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MERRITT LYNDON FERNALD
HOLLIS WEBSTER } Associate Editors.

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THE NEW ENGLAND BOTANICAL CLUB

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CAPE COD IN ITS RELATION TO THE MARINE FLORA OF NEW ENGLAND.

William Albert Setchell.

(Plate 134.)

The first to call attention to Cape Cod as a dividing point, or demarcation area, in the marine flora of the Atlantic coast of North America was William Henry Harvey (1852, p. 24). In his introduction to Part I of the Nereis Boreali-Americana, the first account of the North American algae to be published, Harvey divides the eastern coast of North America into four divisions, as follows:— "First, the coast north of Cape Cod, extending probably to Greenland; second, Long Island Sound, including under this head New York Harbor and the Sands of New Jersey; third, Cape Hatteras to Cape Florida, and fourth, Florida Keys and shores of the Mexican Gulf." This division of our eastern coast by one who had collected over a greater extent of it than any one previous to his writing and even more than scarcely any collector of algae since his time, and who had before him a very considerable collection of marine algae from the coasts of the entire world, carries with it the greatest conviction and has withstood most admirably the test of time. The chief difference between our present point of view and that of Harvey lies in the tendency to divide again the coast from Cape Cod north into two or three divisions. The position assigned by Harvey to Cape Cod is much the same in our present considerations.

Farlow (1881, p. 4), in his New England Algae, also emphasizes the relation of Cape Cod as a demarcation point between the marine flora to the north and that to the south of it. Farlow, however, calls

attention to the fact that Cape Cod does not sharply and exactly divide the northern from the southern marine flora of New England and proceeds to add much to our knowledge by discussing the reasons for this imperfect division. He says (loc. cit. p. 3, et seq.):—"If we regard the marine vegetation of the northeastern United States as a whole, we see that, beginning at Eastport, we have a strongly marked arctic flora, which is a direct continuation of that of Greenland and Newfoundland. As we proceed southward towards Boston, although the luxuriance of growth is less, the general appearance of the flora is still unmistakably arctic, if we except a few sheltered localities. The northern shore of Cape Cod, from its sandy character, is practically destitute of all species of algae, except a few forms which are here and there found growing on the eelgrass. As soon as we pass to the south of Cape Cod, however, the flora assumes an entirely different aspect. The arctic and Northern European forms have disappeared, except at a few exposed points like Gay Head and Montauk, and in their place, we find a number of species, as *Dasya elegans*, *Rhabdonia tenera*, *Chondria tenuissima*, *Sargassum vulgare*, characteristic of warmer seas." A little farther on, he goes on to say:—"It will be seen that Cape Cod is the dividing line between a marked northern and a southern flora. In fact, the difference between the florae of Massachusetts Bay and Buzzards Bay, which are only a few miles apart, is greater than the difference between those of Massachusetts Bay and the Bay of Fundy, or between those of Nantucket and Norfolk. This difference in the flora corresponds precisely with what is known of the fauna. That Cape Cod formed a dividing line was known to Harvey, and subsequent observation has only shown, on the one hand, that the flora north of Cape Cod is more decidedly arctic than he supposed, and that, on the other hand, south of the Cape it is more decidedly that of warm seas. The general fact of the distinctness of the two florae is not weakened by the knowledge that we now possess, owing to the investigations of the Fish Commission, of the existence in a few sheltered localities north of Cape Cod of some of the characteristic species of Long Island Sound and, in a few exposed spots south of the cape, of northern species. Of the more common species found along the whole coast of New England, by far the greater part are also common in Europe. . . . But a very few exclusively American species are found throughout our limits. Most of the purely American species are either confined to the shore south of Cape Cod or else to the shore from Boston northward."

In the paragraphs just quoted, Farlow has clearly stated the general relation of Cape Cod to the marine florae of New England. It is clearly the dividing point, but not exact in separating the northern from the southern flora. There are certain species passing over it from north to south and certain other species passing over it from south to north. He adds by way of explanation that the southern species are found in "a few sheltered localities north of Cape Cod" and that the northern species occur "in a few exposed spots south of the cape." As examples of the latter he mentions Gay Head, Massachusetts, and Montauk Point on the eastern extremity of Long Island. He also speaks of Block Island as well as Gay Head as having cold waters and speaks of a characteristic northern species (*Ptilota serrata*) as occurring in reduced form at the Thimble Islands, near New Haven in Long Island Sound. As to "sheltered localities north of Cape Cod," he describes particularly Goose Cove, in the town of Gloucester, near the village of Squam, and makes the remark:—"If we compare the exceptional cases of Goose Cove in the north with Gay Head and Montauk in the south, it seems to be the rule that wherever the water is cold enough, we meet arctic species, and wherever it is warm enough we have Long Island species, regardless of the remoteness of localities where the species naturally abound, and as far as we know, of the absence of currents to transport the spores" (loc. cit., p. 7).

Finally, I may call attention to the remarks of Farlow (loc. cit., p. 6) contrasting the general aspects of the two florae on the New England coast. They are as follows:—"If north of Boston the principal feature of the marine vegetation is the enormous mass of large *Fuci* and *Phaeosporeae*, the *Florideae* forming an insignificant part of the flora, the chief feature of the flora south of Cape Cod is the preponderance of *Florideae* and the comparative insignificance of the *Fuci* and *Phaeosporeae*". I may add that later studies have emphasized this distinction and have shown that the larger *Fuci* and *Phaeosporeae* associations found south of Cape Cod, occur without exception at colder spots and may be looked upon as invasions from the north.

Frank S. Collins, who was long identified with the study of the marine algae of New England and whose knowledge of its species and their habits far surpassed that of any other botanist, made many contributions towards determining the exact relation of Cape Cod to the marine florae of the coast on which it is situated. Besides many papers relating to new species, species new to the coast of New England,

etc., in which there are many details closely related to the topic I am discussing, he published (1900) a list of the marine algae of New England with distribution noted as to the shores of the different status. I quote from his introductory note, as follows:—"Massachusetts . . . is divided into two parts, northern and southern, as the most strongly marked division line for algae on the whole Atlantic coast occurs here. As regards the marine flora, Nahant and Nantucket differ more from each other than the former does from Newfoundland, or the latter from Fortress Monroe. The division line is usually given as Cape Cod but as the flora of the inside of the lower cape is the same as that of Vineyard Sound, the latitude of Provincetown has been taken as the boundary." For the preparation of this paper, Mr. Collins took the trouble to prepare an extended and annotated list, bringing the published list up to present date and adding notes as to habitat and localities for the majority of the species. It seems safe to assert that the flora of the coast of New England is better and more definitely known than that of any coast of similar extent and diversity, and that much of this is due to the efforts of Mr. Collins. I have, therefore, a feeling of the greatest confidence in undertaking the discussion of the geographical distribution of the marine flora of this coast as a model and precedent for similar discussions of the same problem for other and less known coasts. I desire, accordingly, to express here my sincere indebtedness to Mr. Collins for his generosity in turning over for my use of so much valuable data.

Besides the publication of the "list," Collins has called attention to some of the very definite and important warm spots to the north of Cape Cod, all of which have been either discovered or, at least, personally investigated by him. In 1908, Collins especially mentioned three distinct areas of warm spots, viz. . . . those about Quincy and Weymouth, Massachusetts, those about Gloucester, Massachusetts, and those in the vicinity of Casco Bay, Maine. He states that in early warm spring seasons, there are abundant southern forms in these warm spots, while in late cool seasons, southern forms are scarce.

The biological survey of the waters in the vicinity of Woods Hole, Massachusetts, carried on by the U. S. Fish Commission under the direction of Francis B. Sumner and Bradley M. Davis during the years 1903–1905, have been published in excellent form for yielding the greatest assistance to the student of the geographical distribution of the marine flora of New England. The report (1911) on this

work covers the coast from Buzzards Bay to the shoal waters off and above Chatham, Massachusetts. This region is a mixture of enclosed shallow waters, exposed points, and intruding deeper waters and the flora is, in consequence, a mixture of northern and southern species. The data given and the charts of the detailed distribution of the individual species are sufficiently numerous to indicate very exactly the difference in the distribution of the two types of species. In the report of Davis, on the marine algae of the district, we have the definite proof of the statements of Farlow and of Collins.

My own collecting along the coast of New England has been more or less extensive and in 1893, I made a reference to Cape Cod as a dividing line in the kelp-flora of the eastern coast of North America. I also made the statement (1893, p. 370) that the isothere, or line of mean maximum temperature of the surface waters of the north Atlantic Ocean, for 20° C., touched the shore in its neighborhood. The paper of 1893, although dealing only with the Laminariaceae or kelps so far as distribution is concerned, has opened up the larger question of climatic distribution in general for all organisms and paved the way for the papers on the geographical distribution of the marine algae published in 1915, 1917 and 1920. Through the data afforded by demarcation areas such as that of Cape Cod, but situated on all coasts throughout the world, I have divided the photic belts of the neritic shelves of the coasts of the world into climatic zones according to mean maxima of the surface waters, For reasons which I have given elsewhere, it has seemed most natural to establish nine climatic or temperature zones extending from the far north to the extremes of marine plant life in the south and these, with the exception of the two polar zones may be considered to be limited by surface isotheres 5° C. apart. The coast of New England is divided between the North Temperate Zone, between the isotheres of 15° C. and 20° C. and the North Subtropical Zone, between the isotheres of 20° C. and 25° C. The question, therefore, of the relation of the 20° C. isotheres to Cape Cod is vital to any discussion of the climatic zones as I have attempted define and delimit them.

In checking over and tabulating the species of marine algae of New England so kindly and generously provided by Mr. Collins, I find that there are 551 species, varieties, and forms at present to be accredited with some considerable certainty to the coast. Of course, there is some uncertainty in a few cases, but apparently less so than

is the case for most florae. I think that this source of probable error may be discounted without any considerable concern. Of these 551 species, etc., 136 are credited only to the north of Cape Cod, 113 only to the south of it, while 302 are credited to both sides of it. In other words, species, etc., exclusively north amount to about 24.5 per cent. of the whole number, those exclusively south to about 20.5 per cent., and those passing the Cape in one direction or the other to nearly 55 per cent.

The first interest naturally centers in the 302 species, or approximately 55 per cent. of the whole number of species concerning whose exact nature as to whether they may belong more normally with the northern or with the southern group it is desirable to have farther information. Careful examination into the details of occurrence of these species enables one to separate them into their respective groups, only 12 being clearly uncertain and needing more careful study from this point of view to determine their exact status. By removing from the 290 species remaining, those which occur south only in colder waters or which appear or fruit only in the colder seasons, we are able to feel certain that 132, or about 43 per cent. of those generally distributed, are normally northern species. Adding these 132 to the 136 species found only north of Cape Cod, there result 268 which may perhaps seem normally northern. On the other hand, if, in a similar way there are removed from the 302 generally distributed species, the 12 doubtful ones and then those which occur north only in the warm spots or warmer situations, there are found to be 158 of these and this number added to the 113 which are credited only to the south of Cape Cod gives 271 as presumably normally southern. These figures seem to indicate that the number of species, varieties, etc., is approximately the same for each flora.

It might seem that the figures given above were sufficiently accurate and explicit to indicate the exact nature of the situation on the coast of New England, but a careful consideration of the details of the conditions under which the species accredited only to the north exist there, shows that 37 of them occur in warm localities and are presumably to be considered as normally southern. Probably they will be found south of the cape at some future date. As to why they have not as yet been found south may be due to several reasons, viz. incomplete exploration, lack of suitable habitat, scarcity, etc. It must be borne in mind that the shores south of Cape Cod are more largely

sandy and there is a general lack of the bold cliffs so characteristic of the northern shores of New England. If the 37 seemingly southern species are subtracted from the northern list, there remain 99 seemingly true northern species in it.

In a similar way, careful consideration of the list of species yields a surprise by showing that 30 of the 113 species credited only to the south are found solely in localities of colder waters or appear or fruit only in the colder seasons. This leaves 83 species to be regarded as normally southern. The details of the various segregations are given on the accompanying table which shows that 261 species, etc., may be regarded as belonging to the colder waters and 278 to the warmer waters, while 12 are to be placed in the doubtful column for the present at least.

TABULATION OF SPECIES, VARIETIES, FORMS, ETC., OF MARINE ALGAE OF THE NEW ENGLAND COAST.

	Total	Normally N.	Normally S.	Uncertain.
N. of Cape Cod—				
Myxophyceae.	26	4	22	
Chlorophyceae.	29	17	12	
Melanophyceae.	40	37	3	
Rhodophyceae.	41	41	0	
Total.	136	99	37	
S. of Cape Cod—				
Myxophyceae.	18	1	17	
Chlorophyceae.	19	3	16	
Melanophyceae.	37	17	20	
Rhodophyceae.	39	9	30	
Total.	113	30	83	
N. and S. of Cape Cod—				
Myxophyceae.—	56	8	47	1
Chlorophyceae.	68	22	44	2
Melanophyceae.	73	48	17	8
Rhodophyceae.	105	54	50	1
Total.	302	132	158	12
Final Total.	551	261	278	12

These figures, and other deductions which may be drawn from the table, show that Cape Cod does not appear to be so distinctly a dividing line as might have been supposed from the statements of the various authors, yet the general character, or appearance of the flora, especially as seen in the litoral belt, is very different north of Cape Cod

from what it is below. The reasons for this are as have been noted that the conspicuous *Fucus*- and *Laminaria*-associations of the north shores are, to some considerable extent, represented all along the rocky coasts and are more or less conspicuously situated in the literal or upper sublitoral belts, while to the south, these associations occur but seldom and scattered, and the *Laminaria*-associations, in particular are well down in the sublitoral belt and consequently, seldom seen.

The remaining question to be raised and, if possible, answered, is as to the exact relation of Cape Cod to the isotheres of 15° C. and 20° C. and, consequently its situation as to the North Temperate and the North Subtropical Zones. The normal or dominant marine flora north of the cape is clearly that of the North Temperate, intermingled with the florae of the Lower and Upper Boreal Zones as seasonal invasions. The normal or dominant flora of the Long Island Sound district is just as clearly that of the North Subtropical Zone. If Cape Cod is not the strict dividing line, as appears certainly to be the case, where is that dividing line and what is its relation to Cape Cod? The isothere of 15° C. strikes the coast a little to the north of New England and its relations to the coast itself are somewhat complicated. It is sufficient for our present purpose, however, to say that it is far north of Cape Cod. The isothere of 20° C., on the other hand, is represented on the temperature charts as coming toward land some miles west of Montauk Point at the eastern extremity of Long Island. Taken literally, then, the Cape Cod peninsula is situated well within the North Temperate Zone. An examination of the charts of this portion of the New England coast, however, and of such temperature data as are available, show that the isothere of 20° C. bends eastward in an irregular sort of a way, to include at least the more or less enclosed and shallow waters of the easternmost corner of Long Island Sound, Narragansett Bay, Buzzards Bay, Vineyard cr Nantucket Sound and the Nantucket Shoal up the neighborhood of Chatham on the outer Cape Cod peninsular (cf. Setchell, 1915, p. 296). The influence of the warmed up water of these shallow and more or less enclosed areas is doubtless felt some appreciable distance out beyond their boundaries, but exposed points like those at Gay Head, outer coast of Rhode Island at Newport, Point Judith and Watch Hill, Block Island, and the eastern end of Long Island Sound at Montauk Point, vicinity of New London

(exposed to the full outer temperature through the inward cold currents of "The Race") are, and ought to be expected to be provided with waters of a temperature of 20° C. or less. Even if these portions of the coast are somewhat affected by the warmer waters from within, the deeper waters are colder and, consequently, we find that the northern species are frequently found in water of one to thirteen or more fathoms in these areas, whereas north of the cape the same species may occur in the litoral, or at least in the uppermost sublitoral belt. It seems that there is a scanty northern flora in the deeper waters even of the interior of Long Island Sound itself.

I have prepared a map showing the probable details of the deflection of the 20° C. isothere inwards and its enclosure of the inland waters eastward from its approach to land from the outer waters. It passes along the coasts of eastern Connecticut outer coasts of Rhode Island, and southern and southeastern coasts of Massachusetts, and its position illustrates the general relation, at least, of Cape Cod to this 20° C. line of mean maximum temperature. This map and its temperature lines show that the district between Chatham, Massachusetts on the east and New London and Montauk Point on the west, belongs to the North Subtropical Zone so far as the inland or sheltered waters are concerned and more or less normally to the North Temperature Zone, so far as the outer points and even whole ranges of the shores exposed to outer waters are concerned. The outer waters seem to be somewhat affected by the inland warmer waters in their immediate vicinity, however, because the northern species occurring in them either tend to grow in deeper water than they do north of the cape, or are often reduced, or even depauperate. It seems best, therefore, to regard the latitude of Provincetown, as Collins has done, to be the dividing line between the North Temperate and the North Subtropical Zones on the Atlantic coast of North America. The shores to the south, then, even including the deeper waters of Long Island Sound, show a very considerable admixture of northern species flourishing even during the season of normal maximum temperature. In this connection, attention may be called to the fact that the whole coast of New England lies between the mean maxima, or winter, temperatures of from 0° C. to 5° C. and is therefore subject to seasonal invasion, or, in the case of hardy perennial species, of winter or spring fruiting, of species normal to the Upper and Lower Boreal Zones. A discussion of these species would be of great interest, but is only of importance in a

discussion of details. Any attempt to enumerate the species according to the zones to which they are normal must necessarily take cognizance of this fact. This discussion has been intended only to deal with the relation of Cape Cod to the marine flora as a dividing line and I trust that this has been made even more definite than it has been demonstrated by previous writers.

University of California.

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Explanation of Plate 133.

Atlantic Coast of the United States from West Quoddy Head, near Eastport, Maine, south and southwest to just beyond Cape Hatteras, North Carolina, based upon "Sailing Chart, No. 100" of the U. S. Coast and Geodetic Survey. The continuous line running in towards the shore are the surface the isotheres of

15° C., 20° C., and 25° C., or lines of the isotherms of these degrees of temperature for the month of August. The broken lines running tn towards the shore are the isocrymes of 5° C., 10° C., 15° C., and 20° C., or lines of the isotherms for the month of February. These two sets of isotherms show well the relation of Cape Cod to the average seasonal maxima and minima of the surface temperature of the waters of the coasts above and below it. I have prolonged the isothere of 20° C. inward to the very coast itself and have attempted to sketch its deflection inward and northward as indicated by such data as to the temperature of the surface waters just offshore as are available. The deflection toward Long Island Sound and along the coast eastward to the shoals about Nantucket Island, thence northward to about Nauset on the eastern coast of the Cape Cod Peninsula, indicate the transition area lying between the North Temperate Zone above and the North Subtropical Zone below. In this transitional area, the outer coasts are of the North Temperate Zone while the inner are of the North Subtropical Zone. The dotted lines in Cape Cod Bay, in Vineyard Sound, and in Long Island Sound indicate that the isothere of 20° C. passes below the surface at these places. The deflection of the 20° C. isothere as sketched must be considered as only an approximate to accuracy in details. I have to thank my nephew, Charles E. Davis, and Miss. Ruth Jeanette Powell for preparing the map for reproduction.

SOME VARIETIES OF PANICUM VIRGATUM.

D. H. Linder.

There has been considerable difficulty in separating from *Panicum virgatum* L. its var. *cubense* Griseb. or var. *obtusum* Wood. Wood's description[1] of the spikelet of the latter variety (from New Jersey) so closely matches the figure published by Hitchcock & Chase[2] of a spikelet from Grisebach's type of var. *cubense* that there is no doubt that the two varieties are identical. By Hitchcock & Chase the species and variety are separated in a general way by the size of the spikelets, the stoutness of the culms, and the shape of the panicle. Very little Cuban material has been examined, but such as has been studied closely matches the North Carolina and New Jersey plant referred to var. *cubense*. The appearance of the panicle is quite marked, the rays being fewer and farther apart than in typical *P. virgatum*, but the best criterion for the separation of the two is the spikelet. In the variety the lower glume is less than half the length of the spikelet and is broad and blunt, the second glume and the palea are about equal in length and are slightly exceeded by the lemma. The floral parts usually are appressed, giving the spikelet a cylindrical outline.

[1] Wood, Botanist and Florist, 392. 1874.

[2] Hitchcock & Chase, North American Panicum. Contrib. U. S. Nat. Herb. **15**: 93. 1910.

The range of the variety in the New England states is very limited, the only material seen coming from Dennis on Cape Cod and from Westerly, Rhode Island, while the typical *P. virgatum* appears to be limited in New England to the Connecticut Valley from Vermont and southwestern New Hampshire to Connecticut. South and west of this region, typical *P. virgatum* is more general in its distribution.

Growing on the rocks, shore of Flatt's Inlet, Bermuda, is a stout, succulent plant which differs conspicuously from *P. virgatum*. The leaves are broad, smooth, stiff, and coriaceous, the sheaths slightly shorter than the internodes. The panicle is narrowly ellipsoid and dense, the spikelets on short (1–2 mm.) pedicels. The spikelets are easily separated from those of true *P. virgatum* by having the lower glume two-thirds the length of the spikelets and the midvein serrate

Fig. 1. Base of typical P. virgatum.

towards the summit. The lemma is rounded, almost truncate, and is exceeded by the second glume.

In the southern states, from Florida to Mississippi, there is another striking variation which differs from the typical *P. virgatum* by having the lower rays shorter than or barely equalling the numerous, very slender, many-flowered middle ones, the panicle thus having an ellipsoid-cylindrical outline which is distinctive. It can not possibly be confused with *P. virgatum* var. *confertum* Vasey,[3] in which the panicle is much larger, the lower rays far exceeding the middle and upper, var. *confertum* thus being scarcely separable from typical *P. virgatum* to which Hitchcock & Chase rightly reduce it. *P. virgatum*,

[3] Bull. Torr. Bot. Club. **13**: 26. 1886.

var. *breviramosum* of Nash[4] differs from the new *P. virgatum*, var. *thyrsiforme* by having a much smaller panicle (9–13 cm. long, 3–5 cm. wide) and shorter leaves.

Ranging from southeastern Nova Scotia and near the coast from the lower Penobscot Valley to New Jersey and locally to central New York, is a variety which has been confused with both *P. virgatum* and its var. *cubense*. It is, however, readily separated from these by having, not the long scaly, creeping rootstock, but very numerous culms rising from a stout multicipital caudex with very short internodes and with quickly ascending short basal offshoots. The shape of the spikelet in the cespitose plant differs from that of true *P. virgatum* in that, owing to the spreading of the first glume (a habit which, however, is not constant), the spikelet looks blunt and squarish instead of elongate. Again, the spikelet has a more constant length, ranging between 3.2 and 4 mm., the majority being around 3.5 mm.; while the spikelets of typical *P. virgatum* range from 3.5 to 6 mm. in length. The panicle varies from open to quite close, just as in the true form of the species.

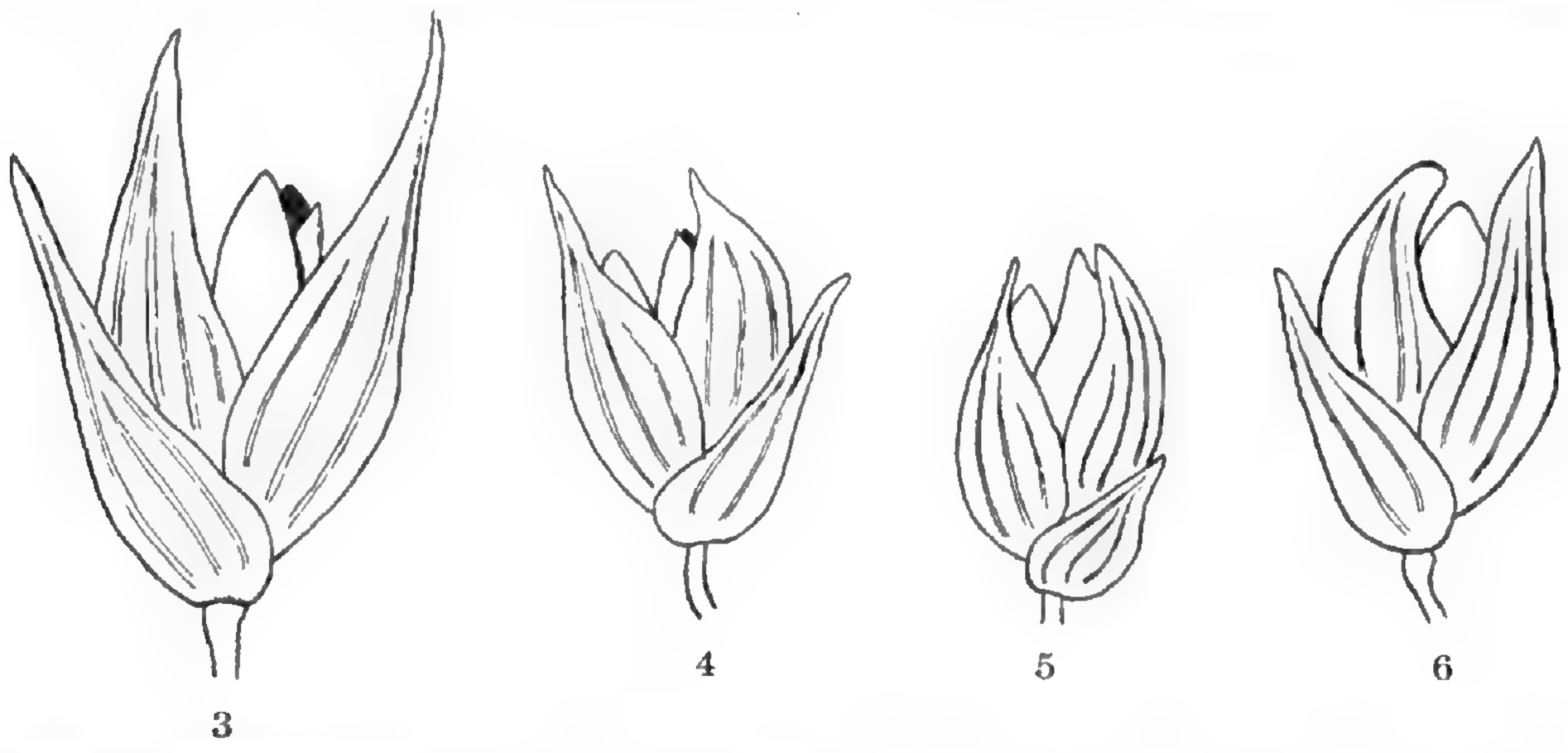
Fig. 2. Base of var. spissum.

The following key will give a more concise idea of the classification of the varieties here discussed:

Plants with long, scaly, creeping rootstocks.
  Lower rays of panicle longer than middle ones.
    Spikelets 3.5–6 mm. long: palea shorter than second glume — *P. virgatum* L.
    Spikelets 2.8–3.2 mm. long: palea and second glume subequal — var. *cubense* Griseb.
  Lower rays of the panicle scarcely exceeding the middle ones.
    Blades 12–15 mm. broad, stiff, coriaceous: lemma rounded at tip: second glume short-mucronate: panicle ellipsoid — var. *scorteum*.
    Blades 7–11 mm. broad, not stiff or coriaceous: lemma pointed: second glume tapering to subulate tip: panicle ellipsoid-cylindrical — var. *thyrsiforme*.
Plants with short, quickly ascending rootstocks, forming tussocks — var. *spissum*.

[4] Bull. Torr. Bot. Club. **23**: 150. 1896.

PANICUM VIRGATUM L., var. **scorteum**, n. var., perenne; culmis erectis robustis simplicibus paucis vel solitariis 7.7 dm. altis; rhizomatibus squamosis repentibus; laminis 4.1–4.5 dm. longis 1.1–1.2 cm.



Figs. 3–6. Spikelets × 5. 3, type-form; 4, var. spissum; 5, var. cubense; 6, var. scorteum.

latis levibus rigidis coriaceis; paniculis anguste cylindratis multifloris, rami inferioribus medios paullo superantibus; spiculis 3.5 mm. longis; gluma superiore breviter mucronata; lemmatibus sterilibus apice rotundatis, gluma superiore brevioribus paleam superantibus.

Culms erect, stout, solitary or few, 7.7 dm. tall: rootstock scaly, creeping: blades 4.1–4.5 dm. long, 1.1–1.2 cm. broad, smooth, stiff, coriaceous: panicle narrowly ellipsoid, contracted, and many-flowered, the lower rays barely equalling the middle ones: spikelet 3.5 mm. long: first glume two-thirds the length of spikelet with middle nerve serrate towards the summit, shorter than the second glume and exceeding the palea. BERMUDA: rocks, shore of Flatt's Inlet, Smith's Parish, July 8, 1905, *A. H. Moore*, no. 2,850 (TYPE in Gray Herb.).

PANICUM VIRGATUM L., var. **thyrsiforme**, n. var., perenne; culmis erectis simplicibus paucis vel solitariis 6.8–13.5 dm. altis; rhizomatibus squamosis repentibus; laminis 3.5–5 dm. longis 6–10 mm. latis, vaginis glabris; paniculis ellipsoideo-cylindratis 2.5–3 dm. longis 4–10 cm. diametro, ramis tenuissimis multifloris inferioribus vix medios aequantibus.

Culms slender, erect, simple, solitary or few, 6.8–13.5 dm. tall: rootstocks scaly, creeping: blades 3.5–5 dm. long, 6–10 mm. broad; sheaths glabrous: panicle ellipsoid-cylindrical, 2.5–3 dm. long, 4–10 cm. in diameter; rays very slender and many-flowered, the lower rays barely equalling the middle ones. FLORIDA: swamp, Indian River region, Brevard County, November 28, 1902, *A. Fredholm*, no. 5,580 (TYPE in Gray Herb.); swamp, Hillsboro County, August 28, 1904, *A. Fredholm*, no 6,365; Pine Key, Key West, *Blodgett*; Bay Head, August 30, 1898, *Coombs*, no. 646. MISSISSIPPI: Biloxi, September 7, 1898, *S. M. Tracy*, no. 4,465. This last specimen is exceptionally large.

PANICUM VIRGATUM L., var. **spissum**, n. var., perenne; culmis erectis simplicibus numerosis 3.2–11 dm. altis; rhizomatibus brevibus statim adscendentibus; laminis 3–4.5 dm. longis 3–7 mm. latis longe acuminatis, vaginis glabris; paniculis rare contractis, ramis adscendentibus inferiore medios superantibus; spiculis quadratis 3.2–4 mm. longis; gluma inferiore acuminatia 3–4 nervia; gluma superiore lemmatibusque sterilibus subaequalibus 5–7 nerviis paleam superantibus.

Culms erect, cespitose, from short quickly ascending rootstocks: blades 3–4.5 dm. long, 3–7 mm. broad, long-acuminate; sheaths glabrous: panicle rarely contracted; rays ascending, the lower exceeding the middle and upper ones: spikelets squarish, 3.2–4 mm. long: first glume attenuate, 3–4 nerved, two-thirds the length of the spikelet: second glume and sterile lemma subequal, 5–7 nerved, and exceeding the palea. This variety, as may be seen from the following citations, has its greatest development in eastern Massachusetts and Nova Scotia. NOVA SCOTIA: peaty pockets in cobbly beach, Great Pubnico Lake, September 6, 1920, *Fernald, Long, & Linder*, no. 19,766 (TYPE in Gray Herb.); gravelly thicket bordering Salmon (Greenville) Lake, August 13, 1920, *Fernald, Long, & Linder*, no.19,758; cobble beach of Butler's (Gavelton) Lake, Gavelton, September 4, 1920, *Fernald, Long, & Linder*, no. 19,760; boggy savannah bordering St. John's Lake, Springhaven, October 8, 1920, *Fernald, & Linder*, no. 19,767; sandy and gravelly beach of Bower's (Beaver Dam) Lake, September 10, 1921, *Fernald & Long*, no. 23,187; cobbly beach of Jones Lake, Roseway River, August 3, 1921, *Fernald & Long*, no. 23,184; upper border of cobbly beach, McKay's Lake, Middle Ohio, Shelbourne County, August, 3, 1921, *Fernald & Long*, no. 23,183 upper border of cobbly beach, Wentzell Lake, Lunenburg County, August 17, 1921 *Fernald & Long*, no. 23,185; rocky shore, Gilfilling Lake, August 23, *Fernald & Long*, no. 23,186; cobbly beach, Goven Lake, July 23, 1921, *Fernald,Long & Bartram*, no. 23,182. MAINE: railroad ballast, Bangor, September 7, 1916, *Fernald & Long*, no. 12,-480; rocky shore, south end of island, Pushaw Bridge, Oldtown, September 18, 1899, *Fernald*; damp sandy shore, Kezar Lake, Lovell, August 30, 1918, *Pease*, no. 17,288; border of salt marsh, Wells, August 8, 1916, *Fernald & Long*, no. 12,478. NEW HAMPSHIRE: shore of Ossipee Lake, September 9, 1903, *T. O. Fuller;* salt marsh island, Seabrook, August 7, 1898, *E. F. Williams*. MASSACHUSETTS: brackish soil, Amesbury, July 23, *White*, no. 248; Medford, July 30, 1880, *C.E. Perkins*; in wet sand of dune hollows, Plum Island, August 11, 1913, *White*, no. 312; edge of cranberry bog near Shawshine River, Ballardvale, September 26, 1903, *Pease*, no. 2,953; Revere, August 13, 1880, *C. E. Perkins*; Readville, July 28, 1870, *Wm. Boott*; Charles River, Dedham, July 27, 1883, *Fuller*; edge of swamp, Concord, August 28, *H. D. Thoreau*; open woods, Scituate, September 6, 1897, *E. F. Williams*; dry sandy upper beach of small pond west of White

Pond, Chatham, September 9, 1913, *Fernald & Long*, no. 8,525; stony beach, Barnstable, September 17, 1916, *F. T. Hubbard*; Eastham, August 24, 1914, *F. S. Collins*, no. 3,125; Chilmark, August 30, 1895, *S. Harris*; Wanwinnit, Nantucket, September 8, 1894, *E. F. Williams*. RHODE ISLAND: Newport, August 24, 1901, *E. A. Mearns*, no. 600; dryish borders of salt marshes about Harbor Pond, Block Island, August 19, 1913, *Fernald & Long*, no. 8,524; Prudence Island, July 23, 1911, *Hope*; Tiverton, August 19, 1877, *J. C. Phillips*. CONNECTICUT: Sawpit, Guilford, July 17, 1904, *W. R. Dudley*; sandy soil above strand of brackish pool, Old Lyme, September 2, 1918, *C. A. Weatherby*, no. D 1,820. NEW YORK: meadow, Ithaca, August 29, 1916, *Metcalf*, no. 5,512; sandy shore of Sweezy Pond, Southampton, Long Island, July 26, 1920, *St. John*, no. 2,564; thicket by pond-shore, Fisher's Island, August 10–15, 1920, *St. John*, no. 2,568; in sand, pine woods, Staten Island, September 14, 1917, *Gershoy*, no. 762. NEW JERSEY: Ventnor, August 20, 1898, *Githens*; Beach Haven, October 19, 1907, *Long*; sandy roadside, Barnegat City, September 22, 1908, *Long*; sandy places, Five-Mile Beach, October 2, 1899, *MacElwee*, no. 1,383. PENNSYLVANIA: Delaware River south of Torresdale, October 1, 1898, *Krout*; swamp, pasture, Fulton Loop, July 8, 1904, *Carter*.

The New England material is to be found in the herbarium of the New England Botanical Club, or the Gray Herbarium; that from New Jersey and Pennsylvania in the herbarium of the Philadelphia Academy of Natural Sciences.

In closing, I wish to thank Prof. Fernald for his valued assistance and Mr. Bayard Long for his kindness in arranging the loan of the material from the Philadelphia Academy

HARVARD UNIVERSITY.

MUSCARI COMOSUM A NEW INTRODUCTION FOUND IN PHILADELPHIA.

BAYARD LONG.

As in many of our higher schools throughout the country which give a general course in Biology, a portion of the work at the Philadelphia High School for Girls consists in preparing a small series of botanical specimens. Dr. Ida A. Keller has charge of this work. Through her close association with the Philadelphia Academy she has from time to time brought to notice specimens often of considerable interest collected by her students. To Miss Dorothy Keeney is due our

knowledge of one of the few stations for the Asiatic *Geranium sibiricum* in the Philadelphia region—in the United States, it may be said with almost equal significance. Another year, a new locality for *Ellisia Nyctelea* was discovered near Berwyn by Miss Margaretta Atkinson. This is an exceedingly rare plant in the area about Philadelphia, and hitherto unknown from Chester County. More recently Dr. Keller brought to the Academy for identification the inflorescence of an unfamiliar species of *Muscari,* which, with the aid of the excellent illustrations in Coste's *Flora de la France* and comparison with Old World specimens, was found to be the Eurasian *M. comosum* (L.) Mill. Dr. Keller, on our enquiring where this strange flower had been obtained, informed us that she was under the impression it had been found growing wild in the southern part of the city. This being a species apparently never recorded in America (as far as literature immediately at hand showed) Dr. Keller was urged to obtain full information about the occurrence of the plant.

To those who know the country roads and the grassy meadows of southeastern Pennsylvania in early spring, a familiar sight is the plant with dainty little globular blue flowers in a close raceme, which is known here as Blue Bottles, Blue Bells, or at times a more bookish (but very appropriate) name, Grape Hyacinths—and to the botanist, *Muscari botryoides.* So frequent is this plant about Philadelphia that it is known to every child in the country districts, and to the botanist it often seems, unfortunately, "too common to collect." It is occasionally seen in old gardens but is much more frequently met thoroughly naturalized in open grassy places. Apparently the Philadelphia area is its center of frequence but it has been collected southward to Washington, D. C., and northward to Massachusetts. Another, similar, species, *M. racemosum*, with very narrow leaves and a more cylindric corolla occurs in a few places in the Philadelphia district but it is a very local and little known plant. There are scattered localities from at least Massachusetts to Virginia. Some stations are upon lawns, where it has proved to be a weed difficult of eradication. Probably it is as frequent along the Potomac above the city of Washington as anywhere in America. But *M. comosum* has not been known heretofore from this continent except as a rare plant in cultivation.

The collector of the specimen of *Muscari comosum*, Miss Adelaide Allen, fortunately was able to designate exactly where it had been

obtained, as the spot lay along the familiar route from her home to school. Through her kindness, and the interest of Dr. Keller, we learned that it grew along the sides of a dyke, running in to South Broad Street from outlying farm houses, near League Island Park, in the southern portion of Philadelphia. This area consists in large measure of the extensive alluvial flats and marshes of the lower Delaware, more or less intersected by ditches. The region is not yet built up to any extent and the more elevated portions are frequently occupied by truck-farms. The southern extension of Broad Street, with its trolleys, offers one of the chief lines of travel in this particular locality, and the nearby farms often obtain access thereto by dykes laid down over the low meadows and more impassable places. These dykes are continually augmented by the dumping of ashes and rubbish down their sides.

In such a habitat, from a detailed sketch-map furnished by Miss Allen, the *Muscari* was found growing. Three small colonies, or clumps, were located but they were without flowers. It was hoped that another year a flowering specimen might be obtained, but a second visit to the station proved no more successful. A trail of withered buttercups lay along the foot-path on the top of the dyke. This was no place to expect to find such a striking flower waiting to be collected by a botanist, when who knows how many little flower-pickers daily passed over this dyke and spied the bright cluster of blossoms as soon as it appeared. So the botanist carefully dug up two bulbs and took them home to his garden, where he had the satisfaction of seeing them flower.

The foremost question always arising on the discovery of any new introduction is whence and how did it arrive. Sometimes happily, this information may be obtained readily, but too often, unfortunately, mere conjecture must take its place.

From the origin and occurrence with us of *M. botryoides* and *M. racemosum* it was naturally presumed that these colonies of *M. comosum* were also escapes from cultivation. But it was not found in gardens anywhere in the vicinity nor has it ever been seen in cultivation by myself or anyone of my acquaintance. Communication with various professional gardeners, horticulturists, and seedsmen indicated that it was practically unknown to these men, their acquaintance at best being with the horticultural form *monstrosum*, known as Feathered Hyacinth—a handsome plant bearing chiefly, or only,

sterile flowers and having the inflorescence transformed into a mass of finely-cut lilac shreds. The plant has been listed by very few American seedsmen, and even such a well known and large establishment as J. M. Thorburn & Co. of New York City never had more than the most limited sale for these bulbs, as they have informed me. Prof L. H. Bailey, one of our foremost horticulturists, has written me that he has no information on how extensively the true *M. comosum* is grown in this country, but is of the opinion that it is rarely planted, nor does he often see *monstrosum*. In his authoritative *Standard Cyclopedia of Horticulture* it is classed among "fancier's plants, interesting chiefly to skilled amateurs."

If it is an actual fact that this species does not occur in cultivation about Philadelphia (and sufficient effort has been expended to suggest that, if grown here, it must be exceedingly rare) one is perforce led to believe that this occurrence may well be of direct foreign introduction. The associated species on the sides of the dyke were distinctly types of foreign weeds rather than escapes from cultivation—in fact a seedling *Allium* of doubtful identity was the only species noted that could by any possibility suggest cultivation. Characteristic associates were *Sisymbrium altissimum*, *Thlaspi arvense*, *Lactuca Scariola*, species of *Bromus*, *Lepidium*, *Melilotus*.

Muscari comosum proves to be an unusually attractive species and perhaps some description of it may not be without interest, especially as it may possibly lay a certain small claim, like some foreigners, to being "American."

The leaves arise in earliest spring, or even in late winter in mild years, but the flower-cluster does not appear for some time, rarely before late April. The flowering period is in May, lasting only about ten days or two weeks. Fruit matures during July, and after the dehiscing of the capsules the plant soon dies down.

The most unique feature of the species lies in the flowers. The lower ones on the inflorescence are normal and fertile but the upper are sterile, abortive, and markedly different in appearance. Before the fertile flowers open they are of a deep, rich royal-purple and borne on ascending pedicels. At anthesis the pedicels have elongated and become stiffly horizontal, while the perianth has lost most of its purple coloring, having faded to a dull brownish on the distal half and dull yellowish at the base. As the progression of bloom passes up the scape a very loose, open raceme is finally formed. Surmounting

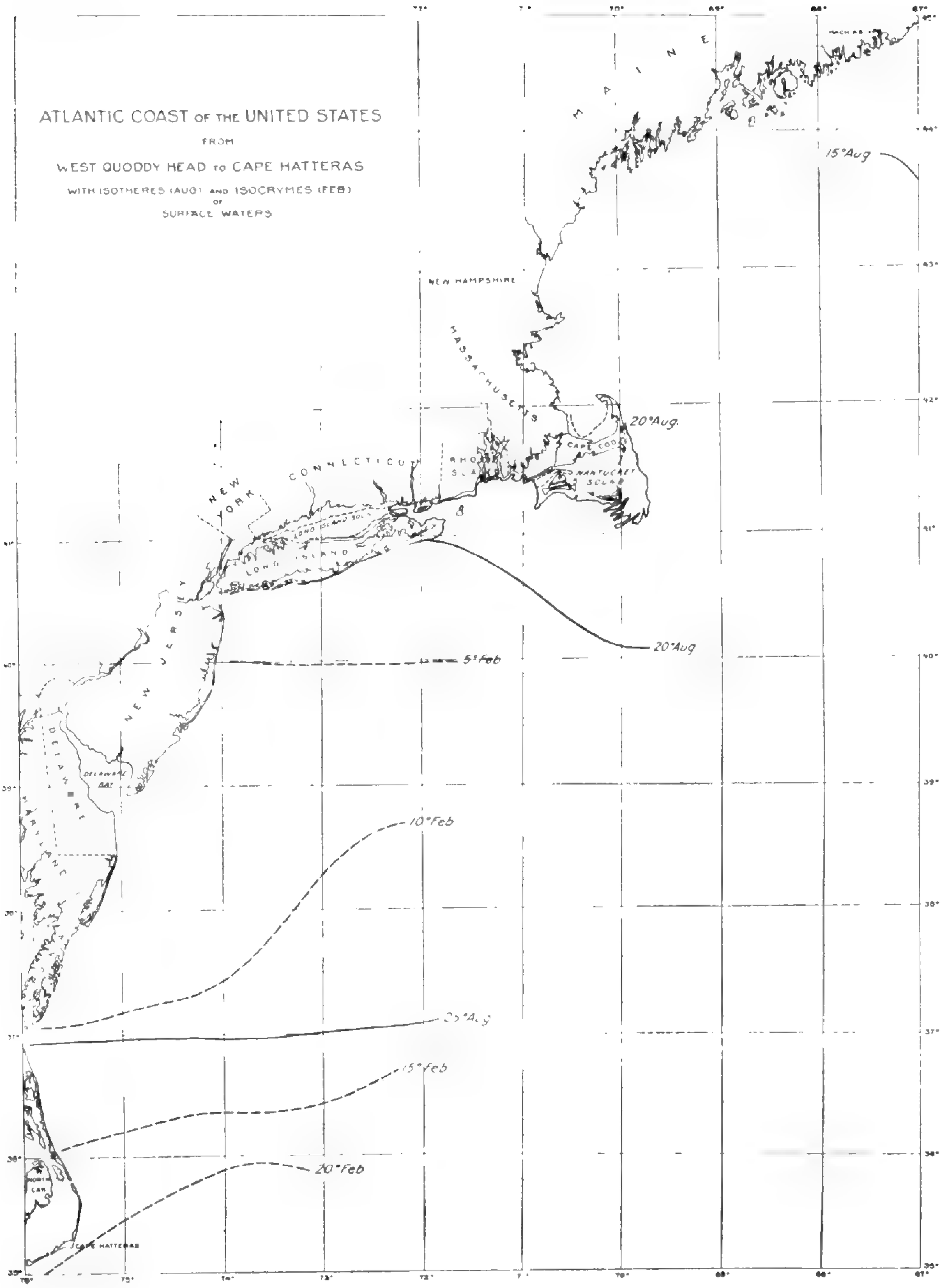
the raceme is a corymbose cluster of sterile flowers on long, slender, (from the first) arcuate-ascending pedicels. The little aborted blossoms and the filiamentous pedicels are of a pale but bright violet —a striking contrast in color to that of the normal flowers.

The small andrenid bees are frequent visitors at the fertile flowers and seed appears to set readily. Blossoms not fertilized soon disarticulate from the pedicels and the sterile cluster withers up shortly after the fertile flowers have faded.

The capsules, as they become yellow and dry in maturity, show handsome pinnate veining on each triangular valve. They do not split very wide open and often retain the basal seeds for some little time—possibly even till the disintegration of the capsule. The seeds, black and roundish, appear to be viable to a goodly percentage, as seedlings in my garden testify.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

The date of the December issue (unpublished as this goes to press) will be announced later.



ISOTHERES AND ISOCRYMES FROM WEST QUODDY HEAD TO CAPE HATTERAS.

Rhodora

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NEW ENGLAND BOTANICAL CLUB

Vol. 24. February, 1922. No. 278.

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SOME VARIATIONS OF CAKILE EDENTULA.

M. L. Fernald.

The Sea Rocket, *Cakile edentula* (Bigelow) Hook., as it occurs on the north Atlantic coast—from Iceland and Labrador to South Carolina and the Azores—is essentially uniform, a comparatively low and, when well-developed, a loosely branched and sprawling fleshy plant, with the upper and fertile joint of the fruit ovoid and tapering to a short flattish beak.

About the Great Lakes a plant essentially indentical with that of the Atlantic coast is of local occurrence but it there gives place primarily to a more slender or less fleshy plant with the slender upper joint of the silique long-beaked. This slender-fruited plant of the Great Lakes has been treated by Millspaugh[1] as *C. americana* Nutt. as contrasted with the broader-fruited *C. edentula*; and with the Great Lake plant he has associated a few slender-fruited individuals of the Atlantic coast. There is nothing in Nuttall's description, however, to indicate that by *C. americana* he intended anything but *C. edentula*, unless it be the secondary habitat, "also on the shores of the great North Western Lakes of the St. Lawrence." Nuttall calls for a plant with "Leaves carnose, entire, . . . both articulations often seminiferous, uppermost ovate."[2] This description is applicable to much of *C. edentula* but not to the slender-fruited plant of the Great Lakes, a plant which has, as Millspaugh says, "Leaves . . with crenate dentations tending to laceration, and even lobation."

[1] Millspaugh, Field Mus. Bot. Ser. ii. 127 (1900).

[2] Nutt. Gen. ii. 62 (1818).

On the Pacific coast of North America, from British Columbia to California, *Cakile edentula* is represented by the plant proposed by Heller as *C. californica*[1]. This is somewhat stouter and taller and with more ascending branches than the plant of the Atlantic coast, but its fruits are in form essentially identical with those of many eastern specimens. Greene, who was not disinclined to recognize new species, could not separate the Californian material from *C. edentula,* although he was surprised to discover that the two are conspecific, for "from the analogies of plant distribution in America where Old World genera are concerned, we should have expected the other species, *C. maritima* of Europe, to recur on the Pacific coast, rather than that the Atlantic American species should have found place here."[2] Again, Millspaugh, in monographing the genus, was unable to separate the Californiana plant and treated it as "introduced." Heller had examined one collection of the eastern plant and from it drew the conclusion, "that the fruit is smaller and more elongated than ours [the Californian]"; but had he seen but one collection of the Pacific coast plant and an adequate series from the Atlantic coast he could have reversed this decision.

In one fundamental character alone do the plants of the Great Lakes and of the Pacific coast differ from those of the Atlantic shores. In the latter the articulating surfaces of the two joints, although varying in the degree of convexity or concavity, are essentially smooth. All mature fruits from the Great Lakes and the Pacific, on the other hand, show a striking departure. The articulating surface of the lower joint bears two elongate and four shorter subulate processes which form two correspondingly deep and four shallow pits in the articulating surface of the upper joint. This character is seen in all Great Lake specimens examined, both in the extreme plant with lacerate or deeply lobed leaves and slender long-beaked siliques and in the plant with merely dentate leaves and ovoid short-beaked terminal joints to the silique. On the Atlantic coast very exceptional individuals show a slight development of the processes and pits and others, equally exceptional, have slender siliques.

[1] Heller, Muhlenbergia, iii. 10 (1907).
[2] Greene, Fl. Francisc. 277 (1891).

It is evident, then, that *C. edentula* is a species of northern origin, originally extending from Iceland to the North Pacific but since the Pleistocene segregated into three geographic areas, the north Atlantic shores, shores of the Great Lakes and shores of the Pacific; and that in each of these areas the species has developed local tendencies which, although of geographic significance, are not to be considered of specific value. The three variations are

CAKILE EDENTULA (Bigelow) Hook., var. **typica**. *C. edentula* (Bigel.) Hook. Fl. Bor.-Am. i. 59 (1830); Millsp. Field Mus. Bot. Ser. ii. 129 (1900). *Bunias edentula* Bigel. Fl. Bost. 157 (1814). *C. americana* Nutt. Gen. ii. 62 (1818); Millsp. 1. c. 127 (1900); in part. *C. maritima* β. Torr. & Gray, Fl. i. 119 (1838), in great part. *C. maritima*, var. *americana* (Nutt.) Torr. Fl. N. Y. i. 66 (1843), mostly. *C. lanceolata*, subsp. *edentula* (Bigel.) O. E. Schulz in Urban. Symb. Ant. iii. 504 (1903).—Upper joint of silique ovoid or rarely ovoid-lanceolate, short-beaked, its articulating base without pits or pits only rudimentary; articulating summit of lower joint without processes or processes barely developed.—Iceland and Labrador to South Carolina, rarely inland to the Great Lakes; Azores.

Var. **lacustris**, n. nom. *C. americana* Millsp. 1. c. 127 (1900) as to plant described (the Great Lake plant), not Nutt.—Upper joint of silique ovoid-lanceolate, long-beaked, its articulating surface with two deep and four shallow pits; articulating summit of lower joint with two long and four short subulate processes.—Strands of Lakes Ontario, Erie, Huron and Michigan. Since Millspaugh mistook this for Nuttall's *C. americana*, it is well to designate a TYPE: sand along Lake Michigan, Millers, Indiana, September 4, 1911, *E. E. Sherff* in Gray Herb.

Var. **californica** (Heller), n. comb. *C. californica* Heller, Muhlenbergia, iii. 10 (1917).—Stiffer, with more ascending branches than var. *typica*; fruits similar, but the articulating surfaces with six well developed processes and pits.—Coast of the Pacific, from British Columbia to California.

GRAY HERBARIUM.

A NEW SPECIES OF ELEOCHARIS FROM MASSACHUSETTS

C. A. WEATHERBY.

ELEOCHARIS **fallax** n. sp., perennis; rhizomate longe repente, diametro circa 2 mm., paleis amplectentibus herbaceis striatis longe acuminatis fusco-rubris obsito; culmis fasciculatis, sectione transversali subteretibus vel siccatis leviter compressis, subellipticis, striatis, gracilibus (diametro ad apicem vaginae superioris 0.5–1.1 mm.),

3–7.6 dm. (plerumque 3–4 dm.) altis; vaginis superioribus rubro-tinctis, apice suboblique truncato integro nec incrassato cartilagineoque nec hyalino juventute punctato aetate fusco; spiculis ovatis vel lanceolatis, acutis, 7–10 mm. longis, circa 3 mm. latis; squamis ovato- vel obvato-oblongis, obtusis, 2.5–3 mm. longis, superne castaneis vel fusco-rubris, costa viridescente, apice et margine angusto hyalinis; setis 3–4(–5), retrorse barbatis, acheniis paullo vel etiam dimidio brevioribus stylis trifidis; acheniis 1.7–2 mm. longis (tuberculo incluso), circa 1 mm. latis, obtuse triangulatis, obovoideis, luteis, levissime reticulato-rugulosis postquam squamae decidunt persistentibus; tuberculis griseis pyramidalibus, acutis, 0.4–0.5 mm. altis, equaliter vel paullo minus latis, ab acheniis evidenter distinctis, basi quam punctus insertionis latioribus.

Perennial; rootstock creeping, about 2 mm. in diameter, beset with sheathing, herbaceous, striate, long acuminate, dark red scales; culms clustered, subterete or, at least in dried specimens, slightly compressed and somewhat elliptic in cross-section, striate, slender (0.5–1.1 mm. in diameter at the summit of the upper sheaths), 3–7.6 dm., averaging 3–4 dm., tall; upper sheaths tinged with red, subobliquely truncate at summit, the margin there entire, not thickened and cartilaginous nor hyaline, finely red-punctate when young, dark in age; spikelets ovate or lanceolate, acute, 7–10 mm. long, about 3 mm. broad; scales ovate- or obovate-oblong, obtuse, 2.5–3 mm. long, castaneous or dark red above with green mid-rib and narrow hyaline apex and margin; styles three-parted; bristles present, 3–4(–5), downwardly barbed, half as long as the achene or only a little shorter; achenes 1.7–2 mm. long (tubercle included), about 1 mm. broad, obtusely triangular, obovoid, yellow, very slightly reticulate-roughened by the raised walls of the epidermal cells, persistent after the fall of the scales; tudercles gray, pyramidal, acute, 0.4–0.5 mm. high, about as broad or a little narrower, evidently distinct from the body of the achene, the base wider than the point of attachment so that the lateral portions, especially at the angles, are free.—MASSACHUSETTS: fresh and barckish springy border of Dinah's Pond, Yarmouth, Aug. 16, 1919, *Fernald & Long*, no. 18,025.

A somewhat puzzling plant. It has the aspect and entire sheaths of the group of *E. palustris*, but is at once distinguished therefrom by its three-parted styles and bluntly trigonous achenes. It combines some of the characters of *E. capitata* (*E. tenuis*) and of *E. arenicola*, but differs from the former in its much smoother achenes and in the regular presence of bristles, from the latter in that the achenes are persistent after the fall of the scales, and from both in the larger size of the achenes and the entire sheaths. *E. arenicola* is apparently its nearest relative—one of the many cases in which a southern type reappears on Cape Cod.

E. arenicola Torr., of which *E. fallax* may be regarded as a northeastern representative, is a species of wide range, extending from South Carolina along the coast to Florida and Texas, thence westward across the continent, apparently following the tertiary and quarternary formations, to southern California and southward, through many Mexican stations, to Guatemala. It varies considerably in certain characters. In all the specimens seen from the southeastern states, the achene is fuscous and the whole base of the tubercle is adnate to it. In typical *E. arenicola* from Texas the achene is yellow and the point of attachment less wide than the base of the tubercle so that its lateral portions are free. Both types of achene and intergradient forms occur, however, in Californian and Mexican material and, as there are no correlating characters, segregation on these lines seems impracticable.

Since most of the Mexican specimens of *E. arenicola* were distributed as *E. montana*, *E. truncata*, or without a name, it may be worth while to cite representative specimens. Such are: Saltillo, Coahuila, June, 1898, *Palmer*, no. 255; in paludosis, Morales, San Luis Potosi, 1876, *Schaffner*, no. 577, and Penasco, no. 578; Durango, 1896, *Palmer*, nos. 99, 974; Valley of Oaxaca, April 19, 1896, *Conzatti*, no. 94.

E. arenicola is apparently closely allied to *E. montana* (HBK.) R. & S., with which it has been united. There is in the Gray Herbarium a single specimen (*Lehmann*, no. 8735) which is from the type region of *E. montana* and which, as Dr. Britton has noted on the sheet, may represent that species. Except in the shape of the spikelet, it agrees well with the original description, especially in the two points, the many-flowered spikelet and the more or less acute scales, in which it differs most conspicuously from *E. arenicola*. It seems likely that *E. arenicola* and *E. montana* are closely related, but sufficiently distinct species.

Two other species, *E. Dombeyana* Kunth and *E. truncata* Schlecht., have also been referred to *E. montana*, but, from the specimens on hand, appear very distinct. The former is a plant of the South American Andes, ranging, so far as the material seen indicates, from Ecuador to Bolivia. There is no absolutely authentic specimen in the Gray Herbarium, but the following seem certainly to belong here: ECUADOR: in Andibus, 1857–9, *Spruce*, no. 5912; in hot springs at Banos,

vicinity of Cuenca, Sept. 17–24, 1908, *Rose*, no. 22893. BOLIVIA: vicinity of La Paz, alt. 10,000 ft., 1890, *Bang*, no.144; vicinity of Cochabamba, 1891, *Bang*, no. 996.

E. truncata is apparently a very local plant of the Federal District of Mexico. It is very close to *E. Dombeyana*, from which it is distinguished by its longer and proportionately narrower spikelets and by the slightly different shape of the achenes. Here belong the following: MEXICO, FEDERAL DISTRICT: wet soil, Cuantitlan, Aug. 14, 1899, *Pringle*, no. 8214; Valley of Mexico, May 7, 1898, *Pringle*, no. 7655; bords des fossés, près Mexico, May 3, 1866, *Bourgeau*, no. 214.

The appended key may help to distinguish the plants discussed.

a. Achenes 1–1.5 mm. long; upper sheaths commonly mucronate.
  b. Tubercle mucroniform, its sides nearly parallel, much less than half as wide as the body of the nearly smooth achene.
    c. Spikelets ovate, the largest not over 8 mm. long.....*E. Dombeyana.*
    c. Spikelets lanceolate to linear, rarely under 8 and up to 12 mm. long.....*E. truncata.*
  b. Tubercle pyramidal, much wider at base than above, about half as wide as the body of the achene, which is distinctly though lightly reticulate-roughened under magnification.
    d. Well-developed spikelets 70–85-flowered; scales oblong-ovate, at least the upper acute.....*E. montana.*
    d. Well-developed spikelets not over 45-flowered; scales all very obtuse.....*E, arenicola.*
a. Achenes 1.7–2 mm. long, lightly but distinctly reticulate-roughened under magnification; tubercle pyramidal; upper sheaths entire.....*E. fallax.*

GRAY HERBARIUM

NOTES ON SPARGANIUM.

M. L. FERNALD.

SINCE the publication[1] in 1907 of the detailed notes on *Sparganium* much material has accumulated and new light has been thrown on the identities and ranges of our species.

Prior to the war the most scholarly authority on the genus, Professor Wladislaw Rothert, formerly of the University of Odessa, later residing at Riga or at Cracow, had in preparation a monograph of the genus and some of the matter here presented was to have been published by him. Since, however, Dr. Rothert suffered the tragic

[1] Fernald & Eames, RHODORA, ix. 86 (1907).

fate of so many elderly Polish and Russian scientists[1] and there is no assurance that his monograph will soon be published, it seems important that, in so far as they clarify our understanding of the species, his critical notes on American *Sparganium* (contained in long and detailed letters to the present writer) should now be quoted. The following notes are, therefore, based in part upon a review just made of the specific characters of *Sparganium* in eastern America, in part upon Dr. Rothert's notes.

SPARGANIUM ANDROCLADUM (Engelm.) Morong, Bull. Torr. Bot. Cl. xv. 78 (1888), in part and as to name-bringing synonym; Bicknell, ibid. xxxv. 58 (1908). *S. simplex*, var. *androcladum* Engelm. in Gray, Man. ed. 5, 481 (1867). *S. lucidum* Fernald & Eames, RHODORA, ix. 87 (1907); Rydberg, N. A. Fl. xvii. 7 (1909).

When *S. lucidum* was published too much dependence was placed upon the abundant specimens of branching *S. americanum* Nutt. (*S. simplex*, var. *Nuttallii* Engelm.) which had been labeled by Morong as *S. androcladum*.

As Dr. Rothert points out in a letter, Engelmann distinguished his var. *androcladum* from the branching state of *S. americanum*, and a detailed study of all available material makes this clear. In branching *S. americanum* the branches usually bear 1–3 pistillate and 1–6 staminate heads; in *S. lucidum* 3–8 staminate and usually 0 (very rarely 1 or even 2) pistillate heads. In *S. americanum* the fruiting heads are 1.5–2.5 cm., in *S. lucidum* 2.5–3.5 cm. in diameter; in *S. americanum* the mature carpels have the stipe 2–3 mm. long, the body 4.5–5.5 mm. long and about 2 mm. thick, the beak 1.5–5 mm. long and the stigma 1–2 mm. long; in *S. lucidum* the stipe measures 2.5–4 mm., the body 5–7 by 2.5–3 mm., the beak 4.5–6 mm. and the stigma 2–4 mm.

Engelmann's original treatment clearly shows, as Rothert points out, that the branching state of *S. americanum* (the plant taken up largely by Morong and later by Rydberg as *S. androcladum* and by Fernald & Eames as *S. americanum*, var. *androcladum*) was considered by him merely a trivial state of his var. *Nuttallii* and that his new var. *androcladum* was *S. lucidum*, most appropriately named by Engelmann from the ordinarily wholly staminate branches of the inflorescence. Engelmann's treatment follows:

[1] See Revue Gén. Bot. xxxii. 238 (1920). Professor de Jaczewski of Petrograd informs me that Dr. Rothert died in 1917.

"Var. **Nuttallii.** Like the last or type [*S. simplex*], but heads axillary; stigma linear-oblong, shorter than the style; fruit less contracted. (S. Americanum, *Nutt.*)—From Pennsylvania and New England northward and northwestward.—Inflorescence rarely branched; heads 8″–9″ wide.

Var. **androcladum.** Stouter (1½°–3° high); inflorescence branched below; branches bearing numerous sterile (rarely also 1 or even 2 fertile) heads; stigma linear, as long as the style; fruit larger, not contracted, long-tapering upwards and downwards. (S. ramosum, in part, of American authors.)—From New England southward and especially westward.—Heads 10″–12″ wide."

In this connection Rothert's decision, based upon study of Engelmann's herbarium, is important.

"As to your *S. lucidum*, my doubts as to its specific difference from *S. americanum* and its determinability in the flowering condition too had already been resolved by the very good material seen formerly [before receiving a new series of specimens], especially from Missouri, where it seems to be comparatively common. At the same time I had come to the conclusion, that this plant should bear the name *S. androcladum* (Engelm.), Engelmann having meant by his *S. simplex*, var. *androcladum* doubtless the same as your *S. lucidum*, only Morong having afterwards confounded it with the branched specimens of *S. americanum* Nutt., which Engelmann had justly and clearly distinguished from it as *S. simplex*, var. *Nuttallii.* This view is confirmed also by Engelmann's type specimens."[1]

The distribution of *S. androcladum* (*S. lucidum*) is unusual. Abundant in eastern Missouri and adjacent Illinois, it is apparently unknown or at least unrecorded in the region between the Mississippi Valley and eastern Pennsylvania. Thence it extends to Long Island and eastward to Nantucket, Cape Cod and Middlesex County, and up the Connecticut Valley to Franklin County, Massachusetts. It seems to be isolated in the Champlain Valley, Vermont (bank of Winooski River, Burlington, August 30, 1903, *N. F. Flynn*) and in the St. Lawrence Valley below Quebec (Beauport, July 30, 1905, *J. Macoun* no. 68,925). This distribution in New England and eastern Canada at once suggests that the plant has followed inland the regions where marine clays left by the Champlain subsidence are found and that search will show it to be more abundant than we now realize.

[1] Rothert in lit. July 12, 1912.

S. CHLOROCARPUM Rydberg, var. **acaule** (Beeby), n. comb. *S. simplex*, var. *acaule* Beeby in Macoun, Cat. Can. Pl. ii. 367 (1890). *S. diversifolium*, var. *acaule* Fernald & Eames, RHODORA, ix. 88 (1907). *S. acaule* Rydberg, N. A. Fl. xvii. 8 (1909).

When the erect *Sparganium* of northeastern America with supra-axillary heads and short stigma (0.8–1.7 mm. long) was separated in 1907 from the Eurasian and western American *S. simplex* Hudson, a plant with larger fruits and longer stigma, it was identified with with *S. diversifolium* Graebn. This identification was due to the fact that in the *Pflanzenr*[illegible] raebner cites, besides the typical European material of *S. diversifolium*, Newfoundland, New England and Minnesota specimens of the common American plant. Subsequently Rydberg has described the larger extreme of the American plant as *S. chlorocarpum*[1] and has proposed as another species the smaller extreme, var. *acaule*. That the American plants should not be placed with *S. diversifolium* now seems clear. In discussing Graebner's species in 1912, Dr. Rothert said in a letter:

"I am much interested to learn from your letter, that *S. chlorocarpum* Rydb. is a form of *S. diversifolium* (in your sense) . . .

I agree with you that the smaller and the larger form of *S. diversifolium* are clearly different in typical specimens . . . . I originally supposed them to be 2 distinct species; yet they are linked together by so many and various transitions, that I am quite unable to trace a limit between them, even as varieties. . . .

"As to the nomenclature of this species, I think that the name *S. diversifolium* Graebner can by no means be kept. Graebner's name comprises chiefly *S. simplex* × *minimum* and slender forms of *S. simplex;* besides, I have seen specimens of *S. affine, S. minimum, S. glomeratum* and *S. affine* × *minimum* determined by G. himself as *S. diversifolium*, not a single one of all these fitting his description. I think a name so extremely indefinite must be absolutely cancelled and the species considered as fantastic."

In the figures accompanying Graebner's original publication of *S. diversifolium*[2] the sepals are shown to be broadly obovate and narrowed to a slender claw. In our American plant the sepals are narrowly cuneate-spatulate and without definite claw. The name *S. diversifolium* should, therefore, drop from our American floras.

[1] Rydb. N. A. Fl. xvii. 8 (1909).

[2] Graebner, Schrift. Naturf. Gesellsch. Danzig, n. f. ix. 335, t. 8, fig. 1b. (1895).

S. ANGUSTIFOLIUM Michx. Fl. Bor. Am. ii. 189 (1803). *S. affine* Schnitzl. Typhac. 27 (1845). This is a circumpolar species and the identity of the Eurasian *S. affine* with our plant is clear. The specimen in the Michaux herbarium at the Muséum d'Histoire Naturelle in Paris, from Lake Mistassini, is the same as *S. affine*. This was determined by the present writer in 1903, but it had been earlier settled, apparently, by Engelmann[1] who had in 1867 cited the two as synonynous; and in 1888 Morong stated that, "Dr. Engelmann writes in a manuscript note in my possession that he, himself has seen Michaux's specimen at Paris. To this name, therefore, belongs the right of priority [over *S. affine*]."[2]

The range in New England of *S. angustifolium* (as well as the other boreal species, *S. fluctuans* and *S. minimum*) presents one feature which needs further study. *S. angustifolium* is common in the upland and northern regions of New England, extending south to Androscoggin Co., Maine, and Carroll and Grafton Counties, New Hampshire. So far as our collections indicate it is absent from southwestern Maine and southern New Hampshire, yet it occurs south of there and at lower altitudes in lakes of Essex, Middlesex and Norfolk Counties, Massachusetts. Is it truly absent from southwestern Maine and southern New Hampshire?

S. FLUCTUANS (Morong) Robinson. In the very firm texture of its fruit, with the epicarp closely investing the seed, *S. fluctuans* is unique, all our other species with long beaks having the thin and brittle epicarp easily detached from the seed. In all our other species of *Sparganium*, too, the sepals are borne chiefly at the summit of the stipe or, in the stipeless *S. eurycarpum*, at the base of the body of the fruit, and they extend from halfway nearly to the summit of the fruit. In *S. fluctuans*, on the other hand, the sepals are borne chiefly along the middle of the stipe and rarely reach the middle of the fruit. This, one of the most distinct species of the genus, is too little collected, presumably because it occurs in comparatively deep water of the larger lakes and ponds. It is essentially a boreal species, ranging from

[1] Engelm. in Gray, Man. ed. 5, 482 (1867).

[2] Morong, Bull. Torr. Bot. Cl. xv. 79 (1888). In a recent attempt (Journ. Bot. lix. 230) to clear the synonymy Mr. Arthur Bennett has misquoted Morong's words as follows: "In 1888 Morong (Bull. Torr. Bot. Club, 79) remarks: 'Engelman[n] has seen Michaux's specimen at Paris, and it is the same as *affine*';" and then drawn the amazing conclusion that, "It seems that for our plant we must use Michaux's name *affine*."

Newfoundland to Lake Mistassini and southward into the northern states. In New England it presents the same anomaly in distribution as *S. angustifolium*, occuring southward to Kennebec, Androscoggin and Oxford Cos., Maine, and Belknap Co., New Hampshire, but being unknown from southwesternMaine and southern New Hampshire, although found in lakes and ponds of Middlesex and Norfolk Cos., Massachusetts. Is it absent from southwestern Maine and southern New Hampshire?

S. MINIMUM Fries. This circumpolar species shows a peculiarity of range in New England similar to those just discussed. Frequent in Maine (south to Androscoggin Co.) and Vermont, the species is quite unknown from New Hampshire except for an old specimen with indefinite data, apparently collected at Meredith, Belknap Co., yet it occurs in Middlesex County, Massachusetts. Is *S. minimum* absent or essentially so from southwestern Maine and from New Hampshire?

In view of the many changes in the treatment of *Sparganium* the following new key to the species occurring from New England and New York northward is offered and a statement of the ranges within this area appended. Specimens showing extension of range or divergence of the specific characters will be gratefully received.

A. Stigmas 2, filiform: mature carpels sessile, broadly wedge-shaped or obpyramidal below, rounded, broadly conical or subtruncate above, 4–8 mm. thick: sepals nearly equaling the body of the fruit. . . . . 1. *S. eurycarpum.*

A. Stigma 1, linear to ovate: mature carpels about equally narrowed to summit and to the more or less stipitate base, 1.2–3 mm. thick: sepals much shorter than to ⅔ as long as body of fruit. B.

B. Staminate heads 2–20 (rarely only 1): fruiting heads 1.2–3.5 cm. in diameter: mature carpels strongly fusiform, 5.5–14 mm. long; the stipe 1–4 mm. long; the usually slender beak 1.5–6 mm. long: inflorescence simple or branching. C.

C. Sepals borne chiefly at summit of stipe, ½–⅔ as long as body of fruit: epicarp thin and brittle, readily removed from the seed; beak fragile, slender, straight or curved; stigma linear to lanceolate, 0.6–4 mm. long: anthers 0.8–1.6 mm. long: erect terrestrial plants or, if aquatic, with the floating leaves rounded and cellular-reticulate beneath and flat and opaque above. D.

D. Heads or branches of inflorescence all axillary. E.

E. Leaves stiffish, at least the middle keeled: bracts strongly ascending: branches bearing 3–8 staminate and 0 (very rarely 1 or 2) pistillate heads: stigma 2–4 mm. long: fruiting heads 2.5–3.5 cm. in diameter: mature carpels lustrous; stipe 2.5–4 mm. long: body of fruit 5–7 mm. long, 2.5–3 mm. thick; beak 4.5–6 mm. long: receptacle fimbrillate–alveolate: anthers 1–1.6 mm. long. 2. *S. androcladum.*

E. Leaves soft and mostly translucent, flat or obscurely keeled: bracts spreading or spreading-ascending: inflorescence simple or branched, the branches (when present) usually with 1–3 pistillate and 1–6 staminate heads: stigma 1–2 mm. long: fruiting heads 1.5–2.5 cm. in diameter: mature carpels opaque or but slightly lustrous; stipe 2–3 mm. long; body 4.5–5.5 mm. long, about 2 mm. thick; beak 1.5–5 mm. long: receptacle scarcely alveolate: anthers 0.8–1.2 mm. long... 3. *S. americanum.*

D. Some of the heads or branches supra-axillary. F.

F. Commonly erect and emersed: leaves flat or slightly keeled, little if at all dilated at base (except for the scarious margin): staminate half of inflorescence 2–10 cm. long, of 4–9 scattered heads (if shorter and with fewer heads, the plant very low and with ribbon-like translucent erect lower bracts): beak of fruit 2–4.3 mm. long: sepals appressed, cuneate-spatulate, scarcely narrowed to a claw.....4. *S. chlorocarpum.*

F. Commonly submersed or floating, sometimes emersed: leaves rounded on the back; the middle and upper with dilated and subinflated sheathing bases: staminate half of inflorescence 1–3 cm. long, of 1–4 (rarely –6) crowded heads: beak about 2 mm. long: sepals loosely ascending, with slender claw and dilated tip.....5. *S. angustifolium.*

C. Sepals borne chiefly along the middle of the stipe, rarely reaching the middle of the fruit: epicarp closely investing the seed: fruit with a strong gladiate-falcate beak: stigma oblong to lance-ovate, 0.4–0.7 mm. long: anthers 0.4–0.7 mm. long: plant aquatic, with flat translucent loosely cellular-reticulate leaves and branching inflorescences.....6. *S. fluctuans.*

B. Staminate head 1: fruiting heads 5–12 mm. in diameter: mature carpels ellipsoid- or slenderly obovoid-fusiform, 3–5.5 mm. long; stipe obsolete or up to 1 mm. long; beak obsolete or up to 1.5 mm. long: inflorescence simple. G.

G. Pistillate heads all axillary: fruit tapering to a conical beak 0.5–1.5 mm. long: sepals elliptic to cuneate-spatulate, ½–⅔ as long as the body of the fruit.....7. *S. minimum.*

G. One or more of the heads supra-axillary: fruit beakless: sepals wanting or slenderly spatulate and rarely ½ as long as the body of the fruit.....8. *S. hyperboreum.*

1. S. EURYCARPUM Engelm.—Shallow water at margins of ponds, pools and streams, chiefly at low altitudes, widely dispersed over the United States and southern Canada, northward with us to the Great Lakes and St. Lawrence (east to Rimouski Co., QUEBEC), Champlain Valley, VERMONT, Franklin, southern Penobscot and Washington Cos., MAINE, southern and southeastern NEW BRUNSWICK, central and eastern NOVA SCOTIA, PRINCE EDWARD ISLAND and the MAGDALEN ISLANDS.

2. S. ANDROCLADUM (Engelm.) Morong. *S. lucidum* Fernald & Eames.—Muddy or peaty shores, swamps or shallow water, eastern

Pennsylvania to Long Island, NEW YORK, eastward to Nantucket, Cape Cod and Middlesex Co. and up the Connecticut Valley to Franklin Co., MASSACHUSETTS; Chittenden Co., VERMONT; Quebec Co., QUEBEC; also Illinois and Missouri.

3. S. AMERICANUM Nutt. Including var. *androcladum* Fernald & Eames, not *S. simplex*, var. *androcladum* Engelm. *S. androcladum* Morong, as to plant in great part.—Muddy or peaty shores, swamps or shallow water, common southward, extending north to Muskoka District, ONTARIO, northern VERMONT and NEW HAMPSHIRE, Franklin, Penobscot and southern Aroostook Counties, MAINE, Kent Co., NEW BRUNSWICK, PRINCE EDWARD ISLAND, Cape Breton Island, NOVA SCOTIA, and Avalon Peninsula, NEWFOUNDLAND.

4. S. CHLOROCARPUM Rydberg. A species with two freely intergrading varieties.

Pistillate heads (1–) 2–4, remote or subremote, in maturity 1.5–2.7 cm. in diameter; the lowest borne 1–6.5 dm. above the base of the plant: staminate half of inflorescence 2–10 cm. long, of 4–9 heads.....*S. chlorocarpum* (typical).

Pistillate heads 1–3, at least the upper usually approximate, in maturity 1.2–2.2 cm. in diameter; the lowest borne 0.1–1.8 dm. above the base of the plant: staminate half of inflorescence 1–4(–5) cm. long, of 2–5 heads.....Var. *acaule*

S. CHLOROCARPUM (typical). *S. diversifolium* Fernald & Eames, not Graebn.—Muddy and peaty shores or swamps or in shallow water, NEWFOUNDLAND, MAGDALEN ISLANDS and Gaspé Co., QUEBEC to Algonquin Park, ONTARIO, south to NOVA SCOTIA, southern MAINE, Bristol Co., MASSACHUSETTS, CONNECTICUT, northern New Jersey, central and western NEW YORK, Indiana and Iowa.

Var. ACAULE (Beeby) Fernald. *S. diversifolium*, var. *acaule* (Beeby) Fernald & Eames. *S. acaule* (Beeby) Rydb.— Similar habitats and range, commoner northward, but extending to Nassau Co., Long Island, NEW YORK, in the uplands to Virginia and West Virginia, and North Dakota.

5. S. ANGUSTIFOLIUM Michx. *S. affine* Schnitzl. *S. simplex* Fernald & Eames, as to plant of eastern America, not Hudson.— Deep or shallow water or muddy or peaty shores, NEWFOUNDLAND and Straits of Belle Isle to Lake Mistassini, QUEBEC, west to Alaska, south to NOVA SCOTIA, eastern and central counties and Androscoggin Co., MAINE, Carroll and Grafton Cos., NEW HAMPSHIRE, Essex, Middlesex and Norfolk Cos., MASSACHUSETTS, Litchfield Co., CONNECTICUT, Catskill Mts. and Oneida Lake, NEW YORK, uplands of northern New Jersey and Pennsylvania, Michigan, Colorado and California, ascending in our mountains to 1104 m. (3600 feet); also Eurasia.

6. S. FLUCTUANS (Morong) Robinson.—Cold waters of lakes and ponds, chiefly in silicious regions, NEWFOUNDLAND to Lake Mistassini, QUEBEC and northern Minnesota, south to NOVA SCOTIA,

Kennebec, Androscoggin and Oxford Cos., MAINE, Belknap Co., NEW HAMPSHIRE, Norfolk and southwestern Middlesex Cos., MASSACHUSETTS, Litchfield Co., CONNECTICUT, Oneida Co., NEW YORK and the uplands of Pennsylvania.

7. S. MINIMUM Fries.—Shallow water of springy spots, brooks, pools and ponds, NEWFOUNDLAND and Anticosti Island, QUEBEC to Lake Ontario basin, ONTARIO, Manitoba and Alaska, south to Cape Breton Island and northern and northwestern NOVA SCOTIA, southeastern and central MAINE (south to Androscoggin Co.), Belknap Co., NEW HAMPSHIRE, southern and southwestern Middlesex Co., MASSACHUSETTS, Litchfield Co., CONNECTICUT, central and western NEW YORK, uplands of northern New Jersey and Pennsylvania, Michigan, Wisconsin, Utah and Oregon; Eurasia.

8. S. HYPERBOREUM Laestad.—An arctic species, extending south, especially in peaty pools, to NEWFOUNDLAND, Cape Breton Island, NOVA SCOTIA, southern Saguenay Co., Anticosti Island and Big River. QUEBEC, northern Manitoba and southern Alaska; Eurasia.

GRAY HERBARIUM.

THE IDENTITY OF THE GENUS ADVENTINA RAF.

S. F. BLAKE.

IN 1836 Rafinesque[1] described under the name *Adventina* a new genus of *Asteraceae* which he had found growing as a weed in the Bartram Garden at Philadelphia. In spite of the full description given, no later author has identified his plant, or plants, for two species were described. Bentham, in the Genera Plantarum, omitted this, as he did practically all the other names proposed by Rafinesque; Baillon likewise does not refer to it, nor does O. Hoffmann in the Pflanzenfamilien; and in Dalla Torre and Harms's Index it is given only among the "Genera incertae sedis." From Rafinesque's description,[2] which

[1] New Fl. N. Amer. 1: 67–68. 1836.

[2] "ADVENTINA Raf. Radiate. Perianthe globular 5 phyle, Sepals connivent equal ovate acute. Phoranthe flat chaffy. Rays 5 fertile, equal small and opposed to sepals, ligules short trilobe white, ovary and seed shut between the sepals and internal palea or chaff, similar to sepals oblong and thus bivalved; style very short bifid, pappus paleaceous multifid. Floscules of the disk minute yellow complete, chaff lanceolate flat, corolla tubular 5toothed, stamens and style inclosed, pappus campanulate multifid.—Seeds black oblong compressed bivalved in rays, oblong terete in disk. *Leaves opposite, flowers terminal.*

"1. PARVIFLORA Raf. Stem slender branched diffuse smooth, leaves petiolate ovate acute angular dentate, lower rounder, upper nearly sessile and entire; flowers terminal lax—Growing spontaneous for several years in the orchard of Bartram's Garden, come with seeds from the South. Annual, Estival, pedal. Leaves thin smooth,

is here reproduced for the convenience of those who do not have access to the original, it is clear that he was describing with considerable accuracy the characters of *Galinsoga*, and that his two species correspond to the plants now generally known as *Galinsoga parviflora* Cav. and *G. aristulata* Bicknell.[1] It is interesting to note that Rafinesque observed the peculiar adherence between each ray-subtending phyllary and the two outer receptacular pales opposed to it, by which the ray achene at maturity is included between the three, somewhat as in *Parthenium*. This feature was likewise noted practically simultaneously by DeCandolle in his *Vargasia caracasana* (now *Galinsoga caracasana*), but although an important generic character, is not mentioned by Bentham in the Genera Plantarum, although he had earlier noted it in his description of *Galinsoga hispida*[2].

The generic name proposed by Rafinesque falls, of course, into the synonymy of *Galinsoga* Cav. (1794), and his *A. parviflora* is likewise by a coincidence identical with *Galinsoga parviflora* Cav. (1794). There can be no question, moreover, that the species described by Rafinesque as *Adventina ciliata*, with its "thick pilose" stem, and "ovate serrate ciliate" leaves, as distinguished from his *A. parviflora*, with "slender diffuse smooth" stem and "ovate acute angular dentate" leaves, is the plant long known as *G. parviflora* var. *hispida* DC., and recently raised to specific rank as *G. aristulata* Bicknell (1916). As the name *ciliata* has not been used in the genus, it becomes necessary to call the common Galinsoga of the eastern States by the name

Galinsoga cilata (Raf.) Blake.—*Adventina ciliata* Raf. New Fl. N. Amer. **1**: 67. 1836. *Galinsoga parviflora* γ *hispida* DC. Prodr. **5**: 677. 1836; not *G. hispida* Benth. 1844. *Galinsoga aristulata* Bicknell, Bull. Torrey Club **43**: 270. 1916.

flowers very [sic] small, white rays hardly exserted. Very different from any known genus, nearest *Achillea*, but habit calix and seed unlike. Named after its adventitious production near Philadelphia. Probably a Florida plant. Seen alive.

"Figure Autikon 5, and Ic. n. sp. 5."

"2. A. CILIATA Raf. Stem thick pilose, trichotome and dichotome, leaves petiolate ovate serrate ciliate, flowers in forks or terminal subcorymbose—Found with the last, but in a different place and season: smaller, but flowers larger, Autumnal. annual, 6 to 10 inches high, hardly ramose or nearly simple. Messrs. Carr owners of Bartram's garden cannot account for the spontaneous production of these plants and several others in their garden.

"Figure Autikon 6. Icon. n. sp. 6."

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[1] See St. John & White, RHODORA **22**: 98–101. 1920.

[2] Bot. Sulph. 120. 1844.

Rafinesque's notice of these two species is of further interest as affording the first record of either plant in the United States. De Candolle[1], in describing *G. parviflora*, notes its spread around Erlangen, Bavaria, "etc." (*Zuccarini*), by seeds from the botanical garden.

BUREAU OF PLANT INDUSTRY, Washington, D. C.

BRASSICA ARVENSIS (L.) Kuntze, var. **Schkuhriana** (Reichenb.), n. comb.—*Sinapis Schkuhriana* Reichenb. Ic. Fl. Germ. ii. 20, f. 4425b (1837–38). *S. arvensis*, β. *Schkuhriana* (Reichenb.) Beck von Man., Fl. Nieder-Ost. 486 (1892); Rouy & Foucaud, Fl. de France, ii. 60 (1895).

Typical *Brassica arvensis* has the mature silique scarcely or only a little torulose, 2.5–3.7 cm. long, 2.5–3.5 mm. broad; var. *Schkuhriana* has the strongly torulose silique more slender, 1.5–2 mm. thick, and often more elongate, 3–5.5 cm. long. Both varieties are widely introduced in America and both have either glabrous or somewhat hirsute siliques.—M. L. FERNALD, Gray Herbarium.

[1] Prodr. **5**: 677. 1836.

Vol. 23, no. 276, including pages 281 to 318, the title-page of the volume, and a new impression of pages 253 and 254 (reprinted to correct accidental transposition of text-figures), was issued 22 April, 1922.

Binders are notified that, through typographical error in paging Vol. 23, page 281 follows page 278, no pages bearing the numbers 279 and 280 have been printed.

Vol. 24, no. 277, including pages 1 to 20 and plate 134, was issued 8 May, 1922.

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NOTES ON NEW ENGLAND ORCHIDS,—II.

THE MYCORRHIZA OF GOODYERA PUBESCENS.

OAKES AMES.

(Plates 135 and 136.)

IN a recent paper, entitled Nonsymbiotic germination of Orchid Seeds, Lewis Knudson[1] has published the results of experiments in which he successfully raised seedlings of Cattleya and Laelia on media from which fungi had been excluded. He proved conclusively that germination of the orchid seeds selected for investigation is not dependent on the invasion of the embryo by a supposedly symbiotic fungal organism, if assimilable food is available. He concluded that germination is a matter of nutrition. It is not necessarily induced by the activities of a fungus. In summing up the results of his experiments he states that the necessity of a fungus for bringing about germination has not yet been conclusively proved, but he does not touch on conditions that seem to be normal among orchids under natural surroundings; in other words, he does not tell us whether germination is possible under natural conditions if the fungus is excluded, and this, it seems to me, is the focal point of the whole orchid mycorrhiza problem.

Although highly interesting from the point of view of laboratory experiments and the possible economic application of the methods employed, it is worthy of note that Knudson's results do not help us to explain the conditions that prevail in nature; his results simply

[1] Bot. Gaz. lxxiii. (1922) 1.

demonstrate that nonsymbiotic germination is possible if by artificial means seeds are supplied with essential food materials in an available form.

Under natural conditions orchids behave in a manner that seems to indicate that the dependence on symbiosis, of a kind, is prevalent. Even under the artificial conditions, that characterize horticultural enterprises, there are indications that symbiosis is essential for successful germination, unless methods such as Knudson described are adopted.

Many years have passed since my interests were centred in the raising of orchid species and hybrids, but it is clear in my memory that seeds sown at the base of a luxuriant orchid plant on a substratum that had become thoroughly settled, gave better promise of germination than those sown on sterilized media in special pots or baskets that had been skilfully prepared and kept under exceptionally clean conditions. And my memory is clear on still another point, that a neighbor who had enjoyed successful horticulture in greenhouses that would have offended, through their rich growth of thallophytes, the carefully trained gardener of a model establishment, raised orchids from seed with uncanny success and inexplicable regularity. When I first read the classic paper which linked Noël Bernard's name indissolubly with symbiosis in the orchids, I imagined that I had at last found a very plausible explanation of the results which I had observed at home and had studied abroad in the realm of orchids raised from seed.

Under natural conditions I have observed that germinating orchids are normally associated with the characteristic fungi of endotrophic mycorrhiza. In fact, as a result of my observations, I have been led to believe that mycorrhiza are not only influential in germination under natural conditions, but that they may have a great deal to do with the manner in which orchids arrange themselves on the ground or on trees and may account for peculiarities of distribution that are well known to collectors in tropical countries and to those systematists who work among orchids. As my observations stimulated interesting conclusions I decided to seek for evidence that would either sustain or demolish my theories.

The species most satisfactory for prolonged and intensive study proved to be our common Rattlesnake Plantain, *Goodyera pubescens* R. Br. (pl. 135). This species is common in New England, is approachable at all seasons of the year and exhibits phenomena that seem to indicate something peculiar in its relation to environment. I undertook to observe this species through a period of twelve consecutive months, my purpose being to follow it from germination of the seed to its adult manifestations.

Goodyera pubescens may well be described as a gregarious species. When it is found under eminently favorable circumstances it forms thrifty colonies in which the leaves almost conceal the underlying humus. Colonies persist for years, and notwithstanding the creeping habit of the rhizomes, retain their compactness. I studied the colony forming habit very carefully and arrived at the conclusion that it is in part to be accounted for by constant replenishment by seedlings. I found that in luxuriant colonies there was always an abundance of young plants that represented several generations of seedlings, and in a paper, published in the Orchid Review[2], I stated that the age of one of these colonies is not to be estimated by the age of its oldest components and that a long-established colony may simply be an aggregation of comparatively young plants, its capacity to attain great age being a direct result of those phenomena which are associated with endotrophic mycorrhiza.

When the mature capsules dehisce in late summer or autumn many of the seeds fall directly to the ground within the confines of the colony and are soon washed by the rain or lodged by other means among the rhizomes and roots of the parent plants. They lie dormant through the winter, and at the beginning of the next growing season germinate and may be observed in July or August, of the year following dissemination, as tiny protocorms[3] hardly a millimeter in length (pl. 136, fig. 1.). At this time the testa of the seed is observable, still adhering to the base of the growing embryo. At first, development is very slow. Protocorms devoid of perceptible chlorophyll, without roots or leaves may be found in the autumn. In this condition they are able to pass through the period of dormancy, and at the beginning of the next

[2] Orch. Rev. xxix. (1921) 106.

[3] This term was used by Treub to designate a young state in Lycopodium. Bernard, Ann. Sci. Nat. ser 9, ix. (1909) 9, adopted it for the conical body from which the cotyledon and roots of seedling orchids emerge.

season of active growth are in much the same condition as that in which they entered on their long winter rest. As active growth begins in the spring of the year, roots and leaves develop, (pl. 136, fig. 2) and the little plants soon become large enough to take their place in the colony and rapidly fill in any gaps that may have been caused by the death of older plants or by the creeping apart of their rhizomes. Up to the present time I have been unsuccessful in my search for protocorms beyond the limits of the colonies, and yet within the colonies they are so numerous that the rhizomes, as they elongate, sometimes become entangled.

From these observations I arrived at the conclusion that only those seeds which fall within a colony enjoy a bright prospect of successful germination. This is true because the mycorrhizal fungi are most likely to be present where mature plants are in abundance. Those seeds which drift away on air currents or are blown abroad by the wind and fall where there is no nidus of the necessary fungus, fail to germinate. Otherwise, how account for the colony forming tendency of the species and the peculiarities of distribution?

The protocorms adhere to the roots of mature plants or nestle close to the rhizomes beneath the rosettes of leaves, and may be aptly compared in their appearance to small white spiders at the centre of miniature webs, the webs being the delicate, elongated hair-like structures (rhizoids) which radiate in every direction and serve as passage ways for the fungal hyphae from the interior of the protocorm to the humus (pl. 136, figs. 1 & 3).

My investigations indicate that protocorms are more frequent in close contact with some part of the mature plants than in the open spaces between the rhizomes. That this condition prevails is pretty well shown by the position in which young leafy plants are usually found, that is, in such close proximity to the rhizomes of older plants that they may readily be mistaken for young offshoots. In fact, before I was convinced of the correctness of my conclusions with regard to the nature and origin of young plants that had developed several leaves, I used to suspect that they were really offshoots and that in freeing them for study I had broken them away from the point of origin on mature rhizomes.

It is worthy of note that many protocorms are quite free from direct contact with the surrounding humus. They may lie suspended

by their elongated hairs in the interstices formed by fibrous materials and be perfectly free from particles of organic matter and sufficiently clean to be placed directly without washing, in the killing fluid. In other words, the only means of direct contact with the substratum in such cases is furnished by the hair-like structures. These are rounded at the tip, unicellular, often much longer than the protocorm and produced singly and in tufts from the epidermis.

The hyphae of the fungus penetrate the delicate walls of the hairs (pl. 136, fig. 3) usually at the tip, and enter directly into the humus. In the hairs they may sometimes form structures that suggest fruiting bodies which recall similar structures characteristic of pure cultures of *Rhizoctonia repens* Bernard (pl. 136, fig. 4). Similar structures may also occur within the body of the protocorm, but as I have only observed a single case of this, in a protocorm collected in May 1921, it must be exceedingly rare.

In passing, it may be worth while to suggest that the periodicity of flowering often noted in colonies of *Goodyera pubescens*, and the comparative paucity of flower shoots observed in large colonies of the species, are to be accounted for by the fact that plants of flowering age are few in number, the colonies being made up, for the most part, of young plants which represent several generations.

If we examine the foregoing facts in the light of Knudson's experiments and observations it becomes evident that there are several points which need further elucidation. The questions seem to be: What likelihood is there that the seeds of *Goodyera pubescens* would germinate under natural conditions if mycorrhizal fungi were successfully excluded from the embryos? Is the organic matter, where the plants grow, in a utilizable condition for embryos that are lodged in the humus or suspended above it, or is the embryo incapable of development unless the necessary food substances present in the humus are changed into assimilable organic compounds by the intervention of a symbiotic fungal organism?

I have attempted to show that *Goodyera pubescens* is a gregarious species, that isolated plants are rare, and my observations have indicated that germination of fertile seeds, while a common event within a colony, is perhaps exceedingly uncommon beyond it. Furthermore, I have shown that throughout the early stages of development the protocorms of *G. pubescens* are devoid of chlorophyll and that they

may pass the first growing season and the first winter of dormancy as rootless, leafless whitish bodies. In this condition I have found that they exhibit all the phenomena associated with the presence of endotrophic fungi. It is yet to be proved that without the presence of the fungus they are able to make use of the soluble organic compounds that may be found in the surrounding humus.

The endotrophic fungi of orchid mycorrhiza are made up of closely related species. This is clearly demonstrated by an examination of pure cultures taken from plants of widely separated orchid genera that inhabit different geographical areas. The behavior of the fungus within the orchid and the relation of the orchid to the presence of the fungus is similar in all the species that I have examined. This similarity of behavior and the close structural resemblance that is evident among the species of the fungus, indicates a long association between the fungi and orchids. It is pardonable to suppose that the present day endotrophic fungi of orchids represent very closely what must have been the ancestral form, that is, the form which may have had much to do with the evolution of the orchid family. This assumption is warranted by the fact that despite the vast host of orchid genera and species, there are very few species of endotrophic fungi. It is assumed that the fungus has not changed much since the alliance with the orchids was formed because it has been removed, by its method of life, from those modifying influences that effect an organism that is subjected to the ordeal of competition.

The fungus lives in the protocorm, or in the upper cortical tissues of roots in adult plants, and is capable of luxuriant development. The hyphae do not enter the epidermal cells and are never found in the vascular tract. They may pass through the hair-like organs already described and are therefore able to carry on the functions of the fungus both within and without the body of the protocorm. As the fungus passes from one generation of seedlings to another it is removed from the necessity for reproduction by spores and perhaps, under natural conditions, does not live for any length of time, if at all, as an autonomous organism. When in association with orchids it is supposed to supply food materials in an available form or to render soluble organic compounds assimilable. It surely derives some benefit for its munificence. In *Goodyera pubescens* the fungus lives through-

out the early stages of development in the protocorm. As the protocorm gives rise to the rhizome, and leaves and roots begin to develop, the fungus passes into the cortical cells of the roots. From my observations it does not again invade the tissues of the rhizome. In adult plants invasion of the roots takes place directly from the humus. All the evidence shows that the association is a close one and that both fungus and orchid derive some benefit from it. The capacity of both organisms to thrive, is, it would seem, a sufficient proof that orchid-fungus symbiosis is a well balanced condition. It is true that some of the cells occupied by the fungus frequently exhibit large lobed nuclei, or that a cell may be occupied by two or more nuclei which are formed directly by fragmentation. This may be taken to indicate a pathological condition. Nevertheless, the fungus is digested in the cells farthest removed from the growing point of the protocorm, in tissues that are soon sloughed off as the protocorm elongates (pl. 136, figs. 5 & 6).

Reinheimer[4] would have us believe that the orchid-fungus association is no longer advantageous, although it is possible that in the past and under special conditions, the fungi have been more useful to the orchids than frequently they are now. If the orchid is capable of nonsymbiotic germination as Knudson and Bernard have demonstrated by laboratory experiments, and the ever present fungus is assumed to be an unnecessary evil in a forced association, sometimes even causing the death of the embryo, how are we to reconcile this assumption with the evidence that may be turned to prove that the orchid family has been eminently successful? The family as at present known is one of the largest phanerogamic groups, numbering some five hundred and fifty genera and fifteen thousand species. In the diversity of floral structure, in the adaptation of the perianth and gynostemium to pollination by insects, and in the extraordinary modification of the vegetative parts to meet the exigencies of terrestrial and epiphytal distribution, the orchids are unsurpassed by any other plant family. Furthermore the Orchidaceae constitute the predominant group as to number of species in some of the richest floral regions of the globe. In Borneo[5] and the Philippines, for example,

[4] *Symbiosis, A Socio-physiological Study of Evolution* (1920).

[5] Merrill in *Journ. Str. Br. Roy As. Soc.* Special No. (1921): *Orchidaceae* 86 genera, 702 species; *Rubiaceae* 64 genera, 333 species; *Euphorbiaceae* 57 genera, 195 species; *Leguminosae* 59 genera, 174 species.

the orchids outnumber in genera and species such successful families as the Rubiaceae, Euphorbiaceae, Leguminosae and Compositae. Is it to be supposed that degeneracy, moribund constitution and maladjustment are just now apparent in the orchid family, or are just beginning to make themselves felt, and that the most highly differentiated concept of the monocotyledons, is on a biological toboggan slide headed for extinction as a penalty for having entered into partnership with a fungus? Surely, if number of genera and species, extraordinary modification of the flower for symbiosis with insects, and wide distribution are to be taken as criteria of biological success, then the orchids have been successful. I am not prepared to admit that orchid-insect symbiosis alone is the fundamental and definitive association that has influenced the evolution of the Orchidaceae and that orchid-fungus symbiosis is simply the result of combat in which orchids have nearly balanced matters and then degenerated.

In the two species of our native orchids of which abundant protocorm material has been available for investigations (I refer to *Goodyera pubescens* and *Spiranthes cernua*), I have sought in vain for protocorms that were free from endotrophic mycorrhiza. Both of these species are prolific in their production of seedlings. In fact I have come to the conclusion that *Spiranthes cernua* is dependent for persistence on numerous progeny. I believe it is a short-lived species and that its replenishment is accomplished by extraordinary fertility and a high degree of success in germination. It is a wide-spread species, adapts itself readily to different conditions of soil and climate, and crosses freely with *Spiranthes gracilis*.

It is assumed that the orchids because of prodigality of seed production are low in organization. Darwin[6] was puzzled by the vast profusion of seeds produced by the orchids, because, as he put it: "the production of an almost infinite number of seeds or eggs, is undoubtedly a sign of lowness of organization" and, as he went on to say: "that a plant, not being an annual, should escape extinction, chiefly by the production of a vast number of seeds or seedlings, shows a poverty of contrivances or a want of some fitting protection against other dangers." The profusion of orchid seeds has been very well

[6] The Various Contrivances by which Orchids are Fertilized by Insects 2nd.rev. 277.

indicated by Darwin's observations.[7] He estimated that a ripe capsule of *Cephalanthera grandiflora* yielded 6,020 seeds, of which very few were bad. In *Orchis maculata* he found about the same number of seeds and estimated that the combined capsules of a single inflorescence would furnish 186,300 seeds, and that, allowing for a certain percentage of infertile seeds, such an inflorescence, if six inches were alloted to each plant produced, had the capacity to populate an acre of land. The great grandchildren of this population, if removed from competition, he found, would be sufficiently numerous to cover, with a uniform green carpet, the entire surface of the earth throughout the globe. The interesting point here, if we accept prodigality of seed yield as a sign of low organization, is not what would be the result if *Orchis maculata* enjoyed one hundred per cent fertility and complete capacity to germinate, but that the species observed by Darwin are admittedly low in the scale of development as we arrange orchids taxonomically, and that they are pretty poor in seed yield when compared with some of the more highly developed species of the *Sarcanthineae*, species which are admittedly the most highly organized orchids from the point of view of botanical classification. In other words it is among the more highly developed orchids, taxonomically speaking, that seed yield reaches truly extraordinary profusion! Fritz Mueller estimated that a single capsule of a Maxillaria species yielded 1,756,440 seeds, and yet, Maxillaria is admittedly much higher in the evolutionary scale, as botanists estimate development, than either Orchis or Cephalanthera. But why not admit that though a vast expenditure of energy in the production of seeds was characteristic of the ancestral orchids and indicates that in the dim history of the group a low degree of organization was manifested, the orchids are now a highly specialized concept, the prodigality of seed yield having been perpetuated, and increased in the more highly organized *Sarcanthineae*, as a necessity, because of the peculiarities of the symbiotic relations that sprang into existence when an intrusive fungus became a helpful partner in the economy of the ancestral orchids? In other words, prodigality of seed

[7] In many species of the Orchidaceae the ovules are still rudimentary at the time of pollination; the stimulus exercised by the pollen-tube induces further development. The stimulus is not necessarily dependent on the fertilizing influence of the pollen-tube, as it is brought about when pollen which is without capacity to bring about fertilization is applied to the stigma. This peculiarity has a deep significance in connection with the present discussion.

yield, a million seeds per capsule in some cases, does not indicate a low degree of specialization in a group that depends for successful germination on a symbiotic fungus. For every dozen seeds that fall where endotrophic fungi of the proper type are present, millions must drift to sterile ground and suffer extinction. Consequently in overcoming any economic disadvantages that high yield of seeds implies the orchids through adaptation of seed yield to the exigencies of a symbiotic union have manifested a high degree of success, as success is measured in the human interpretation of organic development. This line of reasoning implies, quite naturally, that orchid-fungus symbiosis is a good thing, that it has been advantageous and admirable. It denies that an association such as orchid-fungus symbiosis is indicative of degeneracy having resulted on the part of the orchid with a consequent moribund constitution. Sparse distribution, notwithstanding an extravagant production of seed, seems to be an indisputable piece of evidence from which to argue that orchids are in a precarious biological situation, but sparse distribution need not be taken as an indication of impending extinction through an unfortunate luxury-symbiosis, if we admit that the orchids are perfectly adapted to sparse distribution, even though incapable of taking possession of the earth.

Harvard University, Bussey Institution.

PLATE 135.

Goodyera pubescens R. Br.

Plant, approximately natural size with flowering and fruiting racemes, detached.

Fig. 1. Flower much enlarged to show the perianth.
Fig. 2. Flower sectioned to show relation of the labellum and gynostemium to the ovary, sepals and petals.
Fig. 3. Gynostemium drawn to show position of stigma and anther.
Fig. 4. Pollinia.
Fig. 5. A pollen tetrad.
Fig. 6. The mature seed

Drawings by Blanche Ames.

PLATE 136.

Goodyera pubescens R. Br.

Fig. 1. Protocorm (×25), showing testa still adherent to the base; spreading hair-like structures through which the hyphae pass to and from the humus, and the growing tip. The darker portion indicates the extent of distribution of the fungus.
Fig. 2. Four stages in the development of young plants (×2).
Fig. 3. The upper portion of a hair-like process through the tip of which two fungal hyphae have passed.
Fig. 4. Part of a hair-like process in which fruit-like structures have formed.
Fig. 5. A cell from the lower part of the protocorm showing a large nucleus closely appressed to a mass of digested hyphae.
Fig. 6. An earlier stage of digestion than that shown in fig. 5. The nucleus and partly digested fungus are surrounded by a skein of hyphae.

Figs. 1–3 from drawings by Blanche Ames. Figs. 4-6 from drawings by the author.

VARIETIES OF GEUM CANADENSE.

M. L. Fernald and C. A. Weatherby.

As anyone who has critically examined any considerable series of specimens must be aware, *Geum canadense* Jacq. is a variable species. Rydberg (N. Am. Fl. xxii. pt. 5: 403 (1913)) has segregated two of its forms as species; but had he seen material from a wider range his conclusions might have been different. Far from being, as he states, confined to the prairie region, his *G. camporum*, or a plant answering in all respects to his description, is apparently the commonest form of the group as far east as central New York and, beyond that, occurs in considerable quantity in northern and eastern Maine, New Brunswick and Nova Scotia, in eastern Massachusetts and rarely at scattered stations elsewhere in New England. Two of the characters—the shape of the petals and the length of the upper internode of the style—which he uses to distinguish *G. camporum* from *G. canadense*, break down completely: indeed, so far as the latter is concerned, we have seen only one specimen, and that referable to what we here call var. *texanum*, in which the upper internode is short enough to fit the measurement, "scarcely 1 mm. long," given by him for *G. canadense*. In all other characters *G. camporum* and *G. canadense* pass almost imperceptibly into each other: the former can hardly be kept up as a species by anyone who accepts the category of variety at all. *G. Meyerianum* Rydb. (*G. agrimonioides* C. A. Meyer) appears to be only an inconstant foliage form, its pinnate lower leaves occurring in indiscriminate combination with all other characters in the group, and to be unworthy of any recognition.

As understood by the writers, *G. canadense* exhibits six recognizable trends, which may be distinguished as follows:

a. Upper internode of the style conspicuously, though sparsely, bearded with stiff white hairs; body of the carpel usually sparsely appressed-pubescent as well as hispid with long setae: outer surface of sepals, petioles and stems with at least a few long hairs, or the stems sometimes glabrate. *b.*

b. Flowers and fruiting heads with 30–60 carpels; these, when mature, with mostly broadly ovate to obovate bodies 2.5–3 mm. long: peduncles (except for the glands, when present) typically, but by no means always, finely puberulent only, or with a few, scattered long hairs: leaves thin in texture; blades of the median cauline leaves 5–10 cm. long, rarely shorter, the terminal segment mostly acute. *c.*

c. Outer surface of sepals and peduncles without glands. . . 1. *G. canadense*
c. Outer surface of sepals and peduncles more or less densely beset with articulate gland-tipped trichomes. . . . . 2. f. *glandulosum*
b. Flowers and fruiting heads mostly with 60–160 carpels; leaves of thick texture. *d.*
d. Stem low and slender, 3–4.5 dm. high: blades of the median leaves 4–5 cm. long, the terminal segment rather broadly rhombic-ovate and commonly obtusish: bodies of the 60–100 carpels broadly ovate, 2–3 mm. long. 3. var. *texanum*
d. Stem stout and mostly over 4.5 dm. tall; blades of the median cauline leaves 6–12 cm. long; the terminal segment mostly acute: peduncle typically but by no means always, pubescent with comparatively long hairs[1]: carpels 60–160; their bodies commonly narrowly obovate or cuneate, 3–4 mm. long. *e.*
e. Outer surface of sepals and peduncles glandless. . . . . 4. var. *camporum*
e. Outer surface of sepals and peduncles with gland-tipped articulate trichomes. . . . . 5. f. *adenophorum*
a. Upper internode of the style merely very shortly and inconspicuously hispidulous; body of the carpel hispid above, otherwise glabrous; peduncle usually with gland-tipped trichomes; outer surface of sepals, petioles and stem merely puberulent or the stem sometimes glabrate. . . . . 6. var. *Grimesii*

1. Geum canadense Jacq. Hort. Vind. ii. 82 (1773). *G. album* J. F. Gmel. Syst. Nat. ii. 861 (1791). *G. agrimonioides* C. A. Meyer, Ind. Sem. Hort. Petrop. xi. suppl. 29 (1846), not Pursh. *G. Meyerianum* Rydb. N. Am. Fl. xxii. pt. 5: 403 (1913).— Rich woods, wood-margins and thickets, New Brunswick to West Virginia, westward to Illinois and Minnesota. The following specimens, mostly fruiting, may be cited as representative. Nova Scotia: Five-mile River, Hants Co., July 19, 1920, *Pease & Long*, no. 21,514. Maine: Woodstock, Aug. 12, 1890, *Parlin*. New Hampshire: Alstead, July 28, 1899, *Fernald*, no. 99. Vermont: Salisbury, July 14, 1908, *E. F. Williams*. Massachusetts: Huntington, Aug. 17–21, 1912, *B. L. Robinson*, nos. 716, 749. Connecticut: Trumbull, July 18, 1892, *E. H. Eames*. New York: Fall Creek, Ithaca, Aug. 26, 1916, *A. J. Eames*, no. 6704. Pennsylvania: On the Conestoga, Lancaster Co., Sept. 3, 1892, *Heller*. Virginia: Middle Holston Valley, Smyth Co., July 4, 1892, *Small*. Wisconsin: *Lapham*. Minnesota: Spring Grove, June 30, 1902, *Rosendahl*, no. 652.

2. Forma **glandulosum**, n. f., sepalis extus et pedunculis puberulis et trichomatibus articulatis glanduliferis plus minusve dense obsitis. —Quebec: woods, East Bolton, Brome Co., June 28, 1909, *Pease*, no. 11,980; vicinity of Montmorency Falls, July 5, 1905, *John Macoun*, no. 67,145a, type in hb. Gray. Maine: moist thicket, Vassalboro, July 3, 1902, *E. B. Chamberlain*; Molly Ockett Mt., Woodstock, Aug. 12, 1890, *Parlin*; Farmington, June, 1892, *C. H. Knowlton*. New Hampshire: shaded roadside in village, Colebrook, July 18, 1917, *Fernald & Pease*, no. 16,601; roadside thicket, Randolph, July 12, 1916, *Pease*, no. 16,719; Hanover, July 6, 1910, *E. F. Williams*. Vermont: Manchester, June 25, 1898, *M. A. Day*, no. 380.

[1] But never hirsute as in *G. virginianum*.

3. Var. **texanum**, n. var., planta humilis gracilisque; caulibus 3–4.5 dm. altis, plus minusve villosis vel glabratis; foliorum caulinorum medianorum laminis 4–5 cm. longis, segmento terminali rhombicali-ovato plerumque obtusisculo; sepalis extus et puberulis et sparse villosis pilis longis; carpellis 60–100, 2–3 mm. longis (stylo excluso), hispidis et pubescentibus pilis brevibus subappressis.—LOUISIANA: vicinity of Alexandria, June 8, 1899, *C. C. Bull*, no. 595. OKLAHOMA: in woods near Idabel, McCurtain Co., May 20, 1916, *H. M. Houghton*, no. 3686. TEXAS: moist soil, Onion Creek near Austin, May 17, 1918, *M. S. Young*, no. 161, TYPE in hb. Gray; Houston, April, 1840, *Lindheimer*.

4. Var. **camporum** (Rydb.), n. comb. *G. camporum* Rydb. N. Am. Fl. xxii. pt. 5: 403 (1913).—Fields, meadows, roadsides and waste places, or, in the West, more often in woods: New Brunswick, Nova Scotia, eastern and northern Maine, eastern Massachusetts and rarely elsewhere in New England; central New York to western North Carolina and Alabama, west to North Dakota and Oklahoma. The following specimens, mostly fruiting, may be cited as representative. NOVA SCOTIA: Port Mouton, Queens Co., Aug. 18, 1920, *Bissell & Graves*, no. 21,516; Weymouth, Digby Co., Aug. 21, 1920, *Fernald et al.*, no. 21,517. MASSACHUSETTS: Brewster, Barnstable Co., Sept. 7, 1918, *Fernald & Long*, no. 16,879. NEW YORK: East Utica, July, 1899, *Haberer*, no. 1814. NORTH CAROLINA: Biltmore, July 7 and Aug. 9, 1897, *Biltmore Herb*, no. 457a. ALABAMA: Lomax, June 18, 1898, *Earle & Baker*. MISSOURI: Jackson Co., July 11, 1893, *Bush* no. 92; southeast of Pacific, Aug. 9, 1910, *Sherff*, no. 899. OKLAHOMA: near Guthrie, Logan Co., June 14, 1914, *G. W. Stevens*, no. 3285; near Alva, Woods Co., July 11, 1913, *Stevens*, no. 1678.

5. Var. CAMPORUM, forma **adenophorum**, n. f., a praecedente differt sepalis extus sparse glandulosis, pedunculis pubescentibus trichomatibus articulatis glanduliferis plus minusve dense obsitis.— MASSACHUSETTS: border of woods, Sherborn, July 8, 1911, *M. L. Loomis*, no. 207. MICHIGAN: edge of hardwood, Turin, Marquette Co., July 8, 1901, *Bronson Barlow*. ILLINOIS: rich woods, Peoria, July, 1904, *F. E. McDonald*, TYPE in hb. Gray; Ottawa, *J. W. Hurtt*.

6. Var. **Grimesii**, n. var., caule petiolisque puberulis vel glabratis; foliis crassiusculis; pedunculis plerumque trichomatibus articulatis glandulosis obsitis; sepalis extus puberulis, sine pilis longis; stylorum internodiis superioribus inconspicue et brevissime hispidulis; carpellis 75–120, 3–4 mm. longis (stylo excluso) ad rostri basin sparse hispidis sine pubescentia adpressa.— PENNSYLVANIA: Chester Co., 1858–1864, *S. P. Sharples*. DISTRICT OF COLUMBIA: moist grassy places, Washington, June 18, 1896, *E. S. Steele*. VIRGINIA: Belfield, Greenville Co., June 19, 1893, *Heller*, no. 1004; rich wooded flood-plain near Williamsburg, May 23, 1921, *Grimes* no. 3605, TYPE in hb. Gray; wooded flood-plain, Williamsburg, May 17, 1921, *Grimes*, no. 3583. NORTH

Carolina: Asheville, "June", *W. W. Ashe.* Indiana: flat woods along Muscatatuck River near Weston, Jennings Co., July 14, 1919, *Deam*, no. 28,085 (two sheets); flat woods of the Hennesley bottoms near Huntingsburg, Dubois Co., July 18, 1919, *Deam*, no. 28,321 (two sheets).

As already noted in the key, one of the distinguishing points of var. *texanum* is its tendency to obtuse leaf-segments. In the other three varieties also there is discernible, in addition to the characters above stated, a somewhat vague and far from constant tendency to develop distinctive types of foliage. In var. *camporum* the leaves are not only of heavier texture than in the typical form, but their segments tend to be broader. In var. *Grimesii* this tendency is carried so far that, in the majority of specimens seen, the upper stem-leaves are neither three-parted nor, as often in the other varieties, reduced to merely dentate ovate-lanceolate or ovate-rhombic blades distinctly longer than broad; they are nearly or quite as broad as long and shallowly three- to several-lobed, in the most extreme form closely simulating leaves of *Crataegus rotundifolia.* And the segments of all the leaves tend to be broader even than in var. *camporum.* Forma *glandulosum* and f. *adenophorum* differ from the typical form and from var. *camporum* respectively only in the presence of gland-tipped trichomes. Plants with the lower leaves pinnate (*G. Meyerianum*) occur in the typical form and in vars. *camporum* and *Grimesii.* The original *G. agrimonioides* C. A. Meyer, on which *G. Meyerianum* Rydb. is based, appears from the description to belong with typical *G. canadense.*

Gray Herbarium.

ECOLOGICAL POLYMORPHISM IN ENTEROMORPHA CRINITA[1].

By A. Brooker Klugh.

The term polymorphism has been used in various senses by different writers. By some it is evidently regarded as synonymous with mutation, while others use it merely as an equivalent for great variability. The concept of polymorphism, as held by the majority of

[1] Read before the Ecological Society of America., at the Toronto Meeting of the A. A. A. S., December 29th, 1921.

those who have dealt with the subject, may be defined as the ability of an organism to exist in two or more different forms and to reproduce in each of these states, such states not being phases of the ordinary life-history of the species, and this is the sense in which the term is used here.

Very wide polymorphism transcending the limits not only of species and genera but of orders, classes and phyla has been proclaimed by some writers. Thus Metcalf Johnson ('71) maintained that a *Paramoecium* could give rise to a *Vorticella* and this to an entomostracan, and a *Monas* to a *Chlorococcum* and this in turn to an *Oscillatoria*, a moss or a lichen. Such ideas hardly call for comment nowadays.

The idea of polymorphism in the algae was first put forward by C. A. Agardh in 1829, and Kützing ('40), Borzi ('83) and especially Hansgirg ('85) claimed that most of the *Cyanophyceae* and *Chlorophyceae* were polymorphic and that the simpler forms of these groups were only developmental stages of higher forms. These assertions were based on insufficient data and subsequent experimental work has shown that they were far too sweeping, so that the tendency among modern authorities, for example Klebs ('96), Chodat ('09) and West ('16) is to relegate polymorphism to a very minor position in algological considerations. Nevertheless, while the algae as a class may not exhibit any greater tendency towards polymorphism than some other groups of organisms, there are many well-substantiated cases of polymorphism in this class as is shown by the work of Goroschankin ('91) on *Chlamydomonas*, Cienkowski ('76) and Livingston ('00) on *Stigeoclonium*, Gay ('91) on *Ulothrix*, Chodat and Malinesco ('93) on *Scenedesmus acutus*, Huber ('94) on *Chaetonema irregulare*, Senn ('99) on *Coelastrum microporum*, Chodat ('09) on *Heterococcus viridis* and Rayss ('15) on *Coelastrum proboscideum*.

While we cannot enter here into a discussion of polymorphism in other groups of organisms it is of interest to notice that its occurrence in bacteria is shown by many workers (See Hiss and Zinnser, '16 and Reed, '22), in *Amoeba* by Hausman ('20), in the rotifer *Brachionus* by Whitney ('16), in *Gastropoda* by various investigators, in *Daphnia* by Stingeln ('97), in *Hyalodaphnia* by Zacharias ('03), in the scale-insect *Leucanium* by Marchal ('08), in the moth *Porthretria* by Pictet ('05), in trout and sticklebacks by Jordan, and in salamanders by several workers.

In the summer of 1918, while I was a member of the party engaged in a survey of Miramichi Bay and the Miramichi River, New Brunswick, under the auspices of the Biological Board of Canada, I had an opportunity to make an ecological study of the algae of this region. The survey covered the bay and the river as far as the head of the tide on the Nor-west Branch of the Miramichi and data on the temperature and salinity of the water were secured at numerous stations throughout this range, the observations being made weekly during June, July, August, September and early October at some stations and fortnightly at the stations furthest up the river. For copies of the records of salinity and temperature thus obtained I am indebted to Dr. A. G. Hunstman, Director of the Atlantic Biological Station and chief of the party on the Miramichi.

One of the most abundant algae of this estuary is *Enteromorpha crinita*. This species in its typical form is a branched tubular green alga with short monosiphonous tips at the end of the branches. A study of this species soon revealed the fact that it varied greatly in form in different parts of the estuary and further investigation showed that this variation was correlated with the salinity of the water.

At Station 76 in Miramichi Bay the salinity at the surface varied from 7.38 to 24.40 per mille, giving an average of 19.12 per mille, and at 12 metres the range of salinity was from 19.58 to 27.36, averaging 24.64. Since the specimens of *Enteromorpha crinita* examined were growing in the littoral zone and were in surface water when the tide was nearly low, and in deeper water when the tide was at full flood we can take a single salinity—arrived at by adding together the average surface salinity and the average salinity at 12 m and taking the mean, which in this case is 21.88—as representing the salinity of this habitat. At this station the plants were much-branched and had short monosiphonous tips.

At Station 81, at the mouth of the river, the salinity data was as follows:

Surface 1.41–19.33. Average 10.08.
At 12 m. 16.04–22.77. Average 21.34.
Average salinity 15.71.

Here the plants were similar in form to those of Station 76.

At Station 82, some three miles up from the mouth of the river, the data was as follows:

Surface. 0.07–14.76. Av. 5.65.
At 11 m. 7.16–20.93. Av. 12.75.
Average salinity 9.18.

At this station *E. crinita* had long monisophonous tips.

The data for Station 94, some ten miles from the mouth of the river, was:

Surface. 0.04–3.37. Av. 2.13.
At 12 m. 0.07.–17.45. Av. 4.46.
Average salinity 3.30.

Here the alga was not as profusely branched as at the preceding stations and the monosiphonous tips were very long.

At Station 96, some twenty miles from the mouth of the river, and near the head of the tide, the data was as follows:

Surface. 0.0–0.42. Av. 0.08.
At 6 m. 0.0–8.35. Av. 1.67.
Average salinity 0.87.

At this station *Enteromorpha crinita* existed in a form which bore very little resemblance to typical examples of this species and which would not have been recognized as this species but for two facts —Firstly, the examination of material from numerous parts of the estuary having revealed the gradual lessening of the tubular branched condition and the gradual increase in length of the monosiphonous tips, and secondly, the finding of young plants of this species in a monosiphonous condition at other stations. In the monosiphonous state this species has the appearance of one of the *Ulotricaceae* rather than of the *Ulvaceae*.

That salinity and not temperature is the causative factor of this polymorphism is shown by an examination of the water temperature data, the mean of the average surface and deep temperatures for the above stations being:

Station 76—14.4° C.
Station 81—16.0° C.
Station 82—17.2° C.
Station 94—17.2° C.
Station 96—16.6° C.

Thus the temperatures for one of the stations at which *E. crinita* existed in its typical form was almost the same as at the station where it was monosiphonous, while it was in its intermediate phase at the stations with the highest temperatures.

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QUEEN'S UNIVERSITY, Kingston, Canada.

THE GENERIC NAME PHRAGMITES.

M. L. FERNALD.

IN recent years there has been so strong a tendency to overthrow the long familiar name *Phragmites* for the reed, in favor of *Trichoon*, that it seems important to point out the claims of the former. The error of taking *Trichoon* Roth[1] (1798) instead of *Phragmites* has arisen through starting the latter name from the publication by Trinius[2] in 1820. Thus, when *Trichoon* was brought to the front by Rendle[3], he took it up because it antedated *Phragmites* Trin. Similarly Schinz & Keller[4] and Schinz & Thellung[5], in 1909, retained *Trichoon* as antedating *Phragmites* Trin. But it is important to note that, although in 1899 Rendle dated *Phragmites* from the publication by Trinius in 1820, in 1907 he[6] again took up *Phragmites* as dating from Adanson[7] (1763); and, more recently, Hitchcock[8] has discussed the status of the name, although part of his discussion is unconvincing.

Adanson's publication was characteristically abbreviated: *Phragmites* was included in his 3d Section of the Grasses, in which "Tous ont plusieurs fleurs hermaphrodites, rassemblées en forme d'épi dans un calice commun, qui n'a que 2 bales" (p. 33); and in the "Table" (p. 559) he supplies the following information:

PHRAGMITES. *Diosk.*

Saccaron. *Plin?*
Saccharum. *C. B?*
Arundo. *Scheuz.* 151.
Sucrier. Gall.
Cane à sucre. Gall.

[1] Roth, Archiv. Bot. Roemer, i. pt. 3: 37 (1798).
[2] Trin. Fund. Agrost. 134 (1820).
[3] Rendle, Cat. Afr. Pl. Welw. ii. pt. 1: 218 (1899).
[4] Schinz & Keller, Fl. der Schweiz, Aufl. 3, i. 646 (1909).
[5] Schinz & Thellung, Vierteljahrsschr. Naturf. Ges. Zurich, liii. Heft iv. 587 (1909)
[6] Britten & Rendle, List Brit. Seed-Pl. and Ferns, 35 (1907).
[7] Adans. Fam. Pl. ii. 34, 559 (1763).
[8] Hitchc. Genera Grasses U. S.—U. S. Dept. Agric. Bull. no. 772: 64 (1920).

From this it should be clear that Adanson supposed his genus to have started with Dioscorides, the identity of whose plant the present writer does not attempt to make out, that he thought it might be *Saccaron* of Pliny and *Saccharum* of Gaspard Bauhin, though of these identities he was in doubt; that *Phragmites* was based actually upon *Arundo* of Scheuchzer's *Agrostographia,* 161 (1719) and that the colloquial French names[1] (of *Saccaron and Saccharum,* only doubtfully referred by Adanson to his *Phragmites*) are *Sucrier* and *Cane à sucre.* That *Arundo vulgaris, sive phragmites Dioscoridis* of Scheuchzer was the common reed, *Arundo phragmites* L. Sp. Pl. i. 81 (1753) is clear, not only from Scheuchzer's diagnostic "Folliculis quinis aut senis, in calyce[2] biglumi" and his characteristic figure (t. 3, fig. 14D) but since it was made the basis of the name *Arundo phragmites* by Linnaeus. The familiar name *Phragmites* Adans. (1763) is thus, fortunately, to be retained instead of *Trichoon* Roth (1798).

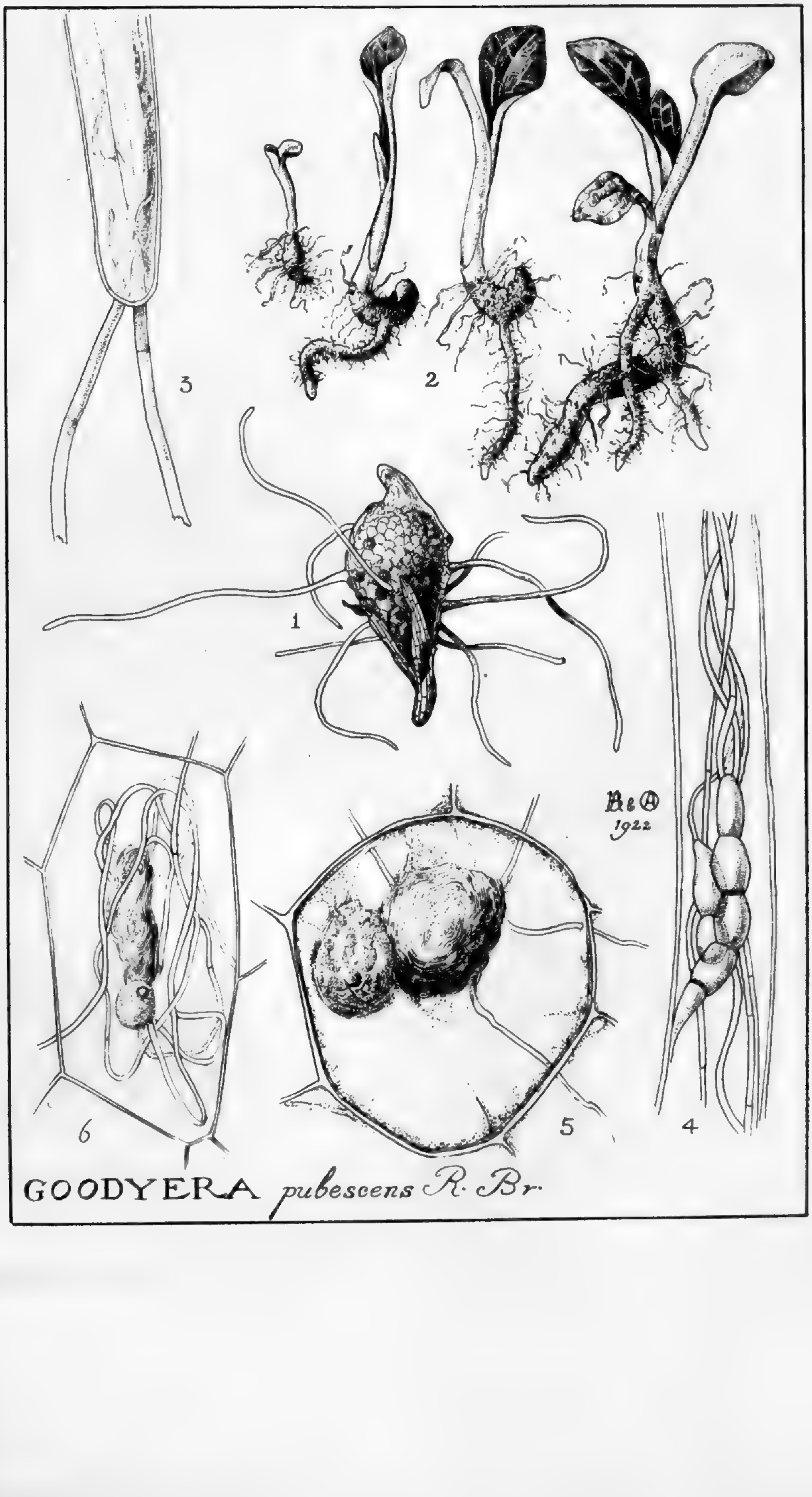
Gray Herbarium.

[1] It is almost inconceivable that Hitchcock should have stated, that "Adanson cites besides [*Arundo* Scheuz.] four other pre-Linnaean references, two of them queried. The other two [*Sucrier* and *Cane à sucre*] . . . are to be excluded because the few generic characters given, especially that the spikelets have several perfect flowers, do not at all apply to them, but do apply to *Arundo phragmites.*" Where were the "other two pre-Linnaean" generic names, *Sucrier* and *Cane à sucre,* published in such a definite way as to justify the assertion of a nomenclatorial specialist, that Adanson's "few generic characters given . . . do not at all apply to them"? These, of course, were used by Adanson merely as the colloquial French names just as, in the same column, he gave the French *Frêne* for *Fraxinus* and *Fraisier* for *Fragaria.*

[2] In the original "calylyce" by obvious misprint.

The date of the February issue (unpublished as this goes to press) will be announced later.

GOODYERA *pubescens R. Br.*



GOODYERA *pubescens R. Br.*

Rhodora

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THE ATLANTIC COASTAL PLAIN ELEMENT IN THE FLORA OF THE GREAT LAKES.

Donald Culross Peattie.

It has long been known that the flora of the sand dunes and shores of the Great Lakes, and particularly of those at the head of Lake Michigan, contains some remarkable elements, for the vegetation of this area is often in sharp contrast to that of the bordering forest and prairies. It has further been known that many species are of coastal plain derivation, and this fact is so anomalous in the Middle West that for some time it has struck the attention of observers.

It is hardly to be supposed that the presence of the coastal plain flora in the neighborhood of the Great Lakes is to be explained on the basis of any accidental or deliberate introduction. Few of the coastal plain plants are of an aggressive or weed-like nature. There is no evidence that plants of conservative habits and habitats, such as *Rynchospora macrostachya, Drosera longifolia, Polygala cruciata* or *Utricularia gibba* follow the footsteps of man or occur as casual weeds.

Therefore, the presence in the flora of the Lake Michigan region alone of some sixty species of plants which are not found, or are but rarely found elsewhere off the true coastal plain, has long awaited some sort of explanation. With the plan of solving this problem, I went into the field in Indiana and Michigan in the summer of 1920 and collected as many coastal plain and other types of plants as I could. But in work at the Gray Herbarium of Harvard University, it at length became evident that the problem of this anomalous distribution could not be solved without reference to the flora of the Great Lakes as a whole and accordingly a study of the costal plain element of the other lakes was undertaken.

For this purpose I had recourse to the Gray Herbarium and, by the courtesy of Dr. Millspaugh and Dr. Pennell, the herbaria in Chicago and New York were referred to through correspondence. Mr. Charles C. Deam, State Forester of Indiana, kindly assisted me by furnishing notes of his collections in Indiana. And, lastly, reference was had to the writings of many authors citied in the text. The present paper is the summary of these investigations.

Definition of the Coastal Plain Element.

The coastal plain of the geologists is that flat area lying between the coast and the piedmont and extending from the Gulf of Mexico to southern New England. It is usually underlaid by Cretaceous deposits but in various areas and especially on its northward extensions is overlaid with Tertiary sands. But by the coastal plain *flora* is meant the flora of that area of acid bogs, sand barrens, savannahs and marshes anywhere from the Gulf of Mexico and Florida to Cape Cod, Nova Scotia and Newfoundland. It does not include the flora of salt marshes, estuaries, the piedmont country which lies just back of the coastal plain and parallel to it, nor does it include any of those plants which, though abundant on the coastal plain are found in a fairly general way upon other areas, such as *Cenchrus carolinianus, Quercus ilicifolia, Strophostyles helvola, Tephrosia virginiana, Lespedeza capitata,* etc. I have, however, included in the list of inland extensions of the coastal plain some species of the dunes and strands of the Atlantic coast. The dunes and strands, it is true, are better considered as littoral features than as strictly of the coastal plain and its floristic extensions which are characterized rather by savannahs and pondholes and accompanying features than by moving sand and wave-beaten shores. The coastal plain is covered by a very distinctive and endemic vegetation. But the dunes are characterized by plants which occur or have close affinities with species occurring more generally around the basin of the North Atlantic, and extend inland with a greater frequency than the coastal plain species. These in cases where they tend to follow coastal plain ranges, I have included in the coastal plain element. It is thus clear that in speaking of the "coastal plain," I shall have in mind that of the botanist rather than the geologist.

Inland Extensions of the Coastal Plain Flora.

Soil and other controlling conditicns of the coastal plain are duplicated in inland stations at various points, and in such places iso-

lated "islands" of the coastal plain flora are likely to be encountered. Such "islands" are to be found along the Great Lakes and on some of the lakes of New York State. They also occur around Havana, Illinois, and at other points on the Illinois River, and there are various small stations on acid bogs of the Middle West. The extensions of the coastal plain flora on the eastern sides of the Appalachians occur chiefly as arms reaching up high, abandoned, sandy flood-plains and are not anomalous, being directly connected with the coastal plain. Or such "islands" may occur as localized colonies in southern New England, Nova Scotia, eastern New Brunswick and Newfoundland—a type of distribution with which we have not to do here.

In the flora of the Lake Michigan area, at least, there are two general types of inland extension from the coastal plain. The first type is the very discontinuous range. In many cases of this kind there are no known stations between the Atlantic coast and the southern end of Lake Michigan. Such a range is that of *Eleocharis melanocarpa,* which is mapped in Figure 1. This is not only typical for the coastal plain but for its "jump" or reappearance on the shores of Lake Michigan. About one third of all the coastal plain species of this area show a roughly similar range with, perhaps, one additional station in New York State or on one of the other Great Lakes.

It is plants of this anomalous range which cause the greatest perplexities to the student of plant distribution and it would indeed be hard to formulate any plausible explanation were it not for the coastal plain extensions of the second type.

Figure 2 shows the range of *Euphorbia polygonifolia.* This little plant of the sea strands also occurs in a general way around the Great Lakes. Such a range is not so difficult to explain as the preceding type and is in itself highly suggestive of an explanation. The majority of the coastal plain species show a similar range. There exist all degrees of continuity between the *Eleocharis melanocarpa* type of range and that of *Euphorbia polygonifolia.* This makes it seem probable that whatever explanation of the second type of range may be offered will be equally well applied to the first type, since the difference is only one of degree.

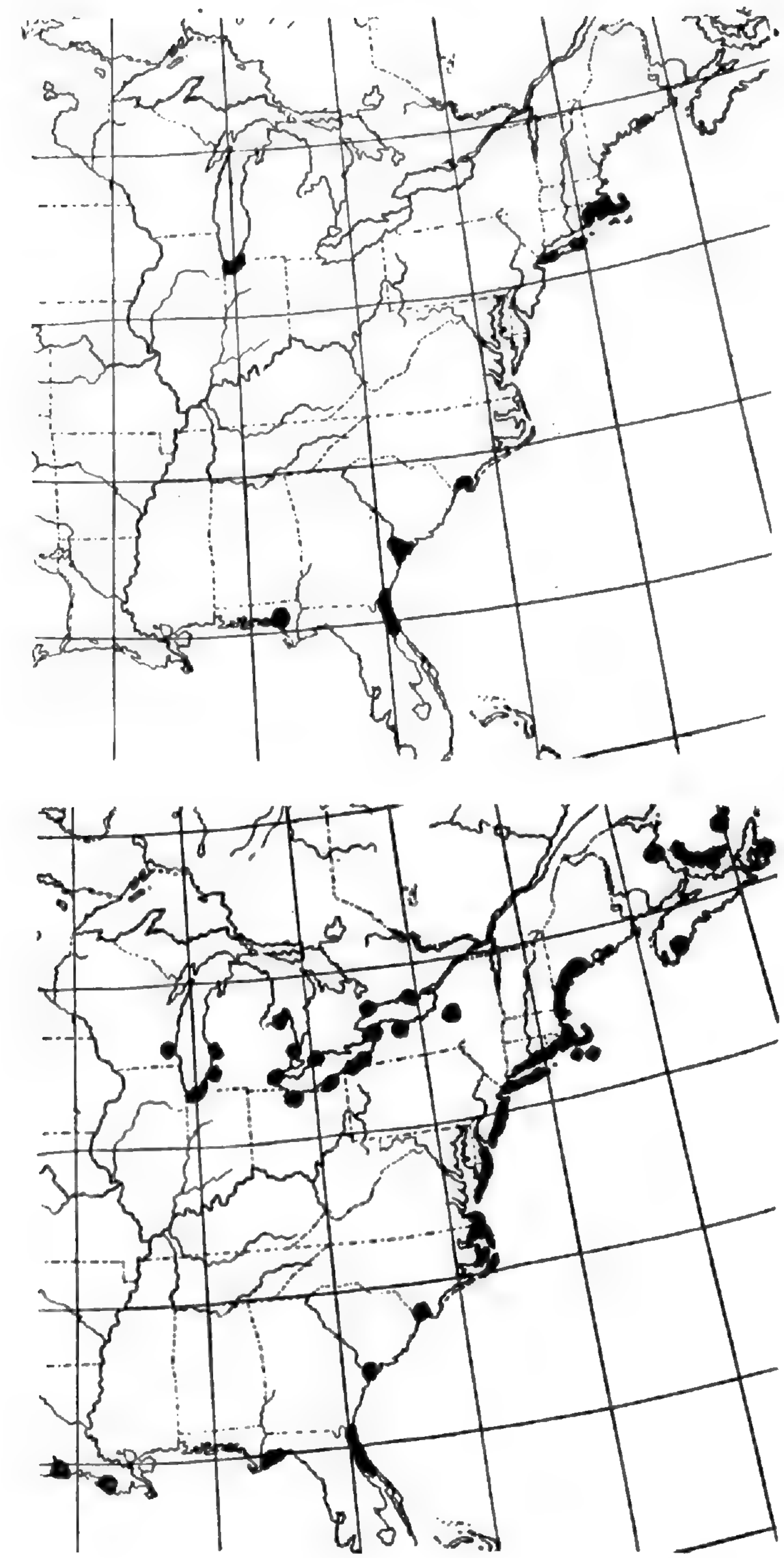


Fig. 1. (above). Range of Eleocharis melanocarpa (area in southern New Jersey inadvertently omitted in copying).
Fig. 2. (below). Range of Euphorbia polygonifolia.

Endemic Species of the Great Lakes.

Many endemic species, wherever they may occur, are closely and obviously related to some other species of characteristic range, so that it is common to speak of a given endemic as "derived" from some other species. And where a variety of a species is endemic there is usually no doubt that the variety is a geographic, as well as an evolutionary, offshoot from the true species.

In the flora of the Great Lakes there are a number of endemic plants and around Lake Michigan, where most are represented, some of them such as *Eleocharis caribaea* var. *dispar* (*E. capitata* var. *dispar*) are undoubtedly of coastal plain origin. In consideration of their clear derivation, it has been thought reasonable to reckon them among the total of the coastal plain element in the flora of the Great Lakes.

Types General in Acid Soil.

There are a certain number of plants which might by some be considered coastal plain species but which are too general in distribution off the coastal plain to belong in that category and yet they are too restricted to be classed as general types of eastern North America. Such a plant is *Eriocaulon septangulare* (*E. articulatum*) which is found locally on acid, sandy or peaty shores and extends inland particularly over the granitic or acid areas of the northern United States and southern Canada. This plant and others like it I have called a type general in acid soil and such plants have not been reckoned into the synopsis of inland extensions of coastal plain species.

Former Extensive Distribution of Coastal Plain Species.

Trying now to account for the presence in the Middle West of the coastal plain flora as we have defined it, we may consider the possible methods of distribution by which it could have spread as it has. It must be remembered that many of the coastal plain types which occur around the head of Lake Michigan make a "jump"—that is, they are lacking or almost entirely lacking from the intervening area. If such species are found one thousand miles apart, without intervening stations, it is obvious that this remarkable distribution is not to be accounted for by that stock method—a most overworked and uncritical method—of dispersal by birds[1], nor yet by winds. Were it by winds, we might expect to find these types as abundantly away from the Great Lakes as near them.

[1] See Fernald, Botanical Expedition to Newfoundland, Rhodora xiii. 143–145 (1911).

Is it not more reasonable to take up what is, in reality, the only remaining hypothesis—namely, that the coastal plain flora was at some time far more extensive around the Great Lakes than it is at present, and that this fact was due to the prevalence, in ancient times, of conditions favorable to its spread? We may conclude that these conditions—which obtain at the present over only very restricted areas—represent conditions at one time fairly general everywhere between the coastal plain and the farthest outlying extensions of its flora.

Summary of the Flora of Some Inland Sand Deposits.

Since the coastal plain flora in its inland extensions seems generally to be associated with sand deposits, it may be well to glance at the localities and vegetation of some dune areas.

Presque Isle is a big "hook" on the Pennsylvania shore of Lake Erie, composed of sand spits, dunes and lagoons. The flora of this area contains 439 species, 18 varieties and one hybrid[1]. About 15 species are coastal plain types, or offshoots from them. Very similar in character are the sands of Indiana, where high dunes, bogs, lagoons and old sand spits abound. Here there are about sixty coastal plain types and related offshoots. Of somewhat different character are the sand deposits of the Illinois River[2]. Here are sandy wastes and dunes where little strand or lagoon life is represented, with the result that the number of coastal plain species falls off to about six.

If now the plant life of the Nebraska dunes be examined[3] we find that there is not a single species[4] which might be classed as commonly restricted to the coastal plain, although a few, such as *Chenopodium leptophyllum* and *Rumex maritimus* var *fueginus* ("*R. persicaroides*") which abound in subsaline regions of the interior, are found on the sea-beaches or brackish sands of eastern America.

[1] According to Jennings, An Ecological Survey of Presque Isle, Erie County, Pennsylvania, Ann. Carneg. Mus. v, 289–421.

[2] See Gleason, Vegetation of the Inland Sand Deposits of Illinois, Bull. Ill. State Lab. Nat. Hist. ix, 23–174.

[3] See Rydberg, Flora of the Sand Hills of Nebraska, Contrib. U. S. Nat. Herb. iii. 133–203.

[4] Rydberg lists *Potamogeton Oakesianus* from Nebraska, but the report seems doubtful.

The Coastal Plain Extensions Connected only with the Great Lakes.

We have seen that the coastal plain types are closely associated with the Great Lakes and that away from these waters and from the lakes or rivers connected with them, there are no stations where any considerable number of coastal plain plants occur. They form, in various areas along the Great Lakes, as they do not elsewhere off the true coastal strip, a conspicuous part of the vegetation. Of course, the Mississippi Valley is an exception. It abounds in coastal plain types but it is not a discontinuous sort of extension but rather forms an arm of the flora of the basin of the Gulf of Mexico, and as such it is noticeable that not many of the coastal plain types which characterize the Mississippi Valley are the same as those which are found extended along the Great Lakes. The Mohawk Valley and the Finger Lakes of New York State might also be taken as exceptions, in that they are not outlets or tributaries of the Great Lakes. But it will be possible to show that in times not far distant they were precisely these.

Glacial History of the Great Lakes.

The Wisconsin Ice Sheet destroyed all plant life in the glaciated area, so that all the vegetation around the Great Lakes can have come there only in post-pleistocene times. The interest for the botanist begins during the important period when the glacier was receding for the last time and the Great Lakes were in process of formation. This period has been thoroughly investigated and described by Leverett and Taylor in *The Pleistocene in Indiana and Michigan and the History of the Great Lakes*[1]. This we may summarize as follows:

The glacier had piled up and left in the course of its various advances and recessions a border of moraines fringing the lakes which lay to the south. The moraines exist more or less along the whole vast extent of the margin, but nowhere are they more marked than over the rolling country of Ohio, Michigan, Indiana, Illinois, and Wisconsin. As the ice receded the great melting floods poured out from its edge, and, meeting with the moraines, were dammed back into the pre-glacial river systems to the north which had been deepened by glacial gouging.

[1] Monographs of the U. S. Geol. Surv. iii.

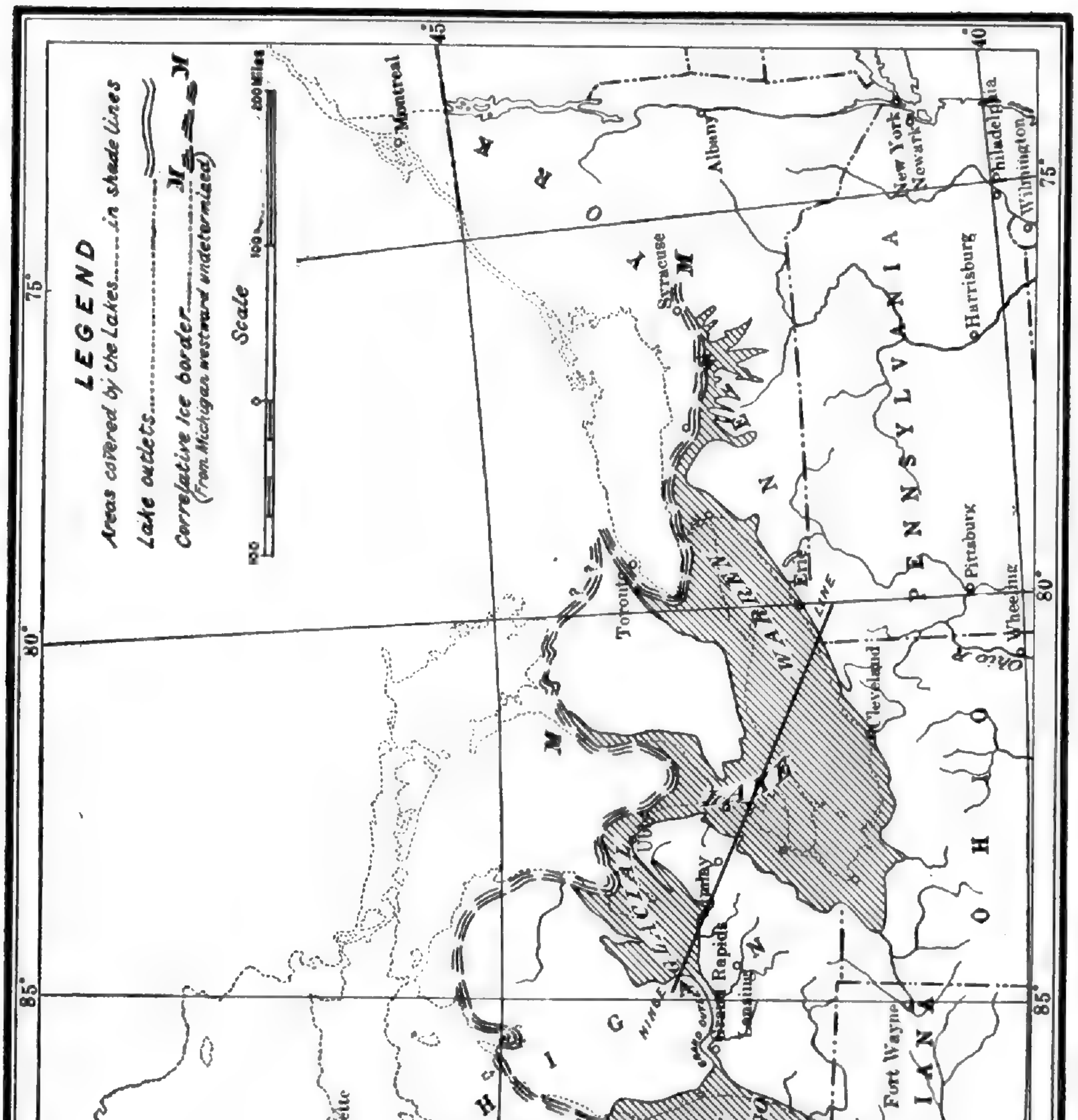


Fig. 3. Lakes Chicago and Warren Stage.

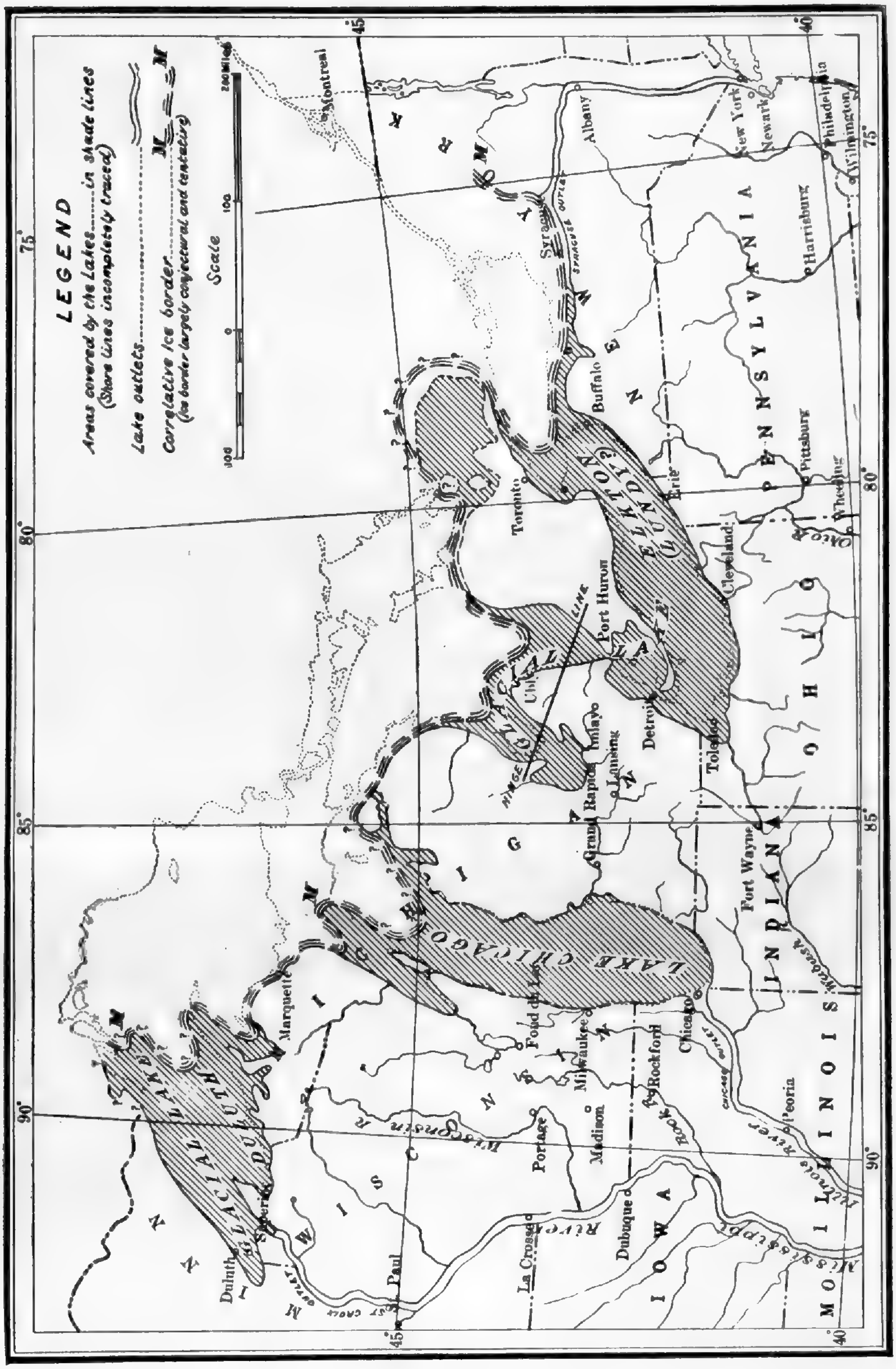


Fig. 4. Lakes Chicago and Lundy Stage.

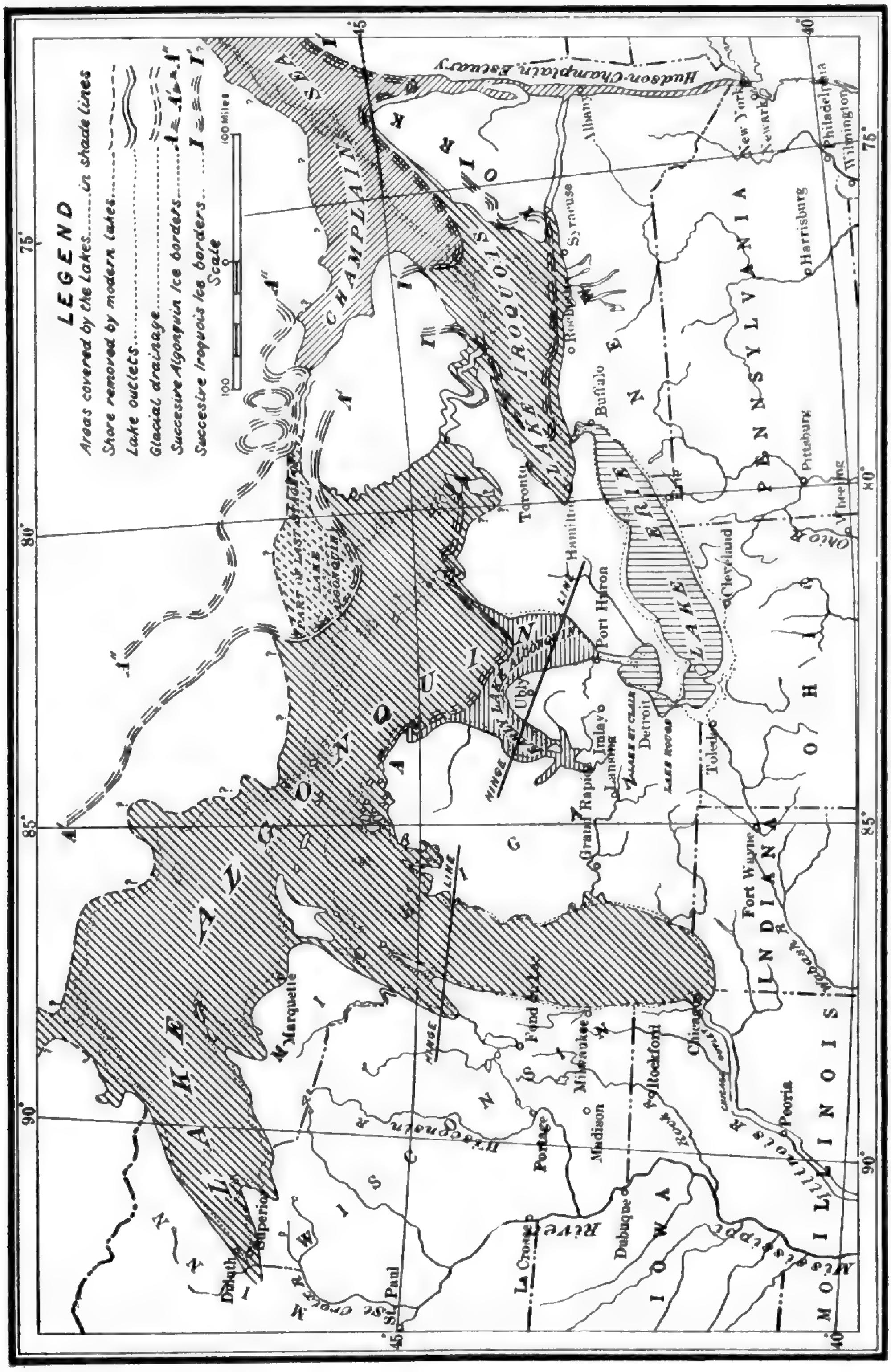


Fig. 5. Lake Algonquin Stage.

In this manner the Great Lakes began to form, and they rose until a low point was found in the barriers to the south or until the receding ice uncovered outlets to the north. First one outlet and then another functioned, as the alternate advances and retreats of the ice altered the height of the water, and as the land tipped with the release of static pressure exerted by the glacier. As a consequence the lakes many times changed their level, shape, and direction of outflow, but for us only the last stages are important. Whatever vegetation may have followed the first retreats of the glacier, it must have been wiped out again at each readvance. But when the ice had receded for the last time, it left in undisturbed possession of the soil some sort of vegetation of which we may expect to find traces to the present day.

Figure 3 is a map of glacial Lakes Chicago and Warren and the connectives, consisting of the Grand River across Michigan and the Finger Lakes and Mohawk-Hudson system of connection with the ocean. The continuous character of what are now Lakes Michigan and Erie is plainly shown and some suggestion of their connection eastward is indicated.

In Figure 4 we have another and subsequent stage in the history of the Great Lakes. This is the Lakes Duluth, Chicago, and Lundy stage. The Grand River connective is considered as probably not functioning at this time, but an exceedingly large Mohawk-Hudson connective with the ocean is affirmed[1]. In Figure 5[2] we have the Algonquin stage. The Great Lakes are now at a maximum, all joined by wide connectives and opening very distinctly into the Champlain Sea. The Mohawk-Hudson connective is functioning, and the ice has retreated well away from the lakes.

Migration of the Coastal Plain Flora.

The glacier never returned after this. The evidence indicates that during the Algonquin stage there undoubtedly took place a shore-wise migration of the coastal plain flora. It might be well questioned whether the migration did not take place in one of the periods preceding. It is hard to fix the exact time and this might appear dogmatic, but during the last of the Algonquin stage, at least, there was certainly ample opportunity for such a migration, and there is evidence that it did then occur.

[1] I am aware that some geologists challenge the existence of this connective, but the evidence of the plants is conclusively for it, as I shall show.

[2] Figs. 3, 4, 5, are reproduced from Taylor, The Glacial and Post Glacial History of the Great Lakes Region, Rep. Smiths. Inst. 1912, 291–327, by the kind permission of Mr. Taylor and of the Smithsonian Institution.

As for the possibility of migration before that time, there is some evidence that migration also took place in the Lakes Chicago and Warren stage, shown in Figure 3. The reason for thus thinking is that so many coastal plain species are found in the present valley of the Grand River in Michigan which, during the stage just referred to (but not later) formed the only connective between Lake Chicago and Lake Warren. According to Leverett and Taylor, this connective ceased to function after this stage. Hence any plants which now persist along the Grand River Valley probably owe their presence to migration during the period earlier than the Algonquin stage, when the Grand River connective was functioning.

On the other hand, it is not perfectly certain that this outlet did not function at later periods of time, and it must be admitted that, with the glacier very close at hand, the period of the Grand River connection was certainly the earliest possible opportunity for the migration and is, perhaps, too early to conform with most of the facts as we know them.

Certainly the migration did not occur much *later* than the Algonquin stage, that is, it is not now going on. This we know because the number of stations for localized coastal plain species has not materially increased during the period of observation on the region. And we know it from the fact that the conditions which favored the spread of coastal plain plants—conditions of which we shall speak later—soon ceased to exist in any general way after the close of the Algonquin.

Place of Coastal Plain Plants in Erosion Cycles and Plant Succession.

It is a remarkable fact that there are many more coastal plain species on Lake Michigan, nearly one thousand miles from the Atlantic, than on Lake Erie, four hundred miles nearer. This I believe to be due to the chance that conditions around the head of Lake Michigan are more favorable to the preservation of plants with habits like those of the coastal plain. There are rarely found on Lake Erie such superlative conditions as exist on Lake Michigan at Pine or Dune Park, Indiana. Indeed, the conditions on the Great Lakes as a whole have now become fairly stabilized. The supply of water is probably in an approximate equilibrium with the loss, so that no changes of level, save seasonal ones, are taking place and the currents have silted up the bays, while the storms have worn away the weaker

promontories. This stability is so favorable to the advance of a vegetation more vascular than that which ordinarily characterizes the coastal plain, that thickets and forests are slowly taking possession on those shores and the coastal plain types are being crowded out.

It is noticeable that those species which show the greatest discontinuity of range, as exemplified by *Eleocharis melanocarpa*, are in most cases inhabitants of the more transitory of the littoral physiographic features—the ponds, pond-margins, and lagoons; while it is those plants of the second type, plants of dunes and strands such as *Euphorbia polygonifolia*, which have tended to persist along the Great Lakes. The discontinuity of the first type would point to a dying-out, and the persistence of the type of dunes and strands merely means that while there are any Great Lakes, there must always be a strand, and also there will usually be dunes.

In general, the coastal plain types persist only where those younger and less-permanent features of the shore erosion cycle are still to be found, and they themselves represent the younger stages of plant succession. Such is the case at Presque Isle, where the whole island has been shown by direct observations over the course of a century to be moving eastward, the west shores being washed away by a prevailing current, and the east being built out by spits. And the Indiana shores of Lake Michigan represent a long series in the cycles of shore erosion and more particularly of lake recession. One may observe there all stages from new barrier beaches and lagoons to shores which have been dry of water for thousands of years.

The coastal plain element follows closely the shores of the lakes as they recede, and the field and forest types of the adjacent country press hard upon it; indeed the coastal plain plants prepare the ground for their successors. By the larger measures of time, the coastal plain element in this region is rather ephemeral, though if the balance of nature is not disturbed by man, it will probably never be entirely eliminated. This pioneering quality of the coastal plain type is, really a further proof of the early migration around the glacial lakes. These plants probably then were, for the same reasons that they now are, biologically well adapted to pressing forward quickly on the unstable margins of these lakes, while the forest types would naturally return more slowly.

Climate at the Close of the Glacial Period.

It may well be questioned whether or not the conditions of life which obtained at the close of the glacial period were suitable for the migragration of coastal plain plants. This question cannot be answered very specifically, for no one knows exactly what were the conditions of life at this time. But I shall give such evidence as there is.

As to climate: it might at first thought appear that it would have been too cold for coastal plain plants. But it has amply been shown upon the best authorities that coastal plain plants have a tendency to range up and down the coastal plain from Florida to Nova Scotia and Newfoundland without very great regard to the variabilities of the several climates of this territory, but with regard chiefly to the acid character of the sands and peats which there abound. It is probable, therefore, that even were the climate of the Algonquin stage fairly rigorous, there might still be an abundance of such types growing along the glacial lakes.

But it is, perhaps, not necessary, to imagine a polar frigidity for this stage. The amount of insolation required to melt back the glacier must have been very great and as the earth and its vegetation have a high coefficient of heat absorption, they received at that time a significant amount of warmth[1].

That it was warm enough for plant life between the glacial advances is proven by the fact of peat deposits found *between* glacial deposits[2]. This furnishes proof that whatever the climate and the length of the interglacial periods, there were not only abundant time but appropriate conditions for a plant growth sufficient to make considerable peat deposits.

But the glacier might reasonably be expected to make the waters of its marginal lakes cold. Even if this were so, it is still true that the coastwise lagoons and bays would be shallow and protected, and hence would soon heat up. It is in these, or on their margins, assuredly, and not in the open waters of the big lakes, that the coastal plain flora must have migrated. Terrestrial types would not have been much affected by the temperatures of the adjacent waters.

[1] The whole matter of climate at this time has been treated by Dachnowski, Peat Deposits and Their Evidence of Climatic Change, Bot. Gaz. lxxii., summarized on pages 85–86 (1921).

[2] Chicago Folio of the U. S. Geol. Surv. 11.

(*To be continued.*)

LOPHOTOCARPUS ON THE NORTH-EASTERN RIVER-ESTUARIES.

Norman C. Fassett.

(Plate 137.)

In Gray's Manual, edition 5 (1867), Engelmann described *Sagittaria calycina*, growing from Maine to Delaware, Wisconsin, and southward, and added "var. *spongiosa*, with a loose or spongy texture and linear bladeless leaves submersed, occurs eastward." In 1894 J. G. Smith transferred *S. calycina* to the genus *Lophotocarpus*[1], keeping var. *spongiosa* as a synonym of *L. calycinus* Smith. Later he described Engelmann's variety as a species[2]. The characters relied upon were as follows:

L. calycinus.	*L. spongiosus.*
Leaves floating or ascending,	Submersed aquatic, with thick, spongy, nodose petioles and scapes[3].
[Leaves] 1.5–4 dm. high.	Petioles 1–2 dm. long.
Blades entire, hastate, sagittate, or triangular crescent-shaped, dorsal lobes usually widely divergent, 8–16 cm. long[4], 5–25 cm. wide, rounded, obtuse or acute at the apex. Basal lobes often much longer than the middle one.	Blades spatulate and obtuse, or elliptical and truncate, or hastate, or sagittate, with the narrow, acute, falcately divergent lobes 2.5–10 mm. wide, sometimes 8 cm. long.
Scape shorter than the petioles, simple, weak, at length decumbent.	Scape simple; not more than half as long as the petioles, spongy, weak, at first ascending, at length decumbent, bearing two verticils of one to three flowers each.
Verticils 2–6; fertile pedicels very thick, recurved in fruit, equaling or longer than the slender sterile ones.	Fertile pedicels much thickened, 1–2 or 3 cm. long, 3–5 or 6 mm. in diameter.
	Sepals broadly ovate, obtuse, scarious at the tip and margins, 10–12 mm. long.
	Fruiting head depressed-globose, 7–10 mm. in diameter.
Achenes obcuneate, truncate, 2–2.5 mm. long, narrowly winged on the margins, with a short, horizontal, triangular beak.	Achene 2–2.5 mm. long, obcuneate, with a narrow dorsal wing and a very short, ascending or horizontal beak.

[1] Mem. Torr. Bot. Club, v. 25 (1894).

[2] Rev. of the Spec. of Loph. of the U. S., 4 (1899) and Rep. Mo. Bot. Gard. xi. 148 (1900).

[3] Much of the material of *L. calycinus* has thick, spongy petioles, and nearly all of the petioles are nodose.

[4] Many apparently normal specimens in the Gray Herbarium have the leaves only 4 cm. long.

The chief difference, according to these descriptions, seems to be that the leaves of *L. spongiosus* average a little smaller than those of *L. calycinus*, and examination of specimens bears this out. The achenes of the two are identical in size and shape except for a little individual variation in both species.

In an attempt to determine to what extent the foliage-characters can be relied upon many plants have been studied, and sketches, shown in plate 137, have been made to illustrate the variations observed.

Fig. 1 shows a characteristic leaf of *Lophotocarpus calycinus* from Webb City, Missouri; fig. 2 is a type occasionally found, and is from the same herbarium sheet as fig. 1. The leaves are often much larger, sometimes a decimeter long, or as large as 12 ×25 cm. in var. *maxima* (Engelm.) Robinson. Fig. 3 is of a similar leaf of *L. calycinus* from Delaware City, Delaware. Figs. 4 and 5 show two leaves from co-type material of *L. spongiosus* from the tidal mud-flats of the Delaware River at Wilmington, Delaware. The only difference between this and *L. calycinus* is that the leaves of the former are a little smaller—hardly enough ground for making a species. Figs. 6, 7 and 8 are from three other specimens from the same station, showing how variable a plant may be without having any character sufficiently constant to set off a species. Figs. 9 and 10 show leaves from Milford, and Figs. 11 and 12 from Old Lyme, in Connecticut, and for both stations exhibit the most nearly hastate leaves found on the specimens in the Gray Herbarium. These also begin to show the tendency which I wish to point out, namely that the leaves of *L. spongiosus*, while everywhere variable, tend less and less to be hastate in the northern stations for the plant. This is more pronounced in specimens from the Mystic River, Massachusetts, which was tidal until the dam was built at Medford. On these plants a stump of a basal lobe is rarely present (figs. 13 and 14). At the mouth of the Merrimac River at Newburyport, Massachusetts, the leaves are of the forms shown in figs. 15 and 16, with all vestiges of the basal lobes lost. The blades are reduced, short and strap-like, and the petioles are thick and spongy[1]. At Winnegance Creek, Phippsburg, Maine (figs. 17 and 18) the leaves become more compressed-subulate; on the Moulies River in Kent County, New Brunswick (figs. 19 and 20) and at Newcastle, New Brunswick, on the Mirimichi River (figs 21, 22, and 23) the blades are almost lost and the petioles are tapering, very thick and spongy.

1. The plant of the Merrimac River mud-flats was described by Smith as *L. spatulatus*, but it may readily be seen how the plant fits into this series of variations of *L. spongiosus*.

A leaf like that shown in fig. 4 is certainly most unlike the one shown in fig. 20, but the transition between the two is perfect. Nearly all the leaf-forms occur at Wilmington, and at each station as the plant goes up our coast, where it seems to be confined to the tidal mud of river-estuaries, the extreme form tends to be less hastate but more subulate.

Lophotocarpus spongiosus, then, grades into *L. calycinus* where the ranges of the two are coincident, but at the parts of its range more remote from *L. calycinus* it shows well-marked extremes. It seems therefore to be better treated as a variety, just as Engelmann first described it, but under *Lophotocarpus* it becomes

L. CALYCINUS (Engelm.) J. G. Smith, var. **spongiosus** (Engelm.) n. comb. *Sagittaria calycina* var. *spongiosa* Engelm., Gray's Manual ed. 5, 493 (1867). *Lophotocarpus calycinus* J. G. Smith, Mem. Torr. Bot. Club, v. 25 (1894). *L. spongiosus* (Engelm.) J. G. Smith, Rev. of the Spec. of Loph. of the U. S., 4. (1899) and Rep. Mo. Bot. Gard., xi. 148 (1900). *L. spatulatus* J. G. Smith, Rev. of the Spec. of Loph. of the U. S., 5 (1899) and Rep. Mo. Bot. Gard., xi. 148 (1900). *Lophiocarpus calycinus* Micheli, DC. Monog. Phan. iii. 61 (1881).

HARVARD UNIVERSITY.

EXPLANATION OF PLATE 137.

Figures 1-3. Lophotocarpus calycinus × ⅓.
Figures 4–23. Lophotocarpus calycinus, var. spongiosus × ⅓.

VARIATIONS OF CAREX ANNECTENS.

K. M. WIEGAND.

WHILE collecting in a field in which *Carex vulpinoidea* and *C. annectens* were very abundant, the writer was troubled by a third form that, though less abundant than either of the others, was represented by many fine clumps. An inspection of the manuals gave no help, and the problem was later taken up for study at the Gray Herbarium. It was possible to separate the material into two rather well marked, though somewhat intergrading strains, which accorded well with the observations in the field. On looking through the literature it was soon found that these two forms of *C. annectens* had already been distinguished by Bicknell in 1896. The two plants should be treated as follows:

C. annectens Bicknell, Bull. Torr. Bot. Club, xxxv. 492 (1908). *C. xanthocarpa annectens* Bickn. Bull. Torr. Club, xxiii. 23 (1896). *C. vulpinoidea*, var. *ambigua* Barratt, Suppl. N. A. Carices, no. 62 (1841), and in Boott's Ill. Carex, iii. 125. t. 406 (1862). *C. setacea*, var. *ambigua* Fernald, Rhodora, viii. 167 (1906).—Inflorescence greenish-stramineous becoming deep brown in age, oval-oblong or more generally linear-oblong; perigynia 2.6–3.2 mm. long, almost always nerved on the outer face; beak rather prominent, broad, serrulate, usually plainly notched. Central Maine along the coast to the District of Columbia (North Carolina, according to Bicknell), and less frequent westward to central New York.

Var. **xanthocarpa** (Bicknell) n. comb. *C. xanthocarpa* Bicknell, Bull. Torr. Bot. Club, xxiii. 22 (1896), not Degland in Loiseleur, Fl. Gall. ii. 299 (1807). *C. vulpinoidea*, var. *xanthocarpa* Kükenthal, Pflanzenreich, IV. xx. 148 (1909).—Inflorescence usually golden-brown, averaging shorter and thicker than in the typical form; spikes less echinate because of the shorter beaks; perigynia smaller, 2.2–2.6 mm. long, the wall thicker and essentially nerveless; beak very short, narrower, usually less serrulate, and more obscurely notched. —Western New Hampshire and central Connecticut to Virginia, westward through New York and Ohio to Illinois, Iowa and Missouri. The writer has seen no specimens from so far east as Cambridge, Mass. (*E. Tuckerman*) as cited by Bicknell. Specimens examined were as follows: Vermont: Lake Dunmore, 1901, *E. Brainerd*. Massachusetts: Allen Street, Springfield, 1878, *L. Andrews*. Connecticut: Hartford, 1878, *C. Wright*; Southington, 1901, *C. H. Bissell*. New York: near Albany, 1918, *H. D. House;* near Utica, *C. Dewey;* near Slaterville swamp, Caroline, *Eames, Randolph & Wiegand*, no. 11,566. Delaware: Wilmington, *Canby*. Virginia: Bluemont, *H. D. House*, nos. 876 & 878. Ohio: *Sullivant*; Oxford, *E. L. Mosely*, no. 7253. Illinois: Marion County, *Bebb;* Decatur, *I. W. Clokey;* Wadra Petra, *V. H. Chase* as Kneuker, no. 366; Joliet, *Wheeler & Steele*, no. 283. Iowa: Fort Dodge, *M. P. Somes;* Peru, *D. E. Hollingsworth*, no. 392. Missouri: Lee's Summit, *B. F. Bush*, no. 3941; Buckner, *Bush*, no. 6793; Grain Valley, *Bush*, no. 93, in part.

The nervation and size of the perigynia go fairly well together. Only one or two specimens were seen with the large fruit and no nerves on the outer face, while there were two or three only with the short measurements and nerves present.

Cornell University, Ithaca, New York.

INTRODUCED SPECIES OF LATHYRUS IN THE NORTHWEST:—Professor Parker's report of the occurrence of *Lathyrus Nissolia* at Pullman, Washington (RHODORA **23**: 246) adds another species to the already considerable representation of the genus in the North Pacific States. The writer is able to report four introduced species from Western Oregon, three of which may be safely regarded as permanently established, and none of which has found mention in the published manuals purporting to cover the region.

The most abundant of these is *L. latifolius* L., originally introduced as an ornamental garden plant, which has spread so rapidly as to have become almost a pest, particularly in the city cemetery at Salem. It seems able to resist the aridity of our rainless summers better than most of the native plants, and its showy clusters of large pink, purple or white flowers are a familiar sight along roadsides and railroad tracks during the long dusty summer.

L. Aphaca L. is a little yellow-flowered annual, frequent in cultivated ground and grassy roadsides, and noteworthy on account of the total absence of a leaf-blade, the petiole appearing as a tendril, and the function of the leaf being performed by a pair of broad foliaceous stipules.

L. hirsutus L. appeared in Salem in 1919, scrambling over other vegetation along the grassy border of a street, and has since spread rapidly over a considerable area, showing a vigor of growth that would suggest the possibility of utilizing it as a forage-plant. It ripens abundant fruit, and seems to have become a permanent member of our local flora, though there is no report of its occurence at any other Oregon station.

In the same year 1919, a botany pupil in the high-school brought in a plant found growing among tall grass on the street-border opposite the school-building, with solitary dark-red axillary flowers, which was determined for us at the Gray Herbarium as *Lathyrus sphaericus* Retz. About a dozen plants in all were found, which matured seed; but no trace of the stranger has appeared in subsequent seasons, either at this or any other station, so that we must regard the species as one of those transient foreign waifs which so frequently and unaccountably appear in Western Oregon. Specimens of all the above species have been deposited in the Gray Herbarium.

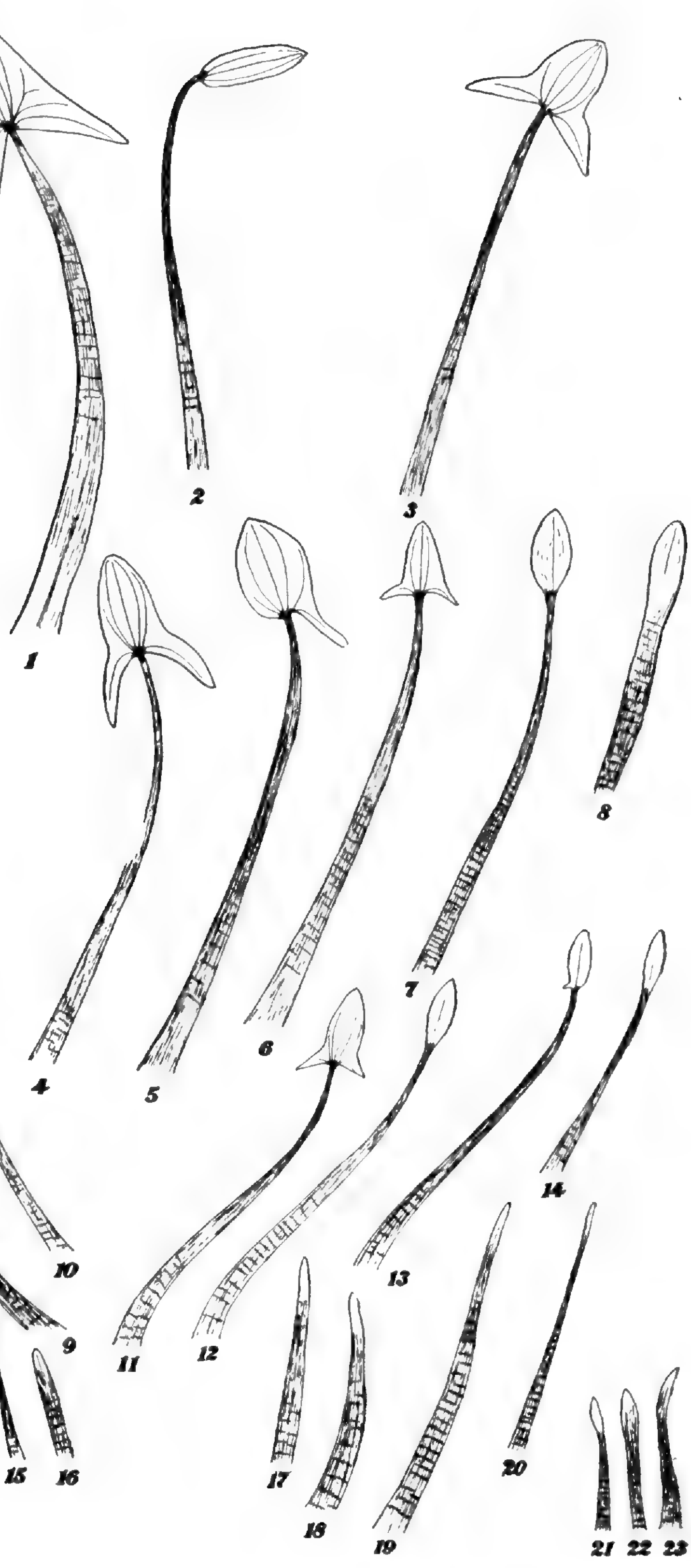
In addition to these introductions, some eleven native species of the genus occur in Oregon, of which three are maritime, and the others mostly inhabitants of open woods and grassy banks.—J. C. Nelson, Salem, Oregon.

Lysimachia terrestris (L.) BSP., var. **ovata** (Rand & Redfield), n. comb. *L. stricta*, var. *ovata* Rand & Redfild, Fl. Mt. Desert, Me. 129 (1894).

A remarkable extreme known only from the type-region, near Somesville, Mt. Desert Island (type in herbarium of the New England Botanical Club). During the nearly thirty years since I first knew var. *ovata* I have watched throughout the northeastern states and northeastern Canada but have found no plants closely approaching Somesville plant.—M. L. Fernald, Gray Herbarium.

Vol. 24, no. 278, including pages 21 to 36, was issued 23 May, 1922.

The date of the March issue (unpublished as this goes to press) will be announced later.



Figs. 1–3. LOPHOTOCARPUS CALYCINUS.
Figs. 4–23. L. CALYCINUS, VAR. SPONGIOSUS.

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NOTES ON TREES AND SHRUBS OF SOUTHEASTERN NORTH AMERICA.

W. W. Ashe.

During the summer of 1921 *Viburnum densiflorum* Chapman and *Quercus hybrida* (Chapman) Small were collected in Newton County, Texas. This extends the distribution of the Viburnum 400 miles westward (hitherto southern Alabama) and that of the oak 300 miles westward (hitherto southern Mississippi). These plants were growing under what would seem to be the same conditions as in the type locations in northwestern Florida, the Viburnum on the edge of small sandy hummocks in longleaf pine forests, and the oak on dry sand bluffs near or bordering streams. Since the name for this oak proposed by Small is already occupied it is suggested on account of its habitat that it be called

Quercus **arenicola** n. n. *Q. hybrida* (Chapman) Small, Fl. S. E. U. S. Ed. 1, 350 (1903), not *Q. hybrida* Bechst., Forstbot. Ed. 5, 211 (1829); nor *Q. hybrida* Brot. Fl. Lusit. **2**: 31 (1804); nor *Q. hybrida* Houba, Chên. de l'Am. Sept. 310 t. (1887). This oak is strongly marked in its characters, although it is not recognized by Sargent in his manual. Notwithstanding its slightly drooping lower branches at a distance it resembles and almost rivals in beauty of foliage *Q. laurifolia* Mx., from which, however, and from *Q. obtusa* Ashe it is separated by having much smaller fruit (acorns only 9–12 mm. thick and much constricted at base), and extremely flat shallow cups with very small scales; while from narrow-leaved forms of *Q. nigra* L. it is separated by the prevail-

ingly broadly oblanceolate leaves, which except on vigorous shoots are entire and acute. The leaves when entire resemble those of *Q. laurifolia*, although when 3-notched on vigorous shoots they are characteristic. Many of the trees in eastern Texas and adjacent parts of Louisiana have only entire foliage, and for such, which without the distinctive fruit are with difficulty separated from large-leaved forms of *Q. laurifolia*, there is suggested the name:

Q. ARENICOLA **integra** n. var. This differs from the type in having all the leaves on the tree entire; fruit as in type. Sandy bluffs along Sabine River, Texas, and Louisiana (type from Haddon Ferry, La. No. 1100).

QUERCUS OBTUSA (Willd.) Ashe. Torreya **18**: 4, 72 (May 8, 1918.) *Q. hybrida* (Mx.) Ashe Proc. Soc. Am. For. **11**: 1; 88 (1916) not *Q. hybrida* (Chapman) Small. *Q. rhombica* Sarg. Bot. Gaz. **65**: 5, 430 (May 15, 1918). *Q. aquatica* var. *laurifolia* (Mx.) Houba, op. cit. 307 (1887). Houba gives an excellent illustration showing characteristic foliage of this tree, but mistakes it for the typical *laurifolia*. This tree is common throughout the entire coastal plain region of the Southern States and has been generally confused with *Q. laurifolia*. In Texas it occurs as far inland as Harrison County, in Louisiana to Sabine Parish and in Alabama as far north as Tuscaloosa, where it has been extensively planted as a shade tree and where it is regarded as being *Q. laurifolia* Mx. It seems to be as distinct from *Q. laurifolia* in southern Louisiana where the two are frequently associated as it is in Georgia and North Carolina. It is locally esteemed for its timber which is regarded as equal to that of *Q. laurifolia*, the best of the water oak group.

Q. OBTUSA **obovatifolia** (Sarg.) n. c. *Q. rhombica* var. *obovatifolia* Sarg. l. c. Specimens of this variety, which differs from the type only in its spatulate leaves with rounded apices, were noted in Caldwell Parish, Louisiana. On one specimen the acorns were oblong in place of ovoid.

QUERCUS **moultonensis** n. n. *Q. hybrida*, Houba, Chênes de l'Am. Sept., 310 (1887). *Q. phellos* L. × *Q. shumardii* Buckl. A number of fine specimens of this were noted in the Moulton Valley of the Tennessee River in Lawrence County, Ala., where both of the supposed parents are common. The leaf blades are oblong, with 5–7 mostly entire spreading or ascending lobes, and with tuft of pubescence in

the axils of the veins, such as are characteristic only of *shumardii*. The fruit while only slightly larger than that of *phellos* has a much deeper and thicker cup with large scales, W. W. A. No. 1080. The cups in this collection are not quite so pointed at base as figured by Houba, but there is considerable variation in *shumardii* in this respect, and there is a yet wider variation in hybrids. Houba's reference to the tufts of pubescence in the axils of the veins points only to *shumardii* as one parent; while only *phellos* as the other parent would determine glabrous foliage in connection with the narrow outline.

ACER BARBATUM **sinuosum** n. c. *A. sinuosum* Rehd., T. and S. **2:** 255 (1913). This form has been found in the Wichita Mountains, Comanche County, Oklahoma, thus extending its distribution more than 300 miles north of the type and hitherto only recorded locality. Rehder has recently reduced it to a varietal status and the material from the Wichita Mountains confirms this disposition by more clearly indicating the relationship of *sinuosum* to *barbatum*. In the Wichita Mountain specimens the leaves are glaucous beneath as in *barbatum* and have the customary leaf form of *barbatum*, there being three prominent lobes with parallel sides, 3-notched at the tips. The first pair of nerves also rises from the petiole and not from the second pair. However, on these same trees the upper leaves have 3 subentire triangular lobes as described for *sinuosum*. The only difference between *sinuosum* and *barbatum* Mx. (*A. floridanum* (Chap.) Pax.) is the exposure of the nerves of the second pair of lobes at the point where they join the petiole and the somewhat stouter bright red-brown twigs.

QUERCUS NIGRA **heterophylla** n. c. *Q. aquatica* var. Aiton, Hort. Kew. Ed. 2, **5**: 290 (1813). This differs from the type only in the leaves especially those on vigorous shoots, which are deeply and irregularly 3–5-lobed, some of the divisions being ligulate, 5–8 cm. long, 1–2 cm. wide, acute obtuse or even rounded at the ends. On the Atlantic Coast an occasional shoot or rarely a tree occurs having such foliage. In western Louisiana and eastern Texas, however, many trees occur on which most of the foliage is of this character. It is with some doubt that Aiton's name is taken up but his description seems to apply very well to this form.

THE ATLANTIC COASTAL PLAIN ELEMENT IN THE FLORA OF THE GREAT LAKES.

Donald Culross Peattie.

(*Continued from page 70.*)

Topography of the Great Lakes Shores at the Close of the Glaciation.

But were there really any warm shallow lagoons and bays? There seem to have been, for a countless number of shallow bays and old sand spits enclosing lagoons have been traced by many geologists and shown to have existed extensively during the Algonquin stage.

It is significant that the stations for coastal plain isolations along the Great Lakes occur precisely where some of the spits and lagoons still exist, as at Presque Isle and Cedar Point on Lake Erie, and around Pine and Dune Park at the head of Lake Michigan where a long era of spit-forming and lagoon-forming is just drawing to a close.

Topography and Flora of the Post-Tolleston Beaches.

The Post-Tolleston is that period of transition between the glacial Lake Chicago and modern Lake Michigan and is synchronous with the Algonquin stage over the Great Lakes as a whole, particularly with the latter phases of the Algonquin. During this period the strand line of Lake Chicago receded in places about six miles and this it did slowly, building up barrier beaches and forming lagoons behind them, and then receding a little more, to build up another bar and lagoon. The lagoons are, many of them, of recent date and their beaches are still intact.

The result is a topography which is scenically monotonous, being a series of ridges and hollows which are about one hundred meters wide, the hollows never more than three or four meters above the level of the present lake, and the ridges scarce two meters above the hollows. There are by actual count 32 such ridges in the four miles between the village of Gibson and the lake shore[1].

The hollows nearest to the present shore are still what might properly be called lagoons; they are occupied by swamp and pond types among which are coastal plain plants, while on the sandy ridges near the shore are many strand plants of the Atlantic coast. But as we

[1] Leverett and Taylor, loc. cit. 357.

progress inward we do not find the hollows filled with water; they are only moist swales, and the ridges are covered by that peculiar vegetation which E. J. Hill has called the "pine barrens of Indiana" and Dr. H. C. Cowles has classified as evergreen dunes or dune heath. Both the swales and the pine ridges show a less-markedly coastal plain character. Further inland still the hollows are nearly as dry as the ridges and are distinguished by very few coastal plain plants (chiefly arenicolous if any) and more and more frequently by prairie types or by the oak barrens which are, for the most part, Alleghenian and Carolinian.

This spot and a few similar ones along the Great Lakes show all that are left of conditions which approximate those which must have been prevalent on the margins of Lake Algonquin. Judging from the large number of old spits and beach ridges which have been traced out for the glacial lakes giving rise to Lake Erie and Lake Michigan, it is reasonable to imagine their shores to have been an intricate series of lagoons, ridges, strands and low dunes, harboring the newly-migrated coastal plain and strand types. This is the more evident when we see that considerable numbers of coastal plain species occur to-day in such places, and rarely occur in others.

Flora of the Outlets of the Glacial Lakes.

It might reasonably be expected that where there were important inlets and outlets of the glacial lakes system, there would be isolations of coastal plain plants. And this is precisely what we find. The narrow St. Clair River, which at the present day forms the connective between Lake Huron and Lake Erie, has at all stages been the only connection. This then, is the gate through which all coastal plain migrations necessarily took place. And it is interesting to record that the coastal plain flora of Port Huron and its vicinity, at the outflow of Lake Huron, is large. So also are the floras of Saginaw Bay and Grand Rapids, which are, respectively at the east and west extremities of the Grand River Valley, the one-time connective across Michigan, seen in Figure 3.

The flora of the Hudson-Mohawk Valley and of the Lake Ontario basin of New York State, particularly around Oneida Lake, contains almost as many coastal plain species as the head of Lake Michigan. The area shows, of course, a good many types which come up from the Atlantic seaboard and do not extend further inland, but they also, with the presence of a large number of the coastal plain types which

do follow the Great Lakes, serve to point the path by which these plants must have travelled. Consequently I have thought it not too extraneous to place in the list at the end of this paper, the coastal plain types in the Mohawk-Hudson Valley and Ontario Basin, whether or not they reach the Great Lakes. It gives me pleasure to acknowledge the kind assistance of Prof. Wiegand in preparing this part of the work.

The connectives through central Ontario and the Ottawa River Valley, which are so conspicuous on the map of the Algonquin stage, are not well known to me in their floristic aspects. But the Ottawa Valley has at least a few coastal plain species to show, such as *Juncus pelocarpus*, *Utricularia resupinata*[1], *Elatine americana*[2], *Carex exilis*[3], *Sporobolus uniflorus*[4], and *Isoëtes riparia*.

And lastly, the sand dunes of the Illinois River, of which we are fortunate in possessing a catalogue of the flora[5], have about eight true coastal plain species. A glance at any of the maps of the glacial lakes will show that the Illinois River functioned as the outlet for Lake Chicago during all the period of which we are speaking. This outlet was, judging from geological evidences, a broad and deep one, lined on its sides by many local sand deposits. It is hardly necessary to state that the presence of some twelve coastal plain species there is in part due to the migration along the shores of the glacial lakes and their outlets.

In the case of the Illinois River, however, as in the case of its tributary the Kankakee, it must be remembered that they have probably been open to more than one coastal plain influence—that is, since they have at different times been connected with the St. Lawrence Basin and with that of the Mississippi, they perhaps owe the origin of their coastal plain elements to both valley systems. Thus such plants as *Rynchospora corniculata* and its variety *interior*, have probably reached Illinois and Indiana by way of the Mississippi Valley and not by way of the Great Lakes. This may be inferred from the fact that these plants are found today well up in the Mississippi Basin and are not found across the Great Lakes shores. To the same path of migration *Mikania scandens* probably owes its presence on the Kanka-

[1] Macoun, Proc. & Trans. Roy. Soc. Can. xii. 30 (1894).
[2] Fernald, Rhodora, xix. fig. 12 (1917).
[3] Fernald, Proc. Am. Acad. xxxvii. 482 (1902).
[4] Macoun, Ottawa Nat. xxiii. 192 (1910).
[5] Gleason, loc. cit.

kee River in Indiana, only some thirty miles south of the old Lake Chicago Basin. The Kankakee itself flows through the site of an old glacial lake bed. But this glacial lake drained into the Mississippi Basin and not into Lake Chicago, and as *Mikania scandens* is not found on the Great Lakes, although extending by way of the Mohawk and Hudson to the Ontario Basin, it is best treated as a plant of the southern coastal plain reaching a northern limit in Indiana, and not one of the migrants of the Great Lakes. Another coastal plain and piedmont plant reaching a northern limit on the Kankakee is *Betula nigra*, and there are others of the same sort.

The Negative Evidence.

There is a certain amount of negative evidence in favor of the glacial lakes as a pathway of migration for coastal plain plants. In the first place, we know only a single coastal plain species[1] on the Great Lakes which is not also found fairly far north on the true coastal plain—far enough north for it to have migrated by way of the New York State connectives with the glacial lakes. In other words, coastal plain plants ranging from the Gulf around Florida to about the latitude of Delaware, *but not northward*, are almost wholly absent from the Great Lakes, though they may often reach far up the Mississippi Basin and be found in southern Illinois, Indiana or Ohio. Such a range have *Styrax americana*, *Taxodium distichum*, *Jussiaea decurrens*, *Spigelia marilandica*, and many others. It is evident, therefore, that few, if any, of the coastal plain plants of our area have come by way of the Mississsippi Basin.

And in the second place, there is the flora of the sand hills of Nebraska, with which there has never been any glacial lake connective which could be satisfactorily demonstrated. And we have already seen that not a single true coastal plain species exists there.

The Zoological Evidence.

There is a little zoological evidence which is corroborative of that of the plants. Animals, being free-moving organisms, are in general less restricted in their ranges than plants. But there are a few animals ordinarily confined to the coastal plain which are isolated in the area

[1] *Eleocharis caribaea* (*capitata*) var. *dispar*, which is an endemic of the Lake Michigan region, derived from true *E. caribaea*, a plant not known on the coastal plain north of Maryland, though further investigations may give it a station far enough north to displace it as an exception to the rule.

around the head of Lake Michigan. The lake itself contains a Mysis, a marine crustacean[1]. And I have it upon the authority of Mr. T. H. Hubbell of the University of Michigan, that the dune grasshopper, *Trimerotropsis maritima interior* is an endemic offshoot of the coastal plain true species. A similar endemic offshoot is another member of the Orthoptera, *Neoconocephalus robustus crepitans*, and still another grasshopper, *Psinidia fenestralis* is found not only along the Atlantic, but on the shores of the Great Lakes and also west of the Mississippi where the soil is sufficiently sandy. And Mr. R. F. Hussey, who has collected animals in Berrien County, Michigan, informs me that one snake which is, in a general way, of the coastal plain, shows the same discontinuous range; it is the pilot snake, *Heterdon contortrix*.

A Tabular View of Inland Extensions of the Coastal Plain Flora.

In conclusion, and in order to give a summary of the inland extensions of the coastal plain flora, I append a tabular view of the stations for each coastal plain species which is found along the Great Lakes and connected waters, so far as I am able to discover. Beside my work in herbaria, I have relied upon a large number of published floras[2]. I have tried to use discrimination with this second- and third-hand information, omitting species of great improbability and using question marks in the case of plants which have, since being reported, been demonstrated by systematists to embrace more than one distinct species, so that it has become impossible to tell just what older writers had in hand when reporting such a species. Thus *Lilium superbum* is really a coastal plain species, but so many things have in the past gone under that name, that I have thought it best to leave it out altogether, despite persistent reports of its occurence inland. So

[1] Chicago Folio of the U. S. Geol. Surv. 10.

[2] Beckwith & Macauly, Plants of Monroe County, New York, and Adjacent Territory, Proc. Rochest. Acad. Sci. iii. 1–150 (1896).

Blatchley, Geology of Porter and Lake Counties, 22nd Ann. Rep. Ind. Geol. & Nat. Res. 92–102 (1897).

Cole, Grand Rapids Flora, 1–160 (1901).

Coulter, S., Catalogue of the Flowering Plants and of the Ferns and their Allies Indigenous to Indiana, 24th Ann. Rep. Dept. Geol. Nat. Res. Ind. 553–1072 (1899).

Day, Plants of Buffalo and its Vicinity, Bull. Buffalo Soc. Nat. Sci. iv, 9–156 (1882).

Deam, Plants New to Indiana, Proc. Ind. Acad. Sci. 144–150 (1918).

Dodge, C. K. Annotated List of Flowering Plants and Ferns of Point Pelée, Ontario and Neighboring Districts, Can. Geol. Surv. v. biol. ser. 2, 8–107 (1914).

—Catalogue of Plants, in A Biological Survey of the Sand Dune Region on the.

also I have had to leave queries for the two coastal plain varieties of *Andropogon scoparius*. They are of such recent distinction that that there has not been time for full reports of their ranges to appear. Species in italics are endemic derivatives of coastal plain types.

In the following list, it may be wondered that a column is not given to Lake Superior. That it is not, is partly due to the fact that I am not familiar with Lake Superior plants and that no adequate accounts of the flora exist. But it is also due to the fact that in all probabilty no important stations for coastal plain extensions occur on Lake Superior. In looking up the ranges of the approximate hundred of coastal plain extensions in the inland, I have been impressed by the fact that the meagerest sprinkling of them occur on Lake Superior; herbarium specimens and reliable reports are in great part lacking for these species in that area.

Probably there has occured no great westward migration of coastal plain plants to Lake Superior. This is the more proven when we recall that Lake Superior was the last of the Great Lakes to be uncovered by the glacier; it was still under the ice when the other lakes were clear of it and probably thriving with marginal vegetation. It is, moreover,

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South Shore of Saginaw Bay, Michigan (edited by Ruthven), Mich. Geol. & Biol. Surv. iv, biol. ser. 2, 72–120 (1911).

—Flowering Plants, Ferns and Fern Allies Growing without Cultivation in Lambton County, Ontario, 16th. Ann. Rep. Mich. Acad. Sci. 137–200 (1914). This range includes Port Huron, Michigan.

Dudley, The Cayuga Flora, Bull. Cornell Univ. ii. 1–132 (1886).

Gates, The Vegetation of the Beach Area in Northwestern Illinois and Southeastern Wisconsin, Bull. Ill. State Lab. Nat. Hist. ix^{5}. 353–369 (1912).

Gleason, Vegetation of the Sand Deposits of Illinois, Bull. Ill. State Lab. Nat. Hist. ix^{3}, 146–170 (1910).

Goodrich, Flora of Onondaga County, 7–193 (1912) (a compilation accepted with some reservations).

Higley & Raddin, Flora of Cook County, Illinois, and a part of Lake County, Indiana, Bull. Chi. Acad. Sci. ii^{1}, 1–156 (1891) (a compilation accepted with some reservations but including the results of the splendid collections of E. J. Hill from northern Indiana).

Jennings, Botanical Survey of Presque Isle, Erie County, Pennsylvania, Ann. Carnegie Mus. v. 405–421 (1909).

Kellerman & Werner, Ohio Plants, Geol. Ohio, viii, 56–403 (1893) (a compilation accepted with some reservations).

Mosley, Sandusky Flora, Ohio State Acad. Sci. spec. pap. i. 35-162 (1899).

Paine, Catalogue of Plants found in Oneida County and Vicinity, Rep. Regents. Univ. N. Y. State, 1-140 (1865).

Pieters, Plants of Western Lake Erie, U. S. Fish. Comm. Bull. 77-79 (1901)

Rydberg, Flora of the Sand Hills of Nebraska, Contrib. Nat. Herb. iii. 133-203, (1895).

Schaffner, Catalogue of Ohio Plants, Ohio Biol. ii^{1}. 131–237. (1914).

a lake, not of warm coastwise lagoons and sandy shores like the others, but a cold and bleak one surrounded by mountainous country—the habitat of northern types of plants.

	Hudson-Mohawk Valley and Ontario Basin (Finger Lakes).	Shores of Lake Ontario.	Region of Lake Erie.	Detroit & St. Clair Rivers, Lake St. Clair & Port Huron.	Saginaw Bay (Lake Huron)	Grand Rapids (Grand River)	Region of Lake Michigan.	Dunes of Illinois River.
Woodwardia virginica	×		×	×	×	×	×	
Isoëtes Engelmanni	×							
Potamogeton pulcher							×	
Potamogeton bupleuroides	×						×	
Potamogeton hybridus			×		×		×	
Najus gracillima	×		?					
Andropogon scoparius, var. villosissimus	?	?	?	?	?	?	×	?
Andropogon scoparius, var. polyclados (littoralis)	?	?	?	?	?	?	×	?
Panicum debile (verrucosum)							×	
Panicum lucidum							×	
Panicum spretum							×	
Panicum meridionale				×	×		×	
Panicum albemarlense							×	
Panicum oligosanthes							×	
Echinochloa Walteri	×		×	×			×	
Ammophila breviligulata ("arenaria")		×	×	×	×		×	
Aristida tuberculosa							×	×
Eleocharis quadrangulata	×		×	×		×	×	
Eleocharis interstincta							×	
Eleocharis melanocarpa							×	
Eleocharis caribaea (*capitata*), var. *dispar*							×	
Psilocarya scirpoides						×	×	
Psilocarya nitens						×	×	
Fimbristylis autumnalis	×		×			×	×	×
Scirpus Eriophorum			×				×	
Scirpus Smithii	×		×			×	×	
Fuirena squarrosa[1]			?				×	
Hemicarpha micrantha	×		×			×	×	×

[1] The report from "northern Ohio" (Kellerman & Werner) is probably incorrect, as is also that from central New York State given by Sartwell and quoted by Coville, Revision of U. S. Species of the Genus Fuirena, Bull. Torr. Bot. Club, xvii. 8.

	Hudson-Mohawk Valley and Ontario Basin (Finger Lakes)	Shores of Lake Ontario.	Region of Lake Erie.	Detroit & St. Clair Rivers, Lake St. Clair & Port Huron.	Saginaw Bay (Lake Huron).	Grand Rapids (Grand River)	Region of Lake Michigan.	Dunes of Illinois River.
Rynchospora fusca	×		×	×	×			
Rynchospora cymosa			×			×	×	
Rynchospora macrostachya							×	
Scleria reticularis								
Scleria reticularis var. pubescens							×	
Carex annectans (true)	×							
Carex alata	×					×	×	
Carex exilis	×							
Peltandra virginica	×		×			×	×	
Orontium aquaticum	×							
Xyris caroliniana[1]	×		×		×		×	
Xyris torta (flexuosa)			×				×	×
Juncus Greenii				×			×	
Juncus balticus var. littoralis	×	×	×	×	×	×	×	
Juncus articulatus	×		×	×		×	×	
Juncus aristulatus			×					
Juncus dichotomus, var. platyphyllus	×							
Juncus scirpoides	?		×				×	
Juncus pelocarpus	×	×		×		×	×	
Sisyrinchium Farwellii				×				
Sisyrinchium atlanticum							×	
Sisyrinchium apiculatum							×	
Listera australis	×							
Myrica carolinensis	×	×	×					
Alnus rugosa	×						×	
Quercus prinoides[2]			×	×		×	?	
Polygonum pennsylvanicum (true)	×						×	
Polygonella articulata	×		×	×	×		×	×
Nelumbo lutea		×	×				×	
Cakile edentula	?	?	?	?	?		×	
Cakile edentula var. *lacustris*		?	×	×			×	
Drosera longifolia	×		×			×	×	
Spirea tomentosa var. *rosea*[3]							×	
Lupinus perennis	×		×	×	×		×	×
Lathyrus maritimus var. glaber	×	×	×	×	×		×	

[1] The specimen in the Gray Herbarium which is recorded here from Lake Huron. comes, more strictly, from Georgian Bay.

[2] The reports from Indiana and New York State are of doubtful authenticity.

[3] Fernald, RHODORA xiv. 190, an endemic derivative occurring also in the mountains of North Carolina.

	Hudson-Mohawk Valley and Ontario Basin (Finger Lakes)	Shores of Lake Ontario.	Region of Lake Erie.	Detroit & St. Clair Rivers, Lake St. Clair & Port Huron	Saginaw Bay (Lake Huron)	Grand Rapids (Grand River)	Region of Lake Michigan.	Dunes of Illinois River.
Linum striatum			×			×	×	
Polygala cruciata			×			×	×	
Euphorbia polygonifolia	×	×	×	×	×		×	
Hypericum gymnanthum			×				×	
Elatine minima[1]	×							
Lechea minor			×				×	
Lechea maritima							×	
Rotala ramosior			×				×	
Ludvigia sphaerocarpa							×	
Hydrocotyle umbellata[2]	×		?				×	
Hottonia inflata			×					
Lyonia ligustrina	×							
Nymphoides lacunosum	×		×					
Convolvulus sepium, var. pubescens			×				×	
Onosmodium virginianum	×		?					
Stachys hyssopifolia						×	×	
Agalinus (Gerardia) purpurea			×			×	×	×
Linaria canadensis			×		×	×	×	
Utricularia clandestina			?					
Utricularia gibba	×		×			×	×	
Utricularia resupinata			×	×		×	×	
Utricularia purpurea							×	
Mikania scandens	×							
Solidago tenuifolia						×	×	
Solidago Mosleyi			×					
Bidens discoides	×			×			×	
Cirsium pumilum[3]	×		?					

[1] Does not go far west in New York State. The specimen is in the Gray Herbarium from Chisago, Minn.

[2] The old report from the Ontario basin was a false one, but the plant recently introduced at Ithaca, N. Y.

[3] *C. Hillii* of the west is too difficult to separate from *C. pumilum* and occupies too general a range there to justify calling it an endemic derivative. The report of *C. pumilum* from Buffalo is doubtfully correct.

HARVARD UNIVERSITY.

NOTES ON SOME EAST-AMERICAN SPECIES OF BROMUS.

K. M. Wiegand.

If one may judge from the confusion of specimens in many herbaria, the species of *Bromus* are not yet satisfactorily understood, notwithstanding the revision of Shear (Bull. U. S. Div. Agrost. no. 23, 1900) and the more recent treatments in our various manuals. Perhaps the following brief sectional keys will aid in making clear the relationship of some of the eastern species.

Following Rouy & Foucaud (Fl. France), Ascherson & Graebner (Synop. Mitteleu. Flora) and other authors, *Bromus secalinus*, *B. racemosus*, *B. commutatus*, and *B. hordaceus* may be correlated in the following manner:

a. Lemmas firm; panicle not compact though the branches often erect; spikelets plainly pedicelled. *b.*
  b. Lemmas at maturity spreading, each individually involute exposing the rachilla, 7–8 mm. long, all nearly equal, sheaths glabrous except the lowermost; blades pubescent or subglabrous; panicle loose, the branches generally more or less spreading; anthers 1.5–1.8 mm. long. *c.*
    c. Lemmas glabrous.....1. *B. secalinus.*
    c. Lemmas pubescent.....forma *hirtus.*
  b. Lemmas at maturity ascending, not separately involute, therefore the rachilla not ordinarily exposed; lower lemmas longer than the upper; panicle contracted, the branches erect; sheaths and blades pubescent. *c.*
    c. Lemmas 7 mm. long; anthers 2.0–2.5 mm. long; panicle contracted; branches short, in pairs, bearing 1(2) spikelets.....2. *B. racemosus.*
    c. Lemmas 9 mm. long; anthers 1.5 mm. long; panicle more open, with long lower branches bearing several spikelets except in depauperate specimens.....3. *B. commutatus.*
a. Lemmas thin, veiny; panicle compact; the branches very short and spikelets nearly sessile; (lemmas broader than in the last species, 7–9 mm. long; anthers 1–2 mm. long; sheaths and blades pubescent). *b.*
  b. Spikelets pubescent.....4. *B. hordaceus.*
  b. Spikelets glabrous or merely scabrous.....forma *leptostachys.*

1. B. secalinus L., Sp. Pl. 76 (1753).—Common in grain fields and waste places almost throughout the United States and southern Canada.

Forma **hirtus** (F. Schultz) comb. nov. *B. secalinus*, var. *velutinus* Rchb. Icon. Fl. Germ. i. t. lxxv, fig. 1599 (1834), not Schrad. *B. mutabilis* δ *hirtus* F. Schultz, Flora, xxxii. 235 (1849). *B. secalinus* I. *vulgaris*, a. *typicus*, 2. *hirtus* Aschers. & Graeb. Syn. Mitteleu. Fl. ii. 604 (1901).—One specimen seen from America, collected in an oat-

field in dry upland soil, Calapooga Valley, Douglas County, Oregon, 1899, *M. A. Barber*, no. 84. Ascherson & Graebner note that this form has been thought by some to be of hybrid origin (*B. hordaceus* × *secalinus*), but they consider the evidence insufficient.

2. B. RACEMOSUS L. Sp. Pl. ed. 2, 114 (1762).—Rare in America. The only American specimen seen by the writer was from a railway embankment, Grand Pré, Nova Scotia, 1901, *Howe & Lang*, no. 375. Shear cites one from Cape Breton Island, one from Foxcroft, Maine, one from Bucks County, Pennsylvania, and one from Delaware. The writer has seen a duplicate of the Maine specimen. It is probably an undeveloped plant of *B. secalinus*.

3. B. COMMUTATUS Schrad. Fl. Germ. 353 (1806).—Frequent through the greater portion of the United States, but especially abundant in the east.

4. B. HORDACEUS L. Sp. Pl. 77 (1753). *B. mollis* L. Sp. Pl. ed. 2, 112 (1762).—Frequent along the Atlantic coast from Nova Scotia to North Carolina; also in New York State, and common through the northwestern states.

Forma **leptostachys** (Pers.) comb. nov. *B. mollis* β *leptostachys* Persoon, Synop. i. 95 (1805). *B. mollis-lejostachys* (M. & K.) Fries, Sum. Veg. 76 (1846), questionably published. *B. mollis*, var. β *glabrescens* Coss. & Germ. Fl. Env. Paris, 654 (1845). *B. mollis* b) *liostachys* Aschers. Fl. Brand, i. 865 (1864). *B. hordaceus* β *leptostachys* Beck, Fl. Nieder-Oest. 109 (1890).—Scattered through the range of the typical form.

In the *ciliatus* group much confusion is due to the placing of too great emphasis on the character of the exsertion or inclusion of the nodes. Though the upper nodes are almost always exserted at maturity, in *B. ciliatus* and *B. purgans* they frequently are not so in younger or depauperate specimens, and in most cases it is the uppermost node only that is so exserted. The following is a brief synopsis of *B. ciliatus* and its immediate allies:

a. Anthers 1.0–2.5 mm. long; lemmas thin, papery; lateral nerves prominent to the base. *b.*
  b. Lemmas narrow, 2.5–3.2(3.4) mm. wide (10–13 mm. long), usually strongly ciliate between marginal nerves and margin, otherwise glabrous; glumes glabrous, nerves scabrous; upper nodes usually exserted at maturity; flanges at orifice of sheath not apparent; nodes almost always hairy; leaves with rare exceptions with scattered or dense pubescence at least above. *c.*
    c. Lemmas strongly ciliate. *d.*
      d. Sheaths villous; blades usually hairy..... 1. *B. ciliatus.*
      d. Sheaths glabrous or the lowermost slightly villous; blades usually glabrous.....forma *denudatus.*
    c. Lemmas nearly or quite glabrous.....forma *laeviglumis.*

b. Lemmas broader, 3.4–4.0 mm. wide (9–11 mm. long), pubescent over much of the lower part especially near the margin, the nerves stronger; glumes generally pubescent; nodes usually all included; flanges at summit of sheaths usually conspicuous; leaves glabrous or rarely with scattered hairs above. *c.*

c. Sheaths and usually the blades glabrous or nearly so except commonly a pilose ring at summit; nodes glabrous.....2. *B. altissimus.*

c. Sheaths and usually the blades villous; nodes usually pubescent.....forma *incanus.*

a. Anthers (2.8) 3–4 mm. long; lemmas broadly elliptical, 3–4 mm. wide (8–11 mm. long), firmer and more involute when old than in the above, inconspicuously nerved except at summit; pubescence spread over most of the dorsal surface, very variable in density; upper nodes usually exserted; flanges of the sheaths not apparent. *b.*

b. Lemmas hairy *c.*

c. Sheaths and usually the blades villous.....3. *B. purgans.*

c. Sheaths and usually the blades (or all but the lowest) glabrous.....forma *laevivaginatus.*

b. Lemmas nearly or quite glabrous.....forma *glabriflorus.*

1. B. CILIATUS L. Sp. Pl. 76 (1753). *B. canadensis* Michx. Fl. Bor. Am. i. 65 (1803). —Labrador to Pennsylvania and westward to Minnesota, British Columbia, Oregon and Nevada.

Forma **denudatus** f. nov., vaginis glabris infimis interdum exceptis. —Throughout the range of the typical form; not uncommon. TYPE in Gray Herb.; Ashfield, Massachusetts, 1909, *E. F. Williams.*

Forma **laeviglumis** (Scribn.) comb. nov., *B. ciliatus laeviglumis* Scribn. in Shear, Bull. U. S. Div. Agrost. xxiii. 32 (1900) — Occasional; reported from Maine, North Carolina and Ontario. The Gray Herbarium specimen of the Maine plant cited by Shear (*Fernald & Strong*, no. 488) is *B. altissimus* Pursh.

In Central New York *B. ciliatus* is generally an inhabitant of marl springs and calcareous boggy places. In other portions of its range it does not seem to be confined to boggy places or even to calcareous situations, yet no structural difference is apparent between the New York material and that from elsewhere.

2. B. ALTISSIMUS Pursh, Fl. Am. Sept. ii. 728 (1814), teste Shear. *B. ciliatus*, var. *Porteri* Rydb. Contr. U. S. Nat. Herb. iii. 192 (1895), teste Shear. *B. purgans latiglumis* Shear, Bull. U. S. Div. Agrost. xxiii. 40 (1900). *B. latiglumis* Hitchc. RHODORA viii. 211 (1906). — A plant of alluvial bottomlands and alluvial stream banks in calcareous regions: northern Maine and western Connecticut to Pennsylvania, and through New York to Iowa (Montana, Nebraska and Missouri, *Shear*).

Forma **incanus** (Shear) comb. nov. *B. purgans incanus* Shear, Bull. U. S. Div. Agrost. no. 23, 41 (1900). *B. incanus* Hitchcock, RHODORA viii. 212 (1906)—Central Maine, Vermont, western Con-

necticut, Pennsylvania, Delaware and West Virginia through New York to Ohio (South Dakota, Iowa and Texas, *Shear*).

3. B. PURGANS L. Sp. Pl. 76 (1753). *B. ciliatus*, var. *purgans* Gray, Man. 600 (1848).—Rocky woodlands, usually if not always in calcareous regions: New Hampshire and Eastern Massachusetts to Florida, westward to Wisconsin, Illinois and Louisiana (Wyoming, Nebraska and Texas, *Shear*).

Forma **laevivaginatus** f. nov., vaginis glabris infimis interdum exceptis.–Scattered through the range of the typical form. TYPE in Gray Herb.: damp thickets in Enfield Ravine, Ithaca, New York, 1916, *F. P. Metcalf*, no. 5821.

Forma **glabriflorus** f. nov., lemmatibus glabris.—New York: rich hillside opposite Beech Woods, Six Mile Creek, Ithaca, 1916, *F. P. Metcalf*, no. 5813 (TYPE in Gray Herb.).

CORNELL UNIVERSITY, Ithaca, New York.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT,—XXXV.

UMBELLIFERAE.

AEGOPODIUM.

A. PODOGRARIA L. Persisting in waste places, rare; Ipswich, Topsfield, Danvers, Cambridge, Watertown, Brookline, Milton.

AETHUSA.

A. CYNAPIUM L. Waste places; frequent near Boston, few reports elsewhere in the district.

ANGELICA.

A. atropurpurea L. Meadows and grassy swamps; frequent north and west of Boston; in south only at Hingham (*T. T. Bouvé*) and Marshfield.

ANTHRISCUS.

A. SYLVESTRIS (L.) Hoffm. On site of old building, Stony Brook Reservation, Suffolk Co. (*N. T. Kidder*, July 17, 1919).

BUPLEURUM.

B. ROTUNDIFOLIUM L. Gravel sidewalk, not persisting, Cambridge (*W. Deane*, June 15, 1884).

CARUM.

C. CARVI L. Moist grassy places, occasional throughout, but much more abundant northward.

CICUTA.

C. bulbifera L. Swamps, common throughout.

C. maculata L. Meadows and swamps; abundant throughout. Our most poisonous native plant.

COELOPLEURUM.

C. lucidum (L.) Fernald. (*C. actaeifolium* (Michx.) Coult. & Rose; see RHODORA xxi. 144–147, 1919.) Brackish marshes and rocky seashore; occasional along the coast, Amesbury to Scituate.

C. lucidum (L.) Fernald, forma **frondosum** Fernald. (Vide supra.) Beverly Bay (*Charles Pickering*, August, 1847); Swampscott (*C. W. Swan*, Aug. 5, 1886).

CONIOSELINUM.

C. chinense (L.) BSP. Along brookside, May St., Needham (*T. O. Fuller*, Sept. 27, 1884, to Aug. 7, 1892; *J. R. Churchill*, Aug. 31, 1901).

CONIUM.

C. MACULATUM L. Roadsides and waste places, occasional.

CORIANDRUM.

C. SATIVUM L. A few plants in strand at Crescent Beach, Revere (*M. L. Fernald*, Oct. 20, 1912).

CRYPTOTAENIA.

C. canadensis (L.) DC. Woods and thickets; Andover, Boxford, Beverly (*John A. Lowell*, June, 1847), Oak Island, Revere, Belmont, Waltham.

DAUCUS.

D. CAROTA L. Fields and waste places, very common throughout.

ERYNGIUM.

E. AMETHYSTINUM L. Escaped in waste ground, Nahant (*J. R. Churchill*, July 29, 1899, Sept. 5, 1902). A European species.

HERACLEUM.

H. lanatum Michx. Swamps and low thickets, mostly near the coast.

H. SPHONDYLIUM L. Waste places at South Boston and the Fenway (corner of Brookline Ave. and Audubon Road).

HYDROCOTYLE.

H. americana L. Moist soil, common.

H. umbellata L. Wet shores of ponds from the southern part of the district to Chebacco Pond, Essex; Martin's Pond, North Reading; and Baddacook Pond, Groton.

LEVISTICUM.

L. OFFICINALE (L.) Koch. Persistent in Wenham and Beverly. Specimens in herb. Peabody Acad. Sci.

LIGUSTICUM.

L. scothicum L. Rocky shores and salt marshes along the coast.

LILAEOPSIS.

L. lineata (Michx.) Greene. Salt marsh, Newburyport (*E. Moulton*, no date), specimen in herb. N. E. Botanical Club; Ipswich (*J. H. Sears*, Aug. 24, 1886), specimen in herb. Peabody Acad. Sci.

OSMORHIZA.

O. Claytoni (Michx.) Clarke. Rich woods, occasional from West Quincy northward.

O. longistylis (Torr.) DC. Rich soils and open woods, apparently frequent from Boston north and west; only southern reports are Hingham (*T. T. Bouvé*) and Medfield.

PASTINACA.

P. SATIVA L. Fields, roadsides and waste places, common.

SANICULA.

S. gregaria Bicknell. Rich woods, local; Andover, Newbury, Rowley, Magnolia, Revere.

S. marilandica L. Woods and thickets, rather common.

SELINUM.

S. CARVIFOLIA L. Vacant lot, South Boston (*C. H. Knowlton* & *W. P. Rich*, July 29, 1908). Lot now covered by a nine-story wool warehouse. This waif is a native of England, Scandinavia, and Russia.

SIUM.

S. suave Walt. (S. *cicutaefolium* Schrank). See RHODORA xvii. 137, 1915. Brooks, ponds and swamps, common.

S. suave Walt., forma **Carsonii** (Durand) Fassett. See RHODORA xxiii. 113, 1921. Frequent in brooks and larger streams.

TORILIS.

T. LEPTOPHYLLA (L.) Reichenb. Waste field, Lynn (*L. A. Wentworth*, Aug. 1, 1902), specimen in herb. Gray. Native of Europe.

ZIZIA.

Z. aurea (L.) Koch. Fields and meadows, frequent north and west of Boston.

CORNACEAE.

CORNUS.

C. alternifolia L. f. Roadsides and open woods, common, but no reports from southeastern towns.

C. Amomum Mill. Wet thickets and borders of streams, common throughout.

C. canadensis L. Rich damp woods, occasional; reported as far south as Scituate, Norwell and Wrentham.

C. florida L. Dry woods, frequent throughout.

C. obliqua Raf. (*C. Purpusi* Koehne). See RHODORA xii. 122, 1910. Moist soil; Topsfield, Malden, Medford, Lincoln, Cambridge, Watertown, Milton, Dover.

C. paniculata L'Hér. Roadsides and damp thickets, common.

C. rugosa Lamarck (*C. circinata* L'Hér). See RHODORA xii. 122, 1910. Ledges and dry woods; frequent from Hingham, Quincy and Sherborn northward.

C. stolonifera Michx. Banks of streams, rare in our territory.

NYSSA.

N. sylvatica Marsh. Woods and swamps, common; especially abundant in southeastern towns.

C. H. KNOWLTON
WALTER DEANE } *Committee on Local Flora.*

A MISLEADING ADDITION TO THE STATE FLORAS OF NEW ENGLAND.

M. L. Fernald.

A thoroughly reliable regional list, such as we have for Mt. Desert[1], Vermont[2], the Metropolitan Park System of Boston[3], Nantucket[4], Connecticut[5], southern New Jersey[6] and numerous other areas, is an indispensable part of the working equipment of the students of a flora, and it is unfortunate that we lack such presentations of the floras of many interesting areas. A regional list to be of any value (models like those above cited) must be based exclusively upon accuratelydetermined specimens and discriminatingly viséed records; and, since such exacting and scholarly work requires much time as well as extreme patience and accurate knowledge of plants, it is natural that such reliable publications are unusual. Many of them are in the course of preparation but, from their nature and the standards of their authors, they cannot be simply compiled from miscellaneous sources without critical inspection of each item and, consequently, they are slow in reaching completion. In the meantime lists prepared by those who do not realize the confusion created by inaccurate publication are being finished, and, singularly enough, although the painstaking and authoritative works which it has taken years to complete are often kept from publication owing to the lack of financial support, there seems to be money readily available for the publication and distribution of inaccurate lists.

The latest addition to the list of state floras[7] of New England was published with laudible zeal but, unfortunately, without clear understanding of the difficulties of accurately preparing such a list. Some (but by no means all) of the recently recorded Rhode Island stations published in Rhodora and elsewhere have been compiled and an attempt made to translate the names used in Bennett's *Plants of Rhode Island* (1888) into a more modern nomenclature. Even such a method, as every experienced systematist knows, requires the ut-

[1] Rand and Redfield, Flora of Mount Desert Island, Maine. 1894.

[2] Brainerd, Jones and Eggleston, Flora of Vermont. 1900; Flora of Vermont,—Vt. Agric. Expt. Sta. Bull. no. 187. 1915.

[3] Deane, Flora of the Blue Hills, Middlesex Fells, Stony Brook and Beaver Brook Reservations. 1896.

[4] Bicknell, The Ferns and Flowering Plants of Nantucket,—Bull. Torr. Bot. Cl. xxxv. 49-62 (1908) and in succeeding instalments to ibid, xlvi. 423–440 (1919).

[5] Graves and others, Catalogue of the Flowering Plants and Ferns of Connecticut. 1910.

[6] Stone, Plants of Southern New Jersey. 1911.

[7] The Ferns, Fern Allies and Flowering Plants of Rhode Island. A Revision of the first fifty-eight pages of James L. Bennett's "Plants of Rhode Island" published by the Providence Franklin Society in 1888. Published by the Providence Franklin Society, 1920.

most care and constant reference to and exact understanding of the specimens; but the list before us seems to have been prepared without sufficient realization of these requirements and too often without accurately determined material. The present writer has long refrained from the unpleasant task of reviewing this new state flora; but recently several careful workers upon the flora of New England have convinced him that it is important to issue a warning, lest those who are not so situated as to realize the uncritical character of the list may be misled by it into perpetuating errors which its publication has spread broadcast. For instance, Bennett's list, following the usage of his time, enumerated *Eriophorum polystachion* and *Carex adusta,* but it was long since pointed out that the plant of southern New England which formerly passed as *E. polystachion* is *E. viridi-carinatum*[1], while the other American species which has passed as *E. polystachion* is *E. angustifolium*, known in New England only from the state of Maine[2]. The new list, although citing these papers, enumerates both *E. viridi-cariantum* and *E. angustifolium.* Similarly the name *Carex adusta* was used in Bennett's time in an inclusive sense, covering *C. foenea* and *C. aenea,* but true *C. adusta,* as understood by all recent students[3] of the group, is a northern species known in New England only from Maine. All three plants, however, are credited to Rhode Island in the new list, although *C. foenea,* var. *perplexa* is probably the only one of them in the state. Again, the references cited in the new list as the bases for Rhode Island records have been too often misunderstood or carelessly compiled. For example, on p. 19 *Carex Crawei* is listed as occurring in Rhode Island on the basis of the present reviewer's Preliminary List of New England Carices[4], but reference to the latter list is sufficient to show that *C. Crawei* is there credited only to Maine, although it was then suggested (p. 228) that this calcicolous species of the St. Lawrence basin should be sought in Vermont. These few illustrations indicate the unfortunate nature of the compilation upon which the new Rhode Island list was based; and we regret the necessity of stating that much of the wholly new matter in the list cannot be accepted at its face value. When the list first came to his attention the reviewer wrote the Providence Franklin Society asking to see specimens of many of the species which, it is quite safe to say, do not occur in Rhode Island. Members of the Society have most generously sought for such specimens but have been able to supply only two, the vouchers for *Solidago Boottii* and *Centaurea americana.* These vouchers prove to be characteristic specimens of *Solidago nemoralis* and *Centaurea nigra,*

[1] See Fernald, Rhodora, vii. 89 (1905).

[2] See Fernald, Rhodora, x. 136, 138, 141 (1908).

[3] See Fernald, Proc. Am. Acad. xxxvii. 481 (1902), Rhodora, iv. 218 (1902); Robinson & Fernald in Gray, Man. ed. 7, 222 (1908); Mackenzie in Britton & Brown Ill. Fl. ed. 2, i. 386 (1913).

[4] Rhodora, IV. 219 (1902).

respectively, and the northeastern limit of *S. Boottii* still remains Virginia and of *C. americana,* Missouri.

Without prolonged discussion, it seems important to publish the following enumeration of plants, accredited to Rhode Island in the recently published list, which, until unquestionable specimens are found, cannot be accepted as occurring in the state:

p. 4 Equisetum hyemale. Undoubtedly var. *affine.*
Lycopodium complanatum. Undoubtedly var. *flabelliforme.*

p. 5 Picea canadensis. If in Rhode Island cultivated and possibly escaped.
Abies balsamea. If in Rhode Island cultivated and possibly escaped.
Thuja occidentalis. If in Rhode Island cultivated and possibly escaped.

p. 6 Juniperus horizontalis. Although listed by Bennett, as *J. Sabina,* var. *procumbens,* the species is not well vouched for from south of Maine and Vermont.
Sparganium simplex. The Rhode Island records belong to *S. americanum.* See Rhodora, ix. 86–89 (1907).
Potamogeton perfoliatus. The Rhode Island plant is *P. bupleuroides.*

p. 7 Triglochin palustris. Listed by Bennett, but no authentic stations known from south of Maine.
Sagittaria heterophylla, var. angustifolia. Based upon Bennett's *S. variabilis,* var. *angustifolia,* which was the slender-leaved *S. latifolia* (See J. G. Smith, N. A. Sp. Sagittaria and Lophotocarpus, 9, 12).

p. 8 Paspalum laeve. Presumably not *P. laeve.* Bennett's record may have been based on either *P. pubescens, P. Muhlenbergii* or *P. psammophilum,* all of which occur in Rhode Island, although not included in the new list.
Panicum philadelphicum. Said to have been reported, as *P. minus,* by Mr. Walter Deane in Rhodora, vi. 151. This paper by Deane deals exclusively with *Polemoniaceae* and *Hydrophyllaceae* and no grass is mentioned. *P. minus* was recorded from Rhode Island by Fernald, Rhodora, viii. 220, but that plant has proved to be *P. Tuckermani,* Rhodora, xxi. 113.

p. 9 Panicum xalapense. A southern species not known in New England. The record was based on Bennett's *P. laxiflorum,* a name used by him to cover plants now included under *P. spretum, P. Lindheimeri* and vars. (See Rhodora, xxiii. 226–228), *P. meridionale, P. albemarlense, P. tsugetorum, P. columbianum, P. oricola* and *P. sphaerocarpum,* all of which are known from Rhode Island and most of them recorded in papers cited in the bibliography, though not included in the new list.
P. oligosanthes. Based on Bennett's *P. pauciflorum* which was *P. Scribnerianum,* a species common in Rhode Island.

p. 11 Danthonia sericea. Based upon Bennett's record, but there is no satisfactory evidence of the species in New England. *D. compressa,* which is common throughout most of Massachusetts and Connecticut and is doubtless in Rhode Island, is not included in either list and the record of *D. sericea* was presumably based upon that species.

p. 13 Glyceria fluitans. Based upon Bennett's record and doubtless referring to either *G. septentrionalis* or *G. borealis.*

p. 14 Elymus canadensis. Based on Bennett's record, which belongs to *E. riparius* Wiegand, Rhodora, xx. 84, a species properly included in the list.
Cyperus flavescens. Based merely on Bennett's record, which did not belong to *C. flavescens* (See Rhodora, x. 139).

p. 16 Scirpus Eriophorum. Based on Bennett's record which belonged to *S. cyperinus* or *S. atrocinctus*.
Eriophorum angustifolium. See above (p. 97).
Carex Crawfordii. Based upon Bennett's enumeration of *C. scoparia*, var. *minor*, a probable misidentification.
p. 17 C. adusta. See above (p. 97).
p. 18 C. albicans. Based on Bennett's record of *C. Emmonsii*, var. *elliptica*. Bennett's plant was *C. varia* (See RHODORA, iv. 223).
C. novae-angliae. Based only on Bennett's record. Very doubtful.
C. plantaginea. Based only on Bennett's record of *Carex laxiflora*, var. *plantaginea* which is *C. anceps* Muhl. (*C. laxiflora*, var. *patulifolia*).
p. 19 C. Crawei. See above (p. 97).
C. debilis. Based on Bennett's record which belongs to var. *Rudgei*.
C. Pseudo-Cyperus. Based on Bennett's record which belongs to *C. comosa*.
p. 21 Xyris montana. Based upon Rhode Island plants which have been correctly referred in the list to *X. flexuosa* (*X. torta* Sm.).
Juncus scirpoides. Based merely on Bennett's record. The species is unknown in New England (See RHODORA, vi. 41).
p. 25 Spiranthes Romanzoffiana. Very doubtful. Not seen by Ames (Orchid. i. 140) from south of Berkshire Co., Mass., and northern Litchfield Co., Conn.
Epipactis repens. Based on Bennett's *Goodyera repens*, which presumably was *G. tesselata*.
p. 26 Salix amygdaloides. Based upon a Bennett record. Very doubtful.
S. longifolia. Based upon a Bennett record. Very doubtful.
p. 27 Carya laciniosa. Based upon Bennett's record of *C. sulcata*. Surely not indigenous.
Betula nigra. Based solely on Bennett's record, which should be carefully verified since the tree is not generally recognized as indigenous between Long Island and northeastern Massachusetts.
p. 28 Quercus falcata. Based only on Bennett's report of *Q. rubra*, var. *runcinata*. The identity of the latter is wholly questionable. Alphonse de Candolle described it from a single small-fruited tree found growing near St. Louis by Engelmann, who thought it was a hybrid. The foliage was said to be exactly that of *Q. rubra* (in the long-accepted sense). The undiscriminating entry of this name by Bennett is an insecure basis for *Q. falcata* from Rhode Island.
p. 33 Stellaria pubera. Needs most careful verification.
p. 34 Nymphaea rubrodisca. Based on Bennett's record of *N. odorata*, var. *minor*, which is identical with the plant called in the new list *Castalia odorata*, forma *rosea*. See RHODORA, xxiii. 162 (1921).
p. 38 Cardamine hirsuta. Retained on the basis of Bennett's list. Bennett's plant, of course, was *C. pennsylvanica*, which is correctly listed.
p. 42 Rubus canadensis. Surely not true *R. canadensis*. The record is derived from old sources and, of course, referred to some of the dewberries.
Rosa acicularis. Very doubtful, unless a garden escape.
Prunus pumila. Based on Bennett's *P. pumila* which was *P. cuneata*.
p. 45 Phaseolus polystachyus. Based on Bennett's record of *P. diversifolia* which, of course, belonged to the common *Strophostyles helvola*.
p. 48 Vitis cordifolia. Based only on Bennett's record, which doubtless referred to some other species.
p. 56 Gaylussacia dumosa, var. hirtella. The New England shrub erroneously referred in the past to var. *hirtella* is var. *Bigeloviana* Fernald. See RHODORA, xiii. 96–99 (1911).

p. 61 Stachys cordata. Based upon Bennett's record. Surely an error.
p. 62 Lycopus lucidus, var. americanus. Surely not this northwestern plant. Based on a record by Bennett, who may have had *L. sessilifolius*, a Rhode Island species not included in either list.
Physalis viscosa, and others. The entries based solely on Bennett's names are wholly indefinite unless his plants can be found and properly identified.
p. 65 Utricularia vulgaris. The Rhode Island plant is var. *americana* which is properly listed.
p. 66 Houstonia tenuifolia. Based upon Bennett's record which belonged to *H. longifolia.*
Lonicera oblongifolia. Surely an error of determination.
p. 69 Solidago racemosa. Surely an error of determination.
S. racemosa, var. Gillmani. Surely an error of determination.
S. decumbens. Surely an error of determination.
S. stricta. Surely an error of determination.
S. Boottii. The plant so recorded is *S. nemoralis* (See p. 97).
S. tortifolia. Surely an error of determination.
p. 70 Aster sagittifolius. Surely an error of determination.
p. 74 Centaurea americana. Record based on a specimen of *C. nigra* (See p. 97).

These are by no means all the misleading entries, for, although citing many recent revisions (for example, of *Sabatia* and *Puccinellia*) published in RHODORA, the compilers stopped with the citations and failed to derive the Rhode Island data from the papers: that *Sabatia dodecandra* does not occur in the state but there is represented by *S. Kennedyana* and that *Puccinellia fasciculata* is a Rhode Island plant. Enough, however, has been here recorded to indicate that the list cannot be used with safety by anyone not intimate with the sources of the data. It is certainly to be regretted that at the untimely death of Mr. Noble, who originally undertook the work with clear understanding of its complexity, his tentative and unverified manuscript fell into the hands of those wholly unequipped for the task. It is also to be regretted that the zeal of these compilers could not have been led by an experienced and sympathetic guide into safer and less complicated channels.

GRAY HERBARIUM.

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NOTES ON SOME ALGAE FROM BRITISH COLUMBIA.

Wm. Randolph Taylor.

The amount of information available regarding the algal vegetation of the mountainous portions of North America being very small it is perhaps not amiss to record the results of a study of some collections of algae made at various points in the Selkirk and the neighboring Eagle Pass Mountains of British Columbia. During the latter part of the summer of 1921 the writer had the pleasure of making one of a party under the direction of Dr. Merkel H. Jacobs which camped in this region. Although not in the field primarily for the purpose of collecting, the opportunity was too good to be altogether neglected, and this note is based on the collections of algae secured at that time and examined on return to the laboratory.

The sources of the material fall into three groups. The first collections were made west of the town of Revelstoke, starting near the Big Eddy of the Columbia River on the west bank, and thence north and west to an altitude of about 7,000 feet on an unnamed mountain lying between Cañon and Half-way Creeks, both of which empty into Jordan Creek, a tributary of the Columbia River. This mountain is one of the Eagle Pass group of the Columbia system, which lies west of the Big Bend of the Columbia River. The other two areas traversed were in the Selkirk Mountains, which lie within the Big Bend, surrounded by it on the east, north and west. A few days at Glacier gave an opportunity to get material from the valley near the Illecillewaet Glacier, from various stations on the Cascade

Ridge, and elsewhere. Finally, a more extended trip was made south from Beavermouth to the headwaters of Quartz Creek, with a side trip to Fish Lake.

In all, some seventy collections were brought away, half from alpine situations and half from lower levels. The number and size of the collections were limited by several factors. The party was carrying its equipment and provisions, and (except at Glacier) was as often as not without any trail to follow, and this with persistent rainy weather made it necessary to minimize the weight of fluid collections for transport. Toward the end of the trip—after the tenth of September—there was considerable snow and the exceedingly low temperatures froze up the alpine pools and thickly coated the more exposed stones in the streams with ice, precluding further operations in the region where the most effective collecting could have been done. A small part of the material was dried in masses on paper, which was very satisfactory for many of the *Myxophyceae*. Other lots were preserved in weak formalin or with iodine, which last was very good for many of the *Conjugales*, though poor for *Myxophyceae*. As each collection included several samples from the habitat under observation they sometimes contained a very considerable number of forms.

From the advanced season at which the material was obtained it may be supposed that the growing season for algae was approaching its close; indeed towards the end the material in the higher pools often appeared far gone in decay. So far as the alpine algae may show seasonal phases, it is, then, the autumnal condition that was represented. To discuss the distribution of the flora geographically is not possible with so small a number of stations represented although certain features of habitat are worth consideration. With regard to altitude, no sharp boundary separating off an alpine flora was found. However, nearly two-thirds of the species found at or above 5500 feet were not noted below that level, while of those found below 3000 feet only one-third appeared also in the higher collections. That this difference in flora is partly due to other factors than alpine conditions is evident from an inspection of the list of species, where it may be seen, for instance, that *Pediastrum* only appeared at the higher levels, a condition which is explained by the fact that large pools of standing water were absent from the lower valleys traversed. In

such lower valleys patches of wet rock or moss frequently were partly covered with *Phormidium Retzii* or in one instance *Cylindrospermum majus*. In the ravine below the Falls of Jordan Creek a series of dripping cliffs supporting a sub-alpine phanerogamic flora (*Pinguicula* etc.) showed a luxuriant growth of *Nostoc commune* and *N. microscopicum* with spherical colonies reaching a considerable size. This alga was one of those most frequently found in damp situations. It was expected that the many small streams would show a rich flora of such genera as *Lemanea* and *Batrachospermum*, but the former was not detected and the latter was represented only by *Batrachospermum moniliforme*, which appeared but once in the Eagle Pass Mountains and once in the Selkirks. In the Selkirks when there was any prominent algal vegetation in the rapid streams it appeared to consist of *Hydrurus foetidus*. The flora of the alpine pools was given special attention. Sometimes grass or mosses bordered the pool and lined its bottom almost to the exclusion of algae. On the other hand the edge among the grasses often showed a large quantity of *Nostoc*, mixed with *Microcoleus paludosus*. Again, in some the bottom was lined with a vigorous growth of *Stigonema ocellatum*. The floating masses of semi-decayed algae which filled many of the pools usually showed a predominance of *Mougeotia*, sometimes with a good deal of *Zygnema*. Mixed with this there appeared a variety of *Myxophyceae*, notably *Scytonema myochrous* and *Tolypothrix lanata*, various species of *Chroococcus*, of which *Chroococcus turgidus* was the most common, *Phormidium laminosum*, *Pediastrum* and *Oocystis*, an abundance of desmids (often with zygospores), diatoms, and fragments of such genera as *Bulbochaete* and *Oedogonium* which probably had matured earlier in the season. Examination of the many places where green masses of filamentous algae covered wet stones or filled little pools among the rocks, showed a predominance of *Mougeotia* with *Zygnema* also frequent, but *Spirogyra* only turned up in a few cases and was always sterile. A *Ulothrix* was attached to the tufts of *Stigonema mammilosum* on the rocks in the bed of Cañon Creek, but could not be identified with sureness. The wet cliffs and rocks on the mountain-sides sloping toward the upper end of Fish Lake offered the best opportunity to study the flora of such a substratum among alpine surroundings. The predominant and showy types were *Glococapsa magma*, which colored the rocks dark red, and *Stigonema informe* which spotted them

with olive-green rounded patches. On one rock *Phormidium autumnale* produced a strongly contrasting blue-green expanse. The stones in a little stream flowing into the lake were found by Dr. Jacobs to be covered with little green streamers which on examination proved to be the interesting *Prasiola fluviatilis*. One patch of "Red Snow" was encountered near the end of the climb in the Eagle Pass Mountains. Samples were melted, allowed to settle, and the sediment preserved. It was found to be composed of spherical cells, probably *Chlamydomonas nivalis*, and the peculiar stellate organism, *Chionaster nivalis*, described by Bohlin[1], [2], from Lapland.

The writer desires to acknowledge with thanks the help of all members of the party in securing material; the advice and assistance of Dr. M. A. Howe and Dr. N. L. Gardner, the kindness of Dr. E. N. Transeau in verifying the determinations of *Mougeotia calcarea* and *Zygnema cylindricum*, the determination of *Chionaster nivalis* by Dr. Tracey E. Hazen, and the opportunity given by Dr. C. W. Dodge for comparing certain specimens with exsiccatae in the Herbarium of the Cryptogamic Laboratory of Harvard University.

List of Species

Myxophyceae

Anabaena flos-aquae (Lyngb.) Bréb. Eagle Pass Mountains: among other algae in a pond and among mosses in rivulet at 6000 feet; rare. Selkirk Mountains: little pools above the head of Fish Lake, 5200 feet.

Anabaena inaequalis (Kuetz.) B. & F. Eagle Pass Mountains: occasional in rivulets and ponds at 6000 feet. Selkirk Mountains: in valley below Asulkan Pass, 5000 feet, and in pools in the pass at the head of Quartz Creek, 6500 feet. In one pool on the ridge east of Quartz Creek at about 6700 feet there occurred a slight "bloom" of an *Anabaena* which lacked spores but which in measurements of vegetative cells and heterocysts agreed with this species. It was the only instance observed during the trip of a blue-green alga forming a "bloom."

Aphanothece microspora (Menegh.) Rabenh. Eagle Pass Mountains: frequent on cliffs near the Falls of Jordan Creek at 2000 feet and in a pond at 6000 feet. Selkirk Mountains: pools in Quartz Creek valley at 5700 feet and near its source at 6500 feet, also at 6700 feet in a pool on the ridge east of the valley.

[1] Bohlin, K. Snöalger från Pite. Bot. Notiser **1893** p. 46.
[2] Bohlin, K. Ueber Schneealgen aus Pite-Lappmark. Bot. Centralbl. **64**: 42–45.

APHANOTHECE SAXICOLA Naeg. Selkirk Mountains: wet rocks by a spring near Cascade Summit, Glacier, at 5500 feet; pools at the source of Quartz Creek at 6500 feet and pools east of the valley at 6700 feet.

CALOTHRIX PARIETINA (Naeg.) Thuret. Frequent, though never in any large quantity. Eagle Pass Mountains: cliffs at the Falls of Jordan Creek at 2000 feet, and in rivulet at 6000 feet. Selkirk Mountains: wet rocks above the head of Fish Lake at 5200 feet, rivulets tributary to Quartz Creek at 3000 feet and at 5700 feet, also in pools in pass at head of Quartz Creek at 6500 feet.

CHROOCOCCUS COHAERENS (Bréb.) Naeg. Selkirk Mountains: in debris in the bottom of pools and on dripping rocks above the head of Fish Lake at 5200 feet, frequent.

CHROOCOCCUS MACROCCUS (Kuetz.) Rabenh. Selkirk Mountains: occasional, pools above the head of Fish Lake at 5200 feet and in the pass at the source of Quartz Creek, 6500 feet.

CHROOCOCCUS MINUTUS (Kuetz.) Naeg. Frequent among other algae. Eagle Pass Mountains: ponds and slow rivulets at 6000 feet. Selkirk Mountains: on rocks near Cascade Summit, Glacier, at 5500 feet; pools above the head of Fish Lake at 5200 feet, and in Quartz Creek valley at 5700 feet, at the source of the stream at 5700 feet and in pools east of the valley at 6700 feet.

CHROOCOCCUS TURGIDUS (Kuetz.) Naeg. Frequent among other algae. Eagle Pass Mountains: rocks at the mouth of Canon Creek and the cliffs at the Falls of Jordan Creek, 2000 feet; rocks between Jordan Creek and the Big Eddy of the Columbia River, 1800 feet. Selkirk Mountains: Cascade Summit Trail at 5500 feet on rocks and in moss, and in the valley below the Asulkan glacier among filamentous algae at 5000 feet. In the Quartz Creek valley it appeared from 5700 to 6500 feet and in ponds east of the valley at 6700 feet.

CYLINDROSPERMUM MAJUS Kuetz. Eagle Pass Mountains: on damp moss in a rivulet near the Big Eddy of the Columbia River.

DICHOTHRIX. Two algae, quite different but seeming to belong to this genus, were found, but could not be certainly identified with any known species. Rare, one in the Eagle Pass Mountains at 6000 feet and the other in the Selkirk Mountains at 6500 feet.

GLOEOCAPSA AERUGINOSA (Carm.) Kuetz. Eagle Pass Mountains: wet rocks between Jordan Creek and the Big Eddy of the Columbia River, 1800 feet; cliffs at the falls of Jordan Creek, 2000 feet. Selkirk Mountains: wet rocks on Cascade Summit trail at 5500 feet, Glacier, and wet rocks above the head of Fish Lake at 5200 feet, where it was one of the chief items.

GLOEOCAPSA MAGMA (Breb.) Kuetz. Selkirk Mountains: locally abundant, forming with *G. aeruginosa* and *Gloeocapsa sp.?* a dark red coating on wet rocks above the head of Fish Lake at 5200 feet.

GLOEOCAPSA SP.? This form seems to be near *G. alpina* (Naeg.) Brand, but cannot, as yet, with any show of assurance be designated as the same. Its identity may best be held in question pending a further comparison with exsiccatae. Locally abundant. Eagle Pass Mountains: with *Trentepohlia aurea* on rocks near the mouth of Cañon Creek at 2000 feet. Selkirk Mountains: also among *T. aurea* on rocks by a small stream tributary of Quartz Creek at 3000 feet, and with *G. magma* above the head of Fish Lake at 5200 feet.

GOMPHOSPHAERIA APONINA Kuetz. Eagle Pass Mountains: not uncommon among *Nostoc*, etc., cliffs at the falls of Jordan Creek, 2000 feet.

HYPHEOTHRIX CALCICOLA (Ag.) Rabenh.? The collections agree fairly well with this species in most characters, but showed differences in manner of growth. Eagle Pass Mountains: cliffs by Jordan Creek near the Falls, 2000 feet, and between Jordan Creek and the Big Eddy of the Columbia River, 1800 feet. Selkirk Mountains: Cascade Summit path at 5500 and 6000 feet, and near the foot of the Illecillewaet Glacier at 4500 feet. Also wet rocks above the head of Fish Lake at 5200 feet, by Quartz Creek at 5700 feet and in a pool east of the stream at 6700 feet.

MERISMOPEDIA GLAUCA (Ehrb.) Naeg. Occasional colonies among other algae. Eagle Pass Mountains: wet rocks between Jordan Creek and the Big Eddy of the Columbia River. Selkirk Mountians: pools above the head of Fish Lake at 5200 feet and in the pass at the source of Quartz Creek, 6500 feet; also in pools east of the valley at 6700 feet.

MICROCOLEUS PALUDOSUS (Kuetz.) Gomont. Selkirk Mountains: banks of pools in the pass at the source of Quartz Creek, 6500 feet, abundant with *Nostoc*.

MICROCOLEUS VAGINATUS (Vauch.) Gomont. Selkirk Mountains: pass at the source of Quartz Creek, 6500 feet, scarce, in scum in standing pools.

NOSTOC COMMUNE Vauch. Colonies of *Nostoc* in various stages of development were present in over a third of the collections made, and the younger stages could not be identified with certainty. The more mature colonies seemed generally to agree in measurements with the above, but it is probable that other species are represented, the distinctness of which was not recognized. Found in all districts visited, often being the dominant alga.

NOSTOC MACROSPORUM Menegh. Eagle Pass Mountains: cliffs at the falls of the Jordan, 2000 feet.

NOSTOC MICROSCOPICUM Carm. With the above.

OSCILLATORIA AMOENA (Kuetz.) Gomont. Sometimes growing in pure masses. Selkirk Mountains: on moss or rocks. Cascade Summit trail at 5000 and 6000 feet, a runnel near the Glacier House at 4000 feet and near the foot of the Illecillewaet Glacier at 4500 feet.

PHORMIDIUM AUTUMNALE (Ag.) Gomont. Selkirk Mountains: forming a blue-green coating on wet rocks above the head of Fish Lake at 5300 feet.

PHORMIDIUM RETZII (Ag.) Gomont. In pure growth on wet rocks or moss. Eagle Pass Mountains: near the Big Eddy of the Columbia River, at 1500 feet; between the Big Eddy and Jordan Creek at 1800 feet and on cliffs at the Falls of Jordan Creek at 2000 feet.

SCYTONEMA MIRABILE (Dillw.) Bornet. Eagle Pass Mountains: cliffs by Jordan Creek at the Falls, 2000 feet. Selkirk Mountains: bottom muck in little pools above the head of Fish Lake at 5200 feet.

SCYTONEMA MYOCHROUS (Dillw.) Ag. Eagle Pass Mountains: cliffs by Falls of Jordan Creek, 2000 feet. Selkirk Mountains: Quartz Creek, in pools beside the stream at 5700 feet and near the source in pass at 6500 feet, abundant.

STIGONEMA INFORME Kuetz. Selkirk Mountains: wet rocks above the head of Fish Lake at 5200 feet, very abundant.

STIGONEMA MAMMILOSUM (Lyngb.) Ag. Eagle Pass Mountains: cliffs near the Falls of Jordan Creek at 2000 feet; Cañon Creek at 2200 feet and rocks in rivulet above 6000 feet.

STIGONEMA OCELLATUM (Dillw.) Thuret. Selkirk Mountains: bottoms and sides of pools above the head of Fish Lake at 5200 feet, abundant.

STIGONEMA PANNIFORME (Ag.) Kirchn. Eagle Pass Mountains: rock near the Big Eddy of the Columbia River at 1500 feet. Selkirk Mountains: wet rocks above the head of Fish Lake at 5200 feet, abundant.

SYNECHOCOCCUS AERUGINOSUS Naeg. Occasional, mixed with other algae and mosses. Eagle Pass Mountains: in a rivulet near the Big Eddy of the Columbia River at 1500 feet; wet rocks between the Big Eddy and Jordan Creek, 1800 feet; cliffs of Jordan Creek near Falls at 2000 feet and rocks at mouth of Cañon Creek at 2000 feet. Selkirk Mountains: Cascade Summit Trail, abundant among moss at 5500 feet and in valley below the Asulkan Glacier at 5000 feet; source of Quartz Creek at 6500 feet.

TOLYPOTHRIX BYSSOIDEA (Hass.) Kirchn. Selkirk Mountains: forming black expanses on rocks in rivulets in the Quartz Creek Valley at 6000 feet. A little more slender than typical, (trichomes 8 μ) and hardly as much as 1 mm. long. Fragments resembling this species were also found in the Eagle Pass Mountains.

TOLYPOTHRIX LANATA (Desv.) Wartmann. Eagle Pass Mountains: pond at 6000 feet. Selkirk Mountains: near source of Quartz Creek, in pools at 6500 feet.

CHLOROPHYCEAE.

ANKISTRODESMUS FALCATUS (Corda) Ralfs. Rare. Eagle Pass Mountains: entangled among other algae in ponds and rivulets at 6000 feet. Selkirk Mountains: in a pool near the foot of the Illecillewaet glacier at 4500 feet.

ANKISTRODESMUS FALCATUS TUMIDUS (W. & G. S. West) G. S. West. Rare. Eagle Pass Mountains: in a rivulet at 6000 feet.

BULBOCHAETE VARIANS SUBSIMPLEX (Wittr.) Hirn. Selkirk Mountains: rare; in scum of pools in the pass at the head of Quartz Creek, 6500 feet.

CHAETOPHORA ELEGANS (Roth) Ag. Selkirk Mountains: on sticks in a small stream tributary to Quartz Creek, at 3000 feet.

CHLAMYDOMONAS NIVALIS (Baur) Wille. Eagle Pass Mountains: forming patches of "Red Snow" at 7000 feet. As nearly as could be told from preserved material, the cells which gave rise to the red color were of this species. Without living material the determination is of course open to question. It was associated with *Chionaster nivalis*.

DICTYOSPHAERIUM EHRENBERGIANUM Naeg. Eagle Pass Mountains: in a rivulet at 6000 feet.

MICROSPORA sp. Selkirk Mountains: in puddles among rocks above the head of Fish Lake an undetermined *Microspora* formed large masses.

MOUGEOTIA CALCAREA (Cleve) Wittr. Selkirk Mountains: in the valley below the Asulkan Pass at 5000 feet and beside the Cascade Summit Trail, in small pools among rocks, 5500 feet. Sparingly fruiting, but because of its variability in the position of the zygospores and the very few localities known for it in North America, a very interesting find.

MOUGEOTIA PARVULA Hassall. Eagle Pass Mountains: abundant in fine fruit in a pond at 6000 feet.

MOUGEOTIA was represented in sterile condition very frequently in all districts visited, and the measurements of the filaments indicated the presence of species considerably different from the above.

OOCYSTIS LACUSTRIS Chodat. Eagle Pass Mountains: frequent, entangled among filamentous algae in a rivulet at 6000 feet.

OOCYSTIS SOLITARIA Wittr. Frequent among other algae. Eagle Pass Mountains: cliffs by Jordan Creek below the Falls, 2000 feet. Selkirk Mountains: wet rocks above the head of Fish Lake at 5200 feet and in pools in the pass at the head of Quartz Creek at 6500 feet.

OOCYSTIS SOLITARIA MAJOR Wille. Selkirk Mountains: occasional among other algae. Cascade Summit trail and valley below the Asulkan Glacier, 5500 and 5000 feet respectively.

PEDIASTRUM BORYANUM (Turp.) Menegh. Selkirk Mountains: occasional among other algae. In the valley below the Asulkan Glacier at 5000 feet and in a pool east of the Quartz Creek valley at 6700 feet.

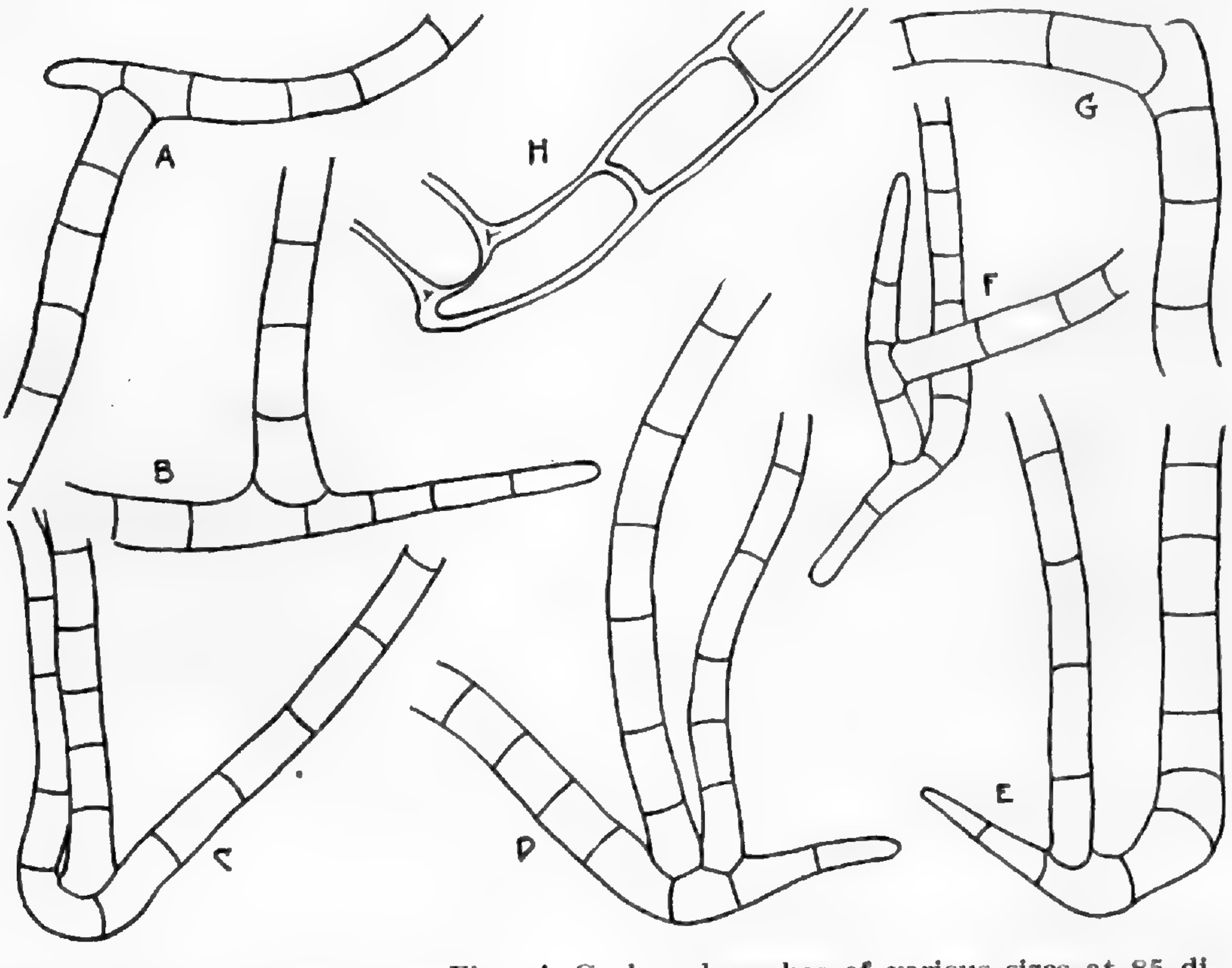
PEDIASTRUM BORYANUM LONGICORNE Racib. Rare, among other algae. Eagle Pass Mountains: in a rivulet at 6000 feet. Selkirk Mountains: in a pool east of Quartz Creek valley at 6700 feet.

PEDIASTRUM TRICORNUTUM ALPINUM Schmidle[3]. Eagle Pass Moun-

[3] Schmidle, W. Beiträge zur alpinen Algenflora. Oesterr. Bot. Zeit. **45**: 245–253. 1895.

tains: among other algae in rivulets and pools at 6000 feet. Selkirk Mountains: in the valley below the Asulkan Glacier at 5000 feet and at the source of Quartz Creek at 6500 feet. This appears to be the first record for this form in North America.

PRASIOLA FLUVIATILIS (Sommerf.) Aresch. Selkirk Mountains: collected by Dr. M. H. Jacobs at 5500 feet in a small stream flowing



RHIZOCLONIUM SELKIRKII. Figs. A–G show branches of various sizes at 85 diameters. Fig. H shows a bend in the filament in a thick-walled region, with one of the cells forming a short spur; magnification 175 diameters.

into Fish Lake. This exceedingly interesting species grew in abundance attached to stones, resembling a small *Enteromorpha*. Collins notes that this species has been found in Greenland and Alaska, but the writer is unaware of any other station as having been reported nearer to the Selkirks than these.

RHIZOCLONIUM SELKIRKII n. sp[4]. Filaments in tangled masses, frequently and sharply bent. Branches a continuation of the cell, or unicellular to multicellular; tapering, generally formed at a bend in

[4] **Rhizoclonium selkirkii**, spec. nov. Filamenta laxe intricata, geniculata, ex geniculis hic et illic ramulos emittentia. Ramuli aut cum cellulis articulorum continui aut in appendices uni- vel pluriloculares prolongati. Articuli 20–50 μ lati, diametro sesqui vel triplice longiores. Membrana ad 3μ crassa.

the axis, not frequent. Cells reaching 50 μ diameter in the main axis though generally 25 μ to 30 μ, and in the branches about 20 μ. Length of the cells generally one and one-half times to twice the diameter, reaching three times in the branches, rarely shorter. Wall generally thick, attaining 3 μ in the main axis.

Notable in this species are the sharp bends in the filaments where frequently arise branches, one to three in number, which when short are tapering and nearly straight, but when they elongate are flexuous, angled and themselves branched. The large diameter and thick cell-wall of some filaments is also characteristic. Selkirk Mountains abundant in running water, in the pass at the source of Quartz Creek, at 6500 feet.

SCENEDESMUS BIJUGA (Turp.) Lagerh. Rare, mixed with other algae. Eagle Pass Mountains: in a rivulet at 6000 feet. Selkirk Mountains: in pools east of Quartz Creek valley at 6700 feet.

SCENEDESMUS OBLIQUUS (Turp.) Kuetz. Selkirk Mountains: in a pool with the above form.

SPIROGYRA: This genus appeared comparatively seldom, but was seen in sterile condition in the Eagle Pass Mountains and in the Selkirk Mountains near Glacier.

TETRAEDRON MINIMUM (A. Br.) Hansg. Selkirk Mountains: in pools above the head of Fish Lake at 5200 feet; rare.

TETRASPORA LUBRICA (Roth) Ag. Selkirk Mountains: in the valley below the Asulkan Pass at about 5000 feet, among filamentous algae.

ULOTHRIX: Only seen in Cañon Creek on *Stigonema mammilosum* and not sufficiently well preserved to be identified.

ZYGNEMA CYLINDRICUM Trans. Selkirk Mountains: Loosely attached to rocks, Cascade Summit trail at 5500 feet. With very abundant aplanospores. Sterile *Zygnema* appeared frequently in all districts visited.

FLAGELLATAE.

HYDRURUS FOETIDUS (Vill.) Kirchn. Selkirk Mountains: rocks in a stream near the foot of the Illecillewaet Glacier and in rivulets flowing into Quartz Creek, in abundance at 5000 and 5700 feet. It was also abundant in rivulets feeding Lake Louise in the Canadian Rocky Mountains.

RHODOPHYCEAE.

BATRACHOSPERMUM MONILIFORME Roth. Eagle Pass Mountains in a rivulet entering Cañon Creek near the Jordan Creek Trail, at 2200 feet. Selkirk Mountains: on sticks in a small stream tributary to Quartz Creek at 3000 feet. In good fruit at both places.

FUNGI ?

CHIONASTER NIVALIS (Bohlin) Wille. Eagle Pass Mountains at 7000 feet in the "Red Snow." First reported by Bohlin from Lap-

land on study of preserved material, and later observed by Wille[5] who finds that it is colorless, and would on that account consider it not an alga as was at first supposed, but a fungus, without clear relationship to any other forms, but possibly to be placed close to the *Chytridiaceae.* The material obtained by the writer was preserved and no observations on color or lack of it could be made. The organism was abundant. and most of the cells were forming aplanospores, either in the center of the cells or in one of the arms.

Botanical Laboratory, University of Pennsylvania.

ADDITIONS TO THE FLORA OF CONNECTICUT. SERIES 2.

The following notes are a continuation of the series published in this journal in 1917, and include the more important results of the work on the flora of the state since that time, bringing the record up to the close of the season of 1920, and including a few entries of the following year.

As in the earlier list, forms not previously reported from the state have been marked, if native, with an asterisk, and if introduced, with a dagger.

The legislature of the state has changed the names of the towns of Huntington and Chatham to Shelton and East Hampton respectively, also has divided the town of Orange into the towns of Orange and West Haven. These changes should be noted in comparisons of present and future records with those made previously.

*Polypodium vulgare L., var. attenuatum Milde. Rare. With the typical form in Redding and Ridgefield (Eames & C. C. Godfrey).

Woodwardia areolata (L.) Moore. North Stonington (Donald White & Harger); Newington and Plainville (H. C. Bigelow).

Thelypteris simulata (Davenp.) Nieuwl. *Aspidium simulatum* Davenp. *Dryopteris simulata* Davenp. Windham (Bissell & Weatherby); Union (Weatherby). Not previously reported from Tolland or Windham Counties.

Botrychium ternatum (Thunb.) Sw., var. intermedium D. C. Eaton. Woodstock (Weatherby); Eastford (Bissell). Not previously reported from Windham Co.

[5] Wille, J. N. F. Algologische Notizen IX–XIV. Nyt Mag. F. Naturvidenskab. **41**[1]: 89–185. 1903 (See page 171).

EQUISETUM PRATENSE Ehrh. Shaded alluvium of the Farmington River, Bloomfield (Weatherby). Previously reported only from the Housatonic Valley.

*EQUISETUM VARIEGATUM Schleich. Salisbury (Bissell). All the Salisbury material referred to var. *Jesupi* in the Catalogue seems to belong rather with the typical form of the species.

E. VARIEGATUM Schleich., var. JESUPI A. A. Eaton. Kent (A. E. Blewitt).

LYCOPODIUM INUNDATUM L., var. BIGELOVII Tuckerm. Woodstock and Killingly (G. E. Nichols); Plainville (Bissell). Extension of range northward. This variety belongs with the group of plants which in Connecticut are found chiefly near the coast, but extend northward in sand-plain areas.

L. ANNOTINUM L., var. ACRIFOLIUM Fernald. Union (Weatherby); Barkhamstead (A. E. Blewitt); Salisbury (A. F. Hill). Extension of range eastward and westward.

PINUS RESINOSA Ait. Kent (A. E. Moss). Previously reported only from Granby and Salisbury

PICEA CANADENSIS (Mill.) BSP. Dry soil near Lake Pachaug, Griswold (G. E. Nichols). See note under *Abies balsamea*.

ABIES BALSAMEA (L.) Mill. Griswold (G. E. Nichols). This species together with *Picea canadensis* is very common in a sandy area adjoining a cemetery in Griswold, where they are both reproducing abundantly among the birches.

CHAMAECYPARIS THYOIDES (L.) BSP. Litchfield (G. E. Nichols). Not previously reported from Litchfield Co.

POTAMOGETON NATANS L. Thompson (Weatherby, RHODORA xxi. 75). Not before reported from Windham Co.

P. AMERICANUS C. & S. Goshen, Litchfield and Salisbury (G. E. Nichols), Washington (A. W. Evans).

*P. PRAELONGUS Wulf., var. ANGUSTIFOLIUS Graebner. Plentiful in Umpawaug Pond, Redding (Eames).

*NAJAS GUADALUPENSIS (Spreng.) Morong. Prof. Fernald informs us that there is in the Gray Herbarium a specimen of this species labelled "Conn., Charles Wright." The plant should be looked for by collectors in the state.

VALLISNERIA AMERICANA Michx. *V. spiralis* of Am. authors, not L. Bantam Lake, Morris (G. E. Nichols).

*Panicum polyanthes Schultes. Guilford (W. R. Dudley, 1882; specimen in Herb. N. E. Botanical Club).

Muhlenbergia mexicana (L.) Trin. As a weed in a shaded roadside near a farmhouse, Colebrook (Weatherby). Previously known from Litchfield Co. only from an old collection by J. P. Brace about 1820.

Alopecurus aristulatus Michx. *A. geniculatus*, var. *aristulatus* Torr. Franklin (R. W. Woodward, Rhodora xx. 97); Somers (Bissell); Canaan (A. E. Blewitt). Not before reported from eastern Connecticut.

Sphenopholis obtusata (Michx.) Scribn. Glastonbury (Mrs. F. W. Starmer); Sharon (Weatherby). Not previously reported inland.

Agrostis alba, var. aristata Gray. Old Lyme (R. W. Woodward, Rhodora xx. 97).

Molinia coerulea Moench. Well established in a field, Chaplin (Bissell & Weatherby); dry hillside, Shelton (Harger).

Melica striata (Michx.) Hitchc. Woodbury and Cornwall (Harger).

Glyceria Fernaldii (Hitchc.) St. John. Woodstock (Weatherby), Goshen (Harger).

Puccinellia distans (L.) Parl. Norwalk and Darien (Eames).

*Festuca ovina L., var. hispidula Hack. Dry, steep, rather barren hillside, Franklin (R. W. Woodward, Rhodora xxi. 72); roadside, Canton (A. Lorenz).

Agropyron caninum (L.) Beauv. East Granby (Harger), Waterbury (A. E. Blewitt) Union, Somers, East Haddam, Southington (Bissell).

*A. caninum (L.) Beauv., f. pubescens (Scribn. & Sm.) Pease & Moore. Union (Bissell & Weatherby); Salisbury (Bissell).

A. caninum (L.) Beauv., var. tenerum (Vasey) Pease & Moore. Dry, rocky open woods, Canaan (Bissell & Weatherby), Sharon (Weatherby). Almost certainly native at these stations; previously known only as an introduced plant at Naugatuck.

*Eleocharis interstincta (Vahl) R. & S. Shallow water of Long Pond, Thompson (Una F. & C. A. Weatherby, Rhodora xxi. 75).

E. Robbinsii Oakes. Thompson (Rhodora xxi. 75) and Woodstock (Weatherby). Not previously reported from Windham Co.

E. OLIVACEA Torr. Thompson (Weatherby, RHODORA xxi. 75). Not previously reported east of the Connecticut River.

SCIRPUS SUBTERMINALIS Torr. Thompson (RHODORA xxi. 75) and Woodstock (Weatherby). Not previously reported from Windham Co.

S. CAMPESTRIS Britton, var. NOVAE-ANGLIAE (Britton) Fernald. Guilford (Bissell). An extension of range eastward.

S. CYPERINUS (L.) Kunth, var. PELIUS Fernald. Washington (A. W. Evans), Colebrook (Bissell, M. L. Fernald & Weatherby). Not before reported from Litchfield Co.

RYNCHOSPORA MACROSTACHYA Torr. Woodstock (Weatherby). Not previously reported from northeastern Connecticut.

CAREX DEWEYANA Schwein. Ashford (Weatherby). Not hitherto reported east of Southington and Guilford.

C. STRICTA Lam., var. CURTISSIMA Peck. Rare or occasional throughout western Connecticut in intimate association with the species, intergrading sometimes even in the same tussock (Eames, Harger).

C. UMBELLATA Schkuhr, var. BREVIROSTRIS Boott. Salisbury (Weatherby).

C. PANICEA L. Killingworth (Harger).

C. POLYMORPHA Muhl. Thompson (Weatherby). Not previously reported in northeastern Connecticut.

C. LIMOSA L. Litchfield (Harger).

C. TRICHOCARPA Muhl. Abundant on low meadows near the Housatonic River at Derby and Shelton (Harger). An extension of range southward.

ARISAEMA TRIPHYLLUM (L.) Schott, var. STEWARDSONII (Britton) G. T. Stevens. Thompson and Waterford (Weatherby); abundant over a considerable area at Southbury (Harger); Morris (G. E. Nichols); Norfolk (A. W. Evans). Not previously reported from Windham or New London Counties.

A. TRIPHYLLUM (L.) Schott, var. PUSILLUM Peck. North Stonington (Donald White & Harger); Madison (Bissell); East Lyme (Harger). Not previously reported east of the Connecticut Valley.

PONTEDERIA CORDATA L., var. ANGUSTIFOLIA Torr. Thompson (Weatherby, RHODORA xxi. 75). An extension of range northward.

JUNCUS DUDLEYI Wiegand. Union (Bissell). Not previously reported from eastern Connecticut.

J. DICHOTOMUS Ell., var. PLATYPHYLLUS Wiegand. Sandy ground in the flood-plain of the Connecticut River, East Haddam (Bissell). The specimen from South Windsor which was referred to *J. Dudleyi* in the Catalogue, proves on further study to belong here. These stations place this variety definitely in the group of plants, chiefly of the coastal plain, which in Connecticut are found only near the coast and inland in the central lowland.

J. EFFUSUS L., var. DECIPIENS Buch. Shelton (Eames). Previously reported only from Madison.

J. MILITARIS Bigel. Thompson (Weatherby, RHODORA xxi. 74). Not previously reported from Windham Co.

*LUZULA CAMPESTRIS (L.) DC., var. BULBOSA Wood. In hard, dry soil, Old Lyme (R. W. Woodward, RHODORA xx. 97).

SMILACINA TRIFOLIA (L.) Desf. Thompson (Weatherby, RHODORA xxi. 74). Not previously reported from Windham Co.

STREPTOPUS AMPLEXIFOLIUS (L.) DC. Granby (I. Holcomb). Previously reported only from Salisbury.

S. ROSEUS Michx. Union (Bissell & Weatherby). Extension of range eastward.

IRIS PSEUDACORUS L. South Windsor (C. W. Vibert); Winchester (A. E. Blewitt). Previously reported only from towns bordering tide-water.

†I. LAEVIGATA Fisch. & Mey. Japanese Iris. Marsh in the flood-plain of the Connecticut River, half a mile from the nearest house (C. W. Vibert). Fugitive from eastern Asia.

SISYRINCHIUM MUCRONATUM Michx. Bolton and Ellington (Weatherby). An extension of range northward and eastward, bringing this species to the edge of the eastern highland.

S. ATLANTICUM Bickn. A white-flowered form is plentiful in several meadows in Orange and occasional elsewhere (Eames).

CORALORRHIZA TRIFIDA Chatelain. Union (Bissell & Weatherby). Not previously reported from Tolland Co.

RUMEX ACETOSA L. West Hartford (Weatherby); Stratford (H. S. Clark); Norfolk (Harger).

SPERGULARIA CANADENSIS G. Don. Old Lyme (R. W. Woodward, RHODORA xx. 97). Previously reported only from Groton.

STELLARIA BOREALIS Bigel., var. ISOPHYLLA Fernald. Thompson (Weatherby); Waterbury (A. E. Blewitt). Not hitherto reported east of the Connecticut Valley.

S. AQUATICA L. Oxford (A. P. Harger). Previously reported only from Newtown, which station is now flooded.

LYCHNIS FLOS-CUCULI L. Southbury (F. S. Collins & Harger).

RANUNCULUS ALLEGHENIENSIS Britton. Occasional throughout western Connecticut.

†R. REPENS L., var. PLENIFLORUS Fernald. Rare. Fields and roadsides, escaped from cultivation. Canaan (Weatherby, Harger); Redding (Eames); Danbury (Bissell).

R. REPTANS L. East Haddam (Harger).

†ACONITUM NAPELLUS L. Established along roadsides, Warren (G. E. Nichols).

ACTAEA RUBRA (Ait.) Willd., f. NEGLECTA (Gillman) Robinson. Franklin (R. W. Woodward, RHODORA xxi. 116).

†BERBERIS THUNBERGII DC. Established in swampy woods as an escape from cultivation, New Haven (G. E. Nichols).

DICENTRA CANADENSIS (Goldie) Walp. Hartland (Weatherby).

CORYDALIS SEMPERVIRENS (L.) Pers. A white-flowered form has been collected at Orange (Harger et al.).

†ERUCA SATIVA Mill. Rare. Bridgeport (Eames).

CARDAMINE PRATENSIS L. South Windham (K. P. Jansson).

ARABIS HIRSUTA (L.) Scop. Killingly (E. E. Brown & Weatherby). Not previously reported from Windham Co.

TIARELLA CORDIFOLIA L. Bolton and Union (Weatherby). Not previously reported east of the Connecticut River.

RIBES TRISTE Pall., var. ALBINERVIUM (Michx.) Fernald. Canaan (Harger).

PHYSOCARPUS OPULIFOLIUS (L.) Maxim. Banks of streams at Lyme (G. E. Nichols), and Washington (A. W. Evans).

AMELANCHIER STOLONIFERA Wiegand. Thompson (Weatherby). Probably occasional throughout in sterile soils.

KERRIA JAPONICA (Thunb.) DC. Monroe (Harger).

RUBUS NEGLECTUS Peck. Thomaston (Harger).

AGRIMONIA PARVIFLORA Ait. Middletown (F. W. Kilbourne). Extension of range eastward.

*Prunus maritima Marsh., f. flava G. S. Torrey. Sandy soil, East Haven (G. E. Nichols).

P. virginiana L., var. leucocarpa Wats. Morris (G. E. Nichols).

Lespedeza Nuttallii Darl. Watertown (A. E. Blewitt). Not before reported from Litchfield Co.

Phaseolus polystachyus (L.) BSP. Beacon Falls (A. P. Harger). Not previously reported away from tide-water in western Connecticut.

Linum medium Planch. Washington (A. W. Evans); Union (Weatherby). Not before reported from Litchfield or Tolland Counties.

Acer pennsylvanicum L. Low swampy ground, Darien (G. E. Nichols). A southerly extension of range, and an interesting station for this species, in that it was growing in the same swamp with Liquidambar and other southern species.

*Impatiens biflora (Walt.) BSP., f. immaculata Weatherby, Rhodora xix. 117 (1917). Thompson and Wolcott (Weatherby); Waterbury (A. E. Blewitt); and probably elsewhere.

*I. biflora (Walt.) BSP., f. citrina Weatherby, Rhodora xix. 115 (1917). Thompson (Bissell & Weatherby); Southington (Una. F. Weatherby).

*I. biflora (Walt.) BSP., f. platymeris Weatherby, Rhodora xxi. 99 (1917). Southbury (Una F. Weatherby).

*I. biflora (Walt.) BSP., f. Peasei A. H. Moore. Moist roadsides, Washington (A. W. Evans).

†Hypericum aureum Bart. Waste ground near a park, Hartford (C. W. Vibert). Fugitive from the southeastern U. S.

H. prolificum L. Established in woods, Washington (A. W. Evans).

*H. dissimulatum Bickn. Voluntown (R. W. Woodward).

*Helianthemum propinquum Bickn. Dry field near the Rhode Island line at North Stonington (Harger); Southington (Bissell).

Lythrum alatum Pursh. Suffield (J. F. Smith); Woodbury (Harger).

Myriophyllum exalbescens Fernald. *M. spicatum* Am. auth. not L. Occasional throughout western Connecticut, usually sterile, but flowering at one pond in Danbury (Eames & C. C. Godfrey).

Epilobium molle Torr. Franklin (R. W. Woodward, Rhodora xxi. 116). Not previously reported east of the Connecticut Valley.

*Circaea canadensis Hill. *C. intermedia* Ehrh. Rich moist woods, Union and Kent (Weatherby). At the former station growing with *C. alpina* and *C. latifolia* and appearing like a hybrid between them.

Aralia spinosa L. Spreading from the root and thoroughly established in rear of a ruined house and in adjacent pasture at Litchfield (Harger).

Sanicula trifoliata Bickn. Middlefield (Harger); Hartland (Bissell). The latter station an extension of range northward.

Conioselinum chinense (L.) BSP. Goshen and Warren (Harger). Probably occasional in cold swamps of northwestern Connecticut.

Moneses grandiflora (L.) Gray. Windham, at South Windham (K. P. Jansson).

Ledum groenlandicum Oeder. North Canaan (G. E. Nichols).

Rhododendron maximum L. Berlin (Miss M. E. Bowers). Not before reported from Hartford Co.

Arctostaphylos Uva-ursi (L.) Spreng., var. coactilis Fernald & Macbride. Union and Putnam (Weatherby). Extensions of range northeastward.

†Primula officinalis Jacq. English Cowslip. A colony of forty or fifty plants apparently well established and seeding in shaded calcareous soil on a river bank, Salisbury (Weatherby).

Lysimachia producta (Gray) Fernald. Oxford (Harger).

†L. clethroides Duby. Dry waste ground, Hartford (Donald Deane). Fugitive from Japan.

Bartonia paniculata (Michx.) Robinson. Guilford (G. H. Bartlett & Harger). Not previously reported from New Haven Co.

Convolvulus spithamaeus L. Franklin (R. W. Woodward). Not before reported east of the Connecticut Valley.

Hydrophyllum virginianum L. Watertown and Naugatuck (A. E. Blewitt); Beacon Falls (Harger).

Cynoglossum boreale Fernald. Warren (Harger).

Agastache scrophulariaefolia (Willd.) Kuntze, var. mollis (Fernald) Heller. Naugatuck (A. F. Hill); Washington (A. W. Evans) not previously reported from New Haven Co.

†Salvia Sclarea L. Clary. Bridgeport (Eames). Introduced from Europe.

Blephilia hirsuta (Pursh) Benth. Washington (A. W. Evans). Previously reported only from Waterbury and Thomaston.

†Mentha verticillata L., var. pilosa (Spreng.) Briq. Moist roadside, Newtown (Eames). "One of the variations of a hybrid of *M. arvensis* and *M. aquatica.*" M. L. Fernald.

†M. stachyoides Host. Dry roadside, Newtown (Eames). "A polymorphous hybrid of *M. arvensis* and *M. rotundifolia.*" M. L. Fernald.

†Perilla frutescens L., var. crispa (Benth.) Deane. Rare. Bridgeport (Eames).

†Solanum triflorum Nutt. Waste ground at State Pier, New London (K. P. Jansson). Fugitive or adventive from the western U. S.

†Linaria Spartea (L.) Hoffmansegg & Link. Plentiful in a dry field, Fairfield (Eames). A white-flowered form also occurs at this station.

†L. reticulata Willd. Rare. Fairfield, with the preceding (Eames).

†L. bipartita Willd. Rare. Fairfield, with the preceding (Eames).

Digitalis ambigua Murr. Washington (A. W. Evans).

Agalinis tenuifolia (Vahl) Raf. *Gerardia tenuifolia* Vahl. A white-flowered form occurs at Milford (A. W. Evans).

Utricularia resupinata B. D. Greene. Muddy pond margin, Woodstock (Weatherby). Not previously reported from northeastern Connecticut.

U. purpurea Walt. Thompson, locally frequent (Weatherby). Not previously reported from Windham Co.

†Plantago media L., var. Monnieri (Giraud) Rouy. Rare. Bridgeport (Eames). Introduced from Europe.

Sherardia arvensis L. Waterbury (A. E. Blewitt).

*Galium circaezans Michx., var. glabrum Britton. Shaded bank of ravine, Derby (Weatherby).

G. palustre L. New Milford, North Canaan and Danbury (A. E. Blewitt); Goshen (Bissell).

G. trifidum L. Goshen (Harger). A southerly extension of range.

*LOBELIA CARDINALIS L., f. ALBA (A. Eaton) St. John. Edges of stream, Washington (A. W. Evans).

†LONICERA BELLA Zabel. Westport (Eames). An escape from cultivation.

L. CANADENSIS Marsh. Union and Ashford (Weatherby). Not before reported east of the Connecticut Valley.

ERIGERON RAMOSUS (Walt.) BSP., var. SEPTENTRIONALIS Fernald & Wiegand. Waterbury (A. E. Blewitt). Previously reported only from Greenwich and Middlebury.

E. PUSILLUS Nutt. Bolton (Weatherby); Old Lyme (Harger).

SILPHIUM PERFOLIATUM L. Flood terraces, Roxbury (G. E. Nichols); open woods, Washington (A. W. Evans).

ASTER AMETHYSTINUS Nutt. Berlin (Bissell). Not previously reported from Central Connecticut.

*A. NEMORALIS Ait. Swampy thickets, margin of Long Pond, Thompson (Harger; Weatherby, RHODORA xxi. 75).

A. DUMOSUS L. Fairfield (Eames). An extension of range westward.

*ANTENNARIA PETALOIDEA Fernald. Rare. Dry pastures, Oxford (Harger); Franklin (R. W. Woodward).

XANTHIUM COMMUNE Britton. Old Lyme (Bissell). An extension of range eastward.

*BIDENS EATONI Fernald. Brackish marshes, Old Lyme (R. W. Woodward, RHODORA xx. 98)

*B. HETERODOXA (Fernald) Fernald & St. John, var. MONARDAEFOLIA Fernald, RHODORA xix. 259 (1917). Strand of Pocotopaug Lake, East Hampton (R. W. Woodward).

*B. HETERODOXA (Fernald) Fernald & St. John, var. AGNOSTICA Fernald, l. c. Same locality (Bissell & R. W. Woodward).

B. BECKII Torr. Thompson (U. F. & C. A. Weatherby); Voluntown (K. P. Jansson); Litchfield and Morris (G. E. Nichols). Not before reported from east of the Connecticut Valley or from Litchfield Co.

†GAILLARDIA ARISTATA Pursh. In grass land, Woodbridge (Eames). Escaped from cultivation.

SENECIO VISCOSUS L. Guilford (Bissell). Previously reported only from Stamford.

CENTAUREA VOCHINENSIS Bernh. Occasional, especially in grassland throughout Fairfield Co. (Eames).

LAPSANA COMMUNIS L. Franklin (R. W. Woodward, RHODORA XX. 98).

†SONCHUS ASPER (L.) Hill, var. PUNGENS Bischoff. Waste ground at Bridgeport (Eames). Flowers without ligules.

E. B. HARGER,
C. B. GRAVES,
E. H. EAMES,
C. H. BISSELL,
C. A. WEATHERBY.

SOME NOVA SCOTIA MOSSES.

EDWIN B. BARTRAM.

WHILE actively engaged in field work covering portions of central and southwestern Nova Scotia during July 1921 the writer, in company with Prof. M. L. Fernald and Mr. Bayard Long, collected about 140 numbers of mosses. No attempt was made to obtain a representative series as the pressure of other work left only brief intervals in which to pick up any thing that was obviously interesting and close to hand but as the material was worked over several range extensions suggested that a brief survey of some of the more interesting species might not be unworthy of record.

The bogs, lake shores and spruce woods of Yarmouth Co., where we spent most of out time, were relatively unproductive but as we worked north through Annapolis Co. into more broken country and on through the gypsum outcrops near Windsor to the granite and sandstone areas of Hants Co. and Halifax Co. the variety of species broadened to a rather gratifying extent.

Sphagnum macrophyllum Bernh. Covering the bottom of a shallow arm of Five Island Lake, Hants Co. Dr. A. LeRoy Andrews in his letter verifying the determination of this species says that this is the first record outside of the range from Maine to Florida given in the North American Flora and therefore new to Canada. It seems to be one of pine barren elements like *Sphagnum Pylaesii* or *Utricularia purpurea* that has spread northward through the marshes and pools of the coastal plain at a time when a continuous land connection existed between Newfoundland, Nova Scotia and the coastal plain

region of the Atlantic Seaboard States. At any rate it presents a very happy illustration of the theory which Prof. Fernald has so ably demonstrated.

Sphagnum Pylaesii Brid. Abundant in a shallow pond near Armdale, just outside of Halifax.

Andrea petrophila Ehrh. In dense reddish cushions on the granite ledges near Uniacke Lake, Hants Co.

Andrea crassinervia Bruch. With the preceding and more abundant. Also on dry sandstone faces bordering Shubenacadie Grand Lake, Halifax Co. Fruiting freely.

Dicranum fulvum Hook. Frequent on boulder faces throughout the range.

Dicranum fuscescens Turn. Rather common in thin soil on boulders and ledges.

Dicranum longifolium Ehrh. Rock faces near Armdale.

Dicranum montanum Hedw. Rock faces in woods near Armdale.

Dicranum spurium Hedw. Thin soil on sandstone and granite ledges in Hants Co. and Halifax Co. Frequent and variable.

Dicranum viride Schimp. On the bark of living trees bordering the lakes in Yarmouth Co. and Annapolis Co.

Ditrichum lineare (Sw.) Lindb. Springy bank near Yarmouth.

Grimmia maritima Turn. Very abundant in dense black cushions on the shore rocks and headlands of Cape Forchu, Yarmouth Co.

Grimmia Olneyi Sulliv. On sandstone rocks, Blueberry Point, Shubenacadie Grand Lake. This species has been found from the New England States west to southern Ontario and southward but the present record seems to extend the range quite a distance in the northeasterly direction. The tufts were vigorous and mostly pure with about the average number of fertile plants but in spots a mixture of *Andrea crassinervia* and *Rhacomitrium microcarpum* was much in evidence.

Rhacomitrium aciculare (L.) Brid. Frequent on wet rocks along the lakes shores. Generally sterile but occasional colonies richly set with fruit.

Rhacomitrium heterostichum alopecurum Hübn. Abundant on granite ledges near Lake Uniacke.

Rhacomitrium heterostichum gracilescens B. & S. With the preceding and hardly separable from it except by the strictly muticous leaves.

Both of these varieties seem very close to *R. sudeticum*. The more simple stem and absence of short lateral branches in the latter species may be influenced to some extent by the habitat. The distinguishing character is at best an unstable one and from a conservative point of view it would seem that all three forms might be conveniently grouped under *R. heterostichum* with varietal rank.

Rhacomitrium microcarpum (Schrad.) Brid. Common on granite faces in Hants Co. and Halifax Co.

Gymnostomum rupestre Schleich. Infrequent and sterile on gypsum ledges near Windsor.

Barbula fallax Hedw. On gypsum rocks near Windsor.

Tortula papillosa (Muell.) Wils. On shade trees in Windsor.

Ulota crispa Brid. Common throughout the region.

Ulota americana (Beauv.) Lindb. On shaded boulders along the lake shores.

Ulota Ludwigii Brid. Frequent and often mixed with *U. crispa*.

Aulacomnium androgynum Schwaegr. Found only on the ledges of the headlands of Cape Forchu, Yarmouth Co., where the slender deep green plants in dense cushions, very dark brown to blackish beneath, with numerous pseudopodia presented a striking combination of field characters.

Leptobryum pyriforme (L.) Wils. Crevices of gypsum rock near Windsor.

Mnium hornum L. Frequent in Yarmouth Co. and freely fruiting.

Pterigynandrum filiforme (Timm) Hedw. In fine yellowish green mats on shaded granite ledges near Uniacke Lake.

Hylocomium brevirostre (Ehrh.) B. & S. Shore of St. John Lake, Yarmouth Co.

Climacium dendroides (L.) Web. & Mohr. Edge of swale at Wentworth gypsum quarries near Windsor.

Campylium chrysophyllum (Brid.) Bryhn. Shaded gypsum ledges near Windsor.

Campylium stellatum (Schreb.) Bryhn. Wet meadow bordering Brazil Lake, Yarmouth Co.

Calliergon straminеum (Dicks.) Kindb. Wet savannah bordering St. John Lake, Yarmouth Co.

Leucodon sciuroides (L.) Schwaegr. Mixed with *L. brachypus* on old willow trees near Windsor.

Neckera complanata (L.) Hübn. On tree bordering St. John Lake. Sterile and apparently rare.

Neckera pennata (L.) Hedw. Common in woods bordering the lakes. The capsules are conspicuous and abundant.

BUSHKILL, PENNSYLVANIA.

WALDSTEINIA IN MAINE.—When the Portland Society of Natural History in 1862, issued its first "Catalogue of Maine Plants," *Waldsteinia fragarioides* (L.) Trattinick was listed from Bethel; but no specimens were produced to substantiate the claim, and the plant has never been found since then in that region. In fact from 1862 till 1922 the species had not been reported authentically from any portion of the state.

About June 1 of the current year, Frederick Godwin, a boy in the 7th grade, brought me a 3-inch bit from the top of a scape bearing one blossom and a calyx from which petals had fallen, but which plainly showed perigynous insertion of the stamens. A little study convinced me of the identity of the plant and I commandeered the services of a friend from Waterville to bring me in some of the plants. It was then so nearly out of flower that only three good specimens could be obtained. One of these has been placed in the herbarium of the New England Botanical Club. The colony is extensive and is located in the town of Benton.—JOHN C. PARLIN, Albion, Maine

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—NEW SERIES, No. LXVI.

POLYPODIUM VIRGINIANUM AND P. VULGARE

M. L. Fernald.

In eastern America we are so used to designating our common Polypody of rocky woods as *Polypodium vulgare* L. and the hosts of fern-specialists who have studied our ferns during the last three-fourths of a century have so universally followed this usage, that to many people it may seem as if our fern has a vested right to the name. When, however, we look into the original treatment of Linnaeus in the *Species Plantarum*,[1] it is at once clear that he restricted the name *P. vulgare* exclusively to the plant of Europe ("*Habitat in* Europa *rimis rupium*"); while to the plant of eastern America ("*Habitat in* Virginia") he assigned the name *P. virginianum*. Linnaeus also included under *P. virginianum* a citation of one of Plumier's West Indian plates and a reference to Petiver which do not belong with the Virginian plant, but the source of his name was clearly the *Polypodium virginiense minus, foliis obtusioribus* of Morison's Plant Hist. Univ. Oxon. iii. 563, sect. 14, t. 2, fig. 3 (1715), published with a good illustration and very fair description of the common Polypody of eastern America. Morison's conventionalized figure showed the rootstock unusually clean of scales (although occasional herbarium-specimens of the American plant have almost

[1] L. Sp. Pl. ii. 1085 (1753).

completely lost them) and from this fact Linnaeus was misled into over-emphasizing this rather unusual and post-mortem character, describing his *P. virginianum*: "Polypodium frondibus pinnatifidis: pinnis oblongis subserratis obtusis, radice laevi" and adding the comparative note: "*Antecedenti* [*P. vulgare*] *simillima, sed minor, & subtus glabra.*" This over-emphasis on the smooth rootstock was again displayed by Amos Eaton when, in 1818,[1] he stated that *P. vulgare*, "var. *virginianum*, has a naked root," though Jacob Bigelow[2] had given a better description of the American plant and referred to the fronds as "divided . . . by sinuses which are more acute than in the European variety."

The first post-Linnean botanist to make a really satisfactory differentiation of our plant from the European *Polypodium vulgare* was Sir William Hooker who, in 1840, considered typical *P. vulgare* almost strictly European, while in America there were two varieties: "β. *Americanum*; minus, fronde angustiore, laciniis remotioribus. P. Virginianum, *Linn. Sp. Pl.* p. 1345 (*excl. Syn. Plum. &c.*) . . . γ. *occidentale;* frondis laciniis acutis acute serratis. P. vulgare, Virginianum. *Bong. Veg. Sitcha*, p. 57."[3] Var. *americanum* was given a range through southern Canada west to the Saskatchewan and Slave River, while var. *occidentale* occurred from the mouth of the Columbia north to Sitka; and Hooker added under var. *americanum* the following illuminating comment: "The common state of this plant throughout the United States and in British N. America, is to be smaller than the European form, with narrower and more oblong fronds, with laciniae more distant, and the sori nearer the margin This is no doubt the *P. Virginianum* of Linnaeus and authors, as far as regards the Virginia plant, on which Linnaeus founded his character." Somewhat later, in that storehouse of accurate observation, his *Flora of the State of New York*, Torrey took up var. *americanum* and in his description added the highly important character: "Segments mostly alternate, 3–4 lines wide."[4] Still later, in 1848, Kunze, who certainly had an intimate knowledge of European ferns, published a suggestive comment: "*P. vulgare*, β. *americanum*. Hook., (*P. virginianum*, L.,) differs from the European form by a

[1] Eaton, Man. ed. 2: 373 (1818).
[2] Bigelow, Fl. Bost. 252 (1814).
[3] Hook. Fl. Bor.-Am. ii. 258 (1840).
[4] Torr. Fl. N. Y. ii. 484 (1843).

narrower and more elongated frond, narrower lobes separated by wider sinus, the lowest being longer or at least not shorter than the following ones, and the sori being always nearer the margin than in the European plant. I have not met with any American specimens entirely agreeing with the true *P. vulgare* of the old world."[1]

These quotations are sufficient to indicate that the most discerning of the earlier students of our ferns were convinced that no true *Polypodium vulgare* occurs in eastern America, although there was difference of judgment as to whether our plant was specifically or only varietally separable from it. Since the statements above quoted little has been consciously added to the once rapidly accumulating series of differential characters and for three-fourths of a century our plant has passed, with only desultory and inconclusive challenges, as typical *P. vulgare*. For instance, the late B. D. Gilbert stated that, "For some time past I have been inclined to look upon our so-called *Polypodium vulgare* in Eastern North America as a distinct species from the European and Pacific coast species . . . However, I am not yet prepared to separate the two, which can only be done by one who has a large number of European as well as American specimens;"[2] while the English specialist, the late C. T. Druery, in 1902, assumed the identity of *P. virginianum* with European *P. vulgare* when he urged "The undesirability of attaching different names on your [American] side to varietal types which may already exist on this [European]."[3] In 1907, it is true, Tidestrom took up our plant as *P. virginianum*, but with only one highly inconstant character: "In its outward appearance this species differs in no appreciable degree from *P. vulgare*. The latter species is characterized by having from 3 to 5 *stelai* at the base of the petiole, while in our plant the number is commonly 2, and in older leaves 3,—2 being normal and 1 is smaller."[4] In such a discriminating work as Christensen's *Index Filicum*, however, *P. virginianum* appears as an unquestioned synonym of *P. vulgare*, although full specific rank is accorded *P. californicum* Kaulf., *P. falcatum* Kell. (*P. vulgare*, var. *occidentale* Hook., *P. Glycyrrhiza* D. C. Eaton, *P. occidentale* (Hook.) Maxon) and *P. hesperium* Maxon, plants so strongly resembling variants

[1] Kunze, Am. Journ. Sci. ser. 2, vi. 82 (1848).
[2] Gilbert, Fern Bull. x. 14 (1902).
[3] Druery, Fern Bull. x. 51 (1902).
[4] Tidestrom, Elysium Marianum, ed. 2: 18 (1907)

of the European *P. vulgare* that only upon the most minute but often inconstant characters can they possibly be kept apart from them.

In fact if one compares a series of typical Californian plants (for example *Heller's* no. 5011 or 7255, *C. F. Baker's* no. 235; *Abrams's* no. 3021 or *Parish's* no. 4375) with a series of the European *P. vulgare*, var. *serratum*, he will have the greatest difficulty in separating the fronds; or similarly, he will be puzzled if he compares them with such European plates as Lowe's *Our Native Ferns*, i. t. 6 (and figs. 6, 18, 21, etc.) or Moore's *Nature Printed British Ferns* (octavo ed.), i. tt. 1 and 2. Hooker & Baker in *Synopsis Filicum*, to be sure, placed *P. californicum* in the Section *Goniophlebium* with "Veins forming ample regular areolae," while *P. vulgare* was kept in *Eupolypodium* with "Veins free"; but they certainly must have been in error for, although some extreme specimens show several areolae, the veins of *P. californicum* are mostly quite free and specimen after specimen shows no difference in venation between this species and the European. Indeed, several European specimens in the Gray Herbarium, especially of *P. vulgare*, var. *serratum*, have quite as many areolae as there are in extreme Californian plants; and such "nature-printed" illustrations of the European *P. vulgare* as those of Moore's *Nature Printed British Ferns* (octavo ed.) tt. 3 D and 5 or Ettinghausen & Pokorny's *Gefässpflanzen Oesterreichs in Naturselbstdruck*, i. (t. 7) show as numerous areolae as many Californian specimens, especially those referred to *P. californicum*, var. *intermedium* D. C. Eaton, of which its author frankly stated, that "in var. *intermedium* this species [*P. californicum*] makes an inconveniently near approach to *P. vulgare*," adding the comment: "It may be noticed in this connection that Milde says of the veinlets of *P. vulgare*, var. *serratum*, '*Interdum ramos anastomosantes inveni.*' "[1]

Similarly, the same difficulty is experienced in separating fronds of *Polypodium falcatum* (for instance, *J. C. Nelson*, no. 1122) from such a plate as Lowe's no. 9, representing *P. vulgare*, var. *Acutum-Stansfieldii*. In this connection it is noteworthy that, in *Synopsis Filicum*, Hooker & Baker assigned *P. vulgare* a North American range only from "Sitka, southward to California and the north of Mexico," *i. e.* they *excluded*, by inference, *P. virginianum* of the East and *included* as specifically inseparable from *P. vulgare* the western

[1] D. C. Eaton, Ferns of N. A. i. 246 (1879).

P. falcatum and *P. californicum*, var. *intermedium;* at the same time calling "*P. falcatum*, Kellogg (*P. glycyrrhiza*, Eaton), a Californian variety, with the pinnae finely toothed, and narrowed very gradually to an acute point."[1] Very similarly, Diels states the range to include in America, at least by inference, only the western region: "südlich bis Makaronesien, Nordafrika, Vorderasien, Japan, Nordmexico."[2]

From earliest times the European *Polypodium vulgare* has attracted the gatherers of medicinal herbs on account of its sweet roots. Gerarde in the 16th century, stated that the root "hath in it a certaine sweetenes";[3] Parkinson, in the 17th, said it has "a certaine sweetish harshnesse in the taste,"[4] Morison, in the 18th, described it with a "sweet taste (sapore dulci)";[5] and Diels, in the 19th, said, "Das Rhizom ('Radix polypodii S. filiculae dulcis'—'Engelsüss') enthält Zucker."[6] In view of the many indications of specific identity between the Polypodies of western America and the European *P. vulgare* it is not surprising, therefore, to find in Kellogg's original account of *P. falcatum* the statement that the rootstock has a "sweetish liquorice flavor";[7] that D. C. Eaton, publishing the same species almost simultaneously gave it the name *P. Glycyrrhiza*, with "Rootlets aerial, having a sweet flavor like that of liquorice";[8] that by Piper & Beattie it is called *Licorice-root Fern* because "The rootstocks taste much like licorice, and are eaten by children";[9] and that Maxon, in describing as a species of the western mountains *P. hesperium*, stated that, "It is doubtful whether *hesperium* is very closely related to the eastern *vulgare*. Its affinities seem rather to lie with the Polypodiums of the Pacific coast, one especially notable feature which it possesses in common with them being the hard licorice-like rootstock. The rhizomes of the eastern *vulgare*, on the other hand, are not only spongy and quite acrid but more or less unsavory in taste."[10]

The only character which I have thus far been able to discover, by which *Polypodium californicum*, *P. falcatum* and *P. hesperium*

[1] Hook. & Baker, Syn, Fil. 334 (1868).
[2] Diels in Engler & Prantl, Pflanzenf. i. Ab. 4: 311 (1899).
[3] Gerarde, Herball, 972 (1597).
[4] Parkinson, Theatrum Botanicum, 1040 (1640).
[5] Morison, Pl. Hist. iii. 562 (1715).
[6] Diels, l. c. (1899).
[7] Kellogg, Proc. Cal. Acad. i. 20 (1854).
[8] D. C. Eaton, Am. Journ. Sci. ser. 2, xxii. 138 (1856).
[9] Piper & Beattie, Fl. N. W. Coast, 3 (1915).
[10] Maxon, Proc. Biol. Soc. Wash. xiii. 200 (1900).

can be separated from most European *P. vulgare*, is in the scales of the rhizome. In most of the European plants the scales are very prolonged into a capillary tip; in the plants of Pacific America they are less prolonged. But such plants as those distributed by Dörfler in his *Herbarium Normale* as no. 3687, *P. vulgare*, forma *variegata* from Germany, have the scales quite like those of the western American plants; and certainly there is nothing to separate this German material specifically from such representatives of *P. californicum* as *Abrams & McGregor's* no. 31 from Ventura Co., California, *Kellogg & Harford's* no. 1164 from Lone Mountain, California, *Heller's* no. 13,090 from Butte Co. or his no. 5030 from Sonoma Co., *Parish's* no. 4373 from San Bernardino Co., or *Abrams's* no. 3100 from San Diego Co. Similarly Dörfler's no. 3687 is quite as indistinguishable from such representatives of *P. falcatum* as Bongard's Sitkan material sent out as *P. vulgare, virginianum, Funston's* no. 13 from Yakutat Bay, *Eastwood's* no. 798 from Shagway or *G. R. Vasey's* no. 42 from Washington, the latter all originally and correctly distributed as *P. vulgare* but specifically inseparable from plants passing as *P. falcatum*.

In European *Polypodium vulgare* and the western American *P. californicum*, *P. falcatum* and *P. hesperium* the scales of the rhizome, though varying in different plants from pale-cinnamon to dark brown, are individually of tolerably uniform color throughout and (under high magnification) show a similarly close cellular structure with thin cell-walls; in the eastern American *P. virginianum*, on the other hand, the scales commonly have a deeper-colored median band and they are of much looser or more open structure, and the cell-walls are thickish. The late D. C. Eaton, leaning too confidently upon European authors, described the rootstock of the eastern American plant as "covered with ovate-acuminate brownish chaffy scales, peltately attached near the base;"[1] but as Miss Slosson points out in her description of the eastern plant: "I find a sinus leading from the base to the point of attachment. An over-lapping of the sides of this sinus often makes the scales appear peltately attached."[2] Miss Slosson thus accurately describes the basal scales of *P. virginianum*, while Eaton's description accords with that of European

[1] D. C. Eaton, Ferns N. A. i. 239 (1879).
[2] Slosson, How Ferns Grow, 49 (1906).

authors when describing their plant, for example Luerssen who definitely calls the scales "schildförmig."[1] Careful comparison of scales from the two plants shows this to be a constant character and, as would be expected, the scales of the western American *P. californicum*, *P. falcatum* and *P. hesperium* agree with the European *P. vulgare* in being peltately attached just above their base.

Reference has been made to Tidestrom's statement that *P. virginianum* differs from *P. vulgare* in having only 2 or 3 vascular bundles at the base of the stipe, two of them large, the third smaller; while in *P. vulgare* there are said to be 3 to 5 bundles. Luerssen[2] somewhat similarly describes *P. vulgare* as having at the base of the stipe 2 large and 2 smaller bundles, while Waters[3] definitely places our plant in his section with "Bundles three at extreme base." Whether there is any pronounced difference in the number and arrangement of the bundles cannot be determined without more adequate European material; but it is significant that some dried European plants, in which the stipe has been severed just above the base, seem to show only 2 bundles while others show but 3.

The habitats of *Polypodium vulgare* and of *P. virginianum* are usually very different. Although some forms occur on rocks or on mossy banks or even sand dunes,[4] a common habitat in Europe is tree-trunks (either living or dead), old stumps and fallen logs. The early European herbalists, for instance Gerarde in the 16th century, distinguished "*Polypodium Quercinum* Polipodie of the Oke," which occurs "in the tops of the trunks of trees in thicke woods";[5] Kerner von Marilaun in his popular compilation, the *Natural History of Plants* (*Pflanzenleben*), says: "*Polypodium vulgare* is often met with enveloping the trunks and boughs of large trees";[6] Luerssen briefly states its habitat in continental Europe: "Auf Baumwurzeln und Baumstumpfen, moosbewachsenen Felsblocken, an alten Mauern und in Felsspalten";[7] while Lowe gives the following vivid picture from Great Britian: "Looking higher up the tree, an epiphyte in the shape of a Fern has taken possession, and is clothing the forks from

[1] Luerssen, Farnpfl. 54 (1889).
[2] Luerssen, Farnpfl. 55 (1889).
[3] Waters, Ferns, 73 (1903).
[4] Warming, Oecology of Plants, ed. Groom & Balfour, 267 (1909).
[5] Gerarde, Herball, 974 (1597).
[6] Kerner von Marilaun, Nat. Hist. Pl. ed. Oliver, ii. 705 (1895).
[7] Luerssen, Farnpfl. 55 (1889).

where the branches spring; and this Fern is the Common Polypody. It is a Fern that delights to run along the ground amongst old wood and moss . . . It may justly be called a parasite—or rather an epiphytal plant—which seeks to hasten to destruction those trees where decay has made its appearance . . . A group of pollard willows clothed with *Polypodium vulgare* are [is] both singular and interesting."[1] Similarly, the Pacific American varieties of *P. vulgare* delight in mossy carpets, old stumps and tree-trunks. Thus Watson, in the *Botany of California* speaks of *P. vulgare* as "often growing on trees" and *P. falcatum* "On trees and sometimes on rocks";[2] Macoun & Burgess speak of *P. falcatum* as "frequent in the hollows of living trees";[3] Piper & Beattie assign *P. occidentale* to "moss on rocks, logs and trees"; [4] while Henry says of *P. vulgare*: "Often on mossy trees and logs".[5]

How different from the ordinary habitat of *Polypodium virginianum*, which is accurately described in many books on the eastern American ferns. Thus Waters says that *P. virginianum* "prefers the top of a shaded ledge of rocks";[6] Miss Slosson likewise says: "Flat or slightly sloping surfaces of rocks, woodland banks, stone walls, etc."; [7] while Clute equals Lowe in his vivid account: "Wherever there is a shaded ledge of rocks in the northeastern States one is almost sure to find the polypody . . . There is no question as to choice of location with this sturdy species. All are alike to it, provided there are rocks upon which it can grow. The only preference it has is for the tops and upper shelves of the rocks where the soil is moderately dry. So characteristic is it in such situations that when one sees a fern clad rocky summit from a distance too great to discern the individual fronds he identifies them with confidence as this species."[8] In fact so generally is *P. virginianum* of eastern America a plant of rock-habitats or woodland banks that, when it is rarely found as an epiphyte it at once attracts attention. Thus when the late Lester F. Ward, in 1878, discovered it as an epiphyte on *Betula nigra*, he was so interested

[1] Lowe, Our Native Ferns, i. 24, 25 (1867).
[2] Watson, Bot. Cal. ii. 334 (1880).
[3] Macoun & Burgess, Trans, Roy. Soc. Can. ii. Sect. iv. 181 (1884).
[4] Piper & Beattie, Fl. N. W. Coast, 3 (1915).
[5] J. K. Henry, Fl. So. Brit. Columb. 3 (1915).
[6] Waters, Ferns, 79 (1903).
[7] Slosson, How Ferns Grow, 51 (1906).
[8] Clute, Our Ferns in their Haunts, 196 (1901).

in the novel habitat that he specially recorded the discovery, the Polypody growing on the "trunk several feet above the base, after the manner of *P. incanum* . . . The roots have taken a firm hold in the clean living bark, so that I collected my specimens with a knife, leaving the bark attached."[1] In 1884, in their paper on *Canadian Filicineae*, after stating the range and the ordinary habitat of the plant in Canada, Macoun & Burgess added as a noteworthy item: "growing plentifully on old elm trees, near Belleville, Ont., near Heely Falls, Trent River, Northumberland Co., Ont., and near Amherstburg, Essex Co., Ont."[2] In 1903 Waters[3] published a photograph, taken apparently near Baltimore, of "The Polypody at the Base of a Tree". In September, 1906, Professor J. Franklin Collins showed me at Lincoln, Rhode Island, several trees of *Betula lenta* with festoons of Polypody hanging from the lower halves of the trunks, and he was so interested in the novelty that he photographed the colony; and similar occurrences in Nova Scotia, observed in 1920, seemed so unusual as to merit the note: "*Polypodium vulgare* [i. e. *P. virginianum*], here having no rocks to grow on, was climbing the tree-trunks, the creeping rootstocks ascending in the crevices of the bark to a height of 2 or 3 meters" and at another station "the tree-climbing *Polypodium* again."[4] Almost simultaneously, Professor Duncan S. Johnson discussed in some detail the occurrence of the eastern American Polypody on trees near Baltimore, this habitat being so unusual in his experience that he had "not been able to find a definite report of its being really epiphytic in habit in the United States."[5] In Europe and Pacific America, then, although often occurring on mossy rocks and wooded banks, *P. vulgare* is frequent on living or dead trees; but the eastern American *P. virginianum*, though very rarely epiphytic, is ordinarily a plant of rock-habitats.

In view of the similarly stout and firm, sweetish rhizome with peltately attached scales of similarly dense structure, the identical fronds with often very broad pinnae (up to 1.8 cm. and rarely to 4 cm.) bearing median sori, the clearly intergrading venation, and the

[1] L. F. Ward, Field and Forest, iii. 150 (1878) and report in Bull. Torr. Bot. Cl. vi. 238 (1878).
[2] Macoun & Burgess, Trans. Roy. Soc. Can. ii. Sect. iv. 181 (1884).
[3] Waters, Ferns, 82 (1903).
[4] Fernald, Rhodora, xxiii. 147, 149 (1921).
[5] D. S. Johnson, Bot. Gaz. lxxii. 237 (1921).

predilection for living or dead trees, stumps and mossy logs, the plants of western America are certainly specifically inseparable from the endlessly variable *P. vulgare* of Europe. Their ranges on the two continents are so strikingly similar to those of *Blechnum Spicant* (L.) Sm. (western Eurasia, north Africa and the Atlantic Islands; southern Alaska to California) and *Equisetum maximum* Lam. (*E. Telmateia* Ehrh.) (western Eurasia, north Africa and the Atlantic Islands; British Columbia to southern California) that absolutely no violence is done the probabilities of truth by treating them as one species; and, until they are shown to have stronger characters than their supporters have yet pointed out, it would seem only the part of sound classification so to treat them. Diels has expressed almost this conclusion by saying, "*P. californicum* Kaulf. (pacifisches Nordamerika) kommt dem *P. vulgare* L. so nahe, dass es nur durch die (noch dazu nicht überall constante) Maschenbildung davon zu trennen ist";[1] Schur, describing the European *P. vulgare*, var. *transsilvanicum* made the note: "An P. vulgare, var. occidentale *Hook*";[2] Eaton, describing *P. californicum*, var. *intermedium*, practically admitted that he could not separate it from the European *P. vulgare*, var. *serratum*; Hooker & Baker gave up the attempt to keep *P. falcatum* distinct from European forms of *P. vulgare*; and Maxon, in publishing *P. hesperium* as a species, suggested the possibility "that the species here described is identical with the var. *rotundatum* [of *P. vulgare*] of Milde."

Neither *Blechnum Spicant* nor *Equisetum maximum* extend eastward far beyond the limits of Europe. It is, therefore, significant to note Hooker's statement[3] of the Eurasian range of *Polypodium vulgare*: "Europe, to its extreme south; North Africa, Madeira, Canaries, and Azores . . . ; Siberia, the Amur, Manchuria, Japan (unknown in the tropical continent of Asia, or even in the Himalaya). From Erzeroum, Asiatic Turkey, I possess specimens." In other words, except from an indefinite "Siberia," the species was not known to Hooker from between Europe and adjacent Asia Minor and "the Amur, Manchuria, Japan." Ledebour, in *Flora Rossica*,[4] cites Siberian material only from the Ural (on the Russian

[1] Diels in Engler & Prantl, Pflanzenf. i. Ab. 4: 312 (1899).
[2] Schur, En. Pl. Transsilv. 830 (1866).
[3] Hook. Sp. Fil. iv. 205 (1862).
[4] Ledeb. Fl. Ross. iv. 508 (1853).

border), then from the Altai eastward across the Baikal region to Kamchatka. I have seen no Altai nor Japanese material and it is probable that all the Japanese plant is referable to *P. Fauriei* Christ, Bull. Herb. Boiss. iv. 672 (1896). (*P. vulgare*, var. *japonicum* Franchet & Savatier, Enum. Pl. Jap. ii. 244 (1879); *P. japonicum* (Franch. & Sav.) Maxon, Fern Bull. x. 42 (1902), not Hoult. (1783)). The plant of Amur and Manchuria, however, well shown in the Gray Herbarium, is neither European *P. vulgare* nor the Japanese *P. Fauriei* but is a good match in all characters for the eastern American *P. virginianum*.

This specific identity of the Polypody of Amur and Manchuria with the plant of eastern America, while the western American species prove to be inseparable from the European, is so exactly what we have learned to expect, that in itself it is some indication that we are dealing with two distinct species; and the various characters already discussed lead inevitably to the conclusion that *P. vulgare* and *P. virginianum* are separated by many fundamental differences.

Another point worthy of brief note is the comparative variability of the two. In Europe *Polypodium vulgare* is so exceedingly given to the production of varieties and sports that it, along with the European and western American *Blechnum Spicant* and *Athyrium Filix-femina*,[1] supplies a large proportion of the 1119 varieties of ferns recognized in the British Isles alone in Lowe's *British Ferns, and where Found*. The fact that, to quote Druery, "This species has been very liberal in 'sports'," [2] supplemented by the infectious charm of the couplet,

"How wonderfully you vary,
Polypodium vulgare."

has stimulated the fern lovers of eastern America to emulate their British cousins in searching for these so-called varieties. The result is well stated by Waters in the words: "The common polypody [of eastern America, i. e. *P. virginianum*] is not ordinarily a variable fern."[3] How different from Druery's statement just quoted or that of Mr. James Britten, in writing of the European plant: "The Poly-

[1] "in the eastern United States and Canada there are two distinct species of lady ferns, neither of which is conspecific with *A. Filix-femina* (L.) Roth of Europe . . . the ferns of the northwest are conspecific with the European plant, but, in some cases, differ from the common European forms of *A. Filix-femina* in certain minor points"—Butters, Rhodora, xix. 178, 179 (1917).

[2] Druery, Brit. Ferns, 172 (1910).

[3] Waters, Ferns, 81 (1903).

pody is a very variable species."[1] Discussion of the larger bearings of this difference, which the writer is considering in another paper, would lead us now too far afield; but the conclusion which immediately concerns us is, that the profound difference in the variability of the Polypodies of the two sides of the Atlantic, as well as on the two slopes of the North American continent, is due to the fact that they are two distinct species of quite different geological and geographic history and distribution.

The diagnostic characters of the two species and their American variations are shown below.

Rhizome firm, sweet, in American forms commonly 0.5–1 cm. thick; its pale-cinnamon to castaneous scales uniformly colored (or darker toward the base), densely cellular, with thin cell-walls, peltately attached slightly above the base, 0.5–1 cm. long; stipes (except in the smallest extremes) 1–3 mm. in diameter, 0.2–3 dm. long: fronds 0.2–5.5 dm. long, 0.1–2.4 (av. 1.1.) dm. broad: pinnae opposite, subopposite or alternate, the lowest commonly shorter than the middle ones; the latter 0.2–2 (in var. *cambricum* –4.5) cm. broad, their midribs commonly curving at base: sori commonly median ..... 1. *P. vulgare.*

Rhizome rather soft and spongy, not sweet, 2–7 mm. thick; its scales darkened on the back, loosely cellular, with thick cell-walls, cordate at base, often with a closed sinus, 2–4.5 mm. long; stipes 0.6–1.7 mm. in diameter, 0.1–2 dm. long: fronds 0.25–2.6 dm. long, 1.5–7 (av. 4) or in very unusual forms –11 cm. broad: pinnae alternate, or the lowest subopposite, usually about as long as or slightly longer than the median; the latter 2–8 (in very unusual forms –11) mm. broad, their midribs and those of the upper pinnae straight: sori nearly marginal .... 2. *P. virginianum.*

1. Polypodium vulgare L. Sp. Pl. ii. 1085 (1753). *P. californicum* Kaulf. Enum. 102 (1824). *P. vulgare*, var. Bong. Vég. Sitch. 175 (1832). *Marginaria californica* (Kaulf.) Presl, Tent. Pterid. 188 (1836). *P. vulgare*, γ *occidentale* Hook. Fl. Bor.-Am. ii. 258 (1840). *P. intermedium* Hook. & Arn. Bot. Beech. Voy. 405 (1841). *P. falcatum* Kellogg, Proc. Cal. Acad. i. 20 (1854). *P. Glycyrrhiza* D. C. Eaton, Am. Journ. Sci., ser. 2, xxii. 138 (1856). *Goniophlebium californicum* (Kaulf.) Moore, Ind. Fil. 386 (1862). *P. californicum*, vars. *Kaulfussii* and *intermedium* (Hook. & Arn.) D. C. Eaton, Ferns N. A. i. 244 (1879). *P. hesperium* Maxon, Proc. Biol. Soc. Wash. xiii. 200 (1900). *P. occidentale* (Hook.) Maxon, Fern Bull. xii. 102 (1904).—Europe and adjacent Asia and north Africa; Atlantic Islands; Alaska to Lower California, Arizona and New Mexico.

In North America the following varieties are recognizable, though

[1] Britten, Europ. Ferns, 165 (1881).

several herbarium-sheets show them variously mixed under one number and intergradient individuals are numerous.

Var. COMMUNE Milde, Fil. Eu. Atl. 18 (1867). *P. vulgare* (typical).—Frond lanceolate, of firm texture, 0.7–2.5 dm. long, 3–9 cm. broad; with subacute to obtuse oblong crenate or minutely serrulate pinnae, the longer 1.5–4.5 cm. long, 0.4–1 cm. broad.—Northern and central Europe; Alaska to Oregon. The following are characteristic. ALASKA: rocks, Nagai Island, Shumagin Islands, July 27, 1872, *M. W. Harrington;* near the Mission, Yakutat Bay, June 6, 1892, *Funston*, no. 13; Sitka, *Bongard*, *Bischoff*; trail to the lakes, Skagway, July 20, 1914, *Eastwood*, no. 798. WASHINGTON: moss on trees, Quiniault Valley, June 20, 1902, *H. S. Conard*, no. 107; Castle Rock, Cowlitz Co., October 31, 1902, *Piper*. OREGON: Hood River, Wasco Co., May 26, 1910, *Heller*, no. 10,095; Elk Rock, Multnomah Co., November 24, 1902, *E. P. Sheldon*, no. 11,342; Calapooya Valley, Douglas Co., July 26, 1899, *M. A. Barber*, no. 122.

The extreme of the var. *commune* with the pinnae strongly rounded at tip is sometimes distinguished as forma *rotundatum* Milde, Gefäss-Crypt. Schlesien, 631 (1858). Var. *rotundatum* Milde, Fil. Eu. Atl. 18 (1867). In publishing var. *rotundatum* Milde made it perfectly clear that the plant of Alaska with round-tipped pinnae was in his mind, giving the range: "Non raro in Europa bor.—Unalaschka. Kadjak. Sitcha."

Var. COLUMBIANUM Gilbert, Working List N. A. Pterid. 19,38 (1901). —Frond firm, narrowly oblong, 0.5–2 dm. long, 2–4.2 cm. broad: the 7–18 pairs of mostly alternate round-tipped obscurely to deeply crenate pinnae oblong-elliptical to narrowly obovate, the median and lower usually of about uniform length; the longer 1–2 cm. long, 0.5–1.2 cm. broad.—Var *rotundatum* E. G. Britton, Fern Bull. vii. 35 (1899), not Milde. *P. hesperium* Maxon, Proc. Biol. Soc. Wash. xiii. 200 (1900). Var. *hesperium* (Maxon) Nelson & Macbride, Bot. Gaz. lxi. 30 (1916).—In the mountains, British Columbia to Montana and the Black Hills of South Dakota, south to Colorado, Utah and Oregon. The following are characteristic. BRITISH COLUMBIA: Fraser River, *Wallace*; within five miles of Lillooet, July, 1916, *J. M. Macoun*, nos. 93,250, 93,251. MONTANA: Big Fork, July 24, 1908, *Mrs. J. Clemens*. WYOMING: dry granite cliffs, Crow Creek, Albany Co., July 8, 1903, *A. Nelson*, no. 8902. COLORADO: Hardscrabble Canyon, Custer Co., August, 1898, *H. M. M.* UTAH: Cottonwood Canyon, August, 1869, *Watson*, no. 1357. OREGON: basaltic cliffs, Bingham Springs, Umatilla River, July 17, 1908, *Cusick*, no. 3287. WASHINGTON: Wenatchie region, July, 1883, *Brandegee*, no. 1208; Stehekin, Lake Chelan, July 5, 1901, *Whited*, no. 1392; rocks, Cape Horn,

August 18, 1894, *Suksdorf*, no. 2336; crevices of rock, Mt. Baldy, July 7, 1902, *Conard*, no. 288.

When he published var. *columbianum*, Gilbert at least knew of *P. hesperium* for he included it in his *List*, but all the points emphasized by him: "the short stipes and narrow fronds, the very glandular surfaces, the odd pinna at base of frond, the deep lobations of lower pinnae, and the occasionally green-gold hue of lower surface," are found in one specimen or another of *P. hesperium*. The measurement of the fronds nearly coincide with those originally given for *P. hesperium* ("6 to 13 cm. long, 2 to 3½ cm. broad."—Gilbert; 3 to 8 inches [7.3 to 19.6 cm.] long, 1 to 1¾ inches [2.4 to 7.2 cm.] broad—Maxon); the glandularity of the frond is extremely variable, though Maxon originally indicated some glandularity for *P. hesperium*; and the alternate pinnae (and consequently "odd pinna at base of frond") were specially emphasized by Maxon and they were described with "margins obscurely (or less often, decidedly) crenate."

When he published *P. hesperium* as a species, Maxon said, "It is barely possible, but hardly probable, that the species here described is identical with the var. *rotundatum* of Milde." Surely the larger development of the plants (such as G. R. Vasey's no. 41 or Whited's no. 1392 from Lake Chelan, the type region of *P. hesperium*) are difficult to distinguish from var. (or forma) *rotundatum* and Mr. J. K. Henry (Fl. So. Brit. Columb. 2) reduces them outright; but the pinnae are too broad and short to satisfy Luerssen's requirement (Farnpfl. 56) of pinnae "linealisch oder länglisch-linealisch;" and although the larger plants closely approach Alaskan and Norwegian specimens of forma *rotundatum*, var. *columbianum* may stand as a fairly differentiated extreme of the western mountains. In its narrower forms passing insensibly to

Var. PERPUSILLUM Clute, Fern Bull. xviii. 98 (1910).—Fronds coriaceous, linear-oblong, 0.3–1.7 dm. long, 1–2 cm. broad; their 6–22 pairs of remote alternate pinnae 2–5 mm. wide.—Mountains of Colorado, New Mexico and Arizona. COLORADO: *Brandegee*. NEW MEXICO: lower side of cliff, vicinity of Brazos Canyon, Rio Arriba Co., August 20, 1914, *Standley & Bollman*, no. 10,626.

Var. PYGMAEUM Schur, Enum. Pl. Transsilv. 830 (1866).—Stipe 1–7 cm. long, slender: frond ovate-lanceolate, ovate or deltoid, 2–8 cm. long, 2–3 cm. broad, with only 1–7 pairs of broad-oblong to narrowly ovate round-tipped pinnae or segments.—Forma *pumilum* Hausm. ex Luerss. Farnpfl. 58 (1889).—The following American

specimens, all from ARIZONA, seem quite like European material: Maple Canyon Falls, Huachuca Mts., 1882, *Lemmon*; dry shaded crevices, north side of cliffs, Miller Canyon, Huachuca Mts., 1909, *Goodding*, no. 123 (distributed as *P. hesperium*); without statement of locality, 1903, *J. H. Ferriss*; moist rocks at 8000 ft., Rincon Mts., 1909, *Blumer*, no. 3439.

Var. OCCIDENTALE Hook. Fl. Bor.-Am. ii. 258 (1840).—Fronds elongate, broad-lanceolate, usually of thin texture, 1–5.5 dm. long, 0.6–2 dm. broad, with 10–36 pairs of narrowly lanceolate, attenuate or acute finely serrate or serrate-dentate pinnae.—*P. falcatum* Kellogg, Proc. Cal. Acad. i. 20 (1854). *P. Glycyrrhiza* D. C. Eaton, Am. Journ. Sci. ser. 2, xxii. 138 (1856). Var. *falcatum* (Kellogg) Christ, Beitr. Krypt. Schweiz. i. Heft. 2: 51 (1900). *P. occidentale* (Hook.) Maxon, Fern Bull. xii. 102 (1904).—Southern Alaska to northern California. ALASKA: dry rocky beach, Tongas Village, August 3, 1915, *Walker*, no. 888 in part (mixed with var. *commune*). BRITISH COLUMBIA: Skidegate, Queen Charlotte Islands, June 13, 1910, *Spreadborough*, no. 94,847; New Westminister, 1899, *A. J. Hill*; Brackendale, June 15, 1916, *J. M. Macoun*, no. 93,246; Goldstream, Vancouver I., May 18, 1887, *J. Macoun*; on tree-trunks, mostly alder, District of Renfrew, 1901, *Rosendahl & Brand*, no. 98. WASHINGTON: mossy rocks and logs, August 20, 1888, *F. Binns*; Friday Harbor, San Juan Islands, 1917, *Zeller*, no. 794; old rotten logs in mossy woods, Tacoma, November 13, 1898, *Flett*. OREGON: Sauvies Island, *J. Howell*; on tree-trunks, Coos Bay, *Lemmon*; moss-covered trees, Coos River, October 29, 1881, *Pringle*; rocky woods, Salem, May 9, 1917, *J. C. Nelson*. CALIFORNIA: Charlotta, Humboldt Co., June, 1915, *E. P. Hawver*; Feather River, Butte Co., March 29, 1919, *Heller*, no. 13,089.

The extreme plant (var. *falcatum*) with very long-attenuate pinnae seems to be practically if not quite the European var. *transsilvanicum* Schur, Enum. Pl. Transsilv. 830 (1866), which was described: "Elatum 12-15 poll. Fronde ambitu lanceolata, utrinque viridi; laciniis lineari-oblongis, 3 poll. long. 3–4 lin. latis, a media sensim acuminatis, acutis, manifeste serratis," with the discriminating comment by Schur: "An P. vulgare var. occidentale *Hook.*" It is also very close to the European var. *attenuatum* Milde, Fil. Eur. Atl. 18 (1867) and to var. *Acutum-Stansfieldii* Lowe, Our Native Ferns, i. 28, t. 9 (1867).

Var. **intermedium** (Hook. & Arn.), n. comb.—Fronds ovate to ovate-oblong, herbaceous to membranaceous, 1–3.5 dm. long, 0.6–1.2 dm. broad, with 6–23 pairs of oblong or oblong-linear coarsely serrate, crenate or subentire acute to obtuse pinnae 0.6–1.8 cm. broad.—*P. intermedium* Hook. & Arn. Bot. Beech. Voy. 405 (1841). *P. californi-*

cum, var. *intermedium* (Hook. & Arn.) D. C. Eaton, Ferns N. A. i. 244, t. 31, fig. 4. (1879).—Oregon to Lower California. OREGON: Multnomah Co., October, 1877, *Howell*. CALIFORNIA: Feather River, Butte Co., March 29, 1919, *Heller*, no. 13,090; Little Chico, March 10, 1897, *Mrs. R. M. Austin*, no. 1868; hills near Santa Rosa, Sonoma Co., March 10, 1902, *Heller*, no. 5011; open banks of Sonoma Creek, May 23, 1902, *Heller*, no. 5030; large mats on boulders and ledges, King's Mountain, San Mateo Co., January 15, 1902, *Baker*, no. 235; Stockton Pass, May 4, 1879, *L. G. Yates*; Santa Cruz, 1873, *Anderson*; foothills west of Los Gatos, Santa Clara Co. March 5, 1904, *Heller*, no. 7255; San Luis Obispo Co., 1886, *M. M. Miles*; Sulphur Mountains, Ventura Co., June, 1908, *Abrams & McGregor*, no. 31; near San Bernardino, May, 1894, *Parish*, no. 2824. LOWER CALIFORNIA: Guadalupe Island, 1889, *Palmer*, no. 857.

The Pacific American representative of var. *serratum* Willd. of southern Europe, the Mediterranean region and the Atlantic Islands. Differing chiefly in the scales of the rhizome, which are usually shorter and less attenuate than in var. *serratum*. When he published *P. californicum* var. *intermedium*, Eaton commented on it as making "an inconveniently near approach to *P. vulgare*" and at the same time quoted Milde as remarking "of the veinlets of *P. vulgare*, var. *serratum*, '*Interdum ramos anastomosantes inveni*,' " the character chiefly relied upon to keep *P. californicum* separate from *P. vulgare*. Azorean specimens (for instance, Ponta Delgada, *Ware*) of var. *serratum* certainly show quite as many areolae as any Californian plants.

Var. INTERMEDIUM, forma **projectum**, n. f., pinnis mediis imisque inequaliter abbreviatis subtruncatis, costis excurrentibus. CALIFORNIA: Chico Canyon, Butte Co., December 29, 1902, *E. B. Copeland*, no. 2749 (TYPE in Gray Herb.).

Var. **Kaulfussii** (D. C. Eaton), n. comb. Fronds ovate to ovate-oblong, coriaceous, 0.5–2.1 dm. long, 0.4–1.3 dm. broad, with 7–15 pairs of oblong to oblong-linear obtuse to acutish serrate, crenate or subentire pinnae 0.7–1.2 cm. broad: veinlets more often anastomosing than in most varieties.—*P. californicum* Kaulf. Enum. Fil. 102 (1824); *P. californicum*, var. *Kaulfussii* D. C. Eaton, Ferns N. A. i. 244 (1879).—California and Lower California. The following are characteristic. CALIFORNIA: Berkeley, March 1, 1891, *Blankinship*; vicinity of San Bernardino, March 23, 1897, *Parish*, no. 4347; Los Angeles, July, 1879, *James*; Del Mar, April 4, 1914, *Clements*, no. 3; near mouth of San Gabriel Canyon, San Diego Co., March 13, 1903, *Abrams*, no. 3120. LOWER CALIFORNIA: Guadalupe Island, 1875, *Palmer*, no. 103, March–June, 1897, *Anthony*, no. 256.

Closely simulating the more coriaceous extreme of var. *serratum* of southern Europe; differing from it chiefly in the shorter and less attenuate scales of the rhizome.

Var. CAMBRICUM (L.) Willd. Sp. Pl. v. 173 (1810).—Frond ovate or ovate-oblong, 2–2.5 dm. long, 1–2 dm. broad; its pinnae or many of them up to 1 dm. long and 4 cm. broad, deeply and irregularly pinnatifid or lacerate.—*P. cambricum* L. Sp. Pl. ii. 1086 (1753). *P. australe* Fée, Gen. Fil. 236, t. 20A, fig. 2 (1850–52). Var. *hibernicum* Moore, Handb. Brit. Ferns, ed. 2: 44 (1853).—Western Europe; Portland Inlet, British Columbia, acc. to Burgess, Trans. Roy. Soc. Can. ii. Sect. iv. 10 (1886).

2. P. VIRGINIANUM L. Sp. Pl. ii. 1085 (1753) as to Virginian plant; Tidestrom, Elys. Marianum, ed. 2: 18 (1907). *P. vulgare*, var. *virginianum* (L.) Eaton, Man. ed. 2: 373 (1818). *P. vulgare*, β. *americanum* Hook. Fl. Bor.-Am. ii. 258 (1840); Torr. Fl. N. Y. ii. 484 (1843); Kunze, Am. Journ. Sci. ser. 2, vi. 82 (1848). *P. vulgare* of eastern Am. authors, not L.—Shaded rocks, woodland banks and rarely tree-trunks, Newfoundland to Manitoba and northeastern Alberta, south to the mountains of northern Georgia and Alabama, Illinois and eastern Missouri. The following are characteristic illustrations: Eaton, Ferns N. A. i. t. 31, fig. i (1879). Clute, Our Ferns in their Haunts, 196 and t. 6 (1901); Waters, Ferns, 78 and 80 (1903).

No true varieties of *P. virginianum* are known. The following minor forms are recognizable.

Forma **acuminatum** (Gilbert), n. comb. *P. vulgare acuminatum* Gilbert, Fern Bull. x. 13 (1902). *P. vulgare*, var. *angustum* of Am. authors, not Muell. *P. vulgare*, var. *attenuatum* Am. authors, not Milde.

Forma **elongatum**, (Jewell), n. comb. *P. vulgare*, forma *elongata* Jewell, Maine Woods, xxx. no. 31: 3 (1908).

Forma **brachypteron** (Ridlon), n. comb. *P. vulgare*, forma *rotundatum* Ridlon, Am. Fern Journ. xi. 48, t. 1 (1921), not Milde. *P. vulgare*, forma *brachypteron* Ridlon, Am. Fern Journ. xi. 122 (1922).

Forma **subsimplex,** n. f., laminis subsimplicibus lineari-lanceolatis 7–9 cm. longis 0.7–1 cm. latis crenatis basi undulatis.—NEW HAMPSHIRE: on top of a rock, Intervale, July, 1911, *Anna I. Rodliff* (TYPE in Gray Herb.).

Forma **deltoideum** (Gilbert), n. comb. *P. vulgare*, formae *deltoideum* and *hastatum* Gilbert, Fern Bull. xiv. 37 (1906). *P. vulgare*, var. *auritum* Buchheister, Am. Bot. v. 56, fig. 3 (1903), not Willd. nor Gilbert. *P. vulgare*, forms, Clute, Fern Bull. xviii. 48, figs. 1, 2 and 3 (1910).

Forma **bipinnatifidum**, n. f., pinnis plus minusve pinnatifidis.—

TYPE: Western Mountain, Mt. Desert Island, Maine, August, 1902, *Miss E. L. Shaw* in Gray Herb.

This form includes the plants referred in eastern America to *P. vulgare*, vars. *cambricum* (L.) Willd., *semilacerum* Moore and *sinuatum* Willd. It is well illustrated by Waters, Ferns, 83 (1903), and by Buchheister, Am. Bot. v. 55, fig. 1 and 57, fig. 4 (1903).

Forma **chondroides**, n. nom. *P. vulgare*, var. *bifido-multifidum* Gilbert, Fern Bull. xiv. 39 (1906), not Druery.

Forma **alato-multifidum** (Gilbert), n. comb. *P. vulgare*, var. *alato-multifidum* Gilbert, Fern Bull. xiv. 105 (1906).

Forma **Churchiae** (Gilbert), n. comb. *P. vulgare*, var. *Churchiae* Gilbert, Fern Bull. xiv. 39 (1906).

CALAMAGROSTIS CANADENSIS AND SOME RELATED SPECIES.

O. L. INMAN.

THE species of the boreal genus *Calamagrostis* have always been difficult to separate. This has been especially true in those groups of species where the habit of the inflorescence has been used as a key-character; to a great extent the density of the panicle is determined by age, young panicles of *C. canadensis*, for example, having loosely spreading branches, while the old panicles are dense, with closely appressed branches.

In an attempt to determine if there are more fundamental characters in the section including *Calamagrostis canadensis* (Michx.) Nutt. and closely related species—see Kearney, Bull. U. S. Div. Agrost. **11**: 26–31 (1898)—the abundant material at the Gray Herbarium has been studied, and it has been found that the spikelets, as would be expected, present characters of great constancy. The results of this study are presented in the following key.

It will be noted at once that *Calamagrostis canadensis* (Michx.) Nutt. is not ascribed, as is usually done, to Beauvois as the author. While Beauvois used the name *C. canadensis* he failed to give any reference or description and according to the International Rules of Nomenclature (art. 37) his publication is not valid. After examination of a large number of specimens, mostly from eastern America and Alaska, it has become evident that the maintaining of *Cala-*

magrostis Langsdorfi as a species simply leads to confusion since the gradations or transitions from and to it, through *C. canadensis*, var. *robusta*, are so many and so close and since in all three plants the details of the spikelets are identical. These plants are, therefore, treated as variations of one species.

Callus-hairs about as long as to longer than the lemma.
  Spikelets 2.25–2.75 mm. long: awn usually attached above the middle of the lemma: palea and lemma subequal. . .*C. Macouniana.*
  Spikelets 3–5.5 mm. long.
    Awn attached at or below the middle of the lemma: palea ½–⅞ the length of the lemma
      Spikelets 3–3.5 mm. long..... *C. canadensis* (typical).
      Spikelets 3.5–4.5 mm. long..... *C. canadensis*, var. *robusta.*
      Spikelets 4.5–5.5 mm. long..... *C. canadensis*, var. *Langsdorfi.*
    Awn attached at the tip of the lemma: palea ⅔–¾ the length of the lemma.....*C. blanda.*
Callus-hairs ¼–¾ the length of the lemma, mostly few.
  Awn attached near the base of the lemma: callus-hairs ¼–⅓the length of the lemma.
    Spikelets 3.5–4 mm. long: palea ⅔–¾ the length of the lemma.....*C. perplexa.*
    Spikelets 4–5 mm. long: palea and lemma subequal.....*C. Porteri.*
  Awn attached only slightly below the middle of the lemma: callus-hairs ⅓–½ the length of the lemma: spikelets 3–4 mm long: palea and lemma subequal .....*C. Scribneri.*

CALAMAGROSTIS MACOUNIANA Vasey, Contrib. U. S. Nat. Herb. iii. 81 (1892). *Deyeuxia Macouniana* Vasey, Bot. Gaz. x. 297 (1885).

C. CANADENSIS (Michx.) Nutt Gen. i. 46 (1818). *Arundo canadensis* Michx. Fl. Bor.-Am. i. 73 (1803). *A. agrostoides* Pursh, Fl. Am. Sept. i. 86 (1814).

Var. ROBUSTA Vasey in Wheeler Rep. vi. 285 (1878). Var. *acuminata* Vasey in Rydberg & Shear, U. S. Dept. Agric. Div. Agrost. Bull. no. 5: 26 (1897).

Var. **Langsdorfi** (Link). n. comb. *Arundo Langsdorfi* Link, Enum. Pl. Hort. Berol. i. 74 (1821). *C. Langsdorffii* Trin. Gram. Unifl. 225, t. 4, fig. 10 (1824). *C. scabra* Presl, Rel. Haenk. i. 234 (1828). *Deyeuxia Langsdorfii* Kunth, Rev. Gram. i. 77 (1829). *C. hirtigluma* Steud. Syn. Pl. Gram. 188 (1855). *C. oregonensis* Buckl. Proc. Acad. Phil. 1862, p. 92 (1863), in part, acc. to Gray, ibid. 334 (1863).

C. BLANDA Beal, Grasses N. Am. ii. 349 (1896). *C. columbiensis* Nutt. ex Gray, Proc. Acad. Phil, 1862, p. 334 (1863), incidental mention in synonymy. *C. pallida* Vasey & Scribn. in Vasey, Contrib. U. S. Nat. Herb. iii. 79 (1892), not C. Muell, Annal. Bot. Syst. vi. 986 (1861), where Mueller erroneously ascribes *C. pallida* to Blytt, Norg. Fl. i. 90, Blytt having merely published *C. Pseudophragmites*, var. *pallida* the description of which Mueller literally translated.

C. PERPLEXA Scribn. U. S. Div. Agrost. Circ. no. 30: 7 (1901). *Deyeuxia Porteri* Dudley, Cayuga Fl. 125 (1886), not *C. Porteri*

Gray. *C. nemoralis* Kearney, U. S. Dept. Agric. Div. Agrost. Bull. no. 11, 26 (1898), not Phillippi (1898).

C. PORTERI Gray, Proc. Am. Acad. vi. 79 (1862). *Deyeuxia Porteri* (Gray) Vasey, Descr. Cat. Grasses U. S. 51 (1885).

C. SCRIBNERI Beal, Grasses, N. Am. ii. 343 (1896). *Deyeuxia dubia* Scribn. Bot. Gaz. xi. 174 (1886). *C. dubia* (Scribn.) Vasey, Contrib. U. S. Nat. Herb. iii. 80 (1892), not Bunge (1847). *C. Langsdorffii*, var. *Scribneri* (Beal) M. E. Jones, Contrib. West. Bot. xiv. 9 (1912).

ANTIOCH COLLEGE, Yellow Springs, Ohio.

CAREX AESTIVALIS IN THE BLUE HILLS.—Last summer I found a few vigorous tufts of a conspicuous Carex near the southerly boundary of the Blue Hills Reservation, growing on a rocky wooded slope. Submitted to Prof. Fernald this proved to be *C. aestivalis* M. A. Curtis. Number XII of the Reports on the Flora of the Boston District in RHODORA, Vol. 13, p. 233 has the following note against this species: "Lexington (*Wm. Boott*, July 2, 1876)." Gray's Manual (7th edition) says "Rocky woods, mostly on upland slopes, N. H. to Ga., rare."—NATHANIEL T. KIDDER, Milton, Massachusetts.

LEUCOJUM AESTIVUM IN DELAWARE.—*Leucojum aestivum* L. was found in Dover, Delaware, in 1921, and identified for the writer by Professor M. L. Fernald. It is thoroughly established in swampy ground near St. Jones' River. The bed is about twenty feet in area and seems to be spreading. The plant blossoms as early as April 15, and as late as May 16.—H. H. HANSON, Dover, Delaware.

The date of the June issue (unpublished as this goes to press) will be announced later.

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COLOR TYPES OF CORALLORRHIZA MACULATA RAF.

H. H. Bartlett.

In the 7th edition of Gray's Manual, Ames describes *Corallorrhiza maculata* Raf. as madder-purple or yellowish; the white lip spotted with magenta-crimson. He notes the rare occurrence of pale forms without spots on the lip, petals, or sepals. In Britton and Brown's Flora the scape is described as purplish, the flowers as brownish purple, and the lip as white, spotted and lined with purple. There is also this note: "A form with yellow scape and flowers occurs in Nebraska (according to Williams)." Williams recorded his observations in an article entitled "Notes on the Canyon Flora of Northwest Nebraska" (Amer. Nat. **24**: 779–780. 1890) as follows:

"Leaving Harrison, we pitched our tent in War Bonnet Canyon . . . In nearly all of the canyons, especially the damper, darker ones, *Corallorrhiza multiflora* Nutt. grew quite plentifully, while only the darkest canyons afforded the rare *C. innata* R. Br. In a small canyon at the head of Jim Creek was found a lavender-yellow variety of the former species." The term lavender-yellow would seem to apply to a form with both purple and yellow pigmentation, rather than to a pure yellow, and unless the literature contains other observations by Williams which have eluded the writer's search, the occurrence of a pure yellow form in Nebraska is not clearly attested.

The pure yellow form of the East has been named *Corallorrhiza multiflora* var. *flavida* Peck. Originally described from New York, it has been reported by Alexander (Report Mich. Acad. Sci. **12**: 97.

1910), from the vicinity of Birmingham, Michigan. As will appear from the following quotation from a letter from Mr. Frederick J. Hermann, this variety is so distinct as to be worthy of recognition in our floras. He writes: "I am sending you a box containing three specimens of coral-root, and I wish you would please identify two of these for me. The first is a yellow one which I can't find described in any book on orchids. I had never seen it before yesterday, when I found about ten plants near Delaware, Keweenaw County, Mich., about twelve miles from Copper Harbor. Later in the day I found about six more specimens at Copper Harbor, Keweenaw County. Both of these colonies were in rather dense spruce woods, and growing in company with Menzies' rattlesnake plantain. At Delaware a few plants of *Corallorrhiza multiflora* were also growing with them. The second specimen is another one that I wish you would identify for me. The third is the common large coral-root (*C. multiflora*) which I thought you might like to use for comparison with the second."

Mr. Hermann's three types are all color varieties of *Corallorrhiza maculata* Raf. (=C. *multiflora* Nutt.), forming a series with regard to pigmentation similar to that in many cultivated plants, in which some varieties have yellow pigmentation due to glucosides of the flavonol group, other varieties, red or purple, containing anthocyanins. The Corallorrhiza series is exceptional in one respect, namely, that there is a variety with predominently brown coloration. This brown variety has a parallel in the brown-husked variety of maize, the latter being one of a series of color types in which the genetical relations have been carefully worked out by Emerson.[1] The brown type in maize has been found to contain a yellow flavonol glucoside, and the brown coloration is probably due to some unknown reaction of the yellow pigment with other plant constituents. If the maize series contains a type with a bright yellow coloration of the husk, it is as yet unknown. The parallelism of the color types in Corallorrhiza with those of plants which have been investigated genetically is pointed out, because it gives the best reason to assert confidently that these types are genetical entities, and not mere variations due to environment.

[1] Emerson, R. A. The genetic relations of plant colors in maize. Cornell Univ. Agric. Exp. Sta. Mem. 39. pp. 156. 1921.

Advantage was taken of Mr. Hermann's fresh specimens to match their colors in Ridgway's "Color Standards and Color Nomenclature" (Washington, 1912). The first type, identified as var. *flavida*, has lemon-yellow flowers with an unspotted, white lip; scape and sheaths Martius-yellow. In the second type, which may be called var. *fusca*, the scape and developing fruits are light cinnamon-drab. (Perhaps this tint was what Williams called lavender-yellow, since it has both purple and yellow components.) The sheaths are Vandyke-brown, and give var. *fusca* its prevailing brown tone. In the third variety the scape and developing fruit are Perilla-purple. The sheaths are a much paler purple than the scape. In this type, which may be called var. *punicea*, there is no trace of brown whatever, in any part of the plant.

In species in which the genetical relations of yellow and purple types are known, the pure yellow has the most recessive factors and the deepest purple the most dominant factors. Geographic distribution indicates that the recessive types more often arise from the dominants than *vice versa*. Consequently the deeply purple-stemmed var. *punicea* might with some reason be viewed as the biological type of the species, and therefore chosen, in the absence of a type specimen, as the nomenclatorial type as well. In most species the var. *typica* is not formally named. These saprophytic orchids, however, undergo brown discoloration in drying, and are probably not varietally distinguishable from old herbarium material. Since practically all distribution records have been based upon dried material, there is a practical reason for wishing to continue to use the binomial for the species in the most comprehensive sense, without implying any particular variety. Consequently var. *punicea* is named as well as the other two. The species probably contains still other varieties.

By way of summary, the color types of *Corallorhiza maculata* may be characterized as follows:

Var. **flavida** (Peck) comb. nov. (*C. multiflora* [Nutt. var.] *flavida* Peck, N. Y. State Mus. Rep. **50**: 126. 1897.) scapis vaginisque et fructibus immaturis pallide flavis; floribus flavis; labello albo, immaculato.

Var. **fusca** var. nov. scapis et fructibus immaturis subfuscis, paulum rubrotinctis; vaginis atrofuscis; floribus ochraceis, purpureomaculatis; labello maculato.

Var. **punicea** var. nov. scapis et fructibus immaturis puniceis,

vaginis pallide purpureis; floribus ochraceis, purpureomaculatis; iabello maculato.

Specimens of all three forms, collected by Frederick J. Hermann in the vicinity of Cooper Harbor, Keweenaw County, Michigan, 20 June 1922, are preserved in the Herbarium of the University of Michigan.

BOTANICAL GARDEN, UNIVERSITY OF MICHIGAN, Ann Arbor.

SOME INTERESTING PLANTS OF THE VIRGINIA COASTAL PLAIN.

E. J. GRIMES.[1]

(Plate 138.)

THE following plants have not hitherto been recognized as members of the coastal plain flora of Virginia, or are otherwise of interest. Practically all were collected on the peninsula between the York and James Rivers. Specimens of the species reported are deposited in the Grimes herbarium under the numbers given and there are duplicates in various other herbaria. Unless otherwise specified determinations were made by Mr. C. A. Weatherby at the Gray Herbarium. To all the botanists who have aided in this way, and to Mr. Edwin H. Lincoln for permission to use the copyrighted photograph reproduced herewith, grateful thanks are due.

Species new to Virginia are indicated by an asterisk; those new to the Gray's Manual range by two asterisks.

**UNIOLA LONGIFOLIA Scribn. Near Williamsburg, Sept. 18, 1920. No. 3038. Dry white oak slope. Infrequent: the only station observed. Not hitherto reported north of Georgia on the Atlantic slope, though occurring in eastern Tennessee. Determined by Mrs. Agnes Chase.

**PSILOCARYA CORYMBIFERA (C. Wright) Benth. Lake Drummond, near Portsmouth Ditch, Dismal Swamp, Oct. 2, 1921. No. 4534. Open swamp. A striking extension of range for this apparently rare and local species, not hitherto known north of Georgia.

[1] These notes, reporting a number of remarkable extensions of range, were in process of compilation by Professor Grimes at the time of his death in December, 1921: they have been prepared for publication by Mrs. Grimes.—Ed.

*Carex oxylepis Torr. & Hook. Near Williamsburg. Mature perigynia collected May 9 and June 13, 1921. Nos. 3546 and 3717. Rather rich neutral soil of mixed hardwood upland. One station. Not reported north of South Carolina on the Atlantic slope.

*Eriocaulon Parkeri Robinson. Chickahominy River near Lanexa, July 30, 1921. No. 4136. In shallow water at edge of river. Reported from Washington, D. C., in the second edition of Britton & Brown's Illustrated Flora, but not included in the recent Flora of the District of Columbia. In all probability new to Virginia.

*Juncus asper Engelm. (*J. caesariensis* Coville). Nos. 3992, 4616. First collected July 13, 1921; mature capsules collected Aug. 15 and Oct. 16. Found at a number of stations west of Williamsburg in sphagnum-magnolia swamps, in heavy, strongly acid soils. This local species has heretofore been supposed to be confined to southern New Jersey. The Virginia specimens seem to have fewer heads and slightly smaller inflorescence than those from New Jersey. Determined by Mr. F. V. Coville.

Luzula saltuensis Fernald. Near Williamsburg, April 9, 1921, No. 3400. Rich neutral soil of white oak and beech woods, associated with *L. campestris*, var. *hulbosa*, but preferring rather more fertile and moister soils. Less common than the latter, but frequent. Apparently not reported from eastern Virginia, though occurring comparatively near the coast in Georgia (*Harper*).

**Dioscorea quaternata (Walt.) Gmel. Near Williamsburg May 9, 1921. No. 3527. Dry soil of hardwood slope. Not reported north of North Carolina.

**Habenaria repens Nutt. Chickahominy River south of Lanexa, July 30, 1921. No. 4128. Wooded swamp along the river; one station only. Not reported north of Florida. Determined by Dr. H. M. Denslow.

*Pogonia affinis Austin. Near Williamsburg June 1, 1920, May 9, 1921. Nos. 2637, 3555. One station: see Rhodora xxiii. 195, Aug., 1921. Not reported south of Pennsylvania. The excellent photograph reproduced herewith was made by Mr. Edwin H. Lincoln from a living plant gathered at this station.

**Ponthieva racemosa (Walt.) Mohr. James City County near Williamsburg, Sept. 19, 1920. No. 3078. Rich damp soil at base of an open slope. York County, near Williamsburg, Sept. 17, 1921.

No. 4386. Rich heavy calcareous soil of flood-plain thicket. Not reported north of North Carolina.

Hexalectris spicata (Walt.) Barnhart. Near Williamsburg. In full flower July 3, 1921. No. 3915. Rare. Observed twice during the summer of 1921 on rich calcareous soil of wooded slopes in slight shade. This species is reported from Virginia in the second edition of Small's Flora, but not in the second edition of Britton & Brown's Illustrated Flora published two months later. In order to remove any possible uncertainty, this definite record from the state is presented.

*Thlaspi arvense L. Williamsburg, May 4, 1920. No. 2534. Weed in alfalfa field. Apparently not previously reported from Virginia.

Parnassia asarifolia Vent. Near Elko along the Chesapeake & Ohio R. R., Aug. 6, 1921. No. 4206. Growing in an open marsh: one station. Reported in the manuals as occurring only in the region of the Alleghanies.

Decumaria barbara L. June 15 and Sept. 19, 1920. Nos. 2709 and 3072. Apparently definitely reported in Virginia only from the Dismal Swamp, but common as a liana throughout the peninsula.

*Lotus corniculatus L. York County, east of Williamsburg, June 13, 1920. No. 2697. Frequent in flat pine woods in sandy soil. Not reported from Virginia in current manuals.

*Euphorbia marilandica Greene. West of Williamsburg, Sept. 9, 1921. No. 4361. Dry soil of abandoned fields. This little-known and apparently local species has hitherto been reported only from eastern Maryland. Very probably it occurs at other stations in this region. It has been suggested that it may be a hybrid of *E. corollata* and *E. ipecacuanhae*, but, thus far, the latter has not been collected on the peninsula.

**Euphorbia prostrata Ait. Williamsburg, Oct. 16, 1921. No. 4640. Weed on stone steps of old house, also along pavements. A tropical and subtropical species, which has apparently not been reported north of Florida, though it has been collected at Charleston, S. C. (*B. L. Robinson*).

Stewartia pentagyna L'Hér. South of Williamsburg, June 24, 1921. No. 3818. Heretofore thought to be strictly confined to the mountains of the Alleghany area, this very beautiful shrub was found

in full flower in June, 1921, on dry wooded slopes along a tributary of College Creek, south of Williamsburg. It is abundant on the south side of this stream for about a mile. This is the only station known and is in rough wooded country nearly a mile from the nearest house of any kind. It does not seem at all likely that the shrub was introduced by man since it has not been observed in any of the old gardens.

**Hypericum setosum L. Williamsburg, Aug. 15, 1921. No. 4237. West of Williamsburg on sandy pine flats in open situations, infrequent. Not reported north of North Carolina.

**Viola villosa Walt. Three miles northeast of Williamsburg, March 28, 1921. No. 3356. Growing in dry sandy soil in pine woods. Scarce. This is the most northerly station known for this species. There is one other record (unpublished) for the state, the plant having been collected by Dr. H. D. House at Gilmerton, Norfolk Co., April 19, 1913. Determined by Dr. Ezra Brainerd.

Viola pedata L. West of Williamsburg, April 17, 1921. No. 3437. One station only observed, in sandy clearing at edge of flat pine woods. This is not, of course, new to the flora of this region, but is interesting since the oldest collection of Linnaean material was from Virginia in 1688. *V. pedata*, var. *concolor* Th. Holm is very abundant. Determination by Dr. Brainerd.

Lilaeopsis lineata (Michx.) Greene. North of Williamsburg, June 28, 1921. No. 3863. Growing in tidal marsh of Queen's Creek, which flows northeast into the York River. A widely distributed species, hitherto reported in Virginia only from Colonial Beach, Westmoreland Co. (*Coville*).

**Ajuga Chamaepitys (L.) Schreb. Southern shore of York River north of Williamsburg, July 15, 1921. No. 4020. Aug. 20, 1921. No. 4273. A European species, heretofore unknown in North America. It is well established on the edge of a tidal marsh along the river, growing in loose sand containing fragments of calcareous shells, a quarter of a mile from the nearest and only house in the vicinity. There is no evidence of its introduction, except a heap of oyster shells near by, which indicates that fishermen used this spot as a landing to open their oysters in times past. When first found, July 15, 1921, it had apparently been in flower for several weeks, and it continued to flower as late as Oct. 8. Determined by Mr. Paul C. Standley.

*SHERARDIA ARVENSIS L. Williamsburg, June 10, 1920. No. 2691. In grass in an orchard at edge of town. Not reported from Virginia in current manuals.

**CHRYSOPSIS ASPERA Shuttl. Near Williamsburg, Sept. 19, 1920. No. 3044. Occurs in dry clay soil; frequent in open situations. Not reported north of North Carolina.

RUDBECKIA LACINIATA L., var. HUMILIS Gray. Near Williamsburg. 1920 and 1921. Nos. 4372, 4598, 4469, 3242, 4600. Wooded flood-plain swamps and wet thickets at a number of stations. Previously reported only from the region of the Alleghanies.

**HELIANTHUS SCHWEINITZII T. & G. Near Williamsburg, Sept. 27, 1921. No. 4474. Sphagnum-magnolia swamp. Not reported north of North Carolina.

COLLEGE OF WILLIAM AND MARY, Williamsburg, Va.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT,—XXXVI.

ERICACEAE.

ANDROMEDA.

A. glaucophylla Link. Cold peat-bogs; occasional from Needham and Natick northward; also at Billings Pond, Sharon.

ARCTOSTAPHYLOS.

A. Uva-ursi (L.) Spreng., var **coactilis** Fernald & Macbride. See RHODORA xvi. 211–213, 1914. Dry sandy and rocky soil, frequent throughout.

CALLUNA.

C. VULGARIS (L.) Hull. Moist pasture, Tewksbury (*J. Dawson*, 1860; *Wm. Boott*, Aug. 1861; *A. Gray*, Sept. 2, 1861; other recent collections); Halifax (*E. & C. E. Faxon*, Sept. 7, 1890); Andover. See RHODORA ii. 53–54, 1900.

CHAMAEDAPHNE.

C. calyculata (L.) Moench. Bogs and swamps, common throughout.

CHIMAPHILA.

C. maculata (L.) Pursh. Dry woods, occasional.

C. umbellata (L.) Nutt., var. **cisatlantica** Blake. See RHODORA xix. 240–242, 1917. Dry woods, common throughout.

CHIOGENES.

C. hispidula (L.) T. & G. Occasional in northern part of district; frequent in *Chamaecyparis* swamps southward.

CLETHRA.

C. alnifolia L. Swampy places, common throughout; most abundant in southeastern towns.

EPIGAEA.

E. repens L. Dry woods and fields; well distributed originally, but seldom abundant, especially in recent years.

GAULTHERIA.

G. procumbens L. Woods and fields, common throughout.

G. procumbens L., forma **suborbiculata** Fernald.[1] Woods, a large patch, Concord (*George Buttrick*, autumn of 1895). See RHODORA xxii. 155–156, 1920. Specimens in herb. N. E. Botanical Club and herb. W. Deane.

[1] The circumstances attending the securing of *Gaultheria procumbens* L., forma *suborbiculata* Fernald, the only record thus far for the district covered by this paper, are interesting and pathetic. George Buttrick was a descendant of an old Concord family and, with two maiden sisters, lived in Concord on the hill overlooking the bridge where the fight took place on April 19, 1775. The troops were commanded by Maj. Buttrick, great grandfather of George. Mrs. Deane and I spent the month of July 1893, with the family and Mr. Buttrick was keenly interested in my botanical work. Later, in November, 1895, he fell sick. A swelling in the throat, which was incurable, was slowly sapping his vitality, but he moved about the place and retained, as far as possible, the vigor of former years.

On December 1, 1895, I received an earnest request from Mr. Buttrick to call upon him. I immediately went to Concord and proceeded to the house. My journal says that I found him comfortable and suffering no pain. He was lying on the couch and knew that he had but few days more to live. Reaching under the sofa he drew forth a brown paper bag filled with dried plants of Gaultheria which he had gathered, not long before, some two and a half miles from the house. The plants covered an area of about a quarter of an acre and he was much struck by the shape of the leaves. He said that the leaves were very round and the plants pulled up much harder than the ordinary form. He hoped I could visit the spot, for Minot Pratt, who was with him at the time, would show me the way. He was sorry he couldn't go too, but he shouldn't be here for he was going away. It was very pathetic and I honored the New England grit of the man. I took the plants with me and specimens are in my own herbarium and that of the New England Botanical Club. Mr. Buttrick died on December 18, following, and I shall always connect his name with this interesting form of our common Checkerberry.—WALTER DEANE.

GAYLUSSACIA.

G. baccata (Wang.) K. Koch. Dry fields and open woods, common throughout.

G. baccata (Wang.) K. Koch, forma **glaucocarpa** (Robinson) Mackenzie. Borders of woods, Andover (*A. S. Pease*, July 27, 1903); Sherborn (*M. L. Loomis*, July 25, 1911); Norfolk (*R. A. Ware*, Aug. 8, 1911); Blue Hill, Norfolk Co. (*N. T. Kidder*, Aug. 11, 1919).

G. dumosa (Andr.) T. & G., var. **Bigeloviana** Fernald. See Rhodora xiii. 99, 1911. Peat-bogs, occasional west and north of Boston; only stations south being at Billings Pond, Sharon, and at Canton.

G. frondosa (L.) T. & G. Thickets and open woods; generally distributed, but not usually very abundant.

KALMIA.

K. angustifolia L. Pastures, roadsides and open woods, common throughout. Collected at Cambridgeport by George B. Emerson, June 30, 1838.

K. angustifolia L., forma **candida** Fernald. See Rhodora xv. 151–152, 1913. Sherborn (*M. L. Loomis*, June 15, 1913). Specimen in herb. Boston Soc. Nat. Hist.

K. latifolia L. Moist woods and swamps, frequent. Not abundant, but usually preserved by its isolation.

K. polifolia Wang. Peat-bogs, 11 stations in Essex and Middlesex Counties.

LEDUM.

L. groenlandicum Oeder. Dry pine woods near Arsenal, Watertown (*Wm. Oakes*, no date); Bedford (*L. L. Dame*, no date); Concord (*E. S. Hoar*, June 7, 1858; *Horace Mann*, 1862; *J. R. Churchill*, May 20, 1880; *Mrs. Alice Hickes*, June 5, 1888, and others); Littleton (*W. H. Manning*, Aug. 13, 1882); Natick, according to Dame & Collins, Fl. Middlesex Co., 63, 1888.

LEUCOTHOË.

L. racemosa (L.) Gray. Swamps and wet thickets; rare in northern portion; well distributed and fairly abundant from Middlesex Fells south and southwest. This shrub and *Clethra* are the favorite hosts for *Cuscuta compacta* Juss.

LYONIA.

L. ligustrina (L.) DC. Moist soil, common throughout. Forms with leafy inflorescence do not seem to be the southern var. *foliosiflora* (Michx.) Fernald.

MONESES.

M. uniflora (L.) Gray. Rich moist woods in Essex County (see J. Robinson, Fl. Essex Co. 74, 1880); also Reading, Stoneham, Westford, Waltham and Natick.

MONOTROPA.

M. Hypopitys L. Rich woods, occasional.
M. uniflora L. Damp woods, common.

PYROLA.

P. americana Sweet. Woods and open places, common.
P. chlorantha Sw., var. **convoluta** (Barton) Fernald. See RHODORA xxii. 49, 1920. Freely distributed over the district in dry open woods as far south as Walpole, and probably throughout.
P. elliptica Nutt. Woods, sometimes in the open; frequent, but not reported from southeastern towns.
P. rotundifolia L., var. **americana** (Sweet) Fernald. See RHODORA xxii. 122, 1920. Woods and open places, common.
P. secunda L. Rich woods; occasional from Norwood and Hopkinton north and east.

RHODODENDRON.

R. canadense (L.) BSP. Swamps, frequent in Essex and Middlesex Counties, rare southward.
R. canescens (Michx.) G. Don. Wooded banks of Jennings Pond, Natick (*K. M. Wiegand*, May 27, 1912); dry open woods, Wellesley Hills (*Isaac Sprague, Jr.*, May 25, 1911); specimen in herb. Boston Soc. Nat. Hist. Reports of *R. nudiflorum* from the western towns in Dame & Collins, Fl. Middlesex Co. 63, 1888 are probably this species.
R. maximum L. Wooded swamps at Medfield and Walpole.
R. nudiflorum (L.) Torr. Purgatory Swamp. It has been collected between 1880 and 1897.
R. VASEYI Gray. Persistent at old nursery site in Halifax and escaping into moist sandy woods (*J. A. Cushman, C. H. Knowlton* et al., May 30, 1907). A species from North Carolina.
R. viscosum (L.) Torr. Swamps and wet woods, common throughout.
R. viscosum (L.) Torr., var. **glaucum** (Michx.) Gray. Frequent with the typical plants.
R. viscosum (L.) Torr., var. **nitidum** (Michx.) Gray. Low woods, Blue Hill Reservation (*J. R. Churchill*, June 28, 1914); Marshfield (*J. R. Churchill & C. H. Knowlton*, July 4, 1914).

VACCINIUM.

V. atrococcum (Gray) Heller. Swampy ground, apparently common.

V. atrococcum (Gray) Heller, forma **leucoccum** Deane, n. comb. *V. corymbosum* var. *atrococcum*, forma *leucococcum* Deane, Rhodora iii. 265, 1901. Single bush with typical *V. corymbosum* and *V. atrococcum*, constant for years in a field near reservoir, Andover (*A. S. Pease*, July 27, 1901, May 11, 1902). Specimens in herb. N. E. Botanical Club and herb. Walter Deane. See Rhodora iii. 265. 1901.

V. corymbosum L. Wet woods to open hillsides, common throughout.

V. corymbosum L., var. **amoenum** (Ait.) Gray. Concord (*E. S. Hoar*, May 16, 1858); border of swamp, Sherborn (*M. L. Loomis*, May 14, 1912); Milton (*J. R. Churchill*, May 26, 1901); Blue Hill Reservation, Blue Hill River Road (*N. T. Kidder*, May 15, 1919); wet places near summit of Blue Hill (*N. T. Kidder*, Aug. 11, 1919).

V. corymbosum L., var. **pallidum** (Ait.) Gray. Swamp, Sudbury (*J. R. Churchill*, May 30, 1900); wet ground near swamp, Sherborn, (*M. L. Loomis*, May 18 and 22, July 22, 1912).

V. macrocarpon Ait. Bogs and swamps, common throughout, except possibly in western towns.

V. Oxycoccus L. Bogs, occasional from Canton north.

V. pennsylvanicum Lam. Dry fields and open woods, common throughout.

V. pennsylvanicum Lam., var. **myrtilloides** (Michx.) Fernald. See Rhodora xi. 54, 1909. Sherborn (*M. L. Loomis*, May 18, 1912); Tyngsboro (*F. S. Collins*, May 15, 1910).

V. pennsylvanicum Lam., var. **nigrum** Wood. Middlesex Falls, Winchester (*S. F. Blake*, July 21, 1912); specimen in herb. Boston Soc. Nat. Hist.

V. vacillans Kalm. Dry woods and light open soil, common.

V. Vitis-Idaea L., var. **minus** Lodd. "In pascuis siccis ad Danvers" (*Wm. Oakes*, about 1820). Specimens in herb. Gray and herb. N. E. Botanical Club. "The Danvers locality seems to stand alone toward the south" (Oakes). Also moist woods under pines, Putnamville, Danvers (*J. A. Sears*, June 18, 1897). See J. Robinson, Fl. Essex Co. 71, 1880.

C. H. Knowlton, Walter Deane } *Committee on Local Flora*

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY, NEW SERIES, NO LXVI.

NOTES ON THE FLORA OF WESTERN NOVA SCOTIA
1921.

M. L. Fernald.

The results[1] of our exploration of Nova Scotia in 1920 were so gratifying that it seemed wise to continue the work, with Yarmouth as a center, during another season. Accordingly, Mr. Bayard Long and I devoted two months in 1921 to further investigation of the flora of western Nova Scotia. We were accompanied for all too short periods in July by Messrs. Edwin B. Bartram and Norman C. Fassett, and for a few days in September we had the active cooperation of Professor Horace G. Perry of Acadia University. The summer of 1920 had been abnormally wet, with the result that savannahs and lake-margins were often inaccessible or the characteristic plants of these habitats drowned or very tardy in development. In marked contrast, the summer of 1921 was phenomenally dry, in northwestern Nova Scotia to the point of extreme drouth; and the shores of undammed lakes were generally exposed, while small ponds had in some instances completely evaporated. We were consequently able to explore many places which were inaccessible in 1920, with the result that the ranges of a large proportion of the coastal plain types were extended and a good number of additions to our previous list of Nova Scotian plants discovered. Several regions, for example southwestern Lunenburg County, in the neighborhood of Bridgewater furnished days of thrilling botanizing and important discoveries, but they were all in general character so similar to our already described experiences of 1920, that they need not be related in detail. The itinerary of the summer, briefly stated, was as follows, the collecting being done by Mr. Long and myself unless otherwise stated.

July 13: Markland (Cape Forchu), Yarmouth Co., *Fernald, Bartram, Long & Fassett.*
July 14: Atwood Brook, Shelburne Co., *Bartram & Long.*
Upper Wood's Harbor, Shelburne Co., *Fernald & Fassett.*
July 16: Brazil Lake, Yarmouth Co., *Bartram & Long.*
Lake George, Yarmouth Co., *Fernald & Fassett.*
July 18: Annapolis Royal and Granville, Annapolis Co., *Fernald, Bartram, Long & Fassett.*

[1] Rhodora, xxiii. 89-111 (1921), 130-152 (1921), 153-171 (1921), 184-195 (1921), 223-245 (1922), 257-278 (1922), 284-300 (1922).

July 19: Granville Center, Belle Isle, Lamb's Lake and Grand Lake, Annapolis Co., *Fernald, Bartram, Long & Fassett.*
July 21: Tusket and Gavelton, Yarmouth Co., *Fernald, Bartram, Long & Fassett.*
July 23: East Branch of the Tusket as far east as St. John (Wilson) Lake, Yarmouth Co., *Fernald, Bartram & Long.*
July 25: Windsor, Hants Co., *Fernald, Bartram & Long.*
July 26: Uniacke Lake and Five-Island Lake, Hants Co., *Fernald, Bartram & Long.*
July 27: Truro, Colchester Co. and Shubenacadie Grand Lake, Halifax Co., *Fernald, Bartram & Long.*
July 28: Darmouth and Armdale (Dutch Village), Halifax Co. *Fernald, Bartram & Long.*
August 2: Welshtown (Birchtown) Lake, Shelburne Co.
August 3: Roseway River, Shelburne Co., north to Jones Lake.
August 4: Shelburne to Sable River, Shelburne Co.
August 5: Harper Lake, Shelburne Co.
August 8: Weymouth, Digby Co.
August 9: Headwaters of Meteghan and Tusket Rivers, from Little Metehgan Lake to Wentworth Lake, Digby Co.
August 10: Drainage of Sissiboo River, from Everitt Lake to Mistake Lake, Digby Co.
August 12: West Branch of Tusket River, frcm Carleton to Parr Lake, Yarmouth Co.
August 13: Gavelton (Butler's) and Vaughan (Tusket) Lakes, Yarmouth Co.
August 15: Bridgewater, Lunenburg Co.
August 16: Bridgewater, Hebb's Lake, Fancy L., Wallace L., etc., Lunenburg Co.
August 17: Lahave River, north to Wentzell Lake; Mushamush River; Rhodes Corner; Blystner Lake; all in Lunenburg Co.
August 18: Wile's (Oakhill) Lake, Feindel's L., and Rhodeniser L., Lunenburg Co.
August 21: Yarmouth, Yarmouth Co.
August 22: Markland (Cape Forchu), Yarmouth Bar and Overton, Yarmouth Co.
August 23: East Branch of Tusket from Quinan to Canoe Lake, Yarmouth Co.
August 25: Salmon (Greenville) Lake to Arcadia, Yarmouth Co.
August 27: Shobel's Mt., Sandy Cove, Digby Co.
August 28: Sandy Cove to Freeport, Digby Co.
August 29: Lakes of Lequille and Liverpool Rivers, from Lamb Lake to Boot and Liverpool Head Lakes, Annapolis Co.
August 30: Annapolis Royal, Annapolis Co.
September 2: Sloane, Fanning, Skinner, Pearl and Crawley Lakes, Yarmouth Co., with *H. G. Perry.*
September 4: Parr Lake, Yarmouth Co., and Cedar Lake, New Tusket, Digby Co., with *H. G. Perry.*
September 5: Argyle Head to Belleville, Yarmouth Co., with *H. G. Perry.*
September 7: Clyde River, from Port Clyde to Upper Clyde River, Shelburne Co.
September 8: Harper, Western and Gold Lakes, Shelburne Co.
September 9: Jordan River, from Jordan Falls to Lake John, Shelburne Co.
September 10: Five-River (Morris) Lake and Bower's (Beaver Dam) Lake, Shelburne Co

The more important range-extensions and observations of the summer are enumerated below; as in the previous enumeration the species new to Canada (37) are marked **, the additional ones (25) new to Nova Scotia.*

WOODWARDIA VIRGINIÇA (L.) Moore. Besides occurring as already reported, in Yarmouth and Queens Cos., the Chain Fern is characteristic of boggy shores and thickets northeastward through Digby Co. to Annapolis Co. (near Lamb's Lake; near Liverpool Head L.) It is frequent throughout Shelburne Co., sometimes, as at Harper Lake, reaching a height of 1.7 m.

W. AREOLATA (L.) Moore. Rather frequent in the Tusket Valley, north to Pearl Lake, Kemptville and east to St. John (Wilson) Lake; splendidly developed in the sandy alluvium and lake-margins of the Roseway River system, Shelburne Co., plants from near the head of McKay's Lake, Middle Ohio, measuring 7 dm. high.

ATHYRIUM ACROSTICHOIDES (Sw.) Diels. Rich woods on north Mt., Belle Isle, Annapolis Co.

A. ANGUSTUM (Willd.) Presl, var. ELATIUS (Link) Butters. Swampy woods on slopes above Lahave River, Bridgewater, Lunenburg Co.

THELYPTERIS SIMULATA (Dav.) Nieuwl. Reported from Yarmouth to Queens; but now known eastward to LUNENBURG Co.: knolls in boggy thicket by Wile's (Oakhill) Lake. Extending north in Yarmouth nad Shelburne Cos. to Kemptville and to Jones Lake, Roseway River.

THELYPTERIS BOOTTII (Tuckerm.) Nieuwl. At various stations in Shelburne and Lunenburg Cos.

CYSTOPTERIS FRAGILIS (L.) Bernh., var. MACKAYI Lawson. Local on the basaltic North Mt.: collected near Granville, Annapolis Co., and on Shobel's Mt., Sandy Cove, Digby Co.

WOODSIA ILVENSIS (L.) R. Br. Basaltic cliffs and ledges, Shofel's Mt., Sandy Cove, Digby Co.

SCHIZAEA PUSILLA Pursh. Additional stations indicate, with those already recorded, that the Curly Grass is to be expected in proper habitats in all acid areas in the province. Unrecorded stations are, for DIGBY Co.: forming a close turf with *Vaccinium Oxycoccus* and *Rynchospora alba* at peaty border (many acres) of Tibert Lake, Freeport,—this, probably the most extensive station known for the species, within a few rods of the Bay of Fundy; wet sphagnous hollows in peaty savannah along The Brook, Central Grove. SHELBURNE Co.: depressions and knolls in sphagnous bog near Birchtown Brook; moist depressions in sandy *Corema*-heath and in wet sphagnous bog, Hope's Lot Barrens, Clyde River; wet mossy hollows in savannah east of Jordan Falls.

LYCOPODIUM INUNDATUM L., var. BIGELOVII Tuckerm. Reported as common in Yarmouth and Digby Cos. Abundant in Shelburne Co. and more locally in Lunenburg and Halifax Cos.

*SELAGINELLA RUPESTRIS (L.) Spring. Basalt ledges, summit of Shobel's Mt., Sandy Cove, Digby Co.

*ISOETES MACROSPORA Dur. Gravelly bottom of Clyde River, Middle Clyde.

I. ECHINOSPORA Dur., var. BRAUNII (Dur.) Engelm. Gravelly and muddy bottoms of brooks, West Branch of Tusket River, Havelock and New Tusket, Digby Co.

PINUS STROBUS L. The wind-swept and starved trees on the rocky barrens near Armdale, Halifax Co., have leaves only 2.5–5 cm. long and from a short distance away so strongly resemble *P. Banksiana* that such trees may have been the bases of unverified records of *P. Banksiana* from near Halifax.

THUJA OCCIDENTALIS L. As suggested in RHODORA, xxiii. 188 (1921), Cedar Lake, east of Corberrie, Digby Co., proves to have a characteristic growth of *Thuja* at its border.

POTAMOGETON OAKESIANUS Robbins. Probably common throughout the silicious areas; additional collections from Lunenburg and Hants Cos.

P. PULCHER Tuckerm. DIGBY CO.: quagmire-margin of Sears Lake, New Tusket (form with remarkably small and round emersed leaves). LUNENBURG CO.: brook-beds in peaty swale by Rhodeniser Lake, east of Bridgewater.

P. AMPLIFOLIUS Tuckerm. ANNAPOLIS CO.: shallow water of Young's Lake, North Mt., Belle Isle. DIGBY CO.: peaty cove in Little Meteghan Lake.

P. CONFERVOIDES Reichenb. SHELBURNE CO.: Swanburg Lake, Shelburne; Five-River (Morris) Lake.

In bog-pools near Argyle Head, Yarmouth Co., *P. confervoides* had developed, in early September, many winter-buds and tubers. The plants, which had fruited in July and early August, were nearly disintegrated, but their extensively creeping, filiform rootstocks bore short branches terminated by reddish fusiform tubers, while the old axils of the stems and the tips of the disintegrating branches bore fusiform dark-green winter-buds 0.7–2 cm. long, their leaves spreading-ascending.

P. DIMORPHUS Raf. At several stations in Digby and Lunenburg Cos.

SCHEUCHZERIA PALUSTRIS L. Quagmires of Shelburne Co.

**ALISMA PLANTAGO-AQUATICA L., var. PARVIFLORA (Pursh) Farwell, Ann. Rep. Comm. Parks & Boulev. Detroit, xi. 44 (1900). The small-flowered and -fruited southern extreme. HANTS CO.: Windsor.

PANICUM DICHOTOMIFLORUM Michx. SHELBURNE CO.: dryish sandy beaches of Harper and Welshtown (Birchtown) Lakes.

P. VIRGATUM L., var. SPISSUM Linder, RHODORA, xxiv. 15 (1922). Besides the stations recorded in RHODORA, xxiii. 192 (1921), the following indicate a wide distribution in the province. YARMOUTH Co.: Goven and Gilfilling Lakes. SHELBURNE Co.: Bower's (Beaver Dam) Lake; McKay's and Jones Lakes, Roseway River. LUNENBURG Co.: Wentzell Lake.

P. DEPAUPERATUM Muhl., var. PSILOPHYLLUM Fernald, RHODORA, xxiii. 193 (1921) and forma CRYPTOSTACHYS Fernald, l. c. 194. Additional stations in Shelburne, Lunenburg and Halifax Cos.

P. SPRETUM Schultes. Additional stations are, for ANNAPOLIS Co.: Grand Lake and Liverpool Head Lake. DIGBY Co.: Journeay Lake, Weymouth. YARMOUTH Co.: Goven and Canoe Lakes. SHELBURNE Co.: Harper Lake. LUNENBURG Co.: Hebb's Lake, Bridgewater; mill-pond north of Blockhouse; Blystner and Rhodeniser Lakes.

**P. MERIDIONALE Ashe. YARMOUTH Co.: cobbly beach of Gavelton (Butler's) Lake, Gavelton; first station east of Massachusetts.

P. LINDHEIMERI Nash, var. SEPTENTRIONALE Fernald, RHODORA, xxiii. 227 (1922). LUNENBURG Co.: dry pine and oak woods on steep slopes along Lahave River, Bridgewater.

**P. CLANDESTINUM L. YARMOUTH Co.: rocky and gravelly thicket bordering Pearl Lake and dominant in thicket along Tusket (Kempt) River, Kemptville. LUNENBURG Co.: upper border of cobbly beach, Wentzell Lake. Heretofore unknown east of the Penobscot.

*ORYZOPSIS PUNGENS (Torr.) Hitchc. Characteristic of dry barrens of Shelburne and southwestern Lunenburg Cos.

CALAMAGROSTIS PICKERINGII Gray. Sandy and peaty barrens, eastward at least to Halifax Co.

C. PICKERINGII, var. DEBILIS (Kearney) Fernald & Wiegand. Similar habitats, more common.

SPHENOPHOLIS PALLENS (Spreng.) Scribn. Near Wentworth gypsum quarries, Windsor.

SPARTINA ALTERNIFLORA Loisel., var. PILOSA (Merr.) Fernald. Apparently frequent on salt marshes from Yarmouth Co. to Annapolis Co. and presumably beyond.

PHRAGMITES COMMUNIS Trin. ANNAPOLIS Co.: a large colony in the ditch and on the adjacent railroad bank bordering the salt marsh west of Annapolis Royal; most of the stolons subterranean, but some superficial and reaching a length of 7.6 m. (25 feet).

DISTICHLIS SPICATA (L.) Greene. Salt marshes, Yarmouth Co. to Annapolis Co.

*POA SALTUENSIS Fernald & Wiegand, var MICROLEPIS Fernald & Wiegand, RHODORA, xx. 124 (1918). ANNAPOLIS Co.: brookside in mossy woods near Yoong,s Lake, North Mt. Belle Isle.

GLYCERIA OBTUSA (Muhl.) Trin. Abundant eastward at least to Lunenburg Co.; extremely variable in stature, some colonies, in open

bogs, fruiting when only 1.5–2 dm. high (panicles 4–6 cm. long), others, as at the quaking margins of Harpers and Western Lakes in Shelburne Co., making dense stands 1.2–1.3 m. high (panicles 1.7–1.9 dm. long).

GLYCERIA LAXA Scribn. Eastward to Hants and Halifax Cos.

**FESTUCA RUBRA L., var. MULTIFLORA (Hoffm.) Aschers. & Graebn. Roadsides, Dartmouth.

AGROPYRON CANINUM (L.) Beauv., forma GLAUCUM Pease & Moore. Crest of barrier beach, East Jordan, Shelburne Co.

*A. CANINUM (L.) Beauv., var. TENERUM (Vasey) Pease & Moore, forma CILIATUM (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 72 (1910). Thin open humus and basaltic talus, North Mt., Belle Isle (Annapolis); Shobel's Mt., Sandy Cove (Digby).

ELYMUS VIRGINICUS L., var. HIRSUTIGLUMIS (Scribn.) Hitchc. DIGBY CO.: wooded basaltic talus, Shobel's Mt., Sandy Cove.

CYPERUS DENTATUS Torr. Eastward at least to Lunenburg Co.; characteristic of sandy or gravelly shores.

ELEOCHARIS ROBBINSII Oakes. Widely distributed; new stations in Annapolis, Hants and Lunenburg Cos.

E. OLIVACEA Torr. Additional stations are as follows. YARMOUTH CO.: peaty quagmire-pools in sphagnous bog near railroad station, Argyle Head. LUNENBURG CO.: peaty quagmire-margin of Wallace Lake, Italy Cross.

*E. NITIDA Fernald. Exsiccated roadside gutter, North Mt., Belle Isle, Annapolis Co.

The occurrence of this little plant on the basaltic North Mt. is interesting, since all its other stations (in Newfoundland, Quebec,and northern New Hampshire) are likewise on basic or more or less calcareous rock.

**E. TUBERCULOSA (Michx.) R. & S. Wet sandy or peaty beach of Harper Lake, Shelburne Co.; the typical southern plant, heretofore unknown from east of Massachusetts.

SCIRPUS OLNEYI Gray. An additional station in Yarmouth Co. is at the border of a salt marsh along Argyle River.

**S. CAMPESTRIS Britton, var. NOVAE-ANGLIAE (Britton) Fernald. Border of salt marsh, Jordan Falls, Shelburne Co.; heretofore unknown east of southern Maine.

RYNCHOSPORA FUSCA (L.) Ait. Common eastward at least to Lunenburg and Hants Cos.

R. CAPITELLATA (Michx.) Vahl. Common or at least frequent. New stations in Digby, Annapolis and Shelburne Cos.

R. CAPITELLATA, var. DISCUTIENS (Clarké) Blake. Additional stations are, for SHELBURNE CO.: wet peaty margin of Harper Lake; upper border of cobbly beach of Bower's (Beaver Dam) Lake.

LUNENBURG Co.; upper border of gravelly beach, Feindel's L., west of Bridgewater.

CLADIUM MARISCOIDES (Muhl.) Torr., forma CONGESTUM Fernald, RHODORA, xxiii. 234 (1922). Sphagnous boggy swale bordering Fancy Lake, near Conquerall, Lunenburg Co.

CAREX STRAMINEA Willd. See RHODORA, xxiii. 235 (1922). Somewhat general, though often in only small quantity, on borders of savannahs along East Branch of Tusket R., Yarmouth Co.

C. BEBBII Olney. HANTS Co.: dryish swales near Wentworth gypsum quarries, Windsor.

*C. ADUSTA Boott. A single plant left growing among disturbed rocks by roadside. Armdale (Dutch Village), Halifax Co.; presumably more abundant somewhere in the neighborhood.

C. ROSEA Schkuhr. Damp thickets and clearings, North Mt., Granville, Annapolis Co.

**_C. muricata_ L. Abundant in large stools, open pastured slopes near Wentworth gypsum quarries, Windsor.

**C. LENTICULARIS Michx., var. BLAKEI Dewey in Wood, Class Book, 755 (1861). Cobbly beach of Wentzell Lake, Lunenburg Co. Previously collected by *J. R. Churchill* at Ingonish, Cape Breton.

C. SWANII (Fernald) Mackenzie. _C. virescens_, var. _Swanii_ Fernald. Occasional from Yarmouth Co. to Annapolis Co.

**_C. panicea_ L., var. _microcarpa_ Sonder in Koch, Syn. ed. 2: 879 (1844). Thin open humus by roadside on North Mt., Belle Isle, Annapolis Co.

C. glauca Murr. Reported by Macoun in 1888 from "dry clay banks on the railway cutting just outside of Windsor." Now a very abundant and variable species throughout the gypsiferous region about Windsor.

*C. ANCEPS Muhl. _C. laxiflora_, var. _patulifolia_ (Dewey) Carey. ANNAPOLIS Co.: damp clearings and open rocky woods, North Mt., Granville; first authentic record from east of southern Maine, Macoun's earlier record being based on _C. leptonervia_ Fernald.

C. CRYPTOLEPIS Mackenzie. Somewhat local, Halifax and Lunenburg Cos.

C. SCABRATA Schwein. DIGBY Co.: rich thicket by brook, East Ferry.

C. OLIGOSPERMA Michx. Apparently general in the acid areas.

**_C. hirta_ L. Abundantly naturalized on a sandy railroad bank, Annapolis Royal.

Although here recorded apparently for the first time from Canada, _C. hirta_ was collected in 1912 in a pastured field at Charlottetown, Prince Edward Island, *Fernald & St. John*, no. 7106.

C. LUPULINA Muhl. YARMOUTH Co.: swale by Ogden Lake. LUNENBURG Co.: by brook flowing into Caribou Lake.

C. MICHAUXIANA Boeckl. SHELBURNE Co.: boggy savannah along Tigney Brook, Sable River. HALIFAX Co.: sandy swale bordering Shubenacadie Grand Lake.

C. BULLATA Schkuhr, var. GREENEI (Boeckl.) Fernald. Northeastward to Annapolis Co. and east to Lunenburg Co.

XYRIS MONTANA Ries. Frequent eastward to Lunenburg Co.; sometimes, as at Wallace Lake, Italy Cross, reaching the phenomenal height of 4.2 dm. with heads 6–7 mm. in diameter.

(To be continued.)

***The date of the July issue** (unpublished as this goes to press) will be announced later.*

POGONIA AFFINIS Austin.

Rhodora

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NOTES ON THE FLORA OF WESTERN NOVA SCOTIA 1921.

M. L. Fernald.

(*Continued from page 164.*)

**Juncus effusus L., var. conglomeratus (L.) Engelm. See Fernald & Wiegand, Rhodora, xii. 85 (1910). Locally abundant in peaty soil, Shelburne. The old record from Nova Scotia was based on young and unidentifiable material.

J. effusus, var. Pylaei (Laharpe) Fernald & Wiegand. Hants Co.: swales near Uniacke Lake.

J. subcaudatus (Engelm.) Coville & Blake, var. planisepalus Fernald, Rhodora, xxiii. 241 (1922). Many new stations east to Hants and Halifax Cos.

J. militaris Bigel. The commonest form of *J. militaris* has, as described by Bigelow, the "Culm . . . with a long sheath or two at base, and commonly another above the leaf. Leaf cylindrical, erect, . . . inserted below the middle of the culm, and exceeding it in height,"[1] and tradition, as recorded in the herbarium of the late T. O. Fuller, tells us that "Bigelow named this *militaris* because it reminded him of a soldier carrying his bayonet above his head." So general is this combination of characters, the very tall and erect leaf and above it the firm bladeless sheath, that they have been treated as diagnostic. Thus, in the *Pflanzenreich*, Buchenau distinguishes *J. militaris* from related species by "Folium frondosum unicum, ca. in medium caulem insertum, strictum, crassum, unitubulosum, pungens, usque 100 cm. longum,"[2] while the key-character used in the 7th edition of Gray's *Manual* is: "Upper cauline leaves

[1] Bigelow, Fl. Bost. ed. 2: 139 (1824).

[2] Buchenau in Engler, Pflanzenr. iv. pt. 36: 173 (1906).

bladeless (or essentially so), consisting of firm tawny or colored sheaths 2.5–5 cm. long," etc.[1]

On the border of Nowland Lake in Havelock, Digby County, Nova Scotia, occurs a plant with technical characters (perianths, seeds, etc.) of *Juncus militaris* but differing conspicuously from the typical form of the species in having two well developed cauline leaves, the upper with the sheath much less chartaceous than usual and terminated by a green blade two to four times its length; and in the large accumulation of material in the Gray Herbarium and the herbarium of the New England Botanical Club there are 2 similar specimens from Cape Cod and 1 from southern Connecticut. After finding the Nowland Lake plant with two frondose leaves, Mr. Long and I watched the species carefully, and, although discovering no more of the Nowland Lake form, found that there are occasional colonies with the ordinary submedian erect leaf but quite lacking the firm bladeless sheath above. Sometimes large colonies of this form are uniform, sometimes it occurs with typical *J. militaris*.

In the material at hand, 125 collections show the typical form of *J. militaris* with one long leaf-blade and above it a large colored bladeless or nearly bladeless sheath; 4 collections have two well developed leaves and 21 a single long leaf without the large bladeless sheath above. The latter form, occuring as it does often intermixed with the typical plant, is a minor variation but the other seems to be a well pronounced form and it will facilitate reference to both these extremes if they are designated

J. MILITARIS Bigel., forma **subnudus, n. f., folio frondoso 1, folio secundo hypsophyllino nullo.—Occasional through the range of the typical form. TYPE: peaty border of a small pond, Upper Cornwall, Lunenburg Co., Nova Scotia, August 17, 1921, *Fernald & Long*, no. 23,627 (Gray Herb.).

J. MILITARIS, forma **bifrons, n. f., foliis frondosis 2, folio hypsophyllino nullo.—Infrequent through the range of the species. NOVA SCOTIA: forming subcespitose clumps, sandy and gravelly beach of Nowland Lake, Havelock, August 9, 1921, *Fernald & Long*, no. 23,626 (TYPE in Gray Herb.), August 27 (*Pl. Exsicc. Gray.*). MASSACHUSETTS: shore of pond, Eastham, July 13, 1907, *F. S. Collins*, no. 297; Dennis Pond, Yarmouth, July 18, 1907, *E. W. Sinnott*. CONNECTICUT: West Pond, Guilford, August 15, 1912, *A. E. Blewitt*, no. 1270.

J. NODOSUS L. Swales near Wentworth gypsum quarries, Windsor.

J. ACUMINATUS Michx. New stations eastward to Annapolis and Lunenburg Cos.

[1] Robinson & Fernald in Gray, Man. ed. 7: 269 (1908).

J. MARGINATUS Rostk. New stations eastward to Annapolis and eastern Shelburne Cos.

LOPHIOLA AMERICANA (Pursh) Wood. *L. septentrionalis* Fernald, RHODORA, xxiii. 243 (1922). LUNENBURG Co.: sphagnous boggy swale bordering Fancy Lake, near Conquerall.

At this station the large, freely stoloniferous and subcespitose plants at the quaking margin of the lake are strikingly similar to the original *L. septentrionalis* from Digby Neck; but farther back, on drier knolls, the plants are small, with solitary stems, short pedicels and denser lanate tomentum, quite like the typical plant of New Jersey. Study of this material shows that the seed- and capsule-characters, which were exhibited by the Digby Neck material, break down, and that *L. septentrionalis* is not specifically separable from *L. americana* of the New Jersey pine barrens.

**SISYRINCHIUM INTERMEDIUM Bicknell. Various colonies seem to belong to *S. intermedium*. The plants are all sterile and there still remains doubt as to whether *S. intermedium* is a true species. Our collections are from YARMOUTH Co.: border of spruce swamp, Markland (Cape Forchu); dry fields and clearings near St. John (Wilson) Lake. ANNAPOLIS Co.: thin open humus on North Mt., Belle Isle.

S. ATLANTICUM Bicknell. Eastward to Annapolis and Lunenburg Cos.

HABENARIA FLAVA (L.) Spreng. Several new stations, all in the valley of the Tusket, Yarmouth Co., north to Parr Lake and east to Canoe Lake.

H. OBTUSATA (Pursh) Richardson. Very rare in the western Counties. ANNAPOLIS Co.: mossy woods, North Mt., Belle Isle. YARMOUTH Co.: mossy spruce woods, Greenville.

H. MACROPHYLLA Goldie. DIGBY Co.: old mixed woods near Cedar Lake, New Tusket.

SPIRANTHES CERNUA (L.) Richard, var. OCHROLEUCA (Rydb.) Ames. Characteristic of the dryest of siliceous barrens. Additional stations are, for YARMOUTH Co.: gravelly railroad-bank, Belleville. SHELBURNE Co.: abundant on dry sandy *Corema*-heath, Hope's Lot Barrens, Clyde River; common on dry sandy *Corema*-barrens north of Jordan Falls.

Salix viminalis L. Naturalized in roadside thicket, Hassett, Digby Co.

OSTRYA VIRGINIANA (Mill.) K. Koch. YARMOUTH Co.: wooded shore of Parr Lake; tree with remarkably coriaceous foliage.

THE VARIETIES OF BETULA LUTEA.—In 1904 Dr. Britton, by describing *Betula alleghaniensis*,[1] called attention to the fact that we have two fairly marked trends of the Yellow Birch which had hither-

[1] Britton, Bull. Torr. Bot. Cl. xxxi. 166 (1904).

to passed as *B. lutea* Michx. f. *B. alleghaniensis*, based primarily upon material from the upper slopes of Mt. Pisgah, western North Carolina, distributed by the Biltmore Herbarium as no. 1619, was given a broad range: "From Massachusetts to Quebec and northern Michigan, south to southern New York, Pennsylvania, and in the mountains to Georgia." Subsequently, in his *North American Trees* (1908), Britton made more definite his differentiation of the two Yellow Birches by stating the key-characters (p. 247):

Fruiting scales 4 to 5 mm. long; leaves mostly cordate
14. *B. alleghaniensis.*
Fruiting scales 8 to 10 mm. long . . . ; leaves rarely cordate
15. *B. lutea.*

On pp. 258 and 259 of the same work, where the two are more fully described and illustrated, *B. alleghaniensis* is shown with the leaves very definitely *not* cordate, with scales there described as "4 to 6 mm. long" and having "the wedge-shaped part below the lobes very short" and the fruits cuneate-obovate; while *B. lutea*, assigned a more northern range, has the scales with prolonged "stalk-like part below the lobes" and the fruits suborbicular. Though recognizing the two extremes indicated by Dr. Britton, various other students of our trees have subsequently been unable to keep them apart as species. Thus, in 1918 Ashe recognized the extreme with short scales as *B. lutea*, var. *alleghaniensis* (Britton) Ashe,[1] and more recently I have so designated[2] much of the comon Yellow Birch of Nova Scotia. Subsequently, in an attempt to label properly the material in the Gray Herbarium and the herbarium of the New England Botanical Club, I have carefully studied the specimens, with the result that it seems possible to recognize two strong trends in the scales. The leaves do not show the difference indicated in the key-characters above quoted and, as already noted, Dr. Britton's own illustration of *B. alleghaniensis* shows no approach to cordate leaves. Neither does the difference of fruit brought out in his illustrations regularly accompany the differences in the scales. But in general the scales which are only 5–8 mm. long (I have been unable to find any mature scales as short as 4 mm. and the material in the Gray Herbarium of Biltmore Herb. no. 1619, the type-number of *B. alleghaniensis*, has the scales 7–8 mm. long) and with short (mostly 1–2 mm.) base are of firm or subcoriaceous texture; while the scales of the other extreme,

[1] Ashe, Bull. Charleston Mus. xiv. 11 (1918).
[2] Fernald, RHODORA, xxiii. 257 (1922).

8–13 mm. long and with prolonged base, are subfoliaceous and sometimes even subsquarrose.

The latter is the tree taken by Dr. Britton to be *B. lutea,* but when Michaux's original description and plate are examined it at once becomes clear that the original *B. lutea* Michx. f.[1] was identical with *B. alleghaniensis,* i. e. the common Yellow Birch with short and subcoriaceous short-based scales which "abonde surtout dans les forêts de la Nouvelle-Ecosse, de la Nouvelle-Brunswick, du district du Maine, où elle est désignée sous le seul nom de *Yellow birch,* Bouleau jaune." This is indicated not alone by the very characteristic drawing of the fruiting ament and scale but by Michaux's definite statement (pp. 153, 154) that "les écailles . . . sont trifides, très-acuminées, et longues d'environs 3 lignes (7 millimètres)." That this extreme of the species is more common in the forests of Nova Scotia, New Brunswick and Maine than is the tree with longer and subfoliaceous scales is clear from the representation of the two in the herbaria (including that of the Arnold Arboretum) at hand. Of typical *B. lutea* (*B. alleghaniensis*) Nova Scotia shows a representation of 7 collections, New Brunswick 3, and Maine 21; while of the tree with long subfoliaceous scales Nova Scotia shows 3 collections, New Brunswick 1 and Maine 3.

Although it has been implied that the long-scaled extreme is of more northern range than the short-scaled typical *Betula lutea* (*B. alleghaniensis*) it is noteworthy that the collections at hand show the latter to be more generally collected in the cooler or more northern regions. The figures just listed are to the point; likewise the fact that our only collections from Quebec are of typical *B. lutea* as are 6 out of 8 from Vermont and 6 out of 9 from New Hampshire. Furthermore, the collections from the southern Alleghanies show the typical short-scaled *B. lutea* from an altitude of 3400 feet on the Blue Ridge of Virginia, from "Upper slopes of Mt. Pisgah," North Carolina (type of *B. alleghaniensis*) and from 6000 feet on the Great Smoky Mountains; while the southern material of the long-scaled extreme is from "along the East Fork of the Greenbrier River," West Virginia, "ex regione inferiori Montium Alleghany, Doe River Valley, Tennessee", from "near foot of Thunderhead Mt., E. Tenn," and common below 4000 feet in the mountains of Macon County, North Carolina. The collections from Indiana are, likewise, consistent with these ranges,

[1] F. André-Michaux, Hist. des Arbres Forest. de l'Am. Sept. ii. 152, t. 5 (1812).

2 numbers being the short-scaled tree, 7 the long-scaled. Fruiting specimens from Newfoundland and Labrador are wanting, but it is significant that nearly all material at hand from Connecticut (6 out of 7 collections), New York (9 out of 10) and Tennessee (2) are of the long-scaled extreme. Whatever factor may influence the distribution of the two it would seem that the typical short-scaled *B. lutea* cannot be regarded as generally of more southern range than the other.

To summarize, the two varieties of *Betula lutea* are:

BETULA LUTEA Michx. f. Hist. des Arbres Forest. de l'Am. Sept. ii. 152, t. 5 (1812). *B. excelsa* Pursh, Fl. Am. Sept. ii. 621 (1814), not Ait. *B. lenta, α genuina* Regel, Nouv. Mém. Soc. Nat. Mosc. xiii. 126, in part (1860). *B. lenta, β lutea* Regel in DC. Prodr. xvi. pt. 2: 179 (1868). *B. alleghaniensis* Britton, Bull. Torr. Bot. Cl. xxxi. 166 (1904), North Am. Trees, 257, fig. 216 (1908). *B. lutea alleghaniensis* (Britton) Ashe, Bull. Charlest. Mus. xiv. 11 (1918).—Scales of the fruiting ament firm and subcoriaceous, 5–8 mm. long; the cuneate basal portion 1–2.5 mm. long.—Cape Breton Island and Gaspé Co., Quebec to Ontario, south to the mountains of North Carolina, West Virginia, Illinois and Iowa.[1]

Var. **macrolepis**, n. var., squamis subfoliaceis maturitate 8–13 mm. longis, parte pedali elongata 2.5–6 mm. longa. *B. lutea* Britton, No. Am. Trees, 258, fig. 217 (1908).—New Brunswick to Wisconsin, south to Tennessee, Indiana and Illinois. The following are characteristic. NEW BRUNSWICK: swamps, Campbellton, July, 1877, *R. Chalmers.* NOVA SCOTIA: Comeauville, August, 1900, *L. L. Dame;* mixed woods, Argyle, August 4, 1920, *Long & Linder*, no. 21,001; wooded roadside, Armdale (Dutch Village), July 28, 1921, *Fernald, Bartram & Long*, no. 23,766. MAINE: rocky woods, Dover, August 5, 1895, *Fernald*, no. 383; woods, High Head, Mount Desert Island, June 15, 1889, *Rand*; South Poland, 1893, *Kate Furbish.* NEW HAMPSHIRE: Randolph, August 17, 1902, *Pease*, no. 440; Breezy Point, Warren, July 23, 1908, *E. F. Williams*; woods, Dublin, July 23, 1897, *B. L. Robinson*, no. 266 (TYPE in Gray Herb.). VERMONT: Windham, July 9, 1904, *W. H. Blanchard*, no. 11. MASSACHUSETTS: Beverly, *Asa Gray*; Needham, December 9, 1883, *T. O. Fuller*; border of *Chamaecyparis* swamp, Hanson, October 29, 1916, *Fernald*, no. 15,128; Granville, September 20, 1913, *F. C. Seymour*, no. 34; Kitchen Brook, Cheshire, July 27, 1916, *J. R. Churchill.* RHODE ISLAND: Johnston, *S. T. Olney*; border of low woods, Tiverton, June 11, 1912, *S. N. F. Sanford.* CONNECTICUT: woods about Keney Park, Hartford, September 8, 1907, *A. W. Driggs;* woods, Southington, August

[1] Without fruiting material it is impossible to determine the exact identity of the Yellow Birch of Newfoundland, Labrador, and some regions to the south of the limits here given.

27, 1894, *Bissell*, no. 538; Mount Carmel, 1857, *D. C. Eaton*. NEW YORK: sandy woodlands, Whitestown, Oneida Co., September 2, 1904, *Haberer*, no. 808; border of sphagnum bog, southeast of Oriskany, July 2, 1904, *Haberer*, no. 809; moist rocky bank, Lower Enfield Ravine, Ithaca, September 5, 1915, *A. J. Eames*, no. 3922. WEST VIRGINIA: along East Fork of Greenbrier River, Pocohontas Co., September 19, 1904, *A. H. Moore*, no. 2364. TENNESSEE: lower slopes of the mountains, Doe River Valley, September, 1884. *John Ball*; near foot of Thunderhead Mt., July 25, 1896, *Ruth*, no. 474. INDIANA: tamarack and huckleberry marsh 6 miles north of Plymouth, August 31, 1914, *C. C. Deam*, no. 15,105; low border of Graveyard Lake, Steuben Co., June 11, 1911, *Deam*, nos. 8648, 8651 8653; wet woods about 12 miles east of Michigan City, June 17, 1911, *Deam*, no. 8760. WISCONSIN: Kilbourn, 1861, *T. J. Hale*; swamp, Preble, Brown Co., August 26, 1892, *J. H. Schuette*. ILLINOIS: Dixon, *Geo. Vasey*.

**BETULA CAERULEA-GRANDIS Blanchard, Betula, i. no. 1 (May 7, 1904). *B. caerulea*, var. *grandis* Blanchard in Vermont Phoenix for May 13, 1904 and Betula, i. no. 2 (May 13, 1904). *B. caerulea*, var. *Blanchardi* Sargent, Man. Trees N. A. 202, fig. 168 A (1905).—A characteristic tree in portions of Nova Scotia; probably of wide distribution. HALIFAX Co.: wooded roadside, Armdale (Dutch Village). LUNENBURG Co.: roadside thickets and banks of Lahave River, Bridgewater.

B. caerulea-grandis is an abundant and characteristic tree in some parts of Prince Edward Island, especially in the forests of Queens County where, in the outskirts of Charlottetown and in the dry woods along Brackley Point Road, it forms very extensive groves with the stature and bark of *B. papyrifera* but at once recognized by the highly lustrous blue-green upper surfaces of the leaves. Upon examination these are found to be quite glabrous as are the young branchlets. The fruiting aments strongly resemble those of *B. papyrifera*. *B. caerulea-grandis*, besides occurring as a characteristic tree on Prince Edward Island and in Nova Scotia, is found thence to the Gaspé Peninsula and the region of Quebec, and south to eastern and central Maine, northern New Hampshire and the Green Mountains of Vermont. It is the tree of eastern America, incorrectly called by me[1] in earlier publications *B. pendula* Roth and *B. pendula* var. *japonica* Rehder. Besides Blanchard's Vermont material and the Nova Scotia collections above cited the following are characteristic.

QUEBEC: vicinity of Montmorenci Falls, July 7, 1905, *J. Macoun*, no. 68,774. PRINCE EDWARD ISLAND: dry woods, Brackley Point

[1] Fernald, Am. Journ. Sci. ser. 4, xiv. 184, 191 (1902): Robinson & Fernald in Gray, Man. ed. 7: 335 (1908).

Road, August, 1 1912, *Fernald, Long & St. John*, nos. 7299, 7300. MAINE: in disintegrated volcanic rock, Haystack Mountain, Aroostook Co., July 11, 1902, *Williams, Collins & Fernald*; shore of Rowe Pond, Pleasant Ridge, Somerset Co., September 10, 1909, *J. F. Collins*; near summit of hill with coast-survey tower, Cutler, July 7, 1902, *Kennedy, Williams, Collins & Fernald*; Sprague's Neck, Cutler, August 11, 1902, *Kate Furbish*. NEW HAMPSHIRE: Endicott Farm, Shelburne, July 4, 1914, *W. Deane*; roadside, Randolph, August 28, 1914, *Pease*, no. 16,298; near Glen House, Pinkham Notch, July 28, 1921, *T. W. Edmonson*, no. 5321.

When he first published *Betula caerulea-grandis* (May 7, 1904) Blanchard also put forward *B. caerulea*, introducing the two with the phrase: "The writer has found and here names and describes two new species of white birch." This first number of Betula was received at the Gray Herbarium on May 10, 1904. Almost immediately (on May 13) Blanchard issued in the *Vermont Phoenix* a popular account of his discoveries and reprinted this account "without change of type" as Betula, i. no. 2. In this second account he says "The blue birch, as I have said, presents two well-marked forms . . . . As these birches are without names I propose to call the smaller one **Betula caerulea** and the larger one **Betula caerulea** variety **grandis.**" This paper was received at the Gray Herbarium May 24 but, that Blanchard himself did not believe the larger-fruited tree to be really a variety of *B. caerulea*, is indicated by his annotations on the two copies sent, and on additional copies sent at the same time of Betula, no. 1. On the two copies of no. 2, in which *B. caerulea*, var. *grandis* was published as a variety, Blanchard had written in red ink; "Wise editor helped spoil" and "Spoiled by wise editor," while on the copies of no. 1 sent at the same time he wrote against the phrase "two new species;" "I stand by this" and "By this I stand now." It is thus clear that, although on *second thought* Blanchard wavered, on *third thought* he regarded the two as species as he had originally done. The name *B. caerulea*, var. *Blanchardi* (1905), based upon the same material as *B. caerulea-grandis* (1904) and *B. caerulea*, var. *grandis* (1904), must be treated as a synonym.

**BETULA CAERULEA Blanchard, Betula, i. no. 1 (May 7, 1904); Sargent, Man. Trees N. A. 201, fig. 168 (1905). HALIFAX CO.: dry rocky thickets Dartmouth; wooded roadside, Armdale (Dutch Village).

At the latter station *B. caerulea* was associated with the abundant *B. caerulea-grandis* and *B. populifolia*; at Dartmouth, only a few miles away, it was with at least *B. populifolia*; and at its Vermont

stations it occurs with *B. caerulea-grandis* and *B. populifolia.* In foliage *B. caerulea* is a good combination of the two; in fruiting aments it is much closer to *B. populifolia*, having short horizontally divergent and puberulent scales, and in a large proportion of specimens there is only a solitary staminate ament, *B. caerulea-grandis* more often having 2 or 3. The present evidence seems to indicate that *B. caerulea* is a hybrid of *B. caerulea-grandis* and *B. populifolia* and it is noteworthy that on one of his sheets of *B. caerulea* in the Gray Herbarium Blanchard originally wrote: "It may be a hybrid between *pendula* [of eastern America, i. e. *B. caerulea-grandis*] and *populifolia.*"

ALNUS INCANA (L.) Moench, var. HYPOCHLORA Call. Recorded from a single station in RHODORA, xxiii. 257 (1922). Frequent eastward at least to Lunenburg Co.

QUERCUS BOREALIS Michx. f., var. MAXIMA (Marsh.) Ashe, Proc. Soc. Am. Foresters, xi. 90 (1916). *Q. rubra* of authors, not L. Although the common oak of Nova Scotia is typical *Q. borealis* (*Q. rubra,* var. *ambigua*), the southern extreme with flattish cups was twice collected. YARMOUTH Co.: dry woods near Canoe Lake. ANNAPOLIS Co.: woods bordering Boot Lake.

***Polygonum Bistorta* L. Sp. Pl. i. 360 (1753). The European Bistort is somewhat naturalized (at least two obviously increasing clumps) in a field in Victoria Park, Truro.

P. MUHLENBERGII (Meisn.) Watson. Additional stations are, in YARMOUTH Co.: cobbly beach of Ogden Lake; rocky swale bordering Dominick Lake east of Springhaven.

*P. PENSYLVANICUM L., var. GENUINUM Fernald, RHODORA, xix. 72 (1917). ANNAPOLIS Co.: exsiccated clay roadway bordering salt marsh, Annapolis Royal; first record from east of Massachusetts, previous records belonging to var. LAEVIGATUM Fernald.

P. ROBUSTIUS (Small) Fernald, RHODORA, xxiii. 147 (1921). Additional stations, in YARMOUTH Co.: cobbly beach of Ogden Lake. DIGBY Co.: rocky thicket bordering West Branch of Tusket R., Havelock; rocky thicket bordering Wentworth Lake. ANNAPOLIS Co.: in peat and granite gravel bordering outlet of Lamb's Lake.

**P. PURITANORUM Fernald, RHODORA, xxi. 141 (1919). ANNAPOLIS Co.: in sand or gravel among granite boulders, beach of Grand Lake; first record outside southeastern Massachusetts.

P. HYDROPIPEROIDES Michx. Common eastward at least to Annapolis and Lunenburg Cos.

P. HYDROPIPEROIDES, var. DIGITATUM Fernald, RHODORA, xxiii. 260 (1922). Typical *P. hydropiperoides* was in maturity from mid-July through August, but the original colony of var. *digitatum*, when visited on August 23, barely showed color in the inflorescences: the original collection was made (in good flower) in October, 1920.

P. **hydropiperoides × **robustius**, n. hybr., caule decumbente

basi valde lignescenti stoloniferoque plerumque 3–5 mm. crasso; ramis floriferis adscendentibus 0.3–1 m. longis; foliis anguste ellipticis vel elliptico-lanceolatis acuminatis vel acutis 0.5–2 dm. longis 0.8–4 cm. latis; ocreis laxe cylindricis strigosis ciliatis, ciliis 2–5 mm. longis; pedunculis erectis elongatis; spicis filiformibus plerumque 0.4–1 dm. longis alternifloris, rhachi purpurascenti; ocreolis ciliatis: perianthiis lacteis 2–3 mm. longis, epunctatis vel rare punctatis: achaeniis vacuis.

NOVA SCOTIA: in great abundance in peat and granite gravel bordering outlet of Lamb's Lake, Annapolis Co. July 19, 1921 (foliage), *Fernald, Bartram, Long & Fassett*, no. 23,802, August 29, *Fernald & Long*, no. 23,803 (TYPE in Gray Herb.) and in *Pl. Exsicc. Gray.*, September 16, *Donald McPherson*, no. 23,804.

Exactly combining the aspect and characters of the two species, both of which occur with or near it. In its coarse habit with stout subligneous base nearer *P. robustius*; in foliage intermediate; in the spike showing the slender habit of *P. hydropiperoides* and the purple color of the rhachis, but in the large milk-white flowers and the great length of the spikes suggesting *P. robustius*. Practically all the achenes are empty. Out of 135 sheets of specimens collected on August 29 we were able to secure only 5 partially filled achenes; while a mass of 100 or more older inflorescences collected in September by Mr. McPherson yielded no good achenes.

Chenopodium Bonus-Henricus L. ANNAPOLIS CO.: locally abundant, roadsides and waste ground, Annapolis Royal.

BRASENIA SCHREBERI Gmel. Lakes of Shelburne Co.

CORYDALIS SEMPERVIRENS (L.) Pers. Apparently rare. Seen only in recently cleared land in Digby Co. (Wentworth Lake) and Lunenburg Co. (Bridgewater).

SUBULARIA AQUATICA L. Many additional stations in Digby and Lunenburg Cos.

SARRACENIA PURPUREA L., forma **heterophylla** (Eaton), n. comb. *S. heterophylla* Eaton, Man. ed. 4: 445 (1824). *S. purpurea*, var. *heterophylla* (Eaton) Torr. Rep. Bot. Dept. Surv. N. Y. Assembly No. 50: 120 (1839), Fl. N. Y. i. 41 (1843). *S. purpurea heterophylla* (Eaton) Britton, Mem. Torr. Bot. Cl. v. 176 (1894).

This very striking color-form, with yellow-green sepals, yellowish petals and stigma and pale-green leaves, occurs abundantly at the boggy margin of Young's Lake, North Mt., Belle Isle (Annapolis Co.).

PYRUS ARBUTIFOLIA (L.) L. f. SHELBURNE CO.: wet thicket bordering Harper Lake.

AMELANCHIER STOLONIFERA Wiegand. Additional stations in Yarmouth Co.

A. STOLONIFERA, var. LUCIDA Fernald, RHODORA, xxiii. 267 (1922). Additional stations in Yarmouth, Shelburne and Lunenburg Cos.

A. LAEVIS Willd., var. NITIDA (Wiegand) Fernald, RHODORA, xxiii. 267 (1922). Many stations from Yarmouth Co. to Halifax Co.

*POTENTILLA PUMILA Poir. LUNENBURG CO.: abundant in dry open soil and at borders of pine woods about Bridgewater; first east of the lower Penobscot. Previously known in Canada only from southern Ontario.—J. M. Macoun, Ott. Nat. xvi. 214 (1903).

**Filipendula rubra* (Hill) Robinson. Damp roadside-thicket, Yarmouth.

RUBUS ODORATUS L. var. **malachophyllus, n. var. foliis utrinque densissime pilosis vel subvelutinis supra juventate et subtus ad nervos atro-glandulosis.

Leaves densely pilose or almost velvety on both surfaces, the upper surfaces of the young and the nerves beneath black-glandular.—NOVA SCOTIA: thicket, Belleville, Yarmouth Co., July 23, 1921, *Fernald, Bartram & Long*, no. 23,974 (TYPE in Gray Herb.).

Typical *Rubus odoratus* has the leaves nearly or often quite glabrous on the upper surfaces and only sparingly pubescent on the nerves beneath, and only rarely in the typical continental plant do glands occur upon the leaf-surfaces. Lindsay records *R. odoratus* as "cult'ed at Annap[oli]s., pos'bly fm. w[ild] plants."

***R. illecebrosus* Focke, Abh. Nat. Ver. Bremen, xvi. 278 (1899).—An ornamental garden plant from Japan, tending to spread from cultivation at Annapolis Royal.

R. ALLEGHENIENSIS Porter. Much of the Nova Scotia shrub is uncharacteristic, having comparatively short and leafy-bracted racemes, and subglobose berries with coarse drupelets of inferior flavor. This may prove to be separable from *R. alleghenienses*.

R. GLANDICAULIS Blanchard. The typical form of the species collected in HANTS CO.: gravelly thicket near Uniacke Lake.

R. AMNICOLA Blanchard. YARMOUTH CO.: thickets and clearings bordering savannah along South Branch of Tusket River, Quinan; high-arching shrubs, very prolific, bearing fruit of the richest quality. Should be cultivated.

R. MULTIFORMIS Blanchard. Many additional stations, especially in Shelburne Co., where this low-arching or trailing species is characteristic of boggy thickets and river- and lake-margins.

R. BIFORMISPINUS Blanchard. One of the most characteristic coarse trailers of the sandy roadsides and railroad embankments in southern Yarmouth and Shelburne Cos. The lustrous foliage of darkest green is very handsome and the stout sprawling canes are often nearly 1 cm. in diameter; fruit inferior.

R. RECURVANS Blanchard. Frequent from Yarmouth Co. to Lunenburg Co. Where well developed, as about Gavelton or in thickets by Ogden Lake, furnishing the choicest blackberries in the province.

R. RECURVICAULIS Blanchard. The observations of 1920 were confirmed: that this is one of the commonest species of rocky or gravelly habitats.

R. VERMONTANUS Blanchard. Additional stations in Annapolis and Shelburne Cos.

R. TARDATUS Blanchard. Additional stations in Yarmouth, Shelburne and Hants Cos.

R. ABBREVIANS Blanchard. Frequent in Yarmouth and Shelburne Cos. Additional stations in YARMOUTH Co.: sphagnous thicket, Markland (Cape Forchu), nos. 23,982, 24,025; gravelly railroad bank, Tusket, no. 23,996; open rocky thicket near Vaughan (Tusket) Lake, Gavelton, no. 24,016. SHELBURNE Co.: gravelly railroad bank, Atwood Brook, no. 23,987; rocky thicket bordering Welshtown (Birchtown) Lake, no. 24,003.

R. ARCUANS Fernald & St. John. Very luxuriant on the gravelly railroad banks from Shelburne to Sable River.

R. JACENS Blanchard. Additional stations northward to Digby Neck and eastward to Lunenburg Co.

**ROSA NITIDA × PALUSTRIS Rydb. N. A. Fl. xxii. 496 (1918). *R. carolina* × *nitida* Crépin, RHODORA, ii. 113 (1900). *R. carolina*, var. *setigera* Crepin, l. c. A characteristic clump in wet rocky thicket bordering Sparrel Lake, southeast of Hasset, Dibgy Co.

*R. NITIDA × VIRGINIANA Rydb. l. c. 502 (1918). Border of spruce swamp, Markland (Cape Forchu).

**R. OBOVATA Raf. as interpreted by Rydberg l. c. 499 (1918). Apparently a well defined species. Our material is from YARMOUTH Co.: damp thicket bordering Brazil Lake. LUNENBURG Co.: borders of dry pine and oak woods on steep slopes along Lahave River, Bridgewater (quite like the southern specimens).

Cytisus scoparius (L.) Link. Long known from Shelburne; but now rapidly covering all open ground of roadside, pasture and woods-border along the main road from Shelburne to Jordon Falls, especially in the vicinity of Swanburg Lake. The plant is locally gathered for the drug market.

Trifolium dubium Sibth. Northeastward to Weymouth.

**Vicia sepium* L. Border of field, Annapolis Royal.

APIOS TUBEROSA Moench. Many additional stations in Digby, Annapolis and Lunenburg Cos. In 1920 the plant appeared always sterile, in 1921 it flowered heavily.

GERANIUM BICKNELLII Britton. Seen only in a recently burned clearing west of Bridgewater—one of the most characteristic habitats of the plant elsewhere. Earlier records of *G. carolinianum* undoubtedly belong here.

ILEX VERTICILLATA (L.) Gray, var. TENUIFOLIA (Torr.) Wats. SHELBURNE Co.: rocky shore of Deception Lake.

I. VERTICILLATA, var. FASTIGIATA (Bicknell) Fernald, RHODORA, xxiii. 274 (1922). Additional stations in Yarmouth and Shelburne Cos.

ACER RUBRUM L., var. TRIDENS Wood. HALIFAX Co.: mixed woods, Armdale (Dutch Village).

**A. Negundo* L. Well naturalized on banks of Lahave River. Bridgewater.

Vitis labrusca × *vinifera*. A single vigorous vine of one of the commonly cultivated grapes is growing in the gravelly thicket at the foot of a railroad bank near Uniacke Lake; obviously sprung from seed thrown from the train.

HYPERICUM DISSIMULATUM Bicknell. Additional stations in Digby, Yarmouth and Lunenburg Cos.

ELATINE MINIMA (Nutt.) Fisch. & Meyer. Many additional stations in Annapolis, Lunenburg and Hants Cos.

HUDSONIA ERICOIDES L. SHELBURNE Co.: dry rocky and sandy barrens, Shelburne.

VIOLA LABRADORICA Schrank. The Nova Scotia material passing as *V. conspersa* has the very small and nearly entire stipules of *V. labradorica*. In foliage it is sometimes quite like the latter, at other times like the former and its exact identification must await better material.

Daphne Mezereum L. Thoroughly naturalized and very handsome in roadside-thickets and on clay banks in the gypsiferous or basaltic regions from Annapolis Co. to Hants Co.

Shepherdia canadensis (L.) Nutt. A single shrub, not yet destroyed, on an open bank near gypsum quarries, Windsor.

DECODON VERTICILLATUS (L.) Ell., var. LAEVIGATUS T. & G. Additional stations, for DIGBY Co.: among granite boulders bordering Cedar Lake, New Tusket. SHELBURNE Co.: quaking sphagnous border of Western Lake, Birchtown Brook; peaty margin of McKay's Lake, Middle Ohio.

RHEXIA VIRGINICA L. Additional stations, for YARMOUTH Co.: peaty and cobbly beach of St. John (Wilson's) Lake; very abundant, peaty swale bordering Canoe Lake. SHELBURNE Co.: upper border of cobbly beach, Welshtown (Birchtown) Lake; upper border of cobbly beach, McKay's Lake, Middle Ohio. LUNENBURG Co.: upper border of gravelly beach, Feindel's Lake, west of Bridgewater.

**EPILOBIUM COLORATUM* Muhl. Open spot with both native and introduced plants near railroad station, Weymouth. Should be sought in more natural habitats. First east of the Penobscot region, the earlier records from eastern Canada resting on *E. glandulosum* vars. *adenocaulon* (Haussk.) Fernald and *occidentale* (Trel.) Fernald.

OENOTHERA HYBRIDA Michx. Fl. Bor.-Am. i. 225 (1803); Blake, RHODORA, xx. 51 (1918). *O. fruticosa*, var. *hirsuta* Nutt. in T. & G. Fl. i. 496 (1840). *Kneiffia tetragona hybrida* (Michx.) Pennell, Bull Torr. Bot. Cl. xlvi. 371 (1919).—DIGBY Co.: dry sandy open soil of pastures and roadsides, Ashmore. Doubtless this is the plant reported by others from western Nova Scotia as *O. fruticosa*.

Dr. F. W. Pennell objects to the use of the perfectly identified and

typified name *O. hybrida* Michx. because, in taking up this earliest valid specific name, "Dr. Blake has hardly improved nomenclature—surely not in the opinion of our genetical friends—by the substitution of the name '*hybrida.*'" Under the generic name *Oenothera* this specific name is, naturally, unfortunate but "No one is authorized to reject, change or modify a name (or combination of names) because it is badly chosen," etc. (Internat. Rules, Art. 50) and under the generic name *Kneiffia*, which Pennell maintains, it could not be very embarrassing to "our genetical friends," since they have not specially concerned themselves with that subgenus (or genus). As a result of his objection to the name *Oenothera hybrida* Michx. Pennell made a special search of literature in "the hope of finding for this species some appropriate name." This he feels that he has found in *O. tetragona* Roth, Catalecta, ii. 39 (1800), a name which antedates by three years Michaux's publication. Pennell has seen no specimen but is satisfied that "the full description would apply to the plant here considered." Whether Roth had a plant which is conspecific with *O. hybrida* Michx. (the *Kneiffia fruticosa* of the Illustrated Flora) is certainly very doubtful. Roth calls for a plant with dichotomus branching (Caulis . . . dichotomus), a habit not shown in any material I have seen; Roth calls for oval, obtuse, entire, recurved leaves about 3 inches long and 1 inch wide (Folia . . . oualia, obtusa, integra, . . . plerumque recurua, tres vncias circiter longa vnciamque in medio lata), but the Illustrated Flora correctly describes our plant with "Leaves lanceolate, ovate-lanceolate or oval-lanceolate, acute or obtusish . . . repand-denticulate, or rarely nearly entire," while Pennell's key-characters describe his *K. tetragona* with "Leaves lanceolate." Roth knew perfectly well that his *O. tetragona* did not have lanceolate and repand leaves, for in contrasting it with *O. tetraptera* Cav. he said: "*Foliis* oualibus, integris; nec lanceolatis, a basi ad medium vsque pinnati fidis." Similarly in distinguishing it from *O. fruticosa* he said: "*Foliis* oualibus, obtusis; nec lanceolatis, acutis." And surely the spreading-ascending leaves of *O. hybrida* are not well described as "recurva." The calyx-tube of *O. hybrida* is very slender, well described as filiform, but Roth described the calyx-tube of *O. tetragona* as cylindric (cylindraceus . . . crassitie pedicelli) and emphasized its thickness by contrasting it with that of *O. fruticosa*: "*Calycis tubo* cylindraceo; nec filiformi, angustissimo." Other points, such as the crenate petals

described by Roth, might be discussed, but enough has already been emphasized to indicate that Roth's detailed description of *O. tetragona* departs in very many points from *O. hybrida* and that those who wish to throw out Michaux's specific name must find an earlier name which is more clearly synonymous with it than is *O. tetragona* Roth.

MYRIOPHYLLUM HUMILE (Raf.) Morong. YARMOUTH Co.: Vaughan (Tusket) Lake. LUNENBURG Co.: Feindel's Lake, west of Bridgewater; Rhodeniser Lake. HANTS Co.: Uniacke Lake.

M. TENELLUM Bigel. The tremendous variation in the stature of this species is illustrated by our collections. At the gravelly margin of Uniacke Lake (Hants) the plant was flowering when 2.5–5 cm. high; but in a peaty cove of Little Meteghan Lake the coarse stems reached a height of 5.5 dm.

PROSERPINACA PALUSTRIS L. At various stations from Yarmouth Co. to Annapolis and Lunenburg Cos.: in the latter region sometimes reaching remarkable development: 0.5 m. high, with emersed leaves up to 8.5 cm. long and 1.3 cm. broad.

P. PECTINATA Lam. Additional stations, for YARMOUTH Co: wet savannahs bordering Goven and Kegeshook Lakes and South Branch by Tusket River, Quinan. LUNENBURG Co.: sphagnous swale west of Italy Cross; sandy and gravelly beach of Blystner Lake; peaty bottom of dried-out mill-pond north of Blockhouse.

**HYDROCOTYLE UMBELLATA L. YARMOUTH Co.: wet sandy and gravelly margin of St. John (Wilson's) Lake; first time east of Massachusetts. Very rare and local and appearing like a waif washed down from some as yet undiscovered station farther up the valley of the Tusket.

H. AMERICANA L. Frequent eastward at least to Annapolis and Lunenburg Cos.

**Aethusa Cynapium* L. Waste ground in barn-yard, Shelburne.

CORNUS STOLONIFERA Michx. Westward to Annapolis Co.

PYROLA CHLORANTHA Sw. At various stations in Digby, Annapolis and Hants Cos. Var. *paucifolia* Fernald seems hardly worth maintaining.

P. ROTUNDIFOLIA L., var. ARENARIA Mert. & Koch. Additional stations eastward to Hants Co.

*VACCINIUM CORYMBOSUM L. The typical form of the species we have only from thickets bordering Goven Lake, Yarmouth Co.

V. CORYMBOSUM, var. AMOENUM (Ait.) Gray. Additional stations eastward to the Roseway River, Shelburne Co.

V. CORYMBOSUM, var. PALLIDUM (Ait.) Gray. Additional stations eastward to Welchtown (Birchtown) Lake, Shelburne Co.

PRIMULA FARINOSA L., var. MACROPODA Fernald. YARMOUTH Co.: turfy crests and slopes of exposed headlands, Markland (Cape Forchu); reported to us from headlands near Pembroke Shore.

SAMOLUS FLORIBUNDUS HBK. SHELBURNE Co.: border of salt

marsh, Port Clyde. LUNENBURG Co.: brackish mud by Lahave River, Bridgewater.

LYSIMACHIA TERRESTRIS (L.) BSP. In boggy thickets reaching a full meter in height; in dry sands fruiting at a height of 2 dm.

SABATIA KENNEDYANA Fernald. Many additional stations, all in the Tusket Valley, eastward to Canoe Lake.

**S. KENNEDYANA, forma CANDIDA Fernald, RHODORA, xviii. 151 (1916). The albino-flowered form local by Vagahan (Tusket) and Canoe Lake.

S. KENNEDYANA, forma **eucycla, n. f., lobis corollae late obovatis plus minusve imbricatis.

Lobes of the corolla broadly obovate, more or less imbricated.—NOVA SCOTIA: wet peaty margin of Vaughan (Tusket) Lake, Gavelton, Yarmouth Co., August 13, 1921, *Fernald & Long*, no. 24,354 (TYPE in Gray Herb.).

The ordinary form of *S. Kennedyana* has the segments narrowly cuneate-obovate, averaging two-fifths as broad as long, and with only rarely overlapping margins. Forma *eucycla*, with the lobes five-sevenths as broad as long and with usually overlapping margins, forms a colony of considerable extent at one point on Vaughan Lake.

BARTONIA VIRGINICA (L.) BSP. Many additional stations in Yarmouth and Shelburne Cos. Plants from *Corema*-barrens north of Jordon Falls have very large flowers, with calyx up to 4.5 mm. long.

B. PANICULATA (Michx.) Robinson. Many additional stations in Digby, Yarmouth, Shelburne, Lunenburg and Halifax Cos.

B. PANICULATA, var. INTERMEDIA Fernald, RHODORA, xxiii. 287 (1922). Many additional stations in Yarmouth, Shelburne and Lunenburg Cos.

B. PANICULATA, var. SABULONENSIS Fernald, l. c. 288 (1922). Colonies closely approaching the Sable Island plant in SHELBURNE Co.: wet sandy beach, Harper Lake. LUNENBURG Co.: peaty and gravelly beach of Feindel's Lake, west of Bridgewater.

APOCYNUM CANNABINUM L. LUNENBURG Co.: cobbly beach of Wentzell Lake.

ASCLEPIAS INCARNATA L., var. PULCHRA (Ehrh.) Pers. DIGBY Co.: rocky thicket bordering Wentworth Lake. YARMOUTH Co.: thicket at upper border of cobbly beach, Parr Lake. LUNENBURG Co.: peaty margin of a dried-out mill-pond north of Blockhouse.

The only other Canadian records are from New Germany, Lunenburg Co.—J. M. Macoun, Ott. Nat. xv. 77 (1901).

(*To be continued.*)

NOTABLE ADDITIONS TO THE FLORA OF KNOX COUNTY, MAINE.

C. A. E. Long.

During the season of 1921, several collecting trips to various parts of Knox County were productive of much interesting and valuable material.

From the island of Matinicus, which had already given us many noteworthy species, we have the following:

Scirpus cespitosus L., var. callosus Bigel. A northern rush, growing sparingly in open peat bog.

Rosa acicularis Lindl. This is the third station for this rose east of the Connecticut River. There are two distinct colonies of it growing in a dry worn-out field.

Trientalis borealis Raf. The rare form with aerial runners, like the plants described by Miss R. S. Smith in Rhodora, iii. 216, t. 34 (1901). Among brush heaps in a recent clearing.

Cirsium pumilum (Nutt.) Spreng. Probably the eastern limit for this thistle.

Anaphalis margaritacea (L.) B. & H., var. occidentalis Greene. Hitherto unknown in Maine from southwest of Washington County. Growing in a recently burned tract.

The "Lily Pond" and vicinity is a botanically rich district in the towns of Rockport and Camden. Its waters, shores, and the lands contiguous yielded the following species, in addition to those that I have already noted in Rhodora.

Elodea canadensis Michx. New to the state. This is the true *E. canadensis*, which is rare in New England (see St. John, Rhodora, xxii. 27). Great masses of it grow in the pond.

Salix pentandra L. Naturalized on the shore. Not recorded from Maine.

Rubus Andrewsianus Blanchard. Not recorded from Maine, though collected in 1916 at Orono by Fernald & Long. Rocky bank near shore.

Lonicera Morrowii Gray. A commonly cultivated shrub, thoroughly naturalized in a dry rocky field. Also collected at Orono in 1916 by Fernald & Long. Not recorded from the state.

Bidens Beckii Torr. Rare in Maine.

The brackish shores of the Georges River in Warren yield a number of species worth recording.

LOPHOTOCARPUS SPONGIOSUS (Engelm.) J. G. Sm. Abundant in the mud below high water.

LIMOSELLA SUBULATA Ives. Abundant in the mud.

JUNCUS ACUMINATUS Michx. Plentiful in one locality. Rare in Maine.

SCIRPUS CAMPESTRIS Britton, var. NOVAE-ANGLIAE (Britton) Fernald. Northern extension of range from York County.

RUPPIA MARITIMA L., var. OBLIQUA (Schur) Aschers & Graebn. First south of Gulf of St. Lawrence.

The shores of Megunticook Lake in Camden, and the waters of the small river leading therefrom, contribute a few additional rare or extra-limited plants.

NAJAS GRACILLIMA (A. Br.) Magnus. New to Maine. In the waters of the stream.

PANICUM SPRETUM Schultes. Rare in Maine. Boggy shore of lake.

RANUNCULUS DELPHINIFOLIUS Torr. Rare in Maine. Plentiful on muddy shore.

MYRIOPHYLLUM ALTERNIFLORUM DC. Rare in southern Maine. Shallow water at edge of river.

Various sections of Rockland are responsible for a few, as follows:

CAREX PRASINA Wahlenb. Brookside in shade. Easternmost known limit. Previously known as far east as Kennebec valley.

SALIX INCANA Schrank. Thoroughly naturalized and spreading. By brook on the road to Thomaston. Recorded from Castine in RHODORA, x. 56 (1908).

RUMEX MEXICANUS Meisn. In old mowing field.

SISYRINCHIUM ATLANTICUM Bicknell. Eastern extension of range in Maine. Damp grassy land near Chickawaukie Lake.

AEGOPODIUM PODAGRARIA L. Naturalized by roadside and in fields.

LYONIA LIGUSTRINA (L.) DC. Eastern limit.

VERONICA CHAMAEDRYS L. Rare in Maine. Growing in damp places at Pleasant View Farm, Glencove.

EUPATORIUM MACULATUM L. A form with pure white flowers found at the "Meadows." Several plants.

GENTIANA LINEARIS Froel. Rare, except in western Maine. Meadow near railroad in Warren.

Specimens of the above plants have been passed upon by Professor Fernald, and deposited in the herbarium of the New England Botanical Club.

MATINICUS, MAINE.

HOFFMANN'S FLORA OF BERKSHIRE COUNTY, MASSACHUSETTS.

M. L. FERNALD.

IT is nearly a century since Chester Dewey published (in 1829) his list of the plants of Berkshire County and, although the region has almost continuously attracted the field-botanist, no serious attempt has been made to replace Dewey's antiquated list. But, now, almost as a centennial reminder of Dewey's work, comes this more ambitious publication.[1] Dewey's list contained about 800, the present 1656 species, varieties and named forms. The new list opens with a preface in which acknowledgment is made to some of the botanists who have aided in the determination of species, and an introduction which contains much of interest. The historical matter is attractively presented and pays special tribute to the genius of Chester Dewey and of Amos Eaton (who, on p. 180, seems to have become confused in the author's mind with the much later and probably unrelated A. A. Eaton). We are told that "In 1824 Eaton went to Troy . . . and in 1827 Dewey took charge of a school in Pittsfield . . . the period of active botanical work on the flora of the County carried on by resident botanists was practically over"; from which it must be inferred that little if any weight has been given the botanical labors of Paul Ansel Chadbourne, long-time president of Williams College, who died in 1883 and whose *Catalogue for Williamstown* contains at least 6 species not included by Hoffmann.

The section on Physiography gives a clear account of the region and closes with what is, from a broad viewpoint, the most important matter, the generalizations. These consist of series of conclusions upon the geographic sources of the Berkshire flora, which, although clearly stated, certainly do not all reflect a clear understanding of simple facts and which can, therefore, only mislead the student who relies upon them. On p. 190 we are told that "The plants in the following groups are those which reach the limits of their ranges in or

[1]Flora of Berkshire County, Massachusetts by Ralph Hoffmann—Proc. Bost. Soc. Nat. Hist. xxxvi. no 5, pp. 171–382. March, 1922.

near Berkshire County. The list is confined to species or well marked varieties whose distribution is well known. The geographical range is based on published records and on an examination of the collections of the New England Botanical Club and the Gray Herbarium."

"(1) Plants that occur in Berkshire County, but have not been found native east of the Connecticut River, ranging northwestward, westward, or southwestward, and in the case of certain calciphiles northeastward (stations in the Connecticut Valley in parentheses)." Then follows the list of 58 species which are reputed to extend only "northwestward, westward, or southwestward" from Berkshire County, with the exception of 4 (*Waldsteinia fragarioides*, *Impatiens pallida*, *Hypericum Ascyron* and *Solidago hispida*) which are admitted as extending as far east as the Connecticut. But surely the "examination of . . . the Gray Herbarium" and the "published records" could not have been very thorough, for of the 58 plants listed as reaching "the limits of their ranges in or near Berkshire County," 3 (*Equisetum variegatum*, *Potamogeton alpinus* and *Viola Selkirkii*) extend more than 1500 miles *northeastward*, quite to Greenland; 10 (*Sparganium fluctuans*, *Potamogeton Friesii*, *Carex eburnea*, *Juncus Dudleyi*, *Populus tacamahacca*, *Salix serissima*, *Arenaria macrophylla*, *Ribes triste* var. *albinervium*, *Viola nephrophylla* and *Solidago hispida*) from 750 to 1100 miles *northeastward*, to Newfoundland or Labrador; 5 (*Sagittaria cuneata*, *Carex Tuckermani*, *Quercus macrocarpa*, *Polygala Senega* and *Impatiens pallida*) 350 to 500 miles *northeastward*, to the Gaspé Peninsula, New Brunswick or Nova Scotia; while 8 (*Carex alopecoidea*, *C. rosea* var. *minor*, *Scirpus Peckii*, *Chenopodium Boscianum*, *Sanicula trifoliata*, *Stachys palustris* var. *homotricha*—including the type collection, *Physalis heterophylla* var. *ambigua* and *Lobelia syphilitica*) reach Maine; 7 (*Pellaea atropurpurea*, *Scirpus lineatus*, *Waldstenia fragarioides*, *Hypericum Ascyron*, *Viola latiuscula*, *Agastache scrophulariaefolia* and *Viburnum affine*) New Hampshire, eastern Massachusetts or eastern Rhode Island; and 6 others (*Carex Davisii*, *C. formosa*, *Morus rubra*, *Cerastium nutans*, *Podophyllum peltatum* and *Veronica virginica*) cross to the eastern side of the Connecticut valley. If we add the species which occur northward in Vermont or beyond, in Quebec, we shall have left of the list of 58 only 2: *Ranunculus circinatus* and *Cirsium Hillii*. Whether the last named is worth counting seems very doubtful. At least, in recent years grave doubt as to its specific value has been raised and in his monograph of the genus Petrak reduces it outright to *C. pumilum*.

The basis of the third group, "Plants that occur in Berkshire County, not found native in Vermont, ranging southward, or southwestward," is as difficult to understand. If the arc had been extended by saying, also southeastward, eastward and northeastward, the perplexity of the discriminating reader would have been removed; for, of the 40 species listed 1 (*Utricularia minor*) extends to Greenland; 4 (*Carex atlantica*, *Juncus militaris*, *Sisyrinchium gramineum*

and *Elatine minima*) to Newfoundland; 3 (*Carex albolutescens* var. *cumulata, Smilax rotundifolia* and *Potentilla pumila*[1]) to the Maritime Provinces; 7 (*Carex laxiculmis, Quercus coccinea, Polygonum tenue, Rubus Enslenii, Linum virginianum, Clethra alnifolia* and *Lycopus virginicus*) to Maine; and 15 (*Juniperus communis, Digitaria filiformis, Panicum umbrosum, Carex seorsa, C. tetanica, Orontium aquaticum, Hypoxis hirsuta, Silene pennsylvanica, Vitis aestivalis, Rhododendron nudiflorum, Vaccinium stamineum, Gentiana Andrewsii, Cuscuta arvensis, Prenanthes Serpentaria* and *Solidago speciosa*) to southeastern New Hampshire or eastern Massachusetts.

This type of easy-going and unscholarly generalization is all too common, but of what value can it possibly be? Incidentally, the insertion of such ill-founded matter casts an unnecessary doubt upon the validity of otherwise admirable work. For the *Flora* itself is one upon which reliance can largely be placed. It is the result of long and untiring field-work and methodical organization of data, and the author has had the collaboration of many competent botanists. It is concisely and definitely presented, although one familiar with the literature would be gratified to know what disposition has been made of species heretofore recorded from Berkshire but not clearly accounted for by Hoffmann; such plants, for instance, of Chadbourne's *Catalogue for Williamstown* as *Carex vestita* (vouched for by Dewey), *Pogonia pendula* (*P. trianthophora*), a wholly unique species which Chadbourne could not have mistaken and which is well known at modern stations close to Berkshire County (southern Windham Co., Vermont, western Franklin County, Massachusetts, and northern Litchfield County, Connecticut) or *Juglans nigra,* the Black Walnut, which others besides Chadbourne have credited to Berkshire Co. Students of our flora may also with good reason ask why Chadbourne's other records, which would greatly extend the local ranges, are ignored; stations for such distinct plants as *Thalictrum anemonoides* (*Anemonella*) at Williamstown (still perfectly well known from just over the line in Vermont), *Asclepias quadrifolia* or *Pentstemon pubescens* (*P. hirsutus*).

Seventeen names or combinations are published as new and the indexers will highly commend the author's wisdom in giving at the end a special enumeration of these. Not all are likely to be taken up, however, for they or earlier valid names already existed. For instance, *Polypodium vulgare,* forma *auritum* (Willd.) dates back to Milde, Gefäss-Crypt. Schles. 632 (1858); *Phalaris arundinacea,* forma *picta* (L.) goes back to Aschers. & Graebn. Synop. ii. 24 (1898) and is antedated by the identical forma *variegata* (Parnell) Druce, Fl. Berks. 558 (1897); *Aster novae-angliae,* forma *rosea* was published by Britton, Proc. Nat. Sci. Assoc. Staten I. ii. Nov. 8 (1890).

[1] Represented for fourteen years in the herbarium of the New England Botanical Club by characteristic and correctly identified Vermont material.

The keys which have been copied or compiled chiefly from other sources add to the usefulness of the work, but in some cases more intelligent copying would have made them more useful. For example, on p. 201, a bit of key extracted from RHODORA, xvii. 127, aims to show the distinctions between two varieties of *Lycopodium annotinum* but, unfortunately, the wrong lines were copied so that they can only lead the user astray.

The local pride and perhaps lack of broader experience which leads the compiler of practically every local list to feel that his region "contains a large proportion of plants that reach the limits of their ranges within or very near its borders," is probably responsible for the long list already enumerated which the author erroneously supposes to limit their northeastern extensions in Berkshire County. The same psychological phenomenon is doubtless responsible for the statement under *Potamogeton confervoides* that Guilder Pond is "The only locality in the State for this local Pondweed," and under *Orontium* that Big Pond in Otis is "The most northern station for this plant of the coastal plain." A little search would have revealed much material of *Potamogeton confervoides* and many records from Robbins's classical station at Chockalog (or Shockalog) Pond in Uxbridge whence it has been known since 1844 and that Tuckerman's station for *P. Tuckermani* (synonym of the earlier-published *P. confervoides*) was in Tewksbury, Middlesex County; while N. A. Cobb's long-known (and published) station for *Orontium* in Slow Brook, Northampton, is surely more northerly than Big Pond.

The Appendix contains a long list of Fugitive Species and another of Excluded Species. In the latter are many entries from Dewey's original list, which must have gone into the discard through failure to understand the usage of Dewey's time. Thus *Festuca fluitans*, *Elymus glaucifolius* and *Vicia sativa*, like many others, are excluded because these names do not cover in the 7th edition of Gray's Manual plants of Berkshire County; but surely the *Festuca fluitans* or *Glyceria fluitans* of early New England botanists and of the first six editions of the Manual was either *G. borealis* or *G. septentrionalis*, species first differentiated from the Old World *G. fluitans* in 1897 and 1906 respectively. *Vicia sativa* of American manuals up to the 7th edition of Gray's Manual was, of course, *V. angustifolia*, var. *segetalis*; and *Elymus glaucifolius* is identical with *E. canadensis*. All these plants appear in the Flora under their now accepted names; but such names of Dewey's as *Eriophorum cespitosum* (synonym of the European *E. vaginatum* but applied by Dewey to *E. callitrix*), *Sagittaria sagittifolia* (the Old World species with which the American *S. latifolia* was formerly confused), *Eriocaulon gnaphalodes* (the name long used for the southern *E. compressum* with which Dewey confused our *E. septangulare*), *Trientalis europaea* (the Old World species with which early New England botanists identified our *T. borealis*) and *Anemone nemorosa* (the European species with which our *A. quinquefolia* was

long confused) are not found in the list of excluded species. If Dewey's *Festuca fluitans*, *Vicia sativa*, etc., are excluded why not the perfectly parallel *Eriophorum cespitosum*, *Sagittaria sagittifolia*, etc.?

It may be thought by some that a reviewer should overlook these and other weaknesses in the new *Flora of Berkshire County* and enlarge upon its accuracy. The latter quality, naturally, is what we have a right to expect from an author who has had unusual opportunities; and the degree to which it is attained can be determined only after prolonged use of the publication. But the very patent departures from accuracy and consistency, unfortunately, stand out prominently upon first examination and it is equally unfortunate that they reflect a tendency of many who feel themselves competent to publish upon geographic distribution,—the failure to realize that exact facts (on the whole easily ascertained) are alone of real and lasting value.

A NEW ENGLAND OCCURRENCE OF LISTERA AUSTRALIS.

H. W. Child.

It gives me keen satisfaction to announce through Rhodora the finding, for the first time in New England, of *Listera australis*. The facts are these: In July 1921, Cyrus Pringle Horsford of Charlotte, Vermont, sent me a plant for identification. While the specimen reached me in poor condition, it was clearly a *Listera*, although certainly not *L. auriculata* or *L. convallarioides*. It seemed to me an unusual form of *L. cordata*.

On May 29th, 30th, and 31st, 1922, Mr. Lownes of Providence, R. I., Mr. Schweinfurth of Chestnut Hill, Mass., and I went to Vermont to find *Calypso bulbosa* and *Cypripedium arietinum*, it being the eighth year I have visited Vermont successfully for that purpose. Mr. Horsford went with us to the various places explored and, in fact, he located most of the plants for us. In Monkton, we found *Listera cordata* in full flower and Mr. Horsford at once said that the plant he had found in July 1921 was not the same species.

On July 29th, 30th and 31st, 1922, I was again in Vermont and at the suggestion of Mr. Horsford visited several most interesting localities, which proved very fruitful. On July 30th, we went to a bog to find some orchids which he knew were to be found there in great abundance. While I was preparing photographs of some of them, he said he would look around. In a short time he came to me with

a plant of *Listera australis*. Concerning the identification of this highly interesting find I think there can be no doubt whatever, it having been my privilege a few years ago to see live specimens of *L. australis* and to have in my collection of orchid photographs a fine print of the species made by Edward A. Eames, Esq., of Buffalo, New York.

Mr. Horsford was asked to show the spot where he gathered the plant and we put it back in its place. We then hunted for more and found four. Of these one was in good flower like the first, two were in fruit and one was a young plant that had no flower this year. The plants were all a little lighter in color than those Mr. Horsford had found in July 1921. When at their best, in a normal season a week or so earlier, they are, as Mr. Horsford states, almost purple.

Two of the plants in flower were photographed, one of them in its original station. All were then carefully packed and taken to Boston, where the plants in flower were again photographed to show the peculiar root system and bud. The plants were shown to Mr. Schweinfurth of the Oakes Ames Botanical Laboratory who made a careful study of them and confirmed the identification. The plants have been distributed as follows: one to the Gray Herbarium of Harvard University, one to the Herbarium of Oakes Ames, one to the New England Botanical Club, one to Mr. Charles Schweinfurth and on to Mrs. H. W. Child.

It seems to me that Mr. Horsford has reason for much pleasure and pride in adding one more to the *Orchidaceae* of New England. It is wise for the present to withhold any information as to the locality until a careful survey can be made to establish the exact range and the number of plants that can be found,. I think the matter can be safely intrusted to Mr. Horsford, who is most capable and thoroughly acquainted with the entire territory.

BOSTON, MASSACHUSETTS.

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CAREX LAXIFLORA AND ITS RELATIVES.

K. M. Wiegand.

It is with much hesitation that the writer ventures a contribution to the literature of this perplexing group of sedges which has been a subject of special study at one time or another of nearly all our students of the Genus Carex. Work on the flora of Central New York has shown, however, that the group is not yet fully understood. To obtain a treatment for these local plants a general study has been undertaken and carried through at the Gray Herbarium. The herbaria of L. H. Bailey, the New York College of Agriculture, and the New England Botanical Club have also been consulted. In presenting the results in the following pages it is hoped that our understanding of this portion of the genus may be made clearer.

In the course of the study some new characters have been employed, and a few others, though generally used, have been omitted. By several recent writers certain species have been characterized as having "ancipital" or "flat" culms. However, during a long experience in the field, embracing all the northern species except *C. ormostachya*, the writer has never seen a plant of the "laxiflora" group with ancipital culms, but always with the culms triangular. The peduncles, to be sure, are sometimes flat, as long ago noted by Dewey (Wood's Class Book), but this is not constant for any species. The purple coloration in the basal sheaths has proved a good specific character in several species, but is difficult to use as these outer sheaths often weather off leaving only the inner which have a brown color. Very often however a small fragment of purple may be found caught among the shreds of the remaining sheaths. The color of

the foliage, and the type of roughness on the angles of the culm are often helpful characters. The length of the anther is useful in some cases, though highly variable within rather wide limits and differing greatly according to condition, that is to say whether fresh and full or dry. This length for the various species is as follows: *C. albursina* 1.4–2.0 (2.2) mm. dry or fresh; *C. blanda* 2.0–2.8 mm. dry, 3.0–3.5 mm. fresh; *C. laxiflora* 2.0–3.0 mm. dry, 3.0–3.5 mm. fresh; *C. ormostachya* 2.8–3.2 mm. dry; *C. crebriflora* 2.0–2.2 mm. dry; *C. ignota* 2.9–3.2 mm. dry; *C. anceps* 2.0–3.0 mm. dry, 3.2–4.0 mm. fresh; *C. striatula* 3.2–4.3 mm. dry; *C. styloflexa* 3.0–4.0 mm. dry; and *C. leptonervia* 1.3–2.3 mm. dry, 1.7–2.5 mm. fresh. The anthers at the very summit of the spike are usually much smaller than those farther down, and the measurements given do not apply to these. The length and plumpness of the perigynia may vary greatly, frequently without the variation being of taxonomic value. Often the filling out of the achene seems to broaden and shorten the perigynium. The term beak as here used signifies a point with concave sides in distinction from a merely acute apex. Many specific characters fluctuate greatly, and though generally true, occasionally fail, so that the species are best defined by the sum of all the characters. On the whole the nine species here admitted, though very closely related, are distinct. In two or three of the southern species there is an apparent tendency to produce stolons, but the specimens are few and imperfect. Much more field study is necessary to understand properly the southern forms. The writer wishes to take this opportunity to protest against the wretched labels so common in herbaria. In the case of several of the southern species treated in this paper, it has been impossible to determine whether they are plants of wet or dry soil, clay or sand, shady or exposed places, as not a single label bears so much as a suggestion of such facts. The localities, too, are for the most part imperfectly given.

The oldest specific name connected with the group is that of Lamarck, *C. laxiflora*. The application of the Lamarckian name has always been a matter of doubt. By the earlier authors the name was applied to narrow-leaved forms of what is here called *C. anceps* Muhl., but usually included also *C. leptonervia* and *C. striatula* Michx. Boott's *C. laxiflora* was more especially *C. striatula*. Bailey in his later papers,[1] after inspecting the specimens in Lamarck's herbarium,

[1] Mem. Torr. Bot. Club i. 32 (1889).

transferred the name to Boott's "var. *intermedia*" stating that Lamarck's specimens, from Virginia and New York, although young, were unmistakably the plant that Boott made var. *intermedia*. He further stated that these specimens had narrow leaves less than one-fourth inch in width, staminate spike conspicuous, pistillate narrow and very loosely flowered (½ to 1½ inches long), and very blunt perigynia. The really loose and alternately flowered forms, however, all have the perigynia apiculate or beaked, except sometimes *C. ormostachya*, which extends southward only to western Massachusetts. Lamarck may have had especially slender specimens of *C. blanda* or of the form called *C. laxiflora* in this paper, though the writer has seen none that would answer the descriptions of Lamarck and Bailey. *C. laxiflora* δ *intermedia* Boott, to which Bailey referred was a complex containing at least *C. ormostachya*, *C laxiflora*, and *C. leptonervia*. Of the plants in the Bailey herbarium labelled *C. laxiflora*, 13 are *C. laxiflora* as interpreted in this paper, 22 are *C. blanda* and several more are to be referred to other species. There is no means of determining how many of these specimens were in Bailey's hands when the above statements were written. The material distributed by Bailey as *C. laxiflora*, var. *intermedia* Boott (no. 159) is our *C. laxiflora*. Until the matter is settled by a reinspection of Lamarck's plants, the name *C. laxiflora* may continue to be applied to the form so named by Mackenzie (Britton & Brown's Ill. Flora ed. 2), and represented by Bailey's distributed specimen (of var. *intermedia* Boott).

C. anceps Muhl. (ex. Willd.) has been variously interpreted. Bailey, who saw the original specimen, treated it as a synonym of *C. laxiflora*, but the figure in Schkuhr's Riedgraeser and also Willdenow's description suggest the plant long called *C. laxiflora* var. *patulifolia*. The beak in Schkuhr's figure, especially, suggests this. The *C. striatula* Michx. also has been variously interpreted. Bailey, who saw the specimen on which this was founded, cites as synonyms (Mem. Torr. Bot. Cl. i. 32) *C. ignota* Dewey and *C. laxiflora* Boott t. 89; while in his herbarium labelled *C. laxiflora* var. *Michauxii* (i. e. *C. striatula* Michx.) are four specimens, two of which are *C. ignota* and two *C. styloflexa*, var. *remotiflora*. *C. laxiflora* Boott t. 89 is of course our *C. striatula*, but all the other citations and specimens of Bailey are not. For the plant called *C. striatula* in the present paper, Bailey proposed the name *C. laxiflora* var. *divaricata*, as

indicated by the type in his herbarium. The plant interpreted by the writer as *C. striatula* Michx. answers Michaux's description, and is the only one in the "Carolina" region cited which does. It also resembles a rather poor photograph of the type in the Bailey herbarium. This photograph was made many years ago, and is not clearly identifiable.

The types of the following species, all in European herbaria, should be re-examined: *C. laxiflora* Lam. Dict. de Bot. iii. 392 (1789), *C. heterosperma* Wahl. Köngl. Acad. Handl. xxiv. 151 (1803), *C. anceps* Muhl. in Willd. Sp. Pl. iv. 278 (1805), Schk. Riedgr. Nachtr. 66 f. 128 (1806), *C. nematostachya* Willd. in Schlecht. Linnaea x. 264 (1836), *C. striatula* Michx. Fl. Bor. Am. ii. 173 (1803), *C. truncata* Boeckl. Flora xli. 649 (1858), and *C. bulbosa* Boeckl. Flora xxxviii. 597 (1855).

a. Perigynia strongly and often sharply (21) 24–45-nerved.
b. Perigynia with a short and rather broad apex or point which is turned more or less to one side.
c. Spikes alternately flowered; scales truncate or retuse, muticous, subflabellate at tip; staminate spike very slender, inconspicuous, equaled or exceeded and often hidden by the aggregated pistillate spikes; culms 1.7–3.5 mm. broad, almost winged, the angles smooth or slightly erose; bracts erect: the broadest 8–20 mm. wide; broadest basal leaves very coarse, 10–40 mm. wide ..... 1. *C. alburina.*
c. Spikes denser, perigynia much overlapping; scales subtruncate, rounded or acute, usually cuspidate; staminate spike conspicuous or inconspicuous; culms narrower, slightly margined, the angles more or less erosely or retrorsely serrulate-scabrous; leaves and bracts narrower, or sometimes rather broad.
d. Basal sheaths brown; bracts usually over-topping the culm; staminate spike sessile or short-stalked; rhachis of pistillate spikes sharply angled usually smooth, the scales pale: tip of the perigynium slightly or abruptly bent ..... 2. *C. blanda.*
d. Basal sheaths purple, but sometimes weathering away; leaves narrower; bracts rarely overtopping the culm; staminate spike usually long-stalked, pistillate spikes more scattered, the scales more often colored; rhachis usually narrower, less sharply angled, granulose; perigynia more cellular, paler, the tip usually more strongly recurved; plants generally more slender ..... 3. *C. laxiflora.*
b. Perigynia with a narrow and sharp more beak-like straight or only slightly oblique apex.
c. Basal sheaths purple at least when young.
d. Angles of the culm plainly granulose; tips of the turgid perigynia usually very short, usually contracted and beak-like, but the perigynia sometimes

appearing blunt and rounded at apex; rhachis smooth: bracts often exceeding the culm.....4. *C. ormostachya.*

d. Angles of the culm smooth or obscurely erose-granulose; perigynia fusiform, very acute, scarcely beaked; rhachis usually granulose, bracts exceeding the culm.....6. *C. ignota.*

c. Basal sheaths brown (angles of the culm smooth, serrulate or obscurely granulose).

d. Spikes contiguous, the staminate more or less obscured; bracts much exceeding the culm, the latter more or less retrorsely scabrous.....5. *C. crebriflora.*

d. Spikes scattered, the staminate prominent; bracts shorter than or scarcely exceeding the apex of the staminate spike; culms with erose, obscurely erose-granulose, or even smooth angles.

e. Perigynia slightly or not at all overlapping, strongly ascending, usually abruptly contracted into a slender beak-like point; bracts generally equalling or projecting beyond the staminate spike; rhachis of the alternate-flowered pistillate spikes smooth; angles of the culm smooth, very rarely slightly erose; leaves soft, on the basal shoots usually broad..... 7. *C. anceps.*

e. Perigynia more overlapping, more spreading, and more gradually acute, also averaging longer; bracts generally ending below the apex of the staminate spike; angles of the culm generally minutely erose-granulose; basal leaves less broad.

f. Pistillate spikes often loosely flowered, the larger on each plant 15–35 mm. long; rhachis smooth, sharply angled; scales abruptly cuspidate; perigynia ascending-spreading; staminate spikes stout, pale, with firm scales; leaves firm, pale.....8. *C. striatula.*

f. Pistillate spikes short and densely flowered, the larger 10–15 mm. long, in the variety 10–20 mm. long; rhachis narrower, not sharply angled; scales acute, not cuspidate; staminate spike narrower, often brown, the scales less firm; leaves narrower, softer, deeper green, and often shorter.

g. Pistillate spikes short and rather dense, the rhachis granulose.

h. Perigynia spreading, curved outward, broadly ellipsoidal.....9. *C. styloflexa.*

h. Perigynia strongly ascending, lance-fusiform, nearly straight.....var. *fusiformis.*

g. Pistillate spikes alternately flowered, the rhachis nearly or quite smooth.....var. *remotiflora.*

a. Perigynia obscurely 15–21-nerved, ellipsoidal, thin and fragile walled, the tip rather slender and straight or slightly oblique, often abrupt; foliage deep green; bracts generally surpassing the staminate spike; culms retrorsely scabrous, rarely almost smooth.....10. *C. leptonervia.*

1. C. ALBURSINA Sheldon, Bull. Torr. Bot. Club. xx. 284 (1893); Mackenzie in Britton & Brown's Ill. Fl. U. S. & Can. *C. laxiflora* ζ.

latifolia Boott, Ill. Carex 38. t. 93 (1858). Var. *latifolia* Bailey, Proc. Amer. Acad. xxii. 115 (1886), and in Gray's Man. ed. 6; Robinson & Fernald in Gray's Man. ed. 7. *C. laxiflora* var. *patulifolia*, in part, Dewey in Wood's Class Book.—Plants stout, pale, culms broadly thin-angled, the sides 1.7–3.5 mm. wide, the angles entire or more or less erose; basal sheaths or the outermost dark purple, soon weathering into a dark brown somewhat fibrous mass; broadest basal leaves (10) 18–40 mm. wide; broadest cauline 8–20 mm. wide, these and the broad bracts very erect, the latter much exceeding the culm; sheaths loose, the angles erose-wavy; upper spikes aggregated, the staminate short and very slender, alternately flowered, overtopped and obscured by the pistillate spikes; scales pale or greenish; anthers small 1.4–2.0(2.2) mm. long both when dry and fresh; pistillate spikes alternately flowered, 10–25 mm. long; rhachis broad, smooth; scales truncate or retuse, usually muticous, the tissue at summit more or less fan-shaped; perigynia plainly stipitate, 3.5–4.0 mm. long, rather strongly 27–35-nerved; orifice broad, short, oblique.—Rich upland woods: Vermont, western Massachusetts and western Connecticut to the mountains of Virginia, westward through western Quebec and Ontario, Kentucky and Tennessee to Wisconsin, Iowa, and Missouri.

2. C. BLANDA Dewey, Sill. Jour. x. 45 (1826), also of Britton & Brown's Ill. Fl. ed. 2. *C. anceps*, var. *striatula* Carey in Gray's Man. ed. i. 554 (1848), not *C. striatula* Michx. *C. laxiflora*, var. *striatula* Carey in Gray's Man, ed. 2. 524 (1856); Bailey in Proc. Amer. Acad. xxii. 115 (1886), and Gray's Man. ed. 6. *C. laxiflora* ε *blanda* a. *major* and b. *minor* Boott Ill. Carex 37–38. Pl. 92. fig. 1 & 2 (1858). *C. anceps*, *blanda*, and *striatula* of Dewey in Wood's Class Book various eds. *C. laxiflora*, vars. *blanda* and *varians* of Gray's Man. ed 7.—Plants stout or rather slender, bright green, rarely slightly glaucous; culms 0.8–2.8 mm. in diam., more or less erose-scabrous on the angles; basal sheaths brown; broadest basal leaves 4–12 mm. wide; broadest cauline 2.5–9.0 mm. wide; sheaths rather loose, the angles usually wavy and erose; bracts exceeding the culm; upper pistillate spikes usually contiguous at base of staminate, the latter conspicuous or small and inconspicuous, pale; anthers 2.0–2.8 mm. long when dry, 3.0–3.5 mm. long when fresh; pistillate spikes 5–30 mm. long, the rhachis smooth; scales oblong-ovate, rounded or acute, muticous or cuspidate; perigynia usually crowded, overlapping, spreading-ascending, broadly stipitate, elliptic-obovoid, 24–38 mm. long, olive green when dry, strongly 23–30 nerved, apex acute, broad, slightly bent or abruptly so at tip.—Rich banks and bottomlands about woods in rather dry soil: Vermont and eastern Massachusetts to the District of Columbia, and in the mountains to Alabama, westward through western Quebec and Kentucky to Minnesota, Nebraska, Louisiana, and Texas.

The distinction between *C. laxiflora*, var. *blanda* and var. *varians*, as these two varieties are treated in Gray's Man. ed. 7, appears to be artificial. All conditions of prominence of the staminate spike are found, also all degrees of aggregation of the upper pistillate spikes, without reference to geographical range, and occasionally in the same colony.

3. C. LAXIFLORA Lam. Encyc. iii. 392 (1789). *C. anceps*, var, *angustifolia* Dewey in Wood's Class Book 423 (1845), mainly *C. laxiflora*, var. *angustifolia* Dewey in Wood's Class Book later eds. *C. gracilescens* Steud. Cyp. Plant. 226 (1855). *C. laxiflora* δ *intermedia* (b), in part, Boott, Ill. Carex 37 (1858), not Pl. 91. fig. 1. *C. laxiflora* ε *blanda* (c) *gracillima* Boott, l. c. 38 (1858), and Pl. 91. fig. 2. *C. laxiflora*, var. *intermedia* of Bailey, Proc. Amer. Acad. xxii. 115 (1886). *C. laxiflora*, var. *gracillima* Robinson & Fernald in Gray's Man. ed. 7, 242, inc. fig. 483 (1908). *C. laxiflora* of Bailey, Mem. Torr. Bot. Club. i. 31 (1889), also Gray's Man. ed. 6, and of Mackenzie in Britton & Brown's Ill. Fl. ed. 2, chiefly.—Plants slender, green, yellowish green when dry; culms 0.5–1.2 (1.5) mm. in diam. the angles more or less serrulate-scabrous; basal sheaths purple, often weathering away; broadest basal leaves 3–8 mm. wide; broadest cauline 1.8–5 mm. wide; sheaths close, the angles more or less erose, wavy; bracts rarely exceeding the culms; spikes scattered, the staminate usually peduncled, conspicuous; scales purplish or brownish, rarely pale; anthers 2.0–3.0 mm. long when dry, 3.0–3.5 mm. long when fresh; pistillate spikes usually all scattered, often slender-peduncled, dense or somewhat lax, 7–25 mm. long, the rhachis usually granulose; scales oblong-ovate, acute or truncate, mucronate or short-awned, usually tinged with brown; perigynia usually crowded, divaricate, 2.5–4.1 mm. long, cellular, pale or glaucous-green, strongly 27–35-nerved, short-stipitate; apex tapering but scarcely beaked, usually strongly bent or recurved.—Low ground mostly in alluvial soil: Medford (*Boott*) and Cambridge (*Fernald*), Massachusetts, and from Vermont and Connecticut to the mountains of Virginia, westward through Ontario and Kentucky to Illinois Wisconsin and Mississippi.

This species is very closely related to *C. blanda*, but the purple sheaths, granulose narrow rhachis, more scattered spikes, narrower green leaves, often more curved and paler perigynia, more generally cuspidate and more tawny scales, and shorter bracts usually are sufficient to distinguish it readily though the individual characters fluctuate to a considerable extent. The plant apparently inhabits alluvial ground which is much more moist than that in which *C. blanda* grows. The soil preferred by *C. blanda* seems to be a rich loam,

while that preferred by *C. leptonervia* is generally muck or peat. *C. laxiflora* flowers and fruits somewhat later than other species of this group in central New York.

4. **C. ormostachya** sp. nov. *C. laxiflora* δ *intermedia* (b) Boott, Ill. Carex 37 (1858) as to Quebec specimens and possibly Pl. 91. fig. 1. *C. laxiflora,* var. *intermedia,* Bailey, Proc. Amer. Acad. xxii. 115 (1886), in small part. *C. laxiflora* Bailey, Mem. Torr. Bot. Club, i. 31 (1889), in small part; Robinson & Fernald in Gray's Man. ed. 7 242 (1908), in part.—Gracilis viridis statu sicco subluteo-viridis; culmis 0.7–1.4 mm. latis, angulo minute granulosis; vaginis infimis purpureo-tinctis; latissimis foliis infimis 3–8 mm. latis, latissimis caulinis 2.5–5 mm. latis; bracteis culmum superantibus; spicis remotis, masculis plerumque pedunculatis, antheris 2.8–3.2 mm. longis foeminis 12–25 mm. longis alternifloris moniliformibus, rhachi laevi, squamis subacutis mucronatis; perigyniis brevibus turgidis 2.5–3.5 mm. longis, valide 25–35-nervatis, apice perbrevibus tenuibus rectis vel obliquis vix vel perbreviter rostratis.

Plants slender, green, when dry yellowish green; culms 0.7–1.4 mm. in diam., minutely cellular crenulate on the angles; basal sheaths or some of them purple-tinged; leaves narrow, the broadest cauline 2.5–5 mm. wide, the broadest basal 3–8 mm. wide; sheaths close with smooth angles; bracts equaling or exceeding the culm; spikes scattered, the staminate usually peduncled and conspicuous, with purplish or green scales; anthers 2.8–3.2 mm. long when dry; pistillate spikes 12–25 mm. long, alternately flowered, moniliform, the rhachis smooth; scales broad, subacute, mucronate; perigynia usually short and plump, 2.5–3.5 mm. long, strongly 25–35-nerved; apex rounded or abrupt with a very short slender straight or oblique point.—Woods and banks in mostly dry soil: Quebec and Maine to eastern Massachusetts westward through western Massachusetts, the Helderberg Mountains of New York, mountains of Central Pennsylvania, and Ontario, to Lake Superior. Specimens examined: Quebec: Bic, 1905, *F. F. Forbes*; Roberval, 1892, *G. G. Kennedy*; Aylmer, 1899 and 1911, *J Macoun.* Maine: Fort Fairfield, *Fernald,* no. 146; Pleasant Mountain 1875, *W. Boott*; Mt. Kineo, 1888, *E. & C. E. Faxon;* Pembroke, 1909, *Fernald,* no. 1528; Mt. Desert Island, *Faxon, Rand, and Redfield*; Orono, 1897, *Fernald*; South Poland, 1895, *K. Furbish*; North Berwick, 1895, *J. C. Parlin,* 1896, *Fernald & Parlin*; York, 1891, *M. L. Fernald.* New Hampshire: Gorham, 1909, *A. S. Pease,* no. 12210, Franconia, 1896, *E. & C. E. Faxon* (Type, Littleton Hill, in Gray Herb.), also two other collections; Hanover, 1908, *T. W. Edmondson,* no. 4187. Vermont: Willoughby, 1894, *G. G. Kennedy*; Moosalamos Mt., Salisbury, 1897, *E. Brainerd*; Middlebury, 1892, *Brainerd.* Massachusetts: Manchester, 1911, *F. T. Hubbard,* no. 52; Ashfield, 1907, *E. F. Williams*; Sunderland, 1915, *F. G. Floyd*; Chester, 1913, *C. A. Weatherby & R. C. Bean*; Stockbridge, Savoy, Sandisfield, and

North Adams, *R. Hoffmann*. NEW YORK: Alcove, 1892, *C. L. Shear*; DeKalb, 1916, *O. P. Phelps*, nos. 1491 and 1501; Nicholville, 1915, *Phelps*, no. 1479. PENNSYLVANIA: Bells Gap, Blair County 1876 *J. W. Lowrie* (Bailey Herb.) ONTARIO: *J. M. Macoun*, nos. 78474, 84003, and 94084; Kingston, 1906, *A. B. Klugh*, nos. 19 and 31; Belleville, *W. Boott Herb.*; Britannia Highlands, 1911, *J. Macoun*, no. 84005. LAKE SUPERIOR REGION: Eagle Harbor, 1860, *W. Boott Herb.*, Porcupine Mts., 1868, *Henry Gillman in W. Boott Herb.*

This is one of the most distinct of the various segregates of *C. laxiflora*, but is apparently without a name. The moniliform pistillate spikes have suggested the name applied. The species is usually recognized with ease by this character together with the granulose culms and purple basal sheaths.

5. **Carex crebriflora** sp. nov. Subgracilis viridis vel laetoviridis; culmis saepissime retrorse scabris; vaginis infimis bruneis; latissimis foliis infimis 3–5 mm. latis, latissimis caulinis 3–4 mm. latis; vaginis angulo suberosis; bracteis culmum multo superantibus; spicis contiguis; masculis brevibus ab foemineis occultis, antheris 2–2.2 mm. longis, foemineis 5–12 mm. longis confertis, rhachi laevi, squamis ovatis-oblongis peracutis vix cuspidatis; perigyniis 3.8–4.5 mm. longis, 35–42-nervatis fusiformibus, base contractis, apice sensim peracutis vel subobliquis non rostratis.

Plants moderately slender, green or pale green; culms usually retorsely scabrous; basal sheaths brown; broadest basal leaves 3–5 mm. wide; broadest cauline 3–4 mm. wide; sheaths more or less erose on the angles; bracts much exceeding the staminate spike; the spikes contiguous, crowded, the staminate short, obscured by the pistillate; anthers 2.0–2.2 mm. long; pistillate spikes 5–12 mm. long, dense, the rhachis smooth, the scales oblong-ovate or oblong, very acute, scarcely cuspidate; perigynia 3.8–4.5 mm. long, 35–42-nerved, fusiform, narrowed at base, gradually very acute at the straight or slightly oblique often beak-like apex. Bottomlands: South Carolina to Florida and Louisiana. Specimens examined: VIRGINIA: Chick Swamp, Richmond, 1894, *J. R. Churchill* (Herb. Bailey) doubtfully this species; SOUTH CAROLINA: *Dewey Herb.* FLORIDA: Low woods, Appalachicola River bottoms near Chattahoochee, 1882, *A. H. Curtiss* (TYPE, in Gray Herb.), another specimen is *Curtiss*, no. 3267. ALABAMA: rocky ravine on west side of Hurricane Creek near its mouth, Tuscaloosa County, 1911 (*R. M. Harper*, no. 141). MISSISSIPPI: Starkville, 1889, *S. M. Tracey*, nos. 20, 21, and 28 (Herb. Bailey). LOUISIANA: Alexandria, 1841, *J. Hale*, no. 34 (Herb. Bailey).

As shown by the long bracts, aggregated spikes, and often retrorsely scabrous culms, this species is more closely related to *C. blanda* than to the species with acute perigynia. The perigynia how-

ever, are very different from those of *C. blanda,* and the rather narrow very acute but not cuspidate scales are unlike those of any species except *C. styloflexa.*

6. Carex ignota Dewey, Sill. Jour. ser. II. viii. 348 (1849); Sartwell's Exsic, No. 97 (1848). Plant stiff but rather slender, pale green; culms slender, minutely scabrous on the angles above; basal sheaths apparently purple when young but in most cases the color lost through weathering; broadest basal leaves 3–5 mm. wide, stiff, nearly equaling the culms; broadest cauline 2–2.5 mm. wide; sheaths with granulose or erose angles; bracts much shorter than the culm; spikes widely scattered, but lower not on especially long and slender peduncles; staminate spikes generally peduncled, not particularly stout, the scales thin, narrowly oblong; anthers 2.9–3.2 mm. long when dry; pistillate spikes 22–32 mm. long, loosely almost alternately flowered, the rhachis granulose to nearly smooth; scales oblong, acute or subacute, cuspidate; perigynia fusiform, strongly acute at each end, slightly curved, obtusely angled, closely and strongly 28–36-nerved, 4.2–5.0 mm. long. Wooded hillsides; Western Florida to Texas.

This plant is related to *C. striatula* to which it shows a close superficial resemblance. It differs in the more slender spikes, the generally granulose rhachis, and the purple basal sheaths. The granulose nature of the rhachis is clearly evident in only about 80% of the specimens, and the purple sheaths are frequently difficult to make out because of weathering. However, the plants have a different aspect from those of *C. striatula,* which fact together with the characters given, has led to their treatment here as a separate species.

7. C. anceps Muhl. in Willd. Sp. Pl. iv. 278 (1805), and Schkuhr's Riedgr, Nacht. 66. t. 128 (1806); Dewey in Wood's Class Book 423 (1845) including var. *patulifolia* Dewey ibid.; Carey in Gray's Man. ed. 1. 554 (1848) including var. *patulifolia;* Mackenzie in Britton & Brown's Ill. Flora ed. 2, including *C. leptonervia* Fernald. *C. plantaginea* Schkuhr, Riedgr. Nacht. 63. t. 195 (1906). *C. laxiflora,* var. *patulifolia* Carey in Gray's Man. ed. 2. 524 (1856); Bailey in Proc. Amer. Acad. xxii. 115 (1886), and Gray's Man. ed. 6; Robinson & Fernald in Gray's Man. ed. 7. *C. laxiflora* γ *plantaginea* and δ *intermedia* (a), in part, of Boott's Ill. Carex 37 (1858).—Plants moderately stout or rather slender, pale or glaucous; culms 0.9–2.0 mm. in diam., smooth or very rarely obscurely erose; basal sheaths brown; broadest basal leaves (5) 7–26 mm. wide; broadest cauline 3.5–8.0 mm. wide; sheaths with smooth or very slightly erose-wavy angles; bracts equaling or exceeding the culm; spikes scattered, the staminate pale, generally conspicuous and peduncled; anthers 2.0–3.0 mm. long when dry, 3.2–4.0 mm. long when fresh; pistillate spikes

15–50 mm. long, alternately flowered, loose, the rhachis smooth; scales oblong-obovate, broadly acute to subtruncate, mucronate or cuspidate, rarely muticous, whitish; perigynia 3.0–4.5 mm. long, broadly fusiform, substipitate; apex short, slender, straight or slightly oblique, usually beak-like, whitish, subhyaline; nerves strong, 24–36.—Rich woods and banks in dry loamy soil: northwestern Nova Scotia and southern Maine to the District of Columbia and in the mountains to North Carolina and Tennessee, westward to Wisconsin and Illinois, also in Oregon.

The broadest basal leaves are often absent at flowering time; hence much of the confusion in the synonomy of the older authors between their *C. laxiflora* and vars. *plantaginea, patulifolia,* and *intermedia.* The perigynia vary considerably in size and number of nerves, but the variations are gradual and varieties cannot be satisfactorily established.

8. C. STRIATULA Michx. Fl. Bor. Am. ii. 173 (1803). *C. laxiflora* Boott's Ill. Carex 36. Pl. 89 (1858). *C. laxiflora,* var. *divaricata* Bailey, Mem. Torr. Bot. Club i. 33 (1889) and Gray's Man. ed. 6. *C. laxiflora,* var. *Michauxii* Bailey, Mem. Torr. Club l. c. as to the Michaux synonym at least.—Plants rather stiff and coarse, pale or glaucous; culms 0.8–1.8 mm. in diam., minutely granular-scabrous on the angles at least above; basal sheaths brown; broadest basal leaves 7–15 mm. wide; broadest cauline 2–7 mm. wide, all rather stiff; angles of the cauline sheaths smooth or slightly scabrous; bracts usually shorter than the culms; spikes scattered, the staminate pale, conspicuous, usually stout and clavate, usually peduncled; scales firm; anthers 3.2–4.3 mm. long; pistillate spikes (larger 15–35 mm. long) rather loosely and somewhat alternately flowered; rhachis, smooth; scales oblong, acute, cuspidate; perigynia 3.8–5.0 mm. long, broadly ellipsoidal, short-stipitate, more or less curved outward; apex evenly and gradually acute, firm; nerves 30–45.—Upland banks and woods: eastern Massachusetts to Alabama.

The leaves differ in color and texture from those of *C. anceps,* and the perigynia contrast more in color with the scales, also they average larger. In distance between the flowers of the pistillate spikes this species lies between *C. anceps* and *C. styloflexa.* Two specimens have been examined which extend the previous known range from New Jersey to eastern Massachusetts. These are: Trumbull, Connecticut, 1903, *E. H. Eames,* no. 3934 (Herb. New Eng. Bot, Club), and Morse's Pond, Wellesley, Massachusetts, 1910, *K. M. Wiegand* (in Herb. Wellesley College and New York State College of Agriculture).

9. C. STYLOFLEXA Buckley, Amer. Jour. Sci. ser. II. xlv. 174 (1843); Mackenzie in Britton & Brown's Ill. Flora ed. 2. *C. laxiflora* β *styloflexa* Boott, Ill. Carex 37. Pl. 90 (1858); Robinson & Fernald in Gray's Man. ed. 7.—Plants tall and slender for the group, brighter green, yellowish green when dry; culms 0.5–1.4 mm. in diam., more or less granulose-scabrous on the angles; basal sheaths brown; broadest basal leaves 2.5–8 mm. wide; broadest cauline 1.8–4 mm. wide, mostly soft; sheaths rather close, the angles smooth or slightly scabrous; bracts usually shorter than the culms; spikes widely scattered, the staminate usually conspicuous and peduncled, the scales, thin, often brown; anthers 3.0–4.0 mm. long; pistillate spikes rather dense, the larger 10–15 (18) mm. long, the rhachis granular-roughened; scales narrowly oblong, acute, rarely cuspidate; perigynia (35) 40–45 mm. long, broadly ellipsoidal, stipitate, divaricate and curved outward, slender-tipped, (21) 24–33-nerved.—Low meadows and woodlands: Connecticut to Florida, Kentucky, Louisiana, and Texas.

Var. **fusiformis** (Chapman) comb. nov. *C. fusiformis* Chapman in Dewey, Sill. Jour. Ser. II. vi. 244 (1848). *C. Chapmanii* Steud. Cyp. Plant. 222 (1856).—Perigynia fusiform-lanceolate, straighter and more ascending; scales lance-oblong.—Damp soil on hammocks: Florida.

The specimens of this variety show some indication of being stoloniferous, and the perigynia are rather characteristic. The plant may prove to be a distinct species.

Var. **remotiflora** var. nov. Foliis perbrevibus et perangustis; spicis laxiflorioribus et longioribus, perigyniis adscendentioribus; rhachibus sublaevibus. Leaves very short and narrow; spikes more loosely flowered and longer; perigynia more ascending; rhachis of the spikes almost or quite smooth. Alabama and northern Florida. Cullman, Alabama, 1891, *Charles Mohr*, no. 8 (Herb. Bailey). Chattahoochee, Florida *A. H. Curtiss* (TYPE in Herb. Bailey).

Mackenzie (Ill. Flora ed. 2) states that the basal sheaths of *C. styloflexa* are sometimes purple, but purple color is not evident in any of the specimens studied by the writer.

10. C. LEPTONERVIA Fernald, RHODORA xvi. 214 (1914). *C. laxiflora*, var. *varians* Bailey, Mem. Torr. Bot. Club i. 32, 1889, and Gray's Man. ed. 6. *C. laxiflora* var. *leptonervia* Fernald, RHODORA viii. 184 (1906), and Gray's Man. ed. 7. *C. anceps* Dewey in Wood's Class Book and Dewey Herb. in large part, not Muhl.; Britton & Brown's Ill. Flora ed. 2 in part. *C. laxiflora* δ *intermedia* Boott, Ill. Carex 37 (1858), in part, especially as to (a).—Plants very slender, bright green; culms 0.4–1.5 (1.8), mostly 0.5–1.1 mm. in diam., retrorsely scabrous, rarely nearly smooth; outer basal sheaths dark purplish brown soon weathering away; basal leaves often large, the broadest (3) 5–10 mm. wide; cauline narrow and rather short the

broadest 2.5–6 (7) mm. wide; sheaths with erose-scabrous angles; bracts usually exceeding the culm; upper spikes often aggregated; staminate spike not large, often partially hidden by the pistillate, the latter 10–30 mm. long, alternately to rather densely flowered; the rhachis smooth; scales often tinged with color, subtruncate to acute, usually mucronate, rarely muticous or even retuse; perigynia ellipsoidal, 2.5–4.0, mostly 3.0–3.7 mm. long, slenderly substipitate thin and fragile walled, apex acute, often slightly beak-like, straight or slightly oblique, nerves obscure, 15–21; anthers 1.3–2.3 mm. long when dry, 1.7–2.5 mm. long when fresh.—Low woods in mucky or peaty soil, rarely in drier places: Labrador to Connecticut and in the mountains to North Carolina and Tennessee, westward through Ontario and New York to Minnesota and probably to Manitoba.

This species was not recognized by Dewey and Boott, and probably was treated by each of these authors under more than one name. The type of Bailey's *C. laxiflora* var. *varians* must be considered to be that one to which he referred in his original description, namely, the specimen on which his cited synonym, "*C. laxiflora* var. *intermedia* Bailey, Bull. 3. Minn. Nat. Hist. & Geol. Surv. 22, 1887, not Boott" was based. This specimen now in the Bailey herbarium is *C. leptonervia*. Of the specimens in the Bailey herbarium at the time the treatment in Gray's Man. ed. 6 was written, and labelled *C. laxiflora* var. *varians*, five are *C. leptonervia*, one is *C. ormostachya* and two are *C. blanda*. There is therefore no doubt that *C. laxiflora* var. *varians* should be considered synonymous with *C. leptonervia*. The writer cannot follow Mackenzie in reducing *C. leptonervia* to *C. anceps*, as it appears to have no close affinity with that plant, and to be as distinct as any of the species here treated. Besides the difference given in the key the leaves, when fresh, are greener and more plicate than in *C. anceps* and more like those of *C. laxiflora* and *C. blanda*. In central New York *C. leptonervia* commonly inhabits the peaty or mucky soils on the borders of swamps.

Cornell University, Ithaca, New York.

NOTES ON THE FLORA OF WESTERN NOVA SCOTIA

1921.

M. L. Fernald.

(*Continued from page 181.*)

Cuscuta Gronovii Willd. *C. vulgyvaga* Engelm. Am. Journ. Sci. xliii. 338 (1842). *C. Gronovii* α *vulgivaga* Engelm. Trans. Acad. Sci. St. Louis i. 508 (1859); Yuncker. Revis. N. A. and W. I. Cuscuta,

65 (1921). LUNENBURG CO.: wet thickets and swales back of brackish shore of Lahave River, Bridgewater; upper border of cobbly beach, Wentzell Lake.

Var. *vulgivaga* is the typical form of the species as was clearly indicated by Engelmann in publishing it: "It is Willdenow's original *C. Gronovii*, in his Hb. nro. 3160."

**C. GRONOVII, var. LATIFLORA Engelm. Trans. Acad. Sci. St. Louis, i. 508 (1859); Yuncker, l. c. (1921). *C. Saururi* Engelm. Am. Journ. Sci. xliii. 339 (1842). YARMOUTH CO.: thickets and damp shores, Quinan, Argyle and Belleville. A coastal plain variety recorded by Yuncker as extending from Texas to southern Illinois and New Jersey.

All our material of var. *latiflora* from Nova Scotia has large, depressed-globose or oblate capsules, in maturity 4–5 mm. broad, and unusually large seeds, 2.2–3 mm. long. Its corolla and anthers are exactly those of the southern plant and, although Yuncker in his recently published *Revision of the North American and West Indian Species of Cuscuta* excludes *C. Gronovii* (in his key, p. 47) from the group characterized by "Capsule globose, more or less depressed," and places it (p. 48) in the group with "Capsule globose-ovoid to conic or long-beaked," many of the specimens placed by him under this species have definitely depressed-globose capsules like the plant of western Nova Scotia. Similarly, although Yuncker's description of *C. Gronovii* calls for seeds "about 1.5 mm. long," many plants which he has identified have seeds up to 2.3 mm. long. The old corollas of *C. Gronovii* and var. *latiflora* sometimes crown the capsule. In such cases there is great difficulty in distinguishing the plants with depressed-globose capsules from *C. Cephalanthi* Engelm. In the latter species, however, the anthers are smaller and more rounded than in *C. Gronovii*.

MERTENSIA MARITIMA (L.) S. F. Gray, forma ALBIFLORA Fernald, RHODORA, xxiii. 288 (1922). Rocky barrier beach, Markland (Cape Forchu), and very abundant and uniform on the barrier beach at East Jordan.

TEUCRIUM CANADENSE L., var. LITTORALE (Bicknell) Fernald. SHELBURNE CO.: crest of barrier beach, East Jordan.

***Solanum Dulcamara* L., var. *villosissimum* Desv. Pl. Angers, 112 (1818). β. *tomentosum* Koch, Syn. 507 (1838). γ. *marinum* Bab. Man. 210 (1843). *S. littorale* Raab in Flora, ii. 414 (1819).—Much of the material collected in western Nova Scotia, at various stations especially near the coast of Yarmouth, Shelburne and Annapolis Cos., belongs to the variety with velvety or densely pilose foliage.

We have it from various stations in Newfoundland, Quebec, and Massachusetts.

GRATIOLA AUREA Pursh. Common eastward to Annapolis and Lunenburg Cos.

Veronica agrestis L. Waste ground, Dartmouth.

AGALINIS NEOSCOTICA (Greene) Fernald, RHODORA, xxiii. 139 (1921). Many additional stations including some in Shelburne Co.

**A. MARITIMA Raf. *Gerardia maritima* Raf. YARMOUTH Co.: very abundant on the salt marsh along Argyle River, Argyle Head. Heretofore unknown east of York Co., Maine.

UTRICULARIA GEMINISCAPA Benj. Additional stations in Shelburne, Lunenburg and Halifax Cos.

U. MINOR L. Additional stations in Digby Co.

U. GIBBA L. Additional stations, in YARMOUTH Co.: forming a filmy turf in quagmire-margin of Sloane Lake, Carleton. LUNENBURG Co.: forming compact mats in shallow pools at outlet of Hebb's Lake, Bridgewater; peaty quagmire-margin of Frank Lake and of a near-by small pond, Upper Cornwall.

U. PURPUREA Walt. Frequent or common eastward to Hants Co.

U. CORNUTA Michx. A colony in exposed peat and sand by Rhodeniser Lake, Lunenburg Co., is noteworthy on account of its forking stems—with 2 or 3 long branches.

**CONOPHOLIS AMERICANA (L. f.) Wallr. LUNENBURG Co.: dry pine and oak woods on steep slopes along Lahave River, Bridgewater; locally abundant, many stems springing from deep-seated thick bases attached to oak-roots. Freshly bruised plant with a strong odor of cider.

LITTORELLA AMERICANA Fernald. On the shores of Shubenacadie Grand Lake *Littorella* did not flower in 1920, owing to the high water; but in 1921 it formed freely flowering carpets stranded on the sandy and shingly beach.

Plantago lanceolata L. There are two well defined varieties of *Plantago lanceolata* naturalized in America and a second species which has been confused with them. The varieties are distinguished as follows.

Spike at beginning of anthesis narrowly ovoid-conic, tapering to apex; in fruit cylindric and obtuse, 1.5–8 cm. long: leaf-blades 0.5–2.3 dm. long, 0.6–4 cm. broad: scapes up to 8 dm. tall.....*P. lanceolata* (typical).

Spike at beginning of anthesis subglobose, rounded to apex; in fruit subglobose to cylindric and obtuse, 0.5–2.3 cm. long: leaf-blades 0.2–1.2 dm. long, 0.3–2 cm. broad: scapes 0.3–4.5 dm. tall.

Upper leaf-surfaces green, glabrous or sparsely pubescent. Var. *sphaerostachya.*

Upper leaf-surfaces gray with abundant long hairs. Var. *sphaerostachya*, forma *eriophora.*

P. lanceolata L. (typical). Generally naturalized from Newfoundland to British Colombia and southward. A locally abundant variant

has the spike branching sometimes with a few, more often with many short and densely crowded branches.

**Var. *sphaerostachya* Mert. & Koch in Roehling, Deutschl. Fl. i. 803 (1823). γ. *pumila* Koch, Syn. 597 (1837). β. *capitellata* Schultz, Fl. Pfalz, 380 (1846). δ. *capitata* Dcne. in A. DC. Prodr. xiii. pt. 1: 715 (1852). *P. microcephala* Royle acc. to Barneoud, Mon. Plant. 29 (1845), not Poir. *P. sphaerostachya* (Mert. & Koch) Kern. Schedae ad Fl. exsicc. Austro-Hung. iv. 71 (1886), not Hegetschw. Fl. Schweiz, 116 (1840).—Fields and roadsides, Newfoundland; Nova Scotia; southern New England; California to British Columbia.

**Var. *sphaerostachya*, forma *eriophora* (Hoffmansegg & Link) Beck von Man. Fl. Nied.-Oesterr. ii. 1093 (1893). *P. eriophora* Hoffmansegg & Link, Fl. Port. i. 423 (1809). *P. hungarica* Waldst. & Kit. Pl. Rar. Hung. iii. 225, t. 203 (1812). *P. lanata* Host. Fl. Austr. i. 210 (1827). *P. lanceolata* δ. *lanuginosa* Koch, Syn. 597 (1837).—Nova Scotia; southern New England; Oregon.

A closely related species, *P. altissima* L. Sp. ed. 2, i. 164 (1762); Kern, Ost. Bot. Zeit. xxv. 59 (1875); Beck von Man. Fl. Nied.-Oesterr. ii. 1093 (1893), was collected by the late H. S. Clark somewhere on the "Connecticut coast" in 1899. The label gives no further information but is sufficient indication that the plant is to be watched for. *P. altissima* is a stouter plant than *P. lanceolata*, with heavy, creeping root, large leaves (up to 4 dm. long and 4 cm. broad) glabrous upon both surfaces; stout scapes 0.6–1. m high; and flowers 6–7 mm. broad (in *P. lanceolata* mostly under 5 mm.).

*CEPHALANTHUS OCCIDENTALIS L. SHELBURNE CO.: rocky shore of Deception Lake; among granite boulders by Lake John; at both stations scarce and local. Mr. R. H. Wetmore informs me that he has found *Cephalanthus* on Cameron Lake (head of Medway River), Queens Co.

VIBURNUM ALNIFOLIUM Marsh. Rare in YARMOUTH CO.: thickets and mixed woods near Lake George. Becoming frequent in Digby Co. Thence eastward through the northern and central region at least to Halifax Co.

SOLIDAGO LATIFOLIA L. LUNENBURG CO.: shaded ledges by Lahave River above Bridgewater

SOLIDAGO BICOLOR L. SHELBURNE CO.: from Shelburne eastward,

*S. UNILIGULATA (DC.) Porter, var. NEGLECTA (T. & G.) Fernald, RHODORA, xxiii. 292 (1922). The plants in a spruce swamp at Markland (Cape Forchu), Yarmouth Co., are thoroughly characteristic of the variety which, in extreme development, we have not had from east of southern Maine.

S. ELLIOTTII × RUGOSA. One colony, apparently of this origin, on a gravelly bank south of Belleville, Yarmouth Co.

S. CANADENSIS × UNILIGULATA. One clump, apparently of this origin, in a thicket near Five-River (Morris), Lake Shelburne Co.

S. SEROTINA Ait., var. GIGANTEA (Ait.) Gray. Various stations from Yarmouth Co. to Lunenburg Co.

SOLIDAGO TENUIFOLIA Pursh. Many additional stations from Yarmouth and Digby Cos. to Halifax Co.

*ASTER UNDULATUS L. LUNENBURG CO.: frequent in dry thickets and borders of woods about Bridgewater and northward at least to Wentzell Lake.

*ASTER LINDLEYANUS T. & G. HANTS CO.: border of old hillside woods, Mt. Uniacke.

*ANTENNARIA PARLINII Fernald. LUNENBURG CO.: abundant at the border of dry pine and oak woods on steep slopes along Lahave River, Bridgewater.

ANAPHALIS MARGARITACEA (L.) B. & H., forma **anochlora, n. f., foliis lineari-lanceolatis supra viridibus glabris sub inflorescentia valde reductis.

Leaves linear-lanceolate, green and glabrous above, much reduced below the inflorescence.—Occasional throughout the range of the typical form. TYPE: dry clearings and burns near Five-River (Morris) Lake, Shelburne Co., Nova Scotia, September 10, 1921, *Fernald & Long*, no. 24,670, in Gray Herb.

Forma *anochlora*, on account of its bright green upper leaf-surfaces, is often sent out as var. *occidentalis* Greene. That variety, of more boreal range than the slender-leaved *A. margaritacea* and forma *anochlora*, has the leaves of more oblong tendency and scarcely reduced in size below the inflorescence. For discussion of it see RHODORA, xiii. 25–37 (1911).

Ambrosia trifida L. Waste ground, Dartmouth.

RUDBECKIA LACINIATA L., var. **gaspereauensis, n. var., foliis subtus et petiolis et rhachibus pilosis.

Lower surfaces of leaves, petioles and rhachises pilose.—NOVA SCOTIA: alluvial soil in thickets close to shore or on the strand of streams and brooks of the Gaspereau River system, Kings County. The type material collected at the border of an alder thicket by Black River (tributary to the Gaspereau), August 31, 1921, by Prof. *H. G. Perry* (TYPE in Gray Herb.).

This indigenous and isolated Nova Scotian variety differs from the continental plant in the development of long pubescence, typical *R. laciniata* being glabrous or merely scabrous.

COREOPSIS ROSEA Nutt. Additional stations, all in YARMOUTH CO.: Salmon (Greenville) Lake; Goven, St. John (Wilson) and Gil-filling Lakes.

Bidens cernua in eastern America. *Bidens cernua* L. is a highly variable species with several well defined varieties in northeastern America. It belongs to a group of three species with simple leaves and achenes with a convex cartilaginous summit. These three species may be distinguished as follows.

Mature disk (except in depauperate extremes) 1.3–2.8 cm. broad: fruiting heads often nodding: outer involucre reflexed, spreading or merely subascending: disk-corollas 4–5 mm. long, 5-toothed: anthers exserted, purple-black: achenes not conspicuously striate between the margins and midribs or keels; the central 1.8–2.5 mm. broad.

Achenes straight and flat, not winged nor strongly keeled, deep-brown or purplish; the outer 6–8 mm. long, with marginal awns 2.8–4.5 mm. long; the central 8–9.5 mm. long, with marginal awns 3.5–5 mm. long: stem firm and usually smooth; its rooting base up to 6 dm. long: outer involucre rarely longer than the inner: chaff reddish-tipped: rays 1.5–3 cm. long ..... *B. laevis.*

Achenes curved, with almost wing-like pale margins and keels, olivaceous; the outer 3.3–6.3 mm. long, with marginal awns 2–2.8 mm. long; the central 4.2–7.8 mm. long, with marginal awns 2.6–4 mm. long: stem soft and usually somewhat hispid; its rooting base rarely 1 dm. long: outer involucre mostly longer than the inner: chaff yellow-tipped: rays wanting or at most 1.7 cm. long ..... *B. cernua.*

Mature disk rarely 1.5 cm. broad: fruiting heads erect: outer involucre ascending: disk-corollas 3.5–4 mm. long, 4-toothed: anthers included, pale: achenes distinctly 7–15-striate on each face; the central 1.4–1.9 mm. broad, flat, olive-brown or drab ..... *B. hyperborea.*

Bidens laevis is not specially variable with us; the variations of *B. hyperborea* have recently been discussed;[1] and to round out the treatment of this group the northeastern varieties of *B. cernua* are here considered. Our variations of this species are as follows.

Stems stoutish, 0.25–1 cm. in diameter at base, commonly branching, 0.5–1.8 m. high: leaves sessile or at most narrowed at base, thickish, 0.2–2 dm. long; heads commonly numerous, broadly hemispherical, many-flowered; the primary ones with disks 1–2.7 cm. broad, nodding in fruit: outer involucre of 5–10 bracts; inner of about 8 bracts 6–12 mm. long.

Leaves tapering to long acuminate-attenuate tips; the primary with 4–24 pairs of sharp serrations: bracts of outer involucre linear to lanceolate, acute or acutish.

Leaves with broad connate or subconnate bases, scarcely narrowed below the middle.

Leaves linear to oblanceolate, with 4–13 pairs of coarse teeth 1–5 mm. high ..... *B. cernua* (typical).

[1] Rhodora, xx. 146–150 (1918).

Leaves linear- to lance-oblong, with 12-24 pairs of fine teeth scarcely 1 mm. high ..... Var. *integra*.
Leaves conspicuously narrowed at base, elliptic-lanceolate ..... Var. *elliptica*.
Leaves mostly blunt or round-tipped; the primary ones entire or with 1–6 pairs of remote teeth: bracts of outer involucre oblong to spatulate, with obtuse or rounded tips ..... Var. *oligodonta*.
Stem capillary, simple or only slightly forking, 0.2–2 dm. high: leaves petioled, oblanceolate or spatulate, thin, 0.4–2.5 (rarely –4) cm. long: heads solitary or very few, campanulate, few-flowered, with disks 1.5–10 mm. broad, scarcely nodding in fruit: outer involucre of 2–6 bracts; inner involucre of 3–6 bracts 2–7 mm. long ..... Var. *minima*.

B. CERNUA (typical). Sloughs, springs, pools and wet shores, extending northeastward to Chicoutimi, Rimouski and Bonaventure Cos., QUEBEC, MADGALEN ISLANDS and Cape Breton, NOVA SCOTIA; Eurasia.

In Nova Scotia unknown from west of Annapolis and Lunenburg Cos.

**Var. INTEGRA Wiegand, Bull. Torr. Bot. Cl. xxvi. 418 (1899).—PRINCE EDWARD ISLAND; Cape Cod, MASSACHUSETTS; Illinois to western North Carolina, Oklahoma and South Dakota.

Var. ELLIPTICA Wiegand l. c. 417 (1899). *B. elliptica* (Wiegand) Gleason, Ohio Nat. v. 317 (1905).—Extending northeastward to the Ottawa Valley, ONTARIO and QUEBEC, and PRINCE EDWARD ISLAND.

Var. OLIGODONTA Fernald & St. John, RHODORA, xvii. 25 (1915).—Brackish or saline shores, MAGDALEN ISLANDS, PRINCE EDWARD ISLAND and MASSACHUSETTS locally inland to western NEW YORK.

**Var. MINIMA (Huds.) DC. Prodr. v. 595 (1836). *B. minima* Huds. Fl. Angl. 310 (1762).—Bogs and shallow pools, MAGDALEN ISLANDS to southern NEW HAMPSHIRE and western NEW YORK and northwestward; Europe.

Our only Nova Scotian collection is from LUNENBURG Co.: boggy margins of shallow pools, outlet of Hebb's Lake, Bridgewater.

*B. CONNATA Muhl.; Fernald, RHODORA, x. 200 (1908). LUNENBURG Co.: wet thickets and swales back of brackish shore of Lahave River, Bridgewater; first station east of southern Maine. Earlier records belong to var. *petiolata* (Nutt.) Farwell.

B. FRONDOSA L., var. ANOMALA Porter. YARMOUTH Co.: in *Zostera* litter, gravelly sea-beach, Yarmouth Bar; margin of thicket bordering cobbly beach of Parr Lake; the latter station unusual in being on a fresh-water lake, the variety usually occurring in brackish habitats.

*MEGALODONTA BECKII (Torr.) Greene. *Bidens Beckii* Torr. DIGBY Co.: deadwater of Rocky Brook north of Hasset; first station east of the Penobscot.

Chrysanthemum Leucanthemum L. The typical form of the species is apparently common at Annapolis Royal and Granville, and pre-

sumably in Annapolis Co.; the common plant generally throughout the province being var. PINNATIFIDA Lecoq. & Lamotte.

**Artemisia Pontica* L. Waste ground, Dartmouth.

PETASITES PALMATUS (Ait.) Gray. Very rare in the western counties. Seen by us only at one station in YARMOUTH Co.: sphagnous thicket, Belleville.

SENECIO AUREUS L. Very rare in the western counties; seen by us only at one station in YARMOUTH Co.: sphangous thicket, Belleville.

LACTUCA HIRSUTA Muhl. Widely dispersed but nowhere abundant in Yarmouth and Shelburne Cos.

PRENANTHES NANA (Bigel.) Torr. YARMOUTH Co.: tur°y crests and slopes ‹ f exposed headlands, Markland (Cape Forchu).

HIERACIUM PANICULATUM L. Occasional from Yarmouth Co. eastward at least to Annapolis and Lunenburg Cos.

H. **paniculatum × **scabrum**. 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 Lahave River, Bridgewater, Lunenburg Co.

MUSCARI COMOSUM IN OREGON.

J. C. NELSON.

BY a rather startling coincidence, the discovery of *Muscari comosum* (L.) Mill. in the East, as reported by Mr. Long in RHODORA **24**: 17 ff. (1922), was simultaneous with its first appearance on the other side of the continent. Here also it was first brought to notice by a school pupil. The first specimens were brought to the botany class of the Salem High School in the first week of May, 1921, by Carter Keene, a farmer's son living about sixteen miles north of Salem. A hasty consultation of that invaluable manual, Gray's Field, Forest and Garden Botany led us to name it tentatively *Muscari comosum*—a determination afterwards kindly confirmed by Mr. Long, who was about the same time studying the material collected by him at Philadelphia. The "find" was so unexpected that a personal visit to confirm the details seemed in order, and I accordingly accompanied young Keene to his home one Friday afternoon after school. The station in which the plant was growing was about 2½ miles north of Waconda, Marion County, in the northwest corner of a field of some 90 acres belonging to the elder Keene. This field had been sown to oats the previous season; in the fall the stubble had been plowed under and the ground left fallow for the following year.

About forty plants were counted, scattered among the furrows over an area of perhaps one hundred yards square. The farm-house was about 300 yards south, on the opposite side of the highway. No other dwelling appeared in the immediate vicinity, though a house had once stood on the same side of the road, about a hundred yards beyond the Keene homestead, the site being marked by an old cellar and a solitary specimen of *Salix babylonica*. Along the roadside near this tree was another interesting plant that sometimes appears mysteriously in western Oregon—*Reseda alba* L. None of the Keene family could offer any explanation for the presence of the Muscari, as they had moved to the farm only a year before. It had of course attracted their attention, and the father persisted in calling it "death camas," although the resemblance to *Zygadenus venenosus* was by no means marked.

Although the plant appeared fairly well established, there seemed reason to fear that its location in a cultivated field might make its tenure decidedly precarious. It was therefore without any strong expectation of finding it again that I made a second visit to the spot on May 27 of the present year (1922). The field had been again sown to oats, which were already breast-high; but scattered everywhere among the grain over the original area were the brilliant violet-tipped clusters of the Muscari. No other weed except the omnipresent grain-field pest of the Northwest, *Centaurea Cyanus*, seemed as well established. An attempt to dig out some specimens showed that the plant had been clever enough to send its bulbs down far enough to escape the plow, and that the problem of survival had therefore been met and solved. The bulbs that had not been more than six inches below the surface at the time of the first visit, had gone down to at least 30 inches in the cultivated ground. We found that the Keene family had transplanted some of the bulbs, and we brought home a few others for our own gardens.

It is even more difficult to explain the plant here than at the Philadelphia station. Almost anything may be expected to appear in the miscellaneous refuse that collects about a large city; but how such a plant found its way into a remote rural neighborhood is hard to understand. If the seeds were introduced in seed-oats, why has it not appeared elsewhere? It has never been reported in cultivation in this part of Oregon—even *M. botryoides* is much less common here than in the East, and has never been found growing spontaneously.

The Oregon specimens agree perfectly with the excellent description given by Mr. Long. It is interesting to note that Linnaeus originally placed this and the other species of *Muscari* in *Hyacinthus*; and it remained for Philip Miller to point out that the shape of the corolla in this group showed so marked a deviation from the funnel- or bell-shaped corolla of *Hyacinthus* proper as to justify a generic segregation.

Boissier in the Flora Orientalis **5**: 291 (1884), gives the native range of *M. comosum* as from Greece and Thrace to Transcaucasia, Asia Minor, Cyprus and Mesopotamia, westward over all of central and southern Europe to Belgium, and into northern Africa. All these Mediterranean weeds seem to find the climate and soil of Oregon peculiarly congenial, and each season marks the appearance of immigrants previously unknown.

Salem, Oregon.

THE AMERICAN VARIATIONS OF LINNAEA BOREALIS.

M. L. Fernald.

For many years the Twinflower of northeastern America passed unquestioned as identical with the European *Linnaea borealis* L., and after it was separated in 1825 as *L. americana* Forbes, it was not generally treated as even varietally distinguishable from the European until it was revived as a species by Britton[1] in 1901 and as var. *americana* (Forbes) Rehder, Rhodora, vi. 56 (1904). In all recent treatments which I have examined it seems to be implied that the typical *L. borealis* does not occur in America and that our plants all belong to the broadly distributed var. *americana* and the more restricted var. *longiflora* Torr. of the Pacific slope, or to a reputed Alaskan species, *L. serpyllifolia* Rydberg, Journ. N. Y. Bot. Gard. viii. 135 (1907). Much of the material from western Alaska and the Aleutian Islands, however, the plant called by Rydberg *L. serpyllifolia*, is quite like typical European *L. borealis*. The western var. *longiflora*, similarly, does not seem to be clearly interpreted. Sometimes, as by Rydberg,[2] it has been treated as a species; sometimes, as by Piper,[3] it has been united without attempt at differentiation with the widely dispersed

[1] Britton, Man. 873 (1901).
[2] Rydb. Fl. Rocky Mts. 812 (1917).
[3] Piper, Fl. Wash. 528 (1906).

var. *americana* as a species, *L. americana;* while later, by Piper & Beattie,[1] all material of the northwest coast has been treated without distinction as var. *longiflora.* Again, certain plants from the lower St. Lawrence, on account of unusually long corollas (1.5 cm.) have been distributed as var. *longiflora.* In view of this diversity of interpretation the following statement of the essential characters of the three well defined American varieties may be of service.

Corolla campanulate, 6–9 mm. long, flaring from well within the calyx, the tube very short: calyx-segments 1.5–2.7 mm. long. ..... *L. borealis* (typical).
Corolla more funnelform, flaring from above the calyx, its tube exserted.
Calyx-segments 1.5–3 mm. long: corolla 8–15 mm. long... Var. *americana.*
Calyx-segments 3–5 mm. long: corolla 10–16 mm. long....Var. *longiflora.*

L. BOREALIS L. Sp. Pl. 631 (1753). *L. serpyllifolia* Rydb. Journ. N. Y. Bot. Gard. viii. 135 (1907).—Northern Eurasia; Alaska. The following Alaskan specimens are characteristic: Cape Nome, 1900, *Blaisdell;* Anvik, July 20, 1907, *J. W. Chapman*; lower Yukon, 1910, *J. A. Kusche*; Makushin Bay, Unalaska, July 14, 1907, *E. C. Van Dyke*, no. 39; Nazan Bay. Atka Island, July 28, 1907, *Van Dyke*, no. 278.

In describing *L. serpyllifolia,* Rydberg stated that the Alaskan plant differs from *L. borealis* "in the very narrow [linear-subulate] almost glabrous calyx-lobes . . . smaller size [corolla about 6 mm. long] of the flower and of the leaves [5–8 mm. long], and in the indistinct toothing of the latter." But surely much of the European plant has linear-subulate calyx-segments. Witness the detailed illustrations in Wittrock's exhaustive study[2] of variation in the European plant—for instance t. 6, figs. 9a and 25a, t. 7, fig. 11a, t. 8, figs. 10a and 29a, t. 9, fig. 13a, etc. etc. Similarly Wittrock recognizes in Europe six named forms with the corolla between 6 and 7 mm. long, and he defines the smaller-leaved forms of Europe with leaves as small as in the Alaskan plant, while such an illustration as his t. 6, fig. 7, showing strictly entire leaves is convincing proof that the Alaskan plant is not specifically separated by the "indistinct toothing" of the leaves. Rydberg recognizes his *L. serpyllifolia* as apparently occuring "also . . . on the island of Sachalin." It is elsewhere in eastern Asia (Amur, *Maximowicz*; Kamtchatka, *Kusmischscheff*; Transbaicalia, *Turczaninow;* Irkutsk, *Haupt*; etc.) and it

[1] Piper & Beattie, Fl. N. W. Coast, 338 (1915).
[2] Wittrock, Linnaea borealis L. Species polymorpha et polychroma. Acta Horti Bergiani, iv. no. 7 (1907).

extends thence westward and is quite inseparable from typical *L. borealis* of Europe.

Var. AMERICANA (Forbes) Rehder, RHODORA, vi. 56 (1904) *L. americana* Forbes, Hort. Woburn. 135 (1825). Var. *longiflora*, forma *insularis* Wittrock, Acta Horti Bergiani, iv. no. 7: 173, t. 13, fig. 11 (1907). Var. *longiflora*, forma *orientalis* Wittr. l. c. figs. 7–9, (1907). *L. borealis*, forma *curticalyx* Wittr. l. c. 174 (1907). *L. borealis* forma *minutifolia* Wittr. l. c. t. 13. fig. 14 (1907). *L. borealis*, forma *integerrima* Wittr. l. c. t. 13 fig. 15 (1907).—Western Greenland and Labrador to Alaska, south to southern New England, Long Island, Maryland, West Virginia, Indiana, South Dakota, Colorado, Utah and northern California.

Var. LONGIFLORA Torr. in Wilkes, S. Pacif. Expl. Exped. xvii. 327 (1874). *L. longiflora* (Torr.) Howell, Fl. N. W. Am. 280 (1900). Var. *longiflora*, forma *angustissima* Wittrock, l. c. 173, t. 13, fig. 12 (1907).— Southwestern British Columbia to northern California. —GRAY HERBARIUM.

The date of the September issue (unpublished as this goes to press) will be announced later.

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A PRELIMINARY REPORT ON THE DESMIDS OF CONNECTICUT.[1]

C. J. Hylander.

I. Introduction.

Of the New England States, New Hampshire, Massachusetts, Rhode Island and Maine have had their desmid flora investigated by Bennett, Cushman, Johnson and Harvey. The only published list of Connecticut desmids, however, is the one found in H. W. Conn and L. W. Webster's "Preliminary Report on the Algae of the Fresh Waters of Connecticut (**2**)." Conn and Webster enumerate 109 species and varieties of desmids in their report, but their list is unsatisfactory in that it contains no accurate data and that no localities are given. Since they state in their introduction that the majority of their collections were made from the vicinity of Middletown, I have taken the liberty to list any species found by them, as coming from Middletown.

Except for the above-mentioned report, the only references to Connecticut stations are found in general reports on North American species. In 1894, L. N. Johnson, in his articles on "Some new and rare desmids of the United States" (**5**, **6**), includes several Connecticut localities, most of which are from the vicinity of Bridgeport. Four years later, after Johnson's death, W. & G. S. West worked over some of his material and published their results in a report on "Some desmids of the United States (**7**)"; this includes also some Connecticut localities, all from the vicinity of Bridgeport.

The only other references to Connecticut records are the following: one species of *Penium*, reported for Connecticut by Wolle in his

[1] Contribution from the Osborn Botanical Laboratory.

"Desmids of the United States (**8**)"; several species of *Closterium* in Cushman's "New England species of *Closterium* (**4**)"; two species in his "New England Saccodermae (**3**)"; and two species distributed in the Phycotheca Boreali-Americana of Collins, Holden and Setchell (**1**).

II. The Collecting of the Material.

The material which forms the basis of this report was collected in three types of habitat; in bogs, in swamps, and in ponds and lakes. Thirty-one localities were visited in the course of the collecting, and the yield was found to vary greatly according to the type of habitat. In respect to number of species, it was found that the bogs, three of which were visited, resulted in the least yield—ten to twenty species to each collection. The swamps seemed a slightly more favorable habitat, for of the nine swamps visited, each one resulted in a yield of from fifteen to thirty species. But by far the best habitat seemed to be the swampy margin of the small meadow pond, or the marshy coves of the larger lakes. Here, in the quiescent but clear water, the floating and submerged masses of moss, sphagnum or aquatic plants contained an abundant desmid flora. One small pond at Morris, not over fifteen yards wide, yielded fifty-two different species in abundance; and squeezings from floating masses of *Riccia fluitans* and *Drepanocladus* at Lake Congamond and Lake Quassapaug resulted in a yield of over seventy desmids at each locality. Without exception, sphagnum appeared to be a less favorable habitat than floating masses of moss or grass, or submerged masses of *Myriophyllum* and *Chara*.

All of the counties in Connecticut were visited by the writer except Tolland, Windham and New London. The places of collection were distributed as follows:

Litchfield County: Bethlehem (Longmeadow Pond); Litchfield (*a*, Bantam Lake, and *b*, swamp in the "Pines"); Morris (small pasture pond); Plymouth (ice pond near Waterville); Thomaston (sphagnum swamp); Washington (Lake Waramaug); Watertown (small meadow pond fringed with sphagnum).

Hartford County: Southington (small meadow pond); Suffield (Lake Congamond).

Fairfield County: Monroe (*a*, pond near Stepney, and *b*, swamp at East Village); Newtown (Botsford tamarack bog).

New Haven County: Bethany (quaking bog); Branford (Lake Saltonstall); Guilford (swamp in North Guilford); Hamden (*a*, Lake Whitney, and *b*, swamp at summit of Mt. Carmel); Madison (swamp at North Madison); Middlebury (Lake Quassapaug); New Haven (*a*, Beaver Park bog, and *b*, pools at foot of West Rock); North Branford (*a*, roadside swamp at Totoket, and *b*, Linsley Ponds); Orange (roadside pond); West Haven (*a*, Lake Maltby, and *b*, Maltby Park swamp); Woodbridge (Dawson Falls pond).

Middlesex County: Killingworth (*a*, swampy pond, and *b*, sphagnum swamp).

In the following list of species, the stations are arranged alphabetically by townships. The records are all based on material collected and preserved by the writer, except where otherwise stated. References to Connecticut specimens in the literature are definitely indicated. Citations for the names of species and varieties are given only in those cases where the forms in question are not found in the four published volumes of "A Monograph of the British Desmidiaceae," by W. & G. S. West. The sequence followed is that adopted by these authors in their first volume.

In the preparation of this report, I am very much indebted to the helpful criticism and inspiration of Dr. Alexander W. Evans, under whose direction I commenced and brought to a conclusion this report. I am likewise very much indebted to Dr. Nellie Carter, who during the past year was a research fellow at the laboratory. Her critical knowledge of the group was an invaluable aid to me in identifying the material; without her assistance this report would have been an impossibility.

III. List of the Connecticut Species.

[An asterisk (*) indicates that the plant is new to Connecticut; two asterisks (**) that it is new to North America; and a dagger (†) that it is known only from North America.]

GONATOZYGON De Bary

*G. Brebissonii De Bary. Suffield.

G. pilosum Wolle. Fairfield (*Johnson*, **6**, p. 280; see also **3**, p. 344).

SPIROTAENIA Bréb.

S. condensata Bréb. Bethlehem, Fairfield (*Johnson*, see **7**, p. 280, and also **3**, p. 345), Hamden (*Carter & Evans*), Middlebury, Washington, West Haven.

MESOTAENIUM Näg.

*M. Endlicherianum var. grande Nordst. Orange.

M. micrococcum (Kütz.) Roy & Bissett. Middletown (*Conn*, see **2**, p. 57).

CYLINDROCYSTIS Menegh.

*C. Brebissonii Menegh. Bethany, Killingworth (*a*), Madison, Newtown, West Haven.

NETRIUM Näg.

N. digitus (Ehrenb.) Itzigs. & Rothe. Bethany, Bethlehem, Branford, Bridgeport (*Johnson*, see **3**, p. 349), Cheshire, Hamden (*b*), Killingworth, Middlebury, Middletown (*Conn*, see **2**, p. 58), New Haven (*a*), Orange, Suffield, Thomaston, Washington.

**N. digitus var. constrictum West & G. S. West. New Haven (*b*), West Haven (*a*).

N. interruptum (Bréb.) Lütkem. Middletown (*Conn*, see **2**, p. 58).

PENIUM Bréb.

P. margaritaceum (Ehrenb.) Bréb. Madison, Middletown (*Conn*, see **2**, p. 60), Morris, Orange, Washington. See also Wolle, **10**, p. 35.

P. Navicula Bréb. Bethlehem, Middlebury, Middletown (*Conn*, see **2**, p. 60), Suffield.

P. polymorphum Perty. Bethlehem, Middletown (*Conn*, see **2**, p. 60).

*P. spirostriolatum Barker. Hamden (*b*).

ROYA West & G. S. West

R. obtusa (Bréb.) West & G. S. West. Middletown (*Conn*, see **2**, p. 60).

CLOSTERIUM Nitzsch

*C. abruptum West. Hamden (*b*), West Haven (*a*).

C. acerosum (Schrank) Ehrenb. Middletown (*Conn*, see **2**, p. 60).

C. acuminatum Kütz. Phycol. Germ. 130. 1845. Litchfield, Middletown (*Conn*, see **2**, p. 60).

*C. acutum (Lyngbye) Bréb. Litchfield, Middlebury, Morris, Orange, Southington, Washington, Watertown.

†C. angustatum var. clavatum Hastings, Am. Month. Micr. Jour. **13**: 155. *pl. 1, f. 7.* 1892. Bridgeport (*Johnson*, **6**, p. 291; see also **4**, p. 113).

C. Braunii Reinsch, Algenfl. Frank. 196. *pl. 12, f. 5.* 1867. Bridgeport (*Johnson*, **6**, p. 291, as *C. maculatum*; see also **4**, p. 130), Middletown (*Conn*, see **2**, p. 61, as *C. areolatum*).

C. Brebissonii Delp. Mem. R. Accad. Sci. Torino II. **30**: 111. *pl. 18, f. 20, 21.* 1876. Middletown (*Conn*, see **2**, p. 61).

**C. Ceratium Perty. Litchfield (*a*).

*C. cornu Ehrenb. Hamden (*a*), Branford (*a*), Hamden (*Carter & Evans*), Middlebury, Plymouth, West Haven (*a*).

C. costatum Corda. Hamden (*b*), Middletown (*Conn*, see **2**, p. 60), Morris.

C. Cucumis Ehrenb. Phys. Abh. Preuss. Ak. Wiss. Berlin **1843**: *pl. 4, f. 29.* 1843. Middletown (*Conn*, see **2**, p. 60), Orange.

*C. Cynthia DeNot. Hamden (*b*), Killingworth, Middlebury, Monroe (*b*), Orange, Southington, Suffield.

C. decorum Bréb. Bridgeport and Easton (*Johnson*, see **7**, p. 283, and also **4**, p. 132), Middletown (*Conn*, see **2**, p. 61), New Haven (*b*), Suffield, Washington.

†C. Delpontei Klebs, Schrift. Physik.-Oekonom. Gesell. Königsberg **5**: 22. 1879. Bridgeport and Easton (*Johnson*, see **7**, p. 283), Middletown (*Conn*, see **2**, p. 60).

C. Dianae Ehrenb. Bethany, Bethlehem, Branford, Hamden (*b*), Killingworth, Madison, Middlebury, Middletown (*Conn*, see **2**, p. 61), Newtown, New Haven (*b*), North Branford (*b*), Orange, Suffield.

C. didymotocum Corda. Bridgeport (*Johnson*, **5**, p. 286), Hamden (*a*), Newtown.

*†C. dilatatum West, Trans. Linn. Soc. Bot. II. **5**: 237. *pl. 13, f. 20–22.* 1896. Hamden (*b*), Morris, North Branford (*b*).

*C. Ehrenbergii Menegh. Bethlehem, Litchfield (*b*), Middlebury, New Haven (*b*), North Branford (*b*), Orange, Suffield.

†C. Ehrenbergii var. immane Wolle, Desm. U. S. 48. *pl. 8, f. 17.* 1884. Bridgeport (*Setchell & Holden*, see **1**, No. 1017).

*C. incurvum Bréb. Hamden (*b*), Middlebury, West Haven (*a*).

*C. intermedium Ralfs. Hamden (*b*), Madison, Middlebury, Newtown, Orange, Thomaston.

C. Jenneri Ralfs. Guilford, Hamden (*b*), Middlebury, Middletown (*Conn*, see **2**, p. 61), Newtown, Orange.

**C. Jenneri var. robustum G. S. West. Morris.

*†C. Johnsonii West & G. S. West, Jour. Linn. Soc. Bot. **33**: 284. *pl. 16, f. 1, 2.* 1898. Guilford.

*C. juncidum Ralfs. Bethlehem, Madison, North Branford (*b*).

*C. KUETZINGII Bréb. Litchfield, Middlebury, North Branford (*b*), Orange, Plymouth.

C. LANCEOLATUM Kütz. Middletown (*Conn*, see **2**, p. 60), North Haven.

C. LEIBLEINII Kütz. Bethlehem, Branford, Guilford, Hamden (*b*), Killingworth, Litchfield (*a*), Middlebury, Middletown (*Conn*, see **2**, p. 61), Morris, New Haven (*b*), Newtown, Suffield, Washington, West Haven (*a*).

C. LEIBLEINII var. CURTUM West. Middletown (*Conn*, see **2**, p. 61).

*C. LIBELLULA Focke. Middlebury, Middletown (*Conn*, see **2**, p 60, as *Penium clysterioides*), Orange, Plymouth, Thomaston, West Haven (a).

C. LINEATUM Ehrenb. Middlebury, Middletown (*Conn*, see **2**, p. 61), Morris, New Haven (*b*), North Branford (*a*), Orange.

†C. LINEATUM var. COSTATUM Wolle, Fresh Water Algae U. S. 25. *pl. 61, f. 3.* 1887. Bridgeport (*Johnson*, **5**, p. 286; see also **4**, p. 129).

*C. LITTORALE Gay. Washington.

C. LUNULA (Müll.) Nitzsch. Bethlehem, Bethany, Madison, Middletown (*Conn*, see **2**, p. 60), Morris, West Haven (*a*).

**C. LUNULA var. COLORATUM Klebs. Plymouth.

*C. MACILENTUM Bréb. Newtown, Suffield.

C. MONILIFERUM (Bory) Ehrenb. Litchfield, Middletown (*Conn*, see **2**, p. 61), Middlebury, Monroe (*b*), North Branford (*a* and *b*), New Haven (*a*), Plymouth, Suffield, West Haven (*a*), Washington, Woodbridge.

C. PARVULUM Näg. Bethlehem, Litchfield (*a*), Middlebury, Middletown (*Conn*, see **2**, p. 61), West Haven (*a*).

C. PRAELONGUM Bréb. Middletown (*Conn*, see **2**, p. 61).

*C. PRITCHARDIANUM Arch. Hamden (*b*).

*C. PRONUM Bréb. Middlebury, New Haven (*a*, *b*), Southington, Thomaston.

*C. PSEUDODIANAE Roy. Litchfield (*a*).

C. RALFSII var. HYBRIDUM Rabenh. Bethany, Bridgeport (*Johnson*, see **7**, p. 284, and also **4**, p. 130), Guilford, Middlebury.

*C. REGULARE Bréb. Watertown.

C. ROSTRATUM Ehrenb. Bethlehem, Middletown (*Conn*, see **2**, p. 61), Suffield.

C. ROSTRATUM var. BREVIROSTRATUM West. Middletown (*Conn*, see **2**, p. 61).

*C. SETACEUM Ehrenb. Bethlehem, Middlebury, Orange, Washington.

C. STRIGOSUM Bréb. Middletown (*Conn*, see **2**, p. 60).

*C. STRIOLATUM Ehrenb. Madison, Middlebury, Morris. New Haven (*a*).

C. SUBCOSTATUM Nordst. in Wittr. & Nordst. Alg. Exs. *370*. Middletown (*Conn*, see **2**, p. 61).

*C. TOXON West. Southington.

*C. TUMIDUM Johnson. Hamden (*a*), Monroe (*b*), Southington.

C. TURGIDUM Ehrenb. Middletown (*Conn*, see **2**, p. 60).

*C. ULNA Focke. Orange, Thomaston.

*C. VENUS Kütz. Hamden (*a, b*), Killingworth, Litchfield (*a*), Middlebury, Morris, North Branford (*a*), Orange, Thomaston, Suffield, Washington.

DOCIDIUM Bréb.

*D. UNDULATUM Bailey Middlebury.

D. BACULUM (Bréb.) DeBary. Middlebury, Middletown (*Conn*, see **2**, p. 61).

PLEUROTAENIUM Näg.

*P. CORONATUM (Bréb.) Rabenh. Middlebury, Morris.

P. CORONATUM var. FLUCTUATUM West. Bethlehem, Middletown (*Conn*, see **2**, p. 61, as *P. crenulatum*), Orange.

P. NODOSUM (Bailey) Lund. Middlebury, Middletown (*Conn*, see **2**, p. 61).

*P. TRUNCATUM (Bréb.) Näg. Bethlehem, Middlebury.

P. TRABECULA (Ehrenb.) Näg. Bethlehem, Middlebury, Middletown (*Conn*, see **2**, p. 61), New Haven (*a*), Newtown, North Branford (*b*), Killingworth, Suffield, West Haven (*Evans*), Washington.

TRIPLOCERAS Bailey

†T. GRACILE Bailey. Washington.

†T. VERTICILLATUM Bailey. Middletown (*Conn*, see **2**, p. 61, as *Docidium*.)

TETMEMORUS Ralfs

*T. BREBISSONII (Menegh.) Ralfs. Bethany, Hamden (*Carter & Evans*,) Killingworth, Newtown, West Haven (*a*).

*T. LAEVIS (Kütz.) Ralfs. Bethany.

EUASTRUM Ehrenb.

*E. AFFINE Ralfs. Southington.

E. AMPULLACEUM Ralfs. Middlebury, Middletown (*Conn*, **2**, see p. 62).

E. ANSATUM Ralfs. Middletown (*Conn*, see **2**, p. 63).

*E. BIDENTATUM Näg. Bethlehem, Bethany, Hamden (*a, b*), Killingworth, Litchfield (*a, b*), Madison, Monroe (*b*), Middlebury, Newtown, Plymouth, Suffield, Thomaston, West Haven (*b*).

*E. BINALE (Turp.) Ehrenb. Bethlehem, Bethany, Cheshire, Hamden (*b*), Monroe (*a*), Middlebury, Newtown, New Haven (*a*), Southington, Suffield, Thomaston, Watertown.

**E. BINALE f. GUTWINSKII Schmidle. Madison.

*E. DIDELTA (Turp.) Ralfs. Plymouth, West Haven (*a*).

E. ELEGANS (Bréb.) Kütz. Middletown (*Conn*, see **2**, p. 62).

†E. EVOLUTUM var. INTEGRIUS West & G. S. West, Trans. Linn. Soc. Bot. II. **5**: 244. *pl. 14, f. 23–25*. 1896. Bridgeport (*Johnson*, see **7**, p. 293), Middlebury.

E. GEMMATUM Ralfs. Bridgeport (*Johnson*, **5**, p. 286; see also **7**, p. 289).

E. INSULARE (Wittr.) Roy. Bridgeport (*Johnson*, **5**, p. 286, as *E. binale* var. *insulare*), Suffield.

†E. INTEGRUM Wolle, Fresh Water Algae U. S. 36. *pl. 27, f. 18–22*. 1887. Middletown (*Conn*, see **2**, p. 62), Morris.

†E. NORDSTEDTIANUM Wolle, Bull. Torrey Club **11**: 16. 1884. Middletown (*Conn*, see **2**, p. 62).

E. OBLONGUM (Grev.) Ralfs. Bethany, Guilford, Madison Middlebury, Middletown (*Conn*, see **2**, p. 62), Morris, Monroe (*a*), Newtown, West Haven (*a*).

**E. PICTUM Borg. Killingworth (*a*).

E. PINNATUM Ralfs. Bridgeport (*Johnson*, **5**, p. 287).

**E. PULCHELLUM Bréb. Morris.

*E. SIBIRICUM Boldt. Middlebury.

E. VERRUCOSUM Ehrenb. Branford, Middlebury, Middletown (*Conn*, see **2**, p. 62), Morris, Suffield, West Haven (*a, b*).

MICRASTERIAS Ag.

M. AMERICANA (Ehrenb.) Ralfs. Middletown (*Conn*, see **2**, p. 63), Morris, Newtown, Plymouth, Suffield, West Haven (*a, b*).

*M. AMERICANA var. LEWISIANA West. Monroe (*a*).

**M. AMERICANA var. BOLDTII Gutw. Newtown.

M. APICULATA (Ehrenb.) Menegh. West Haven (*a, Carter & Evans*), Middletown (*Conn*, see **2**, p. 63).

*M. CRENATA Bréb. New Haven (*a*), Newtown.

M. CRUX-MELITENSIS (Ehrenb.) Hass. Litchfield (*b*), Middletown (*Conn*, see **2**, p. 63), Washington.

*M. DENTICULATA Bréb. Bethlehem, New Haven (*a*), Washington.

*M. LATICEPS Nordst. Vidensk. Medd. Fören. Kjöbenhavn **14**:290. *pl. 2, f. 14.* 1870. Bethlehem, Middlebury, Suffield, Washington, West Haven (*a*).

M. MURICATA (Bailey) Ralfs. Middlebury, Middletown (*Conn*, see **2**, p. 63).

*M. PAPILLIFERA Bréb. Bethlehem, Middlebury.

**M. PAPILLIFERA var. GLABRA Nordst. Bethlehem, Madison.

M. RADIATA Hass. Bethlehem, Middlebury, Middletown (*Conn*, see **2**, p. 63, as *M. furcata*), Morris, Washington.

M. ROTATA (Grev.) Ralfs. Bethany, Litchfield (*b*), Madison, Middletown (*Conn*, see **2**, p. 63), Suffield, West Haven (*a*).

M. SOL (Ehrenb.) Kütz. Hamden (*b*), Middlebury, Middletown (*Conn*, see **2**, p. 63), Orange, Plymouth, Suffield, Washington, West Haven (*b*).

*†M. SPECIOSA Wolle, Desm. U. S. 119. *pl. 45, f. 1, 2.* 1884. Bethlehem.

M. TRUNCATA (Corda) Bréb. Hamden (*Evans*), Killingworth, Middletown (*Conn*, see **2**, p. 63), New Haven (*a*).

COSMARIUM Corda

*C. AMOENUM Bréb. Bethany, Middlebury, Newtown.

*C. BIOCULATUM Bréb. Bethlehem, Middlebury, Morris, Orange, Plymouth, Suffield.

*C. BIRETUM Bréb. Guilford, Madison, Monroe (*a*).

C. BOECKII Wittr. Bridgeport (*Johnson*, **5**, p. 287).

C. BOTRYTIS Menegh. Hamden (*b*), Middletown (*Conn*, see **2**, p. 64), North Branford (*a*), Washington, West Haven (*a*).

C. BROOMEI Thwaites. Middletown (*Conn*, see **2**, p. 64), Suffield, West Haven (*a*).

*C. CAELATUM Ralfs. West Haven (*a*), Woodbridge.

*C. CIRCULARE Reinsch. Middlebury.

*C. CONSPERSUM Ralfs. Morris, West Haven (*b*).

C. CONTRACTUM Kirch. Killingworth, Middletown (*Conn*, see **2**, p. 64).

**C. CORBULA Bréb. Suffield.

C. CRENATUM Ralfs. Middletown (*Conn*, see **2**, p. 64).

*C. CUCUMIS Corda. Middlebury, Newtown, Suffield, Watertown.

C. CUCURBITA Bréb. Bethany, Middletown (*Conn*, see **2**, p. 64).

†C. DENTATUM Wolle, Desm. U. S. 76. *pl. 13, f. 15.* 1884. Bridgeport (*Johnson*, see **7**, p. 308), Middlebury.

*C. DEPRESSUM (Näg.) Lund. Bethlehem, Middlebury, Suffield.

**C. EXIGUUM var. SUBRECTANGULUM West & G. S. West. Thomaston.

C. GALERITUM Nordst. Middletown (*Conn*, see **2**, p. 64), Washington, West Haven (*a*).

C. GRANATUM Bréb. Branford, Middletown (*Conn*, see **2**, p. 64), Morris.

*C. HAMMERI Reinsch. Middlebury, Suffield, Washington.

C. INTERMEDIUM Delp. Middletown (*Conn*, see **2**, p. 64).

*C. LAEVE Rabenh. Morris.

**C. LATIFRONS Lund. Madison.

C. MENEGHINII Bréb. Bethlehem, Killingworth, Middletown (*Conn*, see **2**, p. 64), Suffield, West Haven (*b*), Woodbridge.

†C. MODESTUM West & G. S. West, Jour. Linn. Soc. Bot. **33**: 304. *pl. 17, f. 12.* 1897. Plymouth.

*C. MONILIFORME Ralfs. Washington.

*C. MONILIFORME var. PANDURIFORME Heimerl. Middlebury, Morris, Orange, Suffield, Washington.

C. NAEGELIANUM Bréb. Middletown (*Conn*, see **2**, p. 64).

C. OCTHODES Nordst. Litchfield (*a*), Madison, Middletown (*Conn*, see **2**, p. 64), North Branford (*b*), New Haven (*b*), Suffield, West Haven (*a*).

C. ORBICULATUM Ralfs. Middletown (*Conn*, see **2**, p. 64).

C. ORNATUM Ralfs. Bethlehem, Cheshire, Middlebury, Middletown (*Conn*, see **2**, p. 64), Morris, New Haven (*b*), Thomaston.

*C. ORTHOSTICHUM Lund. Middlebury, New Haven (*b*), Southington.

C. OVALE Ralfs. Bethlehem, Middletown (*Conn*, see **2**, p. 64).

*C. PACHYDERMUM Lund. Branford, Hamden (*b*), Middlebury, Monroe (*b*), Washington, West Haven (*a*).

C. PERFORATUM Lund. Middletown (*Conn*, see **2**, p. 64).

C. PORTIANUM Arch. Middlebury, Middletown (*Conn*, see **2**, p. 64), Morris, Suffield, Washington, West Haven (*b*).

*C. PROTRACTUM (Näg.) Arch. Madison.

C. PSEUDOBROOMEI Wolle. Middletown (*Conn*, see **2**, p. 64).

*C. PSEUDOCONNATUM Nordst. Bethlehem, Killingworth, Middlebury, Washington, West Haven (*a*).

*C. PSEUDOPYRAMIDATUM Lund. Bethany, Madison, West Haven (*a*).

*C. PUNCTULATUM Bréb. Bethlehem, Killingworth, Litchfield (*a*), Madison, Middlebury, Morris, New Haven (*b*), Plymouth, Washington.

*C. PYGMAEUM Arch. Bethlehem, Middlebury, Morris, Plymouth, Suffield, Watertown, West Haven (*b*).

C. PYGMAEUM var. SCHLEIPHACKIANUM West & G. S. West. Bridgeport (*Johnson*, see **7**, p. 302).

C. PYRAMIDATUM Bréb. Bethany, Killingworth (*b*), Madison, Middlebury, Middletown (*Conn*, see **2**, p. 64), New Haven (*a*), Thomaston.

*C. QUADRATUM f. WILLEI West & G. S. West. Bethany, Hamden (*b*), Watertown, West Haven (*a*).

*C. QUADRUM Lund. Hamden (*b*), West Haven (*a*).

*C. RENIFORME Ralfs. Middlebury.

**C. REPANDUM f. MINOR West & G. S. West. Hamden (*b*).

*C. SPECIOSUM Lund. Hamden (*b*), Washington.

C. SINOSTEGOS Schaarschm. Bridgeport (*Johnson*, **6**, p. 294).

*C. SPHALEROSTICHUM Nordst. Watertown.

**C. SUBCUCUMIS Schmidle. Bethlehem, Hamden (*Carter & Evans*)

*C. SUBDEPRESSUM (Näg.) Lund. Suffield.

†C. SUBORBICULARE Wood, Smithson. Contr. Knowl. **241**: 129. *pl. 21, f. 9.* 1872. Middlebury, Middletown (*Conn*, see **2**, p. 64).

*C. SUBTUMIDUM Nordst. Killingworth.

C. SULCATUM Nordst. Bridgeport (*Johnson*, **5**, p. 287).

C. TETRAOPHTHALMUM (Kütz.) Bréb. Middletown (*Conn*, see **2**, p. 64).

*C. THWAITESII Ralfs. Bethany.

*C. TRILOBULATUM Reinsch. Middlebury.

†C. TRIPLICATUM Wolle, Bull. Torrey Club **10:** 16. *pl. 27, f. 8.* 1883. Bridgeport (*Johnson*, **5**, p. 288), Middlebury, Morris, Suffield.

C. TUMIDUM Lund. Middletown (*Conn*, see **2**, p. 64).

*C. TURPINII Bréb. Hamden (*Carter & Evans*).

C. UNDULATUM Corda. Middlebury, Middletown (*Conn*, see **2**, p. 64), Monroe (*a*), Morris, New Haven (*b*), Orange, Southington, Suffield, Thomaston, Washington, Watertown, West Haven (*a, b*).

**C. UNDULATUM var. MINUTUM Wittr. Washington, West Haven (*a*).

*C. UNDULATUM var. WOLLEI West. West Haven (*a*).

*C. VIRIDE (Corda) Josh. Bethany, Hamden (*Carter & Evans*), New Haven (*a*), West Haven (*a*).

XANTHIDIUM Ehrenb.

X. ASEPTUM Nordst. Middletown (*Conn*, see **2**, p. 64).

X. ANTILOPAEUM (Bréb.) Kütz. Bethany, Guilford, Middletown (*Conn*, see **2**, p. 64), Morris, Plymouth, Suffield, West Haven (*a*, *b*).

**X. ANTILOPAEUM var. HEBRIDARIUM West & G. S. West. Morris.

*X. ANTILOPAEUM var. POLYMAZUM Nordst. Bethlehem, Middlebury, Morris, Suffield, Washington.

*†X. ANTILOPAEUM var. MINNEAPOLIENSE Wolle, Desm. U. S. 94. *pl. 52, f. 16.* 1884. Bethlehem, Middlebury, Morris, West Haven (*b*).

X. CRISTATUM Bréb. Hamden (*b*), Killingworth, Middlebury, Middletown (*Conn*, see **2**, p. 64).

*X. CRISTATUM var. UNCINATUM Bréb. Hamden (*b*), West Haven (*b*).

X. FASCICULATUM Ehrenb. Madison, Middletown (*Conn*, see **2**, p. 64).

†X. JOHNSONII West & G. S. West, Jour. Linn. Soc. Bot. **33**: 299. *pl. 17, f. 1.* 1897. Bridgeport (*Johnson*, see **7**, p. 299).

**X. SUBHASTIFERUM var. MURRAYI West & G. S. West. Monroe (*a*).

*†X. TYLERIANUM West, Jour. Roy. Micr. Soc. **17**: 19. *pl. 2, f. 1-4, pl. 3, f. 14.* 1889. Monroe (*a*), Suffield.

ARTHRODESMUS Ehrenb.

A. CONVERGENS Ehrenb. Killingworth, Middlebury, Middletown (*Conn*, see **2**, p. 63), Morris, New Haven (*b*), Suffield, Watertown, West Haven (*b*).

*A. INCUS var. RALFSII West & G. S. West. Hamden (*Carter & Evans*), Litchfield (*a*), Middlebury, Orange, Southington, Suffield, Thomaston, West Haven (*b*).

A. OCTOCORNIS Ehrenb. Middlebury, Middletown (*Conn*, see **2**, p. 63), Plymouth, Suffield, Washington.

*A. TRIANGULARIS Lagerh. Plymouth, Suffield.

(*To be continued*)

PRESERVING INDIAN PIPES WITHOUT DISCOLORATION.

N. M. Grier.

It will be recalled that with the usual procedure *Monotropa* turns black when pressed or preserved in alcohol or formalin. While engaged at the Biological Laboratory, Cold Spring Harbor, New York, during the past summer, the writer developed methods of preservation of these plants which to the present time have yielded very satisfactory results. The success of certain of the following methods is largely due to the suggestions of Dr. Oscar Riddle of the Carnegie Institution of Washington.

The post mortem blackening occurring in these plants is, according to the best authorities, due to the action of an oxidase upon the protein resulting in the formation of melanin pigment. With this in mind, the steps in the methods now given will be better understood.

Specimens should be well washed in cold water, and punctured at intervals along the stem and inflorescence with a fine needle. They should then be just immersed in boiling water and removed immediarely, as a lengthened period of immersion results in a blackening not removed by subsequent chemical treatment. The specimens are then placed in any one of the following solutions for permanent preservation without discoloration.

1. Carnoy's fixing fluid, made up on the basis of 95% alcohol rather than absolute. Punctured specimens, preserved without boiling in this solution, remained an excellent color. This fluid gave better results than any other used.

2. 95% alcohol, to which has been added 10% by volume of concentrated hydrochloric acid. In a few days, such a solution acquires a beautiful ruby hue from the pigment it has dissolved and precipitated. It should then be changed, lest the specimens acquire such coloration. Two or three changes of this fluid at intervals are sufficient. The specimen may then be kept in the final change, although the acid may be dispensed with. If punctured specimens with or without the boiling treatment are kept in 95% alcohol alone, an equally beautiful blue pigment is dissolved and precipitated. The reaction of the pigment to these chemicals resembles that of hematoxylin to acids and alkalies.

3. Hydrogen peroxide solution, full strength, for one week to ten days. At the end of this period, specimens apparently preserve well in alcohol or formalin.

4. A solution composed of 40 parts of distilled water, 2 parts of zinc chloride, 1 part formaldehyde, and 1 part of glycerine. This solution and modifications of it are much used by pomologists to preserve fruits in their natural aspect of form and color. With the formula used as stated, it yielded rather inferior results, although discoloration did not occur.

While immersion in boiling water before placing in preserving fluids gives the best results with all these fluids, less perfect specimens may be obtained by omitting that phase of the treatment. The methods outlined will not remove any blackening which has occurred before they are applied. Specimens treated as described above press to a very pale brown color.

WASHINGTON AND JEFFERSON COLLEGE, Washington, Pennsylvania.

SENECIO OBOVATUS, VAR. ELONGATUS IN CONNECTICUT.—This variety, apparently not hitherto reported from New England, occurs in considerable abundance at a station in Guilford, Conn. It grows more or less mingled with the typical rayed form of the species, both in dense patches from four to ten feet in diameter, and as scattered individuals, in a woodland pasture of thirty acres or more. A part of the ground is a steep, dry, trap hillside: here the rayless plants predominate and are rather small, having a starved appearance. Were it not for the occurrence of vigorous patches in another, moister, part of the lot, where the non-radiate plants fully equal the radiate in size, I should think the rayless ones were merely ill-nourished forms. Some of the patches are almost entirely rayless, while others have nearly all the plants rayed. The long peduncles, however, are a very distinctive feature of the rayless form. I think the rayless plants larger and more abundant this year than last.—GEORGE H. BARTLETT, Guilford, Connecticut.

The annual FIELD MEETING OF THE VERMONT BOTANICAL CLUB was held at Montgomery Center, July 10 to 13, in conjunction with the Vermont Bird Club. There was an attendance of about thirty.

There has been a question pending for a year of merging the two Clubs into one actually as they have been pcratically for some time. It was, however, definitely settled at this meeting that they shall be kept separate, and thus the Botanical Club keeps its individuality and the name that has grown to mean so much to New England botanists.

Last winter's meeting having been given up, several papers were presented at this time, eight new members were voted in and the following officers elected: President, Dr. Ezra Brainerd of Middlebury; Vice-President, Harold G. Rugg of Hanover, New Hampshire; Secretary-Treasurer, Mrs. Nellie F. Flynn of Burlington; Librarian, Lewis H. Flint of Burlington; and Editor of Bulletin, George L. Kirk of Rutland.

Mrs. Davenport and Prof. Burns voiced for the Club their very enthusiastic appreciation of the time and labor expended and the expert mastery of his subject shown by Dr. Ezra Brainerd in his work "The Violets of North America" and its free distribution by the Agricultural Department of the University of Vermont.

Three field excursions were successfully carried out. One of these was to the asbestos mine on Belvidere Mountain in Eden to see the station for *Adiantum pedatum* var. *aleuticum*. This is the first in the eastern States for this northern fern. It was discovered by Mrs. L. Frances Jolly of Berkshire, Vermont. Her first collection of the plant was at the foot of Orford Mountain in Canada not far from the Vermont line. Material from this station was identified by Prof. Fernald. On being urged to find it in Vermont Mrs. Jolly went to Belvidere Mountain as it was in the same range and composed of the same kind of rock. Here she found it growing fully exposed in the crevices of the asbestos.

One trip was to Hazen's Notch where *Saxifraga Aizoon* grows, and a third to a station for the plant which has passed as *Polypodium vulgare* var. *cambricum* but which Prof. Fernald now calls *P. virginianum*, forma *bipinnatifidum*.

The field meeting of 1923 will be held at Bread Loaf Inn in Ripton and at Middlebury. The date will probably be June 29 to July 4 or 5.

The field meeting of 1921 was held at Willoughby Lake with an attendance of about thirty and lasted three days. The many notable orchids, alpine and bog plants of that fruitful region were all seen, but they are so well known to botanists in general that it seems unnecessary to enumerate them here.—Mrs. Nellie F. Flynn, Burlington, Vermont.

Vaccinium atrococcum, forma leucococcum—A Correction. —Through a typographical error in Rhodora xxiv. 156, 1922, line 3, the word **leucococcum** was printed **leucoccum**. The new combination, being founded upon the earlier *Vaccinium corymbosum* var. *atrococcum* forma *leucococcum*, Rhodora iii. 264–265, 1901, must, of course, read **Vaccinium atrococcum** (Gray) Heller, forma **leucococcum.**—Walter Deane, Cambridge, Massachusetts.

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Vol. 24, no. 283, including pages 125 to 144, was issued 6 September, 1922.
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THE NORTHERN VARIETY OF ASPERELLA HYSTRIX.

M. L. Fernald.

The unique Bottle-brush Grass, *Asperella Hystrix* (L.) Humb. (*Hystrix patula* Moench)[1] has two pronounced variations which were detected by that prince of early New England systematists, Jacob Bigelow, but which apparently have not been differentiated by others during the succeeding century. In 1824 Bigelow, after describing *Elymus Hystrix* L., said:

"We have two varieties.

Three or four feet high, sheaths smooth, spikelets about twenty, pubescent.

One or two feet high, sheaths rough, spikelets about ten, glabrous."[2]

Examination of all available material shows that while the stature, degree of pubescence of the sheaths and number of the spikelets are inconstant, the plant with pubescent spikelets is a well defined northern variety which should be set off from the typical southern plant with glabrous spikelets. All material in the Gray Herbarium from the southern half of the range of the species—Oklahoma, Missouri, Illinois, Indiana, Kentucky, North Carolina, West Virginia, District of Columbia, Maryland, Delaware and Pennsylvania—has strictly glabrous lemmas; much material from the northern half of the range—Nova Scotia, Quebec, Ontario, New England, New York, northern Ohio, Michigan and Wisconsin—has densely pilose lemmas. In New

[1] For discussion of the nomenclature of this plant see Hubbard, Rhodora, xiv. 187 (1912).

[2] Bigel. Fl. Bost. ed. 2, 47 (1824).

England and New York the typical plant with glabrous spikelets also occurs but it is noteworthy that, as shown by the very detailed representation in the herbarium of the New England Botanical Club, they are not often found together; the plant with glabrous spikelets occurring in the southern counties or in areas well known for their southern floras—for instance, the alluvial terraces of the Kennebec in Maine or Oak Island in eastern Massachusetts; the plant with pilose spikelets selecting the cooler stations: rocky talus of mountains and hills such as Day Mountain in Franklin County, Maine, Devil's Slide, Stark, New Hampshire, Willoughby Notch and Williamstown Gulf, Vermont, and Horn Pond Hill and Lee's Cliff in eastern Massachusetts.

Although Linnaeus did not indicate whether or not his *Elymus Hystrix* has glabrous or pubescent spikelets, the fact that it came from Virginia (*Clayton*) is reasonable evidence that its spikelets were glabrous and from the contrast of range and habitat above indicated it is clear that the northern variety with pilose spikelets should be separated as

ASPERELLA HYSTRIX (L.) Humb., var. **Bigeloviana**, n. var., spiculis pilosis.—Nova Scotia and Quebec to Wisconsin. The following are characteristic specimens. NOVA SCOTIA: alluvial woods along Five-mile River, Hants Co., July 19, 1920, *Pease & Long*, no. 20,116. QUEBEC: woods, near Cookshire, August 4, 1914, *T. W. Edmondson*, no. 5326. MAINE: rocky woods, Day Mt., Franklin Co., August 1, 1903, *Knowlton;* Hanover, July, 1888, *Parlin*. NEW HAMPSHIRE: alluvial woods by Mohawk River, Colebrook, September 5, 1917, *Fernald & Pease*, no. 17,454; moist woods by Israel River, Lancaster, August 1, 1910, *Pease*, no. 12,785; thin woods by the Connecticut River, Hanover, July 13, 1910, *Williams* (TYPE in Gray Herb.); Walpole, July 16, 1903, *Blanchard*, no. 51. VERMONT: Willoughby Notch, July 23, 1894, *Williams*, July 31, 1894, *Kennedy;* river thicket, Montpelier, August 18, 1915, *Knowlton;* rocky woods, Williamstown, July 15, 1918, *Knowlton*. MASSACHUSETTS: Malden Waterfall, July 15, 1866, *Wm. Boott;* hill near Spot Pond, Middlesex Co., July 11, 1853, *Boott;* rocky woods at the cascade, Melrose, July 29, 1888, *Rich;* rocky woods, Horn Pond Mountain, Woburn, July 8, 1908, *Pease*, no. 11, 356; Lee's Cliff, Concord, July 6, 1859, *H. D. Thoreau;* Muddy Pond Woods, Boston, July 24, 1874, *Faxon;* border of Purgatory, Sherborn, August 15, 1911, *M. L. Loomis*, no. 529; alluvial woods, Greenfield, July 22, 1913, *Murdoch*, no. 5211; rocky banks of Westfield River, West Chesterfield, August 22, 1912, *Robinson*, no. 732. RHODE ISLAND: station not stated, *Thurber*. CONNECTICUT: New Haven, July 12, 1879, *J. A. Allen*. NEW YORK: open alluvial and marshy

flats south of Fall Creek, Ithaca, July 9, 1913, *Palmer*, no. 173; Taughannock Ravine, Ulysses, June 27, 1916, *Metcalf*, no. 5878. ONTARIO: St. Thomas, July 3, 1898, *G. L. Fisher*. OHIO: Rocky River, July 13, 1896, *Greenman*, no. 3200. MICHIGAN: border of Burt Lake, Cheboygan Co., July 28, 1917, *Ehlers*, no. 557; damp low woods, Ann Arbor, June 29, 1838, *Houghton*. WISCONSIN: River Falls, August, 1903, *Powell*.

As stated, all the material examined from south of the above area is typical *A. Hystrix* with glabrous spikelets. It may be of service to others to have a record of the more northern stations for the plant with glabrous spikelets, as follows; and it will be noted that in every case these stations are different from those of var. *Bigeloviana* and decidedly more numerous in southern New England.

MAINE: wooded brooksides and gulleys in clay terraces of the Kennebec, Sidney, *Fernald & Long*, no. 12,749; Pittston, *Reynolds*. NEW HAMPSHIRE: sandy river-terraces of the Pemigewasset, Plymouth, *Fernald*, no. 11,569. VERMONT: dry woods, Shoreham, *Cushman*, no. 6269; ledgy woods, East Jamaica, *Wheeler;* Brattleboro, *Churchill;* Manchester, *Day*, no. 273. MASSACHUSETTS: Essex, *Eaton;* moist woods, West Boxford, *Horner;* Georgetown, *Horner;* rocky woods, Waltham, *Pease*, no. 11,388; rich woods, Oak Island, *Young et al.;* rocky woods, Brookline, *Forbes*; rock, Wellesley, *Wiegand;* Needham, *Fuller;* Dover, *Fuller;* woods near the Mountain House, Mt. Wachusett, *Collins;* rocky wooded hillside, Middlefield, *Fernald & Long*, no. 8825; Stockbridge, *Hoffmann;* wet woods, Sheffield, *Churchill*. CONNECTICUT: West Hartford, *Driggs;* not rare in shade, Southington, *Andrews;* Roaring Brook, *Eaton;* Norwich, *Rogers;* rocky woods, Danbury, *Harger*. NEW YORK: Canton, *Phelps;* western N. Y., *Gray*, N. A. Gram. Cyp., no. 130; dry woods, Ithaca, *Metcalf*, no. 5876. ONTARIO: Battersea, *Fowler*.

GRAY HERBARIUM.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT,—XXXVII.

DIAPENSIACEAE.

GALAX.

G. APHYLLA L. Two clumps in oak woods, Swampscott (*Miss M. E. Ward*, Dec. 5, 1918. See RHODORA xxi. 24, 1919). Specimen in herb. N. E. Botanical Club.

PLUMBAGINACEAE.

LIMONIUM.

L. trichogonum Blake. (*L. carolinianum* of Gray's Manual, 7th edition. See Blake, RHODORA xviii. 61–62, 1916.) Salt marshes, common from Salisbury to Duxbury.

PRIMULACEAE.

ANAGALLIS.

A. ARVENSIS L. Sandy soil near the seashore, sometimes in gardens; rather common.

GLAUX.

G. maritima L. Salt marshes and sandy places close to the sea, rare; Ipswich, Rockport, Somerville, Medford.

G. maritima L., var. **obtusifolia** Fernald. Salt marshes, occasional north of Boston.

HOTTONIA.

H. inflata Ell. Ditches and shallow stagnant water; frequent near the coast.

LYSIMACHIA.

L. NUMMULARIA L. Dooryards and moist places, a frequent escape.

× **L. producta** (Gray) Fernald. Open woods and wet sandy places; Georgetown, Westford, Revere, Wellesley, Holbrook, Halifax.

[L. PUNCTATA L. Whitman and Brockton Heights, according to Arthur Clark, RHODORA iii. 201, 1901.]

L. quadrifolia L. Dry open woods and hillsides, very common throughout.

L. terrestris (L.) BSP. Swamps and low ground, common throughout.

L. thyrsiflora L. Swamps; frequent in Essex, eastern Middlesex and northern Norfolk counties; no reports from northwestern, southwestern or southeastern towns.

L. VULGARIS L. Persistent in old gardens and sometimes escaping

PRIMULA.

P. VERIS Willd. Braintree (*W. H. Manning*, May 8, 1886; *L. L. Dame*, 1887). Specimens in herb. N. E. Botanical Club.

SAMOLUS.

S. floribundus HBK. Brackish marshes and meadows near the sea; occasional in Essex county, rare elsewhere.

STEIRONEMA.

S. ciliatum (L.) Raf. Moist rich soil, occasional north of Boston; Hingham, according to Bouvé, Botany of Hingham, in History of Hingham I, Part 1, 1893.

S. lanceolatum (Walt.) Gray. Meadows and pastures; frequent throughout, except along the South Shore below Weymouth.

TRIENTALIS.

T. borealis Raf. (*T. americana* (Pers.) Pursh. See Blanchard, RHODORA xi. 236, 1909.) Woods in acid soil, common.

EBENACEAE.

DIOSPYROS.

D. VIRGINIANA L. Old pasture, Waltham (*G. E. Morris*, Dec. 1, 1915.) Specimens in herb. N. E. Botanical Club.

OLEACEAE.

FRAXINUS.

F. americana L. Woods, common throughout.

F. americana L., forma **iodocarpa** Fernald. See RHODORA xiv. 192, 1912. Winchester, two stations; Sherborn; probably elsewhere.

F. nigra Marsh. Wet woods and swamps, frequent.

F. pennsylvanica Marsh. Riverbanks, especially along the Merrimac, and other moist places; rare or absent in southern towns.

LIGUSTRUM.

L. VULGARE L. Thickets, rocky woods and pastures; frequent, especially near Boston.

SYRINGA.

S. PERSICA L. Persistent by roadside near old garden, Sudbury (*A. H. Moore*, May 28, 1905). Specimens in Gray Herb. and herb. N. E. Botanical Club.

S. VULGARIS L. Persistent and spreading throughout.

GENTIANACEAE.

BARTONIA.

B. paniculata (Michx.) Robinson. Swampy places in Blue Hill Reservation and vicinity, rare.

B. virginica (L.) BSP. Meadows and wet places; frequent, but unevenly distributed. Collected in Boston in 1830 by Francis Boott.

[*Centaurium umbellatum* Gilib. One station at Concord, 1890, not persistent, reported by A. W. Hosmer as *Erythraea Centaurium* Pers. in RHODORA i. 224, 1899.]

GENTIANA.

G. Andrewsii Griseb. Moist soil, occasional, but no reports from southeastern towns.

G. clausa Raf. See Fernald, RHODORA xix. 147-149, 1917. Occasional from Winchester, Concord and Sherborn north.

G. crinita Froel. Fields and meadows, well distributed throughout but becoming rare. Pink and white forms are occasional.

MENYANTHES.

M. trifoliata L. Peat-bogs and swamps; frequent from Hingham and Needham north.

NYMPHOIDES.

N. aquaticum (Walt.) Fernald. Small pond, Wellesley (*K. M. Wiegand*, Aug. 28, 1912). Specimen in herb. Wellesley College.

N. lacunosum (Vent.) Fernald. Quiet water, frequent.

SABATIA.

S. ANGULARIS (L.) Pursh. Moist sandy loam in mowing field, Salisbury (*Eben True*, Sept. 22, 1885). Specimen in herb. Peabody Acad. Sci. under the name of *S. stellaris* Pursh. See Fernald, RHO-

DORA xviii. 147, 1916. There is no specimen to verify the report of *S. stellaris* at Amesbury (*J. H. Sears*, RHODORA x. 43, 1908) but it is probably this plant also.

S. campanulata (L.) Torr. (*S. gracilis* (Michx.) Salisb. See Fernald, RHODORA xviii. 145, 1916.) Pembroke (*W. L. Foster*, Sept. 10, 1884). Specimen in Gray Herb. In RHODORA i. 224, 1899, A. W. Hosmer records this as found at one station in Concord, 1897. This record is doubtful, for no specimen exists. The plant may have been introduced by Minot Pratt, whose work in introducing plants can be read in RHODORA i. 168, 1899.

S. Kennedyana Fernald. See RHODORA xviii. 150, 1916. (*S. dodecandra* of Gray's Manual, as to Massachusetts plant.) Great Pond, S. Weymouth (*G. E. Davenport*, Sept. 10, 1874 et al. to date); border of pond near shore, Scituate (*F. F. Forbes*, Sept. 20, 1914); Halifax, swamp by pond (*C. H. Knowlton, H. A. Purdie & W. P. Rich*, July 15, 1906).

S. Kennedyana Fernald, forma **candida** Fernald. See RHODORA xviii. 151, 1916. Weymouth (*Miss Underwood*, Aug. 8, 1905). Specimens in Gray Herb. See Dame & Collins, Fl. Middlesex Co., 80, 1888, under *S. chloroides*.

APOCYNACEAE.

AMSONIA.

A. TABERNAEMONTANA Walt. Back Bay waste lands, Boston (*E. F. Williams*, Aug. 12, 1903). Specimens in Gray Herb. See Rich, RHODORA x. 151, 1908.

APOCYNUM.

A. androsaemifolium L. Dry soil, common.

A. cannabinum L. Wet sandy shores of streams and ponds, occasional.

A. medium Greene. Gravelly soil; Milton, Dorchester, Sharon, Needham, Wellesley, Natick, Framingham.

VINCA.

V. MINOR L. Reported only from old Houghton place, Blue Hill Reservation (*E. F. Williams*, April 20, 1902). Doubtless escaped in many other places.

ASCLEPIADACEAE.

ASCLEPIAS.

A. amplexicaulis Sm. Dry sandy soil; well distributed from Dunstable to Duxbury, but seldom abundant.

A. incarnata L., var. **pulchra** (Ehrh.) Pers. Low grounds and margins of ponds, common.

A. phytolaccoides Pursh. Open woods and dry places; well distributed but not abundant.

A. purpurascens L. Dry open ground; apparently frequent from Braintree and the Blue Hills northward.

A. quadrifolia Jacq. Dry open woods; frequent from Hingham and the Blue Hills northward.

A. syriaca L. Dry fields and roadsides, common throughout.

A. syriaca L., forma **inermis** Churchill. Prospect Hill, Waltham (*W. Deane*, Aug. 13, 1910); Dedham (*S. Harris*, Sept. 27, 1896). See RHODORA xx. 206–7, 1918.

A. tuberosa L. Dry sandy soil, rare; Haverhill, Danvers, Beverly, Westford, Bedford, Medfield; Hingham, according to Bouvé, Botany of Hingham, in History of Hingham, I, Part 1, 1893.

A. verticillata L. Dry rocky soil and exposed ledges, rare, at 14 stations, all within 15 miles of Boston.

CYNANCHUM.

C. NIGRUM (L.) Pers. Escaped from cultivation at Newburyport, Medford, Cambridge, Watertown and Brighton.

C. H. KNOWLTON, WALTER DEANE } *Committee on Local Flora*

A PRELIMINARY REPORT ON THE DESMIDS OF CONNECTICUT.

C. J. HYLANDER.

(*Continued from page 224.*)

STAURASTRUM Meyen

**S. ACICULIFERUM (Borge) West. Hamden (*Carter*).

S. ARCTISCON (Ehrenb.) Lund. Nova Acta Reg. Soc. Sci. Upsala

III. **8**: 70. *pl. 4, f. 8*. 1871. Bethlehem, Bridgeport (*Johnson*, see **7**, p. 319), Middletown (*Conn*, see **2**, p. 62), Morris.

†S. ASPINOSUM Wolle, Desm. U. S. 143. *pl. 51, f. 22, 23*. 1884. Bridgeport (*Johnson*, **5**, p. 288).

*S. AVICULA Bréb. in Ralfs, Brit. Desm. 140. *pl. 23, f. 11*. 1848. Litchfield (*a*), Morris, Suffield, Washington, West Haven (*b*).

†S. BICORONATUM Johnson, Bull. Torrey Club **21**: 290. *pl. 211, f. 9*. 1894. Bridgeport (*Johnson*, **5**, p. 290).

*S. BIENNIANUM var. ELLIPTICUM Wille, Öfvers. K. Vet.-Akad. Förh. **5**: 50. *pl. 13, f. 49*. 1879. Guilford, Killingworth, West Haven (*a*).

*S. BREBISSONII Arch. in Pritchard, Infus. 739. 1861. Litchfield (*a*), Plymouth, Suffield, Washington, West Haven (*b*).

S. BREVISPINUM Bréb. Middletown (*Conn*, see **2**, p. 62).

†*S. CONCINNUM West & G. S. West, Jour. Linn. Soc. Bot. **33**: 317. *pl. 18, f. 17*. 1897. Middlebury, Southington.

†S. CORONULATUM Wolle, Desm. U. S. 135. *pl. 44, f. 11, 12*. 1884. Middletown (*Conn*, see **2**, p. 62).

S. CRENULATUM Näg. Gatt. einz. Alg. 129. *pl. 8 Ba*. 1849. Guilford, Madison, Middletown (*Conn*, see **2**, p. 62), Monroe (*a*), New Haven (*b*), Suffield, Washington.

S. CUSPIDATUM Bréb. in Meneghini, Linnaea **14**: 226. 1840. Bridgeport (*Johnson*, **5**, p. 288), Litchfield (*a*), Middlebury, Morris, North Branford (*b*), Orange, Plymouth, Suffield, Thomaston, Watertown, Washington, West Haven (*b*).

*S. CYRTOCERUM Bréb. in Ralfs, Brit. Desm. 139. *pl. 22, f. 10*. 1848. Hamden (*b*), West Haven (*b*).

S. DEJECTUM Bréb. in Meneghini, Linnaea **14**: 227. 1840. Middlebury, Middletown (*Conn*, see **2**, p. 62), Orange, Suffield, Washington.

†S. DEJECTUM var. CONVERGENS Wolle, Desm. U. S. 121. *pl. 40, f. 7, 9, 10, 11*. 1884. Middletown (*Conn*, see **2**, p. 62).

*S. DICKIEI Ralfs, Brit. Desm. 123. *pl. 21, f. 3*. 1848. Suffield, Washington.

*S. DILATATUM Ehrenb. Infus. 143. *pl. 10, f. 13*. 1838. Bethlehem, Monroe (*a*), Morris, Orange.

†S. ELEGANTISSIMUM Johnson, Bull. Torrey Club **21**: 290. *pl. 211, f. 16*. 1894. Bridgeport (*Johnson*, **5**, 290).

S. ERASUM Bréb. Mém. Soc. Imp. Sci. Nat. Cherbourg **4**: 143. *pl. 1, f. 28*. 1856. Middletown (*Conn*, see **2**, 62).

S. EUSTEPHANUM (Ehrenb.) Ralfs, Brit. Desm. 215. 1848. Middletown (*Conn*, see **2**, p. 62), Washington, West Haven (*b*).

S. FURCIGERUM Bréb. in Meneghini, Linnaea **14**: 226. 1840. Middletown (*Conn*, see **2**, p. 62), Morris.

S. GRACILE Ralfs, Ann. Mag. Nat. Hist. **15**: 155. *pl. 11, f. 3*. 1845. Middlebury, Middletown (*Conn*, see **2**, p. 62), Morris, Monroe (*a*), New Haven (*b*), Suffield, Thomaston, Washington.

S. GRANDE Bulph. Bridgeport (*Johnson*, **6**, p. 294), Bethlehem.

*S. GRANDE var. PARVUM West & G. S. West. Bethlehem, Plymouth.

*S. GRANULOSUM (Ehrenb.) Ralfs. Guilford, Litchfield (*a*).

†S. HEXACERUM var. AVERSUM West & G. S. West, Jour. Linn. Soc. Bot. **33**: 313. *pl. 18, f. 13*. 1897. Bridgeport (*Johnson*, see **7**, p. 313).

S. HIRSUTUM (Ehrenb.) Bréb. in Ralfs, Brit. Desm. 127. *pl. 22, f. 3*. 1848. Hamden (*b*), Middletown (*Conn*, see **2**, p. 62), Monroe (*a*).

†S. INCISUM Wolle, Desm. U. S. 132. *pl. 41, f. 12–14*. 1884. Bridgeport (*Johnson*, **5**, p. 288), Morris.

S. INFLEXUM Bréb. Mém. Soc. Imp. Sci. Nat. Cherbourg **4: 140. *pl. 1, f. 25*. 1856. Killingworth (*b*).

†S. IOTANUM Wolle, Desm. U. S. 137. *pl. 51, f. 5–7*. 1884. Bridgeport (*Johnson*, see **7**, p. 315), Middletown (*Conn*, see **2**, p. 62).

S. IRREGULARE West, Jour. Roy. Micr. Soc. **1894**: 12. *pl. 2, f. 49, 50*. Bridgeport (*Johnson*, **5**, p. 288).

S. LEPTOCLADUM Nordst. Vidensk. Medd. Fören. Kjöbenhavn **1869**: 228. *pl. 4, f. 57*. 1870. Middlebury, Middletown (*Conn*, see **2**, p. 62), Suffield, Thomaston.

S. LEPTOCLADUM var. CORNUTUM Wille, Bih. K.-Vet. Akad. Handl. **18**[8]: 19. *pl. 1, f. 39*. 1884. Bridgeport (*Johnson*, **5**, p. 289).

S. MARGARITACEUM (Ehrenb.) Menegh. Linnaea **14**: 227. 1840. Bethany, Guilford, Hamden (*b*, also *Carter & Evans*), Killingworth, Litchfield (*a*), Madison, Middlebury, Middletown (*Conn*, see **2**, p. 62), New Haven (*b*), Southington, Suffield, Thomaston, Watertown, Washington.

S. MEGACANTHUM Lund. Nova Acta Reg. Soc. Sci. Upsala III. **8**: 61. *pl. 4, f. 1*. 1871. Bridgeport (*Johnson*, **5**, p. 288), Middletown (*Conn*, see **2**, p. 62).

*S. MERIANI Reinsch, Act. Senckenb. **6**: 125. *pl. 33, DI*. 1867. Hamden (*Carter & Evans*), West Haven (*a*).

*S. MONTICULOSUM Bréb. in Meneghini, Linnaea **14**: 226. 1840. Monroe (*a*), Suffield.

S. MURICATUM Bréb. in Meneghini, Linnaea **14**: 226. 1840. Hamden (*b*), Middletown (*Conn*, see **2**, p. 62).

*S. MUTICUM Bréb. in Meneghini, Linnaea **14**: 226. 1840. Middlebury, Orange, Suffield, West Haven (*a*, *b*).

†S. ODONTATUM Wolle, Bull. Torrey Club **8**: 2. *pl. 6, f. 11*. 1881. Middletown (*Conn*, see **2**, p. 62).

S. OPHIURA Lund. Nova. Acta Reg. Soc. Sci. Upsala III. **8**: 69. *pl. 467*. 1871. Bethlehem, Bridgeport (*Johnson*, **5**, p. 289), Hamden (*a*).

*S. ORBICULARE var. RALFSII West & G. S. West. Middletown, Morris, West Haven (*b*).

*S. PARADOXUM Meyen, Nova Acta Acad. Caes. Leop. Carol. **5**: 14. *pl. 43, f. 37, 38*. 1828. Plymouth.

*S. POLYMORPHUM Bréb. in Ralfs, Brit. Desm. 135. *pl. 22, f. 9, pl. 34, f. 6*. 1848. Orange.

**S. POLYTRICHUM Perty, Kleinst. Lebens. 210. *pl. 16, f. 24*. 1852. Bethany, Hamden (*a*).

**S. PROBOSCIDEUM Arch. in Pritchard, Infus. 742. 1861. Orange.

*S. PUNCTULATUM Bréb. Branford, Hamden (*a*), Killingworth, Newtown, New Haven (*b*), North Haven, Plymouth.

S. PYGMAEUM Bréb. in Ralfs, Brit. Desm. 213. *pl. 35, f. 26*. 1848. Middletown (*Conn*, see **2**, p. 62).

†S. RAVENELII Wood, Smithson. Contr. Knowl. **241**: 153. *pl. 21, f. 22*. 1872. Middletown (*Conn*, see **2**, p. 62).

*S. SEBALDI Reinsch, Act. Senckenb. **6**: 133. *pl. 24, DI, f. 1–3*. 1867. Guilford, West Haven (*b*).

*S. SETIGERUM Cleve, Öfvers. K. Vet.-Akad. Förh. **20**: 490. *pl. 4, f. 4*. 1863. Bethlehem, Middlebury, Suffield.

*S. SPONGIOSUM Bréb. in Ralfs, Brit. Desm. 141. *pl. 23, f. 4*. 1848. Guilford, Monroe (*a*), Suffield.

*S. TETRACERUM (Kütz.) Ralfs, Ann. Mag. Nat. Hist. **15**: 150. *pl. 10, f. 1*. 1845. Bethlehem, Middlebury, Morris, Thomaston, Washington.

*S. TUMIDUM Bréb. Madison.

†S. VESTITUM var. TORTUM West & G. S. West, Jour. Linn. Soc. Bot. **33**: 317. *pl. 18, f. 16*. 1897. Bridgeport (*Johnson*, see **7**: p. 317).

COSMOCLADIUM Bréb.

*C. SAXONICUM DeBary, Flora **48**: 321. *pl. 1, f. 1–3.* 1865. Branford (*Carter*).

SPHAEROZOSMA Corda

S. PULCHRUM Bailey in Ralfs, Brit. Desm. 209. *pl. 35, f. 2.* 1848. Middlebury, Middletown (*Conn*, see **2**, p. 65).

S. SPINULOSUM Delp. Mem. R. Accad. Sci. Torino II. **28**: 78. 1876. Middletown (*Conn*, see **2**, p. 65), Suffield.

ONYCHONEMA Wallich

O. FILIFORME (Ehrenb.) Roy & Bissett. Bridgeport (*Johnson*, **5**, p. 286), Middlebury, Middletown (*Conn*, see **2**, p. 64, as *Sphaerozosma*), Morris, Thomaston.

O. LAEVE Nordst. Vidensk. Medd. Fören. Kjöbenhavn **1869**: 209. *pl. 3, f. 34.* 1870. Bethlehem, Bridgeport (*Johnson*, **5**, p. 286), Middlebury, Middletown (*Conn*, see **2**, p. 65), Morris, Washington.

SPONDYLOSIUM Bréb.

S. PAPILLOSUM West & G. S. West, Trans. Linn. Soc. Bot. II. **5**: 41. *pl. 9, f. 19.* 1895. Bethlehem, Middletown (*Conn*, see **2**, p. 65,) Morris, Orange, Plymouth.

*S. PLANUM (Wolle) West & G. S. West, Per. Plank. 430. *pl. 19, f. 5–8.* 1912. Killingworth, Thomaston, Washington, Watertown.

S. PYGMAEUM (Cooke) West, Jour. Linn. Soc. Bot. **29: 116. 1892. Thomaston.

HYALOTHECA Ehrenb.

H. DISSILIENS (Smith) Bréb. in Ralfs, Brit. Desm. 51. *pl. 1, f. 1.* 1848. Bethlehem, Hamden (*b*), Guilford, Hamden (*Carter & Evans*), Litchfield (*a*), Madison, Middlebury, Middletown (*Conn*, see **2**, p. 65), New Haven (*b*), North Branford (*a*), Plymouth, Washington.

H. UNDULATA Nordst. Bridgeport (*Johnson*, **5**, p. 286).

DESMIDIUM Ag.

*D. APTOGONUM Bréb. Mém. Soc. Acad. Falaise **1835**: 268. 1835. Hamden (*b*), Middlebury, Washington.

*†D. BAILEYI (Ralfs) Wolle, Desm. U. S. 27. *pl. 2, f. 8–12.* 1884. Bethlehem, Plymouth, Suffield.

D. CYLINDRICUM Grev. Scottish Cryptog. Flor. **6**: 38. *pl. 293*. 1827. Bridgeport (*Holden*, see **1**, No. 1262), New Haven (*a*) Newtown, Middletown (*Conn*, see 2, p. 65).

D. SWARTZII Ag. Syst. Alg. 9. 1824. Bethlehem, Madison, Middletown (*Conn*, see **2**, p. 65), Morris, New Haven (*a*), Plymouth.

GYMNOZYGA Ehrenb.

G. MONILIFORMIS Ehrenb. Berlin Monatz. 212. 1840. Bethlehem, Killingworth, Middlebury, Middletown (*Conn*, see **2**, p. 65), Monroe (*a*), Newtown.

This list includes 266 species and varieties, of which 125 are new to Connecticut and 22 new to North America.

IV. LITERATURE CITED.

1. **Collins, F. S., Holden, I., and Setchell, W. A.** Phycotheca Boreali-Americana. Malden, 1905–1919.
2. **Conn, H. W., & Webster, L. W.** A preliminary report on the algae of the fresh waters of Connecticut. Conn. Geol. & Nat. Hist. Surv. Bull. 10. Hartford, 1908.
3. **Cushman, J. A.** New England desmids of the sub-family Saccodermae. Bull. Torrey Club **33**: 343–351. 1906.
4. ———— The New England species of *Closterium*. Bull. Torrey Club **35**: 109–133. 1908.
5. **Johnson, L. N.** Some new and rare desmids of the United States,—I. Bull. Torrey Club **21**: 285–291. *pl. 211*. 1894.
6. ———— Some new and rare desmids of the United States, —II. Bull. Torrey Club **22**: 289–298. *pl. 239, 240*. 1895.
7. **West, W. & G. S.** On some desmids of the United States. Jour. Linn. Soc. Bot. **33**: 279–322. *pl. 16–18*. 1898.
8. **Wolle, F.** Desmids of the United States and list of American pediastrums. Bethlehem, Pennsylvania, 1884.

ANOTHER PLANT FROM NANTUCKET.—As long ago as 1911, while in Nantucket, I found a grass by the sidewalk which I supposed to be *Digitaria filiformis*. Although never quite satisfied with that determination I failed, through some oversight, to send a specimen of this plant when forwarding many others to Mr. Bicknell while he was

writing up "The Plants of Nantucket." After working over my Bermuda and Florida plants I became convinced that the grass was *Cynodon Dactylon* and a specimen sent to Mr. Bicknell has had his, verification.—MRS. NELLIE F. FLYNN, Burlington, Vermont.

Vol. 24, no. 287, including pages 213 to 228, was issued 4 December, 1922.

ERRATA

Vol 23:

Page 109, line 20, *for* impassible *read* impassable.
" 130, " 9, *for* it *read* in.
" 138, " 5, *for* father, *read* farther.
" 138, " 28, *for* catapillar *read* caterpillar.
" 138, " 35, *for* naterial *read* material.
" 153, " 25, *for* thrysoid *read* thyrsoid.
" 185, " 25, *for* ealirer, r*ead* earlier.
" 186, " 4, *for* Niewl. *read* Nieuwl.
" 225, " 16, *for* shows *read* show.
" 236, " 41, for *vulpinodea* read *vulpinoidea.*
" 237, " 29, *for* 95. *read* 95, 155.
" 244, " 42, for VIRECENS read VIRESCENS.
" 257, " 1, *for* 247 *read* 245.
" 261, " 14, *for* italicis *read* italics.
" 268, " 11, *for* Fer- *read* Fre-.
" 277, " 16, for PROSPERPINACA read PROSERPINACA.
" 286, " 3, *for* Doueette *read* Doucette.
" 293, " 16, for **pynocephala** read **pycnocephala.**

Vol 24:

Page 8, line 33, *for* peninsular *read* peninsula.
" 10, " 40, *for* 133 *read* 134.
" 13, " 4, *for* southeastern *read* southwestern.
" 50, " 3, *for* Hennesley *read* Hunlay.
" 87, " 7, *for* annectans *read* annectens.
" 88, " 26, for *Mosleyi* read *Moseleyi.*
" 89, " 9 & 34, for *hordaceus* read *hordeaceus.*
" 90, " 3 & 23, for *hordaceus* read *hordeaceus.*
" 105, " 14, for MACROCCUS read MACROCOCCUS.
" 115, " 33, for CORALORRHIZA read CORALLORRHIZA.
" 156, " 3, for **leucoccum** read **leucoccocum.**
" 157, " 2, for LXVI read LXVII.
" 200, " 24, for **remotifiora** read **remotiflora.**
" 201, " 37, for *181* read *180.*
" 203, " 23, for ** read *.
" 209 " 2, for PINNATIFIDA read PINNATIFIDUM

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New scientific names are printed in full face type.