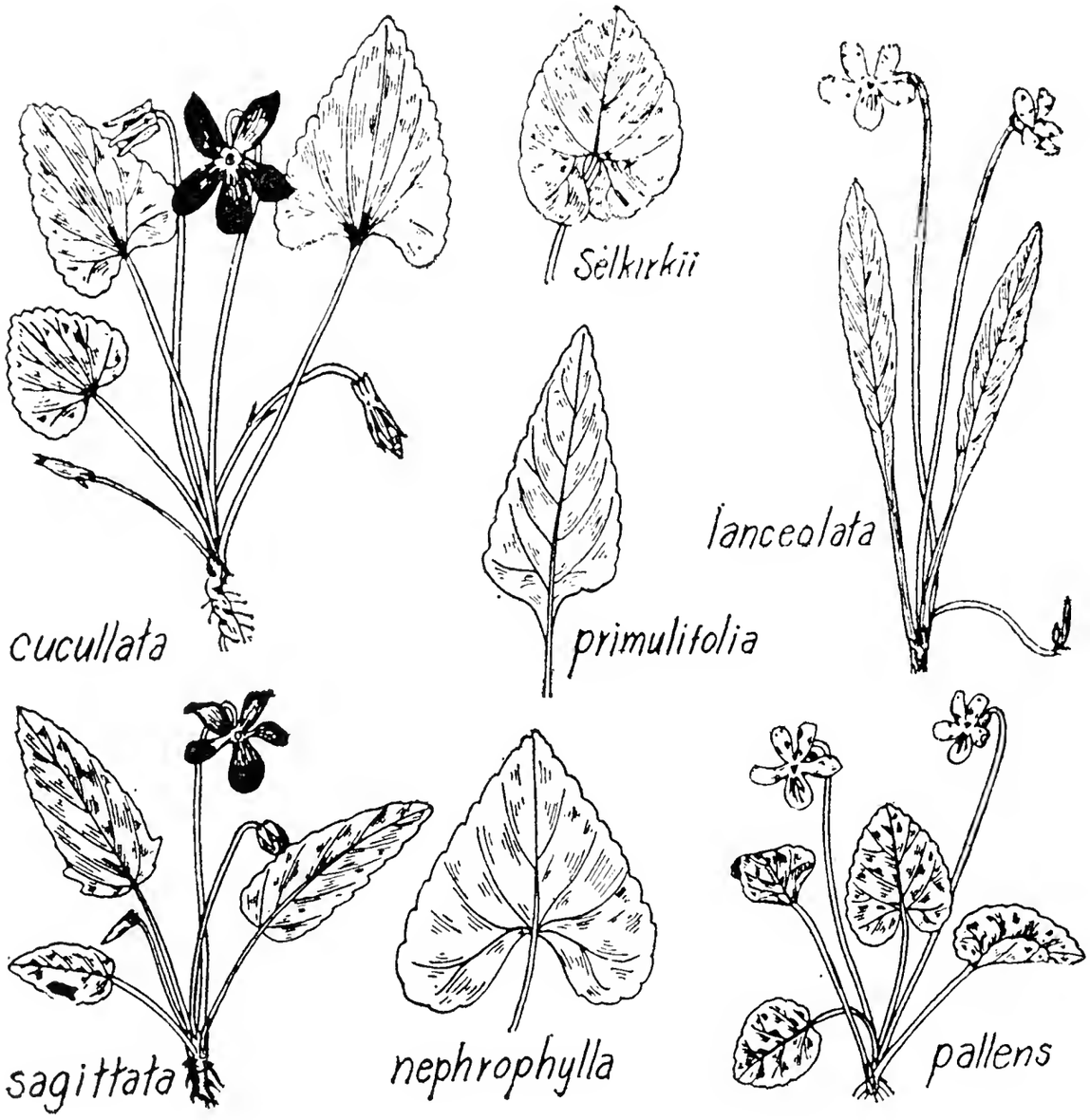


Fig. 100.—**Viola** spp. x $\frac{1}{2}$.

1. **V. cucullata** Ait. Fig. 100. BLUE VIOLET

Common throughout in wet fields, swamps, rocky beaches and meadows. The flowers are often of a paler color in open, wet pastures. 2n = 54. Forma **prionosepala** (Greene) Brainerd, has the leaves more hairy and the margins of the sepals often interruptedly serrate and ciliate. It is more common than the glabrous form and occurs in similar habitats. Nfld. to B.C. south to Ga. and Tenn.

Var. **microtitis** Brainerd has the auricles of the sepals 1-2 mm long, much shorter than those of the typical variety. Rare; reported from

mixed woods at Hectanooga, Digby Co., and from wet thickets at Yarmouth (Fernald, 1921); also scattered further east. Nfld., Magdalen I., N.Y. and N.S.

2. **V. nephrophylla** Greene. Fig. 100. Map 374.

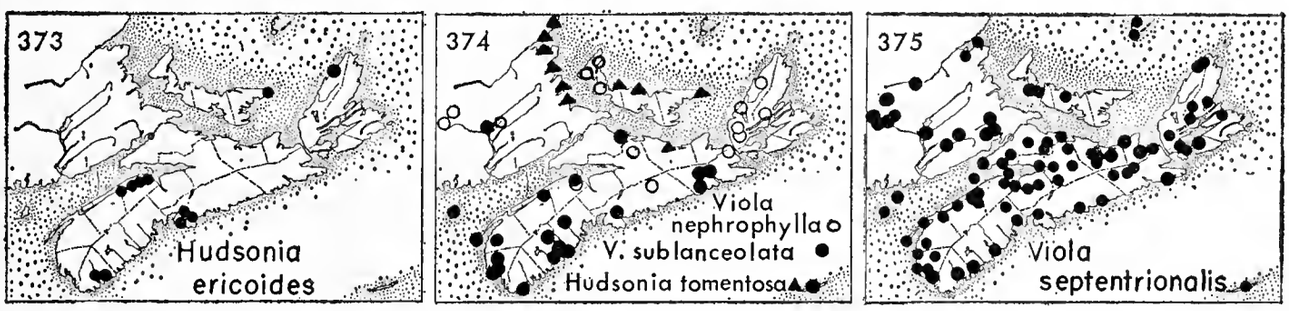
Rare in N.S.: wet woods, north of Truro; and occasionally in northern C.B. Erskine notes that it is very characteristic of cedar swamps in western P.E.I. Cool mossy bogs, borders of streams and in damp woods.

Nfld. to B.C. south to N.S., w. New Eng. and Iowa.

3. **V. septentrionalis** Greene. Map 375.

Common throughout; open woods, often under conifers, on light soils and in pasture land, one of the earliest of the blue violets to flower. This species hybridizes to some extent with *V. cucullata.* Mid-May.

Nfld. to B.C. south to Va. and Tenn.



4. **V. fimbriatula** Sm. Fig. 100. Map 376.

Common on open soil from Yarmouth to Halifax and Hants Co.; Isle Haute, not collected eastward although it is found near Charlottetown in P.E.I. On some of the dry hillsides of the Annapolis Valley, and particularly on the south slope of the ridge above Wolfville occurs a form with deeply toothed leaves and early flowering season. The shape of the leaves shows a tendency towards *V. sagittata* but it does not have the smoother leaves of that species. Specimens collected at Point Pleasant Park, Halifax, likewise seem to be a variation of this species. (*V. sagittata* Ait., var. *ovata* (Nutt.) Torr. and Gray).

On the sand plains near Wilmot, Annapolis Co., the plants are almost glabrous with glabrous sepals. This extreme may be called forma **glabrata** Pennell. Forma **umbelliflora** Fern. (Fernald, 1949-a) has the type from Halifax, where it was collected by J. R. Lunt in 1912. This has the peduncles 3-flowered with the flowers sub-umbellate.

This species often hybridizes with *V. septentrionalis*, and the resulting plants are large, with elongated leaves and ciliate sepals. This cross is especially abundant in the Annapolis Valley and on the slopes of Cape Blomidon. Early May to June.

N.S. to Minn. south to Fla. and La.

5. **V. Selkirkii** Pursh. Map 377.

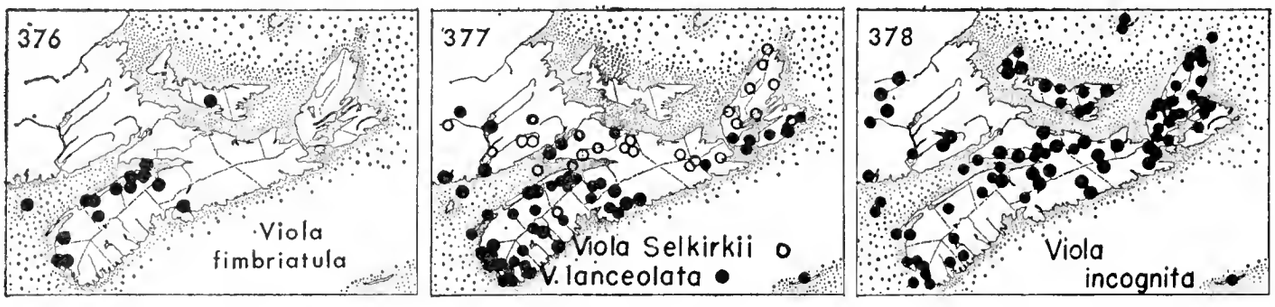
Characteristic of rich hardwood forests from Kings and Cumberland Co. to northern C.B. This plant is local and occurs in small numbers, often found not flowering.

Nfld. and Lab. to Alaska south to Penn., Mich. and Colo.

6. **V. pallens** (Banks) Brainerd. Fig. 100. SMALL WHITE VIOLET

Very common throughout in moist ground, meadows, bogs, borders of lakes, wet thickets, etc. This is our common early white violet. Leaves with long-ciliate petioles do not seem to be common and in most cases the petioles are glabrous. Var. **subreptans** Rousseau (1938-b), is a form with the long stolons bearing cleistogamous flowers; scattered in the range of the species. This plant is sometimes classified as a subspecies of the western *V. Macloskeyi* Lloyd. May-early June.

Lab. to Alaska south to S.C. and Colo.



7. **V. incognita** Brainerd. Map 378. WHITE VIOLET

Common in wet woods and thickets throughout. Lab. to N.Dak. south to New Eng. and N.Y. In Que. this typical variety is the more common one northward.

Var. **Forbesii** Brainerd is common, usually in drier or more upland woods than the preceding variety. Both this variety and the species are more common in shaded locations than is *V. pallens*. Collected by Güssow on Sable I.

N.S. to Minn. south to Penn.

8. **V. renifolia** Gray. Fig. 101. Map 379.

Rare; occasionally seen in rich woods or on slopes in the center of the Province. Nfld. to Minn. south to Mass. and N.Y.

Var. **Brainerdii** (Greene) Fern. is rather common in rich or calcareous woods, on hillsides, under coniferous trees and on gypsum; Annapolis Co. to northern C.B., where Nichols lists it as characteristic of wooded swamps. Boivin (1951) does not consider this as a good geographical variety.

Lab. and Nfld. to Alaska south to Conn. and N.Y.

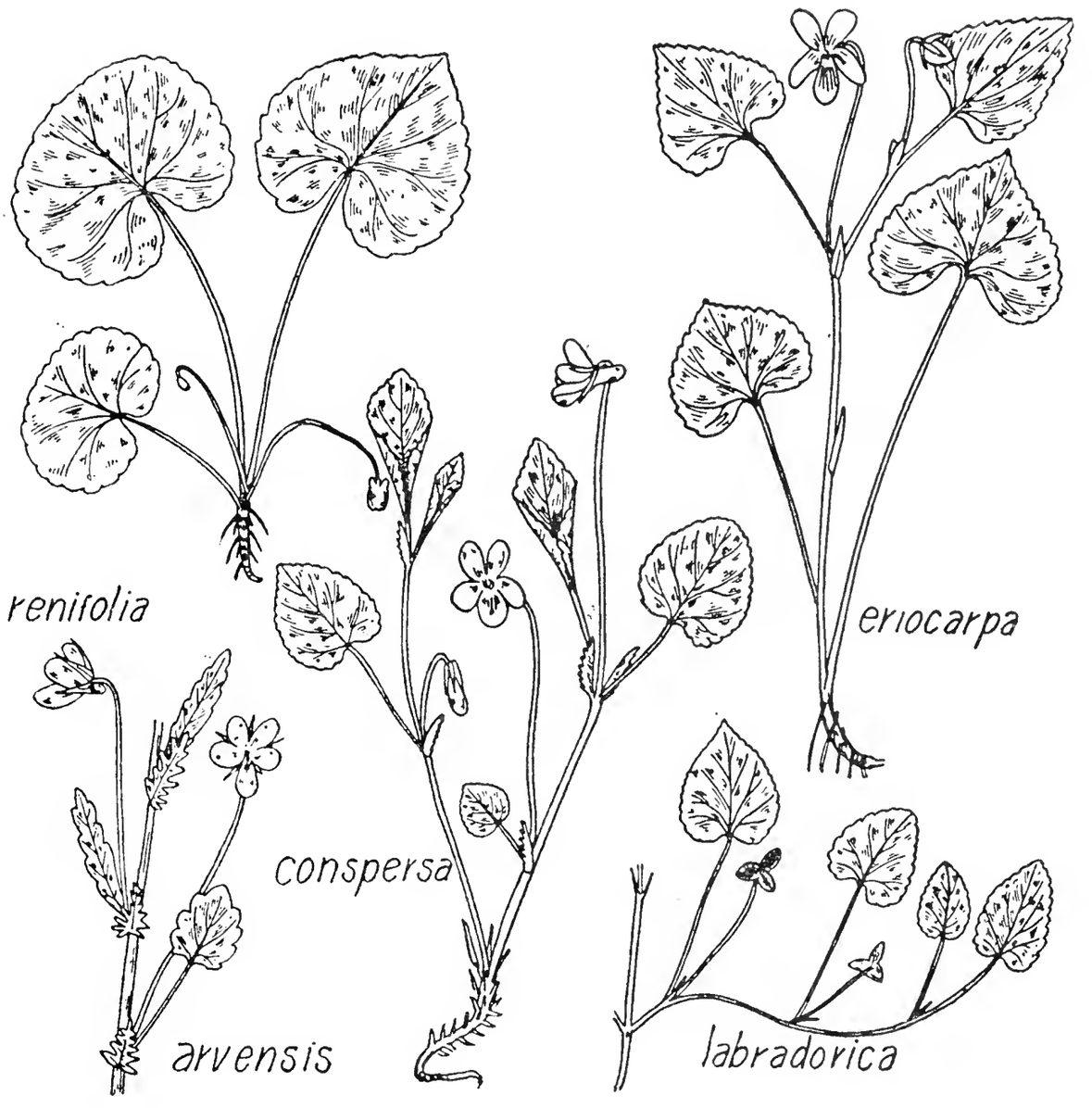


Fig. 101.—**Viola** spp. x $\frac{1}{2}$.

9. **V. lanceolata** L. Fig. 100. Map 377. LANCE-LEAVED VIOLET

Common in the western half of the Province, becoming rarer eastward to Cumberland Co. and through Richmond Co. to Mira in C.B. Co. It is found on the edges of pools, around lakes, on mud flats and in boggy places; abundant on Sable I.; and in grassy fields and headlands around the southwest part of the mainland. The leaves appearing in summer may be much wider than those appearing with the flowers in the spring.

Fla. to Tex. north to C.B., s. Que. and Minn.

10. X **V. sublanceolata** House. Fig. 100. Map 374.

Damp sand, gravel and peat; Yarmouth to Halifax; rare on sandy banks on Sable I.; plants from wet fields north of Canning, Kings Co. belong here. It is local to rare except in the southwestern counties, where it is found around the lakes and in river gravels. This plant is now considered to be a hybrid between *V. pallens* and *V. lanceolata* and true *V. primulifolia* to occur north only to Long I., N.Y. It practically

always occurs with *V. lanceolata*; occasionally the leaves may be practically as round as *V. pallens* but with winged petioles (*V. primulifolia* L., var. *acuta* (Bigel.) T. & G.)

Eastern U.S. north to N.S., N.B. and Que.

11. **V. odorata** L. ENGLISH or SWEET VIOLET

Occasionally planted in gardens or in natural locations and persisting for some time or escaping to roadsides and ditches.

Introduced from Eu.

12. **V. eriocarpa** Schwein., var. **leiocarpa** Fern. & Wieg. See Jones (1959). Map. 380 Fig. 101. YELLOW VIOLET

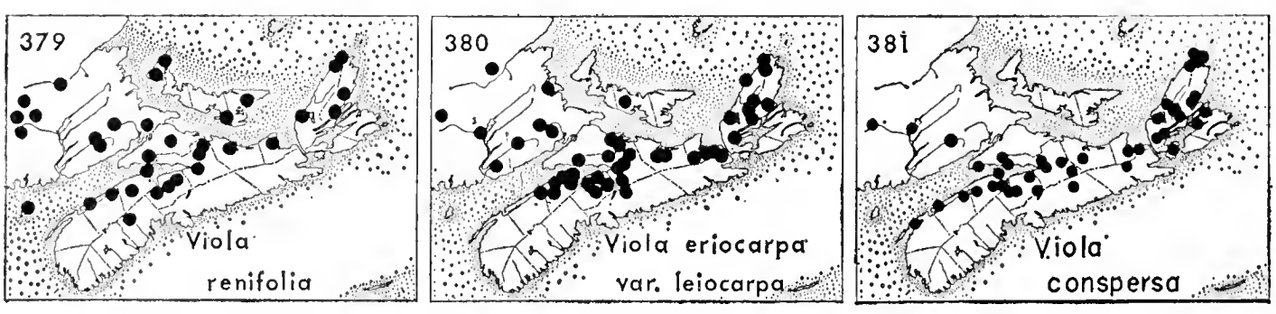
Edges of woods, rich banks, and along shady streams or rich intervales, usually in rich or calcareous soils. In the Annapolis Valley it is scattered along the North Mt., at least in Kings Co., and very rare and local on the South Mt. It is common along the intervales in the central and northern part of the Province; characteristic of rich hardwoods from Cumberland Co. to northern C.B., here growing usually as scattered plants. Early May. This plant is sometimes classed as a variety of *V. pensylvanica* or of *V. pubescens* Ait. 2n = 12.

N.S. and P.E.I. to Man. south to Ga. and Ala.

13. **V. canadensis** L. CANADA VIOLET

Very rare; known only from Newport, Hants Co., near the plaster quarries, where it was also collected by J. S. Erskine more recently in the same general area. The report of Nichols from northern C.B. belongs to the previous species.

N.S.; N.H. to Ont. and Mont. south to Ala. and Iowa.



14. **V. conspersa** Reichenb. Fig. 101. Map 381. DOG-VIOLET

Digby Neck to C.B.; frequent in alluvial meadows in the Annapolis Valley and along the North Mt.; frequent in Cumberland and Colchester Co.; characteristic of mountain swamps in northern C.B.; absent in southwestern N.S. and along the Atlantic Coast. The petals are rather wide and a pale violet in color. Late May-June. Forma **Masonii** (Farw.) House has white flowers; rich woods, Sweet's Corner, Hants Co.

N.S. to Minn. south to Ga.

15. **V. labradorica** Schrank. Fig. 101. Map 382.

Rare; in ravines, along spring-brooks or occasionally in cold woods from along the North Mountain in Annapolis Co. to northern C.B. This small violet is usually found in shaded areas close to tumbling streams or on rocky cliffs where it is moist. (*V. adunca* Sm., var. *minor* (Hook.) Fern.).

Greenland to Alaska south to n. New Eng., Mich. and Colo.

16. **V. tricolor** L. PANSY, JOHNNY-JUMP-UP

This tiny pansy is occasionally found as an escape to roadsides, fields or around old gardens, sometimes very persistent, and flowering over a long period of time.

Introduced from Eu.

17. **V. arvensis** Murr. Fig. 101. FIELD PANSY

Occasional in old fields and seeded ground. This plant has probably been introduced in clover seed, persisting but a short time.

Introduced from Eu.; Nfld. to B.C. and southward.

79. THYMELAEACEAE MEZEREUM FAMILY

Low shrubs with tough bark and simple, alternate, entire leaves. The flowers appear in lateral clusters in late April or early May before the leaves; petals none, sepals usually 4; fruit a berry-like drupe.

a. Calyx small and tubular, without spreading lobes, light yellow; stamens long-exserted; drupe greenish to reddish; leaves obovate and very short-petioled. 1. *Dirca*

a. Calyx showy, with 4 spreading sepals, pink to purple; stamens included; drupe cherry-red; leaves oblanceolate, widest above the middle with a tapering base. 2. *Daphne*

1. DIRCA L. LEATHERWOOD

1. **D. palustris** L.

A single sterile bush of this species was found on the Newport "chimneys", a network of gypsum sinkholes shaded by spruce beside the St. Croix R., Hants Co. Since then W. B. Schofield has found in some unpublished material of Macoun's, in the National Museum at Ottawa, a report of the finding by Dr. Soloan and his students of three stations of this plant in N.S. These were unsupported by collections and the definition of locality was vague, e.g. "Wentworth" (Erskine, J. S., 1953).

N.S. to Ont. and Minn. south to Fla.

2. DAPHNE L. DAPHNE

1. **D. Mezereum** L. Fig. 97, g. DAPHNE

Introduced by the French and locally established at Annapolis, Grand Pré, Louisburg and at scattered places elsewhere. It is rather common along the roadsides and in thickets between Avonport and Kentville in Kings Co., the pale pinkish or rose flowers appearing in late April or early May before the leaves unfold. Occasionally transplanted as an ornamental. The berries are deadly poisonous.

Introduced from Eu.; Nfld. to Ont. and N.Y.

80. ELAEAGNACEAE OLEASTER FAMILY

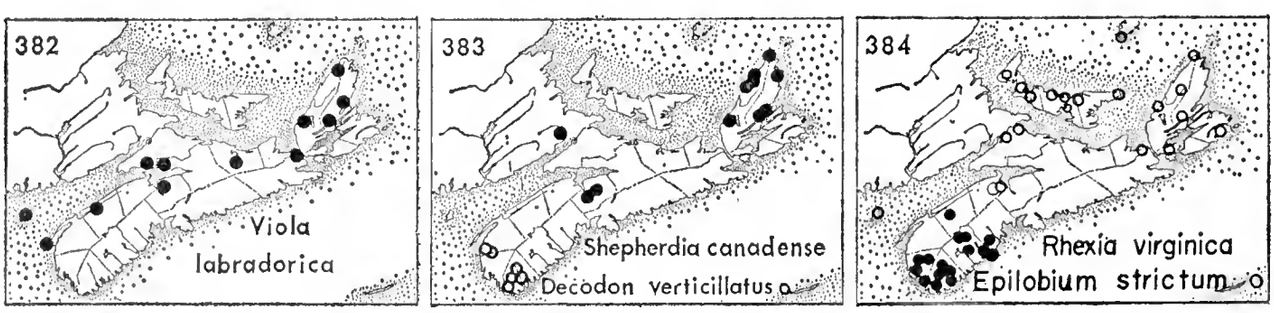
Shrubs or small trees with the leaves scurfy with silvery to reddish scales. The Russian Olive, *Elaegnus augustifolia* L., is often planted as an ornamental.

1. SHEPHERDIA Nutt.

1. **S. canadensis** (L.) Nutt. Fig. 97,f. Map 383. SHEPHERDIA

Locally, but usually abundant where found. In Hants Co. it is abundant on gypsum between Windsor and Brooklyn by the roadside; and in northern C.B. it is found on gypsum or on talus slopes growing with plants such as *Potentilla fruticosa* and *Senecio pauperculus;* also along the coast within reach of the salt spray.

Nfld. to Alaska south to N.S., n. N.Y., Iowa and N.Mex.



81. LYTHRACEAE LOOSESTRIFE FAMILY

Tall perennial herbs with simple, lanceolate, entire or slightly wavy-margined leaves, growing in damp or wet habitats. The flowers are rose-purple and occur in the axils of the upper leaves.

a. Axillary flower-clusters widely separated; leaves tapering to the base, petioled, with numerous lateral veins; stem prostrate at the base and often spongy. 1. *Decodon*

a. Axillary flower-clusters aggregated to make a showy terminal spike; leaves cordate at the base, sessile, and with only 3-5 prominent lateral veins; stem erect, not spongy at the base. 2. *Lythrum*

1. **DECODON** J. F. Gmel. SWAMP-LOOSESTRIFE

1. **D. verticillatus** (L.) Ell., var. **laevigatus** T. & G. Map 383.

Quaking margins of ponds or lakes, or sphagnous borders; rare. It is scattered in Shelburne Co.; and found at New Tusket, Digby Co. The variety is the northern type with the pedicels and the undersides of the leaves glabrous.

The species ranges from Fla. to Texas north to N.S., s.w. Que. and Ont.

2. **LYTHRUM** L. PURPLE LOOSESTRIFE

1. **L. Salicaria** L. Fig. 103, a.

Low ground, marshes and ditches; local; rare near Yarmouth and on Digby Neck; along the Annapolis R. above Middleton; common in the marshes at Truro; and in small numbers in other places in the Province. This plant is apparently being transplanted because of its showy flowers; and it is now more common along roadsides where patches of it are seen in ditches or in low areas. A cultivated form is now being grown in gardens. Most of our plants have the calyx and bracts softly white-tomentose and thus belong to var. **tomentosum** (Mill.) DC.

Introduced from Eu.; Nfld. to Man. and B.C. south to Va. and Ohio.

82. **MELASTOMATACEAE** MELASTOMA FAMILY

A large tropical family with only one genus in our area. Flowers purple, with the parts in 4's and the ovary inferior. The leaves are strictly opposite and are strongly ribbed with bristly teeth; herb.

1. **RHEXIA** L. MEADOW-BEAUTY

1. **R. virginica** L. Map 384. Fig. 103,g. MEADOW-BEAUTY

Wet thickets, peaty swales and lake margins; scattered in the southwestern counties north to the lakes of Annapolis Co. and west nearly to Bridgewater. July-Aug.

N.S.; Me. to southern Ont. south to Ga. and Ala.

83. **ONAGRACEAE** EVENING-PRIMROSE FAMILY

This family of diverse herbaceous plants has perfect, regular flowers, the ovary inferior and the flower-parts in 2's or 4's. The cultivated *Fuchsia* and *Clarkia* are good examples.

a. Flower-parts in 4's; fruit without hooked hairs.
b. Plant prostrate and rooting at the nodes; petals absent; leaves opposite; fruit to 4 mm long (Fig. 103,h). 1. *Ludwigia*

b. Plant erect; petals conspicuous; leaves mostly alternate; fruit long, cylindrical to linear.
c. Flowers purplish to white; calyx-tube scarcely prolonged beyond the ovary; seeds tufted with whitish hairs (Fig. 103,b-f). 2. *Epilobium*
c. Flowers yellow; calyx-tube conspicuously prolonged; seeds without hairs (Fig. 102,b-c). 3. *Oenothera*
a. Flower-parts in 2's, the petals sometimes almost divided; flowers minute, white; fruit with hooked hairs; plants thin-leaved, delicate (Fig. 102,a); leaves always opposite. 4. *Circaea*

Fig. 102.—**Circaea:** (a) *C. alpina* x $\frac{1}{2}$. — **Oenothera:** (b) *O. biennis*, top of plant x $\frac{1}{3}$, (c) *O. perennis* x $\frac{1}{3}$. — **Panax:** (d) *P. trifolium* x $\frac{1}{3}$.

I. **LUDWIGIA** L.

1. **L. palustris** (L.) Ell., var. **americana** (DC.) Fern. & Grisc. Fig. 103, h. Map 385.

Common throughout the northern areas and scattered elsewhere on wet shores, bottoms of ditches, and growing out of shallow water at the edges of lakes or streams. Forms found in deep water, with limp stems and broad, thin distinctly-petioled leaves, belong to forma **elongata** Fassett. The plant has been little-collected between Bridgewater and the Strait of Canso on the Atlantic side of the Province. Our plant is considered a variety of the European plant, although the differences are very slight.

N.S. to Minn. south to Ga. and Tex.; also on the West Coast.

2. EPILOBIUM L. WILLOW-HERB

About 100 species, mainly perennial plants from temperate climates. The white to pinkish flowers with 4 petals and the long inferior ovary serve to identify this genus. The capsule is long and slender and each seed within it has a tuft of long, white to brownish hairs at the upper end. Some species are very variable and need further study before they can be properly classified.

a. Stigma 4-parted; flower showy, 1 cm or more in length; plants 1 m high or higher.
  b. Petals pointed at their ends; flowers numerous in elongate racemes; leaves nearly glabrous. 1. *E. angustifolium*
  b. Petals notched at the ends; flowers few from the upper leaf-axils; leaves villous-hairy. 2. *E. hirsutum*
a. Stigma ovoid or club-shaped; flowers less than 1 cm long.
  c. Stem terete, with no lines running down from the bases of the leaves; leaves entire or nearly so, with inrolled margins.
    d. Capsules and stems velvety with spreading hairs; leaves 4-8 mm wide; petals 7-9 mm long. 3. *E. strictum*
    d. Capsules and stems glabrous to crisp-pubescent with sub-appressed or in-turned hairs (Fig. 103,c).
      e. Upper part of the stem and upper surface of leaves densely pubescent; tips of the stem or branches, and buds before flowering, arching or ascending.
        f. Plant usually much branched; petals 4-6.5 mm long; calyx 3-4.5 mm high; capsules not glandular; leaves numerous, 1-3 mm wide. 4. *E. leptophyllum*
        f. Plant usually simple or little branched towards the top; petals 7-9 mm long; calyx 4.5-6 mm high; capsule tending to be glandular. 5. *E. nesophilum*
      e. Upper part of stem and upper surface of leaves with scattered hairs or becoming glabrous; stem-tips, and pedicels before flowering, nodding. 6. *E. palustre*
  c. Stems with lines running down from the bases of the leaves; leaves toothed, flat, the margins not inrolled.
    f. Plants reproducing by short, basal buds, with the erect stems usually solitary.
      g. Basal bud composed of leathery, ovate scale-leaves which persist until flowering time the following year around the base of the stem.
        h. Stems 1-3 dm high; leaves 2-3 cm long, narrowed to the distinctly winged petiole. 7. *E. leptocarpum*
        h. Stems taller and stouter; leaves 3-6 cm long, rounded at the base and practically sessile. 8. *E. glandulosum*
      g. Basal bud sub-aerial and composed of delicate elongated scales which soon disappear the following season; common throughout.
        i. Seeds beakless; hairs of the seed tawny to dirty-white; leaves lanceolate, tapering to the tip from near the base, closely and irregularly serrate, with 30 or more serrations on each side, with short petioles; mature fruit erect or nearly so. 9. *E. coloratum*
        i. Seeds usually with a short beak; hairs white; leaves more remotely serrate; mature fruit spreading. 10. *E. adenocaulon*
    f. Plants reproducing by slender, creeping basal stolons; the sparingly-branched plants often matted with the stems decumbent at the base and up to 3 dm high. 11. *E. Hornemanni*

1. **E. angustifolium** L. Fig. 103,b. FIREWEED, LARGE WILLOW-HERB

Common and conspicuous in burnt-over areas, along fence-rows, edges of thickets and in waste places throughout. Forma **albiflorum** (Dumort.) Haussk. has white flowers with whitish sepals: occasional, Sandy Cove in Digby Co.; near Wentworth in Cumberland Co.; and a large patch north of Truro. Forma **spectabile** (Simmons)Fern. has white petals with reddish sepals. July 10-Aug.

Greenland to Alaska south to N.C. and Calif.; Eurasia.

2. **E. hirsutum** L.

Beside Steele's Pond, Point Pleasant, Halifax, collected by J. S. Erskine, 1949.

Intro. from Eu.; N.S., Que. to Mich. south to N.Y.

3. **E. strictum** Muhl. Fig. 103,d. Map 384.

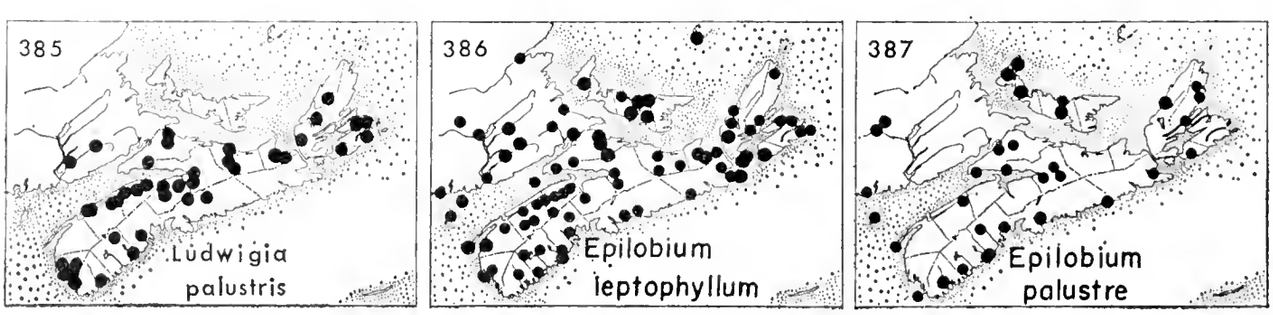
Boggy areas and meadows, scattered throughout C.B., rarer westward: swamp, three miles south of Merland, Antigonish Co.; swamp by main road, Hortonville, and marsh at Sheffield Mills in Kings Co. (Erskine, D. S., 1951); and pond-edge at Amherst Point where it was collected by J. S. Erskine.

N.S. to Minn. south to Va., Ind. and Ill.

4. **E. leptophyllum** Raf. Fig. 103,c. Map. 386. BOG WILLOW-HERB

Scattered to common in swales, wet meadows, bogs and lake and stream margins throughout (*E. densum* Raf.).

N.S. to Alta. south to Va., Ind. and Colo.



5. **E. nesophilum** Fern.

This large-flowered species is relatively rare in the Province. Inverness Co.: bogs head of South Blair R.; Victoria Co.: occasional in swamp, Bay St. Lawrence; common in swamp above Gray GlenBrook; C.B. Co.; rare in bog, Northwest Cove, Scatari I.; and in Richmond Co. common in bog at Point Michaux (Smith and Erskine, 1954).

Var. **sabulonense** Fern. has the leaves oblong-lanceolate instead of narrowly lanceolate, with blunt tips and the fruiting pedicels are shorter

and only up to 1.5 cm long. This is the only variety found on Sable I. and has as yet been found nowhere else.

Anticosti I., the Magdalen I., Nfld. and C.B. with the variety on Sable I.

Fig. 103.—**Lythrum**: (a) *L. Salicaria* x $\frac{1}{3}$. — **Epilobium**: (b) *E. angustifolium*, flowers and leaf x $\frac{1}{3}$, (c) *E. leptophyllum*, stem showing pubescence x 1, (d) *E. strictum*, stem x 1, (e) *E. palustre* x 1, (f) *E. adenocaulon* x $\frac{1}{2}$. — **Rhexia**: (g) *R. virginica* x $\frac{1}{2}$, stem and flower enlarged. — **Ludvigia**: (h) *L. palustris* x 1.

6. **E. palustre** L. Fig. 103,e. Map 387.

This variable northern species is scattered throughout. Several varieties have been proposed and reported as being found in N.S. Most of our plants are about 3 dm high, usually unbranched and rarely with axillary tufts of leaves, the principal leaves 1-4 mm wide and 1-3 cm long and strongly ascending; the leaves subtending the flowers usually only equalling or shorter than the fruiting pedicels. This is var. **oliganthum** (Michx.) Fern. (Map 388). It is found in open bogs or damp

peaty barrens, more characteristic of the Atlantic Region of the Province. July-Aug. (var. *monticola* Haussk.).

Occasionally larger, more branching plants are seen which seem to be more typical of the species as described in Gray's Manual; some growing on wet rocks or cliffs, possibly in the shade, have wide, more flaccid leaves. These have been named var. *grammadophyllum* Haussk. but it is doubtful if they constitute a valid variety.

Greenland to Alaska south to Conn. and the Great Lakes region.

7. **E. leptocarpum** Haussk., var. **Macounii** Trel.

This small, slender species has been reported from N.S. both by Fernald and by Gleason in recent floras, from moist, often calcareous spots. The variety is the eastern form. No recent collections have been seen.

Nfld. to B.C. south to N.S., Ont. and Man.

8. **E. glandulosum** Lehm. Map 390.

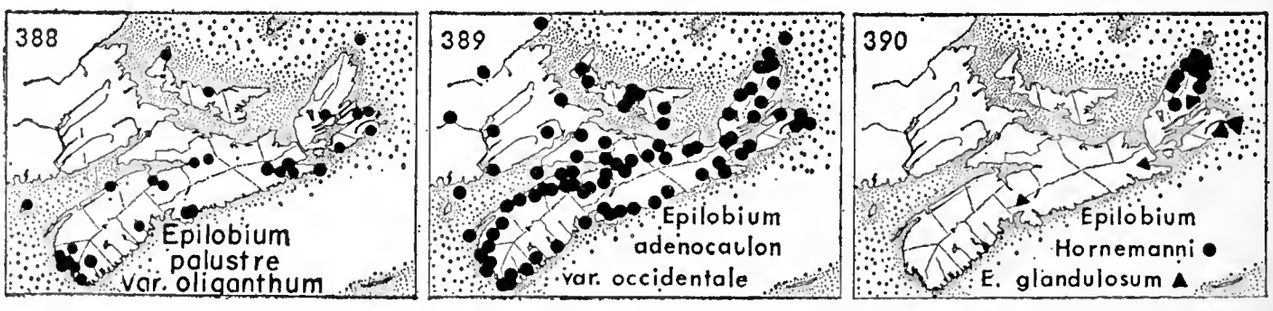
The collections from northern C.B., especially those from the most northern part, show the persistent basal rosette and are here kept separate from the following species. The plants are unbranched and the leaves maintain their size up to the inflorescence.

Lab. south to Que. and N.S.; Alaska to Oreg.

9. **E. coloratum** Biehler.

Open spot near the station at Weymouth as first report east of the Penobscot region, the earlier records from eastern Canada resting on *E. glandulosum* var. *adenocaulon* and *occidentale* (Fernald, 1922). The characters commonly used to separate this species from the next do not apply too well in N.S. Seeds with brownish or grayish hairs often occur; the 4 sepals may or may not project at the tip of the bud as 4 points; the seeds may be rounded or have a short neck at the top. A number of the characters of *E. coloratum* seem to be found at random to some extent in our population of the next species. Plants most typical of this species have also been found in a ditch at Seabright, Antigonish Harbour and in a marsh east of Roxville, Digby Co. Other collections in the north-central counties resemble it more or less.

N.S. and Me. to Minn. south to Ga. and Ala.



10. **E. adenocaulon** Haussk. Fig. 103,f. Map 389. WILLOW-HERB

The plants considered under this name are so variable that the extremes seem like entirely different species. Part of the variation seen in herbaria may result from the stage of development in which they are collected as the plants may be simple in the early stages of flowering and then develop numerous side-branches later. The plants taken as typical of the species are relatively unbranched with the middle stem-leaves ovate to ovate-lanceolate and rounded at the base, the whole plant with a reddish tinge. This is common throughout in rich or damp soils, commonly in dried-out muddy spots.

Var. **occidentale** (Trel.) Fern. is said to be a more-western variety. However, the large, green, bushy plants with many long branches and the leaves narrowly lanceolate are placed here for the present. It is easy to pick out a number of collections from rich soil, edges of swales or wet habitats, especially from the north-central parts of the Province, which appear quite distinctive, but the species is variable and intergrading forms make determination doubtful.

Var. **perplexans** Trel. represents the opposite extreme, with the small, unbranched plants having thin, flaccid leaves which taper to a definite petiole. This has been described as *E. ciliatum* Raf. and resembles depauperate plants of *E. adenocaulon* or plants which have grown in places where pools have dried up in late spring. Wet rocks, cliffs and damp areas, sometimes close to the sea-shore.

Nfld. to Alaska south to New Eng., Del. and Ill.

11. **E. Hornemanni** Reichenb. Map 390.

Mentioned by Fernald (1948, 1950-a) as occurring in C.B., this plant is now found to be characteristic of the banks of cold brooks in the northern part of the Island, in ravines as they approach the plateau, and occasional in damp places in the birch-fir forest at an elevation of 1200 feet (Smith and Erskine, 1954). It was first collected from Big Intervale, C.B. by Macoun in 1898.

Arctic Amer., south to C.B., mts. of New Eng. and N.Y. and Colo.

3. OENOTHERA L. EVENING-PRIMROSE

These yellow-flowered biennial plants are common, especially along the shoulders of roads and in waste places. In the first 4 species self-pollination is the rule but occasional cross-fertilization may occur. Consequently a number of races are found, often existing side by side; and new ones differing in height, coloration, pubescence, size and width of petals and in other characteristics may arise.

The main species is *O. biennis* L. Boivin places the next 3 as forms of this: the large-flowered ones as forma *grandiflora,* the plants with

short wide petals as forma *muricata*, and the ones with short linear petals as forma *stenopetala*. We are retaining the species names but, except for the flower-characteristics, the 3 common types do seem to be closely related and confused. See Fernald (1949-b).

a. Plants stout, erect, more than 5 dm high; capsules not winged on the angles.
  b. Tips of the calyx-lobes in the unexpanded bud close together at the end of the tapering bud and forming a tube, in flower the tips appear terminal and point directly backwards, 2-6 mm long; flowers showy, the petals 1.5-6 cm long.
    c. Petals 15-20 mm long; calyx-lobes 1-2.5 cm long. 1. *O. biennis*
    c. Petals 2.5-6 cm long; calyx-lobes 2.5-5 cm long. 2. *O. grandiflora*
  b. Tips of the calyx-lobes in the bud not close together at the base, spreading at the tip of the more rounded tip or ridge and bent back from it; flowers small, the petals up to 2 cm long.
    d. Petals linear, 1-3 mm wide. 3. *O. cruciata*
    d. Petals obovate, broader. 4. *O. parviflora*
a. Plants slender, 1-5 dm high; capsule winged on the angles.
    e. Bud and tip of the inflorescence erect; petals mostly about 10-20 mm long; inflorescence in fruit less than half the length of the plant; anthers 4-6 mm long. 5. *O. tetragona*
    e. Buds and tip of the inflorescence nodding; petals 5-9 mm long; inflorescence in fruit about half the length of the plant; anthers 1.5-3 mm long. 6. *O. perennis*

1. **O biennis** L. Fig. 102,b. EVENING-PRIMROSE

Scattered to common throughout, but apparently more abundant in the central and western parts of the Province Some of the segregates or races have been named. *O. novae-scotiae* Gates (1916-7), was separated on the basis of the rosette leaves being nearly smooth and with relatively narrow, pale pink midribs; stems red, with leaves tapering at both ends and bracts somewhat curled; buds green and petals about 15 mm long. It was described from plants grown from seed collected near the reservoir on the North Mt. above Middleton. Other plants in the same general region seem to be as distinctive as this segregate.

Var. **canescens** T. & G. has the surface of the calyx, ovaries and capsules densely covered with incurved hairs. This grades into a form with the capsule and calyx covered with thick, ascending or spreading long hairs, which has been known as var. **hirsutissima** Gray. Kings Co.: sand at foot of cliff, Starr's Point. A specimen from the beach at Cook's Cove, Guysborough Co. seems to belong here also (Erskine, D. S., 1951); open roadside, Tusket, Yarmouth Co. (Klawe, 1955).

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

2. **O. grandiflora** Ait. LARGE-FLOWERED EVENING-PRIMROSE

Digby Co.; an escape from cultivation, established for 100 years along the main road at Plympton (Smith and Erskine, 1954). *O. biennis* forma *grandiflora* (Ait.) Carpenter.

Introduced from Eu.; N.S. to Ont. south; B.C.

3. **O. cruciata** Nutt.

There is a tendency towards narrow-petalled plants in the Maritimes. Erskine reports this species from several locations in P.E.I. and Smith and Erskine (1954) list it from Wentzell's Lake in Lunenburg Co. for the first record for the mainland of N.S. (*O. biennis* forma *stenopetala* (Bickn.) Boivin).

St. John states that it is occasional on the slopes of the dry dunes on Sable I. and Fernald (1949-b) describes these plants as var. **sabulonensis** Fern. because of the low stems; up to 3.5 dm high, the calyx minutely and sparsely pilose instead of villous; and the capsule 8-10, instead of 5-7 mm thick.

Dry open soil, beaches, etc., N.S. to Ont. and Mich. south to New Eng.

4. **O. parviflora** L. SMALL-FLOWERED EVENING-PRIMROSE

This seems to be the common species in eastern N.S. around the coast and spreading along the roadside shoulders; becoming rarer westwards at least to Cumberland and Guysborough Co. The evening-primroses seem well adapted to the roadside habitat and are apparently spread by maintenance machinery. (*O. ammophiloides* Gates and Catcheside, described from plants grown from seeds from Guysborough).

Nfld. to northern Ont. south to N.Y.

5. **O. tetragona** Roth

Scattered at various places in Digby Co.; old fields, edges of thickets and roadsides in dry, open sandy soil; collected at Wolfville by J. S. Erskine; unknown elsewhere, and probably introduced from further south.

Western N.S.; Ont. to Ill. south to Ga. and Tenn.

6. **O. perennis** L. Fig. 102,c. SUNDROPS

Common in light soils or in sandy places throughout; collected but rarely in the Atlantic coastal region. July-Sept. (*O. pumila* L.). Var. *rectipilis* Blake with the stem having short spreading hairs, instead of appressed stiff ones, is scattered near the coast of N.B. on the Gulf of St. Lawrence and was found by Erskine in north central P.E.I., but still has not been collected in N.S.

Nfld. to Man. south to Del., Ga. and Ohio.

4. CIRCAEA L. ENCHANTER'S-NIGHTSHADE

Perennial herbs with opposite thin leaves, growing in rich soil, usually in shaded locations; flowers with parts in 2's, the petals deeply lobed, small and white. The fruits are usually beset with soft hooked bristles.

a. Leaves firm, shallowly undulate-dentate; mature pedicels strongly reflexed; disk of flower cup-shaped, prolonged about 0.5 mm above the petals; anthers 0.7-1 mm long; stigmas shallowly 2-lobed; mature fruit with strong-hooked bristles, 3.5-5 mm thick, marked with 5 longitudinal corrugations on each face. 1. *C. quadrisulcata*

a. Leaves flaccid, coarsely sharp-dentate; mature pedicels spreading or only slightly reflexed; disk of flower inconspicuous; stigma deeply cleft; mature fruit with soft hairs, 1-3 mm thick, not furrowed.

b. Rhizome slender, scarcely tuberous-thickened; anthers 0.5-0.8 mm long; petals 2.3-3.5 mm long; fruit unequally 2-celled, 1.5-3 mm thick. 2. *C. canadensis*

b. Rhizome tuberous-thickened; anthers 0.2-0.3 mm long; fruit 1-celled, 1-1.5 mm thick. 3. *C. alpina*

1. **C. quadrisulcata** (Maxim.) Franch. & Sav., var. **canadensis** (L.) Hara. LARGE ENCHANTER'S-NIGHTSHADE Map 391.

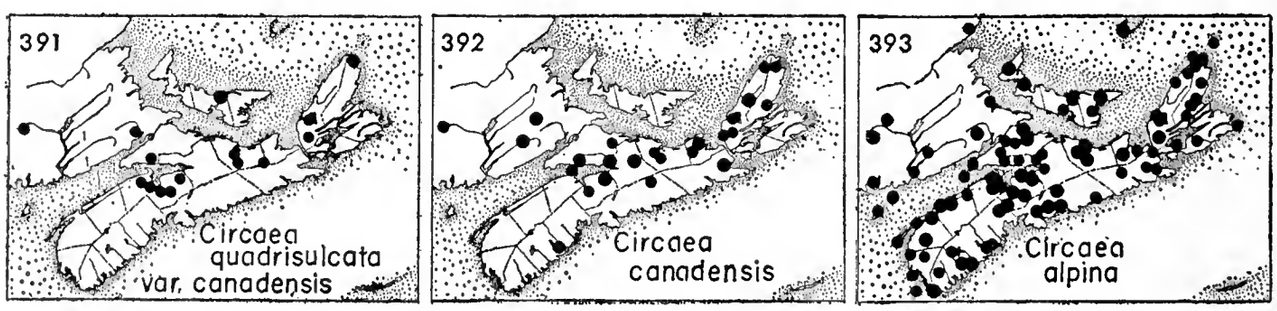
Scattered in rich or alluvial woods from Kings and Cumberland Co. in the northern part of the Province to northern C.B.; large localized stands along the Cornwallis R. in Cambridge, Kings Co. (Schofield 1949). July-Sept. (*C. lutetiana* of earlier authors).

N.S. to Man. south to Ga. and Tenn.

2. **C. canadensis** Hill. Map 392.

Alluvial woods and rich wooded slopes in central N. S. to northern C.B.; rather rare. July-Aug. (*C. intermedia Ehrh.*). This is possibly an intermediate hybrid of our other two species. See Cooperrider (1962).

N.S. to Ont. and Minn. south to mts. of Va.



3. **C. alpina** L. Fig. 102, a. Map 393. SMALL ENCHANTER'S-NIGHTSHADE

Common in rich or wet woods, ravines, dripping slopes and borders of wooded streams and swamps, throughout. This is one of the most common plants in its habitat, often carpeting the ground. 2n = 22. July-Aug.

Lab. to Alaska south to Ga., Tenn. and Colo.

84. HALORAGACEAE WATER-MILFOIL FAMILY

Weak, erect or floating water-plants with either small scale-like leaves or with leaves deeply pinnately lobed or divided; flowers and fruit minute, in the axils of leaves or scales. Seven genera and 150 species (Fig. 104).

a. Flower-parts in 4's; leaves whorled or alternate, the emersed ones scale-like. 1. *Myriophyllum*

a. Flower-parts in 3's; leaves alternate, the emersed ones foliaceous. 2. *Proserpinaca*

1. MYRIOPHYLLUM L. WATER-MILFOIL

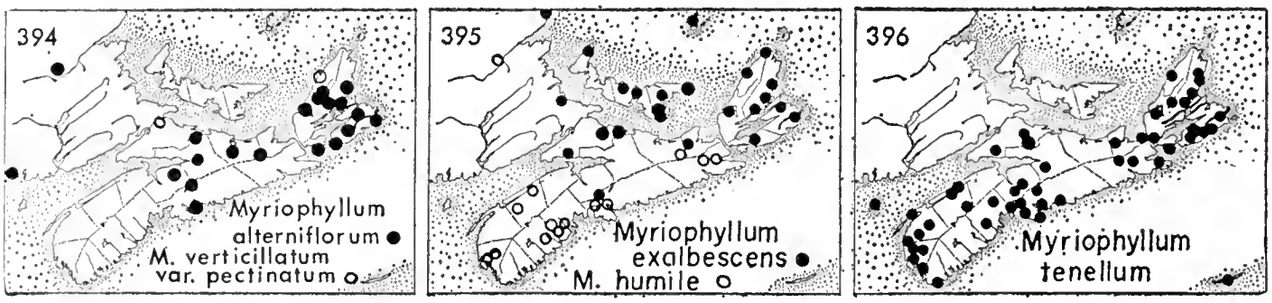
Rather common aquatic plants, but not often found fruiting. The leaves are usually regularly pinnately divided and are not to be confused with those of *Utricularia* (see Fig. 122).

a. Leaves deeply lobed, or cut into narrow or linear segments.
  b. Foliage leaves all whorled.
    c. Floral bracts mostly scattered or alternate, shorter than the flowers; leaves 5-12 mm long, the rachis and segments thread-like. 1. *M. alterniflorum*
    c. Floral bracts whorled; leaves 10-30 mm long.
      d. Floral bracts sparingly dentate or serrate, rarely as long as the flowers or fruit; rachis of the leaves terete, of nearly equal diameter throughout, the segments not broadened at the base. 2. *M. exalbescens*
      d. Floral bracts deeply lobed, about twice as long as the flowers or fruit; rachis of the leaves flattened, much broader towards the base, the segments also broadened at the base. 3. *M. verticillatum*
  b. Foliage leaves partly whorled and partly scattered.
    e. Flowers and fruit borne below the surface of the water in the axils of ordinary leaves; leaves filiformly divided, the segments about 0.1 mm wide at base and tapering to the tip; fruits 2-2.5 mm long, the carpels with prominent tubercles along the dorsal ridge. 4. *M. Farwellii*
    e. Flowers and fruit borne mostly above the surface of the water; leaves coarser; fruit 0.7 mm long, plump, without a ridge or tubercles on the back. 5. *M. humile*
a. Leaves small, inconspicuous, not lobed, to 1 mm long. 6. *M. tenellum*

1. **M. alterniflorum** DC. Fig. 104,c. Map 394.

Occasional in slow streams or shallow pools; central Hants and Halifax Co.; Salmon R. at Truro; in Pictou Co. and common in C.B. The American plants have been designated var. *americanum* Pugsley, but Fernald states that the varietal name refers only to clones with smaller leaves.

Eu. and Greenland; Nfld. to Alaska south to Conn. and Minn.



2. **M. exalbescens** Fern. Fig. 104,d. Map 395. (Löve, A., 1961).

Brackish water or in alkaline ponds, northern C.B.; Sydney Mines, Baddeck and Bay St. Lawrence; in 4 feet of water and fruiting in the pond at Presque Isle, in Inverness Co.; scattered west to Halifax and Cumberland Co.

Nfld. to Alaska south to Md. and W.Va.

3. **M. verticillatum** L., var. **pectinatum** Wallr. Map 394.

Spring pools south of Amherst (Fernald, 1921); mentioned by Nichols as characteristic of ox-bow ponds in northern C.B.

Nfld. to B.C. south to Del. and Md.

4. **M. Farwellii** Morong. Fig. 104,b.

Muddy cove in Lily Lake, Sandy Cove, Digby Neck (Fernald, 1921.).

N.S. and the Gaspé to Minn. south to Me., N.H., Vt. and N.Y.

5. **M. humile** (Raf.) Morong. Map 395.

Peaty, sandy or muddy shores from Yarmouth to Hants Co. and rarer to southern Pictou and eastern Guysborough Co.; local, passing in deep water to forma **natans** (DC.) Fern. which has the stems erect and floating in the water instead of growing on the bottom.

N.S. to N.Y. west to Ont. and Ill.

6. **M. tenellum** Bigel. Fig. 104,a. Map 396.

Shallow water on the sandy or peaty lake-margins from Digby and Yarmouth Co. and now known to exist pretty well throughout the Province; abundant at the borders of fresh-water lakes on Sable I. Nichol's record of *M. humile* from C.B. belongs here. The plant varies greatly in stature from dwarf to tall flowering ones; often it grows in a loose tangled mat in shallow waters.

Nfld. to Ont. and Minn. south to N.J., Penn. and N.Y.

2. PROSERPINACA L. MERMAID-WEED

Perennial, prostrate, amphibious or marsh plants with lobed alternate leaves and the flowers solitary, or 2-3, in the axils of the emersed leaves; flowers with no petals, 3 stamens, and the ovary inferior. These

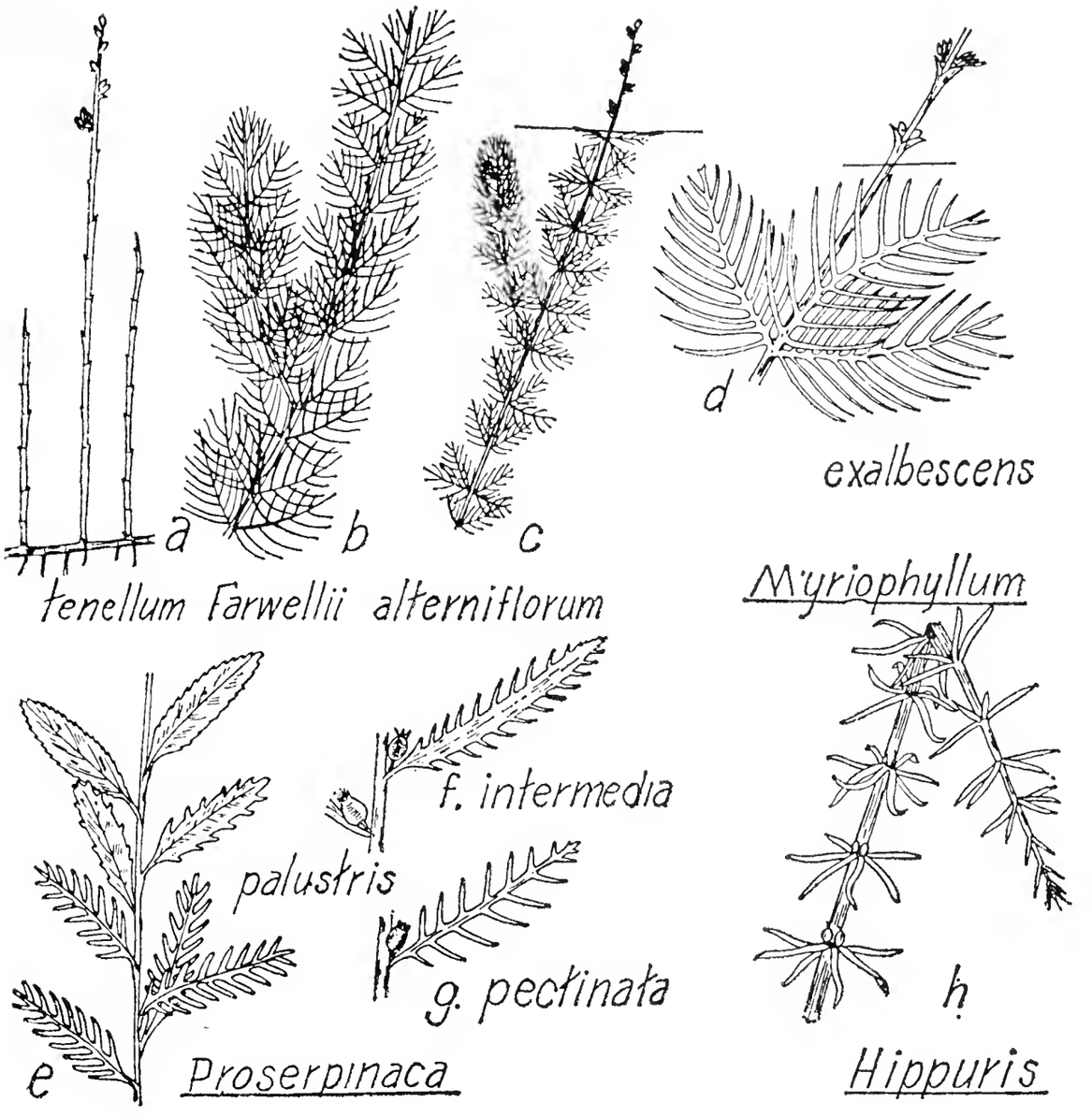


Fig. 104.—**Myriophyllum** spp., (a - d) x 1. — **Proserpinaca** spp., (e - g) x 1. — **Hippuris**: (h) *H. vulgaris* x $\frac{1}{3}$.

plants usually grow at the edges of ponds and in swales and ditches where the lower half may be in water and the upper branches grow out into the air.

a. Leaves of two types, the submersed ones deeply lobed, those above water merely toothed; flowers in the axils of the unlobed leaves; fruit with calyx-lobes as broad as long. 1. *P. palustris*

a. Leaves all alike, deeply lobed; fruit with the calyx-lobes longer than broad.

b. Leaves lobed only part way to the center with the rachis, or central part, about as broad as the segments are long. 2. *P. intermedia*

b. Leaves deeply cut, with the rachis narrow and about as broad as the segments are wide. 3. *P. pectinata*

1. **P. palustris** L., var. **crebra** Fern. & Grisc. Fig. 104,e. Map 397. MERMAID-WEED.

Boggy swales, savannahs, wet marshes and edges of streams, often abundant where found. Scattered in south-western N.S. to central

Halifax, Colchester and Cumberland Co.; rare in eastern N.S. and into southern Inverness and C.B. Co. In Lunenburg Co. it sometimes reaches a remarkable development, up to 15 dm high, with emersed leaves up to 8.5 cm long and 1.3 cm wide (Fernald, 1922). The variety is the northern variation of the wide-ranging southern plant. July-Sept.

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

2. **P. intermedia** MacKenz.

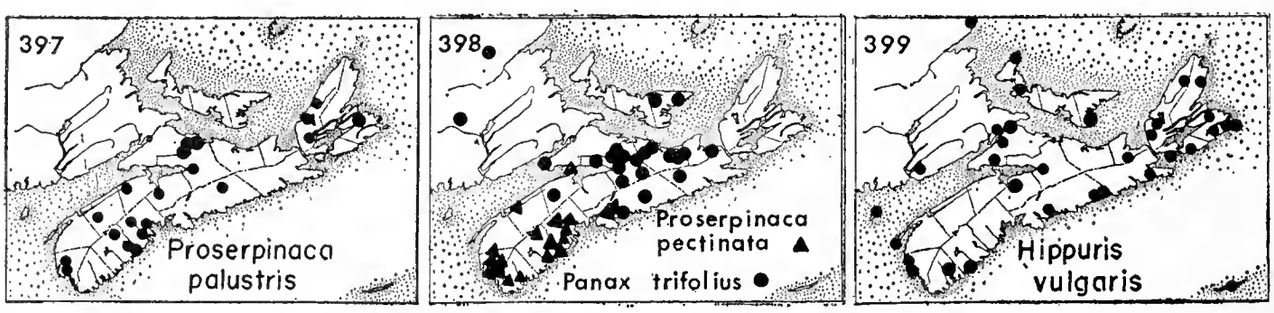
This species is intermediate in its characteristics between the first and the next species and is suspected of being a hybrid between them. It is found in similar habitats, usually growing with the two supposed parents. Boggy savannah by Butler's Lake, Gavelton, Yarmouth Co., filling small depressions which are damp or partly filled with water; scattered elsewhere in southwestern N.S.

N.S.; eastern Mass. to Va.

3. **P. pectinata** Lam. Fig. 104,g. Map 398.

Yarmouth and Shelburne, becoming rarer east to Annapolis and through central Lunenburg to Halifax Co.; wet savannahs, peaty or muddy pond-holes, sphagnous swales and sandy, gravelly or muddy borders of lakes or ponds. Rather common in the Medway Valley, Queens Co., generally growing in dense mats.

Fla. to Tex. north to N.S., sw. Me. and Tenn.



85. HIPPURIDACEAE MARE'S-TAIL FAMILY

This odd family consists of only one genus with one species, a water-plant with erect, unbranched stems and numerous whorls of small lanceolate leaves.

1. HIPPURIS L. MARE'S-TAIL

1. **H. vulgaris** L. Fig. 104,h. Map 399.

Local but widely scattered throughout; edges of ponds, brackish pond, wet swamps, usually edges of ponds, and quite often in pools near the sea, behind barrier beaches; occasionally on borders of streams, a

species of cold waters. It is found on the swampy margins of a few of the larger fresh-water ponds on Sable I.; luxuriant in the sink-holes near gypsum about Amherst. Forma **fluviatilis** (Coss. & Germ.)Gluck is a submerged form with long stems and weak trailing leaves found occasionally: Antigonish, Cumberland and Yarmouth Co. (Smith, 1959).

Greenland to Alaska south to New Eng., N.Y., Minn. and N.Mex.

86. **ARALIACEAE** GINSENG FAMILY

Herbs to shrubby plants with compound leaves and insignificant flowers in small umbels; flower white to greenish with 5 petals, 5 stamens and an inferior ovary. The berry-like fruits are often highly aromatic or spicy. The family has about 60 genera and 750 species, most abundant in the tropics.

a. Plants woody below; leaves alternate or basal, with 3 main divisions, each further divided; inflorescence of 3 or more umbels (Fig. 105). 1. *Aralia*
a. Plants herbaceous, low; leaves in a single whorl, palmately compound, with 3-5 leaflets; inflorescence a single umbel (Fig. 102,d). 2. *Panax*

1. **ARALIA** L. SARSAPARILLA

a. Stem woody, 8-20 dm high, much branched; umbels in a dense panicle on a zig-zag axis. 1. *A. racemosa*
a. Stem 4-8 dm high, woody and bristly below; umbels in a simple or much-branched corymb. 2. *A. hispida*
a. Stem almost absent; umbels 3, stalked on a naked scape. 3. *A. nudicaulis*

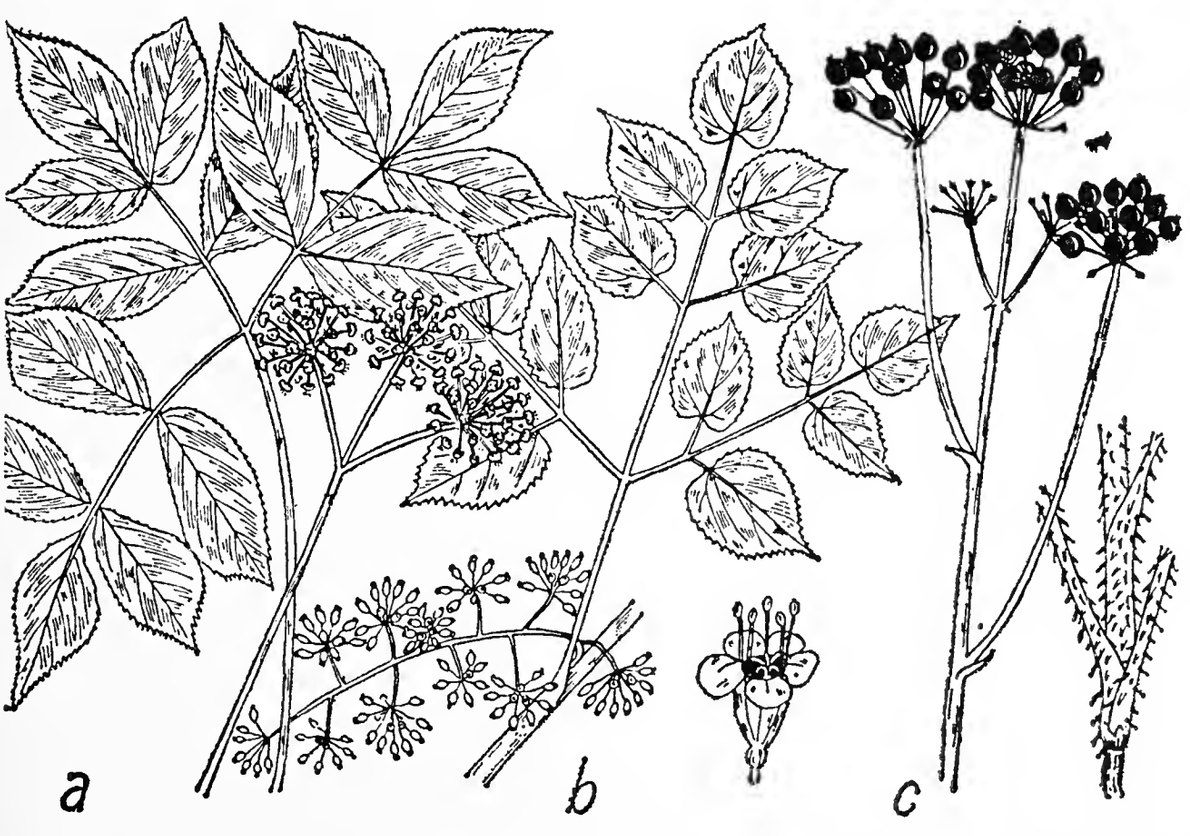


Fig. 105.—**Aralia**: (a) *A. nudicaulis* x $\frac{1}{3}$, (b) *A. racemosa* x $\frac{1}{3}$, (c) *A. hispida*, inflorescence and stem x $\frac{1}{3}$, flower x 3.

1. **A. racemosa** L. Fig. 105,b. Map 400. AMERICAN SPIKENARD

Rich or calcareous wooded slopes and in hardwood forests; occasional from Annapolis and Lunenburg Co. to northern C.B., usually as solitary plants. Absent in southwestern N.S.; rare in Halifax and Guysborough Co.; and not found in the more acid soils in Richmond and C.B. Co. near the Atlantic. Early July-Aug.

N.S. to Man. south to Ga. and Ala.

2. **A. hispida** Vent. Fig. 105,c. BRISTLY ARALIA

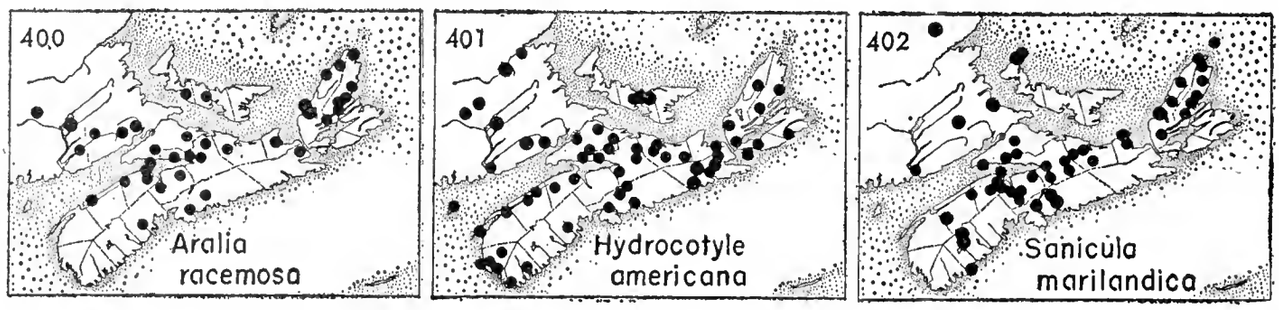
Common in burnt areas, recently-cut forest land, around saw-mills and in light or barren soils; throughout. July.

Nfld. to Alta. south to N.C., W. Va. and Minn.

3. **A. nudicaulis** L. Fig. 105,a. WILD SARSAPARILLA

Common throughout dry woodlands and old forests, one of the common flowering plants in early summer. May 25-June.

Nfld. to B.C. south to Ga., Ill. and Colo.



2. PANAX L. GINSENG

1. **P. trifolius** L. Fig. 102,d. Map 398. DWARF GINSENG, GROUND-NUT

Rich deciduous woods or open woodland, local; Kings Co.; beech woods at Morristown; common on the intervales of northern N.S. from Cumberland Co. east to Antigonish Co.; scattered in rich hardwoods in the Cobequids, east to Antigonish and Guysborough Co., where it is very rare, growing with a number of other typical intervale plants. June.

N.S. and P.E.I. and Ont. and Minn. south to Ga., Ind. and Neb.

87. UMBELLIFERAE PARSLEY FAMILY

A large family with the individually small flowers in sometimes small, but usually many-rayed showy and conspicuous umbels; leaves alternate, with few exceptions compound. The flowers have 5 petals, 5 stamens inserted on a disk, and an inferior ovary with two cells and stigmas (Fig. 107). The fruit consists of two one-seeded dry halves which separate at maturity. These halves may be nearly terete or may

be strongly flattened. The cultivated carrot, parsnip and dill are good examples of the family. The seeds of some species, especially those of *Conium* and *Cicuta*, are very poisonous. The family is a large one with up to 3,000 species.

a. Ovary and fruit densely prickly or bristly.
 b. Leaves palmately compound, the divisions simple (Fig. 106,f). 2. *Sanicula*
 b. Leaves pinnately compound, the divisions filiformly divided, slightly hairy (Fig. 106, a, d). 21. *Daucus*
a. Ovary and fruit not bristly nor prickly, sometimes stiff-hairy.
 c. Leaves simple; plants small of wet habitats.
  d. Leaves orbicular; plants small, creeping; flowers few in the axils of the leaves (Fig. 106, g). 1. *Hydrocotyle*
  d. Leaves reduced to thickened petioles 2-6 cm long; plant creeping, small, in water. 12. *Lilaeopsis*
 c. Leaves compound.
  e. Leaves pinnately-compound with sessile leaflets (Fig. 106, b-e).
   f. Leaflets less than 5 mm wide; each half of the fruit almost terete; flowers white.
    g. Leaflets divided into numerous filiform divisions; bulblets absent; a common weed (Fig. 106,e). 8. *Carum*
    g. Leaflets little or not divided; bulblets sometimes found in the upper axils; marsh plants (Fig. 106,h). 7. *Cicuta*
   f. Leaflets more than 5 mm wide, coarsely cut or toothed.
    h. Leaflets narrowly lanceolate, the upper not lobed or cut; each half of the fruit nearly terete; flowers white (Fig. 106,c). 11. *Sium*
    h. Leaflets elliptical, often nearly as wide as long, the upper one often lobed or deeply cut; (Fig. 106,b).
     i. Fruits terete; expanded leaves mostly basal, the leaflets 1-2 cm long, nearly oval and evenly toothed; flowers white. 9. *Pimpinella*
     i. Fruits thin and flattened; expanded leaves continuing up the stem, the leaflets coarse, up to 5 cm long or more, irregularly cut and toothed; flowers yellow. 19. *Pastinaca*
  e. Leaves more or less palmately compound, with stalked leaflets.
   j. Divisions of the leaf less than 4 mm wide; flowers white; fruit (except in *Conioselinum*) with the halves little flattened.
    k. Involucre, at the base of the umbel, of many persistent bracts; plant 1-2 m high; leaves large. 5. *Conium*
    k. Involucre absent, or 1 to a few bracts.
     l. Divisions of the leaf long and ribbon-like, coarsely toothed; bulblets appearing in the axils of the upper leaves; swamp plant (Fig. 106,h). 7. *Cicuta*
     l. Divisions of the leaf short and lanceolate, irregularly toothed or cut; bulblets absent.
      m. Involucels (at the base of the tiny secondary umbels) long and conspicuous, exceeding the flowers and fruit. 13. *Aethusa*
      m. Involucels much shorter than the flowers or fruit.
       n. Basal leaves variously and coarsely divided; upper leaves with filiform divisions; fruit subglobose, 3-5 mm in diameter. 4. *Coriandrum*
       n. Basal and upper leaves both ternately compound with the divisions 2-4 mm wide; fruit flattened; tall native plant. 16. *Conioselinum*
   j. Divisions of the leaf more than 5 mm wide.

o. Umbels with 2-8 rays, fruit linear with stout appressed hairs (Fig. 107,a); woodland plants. 3. *Osmorhiza*
o. Umbels with more than 10 rays; fruit not linear nor with appressed hairs.
p. Leaves rather fleshy, smooth with anastomosing veins, the teeth few, averaging 5 mm or more long (Fig. 107, d).
q. Involucre of numerous conspicuous bracts; fruit strongly flattened; introduced and rare. 18. *Levisticum*
q. Involucre of a few linear deciduous bracts or absent; fruit almost round; native sea-shore plants. 14. *Ligusticum*
p. Leaves thinner; the teeth close and numerous, averaging 2 mm or less (Fig. 107,c,e).
r. Upper leaf-sheaths much inflated, over 15 mm long (Fig. 107, e).
s. Leaves downy beneath, only once compound; fruit pubescent and strongly flattened; petals of the outer flowers irregularly enlarged. 20. *Heracleum*
s. Leaves glabrous to finely pubescent beneath, twice compound or more; fruit glabrous; outer flowers not enlarged.
t. Fruits flat; involucels of few bracts or none; tall coarse plants of C.B. 17. *Angelica*
t. Fruit terete; involucels of numerous bracts; plants short and stout. 15. *Coelopleurum*
r. Upper leaf-sheaths little inflated, less than 12 mm long; fruit with each half nearly terete.
u. Leaves and stem glabrous; plant without spreading root-stocks, and not growing in patches.
v. Flowers bright yellow; plant to 1 m high, of dry or moist habitats. 6. *Zizia*
v. Flowers white; plant 1-2 m high, in ditches and marshes, with thick fleshy crowns (Fig. 107,c); main lateral veins ending in a sinus between the teeth. 7. *Cicuta*
u. Leaves downy to pubescent; plant 2-10 dm high, spreading by stout rhizomes to make large dense patches in dry ground; involucre none; main lateral veins ending in a tooth. 10. *Aegopodium*

1. HYDROCOTYLE L. WATER-PENNYWORT

Small creeping herbaceous plants, the only members of this family here with rounded undivided leaves.

a. Leaves peltate, the petiole attached to the center of the blade; umbels many-flowered, long-stalked. 1. *H. umbellata*
a. Leaves cordate, the petiole attached at a notch in the blade; umbels sessile, 1-5 flowered, in the leaf axils. 2. *H. americana*

1. **H. umbellata** L.

Very rare; known only from the wet sandy and gravelly margin of St. John (Wilson's) Lake, Yarmouth Co. "Very rare and local and appearing like a waif washed down from some as yet undiscovered station farther up the valley of the Tusket" (Fernald, 1922).

Fla. and Tex. north to Mass. and N.S.; B.C. southward.

2. **H. americana** L. Fig. 106,g. Map 401. WATER-PENNYWORT

Common throughout except in the northern tip of C.B.; moist half-shaded places, bottom of depressions, bordering brooks, ditches, etc. July-Aug.

N.S. to Minn. south to Me., N.C. and Tenn.

Fig. 106.—**Daucus**: **(a)** *D. Carota*, fruiting inflorescence and flowering umbel x $\frac{1}{3}$, (d) leaf x $\frac{1}{4}$. — **Pastinaca**: (b) *P. sativa*, leaf x $\frac{1}{4}$. — **Sium**: (c) *S. suava*, leaf x $\frac{1}{4}$. — **Carum**: (e) *C. Carvi*, leaf division x $\frac{1}{2}$. — **Sanicula**: (f) *S. marilandica*, inflorescence x $\frac{1}{2}$. — **Hydrocotyle**: (g) *H. americana* x $\frac{1}{3}$. — **Cicuta**: (h) *C. bulbifera*, tip of plant x $\frac{1}{4}$.

2. SANICULA L.

Our two species of rich woodland habitats are quite different from other members of the family. The leaves are palmately divided and glossy; and the ovoid bristly fruits are distinctive although the umbel-arrangement of the flowers is not so marked as in other genera.

a. Flowers greenish-white; sepals lanceolate, 1-1.5 mm long; fruit 6-7 mm long. 1. *S. marilandica*

a. Flowers yellowish-green; sepals obtuse and ovate, about 0.5 mm long; fruit 3-4 mm long. 2. *S. gregaria*

1. **S. marilandica** L. Fig. 106,f. Map 402. BLACK SNAKEROOT

Scattered to common in rich woods and intervale soils from Annapolis and Cumberland Co. to northern C.B.; rarer on the Atlantic side of the Province in Queens Co. and central Halifax Co.; rich woods, borders of intervale thickets, usually growing where the soil is rather damp and the humus content good. June-Aug.

Nfld. to B.C. south to Va., Fla. and Kans.

2. **S. gregaria** Bickn. SANICLE

Rarer than the preceding, growing only in rich alluvial woods and along intervales: Five-Mile R., Hants Co.; Kings Co.: abundant in thickets bordering meadows by the Cornwallis R., Cambridge (Schofield, 1949); West R. in Pictou Co., and S.W. Margaree in Inverness Co. July-Aug.

N.S. to Minn. south to Fla. and Ala.

3. **OSMORHIZA** Raf. SWEET CICELY

Loose woodland plants with divided, soft thin leaves, about 5-10 dm high; the distinctive fruits are few in each umbel and are club-shaped with stiff, appressed hairs. The crushed plants have a distinctive sweetish odor. The garden sweet cicely is *Myrrhis odoratus* Scop. and this tends to escape: Wolfville, Halifax and Dartmouth.

a. Each small umbel subtended by several, small persistent leafy bracts; styles nearly straight and parallel; fruiting pedicels spreading.
  b. Styles, together with their bases, 0.5-1 mm long. 1. *O. Claytoni*
  b. Styles, together with their bases, at least 2 mm long in flower to 4 mm in fruit.
    c. Stems glabrous or essentially so. 2. *O. longistylis*
    c. Stems puberulent with short spreading hairs. var. *brachycoma*

a. Each small umbel without leafy bracts at the base; styles at maturity outwardly curved; fruiting pedicels strongly ascending.
  d. Stylopodium (base of the style) usually thicker than long; fruit convexly narrowed to the summit so that the fruit is blunt and rounded on the end. 3. *O. obtusa*
  d. Stylopodium usually longer than thick; fruit concavely narrowed to the summit so that the end is more tapering. 4. *O. chilensis*

1. **O. Claytoni** (Michx.) Clarke. Fig. 107,a. Map 403. HAIRY SWEET CICELY

Rich woods, shaded alluvial soils, and also in upland hardwoods and the most common species: Annapolis Co. to northern C.B. and along

the Cobequids to Cumberland Co. and northward; rare and scattered along the Atlantic half of the Province from Yarmouth to Sydney.

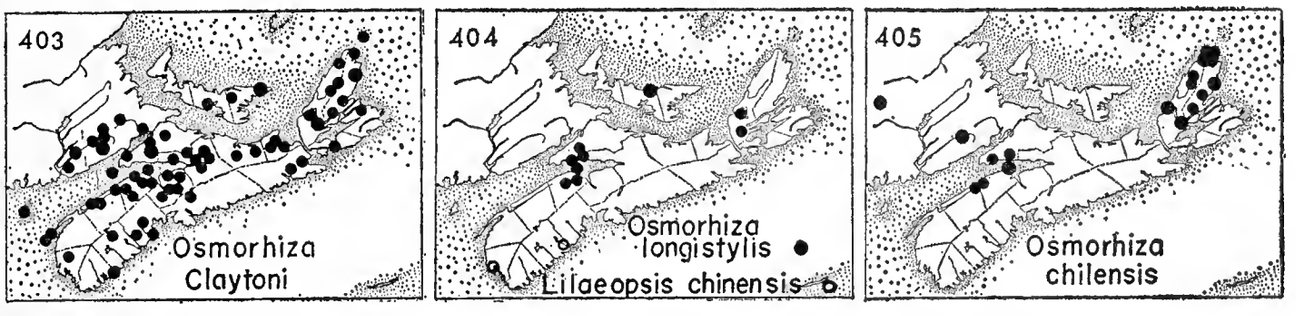
N.S. and Nfld. west to western Ont. south to N.C., Ala. and Kans.

2. **O. longistylis** (Torr.) DC. Map 404.

Scattered in rich hardwoods or along intervales; along the North Mt. and on Cape Blomidon in Kings Co. and directly north in Cumberland Co.; rarer in C.B. where it has been collected south of Whycocomagh and east Lake Ainslie. This plant has not recently been collected between these two small areas, although Robinson (1907) states that it is a much more common intervale plant in eastern N.S. than is usually supposed. Late June-July.

Var. **brachycoma** Blake has been collected along the edge of the intervale at Southampton in Cumberland Co. The stems of this species vary in their pubescence and this variety tends towards the more southern form where the stems in general are more hairy or pubescent, while our northern plants tend to have them almost glabrous.

N.S. to Alta. south to Va., Ky. and Okla.



3. **O. obtusa** (C. & R.) Fern.

Rare near the northern tip of Cape Breton; talus slope at Lockhart Brook and in a woodland at Cape St. Lawrence. This plant closely resembles the next species but the fruits are noticeably shorter and thicker; our plants have mostly 4 rays to the umbel. (*O. chilensis* H & A., var. *cupressimontana* Boivin).

Nfld. and Lab. to Alaska south to N.S. and northern N.B., northern Mich. and to Calif.

4. **O. chilensis** H. & A. Map 405.

Local and restricted to rich hardwoods or their neighborhood; along the North Mt. from Annapolis Co. to Cape Blomidon, and directly north scattered in rich hardwoods in Cumberland Co.; characteristic of climax hardwoods and intervales in northern C.B. This is our largest and most robust species, often growing to 1 m high. (*O. divaricata*). June-July.

Nfld. south to N.S., northern N.B., Me. and N.H.; northern Mich. and Ont.; Alaska to Sask. and Calif.; S.Amer.

4. CORIANDRUM L.

1. **C. sativum** L. CORIANDER

Waste places, rarely introduced and not persisting. Several of the members of this family are grown as herbs or medicinal plants and may be found occasionally as casual escapes.

N.S. south and west; adventive from Eu.

5. CONIUM L.

1. **C. maculatum** L. POISON HEMLOCK

Introduced and rare; found in waste places and on dumps, occasionally in a garden where the seed has been introduced; Weymouth, Digby, Truro, etc. This tall plant has the lower part of the stem with short stripes or blotches of red; deadly poisonous, especially the seeds. July-Aug.

Eu.; widely introduced.

6. ZIZIA W. D. J. Koch

1. **Z. aurea** (L.) Koch. GOLDEN ALEXANDERS

Occasional: Antigonish Co., roadside along Pomquet R. and in meadow above St. Andrews along South R.; Halifax Co.; bank of stream, Upper Musquodoboit (Erskine, D. S., 1951).

N.S. to Man. south to Ga., Tenn. and Texas.

7. CICUTA L. WATER-HEMLOCK

Tall perennial herbs of wet or marshy areas, with conspicuous umbels of flowers in mid-summer. All parts of the plants are poisonous.

a. Leaves with divisions linear, mostly less than 2 mm wide; fruit 1.5-2 mm long; upper leaf-axils with bulblets in autumn. 1. *C. bulbifera*

a. Leaves with divisions lanceolate, 5-10 mm wide; fruit 3-3.5 mm long; axils without bulblets. 2. *C. maculata*

1. **C. bulbifera** L. Fig. 106,h. Map 406. BULBOUS WATER-HEMLOCK

Scattered from Annapolis and Queens Co. to northern C.B.; absent in southwestern N.S. This plant is usually found growing with other marsh plants in shallow water, at the edges of ponds or in wet cat-tail marshes; rather common in north-central N.S. and typical of these habitats. Aug.

Nfld. to B.C. south to Va. and Oreg.

2. **C. maculata** L. Fig. 107,c. WATER-HEMLOCK

Marshes, swamps, ditches and wet pastures and meadows, in mucky or alluvial soils; general from Yarmouth to C.B., becoming more abundant northwards and eastwards; common on the marshes about the head of the Bay of Fundy. July.

N.S. to Man. south to N.C. and Tex.

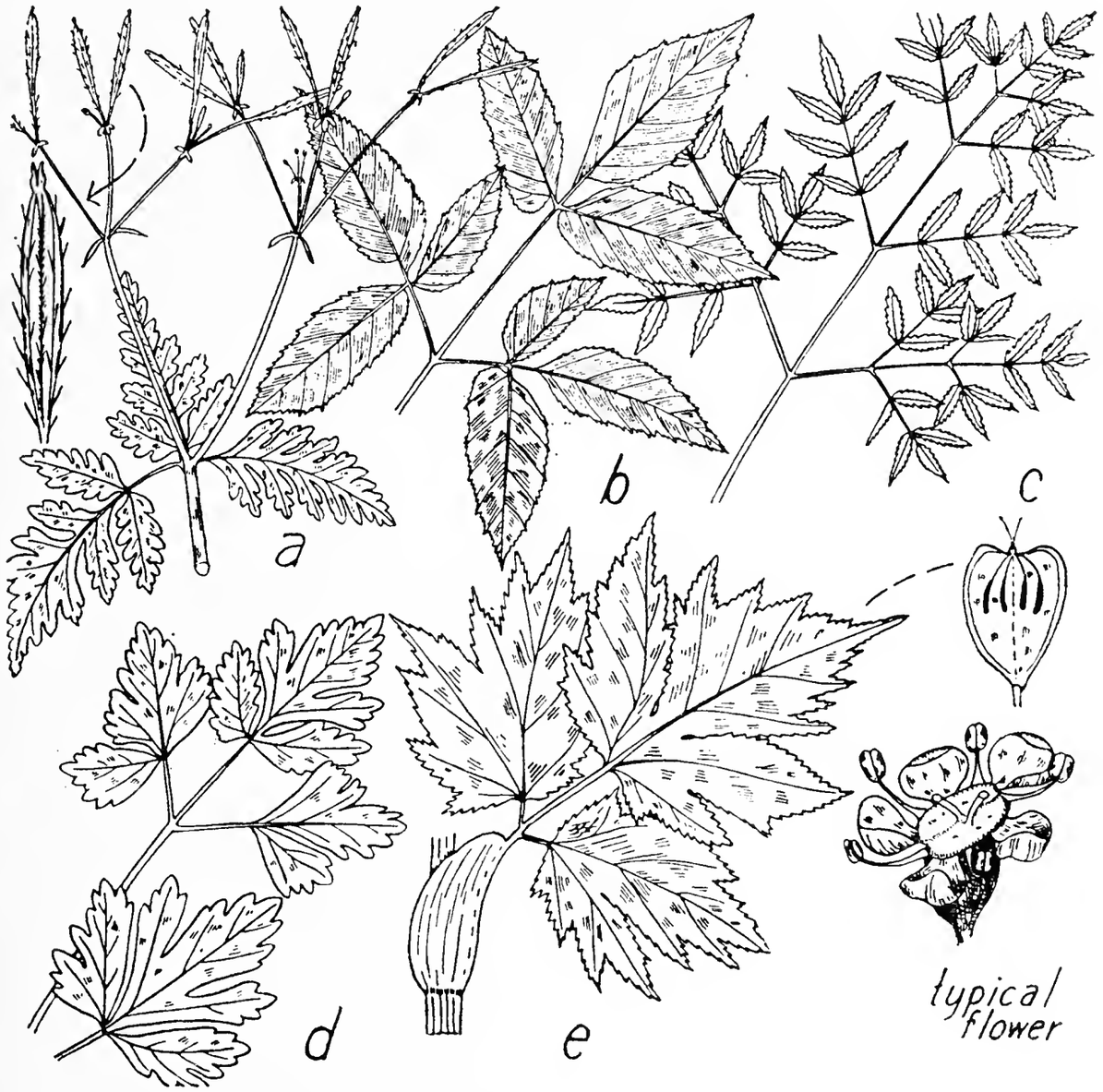


Fig. 107.—**Osmorhiza:** (a) *O. Claytoni*, inflorescence x 1, ripe fruit x 2. — **Aegopodium:** (b) *A. Podagraria*, typical leaf x $\frac{1}{3}$. — **Cicuta:** (c) *C. maculata*, leaf x 1/10. — **Ligusticum:** (d) *L. scothicum*, leaves x $\frac{1}{3}$. — **Heracleum:** (e) *H. lanatum*, leaf with large sheaf x $\frac{1}{4}$.

8. CARUM L. CARAWAY

1. **C. Carvi** L. Fig. 106,e. CARAWAY

Common throughout; damp fields and rich soil, around houses, in meadows and along roadsides. June. The fruits are often used as a seasoning but the plants should not be confused with the poisonous species. Forma **rhodochranthum** A.H.Moore has delicate pinkish

flowers. This was found scattered among the typical whitish flowered plants at Advocate, Cumberland Co.; it is found along the roadside near Havre Boucher east of Antigonish.

Introduced from Eu. and widespread.

9. **PIMPINELLA** L.

1. **P. Saxifraga** L. BURNET-SAXIFRAGE

A weed, locally abundant on lawns and along roadsides at Upper Pubnico in Yarmouth Co., growing in about the habitat and with much the same appearance as Wild Carrot. July-Aug.

Introduced from Eu.; Nfld. to Ont. south to Del., Penn. and Ind.

10. **AEGOPODIUM** L.

1. **A. Podagraria** L. Fig. 107,b. GOUTWEED

Common and a very bad weed at Boylston and Guysborough and frequent around Halifax; occasionally elsewhere and sometimes propagated and spread with garden plants; usually growing near buildings or along roadsides in large patches. A smaller type with variegated leaves is less persistent and rarely fruits; this is often grown as an ornamental. June-July.

Introduced from Eu.; becoming common in northeast N. Amer.

11. **SIUM** L. WATER-PARSNIP

1. **S. suave** Walt. Fig. 106,c. Map 407. WATER-PARSNIP

Common throughout; muddy shores of rivers and lakes, ditches and marshes. Submersed leaves are often finely dissected. July 15-Aug. (*S. circutaefolium* Schrank).

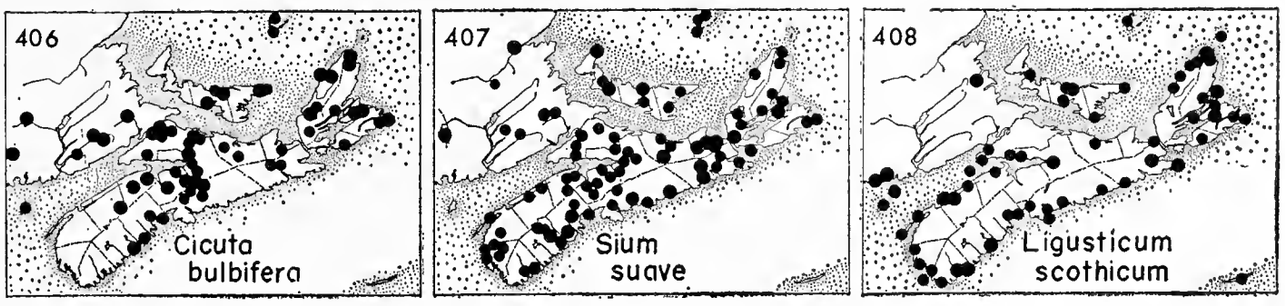
Nfld. to B.C. south to Fla. and Calif.

12. **LILAEOPSIS** Greene

1. **L. chinensis** (L.) Ktze. Map 404.

Known in Canada only from the muddy and rocky tidal banks of the Tusket R., at Tusket, Yarmouth Co. and about the estuary of the Medway R. in Queen's Co. where it was discovered by J. F. Donly. July-Aug.

N.S. to Fla. and west to Miss. along the coast.



13. **AETHUSA** L.

1. **A. Cynapium** L. FOOL'S-PARSLEY

Rare but occasionally introduced around yards, in waste places or in towns; barnyard, Shelburne, and in Halifax.

Introduced from Eu.; N.S. to Minn. south to Penn.

14. **LIGUSTICUM** L. LOVAGE

1. **L. scothicum** L. Fig. 107,d. Map 408. SCOTCH LOVAGE

Scattered near the coast and one of the typical plants of this habitat: rocky cliffs, sea-shores and headlands. July-Aug.

Along the coast from Greenland to N.Y.; Eu.

15. **COELOPLEURUM** Ledeb.

1. **C. lucidum** (L.) Fern. Map 409.

Scattered on gravelly sea-shores and headlands around the coast, except for the sandy shores of Northumberland Strait. It has never been collected between Hubbards and Guysborough but there is no reason why it should not occur along this shore-line. Infrequent on the slopes of the turf-covered dunes on Sable I. July-Aug.
(*Angelica lucida* L.)

Along the coast from Greenland and Lab. to N.Y. and Ont.; B.C.

16. **CONIOSELINUM** Hoffm.

1. **C. chinense** (L.) BSP. HEMLOCK-PARSLEY

Scattered in swamps, mossy coniferous woods or swales and seepy slopes near the coast; common on St. Paul I., rare on the mainland and in C.B. Aug.-Oct.

Lab. and Nfld. to w. Ont. south to N.Y., N.C. and Ind.

17. **ANGELICA** L. ANGELICA

About 50 species of tall coarse perennials with long-petioled decompound leaves, the upper of which are often bladeless. The flowers are greenish-white in compound umbels with few or no bracts.

a. Plant puberulent or minutely pubescent to pilose above and densely so on the rays of the umbels; uppermost leaves reduced mostly to inflated petioles; fruits 5-6 mm long. 1. *A. sylvestris*

a. Plant essentially glabrous or only minutely pubescent above; upper leaves not so prominently reduced; fruits 5.5-7.5 mm long. 2. *A. atropurpurea*

1. **A. sylvestris** L. ANGELICA

Scattered around Sydney; introduced at Louisburg and now very common in that area and spreading out along the roadsides and in fields, an aggressive weed that grows in all the open areas around the town. July-Sept.

Introduced from Eu.; eastern N.S. only.

2. **A. atropurpurea** L. Map 409. PURPLE ANGELICA

Formerly thought to be rare and restricted to coastal areas, this species has been found to be abundant along the upper reaches of the brooks of northern C.B. Inverness Co.: bog-meadow, headwaters of the South Blair R.; gravel beach, mouth of Red R.; headwaters of MacKenzie and Red R., very abundant; Victoria Co.: brookside at headwaters of Gray Glen Brook (Smith and Schofield, 1952); formerly found at other places near the coast in C.B., as at Mabou, Louisburg, Pleasant Bay and Bay St. Lawrence, in swamps, low ground and along streams.

Nfld. to Ont. and Minn. south to W.Va. and Ind.

18. **LEVISTICUM** Hill LOVAGE

1. **L. officinale** Koch

Rare; railway bank, Lake Annis, Yarmouth Co. (Fernald, 1921).

Cultivated as an herb; occasionally found as an escape.

19. **PASTINACA** L. PARSNIP

1. **P. sativa** L. Fig. 106, b. WILD PARSNIP

Escaped from cultivation and a common weed in parts of the Province; most often seen in the Annapolis Valley, scattered elsewhere; roadsides, old fields, waste places and orchards. July.

Naturalized from Eu. and widely distributed.

20. HERACLEUM L.

Very coarse plants with large, decompound leaves and large umbels; leaves irregularly cut and finely toothed.

a. Leaves woolly beneath, large, divided into three main divisions which are irregularly and sharply cut. 1. *H. lanatum*
a. Leaves pubescent beneath only, pinnately divided, the divisions rather bluntly lobed and toothed. 2. *H. Sphondylium*

1. **H. lanatum** Michx. Fig. 107,e. Map 410. COW-PARSNIP

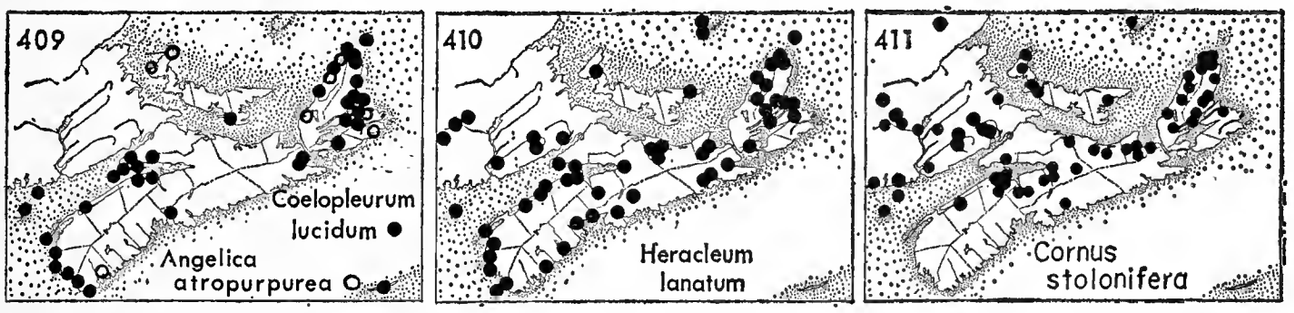
Wet meadows and brooksides in alluvial soil; scattered throughout; a common intervale plant in eastern N.S.; common on sea-bluffs in northern C.B., often growing in large clumps and conspicuous because of its size. (*H. maximum* Bartr.). Early July.

Lab. to Alaska south to New Eng., mts. of Ga. and Ohio.

2. **H. Sphondylium** L.

Common along roadsides and vacant lots near Willow St. in Truro; persistent but it does not appear to be rapidly spreading. Late July-Aug.

Introduced from Eu.; se. Nfld.; N.S. to Ont. and N.Y.



21. DAUCUS L. CARROT

1. **D. Carota** L. Fig. 106, a, d. WILD CARROT

A too-common weed in hay-fields and along roadsides from Yarmouth to central Hants Co.; spreading rapidly in Pictou Co., in areas next to Northumberland Strait, and occasionally in C.B., as along roadsides and fields at Judique and north of Inverness. This weed seems to spread rapidly along road-shoulders and in open fields. It is distinguished from caraway by the hairy leaves and stem; the leaflets are also less crowded on the leaf-rhachis. Flowers of plants near Brooklyn, Hants Co., show a reddish tinge throughout. July-Sept.

Introduced from Eu., throughout N.Amer.

88. CORNACEAE DOGWOOD FAMILY

Shrubs and herbaceous plants with entire leaves that have only a few main veins curving inward toward the tip of the leaf; flowers small and very numerous in rather flat-topped inflorescences; petals 4, stamens 4, and ovary inferior forming a berry-like fruit. Various species are often grown as ornamental shrubs because of their bright red or yellow stems. Fig. 108.

1. CORNUS L. DOGWOOD

a. Low herbs, the flowers in a head surrounded by a 4-leaved white petaloid involucre.
  b. Leaves more or less whorled near the top of the stem; flowers (not the involucral bracts) greenish-white; lateral veins arising from the midrib of the leaf. 1. *C. canadensis*
  b. Leaves all opposite; flowers deep violet; lateral veins arising at the base of the leaf. 2. *C. suecica*
a. Shrubs.
  c. Leaves opposite.
    d. Leaves ovate to lanceolate with appressed hairs beneath, or smooth; branches not normally speckled, bright red the first year; berries white. 3. *C. stolonifera*
    d. Leaves oval, thinly woolly beneath, with 7-9 pairs of veins; branches rather pale, speckled or streaked with purple; berries light blue or almost white. 4. *C. rugosa*
  c. Leaves alternate, clustered toward the ends of the twigs; berries deep blue; stems yellow. 5. *C. alternifolia*

1. **C. canadensis** L. Fig. 108. BUNCHBERRY

Common throughout; heaths, barrens, woodland pioneer, edges of thickets, mature bogs, sometimes a weed. June. The number of leaves and their placement vary but this does not seem to have much significance. Lepage (1946) has described a number of forms, some found in N. S. Forma **ramosa** Lepage, the plant branched and with each branch bearing one whorl of leaves; Arichat, Richmond Co. Forma **intraverticillata** Lepage carries a second whorl of 4-6 leaves lower on the stem under the normal whorl: Bridgewater. Forma **medioloides** Lepage has a second whorl of 3-6 leaves on a prolongation of the stem: Arichat, Isle Madame. Forma **elongata** Peck carries several pairs of opposite leaves on a prolongation of the stem above the normal whorl: Lily L., Sandy Cove, Digby Co. Forma **purpurascens** (M. & T.) Hara has the broad, usually white, bracts roseate throughout; found by J. S. Erskine at Pembroke L., Inverness Co., in 1967.

Lab. to Alaska south to N.C., W.Va. and Calif.

2. **C. suecica** L.

Sphagnous depressions in barrens, St. Paul I.; gravelly shore at Canso, growing with *Empetrum nigrum* (Rousseau, 1938-a). This plant

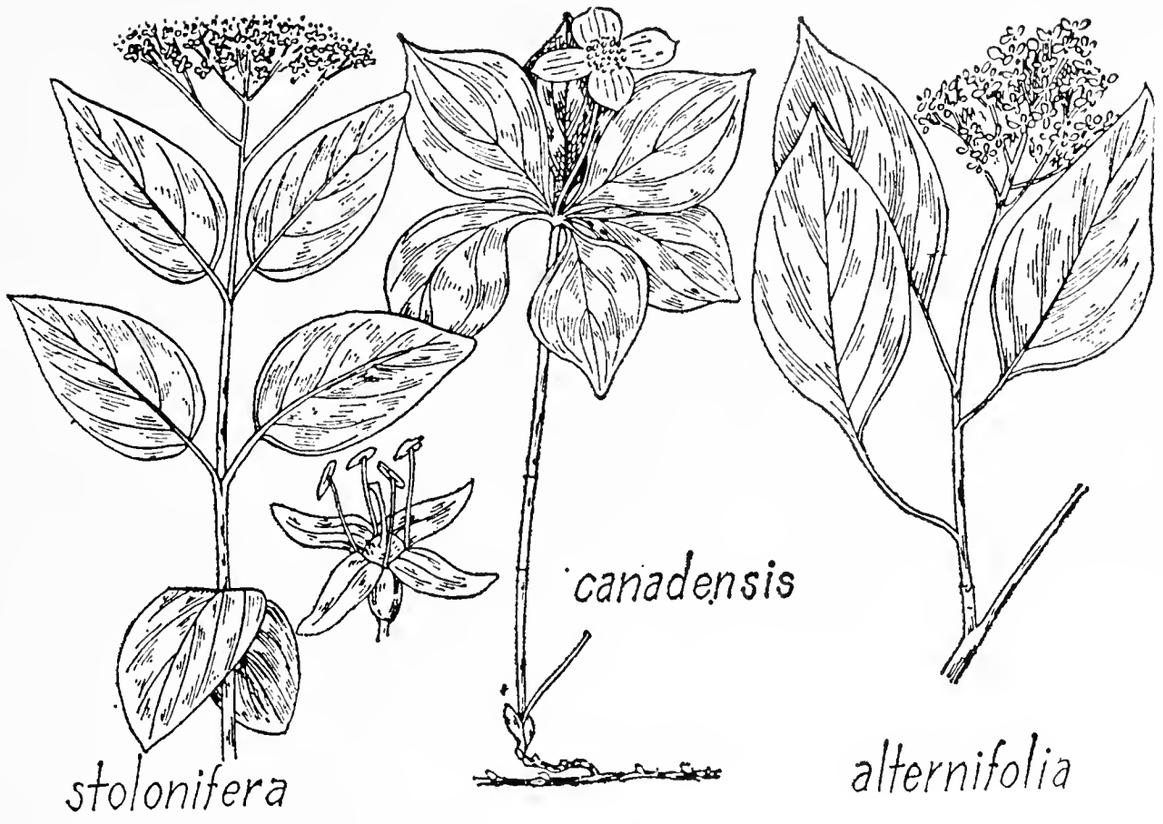


Fig. 108.—**Cornus spp.** x $\frac{1}{3}$.

was also discovered in C.B. Co.: abundant colonies on dry exposed headland, south-east of N.W. Cove, Scatari I.; very abundant on dry exposed sea-cliff, two miles north of N.W. Cove, Scatari. Although growing in abundance and in association with *C. canadensis* L., the hybrid *X. C. unalaschkensis* Ledeb. was not found (Smith and Schofield, 1952).

Greenland and Nfld. south around the Gulf St. Lawrence; Eurasia.

3. **C. stolonifera** Michx. Fig. 108. Map 411. RED OSIER DOGWOOD

Annapolis Co. and common from Kings Co. to C.B.; edges of intervales, brook-sides and wet meadows, June. The bright-red stems are very conspicuous in early spring and may be seen in the ditches along roadsides near Windsor and Truro. It is most common in rich and alkaline soils. It is absent from the southwestern and Atlantic areas of the Province.

Lab. to Yukon south to Va. and Calif.

4. **C. rugosa** Lam. Map 412. ROUND-LEAVED DOGWOOD

Open woods, ravines and talus of cliffs; in nearly neutral or alkaline areas. It is always found near the gypsum areas; common on the slope of Cape Blomidon on the basic trap rock; scattered elsewhere in the northern area from Annapolis Co. to northern C.B., preferring rocky locations. Early July. The range of this species is even more restricted than is the last; it is absent from southwestern N.S. and all along the Atlantic side.

N.S. to Man. south to Va., Ill. and Iowa.

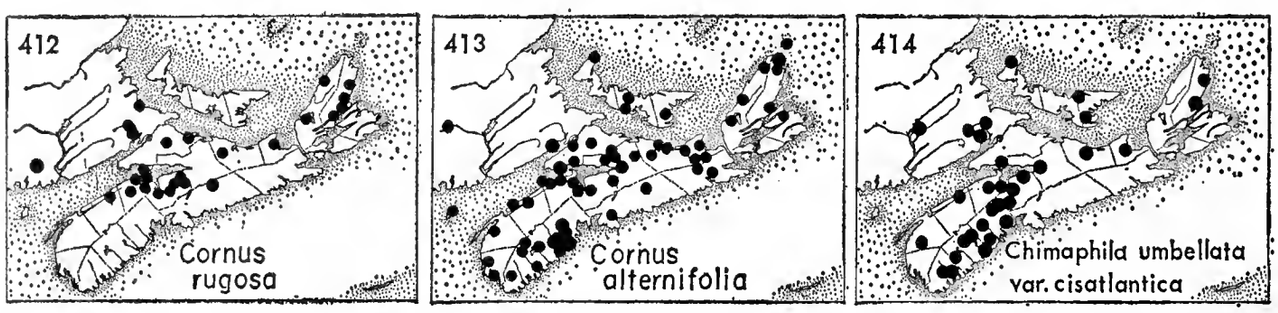
5. **C. alternifolia** L.f. Fig. 108. Map 413. ALTERNATE-LEAVED DOGWOOD

Common from northern Digby Co. to northern C.B., where Nichols reports it as scattered in the climax forest; rare to scattered elsewhere throughout. This species is more of a woodland plant and it is found in rich woods, on ravine slopes and edges of intervales. June15-July15.

Nfld. to Man. south to Fla. and Ark.

X **C. acadiensis** Fern. (Fernald, 1941).

This hybrid is intermediate between *C. alternifolia* and *C. stolonifera*, has the leaves crowded near the tips of the branches as in *C. alternifolia*, but opposite and more like the outline of those of *C. stolonifera;* with small cymes and fleshy blue berries. This is known only from C.B. and was first reported as *C. amomum* from a cold brook at the head of Baddeck Bay (Fernald, 1921).



89. PYROLACEAE WINTERGREEN FAMILY

This small family of the northern hemisphere, consisting of about 8 genera and 35 species, is often included as a subfamily of the *Ericaceae*. The flower-parts are in 5's with the petals separate or barely united; stamens 1-10; and the ovary superior. Herbaceous plants with thick, evergreen leaves; or else non-green saprophytes.

a. Plants with green leaves which are, or tend to be, in a basal rosette; pollen-grains in 4's.
  b. Leaves scattered on the stem, lanceolate; flowers in a terminal short inflorescence; styles very short (Fig. 109,c). 1. *Chimaphila*
  b. Leaves mostly basal, almost round; flowers solitary, or in an erect narrow raceme; style elongate and conspicuous.
    c. Flowers solitary (Fig. 109,d). 2. *Moneses*
    c. Flowers numerous in a raceme (Fig. 109,f-k). 3. *Pyrola*
a. Plants saprophytic, without green color; pollen-grains separate; anthers opening by slits instead of pores. 4. *Monotropa*

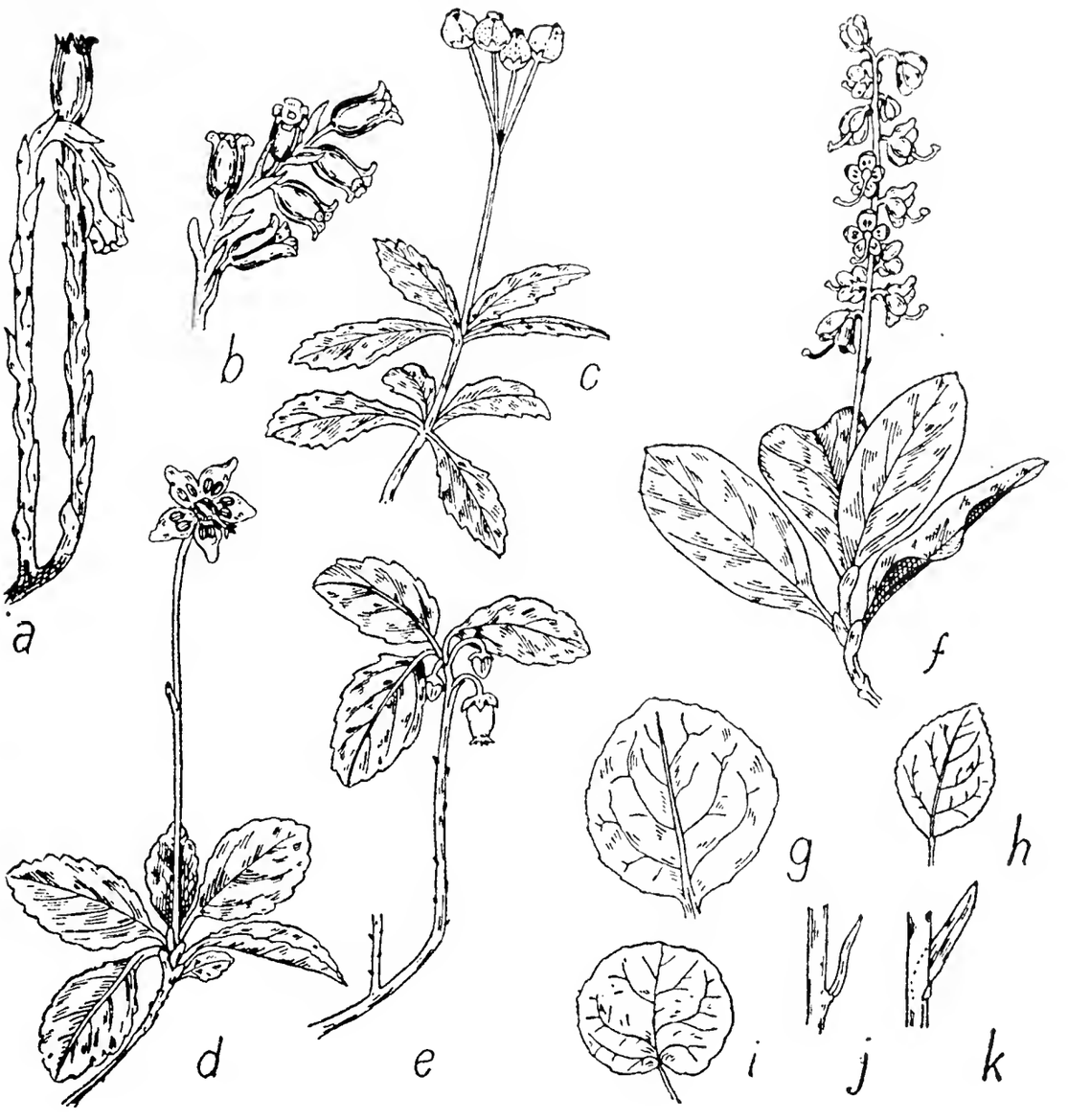


Fig. 109.—**Monotropa:** (a) *M. uniflora* x $\frac{1}{3}$, (b) *M. Hypopitys*, inflorescence x $\frac{1}{3}$. — **Chimaphila:** (c) *C. umbellata* x $\frac{1}{3}$. — **Moneses:** (d) *M. uniflora* x $\frac{1}{3}$. — **Gaultheria:** (e) *G. procumbens* x $\frac{1}{2}$.. — **Pyrola:** (f) *P. elliptica* x $\frac{1}{3}$, (j) bract on stem x 3, (g) *P. rotundifolia* var. *americana*, leaf x $\frac{1}{3}$, (k) bract on stem x 3, (h) *P. secunda*, leaf x $\frac{1}{3}$, (i) *P. asarifolia*, leaf x $\frac{1}{3}$.

1. **CHIMAPHILA** Pursh

1. **C. umbellata** (L.) Bart., var. **cisatlantica** Blake. Fig. 109,c. Map 414. PRINCE'S-PINE

Scattered to rather rare in the western part; very rare in Antigonish and northern Victoria Co.; in dryish soil or sometimes in spruce or fir woods. The flowers are flesh-colored with violet anthers; but the plants are often found non-flowering. Typically Eurasian; the variety occurs on this side of the Atlantic. Mid-July.

Nfld. and N.S. to B.C. south to Ga.

2. **MONESES** Salisb.

1. **M. uniflora** (L.) Gray. Fig. 109,d. Map 415. ONE-FLOWERED SHINLEAF

Found throughout, often rather rare; deciduous or more often in mixed and sometimes in coniferous woods; characteristic of both hardwoods and coniferous forests in northern C.B. The flowers are a waxy-white, with the 10 stamens lying against the petals. Var. **reticulata** (Nutt.) Blake is a western form which has been reported once in eastern America: St. Paul I., northern C.B. This form has the leaves more ovate, usually acute, coarsely dentate and strongly veined (See Porsild, 1939). This record is of doubtful value. June 20-July 20.

Lab. to Alaska south to Penn. and Minn.: Eurasia.

3. **PYROLA** L. WINTERGREEN, SHINLEAF

These are typical plants of barrens, bush and open woods, often on acid soils. They are rarely abundant but one or more species usually occur in most dryish habitats.

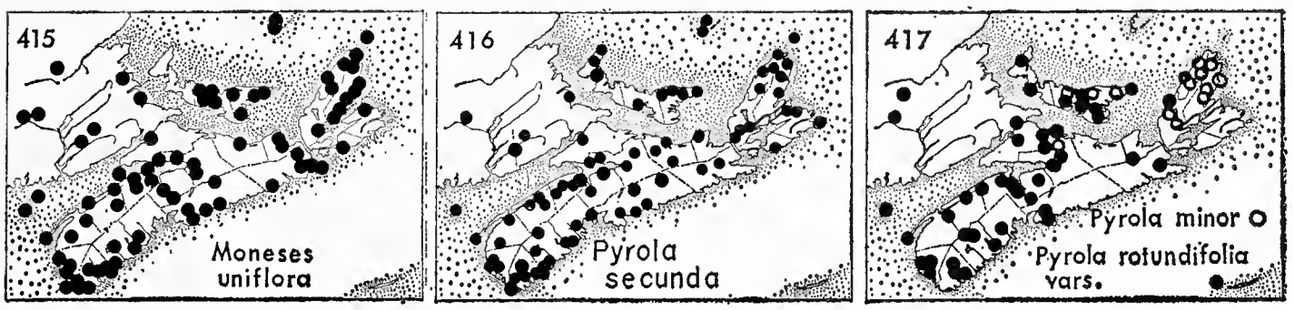
a. Styles and stamens straight, extending outward; the stamens surrounding the style; petals touching each other, forming a tube.
  b. Style longer than the petals; flowers forming a one-sided raceme; bracts at base base of the stem 2-4 mm long, often absent, distinct from the leaves.
    c. Flowers 7-15, in a long raceme; leaves narrowed to a pointed tip, 1.5-6 cm long; stem leafy, elongated and trailing. 1. *P. secunda*
    c. Flowers 3-8, clustered; leaves rounded at the tip, 0.8-3 cm long; stem short with few leaves. P. *secunda* var. *obtusata*
  b. Style shorter than the petals; flowers placed all around the axis of the raceme; the bracts intermingled with the leaves at the base, crowded, usually 1 cm long or longer, often grading into the leaves. 2. *P. minor*
a. Styles and stamens bent downward with the tips upwardly curved; stamens not surrounding the style; petals wide and spreading so that the flower is saucer-shaped.
  d. Bracts on the stem none or 1-3, narrowly lanceolate and long-tipped, not sheathing at their base; sepals little or not at all longer than broad (Fig. 109,j).
    e. Blades of the leaves almost round, 1-3 cm long, shorter than the petioles; anthers with a neck or point; basal bracts 2-4 mm long, distinct from the leaves, acute to acuminate.
      f. Leaves rounded at the base and apex, 1.5-3.4 cm wide, 4-11 in a rosette. 3. *P. virens*
      f. Leaves wedge-shaped at the base and squarish at the apex, 0.7-2.5 cm wide, 0-7 in a rosette. *P. virens* forma *paucifolia*
    e. Blades of the leaves oval, 3-8 cm long, longer than the petioles; anthers blunt; bracts mixed with the leaves at the base, numerous, usually 1 cm long, often grading into the leaves, obtuse to truncate. 4. *P. elliptica*
  d. Bracts on the stem 1-5, ovate-lanceolate, their bases somewhat sheathing the stem (Fig. 109,k); sepals at least a half longer than wide.
    g. Sepals oblong, blunt or sharp, very variable, twice as long as wide, not overlapping at the base; flowers white, leaves not cordate.
      h. Petals 5-7 mm long; leaf-blades 1.8-5 cm long; raceme 3-12 flowered, 2-9 cm long at flowering time. 5. *P. rotundifolia*

h. Petals 6.5-10.5 mm long; plant larger; leaf-blades 2.5-8 cm long; raceme 5-20-flowered, 2.5-20 cm long at flowering time.
P. rotundifolia var. *americana*

g. Sepals triangular, sharp-pointed, about 1.5 times as long as wide, often slightly overlapping at the base; petals crimson to pale pink, about 5 mm long.

i. Leaves usually as broad or broader than long, cordate to rounded at the base, glossy above. 6. *P. asarifolia*

i. Leaves usually slightly longer than wide, rounded to slightly wedge-shaped at the base, dull above.
P. asarifolia var. *purpurea*



1. **P. secunda** L. Map 416. Fig. 109,h. ONE-SIDED WINTERGREEN

Scattered to common throughout; coniferous or mixed woods and in recently cleared areas. July. Because of its technical characters this species is sometimes placed in a separate genus as *Orthilia secunda* (L.) House. Nfld. to Alaska south to New Eng., Va. and Iowa.

Var. **obtusata** Turcz. is rarer than the species. It was reported by Fernald (1921) from a sphagnous spruce swamp at Hectanooga, Yarmouth Co. and specimens are at Truro from a cool damp wood, Nuttby, Colchester Co. Gleason (1952) considers that this variety is merely a small form growing in dense shade. With much the range of the species.

2. **P. minor** L. Map 417. SMALL WINTERGREEN

Rare in cold woods; characteristic of maturer coniferous woods in northern C.B. (Nichols); scattered west at least to Colchester Co. July-Aug.

Greenland to Alaska south to N.S., New Eng. and Mich.

3. **P. virens** Schweigger. Map 418. GREEN-FLOWERED WINTERGREEN

Dry or sandy woods, generally under conifers but also in mixed or deciduous woods; not found in the extreme southwestern area, scattered from Digby to Hants Co. and common eastward to northern C.B. Forma **paucifolia** Fern. seems to be in the more southern part of the range of the species. Practically all the N.S. collections show rosettes with few, blunt-pointed leaves. July-Aug. (*P. chlorantha* Sw.).

Lab. to Alaska south to Mass., Wisc. and Oreg.

4. **P. elliptica** Nutt. Fig. 109,f. Map 419. SHINLEAF

Common throughout; open woods, roadsides, open pastures and hillsides on light soil. This is probably the most frequently observed species and is easily identified. July-Aug. 10.

Nfld. to B.C. south to Penn., Iowa and N. Mex.

5. **P. rotundifolia** L. Fig. 109,g,k. Map 417. ROUND-LEAVED PYROLA

Dry areas, open pastures, sandy plains and barrens from Yarmouth Co. east at least to Colchester Co. and in southern Antigonish and Guysborough Co. This is the smaller European form that is found in America from Greenland and Nfld. south to e. Que. and N.S. (Var. *arenaria* Mert. & Koch).

Var. **americana** (Sweet) Fern. is scattered on the peninsula; open or rich woods and on hillsides, more common in the central part of the Province. July.

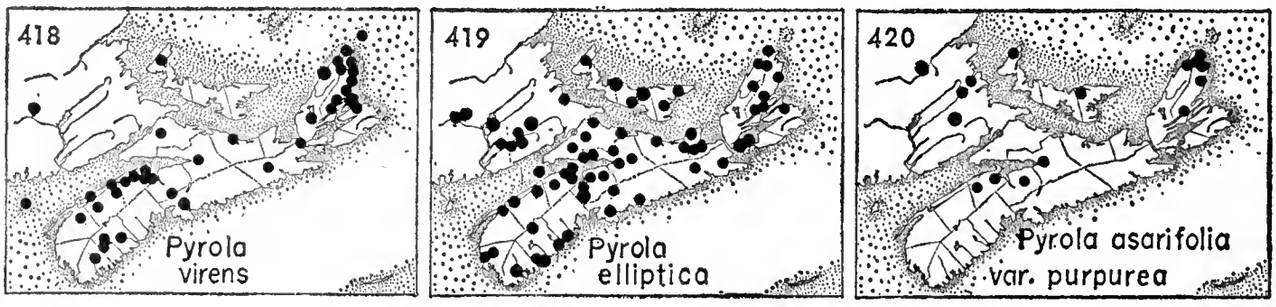
N.S. to Minn. south to N.C., Ky. and Ind.

6. **P. asarifolia** Michx. Fig. 109,i. Map 420.

The differences between the typical and the following variety are slight. Erskine reports typical *P. asarifolia* from rich thickets on the western end of P.E.I. The N.S. plants seem more representative of the variety, with the leaves not cordate at the base. The general ranges of the two varieties are much the same.

Var. **purpurea** (Bunge) Fern. is rare; found in rich hardwoods and along intervales from Bear R., Annapolis Co. to north-central N.S., and in northern C.B. (Var. *incarnata* (Fisch.) Fern.).

Nfld. to Alaska south to New Eng., N.Y., Ind. and Colo.



4. MONOTROPA L.

These unbranched, low herbs are parasitic on roots or saprophytic on decaying organic matter and have lost all green color. The Indian-pipe, with its single recurved flower and pure white plant, is strange in appearance. The Pine-sap is yellowish and darker and thus not so conspicuous. One other related non-green plant has been reported from P.E.I. and may now be extinct there. This is *Pterospora andromedea*

Nutt., a much taller plant with small flowers in an open raceme 1-3 dm long.

a. Flower solitary, white, turning blackish. 1. *M. uniflora*
a. Flowers several, yellowish, usually pubescent. 2. *M. Hypopithys*

1. **M. uniflora** L. Fig. 109, a. Map 421. INDIAN-PIPE

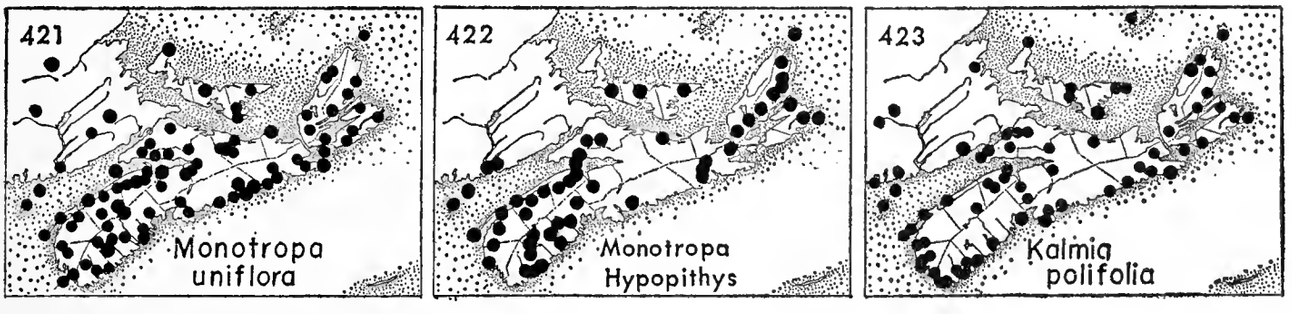
General throughout; thickets, climax or old coniferous forest, sometimes growing in dense shade; and also common in mixed or deciduous growth in leaf-mould. July-Aug.

Lab. to B.C. south to Fla. and Mex.; Asia.

2. **M. Hypopithys** L. Fig. 109,b. Map 422. PINE-SAP

Found throughout but not as abundant as the preceding species and usually in coniferous woods; scattered in pine woods in the Annapolis Valley; in fir and spruce woods eastward; occasionally in older mixed woods. July-Aug. The plants are quite variable and various varieties have been proposed which apparently cannot be maintained. The American plants are sometimes separated from the European ones as var. *americana* (DC) Farw.

Nfld. to Alaska south to Fla. and Mex.



90. ERICACEAE HEATH FAMILY

All the members of this family are low shrubby or woody trailing plants, many with leathery leaves that persist over winter. They are typically plants of acid soils, bogs and woodlands and are very common throughout the Atlantic Provinces. The blueberry and cranberry are common representatives. The flowers have 4-5 petals, usually partly united; with as many or twice as many stamens; pistil one, inferior or superior, forming a berry or capsule. There are about 75 genera and 2,000 species in the family.

a. Leaves 5 mm long or longer, not scale-like.
b. Leaves densely rusty-woolly beneath, the edges strongly inrolled; flowers irregular, white, with petals separate (Fig. 110,b). 1. *Ledum*
b. Leaves greenish or whitish beneath; petals more or less united.

c. Plants erect and shrubby, with wiry woody stems.
d. Ovary superior; fruit a capsule.
e. Leaves with the margins nearly or entirely without teeth; flowers pinkish or flesh-colored.
f. Flowers before the leaves unfold, the corolla funnel-shaped, split irregularly to the base; fruit a capsule 3 times as long as thick; leaves with scattered brownish hairs beneath, glabrous and rugose above.
2. *Rhododendron*
f. Flowers after the leaves appear, the corolla saucer-shaped or bell-shaped, the petals united; fruit almost round; leaves shiny above, whitish beneath or with very short hairs.
g. Flowers saucer-shaped; leaves flat or with the margins very slightly inrolled, white and powdery beneath, the tips blunt (Fig. 110,f).
4. *Kalmia*
g. Flowers vase- or bell-shaped; leaves inrolled so they are nearly linear, finely pubescent beneath with a sharp prickle at the tip (Fig. 110,a).
6. *Andromeda*
e. Leaves with the margins minutely toothed; flowers white, vase-shaped, in a slender arching terminal raceme; the whole plant with a rusty tinge (Fig. 110,d). 7. *Chamaedaphne*
d. Ovary inferior, so that the sepals persist on the tip of the berry-like fruit; flowers vase-shaped; leaves thinner, deciduous in autumn.
h. Berry 10-celled, 10-seeded; leaves resinous-dotted beneath (Fig. 110,e).
12. *Gaylussacia*
h. Berry 5-celled, many seeded: leaves not resinous-dotted beneath; blueberries. 13. *Vaccinium*
c. Plants low, prostrate and trailing, the horizontal branches woody, some genera with erect flowering branches that appear herbaceous.
i. Leaves cordate at the base, 2-3 cm wide, the veins prominent; flowers in late April or early May, tubular, woolly in the throat; mayflower.
8. *Epigaea*
i. Leaves not cordate but tapering to the base.
j. Leaves oval to elliptical, widest at the middle, tapering at the base and with an acute tip; plants with a wintergreen flavor (Fig. 109,e).
9. *Gaultheria*
j. Leaves linear to lanceolate, rarely elliptical, at least twice as long as wide, to 5 mm wide.
k. Leaves opposite, strongly revolute, 3-5 mm long; stems growing in a tangled mat, smooth. 3. *Loiseleuria*
k. Leaves alternate or crowded, flat or only slightly revolute.
l. Young leaves, pedicels and calyces densely brownish-glandular; leaves crowded, linear; flowers purple, 1-several; capsules round, on erect peduncles 2-3 cm long from the top of a branch.
5. *Phyllodoce*
l. Young leaves and pedicels not glandular; leaves not toothed; fruit a berry.
m. Leaves small, 8-12 mm long, mostly rounded at the base, widest at or below the middle; flowers tubular or open at the throat, the parts in 4's. 13. *Vaccinium*
m. Leaves coarse, oblanceolate, widest near the tip and long-tapering to the base, 2-3 cm long; flowers narrowed at the throat, the parts in 5's. 10. *Arctostaphylos*
a. Leaves 1-2 mm long, scale-like, opposite; flowers in elongated racemes, 3-4 mm long, the parts in 4's. 11. *Calluna*

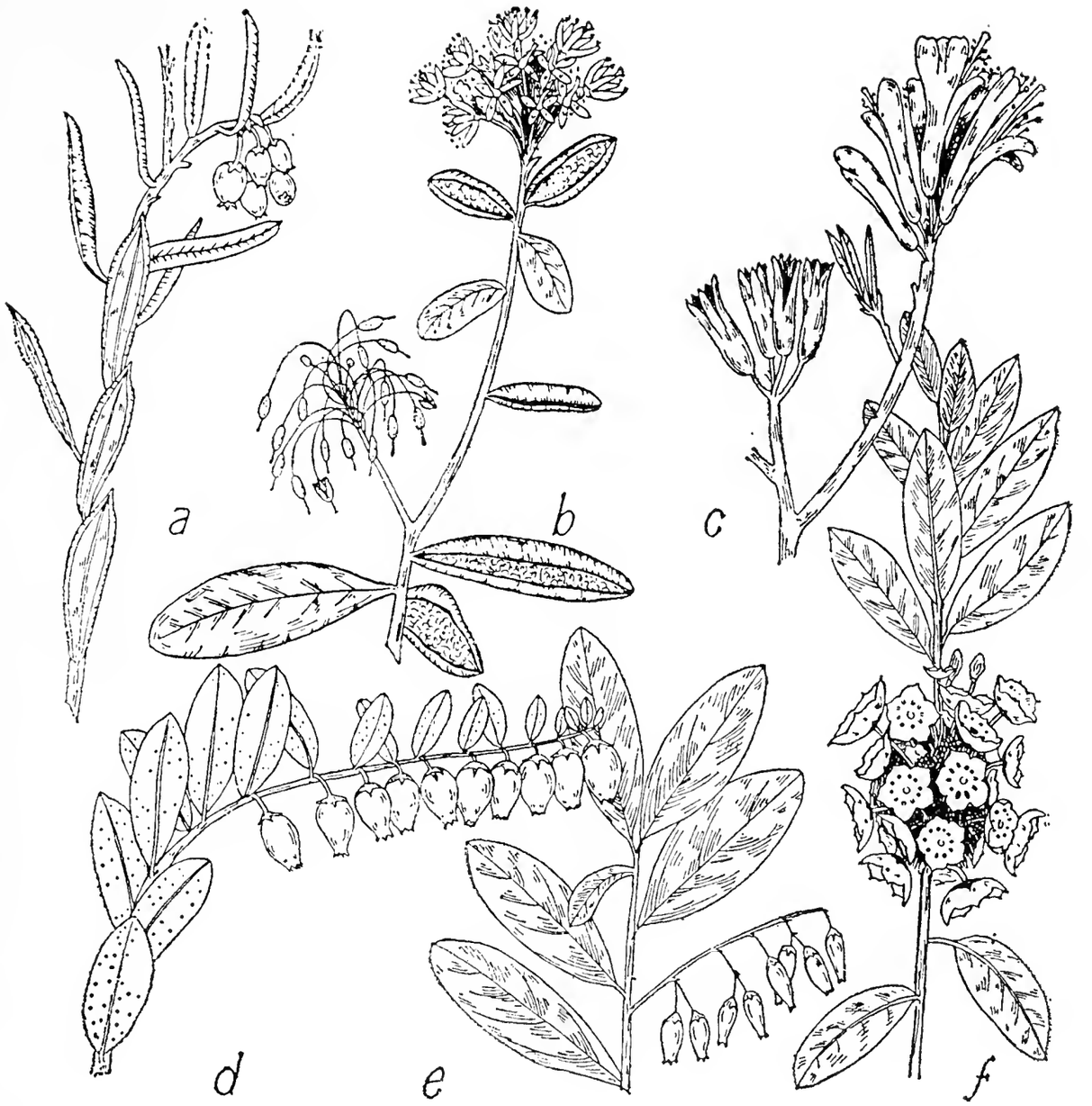


Fig. 110.—**Andromeda:** (a) *A. glaucophylla* x ½. — **Ledum:** (b) *L. groenlandicum* x ½. — **Rhododendron:** (c) *R. canadense* x ½. — **Chamaedaphne:** (d) *C. calyculata* x ½. — **Gaylussacia:** (e) *G. baccata* x ½. — **Kalmia:** (f) *K. angustifolia* x ½.

1. LEDUM L.

1. **L. groenlandicum** Oeder. Fig. 110, b. LABRADOR-TEA

Scattered throughout; bogs, wooded swamps, wet barrens and poorly-drained opens and pastures, not common but usually found as scattered clumps. June 10-30. (**L.** *palustre* L., var. *latifolium* (Jacq.) Michx.).

Arctic Amer. south to Penn., Minn., etc.

2. RHODODENDRON L.

Various species are grown as ornamental plants. The great laurel is of this type, but may possibly now be extinct. The rhodora is sometimes put in a genus of its own or it may be included with *Azalea.*

a. Shrub 2-5 m high; leaves thick and smooth, 8-20 cm long; corolla bell-shaped, 3.5-5 cm wide. 1. *R. maximum*

a. Shrub to 1 m high; leaves thin, deciduous, dull and rugose; corolla 2-lipped, less than 2 cm wide, rose-purple. 2. *R. canadense*

1. **R. maximum** L. GREAT LAUREL

Collected over 70 years ago near Beaver Dam Gold Mines, Sheet Harbour, Halifax Co., and unknown in the Province since that time. Lawson (1875-6) gives an interesting account of the discovery and location of this plant. Some attempts have been made to find it recently but the area is large and the location of the original discovery indefinite. Late June-July.

N.S.; Me. south through the Alleghenies to Ga.

2. **R. canadense** (L.) Torr. Fig. 110,c. RHODORA

Very common throughout; swamps, rocky barrens, poorly-drained soils and in wet pastures and around the edges of bogs. Forma **viridifolium** Fern. has the leaves and twigs lacking the grayish bloom which characterizes the typical variety. Occasionally seen in wet areas in areas in Yarmouth Co. Forma **albiflorum** (Rand & Redf.) Rehd. has white flowers. This is very rare but has been collected near Cambridge in Kings Co. Rhodora is one of our dominant spring-flowering shrubs and large areas may be rose-purple as it comes into flower before the new leaves develop. May 20-June 20.

Nfld. to Que. south to N.J. and Penn.

3. LOISELEURIA Desv.

1. **L. procumbens** (L.) Desv.

Reported by Howe and Lang on dry humus, Kingsport, 1901. This collection may be mislabelled since there is no evidence that the plant grows anywhere near this location. It is common in southern Nfld. and may be expected in C.B.

Mts. of N.H., Me. and Que. to Nfld. and Alaska.

4. KALMIA L.

Showy and readily identified in flower by the saucer-shaped 5-lobed corolla with 10 stamens sunken in depressions in the petals; leaves and stems poisonous to livestock.

a. Leaves smooth beneath, flat; twigs terete; flower-clusters lateral. 1. *K. angustifolia*

a. Leaves finely whitish-pubescent beneath, the edges inrolled; flowers terminal. 2. *K. polifolia*

1. **K. angustifolia** L. Fig. 110,f. SHEEP LAUREL, LAMBKILL

Very common throughout; pastures, barrens, roadsides and open thickets everywhere. It is characteristic of dryish, acid and run-out soils; found also in bogs; one of the worst weeds in blueberry fields where it tends to increase after burning. June 20-early July.

Lab. to Ont. south to Ga. and Mich.

2. **K. polifolia** Wang. Map 423. PALE LAUREL

Scattered in peat bogs throughout; apparently much more common eastward where bog conditions are more often found. This species is more often found as individual plants, rather than in large beds like the sheep laurel, and it is conspicuous only when in flower. Mid-June.

Lab. to Alaska south to Penn., Mich. and Oreg.

5. PHYLLODOCE Salisb.

1. **P. caerulea** (L.) Bab.

Rare in northern C.B., Victoria Co.: abundant locally on steep north-facing cliff slope, Lockhart Brook, Salmon River; an extension from Nfld., Que. and Me. (Smith and Erskine, 1954). See Cody (1953).

Arctic Regions south to the mts. of Me. and N.H.; circumboreal.

6. ANDROMEDA L.

1. **A. glaucophylla** Link Fig. 110,a. Map 424. ANDROMEDA

Peat bogs throughout, except from Kings Co. to central Inverness where cool peat bogs are rare; rather common in its habitat, occurring as individual clumps half sunken in the moss. The plants resemble those of *Kalmia polifolia* but the sharp-pointed leaves serve to identify them. Reports of *A. polifolia* belong here. Early June. (*A. polifolia* L., var. *glaucophylla* (Link) DC).

Lab. to Sask. south to Penn. and Minn.

7. CHAMAEDAPHNE Moench

1. **C. calyculata** (L.) Moench, var. **angustifolia** (Ait.) Rehd. Fig. 110,d. LEATHER LEAF, CASSANDRA

Common throughout, found nearest the center of bogs or marshes and next to the bog-lakes; occasionally found on lake-margins in Sphagnum mats or on the edges of ponds and on poorly-drained, acid soils. May 15-June 10.

There is a single circumboreal species. Our plant is named the variety as distinct from the plants of Eurasia. In the northeast part of the range, and ranging south to N.S. and New Eng. the leaves tend to be wider, about half as broad as long and rounded at the end; the sepals

are broader, ovate and blunt. This is named var. **latifolia** (Ait.) Fern.
Nfld. to Alaska south to Ga., Ind. and Iowa.

8. EPIGAEA L. MAYFLOWER

1. E. repens L., var. glabrifolia Fern. TRAILING ARBUTUS

Rather common; open pastures, hillsides, barrens, open woods and light soils throughout on acid, well-drained soils. April 15-May 15, only occasionally fruiting; flowers white to a deep rose color. The variety is the more-northern form with the leaves becoming glabrous beneath. There is only one other species known, found in eastern Asia.
Lab. to Man. south to Va., N.C. and Tenn.

9. GAULTHERIA L. WINTERGREEN

About 150 species, very numerous in the mountains of S. Amer. The name commemorates Jean-François Gaultier, a naturalist and court physician at Quebec.

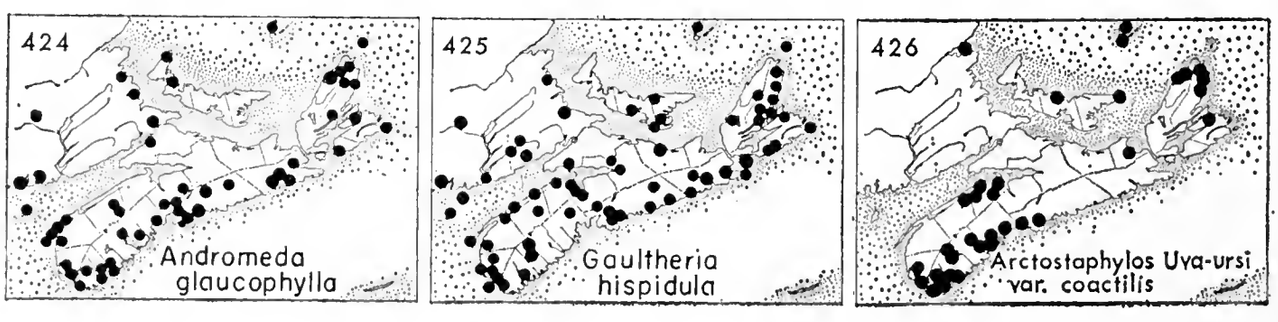
a. Leafy stems erect; leaves 25-35 mm long, reddish-tinged; flowers vase-shaped, the parts in 5's; berries red. 1. *G. procumbens*
a. Leafy stems long-trailing; leaves less than 10 mm long, green; flowers small, the parts in 4's; berries pure white. 2. *G. hispidula*

1. G. procumbens L. Fig. 109,e. TEABERRY, CHECKERBERRY

Very common throughout; woods, barrens, pastures, mostly in the open or nearly so, frequently the common plant of the ground-cover over considerable areas. The berries, leaves and stems have the odor and taste of wintergreen, a characteristic shared to a lesser extent by the following species. Late July-Aug., the berries persisting over winter and distinctive because of their large, fleshy sepals.
Nfld. to Man. south to Ga.

2. G. hispidula (L.) Muhl. Map 425. SNOWBERRY, CAPILLAIRE

Scattered throughout, often abundant on mossy woodland knolls, barrens and mature bogs, and in coniferous woods, growing in moist situations, usually in partial shade. The small oval berries are edible and of excellent flavor. (*Chiogenes* Salisb.) June.
Lab. and Nfld. to B.C. south to N.C.



10. **ARCTOSTAPHYLOS** Adans.

1. **A. Uva-ursi** (L.) Spreng., var. **coactilis** Fern. & Macb. Map 426. BEARBERRY

Common on the sandy barrens of Kings and Annapolis Co.; scattered in dry areas from Yarmouth to Halifax Co.; local in Antigonish Co. and more common in northern C.B. This coarse trailer is local but where it is found it is apt to form considerable patches and a solid cover over the ground. Early June.

Arctic regions south to New Eng., Va. and Colo; Eurasia.

11. **CALLUNA** Salisb.

1. **C. vulgaris** (L.) Hull. LING, HEATHER

Growing in scattered places from Halifax and Pictou to C.B., probably scattered elsewhere and possibly still being planted. All the records known, however, are of early introductions. Aug.

Introduced from Eu.; local, Nfld. to W.Va.

12. **GAYLUSSACIA** HBK. HUCKLEBERRY

The huckleberries are low, freely-branching shrubs forming small clumps and bearing flowers and edible berries much like the blueberries. The yellow-glandular dots on the undersides of the leaves help to identify them.

a. Leaves thick, oval, rounded at the apex with a prominent short point formed by the extension of the midrib; ovary and fruit bristly-hairy. 1. *G. dumosa*

a. Leaves thin, oblong, acute and tapering similarly to both ends; ovary and fruit smooth. 2. *G. baccata*

1. **G. dumosa** (Andr.) T. & G., var. **Bigeloviana** Fern. Map 427. BOG HUCKLEBERRY

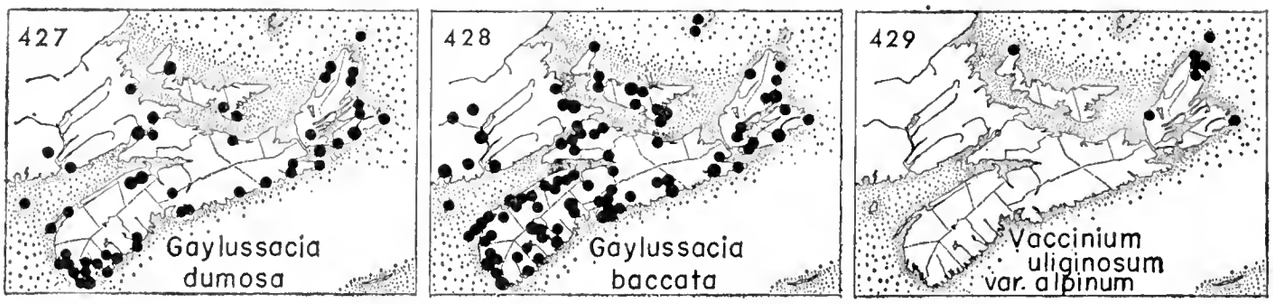
Common in boggy barrens and sphagnous bogs from Yarmouth east along the Atlantic Coast; scattered elsewhere. Early June.

Nfld. south to N.S., N.B. and Va. near the coast.

2. **G. baccata** (Wang.) K. Koch. Fig. 110, e. Map 428. HUCKLEBERRY

Rather general throughout, often common; rocky pastures, barrens and mature bogs, sometimes in light soil or on sand but also in wet soil or on bogs; occasionally seen heavily fruiting, as around Halifax Co. Early June.

Nfld. to Ont. south to Ga. and La.



13. VACCINIUM L. BLUEBERRY, FOXBERRY, CRANBERRY

The genus *Vaccinium* has been divided into a number of subgenera or sections. The cranberries, in particular, are often segregated as the genus *Oxycoccus*. Both our low-bush blueberries and the high-bush *V. corymbosum* are very variable and often difficult to identify exactly. Different clones may vary widely in appearance and hybrids may occur between the different species. See Camp (1944, 1945). Porsild (1938), Hall and Aalders (1961).

a. Corolla vase-shaped to globose, shallowly lobed or toothed; flowers and fruit on short pedicels.
  b. Erect or ascending, woody, much-branched shrubs; fruits blue to black.
    c. Flowers and fruit few in the axils of the leaves or on short, leafy-bracted racemes; anthers bearing a pair of conspicuous awns on the back in addition to the terminal tubules; corolla restricted at the top.
      d. Leaves oval, about 12 mm long, strictly without teeth, leathery and rugose-veined; stems short, stout and much-branched; flowers solitary or 1-3 from axils of the bud-scales, the parts in 4's. 1. *V. uliginosum*
      d. Leaves thinner and larger, toothed at least on the lower part; flower-parts in 5's.
        e. Leaves acute, widely lanceolate, to 25 mm long, sharply serrulate their whole length; plants low. 2. *V. cespitosum*
        e. Leaves elliptical to oval, to 40 mm long, entire or toothed only on the lower part; plant to 1 m high. 3. *V. ovalifolium*
    c. Flowers and fruit in dense terminal or lateral racemes; anthers not awned.
      f. Plants of the low-bush type, seldom over 7 dm high, and usually only 1-4 dm; leaves 2-4 cm long or less; corolla white to rose.
        g. Leaves densely pubescent or downy on both sides, green on both sides, not toothed; twigs densely and finely hairy; fruit with a heavy bloom, light blue. 4. *V. myrtilloides*
        g. Leaves smooth or pubescent only on the midrib beneath, often toothed; twigs hairy only in lines.
          h. Leaves glaucous beneath with a whitish bloom.
            i. Leaves only half as wide as long, nearly entire; twigs not glaucous, green; berries blue with a bloom. 5. *V. vacillans*
            i. Leaves narrow, commonly a third as wide as long; twigs glaucous; berries black. 6. *V. Brittonii*
          h. Leaves bright green on both sides.
            j. Corolla 5-7 mm long; leaves averaging 16.5 mm long and 6 mm wide; common. 7. *V. angustifolium*
            j. Corolla 3-3.5 mm long; leaves averaging 10.6 mm long and 3.6 mm wide; rare and northern. 8. *V. boreale*

f. Tall shrubs, 1-4 m high; leaves 3-8 cm long and 1.5-4 cm wide; corolla white, 6-12 mm long; Halifax to sw. N.S. where it is common.
9. *V. corymbosum*

b. Plant extensively creeping with short, erect branches mostly 5-8 cm high; flowers few, the parts in 4's; berries red with 4 locules (foxberry).
10. *V. Vitis-Idaea*

a. Corolla deeply 4-cleft to below the middle with the lobes recurved; flowers nodding on long, erect filiform pedicels; plants long-trailing on the surface of the ground; fruits red to brownish-dotted, with 4 locules (cranberries).

k. Leaves acute; stem slender and thread-like, not usually growing beyond the flowers and fruit; pedicels with 2 small reddish linear bracts; berry brownish-dotted.

l. Leaves 1-3 mm wide; flowers 1-4; corolla-lobes 5-8 mm long; berry 6-8 mm thick. 11. *V. Oxycoccos*

l. Leaves 3-6.5 mm wide; flowers 2-10; corolla-lobes 6-8 mm long; berry 8-10 mm thick. var. *intermedium*

k. Leaves oblong and blunt; pedicels with wider, green bracts; corolla-lobes 6-10 mm long; berry 10-20 mm thick, red.
12. *V. macrocarpon*

1. **V. uliginosum** L., var. **alpinum** Bigel. Map 429. ALPINE WHORTLEBERRY

Nichols (1918) reports it from the top of Mount Franey, C.B., and says that it is characteristic of the dwarf-shrub heath in northern C.B.; Perry (1931) reports it from the upper slope of a headland, West Point, and South West Light on St. Paul I. Prest (1904-5) says that it is on barrens with blueberries, very rarely in swampy land, and gives no locations. Smith and Erskine (1954) list a number of locations in northern C.B. from high-exposure barrens, bogs, old pastures, and rock outcrops near sea-level where it is rare. The variety is a smaller version of the Eurasian and northwestern American plant.

Circumboreal; ranging south to C.B., northern New Eng., N.Y. and n. Mich.

2. **V. cespitosum** Michx. Map 430. DWARF BILBERRY

Rocky cliffs, Black River in the Gaspereau Valley, Kings Co., where it is abundant on rocky cliffs (Erskine, D.S., 1951); locally abundant in rock crevices, Cheticamp R., Inverness Co. (Smith and Schofield, 1952); ledges and crevices along Indian Brook and old clearings up North R. in Victoria Co.

Lab. to Alaska south to northern New Eng., N.Y. and N. Mich.

3. **V. ovalifolium** Sm. Map 431.

Victoria Co.: shaded banks of Glasgow Brook, near falls; a single but very vigorous colony was seen in ascending Glasgow Brook to its source. This was growing in a sheltered moist location and was in young fruit at the time of collection on July 2. The scraggly bushes reached a height of about one meter (Smith and Schofield, 1952). Also known

from a station covering several acres; shrub under open forest, Lockhart Brook, Salmon River (Smith and Erskine, 1954).

Local; Nfld., Lab. and the Laurentides; n. Ont. to Mich.; Alaska to Oreg.

4. **V. myrtilloides** Michx. CANADA BLUEBERRY

Common throughout; sterile and dry soils, rocky barrens, roadside thickets and open woods, sometimes associated with conifers, and not growing well in open sunlight. The fruit is rather small, with a heavy bloom, and is generally of inferior quality (*V. canadense Kalm*). 2n = 24, according to Aalders and Hall (1962). These authors also discuss the form with white berries.

5. **V. vacillans** Torr.

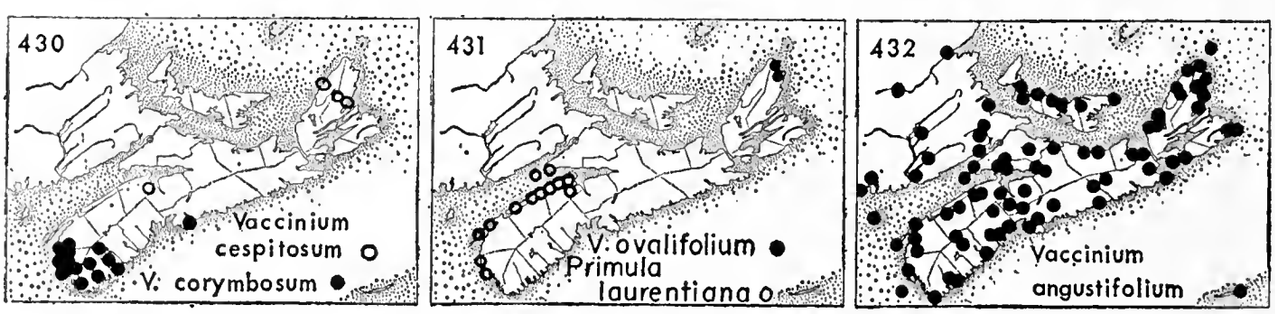
Rare; recorded with doubt by Lindsay from Halifax. It is reported by Fernald (1921) as dominant on the upper border of the cobble-beach of Butler's L., Gavelton, Yarmouth Co. This station is now under water due to the building of a power dam. This area has been little studied recently and the plant should be found elsewhere in the southwestern counties. *V. pallidum* Ait. of earlier records.

Dry open woods and thickets; w. N.S.; s. Me. to Mich. south to Ga. and Mo.

6. **V. Brittonii** Porter

Scattered in the western half of the Province, probably throughout. In the southwestern counties it makes up a considerable part of the blueberry population. It is usually found on light soil and seems to grow in light shade as well as in full sunlight. In the Annapolis Valley it frequently becomes dominant in open second growth on sandy soils. The status of this plant is difficult to evaluate. It does represent an extreme type in our low-bush blueberry population. The chromosome number is tetraploid, 2n = 48, the same as our common blueberry and it is apparently able to cross freely with it.

Nfld. to Minn. south to Penn. and Ill. and the mts. of W.Va.



7. **V. angustifolium** Ait. Map 432.

This tetraploid species is the dominant blueberry of our fields and barrens. It is very variable. Different clones, especially in bloom, show a wide variety of characteristics, and the plants vary considerably

in different environments. Hall and Aalders have concluded that the name *angustifolium* belongs to our common species and that this is the only type found in the cultivated blueberry fields of the Maritimes. Occasionally the leaves may be slightly hairy on the undersides and they suggest that this is due to a cross between *V. angustifolium* and *V. myrtilloides*. Var. **hypolasium** Fern., reported from Nfld. to Va., may be based on this type of material. The species has been known under various names. *V. angustifolium* was first considered a northern plant and our plants were named var. *laevifolium* House. They were later separated as *V. Lamarckii* Camp. If the name *V. angustifolium* applies to our plants, then the diploid northern plants belong to the following species.

Forma **nigrum** (Wood) Boivin, with the leaves greenish beneath but with the berries black and without a bloom, may be considered a hybrid between this species and *V. Brittonii*. It is found mixed with the typical plants and many variations occur. It also occurs over a wide range from Nfld. south to Va. and to Minn.

Forma **leucocarpum** (Deane) Rehd., with white berries, is very rare; reported by Hall and Aalders (1963) from West Brook, Cumberland Co. and East Halls Harbour, Kings Co.

Nfld. to Sask. south to the uplands of Va. and Ohio.

8. **V. boreale** Hall and Aalders

This is a small, much-branched, northern diploid form which grows abundantly on the exposed headlands of Nfld. It is apparently scattered in the northern part of C.B. but the authors state that they have never found it in commercial fields, with the exception of a few in Nfld. It is difficult to separate from the preceding species, since environmental conditions cause the measurements of the two to overlap.

A natural hybrid between this species and *V. myrtilloides* is reported by Hall and Aalders (1962) from a commercial field at Frizzleton, Inverness Co. The two species were growing with *V. angustifolium;* and the hybrid is intermediate between its parents, *i.e.*, intermediate in stem-pubescence and towards *V. boreale* in leaf serration. (*V. angustifolium* var. *integrifolium* Lepage). N.S. and nw. Que.

Nfld. and Lab. to Que. and probably southward in cooler areas.

9. **V. corymbosum** L. Map 430. HIGHBUSH-BLUEBERRY

This species is found in the southwestern counties from Digby around to Halifax: bogs, upland rocky barrens, dry soil and along lake-margins. The plants are very variable, with the progeny from a single bush showing variable combinations as to pubescence, size and bloom of berry, habit of bush, etc. The typical form of the species, with the leaf-margins nearly smooth and the leaves more or less pubescent beneath, is rarely seen: thicket bordering Goven L., Yarmouth Co. Forma **albiflorum** (Hook.) Fern., with toothed leaves and the blades green on

both surfaces, is the commonest form (Var. *amoenum* (Ait.) Gray). This is found in bogs, on lake-margins, thickets, swampy spruce woods and in new clearings. Forma **glabrum** Gray, with the leaves glaucous and nearly or quite glabrous beneath, is much rarer than the preceding form but is occasionally found in wet woods and swampy thickets (Var. *pallidum* (Ait.) Gray). This species will cross with *V. angustifolium* and half-high bushes are frequently found in Yarmouth Co.

N.S. to southern Que. and Wisc. south to Fla. and Tex.

10. **V. Vitis-Idaea** L., var. **minus** Lodd. Map 433. FOXBERRY

Common in any of the cooler regions of the Province; bare headlands, barrens or other exposed situations generally near the sea; occasional on barrens or heaths inland. It is most abundant in Guysborough Co. and C.B. June.

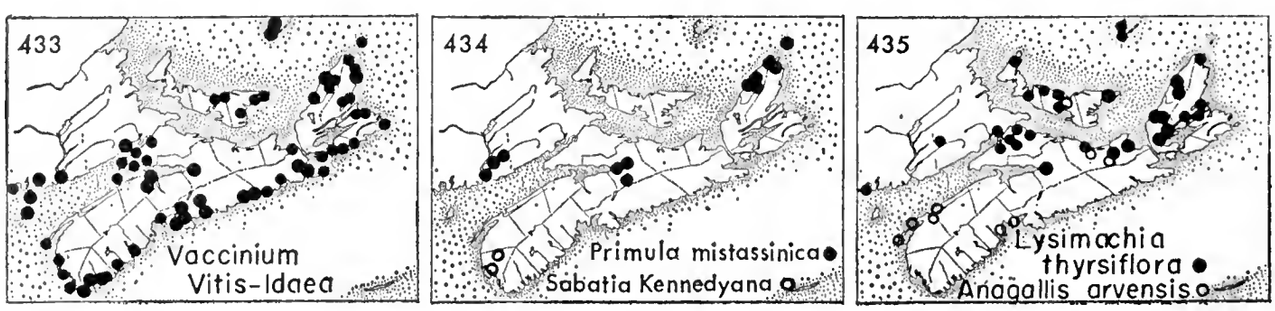
Arctic America south to New Eng., L. Superior and B.C.

11. **V. Oxycoccos** L. SMALL CRANBERRY

Found throughout; in moderately wet, open bogs or poorly-drained swamps, almost always associated with *Sphagnum* moss since the plants are sensitive to the amount of water present. It is most abundant on lake-margins of the Atlantic coastal regions and in C.B. June 20-July 15. Arctic Amer. south to Va. and Wisc.

Var. **ovalifolium** Michx. is rare; spruce bog at Yarmouth, collected by Bissell and Long; edge of cliffs on St. Paul I., C.B. Found throughout with much the same range as the species.

This species is a tetraploid hybrid of two diploid species, the following one and *V. microcarpum* of Eu. and northwestern N. Amer. Camp considers that all the varieties should be placed in one variable species, *Oxycoccus quadripetalus* Gilib., with the different variations in leaf size and width being due to genetic segregation and to be expected throughout the range. In general, the leaves of our plants are rather small and these plants are sometimes designated var. *microphyllum* (Lange) Rouss. & Raym., taking the large form as the species.



12. **V. macrocarpon** Ait. LARGE CRANBERRY

Frequent to abundant in meadows, along brooks, on *Sphagnum* mats around lakes, in poorly-drained swamps, or bogs, in meadows covered by spring tides, and often growing into dryish fields or along the

edges of salt marshes and wet areas back of the beaches. On Sable Is. it is very abundant in most of the dune hollows. (*Oxycoccus macrocarpus* (Ait.) Pers.). Introduced forms are cultivated in the commercial cranberry bogs. Mid-July.

Nfld. to Minn. south to New Eng., N.C. and Ohio.

91. DIAPENSIACEAE

1. DIAPENSIA L.

1. **D. lapponica** L.

A densely-tufted plant with a tuft of green narrow leaves at the end of each branch, with the lower part of the short stems covered by the persistent dead leaves. The white flowers are borne singly on peduncles about 3 cm long. Victoria Co.: frequent in clumps on projecting shoulders and in crevices of steep north-facing cliff-slope, Lockhart Brook, Salmon R. (Smith and Erskine, 1954). Early July.

Arctic regions south to mts. of New Eng. and N.Y.; Eurasia.

92. PRIMULACEAE PRIMROSE FAMILY

Annual and perennial herbs with simple leaves without stipules. The flowers are regular with the parts in 5's; ovary superior or nearly so; petals joined (absent in *Glaux*, which has petaloid sepals) with the corolla-tube very short; stamens 5, opposite the lobes of the petals; fruit a capsule. More than 1000 species, with many in Asia.

a. Plants low; leaves smooth to mealy beneath, in a basal rosette; flowers in a terminal umbel (Fig. 111,b). 1. *Primula*

a. Plant with a leafy stem; leaves not mealy beneath; flowers rarely or scarcely in umbels.

b. Leaves opposite or whorled.

c. Flowers yellow, 1-2 cm wide; leaves numerous, scattered; plants erect, 2-8 dm high, except for one trailing species (Fig. 111,c-g). 2. *Lysimachia*

c. Flowers scarlet, pinkish, lavender or white.

d. Leaves in a single whorl at the top of the stem; plant 10-15 cm high; flowers white (Fig. 113,b). 3. *Trientalis*

d. Leaves in numerous whorls or pairs; plants low or trailing.

e. Plants erect, 0.5-2 dm high, with oblong thickish leaves; flowers 3 mm wide, without petals; seacoast (Fig. 113,a). 6. *Glaux*

e. Plants trailing, with acute thin elliptic leaves; flowers 10-12 mm wide, usually scarlet; capsule circumscissile with the top falling off like a lid. 4. *Anagallis*

b. Leaves alternate; plants rare; flowers never yellow, 1-3 mm wide.

f. Flowers stalked in erect racemes, white; ovary joined at the base to the base of the calyx. 7. *Samolus*

f. Flowers small, sessile in the axils of the leaves, pinkish; ovary wholly separate from the calyx. 5. *Centunculus*

1. PRIMULA L. PRIMROSE

Most of the Primulas inhabit the mountains of central Asia; and a number are cultivated. Our two native species are both rare The chromosome number of *P. mistassinica*, from C.B. material determined by Vogelmann is 2n = 18. The number for *P. laurentiana* from Que. and Nfld., and probably for N.S., is 2n = 36, or more often 72 (Vogelmann, 1960).

a. Plant glabrous; flowers white to pale lilac; calyx less than 7 mm long, close-fitting.
  b. Leaves mealy-whitened beneath; plant 1.4-5 dm high, with leaves 2.5-10 cm long; capsule 9-12 mm long. 1. *P. laurentiana*
  b. Leaves scarcely or not mealy beneath; plant 0.5-2 dm high, with leaves 1-4 cm long; capsule 5-8 mm long. 2. *P. mistassinica*
a. Plant soft-hairy; flowers deep yellow or rarely purplish; calyx more than 10 mm long. 3. *P. veris*

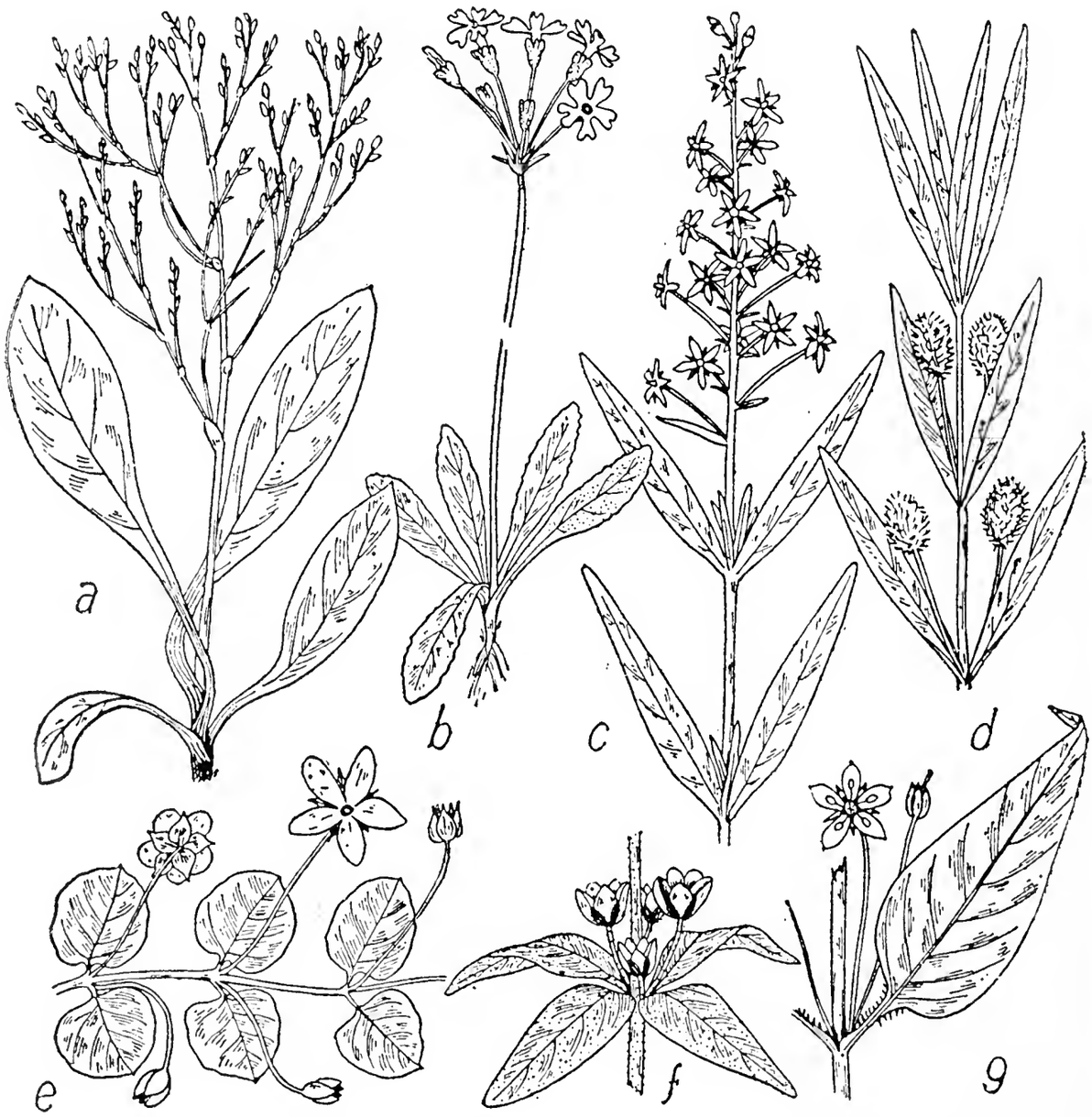


Fig. 111.—**Limonium**: (a) *L. Nashii* x $\frac{1}{4}$. — **Primula**: (b) *P. laurentiana* x $\frac{1}{3}$. —**Lysimachia**: (c) *L. terrestris*, top of plant x $\frac{1}{3}$, (d) *L. thrysiflora* x $\frac{1}{3}$, (e) *L. Nummularia* x $\frac{1}{2}$, (f) *L. punctata* x $\frac{1}{3}$, (g) *L. ciliata* x $\frac{1}{3}$.

1. **P. laurentiana** Fern. Fig. 111,b. Map 431. PRIMROSE

Scattered along the Bay of Fundy on dripping cliffs and basaltic headlands; not known from the northern part of the Province. Late June. Fernald states it is found chiefly on calcareous areas and this may account partly for the limited distribution in N.S.

S. Lab., Nfld. and Ont. to N.S. and eastern Me.

2. **P. mistassinica** Michx. Map 434.

Springy bank of streams and dripping ledges; above Truro on a bank of the Salmon R. where it is locally common; Upper Stewiacke; and scattered in northern C.B., on gypsum banks at Cape North and on St. Paul I.

Lab. to Alaska south to N.S., n. Vt., Wisc. and Iowa.

3. **P. veris** L. COWSLIP

Commonly found as an ornamental in old gardens and about dwellings but gradually disappearing; reported by Macoun as well-established in meadows about a mile inland from North Sydney, as *P. officinalis* L. Introduced from Eu. and occasionally escaped, from N.S. to Conn.

2. LYSIMACHIA L. LOOSESTRIFE

About 140 species mostly of central Asia, ours all with yellow flowers and the corolla often marked with dark dots or lines. Two species are often placed in separate genera. *L. ciliata* L. becomes *Steironema ciliatum* (L.) Raf.; and *L. thyrsiflora* becomes *Naumburgia thyrsiflora* (L.) Duby.

a. Flowers with stamens having the filaments united to the level of the top of the ovary; leaves with the margins of the petioles not ciliate; flowers 1 cm or more wide, numerous.
  b. Plant usually densely glandular-pubescent; flowers large and showy, the petals wide, yellow and not dotted or lined; garden escapes, 1 m or more tall.
    c. Calyx 4-5 mm long, with dark margin; flowers 1.5-2 cm wide, in terminal leafy panicles, the corolla-lobes entire. 1. *L. vulgaris*
    c. Calyx 7-10 mm long, green; flowers whorled in the axils of the upper leaves; corolla-lobes glandular-ciliate. 2. *L. punctata*
  b. Plant not glandular-pubescent; petals dotted or marked with black or reddish lines.
    d. Plant erect; inflorescence a terminal raceme 0.5-2 dm long; native to wet habitats. 3. *L. terrestris*
    d. Plant long-trailing; flowers large, cup-shaped, scattered in 1's or 2's in the axils of the leaves; garden escape. 4. *L. Nummularia*
a. Flowers with the stamens all separate.
  e. Flowers very small, the parts often in 6's, crowded into dense, long-stalked, oval heads in the axils of the middle leaves; petals linear; petioles not ciliate. 5. *L. thrysiflora*

e. Flowers large, solitary or in groups of several with long pedicels from the axils of the upper leaves; petioles of the leaves narrowly winged, the two edges fringed with hairs; flowers with 5 slender sterile stamens between the anther-bearing ones. 6. *L. ciliata*

1. **L. vulgaris** L. GARDEN-LOOSESTRIFE

Occasional about gardens or as an escape; about Pictou and occasionally elsewhere. July-Sept.

Introduced from Eu.; N.S. and P.E.I. to Ont. south to Md.

2. **L. punctata** L. Fig. 111,f. FRINGED LOOSESTRIFE, GOLDEN-CUP

This garden plant is thoroughly naturalized along roadsides and at the edge of marshes in many parts of the Province; common about Truro and often seen elsewhere, growing in large clumps or patches. July-Aug. 15. Our form may be designated var. *verticillata* (Bieb) Boiss.

Naturalized from Eu.; Nfld. to Ill. south to Penn.

3. **L. terrestris** (L.)BSP. Fig. 111,c. LOOSESTRIFE

Common throughout; boggy thickets, meadows, ditches and marshes, one of our common yellow-flowered summer plants. July.

Nfld. to Minn. south to Ga., Ky. and Iowa.

4. **L. Nummularia** L. Fig. 111,e. MONEYWORT

Occasional, at least from Yarmouth to Truro and probably throughout the settled areas. This garden escape is found mostly near gardens, where it is often grown, or in wet fields and meadows near habitations. July.

Introduced from Eu.; Nfld. to Ont. south to Ga., Mo. and Kans.

5. **L. thrysiflora** L. Fig. 111,d. Map 435. WATER LOOSESTRIFE

Swamps, along brooks or growing into shallow water in muck, and edges of alkaline ponds; common in marshes about Truro and scattered north in Cumberland Co.; near James R. in Antigonish Co.; and now known to northern C.B.: Baddeck Forks, South Side Boularderie, Cheticamp and Bay St. Lawrence (Smith 1959) June 15-July.

A hybrid between this species and *L. terrestris* and intermediate between them has been named X *L. commixta* Fern. (Fernald, 1950-c). At its stations it is said to occur in extensive colonies. Reported from North L., Kings Co., P.E.I., and to be expected in N.S. where the two species occur together.

Que. to James Bay and Alaska south to Penn., Ohio and Calif.

6. **L. ciliata** L. Fig. 111,g. Map 436. FRINGED LOOSESTRIFE

Low, damp ground and wet thickets; rare in the southwestern part of the Province, scattered to Halifax and Cumberland Co.; rather common in the Annapolis Valley; common south of Truro, and to Antigonish Co., often abundant where found. Late July.

N.S. to B.C. south to Fla. and Texas.

3. TRIENTALIS L.

1. **T. borealis** Raf. Fig. 113,b. STAR-FLOWER

Coniferous or hardwood forests, and a forest pioneer; rather common throughout and one of the better-known woodland plants. The single whorl of thin leaves and the white, star-like flowers make it easily identified. Mid-June.

Lab. to B.C. south to Va. and Ill.

4. ANAGALLIS L.

1. **A. arvensis** L. Map 435. COMMON PIMPERNEL, POOR-MAN'S WEATHER-GLASS

Sandy beaches, fields and waste places; scattered from Digby Neck and Annapolis Co.; Lunenburg Co.; and in Pictou Co. and probably elsewhere on sandy moist soils, or along river sands. Late summer and early fall.

Naturalized from Eu.; Nfld. to Fla. west to the Pacific.

5. CENTUNCULUS L.

1. **C. minimus** L. CHAFFWEED

The only record for N.S. is that of St. John from Sable I.; locally found on bare sand flats which are occasionally flooded by the sea. The P.E.I. record was based on a mis-identification (Erskine).

Fla. to Tex. and Calif. north to Del., Que. and N.S.; Eu.

6. GLAUX L. SEA-MILKWORT

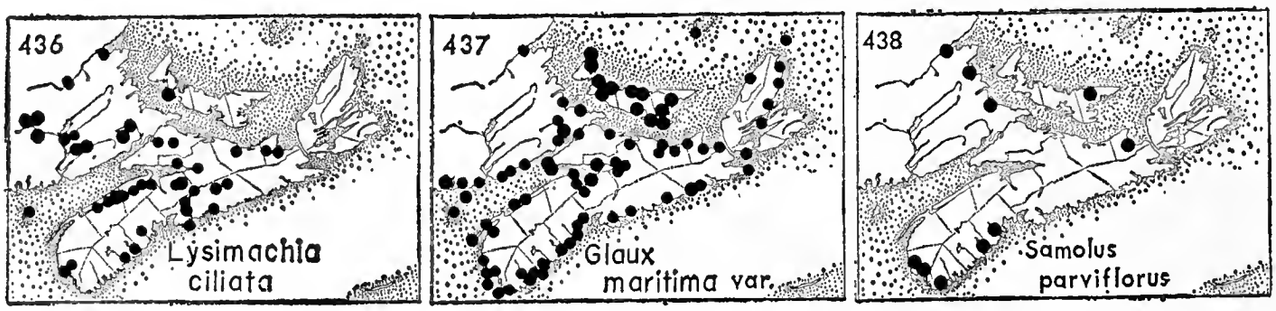
A low, seashore plant with thick, fleshy opposite leaves and pinkish flowers in their axils; corolla absent but the sepals petaloid, the stamens therefore alternate with its lobes.

1. **G. maritima** L., var. **obtusifolia** Fern. Fig. 113,a. Map 437. SEA-MILKWORT

Common around the coast in salt meadows, behind sandy shores or near the upper limits of the dykelands, sometimes abundant in low damper areas.

Occasionally much-branched prostrate plants and erect simple plants grow together and the difference between the two is conspicuous. The species is circumboreal and three varieties have been described from N. Amer. Our prostrate form has been ascribed to the typical European variety but it is dubious whether this should be done, although introductions may possibly occur. June 15-July 20.

Nfld. to Ont. south to N.J.



7. SAMOLUS L.

1. **S. parviflorus** Raf. Map 438. WATER PIMPERNEL, BROOKWEED

Rather rare; brackish meadows, tidal banks and edges of salt marshes from the Tusket R. in Yarmouth to Bridgewater; Antigonish; and brackish shore in eastern P.E.I. July-Sept.

Fla. to Calif. north to N.S. and Ont.

93. PLUMBAGINACEAE LEADWORT FAMILY

1. LIMONIUM Mill. SEA-LAVENDER, MARSH-ROSEMARY

1. **L. Nashii** Small. Fig. 111,a. Map 439. SEA-LAVENDER

This is one of the characteristic plants of our salt marshes where the wide corymbs of small, bluish papery flowers are a common and conspicuous feature. Salt marshes and around seashores; common on the marshes about the head of the Bay of Fundy; an early pioneer on salt marshes in northern C.B.; scattered elsewhere and rarer eastward. July 20-Sept.

The northern plants have the calyx stiff-hairy, at least on the angles, to half way up its length. These have been named var. *trichogonum* Blake. In southwestern N.S. the plants are less strigose and in some cases have only a few hairs towards the base of the calyx. These may be placed in the typical variety. Further south occurs the very similar *L. carolinianum* with the calyx glabrous.

Salt marshes Fla. to Tex. north to Nfld. and the lower St. Lawrence R.

94. OLEACEAE OLIVE FAMILY

Trees or shrubs with opposite leaves; ovary superior, stamens ordinarily 2.

a. Leaves compound; trees; flowers individually very small and with the corolla absent, usually unisexual. 1. *Fraxinus*
a. Leaves simple; shrubs; flowers showy in terminal clusters, with the corolla 4-lobed; lilac. 2. *Syringa*

1. FRAXINUS L. ASH

Trees; flowers in large inflorescences; fruit a one-seeded samara with a terminal flattened wing. The ash and maple are our only opposite-leaved trees. The species are often difficult to determine without fruit because the leaves are quite variable. See Miller (1955).

a. Samara with a terete body and flat wing; calyx present, persistent at the base of the fruit; flowers either staminate or pistillate.
b. Wing of fruit terminal or only slightly decurrent, the body usually over 3 cm long and 3 mm thick; leaflets definitely short-petioled, oblong to ovate, often rounded at the base, glaucous beneath, teeth often obscure or only on the upper half of the leaflets; twigs and petioles glabrous; terminal bud obtuse. 1. *F. americana*
b. Wing of fruit decurrent to about half-way down the body; the body rarely more than 2 mm thick; leaflets broadly lanceolate with their stalks decurrent to the base, usually plainly toothed, not glaucous beneath; terminal bud acute. 2. *F. pennsylvanica*
a. Samara with a flat body little thicker than the wing, about 3 cm long; calyx absent or deciduous.
c. Leaflets sessile, rounded at the base, with the midribs densely brownish-hairy near the base, and at the axil of each leaflet. 3. *F. nigra*
c. Leaflets tapering to the base on short, winged petiolule; midribs slightly pubescent only. 4. *F. excelsior*

1. **F. americana** L. Fig. 112, a. WHITE ASH

Throughout; rather common in the center of the Province; intervale forests; low ground and open woods. Late May.

N.S. to Nebr. south to Fla. and Tex.

2. **F. pennsylvanica** Marsh., var. **Austini** Fern. Map 440.

This species, which is rather common further north in the St. John Valley is rare in N.S. It is found near lakes or ponds, or in low ground, in the center of the Province; in central Lunenburg Co.; and scattered near Mt. Uniacke in Hants Co. and at Lakelands. It is very doubtful if this tree is found in C.B. This native species can be distinguished from the other species by the densely short-pubescent twigs and petioles. The variety has wider wings on the fruit. Forma *colorata* Boivin, with purple-tinged samaras, is described from N.B.

The introduced trees, which may occasionally be found planted or near old habitations, belong to var. *subintegerrima* (Vahl) Fern. (Fernald, 1947). This variety has glabrous twigs and petioles and the wing of the fruit is not as wide (Var. *lanceolata* Borkh.).

N.S. and N.B. to Man. south to Va. and Iowa.

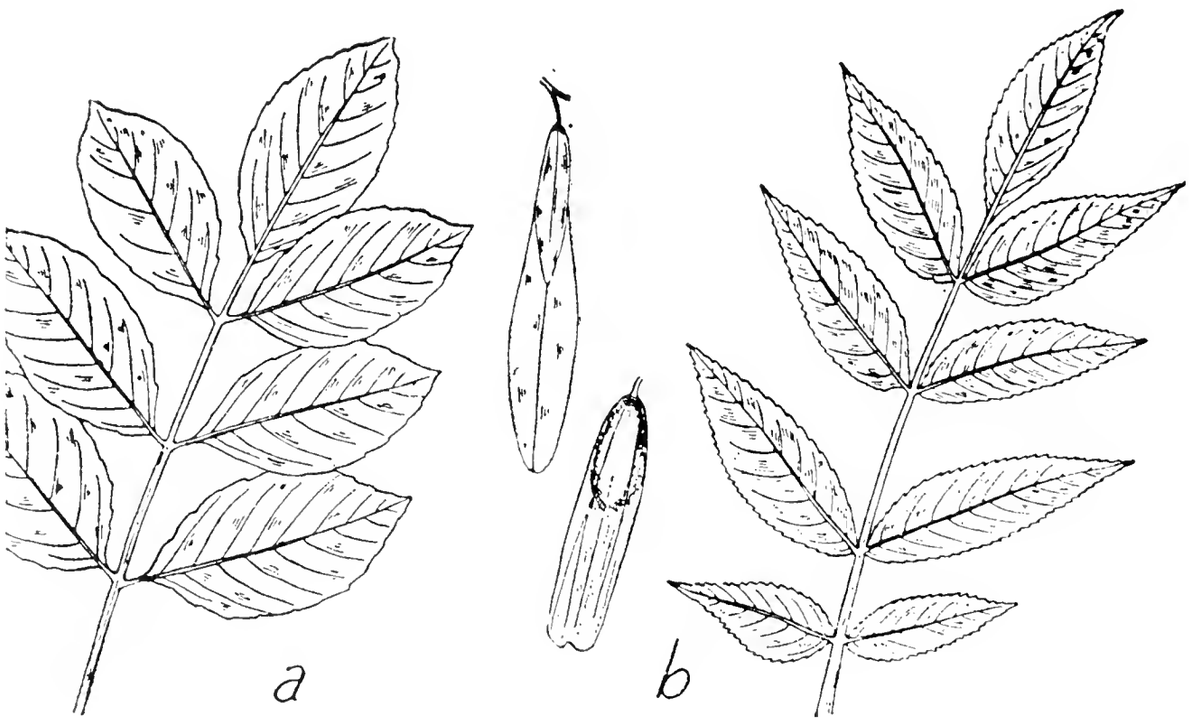


Fig. 112.—**Fraxinus:** (a) *F. americana*, leaf x $\frac{1}{4}$, fruit x $\frac{1}{2}$, (b) *F. nigra*, leaf x $\frac{1}{4}$, fruit x $\frac{1}{2}$.

3. **F. nigra** Marsh. Fig. 112,b. Map 441. BLACK ASH

Low ground, damp woods and swamps; Digby and central Lunenburg Co. to northern C.B., scattered through the northern parts of the Province, rare elsewhere. The species listed by Nichols as characteristic of wooded and poorly-drained swamps in northern C.B. probably belongs here. The trees are usually small, with a yellow bark.

Nfld. to Man. south to Va. and Ind.

4. **F. excelsior** L. EUROPEAN ASH

Occasionally planted and becoming a large, wide-spreading tree. It shows a tendency to escape and is rather vigorous. Escaped to roadsides, railroad-embankments, etc. Pictou; waste ground, Dartmouth; naturalized, LaHave R., Bridgewater, Fernald (1948). At West River, in Pictou Co. a considerable colony of it has grown, starting apparently from a tree in a door-yard.

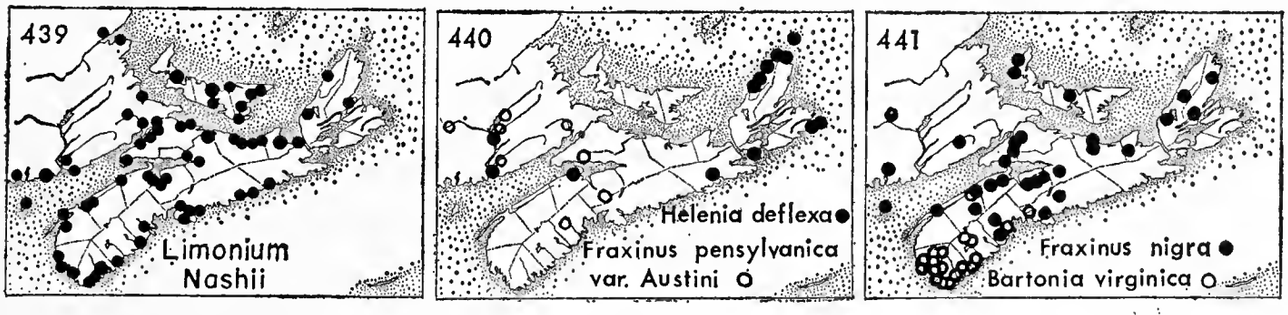
Introduced from Eu.

2. SYRINGA L. LILAC

1. S. vulgaris L. LILAC

An ornamental that is widely planted and persists around old house-sites and sometimes along roadsides. The persistent types all have lilac-purple flowers although white varieties may be cultivated. It does not spread from seed but, once-established, it may persist indefinitely. Early June.

Introduced from Eu.



95. GENTIANACEAE GENTIAN FAMILY

Various glabrous herbs with opposite leaves (except *Menyanthes*); flowers regular with superior ovary; stamens as many as the corolla-lobes and alternate with them; fruit a capsule.

a. Leaves not typically lily-like or floating; plants of dry land or marshes.
  b. Leaves opposite, sessile, simple and untoothed.
    c. Leaves of normal size, green; corolla large.
      d. Style long and thread-like; petals not spurred, rose-purple.
        e. Corolla showy with a very short tube, with 5-12 lobes; flowers peduncled (Fig. 113,c). 1. *Sabatia*
        e. Corolla with a long tube, usually with 5 lobes, about 10 mm wide; flowers mostly sessile. 2. *Centaurium*
      d. Style short or none; petals 4, mostly prominently spurred at the base, yellowish-purple; flowers all peduncled, 4-5 mm wide (Fig. 113,f.) 3. *Halenia*
    c. Leaves reduced to scales; petals 4, 3-4 mm long, greenish; plants wiry, insignificant (Fig. 113,e). 4. *Bartonia*
  b. Leaves alternate, stalked, with 3 leathery leaflets (Fig. 113,d); corolla white, the lobes conspicuously fringed within. 5. *Menyanthes*
a. Leaves lily-like, round with a v-shaped notch at the base; floating on the surface of quiet waters (Fig. 113,g); flowers white, about 1 cm wide. 6. *Nymphoides*

1. SABATIA Adans.

1. **S. Kennedyana** Fern. Fig. 113, c. Map 434. PLYMOUTH GENTIAN

Known only from the Tusket Valley, Yarmouth Co., where it is common to rare locally on the cobbly and sandy beaches and peaty

Fig. 113.—**Glaux:** (a) *G. maritima*, plant x $\frac{1}{2}$, flower x 2. — **Trientalis:** (b) *T. borealis* x $\frac{1}{4}$. — **Sabatia:** (c) *S. Kennedyana* x $\frac{1}{2}$. — **Menyanthes:** (d) *M. trifoliata* x $\frac{1}{4}$. — **Bartonia:** (e) *B. virginica* x 1. — **Helenia:** (f) *H. deflexa* x $\frac{1}{2}$. — **Nymphoides:** (g) *N. cordata* x $\frac{1}{3}$.

margins of rivers, lakes and boggy savannahs, from near Tusket to near Kempt. Two variations occur with the same general distribution as the species. Forma **candida** Fern. has the flowers white; forma **eucycla** Fern. has the lobes of the corolla broadly obovate and more or less overlapping. Both forms are rare. August.

Southwestern N.S.; e. Mass. and R.I.

2. **CENTAURIUM** Hill

1. **C. umbellatum** Gilib. CENTAURY

Found in the Maritimes on Sable I., where it is common in the wet dune hollows and sandy borders of freshwater ponds; reported erroneously in the 7th edition of Gray's manual from waste grounds,

N.S. Also found by T.M. Taschereau at Tidnish, N.S. by saltwater in brackish pastures, August 1967, in flower and fruit. Aug.-Sep.

Sparingly introduced from Eu.; N.S., Que. to Mich. south to Ga.; B.C.

3. **HALENIA** Borkh.

a. Plant 10-90 cm high, the main internodes 5-10 cm long; stem simple or branched above; flowers greenish, numerous, short-stalked, in a loose cyme.
1. *H. deflexa*

a. Plant 3-15 cm high, the internodes 1-3 cm long; stem much branched; flowers purplish, in a 3-flowered cyme, the central one long-stalked.
H. deflexa var. *Brentoniana*

1. **H. deflexa** (Sm.) Griseb. Map 440. Fig. 113,f. SPURRED GENTIAN

Damp soil, exposed places and sea-bluffs; rare on mainland of N.S. and found only at Halls' Harbour and near Sherbrooke; common on bleak exposed headlands around northern C.B. and on the east side from near Scatari I. Late-flowering colonies occasionally bear flowers without or with only one or two spurs. These belong to forma **heterantha** (Griseb.) Fern.

Var. **Brentoniana** (Griseb.) Gray (see Allen, 1933) is a dwarf form found on exposed headlands in northern C.B., the Magdalen I. and northward.

Lab. south to mts. of N.Y. west to B.C. and Mont.; central Mex.

4. **BARTONIA** Muhl.

These thin, wiry almost-leafless plants grow to 3 dm high and are almost invariably found scattered in the colder bogs. The key to the varieties of *B. paniculata* is largely that of Fernald (1921). See also Gillett (1959).

a. Corolla-lobes oblong or gradually widening to a rounded summit, blunt and usually toothed at the apex; stigma columnar, about 1 mm long; leaf-scales essentially opposite, the numerous nodes becoming more crowded towards the base.
1. *B. virginica*

a. Corolla-lobes lanceolate to oblong or obovate, blunt or acutish; stigma 0.5 mm long or less; leaf-scales essentially alternate, the few nodes but slightly closer near the base.

b. Calyx cleft nearly or quite to the base, the lobes lanceolate or narrowly oblong, acuminate or at least acute.

c. Plant yellowish-green, rarely purplish; flowers 2.5-5 mm long; corolla-lobes mostly creamy-white, 0.7-1.5 mm wide; anthers mostly yellowish, to 0.5 mm long.
2. *B. paniculata*

c. Plant purplish or fulvous; flowers 3.8-6 mm long; corolla-lobes purple-tipped or watery-white, 1.2-2 mm wide; anthers purplish, to 1 mm long.
B. paniculata var. *intermedia*

b. Calyx cleft, at least on one side, only 2 /3 or 3 /4 to the base; the lobes herbaceous, oblong to ovate; corolla-lobes 1-2 mm long; plants purplish; anthers about 1 mm long.
  d Flower-stalks club-shaped; two or three calyx-lobes cut to the base; corolla 3-5 mm long, creamy-white; anthers mostly yellowish. var. *sabulonensis*
  d. Flower-stalks thread-like; calyx-tube 1-2 mm long, the lobes not distinct to the base; corolla 4-7 mm long, often purple-tinged; anthers mostly purple. var. *iodandra*

1. **B. virginica** (L.)BSP. Fig. 113,e. Map 441. BARTONIA

Lake beaches, sandy and peaty bogs, even into dry barrens; rather common in southwestern N.S., becoming rarer to e. Halifax Co. and Middleton. Hybrids occur occasionally with the next species and Gillett (1959) mentions intermediates from Port Mouton and Shelburne.

Fla. to La. north to St. P. and Miq. I., s. Que. and Minn.

2. **B. paniculata** (Michx.) Muhl. Map 442. SCREW-STEM

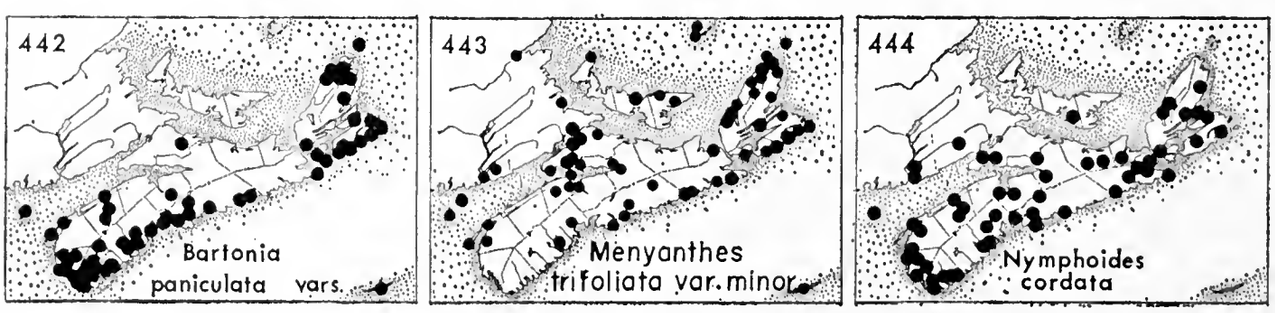
Michaux described *B. paniculata* in 1803 and Robinson described *B. iodandra* from Newfoundland in 1898. Fernald, on his expedition to N.S. found so many intermediates that he named var. *intermedia* in 1921. Gillett (1959) placed all the plants in two subspecies. The subspecies from Mass. south as sp. *paniculata*; and one mainly north of this named sp. *iodandra*. In N.S. there appears to be a complete gradation from plants typical of var. *paniculata* in south-western N.S. to purplish plants showing marked characters of var. *iodandra* in C.B.

Wet bogs, quagmires, peaty and cobbly shores; common in Yarmouth Co., found to Halifax and Digby, grading into the following varieties. Fla. and La. north to N.S., Ky. and Okla.

Var. **intermedia** Fern. is widely distributed in similar situations from Yarmouth to Richmond Co. and south to N.J.

Var. **sabulonensis** Fern. was first described from Sable I. It is usually more branched, with 4-30 flowers; rare in swales, sandy shores and cobbly margins in southern Yarmouth, Shelburne and Lunenburg Co., N.S. and St. P. and Miq. I.

Var. **iodandra** (Robins.) Fern. was first reported only from Nfld. and is represented in C.B. by the transitional var. *intermedia*. However, much of the material from Isle Madame and northern C.B. seems to resemble this variety. Nfld. and C.B.



5. MENYANTHES L. BUCKBEAN

1. **M. trifoliata** L., var. **minor** Raf. Fig. 113,d. Map 443.

Stagnant pools, bogs, often dominant in its particular habitat and with the roots covered with water; common in marshes at Kentville, Truro, Advocate and Amherst to northern C.B.; rather rare southward; found but once on Sable I. Our plants are scarcely separable from the Eurasian and Pacific N. Amer. forms. June. 2n = 54.

Lab. to Alaska south to Md., Ohio, Mo. and Wyo.

6. NYMPHOIDES Hill

1. **N. cordata** (Ell.) Fern. Fig. 113,g. Map 444. FLOATING-HEART

Common in lakes and ponds in quiet waters throughout; most numerous in the south-western parts of the Province where it may be found in ponds and lakes and slow-moving water in the pools of streams and rivers. The leaves are much like small water-lily leaves, but there is a tuft of roots just below the surface; the small white emerging flowers are sometimes conspicuous. July-Aug.

Nfld. to Fla. west to Ont. and La.

96. APOCYNACEAE DOGBANE FAMILY

About 1,000 species, most with milky juice, and more abundant near the tropics. Our plants have opposite leaves; flowers with 5 sepals, 5 united petals, and 5 stamens joined to the corolla and alternate with the lobes. The solitary pistil has two carpels which form two nearly separate follicles.

a. Plants slender and trailing, forming mats with evergreen glossy leaves; flowers blue, solitary in the leaf-axils. 1. *Vinca*

a. Plants stout, erect or prostrate; flowers white to pink, small, bell-like, in cymes. 2. *Apocynum*

1. VINCA L.

1. **V. minor** L. Fig. 114,e. MYRTLE, PERIWINKLE

A garden plant, often planted in cemeteries, along shady lawns or roadsides, occasionally spreading and often persistent, grown mainly as a ground cover. May to early June.

Naturalized from Eu.; N.S. to Ont. southward.

2. APOCYNUM L. DOGBANE

Plants with milky juice and opposite leaves; flowers small and bell-like, white or pinkish. See Boivin (1966-a).

a. Leaves drooping or spreading, hairy to glabrous beneath; corolla at least twice the length of the calyx-lobes; hair of the seeds pale tawny.
  b. Leaves drooping; corolla at least 3 times the length of the calyx lobes, 5-10 mm long; seeds 2 mm long, the hairs 1.5-2 cm. long. 1. *A. androsaemifolium*
  b. Leaves spreading or ascending-spreading; corolla about twice the length of the calyx-lobes, 4-5 mm long; seeds about 4 mm long; the hairs pale-tawny, 2 cm long. 2. *A. medium*
a. Leaves ascending, nearly or quite without petioles, smooth or glaucous beneath; corolla with erect lobes, barely exceeding the calyx, 2-3.5 mm long; follicles straight 4-10 cm long; seeds 3.5-4 mm long with hairs 8-12 mm long. 3. *A. cannabinum*

1. **A. androsaemifolium** L. Fig. 114,a. SPREADING DOGBANE

The typical variety has the leaves glabrous beneath. This is widely distributed in the western states and in B.C.; it is known from Kentville, N.S., St. John, N.B., and from Quebec. Var. **incanum** DC. is the common form with the leaves more or less pubescent on the lower surface. This is a weed in the Annapolis Valley and along roadsides and occasionally in fields in the central part of the Province; common along streams and intervales in eastern N.S.; scattered through the rest of the Province, usually on sandy or light soils. July-Aug.

Nfld. to Alaska south to N.C. and Mex.

2. X **A. medium** Greene

Reported by Woodson (1930) from the cobbly border of Shubenacadie Grand L. and at the edge of Wentzell L. in Lunenburg Co. This has been found to be a fertile hybrid of the preceding and the following species and may be expected when these two species grow together. See Anderson (1936).

Nfld. to B.C. south to Va. and Tex.

3. **A. cannabinum** L. Fig. 114,b. Map 445. INDIAN HEMP

The plants of eastern Canada are variable in the shape of the leaves. Plants with rather narrow lanceolate leaves tending to be cuneate at the base with a definite petiole have been named var. **glaberrimum** DC. This is rather rare in N.S. but is known from river-banks in central N.S. and from north of Judique in Inverness Co.

Var. **hypericifolium** Gray has the median stem-leaves more ovate, subcordate at the base, and sessile or nearly so. Gravelly beaches and cobbly or sandy banks of streams; Kings Co. and Lunenburg Co. to northern C.B.; most common in Colchester and Pictou Co., becoming rarer along the South Shore. (*A. sibiricum* Jacq.) The plants are often prostrate rather than erect. This is forma **arenarium** (F.C. Gates) Boivin. July-Aug.

Nfld. to B.C. south to Tex.

97. ASCLEPIADACEAE MILKWEED FAMILY

Our species are erect, scarcely branched, perennials up to 1.5 m high, with opposite or whorled leaves and with milky juice. The flowers are purplish or rose-purple, numerous in terminal umbels, and are regular but elaborate in structure; each flower starting two but usually maturing only one large, many-seeded follicle.

1. ASCLEPIAS L.

a. Leaves lanceolate. smaller and tapering to an acute tip, irregularly veined with the few veins curved towards the tip, smooth or finely pubescent beneath. 1. *A. incarnata*

a. leaves oblong to oval, 12-20 cm long, regularly pinnately veined with the veins straight, densely woolly beneath. 2. *A. syriaca*

1. **A. incarnata** L. Fig. 114,g. Map 446. SWAMP-MILKWEED

Rare in wet or rocky thickets, usually near a lake or stream from Yarmouth Co. through the center of the Province to central C.B.; outlet to Lake Paul in Kings Co.; headwaters of Gays R. in Halifax Co.; along river north of New Germany; and near Whycocomagh and Black R. in C.B. Three varieties have been reported from N.S. but, as J. S. Erskine (1953) observes: "The three varieties are all found and do not separate satisfactorily. Each colony found seemed to have differences nearly as important as those of number and size and pilosity of leaves".

The typical variety has the leaves and the upper part of the stem glabrous or nearly so; while var. **pulchra** (Ehrh), Pers. has these densely pubescent or pilose. Smaller plants with only 7-11 pairs of leaves, and with leaves almost smooth beneath, were named var. **neoscotica** Fern. (Fernald, 1921). This variety was then reported from a gravelly beach along the Shubenacadie Grand L. and along the Tusket L. in Yarmouth Co. Known only from N.S. Early Aug.

N.S. to Man. south to Ga. and Tex.

2. **A. syriaca** L. COMMON MILKWEED

Sparingly introduced as a weed in light soil; at scattered places in the Annapolis Valley; at LeBreau's Creek in Hants Co.; and near Mabou in C.B.; presumably being introduced also elsewhere. Scattered throughout the Maritime Provinces. July.

N.S. to s. Man. south to Ga. and Kans.; introduced eastward.

98. CONVOLVULACEAE BINDWEED FAMILY

This family includes about 47 genera and 1,100 species. Our representatives are the wild morning-glory and the parasitic dodders. The plants are twining; and the flowers are regular with the parts in 5's, with a tubular or funnel-form corolla. The sweet potato and the cultivated morning glory belong to the genus *Ipomoea.*

a. Plants large with green leaves; corolla large, showy; plants with stout rootstocks; leaves sagittate. 1. *Convolvulus*
a. Plants without green leaves, yellowish, parasitic; corolla small, short, whitish. 2. *Cuscuta*

1. CONVOLVULUS L. BINDWEED

Consult Tryon (1939) and Fernald (1949-b)

a. Calyx enclosed by two large green bracts; stigma oval or oblong; corolla 4-8 cm long. 1. *C. sepium*
a. Calyx not enclosed by green bracts; style filiform; leaf-blades 3-5 cm long; corolla about 2 cm long. 2. *C. arvensis*

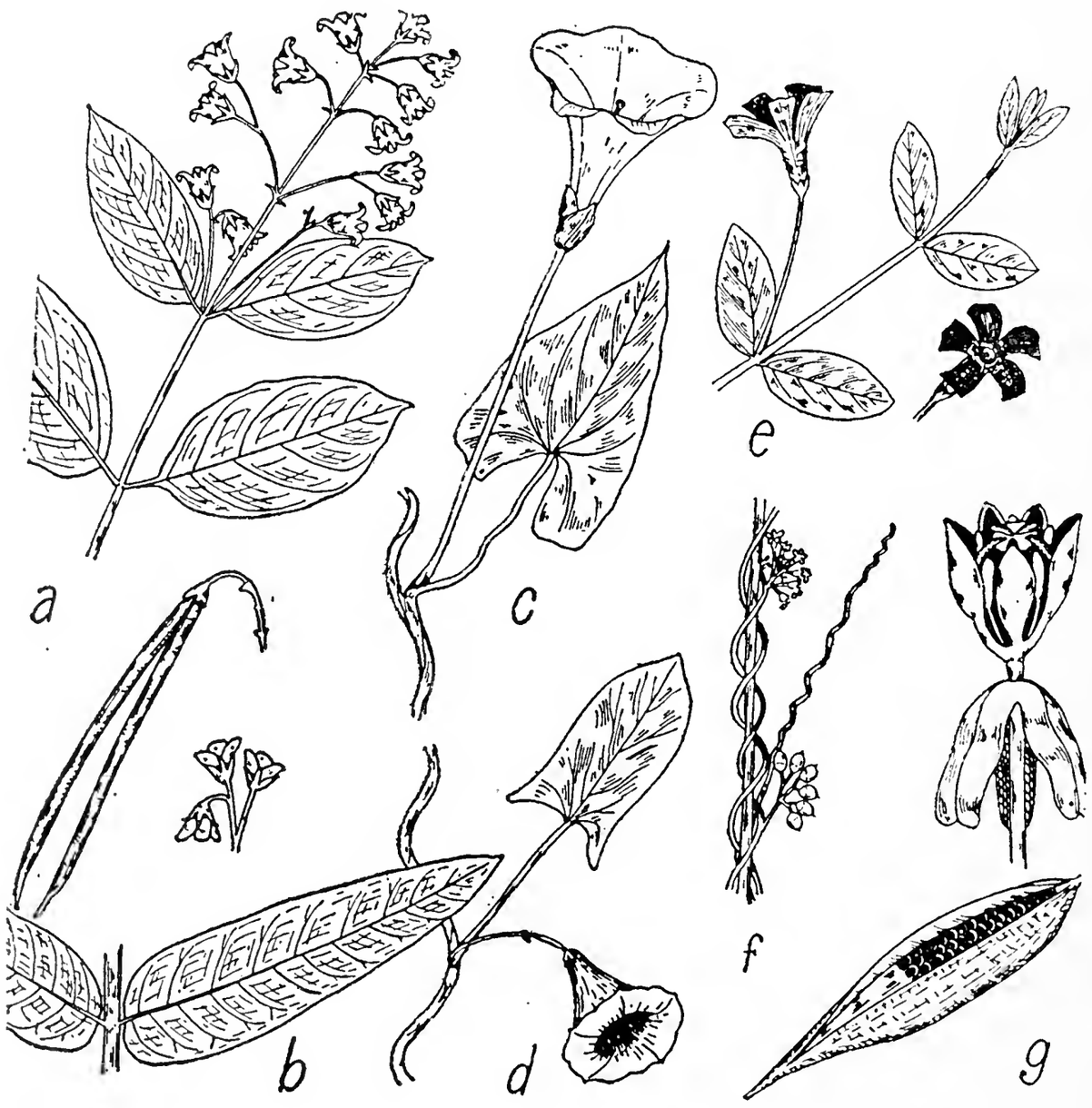


Fig. 114.—**Apocynum:** (a) *A. androsaemifolium* x ½, (b) *A. cannabinum*, leaves, fruits and flowers, x ½. — **Convolvulus:** (c) *C. sepium* x ⅓, (d) *C. arvensis* x ⅓. — **Vinca:** (e) *V. minor* x ⅓. — **Cuscuta:** (f) *C. Gronovii* x ⅓. — **Asclepias:** (g) *A. incarnata*, flowers much enlarged, fruit with seeds x ⅓.

1. **C. sepium** L. Fig. 114,c. BINDWEED, WILD MORNING-GLORY

Common along the coast, often a bad weed in towns, waste places, along roadsides and spreading into fields and orchards; along lake-shores or clambering over vegetation near open areas. The native plants are sometimes considered to be a separate variety because the basal leaf-lobes are possibly more rounded instead of being angular (Var. *americanus* Sims). Forma **coloratus** Lange is our common form. It has pinkish flowers instead of white ones. Forma **malachophyllus** Fern. has the leaves, petioles and stems soft-pilose. Plants growing near the coast may show this trait. July-Aug.

Var. **dumetorum** Pospichal has the leaves roundish to sub-orbicular, with the apex rounded or blunt, and the white flowers only 4-4.5 cm long instead of 5-8 cm. This variety is an introduction from the Adriatic and Fernald reports this from roadsides, waste places and ballast-lands, Yarmouth; and from grassy or bushy roadsides near a house at Barrington.

Nfld. to B.C. south to Fla. and N. Mex.

2. **C. arvensis** L. Fig. 114,d. FIELD-BINDWEED

Rare; occasionally found in fields and along roadsides in the Annapolis Valley; seen at Lunenburg, Windsor and Truro. Macoun reports it from ballast heaps at Pictou; and Robinson found it at Pictou Landing in 1906. The plant does not seem to be very aggressive here.

Introduced from Eu.; throughout N.Amer. and a bad weed westwards.

2. CUSCUTA L. DODDER

The introduced members are left out of the key since they appear so rarely as parasites of our cultivated crops. Very rarely a garden crop such as Summer Savoury, may be contaminated with dodder but no recent instances are known. This may be due to *C. pentagona*, which is one of the commoner species. Clover dodder likewise has not been seen, although a collection exists from Lawrencetown, Annapolis Co. and was probably *C. Epithymus* Murr. Two native species are present and need further study to determine their exact distribution. Consult Yuncker (1932).

a. Flower-parts mostly in 4's, occasionally in 3's; petals tending to be erect or spreading; capsule tending to be depressed globose, or wider than long.
1. *C. Cephalanthi*

a. Flower-parts in 5's; petals reflexed; capsule globose, rarely wider than long.
2. *C. Gronovii*

1. **C. Cephalanthi** Engelm.

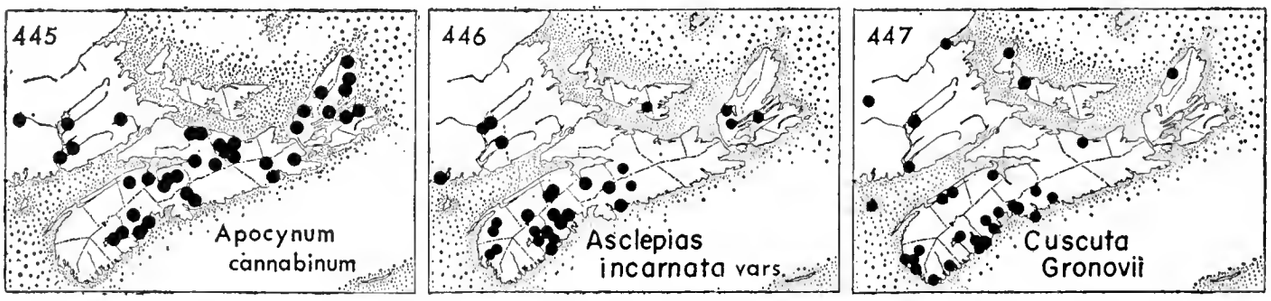
This plant is reported in Gray's Manual as from N.S. and possibly some of the collections recorded as *C. Gronovii* var. *latiflora* belong here. A collection from Loch Broom, Pictou Co., where it was luxuriantly growing near the seashore on asters, is placed here.

N.S. to s. B.C. south to Tenn. and Texas.

2. **C. Gronovii** Willd. Fig. 114,f. Map 447. COMMON DODDER

Scattered along the borders of lakes, back of brackish shores, or in wet thickets; rather common and found on a variety of hosts, mostly in dampish habitats. It is most common in southwestern N.S. and is scattered eastward to northern C.B. Var. *latiflora* Engelm. was first thought to be a coastal plain variety but does not now seem distinct. A short discussion of the N.S. plants is given by Fernald (1922). Late July-Aug.

N.S. to B.C. south to Fla. and Ariz.



99. POLEMONIACEAE PHLOX FAMILY

A small family, chiefly of N. Amer., characterized by having the corolla-lobes and stamens in 5's, but with the superior ovary having only three carpels. The genus *Phlox* is the main group of the family; all our members are introduced. The *Polemonium* mentioned in the 1st ed. of this Flora (Roland, 1947) was surely the cultivated *P. caeruleum* L.

a. Leaves mostly alternate; flowers small, slender and insignificant; scattered weed. 1. *Collomia*

a. Leaves opposite or mostly so; flowers showy, at least 1 cm wide; garden escapes. 2. *Phlox*

1. COLLOMIA Nutt.

1. **C. linearis** Nutt. Fig. 115,b.

Scattered near the railroad north from Truro, carried south from the Bay of Chaleur region where abundant and perhaps native.

N.B. to B.C. s. to Wisc. and Calif.; introduced southward.

2. PHLOX L.

a. Plant creeping in mats; leaves needle-like, rigid. 1. *P. subulata*
a. Plants erect; leaves wide and flat. 2. *P. paniculata*

1. **P. subulata** L. Fig. 115,a. GROUND-PINK, MOSS-PINK

This garden plant is occasionally found along roadsides or in waste places; most often persisting where it had once been planted. The old-fashioned pink form is more persistent than the newer varieties.

N.Y. to Mich. s. to N.C ; an escape elsewhere.

2. **P. paniculata** L. GARDEN-PHLOX

Occasionally in waste places or along roadsides near gardens where it may persist for some time; doubtfully persisting for any length of time without cultivation.

N.Y. to Iowa s. to Ga.; cultivated and escape elsewhere.

100. BORAGINACEAE BORAGE FAMILY

Herbaceous, often rough-hairy, plants with simple, untoothed alternate leaves and bluish, or very rarely white, flowers. The inflorescence is usually a coiled simple or branched raceme with the flowers developing from the base upwards as it straightens out. The fruit consists of 2-4, usually 4, nutlets formed from the lobes of the superior ovary.

a. Corolla regular or nearly so.
b. Corolla rotate (like the flower of the potato), bright blue, 1 cm wide or wider; stamens large, exserted, surrounding the pistil. 1. *Borago*
b. Corolla tubular, or if flattish much less than 1 cm wide.
c. Flowers solitary in the axils of the upper leaves, remote at maturity, 3-4 mm wide; nutlets not bristly. 5. *Lithospermum*
c. Flowers in coiled racemes which straighten after flowering.
d. Nutlets armed with hooked bristles; throat of the corolla closed by 5 scales.
e. Leaves 5-15 cm long, lanceolate to ovate; nutlets flattened and horizontal, covered uniformly with short bristles; stem simple. 6. *Cynoglossum*
e. Leaves less than 5 cm long, lanceolate to linear; nutlets erect, with 2 rows of bristles up each side of the dorsal face. 9. *Lappula*
d. Nutlets without bristles.
f. Plants coarse and stout, 5-10 dm high, much-branched; throat of the corolla closed by scales (Fig. 118,a). 2. *Symphytum*
f. Plants weak or trailing, up to 6 dm high.
g. Corolla slightly irregular, the throat closed by scales and the tube funnel-shaped; plant very bristly-hairy; racemes leafy-bracted. 3. *Lycopsis*
g. Corolla regular, throat not closed by scales.
h. Plants not succulent; racemes without bracts, at least in the upper part; flowers 8 mm wide or less, the corolla-tube very short; leaves up to 1 cm wide (Fig. 115,c,d). 7. *Myosotis*
h. Plants succulent, glabrous, of seashores; racemes with leafy bracts; flowers 10-15 mm wide; leaves 1-3 cm wide (Fig. 115,f). 8. *Mertensia*

a. Corolla very irregular, the throat spreading, not closed; stamens exserted on long filaments; plants large, coarse and bristly (Fig. 115,e); flowers a vivid blue. 4. *Echium*

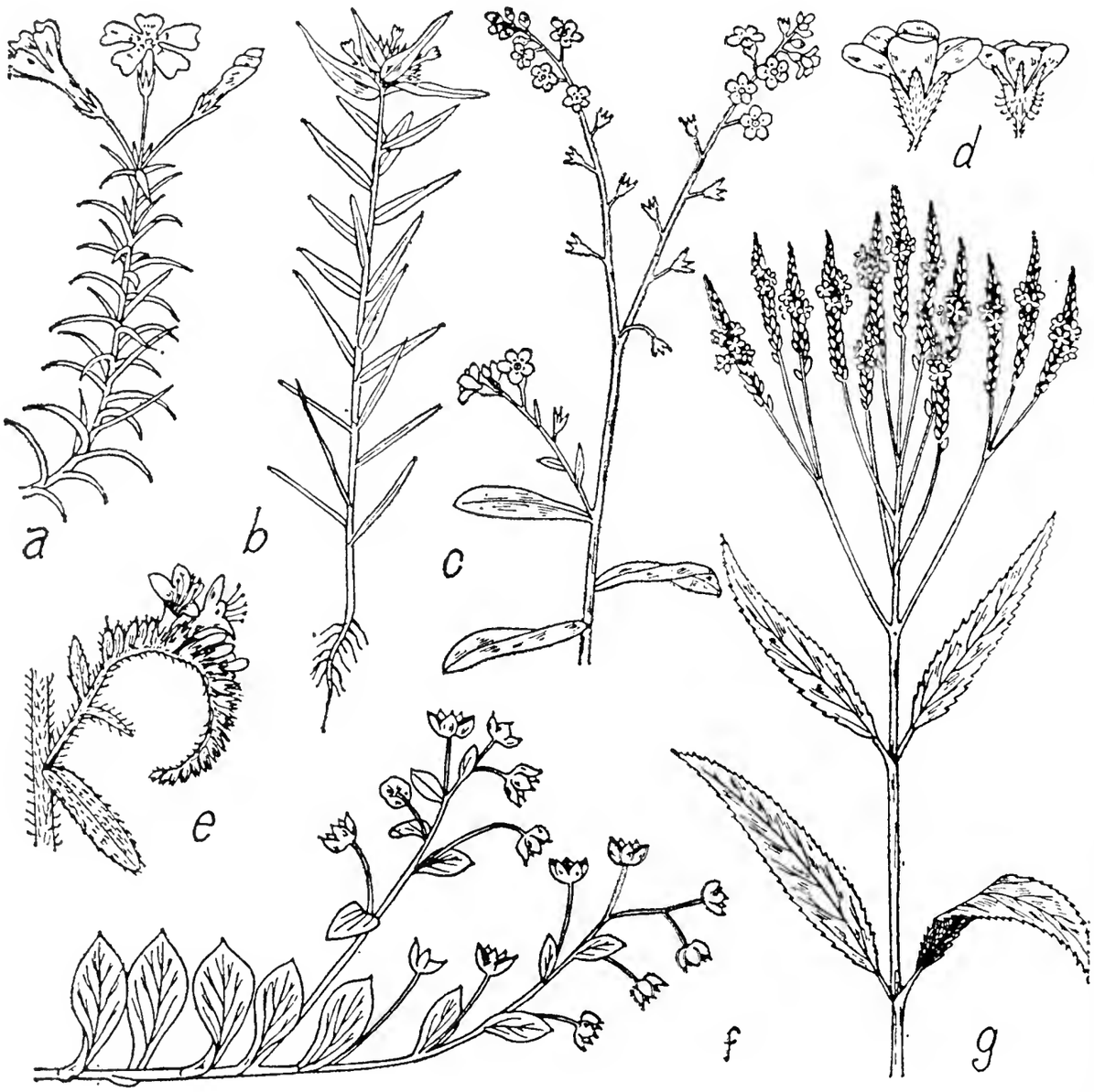


Fig. 115.—**Phlox**: (a) *P. subulata* x $\frac{1}{3}$. — **Collomia**: (b) *C. linearis* x $\frac{1}{3}$. — **Myosotis**: (c) *M. laxa* x $\frac{1}{2}$, (d) flowers x 3. — **Echium**: (e) *E. vulgare*, branch of inflorescence x $\frac{1}{2}$. — **Mertensia**: (f) *M. maritima* x $\frac{1}{3}$. — **Verbena**: (g) *V. hastata*, top of plant x $\frac{1}{4}$.

1. BORAGO L.

1. B. officinalis L. BORAGE

Introduced and occasionally seen about old gardens or in waste places, doubtfully persisting. Native of the Mediterranean and sparingly introduced into many parts of N. Amer. from N.S. to Alta. south.

2. SYMPHYTUM L. COMFREY

a. Plants with stout, prickly recurved hairs; leaves very slightly decurrent; flowers usually purple; tips of the corolla-lobes erect. 1. *S. asperum*

a. Plants rough-hairy; leaves decurrent and forming broad wings down the stems; flowers usually cream-colored; tips of the corolla-lobes recurved.
2. *S. officinale*

1. **S. asperum** Lepechin. Fig. 118,a. ROUGH COMFREY

Dry and sandy areas and waste places, rare; reported by Macoun from Pictou; abundant at Grand Pré and Yarmouth. June 15-July. Both this and the next species are coarse, perennial garden plants which persist chiefly in patches near old habitations.

Introduced from Eu.; N.S. to Man. south to Md.; B.C.

2. **S. officinale** L. COMMON COMFREY

Waste land, a garden escape; scattered and probably throughout; most common in Kings and Pictou Co. June 15-July.

Naturalized from Eu.; Nfld. to w. Ont. south to La.; Alta. and B.C.

3. LYCOPSIS L.

1. **L. arvensis** L. SMALL BUGLOSS

Dry sandy fields and waste places; rare, reported by Macoun from Pictou. Not recently collected in N.S. although Erskine records this sporadic weed from a number of locations in P.E.I.

Adventive from Eu.; P.E.I. to Alta. south to Va.; Calif.

4. ECHIUM L.

1. **E. vulgare** L. Fig. 115,e. BLUE DEVIL, VIPER'S BUGLOSS

Rare or local; a weed of waste places and roadsides. It has been found at Truro, New Glasgow, near Antigonish and above Parrsboro, where it was abundant for some distance along the road. Other scattered locations are known. It rarely invades fields. However, it does not seem to spread actively in N.S.; very conspicuous when in flower.

Var. **pustulatum** (Sibth. & Sm.) Coincy has the pubescence of the leaves and inflorescence with conspicuous blister-like bases and the inflorescence is looser and wider. This is reported from N.S. in Britton and Brown (Gleason, 1952). In view of the sporadic nature of the introductions this variety could be expected.

Naturalized from Eu.; widely distributed.

5. LITHOSPERMUM L.

1. **L. arvense** L.

This annual weed is scattered and may be introduced at any time; collected by W. B. Schofield around a chicken-run at Cambridge, Kings Co.

Native of Eu.; waste places throughout Can. and the U.S.

6. CYNOGLOSSUM L.

Rare, coarse pubescent plants up to 10 dm high, with broad corollas about 8 mm wide and the large nutlets with conspicuous hooked bristles.

a. Stem leafy to the summit; flowers dull reddish; nutlets 5-8 mm long. 1. *C. officinale*

a. Stem leafy mostly near the base; flowers blue; nutlets 4-5 mm long, uniformly bristly. 2. *C. boreale*

1. **C. officinale** L. HOUND'S TONGUE

This native of Eurasia is occasionally reported from fields and the edges of open woods; reported from both N.S. and N.B. although no collections have been seen.

Widely introduced; N.S. to Ont. and Alta. to B.C. south.

2. **C. boreale** Fern. WILD COMFREY

Rare; in open beech woods on dryish soil just west of Kentville and on gypsum near Windsor, only occasional plants have been found.

Woods and thickets from N.S. to Iowa south to N.Y.; B.C.

7. MYOSOTIS L. FORGET-ME-NOT

Our common plants of moist soils have small blue flowers in early summer. There are about 40 species of wide distribution, with all of ours except one introduced.

a. Flowers blue; pedicels much longer than the calyx.
  b. Hairs of the calyx straight and appressed; stems and leaves with stiff appressed hairs; calyx with the lobes wide and much shorter than the tube or merely equalling it.
    c. Corolla 5-8 mm wide, the tube distinctly longer than the calyx; inflorescence without bracts. 1. *M. scorpioides*
    c. Corolla 3-5 mm wide, with the tube about the length of the tips of the calyx-lobes; inflorescence with usually one or two leaves near the base of the longest branch. 2. *M. laxa*
  b. Hairs of the lower part of the calyx prominently hooked; calyx with the lobes as long or usually much longer than the tube.
    d. Flowers 5-8 mm wide; escaped ornamental. 3. *M. sylvatica*
    d. Flowers 2-4 mm wide; plants of dryish habitats. 4. *M. arvensis*
a. Flowers yellow when young; pedicels shorter than the calyx; corolla about 2 mm wide. 5. *M. versicolor*

1. **M. scorpioides** L. FORGET-ME-NOT

Common in wet muddy places, in ditches, meadows and along brooks throughout, sometimes growing in large masses in very wet areas. Early June-July.

Nfld. to Man. south to Ga.; B.C.; introduced from Eu.

2. **M. laxa** Lehm. Fig. 115,c,d. SMALL FORGET-ME-NOT

Very common throughout; wet muddy places, edges of streams, ditches and meadows. June-July.

Nfld. to Ont. and N.C. south to Ga. western America; Eurasia.

3. **M. sylvatica** Hoffm. GARDEN FORGET-ME-NOT

Grown as an ornamental with many strains for early spring flowers in rock-gardens and moist borders; occasionally escaping or persisting where it has been discarded in waste places and dumps, occasionally also in ditches or along roadsides. Late May-June.

N.S. to Mich. south to New Eng.; introduced from Eu.

4. **M. arvensis** (L.) Hill. Fig. 115,d. Map 448. ROUGH FORGET-ME-NOT

Wet runs and moist places, but more often growing on dryish soils, a plant rough to the touch and with small pale flowers. It is common in the Annapolis Valley, scattered elsewhere in western N.S., and known only from Sydney east of Truro. May 15-June.

Introduced from Eu.; Nfld. to Sask. and B.C. south to Penn. and W.Va.

5. **M. versicolor** (Pers.) Sm.

This species has long been known from dryish to moist hill-slopes along the Gaspereau road and on the ridge south of Wolfville where it is scattered. The corolla is a pale yellow but it gradually changes to a bluish and then a violet color as it gets older (*M. discolor* Pers.). Early May-June.

Sparingly introduced from Eu.; N.S., Mass. and N.Y. to Va.

8. MERTENSIA Roth

1. **M. maritima** (L.) S. F. Gray. Fig. 115,f. SEA-LUNGWORT

Common around the Province, on sandy beaches, dunes and shorelines just above high tide level; flowers blue or rose-tinted. The clumps of this plant with the fleshy glaucous leaves form a common feature of most sea-shore vegetation. Forma **albiflora** Fern. is a white-flowered form found on various beaches of Queens, Shelburne, Yarmouth and Digby Co. June 15-Aug.

Mass. north around the coast to Greenland and Alaska; Eurasia.

9. LAPPULA Moench

1. **L. echinata** Gilib. STICKSEED

Waste land, railroad yards and introduced in feed grain, as around poultry yards. It may often be found in dryish soils, but although it is

scattered throughout and sometimes is common in one location it does not long persist. June-Sept.

Introduced from Eu.; Nfld. to Alaska south to W.Va. and Tex.

101. VERBENACEAE VERVAIN FAMILY

This large cosmopolitan family is represented here by only one native species. The cultivated *Verbena hybrida* Vess. is a common garden flower.

1. VERBENA L.

1. **V. hastata** L. Fig. 115,g. BLUE VERVAIN

This tall plant with the numerous spikes of small blue flowers is rare; in river bottoms or in rich or mucky soils; scattered from Queens, Annapolis and Cumberland Co. east to C.B. Aug-Sept.

N.S. to B.C. south to Fla. and Ariz.

102 LABIATAE MINT FAMILY

A large family of about 3,500 species, ours all herbaceous and many aromatic. The leaves are opposite or whorled; the stems are commonly square in cross-section. The flowers may be nearly regular but more often are strongly 2-lipped, with the stamens 4 in 2 sets, or only 2. The single style arises from a 4-lobed ovary and the fruit consists of 4 nutlets. The genera are separated on highly technical characteristics. *Coleus* and *Salvia* are cultivated representatives.

a. Corolla with the upper lip apparently absent, the lower one 5-lobed,12-18 mm long; flowers purplish in an interrupted terminal spike (Fig. 116, a). 1. *Teucrium*

a. Corolla with both upper and lower lips, or regular.
  b. Calyx with a swelling on the upper side; flowers blue, solitary or in one-sided axillary panicles (Fig. 116,b,c). 2. *Scutellaria*
  b. Calyx without such a swelling.
    c. Inflorescence axillary, in numerous whorls, or in a few whorls with the subtending leaves but little reduced in size.
      d. Corolla almost regular; whorls numerous in the axils of the leaves; calyx-teeth not rigid and nettle-like.
        e. Calyx strongly irregular; stamens 2; plant small, usually unbranched, very strongly aromatic (Fig. 116,h). 11. *Hedeoma*
        e. Calyx nearly regular.
          f. Stamens with anthers 2; plants smooth, not aromatic; flowers sessile in the leaf-axils, white (Fig. 117,f,g). 16. *Lycopus*
          f. Stamens with anthers 4; plant often hairy, aromatic; flowers with pedicels 0.5-2 mm long by flowering time; flowers bluish (Fig. 117). 17. *Mentha*
      d. Corolla very irregular with a prominent upper and lower lip.
        g. Sepals rigid and sharp-pointed, so that the flowers are nettle-like (*Stachys* may key out here, but the flowers are in more of an interrupted spike with the upper leaves reduced, sepals rigid but not so definitely awn-tipped).

h. Leaves narrow, thick, the lower deeply and sharply lobed, palmately veined; whorls of flowers many; plants 1 m high or more, unbranched (Fig. 117,h). 7. *Leonurus*

h. Leaves all ovate, toothed, pinnately veined and rough-hairy; plants much branched and with flowers clustered toward the tips of the branches (Fig. 117,a). 8. *Galeopsis*

g. Sepals herbaceous and the flowers not nettle-like.

i. Stem prostrate and creeping; flowers blue, long pedicelled, usually 3 in each leaf-axil; leaves almost round, shallowly toothed (Fig. 116,d). 5. *Glechoma*

i. Stem erect; flowers white or pinkish, sessile or nearly so in the axils of the upper, little-reduced leaves.

j. Stamens included in the tube of the corolla; calyx nearly regular, the 5-10 small lobes hooked at the apex. 3. *Marrubium*

j. Stamens ascending under the upper lip of the corolla; lobes of the calyx not hooked at the apex.

k. Calyx distinctly 2-lipped, with the long slender teeth grayish hairy; flowers in 1 or 2 dense whorls near the tip of the plant; native plants (Fig. 116, g). 12. *Satureja*

k. Calyx nearly regular, not grayish; flowers few and less densely crowded; small introduced weeds. 9. *Lamium*

c. Inflorescence terminal in a compact spike, or often interrupted with the whorls subtended by much-reduced leaves or bracts.

l. Flowers in a many-flowered, rounded or pyramidal, often compound panicle usually as wide as long, pinkish to purple; plants 4-8 dm high. 14. *Origanum*

l. Flowers in an inflorescence more spike-like and longer than wide.

m. Leaves less than 1 cm long, elliptic to ovate, blunt and untoothed; plant extensively trailing in mats; flowers rose-colored, aggregated into a long inflorescence about 1 cm wide; plants aromatic (Fig. 116, f). 15. *Thymus*

m. Leaves with blades over 1 cm long.

n. Inflorescence of small clusters crowded in a spike or an oblong, uninterrupted head; leaves not sharply toothed; flowers usually blue or bluish-purple.

o. Inflorescence an oblong, uninterrupted head; flowers blue; leaves wavy-margined; plants low and prostrate at base; common lawn and roadside weed (Fig. 116, e). 6. *Prunella*

o. Inflorescence of whorls closely grouped in a spike; flowers blue-purple; leaves lanceolate to linear, entire. 13. *Hyssopus*

n. Inflorescence usually interrupted and composed of numerous whorls of flowers; leaves sharply toothed; plants tall and erect.

p. Leaves heart-shaped, nearly as wide as long, long-petioled; lower groups of flowers stalked, as if on side branches. 4. *Nepeta*

p. Leaves lanceolate; flowers all nearly sessile on the main axis.

q. Corolla irregular, the stamens placed under the upper lip; calyx-teeth rigid; leaf-blades truncate at the base with short petioles; not aromatic (Fig. 117, e). 10. *Stachys*

q. Corolla nearly regular, the stamens exserted; calyx-teeth herbaceous; leaf-blades tapering to the base; very aromatic (Fig. 117, c). 17. *Mentha*

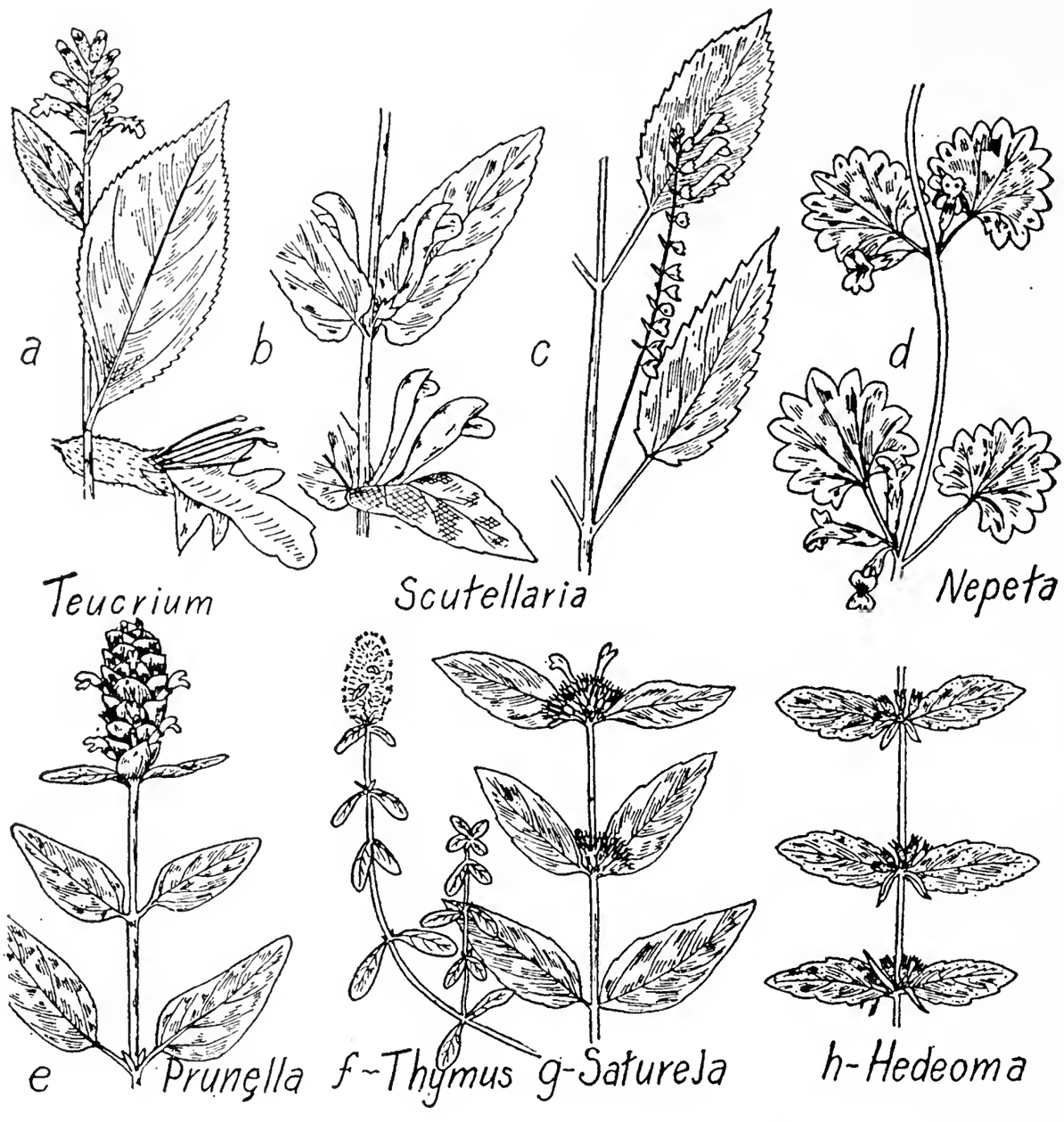


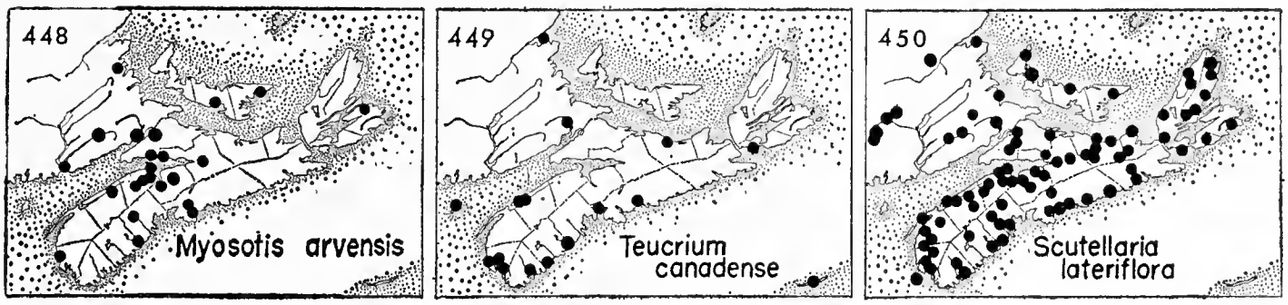
Fig. 116.—**Teucrium**: (a) *T. canadense* x $\frac{1}{3}$, flowers enlarged. — **Scutellaria**: (b) *S. galericulata*, part of plant x 1, (c) *S. lateriflora* x $\frac{1}{2}$. — **Glechoma**: (d) *G. hederacea* x $\frac{1}{2}$. — **Prunella**: (e) *P. vulgaris* x $\frac{1}{2}$. — **Thymus**: (f) *T. Serpyllum* x $\frac{1}{2}$. —**Satureja**: (g) *S. vulgaris* x $\frac{1}{2}$. — **Hedeoma**: (h) *H. pulegioides*, one third of plant x 1.

1. TEUCRIUM L.

1. **T. canadense** L. Fig. 116,a. Map 449. AMERICAN GERMANDER

Gravelly sea-coasts, generally found at the crests of the beaches beyond the reaches of the tide; rather rare and scattered from Annapolis to Shelburne Co.; Halifax Co., barrier beach at Queensland; and by the bridge to Is. Madame in Richmond Co. (Erskine, D. S., 1951); Sable I.

Fla. to Tex. and north to N.S., N.B. and Ont.



2. **SCUTELLARIA** L. SCULLCAP

Rather common, usually branched herbs with showy pale to bright blue 2-lipped flowers. The conspicuous bump on the top of the calyx distinguishes these plants both in flower and fruit.

a. Flowers in axillary one-sided racemes, straight and 5-8 mm long; middle stem-leaves with petioles 1-2 cm long. 1. *S. lateriflora*

a. Flowers in the axils of the leaves, or towards the ends of the branches in the axils of smaller leaves, upwardly curved from the calyx; middle stem-leaves with petioles up to 10 mm long.

b. Petioles of middle stem-leaves 3-10 mm long; corolla 9-12 mm long. 2. *S. Churchilliana*

b. Petioles of leaves very short, less than 4 mm long; corolla 15-23 mm long. 3. *S. galericulata*

1. **S. lateriflora** L. Fig. 116,c. Map 450. SKULLCAP

Common throughout; marshes, along streams, lakes, river-thickets and rich ground often in rather wet areas. July-Aug.

Nfld. to B.C. south to Ga. and s. Calif.

2. **S. Churchilliana** Fern.

Lunenburg Co.: scattered on lake-shore at Wentzell's L., collected by J. S. Erskine; abundant on lake shore, Lewis L. (Smith and Erskine, 1954). This species seems intermediate in many respects between the first and the next species and is suspected of being hybrid between them.

Western Que. to s. N.B., N.S. and s. Me.

3. **S. galericulata** L. Fig. 116,b.

Common throughout, growing in more open locations than the first species; behind sea-beaches, cobbly borders of lakes, edges of ponds and marshes and along rivers. The American plants may be named *S. epilobiifolia* A. Hamilton if they are considered sufficiently distinct from the European ones. Different geographic varieties seem to exist and our plants have been named var. **pubescens** Benth. July 15-Aug.

Lab. to Alaska south to Del., Ohio and Calif.

3. MARRUBIUM L.

1. **M. vulgare** L. HOREHOUND

Introduced from Eurasia and formerly cultivated as a medicinal herb, rarely found as an escape near gardens or in waste places. July-Aug.

Scattered from N.S. to B.C. southward.

4. NEPETA L.

1. **N. Cataria** L. CATNIP

Waste places throughout; rare, usually in small patches near dwellings and showing little tendency to spread. Above Cheticamp, northern C.B., it was found spreading along roadsides and over the talus of cliffs. July-Sept. Plants from N.S. and P.E.I. had 2n = 34 (Mulligan, 1957).

Native of Eu. and se. Asia; throughout much of N.Amer.

5. GLECHOMA L.

1. **G. hederacea** L. Fig. 116,d. GROUND-IVY, GILL

The larger plant with the corolla 1.6-2.3 cm long, with green leaves, is only occasionally seen, generally growing in shady, rather rich soil; Arcadia, Yarmouth Co.; Earltown, Colchester Co., abundant in rich thickets. Introduced from Eu. and somewhat local from Nfld. to Ont. south to Tenn. (*Nepeta* L.).

Var. **micrantha** Moricand is the usual form. This has smaller flowers only 1-1.5 cm long and the leaves are reddish. It is a common weed around buildings, in shady places, on roadsides and in fields, and often a bad weed around habitations where it forms large patches almost impossible to eradicate. (var. *parviflora* Druce). May-Aug.

Introduced from Eu.; Nfld. to Alta. south to Ga.; Pacific Coast.

6. PRUNELLA L.

1. **P. vulgaris** L. Fig. 116,e. HEAL-ALL, SELF-HEAL

This neat weed of grassy habitats is common throughout. As with a number of our other plants, the population consists of a native element and in part of plants introduced from Europe. These differ in minor characteristics such as leaf size and shape but are usually difficult to tell apart. The species is most common in Europe and is scattered in N.Amer.; shady places and thickets, in rich soil or rarely as a weed in fields or gardens. This has the main stem-leaves ovate or ovate-oblong, rounded or abruptly cuneate at the base, and 2/5 to 2/3 as broad as long. Nfld. to B.C. southward.

Var. **lanceolata** (Bart.) Fern. is considered to be native; common throughout, often a weed; fields, roadsides, pastures and thickets. This has the principal leaves more lanceolate and tapering to the base, the blades 1/5 to 1/2 as broad as long. Forma **candida** Fern, with white corollas, is scattered on the west coast of C.B. and is common around Pleasant Bay. Both the calyx and the corolla may vary in their color. Forma **rhodantha** Fern. has a pink corolla; lawn at Truro, growing with the typical blue form.

Nfld. to Alaska south to N.C. and Ariz.

7. LEONURUS L.

1. L. Cardiaca L. Fig. 117,h. MOTHERWORT

Scattered around old houses and gardens, rarely becoming a weed in cultivated land and showing little tendency to spread; probably less common now than formerly. The calyx lobes are prolonged into stiff spines so that the long, interrupted inflorescences are prickly to the touch.

Introduced from Eu.; N.S. to Sask. south to N.C. and Tex.; B.C.

8. GALEOPSIS L. HEMP-NETTLE

Annual weedy plants of Eurasia and N.Afr., with several whorls of flowers in the axils of the upper leaves and the sepals with sharp pointed tips.

a. Stems swollen under the nodes, bristly-hairy; leaves ovate, coarsely serrate. 1. *G. Tetrahit*

a. Stems not swollen under the nodes, covered with soft appressed hairs; leaves lanceolate, obscurely serrate or entire. 2. *G. Ladanum*

1. G. Tetrahit L. Fig. 117,a. HEMP-NETTLE

This rough, weedy plant is common throughout, a bad weed of gardens and sometimes fields in the agricultural areas; and elsewhere in waste places, around sea-shores and in towns. The plant is known to be a tetraploid hybrid and is quite variable. Two varieties are commonly recognized. The typical variety has the leaf-blades rounded at the base, the flowers about 20 mm long with the lowest corolla-lobe nearly square. This has been introduced from Nfld. to Alta. south to N.Y. but is apparently rare in the Maritime Provinces.

Var. **bifida** (Boenn.) Lej. & Court. is our common plant. This has the leaf-blades tapering at the base, and the flowers smaller from 12-16 mm long, with the lowest corolla-lobe notched at the tip. The flowers vary in color from a spotted purple to pinkish to white. The white-flowered form is scattered, especially in northern C.B., and may be called forma **albiflora** House.

Nfld. to Alaska south to N.C.; introduced from Eu.

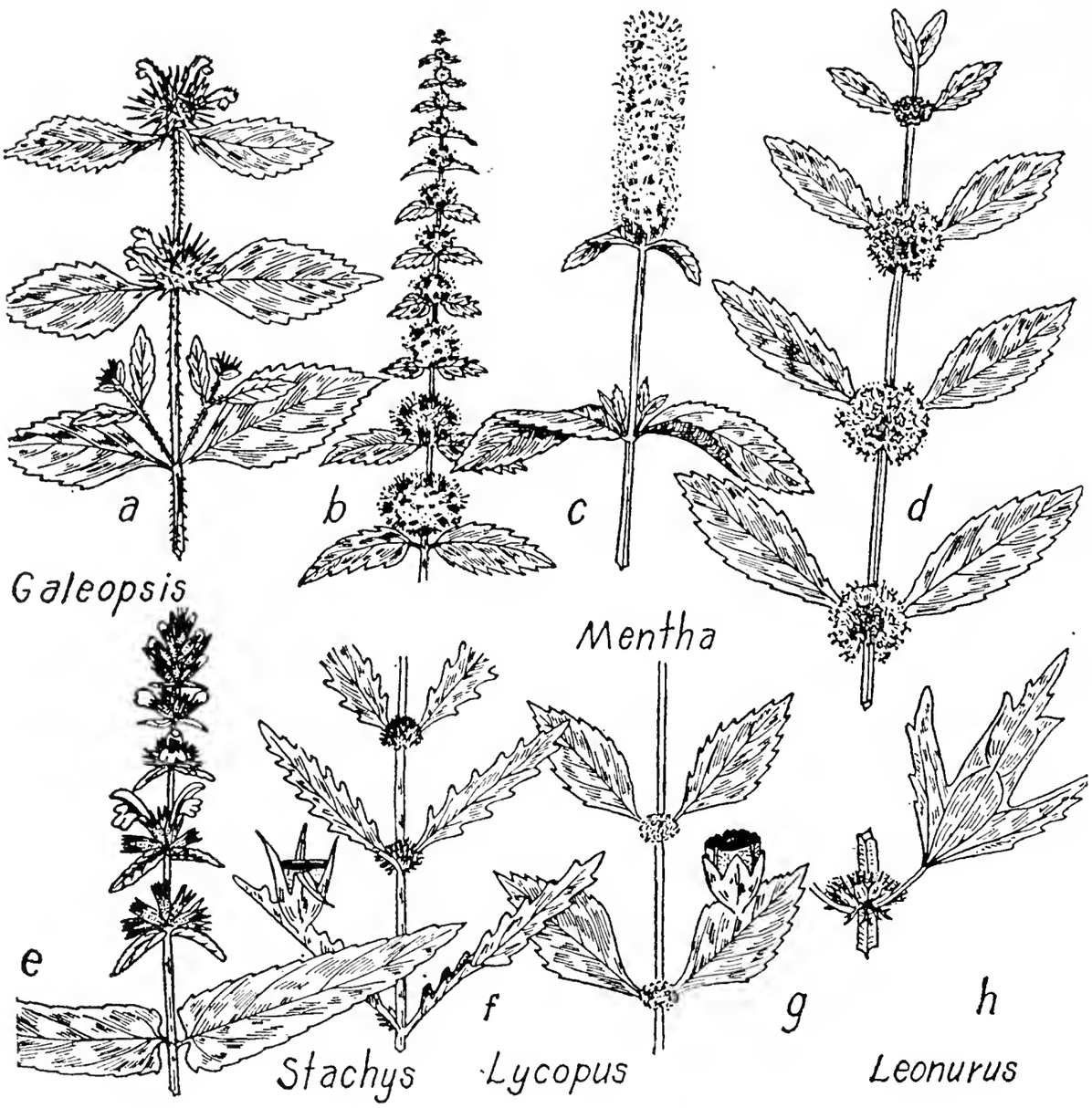


Fig. 117.—**Galeopsis**: (a) *G. Tetrahit* x $\frac{1}{3}$. — **Mentha**: (b) *M. Cardiaca*, top of plant x $\frac{1}{2}$, (c) *M. piperita* x $\frac{1}{2}$, (d) *M. arvensis* x $\frac{1}{2}$. — **Stachys**: (e) *S. palustris*, top of plant x $\frac{1}{2}$. — **Lycopus**: (f) *L. americana* x $\frac{1}{2}$, flowers enlarged, (g) *L. uniflorus* x $\frac{1}{2}$, flowers enlarged. — **Leonurus**: (h) *L. Cardiaca*, node x $\frac{1}{3}$.

2. **G. Ladanum** L.

Occasionally adventive about ports in eastern Canada; listed for N.S., although we have no collections and the plant must be rare.

Nfld. to Que. south to N.J. and Ind.

9. LAMIUM L.

Small, decumbent to erect annuals with small reniform or ovate leaves.

a. Upper leaves sessile and clasping. 1. *L. amplexicaule*
a. Upper leaves petioled, crowded. 2. *L. purpureum*

1. **L, amplexicaule** L. HENBIT

Rare; collected by H. Groh in waste ground at Bridgewater. A small cleistogamous form exists around the Agricultural College at Truro and continues to flower until winter. This is forma **clandestinum** (Reichenb.) G. Beck. Here occasional plants also have normal expanded flowers.

Native of Eurasia and N.Afr.; across N.Amer.

2. **Lamium purpureum** L. RED DEAD-NETTLE

Occasionally reported as found on waste ground or on ballast heaps; North Sydney, Pictou, and Quoddy, Halifax Co.; weed in a garden at Truro. A very similar species, *L. hybridum* Vill. is reported by Erskine on P.E.I. and some of the above records may refer to this species. *L. hybridum* has the leaf-blades more deeply and doubly toothed instead of only shallowly toothed; and its corolla-tube has no ring of hairs inside. July-Aug.

Introduced from Eurasia; scattered from Nfld. to Mich. and N.C.

10. STACHYS L. HEDGE-NETTLE

About 200 species of annual or perennial herbs with the flowers in loose or interrupted spikes; calyx nearly regular; corolla strongly 2-lipped; stamens 4.

a. Annual with fibrous roots; stems diffuse or decumbent; leaves ovate, rounded at the tip. 1. *S. arvensis*
a. Perennial with extensive, thick rootstocks; stems erect, 3-5 dm high, little branched; leaves lanceolate and acute at the tip. 2. *S. palustris*

1. **S. arvensis** L. ANNUAL HEDGE-NETTLE

Occasionally introduced and scattered; Halifax Co.: gardens and roadsides, Halifax and by Bedford Basin; Lunenburg Co.: swamp at Chester; abundant weed in cultivated field at Windsor; and edge of lawn, Main Street, Kentville (Smith and Erskine, 1954).

Local; N.S. to N.Y. and Penn.; B.C.

2. **S. palustris** L. Fig. 117,e. Map 451. WOUNDWORT, HEDGE-NETTLE

Ditches, thickets, around sea-ports and shores in many parts of the Province, now often becoming a very aggressive weed, difficult to control in some fields and orchards; luxuriant in places and apparently becoming much more common recently. The plant is variable, especially as to the amount and type of pubescence, and a number of varieties and forms have been described. Ours closely approach the species; and it may be that all of our plants are introduced from Eu.

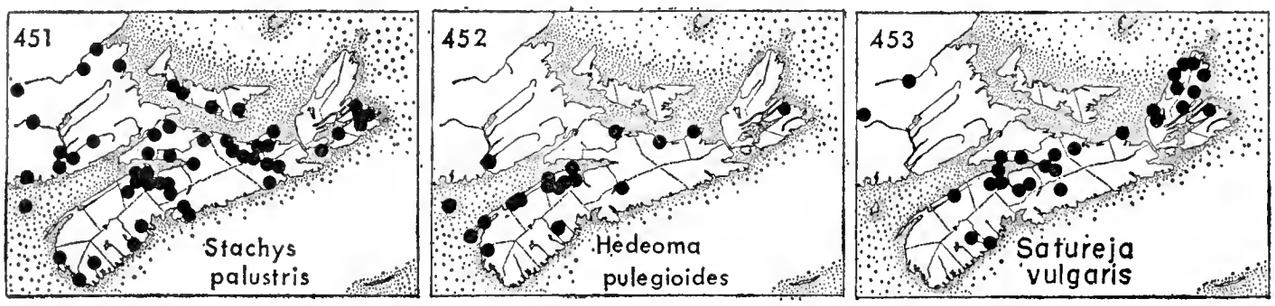
Nfld. to Ont. south to N.Y., all or mostly introduced from Eu.

11. **HEDEOMA** Pers.

1. **H. pulegioides** (L.) Pers. Fig. 116,h. Map 452. PENNYROYAL

This small, strongly-aromatic plant is characteristic of stony soil and upland pastures throughout the northern part of the Province, occasionally near the sea-shores; rather rare and most common on the slopes of the Annapolis Valley. Aug.

N.S. to Minn. south to Fla. and Calif.



12. **SATUREJA** L.

1. **S. vulgaris** (L.) Fritsch, var. **neogaea** Fern. Fig. 116,g. Map 453. BASIL, CALAMINT

Grasslands, pastures and borders of woods, usually on hillsides, and characteristic of rocky, seepy sides of ravines throughout the northern regions from Annapolis and Cumberland Co. to northern C.B.; rare in Halifax and Queens, unknown in the southwestern counties. The variety is the N. Amer. plant.

Nfld. to Man. south to N.C.; B.C. to N.Mex.

13. **HYSSOPUS** L.

1. **H. officinalis** L. HYSSOP

Growing along a brook-side at Wallbrook, Kings Co., perhaps escaped from a near-by garden, collected by D. S. Erskine.

Introduced from Eu.; scattered from N.S. to Sask., more abundant southward.

14. **ORIGANUM** L.

1. **O. vulgare** L. WILD MAJORAM

Hants Co.: covering a considerable area along the Wentworth Road, a mile west of Sweets Corner, collected by J. S. Erskine. At this station it set no fruit and is spreading vegetatively only (Erskine, D. S., 1951).

Introduced from Eu.; N.S. and Ont. south to N.C.

15. THYMUS L.

1. **T. Serpyllum L.** Fig. 116, f. THYME

This plant, reported from Cumberland Co. by Macoun over 60 years ago, is now a common weed throughout the northern part of the county and scattered to Folleigh L. It grows on well-drained or lighter soils, often in large mats along roadsides, pastures and waste places. July-Aug. The smaller cultivated garden Thyme is *T. vulgaris* L.

Northern N.S., common in central P.E.I. to Ont. and N.C.

16. LYCOPUS L.

Perennial herbs with small, dense axillary clusters of small white flowers, usually growing in damp situations. See Henderson (1962).

a. Calyx-teeth short and triangular, not tipped with spines, shorter than the mature nutlets. 1. *L. uniflorus*

a. Calyx-teeth narrowly triangular, with a strong mid-nerve that forms an awn on the tip of the lobe, surpassing the mature nutlets.

b. Leaf-blade ovate to oblong in general outline, the upper surface more or less stiff-hairy; calyx-lobes about 2 mm long; introduced. 2. *L. europaeus*

b. Leaf-blade lanceolate or narrowly oblong in general outline, commonly deeply cut or pinnatifid, smooth or nearly so above; calyx-lobes about 1.5 mm long; native. 3. *L. americanus*

1. **L. uniflorus** Michx. Fig. 117,g. BUGLE WEED

Common throughout in swamps, wet ditches, low ground and along streams, showing great variation in habitat and habit. Plants growing in shady places have the leaves larger and thinner; plants in impoverished soil and sandy areas are small, have thick leaves, and are often sterile. Plants growing in wet areas or on damp sand sometimes have long whip-like branches from the lower nodes. This is forma **flagellaris** Fern. In extreme cases the main stem and branches may recurve and root at the tip. This was first described from the sandy and cobbly margin of Pottle's L., North Sydney (Fernald, 1921). July-Sept. (*L. virginicus* L., var. *pauciflorus* Benth.).

Plants growing near the sea-shore in exposed places may have the leaves somewhat fleshy and the lower ovate and sparingly or not-at-all toothed. This was described as var. *ovatus* Fern. and St. John, based on plants from Sable I. but the variety does not seem to be a valid one.

Nfld. to B.C. south to N.C. and Okla.

2. **L. europaeus** L.

Halifax Co.: edge of ballast dump, Steele's Pond; Point Pleasant Park, Halifax. An adventive species very similar to *L. americanus*, newly recorded for the Maritimes (Erskine, D. S., 1951).

Introduced from Eu.; N.S. to southern Que. and Ont.; Mass. to Va.

3. **L. americanus** Muhl. Fig. 117,f. WATER-HOREHOUND

Common throughout; wet meadows, swamps, and sometimes brackish places, along brooks and in the margin of the sphagnum mat of ponds. July-Sept.

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

17. MENTHA L.

Perennial aromatic herbs with small pale blue or lavender flowers in apparent whorls in the axils of the leaves or these clustered to make a terminal spike or head. The flowers are regular or nearly so with 4 corolla-lobes and 4 exserted stamens. Our only native species is *M. arvensis*. Most of our introduced mints are hybrids of European species. See Stewart (1944).

a. Flowers in heads or long, often interrupted, terminal spikes with the subtending leaves, if any, distinctly smaller than the foliage leaves.
  b. Bracts of the inflorescence narrow and barely exceeding the flowers in length.
    c. Spikes several to many times longer than wide; leaves lanceolate, with short petioles.
      d. Spikes very long and narrow, the whorls of flowers globular; flowers small, the calyx to 2 mm long; leaf-petioles 0-3 mm long. 1. *M. spicata*
      d. Spikes long-oblong, compact and rounded at the top; flowers larger with the calyx 3-4 mm long; leaves with petioles 4-15 mm long. 2. *M. piperita*
    c. Spikes oval, with only 1-3 crowded whorls; leaves widely ovate with long petioles. 3. *M. citrata*
  b. Bracts of the inflorescence much longer than the flowers, resembling but narrower than the foliage leaves; flowers in numerous interrupted whorls which are gradually smaller to the tip of the plant. 4. *M. Cardiaca*
a. Flowers in whorls in the axils of ordinary foliage leaves, not crowded into spikes.
    e. Leaves in the region of the inflorescence ovate to elliptic, with more or less rounded bases.
      f. Angles of stems more pubescent than the sides; petioles, lower surfaces of leaves and stem slightly to very pubescent. 5. *M. arvensis*
      f. Angles and sides of stem more or less equally pubescent with spreading hairs 1-3.5 mm long; petioles and lower sides of the leaves more or less densely pubescent. *M. arvensis* var. *lanata*
    e. Leaves in the region of the inflorescence lanceolate with more or less cuneate bases.
      g. Stem in the region of the first-flowering whorls pubescent on the sides and the angles. *M. arvensis* var. *villosa*
      g. Stem in the region of the first-flowering whorls glabrous on the sides, and minutely pubescent on the angles. *M. arvensis* var. *villosa* forma *glabrata*

1. **M. spicata** L. SPEARMINT

This large, widely-branched, handsome mint is occasionally introduced and grown in wet areas or on rich soil. It may possibly escape but our collections seem to be from locations near where it was formerly planted. July-Sept.

Introduced from Eu.; N.S. to B.C. southward.

2. X **M. piperita** L. Fig. 117, c. PEPPERMINT

Scattered and rather local; wet areas, along streams or in meadows near open or cultivated areas. This plant is considered to be a hybrid between *M. spicata* and *M. aquatica;* and it more closely resembles *M. spicata* by its narrow leaves and longer spikes.

Introduced from Eu.; N.S. to Ont. south; B.C.

3. X **M. citrata** Ehrh.

This species is considered to have the same parentage as the preceding, but it resembles *M. aquatica* more closely by its wide leaves and ovoid heads. *M. aquatica* L., which differs in having the leaves, calyces and pedicels pubescent instead of glabrous, was reported from Pictou by Lindsay and from Truro by Macoun. It has not been observed in recent years and the occasional records may belong to this hybrid.

Introduced from Eu.; N.S. to Ont. south to Va.; B.C.

4. X **M. cardiaca** Baker. Fig. 117,b.

This tall, upright strongly aromatic plant is considered to have originated from a cross between *M. spicata* and *M. arvensis.* The upper leaves subtending the whorls are several times longer than the flowers and gradually become smaller to the top of the plant. One clone, widespread in C.B., has very vigorous running rootstocks; occasionally prostrate plants in very wet areas may have thick, almost oval leaves. Hundreds of mint hybrids occur and it is impossible to define the groups exactly. *M. gentilis* L., supposedly of the same origin, closely resembles a smooth *M. arvensis.* This is not definitely known from N.S.

Introduced; Nfld. to Mich. south to Va. and Ind.

5. **M. arvensis** L. Fig. 117,d. FIELD-MINT

Throughout; most frequent in the Annapolis Valley where it is common and occasionally a bad weed in orchards, cultivated fields and low ground. Partly and widely introduced and apparently partly native. Forma **lanata** (Piper) Stewart is a more hairy form scattered in eastern N. Amer.

Var. **villosa** (Benth.) Stewart is a common native plant; found along brooks, in ditches, swamps, along lake-margins or outlets throughout. Minor variations occur in the pubescence of the stems and leaves; and forma **glabrata** (Benth.) Stewart is wide-ranging in eastern N.Amer. July-Aug.

Nfld. to Alaska south to Va., N.Mex. and Calif.

103. SOLANACEAE NIGHTSHADE FAMILY

This widespread family of possibly 3,000 species is represented with us only by cultivated plants and a few introduced weeds. The tomato, potato and pepper are typical representatives; and *Petunia* and *Salpiglossis* are flowering ornamentals. Some forms are poisonous. Leaves alternate, sometimes divided or deeply lobed; flowers regular or nearly so with 5 sepals, 5 partly-united petals, 5 equal stamens, and 1 pistil with the ovary having 2 locules and many seeds. *Petunia parviflora* Juss. has been reported as a waif at Pictou.

a. Plant woody, climbing, with long drooping branches, without thorns; fruit a dryish orange-red ellipsoid berry; leaves not lobed; flowers pinkish-purple, about 1.5 cm wide. 4. *Lycium*

a. Plants herbaceous (or partly woody and climbing, with lobed leaves in *S. Dulcamara*); fruit a fleshy berry or large capsule.

b. Corolla wheel-shaped (rotate) as in a potato flower; anthers touching, opening by terminal pores; fruit a berry, not enclosed by the calyx (Fig. 118, b,d). 1. *Solanum*

b. Corolla funnel-form; anthers opening by longitudinal slits.

c. Corolla yellow, 1.5-2.5 cm wide; flowers pendulous; calyx much inflated, turning yellowish and enclosing the fruit; fruit a 2-celled berry (Fig. 118, e). 2. *Physalis*

c. Corolla whitish, strongly veined with purple, or purple, 3-5 cm wide; flowers not pendulous.

d. Plant clammy-pubescent; corolla and stamens slightly irregularly placed; corolla greenish-yellow with a purple throat; fruit a capsule, opening by a lid. 5. *Hyoscyamus*

d. Plant not clammy; corolla and stamens regular.

e. Calyx deeply 5-parted, becoming inflated and 2-3 cm long; corolla purplish-blue; fruit a dryish pulpy berry. 3. *Nicandra*

e. Calyx merely 5-toothed; corolla white to purplish; fruit a prickly capsule, opening by teeth at the apex (Fig. 118, c). 6. *Datura*

1. SOLANUM L.

The potato, *S. tuberosum* L., and the Jerusalem cherry *S. Pseudocapsicum* L., may occasionally be found on rubbish heaps. The tomato is the closely related *Lycopersicum esculentum* Mill.

a. Plant trailing or climbing, 1-3 m long; flowers bluish-purple; berries red. 1. *S. Dulcamara*

a. Piant erect, 1-6 dm high; flowers white; berries black. 2. *S. nigrum*

1. S. Dulcamara L. Fig. 118,b. BITTERSWEET

Scattered throughout; thickets, along roadsides, often in low ground along streams, on rubbish heaps, and in many cases in rough ground around buildings or along fences. This plant seems to be much more common than formerly and it is becoming a bad weed in a number of

orchards. The leaves are ordinarily minutely pubescent; distinctly hairy leaves have been segregated as var. **villosissimum** Desv. and are scattered in N.S. (Fernald, 1922). June-Sept.

Naturalized from Eu.; N.S. to Alta. south to Ga.; West Coast.

2. **S. nigrum** L. Fig. 118,d. BLACK NIGHTSHADE

Scattered around the coast on sandy sea-beaches, thoroughly established in gardens on Sable I. The berries of the wild forms are considered to be poisonous but some strains are edible and are cultivated in gardens under the name of Garden Huckleberry. July-Aug.

Introduced and cosmopolitan.

Fig. 118.—**Symphytum:** (a) *S. asperum*, branch x $\frac{1}{3}$. — **Solanum:** (b) *S. Dulcamara* in fruit x $\frac{1}{3}$, flowers x 2, (d) *S. nigrum* x $\frac{1}{2}$. — **Datura:** (c) *D. Stramonium*, flowers, leaf and fruit x $\frac{1}{3}$. — **Physalis:** (e) *P. heterophylla*, top of branch x $\frac{1}{2}$. — **Chaenorrhinum:** (f) *C. minus* x $\frac{1}{2}$.

2. **PHYSALIS** L.

1. **P. heterophylla** Nees. Fig. 118,e. GROUND-CHERRY

Occasionally seen around the edge of orchards in the Annapolis Valley, where it is a persistent weed. July-Aug.

Probably introduced; N.S. to Man. south to S.C. and Texas.

3. **NICANDRA** Adans.

1. **N. physalodes** (L.) Pers. APPLE-OF-PERU

Found occasionally in waste ground near dwellings; Windsor; neglected rich land, Cambridge, Kings Co., rare but appearing annually and as a weed (Schofield, 1949); weed in moist places in a garden at Wolfville. It is rare and probably does not persist, occasionally cultivated as an ornamental.

Native of Peru; N.S. to Ind. and Mo. south to Fla.

4. **LYCIUM** L.

1. **L. halimifolium** Mill. MATRIMONY-VINE

Occasionally found about old gardens or dwellings; Digby, 1933; Port Mouton, 1920; Sable I.; and along dyke at Hortonville in Kings Co.; now rarely cultivated. Late June-Sept.

Introduced from Eu.; N.S. to B.C. south to Va. and Kans.

5. **HYOSCYAMUS** L.

1. **H. niger** L. BLACK HENBANE

Formerly occasional about old dwellings and gardens but no recent records exist; poisonous. Reported as a garden escape by Lindsay, and from the ramparts of the old fort at Annapolis by Macoun; collected at Annapolis in 1902.

Naturalized from Eu.; N.S. to Alta. south to New Eng. and N.Y.

6. **DATURA** L.

1. **D. Stramonium** L. Fig. 118,c. JIMSONWEED, THORN-APPLE

Formerly more common but now only rarely seen about buildings, in towns, waste places or on roadsides; and occasionally sent in for identification. The plant, and especially the fruit, is poisonous and should be exterminated wherever it is found growing as a weed. July-Sept.

Probably introduced from Asia; widely distributed.

104. SCROPHULARIACEAE FIGWORT FAMILY

A large family of over 200 genera and about 2,600 species, ours herbaceous with simple, sometimes lobed, leaves without stipules. The corolla has 5 united petals and varies from nearly regular to strongly 2-lipped; stamens occasionally 5, or 4 with the upper one sterile, or sometimes reduced to 2. The superior ovary has 2 carpels and numerous ovules, forming a capsule. The snapdragon, *Antirrhinum majus* L., is a common ornamental.

a. Leaves all or chiefly basal; plant filiform, matted or creeping, to about 6 cm high; flowers solitary, erect, whitish (Fig. 119, d). 10. *Limosella*

a. Leaves scattered along the stem.

b. Middle stem-leaves mainly alternate.

c. Stamens 5; flowers in tall, elongated spike-like racemes; corolla saucer-shaped, yellow to white. 1. *Verbascum*

c. Stamens 4.

d. Corolla spurred at the base, the spur protruding under the calyx; leaves not pinnately lobed.

e. Leaves lanceolate to linear; plants erect, never trailing.

Flowers in terminal racemes, blue or yellowish; stem smooth (Fig. 119, a). 3. *Linaria*

Flowers solitary in the axils of the leaves, pink; stem glandular-pubescent (Fig. 118, f). 4. *Chaenorrhinum*

e. Flowers in the axils of the leaves, blue with yellow palate, 7-10 mm long; leaves nearly orbicular; plant trailing. 2. *Cymbalaria*

d. Corolla not spurred at the base, pinkish-purple, about 2 cm long and very strongly arched; leaves deeply and finely pinnately lobed; plant 3-5 dm high; n. C.B. 18. *Pedicularis*

b. Leaves predominantly whorled or opposite although the upper bract-leaves may sometimes be alternate.

f. Corolla a clear yellow.

g. Flowers tubular, nearly regular; plants procumbent or ascending, usually much branched; native in dry habitats.

h. Stamens 4; leaves petioled, ovate-oblong, villous and viscid (Fig. 119, f). 8. *Mimulus*

h. Stamens 2; leaves sessile, nearly glabrous, with minute dark glands, narrow, rounded at the base (Fig. 119, e) 9. *Gratiola*

g. Flower with the upper lip of the corolla strongly arched; stems wiry, erect and usually unbranched; calyx much inflated in fruit; introduced weeds of open fields (Fig. 121, c). 17. *Rhinanthus*

f. Corolla purplish to blue to white, often with darker lines.

i. Stamens with anthers 2; corolla nearly regular.

j. Calyx-lobes 4; stamens much exserted, sterile ones none; capsule flattened and often notched at the summit (Fig. 120). 12. *Veronica*

j. Calyx-lobes 5; stamens not exserted beyond the upper lobes of the corolla; sterile stamens 2; capsule ellipsoid, not notched; leaves narrowed to the base; plant 1-3 dm high. 11. *Lindernia*

i. Stamens 4.

k. Calyx-lobes 4 (very rarely 5); corolla strongly 2-lipped, the upper lip arching and hiding the stamens; plants low, rarely over 3 dm high.

l. Leaves nearly round, rarely to 20 mm long, often with deeply-cut teeth, palmately veined; flowers prominently marked with purple or violet veins (Fig. 121, e, f). 15. *Euphrasia*

l. Leaves lanceolate to linear, shallowly toothed, pinnately veined; flower not marked with lines.

m. Flowers yellowish to greenish-purple; leaves entire or with several coarse projections near the base (Fig. 121, b). 14. *Melampyrum*

m. Flowers an even rose color; leaves with shallow teeth; upper lip of the corolla entire (Fig. 121, d). 16. *Odontites*

k. Calyx-lobes 5.

n. Stems 0.5-1.5 dm high; leaves linear, not toothed; corolla rose-purple, obscurely 2-lipped, 1-1.5 cm long (Fig. 121, a). 13. *Gerardia*

n. Stems 4-15 dm high; leaves wide and toothed; corolla strongly 2-lipped.

o. Flowers pure white, few in a short, dense terminal spike, 2-3 cm long (Fig. 119, b). 6. *Chelone*

o. Flowers axillary or scattered in a branched terminal inflorescence.

p. Flowers axillary, solitary in the axils of slightly-reduced leaves, bluish (Fig. 119, c). 8. *Mimulus*

p. Flowers numerous in the axils of much-reduced leaves or scales.

q. Flowers white, showy, about 2.5 cm long; leaves deeply, sharply and irregularly toothed, sessile. 7. *Pentstemon*

q. Flowers reddish to greenish brown, 1 cm long and flattened; leaves shallowly dentate, long-petiolate (Fig. 121, g). 5. *Scrophularia*

1. **VERBASCUM** L. MULLEIN

a. Plant densely woolly; flowers in a dense cylindrical spike to 2 m high. 1. *V. Thapsus*

a. Plant pubescent but not woolly; flowers in a more open inflorescence with pedicels 3-5 mm long. 2. *V. virgatum*

1. **V. Thapsus** L. COMMON MULLEIN

Throughout, usually on light soil, roadsides, hillsides, gravel plains or sandy pastures; a common weed in rough land. July-Aug.

Introduced from Eu.; throughout N.Amer.

2. **V. virgatum** Stokes. MOTH-MULLEIN

An early record of this plant is by Macoun: roadside near Mira Bay, C.B. Co. In a cemetery, Sydney, collected by G. C. Warren, 1946. From the same county as Macoun's sole record, this collection indicates the presence, although probably not persistence, of this species (Erskine, D. S., 1951).

Introduced from Eu.; N.S. and southern Ont. south to S.C. and Tex.

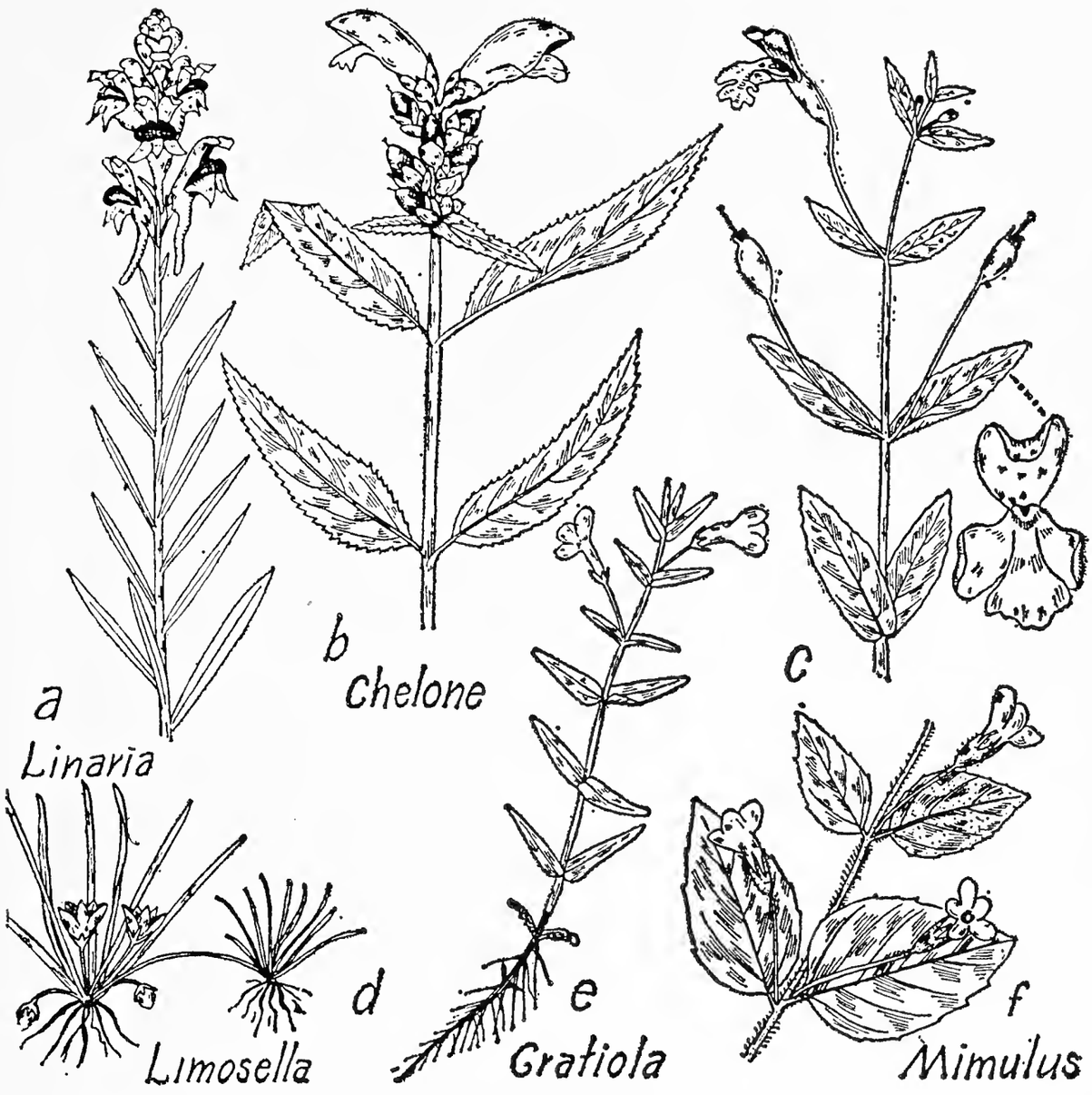


Fig. 119.—**Linaria**: (a) *L. vulgaris* x $\frac{1}{3}$. — **Chelone**: (b) *C. glabra*, top of plant x $\frac{1}{2}$. — **Mimulus**: (c) *M. ringens*, top of plant x $\frac{1}{2}$, flower enlarged, (f) *M. moschatus* x $\frac{1}{3}$. — **Limosella**: (d) *L. subulata* x 1. — **Gratiola**; (e) *G. aurea* x $\frac{1}{3}$.

2. **CYMBALARIA** Hill

1. **C. muralis** Gaertn., Mey. & Scherb. KENILWORTH-IVY

This small, trailing plant is often cultivated in greenhouses or in window-boxes, infrequently escaping from cultivation. Yarmouth Co.: shady roadside, Vancouver St., Yarmouth. This is the first report of the establishment of this introduction in N.S. (Erskine, D. S., 1951).

Introduced from Eu.; widespread.

3. **LINARIA** Mill. TOADFLAX

Corolla very irregular, with the upper lip erect; the conspicuous feature is the prominent spur below the base of the flower. All of our species are introduced and somewhat weedy.

a. Plants slender; flowers pale blue or whitish, up to 1 cm long; leaves linear or nearly so.
b. Lower lip with a prominent palate, closing the throat; plant perennial from creeping rootstocks. 1. *L. repens*
b. Lower lip with only rounded ridges, the corolla with the throat open; plant very slender from fibrous roots. 3. *L. canadensis*
a. Plants stout; flowers yellow, 2-4 cm long.
c. Leaves linear to linear-lanceolate, narrowed to a petiole-like base. 2. *L. vulgaris*
c. Leaves ovate to ovate-lanceolate, rounded and clasping at the base. 4. *L. dalmatica*

1. **L. repens** (L.) Mill. STRIPED TOADFLAX

Kings Co.; orchard back of the laundry, Acadia University.

Introduced from Eu.; local from Nfld. to Mass. and Penn.

2. **L. vulgaris** Mill. Fig. 119, a. BUTTER-AND-EGGS, TOADFLAX

Very common around towns and along roadsides throughout; spreading out into the country, especially in light soils, and in some cases a rather common and persistent weed. Forma **leucantha** Fern. has the corolla milky-white except for the yellow palate and is common in the north-central part of the Province where patches of a lighter color are often seen. July-Aug.

Introduced from Eu.; Nfld. to B.C. south to Fla. and Calif.

3. **L. canadensis** (L.) Dumont

Found sparingly introduced as a railroad weed from Halifax to Yarmouth; also about some of the sea-ports or on sandy shores as a rare introduction in sw. N.S. Collections by W. B. Schofield from Brier I., Digby Co., have the flowers reduced to a mere cap and fertilized without expanding. This is forma **cleistogama** Fern.

Introduced in the northeast; native from Mass. to Iowa, south to Fla. and Tex.

4. **L. dalmatica** (L.) Mill., see Alex (1962).

Reported by Fernald (1948) from fields and roadsides, South Ingonish, Victoria Co.; found also on Middle Head. Collected by J. S. Erskine from a roadside ditch at Hubbards, Halifax Co. This species as yet is very sparingly introduced.

Introduced from se. Eu.; N.S. to Penn. west to B.C.

4. **CHAENORRHINUM** Reichenb.

1. **C. minus** (L.) Lange. Fig. 118, f. DWARF SNAPDRAGON

This is a characteristic railroad weed from Halifax northward; found scattered in other towns and along railroad lines throughout the

Province but nowhere abundant, especially on cinders and often dirty because of the sticky glandular pubescence. July-Aug.

Native of the Mediterranean; N.S. to B.C. south to N.J. and Ill.

5. **SCROPHULARIA** L. FIGWORT

1. **S. lanceolata** Pursh. Fig. 121, g. FIGWORT

Rare; in open woods or dryish thickets, only occasionally in open ground. It is known from but three widely separated places: growing around the bases of apple trees in an orchard, Harmony, Kings Co.; Boylston, Guysborough Co.; and near Baddeck, Victoria Co. June-July.

N.S. to B.C. south to S.C. and Calif.

6. **CHELONE** L.

1. **C. glabra** L. Fig. 119, b. TURTLEHEAD, BALMONY

Scattered throughout, rather common in the northern part of the Province; swamps, wet roadsides, along rocky streams, meadows and estuarine rivers above the influence of the salt water. Forma **tomentosa** (Raf.) Pennell is a form with the leaves densely hairy beneath. Found at Sandy Cove, Digby Co.; and scattered throughout the range of the species.

Var. **dilatata** Fern. & Wieg. is a more northern extreme with the leaves little if at all smaller towards the top of the stem and rounded to the petioles. This is common from Kings Co. to northern C.B., while the southwestern plants have the leaves much reduced upwards and tapering to the petiole. July 15-Aug.

Nfld. to Ont. south to Ga. and Ala.

7. **PENTSTEMON** Mitchell

1. **P. Digitalis** Nutt. BEARD-TONGUE

Kings Co.; north side of run-out field, top of Cape Blomidon. Originally in meadows and prairies in western America, now spread to fields and clearings; introduced.

Me. to Ont. and S.D. south to Ala. and La.

8. **MIMULUS** L. MONKEY-FLOWER

a. Plant erect, smooth; flowers violet-purple; leaves sessile, clasping, lanceolate. 1. *M. ringens*

a. Plant prostrate, soft-hairy and clammy; flowers yellow; leaves short-petioled, ovate. 2. *M. moschatus*

1. **M. ringens** L. Fig. 119, c. Map 455. MONKEY-FLOWER

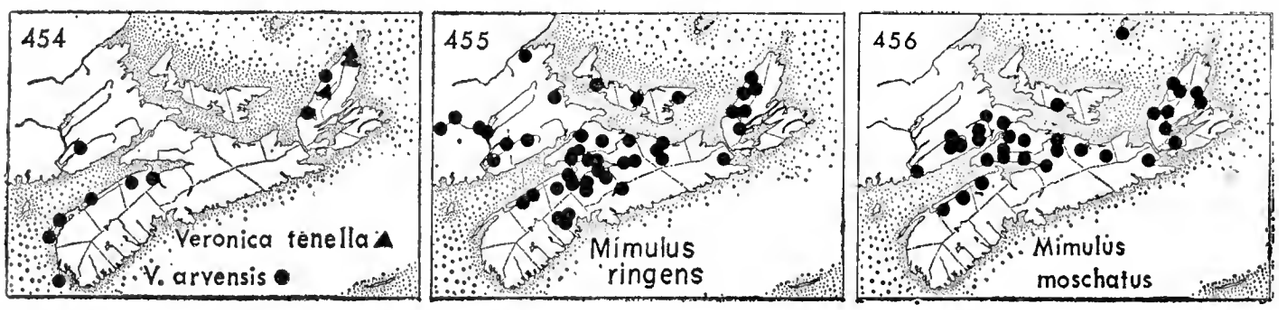
Moist ground, around lakes or along stream-bottoms, occasionally in marshes or wet meadows; scattered from Annapolis and Lunenburg Co. to northern C.B.; absent in sw. N.S. and along the Atlantic Coast from Halifax to eastern C.B. July-Aug.

N.S. to Sask. south to Ala. and Colo.

2. **M. moschatus** Dougl. Fig. 119, f. Map 456. MUSKFLOWER

Scattered from Annapolis and Cumberland Co. to northern C.B.; often forming dense mats on springy hillsides or over wet areas, perhaps introduced but often with the appearance of a native plant. Plants are without a musky odor. July-Aug.

Nfld. to Ont. south to N.C.; Pacific N.Amer.



9. GRATIOLA L.

Small annual or perennial herbs with opposite leaves and yellowish flowers which are solitary on slender pedicels from the axils of the leaves.

a. Leaves lanceolate, widest above the middle and with a narrower base, remotely toothed; corolla with a yellow tube and whitish lobes; capsules 3-5 mm long. 1. *G. neglecta*

a. Leaves lanceolate to ovate, with a wide base, usually not toothed; corolla yellow; capsule 2-3 mm long. 2. *G. aurea*

1. **G. neglecta** Torr.

Collected in a meadow swale on the south bank of the Stewiacke River at Middle Stewiacke in fruit, Aug. 21, 1954.

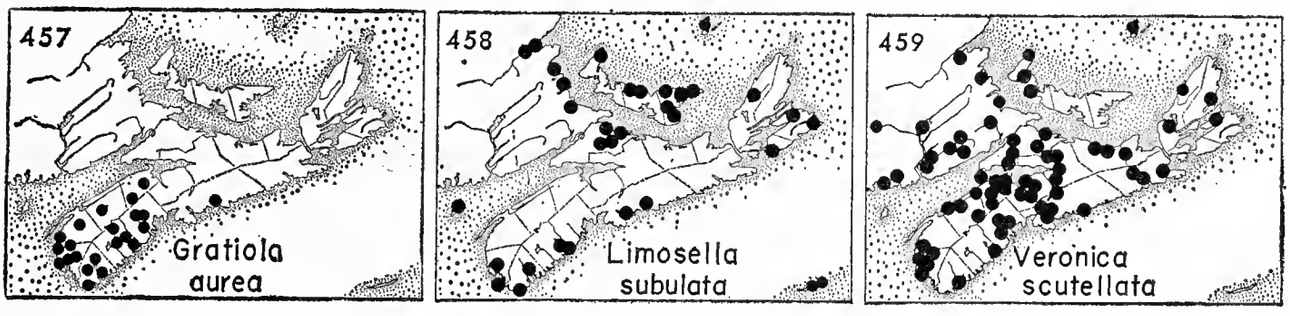
Usually found in wet or muddy places; N.S.; central Maine through southern Que. to B.C. southward.

2. **G. aurea** Muhl. Fig. 119, e. Map 457. GOLDEN-PERT

Common in Yarmouth and Shelburne Co.; scattered east to the Gaspereau L. in Kings Co. and to Bridgewater and Halifax Co.; often in mats on the slatey lake shores, low areas, and even onto dryish savannahs in the moister areas. Forma **leucantha** Bartlett, with the corolla pure white except for a yellowish tinge on the inside of the throat,

forms pure colonies on the pebbly strand of Ponhook L., Queens Co. (Weatherby, 1942); also found from Mass. to Del. July-Aug.

Se. Nfld.; Que. and N.S. and south along the coastal plain to Fla.



10. **LIMOSELLA** L.

1. **L. subulata** Ives. Fig. 119, d. Map 458. MUDWORT

Scattered near the coast of Yarmouth and Shelburne Co.; abundant on the brackish beach and sand flats near Wallace L. on Sable I., scattered elsewhere. Recent collections have now been made on both the south coast of the mainland and on C.B.; low area by ponds, gravel shores on lake mire, muddy edge of pond behind barrier beach; mud on river margin at Oxford, Cumberland Co.; marsh by estuary, Port Medway, Queens Co.; tidal mud of Eastern Passage, Halifax Co. (Smith, 1959).

The species shows two extremes. Those growing on tidal shores are coarse; those on the sandy margins of pools further back in the sand dunes usually have blacker capsules on more recurved pedicels, sepals less acute and leaves more slender. This is forma **maritima** (Raf.) Pennell.

Nfld. and the lower St. Lawrence R. south along the coast to Va. on brackish sand and mud; Alta. and B.C.

11. **LINDERNIA** All.

1. **L. dubia** (L.) Pennell FALSE PIMPERNEL

First collected in the Province at Sheffield Mills, Kings Co. by Fernald; abundant on bottom of drained millpond, Maitland Pond, Lunenburg Co. (Smith and Erskine, 1954); damp gravel pit near Shinimicas Bridge (these tiny plants, up to 3 cm, were growing among *Ludwigia palustris* and were flowering cleistogamously); damp, muddy bank of River Philip, near Oxford, Cumberland Co. (Schofield, 1955).

Wet areas and edges of streams, N.S. to Minn. south to Ala. and La.; B.C. to Calif.

12. VERONICA L. SPEEDWELL

Annual or perennial herbs with opposite leaves and white to blue, small flowers. The calyx is deeply 4-parted. There are about 250 species, mainly in Eu. Two subgenera are quite distinct; in the first the stem ends in an inflorescence while in the second the flowers are borne in racemes from the axils of the leaves.

a. Flowers borne in the axils of the leaves or in a terminal spike so that the main stem terminates in an inflorescence; in all cases the upper bract-leaves alternate.
  b. Plants perennial from creeping rhizomes; flowers crowded in defininte racemes with the bracts much smaller than the leaves.
    c. Racemes dense, spike-like; plants erect, 5-15 dm high. 1. *V. longifolia*
    c. Racemes loose; plant creeping and ascending at the tips, 5-15 cm high.
      d. Stem and pedicels with incurved, non-glandular hairs; corolla 3-5 mm wide, pale blue with blue lines. 2. *V. serpyllifolia*
      d. Stem and pedicels with spreading glandular hairs; corolla 5-8 mm wide, pale to deep blue with darker blue veins. 3. *V. tenella*
  b. Plants annual, fibrous rooted; flowers in the axils of most of the leaves.
    e. Pedicels shorter than the sepals, less than 2 mm long, so that the flowers and fruits are almost sessile; seeds less than 1 mm long, smooth.
      f. Flower white; plant glabrous and rather fleshy; leaves pinnately veined; style very short. 8. *V. peregrina*
      f. Flowers bluish; plant very hairy, not fleshy; leaves palmately veined; style evident. 9. *V. arvensis*
    e. Pedicels longer than the ovate sepals, 4 mm long or longer; seeds 1.3-3 mm long, roughened; plants creeping with the tips ascending.
      g. Capsule 3.5-5 mm wide, not reticulate, the lobes rounded in profile; slightly and narrowly notched; corolla scarcely exceeding the sepals. 10. *V. agrestis*
      g. Capsule 5-9 mm wide, strongly reticulate-veined, the lobes acutish in profile, widely notched at the top; corolla much exceeding the sepals. 11. *V. persica*

a. Main stem never terminating in an inflorescence; leaves opposite throughout; flowers in axillary racemes.
    h. Plants pubescent, of dryish soils.
      i. Leaves sessile; plants creeping; corolla 3-4 mm long; pedicels much shorter than the bracts.
        j. Upper leaves 25-40 mm long, 15-28 mm wide, rounded at the tip. 4. *V. officinalis*
        j. Upper leaves 15-30 mm long, 5-15 mm wide, acute at the tip. *V. officinalis* var. *Tournefortii*
      i. Leaves narrowed to the petiole; plants erect, 1-3 dm high; corolla 5-6 mm long; pedicels much exceeding the bracts. 5. *V. Chamaedrys*
    h. Plants smooth or nearly so; swamp or aquatic plants.
      k. Leaves linear to lanceolate, with a few fine points for teeth, tapering to a long tip. 6. *V. scutellata*
      k. Leaves oblong or ovate, coarsely toothed, with a rounded tip. 7. *V. americana*

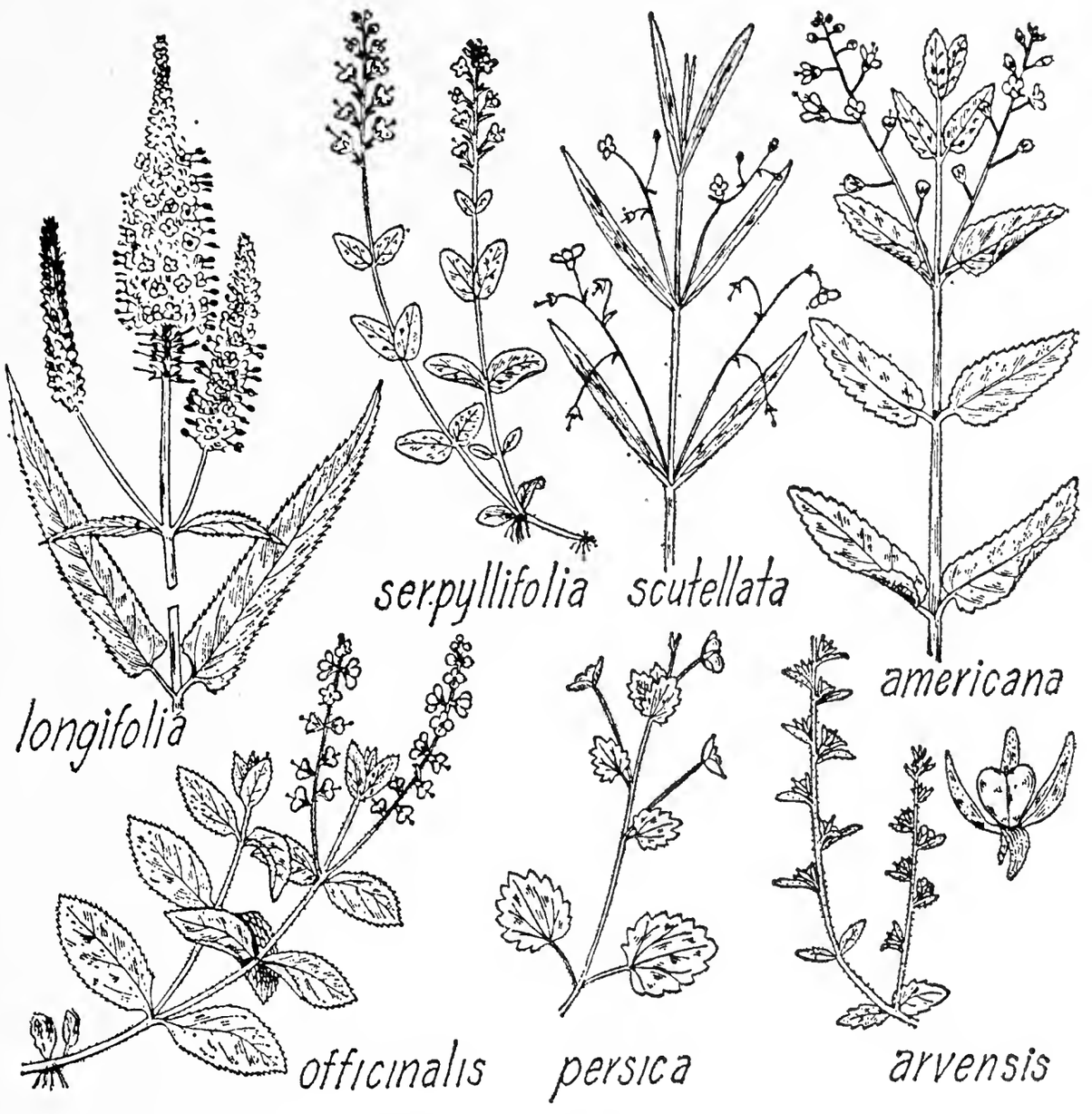


Fig. 120.—**Veronica** spp. x $\frac{1}{2}$.

1. **V. longifolia** L. Fig. 120. GARDEN-SPEEDWELL

Commonly planted in gardens; an abundant roadside escape in roadside thickets through Yarmouth, Digby and Annapolis Co.; scattered to Pictou and Amherst. July-Aug.

Introduced from Eu.; N.S. to Md.

2. **V. serpyllifolia** L. Fig. 120. THYME-LEAVED SPEEDWELL

Common throughout; in moist soils, pastures and damp runs, creeping in the grass and one of the early-flowering plants. (Including var. *nummularioides* Lec. & Lem.). May 15-Oct.

Introduced from Eurasia; Lab. to Ont., southward, B.C.

3. **V. tenella** All. Map 454.

Found in many of the cold northern ravines and along the brooks. The isolated populations in the different ravines seem to differ somewhat in flower color and in general appearance. Victoria Co.; abundant, wet mossy brook-banks, 8 miles from the mouth of the Salmon R.;

common along Gray Glen Brook; Inverness Co.; occasional on gravelly river bank, South Blair R.; abundant on wet cliff face, Big Intervale, Margaree (Smith and Erskine, 1954). (*V. serpyllifolia* var. *humifusa* (Dick.) Vahl.).

Lab. to Alaska south to Me. and n. N.Y.; Eurasia and S.Amer.

4. **V. officinalis** L. Fig. 120. COMMON SPEEDWELL

Roadsides, shady places and as a weed of cultivated fields, usually in richer and more shaded places than the variety. July-Aug. Probably introduced from Eu.; Nfld. to Dak. southward.

Var. **Tournefortii** (Vill.) Reichenb. is found everywhere throughout the Province in open fields, along roadsides, in lawns and thickets. It is rather doubtful if this is a clear-cut variety here as the leaves of this species vary greatly in size and shape according to the vigor of the plant.

Introduced from Eurasia; Nfld., P.E.I. and N.S.

5. **V. Chamaedrys** L. BIRD'S-EYE

Very rarely introduced about some of the towns; collections have been seen from Yarmouth, Windsor and Truro, and from the Gaspereau Valley in Kings Co.; Macoun reports it as sparingly naturalized at Windsor and Halifax.

Introduced from Eu.; Nfld. to B.C. south to Md.

6. **V. scutellata** L. Fig. 120. Map 459. MARSH-SPEEDWELL

Scattered throughout; shallow water, or more often at the base of rushes and cat-tails, in partly dried-out ponds and in swamps. It is more common in the northern and central parts of N.S.; and in P.E.I. it is found only west of Summerside. June 15-Sept.

Nfld. to Alaska south to Va., Colo. and Calif.

7. **V. americana** (Raf.) Schwein. Fig. 120. Map 460. AMERICAN BROOKLIME

Rather common in cold streams, springs, margins of rivers and along shaded ditches and swamps from Yarmouth to northern C.B. in the northern half of the Province; not known on the Atlantic side. June-Sept.

Nfld. to Alaska south to N.C. and Calif.; ne. Asia.

8. **V. peregrina** L.

Halifax Co.; edge of bare slate, in Point Pleasant Park by the Martello Tower, Halifax (Smith and Erskine, 1954).

A weedy species east to Que.; Que. to Minn. south to Fla.; B.C.

9. **V. arvensis** L. Fig. 120. Map 454. FIELD-SPEEDWELL

Dry fields, on slopes and in open woods, usually growing in dry and often very sandy soils; scattered from Yarmouth through the Annapolis Valley, in Pictou Co., and presumably elsewhere, often in large colonies. May-June.

Nfld. to Minn. southward; B.C. to Calif.; introduced from Eurasia.

10. **V. agrestis** L.

Waste ground and sandy fields, rare; Windsor, Halifax and Boylston; collected at Windsor by How, and from waste ground at Dartmouth by Fernald in 1922.

Introduced from Eu.; Nfld. to Alta. south to Penn.

11. **V. persica** Poir. Fig. 120. BIRD'S-EYE

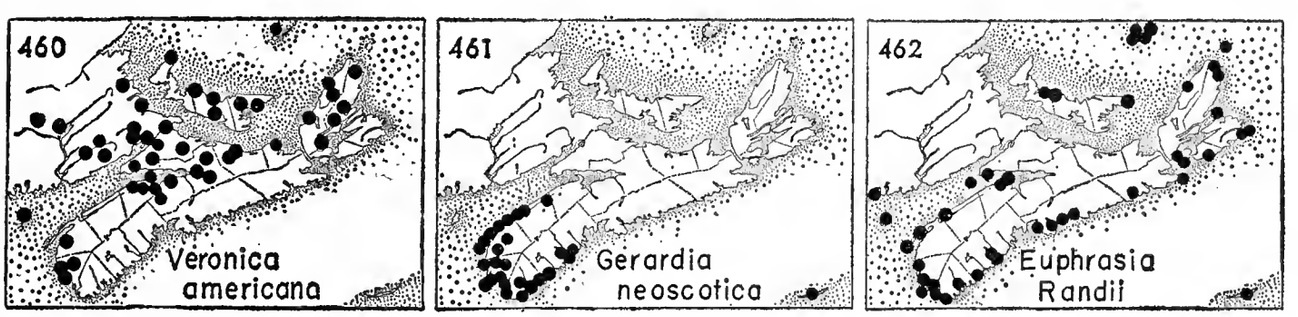
Fields, lawns or open woods; not uncommon about Truro and found at scattered places from Yarmouth to C.B. It was reported by Macoun, under the name *V. Buxbaumii* Tenore as very sparingly naturalized at North Sydney and Pictou. Introduced and occasionally appearing as a lawn weed. Our plants belong to var. **corrensiana** (Lehm.) Boivin (1952-b). The flowers are blue, including the lower lip.

Introduced from Eu.; Nfld. to Ont. southward.

13. GERARDIA L. GERARDIA

Small, erect annuals with opposite linear leaves; flowers tubular and a showy pink, lasting but a single day; western N.S.

a. Calyx-lobes lanceolate, or lance-triangular and usually acute to acuminate; pedicels shorter than the length of the calyx; plants not fleshy.
  b. Calyx-lobes usually longer than the calyx-tube and capsule, 3-8 mm long; flower 1-1.5 cm long. 1. *G. neoscotica*
  b. Calyx-lobes usually shorter than the tube and capsule, 2-3.5 mm long; flowers 1.5-2.5 cm long. 2. *G. purpurea* var. *parviflora*
a. Calyx-lobes oblong to semi-circular, blunt to round, much shorter than the tube; pedicels usually twice as long as the calyx; plants somewhat fleshy. 3. *G. maritima*



1. **G. neoscotica** Greene Fig. 121, a. Map 461.

This species was originally described from plants collected near Middleton in Annapolis Co. It is common in damp or exsiccated sandy or peaty open soil in Yarmouth and Digby Co., found along the Bay of Fundy into Annapolis Co., and in the Annapolis Valley to Middleton; scattered along the South Shore to Queens and Lunenburg Co.; on Sable I. It is very similar to *G. purpurea* L. and is often treated as a variety of it. (*Agalinis neoscotica* (Greene) Fern.). Late July-Sept.

Found only in N.S.

2. **G. purpurea** L., var. **parviflora** Benth.

This small-flowered form of *G. purpurea* has been little-studied in N.S. and is possibly confused with the preceding species. It has been listed for both sw. N.S. and sw. N.B. and larger, stout plants from western N.S. approach this variety. (*G. paupercula* (Gray) Britt.). Aug.

A northern variety from Me. and Penn. west to Iowa.

3. **G. maritima** Raf.

Local; known from salt marshes along the Argyle River at Argyle Head (Fernald, 1922); and elsewhere along the coast in Yarmouth Co. Forma **alba** D. S. Erskine, with white petals, is not uncommon and grows with the purple-flowered form in a salt marsh at Wedgeport, Yarmouth Co. (Klawe, 1955).

Saline marshes along the coast; N.S.; Me. to N.C.

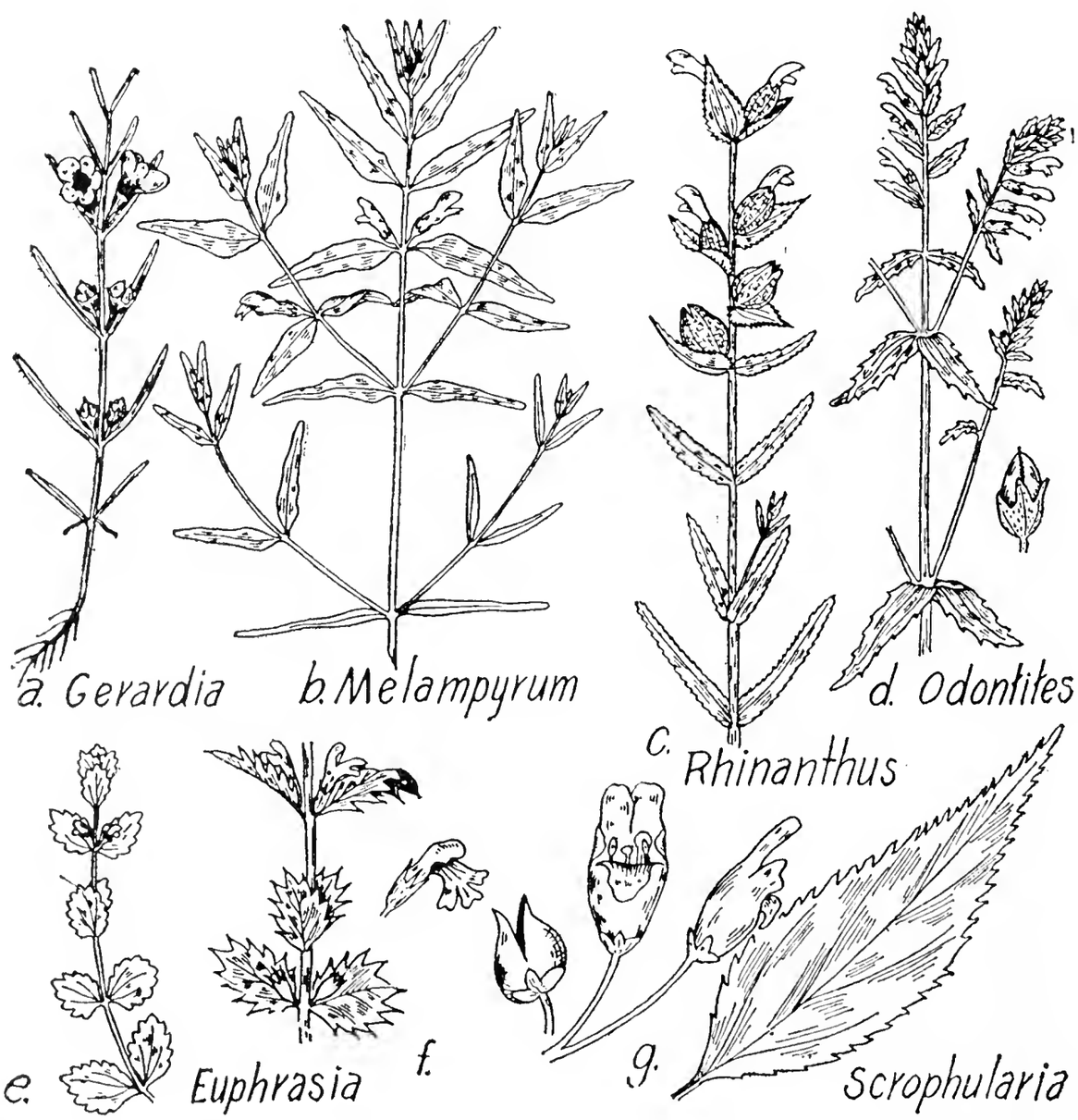


Fig. 121.—**Gerardia:** (a) *G. neoscotica* x $\frac{1}{3}$. — **Melampyrum:** (b) *M. lineare* x $\frac{1}{2}$, —**Rhinanthus:** (c) *R. Crista-galli* x $\frac{1}{2}$. — **Odontites:** (d) *O. serotina* x $\frac{1}{2}$. — **Euphrasia:** (e) *E. Randii* x $\frac{1}{2}$, (f) *E. americana* x $\frac{1}{2}$. — **Scrophularia:** (g) *S. lanceolata*, leaf x $\frac{1}{4}$, flowers x 1.

14. **MELAMPYRUM** L. COW-WHEAT

Slender wiry annuals with opposite, light-green leaves; flowers strongly 2-lipped, pale yellowish, often with a purplish tinge, scattered in the axils of the upper leaves. Our species is usually divided into 3 or 4 sub-species or varieties with different but overlapping ranges. Two occur in N.S. but they intergrade and collections cannot always be definitely named.

a. Stem simple or nearly so, 0.5-2 dm high; foliage leaves and bracts linear, 1-5 mm wide, entire or the uppermost bracts rarely toothed at the base. 1. *M. lineare*

a. Stem bushy-branched, 2-5 dm high; foliage leaves 2-10 mm wide; bracts up to 20 mm wide, some or all sharply toothed at the base. var. *americanum*

1. **M. lineare** Desr. Fig. 121, b. COW-WHEAT

Bogs, heaths, peaty or rocky barrens in rather exposed situations; rather common in its habitat. In northern C.B. it is characteristic of dwarf-shrub, sedge and other heath associations. Nfld. and southern Lab. to B.C. south to N.S., northern New Eng. and Wisc.

Var. **americanum** (Michx.) Beauverd is found on more favorable situations and soils, especially on sands; and it is common in the low-bush blueberry fields.

Dry woods, Anticosti to Minn. south to N.S., N.C. and Tenn.

15. **EUPHRASIA** L. EYEBRIGHT

Small annuals with almost round, sessile, opposite palmately-veined leaves; flowers nearly sessile, small and 2-lipped, the lower lip often with prominent purplish veins; calyx only 4-lobed; stamens 4. About 100 species in the cooler parts of the northern hemisphere. All species are probably semi-parasitic on the roots of other plants.

a. Flowers 2.2-4 mm long, the lower lip not exceeding the upper and scarcely fan-shaped; mature calyx-lobes 1-2 mm long; teeth of the bracteal leaves obtuse or rounded; plants small, mostly 5-10 cm high. 1. *E. Randii*

a. Flowers 4-10 mm long, the lower lip generally exceeding the upper, spreading and conspicuous; mature calyx-lobes 2.5-3.5 mm long; plants usually much larger.

b. Flowers produced along the greater part of the plant, the lower fruits near the bases of the stems and branches.

c. Corolla 5-6.5 mm long, with pale lavender or bluish lines; the lower lip with the lobes not so strongly divergent, about to a 45 degree angle. 2. *E. canadensis*

c. Corolla 6-10 mm long with dark purple lines, the lower lip with wide-spreading lateral lobes. 3. *E. rigidula*

b. Flowers produced usually only on the upper third of the stem and branches; corolla 7-10 mm long with dark purple lines, the lower lip with wide-spreading lateral lobes diverging about 60°. 4. *E. americana*

1. **E. Randii** Robins. Fig. 121, e. Map 462. SMALL EYEBRIGHT

Common on turfy soil and sea-cliffs along the Atlantic Coast and the Bay of Fundy and scattered elsewhere around the coast. This is the most common type and is occasionally very abundant in wet pastures near the coast. Forma **albiflora** (Fern. and Wieg.) Fern., with the lobes of the corolla whitish, is also often common Forma **iodantha** (Fern. and Wieg.) Fern., with the lobes of the corolla purple, is reported by Rousseau (1938) from pastures at Fourchu, C.B.

The leaves are usually more or less pubescent on both sides. Plants with the leaves very densely hairy and the corolla generally whitish have been named var. *Farlowii* Robins.; while plants with leaves smooth on both surfaces are var. *Reeksii* Fern. Neither seems to be a good variety; in fact the classification of *Euphrasia* seems to depend largely upon variable vegetative characteristics.

Lab. and Nfld. to Me.

2. **E. canadensis** Townsend Map 463. EYEBRIGHT, EUPHRASIA

Open barren fields and roadsides, usually near the coast and rather rare; Yarmouth and Shelburne Co.; Is. Madame and St. Paul I. in C.B., probably widely distributed in its habitat near the coast in all the cooler areas of the Province.

Probably introduced; Que., the Maritime Provinces and northern New Eng.; Nfld.

3. **E. rigidula** Jord.

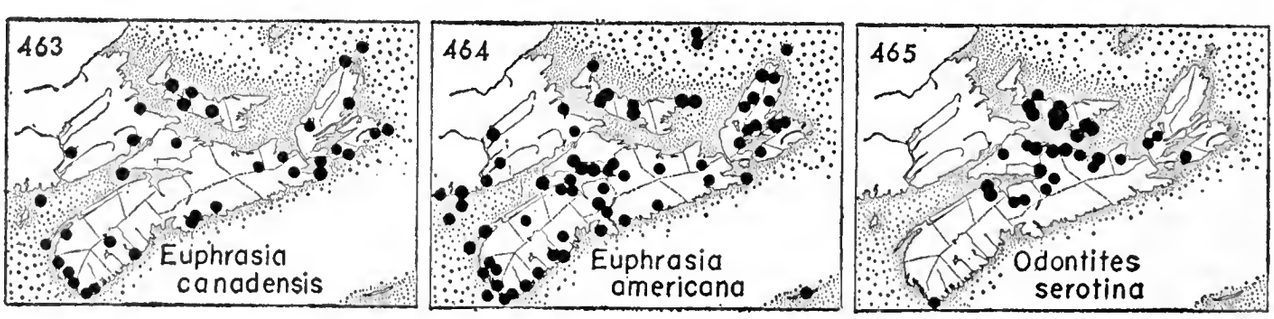
Scattered and in some respects combining the characters of the preceding and the next species. This species, and possibly our other two flowered Euphrasias, are introduced and becoming more common in the proper habitats.

Nfld. to Que. south to N.S., New Eng. and N.Y.

4. **E. americana** Wettst. Fig. 121, f. Map 464. COMMON EYEBRIGHT

This species is common throughout in sterile fields, along roadsides and in pastures near the coast, often found more inland in lawns and pastures. It is by far the most common species of the genus and it is found in a wide variety of habitats and is probably still spreading as a weed. Late July-Sept.

Nfld., the Maritimes and Que. south to Me.



16. **ODONTITES** Ludwig

1. **O. serotina** (Lam.) Dum. Fig. 121, d. Map 465. RED BARTSIA

Scattered in southern C.B.; common along the North Shore and becoming rarer to Hants and Kings Co.; in fields and waste places, in moist soil, usually near the coast. This plant seems to be becoming more common and occasionally it is found as a common weed in damp, old fields or in low pastures. (*O. rubra* of earlier authors). July-Sept.

Introduced from Eu.; N.S. to Que. south to Me. and northern N.Y.; Man. and Alta.

17. **RHINANTHUS** L. YELLOW-RATTLE

Erect, wiry annuals with small, 2-lipped flowers in the axils of the upper reduced leaves. The calyx becomes much inflated in fruit. The common weedy plants are introduced from Europe; more northern forms may be native. The plants are variable and a number of species have been described which are doubtfully present in our area.

a. Bracts subtending the flowers with at least the lower teeth attenuate and ending in slender bristle-tips. 1. *R. Crista-galli*

a. Bracts with the teeth broad and blunt, scabrous and shorter than the mature calyx. 2. *R. borealis*

1. **R. Crista-galli** L. Fig. 121, c. YELLOW-RATTLE

Two varieties occur. Anthocyanin pigments are absent from the species so that the stems lack any black lines and the upper lip of the corolla is without any violet coloring. This is scattered or local; old hay field near North Light, Brier I., Digby Co.; common in pasture at shore, Cape St. Lawrence in Inverness Co.; abundant in field at Northwest Cove, and abundant on exposed areas behind the beach, Eastern Harbour, both on Scatari I., C.B. Co. (Smith and Erskine, 1954). This plant may possibly be native; and the teeth of the floral bracts are not nearly so acute nor bristle-form as in our common weedy plants. Nfld. to B.C. south to the coast of southern Me. and to northern New Eng.

Var. **fallax** (Wimm. & Grab.) Druce has the stems and branches marked with prominent black lines and there are bluish to violet markings on the corolla. This is one of the common weeds of N.S., found throughout in neglected fields, along roadsides and in waste places, where it may be more abundant in places than the grass. Any records of *R. stenophyllus* and *R. Kyrollae* are included within this species. June 15-July.

Nfld. to Que. south to southern New Eng.

2. **R. borealis** (Sterneck) Chabert

Collected but once: by Perry and Roscoe near the ruins of an old house, Trinity Cove, St. Paul I. (*R. oblongifolius* Fern.; *R. groenlandicus* Chabert).

Arctic Amer. south to Nfld., C.B., and alpine areas of New Eng. and N.Y.

18. PEDICULARIS L. LOUSEWORT

1. **P. palustris** L. SWAMP-LOUSEWORT

Rare or local; a collection made by A. H. MacKay is simply labelled western N. S., June 1908; another collection was made by A. G. Huntsman, C.B., July 1917; and Miss M. S. Brown collected it in flower in a marsh, Bay St. Lawrence. It is now known to be common in meadows about the Bay St. Lawrence; and specimens have been seen from Guysborough Co. July.

Marshes and meadows, se. Nfld., the Magdalen I., e. Que. and N.S.

105. OROBANCHACEAE BROOM-RAPE FAMILY

This is a small cosmopolitan family of herbaceous plants without green color. Our representatives are small, yellowish to brownish plants with irregular flowers and the leaves reduced to scales.

a. Flowers numerous in racemes or spikes; plants nearly glabrous.
  b. Plants dry and slender, branched, with loose racemes of flowers; parasitic on beech roots. 1. *Epifagus*
  b. Plants thick and fleshy, consisting mostly of large thick roots and unbranched, dense, cone-like spikes of flowers. 2. *Conopholis*
a. Flowers solitary, a terminal one for each stem; plants in clusters but unbranched except at the base, glandular-pubescent. 3. *Orobanche*

1. EPIFAGUS Nutt.

1. **E. virginiana** (L.) Bart. Fig. 123, a. Map 466. BEECH-DROPS

Frequent and to be expected wherever beech occurs, found scattered under the beech trees with the dry stems persisting over winter; especially common from Annapolis to northern C.B.

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

2. CONOPHOLIS Wallr.

1. **C. americana** (L.) Wallr. Map 467. CANCER-ROOT

Reported by Fernald (1922) from "dry pine and oak woods on steep slopes along the LaHave R., Bridgewater; locally abundant, many stems springing from deep-seated bases attached to oak roots." Kings Co.:

oak woods, Belcher St., near Kentville, collected by R. M. Lewis, 1946; Queens Co.: in clumps under oaks, back of the fish pond, Lake Kedgemakooge, collected by S. Bleakney, 1950 (Smith and Schofield, 1952).

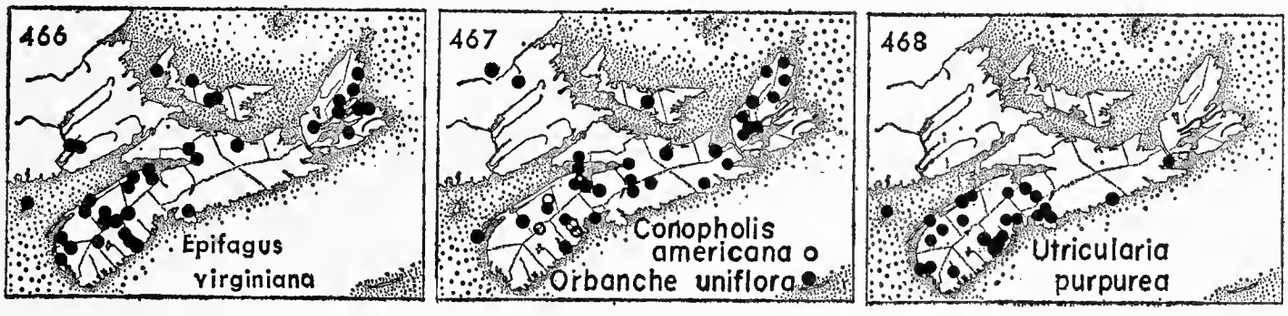
N.S. and southern Me. to Man. south to Fla. and Ala.

3. **OROBANCHE** L.

1. **O. uniflora** L. Fig. 123, b. Map 467. BROOM-RAPE

Under alder shrubs near Wedgeport, Yarmouth Co. (Klawe, 1956); scattered from Kings Co. to Pictou and beyond in various habitats. In the Annapolis Valley it has been found on the sandy plains; but in Colchester and Pictou Co. it is usually found along the river intervales or on grassy slopes, growing in large clumps. It is parasitic on various plants. June-July.

N.S. to Mont. and B.C. south to Fla. and Tex.



106. **LENTIBULARIACEAE** BLADDERWORT FAMILY

Plants of aquatic habitats or on wet mud, partly carnivorous; flowers very irregular, solitary or few on erect peduncles; stamens 2; fruit a capsule.

a. Leaves small and linear, or large and divided into capillary lobes; bladders usualy present; calyx 2-lobed. 1. *Utricularia*

a. Leaves elliptical to ovate, in a basal rosette, 2-5 cm long; bladders absent; flowers solitary, calyx 5-lobed. 2. *Pinguicula*

1. **UTRICULARIA** L. BLADDERWORT

This genus has about 300 species and is almost cosmopolitan. The plant body is much divided and it is possible that what are here called leaves may be divided branches. Tiny bladders, designed to trap small aquatic animals, are common on the submersed species. Three types of plants occur here. The first 5 species are usually submersed, aquatic species with visible and often conspicuous leaves with bladders. They are all perennial by means of special winter buds consisting of crowded small leaves. The next 3 are likewise perennial but have flattened leaf-divisions growing on wet mud. The last 3 are annuals growing on wet mud with only the flowering scapes visible. Consult Rossbach (1939).

a. Stems floating in the water, or creeping over the wet mud; branched leaf-like stems or divided leaves conspicuous; bladders well-developed and common (Fig. 122, b-g).
b. Division of the leaves progressively smaller and capillary, without a midrib and gradually tapering to the tip; plants various and usually floating submersed.
c. Plants large and stout, 3-10 dm long, free-floating in the water; scape 10 cm or more high, with 2-20 flowers; leaves finely divided.
d. Leaves, at least the upper ones, in whorls of 4 or more; submersed leaves 4-6 times divided with capillary segments.
e. All leaves whorled and capillary; flowers purple (Fig. 122, f).
1. *U. purpurea*
e. Submersed leaves alternate and very finely divided with no definite rachis, the flowering scape with a whorl of inflated leaf-like branches half-way to the top which act as floats; flowers yellow. 2. *U. radiata*
d. Leaves scattered, none in whorls, the submersed ones less divided so as to form a zig-zag axis with 3 orders of divisions; flowers yellow, the scape without a whorl of inflated branches.
f. Leaves without spines except at the tips of the divisions, the outline circular or nearly so; basal leaf-divisions about 0.25 mm wide; scapes without scales, 2-5-flowered, the bracts below the flowers without basal lobes; small cleistogamous flowers often present. 3. *U. geminiscapa*
f. Leaves with a bristly margin when seen under magnification, the outline elliptical; basal leaf-divisions 0.5-0.75 mm wide; scape 6-12-flowered, with 1-5 scales, the bracts with basal lobes (Fig. 122, d). 4. *U. vulgaris*
c. Plants small and slender, with short branches creeping over wet mud or in shallow water; scape less than 10 cm high, with 1-2 flowers; leaves with 2-5 rather long, capillary, not overlapping divisions. 5. *U. gibba*
b. Divisions of the leaves flattened, with a midrib and parallel sides with the branches about as wide as the main axis; plants small, generally less than 15 mm wide, the leaves with 4-10 short often overlapping lobes; bracts of scape with basal lobes.
g. Margins of the leaf-divisions entire except sometimes at the tip; bladders on most of the leaves, not on special leafless branches; spur very short; pedicels curved downwards in fruit. 6. *U. minor*
g. Margins of the terminal divisions of the leaf minutely and sharply serrulate; spur about as long as the lower lip of the flower and close to it; pedicels ascending in fruit.
h. Bladders borne on separate leafless branches; apices of the terminal divisions rounded, except for delicate plants in deep water, and mucronate (Fig. 122, b). 7. *U. intermedia*
h. Bladders borne on both leafless branches and on the leaves; terminal divisions of the leaves acuminate; leaves and their teeth larger.
8. *U. ochroleuca*

a. Stems erect, from a base definitely anchored in the sand, mud or bog; leaves minute and linear or none; bladders absent or poorly-developed (Fig. 122, a).
i. Flowers yellow, several at the top of the scape; bracts on the scape just below the flowers not in pairs, stems solitary; leaves very small and narrow, seldom seen.
j. Stems stout, the inflorescence with a straight rachis; pedicels very short so that the flowers appear sessile. 9. *U. cornuta*
j. Stems very slender, the inflorescence zig-zag; pedicels of the flowers filiform, 1-2 cm long. 11. *U. subulata*
i. Flowers purple, solitary, facing upwards; bracts just below the flower in pairs and united to form a tube; leaves small and with few lobes.
10. *U. resupinata*

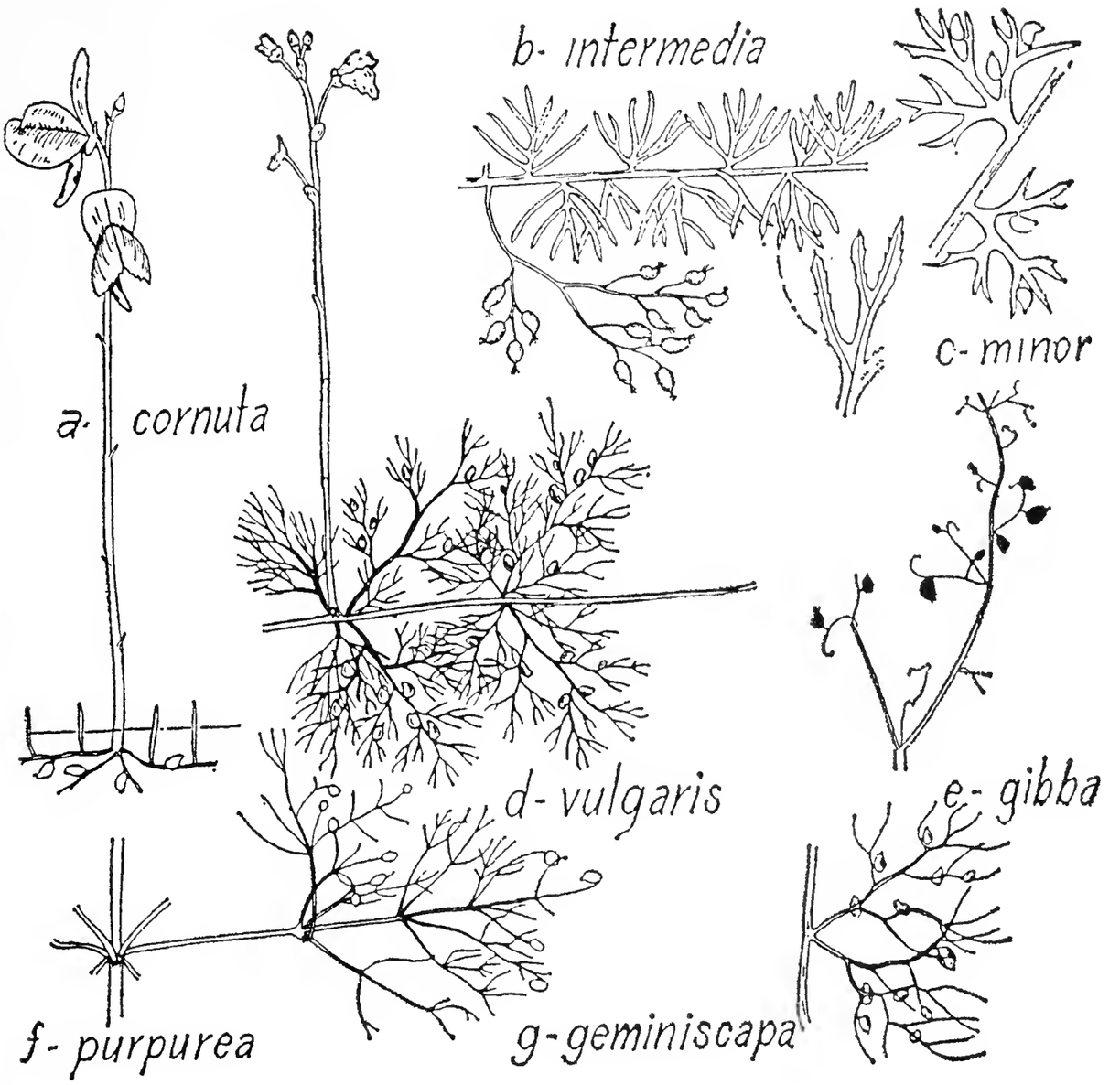


Fig. 122.—**Utricularia**: (a) *U. cornuta* x $\frac{1}{2}$, (b) *U. intermedia* x **1**, (c) *U.* minor x 1-$\frac{1}{2}$, (d) *U. vulgaris* x $\frac{1}{2}$, (e) *U. gibba* x 2, (f) *U. purpurea* x 1, (g) *U. geminiscapa* x 1 (c, e, f and g after Rossbach).

1. **U. purpurea** Walt. Fig. 122, f. Map 468.

Frequent to common from Yarmouth through Digby and Lunenburg Co. to Hants and Halifax; eastern Guysborough Co.; deep water, quiet pools or pond-holes. This is one of our larger and most distinct species, conspicuous on account of its distinct whorls of leaves.

Fla. to La. north to N.S., N.B., e. Ont. and s. Que. and Wisc.; and the Avalon Pen. in Nfld.

2. **U. radiata** Small Map 469.

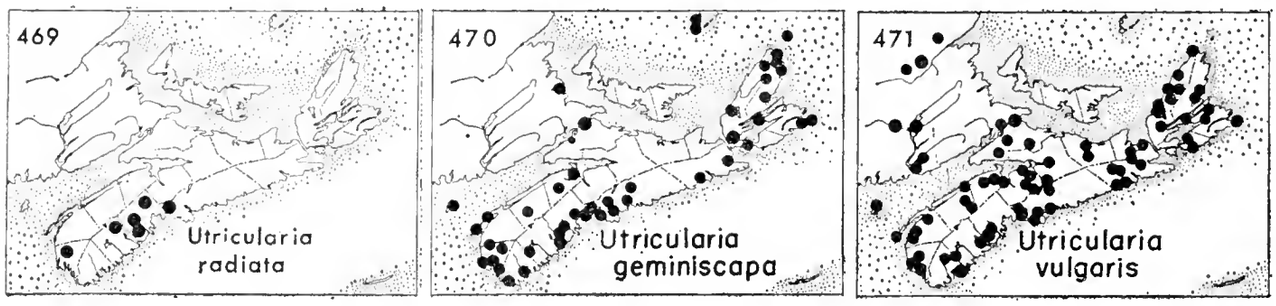
Discovered by Miss M. S. Brown (1940) in full flower, Aug. 31, 1939, in Lake Sawlor, near Hubbards, Halifax Co. She states that the water-level of the lake was exceptionally low at the time of collecting. The plant has since been collected at several other locations in western and south-central N.S. This species is closely related to *U. inflata* See Reinert and Godfrey (1962).

Fla. to Texas north to N.S., s. Me., Penn. and Ind.

3. **U. geminiscapa** Benj. Fig. 122, g. Map 470.

Common in bog-pools and peaty quagmires in barrens, and in pools and brook-ponds from Yarmouth Co. in sw. N.S. and scattered east to Kings Co. and to northern C.B. Very similar to *U. vulgaris* but much smaller. (*U. clandestina* Nutt).

Nfld. to Del. and Va. west to s. Que. and Wisc.



4. **U. vulgaris** L. Fig. 122, d. Map 471.

Common throughout; pools, lake shores, oxbow ponds, in sink-holes and slow streams, our largest and most frequent species. Our plants are var. **americana** Gray.

Lab. to Minn. and Alaska south to Va. and Texas; circumboreal.

5. **U. gibba** L. Fig. 122, e. Map 472.

Rather rare in sw. N.S.; shallow margins of lakes, small pools, and in small ponds in quagmires or peaty situations (Fernald, 1921, 1922); central N.S. and St. Paul I.

Fla. to Tex. n. to N.S. and the Great Lakes; Calif; W.I.

6. **U. minor** L. Fig. 122, c. Map 473.

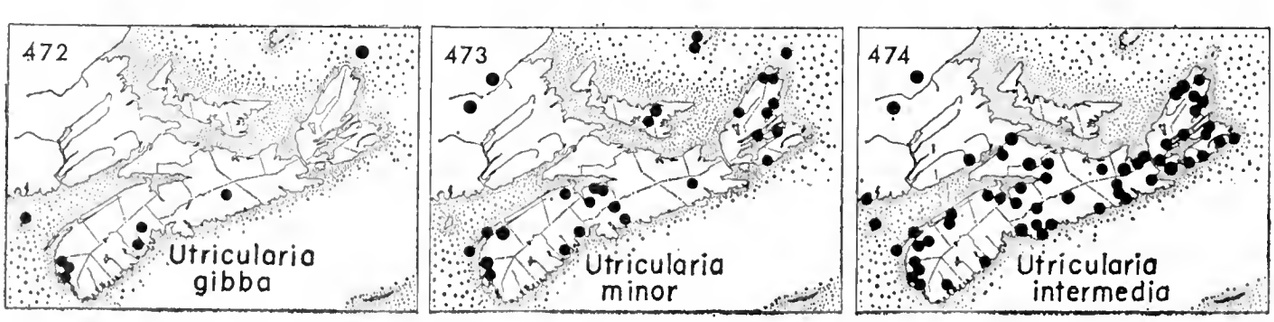
Scattered throughout; pond edges, bog pools, mud in bog pool, edges of meadow ponds, along the boggy margins of lakes and on the muck of lakes, sometimes well under water; St. Paul's I. When the plant creeps out upon the mud the leaves tend to be somewhat larger and more flattened than in the typical form, and the bladders are larger (Perry, 1931).

Greenland to B.C. south to N.J. and Calif.

7. **U. intermedia** Hayne Fig. 122, b. Map 474.

Common throughout; characteristic of the bottoms of marshes, lake shores and often in wet hollows in peat bogs, creeping over the wet substratum of muck or peat and rarely flowering.

Greenland and Nfld. to Alaska south to Penn. and Calif.; Eurasia.



8. X **U. ochroleuca** R. Hartman Map 475.

This rare plant was collected by Perry and Roscoe from St. Paul I., northern C.B. The plants were sterile (Perry, 1931); and this entity is now considered to be a hybrid.

Common in northern Eu.; reported from two localities in Greenland.

9. **U. cornuta** Michx. Fig. 122, a. Map 476.

Common throughout; exposed sand around lake margins, in peat, mucky areas or in boggy depressions and peat bogs from Yarmouth to northern C.B. In some places the brilliant yellow flowers will form carpets over considerable areas. Fernald (1922) mentions a colony at Rhodenizer L., Lunenburg Co., with stems forking into 2 or 3 long branches.

Nfld. to Man. south to Fla. and Texas.

10. **U. resupinata** B.D. Greene

Digby Co.; reported by Fernald in 1921 as locally abundant on the muddy margin of Midway L., Centerville on Digby Neck, and also collected in the same place by Schofield in 1955. This plant has also been found at Barren Lake in Richmond Co., growing in one foot of water.

N.S. to Wisc. south to Penn.; pine barrens S.C. to Fla.

11. **U. subulata** L. Map 475.

Characteristic of wet, sandy and peaty lake-margins of Yarmouth and southern Digby Co., always growing with and clearly passing into forma *cleistogama* (Gray) Fern. (Fernald, 1921). All gradations between the smallest extreme with cleistogamous flowers with tiny creamy or milk-white, spurless corollas sometimes not larger than a pinhead, and the typical *U. subulata* can be found at most of the stations in the Province (Fernald, 1921).

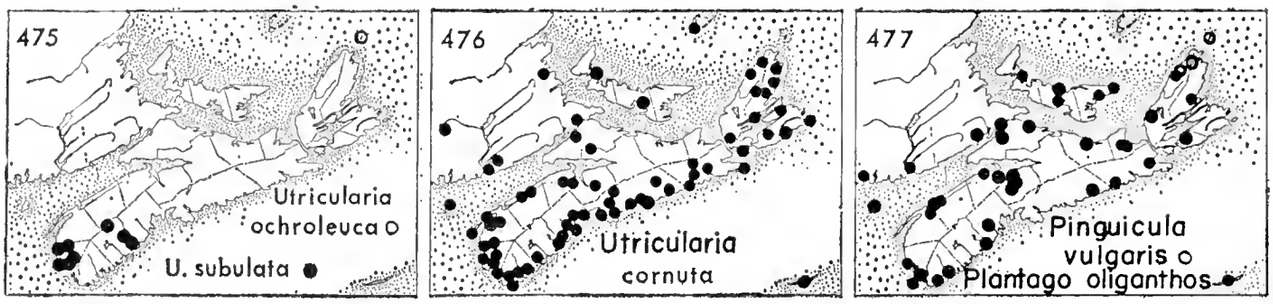
Fla. to Texas north to se. Mass. and N.S.

2. PINGUICULA L.

1. **P. vulgaris** L. Map 477. BUTTERWORT

This small plant with solitary, irregular flowers is one of our rarest species. It was first discovered by Perry and Roscoe on banks of a streamlet on St. Paul I., northern C.B. It was later found to be rare on moist ledges in *Sphagnum* on a cliff near the mouth of the Cheticamp R.; and 2 plants were found in small crevices at the water's edge along Big Southwest Brook, Inverness Co. The leaves are greasy in appearance and small insects are caught and digested on the slimy surfaces.

Wet rocks and shores: Lab. to Alaska south to N.S., northern N.Y. and Mich.



107. PLANTAGINACEAE PLANTAIN FAMILY

A small cosmopolitan family consisting of 3 genera. *Plantago* has over 200 species; *Littorella* has one species in the northern hemisphere and one in South America; while the third genus consists of one species in the high Andes. Our representatives are low herbs with small greenish flowers solitary or in spikes, the corolla membranous and minutely 4-lobed.

a. Flowers numerous in spikes or elongated heads; fruit a circumscissile capsule with 2 or more seeds. 1. *Plantago*
a. Flowers solitary; fruit indehiscent, 1-seeded; plant only a few cm high. 2. *Littorella*

1. PLANTAGO L. PLANTAIN

Several other species may possibly occasionally occur as waifs. Consult Fernald (1925) and Pilger (1937).

a. Leaves all basal; flowers on naked stalks arising from the rosette at the base.
  b. Leaves broadly elliptic to ovate; spikes long and slender; seeds plump and angular, to 2 mm long.
    c. Sepals and bracts broad and blunt at the end; capsule ovate and circumscissile near the middle; base of the petiole rarely reddish; seeds about 1 mm long. 1. *P. major*
    c. Sepals and bracts narrow and pointed; capsule opening much below the middle, elliptic-oblong; base of the petiole purplish; seeds about 2 mm long. 2. *P. Rugelii*
  b. Leaves lanceolate to linear.
    d. Leaves lanceolate, thin and strongly ribbed; spikes at the beginning of flowering ovoid and tapering to the tip, dense; seeds 2-3 mm long, deeply concave on the inner face. 5. *P. lanceolata*
    d. Leaves narrowly lanceolate to linear, fleshy with the nerves obscure; spikes narrow and usually elongate; seeds plump, not concave; near the coast only.
      e. Bracts and calyx-segments mostly hairy and minutely ciliolate; spikes usually dense to the base; seeds oblong to narrowly oval, 1.2-2.3 mm long; leaves mostly shorter than the spikes. 3. *P. juncoides*
      e. Bracts and calyx-segments smooth or nearly so; spikes often remotely flowered at the base; seeds oblong-linear, 2-3 mm long; leaves very fleshy, often exceeding the scapes. 4. *P. oliganthos*
a. Leaves scattered on the stem, linear and opposite; heads axillary on long peduncles, 1-1.5 cm long. **6. *P. indica***

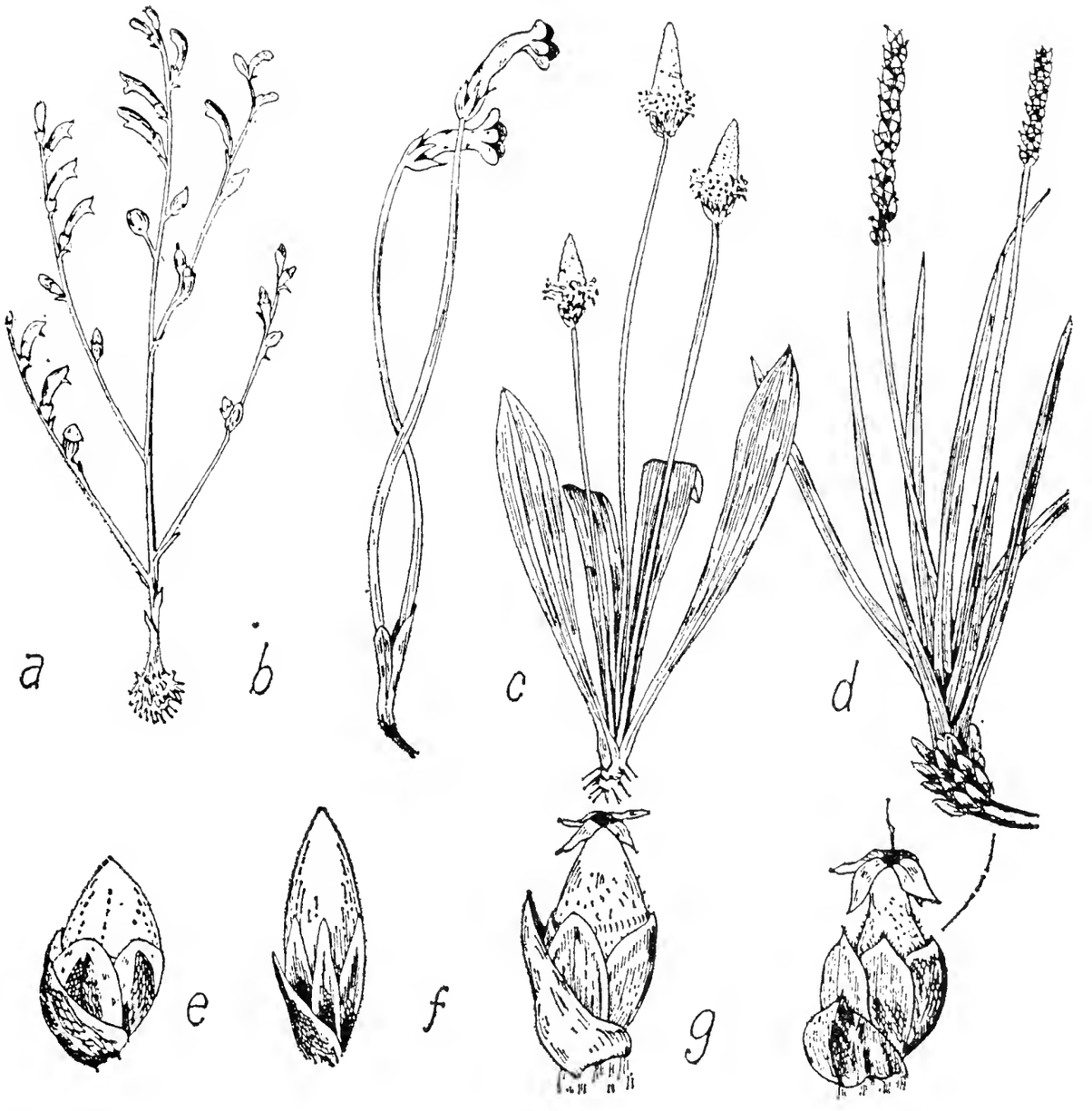


Fig. 123.—**Epifagus:** (a) *E. virginiana* x $\frac{1}{3}$. — **Orobanche:** (b) *O. uniflora* x $\frac{1}{2}$. — **Plantago:** (c) *P. lanceolata* x $\frac{1}{4}$, (d) *P. juncoides* x $\frac{1}{3}$, flower x 4, (e) *P. major*, flower, (f) *P. Rugelii*, flower and fruit, (g) *P. oliganthos*, flower.

1. **P. major** L. Fig. 123, e. BROAD-LEAVED PLANTAIN

Very common throughout and very variable as to pubescence; lawns, road-sides, dooryards, in waste places, and not uncommon along shores and in more native locations, apparently partly native and partly introduced. Twelve varieties and numerous subvarieties and forms have been described. Forma **intermedia** (Gilib.) Pilger is glabrous or nearly so with the leaves round-based. Introduced from Eu. and cosmopolitan.

Var. **scopulorum** Fries and Broberg is found on maritime, often brackish shores. The leaves are decumbent or slightly ascending and the scapes are decumbent at the base. Eu.; C.B. and P.E.I. to Del.; James Bay; Wash. to Calif.

2. **P. Rugelii** Dcne. Fig. 123, f. RUGEL'S PLANTAIN

Common in the Annapolis Valley, scattered around Truro, apparently rare elsewhere and much less common than the preceding even in the favored habitats. Perennial in lawns, along roadsides and sometimes in fields and pastures.

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

3. **P. juncoides** Lam. Fig. 123, d. Map 478. SEASHORE-PLANTAIN

This may be considered as the N. Amer. representative of the circumboreal *P. maritima* L., with our typical seashore plants belonging to var. **decipiens** (Barneoud) Fern. Common around the whole coast; edges of salt marshes and dykelands, sea-cliffs and beaches. On headlands and in unfavorable locations the plants may be very small with reduced leaves and spikes. These may be called forma **pygmaea** (Lange) Rousseau (1943). Greenland and Hudson Bay south to Me. and Md.

Var. **laurentiana** Fern. has the leaves wider, lanceolate to oblanceolate, wide-spreading and often toothed. This is common around northern C.B. where all gradations in degree of leaf-width and type of spreading may be found. Coastal areas of the Gulf of St. Lawrence.

4. **P. oliganthos** R. & S. Fig. 123, g. Map 477. SEASHORE-PLANTAIN

Much less common than the preceding, scattered around the coast and largely restricted to salt marshes and tidal flats. The distinctness of this and the preceding species is again a matter of debate. The extremes appear quite different but this may be largely due to the differences in the habitats the two occupy. Gleason places this species also with *P. maritima* and states that careful studies have shown that these segregates merge completely. July-Sept.

Lab and Nfld. on the coast of the Gulf of St. Lawrence and south to N.J.; Man. and Alta.

5. **P. lanceolata** L. Fig. 123, c. RIB-GRASS, ENGLISH PLANTAIN

Common throughout, especially in hay-fields in late July and August and a common and troublesome weed in many locations. Fernald (1922) mentions a locally abundant variant with the spikes branching, sometimes with a few, often with many, short and densely crowded branches. This monstrosity is also found in the U.S. The plant is somewhat variable, especially in respect to the hairiness of the leaves.

Var. **sphaerostachya** Mert. & Koch has the spikes almost globose and rounded at the tip, instead of being elongated as in the typical variety. This is occasionally seen in the Annapolis Valley and in the southwestern counties on light soils. It is perhaps best regarded as only a form.

Naturalized from Eu.; throughout U.S. and Can.

6. **P. indica** L.

Halifax Co.; railway yard, Halifax, collected by M. S. Brown, 1950 (Erskine, D. S., 1951).

Native of Eurasia; and rapidly becoming established from N.S. to Minn. south to Va. along railroads, etc.

2. LITTORELLA Bergius

1. **L. americana** Fern. Map 479.

Some twenty stations are now known. The greatest concentration of the plant is in southern C.B. with scattered stations on the mainland. The general habitat is the gravelly or sandy bottoms of lakes in sheltered locations. Usually the plants are covered with from 3-18 inches of water, but occasionally extend deeper into the lakes. In only two locations were plants found above the water level at the time of collection. About half the collections are sterile, Flowering and fruiting specimens were found both exposed and immersed with flowering collections from July 19 to Sept 12. Often abundant locally (Smith, 1959). Formerly known only fron the sandy shores of Shubenacadie Grand L, where it was first collected by Mrs. Britton in 1902. The American plants are slightly smaller than the European *L. uniflora* (L.) Asch.

Local from Nfld. to Ont. and Wisc. south to Me. and n. N.Y.

108. RUBIACEAE MADDER FAMILY

Our representatives of this large family are herbs and shrubs with simple, untoothed, opposite or apparently whorled leaves. The flowers are regular and perfect, with 3 or 4 lobes to the corolla, 4 stamens and an inferior 2-celled ovary.

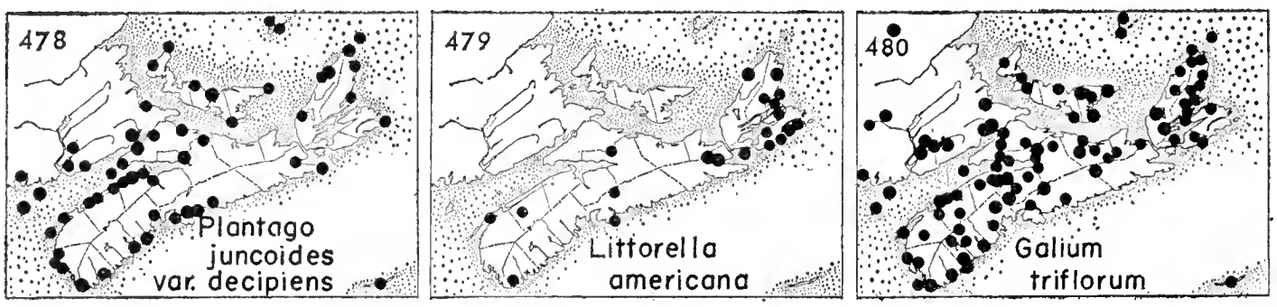
a. Leaves in whorls; plants herbaceous; fruits of two nutlets joined side by side.
  b. Corolla long funnel-shaped; calyx-lobes lanceolate; flowers nearly sessile in leafy-bracted heads; fruits tipped by the persistent sepals. 1. *Sherardia*
  b. Corolla flat with wide-flaring lobes; calyx-lobes absent; flowers on slender pedicels (Fig. 124). 2. *Galium*
a. Leaves opposite, or sometimes in 3's; fruit not as above.
  c. Tall shrubs; flowers in showy globular heads (Fig. 126, a). 4. *Cephalanthus*
  c. Low herbs; flowers few or in pairs.
    d. Plants trailing; leaves round-ovate; flowers pinkish-white, in pairs with one united ovary; fruit berry-like (Fig. 125, d). 3. *Mitchella*
    d. Plants erect; leaves lanceolate, small; flowers pale bluish, solitary; fruit a top-shaped capsule (Fig. 125, a). 5. *Houstonia*

1. SHERARDIA L.

1. **S. arvensis** L. BLUE FIELD-MADDER

Listed in Lindsay's Catalogue from Tatamagouche, Colchester Co. Nothing else is known of this plant in the Province and it is doubtful if it now occurs.

Introduced from Eu.; waste places and fields, N.S. and sw. Que. to N.C. and Mo.



2. GALIUM L. BEDSTRAW

Very common annual or perennial herbs with 4-angled stems and cymes of very small flowers; growing everywhere in damp ground and often in fields and woods. The fruit of two orbicular small nutlets, side by side, is distinctive; many of the species have sprawling, much-branched stems. About 300 widely-distributed species.

a. Ovary and fruit covered with hooked bristles or hairs.
  b. Leaves 1-nerved.
    c. Stems weak and retrorsely hispid; plants annual; leaves mostly in whorls of 8. 1. *G. Aparine*
    c. Stems rather smooth, not clinging; plants perennial.
      d. Plants usually prostrate; leaves lanceolate, in whorls of 6. 2. *G. triflorum*
      d. Plants short and erect; leaves in 2-4 whorls of 4, the upper whorl usually the largest, widely ovate; plant rare in northern C.B. 3. *G. kamtschaticum*
  b. Leaves prominently 3-nerved, firm, linear-lanceolate; stems smooth; leaves in whorls of 4. 4. *G. boreale*
a. Ovary and fruit smooth or nearly so.
    e. Flowers yellow; stem erect or nearly so, not retrorse-scabrous, pubescent with inturned hairs in the inflorescence; leaves often 6 in a whorl, linear. 5. *G. verum*
    e. Flowers white.
      f. Stem smooth or nearly so; plants large, nearly erect, with large decompound inflorescences; leaves 6-10 in a whorl, narrowly lanceolate, upwardly scabrous on the margins, the tips sharp.
        g. Branches of the inflorescence, and the pedicels, wide-spreading. 6. *G. Mollugo*
        g. Branches of the inflorescence, and the pedicels, ascending. 7. *G. erectum*
      f. Stems more or less prickly, or if smooth then with the plants very small and slender; plants matted, reclining or ascending, rather slender.

h. Leaves rounded or acute at the tip but not with a sharp point; plants usually slender.
i. Flowers numerous in a branched inflorescence, 2-3 mm wide, with 4 acute petals; leaves and stems barely retrorse-scabrous. 8. *G. palustre*
i. Flowers solitary, or in 2's or 3's.
j. Corolla commonly with 3 blunt lobes; flowers 1.5 mm wide; fruit 1.25-2.25 mm wide.
k. Pedicels slender and arcuate, mostly 5-10 mm long; flowers mostly solitary.
l. Leaves, stems and pedicel with minute prickles; mature fruit 1.25-1.50 mm thick. 9. *G. trifidum*
l. Leaves, stems and pedicels smooth; mature fruit 1.5-1.75 mm thick. var. *halophilum*
k. Pedicels straight and smooth, mostly 2-6 mm long; flowers mostly in 2's or 3's; leaves and young stems strongly retrorse-scabrous. 10. *G. tinctorium*
j. Corolla commonly with 4 acute lobes; flowers 2-2.5 mm wide, the cymes once-branched with 2-4 flowers.
m. Leaves spreading or ascending, 1.5-2.5 cm long; inflorescence mostly terminal; fruit about 3 mm long, 2.5-3.5 mm thick. 11. *G. obtusum*
m. Leaves mostly reflexed, 0.5-1.5 cm long; inflorescence finally lateral; fruit about 1.5 mm long and 1-1.5 mm thick, on short pedicels. 12. *G. labradoricum*
h. Leaves with a sharp pointed tip; plants very rough, often rather coarse. 13. *G. asprellum*

1. **G. Aparine** L. Fig. 124. CLEAVERS, GOOSE-GRASS

Sparingly introduced; Macoun lists it from ballast heaps and waste places at Pictou and North Sydney; and it is occasionally found elsewhere; Yarmouth Co. (Klawe).

Nfld. to Alaska south to Fla. and Tex.; Eurasia.

2. **G. triflorum** Michx. Fig. 124. Map 480. SWEET-SCENTED BEDSTRAW

Scattered throughout and common from Annapolis to northern C.B.; mixed or deciduous woods. July-Aug.

Nfld. to Alaska south to Va. and Calif.

3. **G. kamtschaticum** Steller Fig. 124. Map 481. NORTHERN BEDSTRAW

Scattered and local in rich hardwoods and ravines in northern C.B.; in the sugar-maple woods at Grand Anse but also in fir-birch associations on top of the plateau; often growing in colonies along cool ravines to the L. O'Law and Whycocomagh.

C.B., Nfld. and Que. south to northern New Eng. and N.Y.; the Aleutians and eastern Asia.

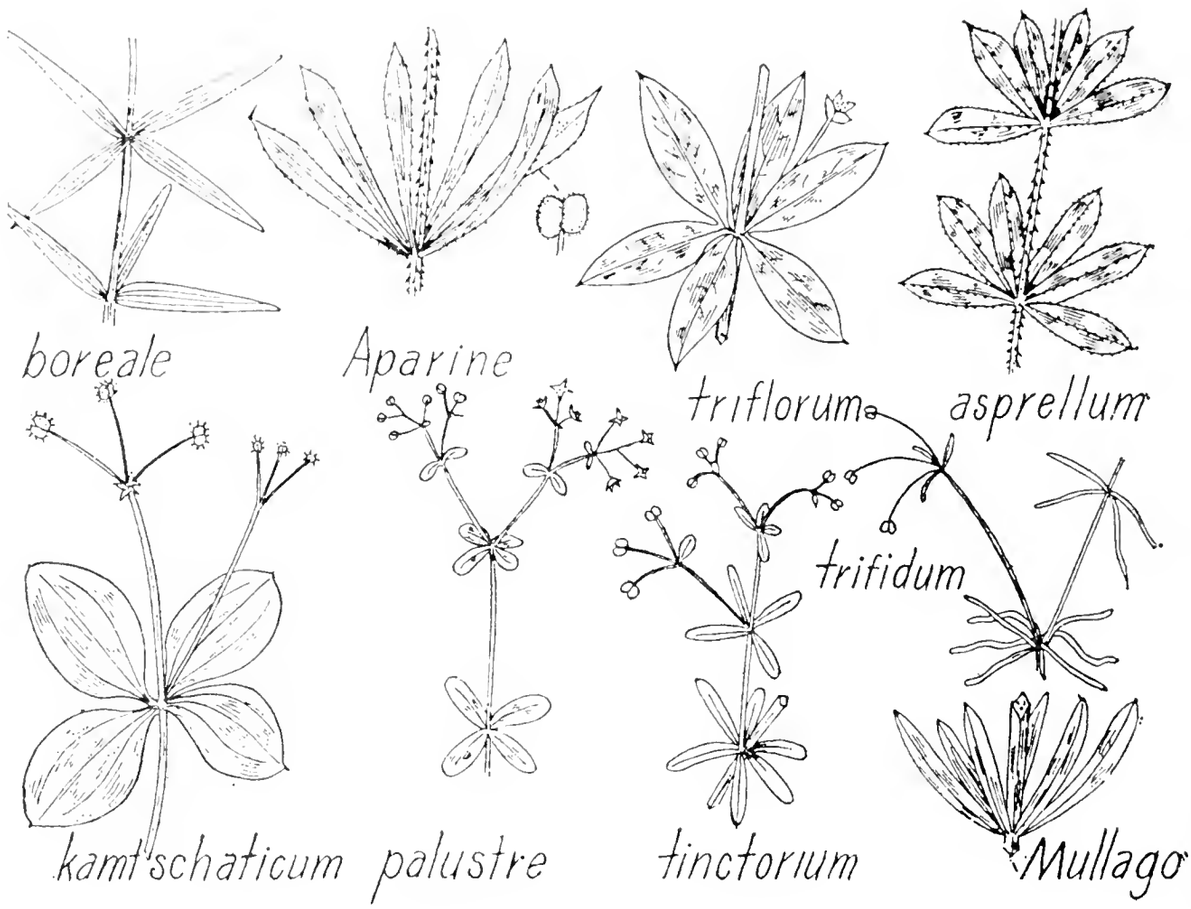
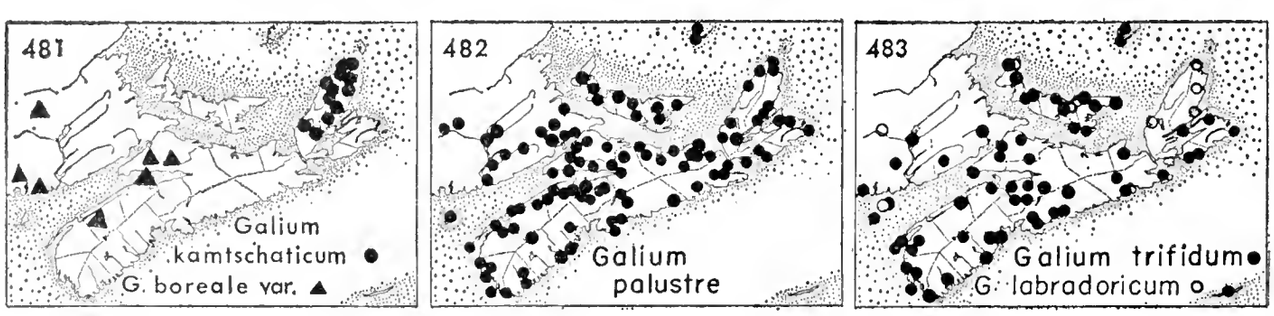


Fig. 124.—**Galium** spp. x $\frac{1}{2}$.

4. **G. boreale** L., var. **intermedium** DC. Fig. 124. Map 481.

Top of Cape Blomidon, Kings Co., where it is local around the edges of woods and in grassy places; Cumberland Co.: a single colony on a hill-top pasture, New Prospect; dry field, Cross Roads (Schofield, 1955). Aug.

N.S. to Ont. westwards and south to Del. and Ind.



5. **G. verum** L. YELLOW BEDSTRAW

Rather rare; seen as an occasional escape along roadsides and near dwellings; on light soils near Kentville in Kings Co.

Recently introduced from Eu.; Nfld. to B.C. south to Va.

6. **G. Mollugo** L. CLEAVERS

This species was reported from Truemanville, Cumberland Co., by Macoun over 60 years ago. Since that time it has spread and become a

bad weed along roadsides and occasionally in fields in the northern and central part of the Province; local elsewhere but apparently spreading. Once established, it forms tall very dense clumps or colonies. July-Aug.

Naturalized from Eu.; Nfld. to Ont. south to Va. and Ind., B.C.

7. **G. erectum** Huds.

Similar to the previous species and probably best considered as a variety of it. This is scattered throughout the center of the Province and, like the last, seems to be becoming more common. It is sometimes weedy along roadsides and in some old fields. It is often considered a variety of the preceding species as var. *erectum* (Huds.) Domin. & Podp. July-Aug.

Introduced from Eu.; N.S. to New Eng. and N.Y.

8. **G. palustre** L. Fig. 124. Map 482. COMMON or MARSH-BEDSTRAW

Very common throughout; ditches, low ground, along streams and in alluvial soils. It is common on intervale meadows and along stream-banks where it grows among the grasses. July-Aug.

Nfld. to Wisc. south to Penn.

9. **G. trifidum** L. Fig. 124. Map 483.

Very wet and boggy places, local throughout except in northern C.B. and much less common than the preceding species, usually growing in rich alluvial soil along stream-bottoms and along swampy borders of freshwater ponds.

Var. **halophilum** Fern. and Wieg. is more fleshy and glabrous throughout. It is found on brackish shores and borders of salt marshes, probably around the whole coast. July 15-Aug.

The species is found from Lab. to Alaska south to N.Y. and Calif.; while the var. is known from Lab. to Mass.

10. **G. tinctorium** L. Fig. 124. SMALL BEDSTRAW

Low areas, along brooks, marshes and bogs; common throughout, flowering several weeks later than the preceding two species. Hara (1939) places this species and the preceding one into one circumboreal species connected by the following variety. (*G. Claytoni* Michx. of earlier records). Nfld. to Nebr. south to S.C. and Tex.

Var. **subbiflorum** (Weig.) Fern. is mostly a western variety intermediate between this and the last species. In the northeast it is more closely connected with, and grades into, *G. tinctorium*. It differs mainly in a tendency towards solitary flowers on longer, sometimes slightly prickly, pedicels. Pebbly lake shore, North Sydney, Howe and Lang. no. 752.

Nfld. to Alaska south to C.B., N.Y. and Calif.

11. **G. obtusum** Bigel., see Fernald (1935).

Rare, with earlier records belonging to *G. palustre*. It is found in boggy swales and wet thickets in the Tusket Valley, Yarmouth Co.; and is to be expected elsewhere in southwestern N.S. Our variety is the typical one which is mainly on the coastal plain. (*G. tinctorium* in Gray, 7th ed.).

N.C. north to N.S. and occasionally inland to Ky., Mo. and Texas.

12. **G. labradoricum** Wieg. Map 483.

This neat and distinctive small *Galium* is scattered in Victoria Co. C.B.; abundant in wet meadow, Bay St. Lawrence (Smith and Erskine, 1954); Inverness Co.; common in an alkaline bog at Black River with other rare species. Erskine reports it from dune slacks and bogs on the north coast of P.E.I.

Nfld. to Man. south to n. New Eng., Penn. and Minn.

13. **G. asprellum** Michx. Fig. 124. ROUGH BEDSTRAW

Very common, the tangled rough masses are found clambering over low bushes and underbrush, roadside weeds and the sides of ditches; in low pastures, along brooksides, ditches, etc. throughout. July-Sept.

Nfld. to Minn. and Nebr. south to N.C.

3. MITCHELLA L.

1. **M. repens** L. Fig. 125, d. Map 484. PARTRIDGE-BERRY

Common throughout; shady and mossy woods, moist banks and hummocky pastures; characteristic of deciduous climax forest in northern C.B.; local on turf-covered dunes on Sable I. It is mostly found in moist places or on hummocks where it does not meet the competition of more vigorous herbs or grasses. July.

Fla. to Texas north to Nfld., Ont. and Minn.

4. CEPHALANTHUS L.

1. **C. occidentalis** L. Fig. 126, a. Map 485. BUTTONBUSH

Local; rare in Shelburne Co.: rocky shore of Deception L., and among granite boulders at L. John (Fernald, 1921), at both stations rare and local; Queens Co.: collected by R. H. Wetmore at Cameron L. and later found to be common along the Medway R. and about the lakes near its head (Weatherby, 1942). This plant is distinctive in flower or fruit because of its globular heads of flowers or of densely packed nutlets. July 15-Aug. 15.

Fla. to Mex. north to N.S. and southern N.B., Que. and Ont.

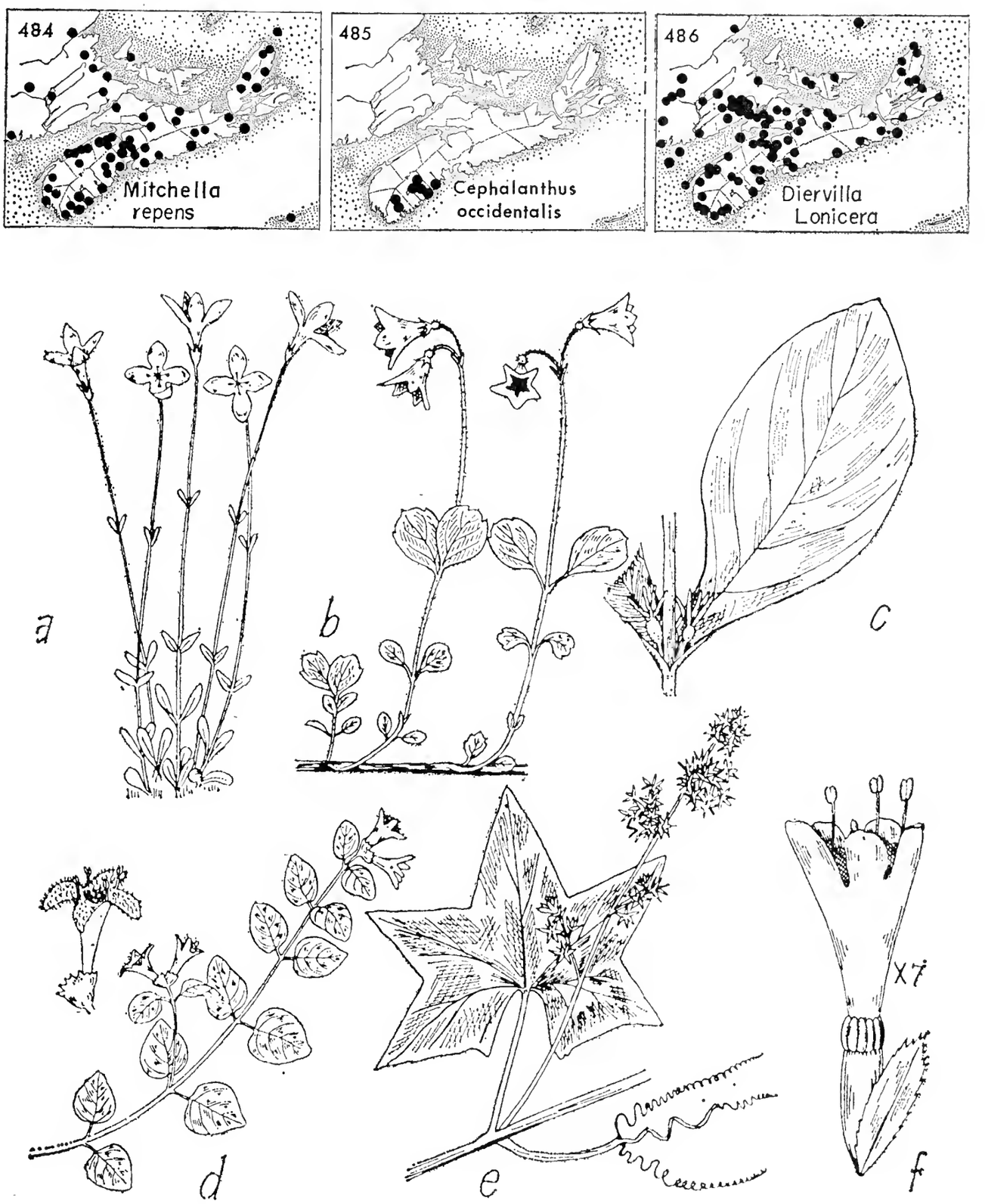


Fig. 125.—Houstonia: (a) *H. caerulea* x $\frac{1}{2}$. — **Linnaea:** (b) *L. borealis* x $\frac{1}{2}$. — **Triosteum:** (c) *T. aurantiacum* x $\frac{1}{2}$. — **Mitchella:** (d) *M. repens* x $\frac{1}{2}$, flower x 1. — **Echinocystis:** (e) *E. lobata* x $\frac{1}{3}$. — **Valeriana:** (f) *V. officinalis*, flower much enlarged.

5. HOUSTONIA L.

1. **H. caerulea** L. Fig. 125, a. Map 491. BLUETS

This small herb is around 7 cm high and tends to grow in tufts or large colonies. Occasionally it is so abundant that a moist hillside or a grassy pasture may be pale lavender when the plant is in flower. It is

scattered in the western counties, often abundant near Halifax and in the north-central area, and becomes rarer eastward. Mid-May to mid-June.

St. P. and Miq. I. to Ont. and Wisc. south to Ga. and Ark.

109. CAPRIFOLIACEAE HONEYSUCKLE FAMILY

Herbs, shrubs or vines with opposite leaves without stipules. The flowers are perfect, regular or irregular, with 5 corolla-lobes, 5 or 4 stamens, and an inferior ovary with 1-5 cells. Numerous species are grown as ornamental plants.

a. Shrubs.
  b. Leaves simple or merely palmately lobed.
    c. Leaves finely and sharply toothed; fruit a capsule; flowers yellow; shrubs 3-6 dm high in spreading patches (Fig. 127, a). 1. *Diervilla*
    c. Leaves entire, or obscurely and bluntly toothed; fruit a berry; flowers pinkish to cream-colored.
      d. Flowers solitary or in axillary clusters; shrubs mostly less than 1.5 m high.
        e. Corolla irregular, funnel-form; berry red or blue, 2-3-celled, several-seeded (Fig. 127, b,c). 2. *Lonicera*
        e. Corolla regular and bell-shaped; berry white, waxy, 4-celled, 2-seeded (Fig. 127, d). 3. *Symphoricarpos*
      d. Flowers small and numerous, in an erect compound inflorescence or cyme; shrubs mostly over 1.5 m high (Fig. 128). 6. *Viburnum*
  b. Leaves pinnately compound, the leaflets toothed (Fig. 126, b, c). 7. *Sambucus*

a. Herbs or trailing semi-woody plants.
    f. Plant trailing, partly woody; flowers in pairs on upright branches, bell-like, pink; stamens 4 (Fig. 125, b). 4. *Linnaea*
    f. Plant erect, herbaceous, around 1 m tall; flowers axillary, sessile, reddish; stamens 5 (Fig. 125, c). 5. *Triosteum*

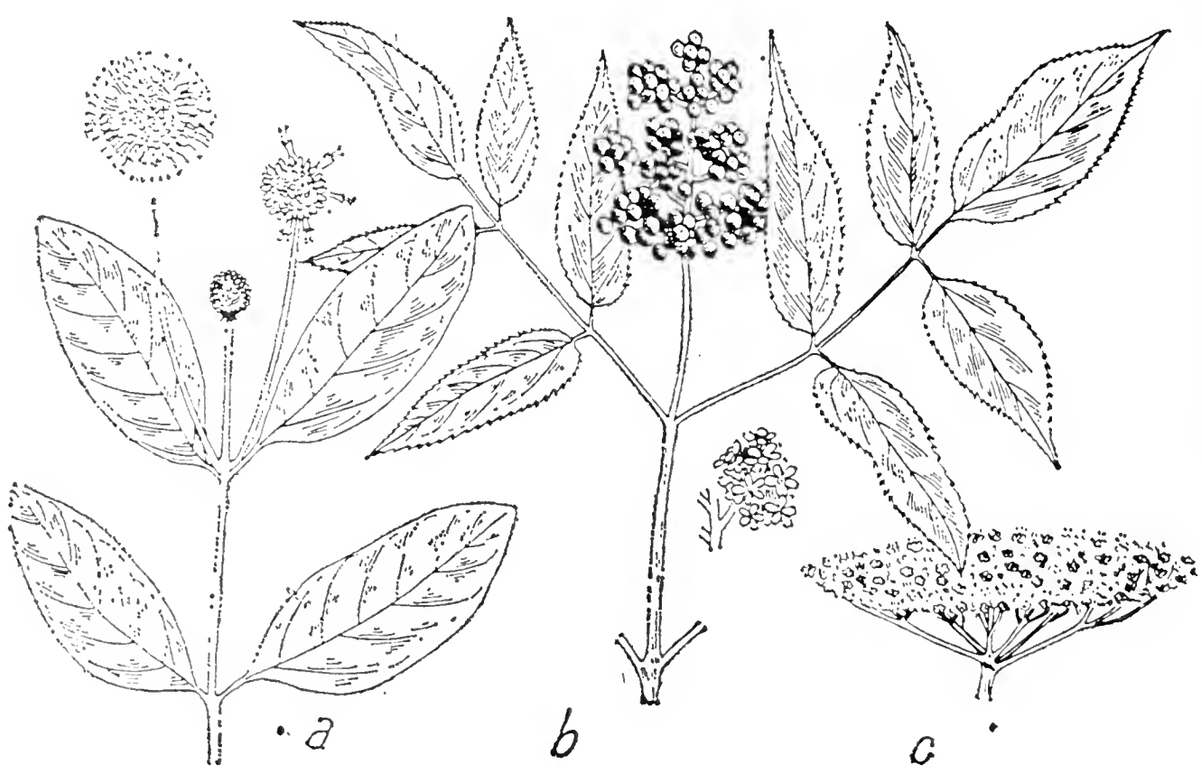


Fig. 126.—**Cephalanthus:** (a) *C. occidentalis* x $\frac{1}{2}$. — **Sambucus:** (b) *S. pubens*, fruiting twig x $\frac{1}{2}$, flower x 1, (c) *S. canadensis*, inflorescence x $\frac{1}{4}$.

1. **DIERVILLA** Mill.

1. **D. Lonicera** Mill. Fig. 127, a. Map 486. BUSH-HONEYSUCKLE

Common throughout; sandy or stony ground, thickets, dry plains, roadsides and pastures; on very light soil it usually grows in the shade but otherwise it shows a wide range of habitats. June 20-July.

Nfld. to Sask. south to N.C. and Iowa.

2. **LONICERA** L. HONEYSUCKLE

Shrubs and vines with entire, opposite leaves. Each peduncle has a pair of sessile flowers, sometimes with their ovaries wholly united. The Tartarian Honeysuckle, *L. tatarica* L., is frequently cultivated as an ornamental shrub and may be found on dumps.

a. Flowers in pairs or rarely solitary; plants bush-like, erect; native.
  b. Leaves elliptical, 2-4 cm long, thick and veiny; flowers cream-colored, on peduncles 3-7 mm long, crowded; fruit blue, the two ovaries united to form one berry; plants less than 1 m high. 1. *L. villosa*
  b. Leaves ovate, thin, smoothish and much larger; flowers greenish-yellow, on peduncles 14-30 mm long; fruit red, the two berries nearly separate; plants mostly over 1 m high. 2. *L. canadensis*
a. Flowers in a dense head, purple tinged, turning yellowish; plant a twining vine; garden escape. 3. *L. Periclymenum*

1. **L. villosa** (Michx.) R. & S. Fig. 127, b. Map 487. MOUNTAIN FLY-HONEYSUCKLE

The typical variety is a northern depressed shrub which is densely hairy on the twigs and leaves. This has not been found in the Province. Several other varieties have been proposed but in N.S., and apparently elsewhere, these intergrade and appear more like forms. (*L. caerulea* L. var. *villosa* (Michx.) T. & G.).

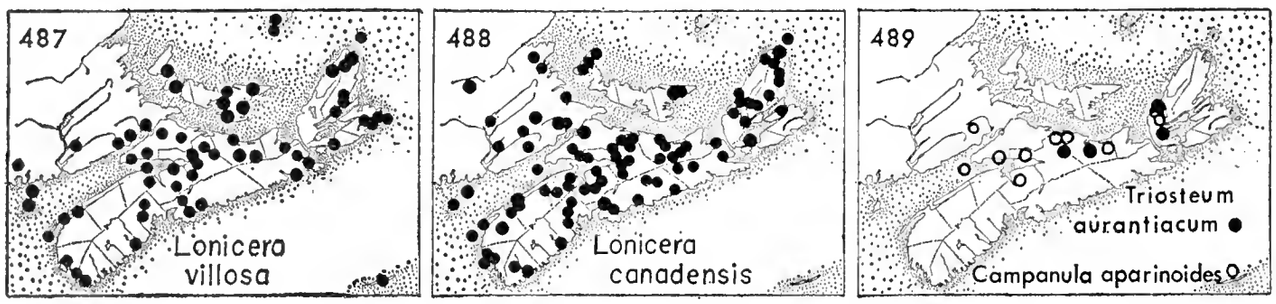
Var. **Solonis** (Eat.) Fern. has the young branches covered with fine short hairs mixed with longer ones and the leaves are pilose beneath. Var. **calvescens** (Fern. & Wieg.) Fern. has the young twigs with only fine short hairs or puberulence. Var. **tonsa** Fern. has the branches glabrous, and the leaves glabrous or nearly so. Most of the material found in bogs, wet pastures, heath-barrens and boggy thickets have the characteristics of the first two varieties; scattered in the cooler parts of the Province. Var. *tonsa* occurs in low pastures above Parrsboro and sometimes fruits abundantly. The berries are delicious in flavor and could be an article of diet where they are found in sufficient quantities. May.

Lab. to Alta. south to Mass., Mich. and Minn.

2. **L. canadensis** Bartr. Fig. 127, c. Map 488. AMERICAN FLY-HONEYSUCKLE

Common throughout, especially from Annapolis Co. to northern C.B.; light or rocky woods, ravine banks, and characteristic of hardwood forests. Early May.

N.S. to Ont. south to N.C. and Iowa.



3. **L. Periclymenum** L. WOODBINE

Noted by Fernald (1921) as becoming naturalized along roadside fence-rows about Yarmouth. The shrub is now becoming rather common there as an escape and is often seen along stone walls and rocky banks. July-Aug.

Native of Eurasia; widely cultivated and occasionally escaping.

3. SYMPHORICARPOS Duham.

1. **S. albus** (L.) Blake, var. **laevigatus** (Fern.) Blake. Fig. 127, d. SNOWBERRY, WAXBERRY

An old-fashioned shrub formerly widely planted around buildings and in gardens because of its large waxy berries; occasionally spreading and persisting; rarely found along roadsides. The variety is the more erect, western form with leaves glabrous beneath. This has been cultivated eastward; and it is difficult to separate it from the typical variety. (*S. rivularis* Suksdorf.). June.

Alaska to Calif. and Mont.; introduced eastwards.

4. LINNAEA Gronov.

1. **L. borealis** L., var. **americana** (Forbes) Rehd. Fig. 125, b. TWIN-FLOWER

Common throughout; characteristic of wooded swamps, spruce bogs and coniferous forests, often forming a carpet over the ground. It is especially common eastward in a variety of habitats, even in open sunlight; also on Sable I. Late June.

Lab. and Nfld. to Alaska south to Md., Ind. and Colo.

5. TRIOSTEUM L.

1. **T. aurantiacum** Bickn. Fig. 125, c. Map 489. FEVERWORT, HORSE-GENTIAN

Local; intervales or in rich soil along the rivers, in one place growing on limestone banks. It is rare and local above Truro and at Kemptown in Colchester Co.; near New Glasgow in Pictou. Co.; and occasional on intervales in central and northern C.B. July. This plant is sometimes included as a variety of the wide-ranging *T. perfoliatum* L.

N.S. to western Ont. and Wisc. south to Md., Ga. and Iowa.

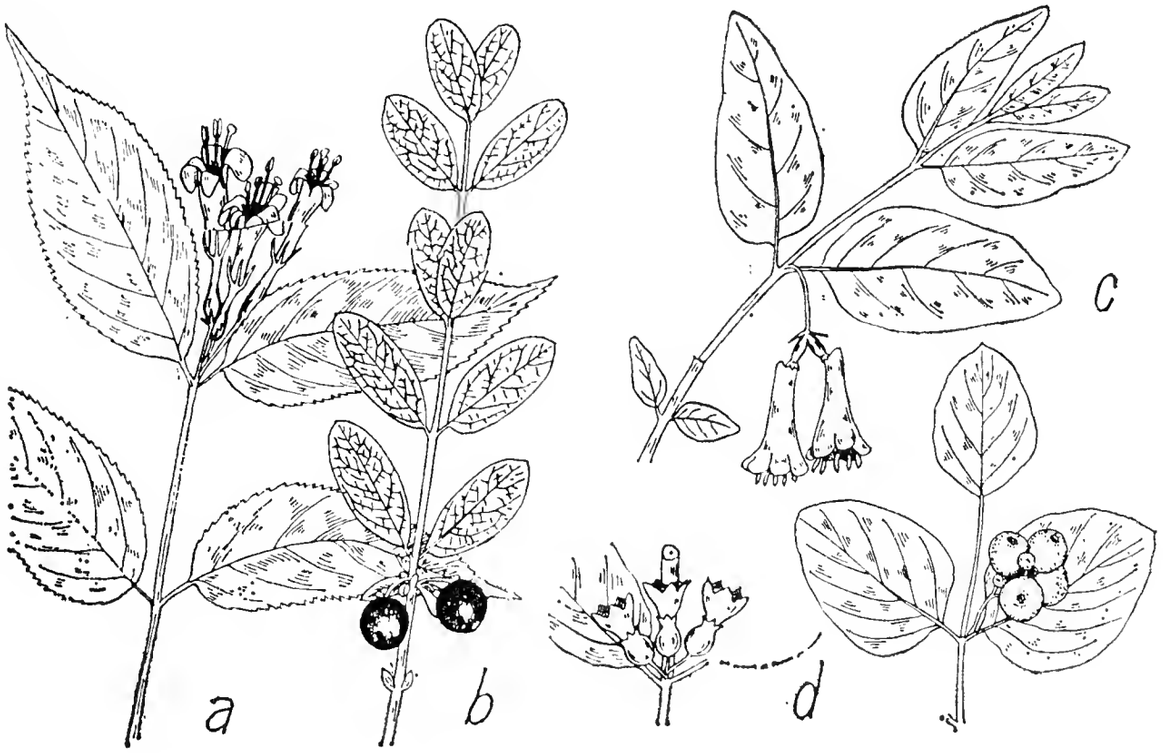


Fig. 127.—**Diervilla:** (a) *D. Lonicera* x $\frac{1}{3}$. — **Lonicera:** (b) *L. villosa* x $\frac{1}{3}$, (c) *L. canadensis* x $\frac{1}{3}$. — **Symphoricarpos:** (d) *S. albus*, fruiting twig x $\frac{1}{3}$, flower x 1.

6. VIBURNUM L.

Shrubs with simple or lobed opposite leaves and numerous small regular flowers in dense terminal cymes. In two of our species some of the outer flowers are enlarged and sterile to make a showy white inflorescence. A number of species are introduced and cultivated.

a. Leaves not lobed, pinnately veined.
  b. Cyme sessile, the marginal flowers large and showy; leaves large, heart-shaped; leaves, twigs and flower-stalks softly brown-scurfy. 1. *V. alnifolium*
  b. Cyme stalked, the flowers all small; leaves not heart-shaped, usually widely lanceolate; leaves, twigs and flower-stalks only minutely brownish-dotted. 2. *V. cassinoides*

a. Leaves palmately veined and 3-lobed.
  c. Leaves without glands at the top of the petiole, slightly and shallowly lobed, glabrous beneath except for a conspicuous band of hairs along the main veins; cyme 1-4 cm wide, the flowers small and all alike. 3. *V. edule*

c. Leaves with large conspicuous glands near the top of the petiole, deeply lobed; cyme 4-6 cm wide, the marginal flowers large and showy.
d. Leaves smooth beneath except the veins; petioles with a wide and shallow groove above, and smaller club-shaped glands; stipules clavate, or with club-shaped tips. 4. *V. trilobum*
d. Leaves downy beneath; petiole with a deep narrow groove along the top, and large disk-shaped glands; stipules near the base of the petiole mostly thread-like and tapering to the end. 5. *V. Opulus*

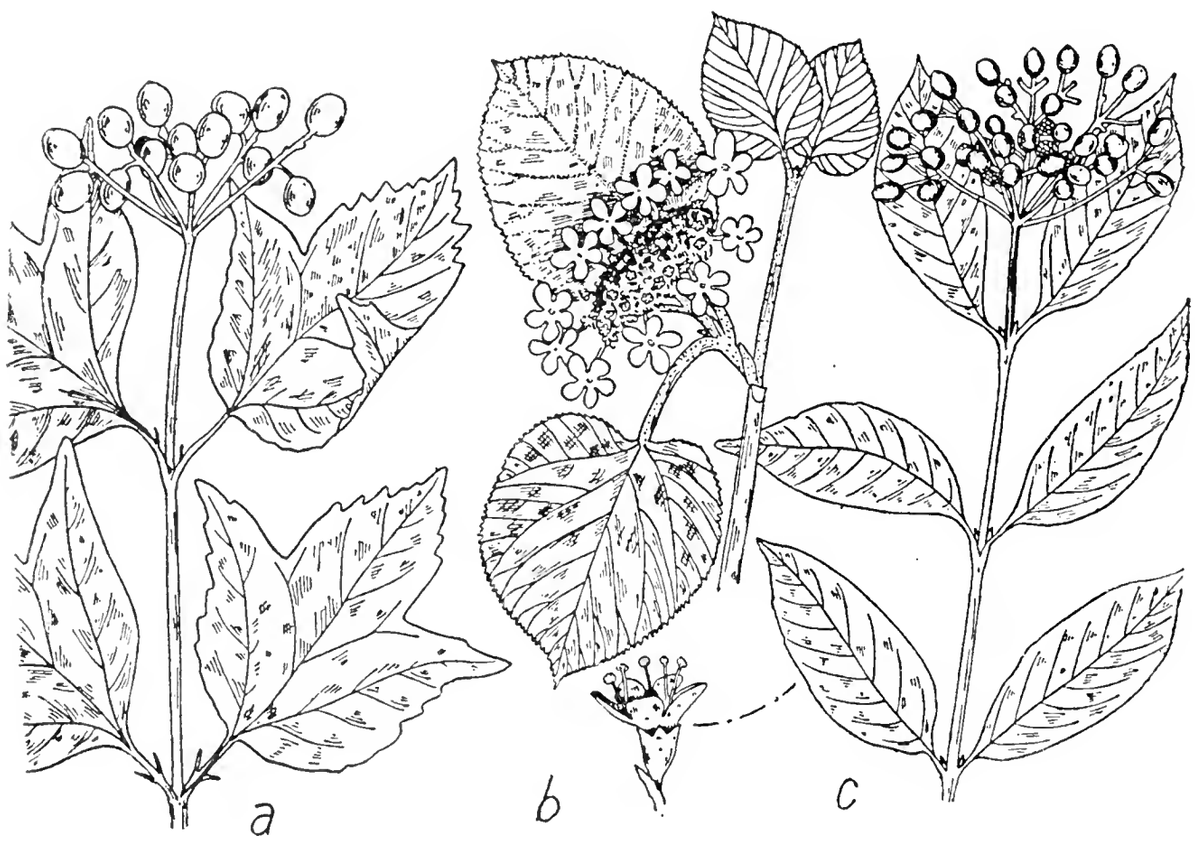


Fig. 128.—**Viburnum**: (a) *V. trilobum* x $\frac{1}{3}$, (b) *V. alnifolium* x $\frac{1}{3}$, (c) *V. cassinoides* x $\frac{1}{3}$, flowers enlarged.

1. **V. alnifolium** Marsh. Fig. 128, b. Map 490. HOBBLEBUSH

Scattered in rich woods, shaded ravines and characteristic of rich hardwoods; rare in the southwestern counties, becoming frequent in Digby Co. and along the northern counties to northern C.B. (*V. lantanoides* Michx.). May 15-June 15.

N.S. to Mich. south to Ga. and Tenn. in the mts.

2. **V. cassinoides** L. Fig. 128, c. WITHEROD, VIBURNUM

Common throughout, often abundant in swamps, wet barrens, open low lands, and in all other types of locations from peaty barrens to dry open areas and pastures. The leaves show great variation in width. The abundant blue berries are insipid. June 20-July 15.

Nfld. to Ont. south to Md. and Wisc.

3. **V. edule** (Michx.) Raf. Map 491. CRANBERRYBUSH

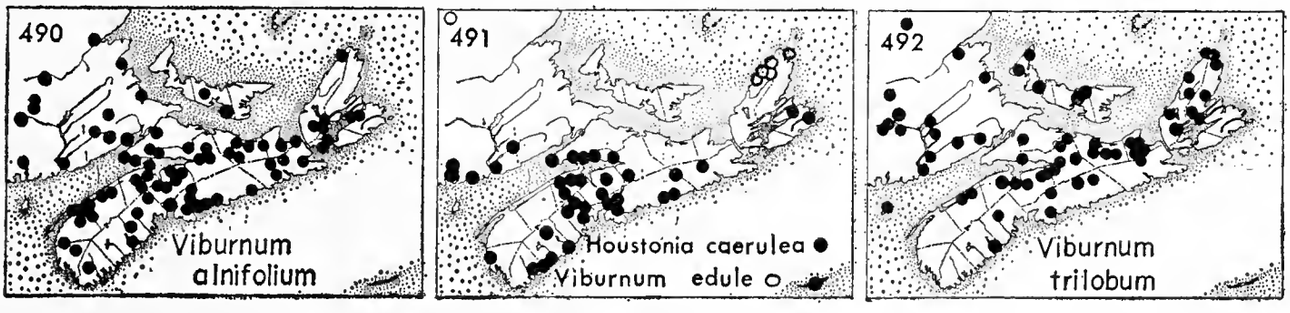
Cold woods and along streams; characteristic, according to Nichols, of the coniferous climax forest in northern C.B. This rather low bush, to 2 m high, is found in our area only in the coolest areas of C.B. and n. N.B. The red berries are very good for juice and jellies. (*V. pauciflorum* La Pylaie).

Nfld. and Lab. to Alaska south to Penn., Iowa and Wash.

4. **V. trilobum** Marsh. Fig. 128, a. Map 492. HIGHBUSH-CRANBERRY

This American variant of *V. Opulus* is found from Annapolis and Cumberland Co. to northern C.B.; occasional in the Annapolis Valley in swamps and along streams, it becomes more common eastward along the intervales of central N.S. Berries are bright red, of an aromatic flavor and excellent for cooking. (*V. Opulus* var. *americanum* Ait.). June-early July.

Nfld. to B.C. south to Penn., Ind. and Oreg.



5. **V. Opulus** L. EUROPEAN CRANBERRYBUSH

Frequently planted and occasionally escaping along roadsides, stream banks or intervales, especially in the northcentral counties. The fruits of this species are bitter, June 15-July 15.

Widely introduced from Eu.

7. SAMBUCUS L. ELDER

These are our only shrubs with opposite, pinnately-compound leaves; the small, numerous white flowers are in large terminal cymes.

a. Flowering July 15-Aug.; inflorescence almost flat; corolla-lobes spreading when dried; fruit dark-purple; pith of the young twigs whitish. 1. *S. canadensis*
a. Flowering June 1-June 20; inflorescence pyramidal-shaped; corolla lobes reflexed in drying; fruit red; young pith reddish-brown. 2. *S. pubens*

1. **S. canadensis** L. Fig. 126, c. Map 493. COMMON ELDER

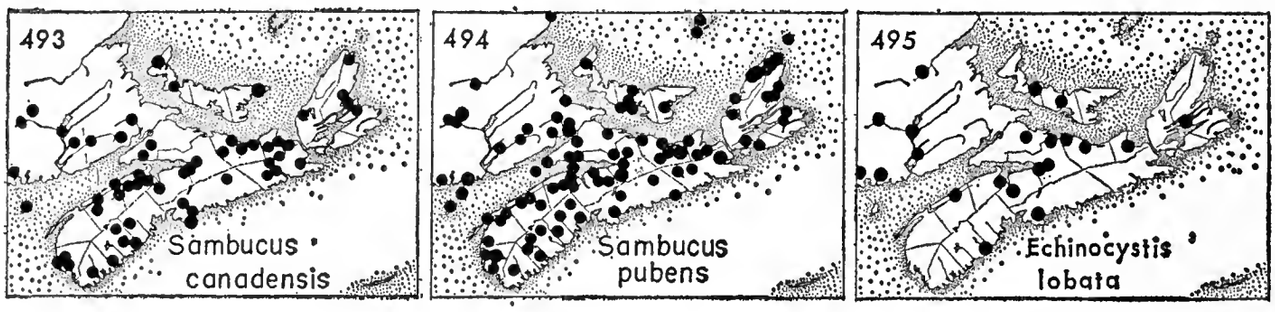
Common in rich soil, open woods, around old fields and along brooks, usually where the ground is damp or there is water, especially in the center of the Province; in wet flood-plains and meadows in northern C.B. Fruit edible. July 15-Aug.

N.S. to Ont. south to Ga., La. and Okla.

2. **S. pubens** Michx. Fig. 126, b. Map 494. RED-BERRIED ELDER

Common in wet places, rocky hillsides or along streams throughout, occurring as scattered plants in the climax forest in northern C.B.; sometimes almost weedy in central N.S. where it may grow along the edges of meadows or even near open fields in rich ground. Berries rather poisonous. June 1-June 20. (*S. racemosa* L., var. *pubens* (Michx.) Wats.).

Nfld. to Sask. south to Penn., Ga. and Colo.



110. VALERIANACEAE VALERIAN FAMILY

Tall herb with pinnately-lobed opposite leaves; with small pinkish to white flowers in a crowded terminal inflorescence; corolla tubular with 5 lobes; stamens 3, exserted.

1. VALERIANA L.

1. **V. officinalis** L. Fig. 125, f. GARDEN-HELIOTROPE

This old-fashioned garden plant is found occasionally as an escape or persisting for a time in old gardens, about dwellings or on roadsides, not spreading. July 15-Aug.

Introduced from Eurasia and widely distributed from N.S. to Ont. and Minn. south to Penn.; B.C.

111. DIPSACACEAE TEASEL FAMILY

1. SUCCISA Neck.

1. **S. pratensis** Moench Fig. 129, e. DEVIL'S-BIT

Common about Louisburg where it grows about dwellings, along roadsides, in fields and waste places; known elsewhere in Can. only in Ont. The leaves are chiefly basal and the flowers are a bright blue. Aug.-Sept. (*Scabiosa Succisa* L.). A rather similar plant from Nfld., and N.B. to B.C. is *Knautia arvensis* (L.) Duby. This has the lower leaves deeply lobed and the receptacle of the flowers with dense hairs instead of bracts; apparently not yet established in N.S.

Eurasia; introduced into N.S., Ont. and Mass.

112. CUCURBITACEAE GOURD FAMILY

This family is represented by the squash (*Cucurbita maxima* Duchesne), the pumpkin (*C. Pepo* L.), and the cucumber (*C. sativus* L.). The following is our only member growing without cultivation.

1. ECHINOCYSTIS T. & G.

1. **E. lobata** (Michx.) T. & G. Fig. 125, e. Map 495. WILD CUCUMBER

This climbing plant, cultivated as a cover for fences and walls, often escapes to waste places near towns and grows luxuriantly on dumps and persists in rich river-bottoms in the central and southern parts of the Province; doubtfully native to N.S. July-Sept.

N.S. to B.C. south to Fla. and Tex.

113. CAMPANULACEAE BLUEBELL FAMILY

Herbs with simple alternate leaves; flowers blue to whitish, either regular or irregular; petals 5, united at the base; stamens 5; ovary inferior, with many ovules. The 2 genera treated here are usually placed in 2 separate families, each family with over 600 species.

a. Corolla regular, bell-shaped; anthers separate; capsule opening by lateral pores. 1. *Campanula*

a. Corolla very irregular; anthers united into a tube about the style; capsule opening at the top. 2. *Lobelia*

1. CAMPANULA L. BLUEBELL

a. Plants 6-10 dm high; flowers blue, 2-3 cm long, in an erect terminal spike; stem-leaves wide and toothed. 1. *C. rapunculoides*

a. Plants 1-6 dm high, weak; flowers few; stem-leaves linear and mostly not toothed.

b. Stem erect, smooth above; corolla blue, 15-25 mm long. 2. *C. rotundifolia*

b. Stem weak and filiform, very rough and clambering; corolla white, 6-10 mm long. 3. *C. aparinoides*

1. **C. rapunculoides** L. Fig. 129, a. BELL-FLOWER, BLUEBELLS

Formerly planted as an ornamental and very persistent, escaping to fields and roadsides. This perennial plant spreads by long underground rootstocks and is often weedy and difficult to eradicate in small gardens or lawns. July 15-Aug.

Introduced from Eurasia; Nfld. to Alta. south to Md. and Ohio.

2. **C. rotundifolia** L. Fig. 129, b. Map 496. HAREBELL

Common around the coast and in cooler parts of the Province; it is often abundant near the sea in meadows, on damp cliffs, and occasionally on cliffs along streams inland. It is extremely variable in size,

Fig. 129.—**Campanula:** (a) *C. rapunculoides*, top of plant x $\frac{1}{3}$, (b) *C. rotundifolia* x $\frac{1}{3}$, basal leaves x $\frac{1}{3}$, (c) *C. aparinoides* x $\frac{1}{2}$. — **Lobelia:** (d) *L. inflata*, top of plant x $\frac{1}{3}$, (f) *L. Dortmanna* x $\frac{1}{3}$. — **Succisa:** (e) *S. pratensis*, inflorescence and leaf x $\frac{1}{2}$.

branching, size and number of flowers, width of leaves and degree of pubescence. The American plants are smooth instead of being pubescent at the base and have been segregated as var. **intercedans** (Witasek) Farw. All the characteristics intergrade and variations are best regarded as being due to the influence of the environment. Forma **albiflora** Rand & Redf. is a rare white-flowered form with each of the following collections consisting of a single plant: among typical plants on cliff face, Rigwash Valley, Inverness Co.; and growing with the typical form on an exposed headland, White Point, Victoria Co. (Schofield and Smith, 1953). June 15-Sept.

Boreal America and Eurasia south to Penn., Ind. and Tex.

3. C. aparinoides Pursh Fig. 129, c. Map 489. MARSH-HAREBELL

Collected along ditches in a meadow north of Auburn, Kings Co.; Ganong reports it as a minor form in the wet marsh about the head of the

Bay of Fundy; near the mouth of the Economy R., Colchester Co. (J. S. Erskine, 1953); abundant along river beaches and in meadows, Kennetcook R. near Mosherville in Hants Co.; abundant in meadow, Marshy Hope, Pictou Co. (Smith and Erskine, 1954); abundant on banks of the Parrsboro R. and common in moist area near Frog Pond, Isle Haute, Cumberland Co. (Schofield, 1955). Aug.

N.S. to Minn. and Sask. south to Ga. and Colo.

2. LOBELIA L.

Consult Bowden (1960).

a. Stem leafy; leaves linear or flat; plants of dry to moist habitats.
  b. Stem slender, rarely branched; stem-leaves narrow; fruit not greatly enlarged or inflated; plants smooth or nearly so.
    c. Pedicels of the flowers 2-4 mm long, with tiny bracteoles only at the base; leaves oblanceolate. 1. *L. spicata*
    c. Pedicels of the flowers about 1 cm long, with tiny bracteoles to above the middle; leaves linear. 3. *L. Kalmii*
  b. Stem stouter, the inflorescence often branched; stem-leaves oblong and toothed; fruit oval, soon much swollen; plants often rough-hairy. 2. *L. inflata*
a. Stem naked, hollow; leaves in a basal rosette, the blades oval in cross-section, rolled to resemble two united cylinders; growing in shallow water or on wet mud. 4. *L. Dortmanna*

1. **L. spicata** Lam. BLUE LOBELIA

Rare in the Maritimes; local and weedy on the top of Cape Blomidon, Kings Co.; Yarmouth Co. (Klawe 1955); locally abundant in a dry field near the shore, Linden, Cumberland Co. (Schofield, 1955).

N.S. to Alta. south to Ga. and Ark.

2. **L. inflata** L. Fig. 129, d. Map 497. INDIAN-TOBACCO

Common throughout except in northern C.B.; dry pastures, run-out fields, roadsides, barrens, etc., usually scattered. July-Aug.

N.S. to Ont. south to Ga., and Ark.; s. B.C.

3. **L. Kalmii** L. Map 499.

Rare; known only from dripping cliffs, meadows, or bogs in northern C.B., usually in calcareous or marly locations: abundant in an alkaline bog at Black River, Inverness Co.; and occasional in a wet quaking mat near McAdam Lake in C.B. Co. At Black R. some of the plants had white flowers. This is forma **leucantha** Rouleau.

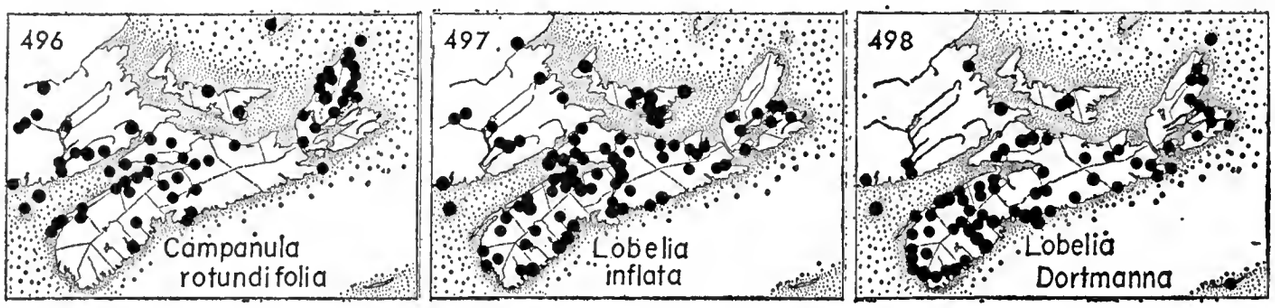
Nfld. to B.C. south to C.B., Penn., Ind. and Colo.

4. **L. Dortmanna** L. Fig. 129, f. Map 498. WATER LOBELIA

Common at margins of lakes and ponds in the southern or acid regions of the Province, rarer northward and in sandy areas. It grows

at the edge of the water with the rosette of leaves submersed and the height of the stem varying with the depth of the water. Aug.

Nfld. to Minn. south to Penn.; B.C. to Oreg.



114. COMPOSITAE COMPOSITE FAMILY

Flower-heads composed of many florets grouped on a common *receptacle*, surrounded by one to several rows of bracts making up the *involucre*. Scales growing on the receptacle among the florets are called *chaff*. If chaff is absent, the receptacle is said to be naked. The flower-heads may have two kinds of florets: tubular or *disk florets* and those with the corolla drawn out into a ray or ligule which are called *ray florets*. The flower-heads are said to be *discoid* if the florets are all disk florets. The flower-heads are called *ligulate* when all the florets are ray florets, as in the dandelion. Each floret is an individual flower with an inferior ovary. The calyx, however, is reduced to scales, teeth, bristles, or may be absent. This reduced calyx is called the *pappus;* and it is most conspicuous after the fruit is formed. The fruit is a one-seeded, dry fruit called an *achene* and resembles, and is often wrongly called, a seed.

The Composite Family is a very large family, consisting of more than 15,000 species. Our representatives are mostly herbs, with only a few being woody at the base. The family is represented here by 10 tribes but the differences between them are rather technical and the following key is entirely artificial.

a. Flower-heads either radiate or discoid.
 b. Flower-heads radiate, with both disk and ray florets.
  c. Pappus of capillary bristles; receptacle not chaffy.
   d. Flowers on bracted stems, appearing before the typical green leaves in early spring.
    Heads solitary, like a tiny dandelion; flowers yellow; summer-leaves heart-shaped and angled, large (Fig. 138,b). 26. *Tussilago*
    Heads numerous, whitish; later leaves reniform, deeply lobed (Fig. 138, c). 27. *Petasites*
   d. Flowers on leafy branches or main stems.
    e. Flowers yellow or orange (cream-colored in one species of goldenrod-*Solidago*).
     Involucral bracts in one series, often with minute bractlets at the base.
      Leaves opposite; entire to shallowly toothed. 28. *Arnica*

Leaves alternate, the upper usually lobed or fringed on the edge. 30. *Senecio*

Involucral bracts in 3 to many series.

Flower-heads large, 2.5-10 cm wide (Fig. 135,f); plants tall and coarse; leaves densely woolly beneath. 9. *Inula*

Flower-heads only 5-15 mm wide; florets and rays few; goldenrods (Fig. 130, 131). 3. *Solidago*

e. Flowers blue, violet or white; receptacle flattish, many disk florets and usually many rays.

Involucral bracts in 3 to 5 series, often very unequal, sometimes leafy or with chartaceous base and a green tip; rays flat, and not crowded. 4. *Aster*

Involucral bracts often subequal, often green in part but not leafy nor with chartaceous base and green tips; peduncles usually not leafy; rays narrow and often very numerous (Fig. 134). 5. *Erigeron*

c. Pappus of scales, awns, a mere crown or absent, not of capillary bristles.

f. Stem leafless, leaves all basal; flowers solitary, white to purplish; garden escape. 2. *Bellis*

f. Stem more or less leafy.

g. Leaves finely and several times divided.

Plants aquatic; leaves of two kinds, the submersed ones finely divided and the exposed ones merely lobed; pappus of awns (Fig. 137, a). 17. *Megalodonta*

Plants terrestrial; leaves all similar; pappus absent or a mere crown.

Flower-heads 3-5 cm wide, daisy-like with conspicuous rays (Fig. 137,c); achenes terete.

Receptacle chaffy (Fig. 137,c). 20. *Anthemis*

Receptacle not chaffy. 21. *Matricaria*

Flower-heads 3-10 mm wide; rays small (Fig. 137, b); receptacle chaffy; achenes much flattened. 19. *Achillea*

g. Leaves widely lobed, or toothed, or entire.

Leaves linear; flowers pink; low slender herb with opposite leaves; Yarmouth Co. 15. *Coreopsis*

Leaves wider, toothed or lobed.

Flower-heads very small with 4-5 grayish rays; plants low and weak with ovate, hairy leaves; plants introduced and weedy. 18. *Galinsoga*

Flower-heads more than 1 cm wide; rays white to yellow.

Receptacle chaffy; rays yellow.

Pappus of awns which are persistent on the top of the flattened achene, often retrorsely barbed (Fig. 136, d, e). 16. *Bidens*

Pappus absent, or a mere crown, or of scales which usually disappear.

Receptacle strongly conic or columnar; plant 3-6 dm high with narrow lanceolate leaves, or tall and slender with leaves 3-5-parted (Fig. 136, b, c). 13. *Rudbeckia*

Receptacle merely concave or nearly flat; plants 1-2 m high; leaves entire, widely lanceolate or ovate. 14. *Helianthus*

Receptacle not chaffy; rays white or rarely yellow. 22. *Chrysanthemum*

b. Flower-heads discoid, without rays.

h. Staminate and pistillate flowers separated in very different-appearing heads on the same plant; heads discoid; involucre of the pistillate flowers closed and indurated, with 1-2 florets; staminate heads numerous in terminal or axillary racemes.

Pistillate heads small in the axils of leaves at the base of the staminate racemes, with a few acute tubercles at the apex; leaves opposite, or alternate and pinnately divided (Fig. 136, a). 11. *Ambrosia*

Pistillate heads forming conspicuous oblong to oval burs covered with hooked spines; leaves rough, alternate and cordate (Fig. 135, e).
12. *Xanthium*

h. Staminate and pistillate florets not in very different-appearing heads; involucre of the fertile flowers not indurated, with the bracts more or less separate.

i. Pappus composed of capillary bristles.

j. Involucral bracts papery throughout; plants more or less whitish-woolly; stem-leaves scale-like to linear.

Basal leaves larger than the stem-leaves, forming a rosette; stem-leaves much reduced (Fig. 134, e, f). 6. *Antennaria*

Basal leaves similar to the stem-leaves or absent; stem-leaves long and linear.

Involucre papery white, the bracts finely striate, spreading; plants forming colonies by underground rootstocks (Fig. 135, a).
7. *Anaphalis*

Involucre yellowish-white or brownish, the bracts not striate, rather appressed; plants solitary, not forming colonies (Fig. 135, b, c).
8. *Gnaphalium*

j. Involucral bracts not wholly thin and colorless, if partly so then the plants not whitish-woolly or the stem-leaves linear.

k. Involucral bracts in one row, often with minute bractlets at the base.

Flowers in early spring, on bracted stems; green leaves in summer basal, reniform, deeply and palmately 5-7-lobed (Fig. 138, c).
27. *Petasites*

Flowers on green leafy stems, appearing in summer and autumn.

Leaves simple and merely toothed; flower-heads 15-20 mm long, the marginal florets all pistillate, whitish (Fig. 139, a).
29. *Erechtites*

Leaves, at least the stem-leaves, deeply lobed; flower-heads 7-10 mm long, the flowers all perfect, yellowish (Fig. 139, b)
30. *Senecio*

k. Involucral bracts in 2 to many rows.

l. Leaves and stems neither bristly nor spiny.

Corolla deeply lobed; involucral bracts deeply toothed or lobed along the sides; receptacle bristly; leaves alternate; plants low and usually much branched (Fig. 140, a). 36. *Centaurea*

Corolla merely toothed; involucral bracts not lobed; receptacle without chaff; leaves opposite or whorled on tall, unbranched stems (Fig. 130, a, b). 1. *Eupatorium*

l. Leaves and stem bristly or spiny; thistles.

m. Flowers white to purple; pappus of a single row of similar hairs or bristles.

n. Pappus with the capillary hairs plumose (with very fine branches).
33. *Cirsium*

n. Pappus of unbranched or merely barbellate capillary hairs.

o. Receptacle densely bristly, the bristles scattered among the florets.

Involucral bracts linear to lanceolate; stamen filaments hairy, separate. 32. *Carduus*

Involucral bracts large and ovate; flower-heads solitary; filaments smooth, united into a tube. 35. *Silybum*

o. Receptacle conspicuously honey-combed, not bristly; leaves cottony-woolly; stem strongly winged. 34. *Onopordum*

m. Flowers yellow; pappus of 10 short teeth, 10 long bristles, and 10 shorter ones in an inner row; whorl of reduced prickly leaves just below the flower-head; leaves scarcely or not running down the stem. 37. *Cnicus*

i. Pappus a mere crown of short bristles, scales or awns, or none.

p. Flowers rose to purplish; flower-heads globular; the corollas deeply lobed; receptacle bristly or chaffy.

Involucral bract stiff and narrow with inwardly-turned hooks, forming a bur; pappus of scales; burdocks. 31. *Arctium*

Involucral bracts not hooked, deeply cut or more often deeply lobed along the sides; fruiting head not a bur; pappus absent or very short hairs. 36. *Centaurea*

p. Flowers yellow to yellowish-white; corollas very small, slightly toothed.

q. Leaves ovate to widely lanceolate, merely toothed, rough; the lower ones opposite; receptacle small, chaffy. 10. *Iva*

q. Leaves finely divided; receptacle not chaffy.

r. Plants 1-3 dm high, annual or occasionally biennial; receptacle strongly conical; flowers dull green to yellowish (Fig. 137, d).

Leaves finely divided, their bases not sheathing the stem; common weeds. 21. *Matricaria*

Leaves toothed or coarsely lobed with sheathing bases; rare on salt flats. 24. *Cotula*

r. Plants over 3 dm high; receptacle flat or slightly convex.

Flower-heads in a flat-topped inflorescence, bright yellow and button-like, erect; tansy. (Fig. 137, e). 23. *Tanacetum*

Flower-heads paniculate, racemose, or spicate, dingy yellow to straw-colored; flowers small (Fig. 138, a). 25. *Artemisia*

a. Flower-heads with the florets all ligulate; juice of the plant usually milky.

s. Leaves chiefly in a basal rosette or near the base.

t. Flowers small, less than 10 mm wide; pappus absent; plants wiry, 1-3 dm high; rare. 39. *Arnoseris*

t. Flowers 1.5-4 cm wide; pappus of capillary bristles; plants larger and stouter.

u. Leaves lanceolate, not toothed; stolons often present (Fig. 142). 49. *Hieracium*

u. Leaves toothed to more or less deeply lobed.

v. Flower-heads solitary; bristles of the pappus simple; achenes spiny near the summit; dandelions (Fig. 141, b). 44. *Taraxacum*

v. Fower-heads several to numerous; achenes not spiny.

w. Pappus bristles plumose (branched); plants low, mostly less than 5 dm high; leaves all basal, lanceolate.

Receptacle chaffy; inner achenes long-beaked; leaves coarse and stiffly hirsute or hairy (Fig. 140, d.). 41. *Hypochoeris*

Receptacle not chaffy; inner achenes not long-beaked; leaves smoothish to finely pubescent (Fig. 140, c). 42. *Leontodon*

w. Pappus bristles simple.

Plants slender, annual or occasionally biennial, without a stout rootstock; bracts of the involucre in one row with smaller ones at the base. 47. *Crepis*

Plants coarse and stout, perennial with a stout short rootstock; bracts of the involucre in several series. 49. *Hieracium*

s. Leaves mainly scattered along the stem.

x. Pappus of small scales, or else absent.

Flowers small, to 10 mm wide, yellow; pappus absent; plants slender, little branched (Fig. 140, f). 38. *Lapsana*

Flowers large, more than 4 cm wide, blue; pappus of scales; plants coarse, woody, much branched (Fig. 140, e). 40. *Cichorium*

x. Pappus of capillary bristles.

y. Pappus bristles plumose; leaves long and linear, grass-like; plants usually not branched; achenes long-beaked, 10-15 mm long (Fig. 140, b). 43. *Tragopogon*

y. Pappus bristles simple and capillary.

z. Flowers yellow; achenes not beaked.

Achenes flattened; pappus bristles shining white; leaves smooth and glaucous; plants succulent (Fig. 141 a). 45. *Sonchus*

Achenes not flattened; pappus bristles tawny; leaves firm, rarely glaucous; plants stiff (Fig. 142). 49. *Hieracium*

z. Flowers bluish, cream-colored, or purplish white to brownish.

Flower-heads erect; achenes more or less strongly flattened, beaked or at least expanded at the summit where the pappus is attached; bluish or cream-colored. 46. *Lactuca*

Flower-heads usually bell-like, hanging, with a few florets, pale purplish-white, brownish or cream-colored (Fig. 141, d); achenes cylindric, not long-beaked. 48. *Prenanthes*

1. EUPATORIUM L.

Tall perennial plants, unbranched up to the large flat-topped inflorescence; leaves opposite or whorled; flower elongated, numerous and discoid with a pappus of capillary bristles. This is a large genus of some 500 species.

a. Leaves in whorls of 3-6, or the upper opposite, their bases not united; flowers purplish.

b. Leaves abruptly contracted to the petiole, more or less 3-nerved; plants somewhat viscid; florets mostly 6-10. 1. *E. dubium*

b. Leaves tapering to the petiole, mostly pinnately-veined; plant not viscid; florets mostly 9-20 in each head.

c. Leaves smaller above, not overtopping the inflorescence. 2. *E. maculatum*

c. Leaves large on the upper part of the stem, the upper much overtopping the inflorescence. *E. maculatum* var. *foliosum*

a. Leaves opposite; flowers white or a dingy pinkish-white.

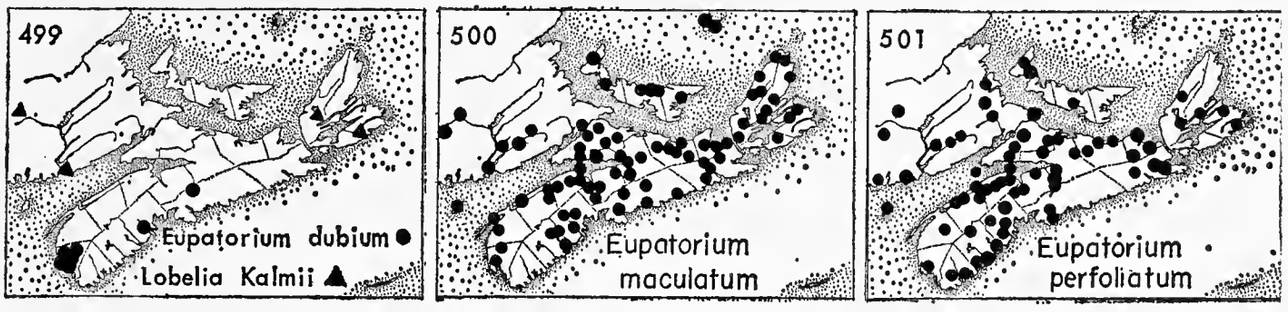
d. Leaves lanceolate, sessile and the bases of the two opposite leaves united; flowers mostly 5 in each head. 3. *E. perfoliatum*

d. Leaves broadly ovate, with definite petioles; flowers 12-24 in each head. 4. *E. rugosum*

1. **E. dubium** Willd. Map 499.

Local to rare; isolated clumps about the rocky shores of some of the lakes in the Tusket Valley, Yarmouth Co.; scattered east to Halifax and Lunenburg Co. and near Guysborough. Aug-Sept.

N.S. and southwestern Me. south to S.C.



2. **E. maculatum** L. Fig. 130, a. Map 500. JOE-PYE-WEED

Common and conspicuous in clumps along brooks, edges of meadows and swamps throughout the northern region from Digby Neck to northern C.B.; rare southward. Forma **Faxoni** Fern. has white flowers. Two plants in a marsh at Whycocomagh (Erskine, J.S., 1953). Late July-Sept. Nfld. to B.C. south to Penn., in the mts. to N.C., and Mich.

Var. **foliosum** (Fern.) Wieg. is found throughout the eastern range of the species and is not uncommon in northern N.S. and P.E.I. This may grade into the species but the extremes are very conspicuous. Nfld. to n. Ont. south to N.S. and New Eng.

3. **E. perfoliatum** L. Fig. 130, b. Map 501. BONESET

Scattered throughout, except for northern C.B.; wet shores, meadows, edges of swamps and bogs, along ditches, streams and meadows. The plants are usually scattered and it does not become a weedy species. Forma **purpureum** Britt. has the heads of varying shades of pink or red; abundant along the river at Ste. Croix, Hants Co. Forma **trifolium** Fassett has 3 leaves at a node instead of two. Late summer and autumn.

N.S. to s.Man. south to Fla., Ala. and Texas.

4. **E. rugosum** Houtt. WHITE SNAKEROOT

Cumberland Co.; frequent along brook near outlet to the sea, Mill Brook west of Advocate, collected by J.S. Erskine. This is the only location known for N.S.; and is an extension from western N.B. (Smith and Erskine, 1954).

N.S. and Gaspé to Ont. south to the uplands of Ga. and Ala.

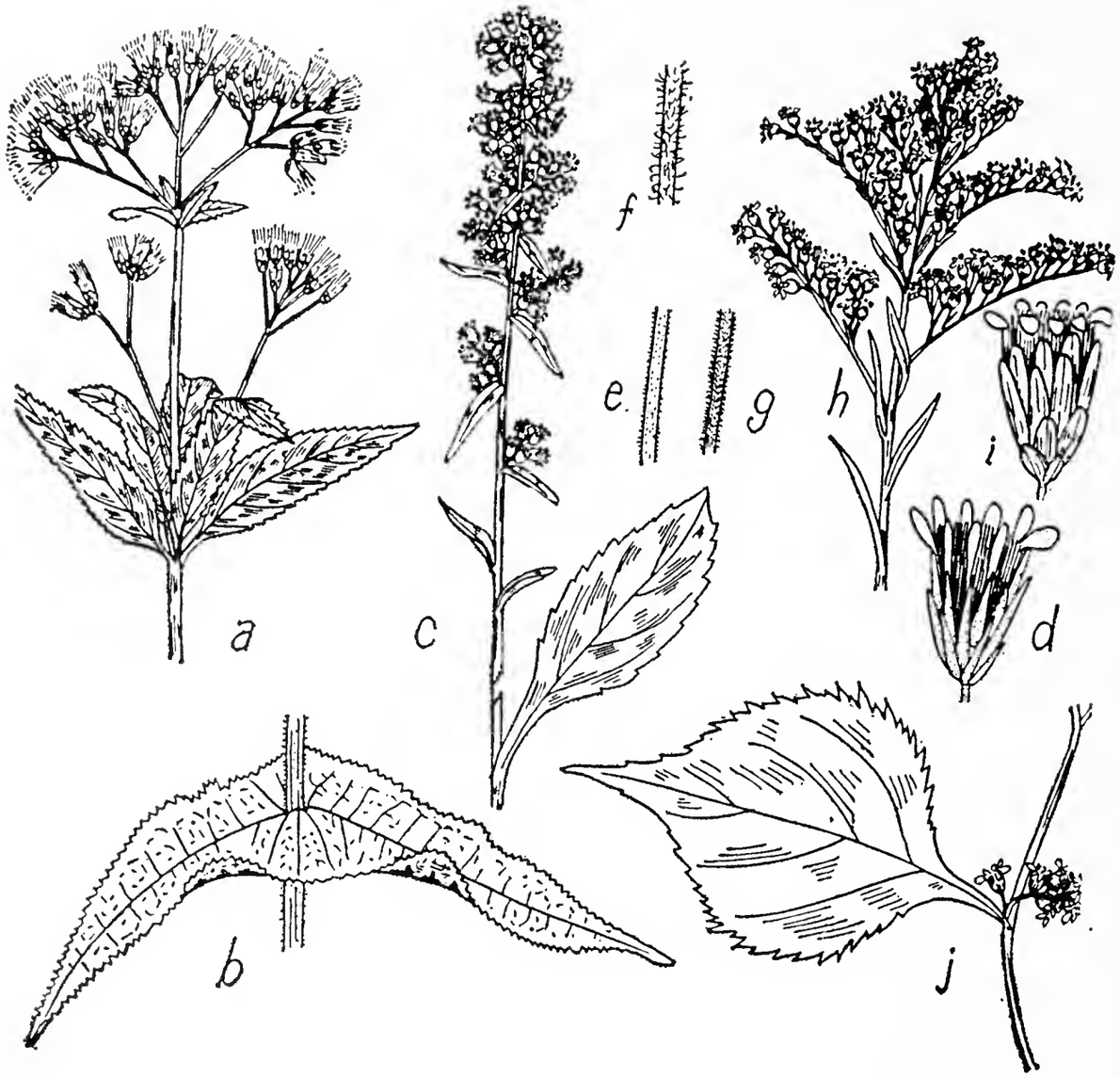


Fig. 130.—**Eupatorium:** (a) *E. maculatum*, top of plant x $\frac{1}{2}$, (b) *E. perfoliatum*, opposite leaves x $\frac{1}{4}$. — **Solidago:** (c) *S. bicolor*, top of plant x $\frac{1}{3}$, (f) stem pubescence, (i) flower x 3, (d) *S. puberula*, flower x 3, (e) stem pubescnce, (g) *S. nemoralis*, stem pubescence, (h) *S. uliginosa*, inflorescence x $\frac{1}{2}$, (j) *S. flexicaulis*, leaf and flowers x $\frac{1}{3}$.

2. **BELLIS** L.

1. **B. perennis** L. ENGLISH DAISY

Macoun reported this plant from meadows and pastures, North Sydney, where it has escaped from ballast. English daisies are often cultivated in gardens and show some tendency to persist and spread locally. However, they are rarely persistent and the recent, double forms are not too hardy.

Introduced from Eu. and widely distributed.

3. **SOLIDAGO** L. GOLDENROD

The goldenrods, with one exception, have numerous yellow flowerheads with a few small rays. Nearly 100 species are known, chiefly in N. Amer. The receptacle is small and naked; pappus is of white capillary bristles. The genus consists of two sections. Section *Euthamia*,

which comprises the last three quite similar-appearing species, has the leaves linear and the rays rather inconspicuous.

a. Inflorescence various, from axillary clusters to a panicle or a large elongated compound inflorescence but not in flat or round-topped corymbs; rays usually fewer than the disk-flowers; leaves often lanceolate but not narrowly linear.
b. Flower-heads in the axils of normal leaves, or with the leafy bracts but little reduced and much longer than the branches of the inflorescence; leaves not triple-nerved.
c. Involucres 3-6 mm high; rays 3-4, rarely 5-6.
d. Leaves lanceolate, sessile or tapering to the base; stem smooth, terete, glaucous. 1. *S. caesia*
d. Leaves ovate, mostly with winged petioles; stem not glaucous, more or less zig-zag, often pubescent near the top (Fig. 130, j). 2. *S. flexicaulis*
c. Involucres 8-12 mm high; heads in the axils of the normal leaves, widely scattered; lower leaves ovate, coarsely toothed and wing-petioled; cool woods and ravines. 3. *S. macrophylla*
b. Flower-heads crowded in the axils of much-reduced upper leaves or bracts to form a terminal inflorescence.
e. Inflorescence long and narrow or else reduced to a terminal cluster, the branches usually short and stiff and any longer ones erect and appressed, without lateral, arching one-sided racemes.
f. Leaves more or less hairy or pubescent on one or both sides; stem densely pubescent above; involucres 3-4.5 mm high.
g. Inflorescence stiffly erect, with short branches, the flower-heads not arranged along one side of the branches; pubescence loose or erect, not of grayish incurved hairs; achenes glabrous (Fig. 130, c).
h. Pubescence scanty to abundant, soft and spreading; bracts of the involucre broad and obtuse with wide scarious margins and greenish tips (Fig. 130, i).
i. Flowers white or cream-colored. 4. *S. bicolor*
i. Flowers yellow. 5. *S. hispida*
h. Pubescence on the upper part of the stem and the leaves finely puberulent with short, stiff, erect clubbed hairs; bracts of the involucre narrow and acuminate, without wide scarious margins (Fig. 130, d). 6. *S. puberula*
g. Inflorescence small, usually curved, the heads strongly secund or arranged along one side of the branches; leaves much reduced towards the top of the stem, with 3 more or less equal veins; stems and leaves uniformly grayish-pubescent with short incurved hairs. (Fig. 130, g), 13. *S. nemoralis*
f. Leaves and stem below the inflorescence essentially glabrous; involucre 4-7 mm high with the bracts rounded to acute but not long-tipped.
j. Achenes persistently hairy or pubescent.
k. Heads 30-65-flowered; arctic-alpine species of northern C.B.; rays 12-23; heads in a terminal compact inflorescence; leaves obtuse; plants 1-4 dm tall, villous-puberulent in the inflorescence. 7. *S. multiradiata*
k. Heads 10-30-flowered, with 7-10 rays; inflorescence elongated but compact; involucre 5-6 mm high; rare or little known. 8. *S. Randii*
j. Achenes usually glabrous; inflorescence ample and elongate with many strongly-ascending cylindric racemose branches, having a brushed-up appearance; large plants of wet ground and bogs with the lower leaves long-petioled. 9. *S. Purshii*

e. Flower-heads in terminal, usually one-sided racemes, the total forming a large, erect or curved wide compound inflorescence called a thyrse; plants large (Fig. 130, h).

1. Plants fleshy with thick shiny entire leaves; heads in a large crowded oblong inflorescence; involucre of flower-heads 4-6 mm high; plants of brackish shores. 10. *S. sempervirens*

1. Plants thin and not fleshy; leaves usually toothed; not confined to brackish shores, usually inland.

m. Leaves pinnately-veined, not 3-ribbed, although sometimes obscurely appearing so.

n. Basal leaves long-petioled, conspicuously larger than the 5-50 stem-leaves (Fig. 131, a).

o. Branches of the panicle pubescent; panicle narrow and compact, the branches short and often ascending.

p. Plants 4-15 dm high, of wet soils or bogs; stems and leaves smooth or nearly so.

q. Inflorescence elliptical or narrower, the branches appressed; heads arranged around all sides of the branches; involucres 4-5 mm high. 9. *S. Purshii*

q. Inflorescence more spreading, the heads arranged unilaterally along the panicle branches; involucres 3-4 mm high, the bracts more rigid and incurved. 12. *S. uliginosa*

p. Plants 3-6 dm high, of dry soils and barrens; stems and leaves uniformly grayish-pubescent with short incurved hairs. 13. *S. nemoralis*

o. Branches of the panicle glabrous; panicle ample, the branches recurved-spreading; involucre 3-5 mm high; rays 8-12. 11. *S. juncea*

n. Basal leaves similar to the 30-100 or more uniform and gradually reduced stem-leaves, usually absent at flowering time; leaves elliptical to lanceolate.

r. Stem, branches and leaves essentially glabrous; branches of inflorescence strongly ascending; involucre 4.5-6.5 mm high; leaves widely lanceolate to oblong, tapering strongly to each end. 14. *S. Elliottii*

r. Stem, branches and leaves pubescent to long-hairy or villous.

s. Flowers mostly in large terminal inflorescence; upper leaves short, not exceeding the branches of the inflorescence. 15. *S. rugosa*

s. Flowers scattered on short branches, the panicles exceeded by the surrounding leaves. *S.* rugosa var. *villosa*

m. Leaves more or less plainly 3-ribbed, with 2 of the lateral veins becoming prominent and elongated parallel to the midrib; heads in one-sided spreading or recurved panicles, forming an ample thyrse.

t. Flowers small, the involucres 2-3 mm high; rays 10-20, small and short (Fig. 131, b); stem pubescent below the inflorescence. 16. *S. canadensis*

t. Flowers larger, the involucres 3.5-5 mm high; rays 7-15, larger; stem glabrous below the inflorescence.

u. Leaves glabrous or somewhat scabrous above, pubescent at least on the midrib beneath. 17. *S. gigantea*

u. Leaves glabrous above and beneath. ***S. gigantea*** var. ***leiophylla***

a. Inflorescence a flat or round-topped corymb, with the flower-heads sessile or nearly so; leaves linear (Fig. 131, c).

v. Plants usually branched above; leaves thin, wide-spreading and long-tipped, usually 3-nerved, with sometimes 2 more fine ones.

w. Florets 15-45 in a head; plants often finely rough-pubescent; leaves 3-, often 5-nerved.

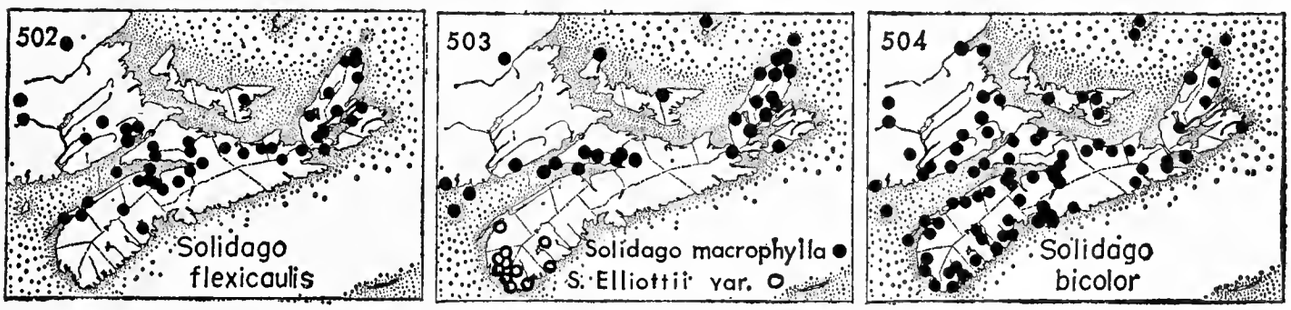
18. *S. graminifolia*

w. Florets 12-20. with disk-florets 5-7, rarely 9; plants with tufts of leaves or short branches in the axils of the leaves; leaves only faintly 3-nerved.

19. *S. tenuifolia*

v. Plants usually unbranched, with a small inflorescence, smooth; leaves thickish, ascending, and blunt; leaves 1-nerved; disk-florets 12-20, with about as many rays.

20. *S. galetorum*



1. **S. caesia** L. BLUE-STEM GOLDENROD

Reported as "scattered in thickets and open woods throughout the north-central region; Macoun lists it from Halifax and the North Mt., near Annapolis; and specimens from oak woods near Kentville belong here." No recent collections have been made and the plant must either be considered as rare and local, or the earlier records may be erroneous. The plant has probably been confused with weak shade-forms of *S. canadensis*.

Central Me. to Wisc. south to Fla. and Tex.; N.S. (?)

2. **S. flexicaulis** L. Fig. 130 j. Map 502. WOOD-GOLDENROD

Common in rich woods, on calcareous slopes and alluvial flood-plains from Digby Neck to northern C.B.; rare on the Atlantic side. It is characteristic of climax forests along flood-plains in C.B.; rare in the southwestern counties, so that Fernald (1922) considers a collection from Bridgewater worthy of record. Late July-Aug. (*S. latifolia* L.).

J.S. Erskine (1953) considers a plant found at Amethyst Cove, Kings Co. to be a hybrid with the size and long-branched inflorescence of *macrophylla*, and the shorter petioles, less coarse serration of leaf and small heads of *flexicaulis*.

N.S. and Gaspé west to S.Dak. south to N.C. and Tenn.

3. **S. macrophylla** Pursh Map 503. LARGE-LEAVED GOLDENROD

Scattered in northern C.B. in the coniferous forest; rare in Richmond Co. and at Pirates Cove on the Strait of Canso; in cool woods or ravines in the Cobequids from Folleigh L. to Advocate; and rare at Amethyst Cove near Cape Blomidon. The plants are large and luxuriant in the ravine at Hart Brook in the Wentworth Valley, Colchester Co. Aug.-Sept.

Nfld. and Lab. to L. Superior south in subalpine areas of NewEng. and N.Y.

4. **S. bicolor** L. Fig. 130, c, f. Map 504. WHITE GOLDENROD

Common in dry soil, old fields and barrens over much of the Province; it is a heath pioneer and an early introduction in burnt-over forest in C.B.; rare in Yarmouth and southern Digby Co. Aug.-Sept.

C.B. to Man. south to Ga. and Ark.

5. S. hispida Muhl.

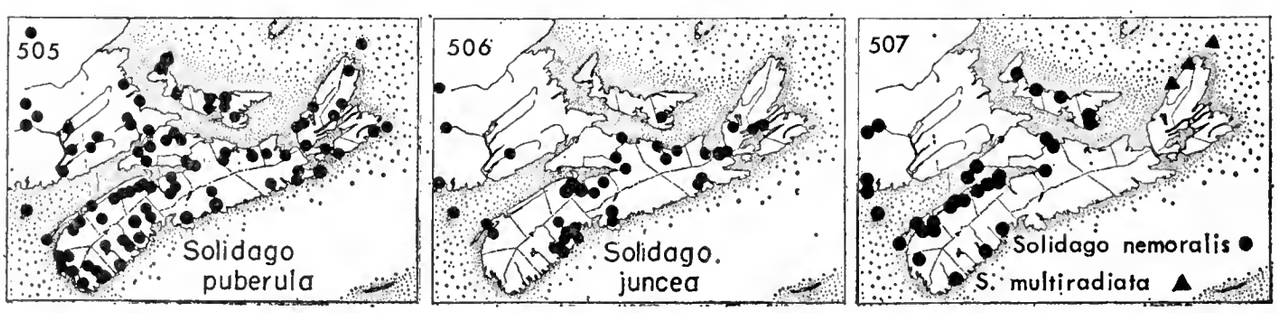
Similar to the last except in the color of the flowers; it is rare and only an occasional specimen is seen. It was reported from Sandy Cove, Digby Co., by D.S. Erskine (1951). (*S. bicolor*, var. *concolor* T. & G.).

Nfld. to Man. south to Ga. and Ark.

6. **S. puberula** Nutt. Map 505. Fig. 130, d, e. ROUGH GOLDENROD

Very common throughout; dry soil, old fields, barrens, exposed headlands and open woods; rarer in the southwestern counties. Forma **albiradiata** Schofield and Smith has white instead of yellow rays; reported from a dry roadside near Goat Lake, Lunenburg Co. (1953). Late July-Sept.

C.B. to e. Ont. south to Fla. and Miss.



7. **S. multiradiata** Ait. Map 507.

Collected by Perry and Roscoe from a barren on St. Paul I., northern C.B.; very rare on moist shaded cliff ledges, Big Southwest Brook (Smith and Schofield, 1952); moist ledges along Cheticamp R. and on ledges up Corney Brook.

Nfld. and northern Lab. south to C.B. and Gaspé; Rocky Mts.

8. **S. Randii** (Porter) Britt.

Reported only from Guysborough Co., where Rousseau (1938-a) reports it from a gravelly beach at Guysborough. No specimens of this plant have been seen and the record must remain doubtful until it is verified. The general range of this plant is further south. (*S. sphathulata* DC., subsp. *Randii* (Porter) Cronq.).

Granitic or siliceous rocks and gravels: Me. and northern N.Y. west to Minn.

9. **S. Purshii** Porter

A rather poorly-dê fined species, often much like *S. uliginosa* but in places in northern N.S. quite distinctive and different from it. About Oxford and in neighboring areas it is common in poorly-drained fields, growing vigorously with a dense elliptical inflorescence of pale appearance and erect appressed branches. The inflorescence has a brushed-up appearance quite different from *S. uliginosa*, from which it differs also in chromosome count, 2n = 18. Scattered collections are also present from Queens to Victoria Co. from wet soils and boggy locations. Older records probably apply to *S. uliginosa*. Late summer. (*S. humilis* Pursh).

Lab. to Man. south to W.Va. and Wisc.

10. **S. sempervirens** L. SEASIDE GOLDENROD

Found around the whole coast of the Province and on Sable I.; salt marshes and sea-shores just above the range of the high tides. It is abundant on the running dykes and is found on the slopes next to the tidal rivers. A plant from Lockeport, Shelburne Co., showed 2n = 18 (Beaudry and Chabot, 1959). Forma **ochroleuca** Weatherby with the ray of flowers very pale yellow, almost white, was found scattered in a salt marsh at Parrsboro, Cumberland Co., Aug. 12, 1942 (Weatherby, 1942).

X **S. asperula** Desf. is a hybrid between this species and *S. rugosa* and is more or less intermediate between them. This has been reported from various locations along the Atlantic Coast and in northern N.S. and is to be expected wherever the habitats allow the two species to grow together. Occasional crosses apparently also appear between *S. sempervirens* and *S. canadensis;* and a hybrid with *S. uliginosa* was found on St. Paul I., (Boivin).

Nfld. and the lower St. Lawrence south to Va., with a variety to Fla. and Tex.

11. **S. juncea** Ait. Fig. 131, a. Map 506. EARLY GOLDENROD

Common in northern N.S. and scattered west to Digby and Lunenburg Co. and east to central C.B.; not seen by the Gray Herbarium Expedition in Yarmouth, Shelburne or Queens Co.; rare in C.B. and P.E.I. This is one of the earliest goldenrods of the season. Found on dryish

soils, along roadsides and in fields, with the bright-yellow curving inflorescences large and conspicuous. Late July-Sept.

C.B. to se.Man. south to Ga. and Tenn.

12. **S. uliginosa** Nutt. Fig. 130, h. BOG-GOLDENROD

One of the common goldenrods throughout the more acid and damper parts of the Province from Yarmouth along the Atlantic coast to northern C.B., rarer inland and there more typically only in bogs. It is characteristic of bogs, dryish peaty barrens and even denuded granitic hills. Several varieties have been described. The typical variety consists of the more robust plants with 20-40 stem-leaves. This is recorded for N.S. but is not common, formerly treated as *S. neglecta* T. & G. The more common form is called var. **linoides** (T. & G.) Fern., first named as *S. uniligulata* (DC.) Porter. This is 1-9 dm high with only 5-20 stem-leaves, apparently an adaptation to more severe ecological conditions. In northern C.B. this slender form has the inflorescence 4-5 cm wide, very short and with the branches spreading almost horizontally. This small form with the corymbose inflorescence is named var. **terraenovae** (T. & G.) Fern.; abundant in bog, Ingonish Barrens at an elevation of 1400 feet; common in bog above Gray Glen Brook, both stations in Victoria Co. (Smith and Schofield, 1952). $2n = 36$ (Beaudry and Chabot, 1959). Aug.-Sept.

Nfld. to Wisc. south to s.Me., N.Y. and s. Mich.

13. **S. nemoralis** Ait. Fig. 130, g. Map 507. OLD-FIELD-GOLDENROD

Local and in general of limited distribution. In the Annapolis Valley it is one of the more common goldenrods of late summer, occupying old fields, sandy roadsides and replacing *S. puberula* on lighter soils. Scattered stations occur southwestward. Fernald (1921) states that it was not seen in Queens and Shelburne Co. and in Yarmouth Co. only at Carleton. It has since been found at Shelburne; and from near Digby. Common on light soils in local areas near Truro; Erskine reports it as more common in eastern P.E.I. The plants are noticeable from a distance because the slender stems are curved at the top in the inflorescence. Aug.-Sept.

N.S. to B.C. south to Ga. and Tex.

14. **S. Elliottii** T. & G. Map 503.

Abundant and often dominant in boggy clearings, swales and damp thickets, spruce and maple swamps and lake shores in parts of Yarmouth Co. east at least to Queens Co. In discussing the flora near Clement Pond near Barrington, Shelburne Co., Fernald (1921) says "the most amazing sight of the day was the acres and acres of the southern *Solidago Elliottii*, forming solid thickets nearly 2 m high in the spruce and maple

swamp." The northern plants from e. Virginia north to Mass. and in southwestern N.S. have been named var. **ascendens** Fern. Mid-Aug.-Sept.

N.S.; Mass. south to eastern Ga.

15. **S. rugosa** Ait. ROUGH GOLDENROD

Common throughout; waste places, along fence-rows, open woods and a weed in old or deserted fields. Var. *villosa* (Pursh) Fern. has the same chromosome number, $2n = 18$, as the typical plant and is perhaps better considered to be forma **villosa** (Pursh) Beaudry. This is also frequent throughout in similar habitats but does not apparently range as far south. The plants are very variable in respect to pubescence from rough hairy to nearly glabrous. Consult Fernald (1936) and Beaudry (1960).

Nfld. to Ont. south to Va. and Ohio.

16. **S. canadensis** L. Fig. 131, b. Map 508. CANADA GOLDENROD

This is one of the most common species throughout the northern regions of the Province; fields, roadsides and edges of woods from Annapolis to northern C.B., very rare in the southwestern counties. Fernald (1921) states that "during the whole summer we did not see this characteristic Canadian species in southern Yarmouth Co. nor in Shelburne and Queens Co." Fernald, the next year, reports one clump from Five-River L., Shelburne Co., that was apparently a hybrid between this species and *S. uliginosa.* Around the coast hybrids occasionally occur with *S. sempervirens;* and it can also hybridize with *S. rugosa.* August.

Var. **gilvocanescens** Rydb. has the leaves grayish with dense rough, short hairs on both sides. This was collected by J.F. Donly near Guzzle Head Pond, Mersey R., in Queens Co.; with the statement "rare in Queens Co." Widely distributed but rare eastward in N. Amer.

Nfld. to B.C. south to Va., Ill. and Colo.

17. **S. gigantea** Ait.

Scattered east from Yarmouth Co.; gravelly thicket by Fanning L., Carleton, Yarmouth Co.; and railroad bank, Middleton, Annapolis Co. (Fernald, 1921).

Var. **leiophylla** Fern. has leaves glabrous or nearly so beneath and occurs essentially throughout the range of the species. It is doubtful if it is worthwhile maintaining this variety for the N.S. plants. The leaves of the plants in eastern N.S. are mostly smooth, but there is considerable variation even in leaves on the same plant. The involucres, also, are only about 3 mm high. Both the species and the variety were found by Beaudry to have diploid and tetraploid forms, although the morphological differences have not been worked out. Common on the

intervales and along streams at least from Truro to north-central C.B., often forming luxuriant stands in rich soil. (*S. serotina* Ait.).

N.S. to B.C. south to Fla. and Tex.

18. **S. graminifolia** (L.) Salisb. Fig. 131, c. NARROW-LEAVED GOLDENROD

Common on sandy and gravelly lake-shores, in damp thickets and swamps in the southwestern counties; becoming rarer east to C.B. and grading into the following variety.

Var. **Nuttallii** (Greene) Fern. is apparently more common and most of the plants from cultivated areas examined belong to this type. Here, again, much variation occurs in the pubescence and it is doubtful if the differences have much significance for our area. Aug.-Sept.

Nfld. to Man, south to N.C., and Mo.; B.C.

Fig. 131.—**Solidago:** (a) *S. juncea*, plant x $\frac{1}{4}$, flower x 3, (b) *S. canadensis*, top of plant x $\frac{1}{4}$, flower x 3, (c) *S. graminifolia* x $\frac{1}{4}$.

19. **S. tenuifolia** Pursh

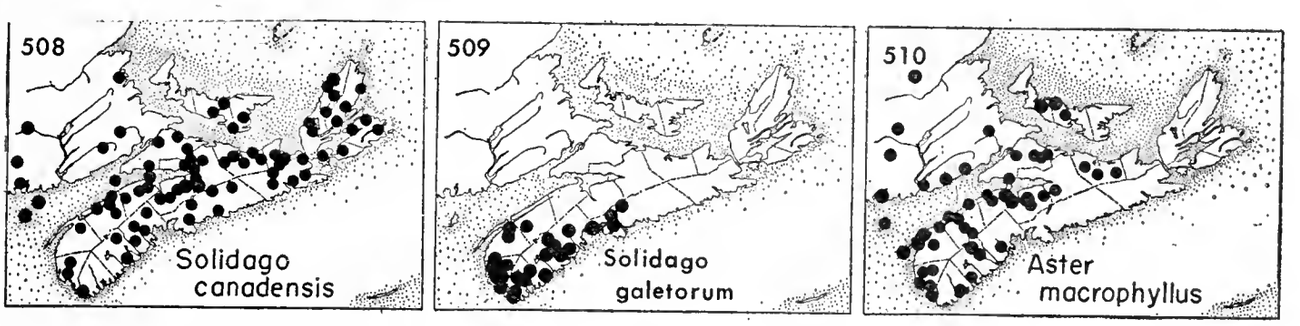
Apparently rare in southwestern N.S. Fernald separates off as this species the larger, more branching plants with spreading thinner leaves: sandy roadside, Sloane L., Pleasant Valley in Yarmouth Co. and gravelly beach of Third L., Windsor Junction in Halifax Co. Further investigation should be made to determine whether one or two species occur in N.S. as this and the following are evidently closely related.

N.S. and Me. south to Va.; n.Ind. and southern Mich.

20. **S. galetorum** Greene. Map 509.

Scattered on sandy and gravelly beaches of lakes and in damp thickets from Digby Co. eastward, becoming rarer in Queens and Lunenburg Co. to Grand L. in Halifax Co. (*S. tenuifolia* var. *pycnocephala* Fern.). Aug.-Sept.

N.S. and perhaps from southern Me. to Cape Cod.



4. ASTER L.

The genus *Aster* has perhaps 250 species widely distributed but mostly in N. Amer. The receptacle is flat or slightly convex with numerous florets; rays from blue or pinkish to white; pappus of capillary bristles. The plants are mostly perennial, with simple leaves. The genus is closely related to *Erigeron* and, although there is little trouble in distinguishing between these two genera, they are not separated by any definite morphological characters. One interesting species is *A. laurentianus* Fern. found on brackish sands in north-central P.E.I. This small plant, less than 30 cm high, has the rays almost entirely absent and is related to a far-western species (Boivin, 1962; Shinners, 1943).

a. Middle and lower stem-leaves petioled, the blades abruptly narrowed to truncate or cordate at the base.
  b. Outer involucral bracts 1.0-2.5 mm wide; peduncles usually more or less glandular; plants with creeping rhizomes, forming large patches, with very large rough leaves (Fig. 132, a). 1. *A. macrophyllus*
  b. Outer involucral bracts 0.2-0.8 mm wide; without glands; plants usually growing singly or in clumps.
    c. Lower leaves roundish in outline, nearly as wide as long, deeply cordate; involucral bracts glabrous on the back; leaves not clasping the stem (Fig. 132, d). 2. *A. cordifolius*

c. Lower leaves more than twice as long as wide, with sides less rounded, firm, tapering or truncate to the petiole or but slightly cordate.
d. Involucral bracts glabrous on the back; stem-leaves not clasping at the base; plant without hoary minute pubescence, essentially glabrous.
3. *A. ciliolatus*
d. Involucral bracts pubescent on the back; upper stem-leaves distinctly cordate-clasping at the base; plant with minute hoary pubescence throughout.
4. *A. undulatus*

a. Middle and lower stem-leaves sessile, or tapering gradually to the base.
e. Garden escape; tall showy plant with rays reddish-purple or rose, rarely blue or white; leaves conspicuously clasping; involucre over 6 mm high, this and the peduncles densely glandular. 5. *A. novae-angliae*
e. Plants of native habitats or weedy; inflorescence not densely glandular.
f. Middle involucral bracts with mid-vein expanded upward into a prominent colored (usually green) tip.
g. Upper leaves more or less strongly clasping at the rounded base; flowers large, blue to rose-purple.
h. Plant hispid-pubescent near the top or throughout, coarse and tall; leaves not conspicuously crowded in the inflorescence; involucres 6-12 mm high; rays 30-60. 6. *A. puniceus*
h. Plant glabrous or pubescent above in lines; plants 10-50 cm high, often with the leaves crowded in the inflorescence; involucres 5-8 mm high.
15. *A. novi-belgii*
g. Upper leaves tapering to the sessile base or only barely clasping.
i. Plants rather slender, often diffusely branched; flowers white to pale lavender or pinkish, small, the involucres 3.5-5, occasionally to 6.5 mm long; rays 3-11 mm long.
j. Involucral bracts, or some of them, subulate with inrolled green tips; plants perennial from a short rootstock; leaves linear to lanceolate, the upper numerous and much reduced; flowers white; rare introductions.
k. Involucre 4.5-8 mm high, about as broad as high; flower-heads 40-100-flowered; rays 5-10 mm long. 8. *A. pilosus*
k. Involucre 4-4.5 mm high, narrower than long; heads 16-32-flowered; rays 12-18, small and about 2.5-5 mm long. 9. *A. parviceps*
j. Involucral bracts flat, with the tips attenuate or acute but not inrolled; flowers often pale bluish or pinkish tinged.
l. Disk-corollas deeply lobed, the lobes half to three-quarters as long as the total of the expanded part above the narrow corolla-tube; plants without creeping rootstocks, low and diffusely branched.
10. *A. lateriflorus*
l. Disk-corollas shallowly lobed, the lobes less than half as long and often only a quarter the length of the limb of the corolla; plants with creeping rootstocks.
m. Plants with stout, creeping rootstocks, growing in large dense colonies, commonly 8-15 dm high; flower-heads very numerous, white to lavender, about 2.5 cm wide; leafy bracts of the peduncles and smaller branches linear to lanceolate, acuminate.
11. *A. simplex*
m. Plants slender and erect, with loose erect branches, from slender running rootstocks; inflorescence elongate, with flower-heads not one-sided along the branches; flowers few.
12. *A. Tradescanti*
i. Plants often branched only near the top, 30-100 cm high; involucres 6-9 mm high; flowers blue, larger, with rays 1.5 cm long; plants from short stout rootstocks.

n. Plants slender with long internodes; flower-heads few; leaves long and linear or nearly so; involucral bracts in 3 to 5 series, the outer much the shorter. 13. *A. borealis*

n. Plants stouter, usually branched with numerous flowers; leaves lanceolate or wider; involucral bracts nearly the same length, the outer as long or longer than the inner.

o. Involucral bracts erect or spreading, acute or acuminate at the tip, usually with scarious margins, mostly 1-2 mm wide. 15. *A. novi-belgii*

o. Involucral bracts green and foliaceous, the outer longer than the inner and recurved, over 1.5 mm wide. 14. *A. foliaceus*

f. Middle involucral bracts without colored tips, or with colored tips not formed by the expansion of the mid-veins.

p. Involucres more than 6 mm high; plants relatively short, much less than 1 m high; pappus a single series of bristles.

q. Outer bracts 1.0-2.5 mm wide; lower leaves reduced and soon deciduous, about 2.5 cm wide or less (Fig. 132, b); achenes not glandular; bogs. 7. *A. radula*

q. Outer bracts narrow, only 0.2-0.8 mm wide; achenes glandular.

r. Largest stem-leaves 3-12 mm wide; plants with 41-75 leaves below the inflorescence (Fig. 133, b). 16. *A. nemoralis*

r. Largest stem-leaves 9-50 mm wide; plants with 10-40 leaves below the inflorescence.

s. Largest stem-leaves 9-24 mm wide; plant with 25-40 leaves below the inflorescence. 17. *A. Blakei*

s. Largest stem-leaves 20-50 mm wide; plants with 10-20 leaves below the inflorescence (Fig. 132, f). 18. *A. acuminatus*

p. Involucres less than 6 mm high; plants 1-2 m high; inflorescence flat-topped; rays white; pappus double with an outer series of shorter bristles (Fig. 133, d). 19. *A. umbellatus*

1. **A. macrophyllus** L. Fig. 132, a. Map 510. LARGE-LEAVED ASTER

Scattered from Yarmouth east to Pictou Co.; dry woods, thickets and open barrens in the southwest, often growing in light shade in large patches, in many cases rarely flowering. The species is very variable in relation to the pubescence. Var. **velutinus** Burgess has the stems and petioles villous and the under surfaces of the leaves softly hairy; of little significance in N.S. Flowers pale blue to whitish, July 15-Aug.

N.S. to se. Man. south to the uplands of N.C. and Tenn.

2. **A. cordifolius** L. Fig. 132, d. Map 511. HEART-LEAVED ASTER

Common from Annapolis to C.B.; thickets, roadsides, fields and about dwellings, often abundant in waste ground and at the edges of fields; sometimes densely branched and floriferous in rich ground. Considerable variation exists in the size of the flowers and inflorescence and in the flower color. Var. **racemiflorus** Fern. has the fewer branches of the panicle long and relatively simple, with slightly larger flowers. Aug.-Oct.

N.S. to Wisc. and Iowa south to Ga. and Ala.

3. **A. ciliolatus** Lindl. Fig. 132, e.

Scattered in open fields in southern Hants Co. and northward between Halifax and Truro; common in the town of Stewiacke and found at Middle Musquodoboit. This plant is deep-green and erect with large bright blue flowers. (*A. Lindleyanus* T. & G.) Aug.-Sept.

N.S. to B.C. south to N.Y. and Mich.

4. **A. undulatus** L.

Scattered in dry open woods and thickets in southern Lunenburg Co. and often invading old fields; Greenfield, in adjacent Queens Co. (Weatherby, 1942).

N.S. to Ont. and Minn. south to Fla. and La.

Fig. 132.—**Aster:** (a) *A. macrophyllus,* inflorescence and leaf x $\frac{1}{2}$, (b) *A. radula* x $\frac{1}{3}$, (c) *A. lateriflorus* x $\frac{1}{2}$, (d) *A. cordifolius* x $\frac{1}{3}$, (e) *A. ciliolatus,* leaf x $\frac{1}{3}$, (f) *A. acuminatus* x $\frac{1}{3}$.

5. **A. novae-angliae** L. NEW ENGLAND ASTER

This tall showy aster is frequently cultivated and occasionally escapes to adjacent fields and roadsides or along hedge-rows and ditches; native further south and west. Aug.-Oct.

N.S.; Que. to Alta. south to the uplands of N.C. and Colo.

6. **A. puniceus** L. Fig. 133, c. Map 512. ROUGH ASTER

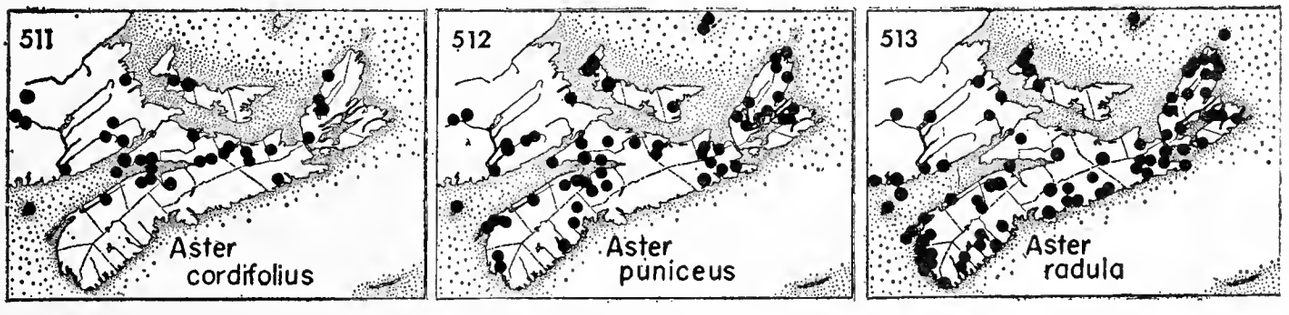
Scattered to common throughout; swamps, wet open areas, edges of swales and along streams, a coarse distinctive species. The rays are usually blue-violet. Forma **candidus** has white rays. Forma **firmus** (Nees) T. & G. has the stem nearly or quite glabrous below the inflorescence. This variation is widespread and is reported from our area. Late July-Oct.

Nfld. to Alta. south to Ga. and Ala.

X **A. tardiflorus** L.

This hybrid was reported by Fernald (1950-b) from a roadside 11 miles north of Truro; it is considered to be a hybrid between the previous species and *A. cordifolius*. The stem-leaves are widely lanceolate and abruptly contracted to winged, partly clasping bases, 8-15 in number below the inflorescence; involucres 6-8 mm high, with blue to blue-violet rays. It has also been collected at Brackley Beach, P.E.I. (D.S. Erskine, 1960).

N.S. to Ont. south to Penn.



7. **A. radula** Ait. Fig. 132, b. Map 513.

Common to scattered throughout; boggy barrens, peaty swales, bogs and damp thickets. It is one of the characteristic plants of the Atlantic side of the Province in its habitat.

Var. **strictus** (Pursh) Boivin is a northern, slender form with only one or several flowers with the bracts of the involucre more herbaceous and acute. This may be found in exposed locations and in northern C.B. July-Sept.

Nfld. and Que. south to the uplands of Va. and W.Va.

8. **A. pilosus** Willd.

This diffusely branched plant with rather small white flowers and narrowly lanceolate to subulate leaves has a wide distribution and is apparently local in western N.S. The record of *A. ericoides* from near

Windsor refers to this species; and a collection of Klawe from a dry meadow, Wedgeport, in Yarmouth Co., may possibly be the same. This species and the next have the involucral bracts, or some of them, with marginally inrolled green tips while those of *A. ericoides* are flat. The stem and leaves are more or less spreading-hirsute in contrast to being densely grayish-pubescent; and the rays are numerous.

N.S. to Ont. and Wisc. south to Ga. and Ark.

9. **A. parviceps** (Burgess) Mack. & Bush.

Well established and scattered over several acres west of Wentworth in Hants Co., first reported as *A. pilosus* var. *pilosus*, see Boivin (1962). This is the only location known in Canada.

Open areas in the mid-western U.S.; introduced into N.S.

10. **A. lateriflorus** (L.) Britt. Fig. 132, c. Map 514.

Common throughout; neglected fields, barrens, roadsides and edges of woods. This tiny much-branched aster with numerous small flowers is one of the abundant autumn-flowering plants. July-late Sept.

Var. **tenuipes** Wieg. has the flower-heads on slender pedicels or branchlets longer than the length of the involucre and more openly arranged instead of being one-sided along the branches; usually with larger heads, the involucres up to 6.5 mm high; and with the leaves not pubescent on the midrib beneath. It is distinct in its extreme form but intermediates occur and it grades into the species. (*A. acadiensis* Shinners).

N.S. to Man. south to Ga., Tenn. and Ark.

11. **A. simplex** Willd.

Damp thickets, edges of fields and along intervales, rare in the Annapolis Valley, common in Colchester and Pictou Co. and scattered east to C.B., often growing in large patches with numerous whitish flowers. The freely-branching form with narrower leaves only 3-12 mm wide and the involucral bracts slightly narrower has been named var. **ramosissimus** (T. & G.) Cronq. Its range is much like that of the species. Aug.-Sept. (*A. paniculatus* Lam.).

Nfld. to Sask. south to N.C., Ky. and Kans.

12. **A. Tradescanti** L. Map 515.

Scattered in boggy savannahs, around gravelly and sandy beaches of numerous lakes in southern Yarmouth Co.; Sandy Cove, Digby Neck; Ponhook L., Queens Co.; and east to Bridgewater and in Guysborough Co. (*A. saxatilis* (Fern.) Blanchard).

Southern Nfld. and N.S. west to Mich. and south to New Eng. and northern N.Y.

13. **A. borealis** (T. & G.) Prov.

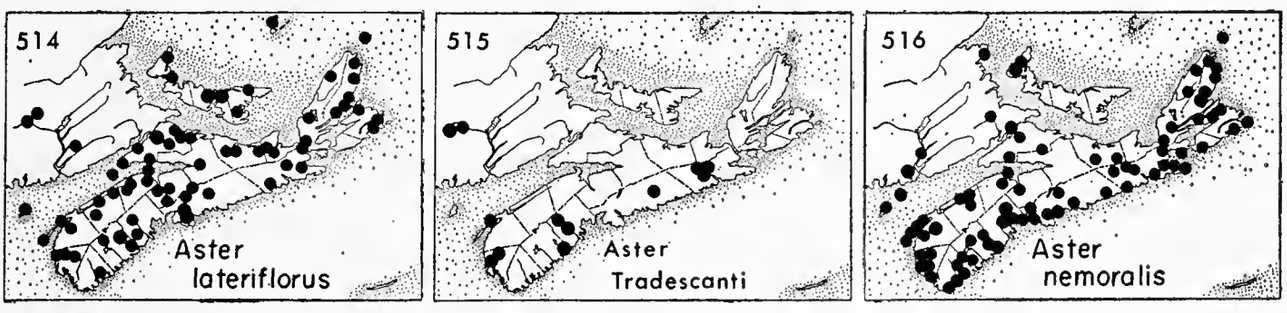
This slender plant with very narrow leaves is found scattered from Yarmouth Co. to C.B.; along brooks, edges of bogs and in damp soil in the cooler parts of the Province; rather rare and but little collected, probably more common than the collections indicate. (*A. junciformis* Rydb.).

N.S. to B.C. south to New Eng. and Ohio.

14. **A. foliaceus** L.

The plants with recurved broad foliaceous involucral bracts over 2 mm wide, simulating upper leaves and herbaceous to the margin, have been named *A. foliaceus* L., var. *arcuans* Fern. Intermediates occur between this and *A. novi-belgii;* and the whole group of blue asters comprising these two species is a difficult one and a number of species and varieties have been proposed. (*A. crenifolius* (Fern.) Cronq. in Britton & Brown; *A. subspicatus* Nees according to Boivin.

N.S. to B.C. south to northern New Eng.



15. **A. novi-belgii** L.

Common in meadows and damp places, especially near the coast and one of the common asters throughout the Province. This species is quite variable and the plants, especially around Truro, vary in the shades of coloring of the flowers. Forma **roseus** Rand & Redf. has the ray flowers roseate or violet. The typical plants have the leaves narrowly lanceolate and rather dull above. On salt marshes in central and western N.S. the plants may be rather tall and the leaves scarcely or not at all clasping at the base.

Var. **litoreus** Gray is found on the sea shores, borders of saline marshes, on headlands and elsewhere in grassy places near the coast. The plant is compact with short internodes and with the leaves larger, more oblong and often broadly based and the bracts of the involucre are relatively broad. These plants have a thickish texture and a shiny appearance to the leaves that is often lacking in the plants of more inland locations. Found from N.S. to Del.

Var. **rosaceus** Rousseau (1942) is the dwarf extreme. The plant grows in a rosette, is less than 15 cm high, with thick wide-based leaves hiding the stem, and the inflorescence compact and scarcely exceeding the leaves; flowers blue. Sable I., around the coast of C.B., and in eastern Que.

Nfld. to Ont. south to New Eng. and Ga.

16. **A. nemoralis** Ait. Fig. 133, b. Map 516.

Common throughout; bogs and marshes, lake margins, and dominant on peaty barrens. The plants are low and wiry, with usually simple stems and one to a few lilac-purple flowers. Forma **albiflorus** Fern. has white flowers; rare.

Nfld. to Algoma, Ont. south to New Eng. and Mich.

17. X **A. Blakei** (Porter) House. Map 517.

Borders of woods and thickets, in damp but sometimes rather dry ground; common in the southern and eastern parts of the Province. It is most often found around the edges of a lake or bog where the habitats of the previous and the following species border each other and it is considered to be a hybrid between them. The characteristics of the plant are intermediate between those of the two supposed parents and in places the hybrid is more common than either of them. (*A. nemoralis* var. *Blakei Porter*).

Nfld. and C.B. to Que. south to N.J.

18. **A. acuminatus** Michx. Fig. 132. Map 518. WOOD ASTER

Deciduous woodlands and thickets, preferring drier soils; common in the northern counties and scattered elsewhere. This is one of the characteristic plants of open woodlands and edges of intervales in northern N.S. Aug.-Sept.

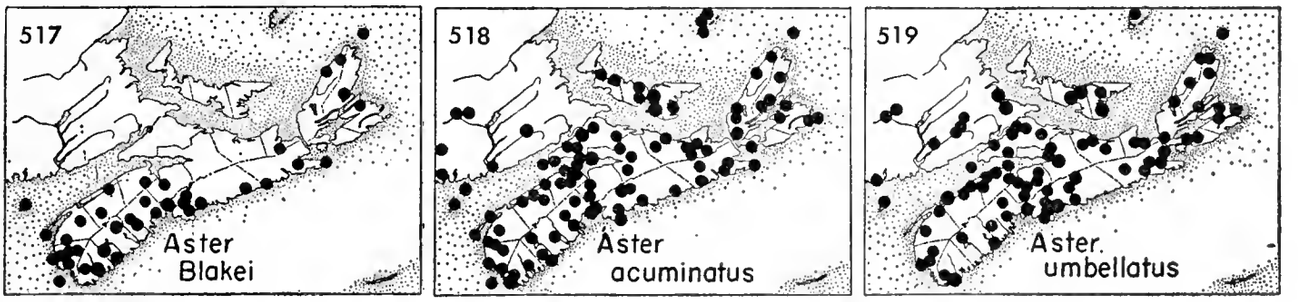
Nfld. to e. Ont. south in the mts. to Ga. and Tenn.

Fig. 133.—Aster: (a) *A. novi-belgii* x $\frac{1}{3}$, (b) *A. nemoralis* x $\frac{1}{3}$, (c) *A. puniceus* x $\frac{1}{3}$, (d) *A. umbellatus* x $\frac{1}{3}$.

19. **A. umbellatus** Mill. Fig. 133, d. Map 519. TALL WHITE ASTER

Swamps, damp thickets, marshes and poorly-drained soils; very common throughout along roadsides, in ditches, wet ground and barrens, conspicuous in late summer and often growing with *Solidago graminifolia;* tall with white flowers and identifiable in fruit by its double series of pappus-bristles. Late July-Sept.

Nfld. to Minn. south to the uplands of N.C. and Ky.



5. ERIGERON L. FLEABANE

A varied group of nearly 200 species, sometimes difficult to separate technically from *Aster* and with the last species sometimes placed in the related genus *Conyza;* common as weedy species.

a. Rays much exceeding the disk; heads 15-33 mm wide, solitary or several to numerous in a flattish corymb.
  b. Heads solitary on long peduncles; rays 20-30, whitish to pale pink; plants slender, 2-3 dm high with the numerous leaves linear and 1-4 mm wide; native habitats only (Fig. 134, b). 1. *E. hyssopifolius*
  b. Heads numerous, with over 50 rays; plants stout, often branched above, 2-15 dm high.
    c. Leaves sessile and clasping; heads 1.5-2 cm wide; rays pinkish, about 0.5 mm wide, up to 150 in number. 2. *E. philadelphicus*
    c. Leaves sessile, not clasping; heads 1-2 cm wide; rays 60-90, pale pinkish or bluish to white.
      d. Median stem-leaves coarsely toothed, ovate to narrowly lanceolate (Fig. 134,a); stems and leaves sparsely pubescent with long stiff spreading hairs. 3. *E. annuus*
      d. Median stem-leaves entire or nearly so, linear to narrowly lanceolate, the lower ones toothed at the apex (Fig. 134,d).
        e. Stem and leaves pubescent with numerous short appressed hairs. 4. *E. strigosus*
        e. Stem and leaves smooth or with scattered long spreading hairs. *E. strigosus* var. *septentrionalis*
a. Rays scarcely exceeding the disk, becoming involute and inconspicuous when dry; heads about 5 mm wide, very numerous in an elongate inflorescence (Fig. 134, c). 5. *E. canadensis*

1. **E. hyssopifolius** Michx. Fig. 134, b. Map 520

Confined largely to gypsum outcrops; common locally in such locations around Windsor and elsewhere in Hants Co.; in Antigonish Co.; Port Bevis and Cape North in C.B. Nichols (1918) records it from the stream-bank association between flood levels and Hounsell and Smith (1968) as characteristic of damp ledges and cliff crevices in northern C.B. Early July.

Calcareous rocks and gravels; Nfld. to MacKenzie south to N.S., central Me., n. N.Y. and Mich.

2. **E. philadelphicus** L. Map 520. PHILADELPHIA FLEABANE

Rare, known but from three locations; reported by Fernald (1921) from Hectanooga, Digby Co.; seen by J. Adams at Hillsborough, C.B.; large colony in field between Upper Musquodoboit and Dean in Halifax Co. (Smith and Schofield, 1952). Usually found on springy slopes, rich soil or in meadows, June-Aug.

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

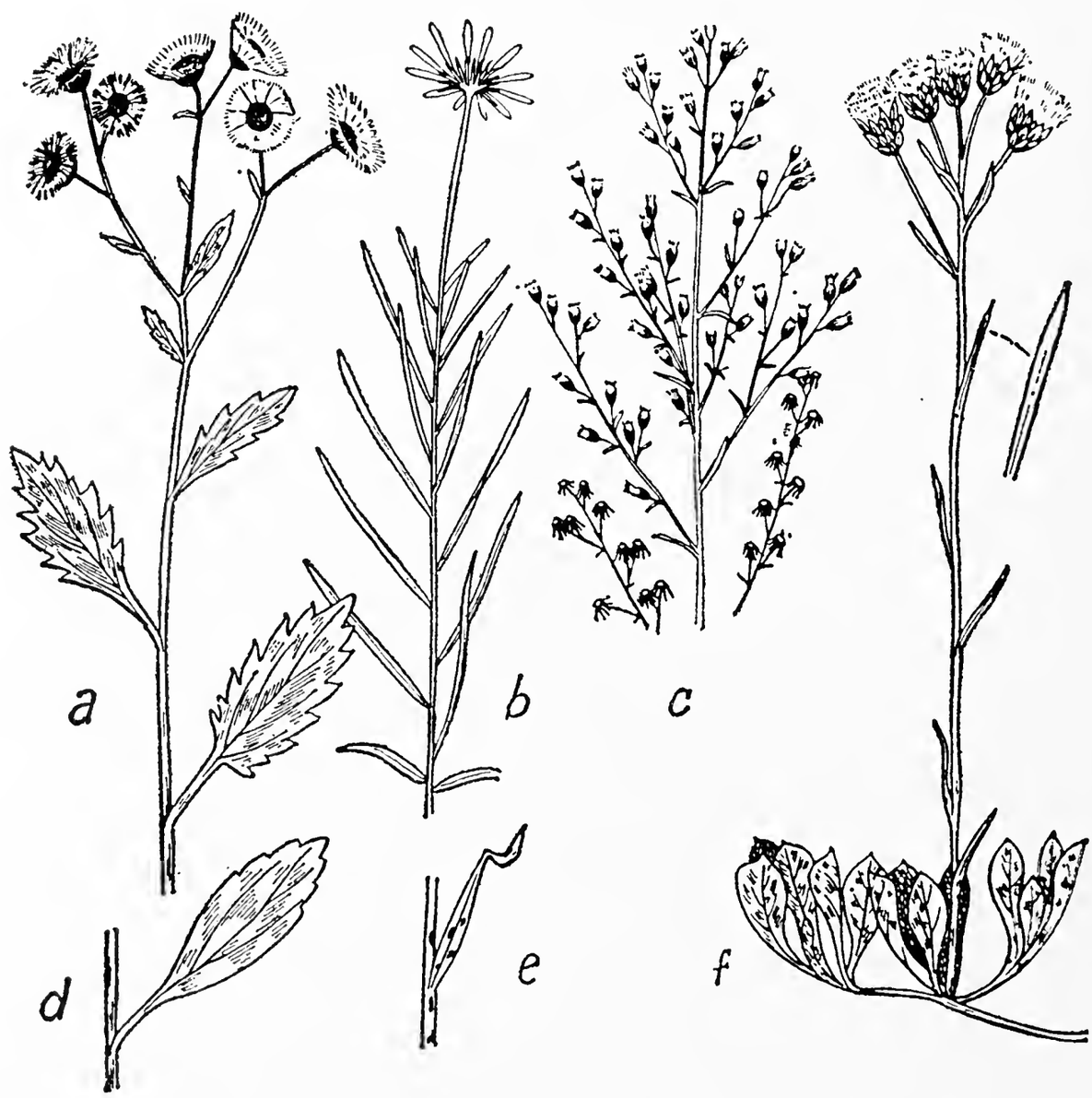


Fig. 134.—**Erigeron:** (a) *E. annuus* x $\frac{1}{3}$, (b) *E. hyssopifolius* x $\frac{1}{3}$, (c) *E. canadensis*, top of small inflorescence x $\frac{1}{3}$, (d) *E. strigosus*, leaf x $\frac{1}{3}$. — **Antennaria:** (e) *A. canadensis*, leaf with appendage x 1, (f) *A. neodioica* x $\frac{1}{2}$.

3. **E. annuus** L. Pers. Fig. 134, a. DAISY-FLEABANE

Common throughout; roadsides, waste places and fields. This and the next species are both very common in hay-fields, sometimes even luxuriant the year after seeding if the land is not properly prepared. July-Sept.

A weed throughout most of n. U.S. and s. Can.

4. **E. strigosus** Muhl. Fig. 134, d. DAISY FLEABANE, WHITE-TOP

Scattered to common in neglected fields, usually a common weed on deserted farms and along roadsides in the central part of the Province, probably introduced from further south and west. Early July-Sept. A weed throughout most of U.S. and southern Can.; introduced into Eu.

Var. **septentrionalis** (Fern. & Wieg.) Fern. is a form intermediate between this species and *E. annuus*, with the pubescence of the stem resembling that of *E. annuus* but with the leaves narrower and but little toothed. Plants are occasionally found along river banks in native habitats; reported from Pictou by Fernald and Wiegand; found along the rocky banks of the Salmon R., Bay St. Lawrence, Victoria Co. and appearing native.

Nfld. to B.C. south to New Eng., Mich. and Calif.

5. **E. canadensis** L. Fig. 134, c. HORSE-WEED

This is a weed of waste places and of light soil, becoming common in parts of the Province and especially in the Annapolis Valley; often in strawberry fields where it grows as a tall coarse annual 1-1.5 m high. (*Conyza canadensis* (L.) Cronq.). July-Sept.

A weed throughout the U.S. and Can.; widely introduced elsewhere.

6. ANTENNARIA Gaertn. EVERLASTING

The *Antennarias* comprise a readily recognized group but the species and varieties are difficult to delimit. Most partly or wholly produce their seeds without fertilization. Cronquist, in the New Britton and Brown Illustrated Flora, places all of our common plants in one species with several varieties. Fernald has described a number of species. The characters are sometimes difficult to see and even more difficult to evaluate. The treatment of Fernald (1945-a) is followed here until population studies in our area give a better idea of the range of variation found.

a. Rosette leaves comparatively small, 0.3-2.0 cm wide, with only the midrib prominent to the tip.

b. Middle and upper stem leaves terminated by a flat or involute papery appendage (Fig. 134, e); rosette leaves tapering and acute at the tip, very rarely rounded.

c. New rosette leaves bright green and glabrous or soon becoming so on the upper surface. 1. *A. canadensis*

c. New leaves grayish- or silky-woolly on the upper surface. 2. *A. neglecta*

b. Middle and upper stem-leaves acute or terminated by a sharp awn-like tip, but not by an appendage; rosette leaves mostly rounded at the end, with a very small pointed tip.

d. Involucre of pistillate plants 6-9 mm high, of the staminate plants 5-7 mm high; heads in a compact inflorescence; leaves equally spaced on the stem, and all ending merely in an acute tip; stolons short, quickly developing rosettes.

e. Leaves more or less whitish-woolly and dull above.

f. Tips of the involucral bracts linear-oblong, mostly blunt and shining white.

g. Plants slender to 4 dm high; stem-leaves to 4 mm wide, becoming well separated; basal leaves 5-18 mm wide; corollas 3.2-5 mm long. 3. *A. neodioica*

g. Plants stout, to 5 dm high; stem leaves 3-8 mm wide, often overlapping; basal leaves larger and greener; corollas 4.8-6 mm long. *A. neodioica* var. *grandis*

f. Tips of the involucral bracts tapering with a sharp or acute tip, thinner and much duller. *A. neodioica* var. *attenuata*

e. Leaves of the rosette glabrous, green and shining above. *A. neodioica* var. *chlorophylla*

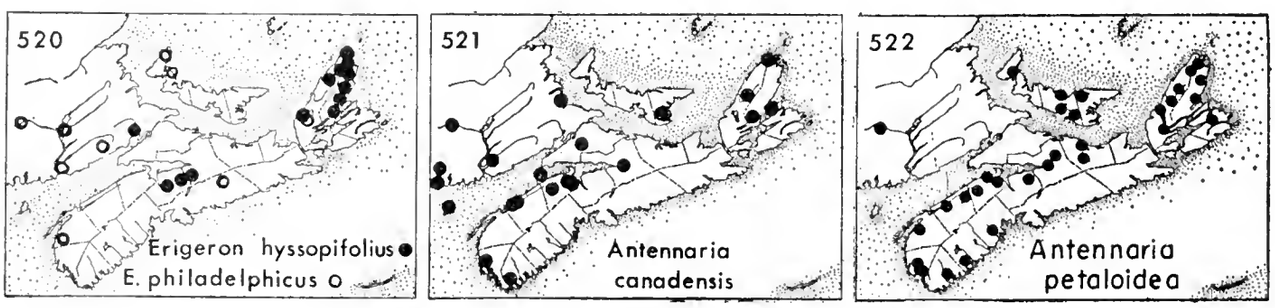
d. Involucre 7-11 mm high; heads in a loose inflorescence, with the lower pedicel often much longer than the upper; upper part of the stem bare or nearly bare of leaves, the upper stem-leaves terminating in a long point; stolons long and only tardily developing rosettes of leaves. 4. *A. petaloidea*

a. Rosette leaves large, 1-7 cm wide, with 3-7 somewhat prominent long ribs beneath. 5. *A. Parlinii*

1. **A. canadensis** Greene Fig. 134, e. Map 521. PUSSY'S-TOES, EVERLASTING

Common throughout; hills, dry and sterile soil, old pastures and deserted fields. This and related species often grow in leached-out soils where little other vegetation exists. (*A. neglecta* var. *Randii* (Fern.) Cronq.). May 15-June.

N.S. to Man. south to N.Y., mts. of Va. and Mich.



2. **A. neglecta** Greene

Scattered around Truro and probably generally distributed. If the character of the stem-leaves is disregarded, then these plants are like *A. neodioica.* Cronquist uses this name for this species but considers that the plants Greene described were those we treat under *A. petaloidea.*

One of the usually abundant species from N.S. to Minn. south to Va. and Ohio.

3. **A. neodioica** Greene Fig. 134, f. EVERLASTING

Scattered to common throughout in sterile soils on old fields, pastures, roadsides and rocky barrens. Nfld. to B.C. south to Va. (*A. neglecta* var. *attenuata* (Fern.) Cronq.).

Var. **attenuata** Fern. is common throughout in gravelly thickets, stony pastures, fields, roadsides and on sterile soil. Nfld. to Wisc. south to Va. Var. **grandis** Fern. is not uncommon, especially in the Annapolis Valley, and scattered in southwestern N.S. N.S. to Mich. south to Mass. Var. **chlorophylla** Fern. is rather similar in appearance to *A. canadensis*. It is reported by Fernald (1921) from pasture fields at Yarmouth; and from mixed woods and moist thickets, Meteghan, Digby Co. June. Nfld. to Wisc. south to N.S., New Eng. and N.Y.

4. **A. petaloidea** Fern., var. **subcorymbosa** Fern. Map 522.

Scattered, probably throughout; railroad embankments, sandy thickets, gravelly banks and fields, usually growing in better soils and more shady locations than the other species. Late May and June. The variety has a more northeastern range.

Nfld. to Ont. south to Mass.

5. **A. Parlinii** Fern.

Reported (Fernald, 1922) as "abundant at the border of dry pine and oak woods on steep slopes along the LaHave River, Bridgewater." Not common. Hants Co.: on gypsum cliffs, Halfway River; on dry bluffs, Kennetcook R.; Kings Co.: open wooded bluff above Gaspereau R. at Melanson. In the case of the first two collections, all plants were sterile (Smith and Erskine, 1954). Other broad-leaved forms observed probably belong to this species. Records earlier of *A. plantaginifolia* probably refer to *A. neodioica*. (*A. plantaginifolia* (L). Richards., var. *arnoglossa* (Greene) Cronq.).

N.S. and southern Me. to se. Man. south to Ga. and Iowa.

7. ANAPHALIS DC. PEARLY EVERLASTING

About 25 species, mostly in eastern Asia. Of these, we have only one but it is a common, conspicuous and variable species. A number of varieties have been described. All of these are wide-ranging and intermediates are common although the extremes seem quite distinct.

a. Leaves rather broadly linear-lanceolate, 3-20 mm wide, not reduced in length just below the inflorescence, bluntish to acute.
  b. Plants 2-9 dm high; leaves becoming bright green and glabrous above; heads numerous, in an open corymb. 1. *A. margaritacea*
  b. Plant dwarf, 1-5 dm high; leaves slightly woolly above; heads showy, few in a crowded cluster. var. *subalpina*
a. Leaves numerous and linear, 1-5 mm wide, much reduced in length upward towards the inflorescence.
  c. Leaves bright green and glabrous above. var. *angustior*
  c. Leaves cobwebby or flocculose on both sides. var. *intercedens*

1. **A. margaritacea** (L.) C.B. Clarke Fig. 135, a. PEARLY EVERLASTING

This northern plant is scattered in northern C.B. where the clumps of green, leafy plants are conspicuous. Plants from around Northumberland Strait are not so typical and have a slight tomentum. Common in eastern Asia and northwestern N. Amer.; Nfld. to New Eng. and Minn.

Var. **subalpina** Gray is a western form in the Rocky Mts., occurring eastward on the mts. of Que., Nfld. and other cool areas. St. John (1921) states that it is very common on the dry dunes and barrens on Sable I., where other varieties of the species are apparently absent.

Var. **angustior** (Miquel) Nakai is occasional throughout N.S. Throughout the range of the species.

Var. **intercedens** Hara is the common form of the plant in N.S.; common on dry hillsides, newly-cleared areas, along stone walls and the borders of woods. Aug.-Sept. Nfld. to Alaska south to Va., Mich. and N. Mex.; northern Japan.

8. GNAPHALIUM L. CUDWEED

Erect simple and scattered plants without enlarged basal leaves; technically distinguished from the previous two genera in having all the florets fertile, the outer ones pistillate and the few inner perfect.

a. Plants often much-branched; heads in a flat-topped corymb, or else in a very irregular diffusely-branched inflorescence; bristles of the pappus separate.
  b. Plants stout, erect; heads ovoid, clustered at the ends of the branches; achenes smooth.
    c. Leaves wide at the base and prominently decurrent on the stem; stem glandular-hairy; bracts of the receptacle yellow-white, acutish. 1. *G. Macounii*
    c. Leaves tapering to the base, not decurrent on the stem; stem woolly, scarcely glandular; bracts white, rather obtuse (Fig. 135, c). 2. *G. obtusifolium*
  b. Plants low, diffuse, and becoming prostrate; heads small, exceeded by the leaves; achenes scabrous; involucral bracts light-brown (Fig. 135, d). 3. *G. uliginosum*
a. Plants erect, unbranched, the heads in small clusters on short branches of the inflorescence in the leaf-axils, forming a spike-like raceme; bristles of the pappus united at the base into a ring (Fig. 135, b). 4. *G. sylvaticum*

1. **G. Macounii** Greene Map 523.

Rare, an early record for N.S. is a specimen collected by How at Windsor; now found scattered in south-central N.S. from Truro to Annapolis and Queens Co.; collected by Fernald on the North Mt., Granville, Annapolis Co. and Five-R. Lake, Halifax Co. Schofield (1949) reports it as growing sparingly scattered in a recently cultivated field at Cambridge, Kings Co., probably introduced in grain seed. D. S. Erskine (1960) reports it as abundant in clearings, and poor fields in southeastern uplands in P.E.I.

P.E.I. and Que. to B.C. south to N.S., Penn., Minn. and N. Mex.

2. **G. obtusifolium** L. Fig. 135, c. Map 524. CATFOOT

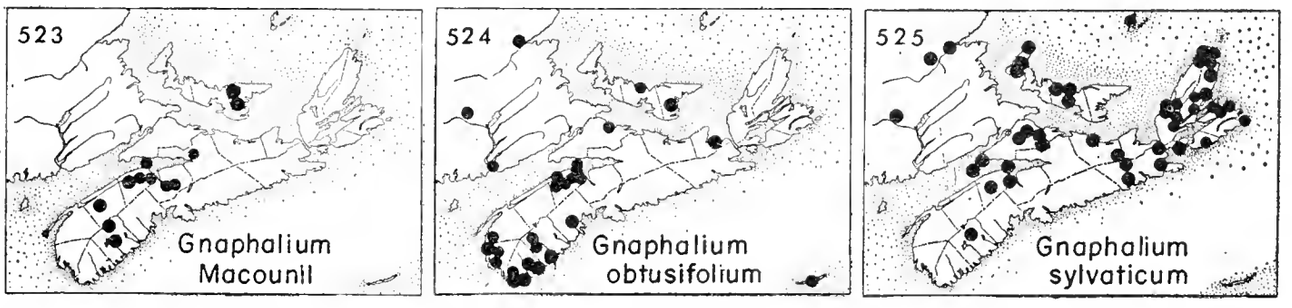
Scattered on dry sandy or rocky places in the western part of the Province: common in Kings Co.; with scattered locations north and east; Sable I., never abundant but probably becoming more common. Aug.-Sept.

N.S. to Ont. south to Ala. and La.

3. **G. uliginosum** L. Fig. 135, d. LOW CUDWEED

Common and weedy throughout; abundant in poorly-drained cultivated fields and gardens and especially so in wet years in grain fields. June-Oct.

Nfld. to B.C. south to Va., Ind. and Colo.



4. **G. sylvaticum** L. Fig. 135, b. Map 525.

Scattered in clearings and along grassy roadsides; common in C.B. and becoming rarer west to Cumberland and Kings Co., often appearing as if native. The only report from the southwestern area is as rare on roadside near Devonshire, Queens Co. (Smith and Erskine, 1954). Aug.-Sept.

Nfld. to Ont. south to n. New Eng.; Eu.

9. INULA L.

A tall, sunflower-like plant with large, coarse leaves which are densely whitish woolly beneath; flowers yellow with numerous very narrow rays.

1. **I. Helenium** L. Fig. 135, f. Map 526. ELECAMPANE

Introduced from Europe by the early French settlers; scattered from Yarmouth to central C.B., often found along damp roadsides and as an escape in neighboring fields in the Annapolis Valley especially around Annapolis and near Windsor, and probably still spreading; beach of Bras d'Or L. near Whycocomagh. Aug.

Introduced from Eu.; N.S. to Minn. south to the Gulf States.

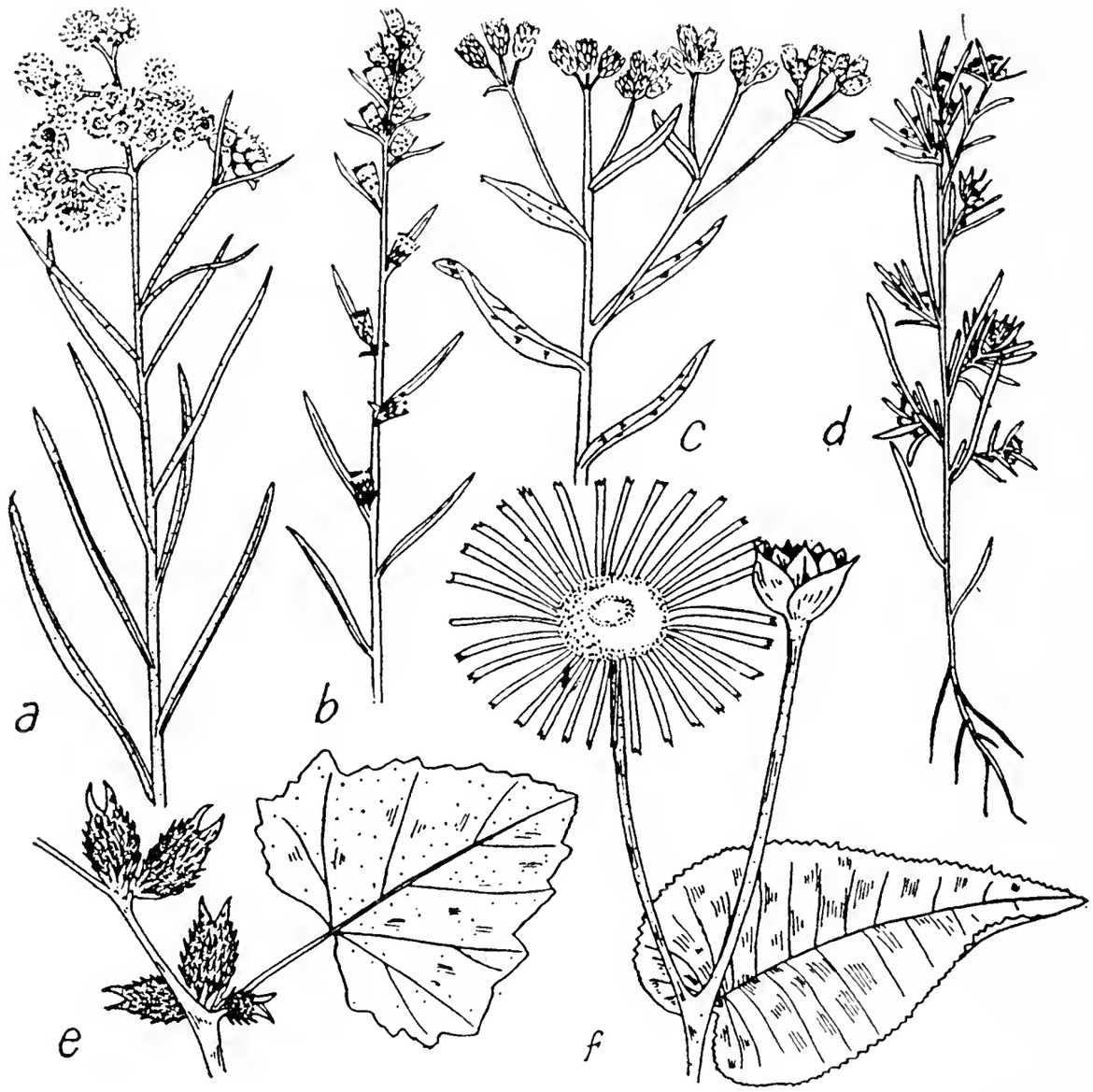


Fig. 135.—**Anaphalis:** (a) *A. margaritacea* x $\frac{1}{4}$. — **Gnaphalium:** (b) *G. sylvaticum* x $\frac{1}{3}$, (c) *G. obtusifolium* x $\frac{1}{3}$, (d) *G. uliginosum* x $\frac{1}{3}$. — **Xanthium:** (e) *X. echinatum*, fruits and leaf x $\frac{1}{3}$. — **Inula:** (f) *I. Helenium*, top of branch x $\frac{1}{3}$.

10. IVA L.

Coarse plants with mostly opposite leaves and small discoid flowers either in panicles or in the axils of the upper reduced leaves.

a. Low shrubby perennial near salt marshes; leaves lanceolate, tapering to a short petiole, fleshy; heads solitary in the axils of the upper reduced leaves. 1. *I. frutescens*

a. Tall annual, weedy; leaves broadly ovate, long-petiolate, thin; heads numerous, not in the leaf-axils. 2. *I. xanthifolia*

1. **I. frutescens** L., var. **oraria** (Bartlett) Fern. & Grisc. MARSH-ELDER

Undoubtedly introduced; rapidly spreading along road embankments and salt marsh near the mouth of the Gaspereau R. at Avonport

and also on the dykes at Pereau and Grand Pré in Kings Co.; found also on the bar below Yarmouth in Yarmouth Co. Our variety is the more northern one.

N.S. and Mass. to Va. on salt marshes.

2. **I. xanthifolia** Nutt.

Introduced around chicken-yards where western grain is scattered; rather common, tall and luxuriant but not found outside this habitat. Aug.-Sept.

Western N. Amer. and introduced eastward.

11. **AMBROSIA** L. RAGWEED

Coarse annual or perennial herbs with mostly lobed or dissected leaves; staminate flowers small and discoid, of numerous stamens surrounded by an involucre, in bractless racemes; pistillate flowers few, in the axils of the leaves, consisting of solitary pistils with no pappus and surrounded by a closed involucre with a few tubercles at the apex. This genus is the main one responsible for the autumn hay-fever in this region.

a. Plants 1-2 m high; leaves deeply 3-lobed or undivided. 1. *A. trifida*
a. Plants 2-10 dm high; leaves finely lobed or divided.
b. Plant annual, without running rootstocks; fruit ovoid, with about 6 acute teeth around the upper margin. 2. *A. artemisiifolia*
b. Plant perennial with slender running rootstocks; fruit with the teeth or tubercles very small or absent. 3. *A. psilostachya*

1. **A. trifida** L. GREAT RAGWEED

Sparingly introduced around towns and ports, occasionally seen in rich soil: Dartmouth, Kentville, Parrsboro, North Sydney, and more commonly in the country around buildings near Northumberland Strait. 2n = 24. Late summer.

Introduced from the west and south; widely distributed.

2. **A. artemisiifolia** L. Fig. 136, a. COMMON RAGWEED

Ragweed occurs on light soil; it is common in the Annapolis Valley, scattered along roadsides in newly disturbed soil to Digby, rare elsewhere inland except where introduced formerly in scratch-grain; found along the sea-coast in the sand and cobble-stones of the upper part of the beaches; occasional from Yarmouth to Halifax, rare from Halifax east and in C.B. Two varieties have been described but are difficult to evaluate. The typical variety has the leaves coarsely lobed with the staminate involucres 3-7 mm broad. This is thought to be native from Nfld. south to D.C. 2n = 36.

Var. **elatior** (L.) Descourtils has the leaves as more divided with narrower segments and the staminate involucres 1.5-5 mm broad. The

common introduced weed. Aug.-Sept., sometimes luxuriant in rich soil, often flowering in unfavourable habitats when only a few inches high.

Southern Can. south to Fla. and Tex.

3. **A. psilostachya** DC., var. **coronopifolia** (T. & G.) Farw.

Sparsely introduced into the Maritime Provinces and doubtfully persisting; collected by H. Groh in an orchard at South Berwick, Kings Co. (*A. coronopifolia* T. & G.).

N.S. to B.C. southward.

12. XANTHIUM L. COCKLEBUR

Coarse sea-shore annual with wide rough leaves and oblong burs with hooked spines.

1. **X. echinatum** Murr. Fig. 135, e. Map 527. COCKLEBUR

Sandy and gravelly beaches along the Northumberland Strait and western C.B., occasionally found around the Bras d'Or L. This plant usually grows just above the high-tide level but it sometimes extends up from the beaches into low areas in cultivated fields. Hybridization may occur and local strains become established. Löve and Dansereau (1959) place all the plants in one species so that our plants then would only be a form of *X. strumarium* L.

N.S. to Va.; cosmopolitan in the larger sense.

13. RUDBECKIA L. CONEFLOWER

Perennial plants with yellow to orange, daisy-like flowers with the receptacle raised and conic or columnar in shape.

a. Disk of the flower greenish-yellow; leaves large and mostly lobed; stem 10-25 dm high (Fig. 136, c). 1. *R. laciniata*

a. Disk of the flower dark brown; leaves lanceolate, unlobed; stem to 10 dm high (Fig. 136, b). 2. *R. serotina*

1. **R. laciniata** L. Fig. 136, c. Map 527. CONEFLOWER

Plants collected by H.G. Perry in an alluvial soil close to the shore of Black River, tributary to the Gaspereau in Kings Co., have been named var. **gaspereauensis** Fern. (Fernald, 1922). The variety has since been found in swales, roadside swamps, and in gulleys at various places in Kings, Hants and Colchester Co., usually rare but occasionally growing in large colonies or spreading over considerable areas. The value of this variety is doubtful, although D.S. Erskine (1960) points out that the plants of P.E.I. are scabrous on the lower surface of the leaves instead of being soft-pubescent. Aug.

The cultivated golden-glow, with a double head, is var. *hortensis* Bailey. This is persistent and occasionally found as an escape or as a relic around house-sites.

N.S. to Mont. south to Fla. and Tex.

2. **R. serotina** Nutt. Fig. 136, b. BLACK-EYED SUSAN

This species has been separated from *R. hirta* L. and some 15 dubious varieties and forms have been described. There is considerable gradation in the amount and form of the pubescence on the lower surface of the leaves. The typical variety has the hairs variously spreading and with open smooth spaces between their bulbous bases. This is rare and grades into the next form with the hairs crowded and appressed with minute bulbous bases.

Var. **sericea** (T.V. Moore) Fern. & Schub. is common throughout the Annapolis Valley and scattered east to C.B., rare in the southwestern

Fig. 136.—**Ambrosia:** (a) *A. artemisiifolia* x $\frac{1}{4}$. — **Rudbeckia:** (b) *R. serotina* x$\frac{1}{2}$, (c) *R. laciniata*, flower and leaf x $\frac{1}{5}$. — **Bidens:** (d) *B. cernua*, flowers x $\frac{1}{2}$, achene, (e) *B. frondosa*, top of plant x $\frac{1}{2}$, achene.

counties. Large colonies grow along the railroad between Halifax and Mt. Uniacke; and considerable areas often persist for a long time in suitable locations. There is a variation also in the length of the rays. Most are less than 3.5 cm long. Plants with rays 3.5-5 cm long have been named var. **lanceolata** (Bisch.) Fern. & Schub.

Man. to Texas, naturalized as a weed in eastern N. Amer.

14. **HELIANTHUS** L. SUNFLOWER

Various species of sunflower may occasionally be introduced from western N. Amer. and occur as garden escapes or in waste ground. The following are rare; others may also be expected.

a. Annual; receptacle flat or nearly so; disks of the flower-heads over 2.5 cm wide; running rootstocks and tubers absent; lower leaves wide, often cordate at the base. 1. *H. annuus*

a. Perennials, with creeping rootstocks and thus growing in patches; flower-heads with the disk usually less than 3 cm wide.

b. Bracts of the involucre lanceolate and greatly overlapping, firm and closely appressed; leaves mostly opposite and triple-nerved; stems and leaves scabrous. 2. *H. laetiflorus*

b. Bracts of the involucre narrowly lanceolate, little overlapping, and some or all with acuminate or attenuate spreading tips.

c. Leaves broadly lanceolate to ovate, triple-nerved, mostly alternate; well-developed tubers on the rhizomes. 3. *H. tuberosus*

c. Leaves lanceolate, at least 3 times longer than wide and not over 4 cm wide; rhizomes often thickened but without prominent tubers. 4. *H. giganteus*

1. **H. annuus** L. SUNFLOWER

Occasionally seen as an escape in waste places and around chicken-yards; neither common nor persisting. A common garden plant or ornamental.

Minn. to Texas and westward; introduced eastward.

2. **H. laetiflorus** Pers., var. **rigidus** (Cass.) Fern.

Introduced as an ornamental and occasional as an escape; Port Williams, Kings Co.; common at the head of the dykelands in waste ground at Truro; probably elsewhere.

Dry prairies, with scattered introductions eastward.

3. **H. tuberosus** L. JERUSALEM ARTICHOKE

Occasional in waste places; rather common in the orchards of the Annapolis Valley on various types of soil; less common than formerly since more orchards are under grass culture.

Throughout eastern and central N. Amer.; introduced eastward.

4. **H. giganteus** L.

This species comprises the plants with narrow, spreading bracts of the involucre and with narrow leaves. Other closely related species

are probably occasionally introduced as adventives. Collected by Erskine and Bentley beside the bridge at Mabou, Inverness Co., C.B., and a few plants on an old dump at Yarmouth, 1951.

Que. to Ont. and southwestward; introduced in the Maritimes.

15. **COREOPSIS** L.

Our only representative is an erect, delicate plant with linear leaves and a few radiate flowers with pink rays.

1. **C. rosea** Nutt. COREOPSIS

Scattered to often common on wet shores and cobbly or sandy beaches and margins of lakes and streams in the Tusket Valley, Yarmouth Co.; unknown elsewhere in the Province. Late July-Aug.

N.S.; Mass. to southern N.J. and Penn.

16. **BIDENS** L. BEGGAR-TICKS

Our species are annual herbs with opposite leaves; heads radiate or discoid; achenes quadrangular to flattened with usually 2-4 teeth which may be retrorsely barbed (Sherff, 1937).

a. Leaves simple and toothed, or the lower divided and lobed with the terminal leaflet on a widely-winged stalk; heads discoid or radiate; achenes often striate.
  b. Leaves sessile, or the lower sometimes with a narrowed base.
    c. Flower-heads hemispheric, the disks 12-25 mm wide, often nodding in age; outer bracts reflexed or scarcely ascending; rays 6-8, up to 1.5 cm long, sometimes wanting; (Fig. 136, d); achenes obscurely striate. 1. *B. cernua*
    c. Flower-heads narrower, the disks 5-15 mm wide; outer bracts erect or ascending; rays to 1.2 cm long or wanting; achenes coarsely striate; estuarine. 2. *B. hyperborea*
  b. Leaves with distinct but sometimes winged petioles 1-4 cm long; rays when present less than 8 mm long. 3. *B. tripartita*
a. Leaves compound with the terminal leaflet plainly stalked; rays absent, or small and inconspicuous (Fig. 136, e); achenes not striate.
  d. Outer involucral bracts 5-16, evenly and copiously fringed with white hairs.
    e. Outer involucral bracts 10-16; inner bracts shorter than the disk; achenes brown or olivaceous, the body 6-12 mm long and the awns downwardly barbed. 4. *B. vulgata*
    e. Outer involucral bracts 5-8; inner bracts equal to the disk; achenes blackish, 6-10 mm long. 5. *B. frondosa*
  d. Outer involucral bracts 3-5, mostly 4, not plainly fringed; body of the achene 3-6.2 mm long, the awns barbed upwardly. 6. *B. discoidea*

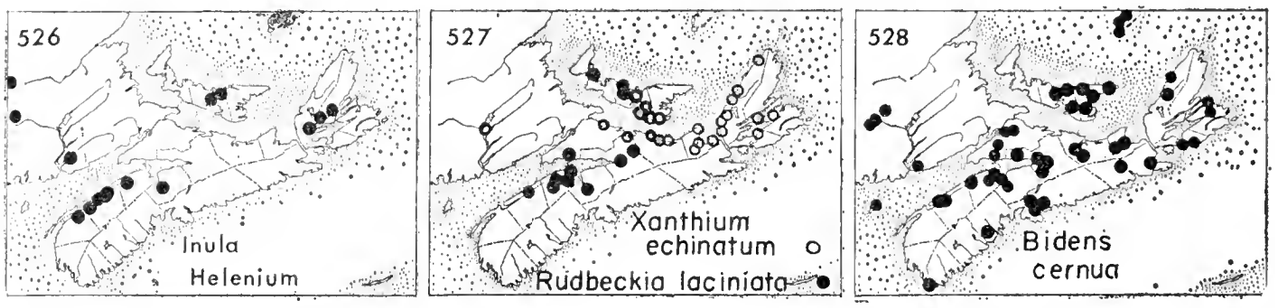
1. **B. cernua** L. Fig. 136, d. Map 528. NODDING BUR-MARIGOLD

Conspicuous and common in springy land, swamps and wet thickets, along brooks and near streams, from Annapolis and Lunenburg Co. to northern C.B. July-Sept. Highly variable in size, and in leaf shape

and serration. The form without rays may be called forma **discoidea** (Wimm. & Grab.) Briq. & Cavill., but it is often as common as the ligulate form.

Forma **minima** (Huds.) Larss. is the smallest extreme; boggy margin of Hebb's L., Bridgewater (Fernald, 1922); bog at the margin of the sea at Gabarus, C.B. (Rousseau, 1938); a large colony on the sandy shore of L. Ainslie at Kenloch, Inverness Co. (Smith and Schofield, 1952). Stem less than 20 cm high, simple or nearly so; heads solitary or few, erect or nearly so in fruit.

N.S. to B.C. south to N.C., Mo. and Calif.; Eurasia.



2. **B. hyperborea** Greene, var. **colpophila** (Fern. & St. John) Fern. Map 529.

Tidal mud-flats of the River Philip, Oxford. This rare estuarine plant is also variable with the plants in each part of its range being slightly different. This variety occurs from the Northumberland Strait of N.B. and N.S. south to Mass.

James Bay; Gaspé; Northumberland Strait to Mass.

3. **B. tripartita** L. Map 530. SWAMP-BEGGAR-TICKS

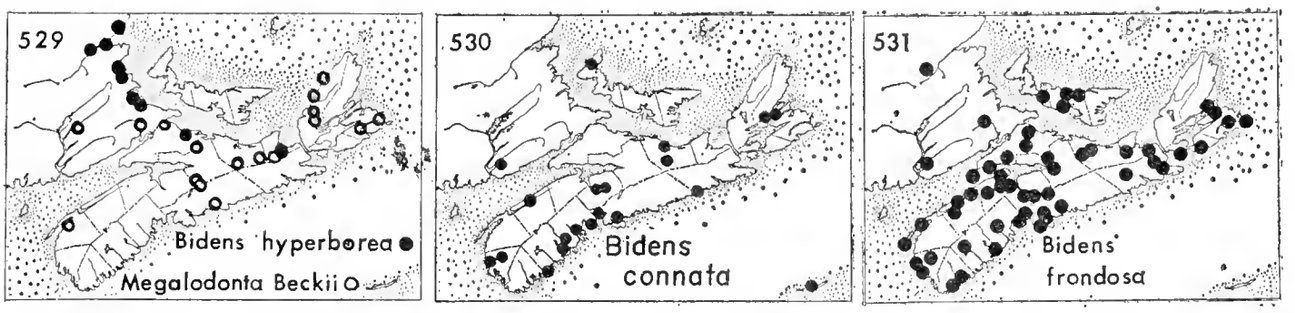
This plant, also known as *B. connata* Muhl., is now considered to be very much the same as the European species. Various varieties and forms have been described but these are probably mostly ecological variations. Plants with the blade of the leaf 3-parted are rare: thickets and swales back of brackish shore of the LaHave R. at Bridgewater (Fernald, 1922). Most of our plants have the petiole not winged and the blade not divided except in very vigorous plants. Boggy swales, borders of ponds and ditches in various parts of the Province; frequent at the borders of fresh-water ponds on Sable I. Forma **anomala** (Farw.) Boivin has the awns of the achenes retrorsely barbed. Plants occurring locally in P.E.I. and the Magdalen I. have the central achenes flattish instead of quadrangular and with obscure midribs. These belong to var. *heterodoxa* Fern.

N.S. to Minn. south to Del., Md. and Ohio.

4. **B. vulgata** Greene. BEGGAR-TICKS

Common in ditches and around the dykelands at Truro; a vigorous, distinctive weed.

N.S. to Alta. and Wash. south to N.C., Kans. and Calif.



5. **B. frondosa** L. Fig. 136, e. Map 531. COMMON BEGGAR-TICKS

Common throughout, often growing in shade around dwellings and as a solid cover in damp waste places. In rich soil it is high and much-branched while in exsiccated soil it may be but a few inches high with a simple stem and few heads. Nfld. to Ont. and B.C. south to Fla. and Calif.

Forma **anomala** (Porter) Fern. has the awns of the achenes upwardly barbellate instead of the opposite. This is rather common from Yarmouth Co. along the Bay of Fundy to Amherst and usually grows along the edges of brackish areas, occasionally elsewhere. The plant known as var. *pallida* Wieg. is poorly understood, It has pale-green leaves, the side-branches longer than the main stem, and the terminal leaflet tends to be stalked. Fernald (1950-a) suggests that this may be a hybrid of this species with *B. connata.* Sherff reports this as collected by Brother Peter at Halifax in 1896.

6. **B. discoidea** (T. & G.) Britt.

Scattered in swamps and gravelly or sandy shores near Pictou, probably local in the north-central region of the Province. Sherff lists it only from beaches at Pictou. July-Aug.

Ala. to Texas north locally to N.S., Que. and Ont.

17. **MEGALODONTA** Greene

This plant is sometimes included with *Bidens;* submerged leaves filiformly dissected and the exposed ones simple; achenes almost terete.

1. **M. Beckii** (Torr.) Greene Fig. 137, a. Map 529. WATER-MARIGOLD

Dead water of Rocky Brook north of Hassett, Digby Co., for the first record east of Penobscot, Me. (Fernald, 1922); wrack of Mattatall Lake, Cumberland Co. (Schofield, 1955); Colchester Co. and from the Musquodoboit R. in Halifax Co. east through Pictou and Antigonish Co. to C.B. where it is abundant in slow-flowing streams about Lake Ainslie and in ponds to the north. In only 2 cases was it found in flower (Smith, 1959). Aug.

N.S. and Que. to Sask. south to N.J. and Ohio; B.C. to Oreg.

18. GALINSOGA R. & P.

1. G. ciliata (Raf.) Blake QUICKWEED

Common along the streets of Halifax; now becoming introduced at widely scattered places elsewhere, usually about towns. The heads are small with several florets and 4-5 small white rays; plant annual, low and branched, with hispid, often glandular, hairs so that the plant soon becomes dirty in appearance. June-Oct.

Introduced from tropical Amer.; widespread.

19. ACHILLEA L. YARROW

Perennial herbs with alternate, subentire to finely and pinnately dissected leaves and many small flowers with whitish to pink rays.

a. Leaves lanceolate, simple, finely toothed; corymb very loose and leafy, with heads few on long pedicels. 1. *A. Ptarmica*
a. Leaves finely divided; corymb more compact, the heads numerous on short pedicels.
b. Rays and disk-florets grayish white.
c. Bracts of the receptacle with dark brown to blackish margins; plants short with 4-9 stem-leaves, northern. 2. *A. borealis*
c. Bracts of the receptacle pale, rarely dark-margined; plants larger and vigorously spreading by underground rootstocks, with 5-20 stem-leaves; common. 3. *A. lanulosa*
b. Rays or disk-florets, or both, pinkish to red. 4. *A. Millefolium*

1. A. Ptarmica L. SNEEZEWEED

Scattered throughout as an escape from gardens and persistent in patches when once established. Double showy forms may also be seen occasionally where recent escapes appear. July-Sept.

Naturalized from Eu.; Nfld. to Ont. south to N.Y. and Mich.

2. A. borealis Bong.

The usual weedy character of the genus was not evident in collections from northern C.B. and Cumberland Co. The plants were confined to specialized "alpine" habitats and seemed to offer no severe competition to associated species. Inverness Co.: small colony on dry exposed cliff-shelfs, Big Southwest Brook, Victoria Co.: rare colonies on exposed cliff of look-off near bog above Gray Glen Brook; abundant colonies on exposed headland, White Point (Smith and Schofield, 1952); Cumberland Co.: cliff ledges, Jeffers Brook; ledges, Isle au Haute. The N.S. plants have been examined cytologically and have a chromosome number $2n = 54$.

This is a hexaploid species from Calif. to Alaska and eastward across northern Can.

3. **A. lanulosa** Nutt. Fig. 137, b. YARROW

The common plant of eastern Amer. has been found to be tetraploid (2n = 36) in nature and thus different from the European hexaploid plant. Common throughout along roadsides, in fields; often troublesome on the dykelands and common in native habitats on headlands and in a variety of situations. July 15-Sept.

Nfld. to Alaska south to Penn. and Calif.

4. **A. Millefolium** L. See Mulligan and Bassett (1959).

A. Millefolium was found to be hexaploid and not the common weedy plant of eastern Canada. The 3 species treated here were further found to intergrade so much in their variable characteristics that it was impossible adequately to tell them apart without cytological investigation. The plants with pinkish to red flowers are considered to be a color form of this species from Europe, forma **rosea** Rand & Redfield.

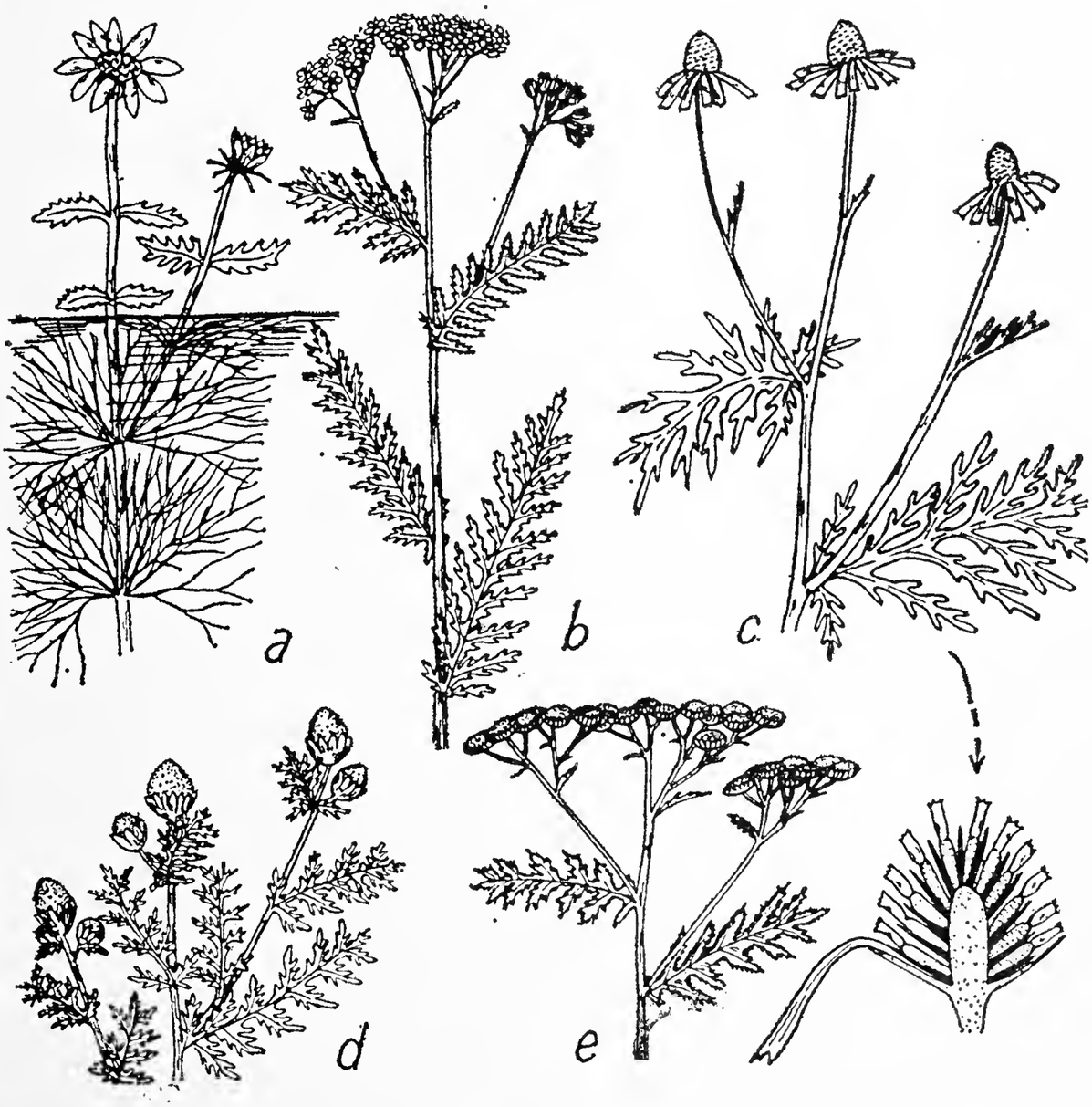


Fig. 137.—**Megalodonta:** (a) *M. Beckii* x $\frac{1}{3}$. — **Achillea:** (b) *A. Millefolium* x $\frac{1}{3}$. — **Anthemis:** (c) *A. Cotula* x $\frac{1}{3}$. — **Matricaria:** (d) *M. matricarioides* x $\frac{1}{3}$. — **Tanacetum:** (e) *T. vulgare*, inflorescence x $\frac{1}{4}$.

White-flowered *A. Millefolium* has been found in P.E.I. and N.S. The red-flowered plants apparently sometimes cross with the white-flowered forms to produce intermediate shades of rays or disk florets. Rousseau (1938-a) discusses the inheritance of this pink color. This species is therefore considered scattered in N.S. but the common plant in most of the area is *A. lanulosa*. 2n = 54.

Eurasia; introduced into N. Amer.

20. **ANTHEMIS** L. CHAMOMILE

Plants with finely divided leaves and daisy-like flowers, with the receptacle chaffy, at least towards the middle.

a. Rays white; disk of the flower-head 5-12 mm wide; annuals.
  b. Receptacle chaffy only towards the center; rays sterile; plant strong-smelling, more or less branched. 1. *A. Cotula*
  b. Receptacle chaffy throughout; rays pistillate; plants not strong-smelling, bushy-branched near the base. 2. *A. arvensis*
a. Rays yellow; disks 10-20 mm wide; plant perennial. 3. *A. tinctoria*

1. **A. Cotula** L. Fig. 137, c. CHAMOMILE

Very common about farmyards, scattered along roadsides and in waste places throughout; usually growing where the soil is more or less compacted and competition from other vegetation is light. July-Oct.

Introduced from Eu.; Nfld. to Alaska south.

2. **A. arvensis** L., var. **agrestis** (Wallr.) DC. CORN-CHAMOMILE.

Occasionally introduced and a more aggressive, weedy species than the last, growing in cultivated or neglected fields. Local but troublesome where it occurs. July-Aug.

Introduced from Eu.; N.S. to Mich. and Va.

3. **A. tinctoria** L. YELLOW CHAMOMILE

Growing as a cultivated flower in gardens, seeding abundantly and tending to be weedy. Found along the railroad track, Truro; escape at Martock in Hants Co.; edge of ballast heap, Point Pleasant Park, Halifax. This escape is now becoming well established in the central part of the Province (Smith and Erskine, 1954). Late June-Aug.

Introduced from Eu.; N.S. to B.C. south to N.J.

21. **MATRICARIA** L.

Herbaceous plants with very finely divided alternate leaves, very similar in appearance to the last genus but with the receptacle of the flower without chaffy scales.

a. Flower-heads 3-4 cm wide, with showy white rays; plants usually over 3 dm high.
b. Plants without a strong odor; receptacle hemispheric, rounded; achenes with 2 marginal and 1 ventral strongly-thickened ribs, minutely roughened. 1. *M. maritima*
b. Plants with a strong odor; receptacle conical and pointed at the apex; achenes with 2 marginal and 3 ventral weaker ribs, otherwise smooth. 2. *M. Chamomilla*
a. Flower-heads small, 5-9 mm wide, without rays, very conical; plant with a strong odor suggesting pineapple. 3. *M. matricarioides*

1. **M. maritima** L. MAYWEED

Growing in much the same habitats as *Anthemis* and rather similar to it in appearance. It is, however, more confined to the areas near the sea-shore; common as a weed along the French Shore of Digby and Yarmouth Co., and along the Northumberland Strait; scattered elsewhere in towns, along roadsides and in waste places although rather rare inland. Mulligan (1959) points out that the plants of western N.Amer. have 36 chromosomes while the plants of the Maritimes have only 18, and that the plants examined from P.E.I. have at least one more chromosome than those from N.S. and N.B. The most probable explanation seems to be that the P.E.I. plants represent a separate introduction from Eu. (*M. inodora* L.). July-Aug.

Nfld. to Alta. south to Penn.; introduced from Eu.

2. **M. Chamomilla** L.

This plant is very similar to the preceding species and has also been widely introduced as a weed in eastern N.S. However, it is more local and much less common. It has been collected in both N.S. and N.B. but the distribution of the species is not well known and it is probably often overlooked.

N.S. to B.C. south to Penn.; introduced from Eu.

3. **M. matricarioides** (Less.) Porter. Fig. 137, d. PINEAPPLE-WEED

Very common along roadsides, about farm-yards and in waste places throughout, usually growing where the soil is disturbed or packed and competition from other weeds is light (*M. suaveolens* (Pursh) Buch.). July-Nov.

Nfld. to B.C. south to Del.; introduced from the Pacific States.

22. CHRYSANTHEMUM L. DAISY

Annual or usually perennial herbs with the receptacle of the flower-head flat and naked; pappus a mere crown or none; rays usually present, white or yellow. The yellow-flowered *C. segetum* L. with large flowers has been listed for N.S. but no recent stations have been found. *C. Balsamita* L., or Costmary, with large leaves which are almost or entirely

unlobed, and rays absent or very small, was found by I. V. Hall by a house at Morden, Kings Co. but it is doubtfully escaped. The chromosome races in the *Chrysanthemum leucanthemum* complex are described by Mulligan (1958).

a. Heads solitary or few, the disk 10-20 mm wide; rays white, 10-20 mm long. 1. *C. Leucanthemum*

a. Heads numerous, the disk 5-9 mm wide; rays white, 4-8 mm long. 2. *C. Parthenium*

1. **C. Leucanthemum** L. OX-EYE-DAISY

Our common daisy exists in 2 forms in the Maritime Provinces, which may be distinguished as follows:

a. Basal leaves pinnatifid, sub-pinnatifid or coarsely and irregularly toothed; middle and upper stem-leaves narrowly oblong or oblanceolate, conspicuously sub-pinnatifid at the base. 1. *C. Leucanthemum*

a. Basal leaves dentate; middle and upper stem-leaves oblong or oblanceolate, coarsely and regularly crenate or dentate above, with larger spreading teeth at the base. *Tetraploid form*

The common daisy of pastures, cultivated land and waste places is found throughout. (Var. *pinnatifidum* Lecoq. & Lamotte). June-July. Lab. to B.C. south to Fla.

The tetraploid form is reported by Mulligan (1959) as being most common in Canada from Quebec City to the Gaspé and in Nova Scotia. This was reported by Fernald (1922) to be common in Annapolis Co.; and now it is found along roadsides near Annapolis Royal. Both forms are introduced from Eu.

Nfld. to Que. south to N.Y. and N.J.

2. **C. Parthenium** (L.) Bernh. FEVER-FEW

Scattered in Annapolis and Digby Co., rare elsewhere; Mill Brook, Pictou Co.; waste ground, Windsor; roadside, Victoria Beach, Digby Co.; occasionally seen along the French Shore in Digby Co. July-Oct.

N.S. to Ont. southward; B.C.

23. **TANACETUM** L. TANSY

1. **T. vulgare** L. Fig. 137, e. TANSY

Scattered throughout; in small patches near old houses or along roadsides, becoming a weed in fields and orchards on the deeper soils near the Minas Basin in Kings Co. and locally in good soils elsewhere. Forma **crispum** (L.) Hayek has the leaves finely divided and coarsely toothed with the teeth partly inturned. This is scattered in various parts of the Province. The strong odor, finely divided leaves, and button-like yellow rayless flower-heads are distinctive. July-Aug.

Introduced from Eu.; Nfld to B.C. south to Ga.

24. **COTULA** L.

1. **C. coronopifolia** L.

Low diffusely-branched plants with toothed to dissected leaves and hemispherical to globose discoid heads. Halifax Co.; salt marsh by the sea, Prospect, collected by M.S. Brown, 1938; edge of brackish pond, beach at Easten Passage. Known for 50 years from P.E.I., and more recently collected in N.B. on Grand Manan and at Lower Caraquet, Gloucester Co. (Erskine, D.S., 1951).

N.S. to Bonaventure Co., Que.; Pacific Coast; native of S. Amer.

25. **ARTEMISIA** L. WORMWOOD

Annual to perennial herbs with pinnately lobed or dissected leaves and numerous small discoid heads. About 40 North American species are known, many of which are widespread and highly variable. Several of ours are introduced from further west and others may be expected.

a. Leaves smooth and glabrous on both sides, thin and crowded, once-divided with triangular sharp teeth; heads small and crowded, the involucres 2-3 mm high. 2. *A. biennis*

a. Leaves finely pubescent to whitish-hairy on one or both sides.
  b. Leaves densely whitish-woolly on both sides, the lobes rounded and about 5 mm wide; involucres 6-7.5 mm high; beaches along the coast. 4. *A. Stelleriana*
  b. Leaves finely pubescent on both sides, or glabrous on the upper side only; involucres 2-4.5 mm high.
    c. Leaves glabrous above and whitish-woolly beneath, partly twice-divided, with lobes 2-4 mm wide and tapering to a sharp tip, ordinarily with one or two pairs of stipule-like lobes at the base; plants 1-2 m tall. 5. *A. vulgaris*
    c. Leaves finely pubescent on both sides, finely 2-3-times divided, the lobes without teeth, and not usually with stipule-like lobes at the base.
      d. Receptacle of the flower-head with numerous long hairs between the florets; lobes of the leaves short, 2-3 mm wide; middle stem-leaves 3-6 cm long, the lower long-petioled; stem stout and tall. 6. *A. Absinthium*
      d. Receptacle of the head without numerous long hairs; lobes of the leaves narrow, scarcely 1 mm wide.
        e. Half-shrubby, the leaves commonly white-hairy on both sides and only 1-3 cm long with short divergent lobes; plant slender with the lower leaves short-petioled. 3. *A. pontica*
        e. Herbaceous, rare northern plant, the leaves green and finely appressed pubescent, crowded at the base of the plant, with long narrow lobes. 1. *A. canadensis*

1. **A. canadensis** Michx.

Collected by Smith *et al.* from Lockhart Brook, Salmon R., Victoria Co. where it was abundant on talus slopes; in bud July 13, 1953. This is the more southern form of the subspecies *borealis* which Cronquist includes under the circumboreal *A. campestris* L. Rare and northern.

Lab. to B.C. south to C.B., N.B., Vt., Mich. and Colo.

2. **A. biennis** Willd. Map 532. BIENNIAL WORMWOOD

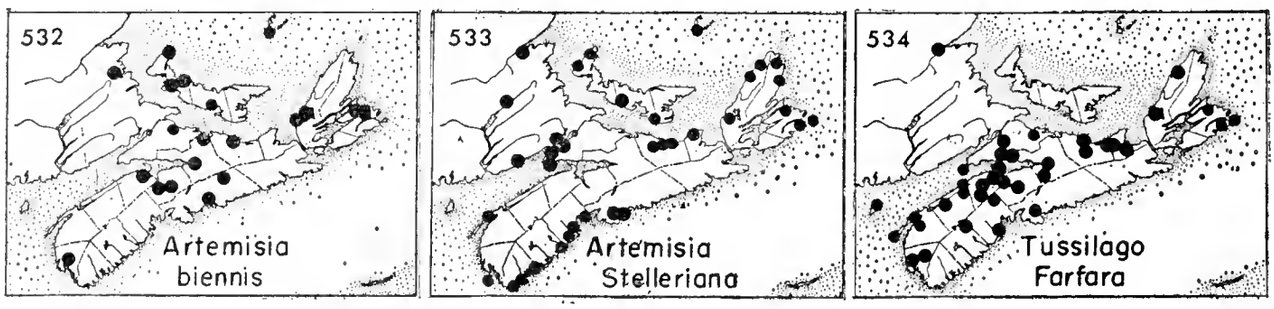
Reported by Lindsay from Windsor and Pictou; collected at Pictou and rather common along the North Shore in heavier soils; scattered westward and usually found only as scattered plants. Aug.-Sept.

Introduced from western Amer.; widely scattered south to Penn.

3. **A. pontica** L. ROMAN WORMWOOD

One of the species only rarely adventive in the East; known only from a collection from waste ground, Dartmouth (Fernald, 1922). Aug.

Introduced from Eu.; rare from N.S. to Man. south to Penn.



4. **A. Stelleriana** Bess. Map 533. BEACH-WORMWOOD

Scattered around the coast on rocky or sandy beaches; most common in northern C.B. and scattered along the Atlantic Coast to Yarmouth and Digby Co. Early Aug.

Introduced from ne. Asia and originally escaped from cultivation; lake shores, Mich. to Ont.; lower St. Lawrence R. to Va.; B.C.

5. **A. vulgaris** L. Fig. 138, a. COMMON WORMWOOD or MUGWORT

Orchards, roadsides, about dwellings and waste places about towns; common from Annapolis to Halifax and Pictou Co., and probably about towns throughout. This tall, much-branched plant is local but is conspicuous where it is found. The closely-related *A. ludoviciana* Nutt. should also be expected. This has the lobes of the leaves untoothed, or the leaves themselves not lobed.

Naturalized from Eu.; Nfld. to Sask. south to Ga. and Penn.; B.C.

6. **A. Absinthium** L. WORMWOOD

Rare; around old dwellings where it was formerly planted as a garden herb. Lindsay lists it from Pictou and Five Islands; collected at Sheet Harbour, Halifax Co. Most locations now found will be from recent introductions. Aug.

Introduced from Eu.; widespread across Can. and the U.S. and as far south as N.C.

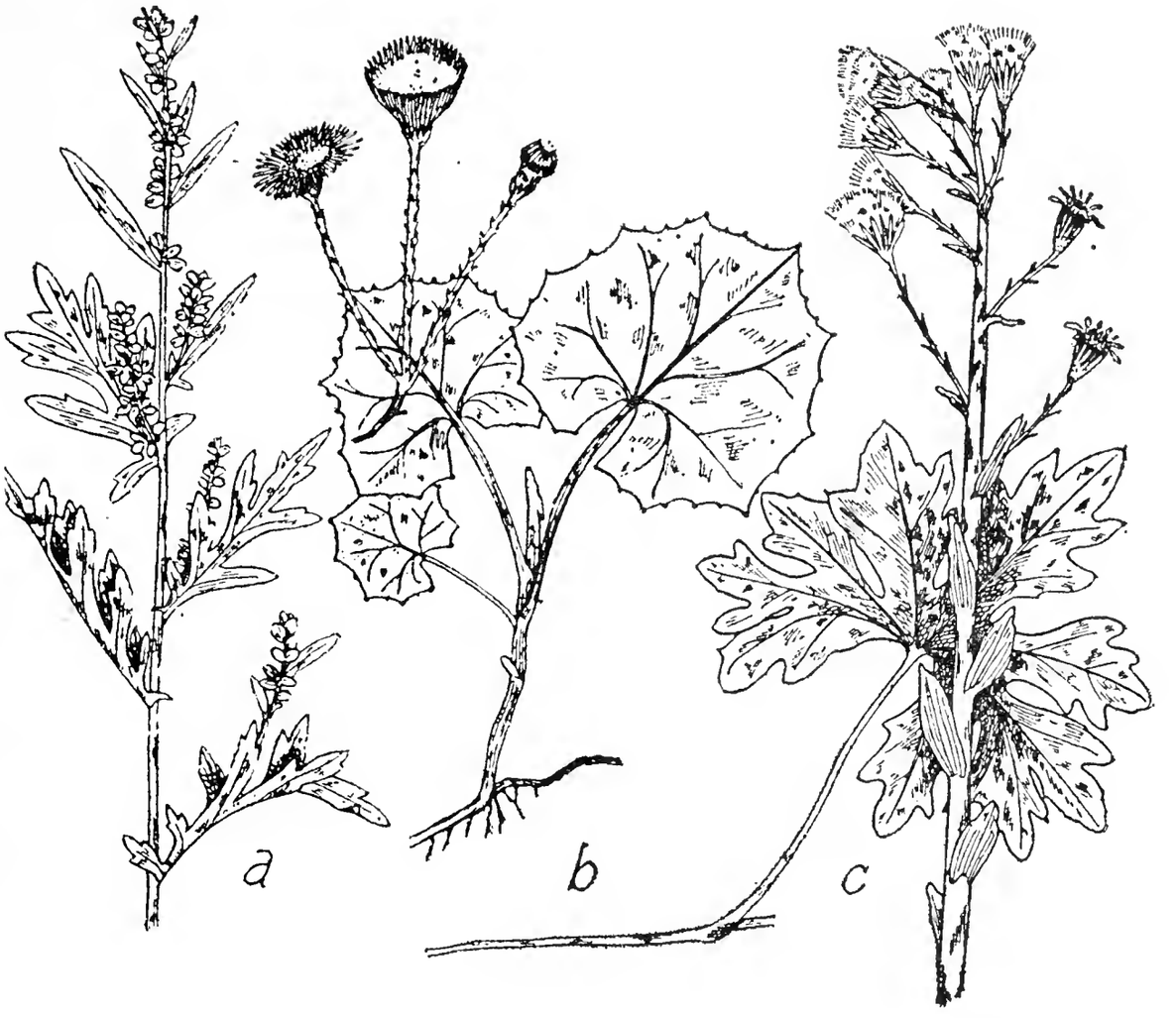


Fig. 138.—**Artemisia:** (a) *A. vulgaris* x $\frac{1}{3}$. — **Tussilago:** (b) *T. Farfara*, flowering plant x $\frac{1}{2}$, summer leaves x $\frac{1}{3}$. — **Petasites:** (c) *P. palmatus*, flowering plant x $\frac{1}{3}$, leaf x $\frac{1}{3}$.

26. **TUSSILAGO** L. COLTSFOOT

This is an unusual plant in that the flowers appear in the early spring before the leaves; heads yellow, dandelion-like, but smaller and with disk flowers and numerous yellow rays.

1. **T. Farfara** L. Fig. 138, b. Map 534. COLTSFOOT

Scattered and becoming a common weed in many parts of the Province, especially about ports. It spreads actively by running rootstocks and forms large patches on damp hillsides, river-banks, roadside cuts and in heavy soils. Patches on lighter soils and on roadside shoulders seem to lose their vigor and gradually disappear. Late April-early May.

Introduced from Eu.; Nfld. to Minn. south to N.J. and Ohio; B.C.

27. **PETASITES** Mill.

This genus is closely related to *Tussilago* and it also has the flowers appearing before the leaves; heads several to numerous and silky white.

1. **P. palmatus** (Ait.) Gray Fig. 138, c. Map 535. SWEET COLTS-FOOT

Scattered in woods, swamps, recent clearings and low thickets from Belleville, Yarmouth Co., to Cumberland and east to Antigonish Co.; rather common in the north-central part of the Province, carpeting the ground over considerable areas back of Stewiacke; rare elsewhere. The leafless flowering-stems arise in May or early June, while the green leaves appear later from the same rootstocks. Cronquist places this plant as one of 3 varieties of the circumpolar *P. frigidus* (L.) Fries.

Lab. to B.C. south to Mass., Mich. and Wisc.

28. ARNICA L.

1. **A. chionopappa** Fern.

Inverness Co.: growing on a nearly-perpendicular cliff, locally abundant though not conspicuous, south branch of the Grand Anse R. near the first waterfall (Smith and Schofield, 1952); cliff-ledges, Big Southwest Brook (Hounsell and Smith, 1966). This plant is perennial with solitary stems, opposite leaves, and 1-several yellow radiate flowers. Cronquist places this as a weak subspecies *chionopappa* (Fern.) Maguire of *A. lonchophylla* which occurs from the Rocky Mts. nearly to the Pole and east to Nfld.

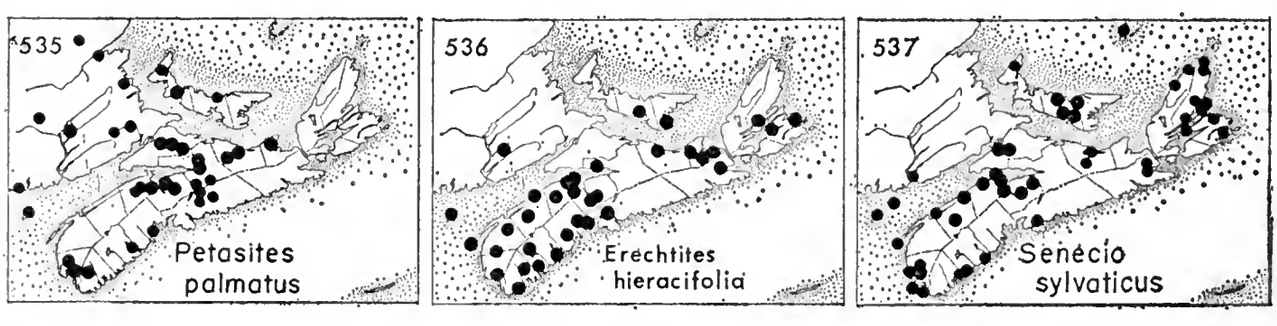
Nfld., Gaspé Pen., Anticosti I. and C.B.

29. ERECHTITES Raf.

1. **E. hieracifolia** (L.) Raf. Fig. 139, a. Map 536. FIREWEED

Common throughout, except in northern C.B.; moist woods, recently burnt areas and open thickets. Fernald has named 3 varieties upon the shape and size of the leaves. These characters appear to be variable. Var. **intermedia** Fern., according to this treatment, would be our commonest type. This has the leaves broad with somewhat clasping bases, rapidly reduced in size upwards to the inflorescence. Other collections, typical of the species, show large leaves up to the apex of the stem. July-Sept.

N.S. to Minn. south to Fla. and Tex.



30. SENECIO L.

This is a large genus with over 1000 species. The flower-heads are yellowish, either discoid or radiate, and have the involucral bracts essentially of the same length in one series, with a few tiny bracteoles at the base; pappus of numerous white capillary bristles. See Barkley (1962).

a. Plants leafy to the top, the leaves gradually becoming smaller upwards.
  b. Plants slender, 1-7 dm high, annual or occasionally biennial; leaves pinnately lobed; branches of the inflorescence and young tips without woolly hairs or only slightly flocculent; involucre 6-7 mm high, the bracts linear, only slightly exceeded by disk florets.
    c. Rays absent or very small and inconspicuous; leaves undulantly toothed with small often-blunt teeth.
      d. Rays absent; outer bracteoles around the base of the involucre numerous, small and black-tipped; involucre glabrous; achenes hairy. 1. *S. vulgaris*
      d. Rays present, inconspicuous, often rolled outwards; outer bracteoles linear, not black-tipped.
        e. Plants lightly pubescent but not glandular; bracteoles very small; involucre pubescent but not glandular; achenes hairy. 2. *S. sylvaticus*
        e. Plants, including the involucre, densely glandular-pubescent and viscid; bracteoles $\frac{1}{3}$ to $\frac{1}{2}$ the length of the involucre; achenes glabrous. 3. *S. viscosus*
    c. Rays few, conspicuous, 5 mm long or more; leaf-blades or lobes with a few sharp and prominent teeth; plant glabrous. 4. *S. squalidus*
  b. Plants stout, 3-12 dm high; biennials or perennials; leaves simple, or, if otherwise, finely twice to thrice divided; branches of the inflorescence and young tips densely flocculent-woolly; heads showy with conspicuous flat rays.
    f. Leaves finely divided, smooth; flower-heads 1-1.5 cm wide; with involucres 3-4 mm high and much exceeded by the disk florets, the bracts widely lanceolate to ovate. 5. *S. Jacobaea*
    f. Leaves widely lanceolate and obscurely toothed, succulent, whitish-woolly beneath; flower-heads 2.5-5 cm wide; the involucres 10-16 mm high. 6. *S. Pseudo-Arnica*
a. Plants usually with many larger basal leaves which are merely toothed or shallowly lobed, and few and much smaller deeply-lobed stem-leaves; rays showy.
    g. Basal and lower leaves ovate to oblong-lanceolate, squarish at the base (Fig. 139, e) or tapering.
      h. Basal leaves long-tapering at the base; stem, especially at the nodes, and leaves and branches of the inflorescence, more or less whitish woolly. 7. *S. pauperculus*
      h. Basal leaves squarish or slightly cordate at the base, the principal ones 2-3 times longer than wide; stem and branches of the inflorescence glabrous or nearly so. 8. *S. Robbinsii*
    g. Basal leaves round or slightly oval, the principal ones cordate at the base (Fig. 139, d). 9. *S. aureus*

1. **S. vulgaris** L. Fig. 139, b. COMMON GROUNDSEL

This common weed is well established in waste places, along roadsides, in towns and gardens, usually in rich soil; common in towns and gradually spreading out into the country; common around many of the

fishing villages and on the cliffs and beaches nearby . Annual and staying green and flowering until late autumn. June-Nov.

Introduced from Eu. and widespread in N. Amer.

2. **S. sylvaticus** L. Map 537.

Clearings, waste places and sea-coasts along the Bay of Fundy to Shelburne Co. and east to northern C.B., usually growing near the coast. This plant is much rarer than the preceding species and is found more in native habitats. It varies with ecological conditions from unbranched plants to much-branched ones with over 100 heads. June-Sept.

Introduced from Eu.; Nfld. and Gaspé south to Me.; locally westwards and on the Pacific coast.

3. **S. viscosus** L. CLAMMY GROUNDSEL

Common around towns and especially about railroads, weedy and very sticky or clammy so that the plants soon become covered with dirt. It is apparently rapidly spreading. July-Sept.

Introduced from Eu.; N.S. to Man. and in B.C.

4. **S. squalidus** L.

Halifax Co.; ballast heap, Steele's Pond, Point Pleasant Park, Halifax, collected by J. S. Erskine in 1949 (Smith and Erskine, 1954).

Adventive from Eu.; unknown elsewhere in N. Amer.

5. **S. Jacobaea** L. Fig. 139, f. RAGWORT, STINKING-WILLIE

Very common from Pictou east to northern C.B. in pastures, along roadsides, waste places and burnt-over ground and in clearings. It is becoming frequent in parts of Colchester and Cumberland Co.; and has been introduced into small areas in Yarmouth, Digby, Halifax and Kings Co. The weed is gradually spreading westward; common throughout P.E.I. Poisonous to livestock. Late July-Sept.

Nfld. to Gaspé south to e. Mass.; casual elsewhere; Pacific Coast.

6. **S. Pseudo-Arnica** Less. BEACH-SENECIO

Rare; St. John reports it as infrequent in gulches near the sea and on the top of the beaches on Sable Is.; Rousseau (1938-a) found it at Canso on a gravelly beach; it is abundant on the cobbly barrier beach below Yarmouth at Sand Beach; one station on the Bras d'Or L., C.B. Co. Early Aug.

Nfld. and Lab. to the lower St. Lawrence south to N.S. and sw. N.B.; Alaska and B.C.

7. **S. pauperculus** Michx., var. **neoscoticus** Fern. Fig. 139, c. Map 538.

Mainly confined to gypsum outcrops where it is sometimes an abundant and conspicuous element of the flora on the dryish cliffs and talus slopes. Scattered about Windsor and to Five-Mile R. in Hants

Co., Antigonish Harbour and Cape North; abundant on wet ledge of cliff, Lockhart Brook, Salmon R., in Victoria Co. The plants of N.S. are all placed in this variety, characterized by stout leafy plants, with the involucre about 4.5 mm high and more or less whitish woolly. Plants from Hants Co. show very dense woolly pubescence on the involucre but those from Lockhart Brook show only a trace of it and in its glabrescent character more resembles typical *S. pauperculus*. The stem-leaves however, are wide and lobed instead of being linear. The variety is reported from N.S. and the Gaspé Pen.

A variable species from Lab. to Alaska south to the uplands of Ga. and Ala. and Colo.

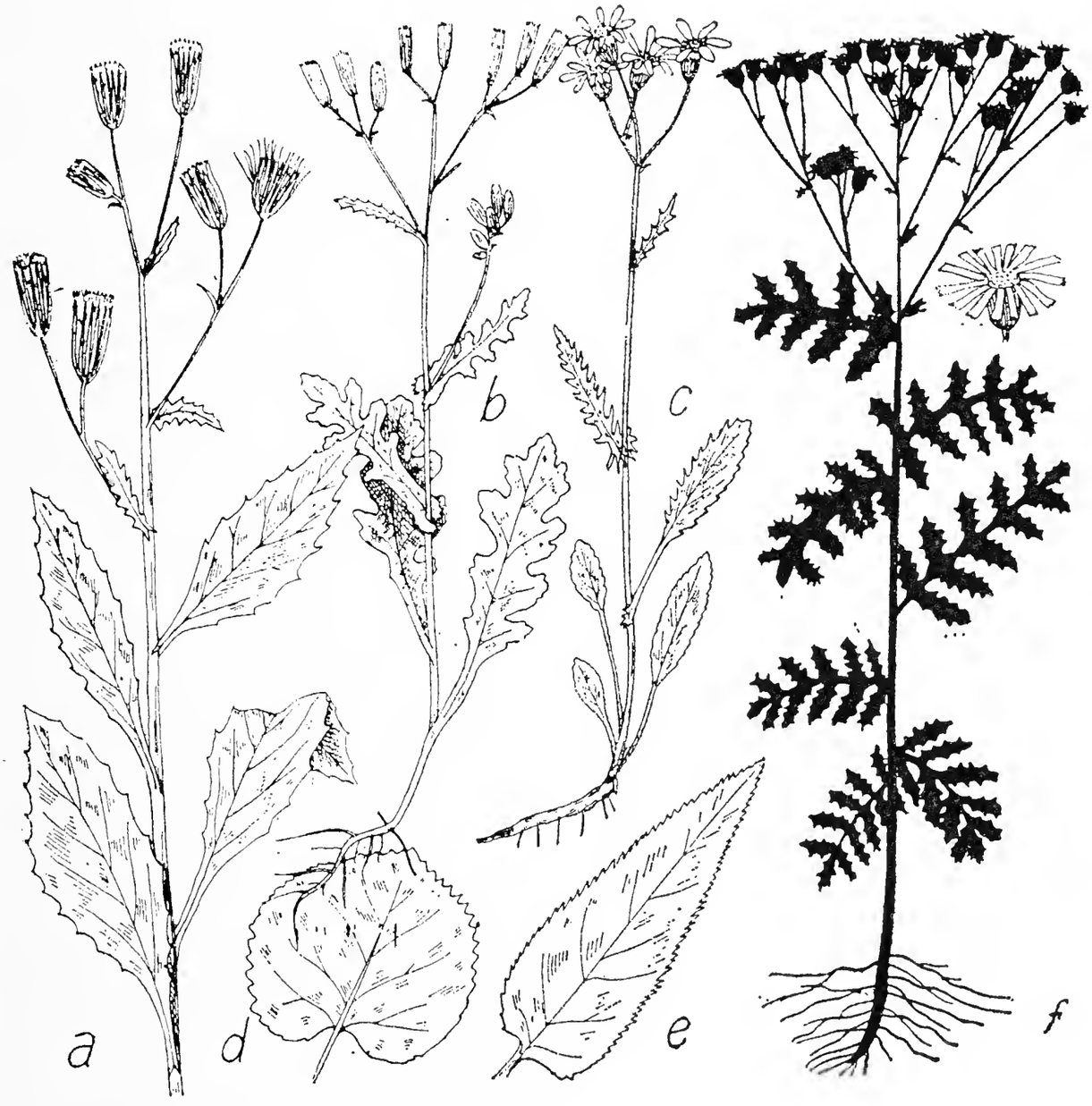


Fig. 139.—**Erectites:** (a) *E. hieracifolia* x $\frac{1}{3}$. — **Senecio:** (b) *S. vulgaris* x $\frac{1}{3}$, (c) *S. pauperculus* x $\frac{1}{3}$, (d) *S. aureus*, leaf x $\frac{1}{3}$, (e) *S. Robbinsii*, leaf x $\frac{1}{3}$, (f) *S. Jacobaea*, plant x 1/10, flower x 1.

8. **S. Robbinsii** Oakes Fig. 139, e. SWAMP-RAGWORT

Common in swamps, wet meadows, low fields and wet thickets throughout, especially abundant from Hants Co. to northern C.B. Conspicuous when in flower and low wet areas may be yellow with it. Mid-June to early July.

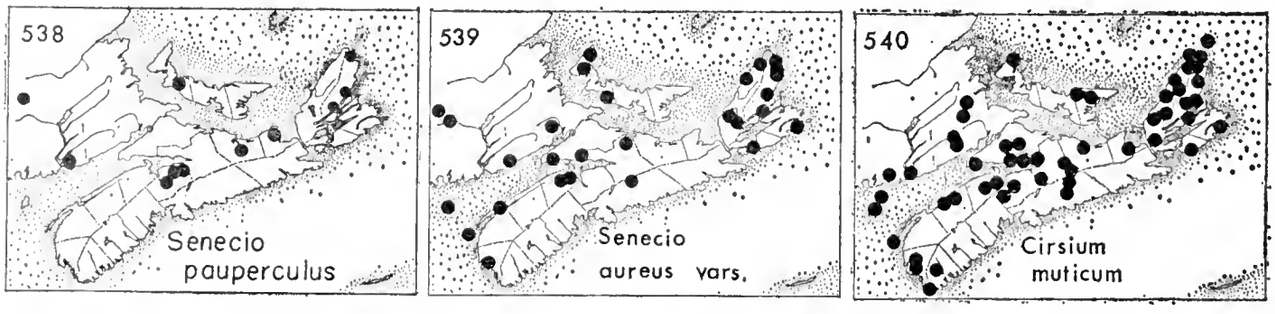
N.S. and w. Gaspé to N.H. and w. N.Y.; rare in the mts. of N.C. and Tenn.

9. **S. aureus** L. Fig. 139, d. Map 539. GOLDEN RAGWORT

Two varieties have been described by Fernald (1943-c). Var. **intercursus** Fern. has smaller leaves which are shallowly cordate and with blunt teeth; and var. *aquilonius* Fern. with large basal leaves, deeply cordate and with sharp teeth or slightly lacerate. The plants found in the open fields or bogs as occasional from Yarmouth Co. and Brier I. through Colchester and Cumberland Co. to northern C.B. seem to belong to the first variety. Occasionally a pure stand will be found, as in a wet meadow west of Parrsboro, where it covered acres of ground. Growing in abundance on the edge of a mucky thicket along the edge of the Cornwallis R., Cambridge, Kings Co. (Schofield, 1949).

Var. **aquilonius** Fern. has been collected near the headwaters of the Barrachois R. in Victoria Co., originally quoted by Fernald; and from a swamp on the C.B. plateau north of Oregon. Rather similar plants have been collected in the intervale just above and below Middle Musquodoboit, Halifax Co. These seem much like very robust plants and may contain a trace of the characteristics of the western *S. pseudaureus* Rydb. Of these collections, only part of the ones from the Barrachois R. show sharp teeth. D. S. Erskine (1960) also mentions that most of the material from P.E.I. seems to be transitional. Mid-June to July.

Nfld. to Alta. south to n. Ala. and Mo., with var. *aquilonius* the more northern.



31. ARCTIUM L. BURDOCK

About 5 closely-related species of Eu. and Asia Minor introduced into N. Amer. and common as weeds.

a. Involucre large and conspicuously woolly, 2-2.7 cm thick; inflorescence more or less a corymb with the heads mostly long-pedunculate; leaf-blades roundish-ovate and obtuse. 1. *A. tomentosum*

a. Involucre smooth or slightly cobwebby; inflorescence with the heads mostly subsessile; leaf-blades usually more acute.
b. Heads 2.5-3.5 cm thick; branches wide-spreading; heads often long-peduncled. 2. *A. nemorosum*
b. Heads 1.5-2.5 cm thick; branches more erect; heads short-peduncled or subsessile. 3. *A. minus.*

1. **A. tomentosum** Mill.

A large woolly burdock common in the vicinity of Pugwash, Cumberland Co.; not seen elsewhere.

Introduced from Eu.; N.S. to Que. south to Penn. and Mo.

2. **A. nemorosum** Lej. & Court.

Reported by Fernald from Weymouth, Digby Co.; a collection by H. Groh, from Pictou, is also placed here. Considerable variation may be noticed in the form and head size of the burdocks and it is possible that the different species may cross. The extremes are quite different but it is questionable if this species should be kept distinct from the next. (*A. minus* var. *corymbosum* Wieg.).

Introduced from Eu.; Nfld. to Ont. and Kans. south to Va.

3. **A. minus** (Hill) Bernh. COMMON BURDOCK

Common in waste places, roadsides, orchards and around buildings throughout; rarely found in native habitats. Forma **pallidum** Farw. has whitish instead of purplish florets; occasional. July-Oct. Introduced from Eu. as a common weed.

Nfld. to B.C. south to Va., Mo. and Calif.

32. CARDUUS L. PLUMELESS THISTLE

About 100 species of thistle-like plants, some occasionally introduced from Eurasia; distinguished from *Cirsium* by the unbranched pappus hairs. See Mulligan and Frankton (1954).

a. Heads nodding, large, solitary on long peduncles; involucre 3-4 cm wide; stems usually without spiny wings for some distance below the heads. 1. *C. nutans*
a. Heads clustered at the ends of winged branches; involucre 1.5-3 cm wide.
b. Leaves narrowly lanceolate, deeply incised with long spiny lobes which project backward, slightly hairy chiefly along the midvein; stems spiny-winged to the heads. 2. *C. acanthoides*
b. Leaves widely lanceolate, shallowly incised with the spiny lobes pointing forward, whitish-woolly beneath; stem spiny-winged to just below the head. 3. *C. crispus*

1. **C. nutans** L. NODDING THISTLE

Reported from N.S. but we have seen no specimens. It is sparingly introduced from Eu. about seaports and towns; and is rare to scattered in east-central N.B.

St. P. and Miq. to Sask. south to N.S., Md. and Mo.

2. **C. acanthoides** L.

Sparingly introduced in waste ground and on ballast; Yarmouth. Specimens reported from elsewhere belong to the following species (Fernald). Aug.-Sept.

Sparingly introduced from Eu.; N.S., Que., Ont. and B.C. south to Va.

3. **C. crispus** L. WELTED THISTLE

A collection from South Sydney was reported by Macoun. Other collections have been made from Pictou, Sydney, and from Pugwash in Cumberland Co. where it is very common.

Sparingly introduced from Eu.; N.S. and Ont. south to Conn. and Minn.

33. **CIRSIUM** Mill. THISTLE

About 200 species, of which one-quarter are native to N. Amer. This genus is distinguished from our other thistles by having the pappus plumose, or with fine side-branches.

a. Heads large, with the involucres 2-4 cm high; plants not spreading by underground rootstocks, usually solitary and 1-2 m high.
  b. Outer and inner involucral bracts long spine-tipped; leaves decurrent on the stem, very spiny. 1. *C. vulgare*
  b. A few of the outer bracts shortly spine-tipped, the inner soft and spineless; leaves not decurrent on the stem, less deeply cut with softer and smaller spines. 3. *C. muticum*
a. Heads small, the involucres 1-2 cm high, numerous; outer bracts of the involucre appressed and barely prickly-pointed.
  c. Lower leaves, at least, strongly decurrent as narrow very spiny bands down the stem; plants solitary, not spreading by underground rootstocks. 2. *C. palustre*
  c. None of the leaves strongly decurrent; vigorously spreading by underground rootstocks and growing in patches. 4. *C. arvense*

1. **C. vulgare** (Savi) Tenore Fig. 140, g. BULL THISTLE

Scattered throughout; open pastures, along roadsides and in waste ground, often in grazed areas but not found in cultivated ground, usually occurring as isolated or a few large plants (*C. lanceolatum* Scop.). July 15-Sept.

Introduced from Eu.; Nfld. to B.C. south.

2. **C. palustre** (L.) Scop.

This plant is rather similar in size to our Canada Thistle; scattered in the vicinity of Halifax where it was found in various localities by W. G. Dore and E. Gorham in the summer of 1944.

Nfld.; N.S. to Mich. and scattered to N.Y.; B.C.

3. **C. muticum** Michx. Map 540. SWAMP-THISTLE

Low ground, wooded swamps, meadows and moist places; probably throughout, often rather common and our only native thistle. Late July-Aug.

Nfld. to Sask. south to N.C. and La.

4. **C. arvense** (L.) Scop. CANADA THISTLE

This is our most common thistle and one of the worst weeds of the Province; found throughout, scattered along roadsides, and often common in fields, pastures and dykelands where the plant is often propagated vegetatively by the long running rootstocks. Such clones often set very few seeds; and clones may occur with only staminate flowers. Forma **albiflorum** (Rand & Redf.) R. Hoffm. has white flowers and is locally common, as about Truro. Early July-Aug.

Introduced from Eu.; widespread.

34. ONOPORDUM L.

1. **O. Acanthium** L. SCOTCH THISTLE

This is rarely introduced but occasionally it is grown because it is considered to be the true Scotch Thistle; potentially it could become a bad weed.

Naturalized from Eu.; local from N.S. to Ont. and Mo. south to Ala.

35. SILYBUM Gaertn.

1. **S. marianum** (L.) Gaertn. LADY'S or MILK-THISTLE

An occasional garden escape, or weed of ballast or waste ground; collected at Halifax by H. Groh. This is a large, very prickly plant with the outer involucral bracts leafy and tapering to a long sharp spine.

Locally introduced from the Mediterranean region.

36. CENTAUREA L. KNAPWEED

Coarse, annual to perennial plants with flower-heads discoid but sometimes with the outer florets enlarged so the flower is quite showy; the distinguishing feature is the comb-like or deeply-lobed margins to the lower involucral bracts. About 400 species, ours introduced and weedy.

a. Plants annual or occasionally biennial; leaves linear, entire; marginal flowers large and ray-like; garden escape. 1. *C. Cyanus*

a. Plants perennial; lower leaves wide, more or less toothed or lobed.

b. Heads large, 12-20 mm wide, the involucral bracts fringed to the base; leaves widely and shallowly lobed to nearly entire. 2. *C. nigra*

b. Heads smaller, 5-10 mm wide, the lower involucral bracts fringed only at the tip; lobes of the leaves long and narrow, almost filiform. 3. *C. maculosa*

1. **C. Cyanus** L. BACHELOR'S-BUTTON, CORNFLOWER

This garden flower is occasionally found in waste places, around gardens or on dumps, not persisting for any length of time. Aug.-Sept.

Introduced from Eu.; widely grown and escaping.

2. **C. nigra** L. Fig. 140, a. KNAPWEED

Common along roadsides throughout, not as abundant as formerly because of the roadside mowing and spraying; often forming a band along newly-disturbed road-shoulders. It is occasionally a weed in hayfields and in parts of N.S. it is common in both fields and pastures. Var. **radiata** DC. has the outer circle of florets with the corolla long and ray-like to make an ornamental flower-head. This has been collected several times along roadsides in the vicinity of South Maitland, Hants Co.

The color of the involucre is variable from black to yellow and the pappus hairs are likewise very variable in size and number and may even occasionally be absent. Fernald (1950-b) reports *C. nigrescens* Willd. as occasional in our area; and he describes this species as having the leaves of the flowering branches blunt and the involucral bracts as having a fringe, only about as long as the breadth of the blade. It is doubtful if this species is worth recognizing here as *C. nigra* is rather variable in a number of respects. A white-flowered form, forma **pallescens** Spenn., was collected at Scots Bay in Kings Co. by J. F. Hockey July, 1939; also found in an old field by the North Aspy R. and at Ingonish in Victoria Co. July-Aug.

Introduced from Eu.; Nfld. to Ont. south to Md. and Ohio; B.C.

3. **C. maculosa** Lam.

This slender form was collected in sandy soil and waste places, Woodside, Kings Co., by H. Groh, in 1936. It is spreading along roadsides in that area and near Canning. Chromosome number is $2n = 36$ according to Moore and Frankton (1954). July-Sept.

Introduced from Eu.; N.S. to Ont. south to Va. and Kans.; B.C.

37. CNICUS L.

1. **C. benedictus** L. BLESSED THISTLE

Rare; not collected in recent years; occasionally introduced into N. Amer. on ballast, in waste places or about towns; or grown in gardens as a curiosity.

Adventive from Eu.; N.S. to Ill. southward.

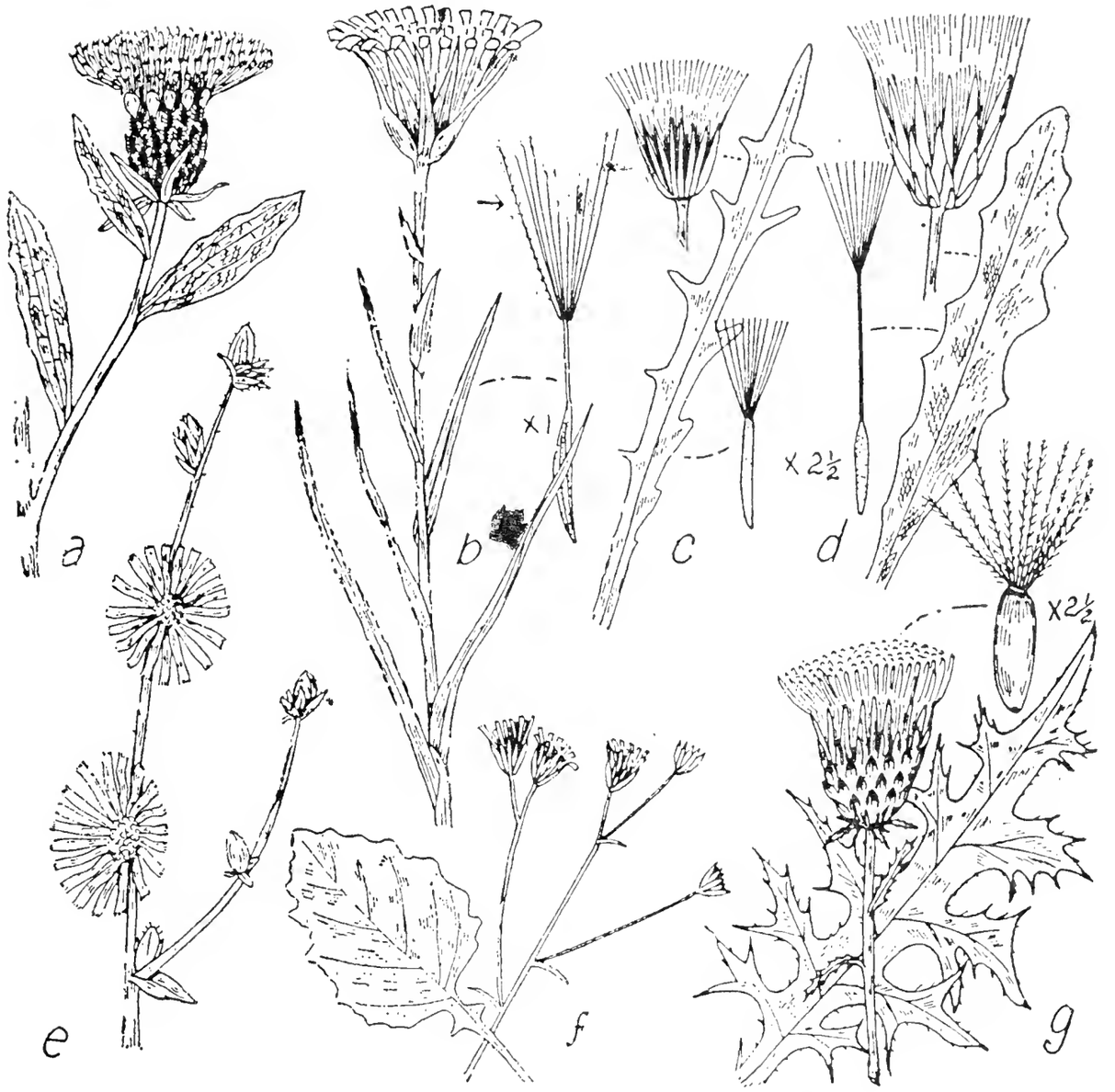


Fig. 140.—**Centaurea:** (a) *C. nigra*, flower x ½. — **Tragopogon:** (b) *T. pratense*, top of plant x ½, achene. — **Leontodon:** (c) *L. autumnalis*, leaf x ½, fruiting head x 1. — **Hypochoeris:** (d) *H. radicata*, leaf x ½, fruiting head x 1, achene. — **Cichorium:** (e) *C. Intybus*, flowers x ⅓. — **Lapsana:** (f) *L. communis* x ½. — **Cirsium:** (g) *C. vulgare*, flower and leaf x ½, achene.

38. **LAPSANA** L.

1. **L. communis** L. Fig. 140, f. NIPPLEWORT

Scattered in towns or about greenhouses; Mahone Bay to Guysborough and Pictou Co., now becoming more wide-spread; Inverness Co.: common in old orchards and gardens, Hillsborough; Victoria Co.: edge of brook beach, west of Warren L. A persistent garden weed not previously reported from C.B. (Smith and Erskine, 1954). July-Sept.

N.S. to Ont. south to Va. and Mo; introduced from Eu.

39. **ARNOSERIS** Gaertn.

1. **A. minima** (L.) Schweigger & Koerte LAMB-SUCCORY

Fernald (1922) reports this tiny annual from a gravelly railroad bed and near the station at Belleville, Yarmouth Co. It is not known from any other location in N.S. although Erskine found it at Charlottetown, P.E.I.

Sparingly introduced from Eu.; local, N.S. to Mich.

40. **CICHORIUM** L. CHICORY

1. **C. Intybus** L. Fig. 140, e. COMMON CHICORY

Becoming common locally along the roadsides of the Annapolis Valley, and especially near Windsor where the plant has often spread along the roadsides for a mile or more; occasionally seen about towns, ports, and waste places elsewhere throughout and slowly spreading and becoming more abundant. July-Sept.

Introduced from Eu.; now cosmopolitan.

41. **HYPOCHOERIS** L.

1. **H. radicata** L. Fig. 140, d. CAT'S-EAR

This plant is very similar to our Fall Dandelion but it is coarser and the receptacle is chaffy. It is now a bad weed in lawns, along roadsides and in fields about Yarmouth and at least as far as Weymouth and Pubnico. It is rapidly spreading and is undoubtedly a bad weed. Other scattered introductions may occur as it was collected at the eastern end of the Province at Aspy Bay in a meadow by Miss M. S. Brown in 1946. June-Sept.

Introduced from Eu.; Nfld. to B.C. south to N.C.

42. **LEONTODON** L.

1. **L. autumnalis** L. Fig. 140, c. FALL-DANDELION, AUGUST-FLOWER

Common throughout, especially characteristic of roadsides, fields and lawns in early autumn after the grass has been mown. Var. **pratensis** (Link) Koch is a slightly larger plant with the involucre and tips of the peduncles densely soft-pubescent with blackish hairs, while those of the species are glabrous to slightly pubescent. The variety has a more northern distribution but in N.S. it is about as abundant as the species and grades into it. Plants which have been attacked by the Aster yellows virus are yellowish with the flowers greenish and unexpanded. Late June-Oct.

Greenland to N.J., becoming rarer inland to Mich.; introduced from Eu.

43. **TRAGOPOGON** L.

About 50 species of Eu. and N. Africa. The tall, little-branched stems and narrow erect leaves enable the plants to compete in grasslands; and the large orbicular dandelion-like heads of plumed achenes are very conspicuous during July. 2n = 12.

a. Flowers purplish; peduncle thickened and hollow just below the flower-head; involucral bracts 2.5-4 cm long; achenes 25-35 mm long. 1. *T. porrifolius*
a. Flowers yellow; peduncles not enlarged in flower and scarcely so in fruit; involucral bracts 1.2-2.4 cm long; achenes 12-24 mm long. 2. *T. pratensis*

1. **T. porrifolius** L. SALSIFY

This garden plant occasionally escapes or persists; rare, collected on the ridge above Grand Pré, Kings Co. *T. dubius* Scop. is much like this species but has yellow flowers. This is also a common weed, particularly westwards, and undoubtedly is or will be introduced but has not as yet been recognized in N.S.

Introduced from Eu.; N.S. to Ont. south to Ga. and Kans.

2. **T. pratensis** L. Fig. 140, b. GOAT'S-BEARD

Reported in Macoun's Catalogue as luxuriant at Prince's Church, Pictou; Robinson (1907) says that it had not yet spread beyond the limits of the town. It is now a common and troublesome weed in grasslands and meadows along the intervales of Pictou Co. Elsewhere in the Province it is frequent along railroads, on grassy banks and occasionally in meadows from Annapolis to C.B. It is a rapidly spreading and persistent weed. Mid-June to Aug.

Introduced from Eu.; N.S. to Alta. and Kans. south; B.C.

44. **TARAXACUM** Zinn DANDELION

The Dandelions present a varied and difficult group with hybridization, reproduction by asexual means, and polyploidy common. More than 1000 species have been described, many of them from the northern regions.

a. Achenes reddish; most of the outer bracts with a callosity near the summit on the back; leaves deeply lobed nearly to the midrib with narrow lobes, usually reddish at the base. 1. *T. erythrospermum*
a. Achenes brownish-green; few or none of the outer bracts of the involucre with a callosity near the summit; leaves coarsely and usually shallowly lobed.
b. Outer bracts of the involucre elongated, conspicuously reflexed even in bud. 2. *T. officinale*
b. Outer bracts rather short, lanceolate to deltoid-ovate, ascending to spreading. *T. officinale* var. *palustre*

1. **T. erythrospermum** Andrz. Fig. 141, b. RED-SEEDED DANDELION

Scattered throughout much of the Province, and common in the Annapolis Valley. It prefers drier soils than the preceding species and is often found on dry hillsides, new clearings in woods and in old pastures. This species, being smaller and less aggressive, usually grows in thinner, more open turfed areas. (*T. laevigatum* (Willd.) DC.). Late May-June.

Introduced from Eu.; N.S. to B.C. south to Va. and N. Mex.

2. **T. officinale** Weber DANDELION

Common throughout and an aggressive weed in lawns, pastures and sometimes even in cultivated soils. May-June. Early introduced from Eu.; Nfld. to Alaska southwards.

Var. **palustre** (Sm.) Blytt is common in low pastures, on wet slopes and roadside banks, usually small and less common than the species. Care must be taken not to confuse this plant with the previous species, which it closely resembles. Much variation exists in the leaf shape and other characteristics of the dandelions in our area. Introduced from Eu.; Nfld. to Que. and southern New Eng.

T. latilobum DC. is given a range by Fernald from Nfld. to western New Eng. This differs from our common species in having the achenes tuberculate nearly or quite to the base instead of only above the middle; it is reputed to be native.

45. SONCHUS L. SOW-THISTLE

Tall erect plants with dandelion-like flowers and bright-green shiny leaves. About 70 species of Eurasia and Africa, ours all introduced and common weeds.

a. Perennial with creeping rootstocks; plant to 2 m high; flower-heads about 4 cm wide; achenes 2-3 mm long.
  b. Involucre and peduncles glandular hairy; bracts of the involucre an even color, the inner often paler. 1. *S. arvensis*
  b. Involucre and peduncles glabrous or nearly so; bracts pale, mostly with white margins. 2. *S. uliginosus*
a. Annual, with fibrous roots only; flower-heads 1.2-2.5 cm wide; achenes 1-1.5 mm long.
  c. Stem-leaves slightly or not at all spiny-toothed; often deeply lobed, the auricles at the base pointed; achenes transversely wrinkled, with more than 3 rather obscure longitudinal nerves on each side. 3. *S. oleraceus*
  c. Stem-leaves spiny-toothed, scarcely divided, the auricles at the base rounded; achenes not transversely wrinkled, with 3 prominent longitudinal nerves on each side. 4. *S. asper*

1. **S. arvensis** L. Fig. 141, a. PERENNIAL SOW-THISTLE

Scattered weed along roadsides, about towns, along dykes and around ports. In places, as in Cumberland Co., it has become a troublesome weed in cultivated fields and grain fields. Perennial sow-thistle is most common near salt water where it can usually be found back of the beaches and on bars. However, although it is probably spreading inland in cultivated areas, it has rarely turned out to be the serious weed that was feared. Chromosome number of Amherst plants and elsewhere is 2n = 54 (Mulligan, 1957). July-Sept.

Introduced from Eu.; Nfld. to Alaska south to Del., Ind. and Oreg.

2. **S. uliginosus** Bieb.

Very similar to the last species and more recently introduced and rarer. It has apparently been introduced from the Prairie region in grains and feeds and is becoming established in orchards, around farmyards and occasionally along roadsides and in towns. This plant, once established, appears to be the more aggressive of the two. (*S. arvensis* var. *glabrescens*). 2n = 36 (Mulligan, 1957).

Native of southeast Eu.; more common further west.

3. **S. oleraceous** L. ANNUAL SOW-THISTLE

Scattered to common in cultivated fields, waste places and commonly a garden weed or about towns. Both this and the following species are variable in respect to leaf shape and are best identified by the achenes. July-Oct.

Nfld. to B.C. southward; introduced from Eu.

4. **S. asper** (L.) Hill. SPINY SOW-THISTLE

Scattered in cultivated fields and gardens throughout; it is not usually an aggressive weed but, like the preceding, is found in small numbers in rich soil or about buildings and orchards. July-Oct.

Introduced from Eu.; throughout the world.

46. LACTUCA L. WILD LETTUCE

Tall coarse herbs with milky juice and small flowers. The garden lettuce is *L. sativa* L. The introduced *L. Scariola* L., with the beak of the achene much longer than the body, is also becoming established in eastern Can.; flowers yellow.

a. Achenes with a long slender beak; flowers cream-colored; pappus whitish.
  b. Involucre 10-14 mm high; achenes, including the beak, 5-6 mm long; pappus hairs 5-7 mm long.
    c. Leaves all unlobed, with a clasping base. 1. *L. canadensis*
    c. Leaves all, or at least the lower, lobed.
      d. Leaves with the lobes narrow and curved, the upper unlobed and linear, pointed or arrow-shaped at the base. *L. canadensis* var. *longifolia*

d. Leaves with the lobes much broader, often toothed, obliquely truncate at the tip; upper leaves wider, winged and clasping at the base.
L. canadensis var. *latifolia*

b. Involucre 16-22 mm high; achenes 7-10 mm long; pappus hairs 7-12 mm long.
2. *L. hirsuta*

a. Achenes beakless or short and thick; flowers bluish; pappus hairs light brown.
3. *L. biennis*

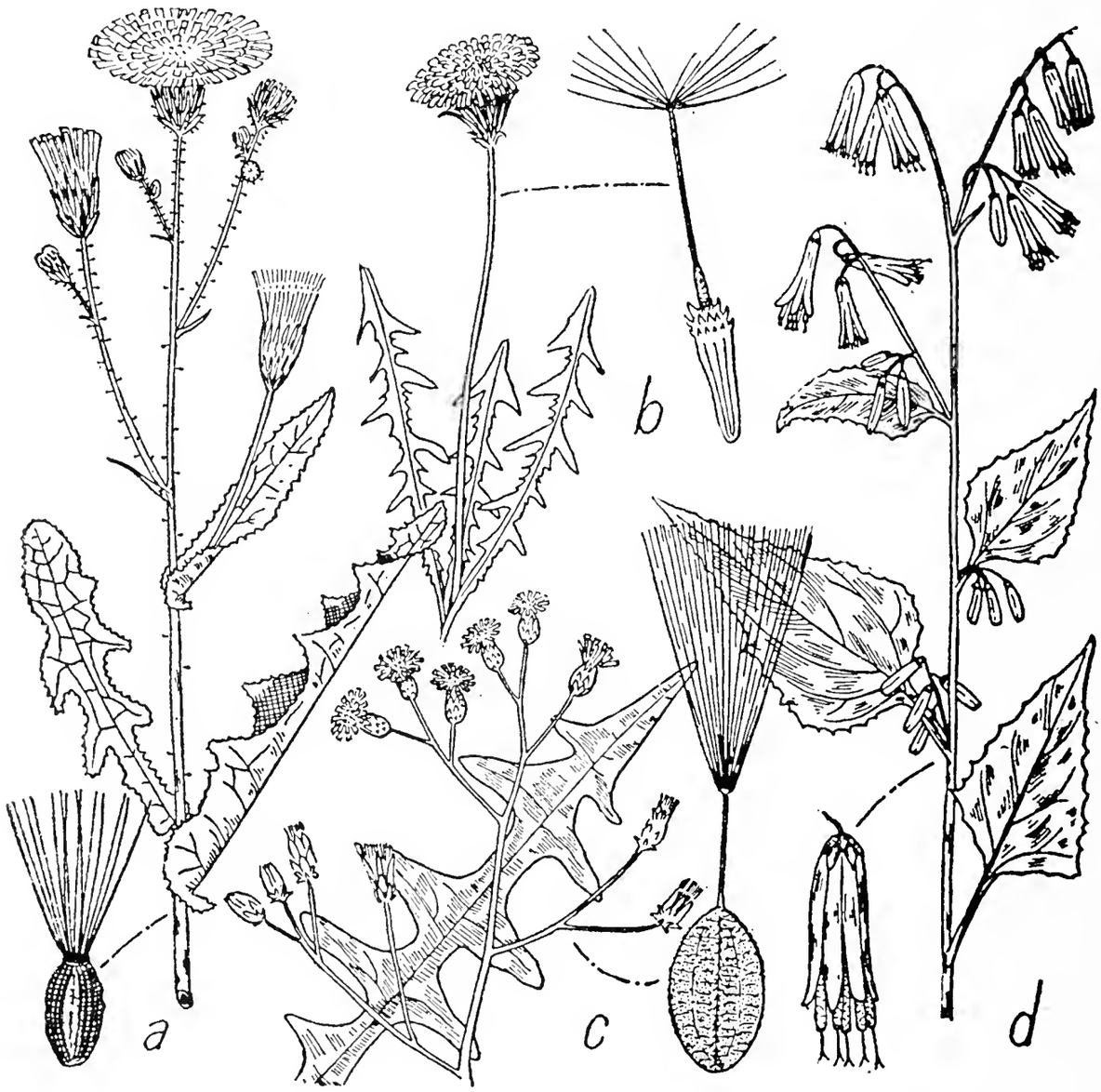


Fig. 141.—**Sonchus:** (a) *S. arvensis* x $\frac{1}{4}$. — **Taraxacum:** (b) *T. laevigatum*, plant x $\frac{1}{3}$, achene x 5. — **Lactuca:** (c) *L. canadensis*, leaf and flowers x $\frac{1}{3}$, achene x 5. — **Prenanthes:** (d) *P. altissima* x $\frac{1}{3}$.

1. **L. canadensis** L. Fig. 141, c. WILD LETTUCE

Scattered throughout; a weed of waste places, edges of thickets and open woodlands and cut-over areas (*L. integrifolia* Bigel.). July-Aug.

N.S. to Minn. south to Ga. and Okla., B.C.

Var. **longifolia** (Michx.) Farw. is a common weed; waste places, roadsides, burnt-over land and clearings. N.S. to Sask. south to N.C.; B.C. to Calif.

Var. **latifolia** Ktze. is rare; found occasionally in open woods and cleared areas, like the last occurring much throughout the range of the species and intergrading with the other varieties.

2. **L. hirsuta** Muhl., var. **sanguinea** (Bigel.) Fern. Map 541.

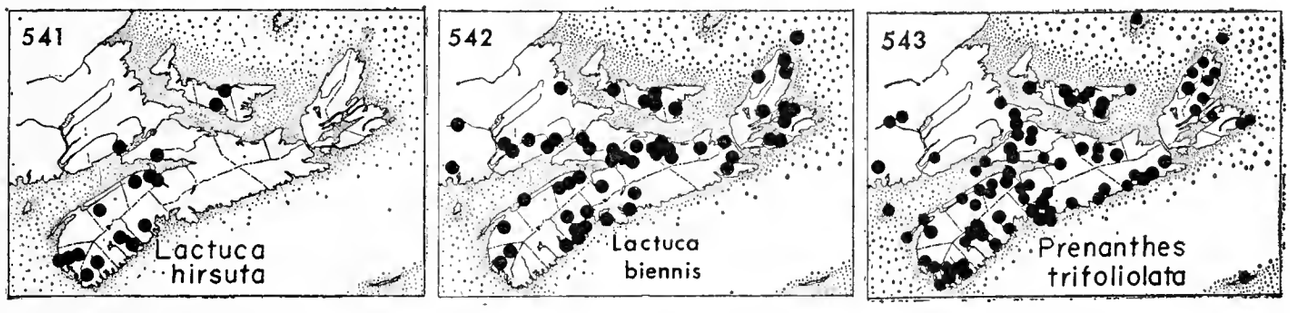
Scattered in Yarmouth, Shelburne and Queens Co.; east to Kings Co. and northward; P.E.I. where it is rare. Aug. The variety is the more northern form.

N.S. to Ont. south to Va. and Tex.

3. **L. biennis** (Moench) Fern. Map 542. BLUE WILD LETTUCE

Scattered throughout and common from Annapolis Co. to northern C.B.; along roadsides, in clearings, waste places and in rough pastures. It is very conspicuous along roadsides and near the edge of the cleared areas in the northern part of the Province in late summer. (*L. spicata* (Lam.) Hitchc.). July-Sept.

Nfld. to B.C. south to N.C. and Tenn.



47. **CREPIS** L.

Small annual or biennial plants like small Fall Dandelions but with the pappus bristles simple instead of plumose.

1. **C. capillaris** (L.) Wallr. HAWK'S-BEARD

Well established in a pasture half a mile northeast of the Villagedale dunes in Shelburne Co. (Erskine, J.S., 1953); a large patch in an old field on the road from Arcadia to Wedgeport, Yarmouth Co. These plants are conspicuous when in flower and, as they were not earlier noticed, probably have been introduced rather recently in clover or grass seed. The very similar *C. tectorum* L. is reported for Abrams R., P.E.I. (Erskine, D.S., 1960). This has the inner involucral bracts pubescent within, instead of glabrous; and the achenes dark purplish brown, instead of pale brown. August.

Introduced from Eu.; widely scattered to the Pacific.

48. **PRENANTHES** L.

Coarse woodland plants. our common species with the flowers bell-like and nodding; achenes cylindrical and not long-beaked.

a. Heads slender, nearly erect, mostly 12-16-flowered, pink to purplish; involucre pubescent with coarse hairs; upper leaves sessile. 1. *P. racemosa*
a. Heads stouter, commonly penduous, 5-12-flowered (Fig. 141,d); involucre glabrous; leaves mostly petioled.
b. Heads 8-12-flowered; principal involucral bracts 8.
c. Plant 1.5-15 dm high; inflorescence paniculate; outer involucral bracts lance-deltoid, the longest 1.5-2.5 mm long. 2. *P. trifoliolata*
c. Plant 0.5-7.5 dm high; stem unbranched and the inflorescence a panicle, rarely more branched; outer involucral bracts ovate to ovate-lanceolate, very unequal, the longest 3-6 mm long, blackish. *P. trifoliolata* var. *nana*
b. Heads 5-6-flowered; principal involucral bracts 5. 3. *P. altissima*

1. **P. racemosa** Michx. RATTLESNAKE-ROOT

Rare; reported in Macoun's Catalog as common at Sydney Mines; Digby Co.: cliff-edge, Sandy Cove, 1948 (Erskine, D.S., 1951). Known also from St. John, N.B. A return visit to Sandy Cove yielded only one plant of this species and one plant which appears to be a hybrid between this and *P. trifoliolata*, x *P. mainensis* Gray (Smith and Erskine, 1954).

N.S. to Alta., south to northern N.J., N.Y. and Mo.

2. **P. trifoliolata** (Cass.) Fern. Map 543. LION'S-PAW

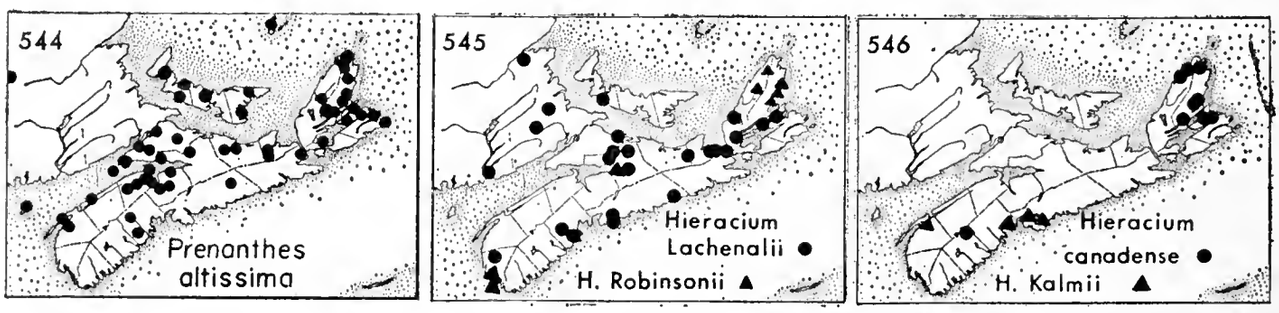
Found in rich woods, or also in light open woods in gravelly, sandy or more acid soils, along the edge of thickets and on wooded roadsides; common throughout. Nfld. to Ohio south N.C. and Tenn.

Var. **nana** (Bigel.) Fern. is found on mossy places, barrens, turfy crests, and around the cooler coasts of the Province; scattered around the coast of C.B., rare elsewhere. Nfld. and Lab. to the coast of N.S. and the higher mountains of New Eng. and northern N.Y.

3. **P. altissima** L. Fig. 141, d. Map 544.

Rich woods from Digby Neck to northern C.B.; rare or absent in the southwestern counties. July-Aug. Forma **hispidula** Fern. has the stem hairy and the leaves pubescent on the veins on the underside. Rich woods; Sandy Cove, Digby Co. (Fernald, 1921).

N.S. to Ont. south to Ga. and Tenn.



49. HIERACIUM L. HAWKWEEDS

Nearly 10,000 species have been described, mostly in Europe; our introduced species are rather few and in general they are well defined

although some do show considerable variation. The florets are all ligulate; achenes smooth and not flattened, truncate at the top, with capillary white or often sordid hairs (Fig. 142).

a. Leaves all basal, or nearly so, not toothed nor lobed; stolons present or absent; aggressive and often very common weeds.
  b. Flowers solitary, or in some smaller forms as many as 4 on some plants.
    c. Flowers small with involucres 6-8 mm high, in 2's-4's; leaves green on both sides, 0.5-1.5 cm wide; whole plant small and slender. 1. *H. Auricula*
    c. Flowers large, 2.5-3 cm wide, with involucres over 8 mm high, usually solitary or occasionally in pairs on the peduncle; leaves wider and the plant stouter.
      d. Leaves spreading, whitish beneath and strongly tomentose with stellate hairs; plants with strong spreading stolons; heads solitary. 2. *H. Pilosella*
      d. Leaves larger, tending to be more erect, green beneath and in general less hairy; stolons short, sometimes upturned; heads 2-4. 3. *H. flagellare*
  b. Flowers numerous in a crowded corymb-like inflorescence, 2 cm or less in width.
    e. Leaves setose to hirsute on both surfaces; plants not glaucous; leaves rather dull.
      f. Flowers orange-red; leaves long-hirsute; plants rather stoloniferous. 4. *H. aurantiacum*
      f. Flowers yellow; leaves setose only; plants not stoloniferous or but weakly so. 5. *H. caespitosum*
    e. Leaves glabrous to slightly hairy but not densely setose, more or less glaucous, the surface smooth and shiny green.
      g. Footstock slender and elongated; stolons numerous. 6. *H. floribundum*
      g. Rootstocks short, stout and abruptly terminated; stolons absent or very weak. 7. *H. piloselloides*
a. Leaves numerous and scattered along the stem or, if basal, 2-5 cm wide and more or less toothed or even lobed; stolons absent; heads various, to 4.5 cm wide.
    h. Leaves mainly basal, with one to several smaller ones along the stem, elliptical to ovate, toothed, the lower long-petioled; flower-heads 2-4.5 cm wide;involucral bracts dark, long and attenuate at the end.
      i. Stem naked or with one or two leaves borne near the base; lower leaves with rounded or cordate bases, sometimes lobes; peduncles glandular. 8. *H. murorum*
      i. Stem with several leaves which are rapidly reduced in size upwards; lowest leaves attenuate to the petioles, often with purple markings or blotches.
        j. Involucre and pedicels stipitate-glandular, with no or but few glandless hairs overtopping the glands; basal leaves 2-5 cm wide; plant 1.5-10 dm 9. *H. Lachenalii*
        j. Involucre and pedicels glandless or only very minutely glandular, copiously long-pilose or villous; basal leaves less than 2 cm wide; plants 1-4 dm high. 10. *H. Robinsonii*
    h. Leaves numerous, scattered along the stem, the lower not conspicuously larger than the stem-leaves, often absent at flowering time.
      k. Leaves bright green, smooth and nearly glabrous with a few scattered hairs to slightly scabrous, not rough and setose; axis and branches of the inflorescence without glands or occasionally with scattered ones; leaves with conspicuous dentate teeth.
        l. Flower-heads 25-45 mm wide on stiff, erect, pubescent peduncles; heads 40-100-flowered, with involucres 8-13 mm high.

m. Leaves more or less scabrous, at least on the margin; middle involucral bracts 1.5-2.5 mm wide, without glandular hairs. 11. *H. scabriusculum*

m. Leaves not scabrous; middle involucral bracts 1-1.5 mm wide.

n. Styles yellow; upper leaves triangular, cordate or truncate at the base; bracts of the involucre glandular, the median oblong-lanceolate.

o. Hairs of the stem, leaves and pedicels about 1 mm long. 12. *H. canadense*

o. Hairs of the stem, leaves and pedicels 1.5-3 mm long, mixed with shorter ones. *H. canadense* var. *hirtirameum*

n. Styles brown; upper leaves not triangular, rounded to cuneate at the base; bracts of the involucre glandular to glabrous, the median ones attenuate.

p. Plant slender on the average, the leaves entire, denticulate or uniformly toothed; involucral bracts often tinted with purple, generally less than 10 mm long. 13. *H. Kalmii*

p. Plant robust; leaves numerous with irregular teeth; inflorescence often very branched. *H. Kalmii* var. *fasciculatum*

l. Flower-heads 10-22 mm wide, on widely spreading, slender flexuous branches; heads 10-30-flowered. 14. *H. paniculatum*

k. Leaves dark green, rough and with stiff hairs; teeth of the leaves very small or absent; peduncles densely and conspicuously glandular-hairy. 15. *H. scabrum*

1. **H. Auricula** Lam.

This small species is local, but often covers considerable areas; leached pastures and bare slopes on the south side of the Annapolis Valley south of Kentville, at Waterville, and in a few other scattered locations.

Introduced from Eu.; N.S. and N.Y.

2. **H. Pilosella** L. Fig. 142. MOUSE-EAR HAWKWEED

Abundant and one of the worst pasture weeds. It was introduced near Pictou some 60 years ago and has by now spread throughout the Province. It is especially common in eastern N.S. and the abundance of the plant is correlated with open soils, bare slopes and over-grazed pastures; often found on very light soils in the Annapolis Valley. Mid-June to early Aug., conspicuous in early summer.

Introduced from Eu.; Nfld. to Ont. south to N.C.

3. X **H. flagellare** Willd.

This plant is a hybrid between *H. Pilosella* and *H. caespitosum* and can be expected to occur wherever the two parents are growing together. It is a larger and greener plant than *H. Pilosella* and more or less intermediate between the two parents or closer to *H. Pilosella.* The styles of the florets may be brown instead of yellow; and the outer ligules have only a short band or terminal blotches of red at the tip instead of having a long band with yellow margins. Collections are mostly from western N.S. from Digby and Shelburne Co. to Cumberland Co. and Halifax; Ciboux I., Victoria Co.

N.S. to Mich. south to Va.

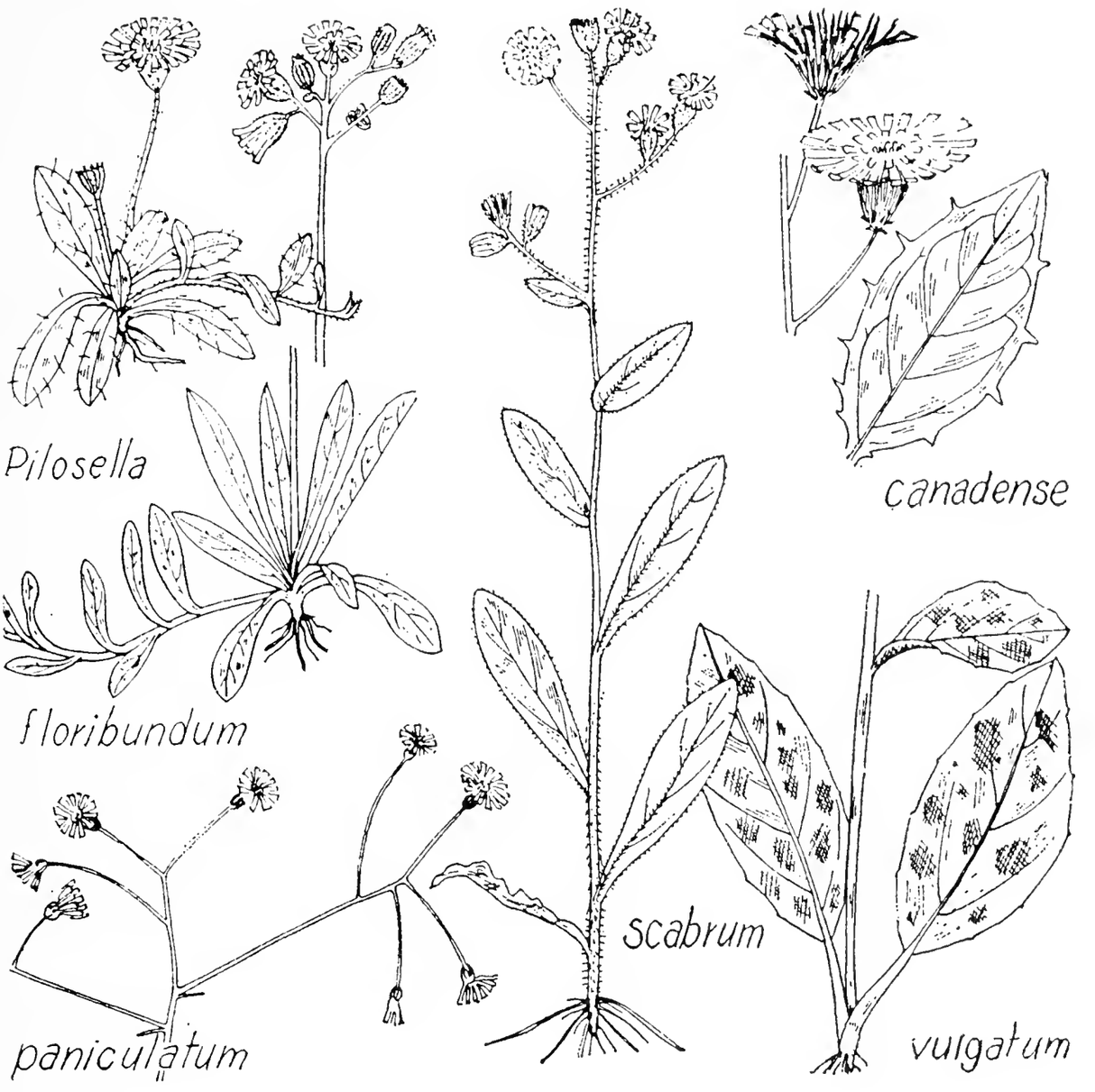


Fig. 142.—Hieracium spp.

4. **H. aurantiacum** L. Map 549. ORANGE HAWKWEED, DEVIL'S PAINT-BRUSH

Local but becoming more common. This species has become established in a number of areas on leached, well-drained soils of old pastures and fields. Very common at Advocate, Cumberland Co., now known in many local areas in the Annapolis Valley and to Antigonish Co.; scattered elsewhere. Once established it is very persistent. Our plants are said not to belong to *H. aurantiacum* but to a closely related European species. June 20-July.

Introduced from Eu.; Nfld. to B.C. south to Va. and Iowa.

5. **H. caespitosum** Dumort. HAWKWEED

Scattered or local from Digby Co. to northern C.B. Along the Cobequids and in other hilly areas with leached and well-drained soils it is often abundant and becomes the dominant species along roadsides, in fields and pastures; rarely found in cultivated soils. Late June-July. This name antedates *H. pratense* Tausch.

N.S. to Ont. south to N.C.; B.C.

6. **H. floribundum** Wimm. & Grab. Fig. 142. KING-DEVIL

This aggressive weed is common in most parts of the Province and roadsides and fields may often be yellow when it is in flower. It produces abundant stolons and spreads rapidly. Mid June-July.

Widespread; Nfld. to B.C., introduced from Eu.

7. **H. piloselloides** Vill.

The common low forms without spreading stolons are grouped under this name. Various forms are present and sometimes taller strains are conspicuous along roadsides. This species seems more variable than our other species and various races may be present. (*H. florentinum* All. and *H. praealtum* Gochnat). Mid June-July.

Nfld. to Ont. southwards; introduced from Eu.

8. **H. murorum** L. GOLDEN LUNGWORT

Sparingly introduced, as at Sydney, Bridgewater and Tusket. These collections show the leaves partly cordate at the base and very coarsely dentate on the lower half: Oregon in Victoria Co. and wooded slopes at Karsdale in Annapolis Co. Collections from near Folleigh L., Cumberland Co., show the leaves more tapering at the base and barely denticulate, somewhat towards *H. Lachenalii*, into which this species apparently grades.

Introduced from Eu.; Nfld. to Mich. south to N.J. and Penn.

9. **H. Lachenalii** C.C. Gmel. Fig. 142. Map 545.

Local in Cumberland and Colchester Co.; often common along roadsides in the mountains and scattered southward along the railroad to Halifax and to C.B.; rare elsewhere. The leaves of this plant are usually lightly blotched with purple. *H. vulgatum* Fries of American authors. See Lepage (1958). July.

Introduced from Eu.; Nfld. to Mich. south to Penn.

10. **H. Robinsonii** (Zahn) Fern. Map 545.

This plant sometimes somewhat resembles *H. Lachenalii* but is smaller and presumed to be a native plant. The first N.S. record is one mentioned by Fernald (1943-a): gravel in river bottoms, Big Intervale, C.B., collected by Macoun. It is now found scattered in rock crevices and cliffs along streams in northern Victoria and Inverness Co.: on cobble river beach at Forest Glen. Plants from Victoria Park at Truro resemble it; and collections made by J. S. Erskine on the Tusket I. in Yarmouth Co. are even more like this species.

Nfld. to N.S., Me., N.H. and Que.

11. **H. scabriusculum** Schwein.

Our interpretation of this and the following two species follows the treatment of Lepage (1960). This plant does not seem to be common

but collections are noted from near Tidnish in Cumberland Co. and Brooklyn in Kings Co.; weed near poultry plant, Truro.

James Bay to Alaska south to Mo. and Ill.; isolated stations in Que., N.B., N.S. and P.E.I.

12. **H. canadense** Michx. Fig. 142. Map 546. CANADA HAWKWEED

This plant has been found most often in northern C.B.; Victoria and Inverness Co.; George R. and North Sydney; Baddeck Bay, Indian Brook and the Oregon Trail; Red R. and Cap Rouge. Lab. and Nfld. to Mich. and Me.

Var. **hirtirameum** Fern. is local and not well known. Collections from Guysborough Co. and from C.B. resemble it. Our more hairy plants probably belong to forma **pilosius** Lepage (1961), which differs only by the presence of longer hairs, to 1.5 mm long, on the leaves, stems and branches. Holotype: on cliff near Eskasoni Brook, Aug. 21, 1951, collected by Smith *et al.*

The variety has much the range of the species; to Minn. and Mich.

13. **H. Kalmii** L. Map 546.

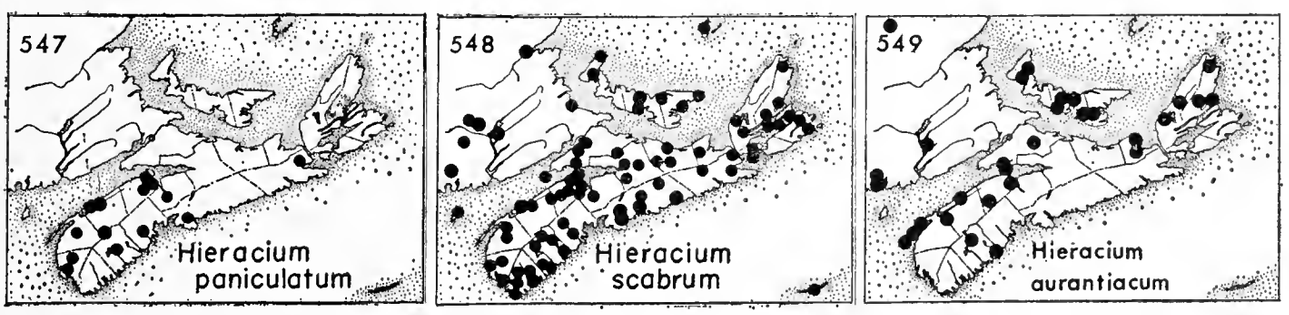
Scattered along roadsides and in open soils: Mistake L., Digby Co.; Chester Basin; Hammonds Plains and Halifax; and north of Earltown in Colchester Co. The leaves are rather narrowly lanceolate. N.S. to Minn. south to Ohio and N.Y.

Var. **fasciculatum** (Pursh) Lepage is a larger, more branched plant; found near Halifax and east of Dartmouth. Its general range is much the same as the species.

14. **H. paniculatum** L. Fig. 142. Map 547.

Mixed or dry deciduous woods; occasional from Yarmouth east to Kings and Lunenburg Co., rather common in oak and mixed woods near Kentville; found at Boylston, Guysborough Co. The Kentville collections have the peduncles lightly stipitate-glandular and belong to forma **glandulosum** R. Hoffm. Aug.-Sept.

N.S. to southern Ont. and Mich. south to Ga. and Ala.



15. **H. scabrum** Michx. Fig. 142. Map 548. ROUGH HAWKWEED

Common throughout; old fields, pastures, rough land and sandy soils. July-Aug. Fernald (1922) reports "a large colony exactly combining the characters of *H. paniculatum* and *H. scabrum* and more abundant than either of them, in dry pine and oak woods on steep slopes along the LaHave R., Bridgewater".

Var. **leucocaule** Fern. & St. John is a Sable I. variety, scattered over the barrens. It differs in having the lower internodes of the stem whitish-woolly mixed with dark glands; both leaf-surfaces are minutely pubescent with gland-tipped hairs.

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

GLOSSARY

A

Achene. Dry one-seeded one-celled fruit.
Acicular. Slenderly needle-shaped.
Acuminate. Gradually tapering to an end or point.
Acute. Evenly tapering to a sharp point or definite angle.
Aggregated. Crowded into a dense cluster.
Anther. Pollen-bearing part of the stamen.
Anthesis. The time during which the flower is fully expanded.
Apetalous. Without petals.
Apiculate. With a minute sharp-pointed tip.
Appressed. Lying close or flat against.
Approximate. Closely situated without running together.
Arcuate. Curved or arching.
Areolate. Reticulated, marked out into small areas.
Apomixis. Production of identical new plants from seed without fertilization.
Aristate. Tipped by a bristle or bristle-like projection.
Armature. Prickles, spines, thorns and bristles for protection.
Articulate. Jointed.
Ascending. Rising obliquely and curving upward.
Attenuate. Slenderly tapering.
Auricle. An ear-shaped lobe, usually at or near the base.
Awn. A bristle-shaped appendage.
Axil. Angle formed by the leaf or branch with the stem.
Axillary. Situated in an axil, usually of a leaf.

B

Barbellate. With very tiny barbs along the side or edge.
Biennial. Lasting two years; a plant which remains vegetative the first season and flowers and fruits the second year.
Bisexual. With both stamens and pistils.
Blade. Expanded portion of a leaf.
Bract. Modified or scale-like leaf associated with the flower or inflorescence.
Bracteate. Having bracts.
Bracteole. Small bract.

C

Calyx. The outer whorl of flower parts; (plural) calyces.
Campanulate. Bell-shaped.
Canaliculate. Longitudinally channeled.

Canescent. Grayish with pubescence or fine hairs.
Capillary. Hair-like.
Capsule. Dry fruit of more than one carpel, opening when ripe.
Carpel. A single pistil, or the equivalent of one in a compound pistil.
Caruncle. Growth or appendage near the hilum of the seed.
Castaneous. Dark brown, or a chestnut color.
Catkin. A dry scaly spike, erect or drooping, usually unisexual, as in the willows, birches and related plants.
Cespitose. Growing in tufts or forming mats.
Chaff. Thin scales or bracts, particularly on the receptacle of the *Compositae*.
Chartaceous. Pale or white with the texture of writing paper.
Ciliate. Fringed with hairs.
Ciliolate. Minutely ciliate.
Cinereous. Ash-colored.
Circumscissile. Opening by a transverse circular line.
Clasping. Of the base of a leaf, partly surrounding the stem.
Clavate. Club-shaped.
Cleistogamous. Flowers small and fertilized without opening.
Clone. Group of plants derived vegetatively from a single individual.
Conduplicate. Folded together lengthwise, as leaves in the bud.
Convolute. Rolled up longitudinally.
Cordate. Heart-shaped with the point at the apex.
Corm. Enlarged thickened base of the stem, for food storage.
Coriaceous. Leathery.
Corolla. Inner part of the perianth of the flower, composed of petals, sometimes absent.
Corymb. Flat-topped or convex flower-cluster with the outer flowers opening first.
Costate. With one or more longitudinal ribs or nerves.
Cotyledon. The one, two, or more primary leaves of the embryo in the seed, often the first to appear above ground.
Crenate. Toothed with rounded, shallow teeth.
Crenulate. Finely crenate.
Culm. Stem of grasses and sedges.
Cuneate. Wedge-shaped or narrowly triangular with the point downwards.
Cuspidate. Sharp-pointed with a rigid or firm point.
Cyme, cymose. Flat-topped flower-cluster with the central flowers opening earliest.

D

Deciduous. Quickly falling; not persistent.
Decompound. More than once divided, or the larger divisions again divided.

Decumbent. Reclining with the ends ascending.
Decurrent. Extending downward from the point of insertion, usually referring to the leaf running down along the stem.
Dehiscent. Opening or splitting.
Deltoid. Triangular.
Dentate. Toothed with outwardly directed teeth.
Denticle, denticulate. A minute tooth, minutely toothed.
Depressed. Flattened from above.
Dichotomous. Forking.
Diffuse. Loosely or widely spreading.
Dioecious. Staminate and pistillate flowers on different plants.
Discoid. In the *Compositae*, with the florets all disk florets without rays.
Distichous. In two vertical ranks.
Divaricate. Widely spreading or diverging.
Dorsal. Relating to the back or outer surface of an organ.
Drupe. A fleshy fruit with a stone, as in cherries and plums.
Drupelet. A small drupe, as in the raspberries and blackberries.

E

Ellipsoid. Solid with an elliptical outline, as with a football.
Entire. Without teeth or divisions.
Epiphytic. Growing on other plants.
Excurrent. With a projecting tip, usually referring to a nerve or vein.
Exocarp. Outer layer of the fruit-coat.
Exserted. Prolonged beyond the surrounding parts.

F

Fasicle. A bundle or cluster.
Fastigiate. With the stems or branches erect and near each other.
Fertile. Capable of bearing fruit, or pollen in connection with the anther.
Fibrillose. With or broken up into fine fibers.
Filament. Stalk of the stamen.
Filiform. Thread-like.
Fimbriate. Fringed.
Flexuous. Curved alternately in opposite directions.
Flocculent. With small tufts or patches of soft hair or wool.
Floret. Small flower, usually one of a dense cluster.
Foliaceous. Leaf-like.
Foliolate. Having leaflets.
Follicle. Dry fruit of one carpel, splitting along one side or suture.
Frond. Leaf of a fern.
Fulvous. Brownish-yellow, tawny.
Fuscous. Grayish-brown.

G

Geniculate. Bent abruptly, as at a knee.
Gibbous. Swollen on one side.
Glabrate. Nearly glabrous or becoming so with age.
Glabrous. Without hairs or pubescence.
Glaucous. Covered with a bluish-white or grayish bloom.
Globose. Almost spherical or round.
Glomerule. A small compact cluster.
Glume. One of two bracts at the base of the spikelet of grasses.
Glutinous. Covered with a sticky substance.
Grain. The one-seeded fruit of grasses.

H

Halophyte. Plant adapted to brackish or salty locations.
Hastate or **halberd-shaped.** Like an arrow-head, with the basal lobes pointing outward nearly at right-angles.
Head. A dense cluster of sessile or very short-stalked flowers or fruit on a short axis or receptacle.
Herbaceous. Not woody; leaf-like in color and texture.
Hilum. Scar or point of attachment of the seed to the fruit.
Hirsute. With coarse or stiff hairs.
Hirtellous. Minutely hirsute.
Hispid. With rigid or bristly hairs.
Hispidulous. Minutely hispid.
Hyaline. Transparent or translucent.

I

Imbricate. Overlapping.
Incised. Cut sharply and irregularly.
Included. Not protruding beyond the surrounding parts.
Indefinite. Very many, or inconstant in number.
Indehiscent. Not opening or splitting.
Indigenous. Native and original to the area.
Indurated. Hardened.
Indusium. Covering of the fruiting dot or sorus in the ferns.
Inferior ovary. One surrounded by and fused to the receptacle or **calyx** so the calyx-lobes appear above it.
Inflorescence. Flowering part of the plant.
Involucel. Small or secondary whorl of bracts.
Involucre. A circle or collection of bracts about a flower-cluster, **head**
Involute. Rolled inward.
Irregular. Having the nembers of a whorl of flower-parts **unequal** in shape, size or union.

K, L

Keel. A sharp longitudinal ridge, as with the keel of a boat.
Lacerate. Irregularly cleft.
Laciniate. Cut into narrow pointed lobes.
Lanceolate. Several times longer than wide, widest below the middle and tapering to the apex.
Leaflet. A single division of a compound leaf.
Legume. The fruit of the legume family, commonly called a pod.
Lemma. The lower of the two bracts enclosing the floret of a grass spikelet.
Lenticular. Lens-shaped.
Ligulate. Provided with a ligule, a strap-shaped appendage; applying to the ray-flowers of the *Compositae*.
Linear. Long and narrow with parallel sides.

M, N

Megaspore. The larger size of spore in *Selaginella* or *Isoëtes*.
Membranous. Thin, and often somewhat translucent and pliable.
Mericarp. Portion of a fruit which splits away as a separate part.
Moniliform. Like a string of beads.
Monoecious. With stamens and pistils on separate flowers on the same plant.
Mucronate. With a short, small, abrupt point.
Nerve. Unbranched vein or simple slender rib.

O

Obcordate. Inverted heart-shaped; with the point downwards.
Oblanceolate. Lanceolate but with the widest part above the middle.
Oblong. Several times longer than broad with nearly parallel sides.
Obovate. Inverted ovate, the broadest part above the middle.
Obovoid. Egg-shaped, the widest part uppermost.
Obsolescent. Becoming rudimentary or obsolete.
Obtuse. Blunt or rounded at the end.
Ocrea. A tubular stipule surrounding the stem at the base of the leaf; smaller ones being ocreolae.
Olivaceous. Olive-green.
Orbicular. Circular.
Ovary. Enlarged base of the pistil, containing the ovules.
Ovate. With an outline like that of an egg, the broader end downward.
Ovoid. Solid with an oval outline.
Ovule. The part of the ovary which after fertilization becomes the seed.

P

Palate. Rounded projection on the lower lip of a flower, closing the throat.

Palea. The upper of the two bracts surrounding the floret of a grass.

Palmately. With the lobes or divisions or veins radiating from one point.

Panicle. A loose irregular flower-cluster with stalked flowers.

Paniculate. Resembling a panicle.

Papillose. Bearing minute nipple-like projections.

Pappus. The modified calyx in the *Compositae* florets, later often very evident as hairs or scales around the summit of the achene.

Parasitic. Growing upon and deriving nourishment from another living plant.

Parthenogenetic. Developing without fertilization.

Pectinate. Comb-like with narrow closely-set segments.

Pedicel. Stalk of an individual flower.

Peduncle. Stalk of an inflorescence or a solitary flower.

Peltate. Shield-shaped with the stalk or petiole attached to the lower surface.

Perfect. With both stamens and pistils.

Perfoliate. With the stem apparently passing through the leaf.

Perianth. Calyx and corolla taken together.

Pericarp. Wall of the fruit.

Perigynium. Inflated sac which encloses the ovary and fruit in the sedges.

Persistent. Long-continuous or lasting.

Petal. Main division of the corolla, usually colored.

Petaloid. Colored and resembling a petal.

Petiole. Stalk of a leaf.

Petiolule. Stalk of an individual leaflet.

Pilose. With long soft hairs.

Pinna. One of the main divisions of a frond or leaf.

Pinnate. Compound with the leaflets arranged along each side of a common stalk or axis.

Pinnule. A division of a pinna.

Pistil. Seed-bearing organ of the flower, consisting of the ovary, style and stigma.

Placenta. Any part of the inside of the ovary which bears ovules.

Plicate. Folded into plaits, usually lengthwise.

Plumose. With fine hairs on each side, as on the pappus bristles of the thistles.

Polyploidy. Condition in which several sets of chromosomes are present in each cell.

Pome. A fleshy fruit from an inferior ovary with several locules with the inner part of the wall of the ovary papery or hard.

Prostrate. Lying flat upon the ground.
Procumbent. Lying flat on the ground but without rooting at the nodes.
Puberulent. Minutely pubescent or hairy.
Pubescent. Covered with hairs, especially short, soft ones.
Pulverulent. Powdered as if by grains of dust.
Punctate. Dotted with depressions, colored dots or glands.
Pyriform. Pear-shaped.

R

Raceme. Inflorescence with stalked flowers upon an elongated axis.
Rachilla. The axis of the spikelet of a grass, along which the floret or florets are arranged.
Rachis. Axis of a spike or of a compound leaf or frond.
Radiate. Spreading from a common center; with both disk and ray flowers.
Raphe. A ridge where the stalk is fused with the coat of a seed.
Receptacle. Expanded tip of the stalk which bears the flower-parts or the florets of a compound flower.
Regular. Uniform in shape and function.
Reniform. Kidney-shaped.
Reticulate. In the form of a network; netted-veined.
Retrorse. Directed backward or downward.
Revolute. Rolled backward from the tip or margin.
Rhizome. Prostrate or underground stem; rootstock.
Rhombic. With four equal, oblique sides.
Rufous. Reddish-brown.
Rugose. Wrinkled or rough.

S

Saccate. Sac-shaped.
Sagittate. Arrow-head shaped, the lobes directed downwards.
Samara. Indehiscent winged fruit as in the maple, ash and elm.
Scabrous. Rough to the touch.
Scale. A thin scarious body, usually a much-reduced leaf.
Scape. Peduncle rising from near the ground, without leaves or nearly so.
Scapose. Resembling a scape.
Scarious. Thin, dry and papery, not green.
Secund. Arranged along one side of an axis or stem.
Sepal. Main division of the calyx.
Serrate. With sharp teeth pointing forward.
Serrulate. Finely serrate.
Sessile. Without a stalk or petiole.

Setaceous. Bristle-like.
Setose. Beset with bristles.
Setulose. Having minute bristles.
Simple. Of one piece; not compound.
Sorus. Fruit-dot of a fern.
Spadix. Spike with a fleshy axis as in the *Araceae*.
Spathe. Large bract or pair of bracts enclosing or lying behind an inflorescence.
Spatulate. Gradually narrowed downward from a rounded summit.
Spicate. Resembling a spike.
Spike. Inflorescence with the flowers sessile or nearly so upon an elongated common axis.
Spikelet. A small spike; a small secondary spike in the inflorescence of a grass or in the sedge family.
Sporangium. The structures in which the microscopic spores are borne in the ferns and their allies.
Spore. Reproductive cells of ferns and their allies, corresponding to the seed of higher plants but microscopic.
Stamen. The pollen-bearing organ of the flower.
Stellate. Star-shaped.
Sterile. Flower without a pistil, or a stamen without an anther.
Stigma. Tip of the pistil for reception of the pollen.
Stipe. Stalk of a pistil; stalk of the frond of a fern.
Stipule. Appendages, often leaf-like, at the base of the petiole or on each side.
Stoloniferous. Producing runners or stolons.
Striate. Marked with fine longitudinal lines.
Strigose. With appressed sharp stiff hairs.
Strobilus. A cone-like structure composed of bracts bearing sporangia.
Style. Upper part of the pistil connecting the ovary and the stigma.
Subsessile. Nearly sessile, or with a very short stalk.
Subtended. Enclosed in an axil, as by a leaf or bract.
Subulate. Awl-shaped.
Succulent. Fleshy and juicy.
Sulcate. Grooved or furrowed.
Superior ovary. One above and free from the sepals.
Suture. Line of union or splitting.

T, U, V

Tendril. A slender twining or clasping part of a leaf or stem.
Terete. Having a circular cross-section.
Ternate. In threes, as the main divisions of a leaf.
Testa. The outer seed-coat, commonly hard and brittle.
Tomentose. Densely pubescent with matted hairs.
Tomentum. Covering of close woolly hairs.

Trifoliolate. With three leaflets.
Trigonous. Three-angled, as a buckwheat seed.
Truncate. Ending abruptly as if cut off transversely.
Tuber. Short, thick underground stem with buds or eyes.
Umbel. Inflorescence with the pedicels or peduncles arising from the same point.
Unisexual. Of one sex, with either only pistils or only stamens.
Ventral. Belonging to the front or inner surface of a part or organ, as opposed to the dorsal.
Villous. Bearing long and soft hairs.
Viscid. Glutinous; sticky.

BIBLIOGRAPHY

Aalders, L. E. and I. V. Hall, *Can. J. Genet. Cyto.* **4:** 90-91 (1962).
Aalders, L. E. and I. V. Hall, *Can. J. Genet. Cyto.* **8:** 528-532 (1966).
Aellen, P. and T. Just, *Amer. Midl. Nat.* **30:** 47-76 (1943).
Alex, J. F., *Can. J. Bot.* **40:** 295-307 (1962).
Allen, C., *Ann. Missouri Bot. Garden* **20:** 167 (1933).
Anderson, E., *Ann. Missouri Bot. Garden* **23:** 159-168 (1936).
Bailey, L. H., *Gentes Herbarum* 5, 1-918 (1941-45).
Ball, E. H., *Trans. N.S. Inst. Sci.* **4** (2), 146-157 (1875-6).
Barbour, J. H., *Trans. N.S. Inst. Sci.* **11:** (4) 553-569 (1905-6).
Barkley, T. M., *Trans. Kans. Acad. Sci.* **65:** 318-408 (1962).
Beal, E. O., *J. Elisha Mitchell Sci. Soc.* **72:** 317-346 (1956).
Beaudry, J. R., *Can. J. Genet. Cyto.* **2:** 389-396 (1960).
Beaudry, J. R. and D. L. Chabot, *Can. J. Bot.* **37:** 209-228 (1959).
Benson, L., *Bull. Torrey Bot. Club* **68:** 157-172, 477-490, 640-659 (1941).
Benson, L., *Bull. Torrey Bot. Club* **69:** 298-316, 373-386 (1942).
Bentley, P. A. and E. C. Smith, *Proc. N.S. Inst. Sci.* **24** (4), 376-398 (1957-8).
Boivin, B., *Rhodora* **46:** 337-377, 391-445, 453-487 (1944).
Boivin, B., *Natur. Can.* **75:** 202-227 (1948).
Boivin, B., *Can. Field Natur.* **65:** 1-22 (1951).
Boivin, B., *Phytologia* **4:** 93 (1952-a).
Boivin, B., *Natur. Can.* **79:** 173-176 (1952-b).
Boivin, B., *Natur. Can.* **89:** 66-74 (1962).
Boivin, B., *Natur. Can.* **93:** 107-128 (1966-a).
Boivin, B., *Natur. Can.* **93:** 959-962 (1966-b).
Boivin, B., *Natur. Can.* **93:** 253-273, 371-437, 583-646, 989-1063 (1966-c).
Boivin, B., *Natur. Can.* **94:** 131-157 (1967-a).
Boivin, B., *Natur. Can.* **94:** 229-231 (1967-b).
Bowden, W. M., *J. Arnold Arb.* **38:** 381-388 (1957).
Bowden, W. M., *Can. J. Genet. Cyto.* **1:** 49-64 (1959).

Bowden, W. M., *Can. J. Genet. Cyto.* **2:** 11-27, 234-251 (1960).
Bradshaw, M. E., P. Dansereau and D. H. Valentine, *Can. J. Bot.* **42:** 89-104 (1964).
Brayshaw, T. C., *Can. Field Natur.* **80:** 160-161 (1966-a).
Brayshaw, T. C., *Can. Field Natur.* **80:** 187-194 (1966-b).
Brittain, W. H. and W. F. Grant, *Can. Field Natur.* **79:** 189-197 (1965-a).
Brittain, W. H. and W. F. Grant, *Can. Field Natur.* **79:** 253-257 (1965-b).
Brittain, W. H. and W. F. Grant, *Can. Field Natur.* **80:** 147-157 (1966).
Brittain, W. H. and W. F. Grant, *Can. Field Natur.* **81:** 116-127 (1967).
Brown, M. S., *Can. Field Natur.* **54:** 44 (1940).
Butters, F. K. and E. C. Abbe, *Rhodora* **42:** 25-32 (1940).
Camp, W. H., *Bull. Torrey Bot. Club* **71:** 426-437 (1944).
Camp, W. H., *Brittonia* **5:** 203-275 (1945).
Campbell, G. G., *Trans. N.S. Inst. Sci.* **6** (3), 209-225 (1884-5).
Campbell, G. G., *Trans. N.S. Inst. Sci.* **6** (4), 283-285 (1885-6).
Cinq-Mars, L., *Natur. Can.* **93:** 895-958 (1966).
Cody, W. J., *Can. Field Natur.* **67:** 131-134 (1953).
Cody, W. J., *Rhodora* **56:** 96-101 (1954).
Cody, W. J., *Can. Field Natur.* **76:** 104-107 (1962).
Cooperrider, T. S., *Rhodora* **64:** 63-67 (1962).
Cox, G. H., *Trans. N.S. Inst. Sci.* **8** (4), 439-444 (1893-4).
Dansereau, P. and G. Pageau, *Mem. Montreal Bot. Garden* **58:** 1-56 (1966).
Donly, J. F., The Orchids of Nova Scotia, Mill Village, N.S. (1964).
Dore, W. G. and A. E. Roland, *Proc. N.S. Inst. Sci.* **20** (4), 177-288 (1941-2).
Drew, W. B., *Rhodora* **38:** 1-47 (1936).
Eiton, G., *Amer. Midl. Nat.* **69:** 257-309 (1963).
Erlanson, E. W., *Bot. Gaz.* **96:** 197-259 (1934).
Erskine, D. S., *Rhodora* **53:** 264-271 (1951).
Erskine, D. S., *Rhodora* **57:** 132 (1955).
Erskine, D. S., Canada Dept. of Agr. Publ. No. 1088 (1960).
Erskine, J. S., *Rhodora* **55:** 17-20 (1953).
Erskine, J. S., *Proc. N.S. Inst. Sci.* **23** (2), 120-145 (1951-2).
Erskine, J. S., *Rhodora* **56:** 203-204 (1954).
Erskine, J. S., *Rhodora* **58:** 245-249 (1956).
Erskine, J. S., *Proc. N.S. Inst. Sci.* **24** (2), 271-296 (1956-7).
Fassett, N. C., *Proc. Boston Soc. Nat. Hist.* **39:** 73-130 (1928).
Fassett, N. C., *Rhodora* **41:** 367-377 (1939).
Fassett, N. C., *Brittonia* **6:** 369-393 (1949).
Fassett, N. C., *Rhodora* **53:** 137-155, 161-182, 185-194, 209-222 (1951).
Fernald, M. L., *Rhodora* **16:** 187-189 (1914).
Fernald, M. L., *Amer. J. Bot.* **5:** 218-236 (1918).
Fernald, M. L., *Rhodora* **21:** 1-22 (1919).
Fernald, M. L., *Rhodora* **23:** 89-111, 130-151, 153-171, 184-195, 223-246, 257-278, 284-301 (1921).

Fernald, M. L., *Rhodora* **24**: 157-164, 165-180, 201-208 (1922).
Fernald, M. L., *Rhodora* **27**: 93-104 (1925).
Fernald, M. L., *Rhodora* **28**: 181-204 (1926).
Fernald, M. L., *Rhodora* **37**: 378-454 (1935).
Fernald, M. L., *Rhodora* **38**: 201-239 (1936).
Fernald, M. L., *Rhodora* **41**: 423-461 (1939).
Fernald, M. L., *Rhodora* **42**: 239-302 (1940).
Fernald, M. L., *Rhodora* **43**: 411-412 (1941).
Fernald, M. L., *Rhodora* **45**: 317-319 (1943-a).
Fernald, M. L., *Rhodora* **45**: 331 (1943-b).
Fernald, M. L., *Rhodora* **45**: 485-511 (1943-c).
Fernald, M. L., *Rhodora* **47**: 221-235, 239-247 (1945-a).
Fernald, M. L., *Rhodora* **47**: 303-329 (1945-b).
Fernald, M. L., *Rhodora* **47**: 333-362 (1945-c).
Fernald, M. L., *Rhodora* **48**: 1-60 (1946).
Fernald, M. L., *Rhodora* **49**: 145-159 (1947).
Fernald, M. L., *Rhodora* **50**: 211-215 (1948).
Fernald, M. L., *Rhodora* **51**: 56 (1949-a).
Fernald, M. L., *Rhodora* **51**: 61-85 (1949-b).
Fernald, M. L., Gray's Manual of Botany, American Book Co., New York, 8th ed. (1950-a).
Fernald, M. L., *Rhodora* **52**: 18-19 (1950-b).
Fernald, M. L., *Rhodora* **52**: 199-201 (1950-c).
Fernald, M. L., *Rhodora* **52**: 250-251 (1950-d).
Fernow, B. C., C. D. Howe and J. H. White, Commission of Conservation, Ottawa, 93 pp. (1912).
Fowler, J., *Contrib. Can. Biol.* 59-70 (1902-5).
Frankton, C., *Can. Field Natur.* **68**: 27-28 (1954).
Ganong, W. F., *Bot. Gaz.* **36**: 161-186, 280-302, 349-367, 429-455 (1903).
Gates, R. R., *Trans. N.S. Inst. Sci.* **14** (3), 141-145 (1916-7).
Gilliett, J. M., *Rhodora* **61**: 43-62 (1959).
Gleason, H. A., New Britton and Brown Illustrated Flora of the Northeastern United States and adjacent Canada. Hafner Publ. Co., New York, 3 vols. (1952).
Gorham, E., *Ecology* **36**: 116-123 (1955).
Green, P. S., *Rhodora* **64**: 32-43 (1962).
Groh, H. and H. A. Senn, *Can. J. Res. C* **18**: 318-346 (1940).
Hall, I. V. and L. E. Aalders, *Am. J. Bot.* **48**: 199-201 (1961).
Hall, I. V. and L. E. Aalders, *Can. Field Natur.* **76**: 203-205 (1962).
Hall, I. V. and L. E. Aalders, *Can. J. Genet. Cyto.* **5**: 371-373 (1963).
Hara, H., *Rhodora* **41**: 385-392 (1939).
Henderson, N. C., *Am. Midl. Natur.* **68**: 95-138 (1962).
Hodgdon, A. R., *Rhodora* **40**: 29-69, 87-131 (1938).
Hodgdon, A. R. and F. Steele, *Rhodora* **68**: 474-513 (1966).
Hounsell, R. W. and E. C. Smith, *Rhodora* **68**: 409-419 (1966).

Hounsell, R. W. and E. C. Smith, *Rhodora* **71**: 176-191 (1968).
How, H., *Trans. N.S. Inst. Sci.* **4** (3): 312-321 (1876-7).
Jones, G. N., *J. Arnold Arb.* **20**: 1-43 (1939).
Jones, G. N., *Rhodora* **61**: 219-220 (1959).
Klawe, W. L., *Can. Field Natur.* **69**: 129 (1955).
Klawe, W. L., *Can. Field Natur.* **70**: 141 (1956).
Lawson, G., *Trans. N.S. Inst. Sci.* **4** (2): 167-178 (1875-6).
Lawson, G., *Trans. N.S. Inst. Sci.* **6** (1): 68-75 (1882-3).
Lawson, G., *Trans. N.S. Inst. Sci.* **6** (2): 101-109 (1883-4).
Lawson, G., *Trans. N.S. Inst. Sci.* **8** (1): 84-110 (1890-1).
Lepage, E., *Natur. Can.* **73**: 5-16 (1946).
Lepage, E., *Natur. Can.* **85**: 81-93 (1958).
Lepage, E., *Natur. Can.* **87**: 59-107 (1960).
Lepage, E., *Natur. Can.* **88**: 44-52 (1961).
Lindsay, A. W. H., *Trans. N.S. Inst. Sci.* **4** (2): 184-222 (1875-6).
Livingstone, D. A. and A. H. Estes, *Can. J. Bot.* **45**: 339-359 (1967).
Löve, A., *Hereditas* **30**: 1-136 (1943).
Löve, A., *Rhodora* **63**: 139-145 (1961).
Löve, A. and D. Löve, *Can. J. Bot.* **34**: 501-521 (1956).
Löve, A. and D. Löve, *Can. J. Genet. Cyto.* **1**: 34-38 (1959).
Löve, D., *Rhodora* **62**: 265-292 (1960).
Löve, D. and P. Dansereau, *Can. J. Bot.* **37**: 173-208 (1959).
Macoun, J., Catalogue of Canadian Plants, 7 vols. Dawson Brothers, Montreal and Ottawa (1893-1902).
Marie-Victorin, Fr., *Contrib. Inst. Bot. Univ. Montréal* **17**: 1-17 (1930).
Marie-Victorin, Fr. and J. Rousseau, *Contrib. Inst. Bot. Univ. Montréal* **36**: 1-74 (1940).
McVaugh, R., *Brittonia* **7**: 279-315 (1951).
Mertens, T. R. and P. N. Raven, *Madrona* **18**: 85-92 (1965).
Miller, G. N., *Cornell Univ. Agr. Sta. Memoir* **335** (1955).
Moore, R. J. and C. Frankton, *Can. J. Bot.* **32**: 182-186 (1954).
Moore, R. J. and D. R. Lindsay, *Can. J. Bot.* **31**: 151-163 (1953).
Mulligan, G. A., *Can. J. Bot.* **35**: 779-789 (1957).
Mulligan, G. A., *Rhodora* **60**: 122-125 (1958).
Mulligan, G. A., *Can. J. Bot.* **37**: 81-92 (1959).
Mulligan, G. A., *Madrona* **16**: 77-90 (1961-a).
Mulligan, G. A., *Can. J. Bot.* **39**: 1057-1066 (1961-b).
Mulligan, G. A., *Can. J. Bot.* **42**: 1509-1519 (1964).
Mulligan, G. A. and I. J. Bassett, *Can. J. Bot.* **37**: 73-79 (1959).
Mulligan, G. A. and J. M. Calder, *Rhodora* **66**: 127-135 (1964).
Mulligan, G. A. and C. Frankton, *Can. Field Natur.* **68**: 31-36 (1954).
Mulligan, G. A. and C. Frankton, *Can. J. Bot.* **40**: 1411-1425 (1962).
Munz, P. A., *Gentes Herbarum* **6**: 463-506 (1945).
Nichols, G. E., *Trans. Conn. Acad. Arts Sci.* **22**: 249-467 (1918).
Nichols, G. E., *Ecology* **16**: 403-422 (1935).
Perry, L. M., *Rhodora* **33**: 105-126 (1931).

Pilger, R., *Das Pflanzenreich IV*, **269**: 39-432 (1937).
Porsild, A. E., *Can. Field Natur.* **52**: 116-117 (1938).
Porsild, A. E., *Rhodora* **41**: 199-301 (1939).
Prest, W. H., *Trans. N.S. Inst. Sci.* **11** (3), 387-416 (1904-5).
Putnam, D. F., *Can. Geogr. J.* **21**: 135-147 (1940).
Reinert, G. W. and R. K. Godfrey, *Am. J. Bot.* **49**: 213-220 (1962).
Raynor, L. A., *Am. J. Bot.* **39**: 713-719 (1952).
Rechinger, H., *Field Mus. Natur. Hist. Publ., Bot. Ser.* **17**: 1-151 (1937).
Robinson, C. B., *Trans. N.S. Inst. Sci.* **10** (4): 502-506 (1901-2).
Robinson, C. B., *Bull. Pictou Acad. Sci. Assoc.* **1**: 30-44 (1907).
Roland, A. E., *Proc. N.S. Inst. Sci.* **20** (3): 64-120 (1940-1).
Roland, A. E., *Proc. N.S. Inst. Sci.* **21** (3, 4): 95-642 (1944-6).
Rossbach, G. B., *Rhodora* **41**: 113-128 (1939).
Rossbach, G. B., *Madrona* **14**: 261-267 (1958).
Rossbach, R. P., *Rhodora* **42**: 57-83, 105-143, 158-193, 203-213 (1940).
Rouleau, E., *Rhodora* **48**: 103-110 (1946).
Rouleau, E., *Rhodora* **50**: 233-236 (1948).
Rousseau, J., *Contrib. Inst. Bot. Univ. Montréal* **32**: 16-62 (1938-a).
Rousseau, J., *Natur. Can.* **65**: 285-315 (1938-b).
Rousseau, J., *Contrib. Inst. Bot. Univ. Montréal* **44**: 26-29 (1942).
Rousseau, J., *Natur. Can.* **59**: 234 (1943).
Rousseau, J. and M. Raymond, *Rhodora* **52**: 27-32 (1950).
St. John, H., *Rhodora* **17**: 73-83 (1915).
St. John, H., *Proc. Boston Soc. Natur. Hist.* **36**: 1-103 (1921).
Sarkar, N. M., *Can. J. Bot.* **36**: 947-996 (1958).
Schofield, W. B., *Can. Field Natur.* **63**: 44-45 (1949).
Schofield, W. B., *Rhodora* **57**: 301-310 (1955).
Schofield, W. B. and E. C. Smith, *Can. Field Natur.* **67**: 93-94 (1953).
Sherff, E. E., *Field Mus. Nat. Hist. Publ., Bot. Ser.* **16**: 1-709 (1937).
Shinners, L. H., *Rhodora* **45**: 344-351 (1943).
Smith, E. C., *Rhodora* **61**: 275-290 (1959).
Smith, E. C. and J. S. Erskine, *Rhodora* **56**: 242-252 (1954).
Smith, E. C. and W. B. Schofield, *Rhodora* **54**: 220-228 (1952).
Smith, E. C. and W. B. Schofield, *Can. Field Natur.* **73**: 155-160 (1959).
Stanford, E. E., *Rhodora* **27**: 156-166 (1925).
Staudt, G., *Can. J. Bot.* **40**: 869-886 (1962).
Steele, F. L., *Rhodora* **63**: 297-304 (1961).
Stewart, S. R., *Rhodora* **46**: 331-335 (1944).
Steyermark, J. A. and C. S. Steyermark, *Rhodora* **62**: 223-232 (1960).
Transeau, E. N., *Plant World* **12**: 272-281 (1909).
Tryon, R. M., *Rhodora* **41**: 415-423 (1939).
Vogelmann, H. W., *Rhodora* **62**: 31-42 (1960).
Wahl, H. A., *Bartonia* **27**: 1-46 (1952).
Walters, S. M. *Watsonia* **3**: 1-6 (1953).
Weatherby, C. A., *Rhodora* **44**: 229-236 (1942).

Webster, D. H., *Proc. N.S. Inst. Sci.* **24** (1): 16-24 (1954-5).
Webster, D. H., A Study of the Genus *Potamogeton* in Nova Scotia, M.Sc. Thesis, Acadia Univ., Wolfville, N.S. (1954).
Wiegand, K. M., *Rhodora* **27**: 113-124, 133-139 (1925).
Woodson, R. E., *Ann. Missouri Bot. Gard.* **17**: 41-156 (1930).
Yuncker, T. G., *Mem. Torrey Bot. Club* **18**: 113-331 (1932).

*Italicized names refer to species mentioned as alternate or closely related to those described in the text.

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