Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

VOLUME 39

1937

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

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Vol. 39. January, 1937. No. 459.

CONTENTS:

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RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

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THE NEW ENGLAND BOTANICAL CLUB

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CRITICAL BRYOPHYTES FROM THE KEWEENAW PENINSULA, MICHIGAN[1]

William Campbell Steere

Several moss specimens from a collection made by the writer in Keweenaw County, Michigan, in July, 1933, were found to represent unfamiliar and puzzling species, and were put aside for study after further field work had made more material available. Opportunity for further study in the Keweenaw area did not come until 1935, when the first two weeks of September were spent in the field in northern Houghton County and in the more accessible parts of Keweenaw County. Most of the coast line of Lake Superior from Eagle Harbor to a point beyond Horseshoe Harbor was traversed, as well as much of the inland region. The dense forest north of Fort Wilkins was most thoroughly studied. The eastern shore of the peninsula was visited at Jacobsville, and again in the vicinity of Bête Gris.

Professor Fernald[2] has published an important report upon the vascular plants which he collected in Keweenaw County in the summer of 1934. He has pointed out that parts of the Keweenaw Peninsula possess, in addition to the usual floristic elements normally present in northern Michigan, a well-marked element of isolated Rocky Mountain and west coast species of ferns and flowering plants. As a result of his discovery, Fernald includes the higher parts of Keweenaw County among the driftless or unglaciated areas which he has previous-

[1] Papers from the Department of Botany and the Herbarium of the University of Michigan, No. 595.

[2] Fernald, M. L., *Critical plants of the upper Great Lakes region of Ontario and Michigan*, Rhodora 37: 197–222, 238–262, 272–301, 324–341, plates 352–379, 1935.

ly identified in eastern North America through tracing similar anomalies of plant distribution.

During the 1935 field season an especial search was made for isolated western species of bryophytes, of which two species had already

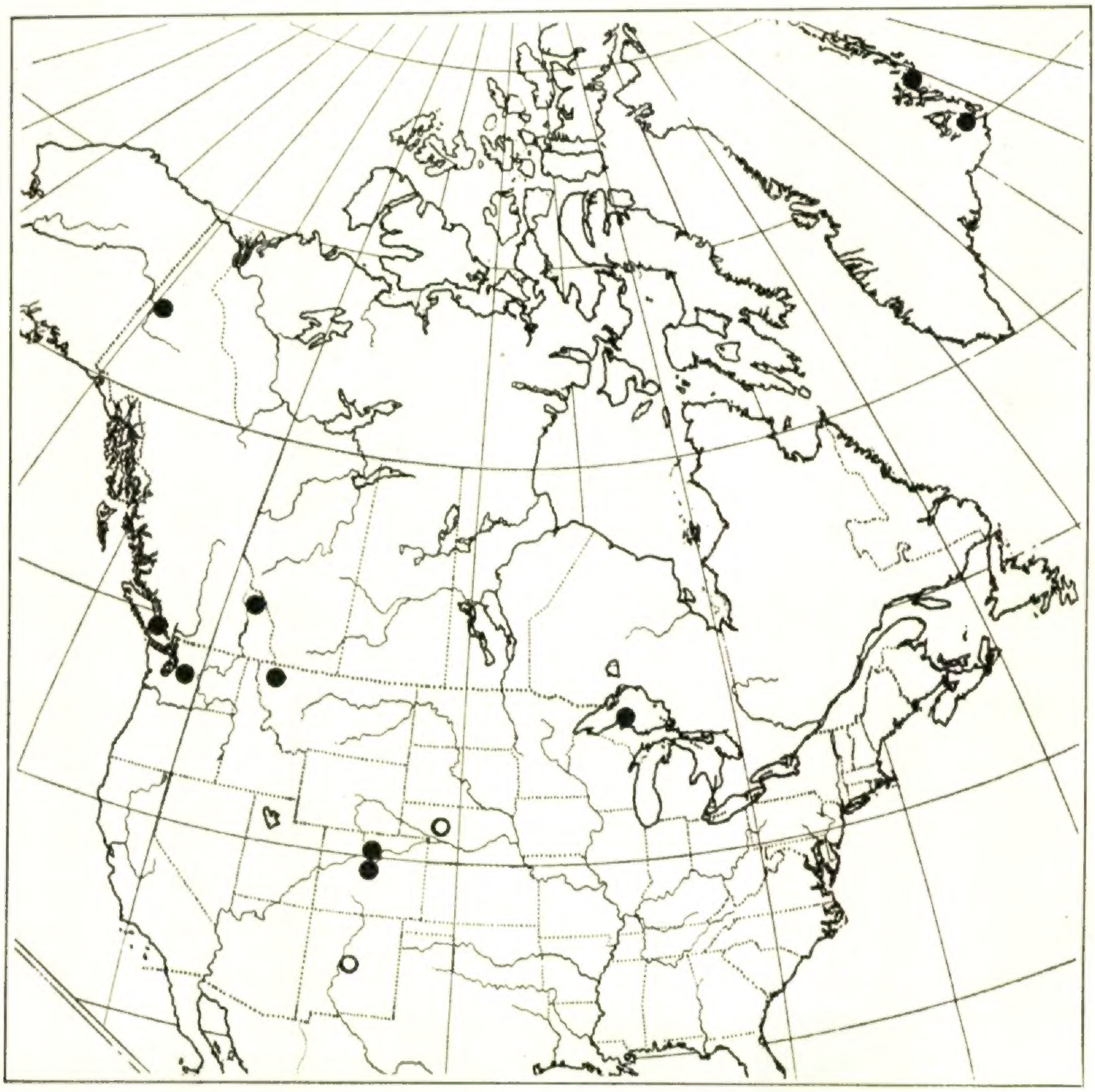

FIG. 1. American Range of TIMMIA AUSTRIACA.

been collected in 1933. The search was well rewarded, and it can be established here that there is a strong element of Cordilleran, Pacific coast, and arctic species in the bryophyte flora of Keweenaw County. This situation is especially interesting because it is not generally known nor admitted that the distribution of bryophytes parallels in general that of phanerogams and pteridophytes.

From among the assemblages of arctic-alpine, trans-continental-boreal, and other interesting geographical and ecological groups of

bryophytes, the following species from the Keweenaw Peninsula may be selected as being critical (in the geographical sense of Fernald); *Jungermannia Schiffneri* (Loitles.) Evans (FIG. 4), *J. sphaerocarpa* Hook., *Lophozia obtusa* (Lindb.) Evans, *Scapania cuspiduligera* (Nees) K. Müll., *Frullania Bolanderi* Aust. (type specimen from San Francisco) (FIG. 5), *Timmia austriaca* Hedw. (FIG. 1), *Pseudoleskea oligoclada* Kindb. (type specimen from Vancouver Island) (FIG. 3), and *Hygrohypnum molle* (Dicks.) Loeske. All these have been known previously on this continent only from the Rocky Mountains or the Pacific Coast, or both.

Although this list of Cordilleran and west-coast species is not a very extensive one, when compared numerically with the list of "critical" phanerogams and ferns given by Fernald, the discrepancy may be explained readily on at least two grounds. In the first place, the inconspicuousness of mosses and hepatics, especially in dry weather, prevents the collector from getting every species on his first inspection of an area. In the second place, when one considers the disparity in the sizes of the two groups, the list of "critical" bryophytes becomes proportionately nearly as large as that of phanerogams and ferns. The total number of species of bryophytes in any one county, even under the most favorable conditions, probably does not exceed 300, whereas there may be as many as 1500 species of flowering plants and ferns.

It is apparent, then, that the geographic distribution of vascular plants, which Fernald uses as a proof of the absence of recent glaciation, is almost exactly paralleled by the distribution of the bryophytes. It is difficult to determine just how much support is given to Fernald's thesis by this discovery. Very little is known of the *exact* distribution of bryophytes, and of the influence of glaciation upon them. There is no more than presumptive evidence that the bryophytes of Keweenaw County have not migrated there in post-glacial times. The bryophyte floras of the various driftless areas have not been studied intensively, and we do not know, consequently, to what extent the species may be regarded as trustworthy indicators of areas which have escaped glaciation. Notwithstanding my sympathy with Fernald's ideas, I do not consider that there is enough evidence based entirely on the distribution of mosses and hepatics to enable a cautious bryologist to conclude that parts of Keweenaw County escaped glaciation. The geological evidence cited by Fernald is very sound, and easily

observed by visitors to Keweenaw County. His conclusion that parts, at least, of Keweenaw Peninsula are unglaciated, will probably prove to be justified, if one may judge by the long series of similar proposals which he has made and which have become generally accepted, although many of his propositions were as startling as this one, when first published.

The possibility that other higher areas along the south shore of Lake Superior may also have escaped glaciation is indicated by the presence there of a significant number of Cordilleran species. Thus the list of "critical" species from the Keweenaw area is well supplemented by collections from the adjoining highlands of northern Michigan. Dr. Nichols[1] has reported *Grimmia patens* (Hedw.) Bry. Eur. [*Rhacomitrium patens* (Hedw.) Hüben.] from the Huron Mountains of Marquette County. This species, according to the most recent monograph of the family,[2] has the following distribution: "Greenland to Alaska, British Columbia, Washington, Oregon, Idaho, and Montana." From a further exploration of the Huron Mountains in 1936 Dr. Nichols reports (personal communication) *Grimmia Hartmani* Schimp. var. *anomala* (Hampe) Mönk. Jones (*l. c.*) gives the known distribution of this moss as follows: "On the divide between Traille River and Independence Creek, Idaho, altitude 6,000 feet . . . This is apparently the only record for North America."

In late August, 1935, Dr. Nichols and I, collecting together in the Porcupine Mountains, found three western bryophytes, which have also been collected by myself in Keweenaw County. These species are *Frullania Bolanderi* Aust., *Pseudoleskea oligoclada* Kindb. (FIG. 3), and *Hygrohypnum molle* (Dicks.) Loeske.

Since the report[3] dealing with the Porcupine Mountain bryophytes went to press, Mr. Bartram has very kindly identified several additional specimens from the Porcupine Mountains which had puzzled me very much. As a result, *Tortula intermedia* (Brid.) Berk.,[4] another

[1] Nichols, G. E., *The bryophytes of Michigan with special reference to the Huron Mountain region*, Bryologist **38**: 11–19, 1935.

[2] Jones, G. N., *Grimmiaceae*, Moss Flora of North America **2** (1): 1–65, 25 pl., 1933.

[3] Nichols, G. E. and W. C. Steere, *Bryophytes of the Porcupine Mountains, Ontonagon County, Michigan*, Papers Mich. Acad. Sci., Arts & Lett., 1937 (in press).

[4] *Tortula intermedia* (Brid.) Berk., Handbook Brit. Mosses, p. 251, 1863 (*Syntrichia intermedia* Brid., Bryol. Univ., **1**: 586, 1826) is much more commonly called *T. montana* (Nees) Lindb., Musc. Scand., p. 20, 1879 (*Syntrichia montana* Nees, Flora **2** (1): 301, 1819). The name in this sense is quite invalid, however, because of the existence of *Tortula montana* Mitt., Musc. austro-Amer., p. 156, 1869, even though it is now placed in *Barbula* [*B. montana* (Mitt.) Jaeg., Ber. St. Gall. Naturw. Ges. 1871–72: 424, 1873].

western species, may be added to the Michigan flora. It was collected along the shore of Lake Superior at the foot of the Porcupine Mountains, in Ontonagon County. *Leptobarbula berica* (De Not.) Schimp., an apparently very rare species, which has been reported in North America only from the northern Rocky Mountains, may be added

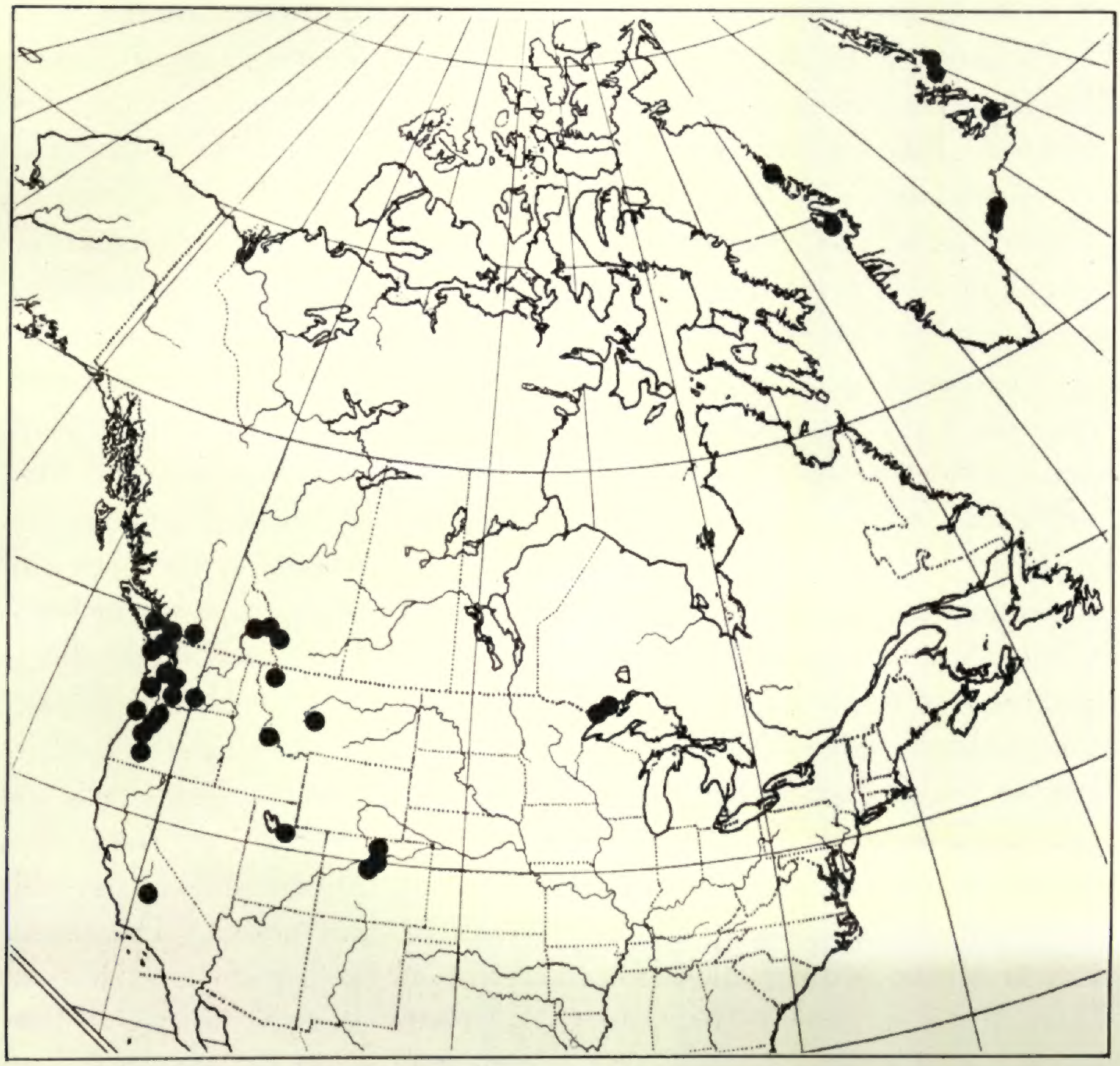

FIG. 2. American Range of ASTERELLA LUDWIGII.

tentatively, as the result of a somewhat doubtful determination of material from the Porcupine Mountains. Even the highlands on the west shore of Lake Superior yield significant species of bryophytes. Perhaps the one of most interest is *Asterella Ludwigii* (Schwaegr.) Underw. (FIG. 2), which in the most recent monograph[1] is given this distribution: "Greenland; Montana to British Columbia, and southward to Colorado and California." In 1927[2] it was reported from

[1] Evans, A. W., *Rebouliaceae*, North Amer. Flora, **14**: 39–56, 1923.

[2] Conklin, G. H., *Collecting hepatics along Lake Superior in northern Minnesota*, Bryologist **30**: 6–8, 1927.

Middle Falls, Pigeon River, Ontario, and in 1928[1] from the American side of the Pigeon River, in Cook County, Minnesota. A careful survey of the higher parts of the same region might reveal other species of significant distribution. A related species, *Asterella saccata* (Wahlenb.) Evans has a similar distribution (FIG. 6). In 1923 Evans[2] gave as its distribution: "Yukon, British Columbia, Idaho, and Washington." In 1929,[3] this hepatic was reported from Winona, Minnesota, which is within the best known and unquestioned driftless area. The similar distribution of these two species of *Asterella* is very significant.

After seeing the remarkable parallelism of bryophyte distribution to that of vascular plants on the Keweenaw Peninsula, it is perhaps safe to predict that the converse is true, and that some of the conservative Cordilleran phanerogams will be found eventually in other areas along the Lake Superior shore. It is even possible to cite some geological evidence that other parts of northern Michigan than the northeast end of the Copper Range possibly escaped glaciation. Evidences of the last stages, at least, of the Wisconsin ice invasion are inconspicuous or even lacking in many parts of the Upper Peninsula of Michigan, especially in the areas to the south of the highlands along the shore of Lake Superior, more particularly in the shelter of the Huron Mountains and the Copper Range.[4] Evidence that the higher parts of the Huron Mountains are driftless was presented as early as 1907. Davis[5] says: "The conclusions reached . . . are: (1) that there exists in northern Marquette County an area of several townships' extent which is almost without glaciation. This land rises to nearly or quite 2000 feet above tide in the higher parts, and is 100 to 200 feet lower in the valleys. (2) From the fact that the drainage was across this highland and followed preglacial rock valleys, while the ice was piled up around its outer margin, it is evident that this area must have been early abandoned by the local ice cap which covered it. (3) . . . It seems probable that the direct movement of the ice from the northeast was practically checked by the Marquette

[1] Conklin, G. H., *A correction, with additions*, Bryologist **31**: 33, 1928.
[2] Evans, A. W., *loc. cit.*, 1923.
[3] Conklin, G. H., *Report of the Curator of the Hepatic Department of the Sullivant Moss Society*, Bryologist **32**: 21–23, 1929.
[4] Leverett, Frank, *Moraines and shore lines of the Lake Superior region*, U. S. Geol. Survey Professional Paper 154-A, pp. 1–72, 1929.
[5] Davis, C. A., *Some interesting glacial phenomena in the Marquette region*, Rept. Mich. Acad. Sci. **9**: 132–135, 1907.

highland and by the Copper Range." It is intimated, in the same paper, that a similar condition may exist in parts of the Copper Range. Much of the interest in Davis's paper lies in the fact that the criteria used are geological rather than biogeographical. By still other authors, the summits of the Porcupine Mountains are considered to have emerged rather early from the thinning ice sheet, as attested by the distribution of till and erratic boulders.[1] They have not been considered as permanent nunataks, although perhaps the evidence might favor such an interpretation.

The flora of Isle Royale contains several species of curious and anomalous geographical distribution, although the western element does not seem to be as well developed as on the Keweenaw Peninsula. Critical study will perhaps reveal more species. Most of the significant bryophytes are really arctic-alpine ones, reaching a southernmost point here.[2] The distribution of only *Frullania Bolanderi* Aust. and *Orthotrichum Macounii* Aust. appears to be truly significant. The latter is distinctly western and is known from no other part of the eastern United States. Of course, there are several unusual phanerogams, also, of which the most spectacular is *Fatsia horrida* (Sm.) B. & H., known otherwise only from the northern Rockies and the Pacific northwest.

The presence of western forms on Isle Royale has been known for a long time, and has attracted considerable attention. In 1906 Ruthven[3] said: "The occurrence of these western and northwestern elements in the biota of Isle Royale is emphasized because . . . the majority of the species are those of the northeastern North American type. Whatever may be the explanation of the occurrence of these western and northwestern forms this far to the east, an important factor is, no doubt, the peneplain nature of the country, which probably formed an extensive highway for boreal forms along the ice margin during the retreat of the last ice sheet." Ruthven's assumption that the biota of Isle Royale migrated there in post-glacial times is undoubtedly correct, although the source of the plants, at least, need not have been the Rocky Mountains or the west coast, especially if Fernald's proposal is correct. Under any circumstances, the presence

[1] Van Hise, C. R. and C. K. Leith, *The geology of the Lake Superior region*, U. S. Geol. Survey Monogr. 52: 1–641, 1911.

[2] Thorpe, Frances J. and A. H. Povah, *The bryophytes of Isle Royale, Lake Superior*, Bryologist 38: 32–46, 1935.

[3] Ruthven, A. G., *An ecological survey in the Porcupine Mountains and Isle Royale, Michigan*, Ann. Rept. Geol. Survey Mich., 1905: 17–55, 1906.

of Cordilleran species of plants upon Isle Royale is rather remarkable, as the island is known to have been completely submerged under one or more of the relatively recent glacial lakes. Dr. George Stanley (who is probably more familiar than anyone else with the ancient shorelines of Lake Superior) tells me that the conspicuous beaches of Lake Algonquin can be found on the very highest parts of the island, so that a very small part of it, indeed, could have remained above Lake Algonquin, and that part not high. Furthermore, the beaches made still earlier by Lake Duluth are, on the mainland across from Isle Royale, some 200 feet higher than the adjacent Algonquin beaches, so that if Isle Royale was uncovered by an ice sheet, it must have been submerged many feet below the surface of that ancient lake.

In spite of the antiquity of the Algonquin beaches, as shown by the enormous amount of differential uplift which they have suffered, and the still greater age of the lake Duluth beaches, they are almost recent as compared to the Maumee or Arkona lakes, or even to Lake Whittlesey, whose beaches are so conspicuous in southeastern Michigan. It appears that the present flora of Isle Royale must have arrived there, not in interglacial or early postglacial times, but much more recently, in post-Algonquin and pre-Nipissing times. Dr. Stanley says (unpublished manuscript) that there was some as yet unexplained hiatus between Lakes Algonquin and Nipissing, so that the correlation between the two lakes is not well known. It is only in this long and incompletely understood period when Isle Royale first really emerged from the high-level post-glacial lakes that the present flora could have begun to invade the island. It is by no means difficult to believe, however, that the first isolated islands to appear above the ice or the glacial lakes might have received their first plant migrants from relatively close nunataks such as those of the Keweenaw Peninsula (if, for the sake of argument, we accept Fernald's conclusion) rather than from south of the ice border.

The history of the post-glacial Great Lakes is still incompletely understood, and is without doubt infinitely more complex than the already involved current explanations. The story of plant migrations in the Great Lakes region is inextricably bound up with the geological history of these lakes, and is certainly just as complex.

Many papers have been written on the ecology of bryophytes, and the influence upon them of their environment. Much work has also been done on the associations of bryophytes, but almost com-

pletely without regard to the geological history of the species, or even to its distribution as a whole. There are a few species whose present distribution really seems to be influenced by at least the most recent glaciation. When the puzzling distribution of *Bryoxiphium norvegicum* (Brid.) Mitt. is analyzed, it appears that the species occurs only in areas which have escaped glaciation.[1] The hepatic *Frullania Bolanderi* Aust. also has a remarkable distribution (Fig. 5). It is common on the west coast, but is also known from the unglaciated parts of the Gaspé Peninsula and from the highlands along the south shore of Lake Superior. In view of the small number of such species, the identification of a disrupted western element in the bryophyte flora of the Keweenaw Peninsula is probably important more as a simple demonstration that the distribution of bryophytes *does* parallel that of vascular plants, than as bearing on a possible lack of glaciation.

It has certainly not been commonly recognized that many species of mosses and hepatics have a significantly localized rather than a general distribution. Of course, there are so many exceedingly common or even weedy species, that "critical" distribution is usually obscured. From the distribution of such weedy bryophytes as *Marchantia polymorpha* L.[2] has come the popular belief in the wide and unlimited distribution and rapid dispersal of bryophytes. As a result, the field of bryogeography in North America has been almost completely neglected. Although several hundred papers have been published on the moss and hepatic floras of restricted areas, no one seems to have analysed the distribution of "critical" species (or any others) over the country as a whole. There are a few comparisons of the hepatic flora of North America with that of other *continents*,[3,4] but the exact identification of regional elements within this continent is not considered, in American literature, with the exception of some notable work done by Evans in New England and Bartram on the mosses of Central America and Mexico.

One commonly sees species labelled in lists or discussions, vaguely

[1] Steere, W. C., *Bryoxiphium norvegicum, the sword moss, as a preglacial and interglacial relic*, Ecology, 1937 (in press).

[2] Graff, P. W., *Invasion by Marchantia polymorpha following forest fires*, Bull. Torrey Bot. Club **63**: 67–74, 1936.

[3] Underwood, L. M., *The distribution of Hepaticae of North America*, Proc. Amer. Assoc, Adv. Sci. **39**: 298–304, 1891.

[4] Müller, K., *Die Lebermoose Deutschlands, Oesterreichs u. d. Schweiz* **2**: 803–860, 1916.

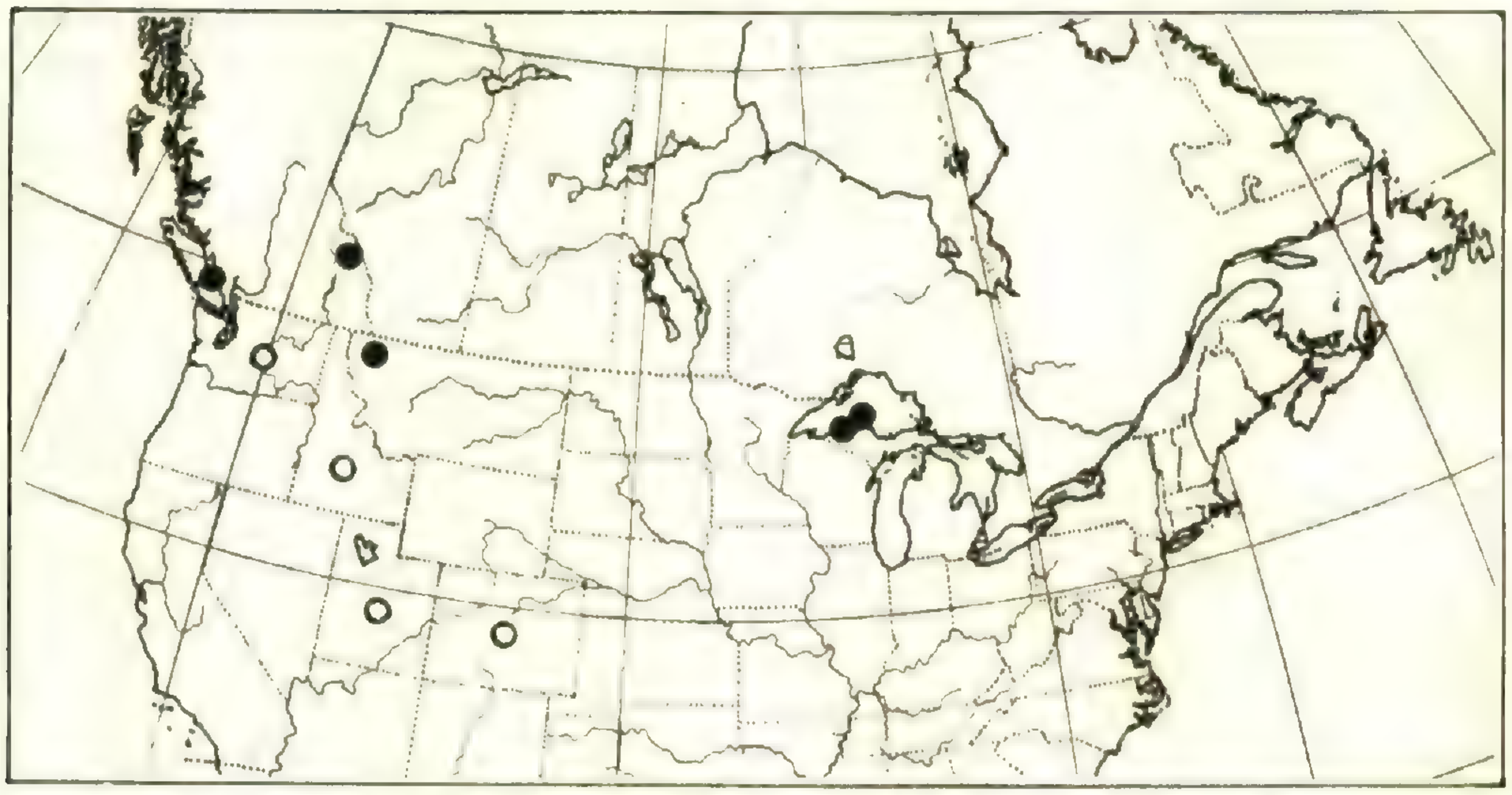

FIG. 3. Range of PSEUDOLESKEA OLIGOCLADA.

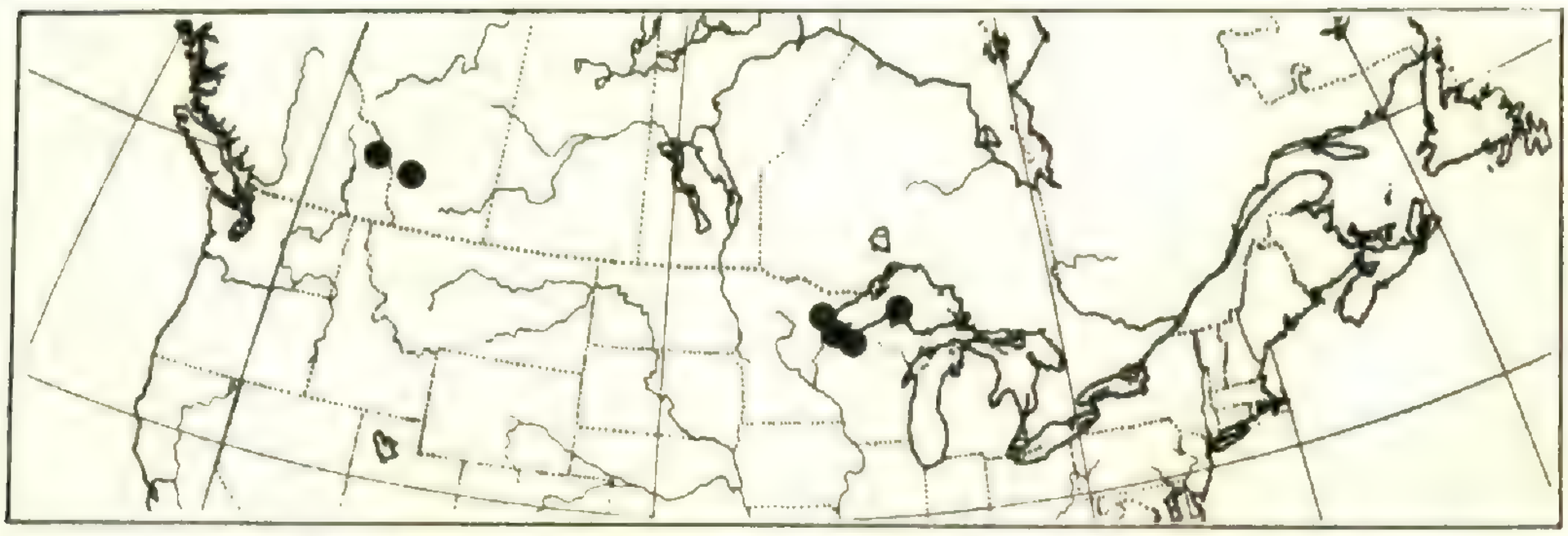

FIG. 4. AMERICAN RANGE OF JUNGERMANNIA SCHIFFNERI.

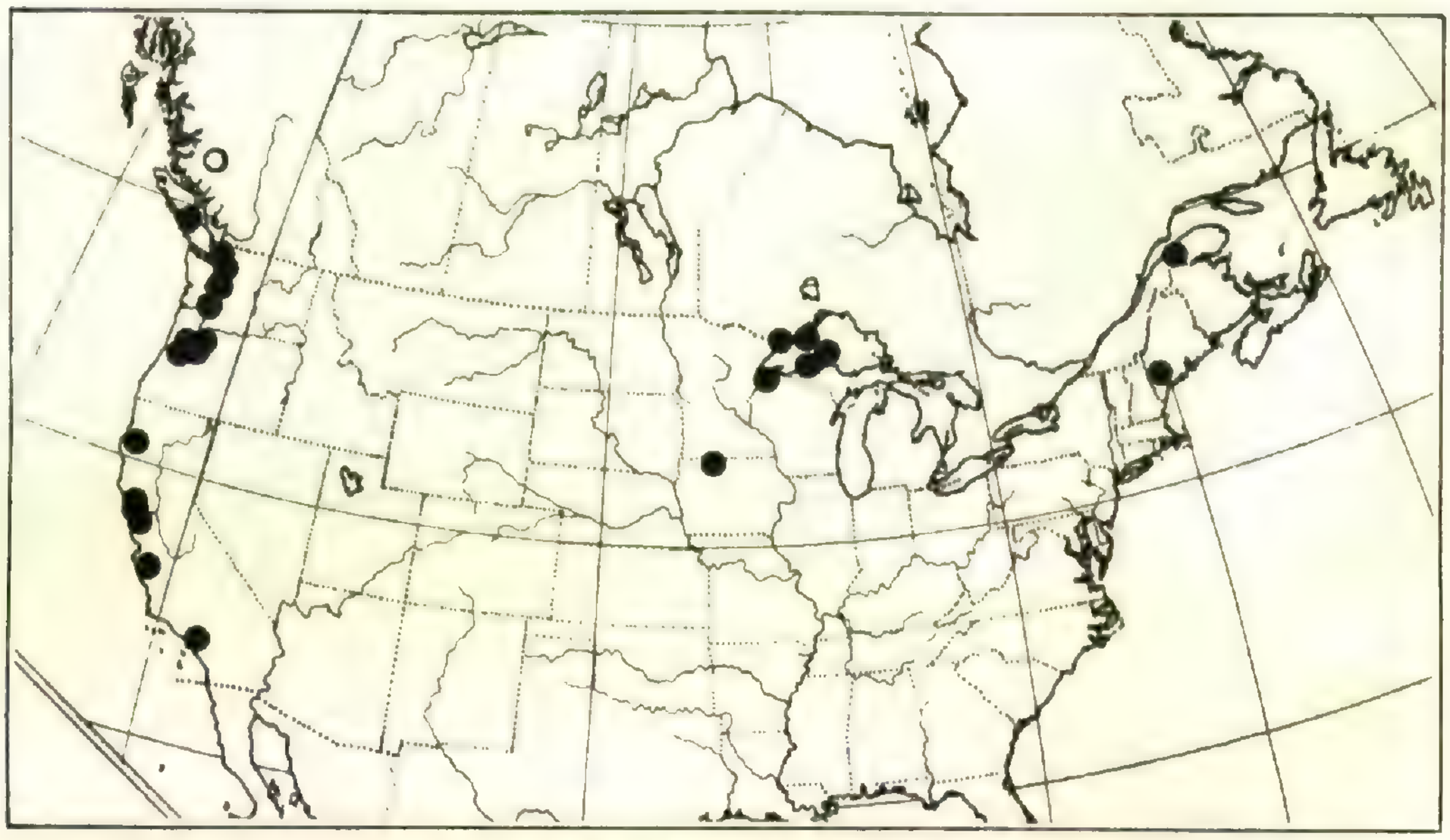

FIG. 5. Range of FRULLANIA BOLANDERI.

and often inaccurately, as "northern," "southern," etc. However, when the known geographical distribution of each species is carefully plotted on outline maps, much of the ambiguity and disorder is cleared up. It is not an overwhelming task to prepare such maps for the relatively small groups of the hepatics and mosses, and the illumination which they shed upon the distributional problems has more than repaid the writer's labor in making them. It has become clear that there are many well-defined floristic elements. It is exceedingly stimulating to discover, when reading over a paper on the distribution of flowering plants, in which the floristic elements are tabulated or mapped, that there are almost always exactly parallel species in the bryophytes. The situation is often masked by the presence of large numbers of non-critical, ubiquitous species.

Three floristic elements, each characterized by a disjunct distribution, can be identified tentatively in the Lake Superior region. (1) Arctic species which here reach their southernmost point. Examples of a moss and a liverwort are *Timmia austriaca* Hedw. (Fig. 1) and *Asterella Ludwigii* (Schwaegr.) Underw. (Fig. 2). (2) Species which are almost strictly Cordilleran, and usually characteristic of high altitudes. Examples of a moss and a liverwort are *Pseudoleskea oligoclada* Kindb. (Fig. 3) and *Jungermannia Schiffneri* (Loitles.) Evans (Fig. 4). (3) Species which are best known on the Pacific Coast, and usually characteristic of lower levels. An example of an hepatic is *Frullania Bolanderi* Aust. (Fig. 5). Another element, with which we are not directly concerned here, but which nevertheless is exceedingly significant in its distribution, is composed of Cordilleran species which are also found in "the" driftless area of Wisconsin, Iowa, Minnesota and Illinois. An example from the Hepaticae is *Asterella saccata* (Wahlenb.) Evans (Fig. 6).

It can be predicted with confidence, on the basis of studies and maps already made that many of the bryophytes will be found to fall into phytogeographic groups with as much precision as do the flowering plants, and furthermore, *into the very same groups*. The analyses will be possible only after the prolonged and careful collection of specimens in critical areas, and by determining centers of migration.

The topography of Keweenaw County is rather varied, so that a large number of different habitats are available for plants. One of the most conspicuous topographical features is the series of several parallel monoclinal ridges, with longitudinal valleys between them.

The ridges are usually relatively high, with a gradual slope to the north and generally a sheer cliff on the south side. The tops of most of the ridges are treeless and windswept; consequently almost barren of bryophytes. Two species which can be depended upon to occur in

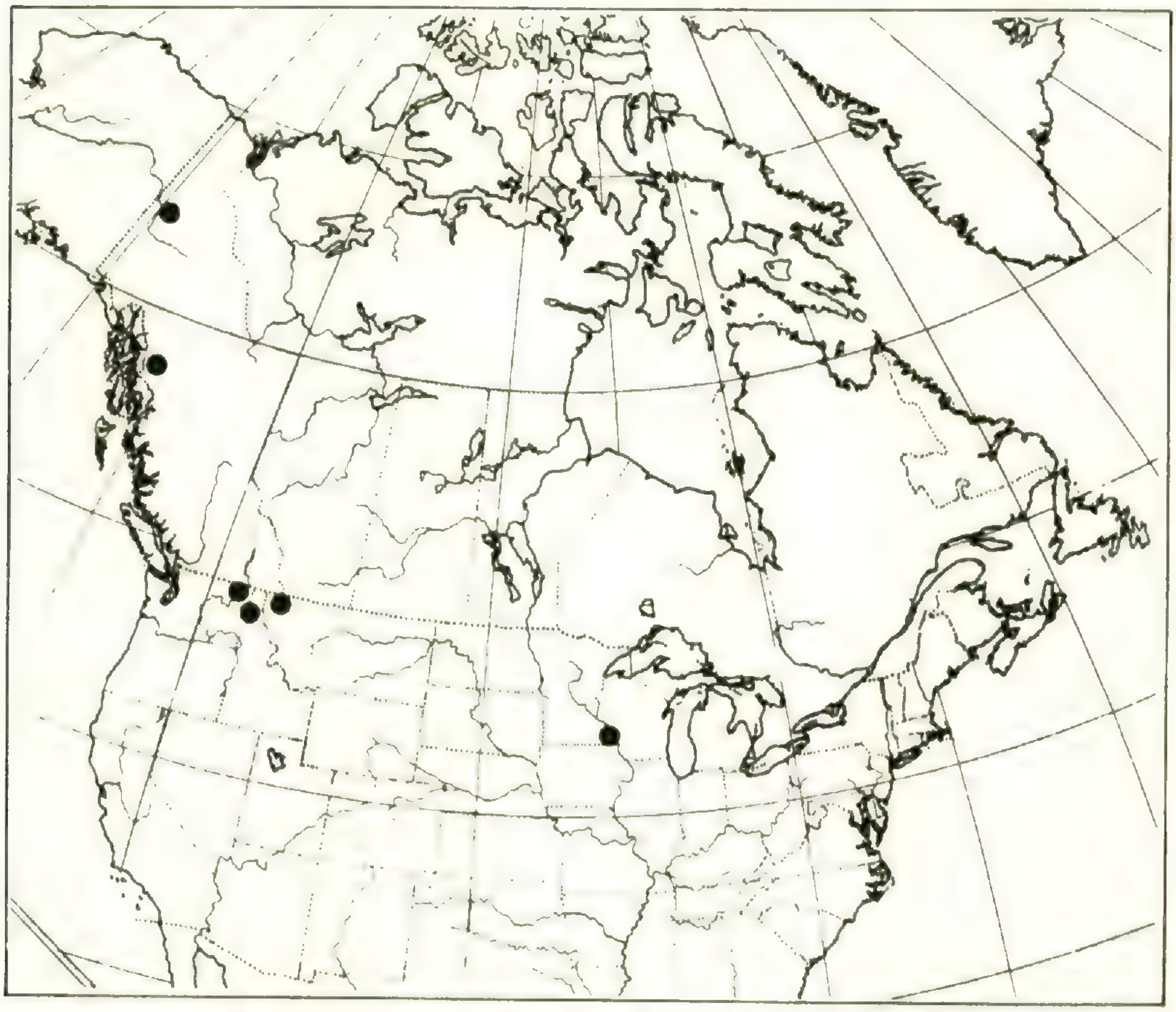

FIG. 6. American Range of ASTERELLA SACCATA.

such situations, however, are *Tortula muralis* Hedw. and *Rhacomitrium canescens* (Timm) Brid.

Some high ridge summits in Keweenaw County in addition to West Bluff (735 feet above lake level), which was so thoroughly discussed by Fernald, are East Bluff (726 feet) and Lookout Point (728 feet). The highest point in the county appears to be on an unnamed ridge just north of Gratiot Lake. The altitude of this point is given[1] as 932 feet above lake level. Other high points are the two monadnocks, Mount Houghton and Mount Bohemia, with elevations of 877 and 867 feet, respectively. Most of these highlands have not been collected

[1] Board of County Road Commissioners, *Road Map of Keweenaw County*, blue print, 22 x 36 inches, 1934.

upon, because of their dryness, so that their bryophyte flora is almost completely unknown, although presumably of little interest.

The cliffs which are so prominent a feature of the linear ridges rather generally face to the south and receive maximum insolation. Consequently they harbor few bryophytes. The talus slopes below conglomerate cliffs are also relatively barren, partly because of their dryness and partly because of their mobility, although they are often well vegetated. The talus slopes of trap-rock cliffs, on the other hand, are among the most favorable habitats for bryophytes. Even the dry slopes exposed to the full force of the sun support xerophytes, as *Andreaea petrophila* Ehrh. and several species of *Grimmia*. On the shaded lower talus slopes, which have been invaded by the forest, are found many species of bryophytes in enormous quantities. The great rock fragments are covered with thick mats of mosses and hepatics, and the chasms between the blocks are often bridged by a carpet suspended only at the margins, a condition which is apt to result in embarrassment or damage to the unwary collector. Perhaps the most productive trap-rock cliffs are those extending for many miles on either side of the settlement appropriately named Cliff. The most important species which were found here, all in quantity, were *Metzgeria furcata* (L.) Dumort., *Tritomaria quinquedentata* (Huds.) Buch, *Orthotrichum strangulatum* Schwaegr., *Homalia Jamesii* Schimp., *Pseudoleskea oligoclada* Kindb., *Isopterygium Muellerianum* (Schimp.) Lindb., and *Rhytidium rugosum* (Ehrh.) Kindb.

The habitats which are richest in species of bryophytes are the sheltered bays or "harbors" along the northern shore of the Keweenaw Peninsula. On the sheltered, shaded conglomerate and trap-rock shores of Agate Harbor, Copper Harbor, and the less easily accessible Horseshoe Harbor are often solid carpets of mosses and hepatics. At the water level and to a foot or so above it are mats of *Leiocolea Gillmanni* (Aust.) Evans [*Lophozia Kaurini* (Limpr.) Steph.], *Scapania cuspiduligera* (Nees) K. Müll., and *Oncophorus virens* (Sw.) Brid. Farther up on the rock ledges are *Blindia acuta* (Huds.) Bry. Eur., *Hypnum arcuatum* Hedw., *Dicranoweisia crispula* (Hedw.) Lindb., *Brachythecium plumosum* (Sw.) Bry. Eur., and *Grimmia alpicola* Hedw. var. *rivularis* (Brid.) Broth. Above the water level, but within the reach of spray and storm waves are species of a more mesophytic character. On the dry faces of the higher shore cliffs *Leiocolea heterocolpa* (Thed.) Buch, *Saelania glaucescens* (Hedw.) Broth., and *Encalypta ciliata* (Hedw.) Hoffm. are not uncommon.

In the moist forest along the lake shore, mosses and hepatics cover the ground and boulders in a thick mat. The most important species are *Lophozia incisa* (Schrad.) Dumort., *L. longidens* (Lindb.) Macoun, *L. Hatcheri* (Evans) Steph., *L. Kunzeana* (Hüben.) Evans, *L. obtusa* (Lindb.) Evans, *L. attenuata* (Mart.) Dumort., and *Tritomaria quinquedentata* (Huds.) Buch. The disjunct western species, *Timmia austriaca* Hedw., was locally common in a few places at the edge of the forest just above the rocky shore ledges. Most of the swamps and bogs were too dry to make satisfactory collecting or even survey work possible, so that the work in these habitats was postponed until a more favorable season.

(To be continued)

THE TYPIFICATION OF ACALYPHA VIRGINICA L.

C. A. Weatherby

Acalypha virginica has no original diagnosis in the Species Plantarum. It rests on citations from the Hortus Cliffortianus, Flora Zeylanica and Hortus Upsaliensis of Linnaeus, from Plukenet and from Gronovius. There is a specimen in the Linnaean herbarium, presumably there in 1753 and labelled by Linnaeus "1 virginiana." In the Hortus Cliffortianus, there is a brief original diagnosis, or rather phrase-name, insufficient to determine what Linnaeus had before him; but there is no specimen in the Clifford herbarium. There is no original diagnosis in the Hortus Upsaliensis. The citations from Plukenet and Gronovius are represented by specimens.

When I revised the group of *A. virginica* in 1927[1] I had seen none of the above specimens. I had before me the statement of Mueller Argovensis[2] that the specimen in the Linnaean herbarium represented the plant of the Upsala garden and certain notes most generously lent me by Dr. S. F. Blake who had himself been interested in the group and who had looked up the material in the herbaria at London. These notes stated that although, as I pointed out, Plukenet's figure resembled rather *A. virginica* β *intermedia* Muell. (*A. digyneia* Raf.), the specimen back of it was actually *A. virginica* α *genuina;* also that Clayton 201, on which the Gronovian citation rests, was *A. virginica*

[1] Rhodora, xxix. 193–204 (1927).
[2] in DC. Prod. xv. pt. 2, 869 (1866).

β *intermedia*. On the basis of the two statements, that the specimen in the Linnaean herbarium represented the plant of the Upsala garden, which Linnaeus of course had seen, and that the plant of Plukenet was the same, I accepted Mueller's application of the name *A. virginica* to the species to which the Linnaean specimen belongs and took up *A. digyneia* Raf. for that represented by Clayton 201.

In 1928, Mackenzie pointed out[1] that the Linnaean specimen was wholly without data and that Mueller's confident assertion rested on inference only—probable enough, but still no more than inference. And last fall, when I had an opportunity myself to examine the specimens concerned, I found that Dr. Blake had apparently been the victim of an unfortunate and unsuspected accident. For the specimen in Plukenet's herbarium (herb. Sloane, vol. 96, fol. 188) labelled with the phrase-name cited by Linnaeus, indexed by Sloane as the original of plate 99, figure 4, and corresponding so exactly to that figure that there can be little, if any, doubt that the artist worked from it, is not at all *A. virginica* of my treatment but very good *A. digyneia*. In all respects—shape of leaves, relative length of blade and petiole, presence of long, spreading hairs on the stem, number and shape of lobes and type of pubescence of the bract, and length of the staminate spike—it is so excellent an example of that species that I cannot suppose that Dr. Blake, who understood the entities concerned as I do, could have determined it otherwise except by some slip. Incidentally, two other specimens in the herbarium of Plukenet bearing the same phrase-name, are also *A. digyneia*. So is Clayton 201; here Dr. Blake's determination met with no mishap.

This puts a very different face on the matter of typification. The specimen of Linnaeus is now shown to represent certainly nothing but a determination made by him; Plukenet's specimen is not the same. The citations from him and from Gronovius are perfectly consistent. There is nothing but the citation from Plukenet, common to both, to indicate the identity of the plants of the Hortus Cliffortianus and Hortus Upsaliensis. Everything which can be definitely associated, as an original, with *A. virginica* L. is *A. digyneia* Raf. Under the circumstances there seems no other course than to transfer the Linnaean name to that species and to take up for *A. virginica* of my treatment the first clearly applicable name, *A. rhomboidea* Raf. This has already been done by Small, Man. se. Fl. 786 (1934).

[1] Rhodora, xxx, 236 (1928).

Mackenzie arrived at the same conclusion, but by a route I should not have followed. He selected the Clayton specimen as the type and said he would have done so even had that of Linnaeus been certainly the plant of the Upsala garden. To this, I should not have agreed; but since the plant of the Linnaean herbarium is not authentic, I must accept Mackenzie's conclusion if not his argument.

The nomenclature and synonomy of the two species concerned now become:

ACALYPHA RHOMBOIDEA Raf. New Fl. i. 45 (1836). *A. caroliniana* Walt. Fl. Car. 238 (1788)? (nomen dubium); certe sensu Michx. Fl. Bor.-Am. ii. 216 (1803). *A. crenulata* Raf. op. cit. 44 (1836), quoad synonyma citatum. *A. virginica* α *genuina* Muell. Arg. Linnaea, xxxiv. 44 (1845). *A. virginica* sensu Weatherby, RHODORA, xxix. 194 (1927), non L. (1753).

Var. **Deamii**, comb. nov. *A. virginica*, var. *Deamii* Weath. RHODORA, xxix. 197 (1927).

A. VIRGINICA L. Sp. Pl. 1003 (1753), excl. syn. Fl. Zeyl. *A. digyneia* Raf. Fl. Lud. 112 (1817); Weath. RHODORA, xxix. 198 (1927). *A. crenulata* Raf. New Fl. i. 44 (1836), quoad plantam descriptam? *A. brevipes*, var. *pubescens* Raf. l. c.? *A. virginica* β *intermedia* Muell. Arg. Linnaea, xxxiv. 45 (1865).

GRAY HERBARIUM.

PRESERVATION OF PLANT MATERIAL IN NATURAL COLORS

FRANCIS J. SCULLY

WHILE the usual method of preparing herbarium specimens by drying and pressing the plant material has been satisfactory for preservation and identification, there is no doubt that the preservation of the natural color of the flowers and foliage would facilitate the identification of the specimens and differentiation of closely allied species. It is true that the newer method of rapid drying in controlled heat retains more of the natural color of the foliage and flowers, but the normal appearance of the floral parts is altered by the pressing.

Various solutions have been employed to preserve plant material, but most of them have had the disadvantage of decolorizing the foliage as well as the flowers. During the past three years I have tried out a number of solutions and formulae with some success, which is reported here.

As a rule only the flowers of the plants were selected for preservation, along with a typical leaf. If the flowers and leaves were large only a single flower and leaf were used, if small a typical portion of the inflorescence was used. Small cylindrical capsule vials one inch in diameter were used as containers. These have a wide mouth, closed by a bakelite screw cap. The height varied from two to four inches, the size used depending on the size of the plant specimen. The same containers have been used for all the experimental work except for a few very large specimens.

The solutions employed were alcohol, formaldehyde, sodium benzoate, hexylresorcinol solution, merthiolate, and several formulae selected from a list furnished through the courtesy of Mr. M. H. Haller of the United States Department of Agriculture. Haller collected a number of formulae from the literature, but states that his experience with them was limited, and that he had employed only one or two of them mainly in the preservation of fruits. Two of these formulae were finally found to give fair success with flowers, and will be designated as formula "A" and formula "B."

Alcohol has long been used as a preservative but did not prove at all suitable for plant material. The flowers and foliage were not only decolorized but became shrunken, due to the dehydrating action of the alcohol. Formaldehyde was used in various strengths, ranging from 1% to 5%, with good preservation of the material but leaving it completely decolorized or somewhat brownish. Sodium benzoate in 2% solution was tried. This solution has long been used to preserve the natural color of vegetables and fruits which have been cooked, but it did not preserve the color of the raw plant material, and had the disadvantage of making the specimen soft and flabby so that it sagged to the bottom of the vial. The same results were obtained with hexylresorcinol. Merthiolate, a mercurial, germicidal preparation was tried in dilutions ranging from 1–1000 to 1–20,000. The stronger solutions gave better preservation, but all dilutions caused a blotchy bluish-green discoloration of the flowers and tender leaves. However, the color preservation was better than with the solutions previously mentioned.

Formula "A" consisted of a single solution, made up as follows:

Sulphurous Acid.....	15 cc	Copper Sulphate.....	15 gm
Boric Acid.....	15 gm	Water to.....	1000 cc

Formula "B" was made up of two solutions. Solution one consisted of:

5% Solution Copper Sulphate

Solution two consisted of:

Commercial Sulphuric Acid	16 cc
Sodium Sulphite	21 gm
Water to	1000 cc

In using formula "B" the vials were filled with solution one and allowed to remain on the specimens twenty-four hours to set the colors. After washing several times in water the vials were then filled level full with solution two and sealed tightly. The vials were stored upright to prevent any possible leakage. From time to time the vials were checked and if the solution had become low more was added. Rarely some clouding occurred in the vials, particularly if the plant material was thick or if solid green fruits, such as those of the crataegus, had been preserved. When this occurred the solution was changed and the specimen washed with water if necessary.

This formula has given good results in over 600 specimens collected during the past two years. The specimens appear as fresh as new material, the green color being clear and vivid, and the material firm and rigid. The normal shape was retained in most instances, except for the rolling of the petals in slender-rayed *Compositae* and in very fragile flowers such as those of *Portulacaceae* and *Commelinaceae*. Yellow flowers, especially of the *Compositae*, retained their color quite well but the more delicate shades of pink and blue, particularly in the fragile *Violaceae* and *Scrophulariaceae* faded out quickly and completely, often leaving the flowers transparent, showing the stamens and pistil through the corolla. Dark reds in both flowers and fruits faded out when preserved in this solution. This also occurred with dark blue fruits, the solution becoming so colored that it was difficult to see the specimens. It has not been quite as satisfactory for comparison between species, though the specimens are well preserved and can be removed from the vials and washed for inspection. It has proven better to use well developed fruits that are green than to use mature, highly colored fruits.

In checking over the specimens, the best results appear to have been obtained with grasses, sedges and rushes, which are entirely green. Good results were also obtained with the *Compositae*, *Labiatae*, *Polygonaceae* and *Cruciferae*. Except for the loss of color in the flowers

of the *Violaceae*, *Scrophulariaceae* and *Rosaceae*, the specimens are well preserved and have retained their normal shape.

Formula "A" also gave good results, but the solution was not as clear and the colors were not as well retained. However, it has the advantage of requiring no changing of solutions or handling of the specimens after they are once placed in the vials. Where it is not practical to change fluids, such as on field trips or where the facilities are not at hand, this method has been quite satisfactory. Vials filled with this solution can be carried on expeditions to preserve flowers and fruits that are likely to be crushed or altered in pressing and drying. Later these specimens can be removed for study along with the dried specimens and are of considerable aid in making determinations. For permanent preservation, however, formula "B" has given the best results.

The natural color of the preserved specimens makes easier identifications than the use of the dried, pressed specimens alone. Instead of a flat surface, as in the usual herbarium specimens, a three dimensional view is given. Comparing specimens to see if they are identical or not is made easier with this method, the small vials being more easily handled than the larger herbarium sheets. The natural green color of the foliage and the color of the flowers, where retained, give a more natural appearance to the specimens. Pubescence can readily be seen by holding the specimens in front of a light and viewing with a hand lens. Should it be necessary the specimens may be removed from the vials, washed with water, and studied. The firmness of the plant material is retained quite well.

This method of preserving plant material is not intended to take the place of the usual method for preparing herbarium specimens, but it is suggested as an additional aid in the identification and study of plant specimens. While the present formulae have given fair success, there is no doubt that further study will improve the solutions and add to their value.

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VARIANTS IN TWO SPECIES OF DELPHINIUM

LILY M. PERRY

WHEN the herbarium material of *Delphinium carolinianum* and *D. virescens* came to hand to be put in order, my attention was directed to the variation in the pubescence of the stems. Two types of trichomes may be present either on the same or on different plants: the one white, crisp, retrorse and closely appressed to the stem; the other yellowish, with bulbous base (glandular) and spreading, nearly or quite at right angles. Since apparently, in the material at hand, the relative position of these on the stem is correlated with a definite geographical range, the following varieties are proposed.

a. Seeds wing-margined with rugose, slightly (if at all) squamellate sides; spur 1½ times the length of the upper sepal; flowers prevailingly blue (at times whitish)....*b.*
  b. Upper part of stem glandular-pubescent, lower usually crisp-pubescent (at times glandular).
    Pubescence not copious; seeds winged, rugose.
      D. carolinianum (typical).
    Pubescence copious (tending to be floccose); seeds strongly winged, markedly rugose.....Var. *Nortonianum.*
  b. Both upper and lower part of stem crisp-pubescent.....Var. *crispum.*
a. Seeds not wing-margined but usually more or less angled, with strongly rugose-squamellate sides; spur 1½–twice the length of the upper sepal; flowers prevailingly white or whitish (at times bluish)....*c.*
  c. Stem in some part glandular-pubescent.
    Upper part of stem glandular-pubescent, lower crisp-pubescent.....*D. virescens* (typical).
    Upper part of stem crisp-pubescent, lower glandular-pubescent.....Var. *Penardi*
  c. Stem crisp-pubescent throughout.....*D. vimineum* (typical).

D. CAROLINIANUM Walter, Fl. Car. 155 (1788). *D. azureum* Michx. Fl. Bor.-Am. i. 314 (1803); Deless. Ic. i. t. 60 (1820). GEORGIA: Augusta, June, 1888, *G. McCarthy;* Athens, *L. M. Perry*, nos. 862, 863; Chickamauga Park, May 27, 1911, *J. R. Churchill;* without data, *Neisler.* KENTUCKY: barrens, *C. W. Short.* MISSOURI: southeast of Cedar Gap, *O. E. Lansing*, Jr., no. 3073. LOUISIANA: Red River, *Hale.* TEXAS: Mineola, *J. Reverchon*, no. 4341; Grand Saline, *J. Reverchon*, no. 3699; vicinity of Huntsville, *R. A. Dixon*, no. 356; Sefkey Swamp, Gonzales Co., *V. L. Cory*, no. 5683; 12¼ miles north of Bracketville, *V. L. Cory*, no. 6103.

Var. **Nortonianum** (Mackenz. & Bush), comb. nov. *D. Nortonianum* Mackenz. & Bush in Trans. Acad. Sci. St. Louis, xii. 82 (1902). *D. azureum*, var. *Nortonianum* Palmer & Steyermark in Ann. Mo. Bot. Gard. xxii. 543 (1935). MISSOURI: Monteer, *B. F. Bush*, no., 377; 1 mile west of Mansfield, *O. E. Lansing*, Jr., no. 3133.

With the few specimens at hand it is hard to tell the real differences

between this and the typical variety. The seeds are slightly larger in the specimen at hand. Whether they would always average so is a matter requiring either field observation or some further collections of at least nearly mature seeds.

Var. **crispum**, var. nov. Caule pubescente pilis retrorsis crispatisque. ILLINOIS: Milroy, July 7, 1908, *H. A. Gleason* (TYPE in Gray Herb.); Warsaw, June 17, 1847, *S. B. Mead.* MISSOURI: between Springfield and St. Louis, *S. D. McKelvey*, no. 2526; Eagle Rock, *B. F. Bush*, no. 228; Swan, *B. F. Bush*, no. 188; Greene Co., May 31, 1888, *J. W. Blankinship.* ARKANSAS: Prescott, *B. F. Bush*, no. 253. OKLAHOMA: near Page, *O. W. Blakley*, no. 1419; Howe, *E. J. Palmer*, no. 39,341.

None of the specimens here cited have mature seeds. The flowers may be blue or whitish; all stems lack the glandular pubescence characteristic of typical *D. carolinianum.*

D. VIRESCENS Nutt. Gen. ii. 14 (1818). *D. albescens* Rydberg in Bull. Torr. Bot. Cl. xxvi. 583 (1899). WISCONSIN: St. Croix Falls, July 3, 1899, *Mrs. N. E. Baker.* MANITOBA: Winnipeg Valley, 1859, *Bourgeau;* Lake Winnipeg, *Houghton.* MINNESOTA: St. Anthony, July 12, 1888, *J. H. Schuette;* Minneapolis, *J. H. Sandberg*, no. 280. IOWA: Fayette, June 25, 1894, *B. Fink;* Decatur Co., June 16, 1896, *T. J. & M. L. Fitzpatrick.* MISSOURI: Watson, *B. F. Bush*, no. 8; Westport, *B. F. Bush*, no. 613. NORTH DAKOTA: Fargo, July 9, 1909, *H. F. Bergman.* SOUTH DAKOTA: Interior, *E. J. Palmer*, no. 37,629. NEBRASKA: on Middle Loup River, near Thedford, *P. A. Rydberg*, no. 1360; Neligh, June 3, 1896, *E. S. Bacon.* KANSAS: prairies, Riley Co., *J. B. Norton*, nos. 8, 8a. OKLAHOMA: west of Tulsa, *S. D. McKelvey*, nos. 2501, 2514; near Alva, *G. W. Stevens*, no. 551. TEXAS: Tarrant Co., *A. Ruth*, no. 374; Victoria, *S. M. Tracy*, no. 9243.

This species is said to have a stouter habit than *D. carolinianum* and in the herbarium material here that is true; on the other hand, I distinctly recall practically covering an entire rolling slope where *D. carolinianum* was rampant before I found plants small enough to make good herbarium specimens. Color of the flower is not reliable except in combination with other characteristics. A number of specimens of *D. virescens* have decidedly hooked spurs, others (but not all) show a definite tendency in that direction. Perhaps the best distinguishing feature is found in the mature (or nearly mature) seeds; unfortunately not a quarter of our specimens have reached that point of development; consequently, in a group with not too definite specific lines, it is difficult to determine such collections.

Var. **Penardi** (Huth), comb. nov. *D. Penardi* Huth in Helios, x.

34—repr. Delph. Art. Ber. Staat. 10 (1892) and in Bull. Herb. Boiss. i. 335, t. 16, fig. 2 (1893). Differs fron the typical variety in having the lower part of the stem glandular-pubescent and the upper crisp-pubescent. NEBRASKA: Callaway, June 15, 1901, *J. M. Bates* in part. KANSAS: prairie, Ellis Co., June 16, 1882, *G. C. Deane;* east of Liberal, *S. D. McKelvey*, no. 2491. OKLAHOMA: near Shattuck, *R. L. Clifton*, no. 3127. COLORADO: New Windsor, June 21, 1905, *G. E. Osterhout;* Poudre Flats, north of Fort Collins, June 27, 1895, *J. H. Cowen;* along railway west of Fort Collins, June 20, 1896, *C. S. Crandall;* Denver, *I. W. Clokey*, no. 3091. TEXAS: Amarillo, *J. Reverchon*, no. 2959; Comanche Spring, New Braunfels, etc., *Lindheimer*, no. 660.

There are also two specimens collected at Noel, Missouri, by *B. F. Bush.* The lack of mature seeds in most of these specimens is a decided handicap in any effort to determine them.

D. VIMINEUM Don in Sweet, Brit. Fl. Gard. ser. 2, iv. t. 374 (1838). Texas and Mexico.

This species so closely resembles *D. virescens* in habit that I mention it here. Although it differs in the crisp-pubescent stem, occasionally somewhat bluer flowers and darker brown seeds, further collections may prove it is not more than a variety of *D. virescens.*

GRAY HERBARIUM.

NOTES ON THE DISTRIBUTION AND HYBRID ORIGIN OF × SOLIDAGO ASPERULA

RICHARD H. GOODWIN

(Plate 453)

IN 1900 Graves[1] published a note on "a little-known New England golden-rod" which Professor M. L. Fernald considered satisfactorily referable to *Solidago asperula* Desf.[2] Concerning the nature of the plant Graves wrote, "Dr. Gray, to whom most of the Massachusetts specimens were submitted, classed them doubtfully as hybrids between *S. rugosa* Mill. and *S. sempervirens* L. Later students, however, have been more inclined to regard this form as entitled to specific rank." Since then, accumulating evidence from field observations has led botanists to agree with Dr. Gray. The seventh edition of Gray's Manual (1908) lists the plant as a probable hybrid between *S. rugosa* and *S. semperivrens.*

[1] RHODORA **2** (15): 57–59. 1900.
[2] Desfontaines, Cat. Hort. Paris ed. 3: 403. 1829.

Fig. A, Solidago sempervirens. Figs. B, C and D, × S. asperula, showing intergradations between A and E. Fig. E, S. rugosa. All specimens from the reclaimed saltmarsh on the Charles River, Cambridge, Massachusetts, September 19, 1932.

In connection with the hybrid origin of × *S. asperula* Desf., the geographical distribution of this plant and of its two alleged parents is of interest. FIGURES 1, 2 and 3 show the northeastern distributions of *S. rugosa*, *S. sempervirens* and × *S. asperula* respectively.[1] Knowlton, Weatherby, and Ripley[2] listed *S. rugosa* as generally distributed and *S. sempervirens* and × *S. asperula* as maritime species. Inspection of the maps shows that the range of × *S. asperula* does not extend

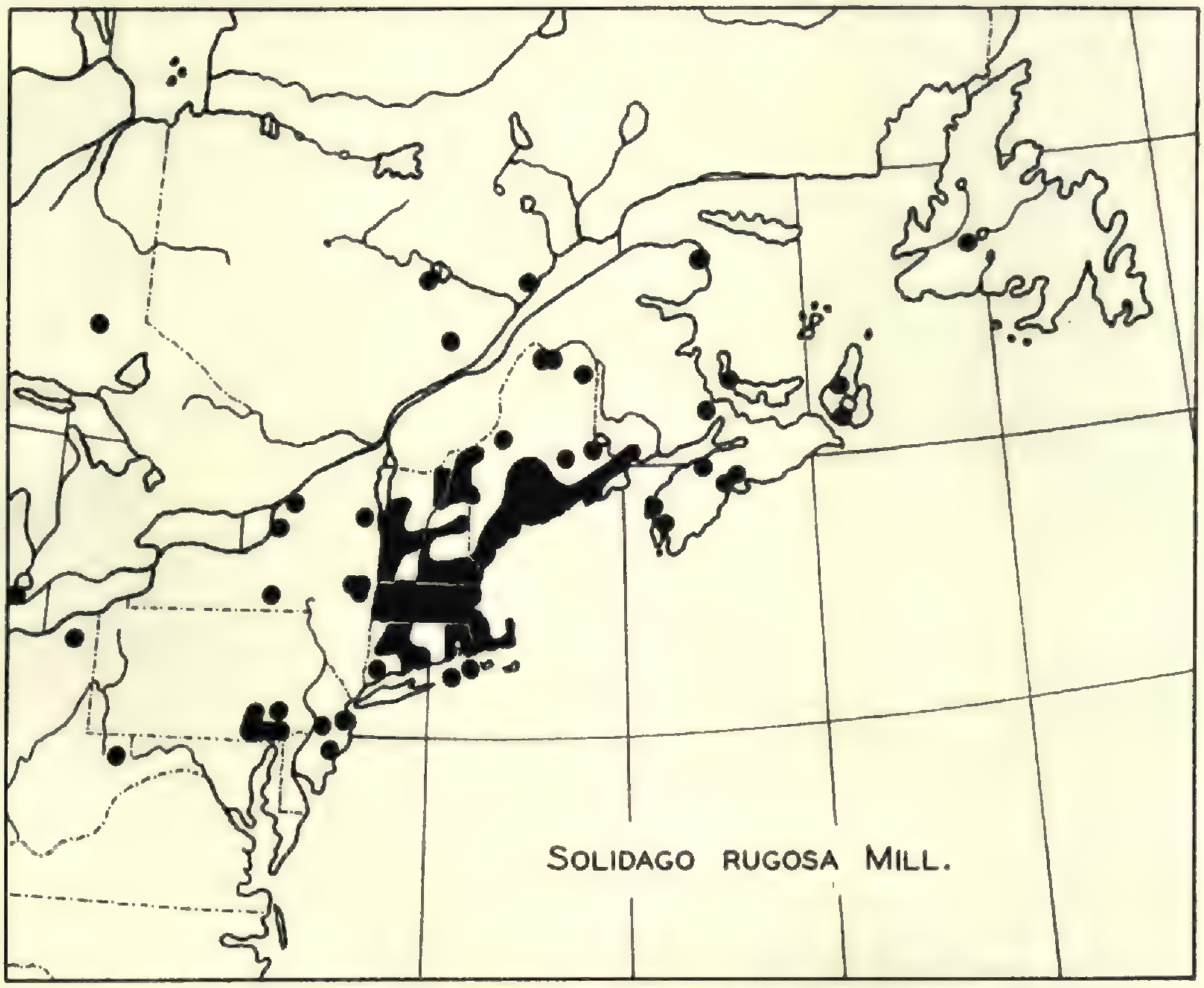

FIG. 1. Northeastern Occurrence of SOLIDAGO RUGOSA.

beyond that common to the two supposed parents. Notes on a large number of the more recent collections of × *S. asperula*, moreover, specifically mention the close proximity of both *S. rugosa* and *S. sempervirens*.

× *S. asperula* may be found most readily along the margins of salt-marshes adjacent to unmowed open land where *S. sempervirens* and *S. rugosa* are both flowering in abundance. Ideal conditions for

[1] Further collecting would undoubtedly extend the distribution of these plants as now shown on the maps. Specimens from the localities indicated may be found in the collections of the Gray Herbarium, of the New England Botanical Club, of Dr. R. H. Wetmore, or of the author.

[2] RHODORA 27 (316): 56–65. 1925.

natural hybridization between *S. rugosa* and *S. sempervirens* were indirectly brought about in Cambridge, Massachusetts, by the closure of the dam at the mouth of the Charles River estuary in 1908. The subsequent ecological changes which took place in the flora of the salt-marsh between the Cambridge cemetery and the Charles River have been described by Mr. Walter Deane.[1,2] By 1912 considerable salt had been leached from the marsh.[1] Although most of the salt-

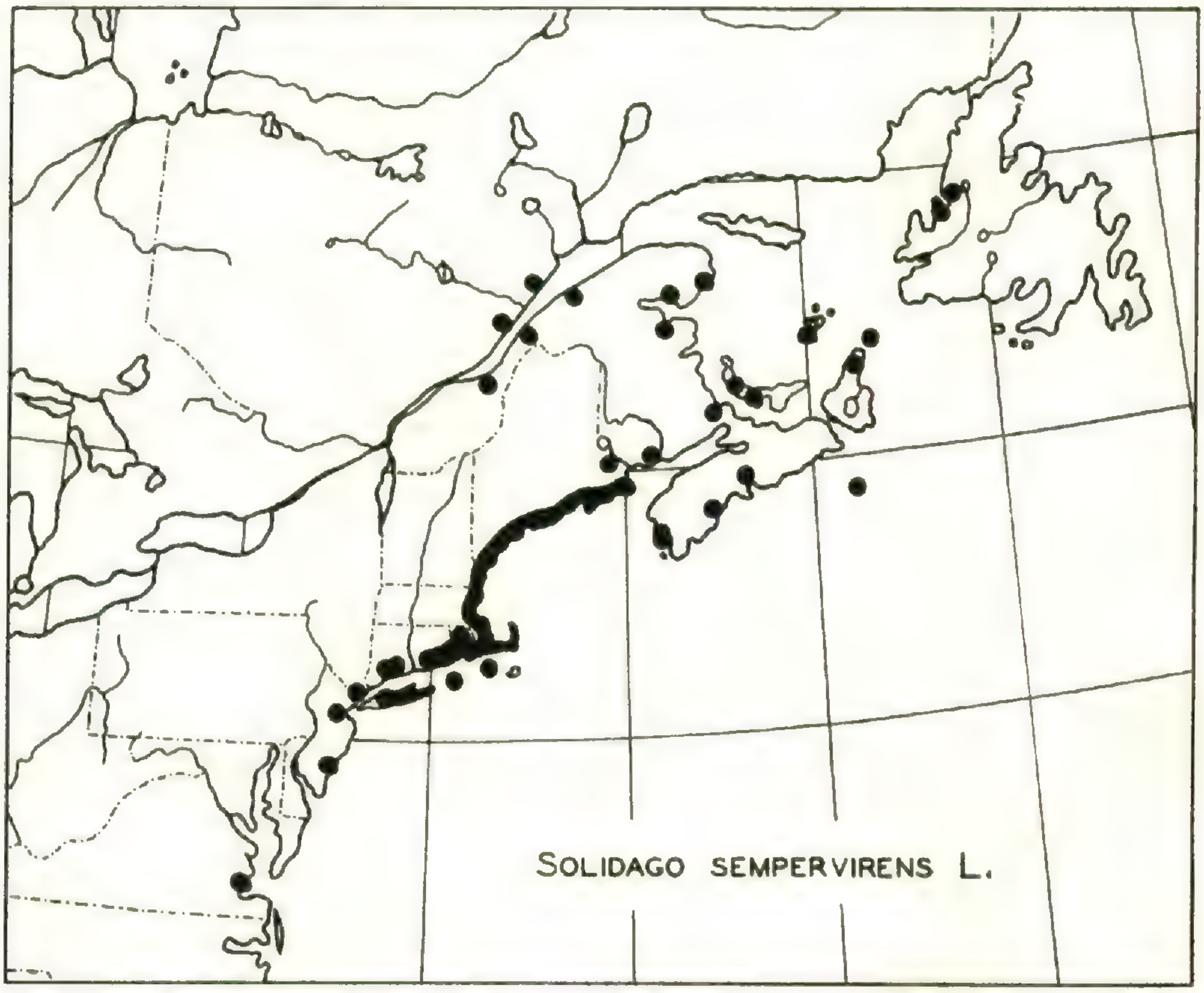

FIG. 2. Northeastern Occurrence of SOLIDAGO SEMPERVIRENS.

marsh plants, including large stands of *S. sempervirens*, were still present, a host of weeds and fresh-water plants had already invaded the area. Among these was *S. rugosa*. In 1923 *S. sempervirens* was one of four maritime plants which Mr. Deane mentions as still persisting. Mr. Deane did not record × *S. asperula* in his original list nor in his supplement published in 1926. A number of specimens of this plant were collected from the area in 1923, however, by Dr. R. H. Wetmore, and it seems probable that it was growing there at an even earlier date. FIGURE 4 shows the distribution of *S. rugosa*, *S. semper-*

[1] RHODORA **17** (203): 205–222. 1915.
[2] RHODORA **28** (327): 37–40. 1926.

virens, and × *S. asperula* over this area in the fall of 1933. *S. rugosa* was common throughout; *S. sempervirens* was restricted to scattered patches; while × *S. asperula* was abundant, but most frequently associated with *S. sempervirens*. Furthermore, × *S. asperula* showed a tremendous variability, exhibiting many intergradations between *S. rugosa* and *S. sempervirens*, as shown in PLATE 453.

The foregoing evidence coupled with the many morphological

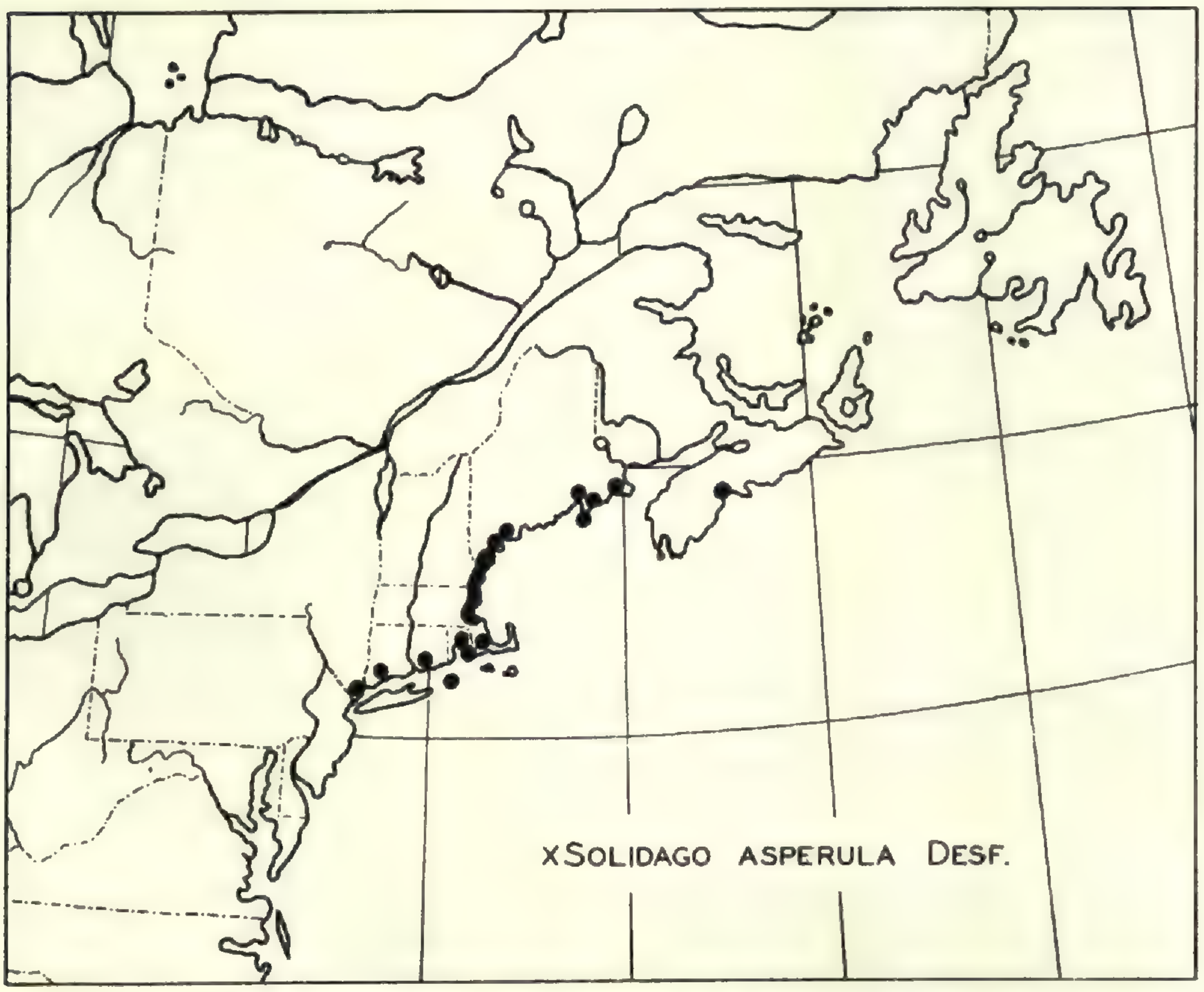

FIG. 3. Northeastern Occurrence of × SOLIDAGO ASPERULA.

characters intermediate between *S. rugosa* and *S. sempervirens* points to the hybrid origin of × *S. asperula*. The fact that these plants set abundant seed indicates that they are fertile and that second generation hybrids and back-crosses with the parents may occur.[1] This would account for the variability encountered in nature.

Genetical work carried out by the writer during the past five years has proved the validity of these conclusions. *S. rugosa* and *S. semper-*

[1] Since hybrid plants are usually sporadic in occurrence and have always been found growing close to their parents, back-crosses between hybrids and their parents should be far more frequent than second generation hybrids.

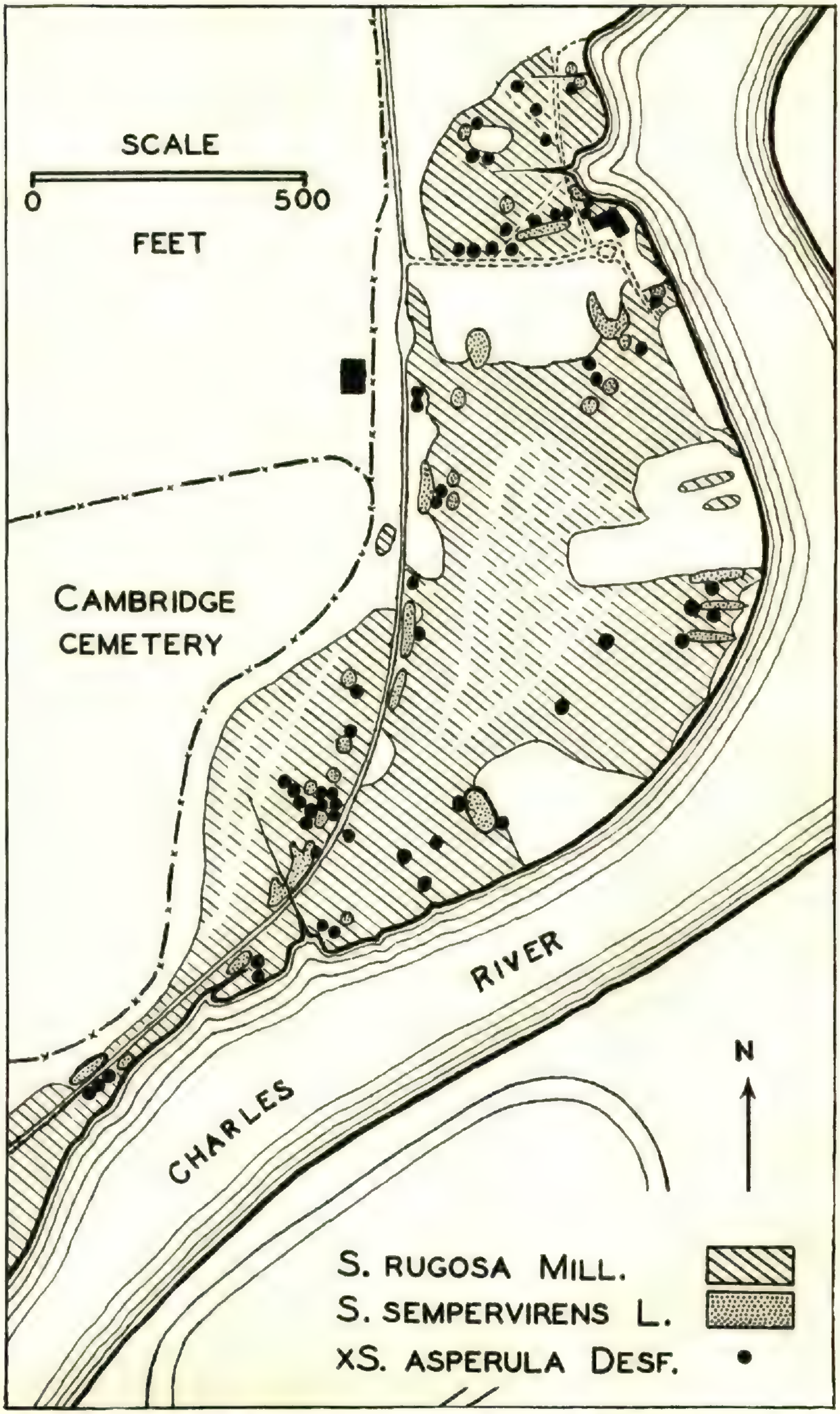

FIG. 4. Occurrence near Cambridge Cemetery of SOLIDAGO RUGOSA, S. SEMPERVIRENS and × S. ASPERULA.

virens[1] were used as stock material during the investigation. Pollinations were carried out in the greenhouse under carefully controlled conditions. The technique will be described in a subsequent paper. The results obtained were as follows:

1) F_1 hybrids were obtained from reciprocal crosses between *S. rugosa* and *S. sempervirens*. Their morphological and floral characters were intermediate between the parents and identical with those of typical plants of × *S. asperula.*[2]

2) Pollination experiments with these hybrids have proved them to be inter-fertile and self-sterile like their parents. A second generation has been brought to flower. Plants of the F_2 generation showed a complete range of intergradations between the two parental types.

3) Back-crosses were obtained between F_1 hybrids and both parents. These varied in appearance between the F_1 hybrid and the parent with which it was back-crossed.

This genetical evidence proves conclusively that × *S. asperula* is a hybrid between *S. rugosa* and *S. sempervirens*. Further, the variability of the second generation hybrids and back-crosses offers an explanation for the variability of × *S. asperula* in nature. The plants growing in an area such as the reclaimed salt-marsh on the Charles River display a complex of variable forms which might well confuse anyone who had not bred and grown these hybrids and back-crosses from seed.

Although *S. sempervirens* and × *S. asperula* are restricted to a maritime distribution, they have been grown from seed in the greenhouse and garden in light loamy soil just as successfully as has *S. rugosa*. Hence it would seem to be factors other than salinity which limit their distribution. The distribution of × *S. asperula* may not be confined to the immediate vicinity of salt water by ecological factors, as is generally the case with its maritime parent. Any spread of the hybrid inland, however, would result in these plants back-crossing exclusively with *S. rugosa*. In this way the characters of *S. sempervirens* would soon be swamped out.

[1] The original plants of *S. sempervirens* were obtained from pure stands on the sand dunes at Ipswich, Mass., while those of *S. rugosa* were collected on a high hill in Belmont, Mass.

[2] The description of × *S. asperula* Desf. in Gray's Manual, 7th edition, is adequate for genetical material grown by the writer in the greenhouse, except that the lowest cauline leaves of my specimens may reach a length of 3.6 dm. Graves' measurements are also correct except for these leaves. In nature the lowest cauline leaves have usually withered at the time of flowering and are frequently not present in herbarium material. Furthermore, there is a tendency for these plants to grow larger under greenhouse conditions.

Crosses between the various varieties of *S. rugosa* and *S. sempervirens* have not yet been attempted. It would be interesting to know whether *S. rugosa* var. *aspera* Fernald or *S. rugosa* var. *celtidifolia* Fernald naturally hybridize with *S. sempervirens* var. *mexicana* Fernald. These varieties all have a more southerly distribution on the Atlantic Coastal Plain.

HARVARD UNIVERSITY.

PETALOSTEMUM **occidentale** (Gray), comb. nov. *P. candidus*, var. *occidentalis* Gray in sched. Pringle Pl. Mex. no. 1216, and ex Heller in Britton & Kearney, Trans. N. Y. Acad. Sci. xiv. 33 (Feb., 1895), basis of *Kuhnistera occidentalis* Heller in Britton & Kearney, l. c. (Feb., 1895). *P. gracile*, var. *oligophyllum* Torr. in Emory, Notes Mil. Rec. 139 (1848). *Kuhnistera candida occidentalis* (Gray) Rydb. Contr. U. S. Nat. Herb. iii. 154 (Sept., 1895). *K. oligophylla* (Torr.) Heller, Bull. Torr. Bot. Cl. xxiii. 122 (1896). *Petalostemon oligophyllus* (Torr.) Rydb. Mem. N. Y. Bot. Gard. i. 237 (1900).

Treated as a species, the southwestern plant has to take the first specific epithet. In publishing *Kuhnistera occidentalis* in February, 1895, Heller definitely stated that he was deriving the name from one used on herbarium-sheets but unpublished by Gray. It seems proper, then, to cite Gray as the originator of the name.—M. L. FERNALD.

Volume 38, no. 456, including pages 456–477, plates 447–452, and the title-page of the volume, was issued 14 December, 1936.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. February, 1937. No. 458.

CONTENTS:

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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Photo W. R. Fisher

SAGITTARIA EDWARDSIANA: fruiting plant, × 2/5; FIG. 1, achenes, × 7
S. TERES: FIG. 2, achenes, × 7.
S. GRAMINEA: FIG. 3, achenes, × 7.

Rhodora

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SAGITTARIA EDWARDSIANA, A NEW SPECIES FROM THE NEW JERSEY PINE BARRENS

R. T. Clausen

(Plate 454)[1]

On June 30, 1935, Mr. J. L. Edwards, W. L. Highton, and the writer visited the New Jersey pine barrens in the vicinity of Speedwell, in quest of the rare *Pogonia divaricata*. After exploring this region, we botanized in the bogs along a small creek just above its junction with the Wading River, about two miles north of Washington, Burlington County. Here we found a great abundance of *Narthecium americanum*, also the southern *Rynchospora oligantha*, which we had found earlier in the day in a bog just south of Chatsworth. While the writer was collecting in the nearby bog, Mr. Edwards discovered and called his attention to a peculiar looking, decidedly succulent Sagittaria. Realizing that this was something that was new to us, we collected several of the plants. Unfortunately it was too early in the season for fruiting material, but most of the specimens were in flower, with the inflorescences raised just out of the water. The great, fleshy phyllodia mostly exceeded the scapes and tended to float on the surface. The plants were growing on a muddy bottom, in 1½ to 2 feet of water, in close association with *Scirpus subterminalis* and other submerged aquatic species.

Specimens of the flowering material of this Sagittaria obtained in 1935 have been shown to a number of critical students of the north-

[1] The publication of the Plate has been made possible through the kindness of Dr. L. H. Bailey.

eastern flora, but none have been able to satisfactorily determine it. Further, the writer has been quite unsuccessful in his attempts to match the plants with *S. teres* or the many forms of *S. graminea*, *subulata*, and other species with which it might be identified.

Without fruits, the Washington specimens could not be placed in any one of the known species groups in the genus. Consequently, attempts were made to secure such material during this season, 1936. On Aug. 28, more flowering plants were found in the Oswego branch of the Wading River near Martha, but still no fruits. On Sept. 15, the writer revisited the Washington station and collected a good fruiting specimen with mature achenes. Now, with all the characters known, we find that our plant is most closely related to *S. graminea* and *S. teres*, but different from both in several details.

The fruiting pedicels are erect, not recurved, thus eliminating the slight possibility of affinity with *subulata*. The phyllodia are decidedly elongate, terete and succulent, exceeding the scape, very different from the condition in either *teres* or *graminea*. True leaves with blades are apparently never developed. The peduncle is quite thick and fleshy, contrasting sharply with the rather slender scapes of *graminea* and *teres*, and bears regularly three or four whorls of flowers, three flowers in a verticel, with the lowest group pistillate. The achenes are most distinctive, differing from those of *graminea* in their turgidity, in their very dark brown, almost black, color, in having the straw-colored wings standing up to form definite ridges, and in having the minute beaks either erect or oblique, rarely incurved. From the achenes of *teres* these differ in having the wings both straw-colored and quite entire, not at all crenate or broken, as is regularly the case in that species. The staminate flowers bear twelve stamens, with the filaments slightly shorter and more pubescent than in *teres*.

In naming this species, I dedicate it to Mr. J. L. Edwards of Montclair, N. J., a most able and critical field botanist.

Sagittaria **Edwardsiana**, sp. nov.—Planta aquatica, monoecia, submersa radicibus fibrosis; phyllodia longa, linearia, teretia, succulentia, acuminata, plerumque superantia scapum 12–51 cm. longa 4 mm. crassa, aliquid nodosa; scapus aliquatenus crassus carnosusque, 22–53 cm. longus, 1–2.5 mm. crassus, fere tres vel quatuor verticillos ferens, infimos fertiles, pedicellis gracilibus bracteis ovatis fuscis subtentis, 3 mm. longis. Flores steriles in pedicellis 0.8–2 cm. longi; sepala tria, viridia, obtusa, 4 mm. longa; petala tria, alba, 5–6 mm. longa; stamina 12, filamentis valde dilatatis, 1 mm. longis, basi 0.8 mm. latis, dense

pubescentibus, antheris luteis, 1 mm. longis 0.8 mm. in diam. Pedicelli fertiles fructiferi erecti, 1.5 cm. longi; achenia fusca, 1.5–2 mm. longa, rostris minutis gracilibus vel erectis vel obliquis, marginibus lateribusque aliquot cristas stramineas, non crenatas, vel alas ferentibus.

SAGITTARIA **EDWARDSIANA**, n. sp. Monoecious, submerged aquatic herb with fibrous roots; phyllodia long, linear, terete, succulent, acuminate, usually exceeding the scape, 12–51 cm. long by 4 mm. thick, somewhat nodose; the scape relatively thick and fleshy, 22–53 cm. long and 1–2.5 mm. thick, typically bearing three to four whorls of flowers, the lowest pistillate, the slender pedicels subtended by dark ovate bracts, 3 mm. long. Staminate flowers on pedicels .8–2 cm. long; sepals three, green, blunt, 4 mm. long; petals three, white, 5–6 mm. long; stamens 12, with the filaments much dilated, 1 mm. long by .8 mm. wide at base, densely pubescent; the anthers yellowish, 1 mm. long and .8 mm. in diam. Pistillate pedicels erect in fruit, 1.5 cm. long, the achenes dark brown, 1.5–2 mm. long, with minute slender beaks either erect or oblique, the margins and sides with several stramineous entire crests or wings.—TYPE in Bailey Hortorium; COTYPES in Gray Herb., Cornell University Herb., and Clausen Herb. On muddy bottom in 1.5–2 ft. of water in branch of Wading River two miles north of Washington, Burlington Co., NEW JERSEY, June 30, 1935, *J. L. Edwards, W. L. Highton, and R. T. Clausen* 1741.

Besides the type collection there may be cited as topotypes: *W. C. Wilson and R. T. Clausen* 2358, in branch of Wading River north of Washington, Sept. 15, 1936; also *J. L. Edwards, J. Kezer, and R. T. C.* 2317, muddy bottom of Oswego River, Martha, Burlington Co., New Jersey, Aug. 28, 1936.

BAILEY HORTORIUM,
Ithaca, New York.

EXTENSION OF RANGE OF CALAMAGROSTIS EPIGEJOS.—At the time Prof. A. S. Hitchcock published his "Manual of the Grasses of the United States" February, 1935, this grass was known only from Harwich and Gloucester, Massachusetts, and from Montgomery County, Pennsylvania, northwest of Philadelphia.[1]

Early in September, 1936, a thriving colony of this grass was found in Juniper Swamp near Middle Village and south of Elmhurst, L. I.,

[1] Mr. Beals' material is like that at the stations in Massachusetts and Pennsylvania, which was discussed in detail in RHODORA, XXXV. 64, 65 (1933), whence Hitchcock derived his information. It belongs to var. GEORGICA (C. Koch) Ledeb., a local variety of southern Russia, rather than to the coarse, typical *Calamagrostis epigejos*, Hitchcock in his *Manual* not admitting most varieties.—M. L. F.

all of which places are within the City of New York, N. Y. Juniper swamp was drained and the low trees and bushes were cut off about twenty years ago. The area is crossed north to south by the New York Connecting Railroad, a double track line in a cut through morainal gravel. The banks of this cut are twenty-five to thirty feet high. The *Calamagrostis* colony is located west of the railroad and only a few feet from the bank of the railroad cut. It is irregular in shape and extends fifty feet north and south and an equal distance east and west. The grass is growing partly on sedge peat of the bed of the swamp and extends upwards over a sharply pitched gravel bank to the top, a height of fifteen feet above the swamp level. The grass forms a dense turf to the exclusion of all other plants. The culms reach a height of forty to forty-eight inches and there were thousands of fruiting panicles.

The colony seems to be spreading by underground shoots only. No smaller areas of this grass were found within a radius of a quarter of a mile of the large colony. This fact may indicate that this grass does not produce many seeds that will germinate. Plants growing on the sedge peat showed no greater vigor than those growing on the gravel slope.

Mrs. Agnes Chase verified my determination of this species and says that this is the first station of it reported from the State of New York.

Unfortunately this station will soon be destroyed as New York City is filling in the swamp to make a public park of the area. Already the filling operation has reached a point only two hundred feet from this colony. Before the first of the year this plat of grass will be covered to a depth of ten feet by cartloads of old plaster, broken brick, ashes and other refuse.

To avoid the extinction of this colony of grass I have dug sixty sizable sods and planted them along the sloping sides of the nearby railroad cut where they will have a possible chance of growing and spreading in area undisturbed by the development of municipal park plans.—A. T. Beals, 2929 Broadway, New York City.

CRITICAL BRYOPHYTES FROM THE KEWEENAW PENINSULA, MICHIGAN

William Campbell Steere

(*Continued from page 14*)

For help kindly given in identification, the writer is grateful to E. B. Bartram, A. W. Evans, M. Fulford, A. J. Grout, and A. J. Sharp.

Species of bryophytes which are new to the flora of Michigan are marked in the following list with an asterisk.

HEPATICAE

Riccardiaceae

Metzgeria furcata (L.) Dumort. This species was collected in July, 1933, on large basaltic boulders near Copper Harbor.[1] Since then, it has been discovered to be locally common at one locality in the Huron Mountains.[2]

Careful search during the summer of 1935 brought to light several new stations in Keweenaw County, although all the colonies occupied the same type of habitat, namely, the shaded, perpendicular sides of trap-rock ledges and large isolated fragments of the same rock.

Pelliaceae

Pellia Neesiana (Gottsche) Limpr. On a rotten log in a small stream along the road to Jacobsville, Houghton County, September, 1935.

Pellia Fabroniana Raddi. On wet trap-rock and conglomerate ledges, Horseshoe Harbor, Keweenaw County, September, 1935.

Lophoziaceae

*Jungermannia Schiffneri (Loitlesb.) Evans. On wet trap-rock ledge, shore of Copper Harbor, Keweenaw County, September, 1935.

This species has a noteworthy disjunct distribution (Fig. 4). It has been reported from Hector and Stephen, British Columbia, very close to the Alberta boundary line,[3] and also from across the boundary line, in Alberta.[4] The only other area known in North America is in

[1] Steere, W. C., *Unreported or otherwise interesting bryophytes from Michigan*, Bryologist **37**: 57–62, 1934.

[2] Nichols, G. E., *loc. cit.*, 1935.

[3] Evans, A. W., *Notes on North American Hepaticae, VII.*, Bryologist **20**: 17–28, 1917.

[4] Brinkman, A. H., *List of hepatics of Pacific coast and adjoining territory*, Rept. Prov. Museum Nat. Hist. B. C., 1933: 24–33, 1934.

the Lake Superior region: Duluth, Minnesota;[1] Douglas, Bayfield, and Iron counties, Wisconsin,[2, 3] all of which adjoin Lake Superior.

*JUNGERMANNIA SPHAEROCARPA Hook. On rocks which are kept moist by seepage water and spray, but not washed over by waves, Copper Harbor, Keweenaw County, September, 1935.

This species is known from the Pacific Coast (California, Washington, British Columbia, Alaska); from the Rocky Mountain area (Colorado, Wyoming, Alberta), and from the Lake Superior shores of Minnesota, Wisconsin and Michigan. It has also been reported from King Oscar's Land and from Ellesmereland.[4]

LEIOCOLEA GILLMANI (Aust.) Evans, Bryologist **38**: 83. 1935. [*Lophozia Kaurini* (Limpr.) Steph.]. This is one of the most characteristic species to be found in sheltered places on the rocky shores of Keweenaw Peninsula. It grows in large mats just above the water level on the trap-rock and conglomerate ledges which form the shores of Agate, Copper and Horseshoe Harbors. Perianths are produced in abundance in these places.

This is a distinctly boreal species. The first North American report was from Alaska (in 1903). The range has been extended since throughout the northern Rocky Mountains, to the Lake Superior shores of Minnesota, Wisconsin and Michigan, and to a very few eastern stations (in Quebec and Vermont). The southernmost known locality in the United States is West Jefferson, Ohio.

LEIOCOLEA HETEROCOLPA (Thed.) Buch. This species is not uncommon in crevices of the low trap-rock and conglomerate cliffs along the lake shore, yet always above the reach of storm waves, and occasionally on rotten wood in the forest, Keweenaw County, September, 1935.

The range of this species, although wide, is typically arctic-alpine.

LOPHOZIA ATTENUATA (Mart.) Dumort. On moist trap-rock ledges along the shore of Copper Harbor and abundant on rotten logs in the forest, Fort Wilkins, September, 1935.

Another species of the Lake Superior region which is otherwise found in the United States only in the mountains of New England and in the far western states.

LOPHOZIA HATCHERI (Evans) Steph. One of the most common

[1] Conklin, G. H., *Report of the Curator of the Hepatic Herbarium of the Sullivant Moss Society for 1924*, Bryologist **28**: 13–14, 1925.

[2] Evans, A. W., *Notes on North American Hepaticae, VII.*, Bryologist **20**: 17–28, 1917.

[3] Conklin, G. H., *The Hepaticae of Wisconsin*, Trans. Wis. Acad. **24**: 197–247, 1929.

[4] Bryhn, N., *Bryophyta in itinere polari Norvagorum secundo collecta*, Rept. 2d. Norweg. Arct. Exped. "Fram." **2** (11): 1–260, 1907.

species on moist trap-rock and conglomerate ledges along the shore of Copper Harbor; also frequent on the ground and on boulders in wet forest and on clay banks along the road between Phoenix and Copper Harbor, July, 1933 and September, 1935.

The geographical distribution of this species is very much like that of the last. The only other record from the Lake Superior region is from the Huron Mountains.

LOPHOZIA KUNZEANA (Hüben.) Evans. Locally common on moist trap-rock and conglomerate ledges at Copper Harbor and on high cliffs along Lake Superior; also on the ground and on boulders in deep forest along the lake, Fort Wilkins, Keweenaw County, September, 1935.

This species is another member of the arctic-alpine group, and shows the usual interesting distribution. Keweenaw Peninsula is only the second known locality in the Lake Superior district for this hepatic. The previous report, and the first one, was made by Nichols on the basis of material collected in the Huron Mountains.

LOPHOZIA LONGIDENS (Lindb.) Macoun. On rotten logs in wet woods, Fort Wilkins, Keweenaw County, September, 1935.

This hepatic is known in Michigan only from several localities near Lake Superior, and on Isle Royale. It is one of a number of arctic-alpine species that are characteristic of the Lake Superior shore.

*LOPHOZIA OBTUSA (Lindb.) Evans. On humus and boulders in dense, wet forest at Fort Wilkins, Keweenaw County, along the shore of Copper Harbor, September, 1935.

This species was first reported for North America from Juneau, Alaska, and was subsequently found to have a rather wide range in the western mountains (Wyoming, Idaho, Washington, Oregon, British Columbia), although nowhere common. It has also been reported from Ellesmereland, and from one New England station (Franklin County, Maine). This is the first report of the species in the Lake Superior region, although on the basis of the geographical distribution of many other species, its presence in Michigan is not at all astonishing.

TRITOMARIA EXSECTIFORMIS (Breidl.) Schiffn. On rotten logs, humus, and moist rocks in forest, Houghton County, September, 1935; Keweenaw County, September, 1935.

This hepatic, although not at all a "critical" species, is noteworthy because of its abundance in Keweenaw and Houghton Counties. In the dense *Thuja* swamps near the ship canal, between Lake Linden

and Jacobsville, in Houghton County, the shaded roadside is often covered with mats of this species, in a pure growth, several feet across, and conspicuous because of the terminal clusters on each plant of the characteristic reddish gemmae.

TRITOMARIA QUINQUEDENTATA (Huds.) Buch [*Lophozia quinquedentata* (Huds.) Cogn.] On moist trap-rock and conglomerate ledges along the lake shore, often growing just above the water level and then usually associated with *Scapania cuspiduligera* (Nees) K. Müll. and *Leiocolea Gillmani* (Aust.) Evans; on rotten wood, humus, and boulders in dense, wet woods, Fort Wilkins; also on moist talus blocks, near Cliff, Keweenaw County, September, 1935.

This is a characteristically northern species, and is known in Michigan only from Isle Royale and the south shore of Lake Superior.

SPHENOLOBUS HELLERIANUS (Nees) Steph. Common on rather dry rotten logs in maple forest, Keweenaw County, September, 1935.

This is a distinctly northern species, and usually is abundant wherever it occurs.

PTILIDIACEAE

BLEPHAROSTOMA TRICHOPHYLLUM (L.) Dumort.

This is one of the most abundant hepatics on moist rock ledges along the shore of Lake Superior, where it often forms great mats. It is, in places, one of the most characteristic and conspicuous members of the plant association inhabiting the upper part of wet ledges. The conspicuousness of so small a species is noteworthy, as well as the habitat. Throughout the greater part of Michigan, this species is found only on humus or decaying wood, and becomes more and more rare to the south. It is apparently a typically northern species, saxicolous under optimum conditions, but able to exist on other substrata.

SCAPANIACEAE

SCAPANIA CUSPIDULIGERA (Nees) K. Müll. This unique hepatic is locally very common on the low trap-rock and conglomerate ledges which form the shores of Agate, Copper and Horseshoe Harbors, and is most often accompanied by *Leiocolea Gillmani* (Aust.) Evans, Keweenaw County, September, 1935.

It is easily recognized in the field by the turgid appearance of the erect stems, upon which the lobes of the uppermost leaves are nearly equal in size. Each plant usually bears at the apex large masses of very dark gemmae, a characteristic which aids further to make identification of the species easy. The diagnostic characteristics by which

this plant may be recognized microscopically have recently been reviewed by Evans.[1] It is apparently not found very frequently in this country. The first locality recorded from North America was Pike's Peak, Colorado (1915). Other localities in the western Mountains (California, British Columbia, Alberta) were soon discovered. In 1929[2] this species was reported from Bayfield County on the Lake Superior shore of Wisconsin. Very recently[28] it has been reported from the shore of Lake Superior near the Montreal River, which forms the Wisconsin-Michigan boundary. The Keweenaw specimens make the disjunct distribution of *Scapania cuspiduligera* even more significant.

Frullaniaceae

Frullania Bolanderi Aust. This species is relatively common on the trunks of various kinds of trees (poplar, ash, birch, and arbor vitae) in the wet woods and swamps of Houghton and Keweenaw Counties.

It is easily recognized in the field, even without a lens, by the specialized erect branches without leaves. These structures project out beyond the prostrate, leafy stems, often in enormous numbers, so that well developed mats often have a curiously denuded appearance.

In view of the abundant production and dispersal of the caducous leaves, which act as a specialized means for vegetative reproduction, this species might be expected to be as common and widespread as the familiar *Marchantia polymorpha* L. Actually, however, its geographic distribution is perhaps as remarkable as that of any other American hepatic (Fig. 5). It was originally described from the vicinity of San Francisco, California, in 1869. Through the next fifty years, its known range was extended, as might be expected, up the west coast into Oregon, Washington, and British Columbia, so that now the species is known to be not uncommon there. In 1914[3] it was reported from Douglas County, Wisconsin, a remarkable range extension. The following year, it was recorded[4] from Bic, Rimouski County, Quebec. More recent range extensions have been to Emmet

[1] Evans, A. W. and G. E. Nichols, *The liverwort flora of the Upper Michigan Peninsula*, Bryologist, **38**: 81–91, 1935.

[2] Conklin, G. H., *loc. cit.*, 1929.

[3] Conklin, G. H., *Preliminary report on a collection of Hepaticae from the Duluth-Superior district, states of Minnesota and Wisconsin*, Trans. Wis. Acad. Sci., **17** (2): 985–1010, 1914.

[4] Evans, A. W., *Notes on North American Hepaticae, VI.*, Bryologist **18**: 81–91, 1915.

County, Iowa,[1, 2] which is the southernmost station in the central states, to Cook County, Minnesota,[3] and to Isle Royale.[4] It has been reported still more recently from the Porcupine Mountains and Keweenaw County, Michigan,[5] and also from Maine.[6]

In general, then, the geographical range of *Frullania Bolanderi* appears broken up into three remote and isolated "islands:" (1) throughout the Pacific coast area of the United States and Canada, (2) around the southwest end of Lake Superior, and (3) in the unglaciated part of the Gaspé Peninsula of Quebec, with an extension into Maine. The discovery of this hepatic in western Iowa is significant, although it is still impossible to determine whether it represents an extension southward of the Lake Superior "island" or an outlier of another isolated group. This anomalous geographical distribution gains still more significance because of its resemblance to that of many of the vascular plants reported from the Keweenaw Peninsula by Fernald.

*FRULLANIA OAKESIANA Aust. On the trunk of *Thuja* in a dense swamp near the ship canal, west of Jacobsville, Houghton County, September, 1935, mixed with *Frullania eboracensis* Gottsche.

Although this uncommon species was not recognized in the field, it was collected because of the slight but perceptible macroscopic differences from the ubiquitous and exceedingly abundant *F. eboracensis*. Under a lens, the autoecious inflorescence makes identification relatively easy.

At present, this hepatic is known only from New England, Nova Scotia, several localities in Quebec, and from the shores of Lake Superior in Minnesota, Wisconsin and now Michigan.

FRULLANIA ASAGRAYANA Mont. This common and widely distributed liverwort does not seem to be particularly frequent in Keweenaw County. When it occurs, it is more apt to be on somewhat exposed conglomerate cliffs than on trees, which form the usual habitat elsewhere in the state; July, 1933 and September, 1935.

[1] Conklin, G. H., *Report of the Curator of the Hepatic Department of the Sullivant Moss Society for 1928*, Bryologist, **32**: 21–23, 1929.

[2] Conard, H. S. and B. O. Wolden, *A key to the mosses of the Okoboji region*, Univ. Iowa Studies Nat. Hist. **14** (7): 1–27, 1932.

[3] Conklin, G. H., *A correction, with additions*, Bryologist **31**: 33, 1928.

[4] Thorpe, Frances J. and A. H. Povah, *loc. cit.*, 1935.

[5] Evans, A. W. and G. E. Nichols, *loc. cit.*, 1935.

[6] Parlin, J. C., *Notes on lichens and bryophytes from Maine*, Bryologist **38**: 73–80. 1935.

MUSCI

Andreaeaceae

Andreaea petrophila Ehrh. Locally abundant and in good fruiting condition, on talus blocks at foot of high cliffs near Phoenix and Cliff, Keweenaw County, September, 1935.

This species, although widespread in North America, usually at high altitudes, has been reported from only two localities in Michigan, Isle Royale and the Huron Mountains.

Fissidentaceae

Fissidens osmundioides Hedw. Not uncommon on wet rocks in small bays and "harbors" at the lake level, or in seepage pools, Keweenaw County, September, 1935.

Ditrichaceae

Saelania glaucescens (Hedw.) Broth. This moss, which is easily recognized because of the glaucous color of the plants, is not uncommon in crevices of rather dry conglomerate and trap-rock cliffs and ledges, Copper Harbor and vicinity, Keweenaw County, September, 1935.

Distichium capillaceum (Sw.) Bry. Eur. Rather uncommon in crevices of the lake shore rocks, Copper Harbor, Keweenaw County, September, 1935.

It is somewhat surprising that this common boreal species is not more abundant in the region.

Seligeriaceae

Seligeria Doniana (Sm.) C. Müll. Locally abundant in crevices of a rather dry conglomerate cliff west of Copper Harbor, Keweenaw County, September, 1935.

Blindia acuta (Huds.) Bry. Eur. Not at all uncommon along the shores of Copper Harbor on low trap-rock and conglomerate ledges, which are often wave-washed; usually sterile, September, 1935.

Dicranaceae

Dicranella Grevilleana (Brid.) Schimp. Infrequent in moist, shaded crevices on shore cliffs near Copper Harbor, Keweenaw County, September, 1935.

This species has been reported previously from Mackinac Island, and from the Munising region of Alger County, Michigan.

Paraleucobryum longifolium (Ehrh.) Loeske. Exceedingly frequent and abundant on rocks in moist, shaded places, especially on talus blocks where the slopes have been encroached upon by the forest, Keweenaw County, September, 1935.

Dichodontium pellucidum (Hedw.) Schimp. Common on trap-rock and conglomerate cliffs and ledges, where the rocks are kept moist by spray, or higher, along seepage channels, Keweenaw County, July, 1933 and September, 1935.

This moss is exceedingly variable, depending apparently upon the amounts of moisture and light which it receives.

*Dicranoweisia crispula (Hedw.) Lindb. Locally common along moisture-retaining seams and joints of exposed trap-rock cliff, shore of Copper Harbor, September, 1935.

This species, from its geographical distribution, is evidently typically arctic-alpine. It is widespread on the Pacific coast, and in the Rocky Mountain area, but is apparently known in the eastern states only from the summit of Mount Marcy, in the Adirondacks. The presence of the species in the Lake Superior region is therefore significant.

Oncophorus Wahlenbergii Brid. On rotten wood in dense forest, Fort Wilkins, Keweenaw County, September, 1935.

*Oncophorus virens (Sw.) Brid. Frequent, and often abundant, on wet trap-rock and conglomerate ledges, Copper Harbor and vicinity, Keweenaw County, September, 1935; also collected on the sandstone ledges on the west side of Au Train Point, in Alger County, in July, 1933.

The geographical range of *Oncophorus virens* is of much interest. In his revision of the genus Williams[1] makes the following statement of distribution: "Greenland to Alaska and south to Gaspé County, Quebec, Minnesota, and California." The range has been extended in the Rocky Mountain area since 1913, but so far as I can discover, no new eastern records have been published. The Minnesota specimen is from the Lake Superior highland region, so that, including the present material, the species has a significantly disjunct distribution.

Encalyptaceae

Encalypta ciliata (Hedw.) Hoffm. Rather frequent, but rarely abundant, in crevices of trap-rock and conglomerate cliffs, both along the shore of Lake Superior and inland, Keweenaw County, 1935.

This is apparently the most common species of *Encalypta* in the Upper Peninsula of Michigan.

Pottiaceae

Tortella fragilis (Drumm.) Limpr. Not uncommon on calcareous rocks, both along the shore of Lake Superior and on talus blocks; Keweenaw County, 1935.

[1] Williams, R. S., *Dicranaceae*, North Amer. Flora **15**: 77–158, 1913.

This is apparently the first report of the species from the Upper Peninsula.

DIDYMODON RECURVIROSTRIS (Hedw.) Jennings (*D. rubellus* (Hoffm.) Bry. Eur.). On moist rock ledges along the shore of Copper Harbor, Keweenaw County, July, 1933 and September, 1935.

TORTULA MURALIS Hedw. Common and abundant on dry, exposed trap-rock and conglomerate ledges, along the lake shore or inland. It often forms great mats many feet across on roadside ledges and on the bare summits of ridges, and is usually associated there with *Rhacomitrium canescens* (Timm) Brid.: Keweenaw County, July, 1933 and September, 1935.

GRIMMIACEAE

RHACOMITRIUM MICROCARPUM (Schrad.) Brid. Infrequent on dry, exposed talus blocks, near Cliff, Keweenaw County, September, 1935.

RHACOMITRIUM CANESCENS (Timm) Brid. Frequent and abundant on dry, exposed trap-rock and conglomerate ledges throughout Keweenaw County, especially conspicuous along roadsides, July, 1933 and September, 1935.

BRYACEAE

POHLIA PROLIGERA Lindb. Not uncommon on moist rocks and soil along the shore of Copper Harbor, Keweenaw County, September, 1935.

The geographical distribution, as this species has very recently been redefined by Andrews[1] shows it to be a high-boreal species, with the characteristic range Rocky Mountains (Colorado, British Columbia); Lake Superior region (Minnesota, Wisconsin, Michigan); Quebec.

MNIACEAE

MNIUM DRUMMONDII Bry. Eur. On the ground in *Thuja* swamp, Fort Wilkins, July, 1933.

The pale color of the leaves, which undergo very little alteration in shape or position during drying, and the small, pale, clustered sporophytes make this species one of the easiest to recognize. In spite of this fact, many of the specimens in herbaria identified as *M. Drummondii* are actually *M. cuspidatum* Hedw.

MEESEACEAE

MEESEA TRICHODES (Hedw.) Spruce. Not rare on moist rock ledges along the shores of Copper Harbor, usually associated with *Preissia quadrata* (Scop.) Nees and *Leiocolea Gillmani* (Aust.) Evans, Keweenaw County, September, 1935.

[1] Andrews, A. L., *Bryaceae*, Moss Flora of North America **2** (3): 184–210, 1935.

BARTRAMIACEAE

PLAGIOPUS OEDERI (Gunn.) Limpr. Not infrequent in moisture-retaining crevices of conglomerate cliffs west of Copper Harbor, Keweenaw County, September, 1935; often in fruit.

BARTRAMIA POMIFORMIS Hedw. Not found on the lake shore, but very common inland on sheltered rocks, especially on talus slopes, Keweenaw County, September, 1935.

TIMMIACEAE

*TIMMIA AUSTRIACA Hedw. Locally abundant in a few places where the forest comes to the edge of the low trap-rock and conglomerate cliffs which form the shores of Copper Harbor, and where the soil and atmosphere are kept continually moist by the spray, Keweenaw County, September, 1935.

Although this moss occurs in only a few places along the shore, wherever it does appear it is exceedingly abundant, and very conspicuous because of the large size both of the individual plants and of the mats. Whereas sterile *Timmia megapolitana* Hedw. might be mistaken for and passed by as a *Catharinea*, *T. austriaca* Hedw. much resembles a large *Polytrichum*, and if sterile might be mistaken for some member of that genus. The plants bear abundant sporophytes, however, some of which, in September, are just past maturity and deoperculate, whereas the others are very young, and will without doubt produce and mature their capsules the following summer.

Timmia austriaca, in America, has hitherto been considered to be exclusively western or arctic. It was first discovered and reported from Colorado. In 1884 Lesquereux and James[1] gave as the distribution of the species simply "Rocky Mountains of Colorado." In the most recent revision of our American species of *Timmia*, Miss Sayre[2] gives for *T. austriaca* a much wider, but nevertheless consistently and distinctly northwestern range, as follows: "Greenland, Yukon Territory, Alberta, British Columbia, Vancouver Island; in the United States, Rocky Mountains south to New Mexico, east to Nebraska." This, then, is a distinctly northern and western species, which illustrates very well the isolation of western plants in the Keweenaw Peninsula (FIG. 1).

ORTHOTRICHACEAE

ORTHOTRICHUM ANOMALUM Hedw. On cliffs of soft Cambrian sandstone, near Bête Gris, Keweenaw County, September, 1935.

[1] Lesquereux, L. and T. P. James, *Manual of the Mosses of North America*, 447 pp., 6 pl., Boston, 1884.

[2] Sayre, Geneva, *Timmiaceae*, Moss Flora of North America **2** (3): 145–149, 1935.

*Orthotrichum strangulatum Schwaegr. Locally abundant on the vertical sides of an enormous boulder in the forest at base of talus slope, near Cliff, Keweenaw County, September, 1935.

Although this is a relatively common and widespread moss, it does not seem to have been reported from Michigan previously.

Orthotrichum speciosum Nees. Common on trunks of ash and poplar in moist forest, Keweenaw County, September, 1935.

Orthotrichum obtusifolium (Schrad.) Brid. On the trunks of deciduous trees in dense woods, infrequent, but usually in fruit, Fort Wilkins, Keweenaw County, September, 1935.

Neckeraceae

Neckera pennata Hedw. Very common on trees in moist forests, also frequent on rocks. Some of the depauperate forms on exposed rocks, especially along the shore of Lake Superior, very puzzling. Throughout Keweenaw County, July, 1933 and September, 1935.

Homalia Jamesii Schimp. Very frequent and abundant on trap-rock blocks in the forest at base of talus slopes; Keweenaw County, September, 1935.

Theliaceae

Myurella julacea (Vill.) Bry. Eur. Not uncommon in moist crevices of trap-rock and conglomerate cliffs, in the vicinity of Copper Harbor, Keweenaw County, September, 1935.

Myurella gracilis (Weinm.) Lindb. On trap-rock ledges along the Silver River, between Eagle Harbor and Copper Harbor, Keweenaw County, September, 1935.

Leskeaceae

*Pseudoleskea oligoclada Kindb. Very common and abundant on rather dry boulders in hardwood forests and on shaded talus slopes, usually in good fruiting condition, Keweenaw County, July, 1933 and September, 1935.

Although the fine fruiting material collected in 1933 was discovered to be a *Pseudoleskea*, final determination was not completed until the 1935 collections had been made. This species was also collected in the Porcupine Mountains by Dr. Nichols and the writer, in August, 1935.

This moss has perhaps the most significant geographical distribution of any of the mosses yet known from the Keweenaw Peninsula (Fig. 3). It was originally described from material collected on Vancouver Island. Since the original description of the species, its range has been extended considerably. In the most recent revision of the genus, Sharp[1] says: "On rocks in the mountains, British Columbia

[1] Sharp, A. J., *Pseudoleskea*, Moss Flora of North America, 3 (4): 185–190, 1934.

to Colorado and Utah." This species probably agrees better than any of the others with the present distribution of many of the vascular plants reported by Fernald from Keweenaw County.

AMBLYSTEGIACEAE

HYGROAMBLYSTEGIUM FLUVIATILE (Sw.) Loeske. Not uncommon in small rock pools and water-filled joints and seams along the rocky shores of Lake Superior, near Copper Harbor, Keweenaw County, September, 1935.

HYGROAMBLYSTEGIUM ORTHOCLADON (Wils.) Loeske. Frequent on wave-washed rocks, near the water line, or in beach pools, near Copper Harbor, September, 1935.

HYGROAMBLYSTEGIUM IRRIGUUM (Wils.) Loeske var. SPINIFOLIUM (Sch.) Grout. In beach pools, Copper Harbor and Horseshoe Harbor, Keweenaw County, September, 1935.

*HYGROAMBLYSTEGIUM IRRIGUUM (Wils.) Loeske forma MARIANOPOLITANUM Dupret. In seepage channels through trap-rock ledges along the shore of Copper Harbor, Keweenaw County, September, 1935.

HYGROHYPNUM MOLLE (Dicks.) Loeske. At water level, in crevices of conglomerate ledge along shore of Lake Superior, west of Copper Harbor, September, 1935. Also collected earlier in the summer in the Porcupine Mountains.

Lesquereux and James interpreted *Hypnum molle* Dicks. very broadly and considered it as a common eastern species. As a result of later and more intensive study, as well as a trend toward narrower species concepts, the old species was split into two, which are the present *Hygrohypnum molle* and *H. dilatatum* (Wils.) Loeske. It is rather surprising to discover that the current *H. molle* has a completely western range. For its distribution, Grout[1] gives: "On stones in streams; arctic-alpine and infrequent. Northwestern U. S. and western Canada from the Rocky Mountains northward and westward." In fact, the wide distribution of this species in the Pacific northwest is so well recognized that it is used as the final distinguishing mark of the species in Grout's key.

The interrelation of *Hygrohypnum molle* and *H. dilatatum* is difficult to interpret. Grout (l. c.) treats *H. dilatatum*, which is common and widely distributed not only through the west, but also through eastern North America, as a subspecies of *H. molle*. Dixon[2] points out the difficulty in deciding which form should be considered

[1] Grout, A. J., *Amblystegieae*, Moss Flora of North America, 3 (2): 63–114, 1931.

[2] Dixon, H. N., *The student's handbook of British mosses*, Ed. III., xlviii + 582 pp. 43 pl., Eastbourne, 1924.

as the subspecies. Although *H. molle* was described much earlier, *H. dilatatum* is much more widely distributed and more common, in the British Isles, as well as in North America. *Hygrohypnum dilatatum* is reported from Michigan only from Isle Royale.

*Hygrohypnum eugyrium (Bry. Eur.) Loeske. Not uncommon on wave-washed trap-rock ledges. Copper Harbor and vicinity, Keweenaw County, September, 1935.

This is a widely distributed species in northern North America.

Hygrohypnum ochraceum (Turn.) Loeske. On wet trap-rock ledges in sheltered pool, Horseshoe Harbor, Keweenaw County, September, 1935. Not common.

Hygrohypnum palustre (Huds.) Loeske. This is the commonest *Hygrohypnum*, occurring on wave-washed ledges and in seams and joints of the rock which are filled with seepage water; Keweenaw County, July, 1933 and September, 1935.

Hypnaceae

Hypnum fertile Sendtn. On humus and rotting wood, in moist forest, Fort Wilkins, Keweenaw County, September, 1935.

Breidleria arcuata (Lindb.) Loeske. On low, moist, trap-rock and conglomerate ledges along the shores of Copper Harbor, often very near the water level, Keweenaw County, September, 1935.

In southern Michigan, the habitat of this moss is on soil and rotten wood in swamps and wet woods.

Isopterygium Muellerianum (Schimp.) Lindb. Rather frequent on the shaded, vertical sides of very large trap-rock blocks in forest at foot of talus slope, near Cliff, Keweenaw County, September, 1935; also Porcupine Mountains, August, 1935.

Hylocomiaceae

*Rhytidium rugosum (Ehrh.) Kindb. Not uncommon on talus fragments at the very base of the slope, where shaded by trees, often in very large mats, near Cliff, Keweenaw County, September, 1935.

The geographic distribution of this species, although boreal, is of very little real significance. The only remarkable fact is that it has not been found before in Michigan.

Hylocomium pyrenaicum (Spruce) Lindb. Frequent and often abundant on boulders and rotten logs in dense forest; also on shaded talus blocks, Keweenaw County, September, 1935.

Polytrichaceae

Polytrichum alpinum Hedw. var. silvaticum (Menz.) Lindb.

Found in abundance only at the foot of talus slopes near Cliff, and on a rocky shore near Bête Gris, Keweenaw County, September, 1935.

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IRREGULARITIES IN THE FLORAL PARTS OF TRADESCANTIA OZARKANA

Cora Shoop

On April 19, 1929 one plant of *Tradescantia ozarkana* Anderson & Woodson with white flowers was taken from the colony near Roaring River, the typical locality of the species, and planted in a window box at Monett, Missouri. The following spring the box was placed on the ground in partial shade at Steelville. An irregularity in the number of petals was noted each of the two following years, but no record was kept. In September, 1933 the plants were transplanted to the ground where they could receive only morning sunshine. Doubling continued. In the fall of 1933 the plant was moved to a position where it received only western sunshine. The original plant by the spring of 1935, when the following record was begun, numbered fifteen many-branched stalks.

Irregularities occurred on any stalk, both young and old, on axillary as well as on terminal umbels. The individual parts of irregular flowers were normal in size and appearance. No observations in the field have been made of irregularities in the species; casual observation in 1929 and in 1935 did not reveal any digressions in floral parts.

No irregularities occurred in *Tradescantia virginiana* L. which was collected at Sarcoxie, Missouri the same spring and cultivated with the plants of *T. ozarkana;* also *Tradescantia subaspera* Ker-Gawl. transplanted to the same garden continued to display the normal number of floral parts.

Mature capsules developed on irregular flowers as readily as on normal, but in no capsule were more than six seeds matured.

The plants continued in full bloom with about the same ratio of normal to abnormal flowers until the stalks were destroyed by water June, 1935.

Flowering records for the spring of 1935 are summarized in Table I.

TABLE I. Flowering record of TRADESCANTIA OZARKANA for spring 1935.

Number of flowers examined	904
" " irregular flowers	109
" " flowers with petals of same number as sepals	65
" " " " fewer petals than sepals	14
" " " " more " " "	40
" " " " stamens twice as many as petals	75
" " " " " one less than twice number of petals	25
" " " " " more than twice the number of petals	3
" " " " two petals and two sepals	3
" " " " " sepals and three or more petals	14
" " " " three or more sepals	68
" " " " ratio of 4–4–8 (Table II)	48

TABLE II. Daily record of abnormal as compared with normal flowers; (x ?) represents the number of flowers in which the ratio at the left occurs.

Date	Number of normal flowers	Number of abnormal flowers	Number of petals	Number of sepals	Number of stamens
May					
1	6	3	4	2	8
			4	4	8
			4	4	7
2	8	2	4	4	8
			6	6	12
3	12	3	4	4	8 (x 2)
			4	3	7
4	17	8	4	4	8 (x 8)
5	12	3	4	4	8
			5	5	10
			6	4	12
24	40	1	4	4	8
25	27	5	4	4	8 (x 4)
			4	3	7
26	24	3	4	4	8
			4	3	8
			4	2	7
27	18	1	4	4	8
28	21	3	4	4	8
			4	3	7
			3	2	6
			4	4	8
			4	4	7
29	19	6	4	4	9
			4	3	6
			4	2	7
			3	2	6
30	23	1	4	2	7
31	29	3	4	4	8
			4	3	8
			2	2	6
June					
1	34	9	4	4	8 (x 2)
			4	4	7 (x 2)
			4	3	7
			4	2	7

TABLE II.—*Continued*

Date	Number of normal flowers	Number of abnormal flowers	Number of petals	Number of sepals	Number of stamens
June					
			4	2	5
			2	2	4
			5	5	10
			4	4	8 (x 3)
			4	3	8 (x 2)
			4	3	7
2	27	8	3	2	6
			5	5	11
			4	4	8 (x 5)
			4	3	7
			4	3	8
3	20	10	4	2	7
			2	2	4
			5	5	10
			4	4	8 (x 6)
			4	3	8 (x 2)
4	35	14	4	3	7 (x 2)
			4	2	7
			4	4	6
			5	5	10
			4	4	8 (x 3)
5	48	5	4	3	8
			4	3	7
			4	4	8 (x 3)
6	33	5	4	4	7
			4	3	7
7	31	2	4	4	8
			4	3	8
8	39	2	4	4	8
			4	3	8
9	31	3	4	3	6
			4	3	7
			4	3	8
10	40	3	4	4	6
			4	3	7 (x 2)
11	28	0			
12	28	1	4	4	8
13	36	0			
14	30	2	4	3	3
			4	3	7
15	44	2	4	4	8
			4	4	7
16	37	1	4	4	8

Observations of the same plant (*Tradescantia ozarkana* reported for 1935) were made again in May and June of 1936. This year the behavior was even more erratic. The first two flowers, opened May 1,

were irregular as were the three which opened the following day. On the third day there were six flowers with a ratio of 1 normal to 1.5 abnormal. The number of normal then increased over abnormal until May 11 when the ratio was 11 normal to 1 abnormal. From May 12 the number of normal flowers decreased until May 18 when the ratio was 1.3 normal to 1 abnormal. Following this period of steady and very marked decrease, there occurred a period of ten days with only slight variations between 1.3 and 1.9 normal to 1 abnormal. After May 29, the normals began a steady and rapid gain and continued up to a ratio of 13 to 1 by June 9.

The greatest number of flowers produced on any one day was 66 on May 27, with 37 normal and 29 abnormal. The petals ranged in number from 2 to 8 inclusive, the sepals from 2 to 6, and the stamens from 5 to 14. Combinations of 4 petals, 4 sepals, and 8 stamens occurred 50 times. The 4-3-8-combination occurred 28 times, and the 4-4-7 occurred 18 times. Some less frequent, but higher combinations were: 5-5-10; 6-6-12; 6-5-13; 7-5-14; 8-3-12; and 8-4-11.

From May 1 to June 9, the plant produced 965 flowers with a ratio of 2.23 normal to 1 abnormal for May; and of 10.6 to 1 for June.

The plant was not cultivated. Seedlings from the 4-4-8-combinations were established this spring, but will not flower until next spring, if then.

STEELVILLE, MISSOURI.

THE CORRECT NAME OF THE LEAFY SPURGE[1]

C. V. MORTON

THE weed known as leafy spurge, of some importance in recent years, has in the United States always been known as *Euphorbia Esula* L.[2] However, in the 1928 Report of the Division of Botany, Department of Agriculture, Dominion of Canada, p. 15, occurs the following statement:

During 1928 the known distribution in the western provinces of a spurge, *Euphorbia virgata* (which has passed in the east as *E. Esula*), has been extended by a number of specimens received.

In October, 1931, Dr. M. O. Malte wrote to Dr. Herbert Groh as follows:

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] J. B Norton, Ann. Rep. Mo. Bot. Gard. **11**: 85. 1900. Gray's Manual, ed. 7, 549. 1908. Britt. & Brown, Ill. Flora ed. 2, **2**: 473. 1913. Rydberg, Flora of the Plains, 519. 1932. Muenscher, RHODORA **32**: 100. 1930, and Cornell Extension Bull. 192. 1930.

An article on *Euphorbia Esula* and its allies by the late Professor Ostenfeld, published in Botaniska Notiser, 1903, gives the characters of *E. Esula* and *E. virgata* as follows:

"*E. Esula*: leaves lanceolate or obovate-lanceolate, broadest above the middle or rarely of equal width throughout, rounded and generally broadened at the apex, thin and without lustre. The lateral inflorescences (those in the axils of the leaves below the main umbel) few or rarely several."

"*E. virgata*: leaves lanceolate or linear-lanceolate, broadest below the middle, acute or acutish, firm and generally somewhat lustrous. The lateral inflorescences numerous."

I may say that all our specimens are *virgata*. We should be glad to have specimens of *Esula*, should you come across it.

In 1932 my attention was directed to these facts by Prof. Herbert C. Hanson, who quoted to me the above letter, and I was able to confirm the opinion of Dr. Malte. It seems, therefore, worth while to call attention to this correction of a prevalent erroneous identification of this common weed. The characters given above by Dr. Malte do not, however, always distinguish between the two species. A more fundamental distinction is found in the lobing of the glands of the cyathium, as follows:

Horns of the glands of the cyathium shorter than the width of the gland (or sometimes nearly obsolete), not denticulate nor enlarged at the apex. Leaves broadest above the middle, narrowed at base, usually subserrulate near apex..... **E. Esula** L

Horns as long as or longer than the width of the gland, enlarged at the apex, at least the larger ones denticulate on the margins. Leaves broadest below the middle, not narrowed at base, acute at apex..... **E. virgata** Wald. & Kit.

Leaves broadest above the middle, narrowed at base, obtusish at apex..... **E. virgata** forma **esulifolia** Thell.

The plants of the midwest are all true *E. virgata*, but most of those of the Atlantic seaboard are referable to forma *esulifolia*. I have seen no specimens of undoubted *E. Esula* from the United States.

UNITED STATES NATIONAL MUSEUM,
Washington, D. C.

ON ECTOCARPUS GRANULOSUS.—*Ectocarpus granulosus* Ag. was first collected by Mr. Borrer. Since that time it has been found, but never in abundance, widely dispersed in the Mediterranean and from the British Isles to the Cape of Good Hope. What has been regarded as an identical species is abundant on the California coast. But in recent years, this has been separated by Setchell and Gardner as *E. granulosoides*.

When Dr. Farlow published his *Marine Algae of New England,* in 1881, he noted its occurrence sparingly from Newport, Rhode Island to Portsmouth, New Hampshire. After that assiduous collector, Dr. Frank S. Collins, had spent years in the study of the marine algae of the Casco Bay, Maine he failed to find this species. But he noted that there was a specimen in the herbarium of the Portland Society of Natural History without exact locality.[1]

In the summer of 1931 I gathered three specimens, on *Laminaria,* in Bluehill Bay, Maine. These have been deposited in the National Herbarium. Since that time, a careful search has failed to locate further material.

It would seem that this form is not well adapted to our cold waters. Though the typical species is profusely ramose, these specimens bore only three to five branches and presented the appearance of a severely pruned shrub. While elsewhere this form is two to four inches high, our specimens were only about twelve mm. high. But abundant sporangia were present, as were two unmistakable characters which mark this aberrant species. In other *Ectocarpi* the chromatophores are band-shaped and more or less spiral; here, they looked like discs punched from a bronze plate. Furthermore, the filaments were enclosed in so dense a felt of corticating cells that one might pardon Kuetzing's attempt to place this species in a separate genus, *Corticularia.*—R. E. Schuh, Brooklin, Maine.

Ranunculus **neglectus** (Greene), comb. nov. *Cyrtorhyncha neglecta* Greene, Pittonia, iv. 146 (1900). Type locality: "Ravines about Golden City," Jefferson Co., Colorado.

This species is a very local endemic in Jefferson Co. It is evident from Greene's statement, l. c., 147, that Mr. E. Bethel collected the material upon which Greene based his description at least in part. Specimens from the "Exact type locality, dry hillside, Mt. Morrison, Jefferson Co., alt. 2120 m." collected June 3, 1921 by *E. Bethel & I. W. Clokey* 4118 will be distributed in Plantae Exsiccatae Grayanae. Although the two statements of the type locality differ, in actuality they mean the same place.

Rydberg, Flora Colorado, 146 (1906), in his key to *Cyrtorhyncha* points out the characters distinguishing this species from its nearest relative, *Ranunculus ranunculinus* (Nutt.) Rydb. (*R. Nuttallii* Gray).

[1] Proc. Portl. Soc. Nat. Hist. vol. II. p. 269.

Oxygraphis Bunge, Verz. Suppl. Fl. Alt., 46 (1836) seems doubtfully distinct from *Ranunculus*. *Oxygraphis* is prior to *Cyrtorhyncha* Nutt. ex Torrey and Gray, Flora North America i. 26 (1838). Benson, Am. Journ. Bot. xxiii. 27 (1936) considers *Cyrtorhyncha* a subgenus of *Ranunculus*.—Louis C. Wheeler, Gray Herbarium.

Spring Flowers in Autumn.—The exceptional and almost unprecedented hot and arid summer in Oklahoma followed by abnormal rains and cool weather during the fall has brought several plants which normally flower only in the spring, into full bloom in October. On a recent field trip (October 10th) I was very much surprised to find *Nothoscordum bivalve* (L.) Britton, *Oxalis violacea* L., *Sagittaria latifolia* Willd., *Viola Rafinesquii* Greene, and *Claytonia virginica* L. in full flowering condition. In addition, numerous cultivated flowering shrubs are in bud at the present time, giving a decidedly vernal aspect to the autumnal vegetation.

From June 5th until the middle of September no rain fell in the vicinity of Norman (except for a 5-minute shower in mid-July) but during the last two weeks of September it rained almost constantly every day for 14 days, and during the first part of October, although the days were cool and clear, there were numerous showers. The summer was unusually hot with the temperature often reaching 100° and higher, and botanizing during July and August yielded very poor results. Legumes, grasses, euphorbias, composites and numerous other large groups of plants which are characteristic of the midsummer prairie flora were either totally dead or in such poor condition that specimens were not worth collecting. But the late appearance of the fall rains with cool weather brought out interesting spring plants and made the autumnal collecting interesting, varied and profuse.—Milton Hopkins, The University of Oklahoma.

Volume 39, no. 457, including pages 1–28 and plate 453, was issued 11 January, 1936.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. March, 1937. No. 459.

CONTENTS:

The New England Botanical Club, Inc.

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Room 1001, 53 State St., Boston, Mass.

Photo W. R. Fisher

NAJAS MUENSCHERI: type specimen × ⅖. (1) Seeds of N. MUENSCHERI × 5; (2) Fruit and Seed of N. GUADALUPENSIS × 7; (3) Seeds of N. FLEXILIS × 5.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. **March, 1937.** **No. 459.**

A NOTE ON THE SALT MARSHES OF NOVA SCOTIA

V. J. Chapman

During a recent brief visit to the western coast of Nova Scotia to examine the salt marshes, some observations were made which, although but cursory, appear to be of sufficient importance to warrant publication. It is improbable that the present author will have another opportunity to visit these marshes, but it is felt that these notes may be of some value to any ecologist who may have occasion to study these salt marshes in the future.

The phenomena were particularly observed on the marshes around Wolfville (between Port Williams and Boat Island) which were examined with some thoroughness. They also appear to be true for all the marshes south to Digby so far as could be seen in those places where the railway winds along the marshes.

In a study of these marshes Ganong (1) stated that the permanent low association of old marsh was a *Spartinetum*, in which *Spartina alterniflora* (*S. glabra* var. *alterniflora*) (2) was dominant. The upper permanent association was stated to be a *Staticetum*, in which *Spartina patens* was dominant and *Limonium trichogonum* (*L. carolinianum* of some authors) (3) subdominant. It was also pointed out that a *Salicornietum* formed the characteristic temporary association of new marsh but was soon crushed by the two permanent associations. Although Ganong noted that one could trace a zonation of *Spartina alterniflora*, followed successively by zones of *Limonium trichogonum*, *Puccinellia maritima*, and *Spartina patens*, he did not consider that they could be regarded as distinct associations.

In 1925 D. W. Johnson (4) recognized the following associations:

(a) Low *Spartinetum* of pure *Spartina alterniflora* (*Spartina stricta glabra*).

(b) *Salicornietum* with *Salicornia herbacea* and *Suaeda maritima*. This association he regarded as composed of annuals acting as primary colonists, and on old marshes it was crushed by (a) and (c).

(c) *Staticetum* with *Limonium trichogonum* (*Statice Caroliniana*) and *Spartina patens* (*S. juncea*).

As a result of my recent visit it seems desirable that the following points should be made clear.

(1) The lowest association of the marshes is a *Spartinetum alterniflorae* which consists of a practically pure stand of *Spartina alterniflora* with very occasional plants of *Salicornia herbacea* (*S. europaea*).

(2) A *Salicornietum* can be recognized, but it appears to be confined to *secondary* marsh and does not occur on primary marsh. On primary marsh the first colonist is *Spartina alterniflora*. Wherever there are bare areas on old marsh caused by the removal of the grasses one can usually find *Salicornia herbacea* and *Suaeda maritima*. Even more striking is the vast area they occupy when one of the dyked marshes becomes inundated by the sea and is being converted back to wild marsh. Under such conditions these two annuals thrive until they are ousted by the more slowly-spreading *Spartina alterniflora* and the members of the *Staticetum*. It may therefore be suggested that the *Salicornietum* is not a part of the prisere but forms part of a secondary sere. Ganong hints at this but does not make it sufficiently explicit.

(3) The zones noticed by Ganong appear to be sufficiently distinct to warrant regarding them as separate associations. This can really only be confirmed by more extensive observations, but it is suggested that a *Limonietum* (*Limonium trichogonum* dominant) should be recognized and also a *Glyceretum* (*Puccinellia* [*Glyceria*] *maritima* dominant, with *Limonium trichogonum* and *Distichlis spicata* subdominant).

(4) Two associations were noticed by the writer which were not recorded by Ganong or Johnson. They were a *Juncetum Gerardii* (pure) and a *Juncetum baltici* in which *Juncus balticus* var. *littoralis* was the dominant. These occurred on high marsh and they probably form part of the transition to fresh-water bog.

(5) There is a marked lack of an algal flora on the marshes when compared with the New England marshes and the salt marshes of Europe. This is probably to be correlated with the rapid deposition of silt.

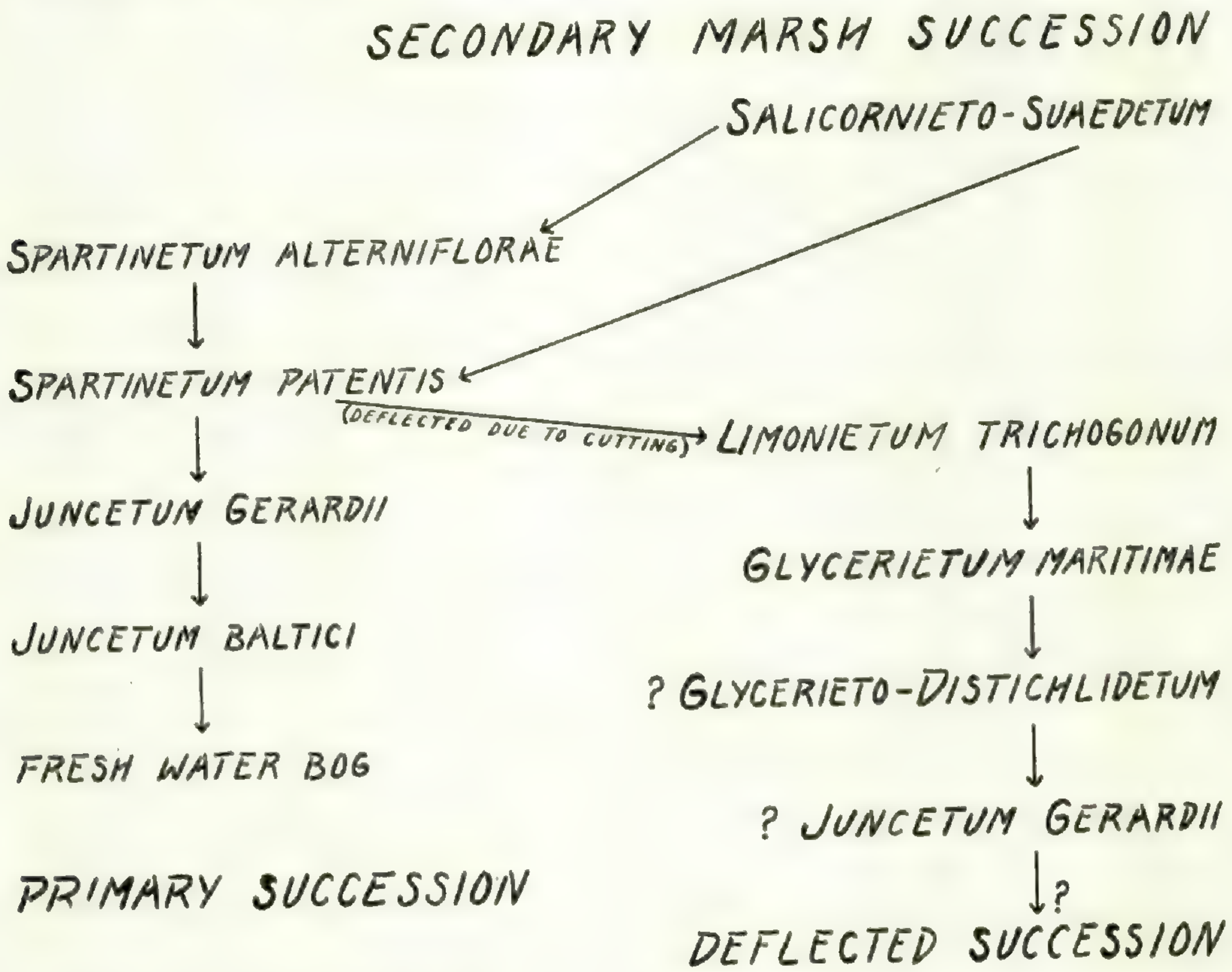
(6) The most striking feature of the Wolfville wild marshes was the distribution of *Spartina patens*. This plant occurred in peculiar isolated clumps six to ten feet in diameter, which were often pure stands. These clumps occurred scattered through the *Glycerietum*. One also found pure stands of *Spartina patens* around the "staddles" (hayrick posts) and in damp sunken areas in the high marsh. In one place (Starr's Point) there is a triangular area where mowing machines cannot well go, and there *Spartina patens* occupies the whole marsh between the low *Spartina alterniflora* association and a high *Juncus Gerardi* association. This peculiar distribution of *Spartina patens* demanded some explanation, especially in view of the enormous areas it occupies on the high marshes of the New England Coast.

It was noticed that nearly all the wild marsh was cut for hay, the tracks of the machines being clearly visible. It then became clear that *Spartina patens* was only abundant in those areas where the mowing machines had no access (along edges of small creeks, small depressions, boggy areas, and around the staddles). The northern limit of *Spartina patens* is on the southwestern coast of Newfoundland, but it may be regarded as approaching its northern limit in the upper part of the Bay of Fundy. It is generally accepted by ecologists that plants on the limits of their distribution are probably much more susceptible to minor fluctuations in the environment than they are at the centre of their distribution. The writer would therefore like to suggest that repeated mowing of these wild marshes is driving out *Spartina patens* which now exists in relict patches in the *Glycerietum*, and also in those places where the mowers cannot have access. Although the New England marshes are regularly cut, *Spartina patens* holds its own because it is nearer the centre of its distribution (i. e., conditions approach more nearly the optimum). If this hypothesis is correct it would be interesting to know exactly how the cutting affects the vitality of the *Spartina* plants. Presumably it is an internal physiological effect.

(7) The bulk of the high marsh around Wolfville is occupied by the *Glycerietum*, and if the previous hypothesis is correct it is at once suggested that the *Glycerietum* cannot really be a natural association, but has appeared because of man's activities which have eradicated the *Spartinetum patentis*. In other words, we are dealing here with what Godwin (5) terms a deflected succession.

(8) If the above remarks approach anywhere near the truth then

the state of affairs on this part of the Nova Scotian Coast might be summarized as follows.



It is not claimed that the above schema necessarily represents the final picture that may be obtained after more intensive work. It is set out merely as a possible guide for future investigators, and as an indication of the lines along which research should be directed. The later stages of the hypothetical deflected succession especially require much further investigation. Before the hypothesis suggested above is accepted it is essential that the effect of cutting upon *Spartina patens* in Nova Scotia should be investigated further, especially by means of experiments in the field. Such experiments will take time before they show any conclusive result, but the present author is strongly of the opinion that such experiments form the only valid means of proving such an hypothesis. One further word of warning may be necessary. These observations were made on marshes bordering the Annapolis and Minas basins and they do not necessarily hold for the rest of Chignecto bay and the Cumberland basin. At the same time the marshes throughout the Bay of Fundy should be worth re-investigation in order to determine whether mowing of the

wild marsh has resulted in a succession, which although appearing natural, yet is really brought about by man's activities.

These observations were made while the author held a HENRY FELLOWSHIP at Harvard University.

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VICTORIA UNIVERSITY,
MANCHESTER, ENGLAND.

A NEW SPECIES OF NAJAS FROM THE HUDSON RIVER

R. T. CLAUSEN

(Plate 455)[1]

In a recent paper (1), the writer suggested that both *Najas flexilis* and *N. guadalupensis* seem to represent aggregate species, but that his attempts to break up these two populations into species or varieties had been quite unsuccessful. At the time of that writing, he had before him only a few sheets of the species to be discussed below, and on only two plants were mature seeds available. By expanding the definitions of the two species mentioned above, it was possible to take care of all of this material under the one or the other. Now, with a copious suite of specimens collected from up and down the Hudson River over an area of 100 miles, from Waterford, Saratoga Co., New York to Iona Island, Rockland Co., this previously considered atypical material emerges as the dominant form, quite constant in its characters, and except for *N. minor*, practically the only species of Najas in the river. Certainly such a population can not easily be treated as a minor form of another species.

This tidal river plant is here proposed as a new species. In general appearance (PLATE 455) it is most similar to *N. guadalupensis*, but is even more slender and graceful. The internodes are greatly elongated,

[1] The publication of the PLATE has been made possible through the kindness of DR. L. H. BAILEY.

to 6 cm. long. The leaves are mostly about 1 cm. long by 1 mm. wide, minutely serrate, and somewhat ascending, but never tending to be recurved, as is slightly the case in *N. flexilis*, and the typical condition in *N. minor*. The leaf bases are broader than in either *N. flexilis* or *N. guadalupensis*, but not auricled as in *N. gracillima*. The seeds (FIG. 1) are the most striking feature of this new species. They are long and slender as in *N. gracillima*, with a slight tendency to be somewhat curved. The seed-coat is very finely reticulate, with 50–60 longitudinal rows of areolae around the seed, the areoles rectangular in shape and much smaller than in either *N. flexilis* or *N. guadalupensis*. The testa is usually opaque, rarely lustrous, and quite rough, since the areoles are sunken as in *N. guadalupensis*. The raphe is more prominent than in other Najas species, producing a distinct ridge or keel on the one side of the seeds. The rather stout styles are intermediate in length between those of *N. flexilis* and *N. guadalupensis*.

As set forth above, it will be seen at once that in several respects this Hudson River material represents a recombining of the essential characters of *N. flexilis* and *N. guadalupensis*, with the slender type of seed of *N. gracillima*, but with the reticulation of the testa different from that of all of these species. With *N. guadalupensis* it agrees somewhat in habit, in the rather stout style, in the usually opaque quality of the seed-coat, and in the sunken areoles. It approaches *N. flexilis* in the length of the style, but not even remotely in the very fine reticulations of the testa. Actually, the only available specimen of this population which at all suggests *N. flexilis* is the collection by Muenscher and Clausen (4273) from the mouth of the Mohawk River where it enters the Hudson at Waterford, Saratoga Co., New York. This material has the lustrous seed-coats and slender styles of *N. flexilis*, but in habit, the shape and size of the seeds, and particularly in the reticulation of the testa, is clearly to be referred to the new species.

The possibility that all of the characteristic Hudson River plants may be hybrids has been considered, but there seems no basis for such an assumption. The fact that in the greater part of the river surveyed, neither of the supposed parent species were present, would seem to indicate that if this is a hybrid between *N. flexilis* and *N. guadalupensis*, the crossing must have taken place in the remote past. Further, the plants fruit abundantly, much more abundantly than the writer has ever observed *N. guadalupensis* to fruit in the north. Besides, if

these plants really were hybrids, we should not expect the seeds to be entirely different (not intermediate) from both parents in size and shape as well as in the nature of the reticulation of the testa. Certainly at the present time this population has all the earmarks of a good species. To consider it a variety of any one of the previously described forms of the section *Americanae* does not seem possible, for the seed characters are too distinct and individual.

The writer takes pleasure in dedicating this species to Dr. W. C. MUENSCHER, who has contributed probably more than any other botanist to our knowledge of the aquatic vegetation of New York.

NAJAS **Muenscheri**, sp. nov. Planta gracilis atroviridis ramosissima radicibus fibrosis; rami valde ascendentes; caules tenues durique; virgae ad 50 cm. longae; folia recta, fere ascendentia, non rigida, 1 cm. longa 1 mm. lata, acute serrata, plus vel minus 50 dentibus in margine, bases lati et aliquid lobati; flores fertiles stylis aliquid validis, 0.7–1.2 (1.5) mm. longis; semina flavo-fulva; testa fere opaca et minute reticulata, 50–60 seriebus longitudinalibus areolarum circum semen; areolae fere rectangulares, plus vel minus 43 μ longae 29 μ latae, submersae, ita ut summa testa asperrima videatur; semina prominente carina longitudinali, saepe aliquatenus curvata, ad basin obtusa, ad apicem acuta; flores staminei incogniti.

NAJAS **Muenscheri,** n. sp. Slender, dark green herb with fibrous roots, much branched, with the branches strongly ascending; the stems thin and wiry, the shoots to 50 cm. long; the leaves straight, usually ascending, not rigid, 1 cm. long by 1 mm. wide, finely serrate, 50± teeth on a margin, the bases broad and somewhat lobed. Pistillate flowers with the styles rather stout, .7–1.2 (1.5) mm. long; the seeds yellowish-brown, with the testa usually opaque and finely recticulate, with 50–60 longitudinal rows of areolae around the seed, these typically rectangular, averaging 43 μ by 29 μ, and sunken, giving the surface of the seed-coat a decidedly roughened appearance; seeds with a prominent longitudinal ridge, often somewhat curved, obtuse at the basal end, acute at the apex; staminate flowers unknown. TYPE in the Cornell University Herbarium, COTYPE in the Gray Herbarium. Tidal mudflats of Hudson River, Imbocht Bay, Greene Co., NEW YORK, Sept. 3, 1936, *W. C. Muenscher and O. F. Curtis, jr.* 5495.

The following specimens, all in the Cornell University Herbarium, may also be cited: ALBANY Co.: Coeymans, *W. C. Muenscher and R. T. Clausen* 4287. COLUMBIA Co.: Hudson River, mouth of Stockport Creek, *M. & C.* 4289. DUTCHESS Co.: South Bay, Hudson River, *M. & O. F. Curtis, jr.* 5494. GREENE Co.: tidal mudflat between Hudson and Athens, *M. & R. T. C.* 4272 and 4286; Imbocht Bay, *M. & O. F. C.* 5496, 5498, 5499 & 5500. ROCKLAND Co.: Iona Island, *M. & O. F. C.* 5492 and 5493. SARATOGA Co.: Waterford,

M. & R. T. C. 4283. Putnam Co.: tidal mudflats, Constitution Island, *M. & C.* 5506. Ulster Co.: Kingston, *M. & C.* 5504. Westchester Co.: Roa Hook, *M. & C.* 5507.

M. & R. T. C. nos. 4283, 4286, 4287 & 4289 were previously cited (1) under *N. guadalupensis*, as which they should now be deleted. All other New York specimens of *N. guadalupensis* which have been cited by the writer have been reëxamined and remain as originally determined.

Further examination of the available material of *Najas Muenscheri* now makes possible the description of the staminate flowers, which are borne singly in the axils of the upper leaves. These consist of a single anther subtended by two membranous envelopes, the inner of which is 2 mm. long, while the outer is 3 mm. long by .8 mm. wide, with the apex developed into three short lobes. Better material must be secured before it is possible to give the minute details concerning the very small anther.

1. Clausen, R. T. Studies in the genus Najas in the northern United States. Rhodora **38:** 333–345. 1936.

Bailey Hortorium,
Ithaca, New York.

POLLINATION OF VACCINIUM PENNSYLVANICUM

Harvey B. Lovell and John H. Lovell

(Plate 456)

The lowbush blueberry, *Vaccinium pennsylvanicum* Lam., grows wild over large areas of pastureland in Southern Maine. Farmers improve the natural conditions under which it produces fruit by removing other shrubs and trees and occasionally burning over the land. As according to the census of 1930 there are 13,888 acres of wild blueberries in Maine, or four times the area found in the other New England states, Maine offers an excellent opportunity for the study of the ecology of this species of the heath family.

Although the ecology of the highbush blueberry, *V. corymbosum* L., has been studied by Coville, no critical studies have been made on the pollination of the lowbush blueberries. Phipps[1] has reported an extensive investigation on the insect pests of the blueberries and huck-

[1] Phipps, C. R., Me. Agri. Exp. St. Bu. 356, 1930.

leberries in Maine and lists a number of visitors found on the different species of *Vaccinium* but has not studied the ecology of the flowers of *V. pennsylvanicum* in detail.

The lowbush blueberry is seldom more than a foot tall. The flowers, few in number, are in short dense racemes and begin to bloom in Southern Maine by May 20th. The white corolla, often tinged with

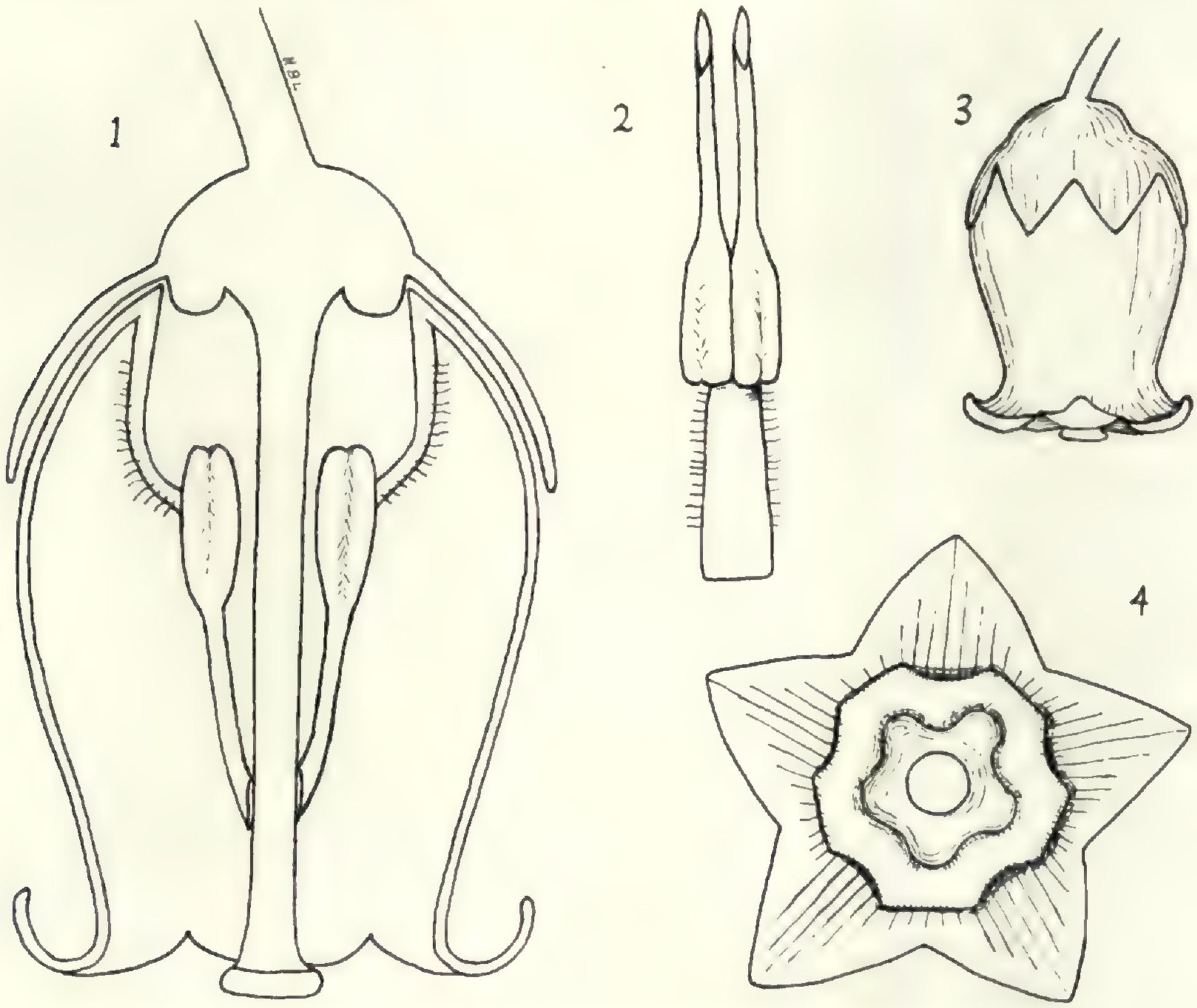


FIG. 1. Details of Flower of VACCINIUM PENNSYLVANICUM.

pink, is 6 to 7 mm. long and 4 mm. wide. The flower is bell-shaped, slightly contracted at the mouth with the five lobes reflexed (FIG. $1^{1, 2}$).

The light brown anthers of the ten stamens terminate in slender tubes 1.8 mm. in length (FIG. 1^{2}), the oblique pores of which rest against the style about 2 mm. below the stigma. The white filaments, which are short, broad, and densely hairy on the edges, form so close a ring around the nectary that access to the nectar seems possible only when a bee inserts its tongue between the anther-tubes and the style (FIG. 1^{1}). This separation of the anther-pores from the style by the

bee allows the white pollen to fall on the head of the visitor. The pollen is in tetrads.

The stigma is capitate and in mature flowers stands nearly in the entrance of the corolla. Around the base of the style there is a five-sided, fleshy, green ring on which nectar is very sparingly secreted (Fig. 1[4]). Although there was an apiary a quarter of a mile away, honey-bees were comparatively rare on the flowers. Three species of bumblebees were observed. A few females of *Andrena vicina* were captured, and two species of female wasps visited the bloom. It is surprising that the number of visitors was so small in comparison with the profusion of flowers, yet they appeared, judging by the set of fruit, sufficient to effect the pollination of most flowers. The bell-shaped corolla excluded short-tongued insects from the nectar, but small species of *Andrena* were often seen hovering over the flowers and occasionally alighting on the anthers. Since pollen was found on the hind legs of one of them, it seems probable that they also assist in the pollination of the flowers.

A list of the visitors is as follows:

APOIDEA: Apis mellifera L. ○; Bombus ternarius Say ○; B. terricola Kirby ○; B. vagans Sm. ○; Andrena vicina Sm. ○.
WASPS: Vespa maculata L. ○; a large yellow wasp, not captured.
DIPTERA: Bombyliidae, Bombylius sp.

In order to determine how far the production of fruit was dependent upon cross-pollination by insects, the following experiments were made. Three boxes, 18 inches square, were covered with galvanized wire-screening of fine mesh. On May 22d boxes 1 and 2 were placed over a thick growth of blueberry bushes. Box 3, on May 25th, was placed over a dense area of bushes 400 feet from the first location. A few flowers which had already opened were removed. In about a week the plants under the boxes were in full bloom, and the flowers appeared to be in rather better condition than those outside, probably due to the greater warmth.

On July 21st an accurate count was made of the number of berries set under the three boxes. In box 1 seven berries mostly of small size were found; in box 2 there was only one blueberry; while in box 3 there were 23 blueberries. In box 3 the flowers had been more abundant and slightly larger than in the other boxes. In a control area outside of one of the boxes there were three to four hundred berries. The advantage of cross-pollination to the blueberry is clearly shown by these experiments (Plate 456, figs. 1 and 2).

As all insects had been carefully excluded from the flowers in the boxes, the few berries produced appear to be the result of self-fertilization. The flowers of *V. pennsylvanicum* are therefore not entirely self-sterile. Self-pollination may have been brought about by the jarring of the flowers by the wind or rain.

The ecology of variety *nigrum*, which was frequently found among the plants of *pennsylvanicum*, does not differ from that of the latter species. It is visited by the same insects.

Waldoboro, Maine.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—No. CXVI.

ARABIS IN EASTERN AND CENTRAL NORTH AMERICA

Milton Hopkins

(Plates 457 and 458)

Introduction

In the large family *Cruciferae*, several genera have long needed critical study. *Arabis* is one of these. Its great complexity, not only in North America but likewise in Europe and Asia, has long perplexed assiduous students and, although many excellent treatments have appeared as parts of various regional floras and synopses, no single adequate study of it in North America has, as yet, been made. It was, therefore, with considerable trepidation that I undertook a critical examination of the genus, for I realized too well the vast scope of the problem. The present paper is offered as a first venture and possesses many limitations with which no one is more familiar than I. It treats the genus in eastern North America primarily from the region east of the one hundredth meridian, but in those cases where a species occurs in western North America as well as in the eastern part, I have discussed it throughout the natural extent of its range.

History

Although Linnaeus tells us[1] that *Arabis* was named for the country Arabia, it has recently come to my attention that perhaps he did not

[1] Phil. Bot. 169 (1751), in which he says of *Arabis:* "Arabia Regione."

give us all the facts. In tracing the etymology of the name,[1] I find that it occurs in two 15th Century manuscripts of Dioscorides' Materia Medica which, in published form, were undoubtedly available to Linnaeus at the University of Upsala. In the standard edition of Dioscorides' work, edited by Max Wellman in 1907,[2] the section in Book ii (§185) pertaining to *Arabis* is omitted from the main text, although included in a footnote, because practically the same description (with only the most minor variations) is given for "*Drabe*" in an earlier section (157). The description for *Arabis* reads as follows, the brackets being mine:

> "Grass [herb] about a cubit high, slender, stem-leaves like a *Lepidium*, but softer and whiter, and the top an umbel having white flowers. The herb is cooked in a gruel in Cappadocia. Fruit when dry is mixed with condiments as a substitute for pepper."

In view of the fact that Linnaeus named a plant *Lepidium Draba*, one is somewhat inclined to the belief that perhaps he was familiar with the above description, and that more than likely he had also seen Dioscorides' similar one for *Arabis* but, realizing that the genus *Arabis* was quite distinct from the genus *Lepidium*, had used the name for our genus, and concluded that, because it (as well as *Lepidium*) was "cooked in a gruel in Cappadocia," it must have been named by Dioscorides from some region nearby. And what region more probably than Arabia? The words "Arabia Regione" in the Philosophia Botanica give only part of the story; one concludes from them that Linnaeus himself named the plant after the country Arabia. But what appears to be much more likely is that Dioscorides first applied the name, and that Linnaeus obtained it from him.

Linnaeus, in 1753,[3] described seven species of *Arabis* and two of *Turritis*, which genus was first merged with *Arabis*, in 1829 by Gaudin.[4] Of Linnaeus' list only *A. lyrata* and *A. canadensis* were strictly North American, the others all being European or Eurasian (except for *A. alpina* and *T. glabra*, which have since been found in North America as well as in Europe). Michaux[5] next discussed the genus in North America, but he included only one species of *Arabis* and none

[1] For invaluable assistance in this search I am deeply indebted to Professor Arthur Stanley Pease of Harvard University. He has also very kindly made the translation for me from Wellman's text.

[2] Wellman, i. 254 (1907).

[3] Species Plantarum, ii. 664–666 (1753).

[4] Gaudin, Fl. Helvetica, 299 (1829).

[5] Michaux, Fl. Bor.-Am. ii. 31 (1803).

of *Turritis*, his *A. falcata* being merely another name for Linnaeus' *A. canadensis*. In 1807 Persoon published his Synopsis Plantarum which included among the known species of *Arabis* and *Turritis* only three from North America, *A. lyrata*, *A. canadensis* and *T. laevigata*. He described no new species but merely brought together in one work those which had already been published in previous volumes by other authors. After Persoon, Pursh, in 1814, treated seven species of *Arabis* and two of *Turritis*,[1] and Nuttall, in 1818, published nine of the former and one of the latter.[2] The treatments of Pursh and of Nuttall, although primarily not of a monographic nature, were eminently satisfactory at the time. But not until three years after Nuttall's work was published did a really impressive treatment appear, when DeCandolle finished his Systema, in 1821. In this great work all the known species of *Arabis* and *Turritis* were treated with adequate diagnoses and discussions of ambiguous or obscure characters. The Prodromus, by the same author and appearing three years later but written on a much more condensed scale, contained one more species of American *Arabis* than the Systema. The next important study of *Arabis* (in North America) appeared in 1829 in Hooker's Flora Boreali-Americana. With many important specimens from Canada and Greenland in his possession Hooker could, quite naturally, give highly accurate descriptions and could include more species from the New World than any of his predecessors had done. He incorporated into his treatment all the new species which had, earlier in the same year, been described by Graham from plants grown at the Royal Botanic Garden at Edinburgh. Hooker's treatment of *Arabis* is scholarly and, although his statements of ranges are often somewhat vague, this is due largely to the fact that the country was unexplored and lacked political boundaries. Hence such ranges as "shores of the Arctic Sea between 107° and 130°" were considered as ample information regarding the station from which a particular species was collected. Nearly ten years after Hooker, in 1838, the first part of Torrey & Gray's superb Flora of North America appeared. *Arabis*[3] was given a comprehensive treatment, on the basis of more material than previous American authors had seen. Many of Torrey & Gray's names are still quite valid. The first edition of Gray's Manual (1848) "hastily prepared to supply a pressing want"[4] treated *Arabis* and

[1] Pursh, Fl. Am. Sept. ii. 436, 437 (1814).
[2] Nuttall, Genera, ii. 70, 71 (1818).
[3] Torrey & Gray, Fl. N. Am. i. 78–83 (1838).
[4] Gray, Preface to Manual, ed. 2 (1856).

Turritis as separate genera, but the fifth edition, nineteen years later, carried them both under *Arabis*, and except for an occasional divergence,[1] succeeding American authors have continued to treat *Turritis* as a section of *Arabis*.

The impetus given to botanical exploration by the opening of the West during the middle and latter part of the nineteenth century made itself manifest in the extensive collecting during that time. Many of the species of *Arabis* brought back were quite new to science. The Synoptical Flora of North America, begun by Gray, with certain sections by Watson, and continued under the editorship of Robinson, contains 38 species of *Arabis* (the treatment by Watson). Edward L. Greene, Marcus E. Jones, Aven Nelson and P. A. Rydberg have worked on the genus and proposed many new species (Greene, in fact, published two species with the same name![2]); but no investigation, whose chief purpose was to "clean house" and to take stock of assets and liabilities, has occurred. The task is not an easy one, involving the examination of well over one hundred type-specimens located in all the important American herbaria. My attempt to put in order those species in eastern and central North America is here presented.

Diagnostic Characters

Roots. The roots of *Arabis* are always either biennial or perennial, those of the former type having simple herbaceous tap roots while those of the latter possess well developed caudices which usually become woody. In eastern North America most of the species are biennial, although *A. arenicola*, *A. alpina* and *A. pendulocarpa* (*A. Collinsii*) become perennial with the characteristic much branched woody caudices. The other species are more usually biennial but some of them, notably *A. patens*, *A. lyrata*, *A. Drummondi*, *A. divaricarpa* (*A. brachycarpa*), *A. Holboellii*, *A. retrofracta* and *A. Hookeri* tend to assume a perennial habit in certain parts of their ranges. Thus, in the Allegheny mountains of Virginia and North Carolina, *A. lyrata* is more often a perennial than a biennial and the woody caudex with its numerous branches resembles exactly that of many of the species from the Rocky Mountains, where a perennial habit, at least in *Arabis*, is predominant. These perennial roots extend downward to a depth of as much as two decimeters, resisting even

[1] Such as Rydberg, Fl. Rocky Mts. 337 (1917).

[2] *A. inamoena* in Fedde, Rep. Sp. Nov. v. 243 (1908) and in Leaflets, ii. 158 (1911).

such coarse implements as a small pick-axe, and being extracted in toto only with the greatest patience and diligence. Although Gray says of *Arabis*: "HERBS, with annual, biennial or perennial roots."[1] I have never yet observed any plant with typically annual roots. Every specimen which has come to my notice has, without exception, possessed a slender or a stout tap root or else a perennial caudex and, although some of the biennial plants may doubtless be short-lived, I should question their being truly annuals.

Stem. The stem of *Arabis* may be either simple or branched. *A. virginica*, *A. alpina*, *A. Holboellii*, *A. Hookeri* and *A. lyrata* tend to branch at the base in great profusion, a simple stem being the exception. Many of the western species, whose high mountain habitats are unfavorable to great stature, are low and are very much branched at the base. But branching at the top is likewise common in the genus and occurs, more or less, in nearly all species. Especially is this true of *A. divaricarpa* (*A. brachycarpa*) whose primary fruiting raceme is nearly always accompanied by numerous secondary branches which bear young flowers. The stem may be either glabrous or pubescent or, if the latter, the pubescence may occur throughout or merely at the base. The types of hairs which are found on the stem, as well as on the leaves, will be discussed under Pubescence.

Radical Leaves. The basal leaves either form dense rosettes or else are merely few to many, not aggregated in thick clusters. When they form rosettes they frequently persist for two years and become brown and black marcescent masses at the base of the stem. Those which are not in rosettes usually do not last more than one season and not infrequently disappear by the time the fruit is ripe. It is a very rare specimen of *A. canadensis* which has its basal leaves attached to the stem after the middle of July, but specimens of *A. laevigata* or of *A. viridis* seldom come into an herbarium without their basal leaves firmly attached to the crown.

The shape of the radical leaves varies from narrowly oblanceolate to broadly obovate-spatulate while the margins may range from entire or subentire to very slightly denticulate or decidedly dentate-serrate but, unlike many members of the *Cruciferae*, they are only rarely lyrate-pinnatifid. *A. virginica* is the only species which has strictly lyrate-pinnatifid basal leaves, while *A. lyrata*, *A. viridis* and *A. glabra* may or may not have them. The two former species most commonly

[1] Gray, Genera, i. 141 (1848).

have such margins, but the last one only infrequently possesses them and is more usually found to have them irregularly but rather sharply dentate. The apices may vary from slightly acuminate, as in some specimens of *A. Drummondi*, to rounded or obtuse, as in some plants of *A. laevigata*. And the size varies considerably, due probably to environmental factors as well as to genetic ones. Some species, as *A. pendulocarpa* (*A. Collinsii*) have very small radical leaves, from 1 to 5 cm. long, while others, notably *A. glabra*, have them of enormous size for the genus—as long as 12 cm. All of these leaves are petioled, the petiole being rather narrowly winged, and they may be either glabrous or pubescent.

Cauline Leaves. These may vary from linear-spatulate, as in *A. lyrata*, to broadly elliptic, as in *A. canadensis*, and are either sessile or very short-petioled. The lowermost may have short winged petioles, as is usually the case in *A. glabra*, but the middle and uppermost are always sessile, with either a nonclasping or an amplexicaul base. If the latter condition is typical for a species, the base is either sagittate or auriculate or, more rarely, both types may be found on the same stem. Beginning at the lower part of the stem and progressing upwards towards the raceme of flowers, the stem-leaves gradually become diminished in size so that measurements should always be made from those leaves nearest the middle of the stem. This progressive decrease in size is very gradual, but its occurrence makes measurements of extreme uppermost or lowermost leaves very misleading. Associated with this progressively diminished size of the cauline leaves is the fact that they are either remote, *i. e.* arranged so that the tip of one leaf does not touch the base of the next higher one; subremote, in which case the tip of one leaf may slightly overlap the base of the next successive one; or definitely imbricated, the leaves clearly overlapping one another as shingles on a house. To rely solely on this remoteness or non-remoteness of stem-leaves is, however, dangerous, for it frequently happens that a plant whose normal tendency is to develop imbricate leaves, will, if the environment is shady, assume the remote-leaved habit, with a stem of the most delicate texture and cauline leaves so few in number as to be almost negligible. Such cases have been observed in *A. pycnocarpa* (*A. hirsuta* of Am. authors) especially.

Flowers. Perhaps the most unsatisfactory organ on which to base a determination, not only of *Arabis* but of any member of the *Cru-*

ciferae, is the flower. Generic lines based solely on this, instantly disappear, and to identify a cruciferous plant in full flower is a task which only a person with great confidence would undertake. The saying "By their fruits ye shall know them" should be a law in so far as the crucifers are concerned. The flowers in *Arabis* vary in size, some being large and showy for the genus (the usual size being from 5 to 7 mm. long), as in *A. Holboellii*, where they attain a length of 9 mm., and others being so minute as to be inconspicuous, as typified by *A. dentata* which has them only slightly over 2 mm. long. They may occur in very close and compact racemes, as illustrated by *A. viridis*, or they may be in long, loose racemes with an average of sometimes as much as 1 cm. between the flowers. They are always actinomorphic, composed of two bimerous whorls and have four minute nectaries located on the receptacle at the base of the stamens, thus suggesting that the flowers are entomophilous.[1]

The petals vary only slightly in shape and are usually either spatulate-oblong or spatulate-oblanceolate. The obtuse to subtruncate apex is the broadest part and this shows considerable variation in breadth, that of the petals of *A. Holboellii* being often as much as 2.25 mm., while that of the petals of *A. pycnocarpa* (*A. hirsuta* of Am. authors), which are long and narrow, never exceeds 1 mm. The venation is fine and delicate except in one form of *A. alpina*[2] where it is distinctly coarse. The color of the petals varies from white through delicate shades of pink to purple, except in *A. glabra* and in *A. dentata*, in which it is deep cream-color to yellowish. In fact, these two species may often be determined in the field in a flowering condition (if one has successfully placed them in the genus!) because they are the only species which have petals bordering on yellow.

The sepals show somewhat more variation than do the petals, being either oblong or oblanceolate in shape and varying from obtuse to subacuminate at the apex. They are either membranaceous or

[1] Although insect pollination may occur in *Arabis*, the genus does not depend solely on this method. Self pollination occurs frequently, the anthers of the four long stamens touching the stigma with their lower ends or those of the two short stamens touching it with their tips. The flowers are homogamous in all species, and although various insects appear to visit various species, self pollination apparently occurs regardless of insect visitors. Because the nectaries secrete only a small amount of nectar (only those two at the base of the short stamens appear to be functional) the genus is not a paradise for honey-seeking insects. Certain species of bees, flies and butterflies are the chief visitors. For a complete discussion of this interesting topic see J. R. A. Davis's translation of "Knuth's Handbook of Flower Pollination," iii. 83–86 (1908).

[2] f. *phyllopetala*. See Fernald in Rhodora, xxv. 270 (1933).

herbaceous in texture, and are green or yellow or purple, with varying hues of these colors. Often they possess a hyaline or a whitish margin. They vary in size from one-half to two-thirds the length of the petals to nearly their entire length, as in *A. viridis*. And they may be either glabrous or pubescent; the types of this pubescence will be discussed under Pubescence. They are always in two decussate whorls, one median and one transverse, the latter, contrary to the orthodox idea that the median pair is the outermost, being, according to Mrs. Arber, the outer pair.[1]

The flowering pedicels, at anthesis, are either ascending, divaricately spreading or descending. They are so similar to the fruiting pedicels in every respect that they will be discussed under that heading.

Fruit. The most important diagnostic character in *Arabis*, as in most cruciferous genera, is the fruit, not solely in distinguishing species, but also in determining phylogenetic trends which enable one to place groups of species in sections and subsections. Sereno Watson[2] grouped the genus into the three sections which are now usually recognized, although only one of them (section *Sisymbrina*) is of his authorship. In this paper, however, I have omitted any mention of sections because I do not feel qualified to group the entire genus into new sections of my own manufacture. The species which occur in eastern North America are treated in the order designated in the key. This follows in some respects the ideas of Watson and others; in many respects, however, it differs.

The siliques are either erect and ascending, divaricately spreading or reflexed and, although some species often may have them in two of the above categories, most of them are either of one type or the other. They are glabrous or pubescent, the trichomes, when present, minute and stellate. The nervation of the valves varies in different species. In *A. virginica* the nerve is apparent only at the extreme base or in rare cases is so faint that the silique appears nerveless, while in *A. canadensis* it is prominent to the tip of the fruit. The length of this nerve is so distinctive that it serves as a most valuable character upon which to differentiate species.

The fruiting pedicels, like their earlier stage at the flowering period, are either ascending, divaricate or reflexed. Although their ultimate position may often be guessed during anthesis, frequently they

[1] Agnes Arber in New Phytol, xxx. 27–29 (1931).
[2] In Gray, Synop. Fl. N Am. i. 159–167 (1895).

become more divergent or more reflexed in fruit and, as one might expect, they are of greater length in the fruiting state than in the flowering one. It often happens that during the flowering period they are quite pubescent but as maturity approaches this pubescence is diminished in amount or entirely disappears.

The seeds show wide variation and range in shape from broadly quadrate to narrowly elliptic or oblong. They may be quite wingless or definitely winged; in *A. canadensis*, the seeds of which are more broadly winged than in almost any other species, the wing ranges from 0.75 mm. to 1 mm. in width. The seeds appear in either one or two rows in the silique, but in many species where, when young, they are in two rows, maturity usually finds them crowded into one irregular row. Such is the case in *A. divaricarpa* (*A. brachycarpa*) and, although included by Watson in his section *Turritis* (which has seeds "somewhat in two rows"[1]), it might equally well be placed in his section *Euarabis*. Likewise, *A. glabra*, although placed by Watson in section *Sisymbrina*, has seeds in one row or two rows and both winged and wingless.

Pubescence. This, a most important diagnostic character, occurs on all parts of the plant except on the petals and seeds and, although it varies in quantity, the type of pubescence appears constant for each species. Most commonly found are the ordinary simple hairs which appear to be the most primitive ones. Seen under the microscope they are observed as slender bristles tapering gradually at the apex to a fine point. Next frequent is the bifurcate hair, which consists of a simple one, two-branched at base. This may be several times compounded until the stellate hair, the most complex of all, is reached. This occurs in many forms and degrees. It may be coarse and large, as in some specimens of *A. divaricarpa* (*A. brachycarpa*), in which case the trichomes are most often spaced far apart, or it may be minute and delicate as in *A. pendulocarpa* (*A. Collinsii*) in which the trichomes are so close together that they appear pannose. Another type of hair which is present, although rather rare, is the malpighiaceous (bifurcate) one, the prongs of which are so flexed at right angles as to be parallel to the surface of the stem or leaf and to give it a strigose appearance. This type of hair is found in *A. Drummondi* var. *oxyphylla*. The hairs are all filiform and slenderly subulate and are unicellular, even when much branched. They are always non-glandular.[2]

[1] In Gray, Synop. Fl. N. Am. i. 163 (1895).

[2] Although glandular hairs are very scarce in the *Cruciferae*, they occur occasionally, as in *Descurainia glandulifera* Rydb.

Other Characters. In the above paragraphs I have discussed only those characters which play an important part in the identification of species. Others, while not of the greatest significance and not possessing any especial variations, may be mentioned. The stamens seem to be of no diagnostic value, nor are the oblong or rarely sagittate anthers, although I have repeatedly endeavored to find adequate differences in species based on relative length and shape of these organs. The ovary is oblong to linear, superior, and possesses ovules with curved embryos without endosperm. The cotyledons vary from accumbent to incumbent or they may be quite oblique. Some species have them accumbent, some have them incumbent, and a few have them both accumbent and incumbent on the same plant. In view of this variation I have not used the position of the cotyledons as a diagnostic character in this paper.

Geographic Distribution

In North America *Arabis* extends from Greenland to Alaska, south to northern Florida and Mexico. Unlike its relative in the *Cruciferae*, *Draba*, it is not of great complexity in Greenland, Labrador and Quebec, although in the Cordilleran area it becomes highly so, and has a large number of species. It prefers chiefly calcareous regions, but some species are also found growing in granitic or silicious environments. Because the region of central and northern Canada has been only locally botanized, the known distribution of the genus in that area is seemingly erratic and often incongruous, but in the future, when the present gaps are filled, it is hoped that in many cases a more normal range will be worked out. I cannot at the present explain why, for example, typical *A. lyrata*, a plant of Alleghenian distribution and extending as far north as southern Ontario, should apparently be isolated in the Lake Athabasca region of southern Mackenzie and northern Alberta.

Arabis presents, in the range covered in this paper, a few very striking examples of endemism and isolation which will be discussed under the species concerned, since at the present writing it appears wiser to postpone a more prolonged account of this subject until the genus in the western part of its range has been more thoroughly studied.

Acknowledgments

To the many persons who have so kindly and freely given me their advice and help, I am deeply grateful. Especially would I thank Professor M. L. Fernald, who first suggested the problem to me, and whose patience and inspiration have guided me through the course of the investigation; also Mr. C. A. Weatherby for numerous valuable suggestions and for his kindness and diligence in examining types in various European herbaria; likewise Miss Ruth D. Sanderson, Librarian of the Gray Herbarium, for her always cheerful and willing help in bibliographical references; and to my other colleagues on the staff of the Gray Herbarium, who have helped in many ways, I would extend my grateful appreciation. To the following curators of herbaria, who have most generously placed their valuable collections at my disposal, I would likewise express my sincere thanks: Dr. William R. Maxon of the United States National Herbarium; Dr. H. A. Gleason of the New York Botanical Garden; the late Dr. M. O. Malte of the National Museum of Canada; Dr. H. K. Svenson of the Brooklyn Botanic Garden; Dr. F. W. Pennell of the Academy of Natural Sciences of Philadelphia; Dr. J. M. Greenman of the Missouri Botanical Garden; Professor N. C. Fassett of the University of Wisconsin; Professor C. O. Rosendahl of the University of Minnesota; Professor P. A. Munz of Pomona College; Professor A. S. Goodale of Amherst College; Professor Aven Nelson of the University of Wyoming; and Mr. C. C. Deam.

In citing specimens from the above herbaria, the following symbols have been employed: The United States National Herbarium (US); The New York Botanical Garden (NY); The Brooklyn Botanic Garden (Bklyn); The Academy of Natural Sciences of Philadelphia (Phil); The Missouri Botanical Garden (Mo); The University of Wisconsin Herbarium (Wisc); The University of Minnesota Herbarium (Minn); The Deam Herbarium (Deam); The Pomona College Herbarium (Pom); The University of Wyoming Herbarium (Wyo); The Herbarium of the National Museum of Canada (Can); The Amherst College Herbarium (Amh). The specimens in the Gray Herbarium and in that of the New England Botanical Club have received no special designation. In view of the large amount of material studied it has seemed unnecessary to cite more than a few characteristic specimens from each state or province.

Synoptic Treatment of Arabis in Eastern and Central North America

a. Mature fruiting pedicels erect, ascending or divaricately spreading but not definitely descending or strictly deflexed; flowering pedicels at anthesis erect, ascending or divaricately spreading....*b.*

b. Mature siliques erect or ascending, often appressed or subappressed to the main stem, not divaricately spreading, straight or curved inward; fruiting pedicels erect or ascending....*c.*

c. Mature siliques one-nerved only at the base, often only faintly so, or more rarely (in *A. arenicola*) as far as the middle; flowers in close racemes....*d.*

d. Plants glabrous throughout; seeds definitely in two rows, narrowly oblong to elliptical, wingless.....1. *A. arenicola.*

d. Plants with pubescent stem and basal and cauline leaves; seeds in only one row, orbicular to subquadrate, winged all around....*e.*

e. Basal leaves lyrate-pinnatifid, petals small, 1.5–3 mm. long; siliques 2–2.5 cm. long; biennial plants of south and southwestern United States.....2. *A. virginica.*

e. Basal leaves merely dentate to subdentate, never lyrate-pinnatifid; petals large for genus, 7–9 mm. long; siliques 4–7 cm. long; perennial plants of Greenland south to Quebec.....3. *A. alpina.*

c. Mature siliques one-nerved at least to the middle or well beyond the middle; flowers in loose racemes (except sometimes in *A. glabra*)....*f.*

f. Seeds distinctly in only one row....*g.*

g. Cauline leaves spatulate to linear, not clasping; plant much branched from the base.....4. *A. lyrata.*

g. Cauline leaves lanceolate to ovate, amplexicaul to subamplexicaul; plant simple or with only one or two branches at the base....*h.*

h. Fruiting pedicels appressed or subappressed to rachis....*i.*

i. Mature siliques 5–9.5 (rarely 4) cm. long, terete, never appearing moniliform; sepals and flowering pedicels always glabrous....*j.*

j. Stem hirsute at base with spreading hairs.
5. *A. glabra* var. *typica.*

j. Stem appressed-pubescent at base.
5a. *A. glabra* var. *furcatipilis.*

i. Mature siliques 3–5 cm. long, flat, often appearing moniliform; sepals and flowering pedicels glabrous or hirtellous.....6. *A. pycnocarpa.*

h. Fruiting pedicels not appressed or subappressed, merely ascending....*k.*

k. Mature siliques 5–7 cm. long; cauline leaves glabrous on upper surface, pubescent on lower surface.....7. *A. georgiana.*

k. Mature siliques 2.5–4 cm. long; cauline leaves pubescent on both surfaces.....8. *A. patens.*

f. Seeds distinctly in two rows....*l.*

l. Stem profusely branched at base; seeds entirely wingless; plants of Greenland and the Yukon Territory.....9. *A. Hookeri.*

l. Stem simple or only slightly branched at base; seeds winged narrowly all around except sometimes in *A. glabra;* plants of boreal North America....*m.*

m. Fruiting pedicels merely ascending or divaricately spreading, finely stellate-pubescent to glabrous, stem finely appressed-pubescent at base with forked trichomes.....10. *A. divaricarpa.*

m. Fruiting pedicels strictly appressed or subappressed, always glabrous; stem hirsute or glabrous (except in *A. glabra* var. *furcatipilis* which is appressed-pubescent at the base)....*n.*

n. Stem densely hirsute below with spreading hairs; flowers creamy-white to deep cream-color or more rarely very light yellow; siliques terete.....5. *A. glabra.*

n. Stem quite glabrous or rarely very scantily hirsutulous at extreme base; flowers whitish to pink or more rarely purplish; siliques flat. 11. *A. Drummondi.*

b Mature siliques divaricately spreading, never appressed or subappressed, curved outward or downward (except in *A. dentata* where they are straight), often arcuate to subarcuate; fruiting pedicels ascending or divaricately spreading....*o.*

o. Plants with stem and radical and cauline leaves glabrous (except in *A. viridis* var. *Deamii*)....*p.*

p. Siliques one-nerved at least to the middle and often beyond; flowers in very close, compact racemes; sepals nearly as long as petals; lower cauline leaves sharply dentate to laciniate.....12. *A. viridis.*

p. Siliques one-nerved only at the base or rarely to the middle; flowers in very long, loose racemes; sepals only one-half the length of petals; lower cauline leaves serrate-dentate to subentire.....13. *A. laevigata.*

o. Plants with stem and radical and cauline leaves pubescent....*q.*

q. Basal leaves finely stellate-pubescent on both surfaces; flowers whitish to pink or purplish.....10. *A. divaricarpa.*

q. Basal leaves hirsute on both surfaces with simple hairs or, if stellate-pubescent, only so on the lower surface, strigose to strigillose above; flowers white to cream-color or yellowish....*r.*

r. Siliques finely and evenly stellate-pubescent. 14. *A. dentata* var. *typica.*

r. Siliques quite glabrous....*s.*

s. Seeds entirely wingless.....14a. *A. dentata* var. *phalacrocarpa*

s. Seeds definitely winged....*t.*

t. Siliques 6–9 cm. long; flowers in very close compact racemes.....12. A. *viridis* var. *Deamii.*

t. Siliques 2.5–4 cm. long; flowers in loose racemes..8. *A. patens.*

a. Mature fruiting pedicels pendulous or reflexed; flowering pedicels at anthesis reflexed or at least somewhat descending....*u.*

u. Siliques one-nerved only at the base or slightly beyond; petals 1.75–2.25 mm. broad at apex.....15. *A. Holboellii.*

u. Siliques one-nerved at least to the middle and usually beyond; petals not exceeding 1.5 mm. broad at apex....*v.*

v. Seeds broadly winged all around; cauline leaves oblong to elliptical, not clasping at base; flowers white to creamy; siliques distinctly falcate.....16. *A. canadensis.*

v. Seeds narrowly winged all around; cauline leaves linear to lanceolate or narrowly oblong with a subamplexicaul base; flowers white to pinkish; siliques straight or only slightly curved....*w.*

w. Pubescence of stem and pedicels finely and minutely hoary-stellate; petals 6–9 mm. long, 1–1.5 mm. broad at apex.....17. *A. retrofracta.*

w. Pubescence of stem and pedicels coarser, loosely hispid to loosely hirsute; petals 4–6 mm. long, 0.5–0.75 mm. broad at apex.....18. *A. pendulocarpa.*

1. A. ARENICOLA (Richards.) Gelert. Perennial from a branching caudex: stem decumbent or erect, branching from the base or simple, low, 12–16 cm. high, glabrous, often purplish at base passing to green above; radical leaves firm, tough or subcoriaceous, numerous, spatulate to oblanceolate, 2–5 cm. long, 3–6 mm. broad, glabrous or more rarely subciliate, obtuse, subentire to dentate with 2–6 shallow teeth, tapering to a long winged petiole; petioles glabrous or more rarely slightly hirsutulous; cauline leaves few, firm, spatulate to narrowly oblanceolate, 8–15 mm. long, 2–4 mm. broad, glabrous throughout, entire, obtuse to subacute, the lowermost sometimes short-petioled, the middle and uppermost sessile: flowers in rather close racemes; flowering pedicels erect or ascending, glabrous, 3–5 mm. long at anthesis; sepals membranaceous, 1.75–2.5 mm. long, averaging 1 mm. broad, one half as long as petals, oblong, obtuse or very rarely subacute, glabrous, yellowish-brown to reddish-purple; petals milk-white, 3.5–5 mm. long, 2–3 mm. broad at apex, oblong-spatulate to oblanceolate: siliques 1–3 cm. long, 1.5–2.25 mm. broad, straight or slightly curved, glabrous, erect or ascending, at maturity faintly one-nerved at base or somewhat beyond, more rarely nearly to top, acute, glabrous; fruiting pedicels erect or ascending or more rarely divaricately spreading, slender, glabrous, 5–9 mm. long at maturity; style 0.25–0.75(–1) mm. long, abruptly tipping the silique; seeds small, in two rows, narrowly oblong to narrowly elliptical, wingless, 1.5–2 mm. long, 0.35–0.5 mm. broad.—Bot. Tidsk. xxi. 287–291 (1898); Britton, Man. Fl. N. States & Can. 464 (1901); Simmons, Vasc. Pl. Ellsmld. 80 (1906); Britton & Brown, Ill. Fl. ed. 2: ii. 179 (1913); Simmons, Phytogeo. Arct. Arch. 95 (1913); Vooge, Vasc. Pl. Erick Rand's Land, 26 (1932). *Eutrema arenicola* Richardson in Hooker, Fl. Bor.-Am. i. 67. t. 24 (1833); T. & G., Fl. No. Am. i. 112 (1838); Watson in Gray, Synop. Fl. N. Am. i. 136 (1895). *Sisymbrium humifusum* J. Vahl, Fl. Dan. t. 2297 (1840); J. Lange, Medd. Groenld. iii Hefte, 51 (1880). *Parrya arenicola* Hooker, Outl. Arct. Pl. 315 (1860). *Arabis humifusa* Wats. in Proc. Am. Acad. xxv. 124 (1889); Macoun, Cat. Can. Pl. v. 303 (1890); Wats. in Gray, Synop. Fl. N. Am. i. 159 (1895).—Sandy or rocky shores in arctic and subarctic regions, East and West Greenland south of lat. 72°, Baffin Island, the Ungava region of Quebec, and Labrador. The following are characteristic. GREENLAND: Disco, Quannersoit, *Fries*, 22 July 1871; Svartenhuk Halvø,

Tartussaq Hus, 71° 22′ N., *Porsild* & *Porsild*, 20 July 1929; Umiarfik Fjord, Vestside, udenfor anden Indsnoeoing, lat. 72° 8′ N., *M. P. Porsild*, 8 Aug. 1934. CANADIAN ARCTIC ARCHIPELAGO: Baffin Island, Lake Harbor, lat. 62° 49′, *Malte*, no. 118,878; Southampton Island, lat. 64° 10′, *Malte*, no. 120,652. UNGAVA: Wolstenholm, Hudson Strait, lat. 62° 40′, *Malte*, no. 120,929; Port Harrison, east coast of Hudson Bay, lat. 58° 17′, *Malte*, nos. 120,786 & 120,826. LABRADOR: spur on southwest side, Mt. Tetragona, Torngat Region, *Abbe*, no. 390; easterly slope of Bishop's Mitre, Kaumejet Mts., *Abbe*, no. 391. *Fl.* June–July; *fr.* July–Aug. MAP 1.

MAP 1. Range of ARABIS ARENICOLA.

Var. PUBESCENS (S. Wats.) Gelert. Base of stem and radical leaves pubescent with simple and bifurcate hairs.—Bot. Tidsk. xxi. 290 (1898). *A. humifusa* (J. Vahl) S. Wats. var. *pubescens* S. Wats. in Gray, Synop. Fl. N. Am. i. 160 (1895).—West coast of Hudson Bay from lat. 52° to 57° N., also at Lake Athabasca, Saskatchewan, and, according to Simmons, in Ellesmereland. ONTARIO: South Twin Island, James Bay, *J. M. Macoun*, no. 2,311 [Can]; Charlton Island, James Bay, *Potter*, no. 540; Cape Henrietta Maria, James Bay, *Spreadborough*, no. 62,308 (as *A. petraea*) [Can]; gravelly shores, west coast Hudson Bay, lat. 56°, *J. M. Macoun*, no. 1,693. MANITOBA: rocks along stream, York Factory, Hudson Bay, *Bell*, no. 100,737 [Can]. SASKATCHEWAN: north shore of Lake Athabasca, *J. W. Tyrell*, no. 34,262 [Can]. MAP 2.

MAP 2. Range of ARABIS ARENICOLA, var. PUBESCENS.

In making the new combination *Arabis arenicola*, Gelert[1] has thoroughly discussed the synonomy of this plant and has clearly brought out the fact that, although previously they had been thought to be quite different, *Eutrema arenicola* Richards. and *Sisymbrium humifusum* J. Vahl are actually the same plant. It seems confined to the region east of Hudson Bay between latitudes 72° and 54°, although

[1] Gelert in Bot. Tidssk. xxi. 287–291 (1898).

it extends as far west as Southampton Island. In Greenland it is reported at numerous stations on both the east and the west coasts, although I have seen no specimens from the east coast, and in southern Baffin Island it has been collected by *Malte* at Lake Harbor. Hooker says of *Eutrema arenicola* (which is merely a synonym for our plant): "Hab. deep sand upon the shores of Arctic America between long. 107° and 150°. *Dr. Richardson. Capt. Sir John Franklin and Capt. Back.*",[1] and Sereno Watson extends Hooker's range to "Glovonin Bay, Alaska, *Muir;* Grinnell Land ? *Greely*".[2] The *Muir* and the *Greely* specimens are both in the Gray Herbarium and are very immature plants, both in the early flowering stage. The stems are entirely scapose (the stems of *A. arenicola* are never scapose, but always possess from two to four cauline leaves at least one of which is placed usually just below the inflorescence so that it appears almost as a bract), and the radical leaves are decidedly oval, abruptly passing into a winged petiole (the radical leaves of our plant are spatulate to oblanceolate tapering gradually into a winged petiole), and are of a much finer texture than are those of typical *A. arenicola* from northeastern North America with which I am familiar. There seems to be little doubt that the *Greely* and the *Muir* specimens belong to some other genus in the Cruciferae, most probably to *Parrya*. But as to the Richardson specimen which is figured in Hooker's Flora Boreali-Americana, it seems only logical to conclude that presumably it was actually collected at a much more easterly station than "between long. 107° and 150°."[3] Gelert has compared it with typical Greenland material of our plant and says: "it was immediately evident to me that this plant [*Eutrema arenicola*—the Richardson one] is identical with *Arabis humifusa* [the Greenland plant.]"[4] And if one wishes further evidence, he need only glance at an herbarium sheet of *A. arenicola* and compare it with Hooker's plate; that the two are identical no one will doubt.

[1] Hooker, Fl. Bor.-Am. i. 67. t. 24 (1830).

[2] Watson in Gray, Synop. Fl. N. Am. i. 137 (1895).

[3] The bases for Hooker's records of numerous other plants often need careful scrutiny, inasmuch as several instances similar to the present one are quite familiar to students of the region. He reports *Geum* (*Sieversia*) *triflorum* as occurring in Labrador, Newfoundland and the White Mountains of New Hampshire, although Professor Fernald, in an unpublished manuscript, remarks: "It is a noteworthy fact that only upon these statements of Hooker's has *Geum triflorum* been listed from either Labrador, Newfoundland or New England. In fact the plant is very rare as far east as Ontario and northern New York. It seems highly probable that Hooker's information was in some way confused."

[4] Gelert, l. c. 289.

As is quite natural, most writers have followed Hooker and Watson in citing the range for this plant. Thus Gelert writes, "The geographic distribution is in Arctic America from Alaska to Grinnell Land and Labrador, in west Greenland from 61°–70° N. lat."[1] And Simmons says: "Occurrence. Grinnell Land: Discovery Harbor (GREELY); I think there need be no doubt about the determination, as the plants of the expedition were examined by *Watson* among others; indeed there is a note of interrogation put after the name (GREELY . . .)."[2] Other students have written similarly, but I cannot at the present time and from the scanty evidence at hand, become convinced that the plant is to be found west of southern Baffin Island. It seems unwise to map ranges without data from herbarium specimens, and, having discarded the *Muir* and the *Greely* plants as misidentifications, I have, consequently, made the above assumption with reference to the plant collected by Dr. Richardson.

The plate of *Sisymbrium humifusum* (*A. arenicola*) in Flora Danica[3] illustrates a plant which is slightly different from that figured by Hooker[4] but, as the species in nature shows considerable diversity in the form of its radical leaves, one can safely discount such small variations. Regarding this point Gelert says: ". . . when we compare the two figures, that of Hooker . . . and that of the Flora Danica we find some difference, the first showing a plant with entire leaves (in the description: integerrima vel parce dentata) and rather short pods (in the description: pedicello vix duplo longiores), the latter showing a plant with deeply dentate leaves (in the description: grosse dentata) and long pods (in the description: pedicello triplo longiores). However these proportions are variable. The common form has entire or slightly dentate leaves, and the pods are generally three or four times as long as the pedicels. Richardson has found the plant on sandy shores. In Greenland also the plant is found on sandy ground."[5]

Var. *pubescens* was first described by Watson,[6] who differentiated it from the typical form of the species on the basis of pubescence. The stem in the variety is usually hirsute and the radical leaves are likewise hirsute, whereas the typical form has them both always

[1] Gelert, l. c. 290.
[2] Simmons, Vascular Plants of Ellesmereland, 80 (1906)
[3] J. Vahl in Fl. Dan. t. 2297 (1840).
[4] Hooker, l. c. pl. 24.
[5] Gelert, l. c. 289.
[6] Watson, l. c. 160.

glabrous. It is found on the west coast of Hudson Bay between latitudes 52° and 57° N., and also as far west as Lake Athabasca in Saskatchewan. I have examined the Saskatchewan specimen (*Tyrell*, no. 34,262), and have carefully checked its determination. It is quite possible that the plant extends farther northward; Simmons reports it from Ellesmereland and says: "The Ellesmereland specimens, of which I have only a couple, are very small with somewhat more dentate leaves than in the figures quoted, for the rest, they are well in accord with them as also with specimens from Greenland in the Copenhagen Herbarium. As they are rather hairy in the lower part of the stem and in the leaves, they may be referred to var. *pubescens*, (Wats.) Gel."[1] However, the specimens at my disposal from the region around the west coast of Hudson Bay do not reveal such decidedly dentate leaves as those of which Simmons speaks. One sheet (*Tyrell*, no. 100,703, 19th July 1893) from the Northwest Territory, lat. 60° 20′, long. 104° 30′, in the Herbarium of the National Museum of Canada is labelled *A. arenicola* var. *pubescens*, and has very dentate radical leaves. It is, however, unquestionably *A. lyrata* var. *kamchatica*. The question arises, therefore, whether Simmons really had var. *pubescens* from Ellesmereland, or whether it was something quite different.

2. A. virginica (L.) Poir. Biennial from a long tap-root: stem spreading from the base, decumbent or ascending, 1–2.5 dm. high, usually hirsute at the base with short and simple or bifurcate hairs, passing to glabrous above or hirsute throughout; basal leaves narrowly oblong, 3–8 cm. long, 7–12 mm. broad, lyrate-pinnatifid with nearly even oblong to linear segments, the segments nearly all one-toothed or entire, petioled, hirsute or glabrous, the hairs when present all simple or more rarely somewhat bifurcate; cauline leaves similar to basal ones but smaller, or the uppermost lanceolate and subentire, 3–7 cm. long, 7–10 mm. broad, either short-petioled or sessile, nearly always glabrous, rarely sparingly hirsute with simple hairs: flowers small, inconspicuous, in close racemes; flowering pedicels short, 2–3 mm. long at anthesis, glabrous; sepals membranaceous, 1–2 mm. long, one-half to two-thirds the length of the petals, glabrous or rarely with a few scattered simple hairs, often tinged purplish or pinkish; petals 1.5–3 mm. long, white to faintly pinkish, oblanceolate to narrowly oblong and rarely almost linear: siliques 2–2.5 cm. long, (1–) 1.25 –1.75 (–2) mm. broad, nearly straight or very rarely slightly curved, erect or ascending or more rarely somewhat spreading, glabrous, faintly one-nerved at the extreme base or more rarely entirely nerve-

[1] Simmons, l. c. 80.

less; fruiting pedicel stoutish, erect or ascending, glabrous, 3–7 mm. long at maturity; style short, 0.25–0.5 mm. long, supporting the minute bivalvate stigma; seeds orbicular to suborbicular or more rarely subelliptic, distinctly in one row, narrowly and evenly winged all around, averaging 1.5 mm. long and 1.25 mm. broad.—Encyl. Supp. i. 413 (1810), excl. description and syn. *Cardamine virginica* Michx.; Trelease in Branner & Coville, Rep. Geol. Surv. Arkansas for 1888; 165 (1891); Britton & Brown, Ill. Fl. ii. 147 (1897); Small, Fl. Se. U. S. 483 (1903); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Rydberg, Fl. Pr. & Pl. 38 (1932). *Cardamine virginica* L. Sp. Pl. ii. 656 (1753), nec Linn. Herb., nec Michaux, Pursh, DeCandolle, Am. auctores. *Cardamine Ludoviciana* Hooker in Jour. Bot. i. 191 (1834); T. & G. Fl. N. Am. i. 85 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 169 (1840); Walpers, Rep. i. 136 (1842); Dietrich, Syn. iii. 698 (1843); Chapman, Fl. S. U. S. 26 (1860). *Sisymbrium Ludovicianum* Nutt. ex. Hooker in synon. Jour. Bot. i. 191 (1834). *Arabis Ludoviciana* Meyer in Index Sem. Hort. Petrop. ix. 60 (1843); Gray, Man. ed 2: 33 (1857); Wood, Classbk. rev. ed: 231 (1861); Coulter in Contr. U. S. Nat. Herb. ii. 19 (1891); Watson in Gray, Syn. Fl. N. Am. i. 161 (1895); Chapman, Fl. S. U. S. ed. 3: 27 (1897). *Planodes virginica* Greene, Leaflets Bot. ii. 221 (1912).—Florida to Texas, north to Virginia, Ohio, Indiana, Illinois, Missouri and Kansas; also California and northern Lower California. The following are characteristic. VIRGINIA: weed in cornfield, Williamsburg, *Grimes*, no. 3,296. NORTH CAROLINA: Weldon, *Bartram*, 19 April 1908 [Phil]. SOUTH CAROLINA: waste ground, Calhoun, Pickens Co., *House*, no. 3,137 [NY]; Clemson College, Oconee Co., *House*, No. 1,703 [NY]; Oconee Co., *A. P. Anderson*, no. 1,137 (as *Cardamine arenicola*) [NY]. GEORGIA: Chattahoochee, *Canby*, no. 10; Georgia, *T. & G. Fl. N. Am.*, without date or number; flat rocks, Athens, *Harper*, March 1897 [Bklyn]. FLORIDA: Quincy, *Herb. Chapman*, without date or number [NY]; Chattahoochee, in cultivated ground, *Curtiss*, 4 May 1898 [Bklyn]; Monticello, Jefferson Co., *Lighthipe*, 20 March 1891 [Bklyn]. OHIO: Fernbank, ad ripas fluminis Ohio, prope "North Bend," *Short*, without date or number [US]; near Cincinnati, *T. G. Lea*, 8 June 1838 [Phil]. INDIANA: sandy soil of flood plain of White R., 2 mi. s. of Bedford, Lawrence Co., *Kriebel*, no. 1,617; in open woods in Goose Pond, about 2½ mi. north of Griffin, *Deam*, no. 50,053 [Deam]; frequent in fallow cornfield, 2 mi. west of Decker, *Deam*, no. 42,858 [Deam]. KENTUCKY: Campbell Co., *T. G. Lea*, 24 April 1838 [Phil]; Ohio R., opposite Hanover, *A. H. Young*, May 1880 [Phil]. TENNESSEE: waste places around Nashville, *Gattinger*, no. 150; cultivated ground, Knoxville, *Ruth*, no. 356; waste ground, summit of Lookout Mt., *Churchill*, 25 April 1906. MISSISSIPPI: Houston, *C. L. Sherwood*, March 1892 [NY]; moist soil, Columbus, *Biltmore Herb.*, no. 1,047b [US]; Starkville, *E. C. Times*, 11 April 1921 [Wisc.]. ALABAMA: Mobile, *Mohr*, without date or number; Auburn, Lee Co., *Earle &*

Underwood, March 1896 [NY]; waste places, Tuscaloosa, *Mohr*, 9 June 1898 [US]; Auburn, Lee Co., *Earle & Earle*, no. 16 [NY]. Illinois: roadsides, Grand Tower, *Gleason*, 3 May 1902; waste places, Saline, *M. S. Bebb*, April 1866 [Bklyn]; N. Evanston, *Earle*, 1878 [US]; E. St. Louis, *Eggert*, 15 April 1878 [US]. Missouri: moist prairies and field, St. Louis, *Geyer*, April 1842; woods, Campbell, *Bush*, no. 6,602; Davis Creek bottom, near Emma, *Demetrio*, no. 91; low ground, Independence, Jackson Co., *Bush*, no. 36. Arkansas: on rocky slope, Hot Springs, Garland Co., *Moldenke & Moldenke*, no. 1,411 [NY]; common in fields, Noark, Clay Co., *Bush*, no. 39 [NY]; Fort Towson, *Leavenworth*, March & April [Phil]. Louisiana: dry ground along railroad, Gretna, opposite New Orleans, *Ball*, no. 309; waste and cultivated ground, Natchitoches, *E. J. Palmer*, no. 7,031 [US]; Opelousia, *Canby, Sargent & Trelease*, no. 16 [US]; St. Martinsville, *Langlois*, 13 March 1892 [Minn]. Kansas: open ground, Cherokee Co., *A. S. Hitchcock*, no. 610. Oklahoma: Moffett, *Benke*, no. 4,561; Muskogee, *E. Brainerd*, 7 April 1908; edge of creek near Crusher Spur, Murray Co., *Stevens*, no. 38; in edge of creek near Paul's Valley, Garvin Co., *Stevens*, no. 1,061. Texas: Houston, *E. Hall*, no. 15; San Antonia, *V. Havard*, no. 220; sandy bottoms, Columbia, Brazoria Co., *E. J. Palmer*, no. 5,036 [US]; Waco, McLennan Co., *Heller*, no. 1,372 (as *Roripa tanacetifolia*); Corpus Christi, Nueces Co., *Heller*, no. 1,407. California: about borders of pools, San Diego, *Brandegee*, no. 1,644; Point Loma, San Diego, *Brandegee*, May 1905 [Bklyn]; San Diego, *Brandegee*, April 1903. Lower California: Tia Juana Mesa, *C. R. Orcutt*, no. 1,459 [US]. *Fl.* March–May; *fr.* April–August.

In 1803 Michaux identified a cruciferous plant from "Canada, Nova Anglia et Pennsylvania"[1] as *Cardamine virginica* L. and gave a diagnosis. This was not, however, the Linnean *C. virginica*, a plant not found, at least to the best of my knowledge, either in Canada, New England or Pennsylvania, but which grows south and west of those regions very commonly. Michaux' identification of his plant was merely an error, but unfortunately subsequent authors did not realize this fact and copied his description almost word for word. Consequently, the *C. virginica* as described by Pursh,[2] by De Candolle,[3] by Elliott,[4] and by Darby,[5] is not what we now know as *Arabis virginica* (which is based on the true *C. virginica* of Linnaeus), but a wholly different plant, identified today with *C. parviflora* as var. *arenicola* (Brit.) O. E. Schulz.

[1] Michaux, Fl. Bor.-Am. ii 29 (1803).
[2] Pursh, Fl. Am. Sept. ii. 439 (1814).
[3] De Candolle, Systema, ii. 258 (1821).
[4] Elliott, Bot. S. Car. & Ga. ii. 144 (1824).
[5] Darby, Bot. Southern States, pt. ii, 21 (1841).

The first correct nomenclatorial combination for our plant was that of Poiret, but he likewise, was quite ignorant of the Michauxian misinterpretation. His description of *A. virginica*[1] so parallels that of Michaux for *C. virginica*, that it seems unquestionable that he based the description on Michaux's own type of *C. virginica*. Linnaeus' herbarium was still, at that time, at Upsala, and the possibility that Poiret had access to it is extremely unlikely. It is much more plausible to believe that he assumed that the Michaux plant and the Linnean one were identical and that his combination was made on that basis. Hence, it is quite valid as to name, but not as to the plant described. Furthermore, the fact that the Michaux herbarium was at the Jardin des Plantes, of which Poiret was the Director, lends further proof to this theory.

The type of Michaux's plant was examined by Professor M. L. Fernald in 1903, and has since been identified by him as *C. parviflora* var. *arenicola*.[2] The type of *C. virginica* in the Linnean Herbarium, although examined by Britton over 40 years ago, has again been verified for me through the kindness of Mr. C. A. Weatherby, whose very complete notes leave no doubt in one's mind that it is the plant under discussion. Britton says of it:

> The specimen preserved under the name *Cardamine virginica* in the Linnaean Herbarium is *Sisymbrium asperum* L. of Southern Europe, which bears a wonderful resemblance to the plant of the Southern United States, readily distinguishable, however, by its glandular-roughened siliques, those of our plant being perfectly glabrous. The foliage of the two species is practically identical. It is perfectly evident, however, from his description that Linnaeus had only the American plant in mind, and this is proved by the types preserved at the British Museum of Natural History. I found no specimen of his *Sisymbrium asperum* except the one labelled *Cardamine virginica*, in the Linnaean

[1] The following excerpt from Poiret's Encyl. Suppl. i. 413 (1810), shows how closely his own description follows that of Michaux. Michaux's in Latin, is given first; Poiret's follows immediately after in French:

"*Cardamine* (virginica), *glabra, erecta, foliis omnibus pinnatis; pinnulis minutis, ovalibus linearibusve, subauriculatis; siliquis tenuibus, longis, stricte erectis.*"

"Autant & plus rapprochée des arabettes que les cressons, cette plant, d'après M. de Lamarck, doit trouver sa place ici. Ses tiges sont droites, glabres, presque simples; toutes les feuilles ailées, médiocrement pétiolées, glabres à leurs deux faces; les folioles petites, ovales ou linéaires, entières, légérement ondulées à leurs bords, auriculées ou munies d'une dent à leur base; la terminale ordinairement à trois lobes obtus; les feuilles radicales plus grandes, étalées en rosette; celles des tiges alternes, peu nombreuses, distantes. Les fleurs sont petites, pédicellées, réunies en une grappe lâche, terminale; il leur succède des siliques grêles, alongées, roides, droites, comprimées. Cette plante croît dans la Virginie."

[2] For discussion see Fernald in RHODORA, xxix. 191 (1927).

Herbarium, and it is clear that this one has been accidently fastened down to the wrong sheet.[1]

The habit of *A. virginica* so resembles that of a *Cardamine* or of *Capsella Bursa-Pastoris*, especially in the flowering stage, that a natural confusion as to its identity in the field is pardonable. In the fruiting condition there is little chance for error in determination because its siliques often possess a faint nerve at the base (a most important character in *Arabis*, but entirely lacking in *Cardamine*), but if this nerve is absent, as it sometimes is, the seeds are always evenly winged throughout, a character which instantly places a dubious *Cardamine* in *Arabis*.

In its distribution, this plant ranges throughout the southeastern United States, often in waste ground as a weed, or in fields and prairies, but also commonly in wet woods or about wet rocky places. North of Virginia it is unknown and is comparatively rare in Ohio, Indiana and Illinois. In California it is very uncommon and, although I have seen specimens only from San Diego (and one from Lower California), Munz says of its occurrence in the state: "Rare, about drying pools, San Diego, Ingelwood, Gardenia; to central Calif., Lower Calif."[2]

3. A. ALPINA L. Perennial from a branching caudex: stems erect or decumbent, 1–3.5 dm. high, branching at the base, loosely to densely hirsute below with spreading, simple and 2- or 3-forked hairs, above hirtellous or more rarely glabrous: radical leaves in rosettes, 0.5–11 cm. long, 0.5–2.5 cm. broad, oblanceolate to obovate-spatulate, coarsely and unevenly dentate to subentire, subacute, stellate-pubescent on both surfaces with 2–3-forked, more rarely simple hairs, petiolate; petioles broadly wing-margined, sparingly to densely stellate-pubescent; cauline leaves remote to subimbricate, rarely imbricate, oblong to ovate-lanceolate, subamplexicaul with an auriculate base, 1–10 cm. long, 0.5–2.5 cm. broad, unevenly dentate to subentire, subacute, stellate-pubescent on both surfaces with 2–3 forked hairs, more rarely the uppermost merely hirtellous: flowers large, showy, in close racemes; flowering pedicels erect, subappressed, sparingly hirsute to glabrous, 6–8 mm. long at anthesis; sepals oblong-lanceolate, greenish-yellow, one-half the length of petals, herbaceous, 3–5 mm. long, loosely hirsute or hirtellous to glabrous; petals white to deep cream color, oblanceolate-spatulate, 7–9 mm. long, 2–4 mm. broad at top, delicately and finely veined: siliques 4–7 cm. long, 1.5–2 mm. broad at maturity, straight or slightly curved inwards, glabrous,

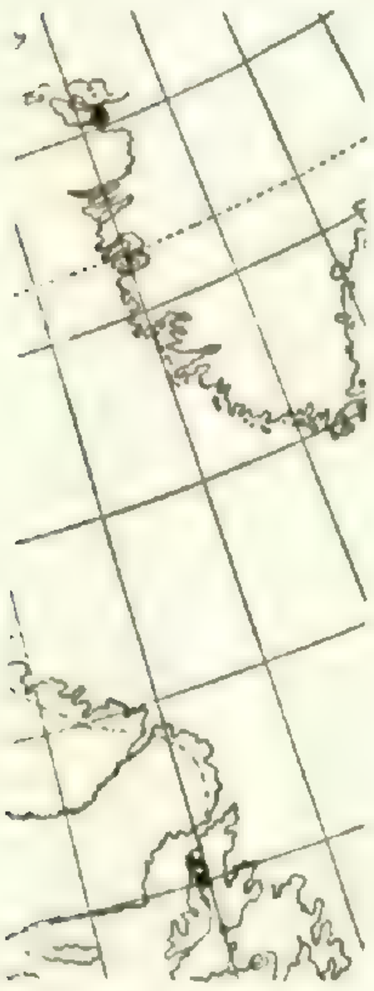
[1] Britton in Bull. Torr. Bot. Club xix. 221 (1891). For further discussion, proving Britton's point, see Baker in Journ. Bot. xliii. 255 (1905).

[2] Munz, Man. So. Calif. Bot. 203 (1935).

erect or ascending, nerveless or nearly so or if one-nerved then only at the extreme base and very faintly so; fruiting pedicels ascending, glabrous, 7–15 mm. long at maturity; stigma small, flat-topped to subcupulate, on a short stocky style 0.25–0.75 mm. long; seeds in one row, orbicular to subquadrate, averaging 1.25 mm. in diameter, narrowly winged all around, the wing averaging 0.25 mm. broad.—Sp. Pl. ii. 664 (1753); Oeder in Fl. Dan. t. 62 (1766); Scopoli, Fl. Carn. ed. ii. 29 (1772); Lam. Encyl. i. 218 (1783); Curtis in Bot. Mag. vii. t. 226 (1793); Persoon, Synop. Pl. ii. 204 (1807); Poir. Suppl. Encyl. i. 410 (1810); Pursh, Fl. Am. Sept. ii. 438 (1814); Hartman, Handbk. Scand. Fl. 225 (1820); DC. Syst. ii. 216 (1821) and Prod. i. 142 (1824); Hooker, Fl. Bor.-Am. i. 41 (1829); E. Meyer, Pl. Labr. 84 (1830); Schlecht., Fl. Labr. in Linnaea x. 102 (1836); T. & G. Fl. N. Am. i. 80 (1838); Ledebour, Fl. Ross. i. 117 (1842); Walpers, Rep. i. 130 (1842); Dietrich, Synop. iii. 689 (1843); Bennett, Fl. Alps i. 18 (1846); Godet, Fl. Jura 36 (1853); Bouvier, Fl. Suisse 40 (1878) and Fl. Alps 10 (1882); Gaudin, Synop. Fl. Helv. 550 (1886); Wats. in Gray, Synop. Fl. N. Am. i. 163 (1895); Britton & Brown, Ill. Fl. ii. 147 (1897); Britton Man. Fl. ed. 2: 464 (1905); Porsild, Fl. Disko, Greenland 83 (1926). *Turritis verna* Lam. Fl. Fr. ii. 490 (1778). *Arabis incana* Moench, Meth. 257 (1794). *A. alpina* var. β *minor* Lange, Medd. Groenld. iii. Hefte, 251 (1887). *A. alpina* var. γ *ruderalis* Wormskj. in Lange, Medd. Groenld. iii. Hefte, 251 (1887). *A. alpina* var. *typica* Paoletti in Fiore & Paoletti, Fl. Anal. d'Ital. i. 427 (1908).—Cliffs, ledges and gravel of basic or circumneutral rock or wet springy hillsides and alpine meadows, e. and w. Greenland, s. of lat. 73°, Baffin Island, Ungava, Labrador, Newfoundland and the Gaspé Peninsula of Quebec. The following are characteristic. GREENLAND: on cliffs, northwest side of Disco Island, *Ohlin*, no. 77; Qeqertarssuaq, Nûgâtsiaq 71° 33′, 16 Juli 1929, *Porsild & Porsild;* Godhavn, Disco Island, *Ralph Robinson*, nos. 61 & 62; Ilua, lat. bor. 59° 55′, *Lundholm* 1889. BAFFIN ISLAND: Cannon Inlet, *R. Robinson*, no. 66; wet ground, among rocks at waterfall, Lake Harbour, *Malte*, no. 126,873; Frobisher Bay, *C. S. Sewall*, no. 314. UNGAVA: Cape Chidley, Hudson

MAP 3. American Range of ARABIS ALPINA.

Strait, sandy shores, *R. Bell*, no. 166; Port Harrison, east coast of Hudson Bay, wet sand, *Malte*, no. 120,721; Wakeham Bay, Hudson Strait, *Malte*, no. 120,247; Port Burwell, Hudson Strait, *Malte*, nos. 120,178, 120,149, 118,876 & 118,877. Labrador: on granitic rock, old sea beaches, Northwest Bay at Head of Ryan's Bay, *Woodworth*, nos. 242 & 243; 20 mi. n. of Nachvak, *H. S. Forbes*, 28 Aug. 1908; Rama, *Sornborger*, no. 168; mossy bed of a brook, Forteau, Straits of Belle Isle, *Fernald & Wiegand*, no. 3,490; stream bank, west of Blanc Sablon, *Abbe*, no. 1,209. Newfoundland: conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, *Fernald & Wiegand*, no. 3,488; east slope of Fishing Head, St. Anthony, *Abbe*, no. 392; wet quartzite rocks and seepy banks along upper Deer Pond Brook, *Fernald & Long*, no. 28,418; limestone cliffs and ledges on western slope under summit, Bard Harbor Hill, *Wiegand, Gilbert & Hotchkiss*, no. 28,416. Quebec: grassy brookside, Pointe a Peau, Brest, Saguenay Co., *St. John*, no. 90,497; calcareous alpine meadow, alt. 1000–1125 meters, Table-Topped Mt., Gaspé Co., *Fernald & Collins*, no. 575; gravel-bar below Middle Camp, Grand Cascapedia River, Bonaventure Co., *Williams, Collins & Fernald*, July 12–15, 1905; gravel and alluvium along Rivière Ste. Anne des Monts, Gaspé Co., *Fernald, Griscom, Mackenzie & Smith*, no. 25,804; along brooks alt. 350–900 meters, north slope of Mt. Albert, Gaspé Co., *Collins & Fernald*, no. 95. *Fl.* July–Aug. *fr.* July–Sept. Map 3.



Map 4. Range of Arabis alpina, var. glabrata (Greenl.) and of A. alpina, forma phyllopetala (Nfld.)

Var. glabrata Blytt. Stem glabrous throughout; leaves usually glabrous, rarely with a few scattered simple hairs.—Norges Flora iii. 974 (1876); Hartman, Scand. Fl. ed. 11: 191 (1897); Lange, Medd. Groenld. iii. 48 (1880). Greenland: Disco Island, Tigpiarssuk ved Nugssag 70° 16′ N., 31 Aug. 1928, *Porsild;* Disco Island, Quannerssit, 22 June 1871, *Fries*. Map 4.

Forma phyllopetala Fernald. Petals firm, greenish white and coarsely veined, otherwise as in the typical form of the species.—Rhodora, xxv. 270 (1933).—Newfoundland: shaded shelves of limestone cliff, Crow's Head, St. John Bay, *Fernald, Long & Fogg*, no. 1,753 (type in Gray Herb.); thickets on quartzite gravel along brook, Deep Gulch, Doctor Hill, *Fernald, Long & Fogg*, no. 1,754. Map 4.

In discussing *A. alpina* in the Synoptical Flora of North America, Watson says: "The *A. stricta* of Pursh's Flora collected in Labrador by *Colmaster*, is probably this species."[1] Without a doubt he is correct as to the specimen concerned. Pursh[2] copied the description

[1] Watson in Gray, Synop. Fl. N. Am i. 163 (1895).
[2] Pursh, Fl. Am. Sept. ii. 437 (1814).

of Willdenow[1] word for word and, although Willdenow did not copy that of Hudson,[2] who is the original author of the name, he deviated only slightly. Hudson's plant is strictly a British one, and is not found in the New World as far as I can ascertain. The ascription of *A. stricta* Huds. to North America in Index Kewensis is no doubt erroneous.

Varying considerably in size and in the degree of pubescence, this plant reaches its northernmost limit at lat. 73° 16′, Kap Franklin, Greenland.[3] It occurs on both the east and the west coasts of that island, south of lat. 73°; and is on Baffin Island, in the eastern Ungava region of Quebec, in Labrador and Newfoundland, thence westward to the Gaspé Peninsula. The variations in stature are considerable, plants often being as low as 7 cm. (Labrador: *Forbes*, 28 Aug. 1908), and as high as 40 cm. (Greenland: Disco Island, *R. Robinson*, no. 61). Some specimens are extremely hirsute on the lowermost part of the stem, while others are very sparingly so, and the basal leaves may likewise vary greatly in pubescence. However, these and similar variations are to be expected in a plant which is so universally distributed throughout the subarctic regions of northeastern North America and, although I have seen no specimens of the following varieties cited by Lange:

> β, *minor* Lange, c. 2″ longa, foliis minutis (c. 1 cm. longis)
> γ, *ruderalis* Wormskj., major, fere pedalis, polyphylla, caule saepe ramossissimo,[4]

I can only interpret them as transient variations due to various edaphic or environmental conditions.

The species is extremely popular as a commercial rock-garden plant, and as such it is sold by many seed houses. An occasional escape, therefore, seems entirely to be expected, and it is as such that I have viewed a sheet "by the roadside, Rockport, Maine" in the Herbarium of the New England Botanical Club. Mr. A. H. Norton also reports it as having gotten a foothold at Cape Elizabeth, Maine.

The earliest published record for var. *glabrata* appears in Blytt's Norges Flora, where one finds the description, "I alle Dele aldeles glat"[5] (all parts glabrous throughout). In North America the variety seems restricted to Greenland, and more especially to the region

[1] Willdenow, Sp. Pl. iii. 539 (1801).
[2] Hudson, Fl. Angl, i. 292 (1778).
[3] Devold & Scholander, Fl. Pl. of se. Greenland 49 (1933).
[4] Lange, Medd. Groenld. Hefte iii. 251 (1887).
[5] Blytt, Norges Flora, iii. 974 (1871).

around Disco. The total absence of pubescence on the plant appears to be a constant and permanent character and as such warrants varietal recognition.

Forma *phyllopetala*, in which the petals are firm, greenish-white and coarsely veined in contrast to those of the typical form of the species which are milk-white, delicate and obscurely veined, already has been adequately discussed by Fernald. I have seen no specimens from regions other than in Newfoundland where it was originally collected.

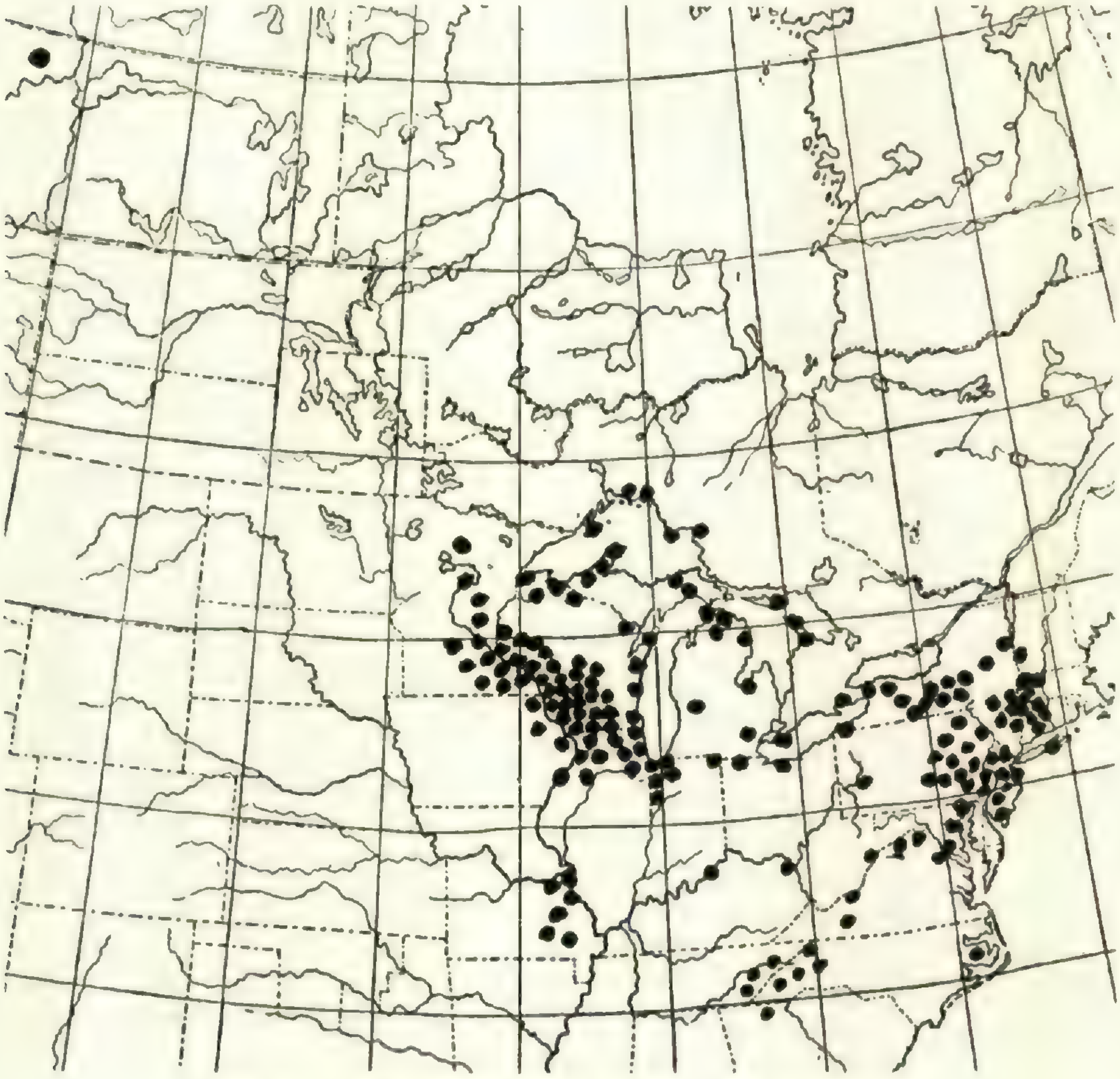
4. A. LYRATA L. Biennial northward, passing to perennial southward: stem ascending, 7–36 cm. high, more or less slender, branching from the base and somewhat above the base, hirsute at base with simple and bifurcate hairs, soon becoming glabrous above or more rarely glabrous throughout: radical leaves 2–4 cm. long, 0.5–1 cm. broad, spatulate to oblanceolate, most frequently lyrate-pinnatifid but often merely dentate or very rarely subentire, densely to sparsely hirsute on both surfaces or rarely only on the lower, with simple and bi- or trifurcate hairs, obtuse to subciliate; petioles hirsute with simple and forked hairs; cauline leaves 1–3 cm. long, 1.5–5 mm. broad, spatulate to linear, tapering to a sessile base or more rarely to a short petiole, the lowermost often lyrate-pinnatifid, more usually dentate to subentire, the uppermost entire, glabrous or more rarely sparingly hirsute with simple and forked hairs; flowers in loose racemes; flowering pedicels erect or spreading, glabrous, 3–4 mm. long at anthesis; sepals 1.5–2.5 (–3) mm. long, one-half to one-third the length of the petals, herbaceous, glabrous, ovate to oblong, acute, greenish to purplish, usually with a narrow hyaline margin; petals white to pinkish or rarely light purple, 6 (5–) –8 mm. long, 2–2.5 (–3) mm. broad at apex, subtruncate or more rarely obtuse, spatulate to oblanceolate: siliques 2–4 (–4.5) cm. long, 0.5–1 (–1.25) mm. broad, slender, straight or slightly curved inward, more or less flat, glabrous, loosely ascending or widespreading, one-nerved at least beyond the middle and often nearly to the tip; fruiting pedicels loosely ascending or spreading, slender, glabrous, 5–15 mm. long at maturity; style slender, up to 1.5 mm. long, or obsolete; seeds elliptical to oblong, averaging 1 mm. long, 0.75 mm. broad, definitely in one row, quite wingless.—Represented in North America by the following varieties and forms.

a. Stem and (or) radical leaves somewhat pubescent with simple, bifurcate or trifurcate hairs....*b.*
  b. Flowers 6 (5–) –8 mm. long; style 0.65–1.25 mm. long, stigma never sessile.....var. *typica.*
  b. Flowers smaller, 3.5–5 (–6) mm. long; style rarely exceeding 0.5 mm. long or obsolete, the stigma then sessile....*c.*
    c. Siliques short, not exceeding 2 cm. long; range of var. *typica* .....var. *typica* f. *parvisiliqua.*
    c. Siliques longer, 2–4 cm. long; plants of Alaska and adjacent regions.....var. *kamchatica.*

a. Stem and radical leaves quite glabrous or rarely the petioles sparingly hirsute with a few scattered simple hairs; stigma sessile or on a short style usually not exceeding 0.75 (1) mm. long; flowers 4–7 mm. long ..... var. *glabra.*

Var. **typica.** *A. lyrata* L. Sp. Pl. ii. 665 (1753); Gronov. Fl. Virg. ed. 2: 99 (1762); Hill, Veg. Syst. xii. t. 9 (1767); Mill. Gard. Dict. (8) Sp. no. 5 (1768); Persoon, Synop. ii. 204 (1807); Pursh, Fl. Am. Sept. ii. 437 (1814); Eaton, Man. Bot. N. Am. 74 (1817); Nutt. Gen. ii. 70 (1818); DC. Syst. ii. 231 (1821); Richardson in Franklin's Journey App. 723 (1823); DC. Prod. i. 146 (1824); T. & G. Fl. N. Am. i. 81 (1838); Walpers, Rep. i. 133 (1842); Gray, Man. Bot. 35 (1848); Chapman, Fl. S. U. S. 27 (1860); Watson in Gray, Synop. Fl. N. Am. i. 159 (1895); Britton & Brown, Ill. Fl. ii. 147 (1897); Britton, Man. Fl. 463 (1901); Small, Fl. Se. U. S. 484 (1903); Robinson & Fernald in Gray, Man. ed. 7: 436 (1908); Rydberg, Fl. Rocky Mts., 358 (1917); Rydberg, Fl. Pr. & Pl. 381 (1932). *A. petraea* Lam. sensu T. & G. Fl. N. Am. i. 80 (1838); Gray, Man. 35 (1848), as to description and specimen cited.—Ledges and cliffs in rich woods or sandy river and lake banks and shores, Vermont, west to Ontario and Minnesota, south to Georgia, Tennessee and Missouri; also in northern Alberta. The following are characteristic. VERMONT: Manchester, *M. A. Day*, no. 397; Mt. Equinox, Manchester, *Goodwin, Rossbach, Hodgdon & Drew*, 19 May 1934. MASSACHUSETTS: exposed ledge, Sheffield, Berkshire Co., *Hoffman*, 8 May 1929; dry ledge near Bash-Bish Brook, Mt. Washington, *Knowlton & Schweinfurth*, 30 May 1919; Hanging Mt., New Boston, Berkshire Co., *Hoffman*, 14 July 1906. CONNECTICUT: calcareous ledges, Salisbury, *Fernald*, 30 May 1902; trap ledges, Bluff Mt., N. Guilford, *G. H. Bartlett*, 3 June 1906; among shrubbery on beach, Fairfield, *E. H. Eames*, 29 May 1898. NEW YORK: rocky soil, n. side of Mohawk River, Little Falls, *Haberer*, no. 65; rich deciduous woods, Palenville near West Saugerties, *Fernald & Hodgdon*, no. 721; growing with *Opuntia vulgaris* and *Prunus maritima* in sand dunes, Mt. Sinai, Suffolk Co., Long Island, *Svenson*, no. 4,465; Goat Island, Niagara Falls, *Wm. Boott*, 1 May 1858 (as *Cardamine hirsuta* v. *virginica*). NEW JERSEY: Sandy Hook, *E. F. Williams*, 19 June 1900; red shale outcrops, ¼ mi. n. of Somerset, *F. J. Hermann*, no. 3,986; Budd's Lake, Morris Co., growing on the open flat sandy shores, *T. C. Porter*, 25 June 1869. PENNSYLVANIA: Safe Harbor, Lancaster Co., *Heller*, 18 April 1889; Blue Hill ledges, Snyder Co., *Wiegand & Manning*, no. 1,260; dunes, Presque Isle, *Pease*, no. 12,987. MARYLAND: dry open hillside along the Susquehanna R., Bald Friar, *Fogg*, no. 1,900; shaly beach of creek, serpentine barrens, Baltimore, *Churchill*, 3 May 1910; shady bank above Oakington Bar, *G. H. Shull*, no. 434. DISTRICT OF COLUMBIA: near Washington, Larkspur Island in the Potomac, *Coville*, 9 May 1890; vicinity of Washington, *T. H. Kearney*, 11 April 1897 [NY]. VIRGINIA: abundant in open rocky woods, Great Falls, *W. Deane*, 17 April 1915; rich hill, rocks

over creek, Wytheville, *H. Shriver*, April 1876; Eggleston's, *Brown, Hogg et al*, 4 June 1890 [NY]; Laurel Creek, north fork of Holston River Valley, Smyth County, *Britton, Britton & Vail*, 22 June 1892. West Virginia: White Sulphur Springs, *Gray, Canby & Redfield*, Aug. 1876. North Carolina: Grandfather Mt., Mitchell Co., *Heller*, no. 1,238; rocky summit of Cedar Cliff Mt., *Biltmore Herbarium*, no. 41b;



Map 5. Range of Arabis lyrata, var. typica.

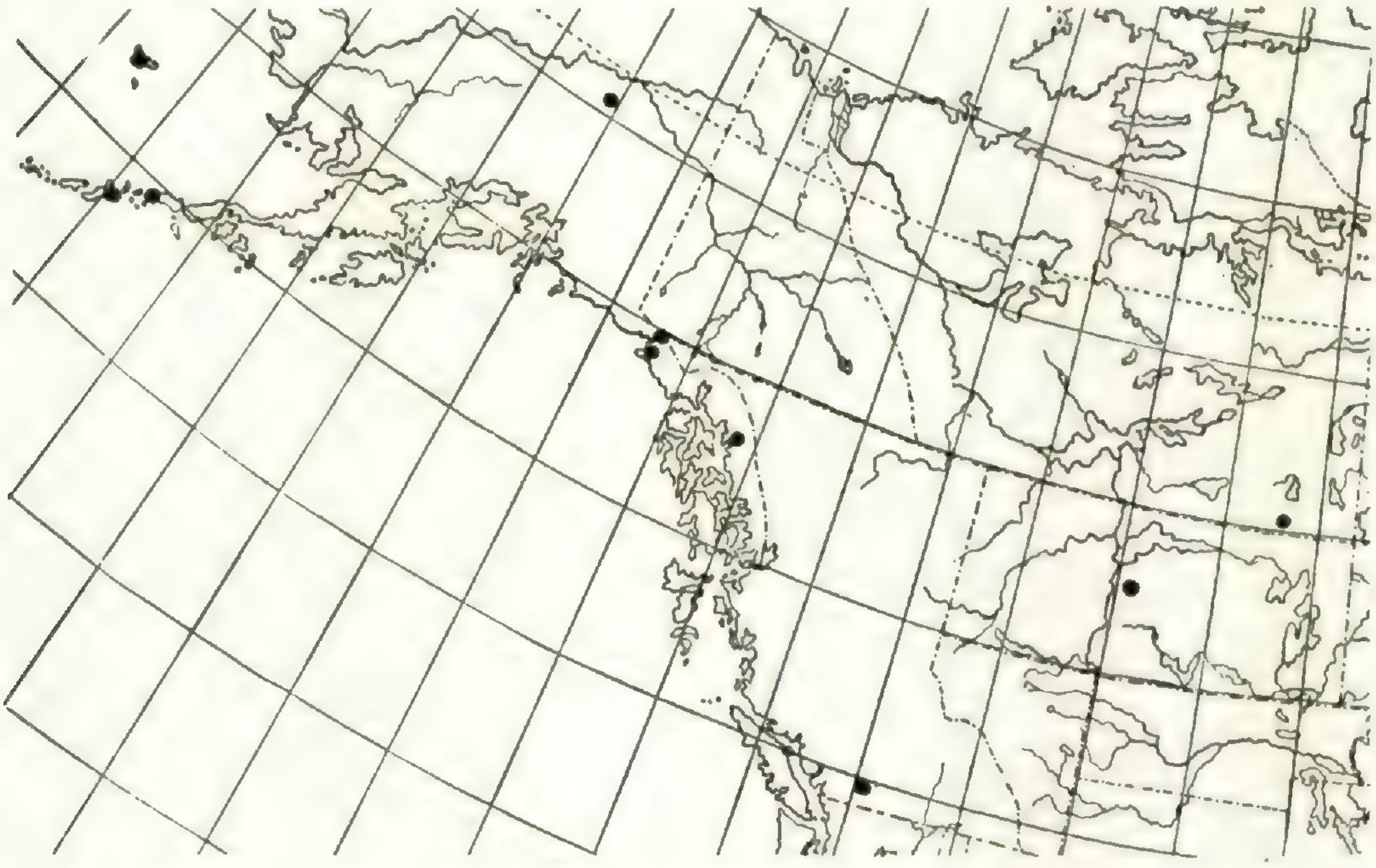
on compacted shell, 10 miles s. of Newbern, Craven Co., *Weatherby*, no. 6,092. Georgia: northern Georgia, *Vasey*, 1878 [Phil.] Ontario: Niagara, *Macoun*, no. 33,785; railroad embankment, Jack Fish, Thunder Bay Distr. *Pease & Bean*, no. 23,535; Hay Bay, Tobermory, Bruce Co., *Krotkov*, no. 7,466; beach, Providence Bay, Manitoulin Island, *Pease & Ogden*, no. 25,002. Michigan: sandy woods, Seul Croix School, Schoolcraft Co., *Pease & Ogden*, no. 25,067; dry sandy beach of Lake Superior, Bête Grise, Keweenaw Co., *Fernald & Pease*, no. 3,339; Isle Royale, *W. S. Cooper*, 8 July 1909. Ohio: Cedar Point, Erie Co., *Moseley*, 19 May 1892; Sandusky, *Kellerman*, 31 May

(without year); Fulton Co., *Moseley*, 23 May 1925 [US]. INDIANA: on sandy banks of Clear Creek, Steuben Co., *Deam*, 12 June 1904; sand hill, Miller, *A. Chase*, no. 789; sandy open woods, Lake Chicago Basin, Pine, *O. E. Lansing, Jr.*, no. 2,705. KENTUCKY: Knobs, Greenup Co., *Short*, June (without year) [Phil]; edge of woods and fields (near Louisville), *O. E. Mueller*, April (without year) [Minn]. TENNESSEE: in apricis rupestribus ad fluv. Holston, *Rugel*, April 1842; ad rupes prope Painted Rock infra Warmsprings, *Rugel*, April 1842 [NY]; on rocks along Tennessee R., Knoxville, *Ruth*, nos. 235 & 1,941 [NY]. WISCONSIN: wooded hills and on limestone rocks ¼ mi. e. of Richland Center, Richland Co., *O. E. Lansing Jr.*, no. 3,404 (in part); open woods at top of bluffs at Dewey Park, *F. H. Smith*, May 1935; dry sandstone ledge, Trempealeau bluff, Trempealeau, *Fassett*, no. 4,242. ILLINOIS: sandy woods near Chicago, *F. E. McDonald*, June 1891; sand in Sheridan Park, Chicago, *F. C. Gates*, no. 16,334; sandy barrens near Oquawka, *H. N. Patterson*, 19 May 1873 [NY]. MINNESOTA: common on sand dunes near mouth of Zumbro R., *Rosendahl*, no. 5,528 [Minn]; bluffs in Winona Co., *Holzinger*, May 1909; Lake City, *W. H. Manning*, 25 June 1883. IOWA: Winneshiek Co., *Fitzpatrick & Fitzpatrick*, 16 June 1899; Decorah, *Holway*, 2 June 1876 [Minn]; on rocky slopes, Valley of Canoe River, 7 mi. s. of Hesper, *Rosendahl*, no. 3,858 [Minn]; Clinton Co., *G. D. Butler*, no. 19 [Mo]. MISSOURI: Jefferson Co. in sandy ground, *Eggert*, (without date or number); Bat Rock, Jefferson Co., *Letterman*, 22 April 1911 [NY]; Pacific, St. Louis Co., *H. W. Edmonds*, 15 May 1927 [NY]. ALBERTA: Moose Lake District, Wood Buffalo Park, Great Slave Lake Region, *Raup*, no. 2,485. *Fl.* April–May; *fr.* May–July. MAP 5.

Forma **parvisiliqua** n. f., siliquis 1–2 cm. longis.—Throughout the range of the typical form of the species. NEW YORK: bank of Seneca Lake, Watkins, *Coville*, 14 June 1884; Aquebogue, Long Island, *E. S. Miller*, 10 June 1875 [Wisc]. NEW JERSEY: Starr's woods, Camden, *C. A. Boice*, 28 April 1869 [Phil]; 3 miles e. of Mickleton, Gloucester Co., *B. Heritage*, 11 May 1892 [Phil]. PENNSYLVANIA: Penn Valley, *Fannie Mulford*, 30 May 1899 [Bklyn]; serpentine barrens, Nottingham, Chester Co., *U. Taylor*, 4 May 1913 [Bklyn]; stony soil, Friedensville, Lehigh Co., *Mary H. Williams*, 13 July 1924 (TYPE in Gray Herb.); Bushkill, Pike Co., *E. B. Bartram*. DELAWARE: serpentine e. of Mt. Cuba, Christiana, *Pennell*, no. 1,507 [Phil]; dry serpentine rocks near Centerville, *A. Commons*, 2 June 1874 [Phil]. MARYLAND: Cromley's Mount, Oakwood, Cecil Co., *Pennell*, no. 1,585 [Phil]; near Annapolis, *K. A. Taylor*, 9 May 1891 [Minn]. DISTRICT OF COLUMBIA: rocky bank, *E. L. Morris*, no. 2,393 [Bklyn]. VIRGINIA: summit of Stony Man Mt., alt. 4,031 ft., near Luray, *Steele & Steele*, no. 31 [US]; New River, White Sulphur Springs, *Canby*, August 1876 [US]. NORTH CAROLINA: Roan Mt., *J. D. Smith*, 15 July 1880 [US]; Grandfather Mt., Mitchell Co., *Heller*, 25 August 1893 [Phil]. ONTARIO: Experimental Farm, Ottawa, probably introduced near hot bed, *Macoun*,

no. 66,463 [Can.]. Michigan: Rock Harbor, Isle Royale, *Cooper*, no. 66 [Minn]. Wisconsin: wooded hills and on limestone rocks, ¼ mi. e. of Richland Center, *O. E. Lansing, Jr.*, no. 3,404; dry limestone cliffs along Fairplay Creek, Fairplay, *Fassett*, no. 10,321 [Wisc]; dry sand plain near Kilbourn, Delton, *Fassett*, no. 3,524 [Wisc]; Danbury, *Davis & Baird*, 26 August 1916 [Wisc]; south side Lake Watosah, near Keshena, *E. E. Honey*, 14 June 1934 [Wisc]. Minnesota: Itasca Co., *J. H. Sandberg*, no. 749 [Minn]. Missouri: sandy banks of Meramec R., Crawford Co., *Eggert*, April 1882 [Mo].

Var. KAMCHATICA Fischer. Biennial; stem hirsute at base with spreading, simple and bifurcate hairs; radical leaves glabrous or spar-



Map 6. Range (American) of Arabis lyrata, var. kamchatica.

ingly hirsute; flowers 3.5–5 (–6) mm. long; stigma sessile or on a short style not exceeding 0.5 (0.75) mm. long.—Fischer ex. DC. Syst. ii. 231 (1821); Hultén, Fl. Kamtchatka, ii. 165 (1928) in part; *Arabis ambigua* var. *intermedia* DC. Syst. ii. 231 (1821) and Prod. i. 146 (1824); Cham. & Schlecht. in Linnaea, i. 16 (1826). *A. Kamtchatica* Ledebour, Fl. Ross. i. 121 (1842); Busch in Not. Syst. Herb. Hort. Petrop. iii. 11 (1922); Busch in Fl. Sib. Orient. Extrem. iv. 467 (1926). *A. petraea* δ *Kamtchatica* Regel in Bull. Mosc. (Pl. Raddeanae) xxxiv. 167 (1861). —Alaska to Mackenzie, south to British Columbia and northern Saskatchewan. The following are characteristic. Alaska: Yakutat, wet meadows, *Mr. & Mrs. E. P. Walker*, no. 1,055 (as *Cardamine ?*); banks, Captains Bay, *Harrington*, 8 June 1872; Unalascha Island, *L. M. Turner*, no. 1,282 in part (as *A. petraea* var. *ambigua*); Glacier Bay, *C. P. Anderson*, no. 1,232 [NY]; Mt. McKinley, *R. L. Shainwald*, 20 July 1903 [NY]; Juneau, *C. P. Anderson*, no. 466 [NY]; Disen-

chantment Bay, *F. Funston*, no. 84 [NY]; St. Paul Island, Behring Sea, *J. M. Macoun*, no. 89,539 [Can]; Minn Glacier, *Addison Brown*, 14 Aug. 1893 [Amh]. BRITISH COLUMBIA: Yale, wet gravel near springs, *Macoun*, no. 1,736 [Can.]. SASKATCHEWAN: Clearwater R., sandy banks, lat. 57°, *J. M. Macoun*, no. 1,725 [Can.] MACKENZIE: lat. 60° 20′, long. 104° 30′, *J. W. Tyrell*, 18 July 1893, no. 100,738 [Can]. MAP 6.

Var. **glabra** (DC.) comb nov. Biennial or rarely perennial; stem and radical leaves quite glabrous or very rarely the petioles sparingly hirsute with a few scattered and simple hairs; style not exceeding 0.75 (–1) mm. long.—*A. ambigua* var. *glabra* DC. Syst. ii. 231 (1821); DC.

MAP 7. Range of ARABIS LYRATA, var. GLABRA.

Prod. i. 146 (1824). *Sisymbrium arabidoides* Hooker, Fl. Bor.-Am. i. 63 (1830). *A. petraea* var. *ambigua* (DC.) Regel in Bull. Mosc. xxxiv (Pl. Raddeanae) 166 (1861) in part. *A. lyrata* var. *occidentalis* Watson in Gray, Synop. Fl. N. Am. i. 159 (1895); Britton & Brown, Ill. Fl. ii. 147 (1897); Piper, Fl. Washington, 292 (1906); Frye & Rigg, Nw. Fl. 190 (1912); Piper & Beattie, Fl. Nw. Coast 170 (1915), all in part. *A. lyrata* var. *kamchatica* Fischer sensu Hultén, Fl. Kamtchatka ii. 165 (1928) in part; Thompson in RHODORA, xxxvii. 418 (1935) in part.—Alaska to Washington, Montana and Saskatchewan; north shore of Lake Superior; western New York. The following are characteristic. NEW YORK: steep rock bank, Green Lake, near Jamesville, *Maxon*, 5 May 1897 [US]. ONTARIO: railroad track, Jack Fish, Thunder Bay District, *Pease & Bean*, no. 23,436; sandy shore of Lake Superior, Agawa Bay, *Pease*, no. 17,978. NORTHWEST TERRITORY: Arctic Canada, waste places, *Dr. Richardson, ex. Hb. Brit. Mus.*, no. 2,312 [Can]; Franklin's Journey, Dr. Hooker (as

Sisymbrium arabidoides, probably an isotype of that species) [NY]. Saskatchewan: stony shore, Poplar Point, Lake Athabaska, *Francis Harper*, no. 88 [US]; near east end of Lake Athabaska, *J. W. Tyrell*, no. 100,741 [Can]; Clearwater River, lat. 56°, *J. M. Macoun*, no. 1,724 [Can]; abundant on sand hills north of Prince Albert, *Macoun*, no. 12,398 [Can]. Montana: Montana, *Coues*, *Ex. Herb. J. W. Chickering*, 1874 [NY]; high rock-slide above Many Glacier Hotel, vicinity of Lake McDermott, *Standley*, no. 16,549 [US]. Alberta: Maligne Lake, *S. Brown*, no. 1,169; Mt. Temple, Laggan, *Butters & Holway*, no. a8; Independence Branch, Pabocton Creek, *S. Brown*, no. 1,355; vicinity of Lake Louise, *F. W. Hunnewell*, no. 4,356. Washington: Nooksack River near Mt. Baker, Whatcom Co., *Suksdorf*, no. 1,999; near Glacier on Heliotrope Ridge, Mt. Baker, *J. W. Thompson*, no. 11,239. British Columbia: Lower Allokagnik Lake, *McKay*, 1882; west and northwest slopes of Mt. Selwyn, about 56° 1′ N., 123° 39′ W., *Raup & Abbe*, nos. 3,797, 4,096 & 4,153; creek valleys, Selkirk Range, *Macoun*, 20 Aug. 1885; grassy places by brookside, Yale, *Macoun*, no. 1,732 [Can]. Yukon Territory: Coffee Creek, *Eastwood*, no. 553; Carcross, *Eastwood*, nos. 707 & 708; Klondyke bottom, *Eastwood*, no. 191. Alaska: Lake Iliama region, *M. W. Gorman*, no. 6; dry sandy beach, Admiralty Island, *Mr. & Mrs. E. P. Walker*, no. 716; near timber line, Kuin Island, *Mr. & Mrs. Walker*, no. 788 (as *Cardamine* ? . . .); vicinity of Karluck, Kadiak Island, *Cloudsley Rutter*, no. 29; Disenchantment Bay, *Funston*, no. 84; St. Paul Island, Behring Sea, *J. M. Macoun*, 3 Aug. 1891. Map 7.

Typical *A. lyrata* is a plant of Alleghenian distribution in the eastern United States, found in Canada only locally in southern Ontario, except for one very isolated station in northern Alberta, and extending from Vermont, which appears to be its easternmost limit, south through western Massachusetts to North Carolina and Tennessee, west to Missouri, Iowa and Minnesota. From the strictly Eurasian *A. petraea* it is quickly distinguished by its narrowly elliptical to oblong seeds, those of the Old World plant being broadly elliptical to suborbicular, and by its siliques which are one-nerved beyond the middle and acute to subacuminate, whereas those of *A. petraea* are one-nerved only at the base and are blunt and obtuse. In general, the Eurasian plant tends to be more strict, and its fruit is usually shorter and more plump. Busch, according to Hultén, further adds, "In Fl. Sib. Orient. Extrem. iv p. 470 he [Busch] says that this species [*A. petraea*] differs from the American *A. lyrata* in being more robust and in having smaller flowers and thicker and longer pods."[1] Although I cannot agree with Busch that the flowers

[1] Hultén, Fl. Kamtchatka, ii, 167 (1928).

of *A. petraea* are smaller than those of *A. lyrata* (at least the Old World specimens which I have examined do not illustrate this distinction), I quite agree with him regarding the size of the fruit in the two species. Torrey & Gray describe *A. petraea* and cite a specimen as occurring on this continent, but upon examining this sheet, which was collected by Dr. Pitcher on the shore of Lake Superior (in the Herbarium of the New York Botanical Garden), I can identify it only as typical *A. lyrata*. In Torrey & Gray's Flora and in the early editions of Gray's Manual the name *A. petraea* refers partly to this and partly to *Braya humilis* (C. A. Meyer) Robinson.

Our Alleghenian plant is characterized by its rather large flowers, varying from 6 to 8 mm. long, and by its pubescent basal leaves and pubescent lower stem. Only in very rare cases have I observed a stem which is quite glabrous at the base, and in these few cases the radical leaves have always been hirsute. A style is always developed, being from 0.5 to 1.25 mm. long, and the seeds are small, narrow and unwinged. Lastly, the plant is comparatively low, seldom exceeding 3 dm. in height, and is usually a biennial in the northern part of its range, becoming perennial from Virginia southward; but several specimens from the Great Lakes region exhibit a perennial habit.

In contrast to this typical form of *A. lyrata* there exists in northwestern North America, from Ontario through western Canada, very locally in Montana and Washington and north to Alaska, a variety in which the radical leaves and base of stem are always quite glabrous, or which rarely has a few scattered, simple hairs on the petioles, and in which the flowers are sometimes, though by no means always, slightly smaller, varying from 4 to 7 mm. in length. This plant has had a rather turbulent taxonomic history, the correct name for it being var. *glabra*, which is based on DeCandolle's *A. ambigua* var. *glabra*. The original description reads:

> α. *glabra*, foliis cauleque glabris. . . .
> Hab. α. in Kamchatka et insulis Kurilensibus. . . .
> Var. α. est ex omni parte glabra. Folia radicalia oblonga sinuato-lyrata, lobis paucis obtusis; caulina inferiora oblonga dente 1–2 instructa; caetera oblonga ferè linearia integerrima. Caulis simplex, pedalis. Flores albi magnitudine A. Alpinae. Pedicelli erecti, 3 lin. longi. Siliquae lineares, sesquipollicares.[1]

Under his *A. ambigua* DeCandolle described two other varieties as follows: "*intermedia*, foliis glabris, caule basi hispido. . . Hab. in

[1] DC. Systema, ii. 231 (1821)

Unalaska," and "*scabra*, foliis piloso-scabris, caule glabro. . . Hab. in Sibiria."[1]

Var. *intermedia* is merely a synonym of *A. lyrata* var. *kamchatica* Fischer, to be discussed in a following paragraph, and var. *scabra* is a plant with which I am not familiar; in all probability it does not occur in North America. From the above description it is evident that DeCandolle separated three varieties of his plant according to the presence or absence of pubescence on the stem and basal leaves, the most constant character which I have been able to find in this group. One cannot adequately separate the typical form of *A. lyrata* from var. *glabra* merely on the basis of fruit or flower, but with pubescence as a guide the task of segregation becomes relatively simple.

Var. *glabra* is merely an earlier name for one of the two plants which Watson included under var. *occidentalis*, a variety which differed, according to his interpretation, from the typical form only in having a sessile or a subsessile stigma and a nerve on the silique which extended nearly to the tip. His complete description reads: "Pods with sessile stigma or a very short and thick style; the valves rather thin but often faintly nerved to the top."[2] He included under this variety every North American plant of *A. lyrata* not belonging to the typical form of the species, quite regardless of pubescence or of a glabrous state. Consequently, Hultén, seeing specimens from Alaska in the Gray Herbarium marked "var. *occidentalis* S. Wats.," and being familiar with Watson's description, wrote: "judging from the specimens at my disposal, specimens of the plant which in America is called *A. lyrata* var. *occidentalis* Wats. completely agree with our plant [the Alaskan var. *kamchatica* Fisher] in the size of the flowers and the pods, and I therefore consider them identical."[3] All the Alaskan sheets of *A. lyrata* in the Gray Herbarium are labelled "var. *occidentalis* S. Wats." but when they are studied on the basis of presence or absence of pubescence as well as on the size of the flowers, two distinct varieties become clear, var. *glabra* and var. *kamchatica*. But I am unable to separate these varieties one from another or from typical *A. lyrata*, as did Watson, either on the character of a sessile or a non-sessile stigma, or on that of the nervation of the pod. Specimens of each of the two varieties often possess a distinct style, and typical *A. lyrata* may not uncommonly have one, only slightly over one-half

[1] DC., l. c.
[2] Watson in Gray, Synop. Fl. N. Am. i. 159 (1895).
[3] Hultén, l. c. 167.

a millimeter in length. The nervation of the pods is entirely inconstant. In every case, however, the nerve extends beyond the middle.

Rydberg records the occurrence in Montana of *A. ambigua* DC.,[1] which leads one to the assumption that some or all of the varieties are to be found there. But as I interpret DeCandolle's conception of the species, no typical form occurs, only the three varieties as listed in the Systema: var. *glabra*, var. *intermedia* and var. *scabra*. Apparently Rydberg did not concur in this interpretation, else he would have correctly taken var. *glabra* as the name for the Montana plant. That he was well aware of the ambiguity of Watson's var. *occidentalis* seems evident, however, from the fact that he discarded it. There is a specimen in the Herbarium of the New York Botanical Garden "legit *Coues*" from Montana, this being the only specimen of var. *glabra* which I have seen from the general region of the Rocky Mountains in this country. But in Washington it has been collected at least twice, once by Suksdorf and once by J. W. Thompson who says (discussing it as *A. lyrata* var. *kamchatica* Fisher): "While on Mt. Baker last summer [1934], I found this rather rare crucifer in great abundance at about 800 meters, just above perpetual snow. Mr. Suksdorf's collection cited by Piper [Contr. Nat'l. Herb. xi. 292 (1906)] must have grown from a chance seed that had been washed down from the higher altitudes where I found it."[2] Both the Suksdorf and the Thompson specimens should be referred to var. *glabra*.

Var. *kamchatica* has flowers which vary from 3.5 to 5 mm. in length, smaller than those either of the typical form or of var. *glabra*, and develops some degree of pubescence either on the stem or on the radical leaves or on both. This is almost always of a hirsute nature with simple or bifurcate spreading hairs. Its stigma is either sessile or on a short style seldom exceeding 0.5 mm. in length. These characters at once distinguish it from var. *glabra* which has larger flowers, a glabrous stem and radical leaves (except for a few simple hairs on the petioles), and either a sessile stigma or a style up to nearly a millimeter long. DeCandolle's *A. ambigua* var. *intermedia* is merely this plant, but because Fischer's plant was described under *A. lyrata* in the Systema,[3] it is more fitting to use its name, even though *A. ambigua* var. *intermedia* occurs earlier on the page. It is found throughout Alaska and the islands in the Behring Sea, in British

[1] Rydberg, Fl. Rocky Mts. 358 (1917).
[2] Thompson in Rhodora xxxvii. 418 (1935).
[3] DC., l. c.

Columbia, Mackenzie and northern Saskatchewan. The paucity of botanical collections from the Yukon region is doubtless the reason why I have seen no specimens from that territory; it should most certainly occur there. The plant from northern Saskatchewan was collected at lat. 57°, on sandy banks of the Clearwater River, while that from Mackenzie was obtained at lat. 60° 20′ by *J. W. Tyrell*, both of them being perfectly good specimens of this variety.

(*To be continued.*)

A singular Variation in Desmodium.—While studying the material of *Desmodium acuminatum* a specimen long unrecognized, except for its affinity with the species, was discovered. Its differences are so marked that description seems necessary.

Desmodium acuminatum (Michx.) DC. forma **unifoliolatum**, n. f., foliis unifoliolatis, ovatis, acuminatis, dispersis, 5.5–15 cm. longis, 3.2–10.5 cm. latis. Type: rocky slopes of Cedar Cliff Mountain, Buncombe County, North Carolina, September 16, 1898, *Biltmore Herbarium*, no. 2125b (in Gray Herb.).

Forma *unifoliolatum* is clearly distinguishable from the other material in the species by its large unifoliolate leaves which are scattered on the stem. In other characters, especially the fruit, the agreement with the species is complete.—Bernice G. Schubert, Radcliffe College.

THE CORRECT NAMES OF THE SMALL-FLOWERED MALLOWS[1]

C. V. Morton

One of the common weeds of California has for many years been known as *Malva borealis* Wallm., under which name it appears in Jepson's Manual of the Flowering Plants of California. In 1933 Professor Jepson sent me material so named and asked for my opinion of the correctness of the identification. I found the specimen to be typical *Malva nicaeensis* All., a species not hitherto reported from the United States. The true *Malva borealis* Wallm. is considered by European botanists a synonym of *M. pusilla* Withering, and such is unquestionably the correct disposition of it.

[1] Published by permission of the Secretary of the Smithsonian Institution.

This brings up, however, the question of the proper typification of *Malva rotundifolia* L. In the Species Plantarum and elsewhere in his writings Linnaeus had two easily recognizable species confused under this name. One, known in the United States as *M. rotundifolia,* has purplish petals at least twice the length of the calyx, and very characteristic carpels, non-reticulate, pubescent, and round-margined. The other (*M. pusilla*) has small white petals scarcely longer than the calyx, and reticulate, sharp-margined carpels. The latter is the common Swedish species, abundant about Uppsala. That it was the one Linnaeus knew best and had in mind when describing the species is shown by the following quotation from his Flora Suecica: "Apud nos flores communiter minores, corolla omnino alba; Stockholmiae autem corolla majore purpurascente obvia, uti apud exteros." Moreover, the specimen in the Linnaean Herbarium is, according to Wallroth, the small-flowered species.

American botanists have always unquestioningly followed English authors in considering the large-flowered species as *M. rotundifolia,* but there seems no reason, other than that of convenience, to continue to do so. The correct typification has been adopted by many continental European botanists, such as Fries, Garcke, Thomé, Schinz, Buchenau, Continho, and Willkomm. Many others, including Hegi, Hallier, Lange, Koch, Lindman, Beck-Mannagetta, Prodan, and Sagorski, recognizing the confusion in the Linnaean name, have discarded it entirely. This latter course seems hardly justifiable.

The United States species may be distinguished by the following key:

Bractlets of the calyx ovate . . . . . **M. nicaeensis** All.
Bractlets of the calyx linear or linear-lanceolate.
  Claws of the petals glabrous . . . . . **M. parviflora** L.
  Claws of the petals bearded.
    Carpels reticulate, sharp-margined . . **M. rotundifolia** L. (syn. *M. pusilla*, *M. borealis*).
    Carpels smooth, round-margined . . **M. neglecta** Wallr. (syn. *M. vulgaris* Fries, *M. rotundifolia* of authors).

All of these species are common, with the exception of true *M. rotundifolia.* It should be mentioned that the plant called *M. pusilla* Smith by Prof. Munz[2] is *M. nicaeensis* All.

United States National Museum,
Washington, D. C.

[2] Manual of Southern California Botany, 304. 1935.

Arthraxon hispidus var. cryptatherus (Hack.) Honda in Pennsylvania.—In the November issue of Rhodora (page 395) are the following statements: "The eastern range 'Pennsylvania to Florida,' given by Hitchcock, Man. Grasses U. S. 725 (1935), needs clarification. This Asiatic plant is represented in the Gray Herbarium from Pennsylvania only by material from the Japanese Garden in the Centennial Grounds of Philadelphia in 1876. Mr. Long informs me that he knows no evidence of it in Pennsylvania except as *cultivated* in the Japanese Garden of 60 years ago!" In the U. S. National Herbarium there are, besides a cultivated specimen collected near "Japanese building, Centennial grounds," a collection by Burk in 1877 from the same place, evidently sent in answer to a query in Vasey's script "Does it continue in existence at the Centennial grounds?" and also a specimen labeled "on ship's ballast, Philadelphia, *F. L. Scribner*, 1878."

As explained in the introduction in the Manual (page 5) the dot on each state represents a specimen examined by the author. Introduced species may have died out and native ones may have been exterminated since the specimens which the dots represent were collected.—Agnes Chase, Bureau of Plant Industry, Washington, D. C.

Moss Flora of North America.—Additional sections of this much-needed work continue to appear with pleasing regularity. Volume 3, part 1 was published in 1928 and Volume 3, part 2 in 1931. Since that time at least one part has been issued every year, with two in 1935. Four parts comprise a volume. Volume 3, covering the pleurocarpous mosses, has been completed and volume 2 lacks only the fourth part. These sections have been reviewed in previous issues of this Journal. Part I of volume 2[1] has now been published. This takes up the *Andreaeales* (by Dr. A. J. Sharp) and the following families of the Bryales: *Tetraphidaceae, Fissidentaceae, Archidiaceae* (by Dr. S. A. Cain), *Ditrichaceae, Seligeriaceae*, and *Dicranaceae* (in part). The following new species are described: *Fissidens sublimbatus* Grout, *Fissidens orcutti* Grout, *Archidium floridanum* (Aust. ms.) Cain, *Pleuridium californicum* Grout, and *Dicranella stickinensis* Grout; and, in addition, three new varieties and two new forms. Nomenclatorial innovations comprise two new species-combinations and seven new variety- and form-combinations. More than 100 species or varieties are figured in the 38 plates, among these being 15 species which are here illustrated for the first time.—G. E. Nichols.

Volume 39, no. 458, including pages 29–52 and plate 454, was issued 6 February, 1937.

[1] *Moss Flora of North America, north of Mexico*, by A. J. Grout. Vol. 1, part 1, pp. 1–61, pls. 1–38. October, 1936.

VACCINIUM PENNSYLVANICUM: FIG. 1, screened plant; FIG. 2, unscreened plant.

RHODORA

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. April, 1937. No. 460.

CONTENTS:

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. **April, 1937.** **No. 460.**

ERYTHRONIUM MESOCHOREUM

H. W. Rickett

Erythronium messachoreum Knerr, "which means the Midland Erythronium," was described in 1891 in a magazine published by Midland College,[1] Atchison, Kansas, where Knerr was professor of science. In the following year it was included in Smyth's *Check List of plants of Kansas* (with the etymologically impossible spelling changed to *mesochoreum*). Reference to the original description is made difficult by the obscurity of its place of publication; even the library of the Missouri Botanical Garden has no copy of this periodical. In the herbarium of this institution, however, filed with Knerr's specimens and two manuscript letters to Dr. Trelease, is the single page bearing the description. Since others may have difficulty in finding a copy, it may be worth while to summarize here the chief characters by which Knerr differentiated between his new species and the nearly related and very similar *E. albidum* Nutt. *E. mesochoreum* is said to occur only on open slopes facing northward, or on wooded northern slopes; *E. albidum* being found in woods and ravines. *E. mesochoreum* has a longer perianth (1–2 inches as compared with ¾–1 inch), less reflexed and tinted with blue; walls of the ovary more convex; style straighter, more slender, with larger and more curved stigmas; the capsule longer (up to 1¼ inches); leaves longer, more slender, and never mottled; a more slender and elongated bulb, which does not form runners, but develops the new bulb within itself at the base. *E. mesochoreum* flowers earlier, and flowering plants appear before the sterile plants, which are relatively less numerous than in *E. albidum*.

[1] Midl. Coll. Monthly **2**: 5 (1891).

I have found typical *E. mesochoreum* near Columbia only on a certain dry and rocky ridge which falls off sharply to the north. Here the plants have long slender leaves, not mottled. Flowers appear early, before the leaves of the sterile plants. The flowers are tinted with blue. The bulbs produce no runners; instead a short "dropper" breaks through the base of each bulb. Elsewhere in this region the plants have conspicuously mottled leaves, which often become 40 or 50 mm. broad; and each bulb characteristically gives rise to two spreading runners, the tips of which bend downward and form new bulbs. Such plants are usually considered typical *E. albidum*. Many of these plants, however, growing in various situations (some on the same rocky ridge), approach *E. mesochoreum* in one or more characters. Almost all the flowers are bluish on the outside, and the perianth is reflexed to various degrees. Many of the characters which distinguish the two species are quantitative, and it is not surprising that gradations should appear between the two extremes. The length of the perianth varies from 25 to nearly 40 mm., being oftenest between 30 and 35 mm.; some of the smallest were found on plants otherwise clearly referable to *E. mesochoreum* (in the location already mentioned); and in general there is no correlation between the length of perianth, the degree to which it is reflexed, and the shape and marking of the leaves. Individuals may be found in flower throughout April in most of the places where patches of *Erythronium* occur; the flowering plants occur in various relationships with the sterile plants. In attempting to identify such plants one is apt to assign them to one or the other species as characters of leaves or of flowers seem most impressive. A similar lack of clear differentiation is evident in the herbarium.

In the hope that the underground parts might furnish a surer means of differentiation, I have carefully dug up about 100 plants at various times during their brief season of growth and in various situations. I have not been able to distinguish the bulbs by shape; one finds various sizes, since each bulb is somewhat larger than its parent. The parts which give rise to new bulbs are often difficult to obtain unbroken and are seldom seen on herbarium sheets. They are apparently similar to those of *E. americanum* studied and described by Blodgett.[1] The seedling of this species forms a "dropper," a structure which originates near the base of the cotyledon and contains the apex of the

[1] Bot. Gaz. 50: 340–372 (1910).

stem. The dropper elongates vertically downward, carrying within its tip the apical meristem, which ultimately becomes the new bulb. The remains of the old bulb may often be seen encircling the summit of the new one; Rimbach[1] figured a series of four such remnants surmounting the fifth bulb. The later bulbs, which are considerably larger than the first, form runners, which often spread laterally for several inches before their tips turn downward. The runner has an origin similar to that of the dropper, the difference being mainly in the degree of elongation; intermediate structures occur. Each bulb of *E. americanum* forms usually three runners, one being apical in origin, the other two axillary. Each contains within its tip a meristem which may become a new bulb.

In patches of *Erythronium* near Columbia it is easy to distinguish the leaves which arise from early generations of bulbs; they are smaller than those which come from later bulbs, more slender, and often not appreciably mottled even in colonies of typical *E. albidum*. If one takes up a cluster of these small plants, all occurring within a radius of 20 or 30 mm., one usually finds some bulbs with runners, some with droppers. This suggests that the transition from droppers to runners in this species occurs irregularly rather than at some definite time after the germination of the seed. It is possible also that there is a segregation of genetic factors which influence the method of vegetative reproduction. Larger sterile plants in the same colonies have usually broad and conspicuously mottled leaves; each bulb of such plants sends out usually two runners (characteristically unequal in length). Occasionally, however, even these plants form droppers instead of runners; there is no strict correlation between the characters of leaves and the nature of underground parts. Frequently only one runner is formed, and this may grow vertically downward instead of at first horizontally; this is evidently a structure intermediate between a runner and a dropper. One bulb sent out two runners from its opposite ends. Flowering plants have usually two mottled leaves, rather narrower than those of the sterile plants. The flowering bulb often forms neither dropper nor runner, but renews itself in place. Sometimes runners appear, frequently singly instead of in pairs; the occasional flowering plant that has only one leaf instead of two usually has a single runner. Often a single dropper is formed, but elongates to such a slight extent that it barely protrudes through the base of the

[1] Bot. Gaz. **30**: Plate XIII, fig. 9 (1900).

old bulb. Many plants approach typical *E. mesochoreum* in the characters of the leaves and underground parts. The latter species evidently differs in failing to change from droppers to runners in its later generations of bulbs; this change occurs generally but irregularly in

E. albidum. Both species occasionally form axillary buds which develop new bulbs in place, the new bulb thus formed being during the following season surrounded by the outer scales of the parent bulb. The drawings illustrate typical *E. albidum* and *E. mesochoreum*, with a few of the intermediate combinations of characters. At the left is typical *Erythronium albidum;* at the right *E. albidum* var. *meso-*

choreum; in the middle intermediate forms. One bulb has been dissected to show the dropper within. The two small plants at the left are from a colony of typical *E. albidum.* Plants with the same numbers were collected at the same time from the same colony (× ⅓).

I have had no opportunity to study in the same way plants from the type location of *E. mesochoreum.* Through the kindness of Dr. J. R. Jackson I have a number of specimens from high hills along the Missouri River near Parkville, Missouri, only about 30 miles from Atchison. Some of these are typical *E. mesochoreum;* others represent the same intergrading combinations of characters described above. The same lack of correlation is evident between length of perianth, shape and marking of leaves, and method of vegetative reproduction.

In seeking to account for the differences among older bulbs of the same colony we may again suppose a genetic segregation; this is to be expected if the not very unlike species, *E. albidum* and *E. mesochoreum,* are interfertile and yield a "hybrid swarm," in which their differentiating characters occur in various combinations. In addition the more frequent occurrence of droppers and of slender, non-mottled leaves on exposed ridges and slopes suggests a selective effect of the environment. It is interesting to recall that Blodgett noticed that runners of *E. americanum* are less numerous in well-drained soil. The solution of the problem must await careful cultural work. Meanwhile we may conclude that *E. mesochoreum* is probably an ecotype of *E. albidum,* more or less stabilized in certain places by environmental selection. In any case the existence of many intergradations between the two groups, and the consequent impossibility of determination of many specimens, render specific separation difficult to justify. I propose therefore that *E. mesochoreum* Knerr be reduced to varietal rank with the name

ERYTHRONIUM ALBIDUM Nutt. var. **mesochoreum** (Knerr), comb. nov. *E. mesochoreum* (as *messachoreum*) Knerr in Midl. Coll. Monthly, **2**: 5 (1891).

DEPARTMENT OF BOTANY,
UNIVERSITY OF MISSOURI.

ARABIS IN EASTERN AND CENTRAL NORTH AMERICA

Milton Hopkins

(*Continued from page 98*)

5. A. GLABRA (L.) Bernhardi. Biennial from a usually stout taproot; stem erect, tall, stout, usually simple below, rarely branching at base, 6–12 dm. high, hirsute at base with simple or bifurcate spreading to subappressed hairs, passing to glabrous and glaucous above or very rarely glabrous throughout: basal leaves spatulate to oblanceolate, rarely lyrate-pinnatifid, entire or irregularly dentate, petioled, acutish, 5–12 cm. long, 1–3 cm. broad, those of the first year rather finely stellate-pubescent on both surfaces with forked trichomes, those of the second year less so or often merely hirsute along the midrib of each surface or more rarely glabrous throughout; petioles hirsute with simple or forked hairs; cauline leaves lanceolate to elliptic-oblong, sessile with an amplexicaul sagittate or auriculate base, imbricate, passing upwards to subimbricate or more rarely subremote, entire or the lowermost sometimes slightly denticulate, acutish, very variable in size, 2–12 cm. long, 1–3.5 cm. broad, glabrous on both surfaces or rarely the lowermost slightly hirsute or stellate-pubescent along the midrib: flowers small, in close or loose racemes; flowering pedicels glabrous, 0.5–1 cm. long at anthesis, slender, erect or ascending, appressed to subappressed; sepals membranaceous, 2–5 mm. long, glabrous, obtuse to subacuminate, oblong, greenish or frequently purple, ¾ the length of petals; petals (fresh) cream-color to yellowish, 2.5–6 mm. long, narrowly oblanceolate to linear: siliques 5 (4–)–9.5 cm. long, 0.75–1 mm. broad, roundish, narrow, straight or slightly curved, appressed close to stem, distinctly erect and ascending, one-nerved at least beyond the middle and usually to the tip or very nearly so; fruiting pedicels erect and appressed to subappressed, glabrous, 7–18 mm. long at maturity; style short and stocky, 0.35–0.85 (–1) mm. long, 0.25 mm. broad; stigma cupulate; mature and fertile seeds irregular in outline, most often elliptical to oblong, sparingly winged all around or at least partially so or very rarely entirely unwinged, in either one or two rows, averaging 1 mm. long, 0.5 mm. broad.—A circumboreal, semicosmopolitan species with two pronounced varieties in North America.

a. Pubescence of stem of simple or more rarely bifurcate, spreading hairs ..... var. *typica.*
a. Pubescence at base of stem stellate, of trifurcate, appressed to subappressed hairs ..... var. *furcatipilis.*

Var. **typica.** *A. glabra* (L.) Bernh. Syst. Verz. Erf. 195 (1800); Britton & Brown, Ill. Fl. ii. 150 (1897); Britton, Man. Fl. 465 (1901); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Nelson & Coulter, New Man. Rocky Mt. Bot. 226 (1909); Frye & Rigg, Nw. Fl. 189 (1912); Piper & Beattie, Fl. Nw. Coast 170 (1915); Jepson,

Man. Fl. Pl. Calif. 428 (1925). *Turritis glabra* L. Sp. Pl. ii. 666 (1753); Smith & Sowerby, Eng. Bot. xi. t. 777 (1800); Smith, Fl. Brit. ii. 715 (1802); Persoon, Synop. ii. 205 (1807); DC. Syst. ii. 211 (1821); DC. Prod. i. 142 (1824); Hooker, Fl. Bor.-Am. i. 40 (1829); T. & G., Fl. N. Am. i. 78 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 463 (1840); Walpers, Rep. i. 129 (1842); Ledebour, Fl. Ross. i. 116 (1842); Dietrich, Synop. iii. 688 (1843); Wood, Classbk. ed. 2: 166 (1847); Gray, Man. 36 (1848). *Dentaria foliis simplicibus* Scopoli, Fl. Carn. 516 (1760); Wagner, Deutsche Fl. ii. 50 (1882). *Erysimum glastifolium*, Crantz, Class. Crucif. 117 (1769). *Turritis perfoliata* Necker, Delic. i. 283 (1773); Bolander, Cat. Pl. San Francisco, 5 (1870). *A. perfoliata* Lam. Dict. i. 219 (1793); Gray, Man. ed. 5: 69 (1867); Watson in Bot. King's Rep. v. 17 (1871); Porter in Hayden, Rep. 478 (1871); Brewer & Watson in Geol. Surv. Calif. i. 31 (1880); Günthart in Biol. Bot. Heft 77 (1912). *Arabis Turritis* Clairville, Man. d'Herb. 223 (1811), non *Arabis Turrita* L., Sp. Pl. ii. 665 (1753). *Sisymbrium simplicissimum* La Peyrouse, L'Hist. Abreg. 382 (1813); and Suppl. 92 (1818); Poir. Suppl. v. 161 (1817). *Turritis macrocarpa* Nutt. ex. T. & G. Fl. N. Am. i. 78 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 463 (1840); Walpers, Rep. i. 129 (1842); Dietrich, Synop. iii. 689 (1843); Torrey, Bot. Wilkes Exped. 227 (1874). *A. macrocarpa* Torrey in Bot. Mex. Boundary, pt. 1: 32 (1858).—Sandy fields, dry roadsides, river banks, basic ledges or cliffs, thickets and woods, southern Quebec, south to Pennsylvania and North Carolina, west to Arizona, California and British Columbia. The following are characteristic. QUEBEC: Grosse Isle, Montmagny Co., sur rochers en compagnie de *Juniperus horizontalis*, *Victorin, Rolland, Rousseau & Meilleur*, no. 40,032; shores of Lake Temiscouata, *Victorin*, no. 95; Ironside, Vallée de la Gatineau, *Victorin*, no. 15,622; rocks beside road to Peasly Pond, Lake Memphremagog, *Churchill*, 15 Aug. 1903. MAINE: waste places, New Limerick, *O. W. Knight*, no. 1; dry limestone ledge, Norridgewock, *Parlin*, no. 3,070; beside railroad track, Crystal, *Pease*, no. 2,831; recent clearings and railroad embankments, Houlton, *Fernald & Long*, no. 13,706; newly seeded field, North Berwick, *Parlin*, no. 1,455. NEW HAMPSHIRE: open woods, Surrey, *Fernald*, no. 172; roadside ledge, Stewartstown, *Pease & Fernald*, no. 16,570; roadside east of Notch, Dixville, *Pease*, no. 16,313. VERMONT: Rutland, *Eggleston*, nos. 1,031 & 1,033; Waterbury, *Greenman*, no. 593 (as *A. hirsuta*); roadside, Howe's Crossing, Newfane, *L. A. Wheeler*, 12 July 1917. MASSACHUSETTS: steep rocky wooded slope, North Adams, *Fernald & Long*, no. 9,563; cliffs in woods, Concord, *Fernald*, no. 9,562; woods, Erving, *Hunnewell, MacBride & Torrey*, 16 May 1915. CONNECTICUT: field, Farmington, *Weatherby*, no. 729; dry scrubby field, Bridgeport, *E. H. Eames*, no. 8,191; sandy plain, Southbury, *Harger*, no. 6,030. NEW YORK: thickets, Glenmont, *House*, no. 17,340; roadside, Potsdam, *O. P. Phelps*, no. 527; open glades of woods in valley, Elmira, *T. F. Lucy*,

no. 403 [NY]. New Jersey: Hamburg, Morris Co., *W. H. Rudkin & N. L. Britton*, June 1, 1884 [NY]; zinc mines, dry hill, Franklin Furnace, *Wm. M. Van Sickle*, 19 May 1891 [Bklyn]. Pennsylvania: old field, introduced with alfalfa seed and persisting for some time, Sellersville, Bucks Co., *W. M. Benner*, June 18, 1912; Troy, Bradford Co., *E. B. Bartram*, July 19–20, 1913 [NY]; Tannersville, *A. A. Tyler*, 12 June 1896 [NY]. Delaware: field near Concord Station, Wilmington, *A. Commons*, 31 June 1896 [Phil]. West Virginia: Davenport, Tyler Co., *E. E. Berkeley*, no. 784 [Mo]. North Carolina: moist banks, Biltmore, *Biltmore Herb.*, no. 120 (as *A. perfoliata*) [NY]. Ontario: low ground, Camp Alexander, Nipigon River, *Macoun*, no. 1,748 [Can]; dry limestone barrens east of Tobermory, Bruce Co., *Stebbins, Jeffrey & Loveless*, no. 142; sandy roadside, Webbwood, *Fernald & Pease*, no. 3,349. Michigan: roadside thicket Bête Grise, Keweenaw Co., *Fernald & Pease*, no. 3,350; sandy soil, aspen association, Douglas Lake, *Ehlers*, no. 410; near Lansing, *L. H. Bailey*, 22 June 1887. Ohio: rocky open soil, Newell Ledge, Portage Co., *R. J. Webb*, 13 June 1908; near Painesville, *Herb. W. C. Connor*, no. 145 (as *A. confinis*); Russell, *G. B. Ashcroft*, June 1897. Indiana: in a fallow field 5½ mi. ne. of Knox, *Deam*, no. 30,889 (as *A. brachycarpa*); in low peaty soil in woods, road leading to Spring Lake, *Deam*, no. 23,743. Wisconsin: just inside the beach line, north shore of Willow Point, Delavan Lake, Delavan, *S. C. Wadmond*, no. X188; Eagle River road, Vilas Co., *S. C. Wadmond*, no. 411–2; Lake Emily, *J. H. Schuette*, 5 June 1898. Illinois: Chicago, *E. Hall*, 1863; damp open woods, near Wady Petra, *W. H. Chase*, 25 May 1895 (as *A. brachycarpa*); Elgin, *Geo. Vasey*, without number [Amh.]. Manitoba: St. Lazare, near Fort Ellice, *Macoun & Herriot*, no. 69,856; Lake Winnipeg Valley, *Bourgeau*, 1857 (as "*A. hirsuta*"—in part). Minnesota: along road, sandy soil near Touriot Camp, Clearwater Co., *J. B. Moyle*, no. 51; Good Harbor, Lake Superior, *Henry Gillman*, 16 Aug. 1868; in virgin prairie soil, 5 mi. ne. of Panoford, *Rosendahl*, no. 4,847 (as *A. Drummondi*) [Minn.]. Missouri: Jefferson Barracks, *A. S. Hitchcock*, 6 May 1890 [Mo.]. Arkansas: Little Rock, *H. E. Hasse*, April 1885 [NY]. North Dakota: Devils Lake, Ramsey Co., *Lunell*, 1 July 1905 (as *A. brachycarpa*) [NY]; in thickets, Devils Lake, *Lunell*, 29 June 1902, no. 524 (in part) [Minn]. South Dakota: rim of Spearfish Canyon, limestone, near Savoy, elev. 5,700 ft., *Murdoch*, no. 4,127 (as *Thelypodium elegans* ?); Custer, Black Hills, *Rydberg*, no. 517. Nebraska: Hershey, *C. D. Mell*, no. 85 [US]; on Middle Loup River near Norway, Thomas Co., *Rydberg*, no. 1,405 (as *A. hirsuta*) [US]; near Plummer Ford, Dismal River, Thomas Co., *Rydberg*, no. 1,508 [US]. Saskatchewan: low ground, Cypress Hills, *J. M. Macoun*, no. 1,757 [Can]; on McHay's Farm, rare, 12 miles from Prince Albert, *Macoun*, no. 12,368 [Can]. Alberta: west of Edmonton, *Spreadborough*, no. 19,248 [Can]; Rocky Mts., near Banff, *ex Herb. W. M. Canby*. Montana: Bridger Mts., alt. 7,000 ft., *Rydberg &*

Bessey, no. 4,208; gravelly railroad embankment near second bridge above Bonner, Blackfoot Valley, 3,600 ft., *C. L. Hitchcock*, no. 1,666. IDAHO: meadow near edge of grain field, 5,700 ft., Corral, Blaine Co., *Macbride & Payson*, no. 2,927; sandy soil, island in Clearwater River, above Lewiston, *Sandberg, MacDougal & Heller*, no. 88. WYOMING: burnt alder patch, French Creek, Carbon Co., *Goodding*, no. 2,025; roadside, Undine Falls, *Nelson & Nelson*, no. 5,682. COLORADO: dry bank of creek, Tabegnache Basin, alt. 8,000 ft., *Payson*, no. 572; bank of Elk River, *C. S. Crandall*, no. 5; common, Mancos, *Baker, Earle & Tracy*, nos. 112 & 310. UTAH: meadow 8,000 ft., Granite Canyon, *MacGuire & Becraft*, no. 2,625; Wahsatch Mts., elev., 6,500, June 1869, *Sereno Watson*, no. 68 (as *A. hirsuta*) (This is not the same plant as Watson's no. 68 in the Herbarium of the N. Y. Bot. Gard., which is good *A. pycnocarpa*. The two plants were collected at different times and in different places in Utah and are obviously quite different species.). NEVADA: Kings Canon, Ormsby Co., *Baker*, no. 1,117; Washoe Lake, *M. E. Jones*, 7 June 1897 [US]. NEW MEXICO: Winter Folly, Sacramento Mts., *E. O. Wooton*, 13 Aug. 1899; along Willow Creek, vicinity of Chama, Rio Arriba Co., *Standley*, no. 6,718 (as *A. ovata*) [US]. ARIZONA: Prescott, *H. H. Rusby*, 21 May 1883 [NY]; Sierra Ancha, s. Arizona, *G. J. Harrison*, no. 7,849 (as *A. hirsuta*) [US]. CALIFORNIA: Plum Valley, Warner Mts., *J. T. Howell*, no. 12,021; Middle Peak, Cuyamaca Mts., San Diego Co., *Abrams*, no. 3,867; in meadow, Fish Creek, San Bernadino Mts., *Munz & Johnston*, no. 8,533; frequent in grassy woodlands, Mather, 4,600 ft., *D. H. Keck*, no. 1,148. OREGON: steep seaward slope, The Heads, Port Oxford. *M. E. Peck*, no. 8,463; along Dixie Creek near Prairie City, Grant Co., *Henderson*, no. 5,288. WASHINGTON: Browns Island, San Juan Islands, *S. M. & E. B. Zeller*, no. 762; near Sprague, Lincoln Co., *Sandberg & Leiberg*, no. 143. BRITISH COLUMBIA: Campbell River, Vancouver Island, *J. T. Howell*, no. 7,599; vicinity of Ucleulet, Vancouver Island, *Macoun*, no. 78,280 [Can]; road at base of bluff, north bank of Peace River at Taylor Flat, *Raup & Abbe*, no. 3,561. ALASKA: Wells, *J. P. Anderson*, no. 2,091 (as *Turritis glabra*) [NY]; Haines, *J. P. Anderson*, no. 784 (as *A. Drummondi*) [NY]. *Fl.* May–June; *Fr.* June–July.

Var. **furcatipilis**, n. var., caulis pubescens pilis stellaribus et adpressis vel subadpressis.—Utah and California. The following are characteristic. UTAH: Logan City Camp, Logan Canyon, Cache Co., *MacGuire*, no. 3,437 (as *A. Drummondi*) (TYPE in Gray Herb.); Parley's Canon, Wahsatch Mts., *S. G. Stokes*, 8 June 1901 [US]. CALIFORNIA: roadside, Linda Vista near Pasadena, *J. Grinnell*, 11 April 1906 [US]; no locality, *Thomas Bridges*, no. 15; Santa Lucia Mts., Monterey Co., *R. A. Plaskett*, no. 53; San Francisco, *J. M. Bigelow*, 3 April 1853–4 [NY]. MAP 8.

MAP 8. Range of ARABIS GLABRA, var. FURCATIPILIS.

Arabis glabra is a semicosmopolitan plant of circumboreal range, often possessing a weedy tendency, extending throughout temperate Asia, Europe and North America. For a species of such wide distribution, one would anticipate the occurrence of numerous varieties. But in North America only one such variation seems worthy of note. Var. *furcatipilis* is in every way like the typical form of the plant except for the pubescence of the stem which in the latter is rather coarse and definitely spreading, but which in the former is decidedly fine, stellate and appressed. The range of this variety seems limited to local stations in extreme western North America; I have seen no European or Asiatic material of it.

A. glabra is found in a variety of habitats. In North America it grows most frequently along roadsides, railroad embankments, in fields or meadows, and in open thickets, habitats which suggest its introduction from Europe. One also finds it, less commonly, on shady limestone cliffs and bluffs or on the walls of canyons, undisturbed locations where the plant is unquestionably native. With these facts of native habitat in mind, I endeavored to separate the European from the American material in the Gray Herbarium, but without success. The seeds of typical specimens from North America were minutely scrutinized as were those of representative European and Asiatic plants, but no fundamental differences were observed. The midnerve of the silique was studied in anticipation of yielding a character on which to differentiate the two, but again the results were negative. Finally, the auricle at the base of each cauline leaf was examined and at first it seemed that the question of identity was solved. But continued investigation proved that both in the Old World and in the New, the auricles were of two kinds, those forming an acute angle with the main stem and those forming an obtuse or a right angle with it and, consequently, it was concluded that the plants found in North America differed in no way from those found in Europe or temperate Asia.

The species exhibits many extremes in its various taxonomic characters. For example, the cauline leaves commonly vary from narrowly lanceolate to broadly elliptic-oblong, and their apices may range from acuminate to obtuse, while their auricles may be either sagittate or auriculate, forming an acute or a right angle with the stem. The flowers may be in a semi-loose raceme or in a compact one, the sepals may range from obtuse to subacuminate and the petals may not

infrequently be fairly broad, although their most typical form is rather narrow. The seeds show considerable discrepancy in their margins, some being partially winged, some winged all around, while some are wingless. And the shape of the seeds is often very irregular, due of course to their being crowded in the pods. Those which are elliptical or suborbicular at maturity usually are found in only one row in the silique, while those with an irregular or angular outline invariably come from pods the seeds of which are tightly packed in two rather incomplete rows. I have attempted to separate those plants with winged or partially winged seeds from those whose seeds lack wings, but entirely without favorable results. It is not uncommon for plants possessing winged seeds to be found in the immediate vicinity of those with partially winged ones, hence the futility of any geographic segregation based on this character is obvious. Other characters which vary considerably are the length of the style which may vary nearly a millimeter, and the size of the silique which has a wide range, from 5 (rarely 4) to 9.5 mm. long.

The extreme forms of the plant have not passed without recognition. In 1874, Torrey, writing on the plants of Pacific North America said of *Turritis macrocarpa* Nutt.: "not uncommon.—Too near *Turritis glabra*, which it represents on the Pacific Coast."[1] Nuttall's type-sheet of *T. macrocarpa* is in the Gray Herbarium, and differs in no way from typical *A. glabra* except in the length of the siliques which average 9–9.5 mm. and, although these are unquestionably longer than most of those of the typical plant, this specimen shows no other variations which necessitate lowering it to varietal rank under *A. glabra*, or which permit its maintenance as a separate species. Numerous herbarium specimens of *A. glabra* which are in any way unusual frequently bear a question mark on the label, showing that their identity was dubious at the time of determination, but these only serve to emphasize again, at least to the present writer, the fact that *A. glabra* is a variable species, but with few extremes of sufficient constancy for the segregation of varieties or forms.

The plates of *A. glabra* in various European floras and manuals further emphasize this point. In Flora Danica, O. F. Müller's plate[2] shows a plant with elliptic-lanceolate cauline leaves which taper to an acuminate apex, and which possess long, sagittate auricles making a right angle with the base of the stem. These features give the plant

[1] Torrey in Bot. Wilkes Exped. xvii. 227 (1874).
[2] O. F. Müller, Fl. Dan. v. t. dcccix (1782).

an aspect somewhat different from the usual form with which we are familiar—a plant with cauline leaves less sagittate and less acuminate. In Thomé's Flora von Deutschland,[1] however, one is immediately impressed by the similarity of the plate to our familiar North American plant. Here the leaves are lanceolate, subacute or obtuse, and the auricles are not especially enlarged but make an acute angle with the main stem. In Bonnier's Flore de France, Suisse et Belgique[2] one sees a plant very similar to that illustrated in Thomé's Flora but differing somewhat in the shape of the leaves. In both European and North American herbarium material I have seen plants showing these and other variations, but conclude that they are to be anticipated in a species possessing such a wide range and often having the tendency of a weed.

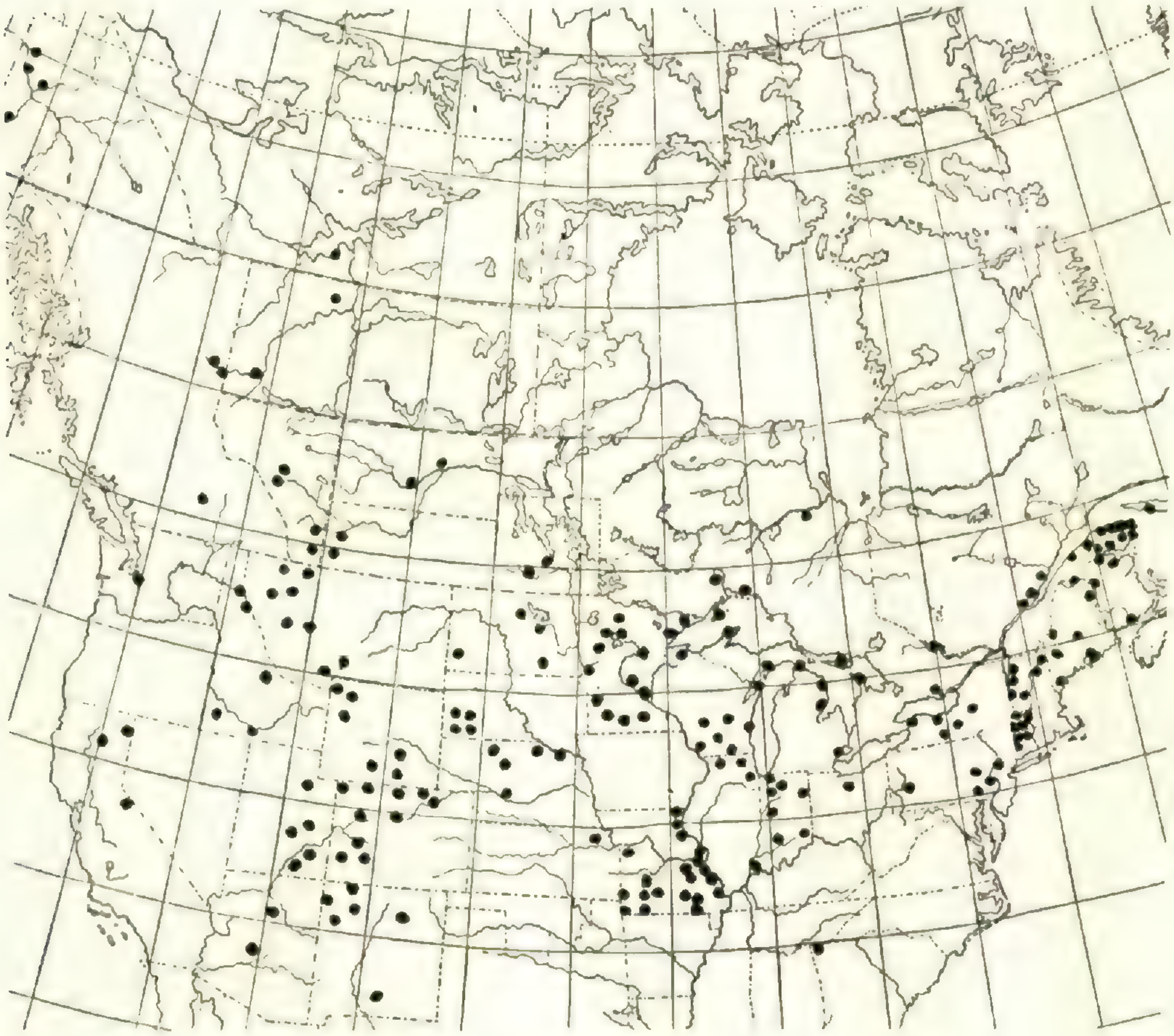
6. A. **pycnocarpa**, sp. nov. (Tab. 458, fig. 1–3), planta biennis: caulibus erectis, gracilibus, simplicibus, vel ramosis inferne et superne, 1.5–8 dm. altis, inferne dense vel sparse hirsutis superne hirsutulis vel glabris, pilis simplicibus et bifurcatis, subadpressis vel patentibus: foliis radicalibus oblongis vel oblanceolatis, 2–8 cm. longis, 0.5–1.5 cm. latis, subscabris, serrato-dentatis vel integris, obtusis vel rarius acutis, utrinque villoso-hirsutis vel hirsutulis pilis simplicibus et bifurcatis vel rariter trifurcatis, petiolis hirsutulis; foliis caulinis oblongis vel lineari-lanceolatis, scabriusculis, subdentatis vel integris, 1–4 cm. longis, 3–14 mm. latis, subremotis vel imbricatis, obtusis vel subacutis infimis subamplexicaulibus, utrinque hirsutis basi subauriculatis vel subsagittatis, summis sessilibus, utrinque hirtellis vel rarius glabris: floribus parvis, in racemis laxis; pedicellis floriferis glabris vel rarius hirtellis per anthesim, 4–9 mm. longis, gracilibus, valde erectis; sepalis 2.5–3.5 mm. longis, 0.75–1 mm. latis, membranaceis, oblongis, petala ⅔ aequantibus, glabris vel parce hirsutis; petalis albis vel pallide roseis, 4–5 (–6) mm. longis, 0.75–1 mm. latis, oblongo-lanceolatis; siliquis plerumque plurimis, plus minusve rectis, angustis, 3–5 cm. longis, 0.75–1 mm. latis, valde erectis et adpressis, glabris, valvis univenosis ad medium vel parce ultra; pedicellis fructiferis erectis, subadpressis, glabris, maturitata 7–9 mm. longis; stigmatibus parvis, cupulatis; stylis gracilibus, 0.4–0.9 mm. longis; seminibus uniseriatis, suborbicularibus vel oblongis, 1–1.25 (–1.35) mm. longis, 0.4–0.7 mm. latis, alatis, ala ambitu toto seminis aequilata vel superne latiore.—Basic ledges, cliffs, bluffs, dry and rocky or moist banks and gravelly alluvium, eastern Quebec to Yukon, south to Georgia, Indiana, Illinois, Missouri, Kansas, New Mexico, Arizona and California. Represented in North America by four varieties.

[1] Thomé, Fl. von Deutschland, ii. t. 272 (1886).
[2] Bonnier, Fl. France, Suisse et Belg. i. pl. 40 (1911).

a. Pubescence of stem spreading or subspreading, predominantly of simple hairs....*b.*
  b. Mature siliques not less than 3 cm. long....*c.*
    c. Mature siliques numerous; cauline leaves more than 10, imbricate to subimbricate, hirsute; stem hirsute throughout; sepals herbaceous..... var. *typica.*
    c. Mature siliques few; cauline leaves 2–10 (–12), remote to subremote, the middle and uppermost glabrous; middle and upper part of stem glabrous; sepals membranaceous..... var. *glabrata.*
  b. Mature siliques short for the species, 1.5–3 cm. long; plants of eastern Quebec only..... var. *reducta.*
a. Pubescence of stem strictly appressed, often giving a strigose appearance, predominantly of bifurcate hairs.....var. *adpressipilis.*

Var **typica.** QUEBEC: slaty ledges near Cap Chat River below Pineau River, Matane Co., *Fernald & Pease*, no. 25,114; sandy and gravelly bars, Grand Cascapedia River, Bonaventure Co., *Collins & Fernald*, no. 96; dry ledges, St. Jean l'Evangéliste, Nouvelle, Bonaventure Co., *Collins & Fernald*, July 19 & 20, 1904 (TYPE in Gray Herbarium); limestone conglomerate cliffs, headland north of Baptiste Michaud's, Bic, Rimouski Co., July 18, 1904, *Collins & Fernald.* ANTICOSTI: sur le talus argilo-calcaire près de l'embouchure, Rivière Vaureal, *Victorin & Rolland-Germain*, no. 27,186. NEW BRUNSWICK: talus of cliffs, gorge of the Aroostook, Victoria Co., Aug. 17, 1901, *Fernald;* dry ledges by the St. John, Connors, Madawaska, *Pease*, no. 2,516; amongst rocks, Campbellton, *Chalmers*, no. 1,696 [Can]. MAINE: gravelly bank, Fort Fairfield, *Fernald*, no. 12; gravelly esker, Alton, August 18, 1900, *Fernald.* NEW HAMPSHIRE: west side of Mt. Prospect, Lancaster, *Pease*, no. 16,928; shaded ledges, narrows of Connecticut River, Bath, Coos Co., *Pease*, no. 19,638. VERMONT: shore of Lake Champlain, Charlotte, June 3, 1881, *Horsford;* West Rutland, May 28, 1893, *W. W. Eggleston;* limestone pasture, East Dorset, June 1, 1908, *G. G. Kennedy.* MASSACHUSETTS: R. R. track, Montague, May 29, 1892, *Churchill;* moist rocky ledges, Sunderland, Aug. 7, 1887, *Deane;* ledges near Bardwell's Ferry, Shelburne, May 11, 1912, *Forbes & Schweinfurth.* CONNECTICUT: dry ground near the Hoosatonic River, Oxford, May 30, 1888, *Harger;* ledges at Bolton Notch, Bolton, Tolland Co., May 26, 1916, *A. W. Driggs.* NEW YORK: ledges of ravine, Enfield, Tompkins Co., *Eames & MacDaniels*, no. 584; Watertown, 1854, *G. W. Clinton;* limestone cliffs, Trenton Falls, Oneida Co., *Haberer*, no. 63. NEW JERSEY: Franklin, *A. P. Garber*, July 1871 [US]; woods along road from Newton to Springdale, Sussex Co., just ne. of Newton, *H. W. Pretz*, no. 525 [Phil]; Swartzwood Lake, Sussex Co., *J. J. Carter*, 5 July 1907 [Phil]. PENNSYLVANIA: on limestone rocks, Chestnut Ridge at Hillside, Westmoreland Co., *John Bright*, no. 143 [Deam]; limestone bluffs on Conestoga Creek, Lancaster, *Long*, 22 June 1909 [Phil]; Kent's Furnace, Easton, *T. Seal*, 28 May 1884 [Phil]. GEORGIA: valley of the Coosa [Floyd Co.], *Ravenel*, without date [Mo]; banks of the Coosa, Rome, *Ravenel*,

without date [Mo]. Ontario: ledges by R. R., Jack Fish, Thunder Bay Distr., *Pease & Bean*, no. 23,671; on limestone, Ottawa, *Rolland*, no. 71; Cove Island, Tobermory, Bruce Co., *Krotkov*, no. 7,460 (as *A. brachycarpa*). Michigan: Woodson's Ramport, Mackinac Island, July 11, 1915, *W. H. Manning;* Thunder Bay Island, Alpena Co., 18 July, 1895, *C. F. Wheeler;* Isle Royale, *W. S. Cooper*, no. 38. Ohio: *Sullivant*, without date and without number; *Riddell*, 1834 [NY].



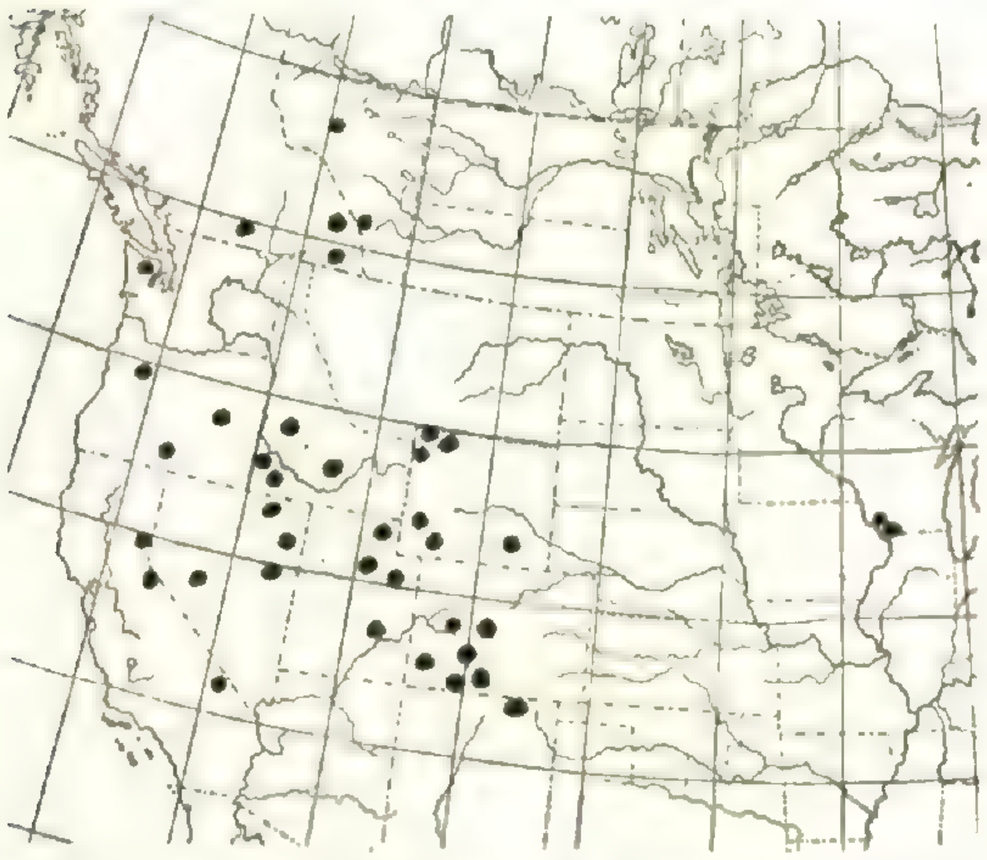
Map 9. Range of Arabis pycnocarpa, var. typica.

Indiana: sandy knoll, 1 mile nw. of Buddah, Lawrence Co., *Kriebel*, no. 1,976; rare on moderately high bank of Eel River, about 2 mi. east of Mexico, *Deam*, no. 40,680 [Deam]; moist wooded bank of Pipe Creek, 2½ mi. n. of Onward, *Deam*, no. 50,215 [Deam]. Wisconsin: near Porcupine Lake, Lake Owen, Bayfield Co., *Griscom*, June 21, 1928; Ephraim, Door Co., *Greenman*, no. 2,169; shaded calcareous cliffs, Ephraim, Door Co., *Pease*, no. 18,011. Illinois: on rocky ledges (dolomite), The Sag, 1 Sept. 1908, *J. M. Greenman;* Ringwood, *Vasey* without number; woods along Desplaines River, Maywood, *Chase*, May 27, 1897. Manitoba: sandhills, north of Carberry, *Macoun & Herriot*, no. 69,857 [Can]; among rocks and on river banks,

Fort Ellice, *Macoun*, no. 1,703 [Can]; ravine, Brandon, *Macoun*, no. 12,400 [Can]. MINNESOTA: slate cliff, northwest exposure, south of Clearwater Lake, Cook Co., *Butters & Buell*, no. 411; sand along dry roadside, near Arago P. O., Hubbard Co., *J. B. Moyle*, no. 486; Fort Snelling, May 25, 1891, *Edgar A. Mearns*. MISSOURI: Oronogo, 3 miles west of Jasper, *E. J. Palmer*, no. 2,535 [Mo]; rocky hillsides, *Eggert*, 17 May 1878 [Mo]. NORTH DAKOTA: prairies, Leeds, *Lunell*, no. 78; Minnewankon, *Lunell*, 26 July 1907 [NY]; dry prairies, *J. F. Brankle*, June 1910 [Deam]. SOUTH DAKOTA: rim of Spearfish Canyon, near Savoy, limestone, elev. 5,600 ft., *J. Murdoch*, no. 4,126; rocky open ground near Rapid City, Pennington Co., *E. J. Palmer*, no. 37,236; Black Hills, Hot Springs, *Rydberg*, no. 518. NEBRASKA: meadow lands, Halsey, *Mell & Knopf*, 9 June 1904 [Mo]; Long Pine, *J. M. Bates*, 28 May 1908 [Bklyn]; Hershey, *C. D. Mell*, 12 June 1903 [US]; Neligh, *R. A. Harper*, 1888 [Wisc]. KANSAS: dry woods, Pottawatomie Co., *J. B. Norton*, no. 611; St. George, Pottawatomie Co., *W. A. Kellerman*, 28 May 1890 [NY]. SASKATCHEWAN: thickets and open prairies, Prince Albert, *Macoun*, no. 12,398 [Can]; thickets, Farewell Creek, Cypress Hills, *Macoun*, no. 10,272 [Can]. ALBERTA: Bankhead, alt. 4,500 ft., *S. Brown*, no. 110; 40–60 miles southwest of Banff, *B. P. Clark*, July–August 1905; Pine Lake Dist., Wood Buffalo Park, *Raup*, nos. 2,496 & 2,498; Crow Nest Pass, lat. 49° 30′, *Macoun*, no. 18,105. MONTANA: Jack Creek Canyon, alt. 7,000 ft., *Rydberg & Bessey*, no. 4,211; South End Pass, Mission Mts., *McDougal*, no. 531 (as *A. ovata*) [NY]; gravelly slope along Appekunny Creek, *Standley*, no. 15,313 [US]. IDAHO: Silver City, Owyhee Co., *Macbride*, no. 991 [NY]; Shoshone Falls, Twin Falls Co., *Nelson & MacBride*, no. 1,731; Wood River, Hailey, *L. F. Henderson*, no. 3,238 [US]. WYOMING: Mt. Leidy, *Tweedy*, no. 390 [NY]; French Creek, Carbon Co., *Goodding*, no. 2,023; shaded banks, Centennial, Albany Co., *A. Nelson*, no. 8,836 [NY]. COLORADO: dry slopes, Brookvale, Clear Creek Co., *Churchill*, 16 June 1918; dry bank of creek, alt. 8,000 ft., Tabeguache Basin, *Payson*, no. 569. UTAH: near Creek, alt. 7,000 ft. Lasal, *Payson*, no. 439; Fish Lake, around Twin Creeks, *Rydberg & Carlton*, no. 7,616 (as *A. ovata*) [NY]; Upper Falls, *O. A. Garrett*, no. 1,746 [NY]. NEW MEXICO: Jemez Springs, *A. Nelson*, no. 11,672; mouth of Ponchuelo Creek, *Standley*, no. 4,076 (as *A. ovata*); *Fendler*, without locality, no. 25 (41). ARIZONA: Buckskin Mts., alt. 9,000 ft., *M. E. Jones*, no. 6,052a [US]; vicinity of Flagstaff, alt. 7,000 ft. *MacDougal*, no. 250; Clarks Valley, *Rusby*, no. 512 [Bklyn]. CALIFORNIA: Burney Falls, Shasta Co., *Baker & Nutting*, 31 May 1894 [US]; Cottonwood Creek, White Mountains, Mono Co., *Coville & Funston*, no. 1,809 [Minn]. OREGON: damp banks of Eagle Creek, Clackamus Co., *J. W. Thompson*, no. 4,266 [Phil]; above Wakkenah Falls, Multnomah Co., *J. W. Thompson*, no. 2,684 [Phil]. WASHINGTON: Pierce Co., *Piper*, no. 232 [US]; no locality, *E. P. Sheldon*, no. 8,107 [US]. BRITISH COLUMBIA: dry bluffs, north bank of Peace

River at Taylor Flat, *Raup & Abbe*, no. 3,581; rich low woodlands, south slopes of Peace River Valley, vicinity of Hudson Hope, *Raup & Abbe*, no. 3,683. Mackenzie: Fort Resolution, *A. Dutilly*, no. 100. Yukon Territory: Cemetery Hill, Dawson, *Eastwood*, no. 437; Carcross, *Eastwood*, no. 703; Klondyke, *John MacLean*, 1898–1901 [Can]; Hawker Creek, *Macoun*, no. 58,381 [Can]; moist ground and rocky banks, Fort Selkirk, *M. W. Gorman*, no. 1,040 [Can]. *Fl.* May–June; *fr.* June–July. Map 9.

Var. **glabrata** (T. & G.), n. comb. Slender; stem glabrous to sparingly hirsute at base, glabrous above: radical and lower cauline leaves glabrous to sparingly hirsute, middle and upper cauline leaves glabrous: sepals membranaceous.—*A. hirsuta*, β *glabrata* T. & G., Fl. N. Am. i. 80 (1838).—Southwestern Wisconsin; Alberta to Washington, south to New Mexico and California. The following are characteristic. Wisconsin: damp cliff, Beetown, Grant Co., *Fassett*, no. 13,369 [Wisc]; limestone cliffs, wooded and pastured bluff along Platte River, Dickeyville, Grant Co., *Fassett*, no. 13,457 [Wisc]. Alberta: vicinity of Basin, 4,600 ft. alt. *S. Brown*, no. 48; Fiddle Creek, Athabasca River, Jasper Park, *without stated collector*, 30 June 1898, no. 19,253 [Can]. Wyoming: on disintegrated formations, Mammoth Hot Springs, Yellowstone Park, *Nelson & Nelson*, no. 5,668; moist semi-wooded slopes, Bates Hole, *Payson & Payson*, no. 4,791; hills east of Afton, alt. 6,500 ft., *Payson & Armstrong*, no. 3,252. Colorado: common in wet places along river bottom, Mancos, *Baker, Earle & Tracy*, no. 36; West Indian Creek, alt. 2,500–2,700 m., *Rydberg & Vreeland*, no. 6,175 [NY]; South Park, Colorado Territory, *Wolf & Rothrock*, nos. 639, 641 & 643; Pagosa Springs, 7,100 ft., *C. F. Baker*, no. 348 (as *A. ovata*). Idaho: grassy bottomlands, Hot Hole, east fork of Bruneau, *Nelson & Macbride*, no. 1,910; moist hillside, alt. 8,000 ft., Lost River Mts., *Macbride & Payson*, no. 3,146; wet grassy swales, alt. 7,000 ft., Silver City, *Macbride*, no. 991. Utah: west fork of Bear R., elev. 8,000 ft., *Payson & Payson*, no. 4,837; Fish Lake, around Twin Creeks, *Rydberg & Carleton*, nos. 7,643 & 7,649 (as *A. ovata*) [NY]; Wahsatch Mts., 6,000 ft., *S. Watson*, Aug. 1869, no. 68 [NY—*not in Gray Herbarium;* Watson's no. 68 in the Gray Herbarium is *A. glabra* collected from a different station in Utah and on a different date]. Nevada: precipitous chapparal slopes, alt. 8,000 ft., Allegheny Creek, *Nelson & Macbride*, no. 2,169; moist



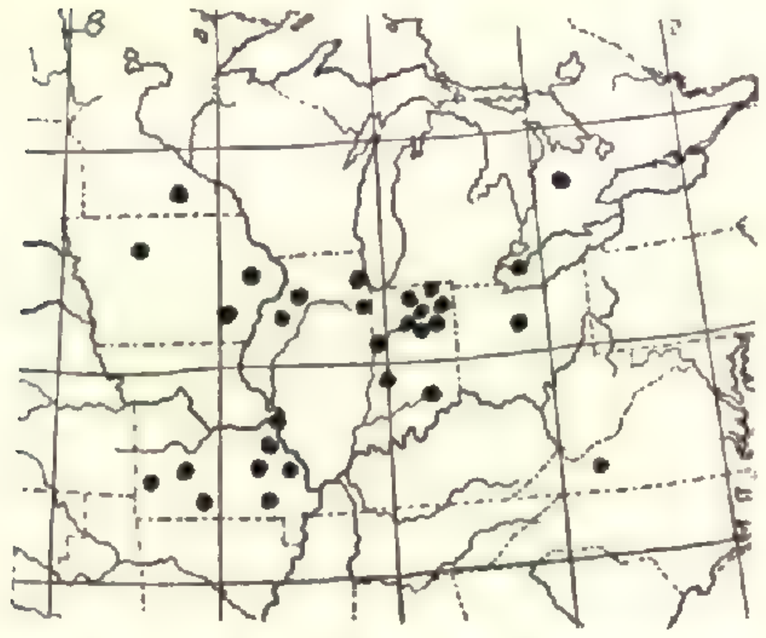
Map 10. Range of Arabis pycnocarpa, var. glabrata.

ravine, Ely, Duck Creek Canyon, *A. E. Hitchcock*, nos. 1,389 & 1,391 [US]; moist ravines, vicinity of Austin, *A. E. Hitchcock*, no. 733 [US]. NEW MEXICO: dry hills, vicinity of Raton, Colfax Co., *Standley*, no. 6,350 [US]. CALIFORNIA: Cottonwood Creek, White Mts., Mono Co., *Coville & Funston*, no. 1,807; Santa Ana River, frequent in shaded damp sand, alt. 6,350 ft., *Munz*, no. 6,324; Truckee, Nevada Co., *C. S. Williamson*, 17 July 1901 [Phil]. OREGON: moist ground along Myrtle Creek, near its confluence with Silvies R., Harney Co., *M. E. Peck*, no. 1,957; wet rocks, Horsetail Falls, Columbia Gorge, *Mrs. N. P. Gates*, no. 106 [Phil]; hills, northwest of Crooked Creek Valley, Lake Co., *M. Loveless*, 22 June 1931 [Phil]. WASHINGTON: rocky slopes of Constance Ridge, Jefferson Co., 3,500 ft., *J. W. Thompson*, no. 6,560 (as *A. furcata*); Washington Territory, *Brandegee*, no. 633 [Phil]. BRITISH COLUMBIA: Lake Osoyoos, between lat. 49° and 45° 05′, and long. 119° 20′ & 119° 30′, *J. M. Macoun*, no. 70,830 [NY]; Glacier, alt. 4,122 ft. *Zoe W. Palmer*, July 1897 (as *A. ovata*) [NY]; Avalanche Path, alt. 4,350 ft., *C. H. Shaw*, no. 37; Mts. near Ainsworth, Kootanie Lake, *collector unknown*, 5 July 1890 [Min]. MAP 10.

MAP 11. Range of ARABIS PYCNOCARPA, var. REDUCTA.

Var. **reducta**, n. var., siliquis brevibus, 1.5–2.5 cm. longis; stylis brevibus pinguis, seminibus 0.6–1 mm. longis, 0.5 mm. latis, late alatis.—Eastern Quebec. QUEBEC: Carlton, gravelly beach, Tracadigash Point, *Collins & Pease*, no. 4,312 (TYPE in Gray Herbarium); ibid, *Collins & Fernald*, no. 4,311; Le Bic, Rimouski Co., *Louis-Marie et al*, no. 34,438a; rocks, Bic, Rimouski Co., *C. S. Williamson*, 18 July 1910 [NY]; cliffs by Bay Orignal, Bic, *F. F. Forbes*, 26 June 1905 [Can]. MAP 11.

Var. **adpressipilis**, n. var., caule pubescente pilis adpressis bifurcatis; foliis caulinis glabris vel subglabris.—River-banks, ledges and bluffs in woods, Ontario to southern Minnesota, south to western Virginia and Missouri. VIRGINIA: Wytheville, Wythe Co., *Shriver & Porter*, 1874 [Phil]. ONTARIO: Point Pelee, Essex Co., *C. K. Dodge*, 3 May 1910 [US]; Wingham, *J. A. Morton*, 14 June 1891 [Phil]. OHIO: Banks of Scioto River, *J. R. Paddock*, 1839 [NY]; Rivière du Scioto, *Lesquereux*, without date or number [NY]. INDIANA: alluvial north bank of Wabash River, about ½ mi. east of Bluffton, *Deam*, 11 July 1906 [Deam]; woods bordering Tippecanoe River just north of DeLong, *Deam*, no. 30,975 [Deam]; rocky bluff of Muscatatuck River, between Vernon & North Vernon, *Deam*, no. 9,116 [Deam]. ILLINOIS:



MAP 12. Range of ARABIS PYCNOCARPA, var. ADPRESSIPILIS.

Lockport Ledge, Lockport, *Skeels*, no. 614; damp open woods near Wady Petra, *V. H. Chase*, 25 May 1895 (as *A. brachycarpa*); banks, Grossdale, *Umbach*, no. 11,544 [Wisc]; railroad track, Romeo, *Umbach*, 4 June 1895 [US]. Missouri: Tower Rock, *H. A. Gleason*, 7 May 1902 (as *Stenophragma Thaliana*); rocks, St. Clair Co., *Eggert*, 7 May 1878 [US]; Montier, *Bush*, no. 32 (type in Gray Herbarium); common on bluffs, Swan, *Bush*, no. 80; on limestone near Moore's Cabin, Allenton, *Letterman*, June 1897 [Mo]. Iowa: woods, Johnson Co., *Fitzpatrick & Fitzpatrick*, 3 June 1900 [Deam]; Badger, *M. P. Somes*, no. A3,023 [US]; rich woods, Chequest Creek, Pittsburg, Van Buren Co., *E. W. Graves*, no. 2,144 [Mo]. Map 12.

A. pycnocarpa is the plant which has previously passed in North America as *A. hirsuta* (L.) Scop. The latter is a Eurasian species which, although superficially resembling the American one, actually is quite different from it. These differences are best presented in tabular form as follows:

	Eurasian A. hirsuta	North American A. pycnocarpa
Cauline leaves:	remote to subremote, rather scattered along the stem, dentate with 5 (3–)–7 teeth.	usually imbricate to subimbricate, close together on the stem, entire to subentire or if dentate with 1–2 (–4) teeth.
Siliques:	rather short, 2–4 cm. long, rather plump, submoniliform to moniliform, the seeds very prominent through the valves of the pod.	longer than in *A. hirsuta*, 3–5 cm., flatter and not so plump as in *A. hirsuta*, not so moniliform as in *A. hirsuta*, the seeds not very prominent through the valves of the pod.
Style:	short and thick, 0.1–0.5 mm. long.	longer and more slender than in *A. hirsuta*, 0.5–0.9 mm. long.
Seeds:	winged narrowly only at the apex.	winged all around narrowly, but very broadly so at apex.
Nervation of silique:	one-nerved to tip.	one-nerved only to middle of silique or slightly beyond middle

The pubescence of both plants, however, seems to be similar, although that of *A. hirsuta* is much more abundant than that of its North American relative. The former plant usually possesses on its stem a great quantity of spreading bifurcate hairs along with the characteristic simple ones, while the cauline leaves are much more hirsute than those of *A. pycnocarpa*. The size of the flower and the length of the anthers is also similar in both plants, and although the sepals tend to vary somewhat in the Eurasian plant, in general they are shorter

than those of the American and appear to be only one-half the length of the petals instead of two-thirds their length as is the case in *A. pycnocarpa*. FIG. 1 of PLATE 457 shows a typical specimen of *A. hirsuta* from Bavaria with the characteristic short moniliform pods and remote to subremote, dentate cauline leaves; these characters instantly differentiate it from a typical specimen of *A. pycnocarpa* from Bonaventure County, Quebec, possessing longer and non-moniliform pods and imbricated, entire leaves, and illustrated in FIG. 1 of PLATE 458. FIG. 3 of PLATE 458 illustrates the differences in the nervation of the silique and in the length of the style, the specimens being taken from the above two sheets. The Bavarian plant is characterized by its short style and by a silique which is one-nerved throughout its entire length, whereas the Quebec plant has a longer, more slender style and a silique which is one-nerved only to the middle. Seed differences between the two species are illustrated in FIG. 2 of PLATE 457, and in FIG 2 of PLATE 458, in which the seeds of *A. hirsuta* are shown with a narrow wing only at the apex, while *A. pycnocarpa* possesses a definite wing extending throughout its entire periphery, although this wing is much broader at the apex than elsewhere.

When Rydberg published his Flora of the Rocky Mountains in 1917, he used the name *A. ovata* (Pursh) Poir. for the plant commonly known at that time throughout North America as *A. hirsuta* (L.) Scop., and in his Flora of the Prairies and Plains in 1932 he continued to use it, and was followed by Small in 1933, whose Manual of the Southeastern Flora erroneously cites Michaux as the authority for the name. *A. ovata* is based on Pursh's *Turritis ovata*,[1] and although Mr. C. A. Weatherby has most kindly searched the important herbaria at Paris and London, and effort has been made to locate the Pursh type in this country, it appears either to be non-extant or else hidden in some unconsulted herbarium. There is, however, in the Barton Herbarium of the American Philosophical Society,[2] a specimen collected by Pursh in "shady woods below Harper's Ferry" and labelled by him "*Turritis? hirsuta! P.*", which is, unfortunately, quite clearly merely *A. canadensis* L. Dr. F. W. Pennell, Curator of the Herbarium of the Academy of Natural Sciences of Philadelphia, in a letter to Professor Fernald writes: "We are adding to our loan of specimens . . . eight sheets of Pursh's specimens represented in the Barton Herbarium of the American Philosophical Society. Among

[1] Pursh, Fl. Am. Sept. ii. 438 (1814).
[2] Deposited at the Academy of Natural Sciences of Philadelphia.

these you will find *Turritis hirsuta* which I think is the specimen that must have later formed the basis of his *T. ovata*."[1] But whether Pursh actually labelled any specimen *T. ovata*, and whether such a sheet is preserved today, cannot be answered here. The description in his Flora reads:

> *ovata*. 2. T. pubescens; foliis radicalibus petiolatis ovatis dentatis obtusis, caulinis amplexicaulibus oblongis serratis acutis. On rocks: Pensylvania to Virginia. ♂. May, June. Resembles *T. hirsuta*.

One is, however, puzzled by the words "Resembles *T. hirsuta*," and it is difficult to understand his interpretation of that plant. Was it the sheet which is today in the Barton Herbarium, or was it the European plant described by Linnaeus, with which he must certainly have been familiar? This question will remain unanswered until the specimen labeled "*T. ovata*" by Pursh himself, if it exists, is seen. It seems quite logical that Rydberg used the name *A. ovata* for the American plant at present under discussion, because he realized that it was distinctly different from the European *A. hirsuta* (L.) Scop., and consequently, selected it as best fitting the species. Pursh's description is so vague and concise that either *A. patens* Sullivant, *A. canadensis* L. or *A. pycnocarpa*—and perhaps even *A. glabra* (L.) Bernh.—might be taken for it.

One more name must be mentioned. Rafinesque described a *Turritis oblongata*,[2] which, from his unusually lucid account, might well be our plant, but the publication of an *Arabis oblongata* by Wenderoth in 1824,[3] automatically invalidates the use of that specific name again under the genus *Arabis*. Hence, I have found it necessary to propose for the North American plant the new name, *A. pycnocarpa*.

In eastern North America var. *typica* reaches its northeastern limit in the Gaspé Peninsula, although in western Canada it extends north to the Yukon region and Alaska. In a southern direction it extends to northern Georgia where Ravenel collected it in Floyd Co., on the banks of the Coosa River near Rome, although from the region between Pennsylvania and Georgia I have seen no specimens; and westward it is found through the prairie states to Colorado. I have

[1] In the Letter Files of the Gray Herbarium of Harvard University, Cambridge, Massachusetts.

[2] Rafinesque in the American Monthly Magazine, ii. 44 (1817).

[3] Wenderoth in Hort. Marb. (1824), acc. to Steudel. Wenderoth was the Director of the Botanic Garden of the University of Marburg, Germany, and although this name was published in some report of the Garden, I have been unable to find said publication or its page.

not examined any specimens from Arkansas and Oklahoma, nor have I seen any from Kentucky or Tennessee, although Gattinger lists it as indigenous to the latter state[1] and Professor H. M. Jennison of the University of Tennessee writes: "With reference to *A. hirsuta* (L.) Scop., I can say that we have in our herbarium a specimen of what answers the description of that species which I collected at Savage Gardens near Coal Creek, Anderson Co., in 1934, in the spring."[2] It extends westward to California, Washington and southwestern British Columbia, where it seems to be rather rare and to be much more commonly represented by var. *glabrata*, which in those regions is found in great abundance. In southern California it is represented by a little known species of which more material is needed, while in the northern Pacific States two closely related species are found in abundance.[3]

Var. *reducta* is characterized by its very small siliques which average only 2 cm. in length, by its short and stout style, by its small and broad seeds which are winged all around and by the fact that the nerve on the silique extends to the tip. Furthermore the basal leaves, stem and cauline leaves possess a setose type of pubescence which is longer and coarser than that of typical *A. pycnocarpa*. It is localized in eastern Quebec and only two stations are known—both of them in areas apparently free from recent glaciation. From the European *A. hirsuta*, this Quebec plant differs in its non-moniliform pods which are plumper than in typical *A. pycnocarpa*, in its seeds which are broader and more widely winged than those of *A. hirsuta*, and in its general habit which is more dwarfed.

Var. *adpressipilis* is, in habit, quite similar to the typical form of the species, but in the details of its pubescence quite different. Instead of the spreading hairs so characteristic of the stem of var. *typica*, this plant possesses bifurcate and occasionally trifurcate hairs which are closely appressed to the stem. The cauline and basal leaves are in general more nearly glabrous than those of the typical form of the species and in some cases the entire plant, except for the appressed pubescence on the stem, is quite glabrous. It is found locally from southern Ontario to southern Minnesota, south to western Virginia and Missouri, inhabiting the rich alluvium of river-banks or ledges and cliffs in deep rich woods.

[1] Gattinger, Fl. Tenn. 89 (1901).

[2] Letter from Prof. H. M. Jennison in Letter Files of the Gray Herbarium of Harvard University.

[3] *A. rupestris* Nutt. and *A. Eschscholtziana* Andrz.

Var. *glabrata* was described by Torrey & Gray as "whole plant glabrous; leaves mostly entire."[1] However, I have never seen a plant which was totally glabrous, nor have I had the good fortune to examine the type-sheet: "Oregon, *Dr. Scouler!*" In view of the fact that I have not seen the type-sheet, I have found it necessary somewhat to amend the original description and to include under the varietal name those plants of *A. pycnocarpa* which tend towards a glabrous condition. The present conception of var. *glabrata*, then, is a plant which possesses few siliques, comparatively few cauline leaves, the middle and uppermost of which are glabrous and remote to subremote, membranaceous sepals which are often, but by no means always, somewhat broader and more acute than those of the typical form of the species, glabrous to sparingly pubescent basal leaves, and a stem which is almost invariably hirsute at the base but which rapidly becomes glabrate shortly above that point and is completely glabrous just below the inflorescence. Furthermore, var. *glabrata* is usually simple, slender and rather delicate, and often is very low, although some specimens attain the height of var. *typica*. It is found in the Wisconsin Driftless Area and in the mountains from Alberta south to Colorado and California, extending as far south in that state as the San Bernardino Mountains. It reaches New Mexico only locally; in Oregon, Washington and southwestern British Columbia it is far more abundant than var. *typica*, which occurs on the Sierra Nevada very sparingly as far south as northern California. Its presence in the famous Driftless Area of southwestern Wisconsin is somewhat unusual, but quite logical in view of the current geological interpretation of that region, which was completely untouched by ice during the glacial period. The only two specimens from that state which I have seen are from Grant Co., and both plants are almost entirely glabrous, have very few siliques and possess the slender and delicate habit so characteristic of this plant in the Rocky Mountains.

7. A. GEORGIANA Harper. Biennial from a thin tap-root: stem slender, erect, simple or branched at base, 3–5 dm. high, hirsute at base passing upwards to hirtellous and glabrous with simple and bifurcate subappressed to spreading hairs: radical leaves oblanceolate, forming a flat rosette, denticulate to serrate, obtuse, tapering to a narrowly winged petiole, 4–8 cm. long, 9–12 mm. broad, finely and loosely pubescent on both surfaces with minute bi- or tri-furcate

[1] T. & G., Fl. N. Am. i. 80 (1838).

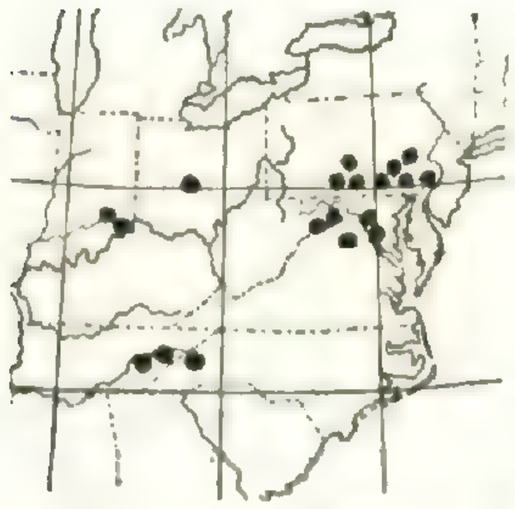
hairs or the upper surface glabrous; cauline leaves 2–4 cm. long, 4–13 mm. broad, subremote to subimbricate, elliptic-oblong to oblong-lanceolate, the uppermost narrower and reduced in size, sessile with a subamplexicaul base, denticulate to subdentate, obtuse, glabrous on upper surface, loosely and finely pubescent on lower surface with minute trifurcate and simple hairs: flowers in loose or somewhat compact racemes, small; flowering pedicels filiform to subfiliform, erect, 5–10 mm. long at anthesis, glabrous; sepals membranaceous, greenish to yellowish, one half the length of petals, ovate-oblong, 2.5–4 (4.5) mm. long, narrowly scarious-margined, glabrous or very rarely sparsely hirsute; petals white to cream, narrowly spatulate to oblanceolate, obtuse, spreading above, 6–9 mm. long: siliques thin, slender, erect or ascending, 5–7 cm. long, 0.75–1 mm. broad, straight or slightly curved, glabrous, one-nerved at least to middle and frequently to top; fruiting pedicels erect or ascending, glabrous, 8–14 mm. long; stigma cupulate, on a style 1–1.75 mm. long; seeds in one row, oblong to oblong-quadrate, averaging 1.5 mm. long, 0.5–0.75 mm. broad, narrowly winged all around but broadly so at apex.—Torreya, iii. 88 (1903); Small, Man. Se. Fl. 571 (1933).—River banks, moist rocks and rich alluvium, Georgia and Alabama. The following are characteristic. GEORGIA: shaded bank of Chattahoochee River, Cretaceous region, *Harper*, no. 1,091 (TYPE in Herb. N. Y. Bot. Gard.); Chatahouchee River, 20 miles from Columbus, *Dr. Boykin*, Aug. 26, 1841 (as *A. hirsuta*) [NY]; Mts. of Georgia, *Herb. Chapman* (without date or number) [NY]; bank of Oostanaula River near Resaca, *Harper*, Dec. 30, 1903 (merely remnants of pods and stalks) [NY]. ALABAMA: bank of Coosa River, below Wetumpka, Elmore Co., Cretaceous region, *Harper*, no. 86; shaded rocks, Pratt's Ferry, Bibb Co., *C. Mohr* (as *A. dentata*). *Fl.* April–May; *fr.* May–June. MAP 13.

MAP 13.
Range of ARABIS GEORGIANA.

A. georgiana, partly of the coastal plain and partly of the mountains, was first described by Harper in 1903, and although originally found in Georgia its range has since been extended into Alabama. It is most nearly related to *A. pycnocarpa* from which it differs in its larger flowers, longer and flatter siliques, longer style, glabrous upper surface of the leaves, longer fruiting pedicels and narrower seeds. From *A. patens* Sulliv. it differs in its longer siliques, and the shape, margin, base and pubescence of its cauline leaves. In *A. patens* the cauline leaves are ovate to ovate-lanceolate, dentate to serrate, definitely clasping and hirsute on both surfaces, whereas in this plant they are oblong to oblong-lanceolate, denticulate to subdentate, sessile with a sub-amplexicaul base and pubescent only on the lower surface.

When it originally appeared, Harper's statement that "this seems to be the first *Arabis* reported from the coastal plain of the eastern United States with the exception of *A. virginica* (L.) Trel.—which, however, is only a weed in the coastal plain"[1] was entirely accurate. But in the light of more adequate information it needs slight modification. He has himself since collected *A. canadensis* from the coastal plain of Georgia, and we now know coastal plain stations also for *A. lyrata* and *A. Drummondi.*

8. A. PATENS Sullivant. Biennial tending towards perennial: stem erect, 3–6 dm. high, simple or branched at base and above, hirsute throughout with spreading, simple or rarely forked hairs, or glabrous above: radical leaves ovate to oblanceolate, 1.5–6 cm. long, 0.5–1.5 cm. broad, petiolate, serrate to dentate, obtuse or acute, hirsute on both surfaces with simple or forked hairs or entirely glabrous; cauline leaves ovate to oblong-lanceolate, 2–5 cm. long, 1–2 cm. broad, sessile, amplexicaul with an auriculate-clasping base, acute to acuminate, serrate to dentate or the uppermost often entire, hirsute on both surfaces with mostly simple or a few stellate hairs: flowers in rather loose racemes; flowering pedicels ascending or erect, glabrous or sparingly hirsute, 5–10 mm. long at anthesis; sepals membranaceous, 2.5–4 mm. long, sparingly hirsute to glabrous, about one half the length of petals; petals white, 5–7 mm. long, broadly spatulate to obovate: siliques 2.5–4.5 cm. long, 0.5–1 mm. broad, attenuate, glabrous, straight or slightly curved inward, suberect or divergently ascending, strongly one-nerved to the middle and often to the tip; fruiting pedicels ascending or divergent, glabrous, 9–18 mm. long at maturity; stigma small, round, on a conspicuous slender style, 0.5–2 mm. long; seeds in one row, oblong to elliptical, averaging 1.25 mm. long, 0.5 mm. broad, narrowly winged all around or more rarely winged only at the apex.—Am. Journ. Sci. xlii. 49 (1842); Gray, Genera, i. 142, t. 58 (1848); Gray, Man. 69 (1848); Chapman, Fl. S. U. S. 27 (1860); Wood, Classbk. ed. of 1861: 232 (1861); Watson in Gray, Synop. Fl. N. Am. i. 162 (1895); Britton & Brown, Ill. Fl. ii. 148 (1897); Britton, Man. Fl. 464 (1901); Rydberg, Fl. Pr. & Pl. 382 (1932); Small, Man. Se. Fl. 571 (1933).—Rocky places along rivers and creeks, Pennsylvania to Tennessee and Indiana. The following are characteristic. PENNSYLVANIA: banks, Schuylkill River, above Conshohocken, *E. Darlington*, 23 Sept. 1866; York Furnace, York Co., *S. Brown*, no. 4,484 [Phil]; Ivy Rock, *I. A. Keller*, 9 May 1896; Mercersburg, *Porter*, 11 June 1850. MARYLAND: near Great Falls of Potomac, *Bartram*, 11



MAP 14. Range of ARABIS PATENS.

[1] Harper in Torreya, iii. 88 (1903).

April 1909; Broadwater, *C. S. Williamson*, 17 April 1908 [Phil]. DISTRICT OF COLUMBIA: in vicinis Washington, *L. F. Ward*, 8 May 1881; common throughout the Carberry meadows, Georgetown, *E. L. Morris*, no. 1,365 [Bklyn]. WEST VIRGINIA: on rocky cliffs, Smoke Hole, Pendleton Co., *E. L. Core*, no. 6,816 [NY]; Smithfield, *E. T. Harper*, 10 Aug. 1894 [Wisc]. VIRGINIA: near Front Royal, rocks at Allen's Cove, Warren Co., *G. S. Miller*, 17 July 1897 [US]. NORTH CAROLINA: Hot Springs, Madison Co., *C. E. Smith*, April 1888 [Phil], *Churchill*, 5 June 1899; Warm Springs, Madison Co., *J. D. Smith*, 28 July 1880 [US]. OHIO: rocky banks of Scioto River (limestone), Columbus, *Aug. D. Selby;* Scioto River, near Columbus, the original locality from which Sullivant obtained his specimens in 1842, *Kellerman, Fullner & Selby*, 1899; Columbus, *Sullivant*, 1840 [TYPE in Herb. Acad. Nat. Sci. Phil.; ISOTYPE in Herb. Gray, both as *A. hirsuta* var.]; near Columbus, *W. C. Werner*, 24 May 1891 [US]. INDIANA: on limestone in woods along Salt Creek, ½ mi. north of Hartsville, Bartholomew Co., *Mrs. C. C. Deam*, no. 36,914; talus at base of cliff along Blue River, 1 mi. north of Whitecloud, *Deam*, no. 42,222 [Deam]. TENNESSEE: on rocks along Tennessee River, Knoxville, *Ruth*, no. 357; Dandridge, *Buckley* without date or number; ad French Broad River, prope Dandridge, *Rugel*, April 1842; vicinity of Knoxville, *Lamson-Scribner*, April 1890 [NY]. *Fl.* April–June; *fr.* May–Sept. MAP 14.

The broad and clasping cauline leaves of *A. patens* are in striking contrast to those of *A. pycnocarpa*, with which species the plant has often been confused. In *A. patens* the pods are ascending but quite unappressed and stouter and broader than in *A. pycnocarpa;* the style is much longer; the pubescence of the stem is much more hirsute and crowded; and the flowers larger and very conspicuous.

The habitat of *A. patens* seems to be rocky and shady river-banks from Pennsylvania south to Tennessee, and west to Ohio and Indiana. It has been reported from Kentucky[1] and from Alabama[2] but I have been unable to substantiate these reports by an examination of actual specimens. It has likewise been reported from Minnesota by MacMillan who says of it "reported as local"[3] and refers to Upham[4] who first recorded the station. But Professor F. K. Butters of the University of Minnesota has shown rather definitely[5] that this record is

[1] Linney, Bot. Madison Co., etc. 28 (1882).

[2] Mohr, Plant Life of Alabama 528 (1901).

[3] MacMillan, Metaspermae of the Minnesota Valley, 268 (1892).

[4] Upham, Supplement to the Flora of Minnesota, 46 (1887).

[5] Letter from Prof. F. K. Butters to Mr. C. A. Weatherby, Asst. Curator of the Gray Herbarium of Harvard University, Cambridge, Mass.; "We have no Minnesota specimens of *A. patens* and I don't think it occurs here. Unfortunately, Upham did not keep the specimens upon which he founded his reports, and his identifications were often pretty shaky. Of course it is very difficult to prove a negative, but where continued collection in a region fails to turn up a plant reported by Upham, we are

exceedingly dubious. Another doubtful station for the plant has been reported from Missouri[1] but this seems unquestionably to be incorrect as no specimen from that state is to be found in any of the herbaria nor do Palmer and Steyermark mention it in their Annotated Catalogue of the Plants of Missouri.[2]

9. A. Hookeri Lange. Biennial from a tap root or perennial from a branched root-stock: stem ascending or erect, profusely branched at base or more rarely simple, varying from 1–4 dm. high, densely hirsute below with usually long simple or often bifurcate spreading hairs, passing to glabrous above or more rarely hirsute throughout: basal leaves in a dense crown, oblanceolate to linear-lanceolate, 3–5 cm. long, 3–7 mm. broad, acute, sinuate to dentate or subentire, finely and densely stellate-pubescent on both surfaces with minute forked trichomes; petioles narrowly wing-margined, pilose; cauline leaves re-

Map 15. Range of Arabis Hookeri.

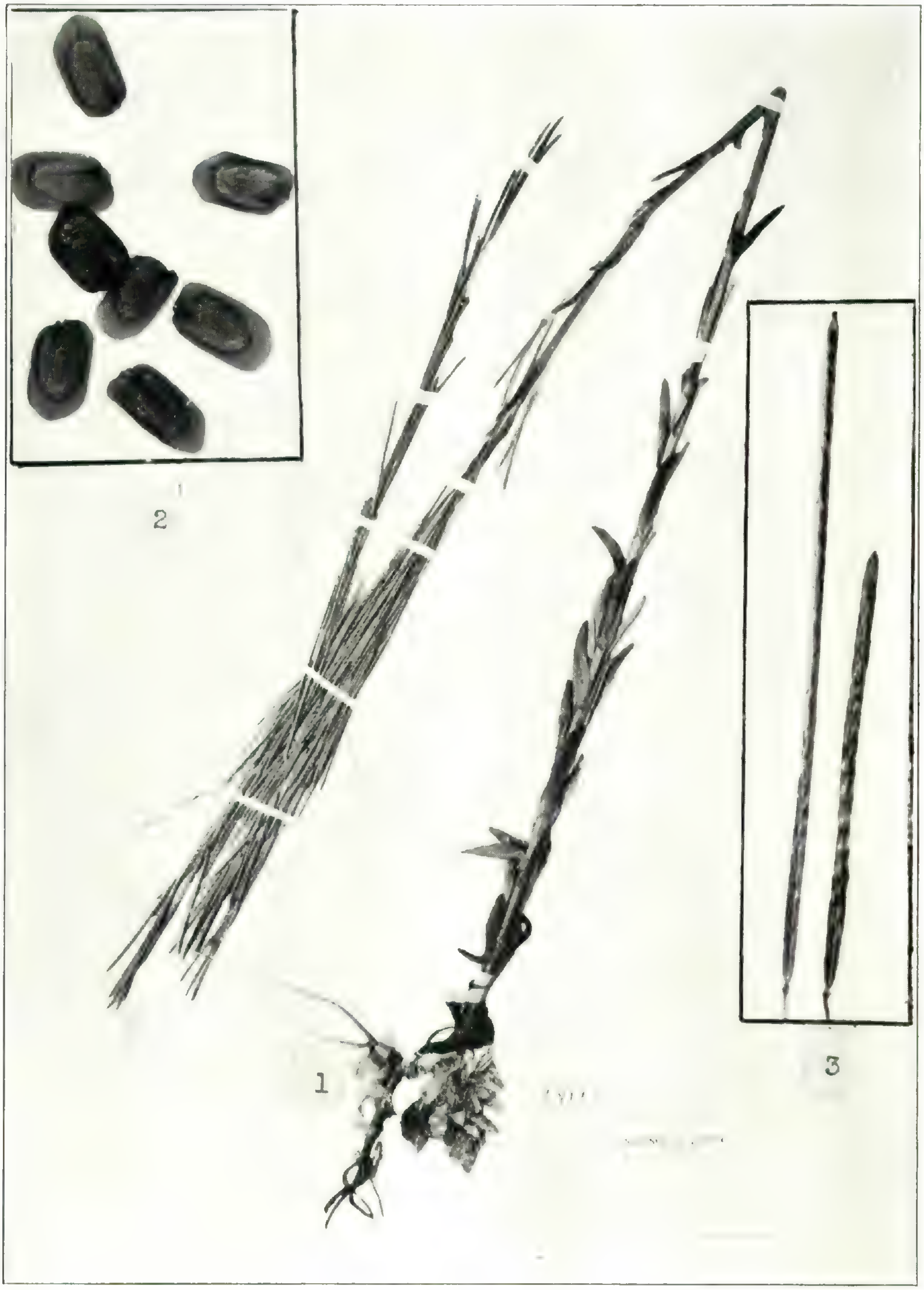
mote to subimbricate, lanceolate to linear-lanceolate, sessile with a sagittate or an auriculate clasping base, usually entire or more rarely subdentate with scattered teeth or slightly subsinuate, revolute, 1–2 cm. long, 1–3 mm. broad, the lowermost finely and densely stellate-pubescent, the uppermost less so; the hairs minute, both simple or forked: flowers in loose racemes, small; flowering pedicels erect or ascending, 3–7 mm. long at anthesis, sparingly pilose or more rarely glabrous; sepals oblong, obtuse, 1–1.5 mm. long, membranaceous, ½ length of petals, pilose with simple or more rarely forked hairs, subhyaline or yellowish along margin; petals small, white to pale cream color, 2.5–4 (–4.5) mm. long, oblanceolate: siliques straight or slightly curved inward, glabrous, attenuate, 1.5–3.6 cm. long, 1.5–2.5 mm. broad, strongly ascending, distinctly and prominently one-nerved

inclined to read it out of our flora and attribute his report to misidentification. I find that in my copy of Gray's Manual I have '*Minnesota*' crossed out in the range of *A. patens*, and '*Ohio*' written in. This must have been done nearly twenty years ago. Incidentally, there has been quite a lot of collection in the vicinity of Mankato (the station which is reported by Upham), and I think that if the plant occurs there, it would have turned up."

[1] Reported, no doubt erroneously, by S. M. Tracy in Cat. Phaenogam. & Crypt. Pl. of Missouri, 10 (1886). No other author records it from the state.

[2] Palmer & Steyermark, Ann. Cat. Pl. of Missouri in Ann. Mo. Bot. Gard. xxii. 375–758 (1935).

ARABIS HIRSUTA: FIG. 1, plants, × ⅖; FIG. 2, seeds, × 10.



ARABIS PYCNOCARPA: FIG. 1, type-specimen, × ⅔; FIG. 2, seeds, × 10; FIG. 3 (left), fruit, × 2.
A. HIRSUTA: FIG. 3 (right), fruit, × 2.

nearly to tip; fruiting pedicels erect or ascending, sparingly pilose to glabrous, slender, 7–13 mm. long at maturity; stigma small, flat, not cupulate, on a style 0.25–1 mm. long; seeds in two rows, narrowly elliptical to narrowly oblong, wingless, averaging 1.2 mm. long, 0.5 mm. broad.—Consp. Fl. Groen. iii. 50 (1880); Warming in Bot. Tidsk. xv. 163 (1886); Rosenvinge, Groen. Fanerogam. 673 (1892); Abromeit in Bot. Ergebn. ii. 27 (1899); Simmons, Rep. 2nd. Arct. Exped. 1898–1902, no. xvi. 68 (1909); Porsild, Vasc. Pl. W. Greenland, 376 (1912); Porsild, Fl. Disko, 83 (1926). *Turritis mollis* Hooker, Fl. Bor.-Am. i. 40 (1829); Hornem., Fl. Dan. xiii. t. 2296 (1836); Torr. & Gray, Fl. N. Am. i. 78 (1838); Walpers, Rep. i. 169 (1842); Dietrich, Synop. iii. 688 (1843); non *Arabis mollis* Steven in Mem. Soc. Nat. Mosc. iii. 270 (1812). *A. Hookeri* β *breviramosa* Abromeit in Bot. Ergebn. ii. 28 (1899). *A. Hookeri* var. *multicaulis* Simmons, l. c. 68; Ostenfeld, Medd. Groenld. lxviii. (reprint p. 12), Fl. Pl. & Ferns Greenland (1925).—West Greenland and Yukon Territory. The following are characteristic. GREENLAND: Etah, W. Greenland, *R. Robinson*, no. 31; in sinu Foulke Fjord (lat. 78° 18′) ad Etah, *Simmons*, no. 1,466 (TYPE of *A. Hookeri* var. *multicaulis*); Etah region, loamy grassy slope at head of fjord, lat. 78° 20′, long. 72° 30′, *Ekblaw*, nos. 384 and 385. YUKON: along cliffs, Klondike River, *Macoun*, no. 58,361 [Can]; hills along Klondike River, *Eastwood*, no. 117 [Can]; river-banks near mouth of Lewis River, *M. W. Gorman*, no. 1,024 [Can]. *Fl.* June–July; *fr.* July–Aug. MAP 15.

This unique Arabis is found on the western and northwestern coasts of Greenland and is represented in several herbaria which I have examined solely from that region. Abromeit remarks: "in Ostgrönland nicht beobachtet (in east Greenland not yet observed)."[1] Porsild says, in discussing its range in Greenland, "a northern type: south of the area [from 66°–70° lat.] observed in only a few places, the southmost at about 64°. North of the area extraordinary many localities in the southmost part of Nordost-Bugt."[2] And an interesting note regarding its Greenland environment is recorded by A. E. Porsild: "so far as I can ascertain, it has never been collected far from human habitations, and it has most likely been dispersed by man. At Umanaq f. inst. it is very common among the houses together with *Puccinellias*, which in lieu of *Elymus*, are frequently used for straw in the native boots (kamiks). People travelling from Umanaq to other places may easily disperse both the *Arabis* and the *Puccinellias*. Like *Alopecurus alpinus* it is a dung lover."[3]

[1] Abromeit in Bot. Ergebn. ii. 27 (1899).
[2] M. P. Porsild, Fl. Disko Island, 83 (1926).
[3] A. E. Porsild, Contr, Fl. W. Greenl. 176 (1926).

There are, in the Herbarium of the National Museum of Canada, three representative sheets of the plant from the Yukon Territory and there is every good reason to believe that it should be found in the arctic regions intermediate between this locality and Greenland. Hooker states: "Shores of the Arctic Sea between long. 107° and 130°. . . . This plant exists in Dr. Richardson's collection from the shores of the Arctic Sea,"[1] which would be exactly the region anticipated. But Mr. C. A. Weatherby, who has been kind enough to examine the type of Hooker's *T. mollis*, writes me: "labelled in Hooker's hand 'Sea Coast Arctic America, Richardson'." He further informs me that there are no other specimens of the plant in the Hooker Herbarium, so the exact locality of the Richardson plant remains unknown. The Yukon plant seems typical in every way.

In 1909, Simmons, interpreting the mode of growth as being of especial significance in setting aside new varieties, named var. *multicaulis*, based on the opinion that those plants possessing a "tap root carrying a number of branches with dense rosules of leaves and several flowering branches again springing from each rosule, the number of inflorescences thus often amounting to a dozen or more,"[2] were sufficiently different from the typical ones to warrant varietal recognition. A close scrutiny of the specimens at my disposal, however, does not satisfactorily convince me that it is either necessary or wise to separate the plants in such a manner.

Lange's description of *Arabis Hookeri*, based on Dr. Richardson's plant which Hooker had previously described as *Turritis mollis*, contains the following: "Biennis? (v. perennis), multicaulis . . ."[3] which indicates that he undoubtedly had before him just such a plant as Simmons describes. The material which I have examined consists of specimens ranging from low, caespitose plants with several branching caudices to those of four decimeters in height with simple caudices, as well as low plants with simple caudices and tall ones with branching caudices. And several sheets show intermediate forms. It appears more probable that the plants which Simmons refers to his var. *multicaulis* have taken on that habit as an edaphic adaptation. My

[1] Hooker, Fl. Bor.-Am. i. 40 (1829).

[2] Simmons, 2nd Nor. Arct. Exp. 1898–1902. no. xvi. 68. (1909).

[3] Lange, Consp. Fl. Groenl. tredie Hefte. 50 (1880). It was impossible for Lange to change Hooker's *T. mollis* to *A. mollis* because Steven had previously (Mem. Soc. Nat. Mosc. iii. 270 (1812)) described an *A. mollis*, which is a Eurasian plant and not in any way connected with this one.

reluctance to maintain the variety is increased by the use of "multicaulis" in the original description of the typical form of the plant.

Nor can I conscientiously maintain Abromeit's f. *breviramosa* as a separate form. His comment and description read: "Namentlich die D r y g a l s k i schen Exemplare erwecken den Eindruck unverästelter einfacher Pflanzen, wodurch sie beträchtlich von der Tracht der typischen Form abweichen. Die kurzen blütentragenden Aste sind stets kürzer als die Stengelblätter, in deren Achseln sie entspringen. Im übrigen tragen die Exemplare den Charackter der *A. Hookeri*. Auch diese Form, die ebenfalls sehr reichblütig ist, dürfte nur zweijährig sein."[1] Typical *A. Hookeri* possesses such widely diverse habits, due to environmental factors, that it seems quite hopeless to attempt to segregate these as varieties and forms, especially since all the other characters of the plant are quite constant.

10. A. DIVARICARPA Nelson. Biennial or rarely perennial: stem erect, 2–9 dm. high, branched at base or above or simple, finely and sparingly hirsute at extreme base with appressed simple or forked hairs or glabrous throughout: radical leaves oblanceolate-spatulate to narrowly oblanceolate in basal rosettes, 2–6 cm. long, 4–10 mm. broad, acute, dentate to denticulate or very rarely subentire, finely and evenly pubescent on both surfaces with minute stellate hairs, petiolate, the petioles very narrowly winged and finely stellate-pubescent; cauline leaves narrowly oblong to linear-lanceolate, imbricate to subremote, erect or strongly ascending, 1.5–6 cm. long, 3–10 mm. broad, sessile with an auriculate or sagittate base, acute, the extreme lowermost subentire to entire, the uppermost quite entire, glabrous on both surfaces or very rarely the extreme lowermost occasionally sparingly stellate-pubescent: flowers in loose racemes; flowering pedicels ascending when young, becoming wide-spreading or somewhat reflexed at anthesis, glabrous or more rarely slightly stellate-pubescent, 6–7 mm. long at anthesis; sepals 2–4 mm. long, 1–1.25 mm. broad, ½ the length of petals, linear to narrowly oblong, herbaceous, essentially glabrous, or more rarely with a few scattered stellate hairs, green with a whitish or hyaline margin; petals pinkish to pale purple, rarely white, oblanceolate-spatulate, 5.5 (5)–8 mm. long, 0.5–1.5 mm. broad at apex: siliques straight or subarcuate, the uppermost and youngest suberect, the lowermost and older suberect to widespreading or subarcuate or subreflexed, glabrous, 2.5–9 cm. long, 1.25–2.5 mm. broad, prominently one-nerved two thirds of their length or often to the tip, fruiting pedicels ascending or divaricately spreading or more rarely subdeflexed, glabrous, 5–12 (14) mm. long at maturity depending on robustness of plant; stigma small, on a short style 0.25–0.5 (0.75) mm. long; seeds when young definitely in

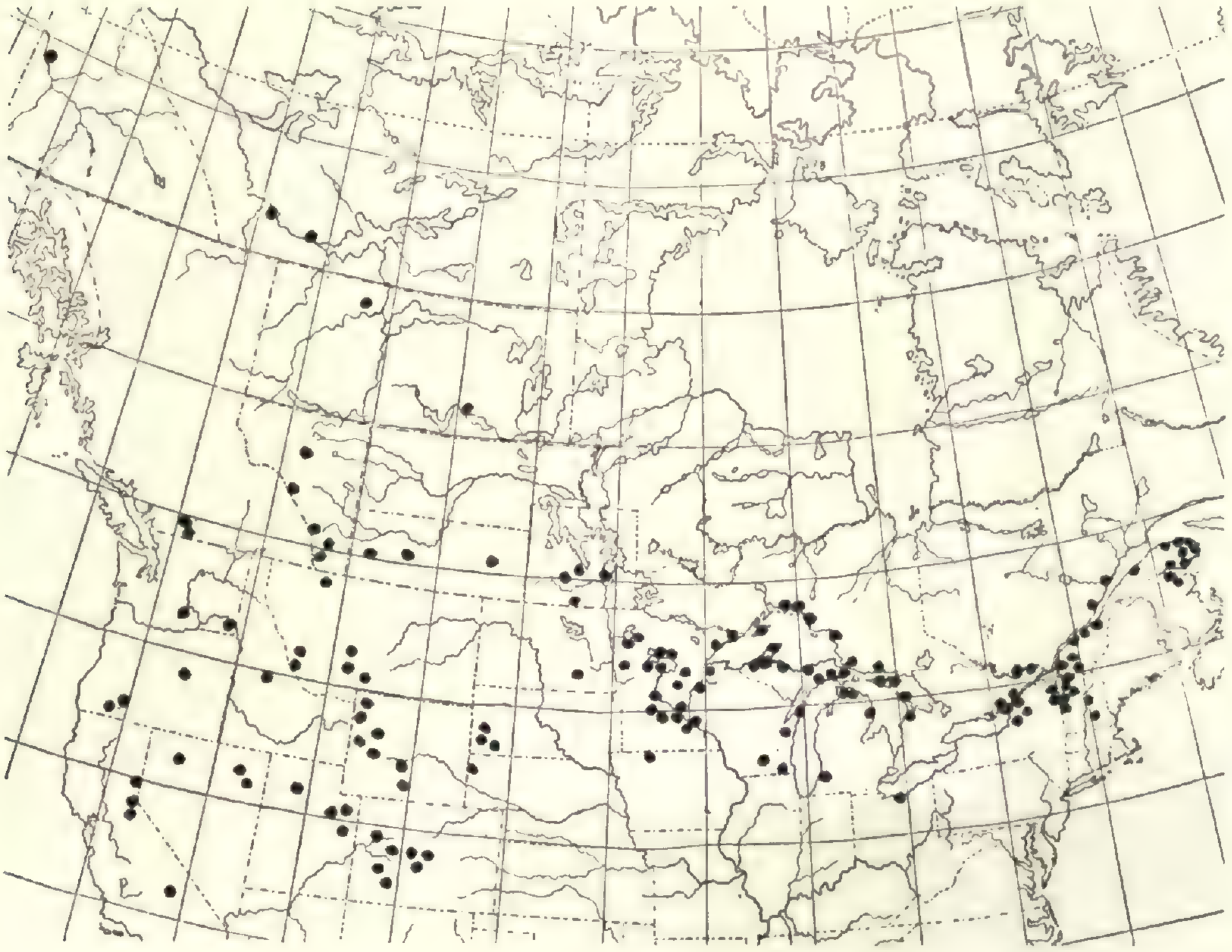
[1] Abromeit, l. c.

two rows but at maturity usually only in one due to abortion of one series, orbicular to oblong, 1–1.5 mm. in diameter, narrowly winged all around. Two varieties occur in eastern North America.

Siliques 1.25–2.25 (–3) mm. broad ..... var. *typica.*
Siliques 0.75–1.25 mm. broad ..... var. *stenocarpa.*

Var. **typica.** *A. divaricarpa* Nelson in Bot. Gaz. xxx. 193 (1900); Coulter & Nelson, Man. Rocky Mt. Bot. 226 (1909); Rydberg, Fl. Rocky Mts. 362 (1917). *Turritis brachycarpa* T. & G., Fl. N. Am. i. 79 (1828); Eaton & Wright, N. Am. Bot. ed. 8: 463 (1840); Walpers, Rep. i. 130 (1842); Gray, Man. 37 (1848). *A. Drummondi* var. *brachycarpa* Gray, Man. ed. 5: 69 (1867). *A. confinis* Watson in Proc. Am. Acad. xxii. 466 (1887) in part; Watson & Coulter in Gray, Man. ed. 6: 67 (1889) in part; Watson in Gray, Synop. Fl. N. Am. i. 163 (1895) in part. *A. confinis* var. *brachycarpa* Watson & Coulter in Gray, Man. ed. 6: 67 (1889); Watson in Gray, Synop. Fl. N. Am. i. 163 (1895). *A. brachycarpa* Britton in Mem. Torr. Bot. Club v. 174 (1894); Brit. & Brown, Ill. Fl. ii. 150 (1897); Britton, Man. Fl. 464 (1901); Fernald in Rhodora v. 231 (1903); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Rydberg, Fl. Rocky Mts. 361 (1917) and Fl. Pr. & Pl. 381 (1932); Marie-Victorin, Fl. Laurent. 261 (1935); non *Arabis brachycarpa* Ruprecht, Fl. Cauc. 73 (1869).—Quebec to central New York, west along the Great Lakes region and Great Plains, thence to Yukon, British Columbia, Washington, Oregon and California. The following are characteristic. Quebec: common in sand dunes, Tadousac, Saguenay Co., *Collins & Fernald,* 1 Sept., 1904; dry rocky bluff above Rivière du Gouffre, near Baie St. Paul, Charlevoix Co., *Stebbins,* nos. 792 and 794 (no. 794 as *A. Drummondi*); sur les sables, La Peninsule, Baie de Gaspé, Gaspé Co., *Victorin, Brunel, Rolland et Rousseau,* no. 17,365; rocky headlands by the Gulf of St. Lawrence east of Marsouin River, Gaspé Co., *Fernald & Pease,* no. 25,112 (as *A. Drummondi*); limestone conglomerate cliffs, peak west of Baptiste Michaud's, Bic, Rimouski Co., *Collins & Fernald,* 16–18 July 1904; sur rochers en compagnie de *Juniperus horizontalis,* Grosse Isle, Montmagny Co., *Victorin et al,* no. 40,030; vicinity of Cap a L'Aigle, *Macoun,* nos. 66,695; 66,696; & 66,697; foot of Eagle's Cliff, Owl's Head Mountain, Lake Memphremagog, *E. Faxon,* 27 & 29 June 1885. New Brunswick: Eel River, Restigouche Co., *John Brittain,* 1 Aug. 1888 (as *A. confinis* var. *brachycarpa*); rocky banks, Campbellton, *Chalmer,* no. 1,674 (as *A. Drummondi*). New Hampshire: Walpole, *W. H. Blanchard,* no. 75 (as *A. laevigata*); Hanover, *C. H. Hitchcock,* 20 June 1883) [NY]. Vermont: dry sandy soil, R. R. embankment, Burlington, *N. F. Flynn,* 12 July 1903; Pease Mt., Charlotte, *Pringle,* Pl. Exsicc. Gray. No. 554; Ferrisburg, *F. H. Horsford,* 17 June 1881, no. 1. New York: lake-shore, Port Henry, *Brainerd,* 27 May 1881; Wells Island, Thousand Islands, *Bicknell,* no. 4,357 [NY]. Ontario: dry banks of the Moira, *Macoun,* no. 134; dry

rocky soil of talus, Ferguson Mt., Temagami Forest Reserve, *W. R. Watson*, no. 976; dry limestone boulders, foot of cliffs, Barrow Bay, Bruce Co., *Stebbins et al.*, nos. 133 and 134; Dunk's Bay, Tobermory, Bruce Co., *Krotkov*, no. 7,461; sandy beach of Lake Superior, Agawa Bay, *Pease*, no. 17,979; dry cliffs, Gore Bay, Manitoulin Island, *Pease & Ogden*, no. 25,019; rocks and sand, Jack Fish, Thunder Bay District, *Pease & Bean*, no. 23,478; barrens, Schreiber, Thunder Bay District, *Pease & Bean*, no. 23,542. MICHIGAN: Isle Royale, *W. S. Cooper*, no. 278; crevices and talus of greenstone bluffs in dry woods



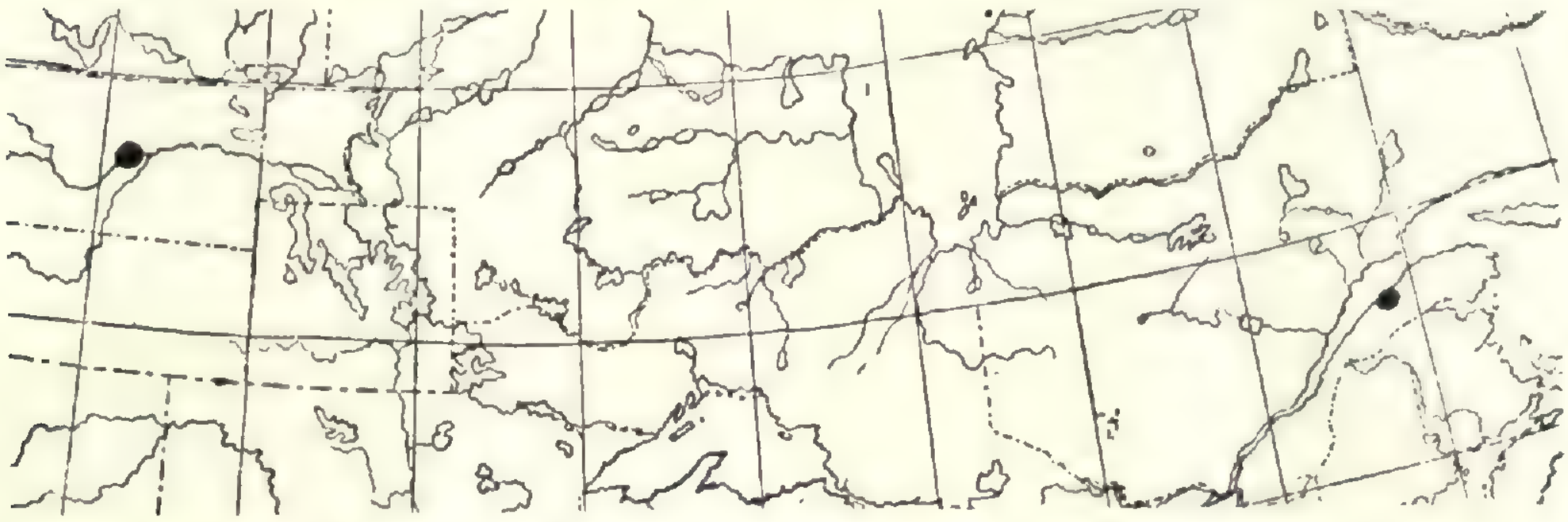
MAP 16. Range of ARABIS DIVARICARPA, var. TYPICA.

near Cliff, *Fernald & Pease*, no. 3,329; open ledges, Mt. Houghton, Keweenaw Co., *Pease & Ogden*, no. 25,188. OHIO: Strontium Island, Lake Erie, near Sandusky, *A. E. Ricksecker*, 28 May 1894 [US]. WISCONSIN: Ephraim, Door Co., *E. J. Kraus et al.*, 30 May 1926; wooded limestone talus, High Cliff, Calumet Co., *Fassett*, no. 16,226; Delavan Lake, Delavan, *S. C. Wadmond*, no. 1,780. MANITOBA: Lake Winnipeg Valley, *Bourgeau*, 1857 and 1859 (both as *T. patula* Graham); Elk Island, Lake Winnipeg, *J. M. Macoun*, 20 July 1884 (as *A. Drummondi*) [NY]; thickets and open prairie, Sewell, *Macoun*, no. 12,373 (as *A. confinis*) [Can]; Carberry, *Macoun & Herriot*, no. 69,862 [NY]; Lothair, *Macoun & Herriot*, no. 69,862a [NY]. MINNESOTA: sand, bank of Lake Itasca, Clearwater Co., *J. B. Moyle*, no.

110; Mississippi banks, *J. H. Schuette*, 1 July 1881 (as *A. laevigata*); Fort Snelling, *E. A. Mearns*, 11 May 1891; talus slope below calcareous cliff, Grand Portage, Cook Co., *Butters & Buell*, no. 368 (as *A. laevigata*). Iowa: dry wood, Iowa Lake, Emmet Co., *Cratty*, 19 May 1900 [Mo]. South Dakota: Elk Canon, Black Hills, elev. 4,000–5,000 ft., *Rydberg*, 29 June 1892, (as *A. Holboellii*) [US]; Custer, Black Hills, alt. 5,500, *Rydberg*, 5 June 1892 (as *A. Holboellii*) [US]. Nebraska: hillside, Kiwa Valley, Scott's Bluff Co., *Rydberg*, 28 July 1891 [US]. North Dakota: on rocks in open woods of hillside, Kathryn, *H. F. Bergman*, no. 1,446 [Mo]. Mackenzie: dry slopes, Fort Simpson, Mackenzie River, *Miss E. Taylor*, 10 July 1899 (as *A. confinis*) [Can]; Fort Providence, Mackenzie, *Preble & Cary*, no. 32 [US]. Saskatchewan: Saskatchewan, *Bourgeau*, 1858 (as *T. patula* Graham); gravelly banks, Clearwater River, lat. 56°, *J. M. Macoun*, no. 1,665 [Can]; prairie, Old Wives Creek, *Macoun*, no. 10,406 (as *A. confinis*) [Can]; thickets, Cypress Hills, *Macoun*, no. 3,072 (as *A. confinis*); rocky and sandy banks of rivers, west of Touchwood Hills, *Macoun*, no. 1,767. Alberta: trail to Lake O'Hara, *Macoun*, no. 64,517; Pine Lake Dist., Wood Buffalo Park, *Raup*, no. 2,486; below Wapta Lake, *Macoun*, no. 64,513; shore of Waterton Lake, foothills of Rocky Mts., *Macoun*, no. A1,004 (as *A. confinis*); Rocky Mts, *Bourgeau*, 1858 (as *T. retrofracta*); vicinity of Banff, gravelly bank, alt. 5,000 ft., *W. C. McCalla*, no. 2,254 [US]. Montana: dry stony places, Middle Creek, Bozeman, 4,500 ft., *Blankinship*, no. 29 [US]; gravelly roadside, Hudson Bay Divide, about 13 miles west of Browning, Glacier Co., alt. about 6,100 ft., *Hodgdon & Rossbach*, no. 72; drying hillsides above Daly Creek on Skalkaho Road, Granite Co., elev., 7,000 ft., *C. L. Hitchcock*, no. 2,067. Idaho: gravel bar, Squaw Creek near Clayton, Custer Co., *Macbride & Payson*, no. 3,386 [US]. Wyoming: on stony and sandy banks of Yellowstone Lake, *Nelson & Nelson*, no. 6,622 (isotype); gravel flat, Jackson Hole, Lincoln Co., alt. 6,700 ft., *Payson & Payson*, no. 2,194 (as *A. Macounii*); sand bars in Horse Creek, 7 miles west of Merna, Sublette Co., *Payson & Payson*, no. 2,742. Colorado: open forest, vicinity of Como, 10,000 ft. *Crandall & Owen*, no. 42; open rocky bank, mountains above Silverton, San Juan Co., alt. about 9,300 ft., *Hodgdon & Rossbach*, no. 7; Clear Creek, *Wolf & Rothrock*, no. 650. Utah: open flats, Young's Springs, Uintah Mts., *Goodding*, no. 1,198 (as *A. Holboellii*); Weber River Valley, *Hayden*, May–June 1870 [Phil]. Nevada: West Humboldt Mts., 6,000 ft. alt., *S. Watson*, June 1868, no. 74 in part; Martin Creek, Elko Co., *P. B. Kennedy*, no. 4,485 [Phil]. California: near Castle Peak, Nevada Co., *Heller*, no. 7,069 (as *A. columbiana*); Wheats Meadow Ranger Sta., Stanislaus Forest, Tuolumne Co., *Eggleston*, no. 9,282 [US]; Farewell Gap region, Tulare Co., *Culbertson*, no. 4,523 (as *A. Drummondi*); Lake Tahoe Region, *Eastwood*, no. 125 [US]. Oregon: open grassy forest of *Pinus Murrayana*, about 5,900 ft., Crater Lake National Park,

Heller, no. 12,630 (as *A. Lyallii*); hill near Dixie Station, Blue Mts., Grant Co., 5,500 ft., *Henderson*, no. 5,291; Ashland Butte, *Henderson*, no. 13 (as *A. hirsuta* var. ?). WASHINGTON: Clemens Mts., Yakima Co., *Henderson*, no. 2,388 in part (as *A. Cusickii*); sandy soil, open ridge and in brush, Godman Springs, Blue Mts., Columbia Co., *Constance et al.*, no. 1,178. BRITISH COLUMBIA: Skagit Valley, between lat. 49° and 49° 15′ and long. 121° and 121° 20′, 5,500 ft. alt., *J. M. Macoun*, no. 70,824; Lake House, Skagit River, *J. M. Macoun*, nos. 70,822 and 70,823 (as *A. columbiana*) [Can]. YUKON: Cemetery Hill, Dawson, *Eastwood*, no. 246. *Fl.* May–June; *fr.* June–Aug. MAP 16.

Var. **stenocarpa**, n. var., siliquis 0.75–1.25 mm. latis.—Calcareous ledges, Quebec and Saskatchewan. The following are characteristic. QUEBEC: ridges east of the village, Bic, *Fernald & Collins*, no. 1,057 (TYPE in Gray Herb.); limestone and limestone conglomerate ridges



MAP 17. Range of ARABIS DIVARICARPA, var. STENOCARPA.

from Pointe aux Corbeaux to Cap Caribou, Bic, *Fernald & Collins*, nos. 1,058 and 1,059; sur le conglomerat nu, Pointe du Vieux, Bic, *Rousseau*, no. 26,391; Le Bic, *Louis-Marie et al.*, no. 24,438. SASKATCHEWAN: near Prince Albert, lat. 53°, *Macoun*, no. 12,376 (as *A. confinis*). MAP 17.

Ruprecht, in 1869, described a plant from the Caucasian region of Eurasia, which he called *A. brachycarpa*,[1] but it is in no way whatever associated with the North American plant which has been passing as *A. brachycarpa* (T. & G.) Britton. According to the homonym rule, Ruprecht's publication invalidates the name "*brachycarpa*" for the plant under discussion, and for it we must take up the next available name which is *A. divaricarpa* A. Nelson. Although Torrey & Gray considered the plant a distinct species,[2] Gray himself later considered it to be a mere variety of his *A. Drummondi*,[3] and Watson, transferring *A. Drummondi* to *A. confinis*, according to his description and citation

[1] Ruprecht, Fl. Cauc. 73 (1869).
[2] T. & G., l. c.
[3] Gray, Man. ed. 5: 69 (1867).

of specimens, included the Torrey & Gray plant in it.[1] Two years hence, however, he and Coulter segregated var. *brachycarpa* from typical *A. confinis*,[2] but it was not until 1894 when Britton made the combination *A. brachycarpa*,[3] based on the Torrey & Gray plant, that it was again given specific rank. Fernald, studying the "*confinis-brachycarpa-Drummondi*" group in 1903, clearly elucidated the fact that *A. brachycarpa* was quite separate from *A. Drummondi*, and that Watson had used the name *A. confinis* to include both plants.[4] Fernald also included Nelson's *A. divaricarpa* as a synonym for our plant, but the homonym rule was not in existence at that time, so he was in no way obligated to discard the name *brachycarpa* in favor of *divaricarpa*.

Graham's description of *Turritis patula*[5] so exactly fitted this plant that I asked Mr. C. A. Weatherby if he would be kind enough to compare it with the Graham type at the Royal Botanic Garden at Edinburgh. Furthermore, the fact that one very old sheet of this species in the Gray Herbarium was labelled "*T. patula* Graham" (*Bourgeau*, collected in Saskatchewan in 1858) suggested the possibility that that name might actually be the correct one for the plant. But Mr. Weatherby, returning from Europe in November 1935, sadly informed me that no specimen had been preserved at Edinburgh by Graham. Gray misunderstood the Graham plant, incorrectly determining *Fendler's* no. 27 as *Turritis patula*,[6] which specimen has since been included in *A. Fendleri* (Watson) Greene; and Torrey, following Gray, but going one step further, made the combination *Arabis patula*.[7] Nevertheless, in the absence of any type specimen[8] and in view of the probability of Graham's plant being any one of several Rocky Mountain species, I am discarding Graham's name entirely, even as a synonym, until I am more certain just what plant he described.

In habit *A. divaricarpa* varies considerably. It may be robust, with

[1] Wats. in Proc. Am. Acad. xxii. 466 (1887).

[2] Watson & Coulter, l. c.

[3] Britton in Mem. Torr. Bot. Club, v. 174 (1894).

[4] Fernald, l. c.

[5] Graham in Edin. New Phil. Journ. 350 (July–Oct. 1829).

[6] Gray, Pl. Fendlerianae in Mem. Am. Acad. ser. 2. iv. 7 (1849).

[7] Torrey, Bot. Mex. Bound. Surv. ii. 33 (1859).

[8] Although Mr. Weatherby very kindly compared two sheets labelled *T. patula* from the Arnott Herbarium and assured me that they matched our plant in every particular, he emphasized the fact that they were merely determinations made by contemporaries of Graham, and should in no way be construed as Graham's conception of the plant.

a weedy appearance (growing in an alluvial or a sandy habitat), or rather delicate, having a fragile appearance (in which case it would most likely be found growing in limestone rock-crevices or talus slopes). The position of its fruiting pedicels and siliques also varies to a great extent, the former being ascending, divaricately spreading or even slightly deflexed, while the latter usually are suberect when young, but as maturity approaches invariably become widespreading and somewhat deflexed. The pods may be either straight or somewhat arcuate and their apices may vary from slightly obtuse to subacuminate. The length of the siliques also shows considerable variance, ranging from 3 to 9 cm. (a very few specimens possess siliques as small as 2 cm. long) and, although every effort has been made to segregate the plants into two series, those possessing short siliques (3–4.5 cm. long) and those possessing longer ones (4.5–9 cm. long) the efforts were finally abandoned. The name "*brachycarpa*" itself instantly suggests plants belonging to the first series and the type specimen of *T. brachycarpa* in the Herbarium of the New York Botanical Garden is actually one of these. But when we find specimens possessing both long and short siliques on the same plant the futility of separating them is obvious. The explanation of this fact, that some plants possess both short and long fruits, seems to be, that, after the original fruit of the main raceme has matured and the seeds are ready to be disseminated, several secondary branches arise from the axils of the leaves on the main stem and quickly bear flowers and fruits. The fruit of these secondary racemes is almost invariably of the short series. Hence the occurrence of plants with mature or overmature fruits of the long-fruited series bearing short fruits on secondary racemes is quite common. There are, of course, a few plants which possess short siliques entirely, but I am unable satisfactorily to segregate these.

The sepals are more often essentially glabrous, but not infrequently possess a few scattered minute hairs similar to those of the basal leaves. The seeds are, when young, very distinctly in two rows in the pod but at maturity one row seems to develop at the expense of the other so that a ripe pod contains, very commonly, only one row of seeds. When two rows occur in such a pod one of them is dwarfed and very irregular in outline. The pubescence of the basal leaves, although always of a stellate type, varies in quantity, some leaves being nearly glabrous, with only a few scattered hairs. Those of the first year, however, are always more stellate-pubescent than those of the

second year, and I have seen some specimens displaying tufts of 2nd year basal leaves which were quite glabrous, although the old leaves of the first year's growth were decidedly stellate-pubescent.

Geographically, *A. divaricarpa* is found in the Rocky Mountains of the United States and Canada, throughout British Columbia and Alberta to the Yukon Territory and the Mackenzie River, extending eastward over the Great Plains through the Great Lakes region to northwestern New England and southern Quebec around the region of the St. Lawrence River, eastward to the tip of the Gaspé Peninsula. It is found in limestone habitats, chiefly in rocky crevices or on talus slopes, but it also grows abundantly on sandy beaches and in various alluvial habitats.

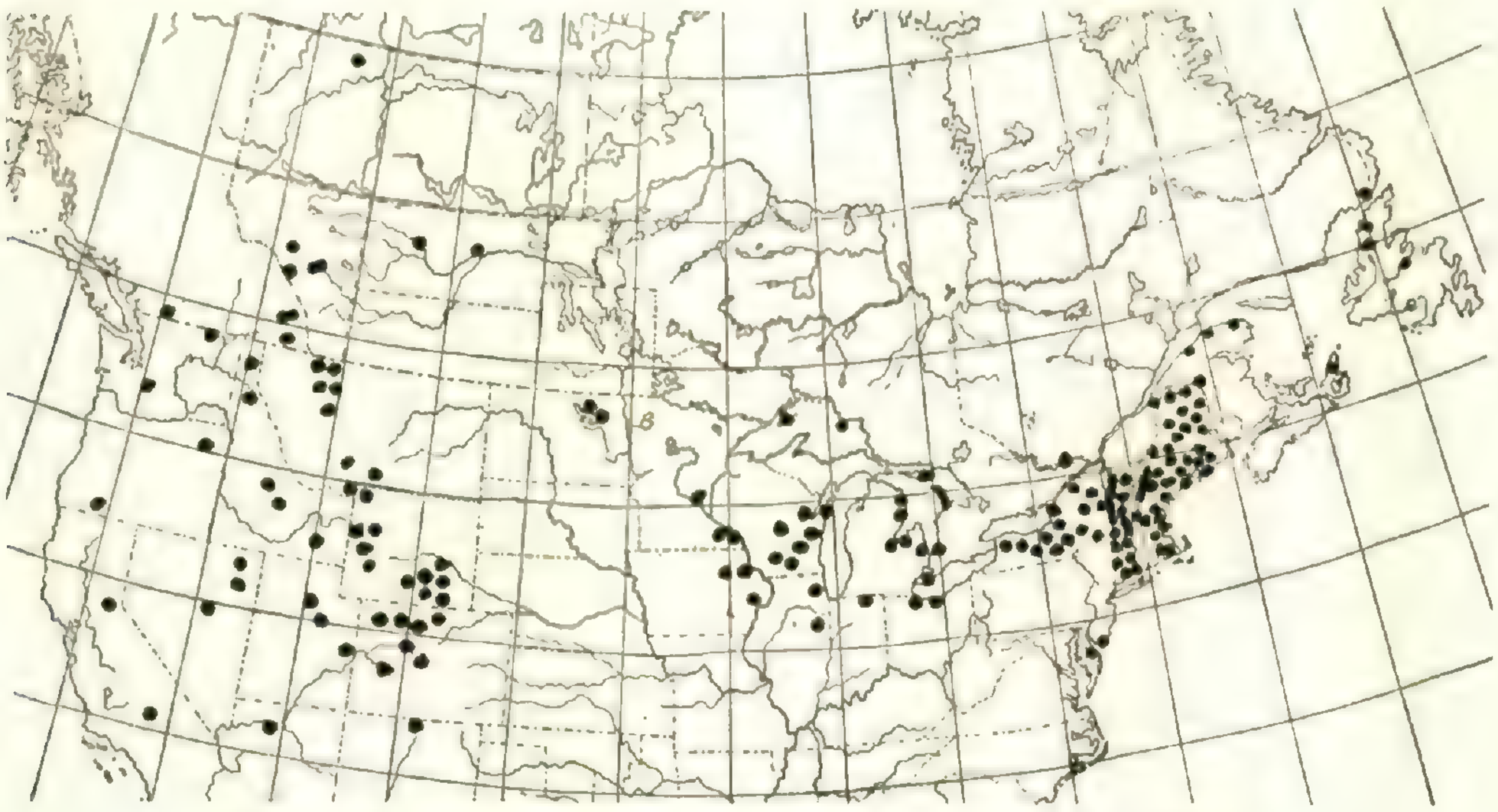
Var. *stenocarpa* has very narrow siliques (0.75–1.25 mm. broad), whereas the typical form of the species has them broader (1.25–2.35 mm.). Except for the station at Bic, Quebec, where both forms of the plant grow in close proximity, the only other locality for var. *stenocarpa* which I have been able to discover is at Prince Albert, Saskatchewan.

11. A. Drummondi Gray. Biennial, becoming perennial in western part of its range, somewhat weedy in appearance: stem erect, 2–9 dm. high, simple or branching at base and above, glabrous throughout to somewhat glaucous or very rarely scantily appressed-pubescent at extreme base: radical leaves spatulate to oblanceolate, in a basal crown, 3–9 cm. long, 5–20 mm. broad, dentate to serrate or subentire, acute to subacuminate, tapering at base to a slender winged petiole, glabrous throughout or rarely sparingly ciliate on the petioles with mostly simple or rarely two-forked hairs; cauline leaves linear-lanceolate to lanceolate-oblong, imbricate to subremote, 2–9 cm. long, 4–15 mm. broad, sessile with a sagittate or very rarely auriculate base, acute to subacuminate, sparingly dentate to entire, glabrous on both surfaces: flowers in loose racemes; flowering pedicels glabrous, erect, 7–10 mm. long at anthesis; sepals linear-oblong, ½ as long as petals, 3–4 mm. long, glabrous, acute to subacute, herbaceous; petals pink to purple (often white when dried), 5–10 mm. long, 0.5–2 mm. broad at apex: siliques straight or very rarely slightly curved, normally flattish, erect or ascending, often subappressed, 4–10 cm. long, 1.5–2.3 mm. broad, obtuse or rarely subacute, glabrous, one-nerved at least beyond the middle and frequently to the top; fruiting pedicels strictly erect, appressed to subappressed, glabrous, 9–15 mm. long at maturity; stigma flattish, on a short style not exceeding 1 mm. long, or rarely sessile to subsessile; seeds in two rows, broadly elliptical to orbicular, averaging 1 mm. in diameter, winged narrowly all around.—A very variable species, represented by six geographical varieties:

a. Siliques 1.5–2.3 mm. broad....*b.*
b. Plants tall, not alpine (except rarely var. *oxyphylla*), 2.5–9 dm. high....*c.*
c. Basal leaves and base of stem quite glabrous or only very rarely subciliate along the margins with simple hairs....var. *typica.*
c. Basal leaves and base of stem pubescent in some form, either stellate or pseudostrigose....*d.*
d. Basal leaves and base of stem stellate-pubescent with tri-furcate hairs, never appearing strigose or strigillose.....var. *pratincola.*
d. Basal leaves and stem appearing strigose or strigillose due to a very appressed pubescence of bi-furcate (malpighiaceous) hairs.....var. *oxyphylla.*
b. Plants alpine, dwarf, subcaespitose, 1–2 dm. high....*e.*
e. Basal leaves and base of stem stellate-pubescent with bi- and tri-furcate hairs.....var. *oreophila.*
e. Basal leaves and base of stem glabrous or only sparingly ciliate along the margins with simple hairs.....var. *alpina.*
a. Siliques 2.4–3.3 mm. broad.....var. *connexa.*

Var. **typica.** *A. Drummondi* Gray in Proc. Am. Acad. vi. 187 (1866) and Manual, ed. 5: 69 (1869); Porter & Coulter, Fl. Colo. 6 (1874); Watson in Gray, Syn. Fl. N. Am. i. 166 (1895) in part; Britton & Brown, Ill. Fl. ii. 150 (1897) in part; Fernald in Rhodora, v. 230 (1903); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Coulter & Nelson, Man. Rocky Mt. Bot. ed. 2: 226 (1909); Rydberg, Fl. Rocky Mts. 359 (1917) and Fl. Pr. & Pl. 381 (1932); Smiley, Fl. Sierra Nevada, 206 (1921). *Arabis laevigata* Hooker, Fl. Bor.-Am. i. 43 (1829), non Poiret. *Turritis stricta* Graham in Edinburgh New Phil. Jour. 350 (1829); Hooker, l. c. 40; T. & G. Fl. N. Am. i. 79 (1838); Walpers, Rep. i. 129 (1843); Dietrich, Synop. iii. 688 (1843); Torrey, Fl. N. Y. i. 53 (1843); Gray, Man. 36 (1848); Gray, Ill. Gen. i. 144. t. 59 (1848); Wood, Classbk. 229 ed. of 1861, non *Arabis stricta* Hudson. *Streptanthus angustifolius* Nutt. ex T. & G. l. c. 76, non *A. angustifolia* Lam. Dict. i. 220 (1789). *Turritis glabra* L. var. β T. & G. l. c. 78. *Arabis confinis* Wats. in Proc. Am. Acad. xxii. 466 (1887); Watson in Gray, Synop. Fl. N. Am. i. 163 (1895) in part; Rydberg, Fl. Pr. & Pl. 380 (1832). *Arabis brachycarpa* Britton in Mem. Torr. Bot. Club, v. 174 (1894) in part. *Turritis Drummondi* Lunell in Am. Mid. Natl. v. 236 (1918).—Southern Labrador, Newfoundland and adjacent Quebec, south to southern New Jersey and northern Delaware, west to interior California, Washington, Oregon and British Columbia. The following are characteristic. Labrador: limestone and calcareous terraces, Blanc Sablon, *Fernald & Wiegand*, no. 3,493; limestone terraces, Blanc Sablon, *Griscom*, no. 2; stream-bank west of Blanc Sablon River, *Abbe*, no. 1,205. Newfoundland: meadow below limestone escarpment, western face of Bard Harbor Hill, *Fernald & Long*, no. 28,422; turfy slopes below limestone crest, Killdevil, *Fernald, Long & Fogg*, no. 1,756; ledges and talus, north bank of Exploits River below the falls, Grand Falls, *Fernald & Wiegand*, no. 5,498. Quebec: schistose talus and wet shelves at base of Big Chim-

ney, Mt. Mattaouisse, *Dodge, Griscom & Pease*, no. 25,806; dry schistose crests and talus of Razorback Ridge, Mt. Logan, *Pease & Smith*, no. 25,807; slaty ridges east of the village, Bic, Rimouski Co., *Fernald & Collins*, nos. 1,062 and 1,063; beach below Middle Camp, Rivière Ste. Anne des Montes, *Fernald & Collins*, no. 572. New Brunswick: dry ledges, St. John River, Connors, Madawaska, *Pease*, no. 2,560. Nova Scotia: Margaree, Cape Breton Island, *Macoun*, no. 18,997 (as *A. laevigata*). Maine: shaded gravelly banks, St. Francis, *Fernald*, no. 13; banks of Androscoggin R., Canton, *Parlin*, no. 2,040; Gardiner, *Richards*, 12 May 1899. New Hampshire: rocky cliffs by railroad, Crawford Notch, *Greenman*, no. 1,107 (as *A. laevigata*); near Willey House, White Mt. Notch, *C. E. Faxon*, 7



Map 18. Range of Arabis Drummondi, var. typica.

June 1878; west base of Fall Mt., Walpole, *Fernald*, no. 102. Vermont: Round Mt., Shrewsbury, *Eggleston*, no. 1,025; rocky talus, Fairlee, *Pease*, no. 20,300 [Amh]; gravelly river bank, South Vernon, *Fernald & Floyd*, 11 May 1912. Massachusetts: river bank, Tewksbury, *C. H. Knowlton*, 9 May 1903 (as *A. laevigata*); valley in sand dunes, Plum Island, *Mulliken*, 16 Aug. 1916; Rocky Mt., Greenfield, *E. F. Williams*, 17 June 1910. Rhode Island: Woonsocket, *Pratt*, 1847 (as *Turritis stricta*, "*T. glabra*"); rocky ridge about 1 mi. north of Albion R. R. Sta., Cumberland, *Collins*, 26 May 1931; on rocky ridge, Snake Den, Johnston, *Collins*, 14 May 1933. Connecticut: wooded hammock at mouth of Connecticut R., Old Lyme, *Graves*, no. 121; shaded sandstone ledges, East Granby, *Weatherby*, no. 4,442. New York: moist rocks, Canton, *O. P. Phelps*, no. 528; Lewiston, *G. W. Clinton*, 1864 (as *T. stricta*); rocky wooded banks, Black River, Watertown, *H. D. House*, no. 8,940; on dry bank, ravine beyond McKinney's Glens, Lansing, *Wiegand*, no. 2,412. New Jersey: white sand among cedars and beach plum, near Bay Shore, Cape May

Point, *W. Stone*, 10 May 1924 (as *A. glabra*); sand hills, Cape May Point, *Mackenzie*, 20 June 1919 [NY]; dry open sandy thickets among dunes, Cape May Point, *Long*, no. 21,517 [Phil]. DELAWARE: field near Concord Station, Wilmington, *Commons*, June 1897. ONTARIO: Cove Island, Tobermory, Bruce Peninsula, *Krotkov*, no. 7,464 (as *A. hirsuta*); dry limestone boulders on shore of Georgian Bay, north of Dyer's Bay, *Stebbins & Loveless*, no. 132; sandy woods north of Oscoda, *Fernald & Pease*, no. 3,330; Pelee Point, Lake Erie, *Macoun*, no. 33,778 (as *A. laevigata*). MICHIGAN: at foot of high ridge near Harrisville, Alcona Co., *C. K. Dodge*, no. 11; Isle Royale, *Cooper*, 4 July 1909; Saginaw Bay, *C. K. Dodge*, nos. 240, 241, 242, 243 [US]. OHIO: Cedar Point, Erie Co., *Moseley*, 15 May 1893 and 24 May 1894; Green Island, Ottawa Co., *Moseley*, 25 May 1895. WISCONSIN: dry sand, Wisconsin River bottoms, opposite Sauk City, Roxbury, *Fassett*, no. 3,528; White Fish Bay, *Gillman*, 1866 (as *T. stricta*); Eagle Cliff, Ephraim, Door Co., *Pease*, no. 18,036. ILLINOIS: large colony in rich open woods near Spoon River bridge, north part of St. Joseph, *Pease*, no. 17,751; Forest Glen, *E. T. Harper*, 4 June 1892 [Wisc]; Elgin, *Vasey*, without number or date. INDIANA: gravelly wooded bank of St. Joseph's River, 1½ mi. sw. of Bristol, Elkhart Co., *Deam*, no. 33,755 [Deam]. MINNESOTA: Lake City, *Manning*, 25 June 1883 [Minn]; dry sandy flat, Rochester, *Ainslee*, no. 1,780 [Minn]; St. Cloud, Stearns Co., *Campbell*, no. 141 [Minn]. IOWA: Iowa City, *A. S. Hitchcock*, without date [Mo]; Fayette Co., *B. Fink*, June 1894 (as *A. laevigata*); Charles City, *J. C. Arthur*, 20 June 1874 [Wisc]; Johnson Co., *Fitzpatrick & Fitzpatrick*, 5 May 1895 [Mo]. NORTH DAKOTA: rocky open ground near Devil's Lake, Ramsey Co., *E. J. Palmer*, no. 36,882; in thickets, Devil's Lake, *J. Lunell*, 29 June 1902. SASKATCHEWAN: base of Mt. Wilson, north fork of north branch of Saskatchewan River, *S. Brown*, no. 999. ALBERTA: Pine Lake District, Wood Buffalo Park, *Raup*, no. 2,488; mountainside, Lake of the Clouds, Laggan, *M. A. Barber*, no. 129; Maligne Lake, *S. Brown*, no. 1,257; Mt. Molar Creek, *Macoun*, no. 64,505. MONTANA: Spanish Basin, Madison Range, *Flodman*, no. 501 [NY]; along Swiftcurrent Creek below Lake McDermott, Glacier National Park, *Standley*, no. 15,514 [US]; West Gallatin River, *Lamson-Schribner*, no. 8h in part (as *A. perfoliata*). IDAHO: Bear Valley, *J. H. Christ*, no. 1,809A [US]; moist creek-bank, Salmon River Mts., near Bonanza, *Macbride & Payson*, no. 3,426; Indian Creek Canyon, vicinity of Pocatello, *Mrs. M. E. Soth*, nos. 189 & 566 [NY]. WYOMING: dry timbered slopes, Centennial, *A. Nelson*, no. 8,736 (as *A. connexa*); dry soil, Teton Pass, *Merrill & Wilcox;* no. 930; Jackson's Hole, Lincoln Co., *Payson & Payson*, no. 2,215; dry hillsides, Bridger Peak, Carbon Co., *Goodding*, no. 1,963 (as *A. connexa*). COLORADO: in open fallen timber, Camp Creek, Larimer Co., *Goodding*, no. 1,461 (as *A. oxyphylla*); Carson, region of the Gunnison R. Watershed, *C. F. Baker*, no. 308 (as *A. oxyphylla forma* ?) [NY]; Breckenridge, *C. L.*

Shear, no. 4,560 (as *A. philonipha*) [NY]. Utah: Big Cottonwood Canyon, Salt Lake Co., *Garrett*, 12 July and 3 Aug. 1905; rock slide, La Sal Mts., Grand Co., *Payson & Payson*, no. 3,945; Alta, Wahsatch Mts., *M. E. Jones*, no. 1,177. Nevada: ridge on north side of Lamouille Canyon, Elko Co., E. Humboldt Mts., *Heller*, no. 9,372 (as *A. philonipha*) [NY]; among rocks, Pine Mt., vicinity of Gold Creek, *A. E. Hitchcock*, no. 1,173 [US]. Arizona: north rim, Grand Canyon, *Eastwood & Howell*, no. 967. New Mexico: grassy slopes, Costilla Park, Jaos Co., *Mrs. O. S. J.*, no. 58. California: Donner Pass, in granite, *Heller*, no. 13,319; Death Valley, near Mineral King, Tulare Co., *Coville & Funston*, no. 1,450. Oregon: Powder River Mts., *Piper*, no. 2,507; Ashland Butte, Siskiyou Mts., *Cusick*, no. 2,970 (in part, the other specimen on the sheet being var. *pratincola*) [Minn]. Washington: rocky talus slope in Angels Pass, Okanogan Co., *J. W. Thompson*, no. 7,044; in rocky ground, Mt. Rainier, *Piper*, no. 2,065; north of Mt. Henderson, *Henderson*, no. 2,396. British Columbia: Cornwall Hills, *McEvoy*, no. 5,097 (as *Arabis confinis*); Avalanche Path, Emerald Lake, *H. Peterson*, no. 52; rocky slopes, Chilliwack Lake, *J. M. Macoun*, no. 33,790 [Can]; crevices of rocks, Toad Mt., Kootenay Lake, *J. M. Macoun*, no. 1,740 [Can]. *Fl.* May to July; *fr.* May to August. Map 18.

Var. alpina Watson. Perennial, low, 1–2 dm. high; caudex multicipital; plant often caespitose: basal leaves glabrous or slightly ciliate on petioles; petioles glabrous or often ciliate to subciliate with both simple and bifurcate hairs.—Watson in Bot. King's Exp. (40th Parallel), v. 18 (1871) in part; Porter & Coulter, Synopsis Fl. Colorado, 6 (1874). *A. Lyallii* Watson in Proc. Am. Acad. xi. 122 (1876) in part; Brewer & Watson, Bot. Calif. i. 32 (1876); Coulter, Man. Rocky Mt. Bot. 20 (1885); Watson in Gray, Synop. Fl. N. Am. i. 166 (1895); Howell, Fl. Nw. Am. i. 44 (1897); Piper, Fl. Wash. 295 (1906); Frye & Rigg, Nw. Fl. 189 (1912); Rydberg, Fl. Rocky Mts., 359 (1917); Tidestrom, Fl. Utah & Nevada, 244 (1925); all in part. *A. Albertina* Greene in Pittonia, iv. 196 (1900); Rydberg, Fl. Rocky Mts., 359 (1917).—Alpine habitats above 5,000 ft. altitude, Alberta and British Columbia, south to Colorado, Utah, Nevada and California. The following are characteristic. Alberta: Mt. Temple, Laggan, *Butters, Holway & Rosendahl*, no. a7; alpine slopes, alt. 6,500 ft., Moose Mt., Elbow R., *Macoun*, no. 18,101 (type of *A. Albertina*) [Can]; Lake O'Hara, alt. 7,500 ft., *Macoun*, no. 64,509 (as *A. Albertina*). Montana: McDonald's Peak, Mission Range, alt. 7,500 ft., *Canby*, no. 19; McDougal Peak, vicinity of Flathead Lake, *Mrs. J. Clemens*, 31 July 1908; Old Hollowtop, near Pony, alt. 9,000 ft., *Rydberg & Bessey*, nos. 4,215 & 4,216 (as *A. columbiana*) [NY]. Idaho: ridge south from Wiessner's Peak, Coeur d'Alene Mts., alt. 2,100 m., *Leiberg*, no. 1,362; slide rock on peak, alt. 9,000 ft., Josephus Lakes, Custer Co., *Macbride & Payson*, no. 3,552 (in part); divide between St. Joe and Clearwater River, alt. 1,900 m., *Leiberg*, no. 1260;

Rocky Mts. at 7,000 ft., *Dr. Lyall*, 1861 (as *T. stricta;* type of *A. Lyallii*). WYOMING: Dunraven Peak, *Nelson & Nelson*, no. 6,698 [NY]; upper fork to head of Du Noir R., *C. C. Curtis*, 15 Aug. & 3 Sept. 1899 [NY]; crevices of rocks, Teton Mts., Jackson's Hole, *Merrill & Wilcox*, no. 1,253 [US]; Red Mt., ne. of Smoot, Lincoln Co., *Payson & Armstrong*, no. 3,638 [Mo].

COLORADO: Berthoud Pass, *L. Johnson*, no. 984 [Mo]; rocks about Berthoud, *Engelmann*, 2 Sept. 1874 [Mo]. UTAH: moist slopes below snow banks, La Motte Peak, Uintah Mts., elev. 10,500 ft., *Payson & Payson*, no. 5,043; Alta, Wahsatch Mts., alt. 11,000 ft., *M. E. Jones*, no. 1,248; Mt. Barette, *Rydberg & Bessey*, no. 7,326 [NY]. NEVADA: Clover Mts., alt. 10,000 ft., *S. Watson*, no. 75 (in part) (TYPE in Gray Herbarium). CALIFORNIA: Tamarack Trail, Tahoe, alt. 8,200 ft., *Smiley*, no. 271; on granite rocks below Donner Pass, Nevada Co., *Heller*, no. 7,121; Pyramid Peak, east side just below the summit, alt. 9,900 ft., *Smiley*, no. 118. OREGON: Cascade Mts., *Dr. Lyall*, 1860 (as *T. stricta*); cliffs of Blue Mts., head of Anthony's Creek, alt. 7,000 ft., *Cusick*, no. 2,245; Eagle Creek Mts., alt. 6,000 ft., *Cusick*, no. 1,053; summit of Paulina Peak, *M. E. Peck*, no. 9,672. WASHINGTON: Mt. Rainier, alt. 7,000 ft., *E. C. Smith*, no. 801; Mt. Adams, *T. Howell*, no. 557; loose soil among rocks, Mt. Paddo, alt. 7,000 ft., *Suksdorf*, no. 508; dry rocks of Columbia R., Klickitat Co., *Suksdorf*, 28 April 1881; high peaks, Olympic Mts., alt. 6,500 ft., *Piper*, no. 2,180. BRITISH COLUMBIA: Lake House, Skagit R., *J. M. Macoun*, no. 70,827 [Can]; among lichens on large boulder, alt. 5,600 ft., Cheam Range, no. of Chilliwack R., *J. M. Macoun*, no. 33,787 [Can.]; slopes between Mt. Field and Mt. Wapta, *M. V. Walcott*, 1919 [US]. MAP 19.

MAP 19. Range of ARABIS DRUMMONDI, var. ALPINA.

Var. **oreophila** (Rydberg), comb. nov. Perennial or more rarely biennial, low, rarely 1–2 dm. high; stem glabrous or more rarely faintly stellate-pubescent at the extreme base; basal leaves loosely stellate-pubescent on both surfaces with 2–3-forked hairs.—*A. oreophila* Rydberg in Bull. Torr. Bot. Club, xxxiv. 437 (1907); Rydberg, Fl. Rocky Mts. 359 (1917). *A. Lyallii* Watson in Proc. Am. Acad. xi. 122 (1876) in part.—Alberta to Washington, along the mountains to Colorado. The following are characteristic. ALBERTA: head of Ptarmigan Valley, *S. Brown*, no. 385; Brazeau, opposite Cataract Pass, *S. Brown*, no. 1,044 [Phil]; on "The Saddle," Lake Louise, *Macoun*, no. 64,510. MONTANA: MacDougal's Peak, nw. Montana, *D. T. MacDougal*, no. 606 [NY]; mountain sides, Midvale, *Umbach*,

Map 20. Range of Arabis Drummondi, var. oreophila.

no. 577 [NY]. Idaho: alpine slopes, Henry Lake, Fremont Co., *Payson & Payson*, no. 1,984 [NY]; mts. of central Idaho, *L. F. Henderson*, no. 13,932 [Phil]. Wyoming: mountains near Cottonwood Lake, east of Smoot, Lincoln Co., alt. 9,500 ft., *Payson & Armstrong*, no. 3,788; Union Peak, *A. Nelson*, no. 1,007 [NY]. Utah: Big Cottonwood Canyon, Salt Lake Co., *Garrett*, 28 June 1905; Alta, Wahsatch Mts., *M. E. Jones*, no. 1,248; divide between Big Cottonwood Canyon and Heber Valley, *Rydberg & Carlton*, no. 6,678 (type in Herbarium of N. Y. Botanical Garden). Nevada: Clover Mts., near Deeth, *Heller*, no. 10,231 [US]. Oregon: Eastern Oregon, *T. J. Howell*, no. 245 [US]. Washington: Sheep Mt., Okanogan Forest, Okanogan Co., *Eggleston*, no. 13,314 [US]; rocky ravines, Mt. Rainier, *J. B. Flett*, 29 August 1896 [US]. British Columbia: gravel at 7,000 ft. level, Burgess Pass, Emerald Lake, *Pease*, no. 22,358 [Amh]. Map 20.

Var. **pratincola** (Greene), comb. nov. Base of stem and radical leaves minutely stellate-pubescent, otherwise similar to var. *typica*.—*A. pratincola* Greene in Fedde, Rep. Spec. Nov. v. 244 (1908).—Alberta and British Columbia south to New Mexico and California. The following are characteristic. Alberta: Laggan, *Macoun*, no. 64,518; Porcupine Hills, *W. D. Cram*, 15 June 1920 [Can]. Montana: Bozeman, Gallatin Co., *E. J. Moore*, 19 May 1900; Middle Creek, *Blankinship*, 6 June 1900 [NY]; Middle Creek, near Bozeman, *Blankinship*, no. 30 [US]; open hillsides, vicinity Glacier Park Station, *Standley*, no. 15,014 [US]; hills, Midvale, *Umbach*, no. 62 [Wisc]. Idaho: alpine slopes, Henry Lake, Fremont Co., *Payson & Payson*, no. 1,984. Wyoming: sand bars in creek, Horse Creek, 7 mi. w. of Merna, Sublette Co., *Payson & Payson*, no. 2,739 [US]. Colorado: near Estes Park, *G. E. Osterhout*, June 1894 [Minn]. Nevada: Spooner, Douglas Co., *Baker*, no. 1,149 (type of *A. pratincola*). New Mexico: gulch of small stream on road to Park View, Tierra Amarilla, Rio Arriba Co., *Eggleston*, no. 6,481 (as *A. oxyphylla*) [NY]. California: Mono Pass, *Bolander*, 1866; Half Moon Lake, region of Lake Tahoe, *E. A. McGregor*, no. 66 [US]; Loy Lake, Siskiyou Co., *G. D. Butler*, no. 1,524 [US]; Twin Valley near Truckee, Nevada Co., *C. F. Sonne*, no. 17 [Phil]. Oregon: Ashland Butte, *Cusick*, no. 2,970 (in

Map 21. Range of Arabis Drummondi, var. pratincola.

part, the other specimen on the sheet being var. *typica*); sandy ground, summit of Horse Pasture Mt., 10 mi. s. of McKenzie Bridge, Lane Co., *M. E. Peck*, no. 2,708; sandy slope, Siskiyou Mts., 4 mi. se. of Oregon Caves, Josephine Co., *Peck*, no. 8,276; moist slopes of Strawberry Mt., Blue Mts., Grant Co., *L. F. Henderson*, no. 5,579. WASHINGTON: rocky open slopes, Mt. Angeles, Clallam Co., *J. W. Thompson*, no. 7,427; alpine rocky slopes in Chinook Pass, Yakima Co., *J. W. Thompson*, no. 9,844 [NY]. BRITISH COLUMBIA: northern British Columbia, *J. T. Rothrock*, no. 30 [US]; Old Glory Mt., between Kettle & Columbia Rivers, *Macoun*, no. 63,495a [US]. MAP 21.

Var. **oxyphylla** (Greene), comb. nov. Basal leaves closely appressed-pubescent with bifurcate (malpighiaceous) hairs, appearing strigose or strigillose.—*A. oxyphylla* Greene in Pittonia, iv. 196 (1900). *A. philonipha* Nelson ex Rydberg, Fl. Colorado, 165 (1906).[1]—High altitudes from northern British Columbia to the Black Hills, South Dakota, New Mexico and California. SOUTH DAKOTA: rim of Spearfish Canyon, near Savoy, *J. Murdoch, Jr.*, no. 4,117. SASKATCHEWAN: Cypress Hills, *Macoun*, nos. 1,744, 3,071 and 10,407 [Can]. ALBERTA: Squaw Mt., Banff, *Miss A. Pelluet*, no. 91,116 [Can]; Sheep Mt., Waterton Lake, *Macoun*, no. 10,408; summit, Tunnel Mt., *Macoun*, no. 1,667 [Can]; alpine slopes, Rocky Mts., *Macoun*, no. 100,729 [Can]. MONTANA: Cedar Mt., alt. 10,000 ft., *Rydberg & Bessey*, no. 4,217 (as *A. philonipha*) [NY]; Spanish Peak, Madison Range, *Flodman*, no. 500; Bridger Mts., *Rydberg & Bessey*, no. 4,209. IDAHO: dry gravelly woods above Yalma, *L. F. Henderson*, no. 3,536 [US]; divide between St. Joe and Clearwater Rivers, *Leiberg*, no. 1,212; ridges south from Wiesner's Peak, *Leiberg*, no. 1,374. WYOMING: dry soil, Leckie, *Merrill & Wilcox*, no. 549; Teton Mts., near Leigh's Lake, *Merrill & Wilcox*, no. 1,052; Surveyor Park, Sublette Co., *Payson & Payson*, no. 2,850; on moist slopes below snowbanks, Telephone Mines, Albany Co., *A. Nelson*, no. 7,913 (type of *A. philonipha*). COLO-

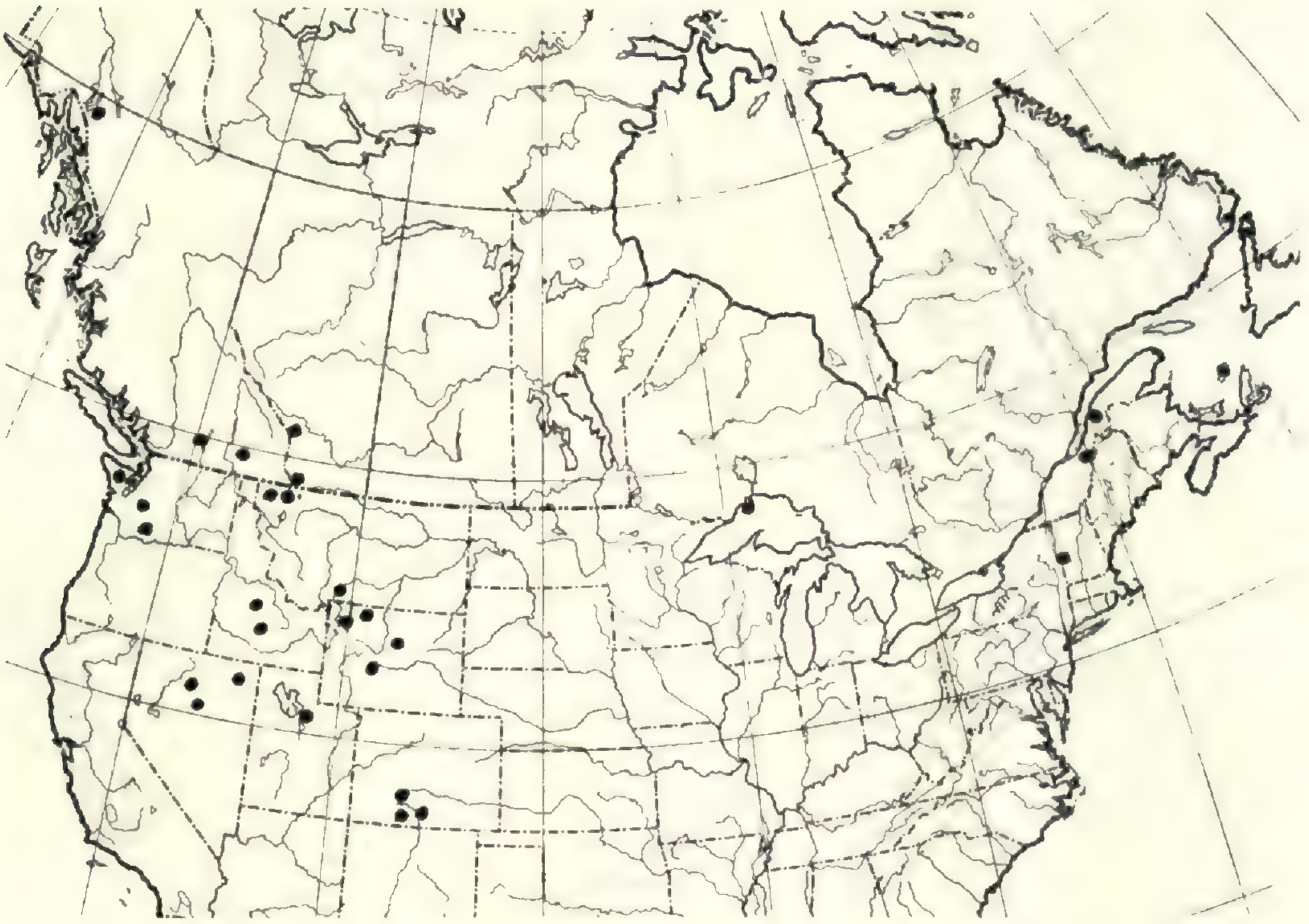
MAP 22. Range of ARABIS DRUMMONDI, var. OXYPHYLLA.

[1] See letter of Feb. 1, 1909, P. A. Rydberg to Miss Mary A. Day, Librarian of the Gray Herbarium of Harvard University, preserved in Historic Letter Files of that institution. Rydberg says, in discussing errors in his Flora of Colorado: "page 165. *Arabis philonipha* A. Nels. should be *Arabis Drummondii* A. Gray. Prof. Nelson had distributed the plant under a manuscript name. Long time ago I discovered its identity with *A. Drummondii* and corrected it in my mss. for my unpublished Rocky Mountain flora. I do not know how it happened that the correction was not made in that for the Flora of Colorado also."

RADO: grassy places among willows, Beaver Creek, Larimer Co., *Goodding*, no. 1,446; Gunnison R. Watershed, Carro Summit, *Baker*, no. 48 [Mo]; Dark Canyon, *Clements & Clements*, no. 176; near Pagosa Peak, *C. F. Baker*, no. 747 (ISOTYPE in Herbarium of Pomona College). Chicken Creek, W. La Plata Mts., *Baker, Earle & Tracy*, no. 128. UTAH: Wahsatch Mts., *S. Watson*, no. 74 in part; slope of mountain near Delano Peak, Tushar Range, *Hodgdon & Rossbach*, no. 71; common in open pine forest, Stillwater Fork, Uintah Mts., *Payson & Payson*, no. 4,980; open flats, Young's Springs, Uintah Mt., *Goodding*, no. 1,197. NEVADA: East Humboldt Mts., *S. Watson*, no. 75 (in part; in Gray Herbarium, but not the plant in the U. S. National Herbarium which is *A. Drummondi* var. *alpina*); on slopes, Bunker Hill Mt., *Tidestrom*, no. 10,928 [US]; dry open woods, 7 mi. e. of Ely, *A. E. Hitchcock*, no. 1,307 [US]. NEW MEXICO: Grass Mt., Pecos River National Forest, alt. 10,000 ft., *Standley*, no. 4,069; Navajo Indian Reservation in Tunitcha Mts., *Standley*, no. 7,539 [US]; vicinity of Ute Park, Colfax Co., *Standley*, no. 14,152 [NY]. CALIFORNIA: Mono Pass, Tuolumne River, *Brewer*, no. 1,729. WASHINGTON: near summit of Mt. Hermann, 5,500 ft., region of Mt. Baker, *J. W. Thompson*, nos. 5,742 and 5,323; rocky draw near stream, Mt. Angeles, Olympic Mts., *Thompson*, nos. 7,427 and 7,544. BRITISH COLUMBIA: west and northwest slopes of Mt. Selwyn, alt. 5,000 ft., about 56° 1′ N., 123° 39′ W., *Raup & Abbe*, no. 4,081; Cheam Range, north of Chilliwack River, *J. M. Macoun*, no. 33,489 [Can]. MAP 22.

Var. CONNEXA (Greene) Fernald. Siliques 2.4–3.3 mm. broad, otherwise as in var. *typica*.—RHODORA v. 231 (1903); Smiley, Bor. Fl. Sierra Nevada in Calif. 206 (1921). *A. connexa* Greene in Pittonia, iv. 197 (1900); Rydberg, Fl. Colo. 165 (1906).—Southern Labrador, Newfoundland and Quebec, northern New England, Michigan, Rocky Mountains west to Washington and British Columbia. The following are characteristic. LABRADOR: limestone and calcareous sandstone terraces, Blanc Sablon, Straits of Belle Isle, *Fernald & Wiegand*, no. 3,493. NEWFOUNDLAND: dryish limestone talus, western face of Doctor Hill, *Fernald & Long*, no. 28,420; mossy and turfy trap cliffs and talus, Anse aux Sauvages, *Fernald, Wiegand & Long*, no. 28,421. QUEBEC: dry ledges, Rivière du Loup, Temiscouata Co., *Fernald & Collins*, 12 & 13 July, 1904; Rivière du Loup, *Fernald & Williams*, 2 Aug. 1902; Natashquan, sur les dunes, rare, une seule colonie, *Victorin & Rolland*, no. 28,571; sur le sable sec, Ile de Havre-aux-Maisons, Magdalen Islands, *Victorin & Rolland*, no. 9,583. VERMONT: on ledges, Birch Hill, Brandon, *D. L. Dutton*. MICHIGAN: rock crevices, Rock Harbor, Isle Royale, *C. S. Williamson*, no. 2,303 [Phil]. ALBERTA: mountain slopes, Silver City, *Macoun*, 7 Aug. 1885 [Can]; prairies, foothills of Rocky Mts., Waterton Lake, *Macoun*, no. A1002. MONTANA: gravelly roadside, Hudson Bay Divide, about 13 mi. w. of Browning, *Hodgdon & Rossbach*, no. 70; open slope, vicinity of Cracker Lake, Glacier National Park, *Standley*, no. 15,865 [US];

East De Lacy's Creek, Yellowstone Park, *Rydberg & Bessey*, no. 4,210. IDAHO: along creek, above Redfish Lake, Custer Co., *Payson & Macbride*, no. 3,659; Wood River, 5 mi. above Ketcham, *L. F. Henderson*, no. 3,241 [US]. WYOMING: parks, Big Horn Mts., *W. H. Forwood*, 5 Aug. 1881–82 [US]; Gardiner, Yellowstone Park, *P. H. Hawkins*, 7–12 Aug. 1922 [US]; Union Pass, *A. Nelson*, no. 875. COLORADO: Rocky Mts., *Hall & Harbour* No. 35; lower slopes of peak on divide between Silvertown and Ourey, San Juan Mts., *Hodgdon & Rossbach*, no. 69; near Pagosa Peak, *C. F. Baker*, no. 341 (ISOTYPE of



MAP 23. Range of ARABIS DRUMMONDI, var. CONNEXA.

A. connexa); Cumberland Basin, La Plata Mts., *Eastwood*, Aug. 1892. UTAH: without locality, *L. F. Ward*, 1875 [US]. NEVADA: ridge in north side of Lamoille Canyon, Elko Co., *Heller*, no. 9,370 [US]; dry hill, vicinity of Gold Creek, *A. E. Hitchcock*, no. 1,098 [US]; dry hill, Toiyabe Forest, Bunker Hill, *A. E. Hitchcock*, no. 8,691 [US]. WASHINGTON: base of cliffs on Church Mt., *J. W. Thompson*, no. 11,283 [NY]; dry ledges, Olympic Mts., *Piper*, no. 2181; Mt. Rainier, *Piper*, no. 206X; Mt. Angeles, *J. T. Howell*, no. 7,471; north of Mt. Adams, *L. F. Henderson*, no. 2,397. BRITISH COLUMBIA: near International Boundary between Kettle & Columbia Rivers, Mt. St. Thomas, *J. M. Macoun*, no. 63,499; Tami Hy Mt., Chilliwack Valley, *J. M. Macoun*, no. 33,788; Lake Atlin, *Eastwood*, no. 638. MAP 23.

The identity of typical *Arabis Drummondi* has been thoroughly discussed by Fernald,[1] and our conception of it has not materially changed in the thirty years since his paper appeared. Through the kindness of Mr. C. A. Weatherby, the type-specimen of *Turritis stricta* Graham, on which our species is based, has been examined, and he informs me that it complies in every character with the description given by Fernald.

In the flowering stage in the field it is very easy to confuse this species with *A. glabra* and with *A. divaricarpa* (*A. brachycarpa*). From them both it may be quickly distinguished by the almost glabrous stem and basal leaves, *A. glabra* having a hirsute pubescence in great abundance on basal leaves and lowermost stem, while *A. divaricarpa* has a stellate type of pubescence on these parts. From *A. glabra* the plant may be further differentiated by its pinkish to purplish flowers (rarely white), those of *A. glabra* always being yellowish to cream-color, and by the fact that it comes into full flower about two weeks earlier than *A. glabra*.

In the eastern part of its range it is almost wholly a biennial, and found in such habitats as rocky woods, dry ledges and cliffs, sandy or rocky river banks, open fields and open sand dunes (at Plum Island, Newbury, Mass.; white sand among cedars and beach plum, Bay Shore, Cape May Point, New Jersey). Here it flowers as early as the first week in May and continues until early June, by which time it is almost always in mature fruit. But in the Rocky Mountains and westward it tends to become a perennial, although still frequently maintaining the biennial habit, and flowers from one to two months later than in the East.

Var. *pratincola* is based on *A. pratincola* Greene, the type-specimen of which (Spooner, Douglas Co., Nevada, *Baker*, no. 1,149) has the erect and subappressed siliques so characteristic of var. *typica*, but with stellate-pubescent basal leaves and base of stem. From *A. divaricarpa* it differs at once in its strict and subappressed, longer siliques, but in flower the two are very similar and it is almost impossible to make a positive identification. This is one of the best examples of the similarity of species of *Arabis* in the flowering stage. In fruit, however, the two can be easily distinguished.

The type of *A. oxyphylla* Greene, on which I have based var. *oxyphylla*, is in the Herbarium of Notre Dame University. As it was

[1] Fernald in Rhodora v. 225 (1906).

not possible for me to visit that institution to examine the type itself, and as I felt that a photograph was inadequate, I was able to borrow, through the kindness of Professor P. A. Munz of Pomona College, a sheet cited by Greene as authentic material from "Pagosa Peak [Colorado] at 10,000 ft. [collected by] C. F. Baker, 1899."[1] This variety includes all plants of *A. Drummondi* having a very characteristic appressed type of pubescence on the basal leaves. This is always more noticeable on those of the first year's growth, and plants still retaining old radical leaves are very quickly determined. Often, subsequent leaf-growth produces radical leaves which are quite glabrous, but the old marcescent leaves are usually present, at least in part, so that recognition of this appressed pubescence is not difficult. To the naked eye it seems to be strigose or strigillose but when the hairs are examined under a hand-lens they are found to be bifurcate (malpighiaceous), the branches making a complete right angle with the main axis so that they lie flat and parallel to the surface of the leaf.

Var. *alpina* was described by Watson as "a reduced subalpine and alpine form, with a few crowded purple or white flowers; glabrous or stellately pubescent. East Humboldt and Clover Mountains, Nevada, and in the Uintas; 8–10,000 feet altitude; July–Sept."[2] As he cited no actual specimens, one would naturally consider the plant in the Gray Herbarium labelled "East Humboldt Mts., Nevada, 8,000 ft., no. 75" collected by him, as the type. Unfortunately there are two different plants on one sheet, both under no. 75. One is clearly var. *oxyphylla* collected in the East Humboldt Mts.; the other is var. *alpina* as defined, collected in the Clover Mts. at 10,000 ft., and must be accepted as the type. It is a dwarf alpine specimen with glabrous radical leaves and slightly ciliate petioles, but in every other way resembles *A. Drummondi*. The obvious conclusion seems to be that Watson considered any dwarf form of *A. Drummondi* growing at high altitudes as var. *alpina*, quite regardless of the presence or absence of pubescence. But five years later, with more collections at his disposal, he described *A. Lyallii* as follows:

> Perennial and alpine or subalpine, glabrous and bright green or glaucous, or somewhat villous below with spreading hairs, especially on the margins of the petioles; rarely more or less canescent with stellate hairs: stems slender from a branching base, two to fifteen

[1] Greene, in Pittonia iv. 196 (1900).
[2] Watson in Bot. King's Exped. (40th Parallel) v. 18 (1871).

inches high, often dwarf: radical leaves oblanceolate, on slender petioles, acute, entire: the cauline oblong-lanceolate, clasping and sagittate at base: petals light pink, about three lines long, twice longer than the sepals: style none: pods straight, narrow, erect or ascending, one to three inches long: seeds in two rows, narrowly winged.—Resembling some forms of *A. Drummondi*, but distinguished by its perennial root.[1]

As the only synonym for the species he listed *A. Drummondi* var. *alpina*, but again failed to cite a specimen which might be taken for the type. However, judging from the specific name which he gave it, there is small doubt that either of the two following plants—on the same sheet in the Gray Herbarium—should be selected as the type. (1) Oregon Boundary Commission, Rocky Mts., alt. 7,000 ft., coll. *Dr. Lyall*, 1861 (as *T. stricta*); (2) Oregon Boundary Commission, Ashtnola, Cascade Mts., coll. *Dr. Lyall*, 1860 (as *T. stricta*). I have arbitrarily selected the former. Both specimens are dwarf alpine forms and possess glabrous basal leaves with slight ciliation on their petioles and are in every respect identical with Watson's no. 75 collected in the Clover Mts. of Nevada at 10,000 ft. altitude. The other components of the complex *A. Lyallii* appear to be var. *orcophila*, which is the low plant having stellate-pubescent radical leaves, and var. *pratincola*, which is the intermediate plant with stellate-pubescent basal leaves.

Var. *connexa*, as elucidated by Fernald,[2] needs no further explanation except possibly to place additional emphasis on the unusual breadth of the siliques, varying from 2.4–3.3 mm., which are exceedingly blunt at the apex. In New England only two stations are known to me, one in Vermont, and one in Maine, where it has been reported by A. H. Norton.[3]

(*To be continued*)

On Ectocarpus ovatus.—*Ectocarpus ovatus* Kjellm. was first collected by Kjellman in the western Baltic and described by him in 1877. It was very rare, and except that it has since been found in Scandinavia and Greenland, it has never been located in Europe outside of its original habitat. Later, it was figured by the late Dr. Kuckuck in a beautiful plate in Reinke's Atlas (Pl. 20).

In this country it was first collected at Edgartown, Massachusetts

[1] Watson in Proc. Am. Acad. xi. 122 (1876).
[2] Fernald in Rhodora, v. 231 (1903).
[3] A. H. Norton in Rhodora, xv. 140 (1913).

by Miss Colt and Miss Jernegan.[1] This is a part of good evidence that it was brought to us by the currents which set from northwestern Europe to eastern Greenland and then creep southward along eastern North America.

Within our limits it is always very rare, but it seems most at home in the waters of southern New England. In the last thirty-five years I have collected it at several points in southern Massachusetts and also in Narragansett Bay in Rhode Island. Some years ago it appeared occasionally at various places along the coast of Maine. For several seasons I have not been able to locate it, and I write this note in the hope that younger and more vigorous workers may meet with better success. It grows upon rocks and other algae, both red and brown. In our southern limits, it is somewhat deeply colored; but in this state, it is paler. Our forms are larger than those in the eastern Atlantic. But everywhere it is the most beautiful of this interesting genus.

It is worthy of note that what may be the same species has been collected at Sitka, Alaska by Setchell and Gardner, and hesitatingly named *E. affinis* S. &. G. And so this seems to be another instance in which because of the eastward whirl of the earth and the inertia of the water certain species evolved in the Atlantic or the Arctic are carried through the Northwestern Passage or the Arctic Ocean, and by migrating through Bering Strait have become established in the Pacific and along the western border of our continent.—R. E. Schuh, Brooklin, Maine.

NOTES ON ROCKY MOUNTAIN PLANTS

Estelle H. Kelso

On a short stay in Rocky Mountain National Park during the summer of 1936, a number of plants not previously recorded for this area were found.

Botrychium Lunaria (L.) Sw. Lawn Lake trail, alt. 9,200 feet, among *Vaccinium*, sedges and grasses, August 7, 1936; no. 308.

Botrychium lanceolatum (Gmel.) Angstroem. Lawn Lake trail, alt. 9,200 feet, among *Vaccinium*, sedges and grasses, August 7, 1936; no. 309.

Although these unusual plants were collected, identified, and recorded, they were lost in transit from Colorado. However it was

[1] See F. S. Collins, Rhodora I., p. 126, July, 1899.

thought advisable to list them here among the other new records for the Park.

Muhlenbergia cuspidata (Torr.) Rydb. Meadow near Bryson's Camp, alt. 8,300 feet, August 4, 1936; no. 310.

Sporobolus cryptandrus (Torr.) Gray. Common around Aspenglen Camp ground.

Agrostis humilis Vasey. Rocky slope on south side of Iceberg Lake, alt. 11,800 feet, August 5, 1936; no. 314.

Glyceria borealis (Nash) Batchelder. Sheep Lake, August 2, 1936; no. 315.

Puccinellia distans (L.) Parl. Along creek, Bryson's Camp, August 1, 1936; no. 312.

Carex praegracilis W. Boott. Sheep Lake, August 2, 1936; no. 318.

Juncus bufonius L. Damp ground along road near Bryson's, August 4, 1936; no. 311.

Salix petrophila Rydb., f. **graminifolia**, f. nov., folia anguste oblongo-oblanceolata, 7x25—8x40 mm.—Colorado: Rocky slope on south side of Iceberg Lake, alt. 11,800 feet, August 5, 1936, *L. and E. H. Kelso* 313 (type, in my collection).

Leaves narrower, narrowly oblong-oblanceolate; otherwise similar to the species.

Astragalus sulphurescens Rydb., var. **pinicola**, var. nov., varietati typicae similis sed calycis dentibus 3–4.5 mm. longis, non reflexis; tubo 5–7 mm. longo; foliolis obtusis.—Colorado: Dry hillsides in the rock pine association, Bryson's Camp, alt. 8,250 feet, August 8, 1936, *L.* and *E. H. Kelso* 319, 320 (type, in my collection); Long Gulch, Larimer Co., July 28, 1898, no coll.

Calyx-teeth distinctly shorter than the tube, not spreading nor reflexed in drying; leaflets obtuse; flowers mostly white, slightly yellow only after drying.

Chamaesyce serpyllifolia (Pers.) Small. Roadside near Bryson's Camp, August 6, 1936; no. 316.

Tithymalus lucidus (Waldst. and Kit.) Klotsch and Garcke. Meadow north of Bryson's Camp, August 6, 1936; no. 317.

In addition the following new forms have been noted in the Rocky Mountain area.

Disporum trachycarpum B. and H., var. **subglabrum**, var. nov., folia glabriora, pagina inferior vix vel non puberula.—Arizona: Weits Canon, crevices of rock near Flagstaff, May 2, 1891, *McDougal* 64 (type, no. 36,120 in U. S. Nat. Herb.); Mt. Lemmon, July 4, 1926, *Peebles* and *Harrison* 2177; Interior Sawmill, White River, June, 1918, *Hough*. New Mexico: Carrizo Mountains, May and June, *Matthews;* moist thicket, Navajo Indian Reservation, in the Tunitcha Mountains, August 8, 1911, *Standley* 7722.

Leaves more glabrous, scarcely or not at all puberulent on the under

side, this character evident in young as well as mature specimens; stems sometimes glabrous; otherwise similar to the species.

Salix monticola Bebb, var. **neomexicana**, var. nov., ramulis gemmisque persistenter pubescentibus; foliis plus minusve oblongo-oblanceolatis.—NEW MEXICO: Along streams, shrub 2–4 meters, Navajo Indian Reservation, in Tunitcha Mountains, August 8, 1911, *Standley* 7652 (TYPE, no. 686,614, in U. S. Nat. Herb.); Vicinity of Cedar Hill, San Juan Co., altitude about 1900 meters, August 16, 1911, *Standley* 8001.

Stems and buds persistent-silky; leaves oblong-oblanceolate; otherwise similar to the species.

Astragalus succulentus Richards., var. **Paysoni**, var. nov., foliolis subglabris; calyce vix vel non nigro-strigosa.—WYOMING: Carbon County, sagebrush slope, Big Creek, road to Encampment, June 30, 1922, *Payson* and *Payson* 2514 (TYPE, no. 1,244,148, in U. S. Nat. Herb.); Carbon Co. 1897, *Nelson*, 3143. MONTANA: Silver Bow, July 8, 1895, *Shear* 3210. COLORADO: Denver, *Wolf* 232.

Calyx scarcely black-hairy; leaflets glabrate; otherwise like the species.

Ceanothus Greggii Gray, var. **orbicularis** var. nov., folia adulta ovalia vel orbicularia subglabra; ramulis glabrioribus.—ARIZONA: Hackberry, alt. 3,800 feet, September 13, 1917, *E. A. Goldman* 2946 (TYPE, no. 891,182 in U. S. Nat. Herb.).

Mature leaves oval to orbicular, nearly glabrate; branchlets more glabrate. Otherwise similar to typical specimens from Mexico.

Ipomoea leptotoma Torr., var. **Wootoni**, var. nov., caulibus et ramis conspicue hirsutis.—ARIZONA: Santa Rita Mountains, September 10, 1914, *Wooton* (TYPE, no. 584,650, in U. S. Nat. Herb.); fenced area, Santa Rita Forest Reservation, September 27 to October 4, 1903, *D. Griffiths* 5976.

Stems and branches conspicuously hirsute instead of glabrous; otherwise similar to the species. Several other specimens were examined from the Santa Rita Mountains, and all belonged to this variety.

Artemisia tripartita Rydb., var. **Hawkinsii**, var. nov., folia tripartita, lobis foliorum primariorum bifidis vel tripartitis filiformibus.—WYOMING: Yellowstone National Park, Old Faithful, July 2–7, 1922, *P. H. Hawkins* 513 (TYPE, no. 1,436,476, in U. S. Nat. Herb.); Upper Geyser Basin, September 9, 1887, *F. H. Knowlton;* in black sands area, Upper Geyser Basin, ca. 7,300 feet, September 6, 1927, *Blake* 1045.

The divisions of the first or early summer leaves bifid to trifid, filiform; inflorescence subspicate, with a few scattered heads; in form of late summer leaves and other characters similar to the species.

WASHINGTON, D. C.

Dactylina arctica in the United States.—The article in the May, 1934, number of Rhodora, by Professor Bernt Lynge of the University of Oslo, Norway, on "General Results of recent Norwegian Work on Arctic Lichens," interested me, with its suggestions that certain Arctic lichens, especially species of the genus *Dactylina*, ought to be found on mountains in the Rockies. I kept an eye open for Dactylinas on eastern mountains, in the Adirondacks, New England, and Gaspé, in field trips during 1935 and 1936, without results. I asked friends who might be going into the Rockies to look for species of this genus.

Miss Antoinette Wilson and her nephew, Warren Wilson, of Spring Valley, New York, while studying alpine flowering plants in Mount Rainier National Park, Washington, in July, collected lichens for me and sent me a box of them. Among species of *Stereocaulon* and *Cladonia* were a number of tiny podetia which were new, and which looked as if they might be *Dactylina*. They resembled *Dactylina arctica*, as pictured by Zahlbruckner, but were much smaller. I sent them to Professor Lynge, and have now heard from him, that they are small plants of *D. arctica*.

This is the first record of *Dactylina arctica* in the United States. The nearest record for North America, as shown on Prof. Lynge's map of its distribution, opposite page 27 in his paper "On Dufourea and Dactylina," 1933, is in Alberta, Canada, some hundreds of miles northeast of the station found by Miss and Mr. Wilson in Mount Rainier National Park. Their discovery suggests that it might be found on alpine sod, in the northern Sierras or Rockies in the United States, with careful search. Prof. Lynge's map of the distribution of *Dactylina madreporiformis* shows three stations in the United States: on Pike's Peak, Colorado; Baldy Peak, New Mexico; and the Quintal Mountains, Utah.

The Mount Rainier station for *D. arctica* is described by Miss Wilson as on Sunset Ridge, at 6500 feet, not far from the edge of nearby snow and ice fields.—Raymond H. Torrey, Hollis, Queens, N. Y.

Volume 39, no. 459, including pages 53–100 and plates 455 and 456, was issued 12 March, 1937.

RHODORA

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. May, 1937. No. 461.

CONTENTS:

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. May, 1937. No. 461.

A NOTE ON AMOS EATON'S HERBARIUM

A. H. Gustafson

There are several bits of evidence which suggest that Amos Eaton made extensive collections of plants in northeastern America. He traveled over much of the region lecturing on botany and geology, and is known to have covered about 17,000 miles on trips in the region during his geological surveys. He corresponded with numerous amateur botanists from widely separated localities as well as with such eminent men as Nuttall, LeConte, Eddy, and Rafinesque. He doubtless exchanged specimens with them for several of these authors named specimens in honor of Eaton. The preface of the seventh edition of his manual informs us that he acquired collections from others. The publication of "A Manual of Botany for the Northern States," the first of its kind for this region and the precursor of Gray's Manual, certainly implies that he made extensive collections. It is known that students at Williams collected all sorts of Natural History specimens, including plants, under his direction. In fact, his Williams students were so delighted with the work which he presented in botany that they raised the funds among themselves for the publication in 1817 of the first edition of his manual. We know also that he emphasized the need for collecting in connection with the study of plants and gives minute directions for collecting and preserving specimens. Ballard[1] states that Eaton began an herbarium while studying at Yale in 1815–16 and quotes Albert Hopkins to the effect that Eaton collected in the swamps of Pownal, Vermont.

[1] Ballard, *Amos Eaton, a pioneer of science in Berkshire County*, Collections of the Berkshire Historical and Scientific Society, Pittsfield, Mass., 1897.

In spite of this evidence that Eaton had an extensive collection, repeated inquiries by various interested students at the several institutions with which Eaton was connected have failed until recently to turn up a single one of Eaton's specimens. Miss Day[1] found no trace of Eaton's plants in her survey of the herbaria of New England. Ballard reports that Eaton's geological collections were probably destroyed by a fire at the Rensselaer Polytechnic Institute and his plants may have gone the same way. The author has gone over the Williams records and collections with care without finding a trace of his collection. If any of his plants had been left at Williams, they would probably have been lost in the fire which in 1855 partially destroyed the extensive collections of the Williams College Lyceum of Natural History.

Ballard mentions giving two sheets from Eaton's herbarium to the Berkshire Historical and Scientific Society. The Director of the Berkshire Athenaeum at Pittsfield, Mass., reports that the two sheets are on file in the Athenaeum vaults. One has a specimen labelled *Poa canadensis*. The second is labelled:—Class III, *Briza canadensis* W and *Dactylis glomerata* W and *Poa spectabilis* June 11th. The third specimen of the second sheet is missing.

The above evidence turned up while the author was making inquiries at several institutions in preparation for an exhibit of early science at Williams held in connection with the celebration of the Mark Hopkins Centenary. In addition, a letter from Professor A. W. Bray of the Rensselaer Polytechnic Institute gave high hopes that a more extended collection of Eaton's material might be in existence. It appears that President Ricketts of the Institute turned over a small portfolio of plants to Professor Bray a few years ago. It had been picked up in an abandoned farmhouse in the South during the Civil War. No details of its rescue are known.

The following label was written on the back of the folio: Botany, Rensselaer School, 1830, Vol. 5. It contained 111 specimens mounted on coarse paper five by six inches in size. Excluding duplicates, there were 104 species. Most interesting and conclusive is the fact that each specimen is *labeled in Eaton's handwriting*. Each label gives the name of the plant, a locality, the month, the year 1830, and a system of numbers.

[1] Day, *Local Floras of New England* and *Herbaria of New England*, RHODORA, I, II, and III.

Most of the labels give Troy as the locality but Albany, Fort Erie, Fort Oswego, New York City, Salina, Schenectady, and Scaighticoke are also included. The months range from April to October. The system of numbers corresponds to that used in the several editions of Eaton's Manual. The system includes the class and order of Linnaeus' artificial system, the natural order of Linnaeus, and the order of Jussieu. The latter also appears on the back of each specimen apparently as an aid in filing as recommended by Eaton. The names of the plants correspond to those of the seventh edition of the Manual published in 1836.

One of the following names—Houghton, Stevenson, Wright, and Fox—appears on about half the labels. All but Fox are mentioned specifically in both the sixth and the seventh editions of the Manual as correspondents whose opinion Eaton followed on matters of distribution. Wright doubtless refers to Dr. John Wright who assisted in the preparation of the eighth edition of the Manual. It seems likely that these men collected the specimens although the labels were written by Eaton. Houghton's name is spelled incorrectly in one instance which indicates that he did not make the label. This together with the more positive fact that the labels are in Eaton's handwriting make it reasonable to suppose that the specimens were in Eaton's possession.

The date, the localities, the correspondents, the system of numerals, and most important, the handwriting all give evidence that the plants were actually Eaton's.

Professor Bray was kind enough to loan the folio for exhibition at Williams during the Mark Hopkins Centenary. It has been returned to him and may be consulted at the Biological Laboratories at the Rensselaer Polytechnic Institute.

WILLIAMS COLLEGE.

ARABIS IN EASTERN AND CENTRAL NORTH AMERICA

MILTON HOPKINS

(*Continued from page 148*)

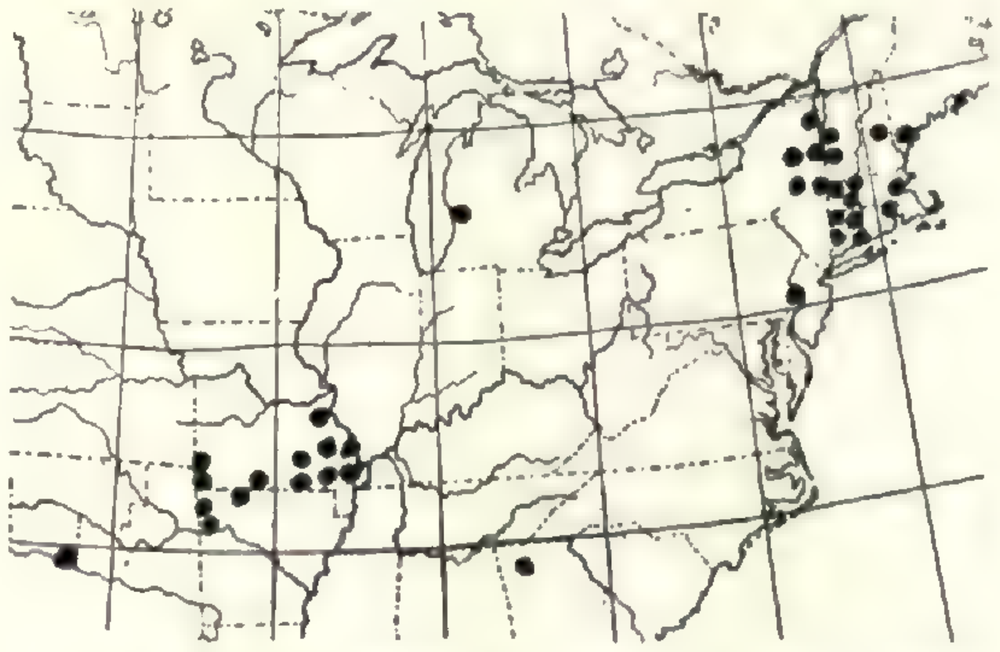
12. A. VIRIDIS Harger. Biennial from a spreading tap-root: stem 2–5 dm. high, branched at base or above or more rarely simple, leafy, averaging 25 internodes to the first flower, glabrous throughout, (pubescent in the var.) bright green: radical leaves rosulate, lanceolate

to spatulate, those of the first year dentate to laciniate, glabrous, persistent, those of the second year strongly laciniate to lyrate-pinnatifid, glabrous on both surfaces, 2–9 cm. long, 5–15 mm. broad, petioled, the petioles glabrous; cauline leaves imbricate, numerous, appressed to subappressed, 1–8 cm. long, 3–15 mm. broad, the lowermost lanceolate and strongly laciniate or very rarely lyrate-pinnatifid, the middle ones lanceolate to linear-lanceolate and laciniate or dentate, the uppermost smaller, lanceolate to linear, subentire to dentate, all cauline leaves glabrous, sessile with a sagittate base, acute to subobtuse: flowers in close, compact racemes; flowering pedicels strictly erect, never divergent, glabrous, averaging at anthesis 3–8 mm. long; sepals linear-oblong, membranaceous, glabrous, acuminate, 3–5 mm. long, nearly one-half the length of the petals; petals creamy-white to yellowish-white, 6–8 mm. long, spatulate to oblanceolate: siliques at first erect, soon becoming falcate-arcuate, recurved, 6–9 cm. long, 1.75–2 mm. broad, glabrous, one-nerved to the middle and often two-thirds their length; fruiting pedicels erect or ascending, glabrous, 6–10 mm. long; stigma small, round, on a short style 0.75–1 mm. long or very rarely subsessile; seeds in one row in the pod, broadly elliptical to quadrate-oblong, 1.5–1.8 mm. long, averaging 1 mm. broad, winged all around, the wing averaging 0.33–0.5 mm. broad.—Represented by two geographical varieties.

Stem, radical and cauline leaves and pedicels quite glabrous . . . . . var. *typica.*
Stem, radical and cauline leaves and pedicels pubescent with short, stiff hairs . . . . . var. *Deamii.*

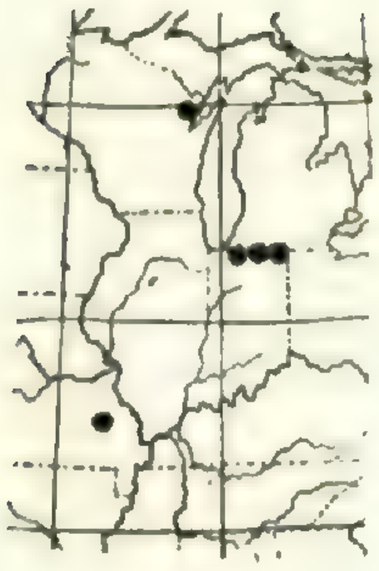
Var. **typica.**—*Arabis viridis* Harger in Rhodora, xiii. 37 (1911); Britton & Brown, Ill. Fl. ed. 2: ii. 181 (1913); Taylor in Mem. N. Y. Bot. Gard. v. 348 (1915). *A. laevigata* var. β *laciniata* T. & G., Fl. N. Am. i. 82 (1838); Britton, Man. 464 (1901).—Cliffs, ledges or rocky woods, New England, eastern New York and eastern Pennsylvania, with an isolated station in Georgia; Michigan; southern Missouri, northwestern Arkansas and Oklahoma. The following are characteristic. Maine: crevices of cliffs at the Gulf, South Berwick, *Parlin*, no. 1,114; on cliffs, local, South Berwick, *Parlin & Fernald*, no. 669. New Hampshire: summit of East Rattlesnake Mt., Holderness, Asquam Lake, *Svenson*, 24 July 1921. Vermont: shaded slaty talus, Ira, Rutland Co., *Pease*, no. 23,976; Twin Mountains, West Rutland, *W. W. Eggleston*. no. 1,030. Massachusetts: wet cliffs at Cascade, Melrose, *W. P. Rich*, 11 June 1892; Bearberry Hill, Stony Brook Reservation, *E. F. Williams*, 30 May 1897; in seams of low cliffs, Horn Pond Mt., Woburn, *A. H. Moore*, no. 2,697; Bussey's Hill, Boston, *C. E. Faxon*, 31 May 1878; north bank of Connecticut River, Gill, *St. John & Weatherby*, 11 May 1912; trap ledges, Miller's Falls, Montague, *Fernald*, 13 May 1911; Granby, *Floyd*, 21 May 1915; common on trap ledges, Holyoke diabase, Mt. Tom, Hampshire Co., *Forbes & Wheeler*, 17 May 1913; among rocks of Devil's Garden, Holyoke Range, *T. O. Fuller*, 30 May 1887. Rhode Island: Johnston, *J. W. Congdon*, 9

May 1878 [NY]. CONNECTICUT: dry crevices of trap cliff, Southbury, *Harger*, no. 5,322 (TYPE); Wethersfield, *C. Wright*, 1878; valley of Farmington River, Tariffville, *Winslow & Hill*, 17 May 1913; dry woods, South Britain, *Woodward*, 31 May 1909; dry top of Mt. Carmel, Hamden, New Haven Co., *Blewitt*, no. 3,476; in crevices and thin soil on trap ridges in half shade, Southbury, *Harger*, Pl. Exsicc. Gray. no. 458. NEW YORK: thin soil in rocks, southern slope of Peaked Mt., southern W. Fort Ann, *Burnham*, 16 June 1918; rocky places, Delph Pond, west of Comstocks, Washington Co., *Burnham*, 19 June 1900; rocky woods, Glenmont, Albany Co., *House*, no. 7,872; on cliffs, Snake Hill, Saratoga Lake, *Muenscher & Lindsey*, no. 3,335 [Mo]; Troy, *H. H. Eaton*, June 1817 [Phil]. PENNSYLVANIA: dry wooded slope along Schuylkill River, Linfield, Montgomery Co., *Long*, no. 11,688 [Phil]. GEORGIA: Kennesaw Mt., *R. N. Larrabee*, 16 May 1885; large knob, Kennesaw Mt., Cobb Co., *L. M. Perry & L. C. Meyers*, no. 913. MICHIGAN: Muskegon, *C. D. McLouth*, 17 May 1896 (as *A. confinis*). MISSOURI: rocks, Iron Co., *Eggert*, 12 April 1893 (as *A. confinis*) [Mo]; in crevices of granite along Black River near Monterey, Reynolds Co., *Drouet*, no. 333; Shannon Co., *Bush*, no. 27 (as *A. hirsuta*) [US]; upland woods near Jack's Fork of Current River, Texas Co., *Steyermark*, no. 18,580; rocky woods, Dexter, Stoddard Co., *E. J. Palmer*, no. 14,773 [Mo]; two miles north of Pickle, St. Genevieve Co., *Steyermark*, no. 1,271 [Mo]; limestone ledges, wooded bluffs, near Galena, Stone Co., *E. J. Palmer*, no. 17,232 [Mo]. ARKANSAS: rocky barrens, Eureka Springs, Carroll Co., *E. J. Palmer*, no. 5,614 [Mo]; along sandstone bluffs near Midway, Sebastian Co., *E. J. Palmer*, no. 33,284 [Mo]; Mulberry Creek, Crawford Co., *D. Demaree*, no. 6,387 [US]; bluffs at Mulberry, Crawford Co., *D. Demaree*, no. 6,408 [US]. OKLAHOMA: vicinity of Fort Sill, Comanche Co., *Mrs. J. Clemens*, no. 11,597. *Fl.* May–July; *fr.* June–Sept. MAP 24.



MAP 24. Range of ARABIS VIRIDIS, var. TYPICA.

Var. **Deamii**, n. var., caule pubescente pilis brevibus rigidisque; foliis radicalibus caulinisque hirsutis vel glabris. *A. laevigata* var. *heterophylla* Farwell in Rep. Mich. Acad. Sci. xix. 248 (1917) as to description but not as to source of name, *A. heterophylla* Nutt.—Northern Indiana, southern Michigan, eastern Wisconsin and locally in eastern Missouri. INDIANA: dry sandy soil in the woods on east side of Lake James, Steuben Co., *Deam*, no. 20,247 [Deam]; sandy black-white oak woods 5 miles west of South Bend, St. Joseph Co.,



MAP 25. Range of ARABIS VIRIDIS, VAR. DEAMII.

Deam, no. 36,351 [Deam]; on cleared gravelly slope on east side of the old tamarack bog, 5 miles east of La Grange, La Grange Co., *Deam*, no. 36,370 (TYPE in Herb. Gray); in sandy black oak woods, 1⅛ mi. southeast of Mongo, La Grange Co., *Deam*, no. 40,698 [Deam], all as *A. hirsuta*. WISCONSIN: Killy Lake, Oconto Co., *J. J. Davis*, 2 July 1915 [Wisc]; Mosinee, *J. J. Davis*, 21 June 1919 [Wisc]; east of Keshena, Oconto Co., *E. E. Honey*, 5 July 1934 [Wisc]. MISSOURI: along wooded bluffs of creek, Howe's Mill, Dent Co., *E. J. Palmer*, no. 34,950 [Mo]. MAP 25.

This plant is most easily mistaken for *A. laevigata*, chiefly due to the fact that the habits are very similar. The pods are recurved and arcuate to subarcuate; at first glance the leaves and flowers are similar and the seeds are essentially identical. But thorough examination reveals distinct differences which may best, perhaps, be observed in comparative form as follows:

A. viridis: Very leafy, averaging 25 internodes to the first flower. Cauline leaves smaller than those of *A. laevigata*, varying from 1–8 cm. long and appressed or subappressed to the stem. Basal leaves of the first year quite glabrous, those of the second year lacinate to lyrate-pinnatifid. Flowers in very close and compact racemes, the petals considerably longer than the sepals. Pods one-nerved rather prominently to the middle and often beyond.

A. laevigata: Less leafy, averaging 13 internodes to the first flower. Cauline leaves larger than those of *A. viridis*, varying from 3–20 cm. long and spreading or ascending but never closely appressed to the stem. Basal leaves of the first year always densely to sparingly pilose with short, simple hairs, never glabrous, those of the second year merely dentate to sharply serrate, but never laciniate or lyrate-pinnatifid. Flowers in long, loose racemes, the petals scarcely exceeding the sepals in length. Pods faintly one-nerved at the base or very rarely to the middle but never beyond it.

In flowering condition *A. viridis* suggests *A. Drummondi*, having the close, compact racemes of that species, and the more or less strict cauline leaves and flowers. But in *A. Drummondi* the petals are usually roseate instead of creamy-white, and in fruit the two are quite distinct, the latter having strict and appressed siliques while the former has them spreading and recurved. *A. Drummondi* has basal leaves merely dentate whereas *A. viridis* has them lyrate-pinnatifid or laciniate.

It seems highly probable to me that *A. laevigata* var. *laciniata* Torrey & Gray[1] is simply *A. viridis*, but unfortunately they cited no

[1] Torrey & Gray, Fl. N. Am. i. 82 (1838).

type nor did they give any information relative to its range. One is led to assume, consequently, that it is found wherever one finds typical *A. laevigata*, and that it was considered by them as merely a leaf-form of that species. But the cauline leaves of that plant are only seldom saw-toothed and are never laciniate, whereas in *A. viridis* they are decidedly so. Without a type-sheet for examination one can only surmise as to the identity of this variety. On page 82 of the copy of Torrey & Gray's Flora in the Library of the Gray Herbarium, Watson pencilled after *A. laevigata* var. *laciniata* "*A. heterophylla* Nutt!", but one can hardly reconcile oneself to an admission that such is the case, inasmuch as the above authors, copying Nuttall's manuscript, explicitly describe *A. heterophylla* "Radical leaves somewhat pilose with simple hairs."[1] The first year's basal leaves of *A. viridis* are quite glabrous in every specimen which I have examined, while those of *A. laevigata* are without exception pilose with short and simple hairs (although those of the second year are glabrous); it therefore appears that *A. heterophylla* Nutt. (the type specimen of which I have not yet been able to find) and *A. laevigata* var. *laciniata* T. & G. are *not* identical.

A. viridis is found locally in eastern New England, where it is rather rare, but becomes more common on the trap ledges and cliffs of the Connecticut Valley of Massachusetts, and in Connecticut, Vermont and New York. From Pennsylvania I have seen only one specimen (from Montgomery County) and it appears isolated in Cobb County in northern Georgia with, so far as I have been able to learn, no intermediate stations. In Michigan it is extremely local, is apparently absent from Indiana, at least in the typical form, but becomes common in Missouri, from which state I have seen more specimens than from any other. In northeastern Arkansas it does not appear to be a rarity, but it is isolated in the Wichita Mountains of southwestern Oklahoma. One should watch for it in extreme eastern Oklahoma and in Indiana, as well as in Ohio and in the states between Pennsylvania and Georgia. Despite the gaps in its range, it is clearly a plant of Alleghenian and Ozarkian distribution.

Var. *Deamii* is characterized by a pubescence which is found on the stem, on the basal and cauline leaves and on the flowering and fruiting pedicels. The hairs on the stem are short and stubby, but on the leaves they are a millimeter or more in length and give a hispid ap-

[1] T. & G., l. c.

pearance to these parts. Mr. C. C. Deam, being unfamiliar with *A. viridis* from Indiana, identified his specimens as "*A. hirsuta*" and pointed out to me the fact that the basal leaves were strongly laciniate and lyrate-pinnate. The flower and fruit of his specimens show no relation to *A. pycnocarpa* ("*A. hirsuta*") but in every character are a perfect match for *A. viridis*. The habit of the Indiana specimens exactly fits that of *A. viridis*, and there seems to be no question as to their specific identity with it.

In 1917, Farwell described a plant which he collected in Michigan[1] as *A. laevigata* var. *heterophylla*, his combination being doubtfully based on Nuttall's *A. heterophylla*. Although I have not examined Farwell's specimen, his description strongly suggests that it is *A. viridis* var. *Deamii*. Since I am interpreting it as resting *nomenclaturally* in part on *A. heterophylla* Nutt. and, consequently, a mixture, it seems unwise to perpetuate the confusion by taking up the ambiguous name *heterophylla* for the pubescent variety. I am, therefore, giving an unequivocal name.

13. A. LAEVIGATA (Muhl.) Poir. Biennial from a somewhat branched tap root: stems 3–9 dm. high, branched at base and above or simple, glabrous and strongly glaucous throughout, averaging 13–15 internodes to the first flower: basal leaves rosulate, soon disappearing, spatulate-obovate to narrowly oblanceolate, those of the first year sparingly pilose with short simple hairs, those of the second year entirely glabrous, dentate to serrate, 3–11 cm. long, 0.5–2.5 (–3) cm. broad, acute to subacuminate, petiolate; cauline leaves oblong-lanceolate to linear, spreading to subappressed, imbricate, 3–20 cm. long, 3–15 mm. broad, sessile with a sagittate or sometimes auriculate base, glabrous throughout, serrate-dentate to entire, acute to obtuse or somewhat acuminate: flowers small, in long, loose racemes; flowering pedicels ascending, often divergent, glabrous, 5–9 mm. long, at anthesis; sepals membranaceous, greenish, 2.5–4.5 mm. long, nearly the length of petals, glabrous, spatulate to oblong; petals white, 3–5 mm. long, spatulate to oblanceolate: siliques irregularly downward-curved to subarcuate or more rarely slightly straightish, ascending in youth, recurved-spreading at maturity, compressed, attenuate, glabrous, faintly one-nerved below the middle or only toward the base, 5–10 cm. long, 0.75–2.5 mm. broad; fruiting pedicels ascending, divergent, glabrous, 7–14 mm. long at maturity; style 0.5–1 mm. long or very rarely the stigma subsessile; seeds in one row, quadrate to oblong, averaging 1 mm. long, 0.5 mm. broad, winged all around.—Encyl. Suppl. i. 411 (1810) as "*levigata*"; DC. Syst. ii. 237 (1821); DC. Prod. i. 147 (1824); Hooker, Fl. Bor.-Am. i. 43 (1829); Beck,

[1] Farwell in Rep. Mich. Acad. Sci. xix. 248 (1917).

Bot. N. & M. States, 30 (1833); T. & G. Fl. N. Am. i. 82 (1838); Torrey, Fl. N. Y. i. 55 (1843); Eaton & Wright, N. Am. Bot. ed. 8: 131 (1840); Wood, Classbk. Bot. 39 (1845) as *"levigata"*; Gray, Man. 36 (1848); Chapman, Fl. S. U. S. 28 (1860); Watson in Gray, Synop. Fl. N. Am. i. 162 (1895); Britton & Brown, Ill. Fl. ii. 149 (1897); Britton, Man. Fl. 464 (1901); Robinson & Fernald in Gray, Man. ed. 7: 438 (1908); Rydberg, Fl. Pr. & Pl. 382 (1932); Small, Man. Se. Fl. 572 (1933). *Turritis laevigata* Muhl. Index Fl. Lancastr. in Trans. Am. Phil. Soc. iii. 173 (1793) nomen only, and in Willd. Sp. Pl. iii[1]. 543 (1801); Persoon, Synop. ii. 205 (1807); Pursh, Fl. Am. Sept. ii. 438 (1818); Rees, Cycl. xxxvi. no. 2. (1819). *Turritis lyrata* Raf. in Am. Monthly Mag. ii. 44 (1817). *Arabis pendula* Nutt. Genera. ii. 70 (1818), non Linnaeus, Sp. Pl. ii. 665 (1753). *Arabis pendula* var. β DC. Syst. ii. 236 (1821). *Arabis lyraefolia* DC. Syst. ii. 244 (1821). *Arabis heterophylla* Nutt. ex. Torr. & Gray, Fl. N. Am. i. 81 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 131 (1840); Walpers, Rep. i. 133 (1842); Dietrich, Synop. iii. 693 (1843); Wood, Classbk. ed. 2: 166 (1847); Gray, Man. 36 (1848). *Arabis hastata* Eaton, Man. Bot. ed. 2: 141 (1818). *A. laevigata* var. *heterophylla* (Nutt.) Farwell in Rep. Mich. Acad. Sci. xix. 248 (1917) as to name-bringing synonym but not as to plant described.—Rich rocky woods, rocky hillsides and ledges, southwestern Quebec to South Dakota, south to Georgia, Alabama, Arkansas and Oklahoma. The following are characteristic. QUEBEC: dry rocky woods, limestone, Philipsburg, Missisquoi Co., *C. H. Knowlton*, Aug. 10–11, 1923 (as *A. Drummondi*). NEW HAMPSHIRE: Hinsdale, *Kennedy*, 29 Aug., 1907; Nottingham, Rockingham Co., *A. A. Eaton*, no. 444; Walpole, Cheshire Co., *R. W. Woodward & L. A. Wheeler*, May 25, 1917. VERMONT: Mt. Philo, Charlotte, *Kennedy*, 9 July, 1908; Gardner's Island, Lake Champlain, *C. E. Faxon*, Aug. 7, 1880; Castleton, Rutland Co., *Eggleston*, Aug. 2, 1903. MASSACHUSETTS: dry rocky wooded hillsides, Middlefield, Hampshire Co., *Fernald & Long*, no. 9,568; lime cliffs and outcrops, Sheffield, Berkshire Co., *J. A. Cushman*, no. 600. CONNECTICUT: trap ridge, Southbury, *Harger*, 29 May, 1908; on trap ledges, North Guilford, *G. H. Bartlett*, 20 May 1906; rich woods, Stratford, *E. H. Eames*, 9 June 1901. NEW YORK: rocks, south side Portland Point Ravine, Lansing, *Gershoy*, no. 6,537; rich shaded ravine slope, Enfield Ravine, ½ mi. below falls, Enfield, *Wiegand*, no. 8,221; dry rocky woods above falls, Taughannock Ravine and vicinity, Ulysses, Tomkins Co., *A. J. Eames*, no. 4,219; rocky bank of Hudson River Big Hollow, Hudson Falls, Washington Co., *S. H. Burnham*, 10 June 1890. NEW JERSEY: Ramapo, *C. W. Hall*, 8 May 1876 [Bklyn]; Rocky Hill, *Lighthipe*, 15 May 1884 [Bklyn]; rocky woods, Hamburg, *W. M. Van Sickle*, 3 May 1892 [Bklyn]. PENNSYLVANIA: moist rocky wooded slopes along Delaware River, New Hope, Bucks Co., *St. John & Long*, no. 2,313; steep wooded slopes, Edison, Bucks Co., *Fogg*, 27 May 1923; on the Conestoga River, south of Lancaster, Lancaster Co., *Heller*, May 5,

1900. DELAWARE: rocky woods, Wilmington, *A. Commons*, 8 May & 16 Aug. 1897; shaded hillside along Brandywine, Granogue, *A. Commons*, 15 May & 24 Aug. 1896 [Phil]. MARYLAND: Harper's Ferry Heights, *S. Watson*, 17 April 1890; rocky wooded slopes along Susquehanna River, Bald Friar, Cecil Co., *St. John & Long*, no. 1,010; rocky woods, Cabin John Bridge, Montgomery Co., *Pease*, no. 7,403; wooded hillsides, Glen Echo, Montgomery Co., *J. H. Painter*, no. 1,317 [Mo]. DISTRICT OF COLUMBIA: rich ground on Potomac River, *Morong*, May 1877; ad vias, frequens prope Washington, *T. Holm*, April & Sept. 1888; hillsides, *Steele*, 16 April 1897. VIRGINIA: Bedford Co., *Curtiss*, 1 May 1887; Natural Bridge, *G. G. Kennedy*, 7 May 1887; on rocks, Difficult Run, vicinity of Great Falls, *Killip*, no. 7,418; about Mt. Crawford, Rockingham Co., *Heller*, May 5–13, 1893. WEST VIRGINIA: Snowy Mt., Pendleton, *Rydberg*, no. 9,064 [NY]; wet rocks, Morgantown, *Millspaugh*, no. 12 [NY]; New Creek, Hampshire Co., *J. D. Smith*, 28 June 1880 [US]; Upshur Co., *Pollock*, 24 May 1897 [Mo]; Lewis Co., *Pollock*, 24 April 1897 [US]. NORTH CAROLINA: rich ravines, Great Smoky Mts., Swain Co., *Beardslee & Kofoid*, 5 Aug. 1891; woods, Linville, Avery Co., *F. W. Hunnewell*, 21 July 1933; Catawba River, near Morgantown, *M. E. Hyams*, April 1897 [NY]. GEORGIA: cliffs of Coosa River, near Rome, *Canby*, no. 7: Stone Mt., Dekalb Co., *Small*, May 1–18, 1895 [NY]; Rome, *Ravenel* [Mo]; Cave Spring, *C. Mohr*, June 1881 [US]; Stone Mt., *Biltmore Herb.*, no. 1,033 [Phil]. ONTARIO: rocky woods, Talbot's Woods, Elgin Co., *Macoun*, no. 141; rocky woods along streams, Picton, *Macoun*, no. 1,722 [Can]; dry or rocky margins of woods, Port Stanley, Lake Erie, *Macoun*, no. 1,723 [Can]. MICHIGAN: Detroit, *Glatfelter*, 5 Aug. 1898 [Mo]; near Lansing, *L. H. Bailey*, 25 May 1888; moist wooded slopes west of Ann Arbor, *Ehlers*, no. 2,815 [Phil]; near Port Huron, *C. K. Dodge*, 13 May & 15 July 1894; Huron R., *Mosely*, 30 May 1893 [Mo]. OHIO: near Cincinnati, *C. G. Lloyd*, 17 April 1882; Cleveland, *I. J. Hicks* [Mo]; rocky soil, N. Amherst, Lorain Co., *Webb*, no. 5,255; rich wooded hillsides north of Columbus, *Gleason*, 13 May 1905; south of Swanton, Fulton Co., along Wabash R. R., *Mrs. R. Engle*, 4 July 1927 (as *A. brachycarpa*). INDIANA: wooded slopes of the Millport Hill about 11 miles north of Salem, *Deam*, no. 23,233; wooded base of bluff of Ohio River about 6 miles east of Cannelton, *Deam*, no. 24,963 [Deam]; wooded bluff of stream near Lake Michigan, Tremont, *F. W. Johnson*, nos. 1,729 & 1,804 [NY]. KENTUCKY: Boone Creek, Fayette Co., *W. A. Anderson*, no. 423; Shelbyville, *Miss M. B. Flint;* Elkhorn Cliff, Stamping Ground, *J. W. Singer*, no. 23 [US]; Blue Lick Hills in early spring, near Lexington, *Short;* High Bridge, banks of Kentucky R., *F. T. McFarland*, no. 20 (as *A. Drummondi*) [US]. TENNESSEE: wet limestone bluffs, Turnbull Creek, Kingston Springs, *Svenson*, no. 7; rich woods, Knoxville, *Ruth*, nos. 1,940 & 234 [NY]; bluffs on Tennessee River, Knox Co., *Kearney*, 3 April 1893 [NY]; Cumberland Mts., Franklin Co., *Eggert*, 6 May

1898 [Mo]; vicinity of Knoxville, *Lamson-Scribner*, April 1890 [US]. ALABAMA: Havana Glen, *L. M. Underwood*, May 1896 [NY]; Florence, *C. M. Wilson*, 5 April 1893 [US]; rocky banks, Warnock Mt., *Mohr*, 12 May 1898 [US]. WISCONSIN: moist hillside, Ferry Bluff, *F. H. Smith*, nos. 23 & 200; moist hillside, Pewitt's Nest, *F. H. Smith*, no. 8; Egg Harbor, Door Co., *Schuette*, 6 July 1882 [US]. ILLINOIS: on rocks in shady ravines, The Sag, *Greenman*, no. 3,601; alluvial woods by Sangamon River, White Heath, Piatt Co., *Pease*, no. 13,421; rich shady woods, Grand Tower, *Gleason*, 5 May 1902; wooded hillside, Urbana, *Gleason*, no. 2,364. MINNESOTA: Fort Snelling, *E. A. Mearns*, 16 June 1891 [US]; Center City, *B. C. Taylor*, June 1892 [US]; Winnebago Valley, Houston Co., *W. A. Wheeler*, no. 154 [Minn]. IOWA: Bentonsport, *E. W. Graves*, no. 1,786½ [Mo]. MISSOURI: on bluffs, Noel, *Bush*, no. 5,753; Montier, *Bush*, no. 31 (as *A. brachycarpa*); low woods, Centerville, *E. J. Palmer*, no. 1,724; woods, Williamsville, Wayne Co., *Eggert*, 17 May 1893 [Mo]; banks of Cuivre R., near Old Monroe, St. Charles Co., *J. Davis*, no. 7,232 [Mo]. ARKANSAS: sandy creek banks, northwest Arkansas, *F. L. Harvey*, no. 23; Benton Co., *E. N. Plank*, 1899 [NY]; along wooded sandstone bluffs of river near Shirley, Van Buren Co., *E. J. Palmer*, no. 33,208 [NY]. OKLAHOMA: gravelly mountainside, near Cache, Comanche Co., *G. W. Stevens*, no. 1,341T; Sapulpa, *Bush*, no. 1,018 [Mo]. COLORADO: Buena Vista, *E. T. Harper*, May 1886 [Wisc]. *Fl.* late April–July; *fr.* June–Sept.

Var. BURKII Porter. Cauline leaves linear to linear-lanceolate, entire to subdenticulate, sessile, not amplexicaul; siliques one-nerved at least to the middle and often slightly beyond.—Porter in Bull. Torr. Bot. Club. xvii. 15 (1890); Watson in Gray, Synop. Fl. N. Am. i. 162 (1895); Britton & Brown, Ill. Fl. ii. 149 (1897); Britton, Man. 464 (1901); Robinson & Fernald in Gray, Man. ed 7: 438 (1908). *Arabis serotina* Steele in Contr. U. S. Nat'l. Herb. xiii. 365 (1911). *A. Burkii* Small, Man. Fl. Se. U. S. 572 (1933).—Dry hillsides or bluffs, Pennsylvania to North Carolina. The following are characteristic. PENNSYLVANIA: Saw Mill R., lower St. Clair Township, Allegheny Co., *J. A. Shafer*, no. 1,268 [Phil]; Mercersburg, Franklin Co., *Isaac Burk*, 1852 (TYPE in Herb. Phil. Acad. ISOTYPE in Herb. Gray); Harrisburg, *I. Burk*, May–June, 1867; Dauphin Co., *I. Burk*, 1865. VIRGINIA: vicinity of Millboro, Bath Co., *Steele*, 3 Sept. 1906 [Gray], and 21 Aug. 1907 (type of *A. serotina* in U. S. Nat'l. Herb.); shale banks near New Market, Massanutten Mts., Shenandoah Co., *Lena Artz*, 15 July 1935; Massanutten Mts., Shenandoah Co., *L. Artz*, 8 Aug. & 29 Sept. 1935. WEST VIRGINIA: Roanoke R., south of Roanoke, *Small & Heller*, no. 443 [Amh]; in precipitous woods along Wheeling Creek, 8 miles east of Wheeling, *A. MacElwee*, 18 May 1909 [Phil]; North Fork Mt., Pendleton Co.,

MAP 26. Range of ARABIS LAEVIGATA, var. BURKII.

P. D. Strausbaugh, 24 June 1932 [Minn.]. North Carolina: rocks, Hot Springs, Madison Co., *Churchill*, 5 June 1899. Map 26.

Willdenow described *Turritis laevigata* (ascribed to Muhlenberg in litt.) as having erect siliques.[1] Unfortunately, Muhlenberg sent it to Willdenow under a manuscript name, although he had already written a description for it in his manuscript Florula Lancastriensis,[2] an Index to which was printed in the third volume of the Transactions of the American Philosophical Society for the year 1793, and on page 173 of which the name was duly published without a description. But this *T. laevigata* of the Index is merely a nomen; the description of Willdenow is the first published one to which we may refer.

An excellent tracing of the Muhlenberg type in the Willdenow Herbarium at Berlin is in the Gray Herbarium and it shows all the characteristic features of *Arabis laevigata* as generally understood. The basal leaves of the first year's growth are typical, even to an attempt to reproduce in ink the pilose pubescence; the cauline leaves match in every detail those of our plant; the flowers are in every way typical, while the siliques, so young that the sepals and petals still remain on the flower, are at the stage when it would be quite impossible to say whether they were erect or pendulous. The fruit of this species does not normally become deflexed until just at or slightly before the seeds mature, and any attempt to predict their direction before this period would lead only to the conclusion that they were erect.

This emphasis of Willdenow's on erect siliques caused considerable confusion among subsequent taxonomists. DeCandolle in both the Systema and the Prodromus describes the plant "siliquis erectis," but according to Torrey & Gray, "The description of DeCandolle was drawn from a dwarf specimen, without fruit, in Pursh's herbarium."[3] Pursh, however, omits all mention of the siliques in the description in his Flora of North America. Hooker describes the plant "siliquae quite erect, 1½ inches long, linear, plane, tapering at the extremity into a very short style"[4] to which Torrey & Gray reply: "*T. laevigata* [Hooker publishes the name quite clearly as *A. laevigata*], Hook. fl. Bor.-Am. i. p. 43, must be a very different plant from the one here described [A laevigata],"[5] but about which they expressly say "siliques

[1] Willdenow, Species Plantarum. iii[1]. 543 (1801).
[2] Muhlenberg, Florula Lancastriensis, i. 483 (ined.).
[3] Torrey & Gray, Fl. N. Am. i. 82 (1838).
[4] Hooker, Fl. Bor.-Am. i. 43 (1829).
[5] T. & G. l. c.

linear, narrow & elongated, recurved-pendulous." In view of the facts that the siliques of *A. laevigata* do not become pendulous or subpendulous until reasonably late in their development and that the fruiting pedicels are always ascending, the descriptions of Hooker and DeCandolle may satisfactorily be attributed to the fact that they saw plants in very young fruit—as did Willdenow.

That the *T. lyrata* of Rafinesque is merely the plant under discussion seems entirely probable from his description,[1] although the actual identity of it is not known. The "narrow, compressed, and sickle shaped" siliques are characteristic of *A. laevigata*, as is also the "smooth stem." The only other plants which Rafinesque might have had in mind are *A. canadensis* and *A. viridis*, but the former does not fit his description, possessing a pubescent stem, at least at the base, and being further characterized by siliques which are anything but "narrow," measuring well over 2.5 mm. broad at their narrowest point, and the latter, although having "radical leaves spreading lyrate obtuse" has not, to the best of my knowledge, been found in the Catskill Mountains, the habitat of Rafinesque's *T. lyrata*.

A. laevigata grows on basic or circumneutral ledges and bluffs or in rocky woods from the southernmost part of Quebec, just above the Vermont-New Hampshire line, and western New England, across the northern United States and southern Ontario, and is reported as far west as the Dakotas (although I have seen no specimens from those states). In a southerly direction it reaches Georgia and northern Alabama (no record of its existence in Mississippi seems available) and is reported westward as far as Oklahoma, Kansas and Nebraska, although from the last two states I have not examined any specimens.

According to its habitat, the size of the plant and luxuriance of its foliage varies considerably. The cauline leaves range from 3 to 20 cm. long with accompanying extremes in width. On luxuriant specimens the siliques are very numerous and crowded, as well as very long, whereas in dwarfed and depauperate plants there may be as few as 12 or 15 on an entire raceme. The margins of the stem-leaves vary from sharply serrate to subentire, and not infrequently some of the upper-

[1] Rafinesque in the American Monthly Magazine, ii. 44 (1817). The description reads as follows: "*Turritis lyrata*. Smooth, stem striated very simple; radical leaves spreading lyrate obtuse, and with obtuse teeth, stem leaves erect sessile acute, the lower ones oblong with acute teeth, the upper ones lanceolate entire; peduncles shorter than the flowers, petals entire, siliques narrow, compressed and sickle shaped. —Obs. Annual. A very distinct species found in blossom in June, at the foot of the Catskill mountains, in woods."

most ones are quite entire. Although the seeds are in every case fully winged all around, the breadth of the wing differs greatly.

Var. *Burkii* was first collected by Isaac Burk in 1852 and was named in his honor by T. C. Porter. It was raised to specific rank by Small[1] in 1933 but, since it differs from *A. laevigata* only in two secondary characters, I cannot consider it other than a localized geographical variety of that species. Its cauline leaves are quite sessile and are linear to linear-lanceolate, while those of typical *A. laevigata* are amplexicaul or subamplexicaul and lanceolate to oblong-lanceolate. Its siliques are one-nerved to the middle or slightly beyond, but those of the typical form of the species are one-nerved only about one-third their length. It occurs only in the Allegheny Mountains from Pennsylvania south to North Carolina, although Small says of *A. Burkii:* "various provinces N. of Coastal Plain, N. Car. to Mo., & Vt."[2]

A. serotina Steele appears to me to be merely a much branched, late flowering form of var. *Burkii.* All attempts to find characters on which to separate the two plants have failed, although Steele says:

> This plant was at first taken to be *Arabis laevigata burkei* Porter, which it resembles in several particulars of the description, but Doctor Rose, who kindly compared a specimen with Porter's material at the New York Botanical Garden, thinks the two are not the same. In any case, it is out of the question to refer this in any way to *A. laevigata.* Even if we disregard the fact that it is in perfectly normal bloom the middle of August while *A. laevigata* blossoms in April or May, the differences are fully of specific worth. The most striking are in the small flowers of the present plant, its narrow, nonsagittate, leaves, its more slender and woody stems, and its numerous spreading branches.[3]

The "differences" are almost impossible to ascertain. The flowers of the Steele plant seem in no way to be smaller than those of either the typical form of *A. laevigata* or of var. *Burkii* (although Steele emphasizes their small size), nor are the seeds of his plant, as far as I can discern, any larger than those of the other two, as he indicates. The only real differences apparent to me are that *A. serotina* at Steele's station (and all of his specimens in the United States National Herbarium were collected at one station) possesses a much branched habit and blooms later than any other plant of *A. laevigata* which has been observed in the course of this investigation. There are, in the Gray Herbarium, three specimens from the herbarium of Miss Lena Artz which were collected by her in the Massanutten Mountains of

[1] Small, Man. Fl. Se. U. S. 572 (1933).
[2] Small, l. c.
[3] Steele in Contr. U. S. Nat. Herb. xiii. 365 (1911).

Shenandoah County, Virginia, and which show considerable branching, although by no means as much as that of the Steele specimens, and which bloom in July. She says of her collection:

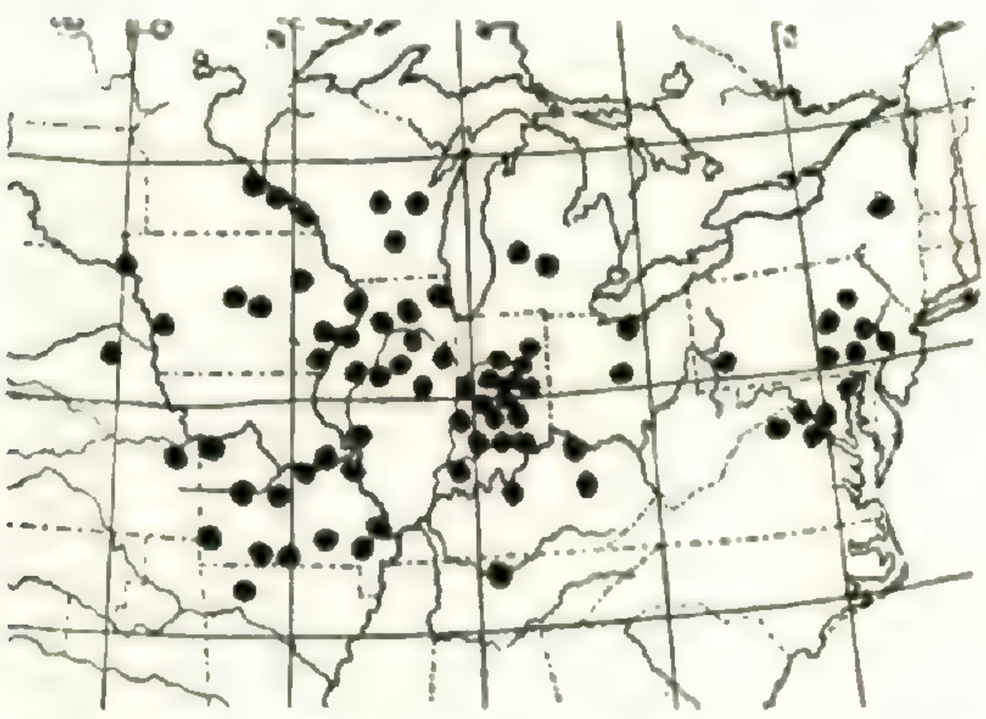
> *An Arabis.*—On May 24, 1934, I found on the shale banks near New Market in Shenandoah County, a small plant, then about two inches in height, which looked as if it were one of the Cruciferae. I planted two of the plants in my garden and in July when the plant began to bloom, I made another trip to the shale banks to collect it. The plant looked definitely like an *Arabis*. Of the species of *Arabis* in Gray's Manual it resembled most *A. laevigata* (Muhl.) Poir. However, its leaves were not arrow-shaped at the base; they were much narrower than the leaves of *A. laevigata*. The plant was just beginning to flower July 15, while *A. laevigata* has a much earlier flowering season, and the flowers were noticeably smaller than those of *A. laevigata*.
>
> I sent several plants to the National Herbarium and Mr. E. C. Leonard checked them as *Arabis laevigata* . . . The plant seemed to me to resemble *A. serotina* Steele in Britton and Brown. I sent specimens to Dr. Wherry of the Department of Botany at the University of Pennsylvania. He checked the plant as *A. serotina* Steele.[1]

But again, I can view these plants of Miss Artz' only as var. *Burkii*. The flowers of *A. laevigata* and of var. *Burkii* vary from 3 to 5 mm. long, and as those of the Artz specimens slightly exceed 3 mm., they are quite within the limits of the two above-mentioned plants.

14. A. DENTATA (Torr.) T. & G. Biennial from a simple tap-root: stem branching at base or rarely from the top or simple, ascending 2–6 dm. high, leafy, pubescent throughout with appressed to subappressed simple or forked hairs, green: radical leaves spatulate or obovate to oblanceolate, 4–15 cm. long, 1–4.5 (–6) cm. broad, acutish, petiolate, irregularly dentate to sinuate or very rarely lyrate-pinnatifid, finely and evenly stellate-pubescent on the lower surface, strigose to strigillose on the upper surface; cauline leaves oblanceolate to lanceolate or narrowly obovate, 1–6 cm. long, 0.5–2.5 cm. broad, imbricate to subimbricate, sessile with an amplexicaul base, irregularly dentate or more rarely sinuate, acutish, finely and evenly stellate-pubescent on the lower surface, strigillose to glabrous on the upper surface: flowers very small, in rather close racemes; flowering pedicels erect or ascending, 0.8–2 mm. long at anthesis, strongly hirsute with simple and forked hairs; sepals membranaceous, 1.5–2.5 mm. long, one-half the length of the petals, greenish, finely stellate-pubescent; petals white to cream-colored, 2–3 mm. long, narrowly oblanceolate to broadly linear: siliques 1.5–4 cm. long, 0.75–1.25 mm. broad, nearly straight or only very slightly curved, more or less finely stellate-pubescent on both surfaces with small stellate trichomes, divaricately spreading or slightly ascending, faintly one-nerved at the base or more often entirely nerveless; fruiting pedicels divaricately spreading or slightly

[1] Lena Artz in Claytonia, ii. 10 (1935).

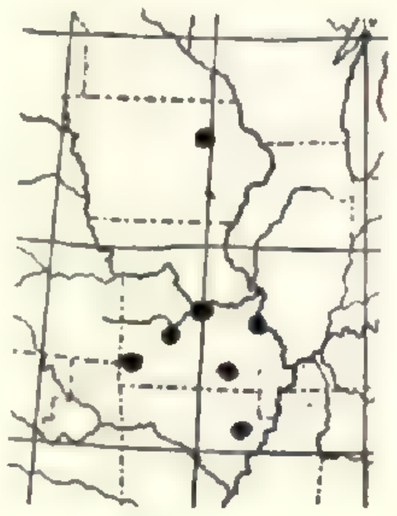
ascending, coarsely pubescent with simple and forked trichomes, 2–3.5 mm. long at maturity; style short and stocky, 0.25–1 mm. long, often as broad as long; seeds oblong to subelliptical, in one row, wingless, averaging 1 mm. long, 0.5 mm. broad.—Fl. N. Am. i. 80 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 130 (1840); Walpers, Rep. i. 133 (1842); Torrey, Fl. N. Y. i. 54 (1843); Dietrich, Synop. iii. 690 (1843); Wood, Classbk. ed. 2: 167 (1847); Gray, Man. 35 (1848); Chapman, Fl. So. States, 27 (1860); Britton & Brown, Ill. Fl. ii. 148 (1897); Britton, Man. 464 (1901); Small, Fl. Se. U. S. 484 (1903); Rydberg, Fl. Pr. & Pl. 382 (1932). *Sisymbrium dentatum* Torrey in Short, 3rd. Suppl. Cat. Pl. Kentucky, 338 (1833). *Iodanthus dentatus* Greene in Pittonia, iii. 254 (1897).—Shady banks and bottomlands or on limestone bluffs and ledges in rich woods, central New York to Minnesota and eastern Nebraska and Kansas, south to Virginia, Kentucky, Tennessee and Arkansas. The following are characteristic. New York: Utica, *Gray*. Pennsylvania: York Furnace, lower Susquehanna R., *W. Stone*, no. 7,775 [Phil]; 2 mi. n. of Wrightsville, York Co., *Small*, 2 May 1891 (as *A. patens*) [NY]; Aspinwall, Allegheny Co., *J. A. Schafer*, no. 1,505. Maryland: Bald Friar, Cecil Co., *J. J. Carter*, 29 May 1917 [NY]; along Potomac R., Cabin John, *Painter*, no. 572 [Mo]; rich alluvium along the Susquehanna R., Bald Friar, Cecil Co., *St. John & Long*, no. 8,070 [Phil]. District of Columbia: *Crandall*, without date or number; alluvial ground, *Steele*, 4 May 1896 [Minn]. West Virginia: Wheeling, *G. Guppenburg*, 28 May 1878 [NY]. Virginia: in cedar woods, Cedar Creek, Middletown, *F. W. Hunnewell*, 14 May 1932 [Bklyn]; rocky banks, Difficult Run, vicinity of Great Falls, *Killip*, no. 7,028 (as *A. laevigata*) [US]; along the Potomac R., near mouth of Dead Run, Fairfax Co., *Killip*, no. 12,892 [Phil]. Michigan: cool woods near Lansing, *Bailey*, 4 June 1886; shore of Grand River, near the Soldier's Home, Grand Rapids, *Wheeler*, without date or number; open woods, sw. of Grand Rapids, *C. W. Fallass*, 5 June 1897 [Minn]. Ohio: South Florence, Erie Co., *Moseley*, 14 May 1898; vicinity of Sandusky, *Moseley*, 24 May 1893 [Mo]; shaded bottomlands, Columbus, *Gleason*, 9 May 1905. Indiana: White R., 2 miles south of Bedford, Lawrence Co., *Kriebel*, no. 1,621; flood plain of Flat Rock R., 1 mi. west of Flat Rock, Shelby Co., *Deam*, no. 23,171 [Deam]; wooded slope of ravine, 4 mi. north of Lafayette, *Deam*, no. 54,802 [Deam]. Kentucky: wooded mountain, Quire's Camp, *J. W. Singer*, no. 258 [US]; banks of Elkhorn Creek,



Map 27. Range of Arabis dentata.

Short, 1860 [Mo]; sandy border of Ohio R., *Wildberger;* Lexington, *Short*, no. 75 [NY]. TENNESSEE: Nashville, *Gattinger*, April 1879 [Mo.]. WISCONSIN: Madison, Dane Co., *Gaca Melaas*, 1905; limestone cliffs east side of Lake Winnebago, *F. H. Smith*, no. 15; Pittsville, Wood Co., *Carl Colby*, nos. 4,486 & 4,491. ILLINOIS: rich woods and rock dens, Decatur, *Gleason*, no. 546 (as *Sisymbrium Thaliana*); woods along Desplaines River, Proviso, *A. Chase*, no. 1,292; wooded banks, Tazewell Co., *F. E. McDonald*, 3 May 1895. MINNESOTA: bluffs, Winona Co., *Holzinger*, May 1901 [NY]; near Lake City, *S. M. Manning*, 6 June 1884 [Minn]; wet places, Red Wing, *J. H. Sandberg*, May 1884 [Minn]. IOWA: Marshalltown, *Ball*, no. 492; sandy alluvial flat, west of Bayfield, Muscatine Co., *B. Shimek*, 7 May 1903; Council Bluffs, *Geyer*, no. 218 [Phil]; Vinton, *J. J. Davis;* Fayette, *B. Fink*, May 1894. MISSOURI: rich woods along limestone bluffs, Crowley's Ridge, Painton, Stoddard Co., *E. J. Palmer*, no. 43,904; rich woods, Vale, *Bush*, no. 4,932; rich rocky woods, Courtney, *Bush*, no. 7,923; moist banks, Sibley, *Bush*, no. 8,301 [US]. ARKANSAS: Forum, *Bush*, no. 14,476 [Mo]. NEBRASKA: woods, Lincoln, *Hedgecock*, 6 June 1900 [Mo]. KANSAS: woods, Miami Co., *Oyster*, 20 May 1883 [NY]; edge of field, vicinity of Congo, *R. Hoffman*, 28 March 1917 [Mo.]. SOUTH DAKOTA: open woods, Brule Creek, Union Co., *W. H. Over*, no. 17,226. *Fl.* April–May; *fr.* May–July. MAP 27.

Var. **phalacrocarpa**, n. var. Siliquis glabris.—Rich woods and shaded cliffs, Missouri, Iowa and Arkansas. The following are characteristic. MISSOURI: along shaded limestone bluffs of Osage River, St. Clair Co., *E. J. Palmer*, no. 35,650 (TYPE in Gray Herb.); Hematite, Jefferson Co., *Eggert*, 29 April 1896 [NY]; woods along Missouri R., 3 mi. w. of Alton, *Drouet*, no. 1,379; 7 mi. southeast of Pacific, Jefferson Co., *Steyermark*, no. 907 [Mo]; Carthage, Jasper Co., *E. J. Palmer*, no. 1,749 [Mo]; Jefferson Co., rocks on riverside, *Eggert*, [Mo]; Blue Lick, along bluffs, *Bush*, no. 13,444 [Mo]. IOWA: shaded woods, Blackhawk Co., *C. Russell*, 10 May 1898 [Mo]. ARKANSAS: common in woods, Newport, *Bush*, no. 1,378; *Dr. Pitcher*, without locality [Phil]. MAP 28.



MAP 28. Range of ARABIS DENTATA, var. PHALACROCARPA.

One of the two fundamental characters of typical *Arabis dentata* is its pubescent siliques. These are always covered with very minute, stellate trichomes which may be observed even in the earliest stages of fruit. The second striking character of this plant is the pubescence of its leaves. The basal ones show very clearly two distinct types of pubescence, the lower surfaces being covered quite thoroughly and, usually rather densely with very fine, forked trichomes, while the upper surface has instead coarse, decidedly strigose hairs scattered

either in great abundance or rather sparingly. The cauline leaves exhibit the same characters but to a less degree. The stellate pubescence of the lower surface of a typical stem-leaf is less dense than that of a basal one, while its upper surface shows considerably fewer strigae and may not infrequently be practically glabrous.

It seems rather remarkable that this interesting form of pubescence has seemingly escaped comment in the past. Torrey & Gray undoubtedly noticed it, although they failed to describe it completely, for they say in their description of the plant, "the pubescence (particularly of the under surface of the leaves) short and rather scabrous."[1] This is probably some slight implication that the lower surface of the leaves is different from the upper.

The siliques of var. *phalacrocarpa* lack the minute pubescence so characteristic of the typical form of the species, although its leaves have the usual strigose type. It occurs locally in Iowa, Missouri and Arkansas.

15. A. Holboellii Hornem. Biennial or more rarely perennial: stem erect, 2–6 dm. high, branched at the base or more rarely simple, first to 7th internode finely stellate-pubescent with minute bi- and trifurcate and branched appressed hairs, gradually becoming glabrate, usually glabrous beyond the 10th internode, or more rarely in shade forms, only the 1st and 2nd internode stellate-pubescent: radical leaves rosulate, narrowly obovate to oblanceolate, entire, 2–8 cm. long, 4–10 mm. broad, subacuminate to acute, minutely and densely stellate-pubescent on both surfaces with bi- and trifurcate hairs, tapering to short narrowly winged and stellate-pubescent petioles; cauline leaves oblong-lanceolate to narrowly oblong, remote to subimbricate, often subrevolute, entire, acute to subacuminate, 1.5–4 cm. long, 3–9 mm. broad, sessile with a subamplexicaul sagittate base, the lowermost finely and evenly stellate-pubescent, the middle ones less so, the uppermost nearly or quite glabrous or rarely in shade forms all the cauline leaves glabrous: flowers large and showy for the genus, mostly secund, in loose racemes, at first suberect, but soon becoming spreading; flower buds sparingly stellate-pubescent or very nearly glabrous; flowering pedicels sparingly stellate-pubescent with minute trichomes or more rarely glabrous, 4–6 mm. long, soon becoming spreading or slightly descending; sepals herbaceous, one-half the length of petals, oblong, sparingly stellate-pubescent with minute trichomes or more rarely glabrous especially in shade forms, 3–4.5 mm. long, 1–1.5 mm. broad, obtuse, purplish with a white or subhyaline margin; petals white to pinkish or lilac-purple, 7 (6.5–)–9 mm. long, 1.75–2.25 mm. broad at apex, the limb rather spreading, narrowly spatulate-ovate to spatulate-oblanceolate; siliques 3 (2.5–)–6 cm.

[1] Torrey & Gray, Fl. N. Am. 1. 80 (1838).

long, 1.5–2 (–2.5) mm. broad, somewhat irregularly curved inward or outward or very rarely nearly straight, slightly reflexed or somewhat descending, mostly secund, glabrous, bluntish at apex or rarely subacuminate, prominently one-nerved only at base or slightly beyond, the nerve soon tapering into obscurity; fruiting pedicels short, subgeniculate to geniculate, 4–9 (–11) mm. long at maturity, sparingly stellate-pubescent with minute trichomes or some of them glabrous; stigma sessile or on a very short style not exceeding 0.25 mm. long; seeds in one row at maturity, orbicular to suborbicular, narrowly winged all around, 1–1.5 mm. in diameter.—Fl. Dan. xi. t. 1879 (1828); Walpers, Repert. i. 132 (1842); Dietrich, Synop. iii. 693 (1843); Lange, Consp. Fl. Groenl. 49 (1880); not *A. Holboellii* of many American authors. *Turritis patula* Graham var. β Hooker in Fl. Bor.-Am. i. 41 (1829).—Greenland, Quebec and the Great Lakes region. The following are characteristic. GREENLAND: Upernavik, Gnejs. 71° 15′ N., *Porsild & Porsild*, 14 July 1929; Umanaq Storoe, Paornat, 70° 41′ N., *Porsild & Porsild*, 8 July 1929; S. Disko, 69° 15′ N., *R. T. Porsild*, 26 June 1929; Scoresby Sund, *N. Hartz*, 16 July 1891 [Can]. QUEBEC: dry rocky bluff near Rivière du Gouffre above Baie St. Paul, Charlevoix Co., *Stebbins*, no. 798; rocker, Bic, Rimouski Co., *Rousseau*, no. 28,830 (as *A. Collinsii*); cold and shaded limestone and limestone conglomerate ridges from Pointe aux Corbeaux to Cap Caribou, Bic, *Fernald & Collins*, no. 1,061; colline au sud de la propriété d'Etienne Doucet, Bic, *Rousseau*, no. 26,919; Cap aux Corbeaux, sur le conglomerat nu, *Rousseau*, no. 26,440; moist open cliff on peak at southern end of Lake Matane on the west side, Matane Co., *J. H. Pierce & W. H. Hodge*, no. 15A; talus of calcareous cliffs near Cap Rosier, Gaspé Co., *Pease*, no. 20,209. ONTARIO: Ferguson Mt., Temagami Forest Reserve, *W. R. Watson*, no. 976 [Wisc]. MICHIGAN: wind-swept crests, crevices and talus of sandstone conglomerate, West Bluff, Keweenaw Co., *Fernald & Pease*, no. 3,334; rocky shore near Agate Harbor, Keweenaw Penin-

MAP 29. Range of ARABIS HOLBOELLII.

sula, *Pease & Ogden*, no. 25,181. *Fl.* June–Aug.; *fr.* July–Sept. Map 29.

A. Holboellii, although actually having a very limited occurrence in North America, has long been treated as a Rocky Mountain species with outlying stations in Greenland, and almost every *Arabis* which possesses reflexed siliques and a stellate type of pubescence has been, at one time or another, referred to it. In reality, however, the plant is limited to the coasts of Greenland as far north as latitude 72°, and to very local stations in Charlevoix, Rimouski, Matane and Gaspé Counties, Quebec, as well as on the Keweenaw peninsula in Michigan and on Mt. Ferguson in the Temagami Forest Reserve of Ontario. It is quite distinct from any cordilleran species of *Arabis* and is quickly distinguished by its long petals (7–9 mm.) which have a very broad claw (1.75–2.25 mm.), cauline leaves never revolute or at most only very rarely subrevolute, and only slightly refracted siliques mostly secund and prominently one-nerved only at the extreme base. In the pubescence of its stem, however, it is like the cordilleran *A. retrofracta* Graham, both plants having a fine, minutely hoary, stellate pubescence which gradually disappears towards the top, although the pubescence of the basal leaves of the two plants is somewhat different, that of *A. retrofracta* being pannose or subpannose, while that of *A. Holboellii* is merely finely and evenly, but not densely, stellate. The characters above given, however, serve to separate our plant from that of Graham, although the two have usually been treated as synonymous. Thus, Frye & Rigg, in their Northwest Flora, give *A. retrofracta* as a synonym for *A. Holboellii* (p. 190), Piper lists *A. Holboellii* with *A. retrofracta* as a synonym (Fl. Washington, p. 293), and many other authors have treated the two species as identical. Such reductions have been the source of much difficulty in mapping the distribution of the plant, and have caused such a careful student as Porsild to state the range: "south of this latitude [in Greenland, 64°] only a single specimen is known from about 61°. In spite of this it must be stated as a decided southern type according to its occurrence in America."[1] And Porsild, following his predecessors, cites *A. retrofracta* as a synonym.

Greene appears to have been the first American botanist to realize that the Hornemann plant, which is exquisitely illustrated in Flora Danica, the plate being drawn from the type specimen,[2] was distinct

[1] M. P. Porsild, Fl. Disko Island, 83 (1926).
[2] Hornemann, Flora Danica, xi. t. 1879 (1828).

from that of cordilleran North America. He discusses the matter as follows:

> I have made repeated careful and laborious efforts to ascertain to what extent genuine *Arabis Holboellii*, a Greenland plant as to the original, is indigenous to British America and the United States. And while the results attained can not be considered final, I think it well to put them on record.
>
> And for one thing, I am convinced that *A. Holboellii* does not occur, so far as known, upon United States territory; nor have I yet met with satisfactory evidence of its occurrence on this continent; although it is to be expected from very far northward, along the shores of the Arctic seas. Our Rocky Mountain and other far western and northwestern plants that have been so referred must, it seems to me, be treated as fair subspecies at the least. A number of segregates have already been proposed, and I shall here present the characters of several more.
>
> But first of all, I shall attempt, what seems never yet to have been given, a real diagnosis of the original of this group, which has hitherto been recognizable only by means of the plate in the *Flora Danica*.[1]

His description of *A. Holboellii* "drawn from Greenland material in the herbarium of Mr. Theo. Holm"[2] is clear and concise and following it is one of *A. retrofracta* Graham, which brings out the essential differences between the two plants. Although I have not seen Macoun's no. 18,110, which is cited by Greene as being typical of *A. retrofracta*, nos. 18,109 and 18,108 (collected at Crows Nest Pass, Rocky Mts. on July 28th and 29th, 1897, no. 18,110 having been collected from the same station in August of that year) are in the herbarium of the National Museum of Canada, and are before me at the present moment. These two plants possess the fine and hoary stellate pubescence of the stem so typical of the Greenland plant, and if Macoun's no. 18,110 is at all similar, it is not clear why Greene regards it as being "more hirsutulous than stellate-hairy."[3]

The occurrence of *Arabis Holboellii* in Quebec is decidedly local; so rare is the plant in that region that comments such as "A second treasure was true *Arabis Holboellii* Hornem., the second collection of the typical plant outside Greenland, the first being on calcareous cliffs east of Bic,"[4] and: "On this gravelly slope [near Baie St. Paul in Charlevoix Co.] was an abundance of my most interesting 'find', *Arabis Holboellii* Hornem. This is the third station for this species in Quebec. The other two stations, at Bic and at Cap Rosier at the

[1] Greene, Pittonia, iv. 187 (1900).
[2] Greene, l. c. 188.
[3] Greene, l. c. 188.
[4] Pease in Rhodora, xxxi. 55 (1929).

tip of Gaspé, are both much farther north and in areas which escaped Wisconsin glaciation. It is, consequently, interesting that, in his study of Pleistocene deposits about Baie St. Paul, Coleman should have found that 'the proofs of Wisconsin glaciation are confined to the valley and do not extend to the mountains which rise above it to the east and west'."[1] The evidence that stations for this species in Quebec have been untouched by Wisconsin glaciation has been thoroughly discussed by Fernald[2] and needs no amplification here. Regarding the Ontario and Michigan stations, moreover, it seems quite likely that the latter escaped Wisconsin ice and, although I can find no evidence regarding the former, it seems evident, in view of the fact that the other stations for *A. Holboellii* outside of Greenland are in regions thought to have escaped Wisconsin ice, that the Mt. Ferguson station may also have remained undenuded. Fernald says of the Michigan habitat: "Similarly, on the Keweenaw Peninsula evidences of extensive and profound work by glaciers were obvious at many low levels; but at the higher levels, such as West Bluff [where *A. Holboellii* was collected], 735 feet (224 m.) above Lake Superior, where the deeply weathered trap and conglomerate cliffs stand well above the levels of evident glacial till and denudation, subaerial decay and weathering have obliterated any apparent traces of glaciation, if there ever were any. . . . It is significant, then, that Keweenaw County has a greater assemblage of remotely isolated relic-species and isolated endemics than any other botanically explored region between the Gaspé cliffs and mountains and the Driftless Area of Wisconsin, Minnesota, Iowa and Illinois."[3] He considers a conservative group consisting of "veteran" plants which are found in Greenland, in the Upper Great Lakes region and in other scattered regions of the northeastern part of this continent. It is in this class that *A. Holboellii* belongs, and if one can visualize its range before the Wisconsin ice as extending over a very broad area between Greenland and the Great Lakes, one can easily understand how its present-day stations in recently unglaciated regions, came about—simply because at these points the glaciers did not touch it, but left it to survive as a relic of a much more wide dispersal in previous times.

That Hooker's var. "β" of *A. patula* is merely our plant seems obvious from his comment "Professor Hornemann has sent me the

[1] Stebbins in Rhodora, xxxiv. 68 (1932).
[2] Fernald in Mem. Am. Acad. xv. 239–342 (1925)
[3] Fernald in Rhodora, xxxvii. 204–205 (1935).

var. β from Greenland,"[1] Moreover, Mr. C. A. Weatherby has very kindly examined the specimen in the herbarium at Kew to which Hooker referred and assures me that it is an excellent match for *A. Holboellii* in every detail.

16. A. CANADENSIS L. Biennial, from a thick tap root: stem erect, tall, 3–9 dm. high, simple or more rarely sparingly branched above, sparsely hirsute at base usually with simple, more rarely bifurcate hairs, passing to entirely glabrous above: basal leaves soon disappearing, obovate to lanceolate, 2.5–13 cm. long, 1.5–4 cm. broad, serrate-dentate to slightly runcinate, hirsute on both surfaces especially along the midrib with simple and bifurcate hairs or more rarely entirely glabrous, petioled; cauline leaves imbricate to subremote, oblong-lanceolate to elliptic, 2.5–12 cm. long, 0.5–2.5 cm. broad, attenuate to a sessile or subsessile base or the lowermost short-petioled, acuminate, denticulate or more rarely subentire, lowermost villous-hirsute, uppermost hirsutulous with simple and forked hairs to entirely glabrous: flowers small, the lowermost often pendulous, in very long loose racemes; flowering pedicels 7–10 (–12) mm. long at anthesis, glabrous or often hirsutulous with simple hairs, erect at youth but becoming pendulous at anthesis; sepals 2–4 mm. long, 1–1.25 mm. broad, membranaceous, acute or obtuse, yellowish or purplish, hirsutulous with simple and bifurcate hairs, only slightly shorter than the petals; petals white to cream, narrowly oblanceolate to oblong, 3–5 mm. long: siliques falcate to arcuate, never straight, pendulous or recurved, 7–10 cm. long, 2.5–4 mm. broad, attenuate to subattenuate, glabrous, distinctly one-nerved to the top or slightly below the top, prominently reticulate-veined; fruiting pedicels slender, at first divaricate or ascending, deflexed and subgeniculate at maturity, hirsutulous to glabrous, 8–12 (–15) mm. long at maturity; stigma small, on a style 0.5–1 mm. long, never sessile; seeds in one row in the pod, averaging 1.25 mm. in diameter, orbicular to broadly elliptical, broadly winged all around except at the base where the wing becomes cordate, the wing averaging 0.75 mm. broad.—Sp. Pl. ii. 665 (1753); Lam. Dict. i. 121 (1783); Persoon, Synop. ii. 205 (1807): DC. Syst. ii. 238 (1821); Delessert, Icon. Select. ii. 9, tab. 29 (1823); Elliott, Bot. S. Car. & Ga. ii. 143 (1824); DC. Prod. i. 147 (1824); Torrey, Compend. 250 (1836); Hooker, Fl. Bor.-Am. i. 43 (1829); Beck, Bot. N. & M. States, 30 (1833); T. & G. Fl. N. Am. i. 82 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 130 (1840); Darby, Bot. So. States, pt. ii. 21 (1841); Walpers, Repert. i. 133 (1842); Dietrich, Synop. iii. 694 (1843); Torrey, Fl. N. Y. i. 55 (1843); Wood, Classbk. 39 (1845); Gray, Man. 36 (1848); Chapman, Fl. So. U. S. 28 (1860); Provancher, Fl. Canad. i. 45, figs. 31–33 (1862); Watson in Gray, Synop. Fl. N. Am. i. 162 (1895); Britton & Brown, Ill. Fl. ii. 149 (1897); Britton, Man. 464 (1901); Robinson & Fernald in Gray, Man. ed. 7: 438

[1] Hooker, Fl. Bor.-Am. i. 41 (1829).

(1908); Rydberg, Fl. Pr. & Pl. 382 (1932); Small, Man. Se. Fl. 572 (1933). *A. falcata* Michx. Fl. Bor.-Am. i. 31 (1803); Poir. Encyl. Supp. i. 414 (1810); Pursh, Fl. Am. Sept. ii. 437 (1814); Bigelow, Fl. Bost. ed. 2: 251 (1824). *A. mollis* Rafinesque in Am. Month. Mag. ii. 43 (1817), non Steven in Bull. Soc. Nat. Mosc. iii. 270 (1812).—Rich woods, thickets or rocky banks, New England to Minnesota, south to Georgia and Texas. The following are characteristic. Maine: Skowhegan, Somerset Co., *Furbish*, 3 July 1903. New Hampshire: Nottingham, *A. A. Eaton*, 1896. Vermont: dry woods along West River, Brattleboro, Windham Co., *L. A. Wheeler*, 19 Aug. 1915; Manchester, *Blanchard*, no. 35; rocky woods, Pawlet, *Weatherby*, 8 June 1935. Massachusetts: steep rocky wooded slopes, North Adams, *Fernald & Long*, no. 9,569; rocky woods, Chelmsford, *Knowlton*, 13 June 1903; Lexington, *E. F. Williams*, 19 Sept. 1897. Rhode Island: Providence, *Olney* [NY]. Connecticut: rocky woods, Franklin, *Woodward*, 6 June & 19 July 1906; rocky woods, Southington, *Bissell*, no. 61; Wethersfield, *C. Wright*, 1878; Greenwich, *L. M. Stabler*, 26 June 1886. New York: west end of Beebe Lake, Ithaca, Tompkins Co., *E. L. Palmer*, no. 589; dry rocky woods above falls, Taughannock Ravine and vicinity, Ulysses, Tompkins Co., *A. J. Eames*, no. 4,220; calcareous soil, Haynes Hill, southern West Fort Ann, Washington Co., *Burnham*, 2 July 1920. New Jersey: vicinity of Clifton, Passaic Co., *G. V. Nash*, 19 June 1890 [US]; rich woods along Otter Brook west of Somerdale, *H. B. Meredith*, 27 May 1921; along old wood road on slope of Second Mt., Watchung, Somerset Co., *Moldenke*, no. 1,692 [US]. Pennsylvania: mountains, East Dauphin, *Small*, 30 June 1888; Easton, *A. A. Tyler*, 23 July 1896 [NY]; Erie, *Kuntze*, 8 Aug. 1874 [NY]; vicinity of McCall's Ferry, York Co., *Rose & Painter*, no. 8,116a [US]. Delaware: loamy wooded slopes, Guyencourt, Newcastle Co., *Long*, no. 27,530 [Phil]; loamy wooded slope, Mermaid, Newcastle Co., *Long*, no. 28,280 [Phil]. Maryland: Plummer's Island in Potomac R., near Cabin John, Montgomery Co., *Kearney & Maxon*, no. 65 [US]; rocky woods, Garrett Co., *J. D. Smith*, 7 July 1882 [US]; wooded slope along Susquehanna R., Conowingo, Cecil Co., *Long & Bartram*, no. 1,266 [Phil]; Cromley's Mount, Oakwood Township, *Pennell*, no. 1,583 [Phil]. District of Columbia: in vicinity Washington, *L. F. Ward*, 24 May 1877; woods, *Steele*, 10 June & 14 July 1896 [Minn]; Prince Mill, *D. L. Topping*, 4 August 1896 [Minn]. West Virginia: near Varney School, Mingo Co., *Berkley*, 8 July 1930; Snowy Mt., Pendleton Co., *Core*, 13 Aug. 1931 [NY]. Virginia: Bedford Co., *A. H. Curtiss*, 9 June 1871; Mountain Lake, *Brown, Britton, Hogg et al*, 1 June 1890 [NY]; Walker Mt., vicinity of Marion, Smyth Co., *Brown, Britton & Vail*, 1 June 1892 [NY]; Peaks of Otter, Bedford Co., *Rydberg*, no. 9,267 [NY]. North Carolina: dry woods near Waynesville, *Biltmore Herb.* no. 1,241b; Asheville, *B. L. Robinson*, no. 68; on ledge, upper slope, Bald Mt., *Hodgdon & Rossbach*, no. 74; dry banks, Swain Co., Great Smoky

Mts., *Beardslee & Kofoid*, 20 July 1891. South Carolina: summit of Paris Mt., *Small*, July 1896 [NY]; Andersonville, *F. E. H.*, 1886 [US]; Santee R. bottom, w. of St. Paul, Clarendon Co., *W. Stone*, no. 613 (as *A. laevigata*) [Phil]. Georgia: on limestone rocks in rich woods near Grier's Cave, Randolph Co., *R. M. Harper*, no. 2,229; dry woods near Oconee River, Athens, *Harper*, May 1897 [NY]; Wilkes Co., *Chapman*, 1883 [NY]. Ontario: gravelly hillside, Port Stanley, Lake Erie, *Macoun*, no. 11; dry open rocky woods, Niagara Falls, *Macoun*, no. 1,659 [Can]. Amherstburgh, *Macoun*, no. 33,777 [Can]; on rocks, Lincoln Co., *McCalla*, no. 43 [Can]. Michigan: woods, Saugatuck, *Umbach*, 27 July 1898 [US]; Jackson Co., *S. H. & D. R. Camp*, 12 June 1897 [Minn]; dry sandy soil, Grand Rapids, *E. J. Cole*, 20 June 1894 [Minn]; dry wooded slopes, Ann Arbor, *Hermann*, no. 6,811. Ohio: Columbus, *Sullivant*, 1840; Brady Lake, Portage Co., *L. S. Hopkins & R. J. Webb*, no. 1,253; near Cincinnati, *T. G. Lea* [Phil]; Sylvania, Lucas Co., *L. R. Wilson*, no. 1,476 [Wisc]. Indiana: rocky soil on top of "knob," 3½ mi. nw. of New Albany, Floyd Co., *Deam*, no. 23,272 [Deam]; Lake Maxinkuckee, *B. W. Everman*, no. 824 [NY]; sandy open black-white oak woods, 1 mi. e. of Mongo, *Deam*, no. 20,703 [Deam]. Kentucky: hillside woods west of Olive Hill, Carter Co., *Weatherby & Weatherby*, no. 6,387; Star Limeworks and Bluff Spring, Lyon Co., *Eggleston*, no. 4,667 [NY]; Rockdale, *R. Runyon*, no. 1,308 [US]. Tennessee: woods, Sherwood, Franklin Co., *Eggert*, 8 June 1897 [Mo]; border of thickets, Knoxville, *Ruth*, no. 355; Lavergne, Rutherford Co., *Svenson & Shaver*, no. 6,939. Alabama: exposed sandstone cliff in gorge of Rocky Branch near Scales, Tuscaloosa Co., *Harper*, no. 3,054 [NY]; wooded hilltop, Birmingham, *Earle*, 24 May 1901 [NY]; Auburn, *Earle & Baker*, 29 May 1897 [Minn]. Wisconsin: wooded sandstone bluff above Beef Slough, Alma, Buffalo Co., *Fassett & Hotchkiss*, no. 2,947; Boscobel, *H. E. Hasse*, 12 June 1884 [NY]; cascades of Bay Settlement, Brown Co., *J. H. Schuette*, 28 June 1881 [US]. Illinois: black-jack association, Havana, *H. A. Gleason*, 17 Aug. 1904; open dry woods, Peoria, *F. E. McDonald*, Aug. 1904; copse near Wady Petra, Stark Co., *V. H. Chase*, no. 641 [Phil]. Minnesota: Jordan, Scott Co., *C. A. Ballard*, no. B196 [Minn]; wooded north slope of Zumbo Valley, near Thielman, Wabasha Co., *Butters & Rosendahl*, no. 3,531 [Minn]; Winnebago Valley, Houston Co., *H. L. Lyon*, 16 June 1899 [Minn]. Iowa: rocky woods, Fayette, *Fink*, June 1894; upland woods, Decatur Co., *Fitzpatrick & Fitzpatrick*, 26 May 1898 [NY]; Fort Dodge, *M. P. Somes*, no. C3,319 [US]. Missouri: Meramec Highlands, *H. A. Gleason*, 25 June 1904; Allenton, St. Louis Co., *Churchill*, 20 May 1918; rocky soil, Courtney, *Bush*, no. 7,985 [US]. Arkansas: Bethesda Springs, *H. C. Benke*, no. 5,493; dry woods near summit of West Mt., 3 mi. w. of Hot Springs, Garland Co., *R. M. Harper*, no. 31; Benton County, *E. N. Plank*, 1899 [NY]. Nebraska: Weeping Water, *M. E. Day*, no. 2; Nebraska City, H. J. Webber [NY]; Bad Lands, *Hayden*, 5

July 1853 [Mo]. Kansas: rocky woods, Riley Co., *A. S. Hitchcock*, no. 1,009; Fort Riley, *E. E. Gayle*, June 1892 [NY]; Atchison Co., *G. Scarborough*, 28 May 1886 [Bklyn]. Oklahoma: LeFlore Co., *T. R. Stevens*, 25 June 1931 [US]; Sapulpa, *Bush*, no. 1,196 [Mo]. Texas: sandy woods, very rare, Dallas, *Reverchon*, May 1876; sandy upland woods, Larissa, Cherokee Co., *E. J. Palmer*, no. 7,847 [US]; rocky woodlands, Morris Co., *Biltmore Herb.*, no. 1,241e [Deam]. *Fl.* April–June; *fr.* June–Sept.

This very distinct and readily identified plant has had a fairly calm taxonomic history. Michaux, however, described it as a new species, *A. falcata*,[1] and some subsequent authors used his name: Pursh, Nuttall and Bigelow. Michaux's type of *A. falcata* was studied in 1903 by Professor M. L. Fernald, whose notes indicate that it is identical with *A. canadensis* L. Rafinesque, writing in the American Monthly Magazine, described *A. mollis*, which is without a doubt merely *A. canadensis*. He says of it:

> Stem upright, leaves sessile, lanceolate, acute, hairy, with remote teeth: flowers on long racemes and long peduncles, calyx hispid, petals cuneate obtuse, entire, longer than the calix, siliques drooping, sickle shaped compressed.—Obs. This species has perhaps been overlooked, being taken for a variety of *A. canadensis* or *A. falcata* of which it has the habit and fruit, but it differs widely by the leaves which are not smooth or hastated. It is more scarce, and grows in rocky woods on the Highlands, the Catskill mountains, and near Athens, Hudson, Fishkill, &c. Mr. Torrey has found it also on the Island of New-York; it blossoms in June and July. The stem rises without branches, from one to three feet, the leaves are thin and soft. Perennial. It varies with smooth and hairy stem, sometimes branched, and a variety has oblong leaves. The flowers have the glands as in *A. alpina*.[2]

A. canadensis does not possess either smooth leaves nor "hastated" ones, as implied by Rafinesque, nor is it ever a perennial, as far as I can discern, so that it is apparent that Rafinesque misinterpreted *A. canadensis*. His characterization of *A. mollis* so perfectly fits our plant that it seems clear that it is true *A. canadensis*. No other species of *Arabis* familiar to me from the Catskills and Highlands region possess "hairy" leaves and sickle-shaped siliques. In the discussion of *A. pycnocarpa* in this paper, I have stated that the plant which was perhaps the basis of Pursh's *Turritis ovata* is quite clearly *A. canadensis;* but whether *A. ovata* (Pursh) Poir. should be correctly placed as a synonym for *A. canadensis* can only be surely known when and if the type specimen of the Pursh plant is found. DeCandolle

[1] Michaux, Fl. Bor.-Am. ii. 31 (1803).
[2] Rafinesque in Am. Mo. Mag. ii. 43 (1817).

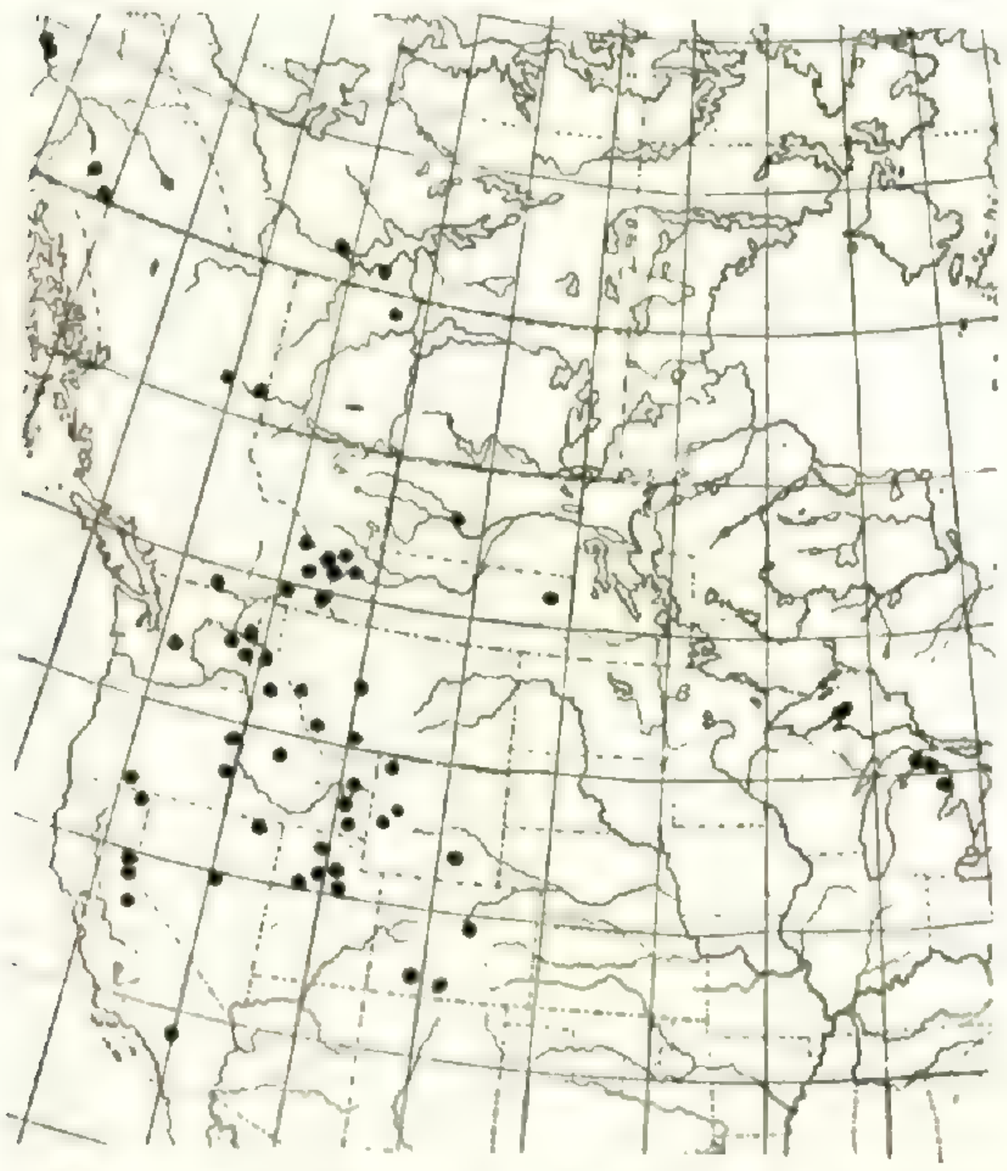
reduced it to a variety of *A. sagittata*,[1] and Torrey & Gray included it as a variety of *A. hirsuta*,[2] which they considered to be identical with *A. sagittata* DC. But I have felt that it was wiser to omit it from the synonomy of any species.

In the Herbarium of the United States National Museum there is a specimen from Oklahoma collected in LeFlore Co., by T. R. Stemen and supposed to be a hybrid of *A. canadensis* and *A. laevigata*. The plant appears to me to be typical *A. canadensis* in every detail except for the perfectly glabrous cauline leaves which lack the characteristic hirsute or hirsutulous pubescence of that species. The only character of *A. laevigata* which the specimen possesses is the glabrous leaves, but in the absence of further proof of its hybrid origin (such as cytological studies), I have treated it as ordinary *A. canadensis*.

17. A. RETROFRACTA Graham. Biennial or more rarely perennial; stem erect, simple or more rarely branched at base, the base finely hoary-pubescent with minute stellate trichomes, becoming less hoary upwards and passing to glabrous; radical leaves rosulate, narrowly obovate to oblanceolate, entire to denticulate, 2–5 cm. long, 3–9 mm. broad, subacute, pannose to subpannose on both surfaces with minute stellate trichomes, tapering to short narrowly winged minutely stellate-pubescent petioles; cauline leaves linear-lanceolate to lanceolate, imbricate to subimbricate, entire with distinctly revolute margins, 1.5–5 cm. long, 3–6 mm. broad, sessile with a subamplexicaul sagittate base, acuminate, the lowermost finely pannose on both surfaces, the middle ones subpannose or merely minutely stellate-pubescent, the uppermost nearly or quite glabrous; flowers at first erect but becoming reflexed at anthesis, in loose racemes; flower buds minutely stellate-pubescent or very rarely subtomentose; flowering pedicels minutely stellate-pubescent, 5–7 mm. long, soon becoming reflexed; sepals herbaceous, 2.5–4.5 mm. long, 1–1.5 mm. broad, oblong, one-half to one-third the length of the petals, finely stellate-pubescent with minute trichomes or more rarely nearly glabrous; petals white to pinkish or lilac-purple, 6–9 mm. long, 1–1.75 mm. broad at apex, narrowly spatulate-obovate; siliques straight or nearly so, narrow, 3.5–7 (–8) mm. long, 1–1.5 (–1.75) mm. broad, acute to acuminate, glabrous, strongly reflexed, appressed to subappressed, one-nerved prominently to middle or slightly beyond, the nerve quickly becoming obscure beyond there; fruiting pedicels 5–12 mm. long, strongly reflexed, geniculate to subgeniculate, finely stellate-pubescent with minute trichomes or some of them quite glabrous; stigma sessile or on a very short style not exceeding 0.25 mm. long; seeds mostly in one row at maturity, orbicular to suborbicular,

[1] DC., Syst. ii. 222 (1821).
[2] T. & G., Fl. N. Am. i. 80 (1838).

narrowly winged all around, 0.75–1.2 mm. in diameter.—Edin. New Phil. Journ. 344 (July–Oct. 1829); Howell, Fl. Nw. Am. i. 45 (1897); Greene, Pittonia, iv. 188 (1900); Rydberg, Fl. Rocky Mts., 362 (1917) and Fl. Pr. & Pl. 382 (1932). *Turritis retrofracta* Hooker, Fl. Bor.-Am. i. 41 (1829). *A. Holboellii* var. *retrofracta* Rydberg in Contr. U. S. Nat'l. Herb. iii. 484 (1896); Jepson, Man. Fl. Pl. Calif. 429 (1925), the combination erroneously ascribed to Jepson; Munz, Man. So. Calif. Bot. 205 (1935). *A. Kochii* Blankinship in Mont. Agri. Coll. Sci. Stud. i. 57 (1905).—Northern Michigan; Mackenzie and Yukon, south in the Mountains to Colorado and California. The following are characteristic. MICHIGAN: sands, north shore of Thunder Bay near Alpena, *C. F. Wheeler*, 3 July 1895; wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., *Fernald & Pease*, no. 3,335; sand dunes of Big Stone Bay, Emmet Co., *Ehlers*, no. 501 (as *A. canadensis*). MACKENZIE: Mackenzie River, *I. S. Onion, R. Kennicott & W. L. Hardisty*, 1861–62 [NY]; rocky soil, Windy Point, Great Slave Lake, *G. S. Hume*, no. 102,665 [Can]. ASSINIBOIA: Assiniboia River railway survey, *Macoun*, no. 75. SASKATCHEWAN: junction of north fork and north branch of Saskatchewan River, *S. Brown*, no. 924 (as *A. Holboellii patula*). ALBERTA: Rocky Mt. Park, Wapta Lake, *Macoun*, no. 64,511; Pine Lake District, Wood Buffalo Park, *Raup*, nos. 2,489 & 2,491; Banff, *Butters & Holway*, no. 52; Crow Nest Pass, lat. 49° 30′, *Macoun*, no. 18,109 (as *A. patula*); Rocky Mts., Palliser's Brit. N. Am. Expl. Exped., *E. Bourgeau*, 1858 ["substitute type" in Gray Herb.]. MONTANA: dry gravelly bank, west fork of Rock Creek near Mud Lake, Ravalli Co., *C. L. Hitchcock*, no. 1,754; near Pony, *Rydberg & Bessey*, no. 4,227; vicinity of Helena, *B. T. Butler*, no. 1,854 [NY]. IDAHO: ridges south from Wiesner's Peak, Coeur d'Alene Mts., *Leiberg*, no. 1,404; Ketchum, *A. I. Mulford*, 24 June 1892; rather open slopes, Parker Mt., Custer Co., *Macbride & Payson*, no. 3,271 (as *A. lignifera*). WYOMING: Surveyor Park, Fremont Lake, Sublette Co., *Payson & Payson*, no. 2,817; gravelly sagebrush flat, Alpine, Lincoln Co., *Payson & Armstrong*, no. 3,401 (as *A. exilis*); Copperton, Carbon Co., *F. Tweedy*, no. 4,467 [NY]. COLORADO: South Park, *Wolf &*



MAP 30. Range of ARABIS RETROFRACTA.

Rothrock, no. 655 (as *A. patula*); Ojo, *Rydberg & Vreeland*, no. 6,179 [NY]; Mancos, *Eastwood*, June 1892 [NY]. UTAH: Salt Lake City, *O. A. Garrett*, no. 1,094; Logan, *A. I. Mulford*, no. 49 (as *Thelypodium micranthum*) [NY]; mountains southeast of Silver Lake, near the headwaters of Big Cottonwood Creek, *Rydberg & Carlton*, no. 6,564 (as *A. elegans*) [NY]; Bingham, *M. E. Jones*, no. 378. NEVADA: dry bottomlands, Jarbridge, *Nelson & Macbride*, no. 1,920 (as *A. exilis*); Palisade, alt. 5,000 ft., *S. G. Stokes*, 17 June 1903 [US]. CALIFORNIA: Soda Springs, *Brewer*, 1863 (as *A. patula*); lower end of Donner Lake, Nevada Co., *Heller*, 13 July 1903; cactus flat of Cushenbury Canon, *M. E. Jones*, 12 May 1926 [NY]; Bear Valley, San Bernardino Mts., *S. B. Parish*, no. 2,483 [NY]. OREGON: Swan Lake Valley, Klamath Co., *E. I. Applegate*, no. 29; mountain sides, Baker Co., *Cusick*, no. 1,080; near Harper Ranch, Malheur Co., *Leiberg*, no. 2,092 [NY]; summit of Blue Grass Ridge, Mt. Hood, alt. 4,500 ft., *J. W. Thompson*, no. 3,294 [Phil]. WASHINGTON: Spokane, *Piper*, no. 2,690; on mountains, west Klickitat Co., *Suksdorf*, May 1884 & July 1885 (as *A. canescens*); near Sprague, Lincoln Co., *Sandberg & Leiberg*, no. 139 [NY]; Spokane Valley, *Dr. Lyall*, 1861; Simcoe Mts., *Howell*, June 1881 [NY]. BRITISH COLUMBIA: Kicking Horse Valley, vicinity of Field, *S. Brown*, no. 351; shore of Howser Lake, *C. H. Shaw*, no. 711; dry bluffs, north bank of Peace R., at Taylor Flat, about 56° 8′ N., 120° 40′ W., alt. 6,000 ft., *Raup & Abbe*, no. 3,573; west and northwest slopes of Mt. Selwyn, about 56° 1′ N., 123° 39′ W., alt. 4–5,000 ft., *Raup & Abbe*, no. 3,958. YUKON TERRITORY: White Horse, *Macoun*, nos. 58,354, 58,358 & 58,359 [NY]; Hunker Creek, *Macoun*, no. 58,357 [NY]; Dawson, *Eastwood*, no. 134. *Fl.* late May–June; *fr.* June–July. MAP 30.

After a careful search in the herbarium of the Royal Botanic Garden in Edinburgh, Mr. C. A. Weatherby informs me that no type of Graham's *Arabis retrofracta* is to be found there, and adds that the only old specimen labelled "*A. retrofracta*" is one from the Palliser Expedition collected by Bourgeau in 1858. A duplicate of this Bourgeau plant is in the Gray Herbarium and pasted in one corner of the sheet is an envelope on which is written in Asa Gray's hand, "Pod of what is thought to be *Turritis retrofracta*. From Herb. Graham." This envelope contains one silique of a plant which is unquestionably an *Arabis* and which possessed reflexed pedicels, for there is enough left of the pedicel to show a geniculate condition indicative of a reflexed position on the stem. Its nervation and the characters of the mature seeds contained in the pod indicate that it came from a plant of what we now recognize as *A. retrofracta* but from what specimen it is impossible now to say. It is a perfect match for the siliques of the Bourgeau specimen, which is an excellent representa-

tive of the plant so lucidly described by Graham as *A. retrofracta*. Graham's description reads as follows:

> *Root* branching, fibrous. *Stem* erect, scarcely branched, hoary, especially below, where also purplish, green above. *Leaves* soft and hoary on both sides, revolute in their edges, sessile, dilated at the base and stem, clasping; the lower leaves mostly hoary and purplish, entire or slightly toothed at the apex only, spathulato-linear, higher up lanceolato-linear, and towards the top subulate, entire and sagittate, those lower on the stem having small auricles. *Raceme* terminal, elongating while flowering; *pedicels* opposite, but frequently solitary (from abortion?), bent down, with a very acute angle at their origin, turned to one side, hairy, hairs branched. *Calyx* yellowish-green, leaflets elliptical, edges membranaceous, adpressed, half the length of the pedicel, sparingly covered with similar hairs. *Corolla* nearly as long as the pedicel, white, or with a very faint purple tinge; *petals* spathulate, somewhat oblique at the apex, and slightly emarginate. *Stamens* rather longer than the calyx, the longer exceeding the shorter by the length of the anthers; filaments colorless, smooth; anthers pale yellow. *Pistil* rather shorter than the stamens; germen linear, slightly swollen at its base, slightly compressed, much elongated before the flowers fall; style nearly wanting; stigma very small, blunt, simple, glandular only on its upper surface. Seeds arranged in a single row in each loculament, bordered; cotyledons flat, embryo applied to their edges.
>
> Raised at the Botanic Garden from seeds collected in Captain Franklin's last expedition. The station of the species is stated by Dr. Richardson to extend from Hudson's Bay to the Rocky Mountains, and from Canada to Lat. 68° at Mackenzie's River.

Because his description so adequately fits the plant of cordilleran and Pacific North America, although no actual type-specimen seems to exist, and because Hooker and subsequent authors well understood it, I am continuing to use Graham's epithet rather than discard it in favor of a new one and have cited the Bourgeau specimen as a "substitute type," in case the true type should come to light in the future. *A. retrofracta* is characterized by a minute stellate pubescence on the stem, which normally appears hoary. The radical leaves range from pannose to subpannose, the cauline leaves are lance-linear and very revolute, tapering to an acuminate apex; the flowers are large for the genus and somewhat secund; the sepals and flowering pedicels display the same minute (hoary) stellate pubescence as does the stem; and the siliques are long, straightish, narrow, and prominently nerved to the middle. In its pubescence the plant closely resembles *A. Holboellii*, although that of the latter is usually less pannose on the radical leaves, being merely minutely stellate.

Although a majority of American authors have consistently con-

fused our plant with the Greenland *A. Holboellii*, *A. retrofracta* has been correctly interpreted by Rydberg, by Greene and by Howell,[1] but each of them has emphasized certain characters not brought out by the others. The differences between the two plants have been stressed in the discussion of *A. Holboellii* and need not be rediscussed. *A. retrofracta* is a cordilleran species found eastward only in isolated and extremely local stations in northern Michigan, extending throughout the Rocky Mountain and Pacific coast regions. In southern California it is isolated in the San Bernardino Mountains, but this isolation is quite in accord with the present interpretation of endemism in that region.[2]

Although it appears quite probable that *A. lignipes* A. Nelson[3] is a synonym for *A. retrofracta*, I have refrained from citing it in the formal bibliographical list because the type-specimen is unavailable to me at the present time. Several sheets from the immediate vicinity of the type-station, identified by Professor Nelson as *A. lignipes*, were kindly loaned to me by him, but until the actual type itself is seen, I ought not to say with certainty that it is *A. retrofracta*.

18. A. PENDULOCARPA A. Nelson. Perennial from a subligneous base: stem erect, slender, 1–3 dm. high, branched at base or above or more rarely simple, densely hispid or hirsute below with simple or bi- or trifurcate, spreading to subspreading hairs, passing above to loosely-hispidulous and glabrous: radical leaves densely rosulate, oblanceolate to narrowly obovate, acute to subacute, 1–5 cm. long, 4–10 mm. broad, entire to subdentate with a few scattered teeth near the apex, pannose on both surfaces with minute stellate trichomes, petiolate, the petioles hirsute to ciliate; cauline leaves lanceolate to narrowly oblong, acute to subacuminate, entire, remote to subimbricate or often entirely imbricate, sessile with an auriculate or a sagittate

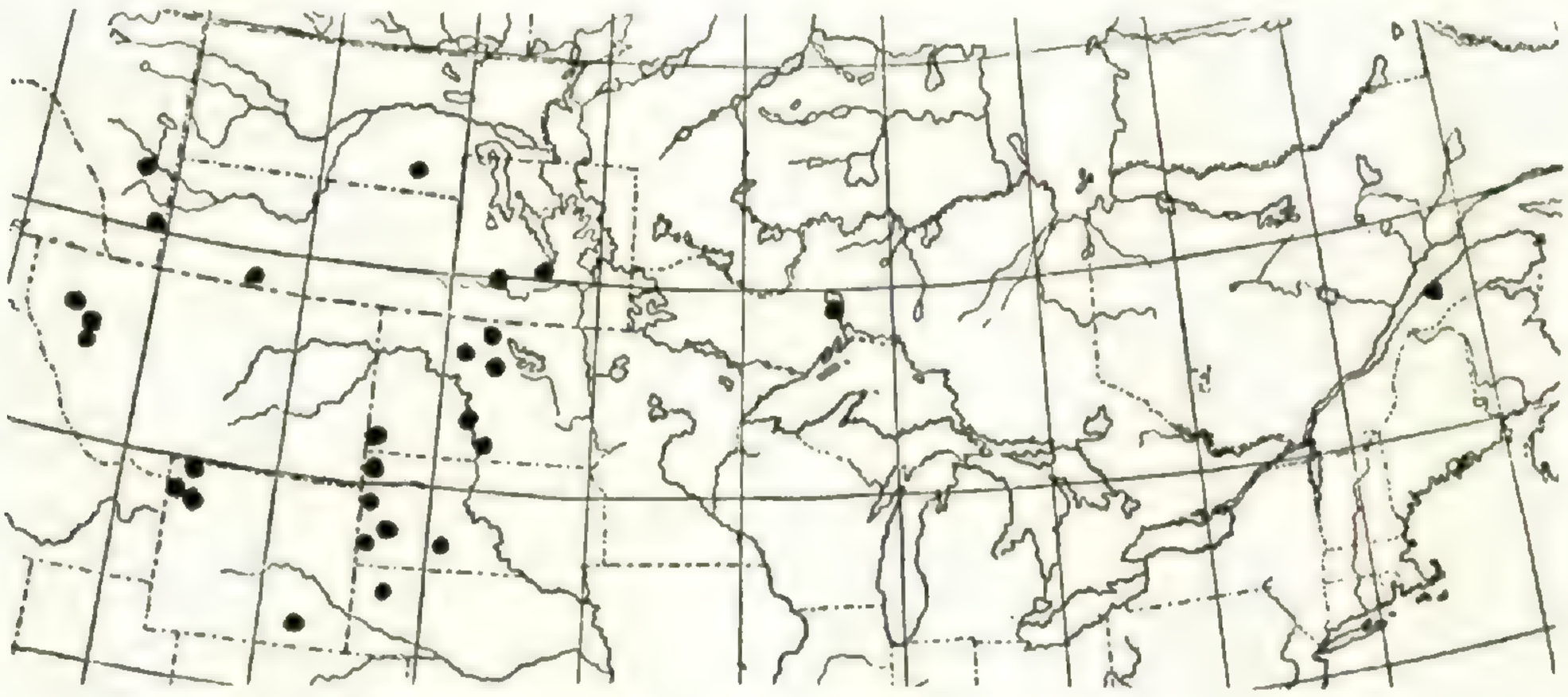
[1] Greene, discussing the plant in Pittonia, iv. 188 (1900) says: "I note that Mr. Howell, in his Northwestern Flora, has taken up the name *A. retrofracta*, but, as it appears from the description, for a plant very different from this [Graham's *A. retrofracta*]." Howell's description seems to tally in every respect with Graham's, even more closely in some ways than Greene's.

Rydberg, although at first considering the two species as so closely related that he treated *A. retrofracta* as a mere variety of *A. Holboellii* [Contr. U. S. Nat'l. Herb. iii. 484 (1896)], later realized that they were quite separate, and in his Flora of the Rocky Mountains (1917), and in his Flora of the Prairies and Plains of North America (1932) correctly interpreted *A. retrofracta*. Its occurrence in Nebraska, as cited by him in each book is, however, somewhat dubious. It seems more probable that specimens referred to that state were misidentified, especially as *A. pendulocarpa* (*A. Collinsii*) has been recorded from there, and as it is not difficult to confuse the two species unless they are clearly understood.

[2] For discussion of endemism in the Southern California flora see Munz, Man. S. Calif. Bot., Introd. xv–xvi (1935).

[3] A. Nelson in Bot. Gaz. xxx. 191 (1900).

base, revolute to subrevolute, 8–23 mm. long, 1.5–4.5 mm. broad, the lowermost subpannose to hirsutulous, the uppermost hirsutulous or frequently glabrate: flowers small, somewhat secund, in loose racemes; flowering pedicels hispidulous to glabrate, 5–7 mm. long at anthesis; sepals herbaceous, oblong, one-half to one-third the length of petals, 2–4 mm. long, 0.5–0.75 mm. broad, green or greenish with a white or slightly hyaline margin around the upper periphery, hispidulous to glabrate with simple and bifurcate hairs; petals white to pink or pinkish, narrowly spatulate-obovate to spatulate-oblanceolate, 3–6 mm. long, 1–2 mm. broad at apex: siliques straight or more rarely somewhat curved, glabrous, 2.5–5 (–6) cm. long, 1–1.5 mm. broad, acute to subacuminate, somewhat secund, reflexed at maturity, prominently one-nerved to the middle or rarely only slightly beyond; fruiting pedicels strongly refracted, subappressed to appressed, loosely



Map 31. Range of Arabis pendulocarpa.

hispidulous with simple and bifurcate hairs or often some of them quite glabrous, geniculate to subgeniculate, 6–12 (–15) mm. long at maturity; stigma round, small, on a short style usually 0.25–0.35 mm. long or quite sessile; seeds crowded somewhat in two rows, suborbicular to broadly oblong or very irregular in outline, 0.75–1.2 mm. in diameter, narrowly winged at apex or all around.—Bot. Gaz. xxx. 192 (1900); Rydberg, Fl. Rocky Mts. 363 (1917). *A. Collinsii* Fernald in Rhodora, vii. 32 (1905); Britton & Brown, Ill. Fl. ed. 2: ii. 183 (1913); Victorin, Fl. Laurentienne, 261 (1935).—Dry ledges, grassy hillsides and rocky thickets, Bic, Quebec; western Ontario to Alberta, south to northwestern Nebraska and Wyoming. The following are characteristic. Quebec: limestone-conglomerate cliffs and ledges, island headland east of Baptiste Michaud's, Bic, *Collins & Fernald*, 16–18 July 1904 [type of *A. Collinsii* in Gray Herbarium]; près du Cap Enragé, Bic, *Victorin*, no. 9,582; ledges, Bic, *Churchill*, 12 July 1905; sur le conglomerat nu, Ilet à d'Amours, Bic, *Rousseau*, nos. 26,600 & 26,611. Ontario: dry rocky places, trap rock, Black-

water R., Lake Nipigon, *Macoun*, no. 1,685 [Can]. MANITOBA: prairies north of Carberry, *Macoun & Herriot*, no. 69,860 (as *A. lignipes*) [Can]; Pine Creek, *Macoun & Herriot*, no. 69,859 (as *A. lignipes*) [Can]; dry open meadow near Insane Asylum, Brandon, *Macoun*, no. 12,371 [Can]. NORTH DAKOTA: Towner, McHenry Co., *J. Lunell*, 29 May 1908 [Phil]; Mandan, *J. T. Sarvis*, 1915 [US]; dry gravelly soil, Minot, *Olga Lakela*, no. 451 [Minn]; Dunseith, Rolette Co., *J. Lunell*, 4 June 1911 [NY]; in sandy soil on hillside, Cannon Ball, *H. F. Bergman*, no. 1,556 [Minn]; bluffs in Bad Lands, Marmarth, *L. R. Moyer*, no. 452 [Minn]. SOUTH DAKOTA: rocky shaded ledges, Custer Peak, Lawrence Co., *E. J. Palmer*, no. 37,545; Elk Canyon, Black Hills, alt. 4–5,000 ft. *Rydberg*, no. 520 [NY]; Redig, *J. W. Moore*, no. 1,535 [Minn]; hillsides, Mayo, Custer Co., *Over*, no. 1,849 [US]; grassy hillsides, Bear Creek, Washabaugh Co., *Over*, no. 2,087 [US]. NEBRASKA: Fort Robinson, *J. M. Bates*, 4 June 1890. SASKATCHEWAN: prairies, 12 Mile Lake, near Wood Mt., *Macoun*, no. 10,305 [Can]; dry thickets and in sparsely wooded country, Pheasant Plain, *Macoun*, no. 1,691 [Can]. MONTANA: exposed slope of Waterworks Hill, North Missoula, 3,600 ft. elev. *C. L. Hitchcock*, no. 1,592; barren gravelly ridge, 5 miles east of Parma, Sanders Co., *C. L. Hitchcock*, no. 1,551; dry rocky slope near second bridge above Bonner, Blackfoot Valley, Missoula Co., *C. L. Hitchcock*, no 1,686. WYOMING: Mammoth Hot Springs, Yellowstone National Park, *F. Tweedy*, June 1885 [US]; Laramie, *A. Nelson*, no. 56 (as *A. Lemmoni*) [US]; on cliffs and rocky ledges, Madison, Yellowstone National Park, *A. & E. Nelson*, no. 5,504 [TYPE in Herb. Univ. of Wyoming]; Yellowstone River near Junction Butte, Yellowstone National Park, *A. & E. Nelson*, no. 5,738 [CO-TYPE in Herb. Univ. of Wyoming]. ALBERTA: dry grassy hills, Black Birch Coulee, vicinity of Rosedale, *M. E. Moodie*, no. 823 [NY]; Medicine Hat, *Macoun*, no. 3,073 [Can]. *Fl.* June–July; *fr.* June–Aug. MAP 31.

Arabis pendulocarpa is primarily a species of the northern Great Plains, extending into the Rocky Mountains of the United States and quite isolated at Bic, Rimouski County, Quebec, where it has been, since its discovery there in 1905, one of the many famous "relics" of that area. It is found around Lake Nipigon, in western Ontario, in the prairies of Manitoba, Saskatchewan and eastern Alberta, extending southward through North Dakota into the Black Hills of South Dakota and in extreme northwestern Nebraska, thence westward to Yellowstone National Park in Wyoming, and, locally in Montana. From west or south of Wyoming I can find no records of its occurrence, and all efforts to place it in the Canadian Rocky Mountains have likewise failed.

A. pendulocarpa is easily confused with *A. retrofracta* Graham,

from which it differs in its loosely hispid stem-pubescence and in its smaller flowers, and with the Greenland *A. Holboellii* (which also occurs at Bic), from which it is easily distinguished by the pannose pubescence of its radical leaves, its narrower petals (in *A. Holboellii* the petals are 1.75–2.25 mm. broad at the apex; in *A. pendulocarpa* they average 1.5 mm. broad), and its narrow, straightish siliques. The type-specimen of *A. Collinsii* Fernald matches Nelson's type of *A. pendulocarpa* in every detail.

EXPLANATION OF PLATES

PLATE 457. A. HIRSUTA (L.) Scop. FIG. 1, habit of plant, × 1, from Bavaria, Germany, *Fischer*, 9 June 1900; FIG. 2, seeds, × 10, from the same plant.

PLATE 458. A. PYCNOCARPA n. sp. FIG. 1, habit of plant, × 1, from Bonaventure Co., Quebec, *Collins & Fernald*, July 19–20, 1904 (TYPE); FIG. 2, seeds, × 10, from the same plant; FIG. 3, fruit of A. PYCNOCARPA and A. HIRSUTA, × 2, the long fruit being from the type specimen of A. PYCNOCARPA and the short fruit from the Bavarian specimen of A. HIRSUTA.

NEW RECORDS FOR THE CONNECTICUT VALLEY IN MASSACHUSETTS

WAYNE E. MANNING

THE following plants, collected by the writer unless indicated otherwise, have not been previously reported from this part of Massachusetts, and in one case from the state. All identifications have been verified at the Gray Herbarium.

EQUISETUM PALUSTRE L. Growing in springy clay outcrop along the bank of the Connecticut River near Hadley; first collected June 6, 1931.

The plants are few in number, and are being crowded out by *Equisetum arvense* L., with which they are associated. No plants have been seen in fruit, though the area has been examined at several seasons during the year.

EQUISETUM HYEMALE L. var. INTERMEDIUM A. A. Eaton. Dry bank of the Connecticut River, near the old ferry crossing, Hockanum Road, Northampton, June 2, 1931.

The plants do not appear to be evergreen, possibly because the old shoots had been carried away in high water. *Equisetum pratense* Ehrh. grows nearby in the meadows with *E. arvense* L.

SAGITTARIA CUNEATA Sheldon (*S. arifolia* Nutt.). A small colony in a drainage ditch between the road and a drained marsh along the

Easthampton-Holyoke mountain road, just inside of Hampden County; first collected Aug. 1, 1932.

STELLARIA PUBERA Michx. A weed at the Gillett Nursery, Southwick, collected May 18, 1929, and a small patch at the city dump ground, Northampton, collected June 26, 1930 and in 1932.

This plant was probably introduced with North Carolina shrubs into the nursery, thence to Smith College, and from there to the city dump. The colony at the latter place has persisted for five years, but is gradually dying out on the poor gravelly soil.

CABOMBA CAROLINIANA A. Gray. Very abundant in South Pond, one of the Hatfield Ponds, a part of a very old oxbow of the Connecticut River, at Hatfield; first collected by the writer Oct. 6, 1930.

According to Mr. Harold Keyes, florist of Florence, Mass. and a fisherman, *Cabomba* has been growing in this pond at least ten years. He has pulled up plants over five feet long. The plant is so abundant, and has succeeded so well in surviving the past few severe winters, that it almost appears native in this area. If it is introduced, the means of introduction—by bird or man—is very uncertain. At the Gray Herbarium there is no record of *Cabomba* growing in any lake nearer than New Jersey (escaped), though it may occur in other places.

GENISTA TINCTORIA L. Frequent on Prospect Hill, Mt. Holyoke College campus, collected by Miss *Sara J. Agard*, July 26, 1920 (Mt. Holyoke College herbarium), and by the writer, Aug. 26, 1930.

Whether this is an escape from cultivation, or is merely persistent after cultivation, is uncertain. It has been growing on Prospect Hill at least 40 years; at one time the hill was landscaped by Mr. Bates, and Genista might have been planted at that time.

DESMODIUM SESSILIFOLIUM (Torr.) T. & G. Collected at West Springfield, Sept. 12, 1934, by *Francis H. Sargent* of the U. S. Geological Survey.

According to the "Catalogue of the Flowering Plants and Ferns of Connecticut," this plant grows in that state only in the Thames River valley, extending as far north as Windham, in the east-central part of the state.

VIOLA CONSPERSA Reich., forma MASONII (Farwell) House. This white-flowered sport, resembling *V. striata* Ait., was found in moist woods near the Holyoke Country Club grounds, not far from Mt. Tom Station, May 1932. There were only four or five plants in a space about six feet square. In May 1936 this same form was found by the Mountain Street reservoir, near Haydenville, and in the hills near North Hatfield.

In all cases typical *Viola conspersa* was growing with the white-flowered form.

Circaea canadensis Hill. Collected on alluvial soil at the base of Whately Glen, Whately, August 6, 1930.

C. alpina L. and *C. latifolia* Hill grow in the same glen, so in this case all three species grow near together (see Professor Fernald's article in Rhodora 19: 87). Besides the distinguishing characteristics noted in that article by Professor Fernald, there is another very minor one: *C. alpina* has glabrous pedicels, *C. latifolia* quite hairy ones, and *C. canadensis* has only a few hairs on the pedicels, especially in the upper part.

Aster infirmus Michx. Another southern plant collected by Mr. *Sargent* in rocky woods in Holyoke-Westfield area, Sept. 27, 1934.

Specimens of all of the above are deposited in the Smith College Herbarium.

Smith College.

A NEW VARIETY OF SPARGANIUM AMERICANUM

R. T. Clausen

While collecting in the pools and backwaters along the southern New Jersey coast during September, 1934, Mr. J. L. Edwards and the writer discovered in the Tuckerton Creek Pond a colony of a striking Sparganium, possessing the fruiting heads of *S. americanum*, but with the habit and foliage of the northern *S. chlorocarpum*. Collections were made and subsequent study of this material has seemed to indicate that these plants represent an undescribed coastal plain variety of the wide ranging *S. americanum*.

The Tuckerton plants possess rather dense fruiting heads, with the lowest one on the main branch of the inflorescence supra-axillary. The fruits are dark brown, opaque, and abruptly contracted at top and bottom, giving them the characteristic appearance of the fruits of *S. americanum*. The leaves, however, are stiff and narrow, as in *S. chlorocarpum*. This foliage character, coupled with the supra-axillary condition of some of the fruiting heads, seems to indicate affinity with that species, particularly since considerable significance has been attached to the relation of the heads to the bracts of the inflorescence.[1] Investigation by the writer of a large series of both

[1] See Fernald in Rhodora 24: 26–34. 1922.

americanum and *chlorocarpum* leads to the conclusion that the shape and texture of the fruits, along with the length of the fruiting styles, represent far more constant and reliable characters in separating the two species than the relation of the heads to the bracts of the inflorescence or the condition of the leaves. Consequently our New Jersey plants definitely must be placed under *S. americanum*.

The following key and redefinition of characters may help to clarify the relationship between these two species and their varieties:

A. Fruiting heads very dense; the fruits dark brown, opaque, oblong, with a prominent, median, circumferential constriction, 2–2.5 mm. in diam., abruptly contracted at both ends; the fruiting styles 2.5–4.5 mm. long.....*S. americanum.*
B. Plants lax, the leaves soft and somewhat translucent, .6–1.2 cm. wide, not scarious-margined towards the base. Pistillate heads all truly axillary.....*S. americanum*, var. *typicum.*
B. Plants strict, the leaves rigid and coriaceous, 4–6 mm. wide, somewhat scarious-margined towards the base.
S. americanum, var. *rigidum.*
A. Fruiting heads relatively loose, the fruits greenish brown, lustrous, elliptical, 2–3 mm. in diam., gradually tapering towards each end; the fruiting styles 3.5–5 mm. long. Heads either supra-axillary or axillary.....*S. chlorocarpum.*
C. Heads remote or subremote, the lowest 12–95 cm. above the base of the plant.....*S. chlorocarpum*, var. *typicum.*
C. Heads crowded, not remote, 2–12 cm. above the base of the plant.....*S. chlorocarpum*, var. *acaule.*

S. AMERICANUM Nutt. Throughout its range it exhibits a wide variation in foliage characters, the leaves varying all the way from rather broad, soft and translucent to quite stiff and narrow. Suspicions that this species might intergrade with *chlorocarpum* seem entirely unjustified, because, although the vegetative parts are extremely inconstant, the fruits furnish very reliable characters.

S. AMERICANUM, var. TYPICUM. The common, widespread form of the species.

S. AMERICANUM, var. **rigidum**, var. nov., var. *typico* affine, sed infimo capite pistillato conspicue supra-axillari; folia stricta et coriacea, ad 50 cm. longa 4–6 mm. lata, aliquatenus scario-marginata ad basin.—Eastern Massachusetts; southern New Jersey. TYPE in Gray Herb. and COTYPE in Clausen Herb.: on sandy bottom in Tuckerton Creek Pond, Tuckerton, Ocean Co., NEW JERSEY, September 22, 1934, *J. L. Edwards and R. T. Clausen* 1399.

In the herbarium of Cornell University are two other sheets of this variety. The first, collected at Atsion, in Burlington Co., New Jersey on September 5, 1927, by *A. Gershoy* (no. 20), has leaves to 5 mm. wide and the lowest head supra-axillary, 4 mm. above the bract; the

fruits are dull, dark brown, abruptly contracted into a short beak, 2.5–3 mm. long. The other is the collection of *A. J. Eames* from Framingham, Middlesex Co., Massachusetts, which is flowering material with the styles 3 mm. long.

S. CHLOROCARPUM Rydb. var. TYPICUM. At North Spencer, Tioga Co., New York, occur plants which, although they possess each of the other characters of this species, have been considered atypical because all of the fruiting heads were axillary. If we consider the fruits, rather than the relative position of the heads to the bracts, to represent the primary character for determining *chlorocarpum*, then these forms would be definitely placed here. It seems desirable to alter our definition of this species to include plants both with axillary and supra-axillary heads.

S. CHLOROCARPUM Rydb. var. ACAULE (Beeby) Fernald. This variety strongly suggests a response to an altered ecological condition and seems doubtfully worthy of nomenclatorial distinction. Observations made by Dr. W. C. Muenscher and the writer during several seasons seem to indicate that *chlorocarpum*, var. *typicum* occurs in shallow water along the shores of ponds and streams, whereas the var. *acaule* is found more often up on the shores, in bogs removed from the water, or in places from which the water has receded during certain seasons. The relative position of the crowded fruiting heads towards the base of the plant seems to be the sole criterion for determining this variety. The difference in the size of the fruiting heads of *acaule* as compared with the typical variety seems insufficient to warrant use as a key character.

BAILEY HORTORIUM, Ithaca, New York.

A STATION FOR HYMENOPHYSA PUBESCENS IN THE EASTERN UNITED STATES

JOHN M. FOGG, JR.

LATE in April, 1936, I first noticed, from the window of a passing train, a colony of cruciferous plants growing on a high embankment along the tracks of the Pennsylvania Railroad a few blocks northwest of the 30th Street Station in Philadelphia. The broad leaves and flat-topped inflorescences strongly suggested *Lepidium Draba*, and as this is not a common introduction in the Philadelphia area the locality was

visited a few weeks later for the purpose of collecting material. Although upon this date, May 18, the plant was only in bud, its corymbose inflorescences and oblong, clasping leaves still contributed to its superficial resemblance to *Lepidium Draba*.

On May 27 the plant was in full bloom, its corymbs of whitish flowers forming an attractive sight as seen from the car-window. Specimens collected on this date revealed a few immature silicles, and as these were ovoid rather than flattened it was apparent that the species must belong to some genus other than *Lepidium*. By June 8 its fruits were well developed and the still corymbose heads were crowded with upright, purplish, ovoid to globose, mucronate pods. It was now evident that the plant could be referred to no species included in our current manuals for eastern North America. Comparison with herbarium material, aided by reference to standard Old World treatments, established its identity as *Hymenophysa pubescens* C. A. Mey., a species said to be native to Siberia.

A casual survey of recent literature disclosed the fact that the plant had already twice been recorded from North America. In 1925 Dr. P. C. Standley published a note on its occurrence in Idaho,[1] and the following year Dr. B. A. Walpole called attention to the fact that he had previously (1919) collected and distributed specimens of *Hymenophysa* from Ypsilanti, Michigan.[2]

In an effort to ascertain whether the species had been detected in any of the eastern states, I addressed inquiries to the Field Museum, the Gray Herbarium, the Missouri Botanical Garden, the New York Botanical Garden and the U. S. National Museum. To the authorities of these institutions I am greatly indebted for their kindness in having examined the material in their respective collections and supplying me with all the available records. From the evidence thus accumulated it appears that *Hymenophysa pubescens* has become well established in several of the far western states, e. g., California, Oregon, Washington, Idaho, Wyoming and Colorado, but that it has not before been collected east of Ypsilanti (Washtenaw County), Michigan. The Philadelphia locality, then, is apparently the first to be noted for any of the eastern states.

The plant occupies the crest of a grassy embankment, at 31st and Baring Streets, overlooking the tracks. Although twice cut back and

[1] Science II, **62**: 509 (1925).
[2] Science II, **63**: 335 (1926).

once burnt over by railroad workers, it continues to put up new shoots from its perennial bases. It seems reasonable to suppose that the plant will persist and that in the future it will be reported from additional stations in this area as well as elsewhere on the Atlantic seaboard.

Specimens of five separate collections (Fogg Nos. 10347, 10440, 10527, 11046, 11145) have been deposited in the herbarium of the University of Pennsylvania and duplicates of one or more of these numbers are being distributed to the Philadelphia Botanical Club, the Gray Herbarium, the Missouri Botanical Garden and the U. S. National Museum.

University of Pennsylvania.

Volume 39, no. 460, including pages 101–152 and plates 457 and 458, was issued 5 April, 1937.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. June, 1937. No. 462.

CONTENTS:

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Room 1001, 53 State St., Boston, Mass.

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Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. June, 1937. No. 462.

SOME RELATIONSHIPS OF THE FLORA OF THE CUMBERLAND PLATEAU AND CUMBERLAND MOUNTAINS IN KENTUCKY

E. Lucy Braun

Botanizing in eastern Kentucky is particularly interesting because of the element of surprise which is introduced from time to time by the finding of totally unexpected plants. That part of the state to the east and south of the Blue Grass is in the Appalachian Plateaus Province,[1] made up of the Allegheny Plateau northward and the Cumberland Plateau southward (drainage basins of Kentucky and Cumberland rivers) with maximum elevations from about 1200 feet on the west to about 2000 feet on the east; and the much more rugged Cumberland Mountains in the extreme southeastern part of the state (Fig. 1).

It will be noted that this Cumberland Mountain section is separated from the Blue Ridge Province—commonly called the Southern Appalachians—by the broad strip of longitudinal valleys and ridges comprising the Ridge and Valley Province. Furthermore, it does not attain the altitude of that Province, the maximum elevation being slightly over 4000 feet.

The flora to be expected in eastern Kentucky is that of the Alleghenies generally. Because of geographical location, Kentucky is a meeting place of northern and southern Allegheny species. We expect, hence, to find white pine and magnolias, for instance, but we do not expect the extreme northern forms which extend south in the

[1] Physiographic provinces after Fenneman (1928).

higher mountains (at least we do not expect them at low elevations); neither do we expect to find in the plateaus and mountains any considerable number of plants from the Coastal Plain; nor, because of the separation from the Blue Ridge Province, typical Southern Appalachian species in any quantity. Yet all of these groups of species do occur.

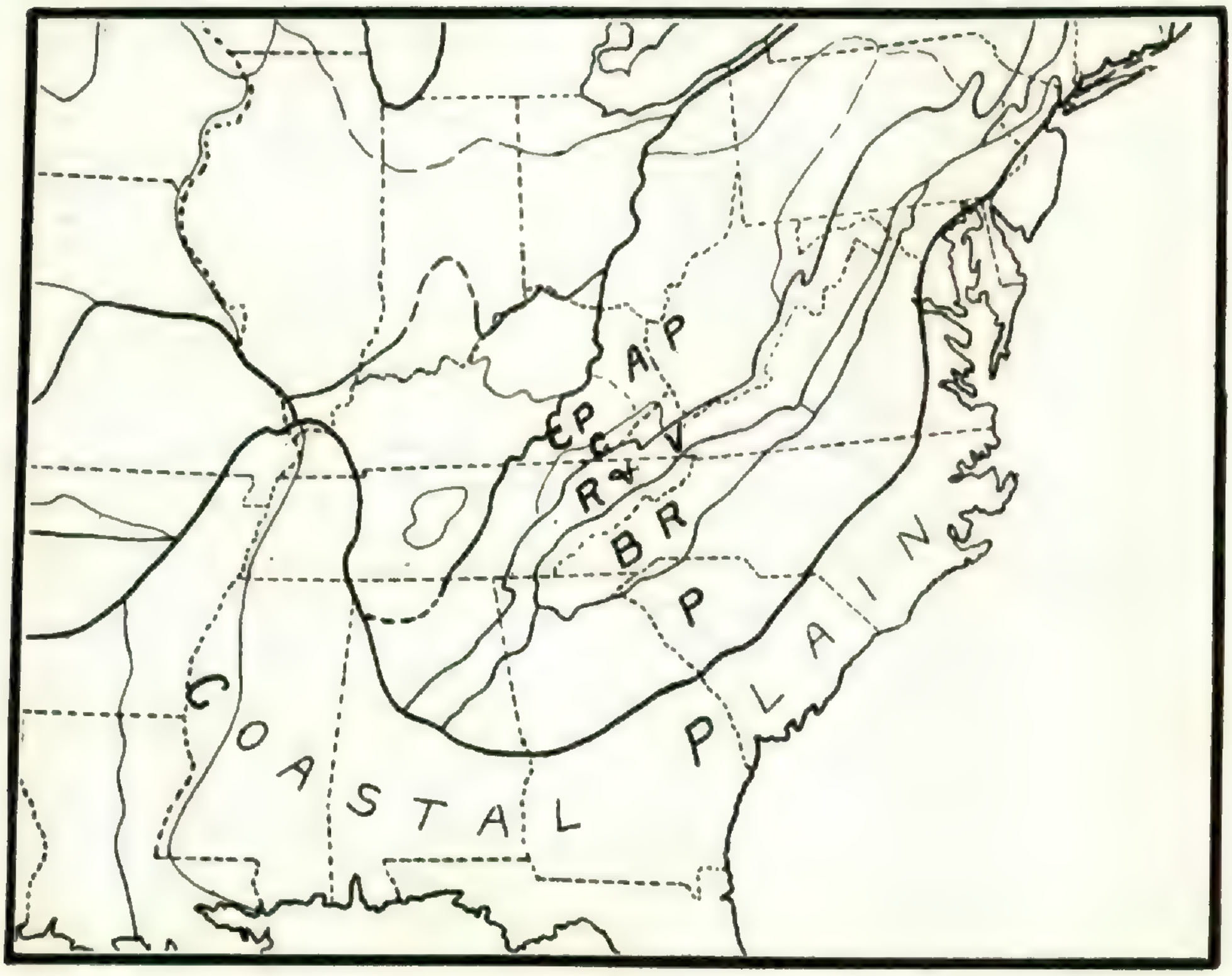
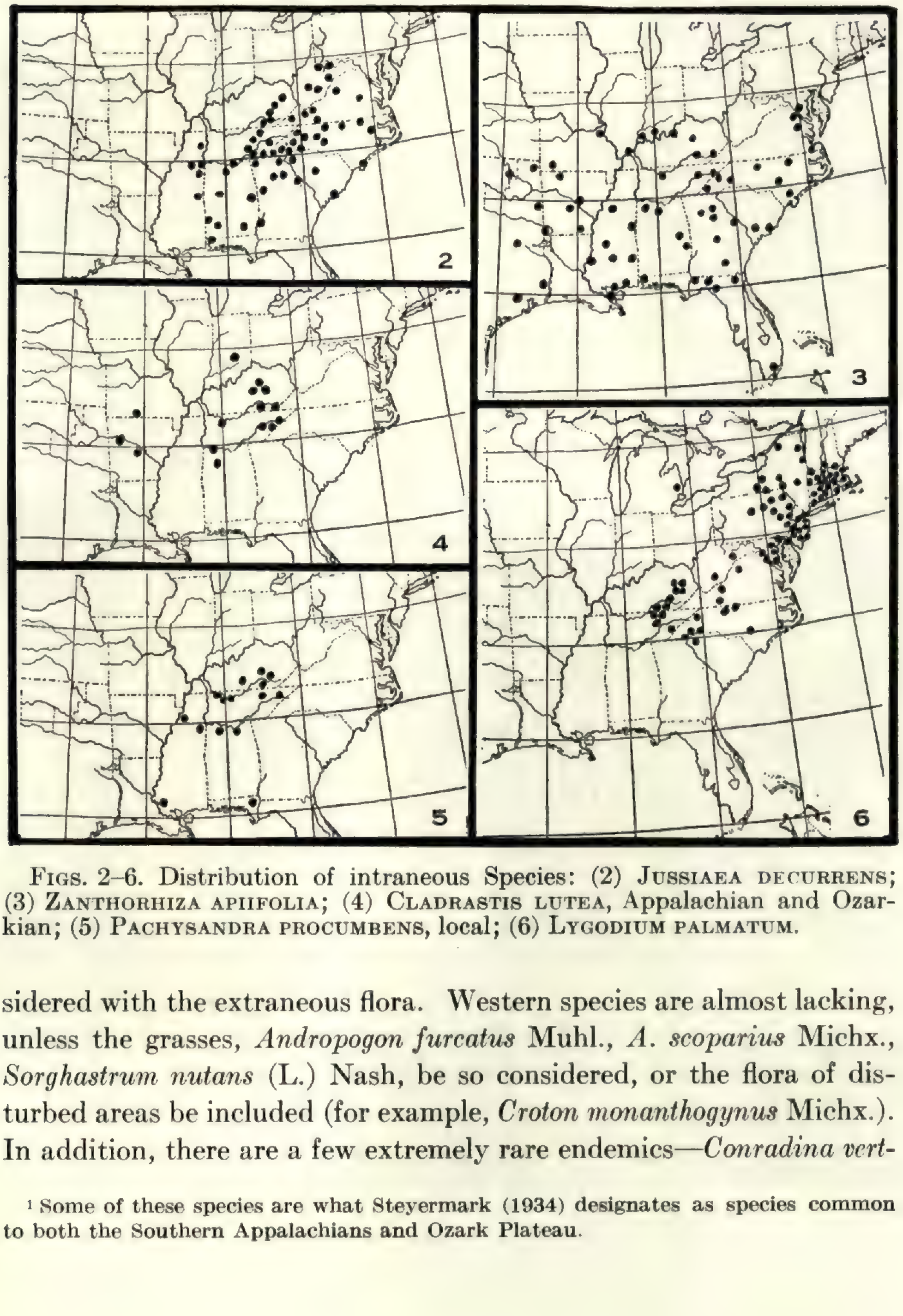


FIG. 1. Map showing boundaries of physiographic provinces and sections: Coastal Plain; Piedmont (P); Blue Ridge (BR); Ridge and Valley Province, (R&V); Appalachian Plateaus Province, made up of the Allegheny Plateau (AP); the Cumberland Plateau (CP), and the Cumberland Mountains (C). After Fenneman.

The intraneous flora of eastern Kentucky is made up chiefly of widespread species whose ranges generally include this area, of Appalachian species of wide range such as *Zanthorhiza apiifolia* L'Her. (FIG. 2), and of southern species at or near their northern limits as *Arisaema quinatum* (Nutt.) Schott, *Magnolia macrophylla* Michx., *Galactia volubilis* (L.) Britton, *Jussiaea decurrens* (Walt.) DC. (FIG. 3), *Aralia spinosa* L., *Bignonia capreolata* L., *Elephantopus tomentosus* L., *Coreopsis auriculata* L., and *Helenium tenuifolium* Nutt. Another group of intraneous species of interior or southern-interior

range,[1] is represented by *Trautvetteria caroliniensis* (Walt.) Vail, *Hypericum dolabriforme* Vent., *Cladrastis lutea* (Michx.) Koch (FIG. 4), *Polygala Curtissii* A. Gray, *Mechania cordata* (Nutt.) Britton. A few northern species extend southward into this area, as *Pinus Strobus* and *Betula lutea* Michx.; others occur as disjuncts and are best con-



FIGS. 2–6. Distribution of intraneous Species: (2) JUSSIAEA DECURRENS; (3) ZANTHORHIZA APIIFOLIA; (4) CLADRASTIS LUTEA, Appalachian and Ozarkian; (5) PACHYSANDRA PROCUMBENS, local; (6) LYGODIUM PALMATUM.

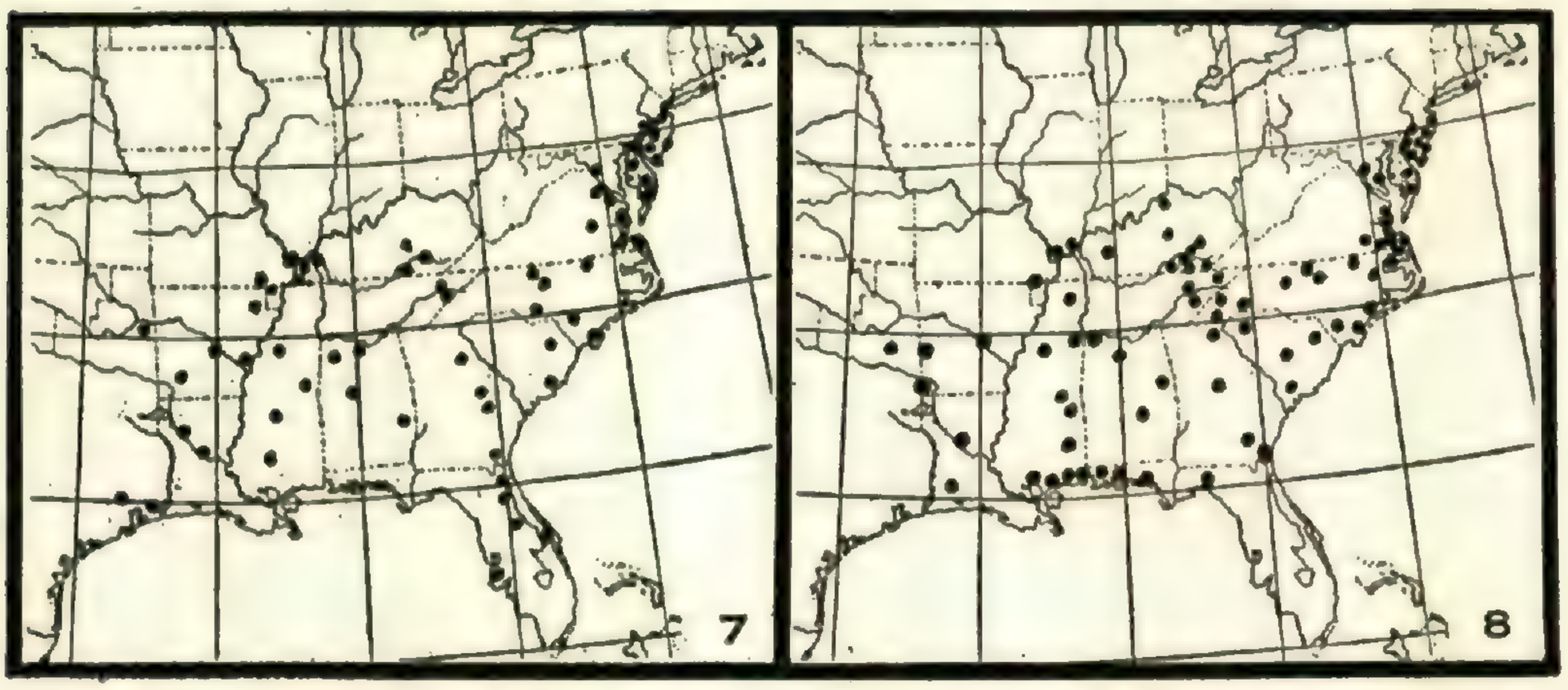
sidered with the extraneous flora. Western species are almost lacking, unless the grasses, *Andropogon furcatus* Muhl., *A. scoparius* Michx., *Sorghastrum nutans* (L.) Nash, be so considered, or the flora of disturbed areas be included (for example, *Croton monanthogynus* Michx.). In addition, there are a few extremely rare endemics—*Conradina vert-*

[1] Some of these species are what Steyermark (1934) designates as species common to both the Southern Appalachians and Ozark Plateau.

icillata Jennings (*C. montana* Small)[1] and *Silphium brachiatum* Gattinger[2]—and some localized species more or less abundant on the Cumberland Plateau, as *Pachysandra procumbens* Michx. (FIG. 5), *Lygodium palmatum* (Bernh.) Sw.[3] (FIG. 6) and *Gaylussacia brachycera* (Michx.) Gray.[4]

The extraneous species are of particular interest for they give some clews to the probable vegetational history of the area.

The Coastal Plain element is especially well represented on the Cumberland Plateau, particularly near its western margin; and much less pronounced, though present, on Pine Mountain in the Cumberlands. One Coastal Plain tree, *Quercus phellos* L. (FIG. 7) is an im-



FIGS. 7, 8. Species ranging through the Coastal Plain and Mississippi Embayment, with interior upland stations: (7) QUERCUS PHELLOS; (8) ITEA VIRGINICA.

portant species of certain swamp forests of Whitley County. Among the grasses are *Andropogon glomeratus* (Walt.) B. S. P., *Erianthus alopecuroides* (L.) Ell. (*E. divaricatus*), *Aristida affinis* (Schult.) Kunth (*A. palustris*), *Uniola laxa* (L.) B. S. P. and *Panicum longifolium* Torr.,[5] the first in two stations, each of the others in one on the Cumberland Plateau. *Pogonia* (*Cleistes*) *divaricata* (L.) R. Br. (FIG. 10), which Fernald (1931) considers "a typical species of the Coastal

[1] Known from Clear Fork River, Fentress and Morgan counties, Tennessee (Jennison, 1935) and from South Fork Cumberland River, McCreary County, Kentucky (Braun, 1936).

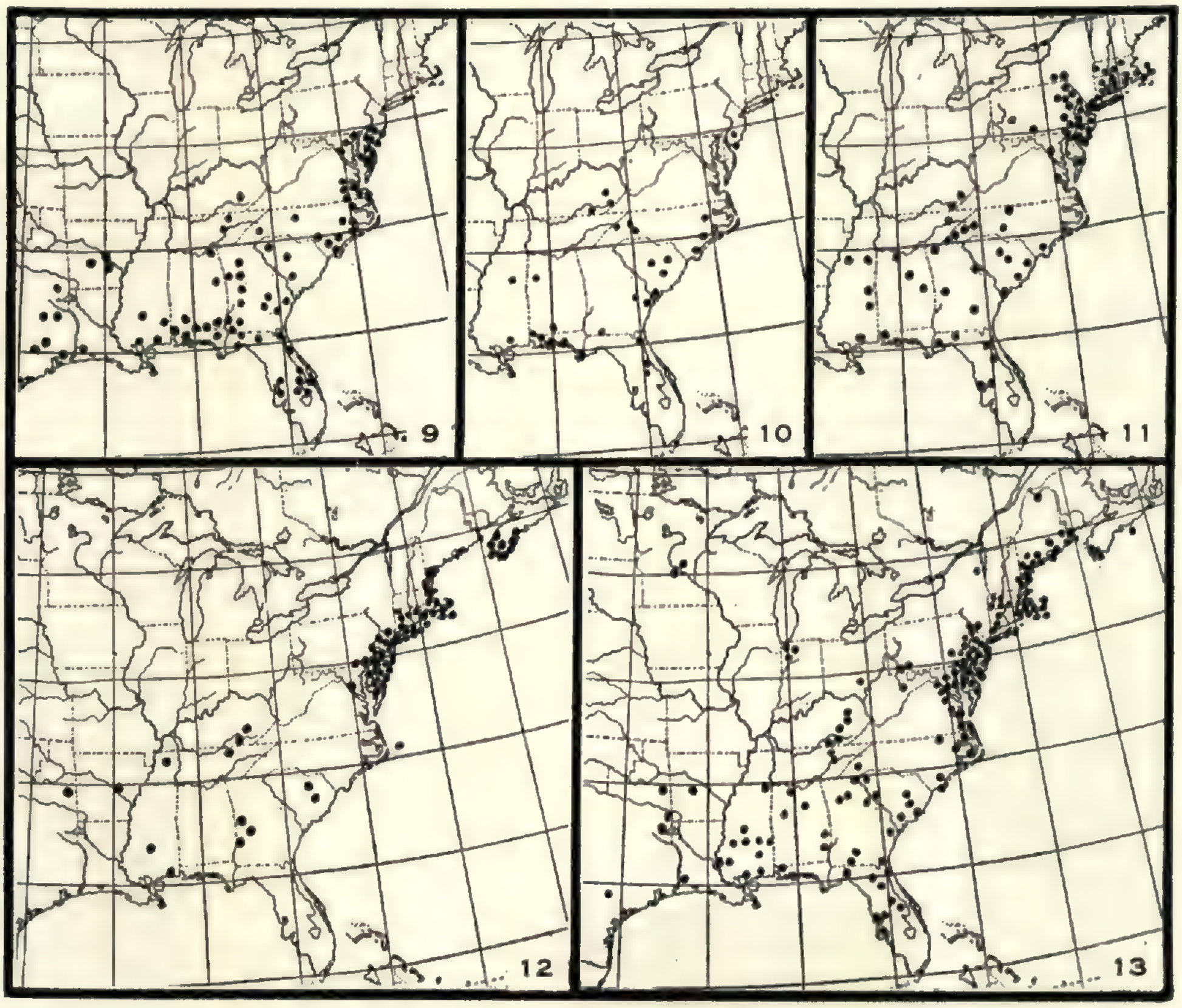
[2] Recorded by Small (1933) from "Appalachian Plateau, Tenn." and by Braun (1936) from Clay County, Ky.

[3] These upland stations considered by Fernald (1931) as relic colonies of a tropical genus.

[4] For map of distribution of this species, see Wherry (1934).

[5] The identification of these grasses verified by A. S. Hitchcock or Mrs. Chase. For ranges, see Hitchcock (1935).

Plain, and well known from high tablelands of the Southern Appalachians," is found near the headwaters of the Cumberland River between Pine and Black Mountain at 1700 feet (in Letcher County) and at the westernmost margin of the Cumberland Plateau in Wolfe



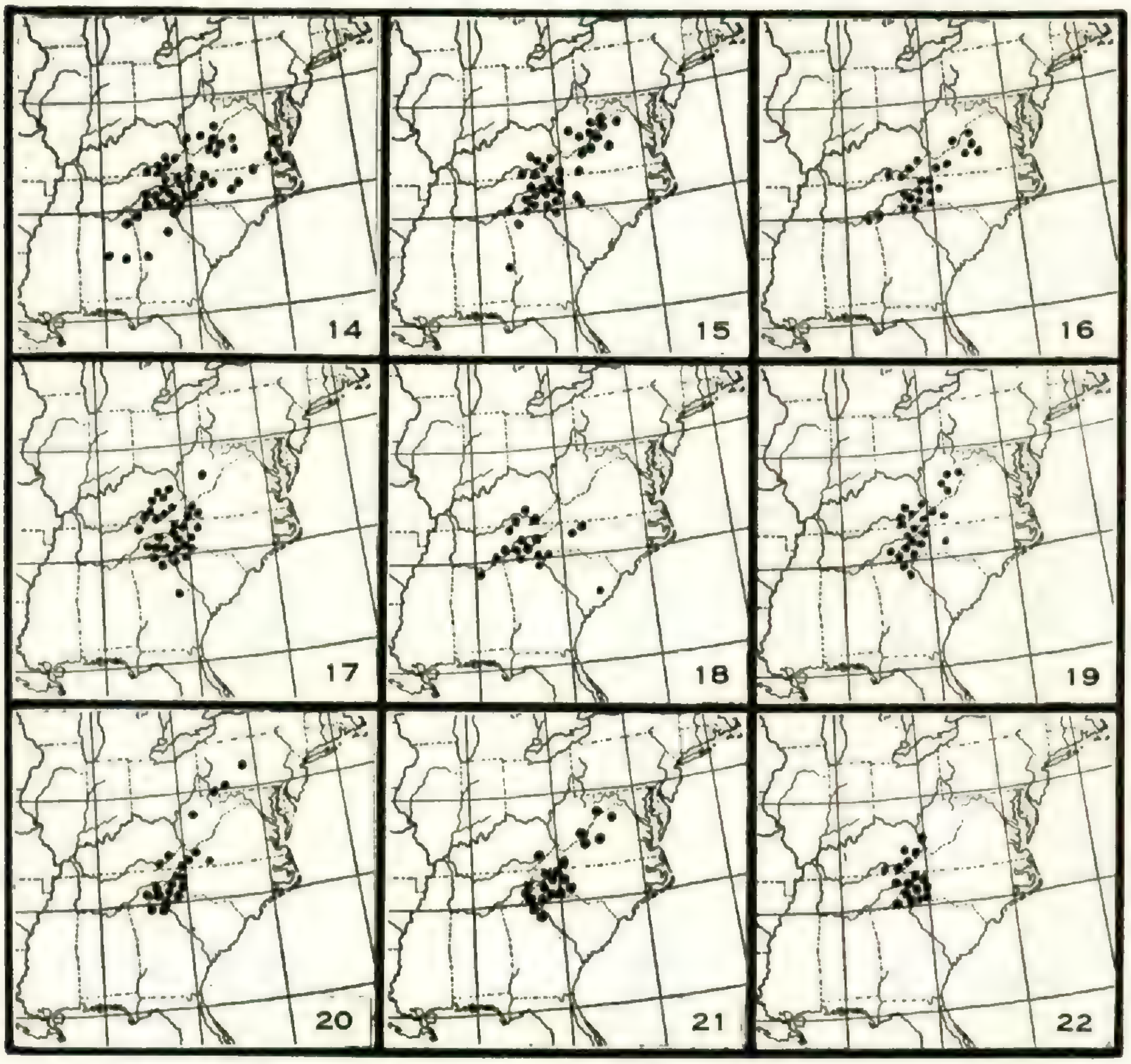
FIGS. 9–13. Coastal Plain species: (9) GRATIOLA PILOSA, (10) POGONIA DIVARICATA, representative Coastal Plain species with upland occurrences only southward; (11) ORONTIUM AQUATICUM, (12) BARTONIA PANICULATA,[1] (13) VIOLA PRIMULIFOLIA, representative Coastal Plain species with upland occurrences southward and in New England.

County and more commonly in McCreary County on sandstone knobs or monadnocks of the undissected portions of the plateau, which are remnants of the Cumberland Peneplain. All three stations are far removed from the Coastal Plain and from the Southern Appalachians. *Schwalbea australis* Pennell[2] is another Coastal Plain species found

[1] BARTONIA, so far as known, confined to the Coastal Plain in the South, except for one station on the Ozark Plateau and three stations close to one another at the western edge of the Cumberland Plateau. Map shows distribution of B. PANICULATA, including B. LANCEOLATA, but omitting the northern varieties SABULONENSIS, IODANDRA and INTERMEDIA.

[2] Identified by F. W. Pennell. For distribution, see Pennell, 1935.

with *Cleistes* on these monadnocks of the Cumberland Plateau in McCreary County, and one which is a pronounced disjunct. *Cyperus retrofractus* (L.) Torr. is also here. The Coastal Plain *Itea virginica* L. (FIG. 8) is a dominant shrub in many a swamp near stream head-

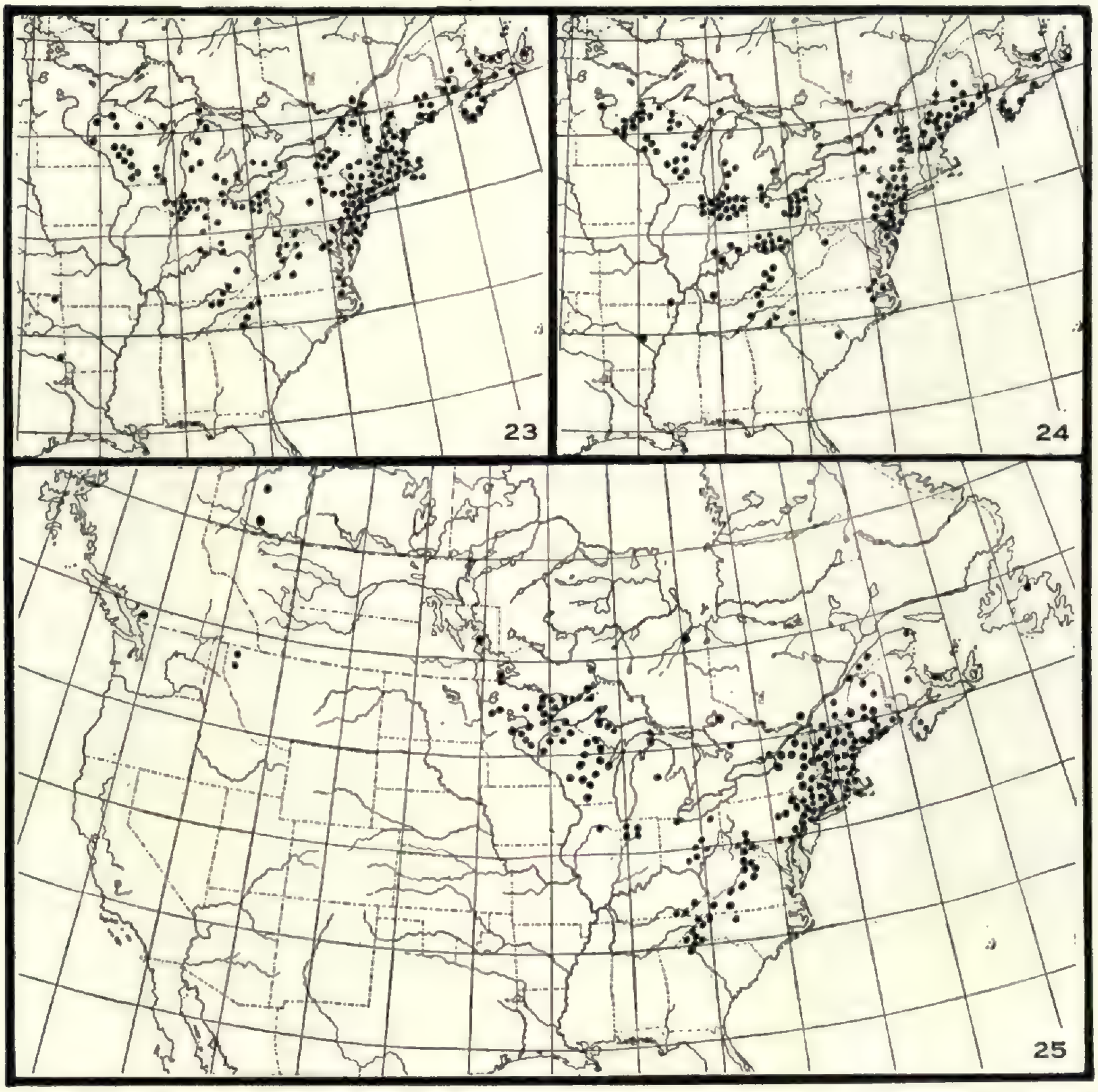


FIGS. 14–22. Southern Appalachian species: (14) GALAX APHYLLA; (15) CAMPANULA DIVARICATA; (16) RHODODENDRON CATAWBIENSE; (17) CLETHRA ACUMINATA; (18) STEWARTIA PENTAGYNA; (19) MAGNOLIA FRASERI; (20) HOUSTONIA SERPYLLIFOLIA; (21) SAXIFRAGA LEUCANTHEMIFOLIA; (22) ASTILBE BITERNATA.

waters on the Cumberland Plateau; *Viola primulifolia* L. (FIG. 13) is almost always found in the same situations. *Bartonia paniculata* (Michx.) Robinson (FIG. 12) in two stations in Sphagnum cushions; *Ascyrum stans* Michx., *Gratiola pilosa* Michx. (FIG. 9) and *Lobelia Nuttallii* R. & S.[1] in wet meadows are other Coastal Plain species that may be mentioned for the Cumberland Plateau. *Orontium aquaticum*

[1] For map of distribution of *Lobelia Nuttallii* see McVaugh (1936).

L. (Fig. 11); typically Coastal Plain but known from a few stations in the mountains of Pennsylvania, North Carolina and Tennessee, is on Pine Mountain in southeastern Kentucky, in Bell and Letcher counties. These are only some of the Coastal Plain species, a very



Figs. 23–25. Northern species of general distribution northward: (23) Rubus hispidus; (24) Spiraea tomentosa (including var. rosea); (25) Corydalis sempervirens (Alaska stations not shown).

fair proportion of which have not hitherto been known from the area under consideration.[1] Ten of these plants were found together in one small area of swamp woods and wet meadow in Laurel County (Braun, 1937).

Typically Southern Appalachian species are more often found in the Cumberland Mountains—either on Black Mountain or on Pine

[1] Some stations recorded by Braun, 1936.

Mountain—than on the Cumberland Plateau, though they are represented there on the *western* margin. Southern Appalachian species in the Cumberland Mountains are *Anemone lancifolia* Pursh, *Cymophyllus* (*Carex*) *Fraseri* (Andr.) Mackenzie, *Magnolia Fraseri* Walt. (FIG. 19) in coves, lower slopes and on rocky summits, *Gentiana decora* Pollard, *Saxifraga leucanthemifolia* Michx. (FIG. 22), *Monotropsis odorata* Ell., and *Houstonia serpyllifolia* Michx. (FIG. 20) as low as 1600 feet. On the Cumberland Plateau only (near Cumberland Falls) is *Boykinia aconitifolia*. A few species occur in both areas—the Cumberland Mountains and the *western edge* of the Cumberland Plateau. Among these are *Astilbe biternata* (Vent.) Britton, *Galax aphylla* L., *Campanula divaricata* Michx., *Stewartia pentagyna* L'Her., *Clethra acuminata* Michx. and *Rhododendron catawbiense* Michx. (FIGS. 14–22). The last named species, *Rhododendron catawbiense*, grows in separated stations practically throughout the entire length of Pine Mountain at about 3000 feet elevation, and on a cliff-margin at 1200 feet in McCreary County at the western edge of the Plateau and fifty miles removed from the nearest part of Pine Mountain.

Northern forms are few in the Plateau sections, though *Viola rotundifolia* Michx. (FIG. 29) is common in many stations, and *Claytonia caroliniana* Michx. (FIG. 26) only slightly less so; *Rubus hispidus* L. (FIG. 23), *Spiraea tomentosa* L. (FIG. 24) and *Pyrus melanocarpa* (Michx.) Willd. are present in swamps (the latter also on rocky summits). *Myrica asplenifolia* L. and *Solidago racemosa* Greene[1] occur in one river-bank station. *Taxus canadensis* Marsh. is known from one station in the Allegheny Plateau in northern Kentucky (in Carter County) but does not occur on the Cumberland Plateau. In the Cumberland Mountains, one is surprised to find *Oxalis montana* Raf. (American *Oxalis Acetosella*) (FIG. 27) which the most recent of our manuals states grows in "cold damp woods, Blue Ridge and more northern provinces, N. C. to Tenn., Man. and N. Sc." (Small, 1933). Here it grows in several stations: on Black Mountain at 3500 feet, and as low as 1800 feet on Pine Mountain. More surprising still is the occurrence of this plant in the Allegheny Plateau at an elevation of only 700 feet on the Little Sandy River in Elliott County. *Trillium undulatum* Willd. (FIG. 30), called by Small a "typically northern type of Trillium" and said to grow in damp woods and bogs, is found in the Cumberlands in three stations: at 4000 ft. on Black Mountain in

[1] Identified by M. L. Fernald.

a chestnut forest with an ericaceous understory, and on Pine Mountain, at 1800 and 2200 feet, under hemlocks. Other northern species found in the Cumberland Mountains are *Circaea alpina* L., as low as 1600 feet in the Cumberland Valley; *Luzula saltuensis* Fernald, on Black Mountain in Letcher County at about 2000 feet; *Streptopus roseus* var. *perspectus* Fassett,[1] on north slopes of Black Mountain in Harlan County at 3500 feet; *Corydalis sempervirens* (L.) Pers. (FIG. 25) on sandstone outcrops along Pine Mountain in Bell, Harlan, and Letcher counties; and *Acer pensylvanicum* L. (FIG. 28), abundant on Pine and Black Mountain.

That this may not become a mere enumeration of species, I have omitted many of the less striking examples of the several groups of species.

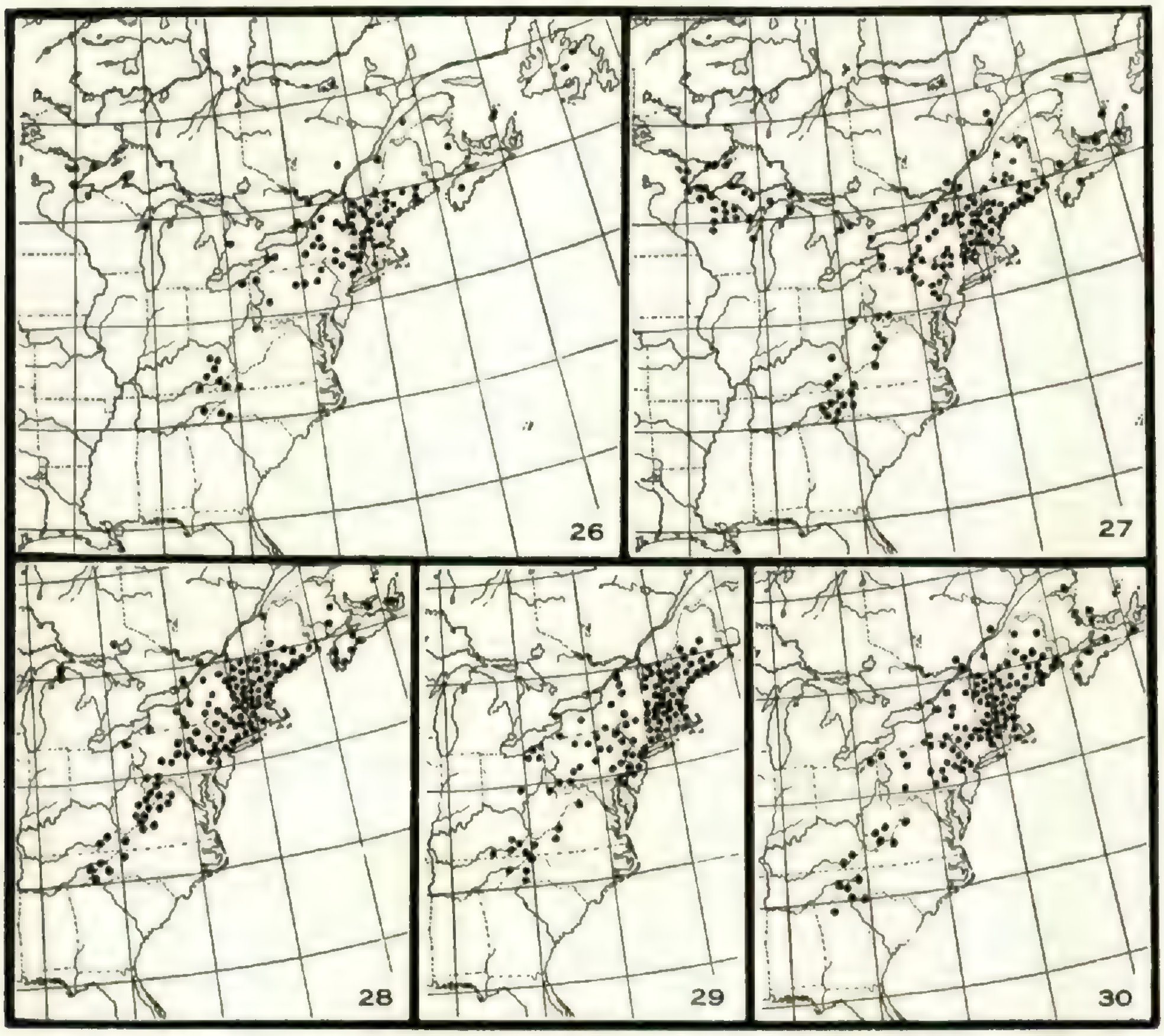
Are these observed occurrences a matter of chance, of random distribution, or have they been brought about by changing conditions in more recent geological time? Seldom do we find a more perfect example of the inter-relations of species-distribution and geological history. Hence, for explanation of the occurrences noted we must turn to the physiographic history of the area.

The ancient Paleozoic land-area of eastern North America was base-leveled, perhaps a number of times. Base-leveling favors mesophytes and swamp plants, and greatly restricts plants of cliffs and rocky summits. The last base-level which was general over this area—*except* for *certain monadnocks*—was that known as the Schooley or Cumberland Peneplain. This has been called the "Cretaceous Peneplain," but physiographers now date it as "not older than Miocene" (fide Fenneman).

At this time we may conceive, then, of a low-lying land-mass of slight relief on which meandered sluggish streams. In places there were hills, where the base-level was incomplete, or even remnants of ledges, if very resistant rocks underlaid slopes as must have been the case along the western outcrop of the Pottsville—now the western margin of the Cumberland Plateau. Too, narrower valleys or slightly steeper protected slopes would be present where streams of the gently undulating peneplain crossed the margin of resistant rocks. This slight diversity of topography would have been a feature of the western outcrop of the Pottsville sandstone. The mountains of the southern Blue Ridge Province—the Southern Appalachians—were but very

[1] For the distribution of this species and its varieties, see Fassett, 1935.

incompletely base-leveled, in fact remained in almost mountainous condition, and to this it is generally agreed they owe in large part their relic-endemic flora. In southeastern Kentucky, "Pine Mountain may have constitued a low swell, several hundred feet high which, when followed longitudinally rose and fell mildly, or was subdivided into long elliptical embossments."[1] That is, where the rugged Pine Mountain now is there was then a series of hills held by the superior hardness of the rock (the Pottsville sandstone). The higher Black Mountain, too, was represented by monadnocks on the Schooley or Cumberland Peneplain, due to another resistant sandstone.



FIGS. 26–30. Species of the northern Great Lakes region and New England, with isolated stations in the Appalachian region southward: (26) CLAYTONIA CAROLINIANA (exclusive of Rocky Mountain stations); (27) OXALIS MONTANA. Northern species whose distribution centers in New England, with isolated stations in the mountains southward: (28) ACER PENSYLVANICUM; (29) VIOLA ROTUNDIFOLIA; (30) TRILLIUM UNDULATUM.

[1] For certain data on the physiography of this section, the writer is indebted to Dr N. M. Fenneman for the privilege of reading a portion of the manuscript of his book, "Physiography of the Eastern United States."

These several features introduced diversity into the vegetation of the peneplain. Mesophytic forest prevailed. Swamp plants and plants of poorly drained sandy flats found favorable environment along the sluggish old-age streams and on the reduced uplands between the streams. On the sheltered slopes of monadnocks, in less open valleys crossing resistant rocks, and in hillier places generally the most mesophytic of species found favorable retreats. On the few exposed summits and ledges—as the upturned strata of Pine Mountain[1] and the monadnocks of the western Pottsville border—plants of dry sandy soil or cliffs persisted.

Picture this peneplain uplifted and streams given renewed cutting power. The flora of the plain suffered most, and retreated before the changing environment, moving outward onto the emerging Coastal Plain, and perhaps in part northward where uplift was less pronounced, but not without leaving remnants behind it—the present relic colonies of what are now considered Coastal Plain species. In these relic colonies are often a few somewhat northern species as *Spiraea tomentosa*, *Pyrus melanocarpa* and *Rubus hispidus* (FIGS. 23, 24), which may represent the flora which moved northward off the elevating peneplain.

"The present Cumberland peneplain is not definitely known to be anything else than the eroded and reduced Schooley peneplain, though it is regarded by some physiographers as a younger and lower peneplain itself elevated and dissected later." In its *western* (and more typical) part, it is submaturely dissected by physiographically young valleys. "Its former character is seen in its broad remnants of a surface in which only shallow valleys of an older generation are found."[2] It is underlain by the strong resistant Pottsville sandstone, here some 600 or 700 feet thick, and the immaturity is due in part to this.

Let us examine now the distribution of the extraneous species in the light of physiographic history.

The present known distribution of most of the Coastal Plain plants in the Cumberland Plateau coincides with the undissected remnants of the Schooley or Cumberland peneplain. Here they occupy swamps and wet meadows at the headwaters of unrejuvenated streams (cf. *Andropogon*, *Erianthus*, *Aristida*, *Uniola*, *Itea*, *Ascyrum*, *Bartonia*, *Gratiola*, *Lobelia*, *Viola*) or occur on the low knobs or monadnocks (*Cleistes*, *Schwalbea*, *Cyperus retrofractus*). A few are sometimes

[1] For vegetation and structure of Pine Mountain see Braun, 1935.
[2] Fenneman, Mss., loc. cit.

found along streams cut into the plateau (*Itea*, *Diodia teres* Walt., *Gymnopogon ambiguus* (Michx.) B. S. P.), or even extend a short distance westward (downstream) from the plateau (*Itea*). The relic *Orontium* on Pine Mountain occupies, in one station, a swamp on an unrejuvenated mountain summit stream, in the other, a valley swamp at the foot of the mountain.

The Coastal Plain element is of particular interest. Two possible explanations present themselves: (1) that the Coastal Plain species now on the Cumberland Plateau have migrated into this area since the development of the distinctive Coastal Plain flora; or (2) that the Coastal Plain species of the Cumberland Plateau are relics, and that they occupied this area before and during the development of the distinctive Coastal Plain flora, a part of which was then derived from the Appalachian highlands. While the two explanations are diametrically opposed, it is possible that both are in part correct, that the occurrence of certain species may be explained in one way, of other species in the other way. *Itea virginica and Quercus phellos* (FIGS. 7, 8), which alone of the species discussed are found in the Mississippi embayment region of western Kentucky, may have migrated from the Coastal Plain upstream onto the Plateau. The occurrence of the other species on undissected remnants of the plateau or on monadnocks and their wide separation from the general area of their ranges, point to the relic interpretation. Furthermore, the localization of a dozen or more of Coastal Plain species in a single swamp (in Laurel County) but a few acres in extent (Braun, 1937) and the absence of most of these species from other stations (so far as yet ascertained) is difficult to explain on a basis of recent migration. The association of northern plants (*Spiraea*, *Rubus*, *Pyrus*) with these, and their physiographic location (on undissected portions of the Cumberland peneplain) indicate ancient occupancy much restricted. Late Tertiary or early Pleistocene segregation of floras, coincident upon changing climates and dissection accompanying the elevation of the peneplain, resulted in migrations northward of those species which later became "northern" species, and southward of those which have become "coastal plain" species.

The southern Appalachian element is made up of species whose general range is that of the southern Blue Ridge Province, that great area which was very incompletely base-leveled. These may be thought of as representatives of ancient genera whose formerly more wide-

spread distribution became greatly curtailed by the time of maximum development of the Cumberland or Schooley peneplain. If the distribution of these species is related to this event in the physiographic history of the Appalachian highlands, then at least some of them should occur in other areas whose history was similar to that of the southern Blue Ridge, and in which diversity of topography was maintained. In the Cumberland Mountains there were monadnocks; along the western margin of the Cumberland Plateau the nature of the underlying rock made highly probable a certain topographic diversity even on the peneplain. In these two places Southern Appalachian species do occur. They are well represented in the Cumberland Mountains by high mountain species (*Saxifraga leucanthemifolia, Houstonia serpyllifolia,* (FIGS. 20, 21); and in the Cumberland Mountains and along the rugged western margin of the Cumberland Plateau (by *Clethra, Galax, Stewartia, Astilbe, Campanula divaricata,* and *Rhododendron catawbiense,* FIGS. 14–18, 22). That is, these southern Appalachian forms belonging to the most ancient genera, and whose ranges were restricted by peneplanation, now occur as relics on all or part of the former monadnock areas but not elsewhere.

The northern element is made up of species of general northern range (FIGS. 23–25) which reach their southern limits here or are uncommon southward, and of species growing in the north or northeast and in the higher mountains southward (FIGS. 26–30). As far as range and habitat in the southern mountains are concerned there is usually little difference between this latter group of northern plants and certain Southern Appalachian species (cf. *Saxifraga leucanthemifolia, Houstonia serpyllifolia,* FIGS. 20, 21).

The range of the northern species is in part at least a result of post-Pleistocene migrations, for all northern stations were attained in this way. Stations southward of the limits of glaciation may be interpreted in either of two ways: (1) they may be relics of a more southern range brought about by southward migrations during the Pleistocene; or (2) they may be still more ancient, relic southern stations of species which, during the final segregation of northern and southern types in late Tertiary or early Pleistocene time, became the northern flora. If the present range is the result of Pleistocene and post-Pleistocene migrations, the species should be expected at higher elevations or in relic boreal habitats. This is not true of most of the northern species in the Cumberland Mountains. If the present range is the result of

late Tertiary segregation followed by post-Pleistocene northward expansion of range, the species should be expected, in the south, in physiographically old regions, *i. e.*, in regions where base-leveling was not attained, and might well be in company with species of southern range rather than in relic boreal habitats. This is true of most of the northern species in the Cumberland Mountains and Cumberland and Allegheny Plateaus—in only one place is there any suggestion of grouping of northern species, and even here distinctly Southern Appalachian species are present also.[1] Northern and Coastal Plain species also occur side by side.

Even if altitudinal limits of forest types had been lowered considerably during the Glacial Epoch, there would still have remained numerous breaks in continuity of the mountains, where valleys intervene. If it is postulated that the Pleistocene southward migration of northern forest vegetation was so great as to completely occupy the mountains, it would be difficult to reconcile the present coincident occurrence of northern species with Southern Appalachian and Coastal Plain species. The finding of spruce and fir pollen in a bog in northeastern Tennessee (Sears, 1935) need not be taken as infallible evidence of a great southward swing of northern forests. Mountain summits of the Cumberlands, though today without spruce or fir, are so close to the elevation at which these trees (especially spruce) are to be expected, that their once higher summits may have had them. It is not difficult to conceive of sufficient lowering of altitudinal limits as to permit spruce-fir summit forest more extensive than in the Great Smoky Mountains today. It is difficult to conceive of southward movement of a spruce-fir forest to Tennessee, *without displacing all extremely southern and Coastal Plain species.* If these were displaced, their presence now could be explained only by recent migrations, migrations into occupied territory. But the time has not been long enough to account for their return to the isolated stations in which they now occur.

Summary and Conclusions

As interpreted here, the flora of the Cumberland Plateau and Cumberland Mountains in Kentucky displays strong southern affinities, indicated by (1) the large proportion of species of southern range in the intraneous flora, (2) the Southern Appalachian species, and (3) the Coastal Plain species. Northern species are present and are

[1] On Pine Mountain, in southeastern Kentucky. See Braun, 1935.

interpreted as representing survival from the undifferentiated Tertiary flora. The affinities with the Southern Appalachian or Blue Ridge flora are so striking as to indicate that the Cumberland Mountains are floristically a part of the Southern Appalachians, though they are physiographically isolated by the valleys of the Ridge and Valley Province. This relationship is correlated with physiographic history, which was similar in the two regions, both of which escaped complete peneplanation.

The perfect accord between distribution of disjunct species and location of physiographically old situations—monadnocks, undissected parts of peneplains, unrejuvenated streams and undrained plateau swamps—supports the interpretation of species-distribution based on a known sequence of physiographic events.

Acknowledgements

The distribution-maps in this paper are based upon data secured from the Gray Herbarium, the herbaria of the New York Botanical Garden and the Academy of Natural Sciences of Philadelphia, to the officers of which the writer is indebted. In a few instances, where the picture of distribution thus gained was erroneous either because of lack of data from states in the more westerly part of the ranges or because certain Gulf Coastal Plain species thus mapped appeared more frequent in the Appalachian highlands (where every station is probably represented by a specimen) than on the Coastal Plain (from which fewer specimens of common plants reach the larger eastern herbaria), additional data were taken from sources here noted. Additional Ohio records are taken from Schaffner, Revised catalog of Ohio Vascular plants (1932); additional Indiana records of shrubs, from Deam, Shrubs of Indiana (1932); additional records for Mississippi from Lowe, Plants of Mississippi (1921); and for Alabama from Mohr, Plant life of Alabama (1901). To Dr. F. K. Butters of the University of Minnesota, Mr. C. C. Deam of Bluffton, Indiana, Dr. J. H. Ehlers of the University of Michigan, Dr. Norman C. Fassett of the University of Wisconsin, Dr. Hazel Schmoll of the Field Museum, Chicago, and Dr. J. H. Schaffner of Ohio State University, the writer is indebted for additional data from their respective states.

The Kentucky records are based chiefly upon the collections of the writer. The herbaria of the University of Kentucky and of the Kentucky Agricultural Experiment Station were examined by the writer for any additional county records contained therein.

To the American Association for the Advancement of Science and to the National Research Council grateful acknowledgement is made of grants received for aid in field work.

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TWO RARE WEEDS.—While exploring in the vicinity of the Wyman Dam at Moscow, Maine, on August 21, 1934, the writer found a crucifer growing on the fill above the dam which did not seem to belong to any of the species with which he was familiar. A specimen was submitted to Mr. C. A. Weatherby of the Gray Herbarium who identified it as DESCURAINIA HARTWEGIANA (Fourn.) Britton. This plant does not appear in the herbarium of the New England Botanical Club and is in the Gray Herbarium only from the West and from Canada

Photo. E. C. Ogden.

PERICOME GLANDULOSA, n. sp.: FIG. 1, TYPE, × 2/5.
P. CAUDATA: FIG. 2, leaves, × 2/5, from El Paso County, Colorado, *C. S. Sheldon.*

where it is a native. There is one report of this plant in New England, cited in the "Additions to the Flora of Connecticut," Hartford, 1930, as found in Waterbury, Connecticut.

On September 5, 1936, Mr. C. H. Knowlton and the writer were renewing acquaintance with the area of South Boston near the Fish Pier and the Freight Yards where unusual weeds have been found from time to time. In a vacant lot where evidently wool-waste had been thrown out, a strange plant was found which appeared to belong to the Chenopodiaceae but was entirely unfamiliar. Mr. Weatherby also identified this plant. It is BASSIA HYSSOPIFOLIA (Pall.) Volk, a recently introduced weed from southwestern Asia. It has appeared several times in the western United States and was found in waste ground a few years ago in Worcester.—RALPH C. BEAN, Wakefield, Massachusetts.

A NEW SPECIES OF PERICOME

GEORGE J. GOODMAN

(Plate 459)

THE genus *Pericome* has been considered to consist of two species. One, *P. macrocephala* Robinson, from Durango, Mexico, is very distinct, known, to the writer at least, only by the type collection. The other, *P. caudata* Gray, the type species of the genus, is fairly common in herbaria. In the North American Flora, its range is given as "Western Texas to southern Colorado, Nevada, southern California, and Chihuahua." The west end of the Oklahoma panhandle is not so far from this range, but the genus *Pericome* has not been reported heretofore from that state.

The relationship of the new species is with *P. caudata*, but the following description indicates its distinctness.

Pericome glandulosa, sp. nov. (TAB. 459, FIG. 1), herbacea perennis, 1 m. vel plus alta; caulibus ramosis, teretibus, striatis, glandulosis, puberulentibus; petiolis circiter 1 cm. longis, laminis late ovatis vel cordatis, integris vel subintegris, acuminatis, 2–3, raro 4, cm. longis, subtus glandulosis et dense scabro-puberulentibus, supra aliquid minus, palmate 3–5-costatis; inflorescentiis corymboso-cymosis, terminalibus, capitulis pluribus, pedunculis 1–2 cm. longis, involucris turbinato-campanulatis, 5–6 mm. altis, dense glanduloso-puberulentibus, bracteis circiter 20, breviter acuminatis; corollae tubo 1½ mm. longo, faucibus 3 mm. longis; achaeniis anguste oblongis, circiter

3½ mm. longis, sparse strigillosis, marginibus callosis, dense hirsuto-ciliatis; pappi squamis laceratis, 1 mm. vel minus longis.

Pericome glandulosa, n. sp. Perennial herbs a meter or more tall; stems branched, terete and striate, glandular and puberulent; petioles about 1 cm. long, leaf-blades broadly ovate to cordate, entire or nearly so, acuminate, 2–3, or rarely 4 cm. long, glandular and densely rough-puberulent beneath, somewhat less so above, palmately 3–5-ribbed; inflorescence of several-headed terminal corymbose cymes, peduncles 1–2 cm. long; involucres turbinate-campanulate, 5–6 mm. high, densely glandular-puberulent, bracts about 20, short-acuminate; corolla-tube 1½ mm. long, throat 3 mm. long; achenes narrowly oblong, about 3½ mm. long, sparsely strigillose on the faces, densely hirsute-ciliate on the calloused margins; lacerate scales of pappus a little less than 1 mm. long.—At foot of rock cliffs, 3 miles east of Kenton, Cimarron County, OKLAHOMA, August 27, 1934, *Goodman*, No. 2291, TYPE in the Gray Herbarium. ISOTYPE material may be found in the herbaria of the University of Oklahoma, Iowa State College, Missouri Botanical Garden, and elsewhere.

In summary, the new species is readily recognizable by the glandular pubescence, and by the leaves, which are shorter (2–3, rarely 4, cm. long) than are those of *P. caudata* (5–10 cm. long), and cordate, rarely deltoid, and by no means so caudate, characteristic leaves of *P. caudata* being shown as FIG. 2.

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MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS. IV[1]

H. K. SVENSON

(Plates 460–465)

1. Series: TENUISSIMAE[2]

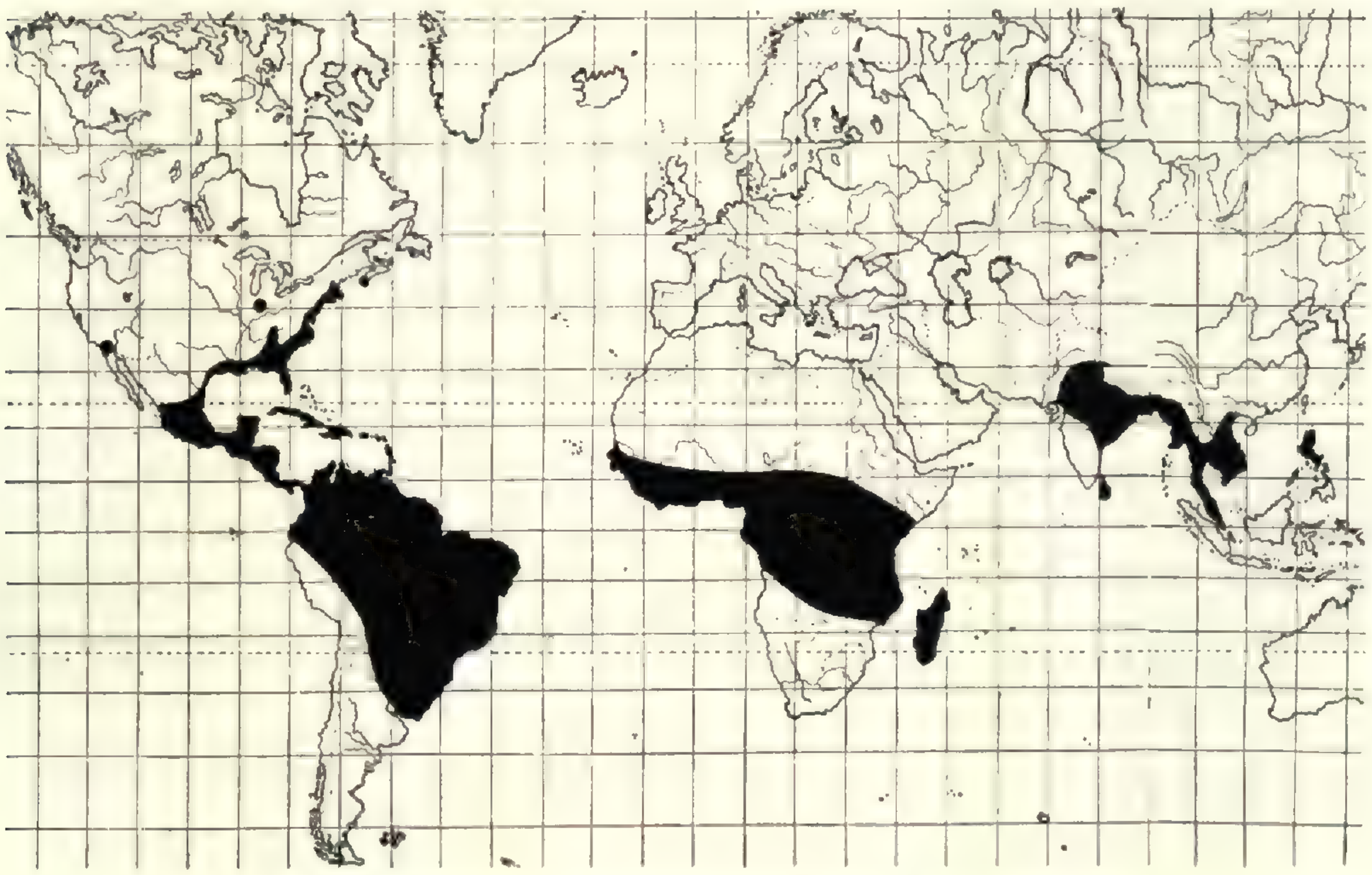
THIS series, primarily of dwarf tropical plants (MAP 1) inhabiting especially the sandy coastal plain of southeastern United States, the pine lands of western Cuba, and the warmer parts of South America, is also well represented in tropical Africa and in Madagascar; otherwise (except for the widespread *Eleocharis*[3], series *Chaetariae* of

[1] Brooklyn Botanic Garden Contributions, No. 75. The cost of the plates is met by the Brooklyn Botanic Garden.—EDS.

[2] See RHODORA xxxi. 129 (1929).

[3] Since no definite ruling has as yet been made I continue here the original spelling ELEOCHARIS instead of HELEOCHARIS. The confusion resulting from the latter spelling has already been mentioned by me (see footnote, RHODORA xxxi. 123 (1929)).

India and the Malay region) it is practically unknown in the Orient and is entirely lacking in Australia. In general, the diminutive size of the plants, the small trigonous achenes (except in *E. minima* var. *bicolor*) and usually punctate quadrangular-sulcate culms, make the group fairly well-defined. The nucleus is formed by the *Tenuissimae* C. B. Clarke, Kew Bull. Add. Ser. viii. 106 (1908), but the *Chaetariae* (l. c.) are intertwined and are not clearly separable. Through the transitional species, *E. retroflexa* and *E. tortilis*, the series has its culmination in *E. tuberculosa*, of larger stature than the other



MAP 1. Range of ELEOCHARIS, series TENUISSIMAE.

species, and characterized by a remarkable development of the style-base. *E. melanocarpa* probably belongs near the *E. Baldwinii-E. vivipara* group, but the relationship is obscure, and I have preferred to include it in the miscellaneous species, treated after the *Tenuissimae* in this paper. The *Tenuissimae* articulate through *E. sulcata* with a series of generally coarser plants, often with prominently elongated rootstocks and with larger achenes (ser. SULCATAE), well represented in Argentina and southern Brazil, including *E. pachystyla*, *E. pachycarpa*, *E. grandis*, *E. Niederleinii*, and, to me, a tangle of other species.

The smaller members of the *Tenuissimae* (especially *E. minima*, *E. nigrescens*, and *E. microcarpa*) have been the source of much confusion and misinterpretation, and in order firmly to establish the

synonymy of these obscure species, I have often found it desirable to illustrate (from the type specimen, whenever possible) the plants representing each name. These illustrations have been made by Miss MAUD H. PURDY, artist for the Brooklyn Botanic Garden. It may be added that the small species (and most of the larger species) of *Eleocharis* must be examined with a good binocular microscope. Magnifications of 30× and 54× have been found most satisfactory.

In the dwarf species of the *Tenuissimae*, and nowhere else in the genus, sessile basal spikelets are of frequent occurrence. These are found at the culm-bases, often so abundantly as to form scaly bulb-like masses. Each spikelet is 1-flowered, developing a single achene which is usually a little larger than the achenes produced in the normal spikelets (cf. PL. 465, FIG. 10). Similar basal spikelets have been described by Chermezon[1] in three Madagascar species of *Scirpus*, and are known also in several South African species of *Bulbostylis* (cf. *B. striatella*, Thistleton-Dyer, Fl. Cap. vii. 206 (1898)), and in the Mexican *Scirpus heterocarpus* Wats. Such spikelets, according to Chermezon, are perhaps the result of alternate immersion and emersion.

Work on this group has progressed intermittently over a period of years, and I have therefore had opportunity to study these particularly difficult species at leisure. Through the kindness of Dr. Merrill and Dr. Gleason of the New York Botanical Garden, I was able to examine the entire rich *Eleocharis* collection of that institution; to Professor Fernald and Mr. Weatherby of the Gray Herbarium I have also been in constant debt. Other curators of herbaria, both in this country and abroad, have been generous with time and specimens, as may be seen from the following institutions, in addition to our own (B), from which I have cited specimens:

(Alb)—New York State Museum, Albany
(Ber)—University of California at Berkeley
(Cal)—California Academy of Sciences
(Cam)—Cambridge University
(Can)—Canadian National Museum
(Cop)—Botaniske Museum, Copenhagen
(D)—Herbarium of C. C. Deam
(G)—Gray Herbarium, Harvard University
(I)—University of Illinois
(K)—Royal Botanic Gardens, Kew
(NY)—New York Botanical Garden
(Ost)—hb. Cornelio Ostén, Montevideo, Uruguay
(Ph)—Academy of Natural Sciences, Philadelphia
(Pom)—Pomona College
(S)—Riksmuseum, Stockholm
(St. L)—Missouri Botanical Garden
(T)—University of Tennessee
(US)—United States National Herbarium
(W)—University of Wisconsin

[1] "Sur quelques *Scirpus* à épillets basicaules," Archives de Bot. Caen Bull. Mens. iii. 193–197 (1929).

The distributional maps, constructed almost wholly from specimens which I have examined, do not adequately represent the dispersal of several species in eastern Brazil, due to the few collections available to me from that area.

KEY TO ELEOCHARIS. SERIES: TENUISSIMAE

(Achene measurements include the style-base (tubercle))

a. NEW WORLD SPECIES....*b.*

b. Achenes cancellate (i. e. with coarse deep-pitted reticulation)....*c.*

c. Achenes large, 2–3 mm. long (species of United States).

Style-base mitriform, as wide as or wider than the achene.....19. *E. tuberculosa*

Style-base conic-subulate, much narrower than the achene.....18. *E. tortilis*

c. Achenes small to medium-sized, not exceeding 1.3 mm. long (species chiefly tropical)....*d.*

d. Aquatic plants with long stolons; achenes obovate-urceolate, 0.8 mm. long (Brazil).....11. *E. glauca*

d. Plants without long stolons....*e.*

e. Achenes 1–1.3 mm. long....*f.*

f. Spikelets narrowly linear (scales only 3–4) (Cuba).
12. *E. alveolata*

f. Spikelets lanceolate to ovate (many-flowered).

Achenes obovate-urceolate, coarsely cancellate; style-base with angles decurrent on achene.
10. *E. retroflexa*

Achenes obovate, finely cancellate; style-base pyramidal, without decurrent angles.

Mature achenes gray to nearly black.

Culms 1–3 dm. high, firm; spikelets linear-cylindric, usually proliferous (s. e. United States).....14. *E. vivipara*

Culms 8–10 cm. high, flaccid; spikelets ovate-oblong (Cuba).....16. *E. grisea*

Mature achenes brownish-iridescent, 1 mm. long (South America).....15. *E. subfoliata*

e. Achenes 0.5–0.8 mm. long, whitish-iridescent when mature.

Achenes 0.5 mm. long; pitting horizontally-elongated (Cuba).....17. *E. minutissima*

Achenes 0.6–0.8 mm. long; pitting circular (Mexico).....8. *E. subcancellata*

b. Achenes smooth to reticulate (not cancellate)....*g.*

g. Achenes biconvex (scattered trigonous achenes usually present).....1. *E. minima* var. *bicolor*

g. Achenes trigonous....*h.*

h. Achenes medium-sized (0.8–1.3 mm. long)....*i.*

i. Spikelets few (2–6)-flowered, ovate; scales dark purplish-brown (Cuba).....6. *E. oligantha*

i. Spikelets many-flowered (if 2–6-flowered, the spikelets linear).

Style-base flat (with an apiculate center), as wide as the achene (Mexico).....2. *E. urceolata*

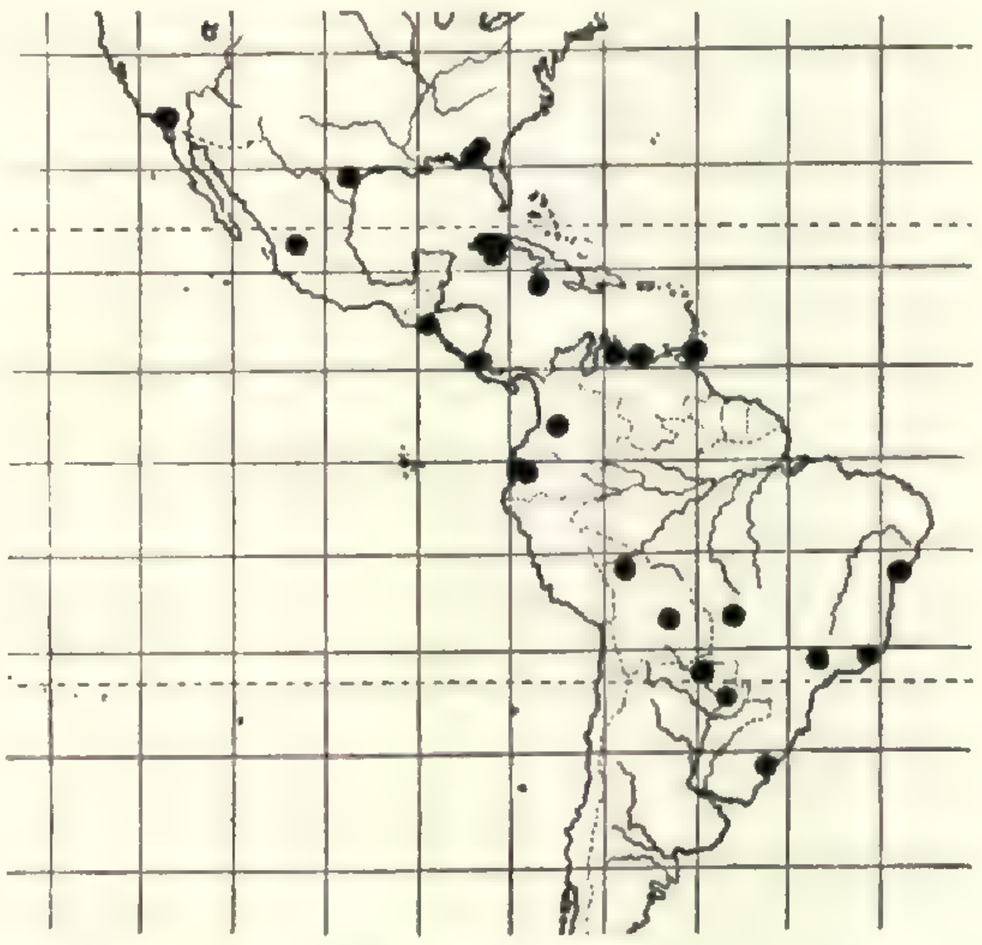
Style-base conic or pyramidal (if depressed much narrower than the achene).

Mature achenes glistening-white.
Scales obviously distichous; achenes lightly pitted; style-base higher than broad..5. *E. amazonica*
Scales not distichous; achene smooth; style-base broader than high.....4. *E. nana*
Mature achenes pale gray to deep brown.
Spikelets obviously distichous.
Style-base subulate-tipped (s. e. United States).....13. *E. Baldwinii*
Style-base pyramidal, obtuse.....1. *E. minima*
Spikelets not distichous....9. *E. microcarpa* var. *filiculmis*
h. Achenes small.
Achenes 0.5–0.6 mm. long, white to faint buff, usually costulate.
Style-base pyramidal to depressed-conic, narrower than the achene.....7. *E. nigrescens*
Style-base flattened (apiculate in the center), as broad as the achene (Argentina).....3. *E. Barrosii*
Achenes 0.6–0.7 (rarely 0.8) mm. long, light gray, not costulate.....9. *E. microcarpa*

a. OLD WORLD SPECIES....*j.*
j. Achenes cancellate.
Achenes medium-sized (1–1.5 mm. long).
Spikelets 1-flowered; much-branched aquatic plant; style-base narrower than the achene.....26. *E. Naumanniana*
Spikelets 3–10-flowered; plants cespitose; style-base as broad as the achene.....20. *E. Chaetaria*
Achenes small (0.6 mm. long).....21. *E. Brainii*
j. Achenes smooth to reticulate (not cancellate)....*k.*
k. Culms broad (0.5–1.5 mm. wide in dried material); achenes 0.8 mm. long.....24. *E. anceps*
k. Culms capillary to filiform.
Achenes medium-sized (1.0 mm. long).
Style-base pyramidal; the angles not decurrent (Madagascar).....23. *E. caespitosissima*
Style-base depressed-subulate; the angles decurrent on the achene (Senegal).....25. *E. trilophus*
Achenes small (0.5–0.7 mm. long).
Perianth-bristles present.....22. *E. Schweinfurthiana*
Perianth-bristles lacking.....7. *E. nigrescens*

1. E. MINIMA Kunth (PL. 460, FIGS. 1, 2, 3, 7; PL. 461, FIG. 1; PL. 465, FIGS. 6–10). MAP 2. *Dwarf*, 3–7 cm. tall, cespitose, with numerous whitish elongated fibrous roots: *culms capillary*, often recurving, quadrangular-sulcate, light green, punctate: sheaths conspicuous, light or dark brown, the apex inflated, blunt, hyaline: spikelets 2–4 mm. long, *ovate*, *few- to many-flowered:* scales ovate-lanceolate, mostly acute, *dark brown* with greenish midrib and hyaline margin: style 3-fid: achene ovate, 0.75–1.0 mm. long, sharply triangular with convex faces, whitish to pale or olivaceous brown, lightly reticulate to minutely striate, narrowed at the apex and base, capped by a brownish or gray, *short-pyramidal style-base:* bristles inconspicuous, transparent-white, obscurely toothed, shorter than the achene, often greatly reduced.—Enum. ii. 139 (1837) [Brazil] [PL. 1, FIG. 7]; Steud. Syn. Cyp. 75 (1855); C. B. Clarke, Bull. Herb. Boiss. ser. 2, iii. 1014 [Pl. Has-

slerianae 236] (1903) and Ill. Cyp. t. xxxii figs. 22–25 (1909); Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 193 (1926); Standley, Field Mus. Publ. Bot. viii. 263 (1931); Ostén, Anales Mus. Nat. Hist. Montevideo, ser. 2a, iii. 176 (1932). *Chaetocyperus polymorphus* Lindley & Nees in Mart. Fl. Bras. ii[1]. 94 (1842) (excluding α *depauperatus*) [Brazil]. *Chaetocyperus Jamesoni* Steud. Syn. Cyp. 74 (1855) [Ecuador] [PL. 1, FIG. 2]. *Heleocharis tenuissima* Boeckl. Linnaea xxxvi. 365 (1869–70). *E. Wrightiana* Boeckl. Cyp. Nov. i. 12 (1888) [PL. 1, FIG. 3]; C. B. Clarke in Urb. Symb. Ant. ii. 70 (1900) [Cuba], and in Bull. Herb. Boiss. ser. 2, iii. 1014 [Pl. Hasslerianae 236] (1903). *Eleocharis Durandii* Boeckl. All. Bot. Zeitschr. 1896. 34 (1896) [Costa Rica] [PL. 1, FIG. 1]. *E. oropuchensis* Britton, Bull. Torr. Club xlviii. 327 (1921) [Trinidad] [PL. 2, FIG. 1]. *E. Jamesonii* N. E. Brown in Kew Bull. 1921. 256 (1921).—Texas, California, West Indies, and southward throughout the tropics. TEXAS: in mud and on bark of old wood lying in the mud, Horseshoe Lake, Jackson County, *J. A. Drushel* no. 4153, Aug. 9, 1920 (B, St. L). CALIFORNIA: southern California, *Orcutt* no. 4584 (NY) (distributed as *E. disciformis* Parish). MEXICO: wet places on hills near Guadalajara, *Pringle* no. 4339 (B, NY) (as *E. subcancellata*). COSTA RICA: Cañas Gordas, alt. 1100 m., *Pittier* no. 10951, acc. to Clarke, Contr. U. S. Nat. Herb. x. 456 (1908) and Standley, Field Mus. Bot. Ser. viii[4] 263 (1931). SAN SALVADOR: vic. San Vicente, alt. 350–500 m., *Standley* no. 21174 (NY). CUBA: margin of lagoon near Pinar del Rio, *C. Wright* no. 3369 (TYPE collection of *E. Wrightiana*) (G, NY); Laguna San Matéo, Pinar del Rio City, *Ekman* no. 18250 (S, NY); south of Mendoza, Pinar del Rio, *León* & *Roca* no. 6950 (NY); Guane, *León* & *Roca* nos. 7014 (NY), 7015 (NY); San Pedro, Isle of Pines, *Britton* & *Wilson* no. 15435 (NY) and *Britton, Wilson* & *Selby* no. 14461 (NY); Las Tunas, *Britton, Britton* & *Wilson* no. 14739 (G, NY). JAMAICA: Green Island, *Britton* & *Hollick* no. 2142 (NY). TRINIDAD: Oropuche Lagoon, *Britton, Hazen* & *Freeman* no. 1155 (TYPE of *E. oropuchensis*, NY); Siparia, *Broadway* no. 7897 (NY). VENEZUELA: Cumana, *Funck* no. 698 (K); Aragua, *Pittier* no. 10159 (NY). COLOMBIA: Neiva, Dept. Huila, alt. 550–600 m., *Rusby* & *Pennell* no. 1066 (K, NY). ECUADOR: savanna of Guayaquil, *Jameson* no. 369 (K, NY) (TYPE of *E. Jamesonii*); prov. Guayas, alt. 0–100 m., *Hitchcock* no. 20087 (G, K, NY, U). BOLIVIA:



MAP 2. Range of ELEOCHARIS MINIMA.

Apolo, 4800 ft., *R. S. Williams* no. 910 (NY); alt. 200 m., Velapo, *O. Kuntze* (K, NY); Buena Vista, Dept. Santa Cruz, *Steinbach* no. 5499 (NY). BRAZIL: Caldas, Minas Geraes, *Regnell* III no. 1307 (coll. *Lindman*) (S); Matto Grosso, *S. Moore* no. 530 (NY); in argillaceo humido, Cuyaba, Matto Grosso, *Malme* in 1902 (S) and 1903 (S); Lagoa, S. José dos Campos, *Löfgren* no. A359 (S); Santa Cruz, Rio Grande do Sul, *Regnell* II, 1112 (S). PARAGUAY: San Bernardino, *Rojas* no. 1061 (B, ex herb. Ostén); in regione cursus superioris fluminis Apa, *Hassler* no. 8345 (G); prope Puerte Carado, loco saepe inundato, *Regnell* no. A2295 (S); Colonia Risso pr. Rio Apa, *Regnell* no. 1062c (coll. *Lindman*) (S).

This little species of wide range and great abundance in tropical America, was poorly typified by Kunth,[1] who merely gave the indefinite location "Brasilia." My conception of the species, I believe, is much the same as that of Kükenthal (Fedde, Rep. Spec. Nov. xxiii. 193 (1926)) who likewise includes *E. Wrightiana* within the limits of *E. minima*. It comprises plants similar to *Funck's* collection from Cumana, which I examined at Kew, bearing C. B. Clarke's annotation "Compared with the type of Kunth and Boeckeler in h. Berlin." In general the achenes of *E. minima* are olivaceous brown, often fading to a pearly gray, the surface markings varying, as shown in Miss Purdy's drawings, from a light reticulum to an almost indistinguishable series of striations. The style-base is usually as broad as the apex of the achene; in this respect the material from western America (representing *E. Durandii* and *E. Jamesonii*) is especially homogeneous and quite similar to C. B. Clarke's illustration of *E. minima* (l. c.).

The specimen illustrated in PLATE 460, FIG. 7 was determined as *E. minima* by C. B. Clarke, and tends toward the condition seen normally in *E. Wrightiana* and *E. oropuchensis*, both of which have the identical outward appearance of material from western South America (*E. Jamesonii*), and are without question merely narrow-tubercled forms of *E. minima*.[2] However, great variation in achene and style-

[1] E. MINIMA. Perpusilla; caespitosa; culmis setaceis, basi vaginatis, aphyllis; spica solitaria, ovata, biflora; squamis 4, carinato-navicularibus, ovatis, obtusis, uninerviis, dorso atro-sanguineis, nervo viridi, sub apice evanescente, apice margineque hyalino-albidis, infima vacua; stylo profunde trifido; achenio subrotundo-obovato, trigono, angulis prominulis, laevi, olivaceo, nitido, basi styli abbreviata pallida terminato; setis nullis.—Brasilia.—Planta subsemipollicaris.

[2] Whether *E. mexicana* Palla (Oesterr. Bot. Zeitsch. lxiii. 402 (1913), from Morelia, Michoacan), based on a collection by Arsène, said to differ from *E. minima* by a larger achene and a style-base "pfriemformig (aufgeweicht schmallanzettlich), spitz, braunlich oder schwartzlich, kaum ¼ mm. hoch.", belongs with *E. minima* I do not know, nor have I seen *Schaffner* no. 22 from Mexico upon which Pfeiffer based *E. minima* var. *mexicensis* (Herbarium, no. 56, 55 (1921)).

base may be found in the same collection (cf. PL. 460, FIG. 2; PL. 465, FIGS. 9, 10, all from *Hitchcock* no. 20087, Ecuador).

Some of the material from southern Brazil, perhaps referable to *E. tenuissima*, has also a higher and narrower style-base than is characteristic of the species throughout the larger part of its range. *E. tenuissima* was a renaming of *Chaetocyperus viviparus* Nees[1] in Mart. Fl Bras. ii[1] 93 (1842), not *Eleocharis vivipara* Link (1821), and the descriptions of both Nees and Boeckeler seem to be based primarily on Sellow's collection from Brazil. A Sellow specimen which I examined at Kew bore the added notation "*Eleocharis exigua* R. & S.?" and is, I believe, merely a form of *E. minima* with loose open spikelets, with achenes sharply angled, light olive-gray, faintly iridescent, smooth to slightly striolate, and with a narrow style-base much as described by Boeckeler "rostro triquetro caryopsi ½ breviore e basi pyramidali acuminato, fuscescenti." Whether this specimen is the equivalent of Nees' *Chaetocyperus viviparus* I cannot state with certainty, but until further evidence accumulates for separating such material from *E. minima*, I prefer to treat *E. tenuissima* as a synonym of *E. minima*.

At Kew is also a collection from Guadeloupe (*Bertero*) which undoubtedly represents the second collection cited under *E. t nuissima* by Boeckeler. This specimen, which I believe to be a diminutive unfruitful *E. retroflexa*, is the basis of the synonymy "*Eleocharis prolifera* Torrey! and *Heleocharis tenuissima* Boeck.!" cited by Clarke under *Eleocharis camptotricha* var. *Schweinitzii*,[2] and therefore the origin of the tangled thread erroneously carrying "*Eleocharis prolifera* Torr." into South America (cf. Ostén, Anales Mus. Nat. Hist. Montevideo ser. 2[a], iii. 177 (1932). With some hesitation, Clarke identified an immature specimen of *Hassler* no. 3659 (Paraguay) as *E. tenuissima* (cf. Bull. Herb. Boiss. ser. 2, iii. 1016 (1903), an inter-

[1] *Chaetocyperus viviparus* Nees in Martius, Fl. Bras. ii[1]. 93 (1842).
"*Chaetocypero polymorpho* simillimus ut formam ejus anomalam credissem, nisi basis rostri dimidii fructus longitudina persistens rostrum conicum referret, quae contra in illo tuberculum depresso-conoideum breve apice mucronulatum refert. . .
In Brasiliae orientalis humidis inundatis legerunt *Sellow*, *Pohl*;—in Minarum prov.: M."

[2] Urban, Symb. Ant. ii. 69 (1900). The chief element in the description of *E. camptotricha* var. *Schweinitzii* was *Northrop* no. 524b which is *E. bahamensis* (see RHODORA xxxi. 230 (1929) and Clarke's annotations accompanying the nondescript specimen in the herbarium of the New York Botanical Garden show that he considered this specimen, quite erroneously, the equivalent of the *Bertero* material from Guadeloupe.

pretation which has further confused the situation in South America.[1] I find material labelled *E. tenuissima* to be generally misidentified, for example, *André* no. 4279[1], San Sablo (Nova Granata) (G, NY) is *E. retroflexa*, while *N. Taylor* no. 391, Higuey, Santo Domingo (NY), a proliferous member of the *E. minima-E. alveolata* group, is in too poor condition for any determination. In Brazil, *E. minima* seems to pass directly into the aquatic phase known as

Var. AMBIGUA (Steud.) Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 194 (1926) (as to name-bringing synonym only), [see var. *bicolor*]. *Chaetocyperus polymorphus* Lindley & Nees γ* *natans* Nees in Mart. Fl. Bras. ii[1]. 95 (1842). (PL. 460, FIG. 4). *Isolepis ambigua* Steud. Cyp. 91 (1855). *Eleocharis subtilis* Boeckl. Linnaea xxxvi. 426 (1869–70).

The specimen of *Scirpus ambiguus natans*, collected by Salzmann at Bahia, and represented in the Lindley Herbarium at Cambridge, is the sole basis for the names *Chaetocyperus polymorphus* γ *natans* Nees and *Isolepis ambigua* Steud. This collection, examined by me at Cambridge, consists of somewhat distichous-spiked dwarf plants with olivaceous trigonous achenes, the scales darker and more spreading than in *E. nana* with which it has been confused, and quite different from the Trinidad material collected by Crueger (det *E. minima* var. *ambigua* by Kükenthal), referred by me to var. *bicolor*. The illustration (PL. 460, FIG. 4) represents a habit-drawing of *Gross* no. 20513 (G) from Brazil, which closely resembles the Salzmann specimen, and the achene-drawing is from a sketch made by me from the Salzmann collection at Cambridge. *Chaetocyperus polymorphus* is a well recognized *nomen confusum*,[2] and the varietal name (i. e. *natans*) is in itself a *nomen subnudum*. *E. subtilis* Boeckl. was based on a *Beyrich* specimen from Brazil, with achenes described as "*depresso-obovata* triangulari, angulis costuliformibus, infra apicem leviter constricta . . . rostro concolorato, perbrevi pyramidato triangulari," *Scirpus ambiguus natans* being given as a synonym. Beyrich's collection labelled "*Scirpus ambiguus natans*, Bahia, in aquis leviter fluentibus" (and,

[1] The beautiful figures of *H. tenuissima* drawn by Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 452, f. 12 (1928), were probably influenced by C. B. Clarke's determinations, and illustrate a plant with long slender culms, creeping rootstock and thick-tubercled achene, evidently a different thing than the *E. tenuissima* under discussion.

[2] A "catch all," for small species, comprising, so far as I can interpret, the following elements:

"α *Depauperatus*," based on *Cyperus depauperatus* Vahl = *E. retroflexa*; "α* *Minimus*," based on *E. minima* Kunth; "β *Sphagnicola*," based on *Scirpus ambiguus sphagnicola* Hb. Lindley = *E. nana*; "γ *Capillaceus*," based on *Scirpus capillaceus* Michx. = *E. acicularis*; "γ* *Natans*", based on *Scirpus ambiguus natans* Hb. Lindley.

according to C. B. Clarke, representing the type collection), examined by me at Kew, has capillary culms 2–3 dm. high, spikelets 5–6 mm. long, with dark chestnut scales, and unquestionably represents the aquatic phase of *E. minima*. In southern United States and on the island of Trinidad, extraordinary plants are found, in which the majority of achenes are lenticular, representing

Var. **bicolor** (Chapman) n. comb. (Pl. 462, figs. 1–3). Cespitose, sometimes with slender elongate rootstocks: culms spongy, nearly terete to quadrangular-sulcate, punctate: sheaths stramineous, often a little inflated at the summit, as in typical *E. minima:* spikelets ovoid, 2–4 mm. long, loosely many-flowered: scales 2 mm. long, obtuse to emarginate, with green keel, brown sides and hyaline margin: style 3-fid: *achene obovoid*, 0.7 mm. long, *lenticular* or trigonous, white to stramineous, smooth to lightly reticulate: style-base olivaceous to dark brown, nearly as wide as the achene, flattened-apiculate to short-pyramidal: bristles white, rudimentary to half as long as the achene.—*E. bicolor* Chapman, Fl. S. United States 517 (1860). *Scirpus exiguus* Griseb. Fl. Br. W. Ind. 569 (1864), not HBK. Nov. Gen. et Sp. i. 225 (1816), which is a high Andean representative of *E. acicularis*. *E. subtilis* Clarke in Urb. Symb. Ant. ii. 71 (1900), not Boeckl. *E. Wrightiana* C. B. Clarke, Urb. Symb. Ant. ii. 70 (1900) in part. *E. savannarum* Britton, Bull. Torrey Club xlviii. 327 (1922). *E. minima* var. *ambigua* (Steud.) Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 194 (1926), as to plant cited, not *Isolepis ambigua* Steud. Cyp. 91 (1855). *E. uncialis* Chapman ex Small, Man. 163 (1933) [pl. 3, fig. 3, triangular achene]. Wet pine barrens, Georgia and Florida; Trinidad. Georgia: pine barrens south of Fitzgerald, Irwin County, *R. M. Harper* no. 1711 (NY); wet pine barrens north of Moultrie, Colquitt County, *Harper* no. 1665 (NY). Florida: Quincy, *Chapman* in 1836 (type, NY); damp pine barrens, *Chapman* (type of *E. uncialis*, NY). Trinidad: moist hole on the O'Meara Savanna, *Britton* no. 2491 (type of *E. savannarum*, NY); Savanna O'Meara, *Crueger* no. 48 (K).

In the collections of both *E. savannarum* and *E. uncialis*, trigonous and lenticular achenes may be found in the same spikelet, the trigonous achenes being inseparable from those of *E. minima*. Crueger's Trinidad specimen at Kew, bearing C. B. Clarke's notation "This was marked by Boeckeler in hb. Berlin *E. Wrightiana* and I think is that," is identical with Britton's type of *E. savannarum*.

2. E. **urceolata** (Liebm.) n. comb. (Pl. 460, fig. 5). Densely cespitose; *culms finely capillary, 3–7 cm. high*, dull green, punctate and obscurely quadrangular-sulcate; sheaths purplish, a little inflated at the summit; spikelets 2–3 mm. long, ovate (occasionally narrowly oblong and fewer-flowered), 6–11 flowered; scales spreading in fruit, keeled, green with purplish sides and hyaline margins; style 3-fid;

achenes triangular, costulate, 0.8 mm. long, *urceolate-obovate, truncate at the apex,* pale gray to brownish yellow, faintly striate-reticulate to smooth; *style-base flat, apiculate in center;* bristles none.—*Chaetocyperus urceolatus* Liebm. in Vidensk. Selsk. Skr. ser. 5. ii. 243 (1851). *Eleocharis Liebmanniana* Boeckl. Linnaea xxxvi. 439 (1869–70).—MEXICO: savanna swamps, [Hacienda de] Mirador, Potrero de Consoquitla,[1] *Liebmann* (G, TYPE coll. of *C. urceolatus*); *Palmer* no. 7069 (G).

Liebmann differentiated *C. urceolatus* from *Chaetocyperus punctatus* Nees (*E. nana* Kunth), but I believe the relationship is closer to *E. nigrescens.*

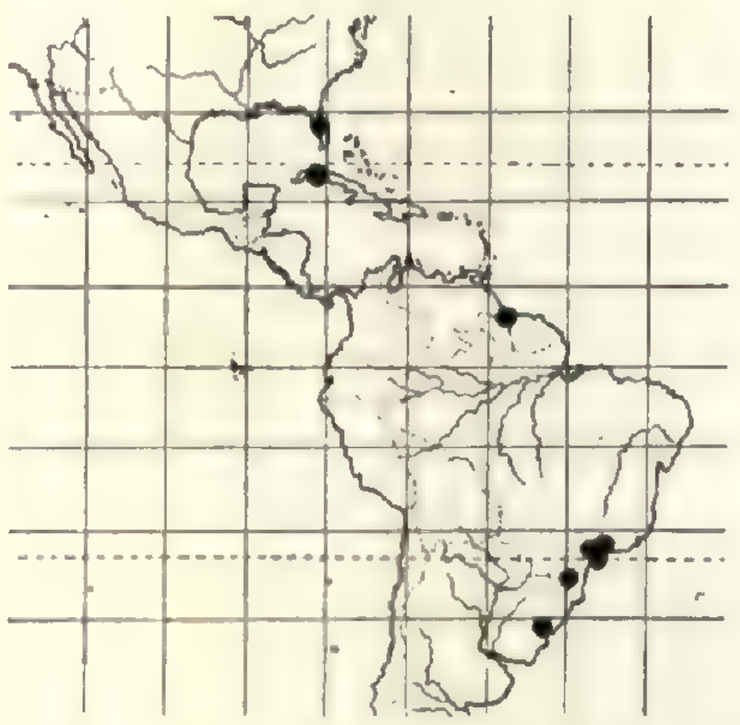
Eleocharis Liebmanniana Boeckl. (based on *Liebmann* no. 603 from Mirador) was characterized by "caryopsi minutissima . . . angulis prominulis, *tuberculato-rugulosa* albida margaritaceo-nitidula; tuberculo *brevissimo conico annulo rugoso circumdato.*" In reading over Liebmann's text, I find no record that any species of *Eleocharis* other than *Chaetocyperus urceolatus* and the wholly distinct *E. nodulosa* were collected at Mirador, and I believe that *E. Liebmanniana* should, from this fact and the similarity of Boeckeler's description, be placed in the synonymy of *E. urceolatus.* However, I may be wrong in this assumption, for we have not, by any means, solved the tangle of Mexican species associated with *E. nigrescens.* For example, *Palmer's* no. 294 from Mexico (G) (labeled *E. Liebmanniana*) has grayish achenes 0.8 mm. long, which are strongly cancellate and with prominent costulate angles, evidently not *E. urceolata.* What *Heleocharis aurea* Boeckl. Cyp. Nov. i. 15 (1888) represents I do not know; the collection, from San Luis Potosi, *Schaffner* no. 212, is said to be related to *E. Torreyana.*

3. E. **Barrosii** n. sp. (PL. 462, FIG. 4), annua, cespitosa, culmis capillaribus tenuibus proliferis *E. minimae* similis; culmis 3–10 cm. longis, obscure sulcatis; vaginis laete brunneis ad apicem paulo inflatis, scariosis; spiculis ovatis, 2–4 mm. longis, subdistichis, laxe pauce- vel multifloris; glumis acutis, 2 mm. longis, carinatis, in carina viridis, latere castaneis, margine late hyalinis; stylo 3-fido; achaeniis trigonis, costulatis, obovato-urceolatis, laevibus, 0.6 mm. longis, albidis vel olivaceis, apice truncatis; stylo-basi multo depresso in medio paullo apiculato; setis nullis vel rudimentariis.—ARGENTINA: Formosa, *Jörgensen* no. 3310 (TYPE in Gray Herb.).

[1] These names do not appear on any maps available to me, but from notations by Liebmann (l. c. p. 207, p. 215, etc.) it is evident that both localities lie in the warm temperate region of the east side of Mexico at an altitude of 3000 and 2500 feet respectively. A specimen of *E. nodulosa* in the Gray Herbarium has the notation "Hidalgo, Mirador."

This clearly distinct little species differs from *E. minima* in having elongated culms and much smaller achenes, truncate at the apex. The achene is also much smaller than in *E. urceolata*. The name is associated with *Dr. Manuel Barros*, the distinguished writer on *Cyperaceae* of Argentina, to whom I am much indebted for helpful information and specimens.

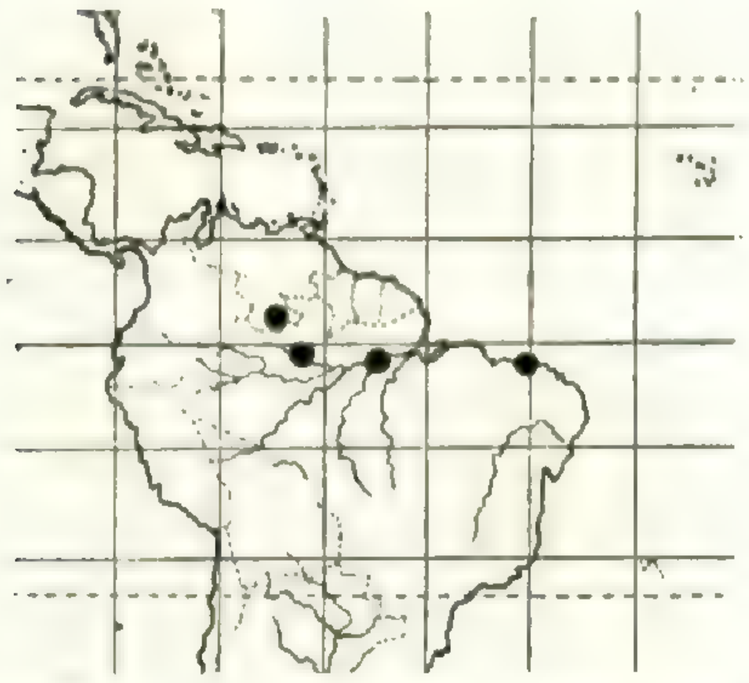
4. E. NANA Kunth (PL. 462, FIG. 12). MAP 3. *Erect* cespitose annual (?) with *coarse whitened roots;* culms 4–12 cm. long, glaucous-green, punctate, irregularly sulcate; sheaths stramineous, often marcescent, the apex appressed-acute to somewhat inflated; spikelets ovate to elliptic, 3–4 mm. long, 5–8-flowered; scales greenish to stramineous, keeled, apex and margin hyaline; style 3-fid; *achene sharply trigonous to costate, 1–1.3 mm. long*, greenish, becoming pearly when mature, *obscurely reticulate;* style-base deep olive to brown, short-pyramidal with an acuminate tip; bristles colorless to light brown, exceeding the achene.—Enum. ii. 140 (1837); Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 193 (1926). *Chaetocyperus punctatus* Nees in Mart. Fl. Bras. ii[1]. 93 (1842). *Heleocharis punctata* Boeckl. in Kjöb. Vidensk. Meddel. 1869: 132 (1869–70); Linnaea xxxvi. 420 (1869–70); not *Eleocharis punctata* Hochst. ex Steud. Cyp. 75 (1855) which is *E. sulcata*. *Eleocharis punctata* C. B. Clarke in Urb. Symb. Ant. ii. 69 (1900). *Scirpus camptotrichus* C. Wright in Sauvalle Fl. Cubana 172 (1873). *Eleocharis camptotricha* C. B. Clarke in Urb. Symb. Ant. ii. 69 (1900).—Florida, West Indies, South America. Specimens examined: FLORIDA: bog mat, Lake Lynch marsh, Winter Haven, Polk County, *J. B. McFarlin* no. 3988 (B); cypress swamp, Polk City road, Winter Haven, *McFarlin* no. 5793 (B). CUBA: *C. Wright* no. 3767 (G). BRITISH GUIANA: Penal Settlement, *A. S. Hitchcock* no. 17099 (G, NY); *Jenman* no. 6112 (NY). BRAZIL: *Burchell* no. 3137 (G); Jacarehy, *Dusén* no. 17011 (TYPE coll. of *E. Dusenii* Pfeiff.) (G); Jacarehy, *Dusén*, no 118a (NY); St. Vincente, Prov. S. Paulo, *Mosén* no. 3724 (S); in paludibus, Pirahy, Paraná, *Dusén* no. 3031 (S); Taquerembo, Rio Grande do Sul, *Lindman* no. A1537 (S); Iguape, S. Paulo, *Hoehne* no. 24281 (G).



MAP 3. Range of ELEOCHARIS NANA.

According to Kükenthal (l. c.) who has examined the type of *E. nana* (*Gaudichaud* no. 3195, Rio de Janeiro), *E. camptotricha* C. B. Clarke and *H. punctata* Boeckl. are synonyms of *E. nana*, which is distinguished from *E. minima* primarily by the taller, more rigid culms and larger achenes.

5. E. AMAZONICA C. B. Clarke (PL. 461, FIG. 9). MAP 4. *Erect* from a slender, much-branched vertical rootstock, *sometimes with slender, elongated rhizomes;* culms 8–10 cm. long, filiform, *dull green, wiry,* punctate, deeply striate to irregularly sulcate; sheath dull brown, scarious, somewhat acute at the apex; spikelets ovate to lanceolate, 4–7 mm. long, *distichous,* about 10–15–flowered; scales obtuse, thin, appressed, punctate on the obscure greenish keel, light brown to greenish on the sides, with a broad scarious margin, the lower scale greenish, erect, *simulating a continuation of the culm;* style 3-fid; achene obovate, 0.8–1 mm. long, trigonous, *costulate, shining white,* smooth to obscurely reticulate; style-base light brown, pyramidal, 1/3 the width of the achene; bristles rudimentary to half as long as the achene, lightly retrorse-toothed.—Kew Bull. Add. Ser. viii. 22 (1908).—BRAZIL: in vicinibus Santarem, Prov. Pará, (*Scirpidium*) (2) *Spruce* in May 1850 (TYPE coll.) (Cop, G, NY), and in Sept. 1850 (S); ad flumen Guainio v. Rio Negro supra ostium fluminis Casigiuari, *Spruce* in 1854 (no. 3757, distributed as *E. polymorpha* Nees (var. ?) (NY); open sandy flats about Sao Lopez, Fortaleza, Ceará, *Drouet* no. 2454 (G, B). VENEZUELA: Esmeralda, *Tate* no. 258 (juvenile) (NY).

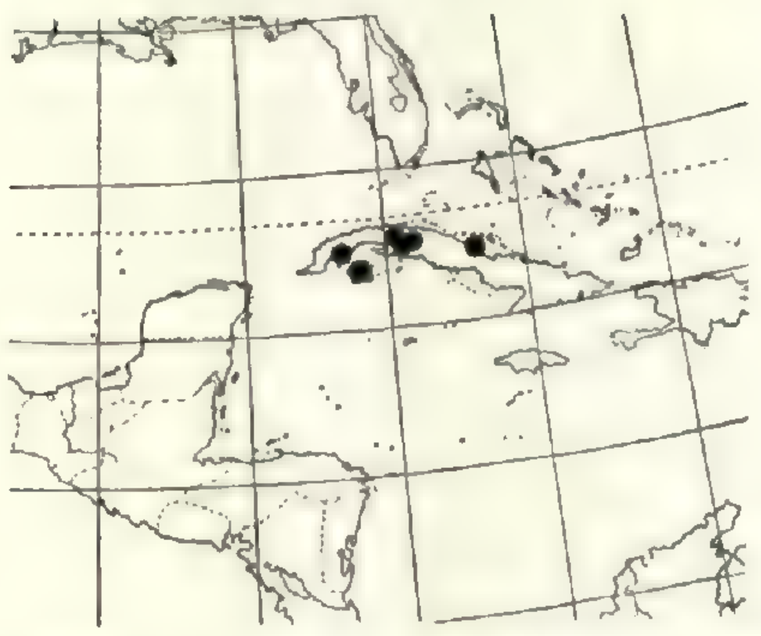


MAP 4. Range of ELEOCHARIS AMAZONICA.

Although of coarser appearance and with wholly different spikelets, *E. amazonica* is nevertheless most closely related to *E. nana.* The latter species has larger, less costulate achenes which have merely a smooth to lightly reticulate surface and are not punctulate as in *E. amazonica.*

6. E. OLIGANTHA C. B. Clarke (Pl. 460, FIG. 6). MAP 5. *Dwarf, densely matted,* often proliferous annual; *culms finely capillary,* 2–5 cm. high, often recurved or prostrate, punctate, quadrangular-sulcate: sheath stramineous to reddish, scarious and slightly inflated at the apex; spikelets 1–3 mm. long, *ovate, 2–6-flowered: scales dark purplish-brown,* keeled, *spreading in fruit:* style 3-fid: achene 1 mm. long, trigonous, sharply-angled, whitish, becoming gray to dark olive-brown when ripe, faintly punctate-reticulate: style-base usually lighter, pyramidal, acute, somewhat 3-crested at base with overhanging projections: bristles hyaline, obscurely retrorse-toothed, rudimentary to nearly as long as the achene.—Urb. Symb. Ant. ii. 69 (1900); Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 193 (1926). *Scirpus retroflexus* Griseb. Pl. Cub. 239 (1866) and Sauvalle, Fl. Cubana 174 (1873) acc. to Clarke (l. c.). *Heleocharis prolifera* Kükenthal in Fedde, Rep. Spec.

Nov. xxiii. 193 (1926) in part, not Torr.—Muddy places in pinelands and savannas, Cuba. The species was based on *C. Wright* nos. 3367, 3368 in herb. Kew. Specimens examined: Without further location: *C. Wright* nos. 3367 (G, in part), and 3368 (G, NY). PINAR DEL RIO: vic. Pinar del Rio, *Britton, Britton & Gager* no. 7234 (NY); *Ekman* no. 17947 (G). ISLE OF PINES: Santa Ana, *Britton & Wilson* no. 15688 (G, NY). SANTA CLARA: El Cumbre, *Ekman* no. 18978 (G, NY); Laguna Pozo Grande, Mordazo, *Ekman* no. 17038 (NY); Sabana de Monasterio, *León* no. 9216 (NY); Mordazo, *León & Cazañas* no. 5946 (NY); Manacas, *León & Cazañas* nos. 5813 (NY) and 5861 (NY); Sabana de Motembo, *León* no. 11382 (NY); at the mines of Motembo in the water of the crater, *Ekman* no. 16858 (N, S).[1] CAMAGUEY: La Gloria, *Shafer* nos. 293 (NY), 613 (G, NY).



MAP 5. Range of ELEOCHARIS OLIGANTHA.

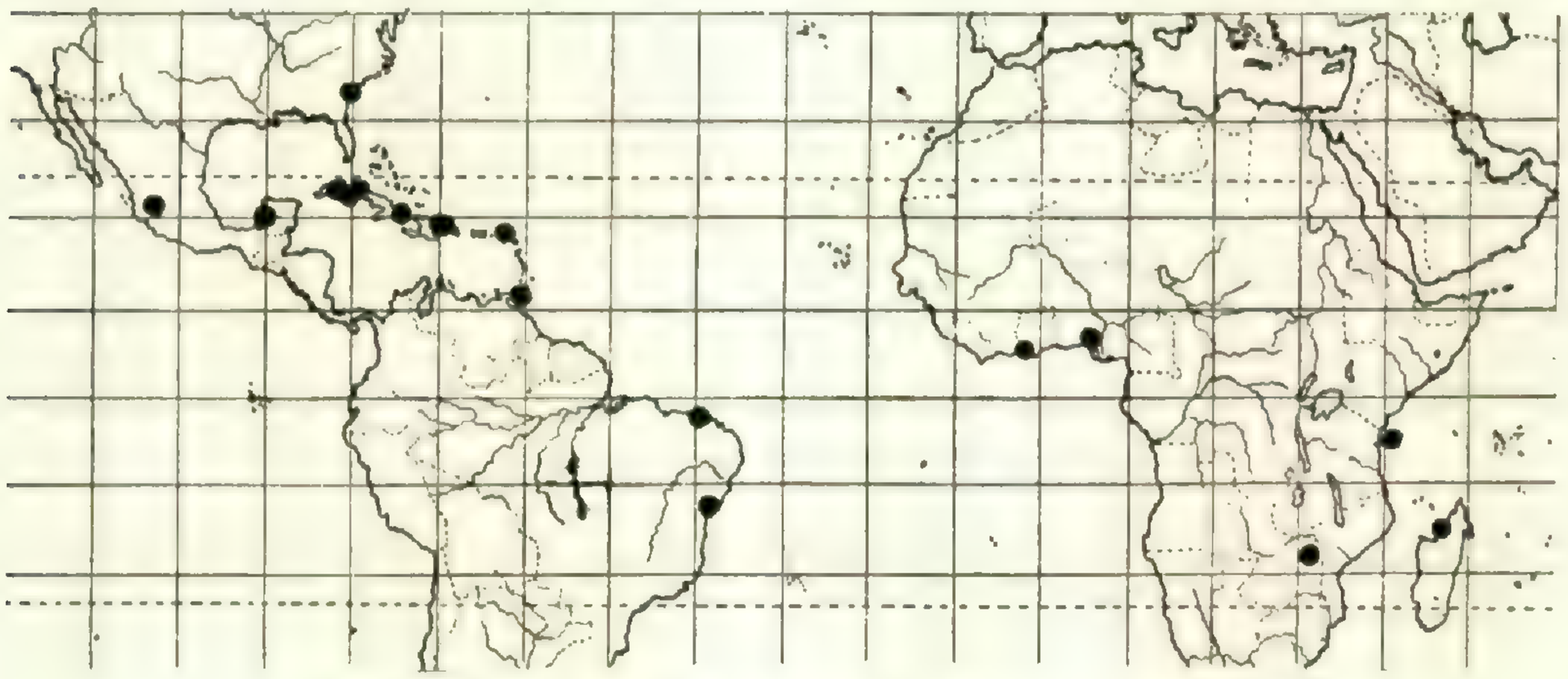
Dr. Kükenthal (l. c.) has differentiated this well marked little species from *E. minima* not only by the shorter and darker scales but also by the wider pyramidal style-base, which, it may be added, usually is 3-pronged at the base.

7. E. NIGRESCENS (Nees) Steudel (PL. 462, FIGS. 5, 6, 7). MAP 6. Cespitose annual with fibrous roots, or perennial with lignescent (usually whitened) vertical much-branched rootstocks: *culms filiform, erect*, 3–7 cm. high, obscurely quadrangular-sulcate, punctate: sheath red (sometimes greenish), the apex marcescent or sometimes projecting into an attenuate appressed appendage 1–2 mm. long: spikelets *many-flowered, ovoid*, 2–5 mm. long; *scales chestnut-brown* with a greenish midrib, obtuse to emarginate, scarcely keeled, spreading at maturity; style 3-fid; achenes trigonous, 0.5–0.6 mm. long; the *mature* achenes[2] (*i. e.* those at the base of the spikelet), smooth, *semitranslucent*, light yellowish brown with prominent *costulate* whitened opaque angles; *immature* achenes (or at least those at the middle part of the spikelets) opaque, white, with *obscure striolate reticulation* and a pearly lustre and with less costulate angles; style-base brown to light gray, pyramidal (or occasionally depressed, acute), 1/3 as wide as the achene; bristles none.—Syn. Cyp. 77 (1855). *Eleocharis nigrescens* Kunth, Enum. ii. 157 (1837) (nomen); C. B. Clarke, Ill. Cyp. t. xxxviii, f. 1–4 (1909); Kükenthal in Fedde, Rep. Spec. Nov. xxiii.

[1] This proliferous specimen, nearly 3 dm. long, was determined by Dr. Kükenthal as *H. prolifera* Torr. It has somewhat the aspect of *Scirpus submersus* C. Wright, but the spikelets and achenes (basal) are typical of *E. oligantha*.

[2] The achenes are here described from the *type* collection. Only one stamen was seen in the flowers examined.

194 (1926). *Scirpidium nigrescens* Nees, Linnaea ix. 293 (1843) (nomen) and in Mart. Fl. Bras. ii[1]. 97 (1842). *Isolepis nigrescens* Steud. Syn. Cyp. 91 (1855). *Scirpus microlepis* Grisebach, Cat. Plant. Cubens. 239 (1866). *Heleocharis atropurpurea* var. γ Boeckl. Linnaea xxxvi. 459 (1869–70). *E. Hildebrandtii* Boeckl. Flora lxi. 34 (1878); [PL. 462, FIG. 6]; C. B. Clarkein Durand & Schinz, Consp. Fl. Afr. v. 598 (1894) and in Thistleton-Dyer, Fl. Trop. Afr. viii. 409 (1902). *E. complanata* Boeckl. Flora 1879. 562 (1879); C. B. Clarke in Durand & Schinz, Consp. Fl. Afr. v. 598 (1894) and in Thistleton-Dyer, Fl. Trop. Afr. viii. 409 (1902); Chermezon, Archives de Bot. Caen iv. Mém. no. 7. 42 (1931). ?*E. Perrieri* Chermezon, Bull. Soc. Bot. France lxxiii. 554 (1926). *E. carolina* Small, Man. S. E. Fl. 165



MAP 6. Range of ELEOCHARIS NIGRESCENS.

(1933).—South Carolina to Mexico and Brazil; Tropical Africa and Madagascar. SOUTH CAROLINA: damp pineland soils, Santee Canal, *Ravenel* (NY) (TYPE of *E. carolina* Small). MEXICO: wet places, Guadalajara, *Pringle* no. 2627 (NY). CUBA: south of Guane, Pinar del Rio, *León & Roca* no. 6997 (NY); Oriente, Sabana San Felipe, *Ekman* no. 2408c (NY); *C. Wright* no. 3370 (G, NY) (TYPE coll. of *S. microlepis* Griseb.). SANTO DOMINGO: *Wright, Parry & Brummel* no. 580 (NY). TRINIDAD: Piarco, *Broadway* no. 2143 (B). BRAZIL: Bahia, in maritimis [*Salzmann* (?)] (TYPE in hb. Lindley, Cambridge Univ.); Piauhy, *Gardner* no. 2374 (G, NY). ZANZIBAR: *Hildebrandt* no. 1063 (K, COTYPE of *E. Hildebrandtii*); *Kirk* in 1872 (K). ANGLO-EGYPTIAN SUDAN: (southwestern); "Terr. Bongo," *Schweinfurth* no. 2576 (K, COTYPE of *E. complanata*). RHODESIA: Salisbury, alt. 4800 ft., *C. K. Brain* no. 8971 (K, B). IVORY COAST: Districte de Toumode, *Chevalier* no. 22376 (K). S. NIGERIA: Lagos, *Dalziel* no. 1297 (K); rice fields, *Barter* no. 1574 (K). MADAGASCAR: Majunga, *Perrier de la Bâthie* no. 17947 (B).

The currently accepted publication of this widespread plant consisted wholly of two *nomina nuda*. Valid publication (as *Scirpidium*

nigrescens), began with Nees in 1842, who cited *Scirpus nigrescens* in Lindley's herbarium, and the first legitimate use of the name *Eleocharis nigrescens* was apparently by Steudel in 1855. The type specimen, so accurately and carefully described by Nees, I have examined through the kindness of Dr. Seward, and the achenes are as Nees states "matura fere laevis, sordide lutescens, juvenilis cum siccetur subtillissime punctulato-striata pallidiorque."

The type is a small annual closely simulating *E. atropurpurea*, to which is was united by Boeckeler, but is clearly transitional to coarse-rooted perennial plants with identical achenes, such as the collection by *León* & *Roca* (no. 6997) figured by Miss Purdy (PL. 3, FIG. 5). The achenes of *E. nigrescens* do not have the consistency in markings found so regularly in species of larger stature, and Clarke's illustration of *E. nigrescens* (Ill. Cyp. t. xxxviii. 1909) was without question a drawing of an immature achene showing a reticulation rarely seen in the more mature achenes of *Wright's* collection (no. 3370 from Cuba), which includes specimens of such variability that the extremes might well be considered as representing entirely different species. Small greenish plants with minute spikelets, fruit-bearing, though often only 1.5 mm. long and 5–6-flowered, intergrade with the larger purplish-scaled material [typical *E. nigrescens*, described by Grisebach from this collection as *Scirpus microlepis*]. These plants no doubt reflect diverse ecological conditions. Though apparently mature, *Ekman* no. 2408[b] has lightly reticulate achenes, not costulate and with a depressed style-base. It was correctly determined as *E. nigrescens* by Kükenthal.

Ravenel's little plant from South Carolina, undoubtedly the basis of Britton's citation (Journ. N. Y. Mic. Soc. v. 107. 1889) of *E. bicolor* from South Carolina, "Santee Canal, Ravenel in 1848" was noted by Dr. Small's keen eye as distinct from any other material collected in the United States, and named by him *E. carolina*. It is identical with the larger plants of *Wright* no. 3370.

The African plants which I have included under this species also show variation in the color of spikelets: thus *Chandler* no. 1372, with deep brown scales, is in every respect a good match for the type specimen of *E. nigrescens*, and it grades into the somewhat lighter-scaled plants exemplified by *Perrier de la Bâthie* no. 17947 from Madagascar.[1] *E. Hildebrandtii* Boeckl. and *E. complanata* Boeckl.

[1] I here express my great appreciation to Dr. H. Chermezon of Strasbourg, the distinguished worker on the *Cyperaceae* of Madagascar, for his kindly help, and for an excellent series of specimens of *Eleocharis*.

have identical achenes, as C. B. Clarke long ago noted (Thiselton-Dyer, Fl. Trop. Afr. viii. 409 (1902)), and *E. complanata* (described by Boeckeler as only 2–5½ inches high) cannot greatly exceed *E. Hildebrandtii* in size. However, I may perhaps err in this disposition of *E. complanata*, which in its culms "valde compressis leviterque 3–4 sulcatis" shows an approach to *E. anceps*.

Typical *E. nigrescens* in the New World passes imperceptibly into plants having cylindric spikelets with appressed scales which I treat here as

Var. **minutiflora** (Boeckl.) n. comb. (PL. 462, FIGS. 8, 9). Culms filiform, erect, light green, *often with fibrous bases*, spongy to quadrangular-sulcate, 4–20 cm. high: sheaths usually marcescent, spikelets many-flowered, *greenish*, *oblong-cylindric* to *elliptic*, 1–3 (rarely 5) mm. long: *scales white with a narrow green keel*, often chestnut-tinged on the sides, acute to obtuse or emarginate, *appressed*, or sometimes spreading in fruit: achene as in typical *E. nigrescens*.—*E. minutiflora* Boeckl. in Engler, Bot. Jahrb. vii. 274 (1886); Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 194 (1926). *E. microcarpa* C. B. Clarke in Urban, Symb. Ant. ii. 71 (1900); Britton & Wilson, Surv. Porto Rico & Virgin Isl. v.[1] 92 (1923), excl. syn.; not Torr.—West Indies, Yucatan. CUBA:[1] Prov. Santa Clara, at the mines of Motembo, hard somewhat moist soil, *Ekman*, no. 16857 (NY, S); *C. Wright* no. 3766 (G); Arroyo Mateo Sanchez, Pinar del Rio City, *Ekman* no. 17945 (S); *C. Wright* (distributed as *Scirpus paracicularis*) (NY). ST. THOMAS: in locis humidis gregaria, Krum Bay, Nov. 1881, *Eggers* no. 767 (NY);[2] *Eggers*, Krum Bay, no. 546 (ISOTYPE, in herb. Calif. Acad. Sci). YUCATAN: south of Villa Hermosa, Campeche, in tintal, *C. L. Lundell* no. 1143, Jan. 8, 1932 (distributed as *E. retroflexa*) (NY).

To Miss Eastwood of the California Academy of Sciences I am much indebted for the opportunity of examining a specimen of *Eggers* no. 546, the TYPE collection of *E. minutiflora*. The plants (5–7 cm. high) are especially characterized by narrow cylindrical green spikelets and somewhat swollen culm-bases, which have a whitened fibrous quality not easily described but perhaps the accumulated debris of basal spikelets or similar sheathing material. *Ekman's* specimens (no. 16857) are still smaller, with culms only 2–3 cm. high. The same plant is represented in a larger and somewhat more flaccid state by

[1] *Ekman* nos. 18979 and 17945 are in addition cited by Kükenthal (l. c.) from Cuba.

[2] This specimen represents a fragment of the collection in herb. Copenhagen, lent in 1930 by Dr. Ostenfeld to Dr. Britton, who up to the very last, maintained keen interest in the *Cyperaceae* and especially in the genus *Eleocharis*.

C. Wright's no. 3766 (G),[1] in which the culms may range as high as 14 cm. Some of the spikelets are tinged with brown as they are also in Lundell's gigantic specimen. The culms in the last-mentioned plant rise up to 20 cm. high from a ligneous turf-like aggregation of matted rootstocks. The basal scales of the elongated spikelets persist after the other scales have fallen.

Gardner no. 2373 (G) (from Piauhy, Brazil (PL. 461, FIG. 8) distributed as *E. nigrescens*), has larger, rotund, grayish, rather deeply reticulate achenes. Although cited under *E. subfoliata* C. B. Clarke, it obviously does not belong with that species but represents either an extreme development of *E. nigrescens*, or a distinct species. *Löfgren's* no. 453 (distributed as *E. sulcata*) from Ceará, Brazil (US) appears to be the same as *Gardner* no. 2373.

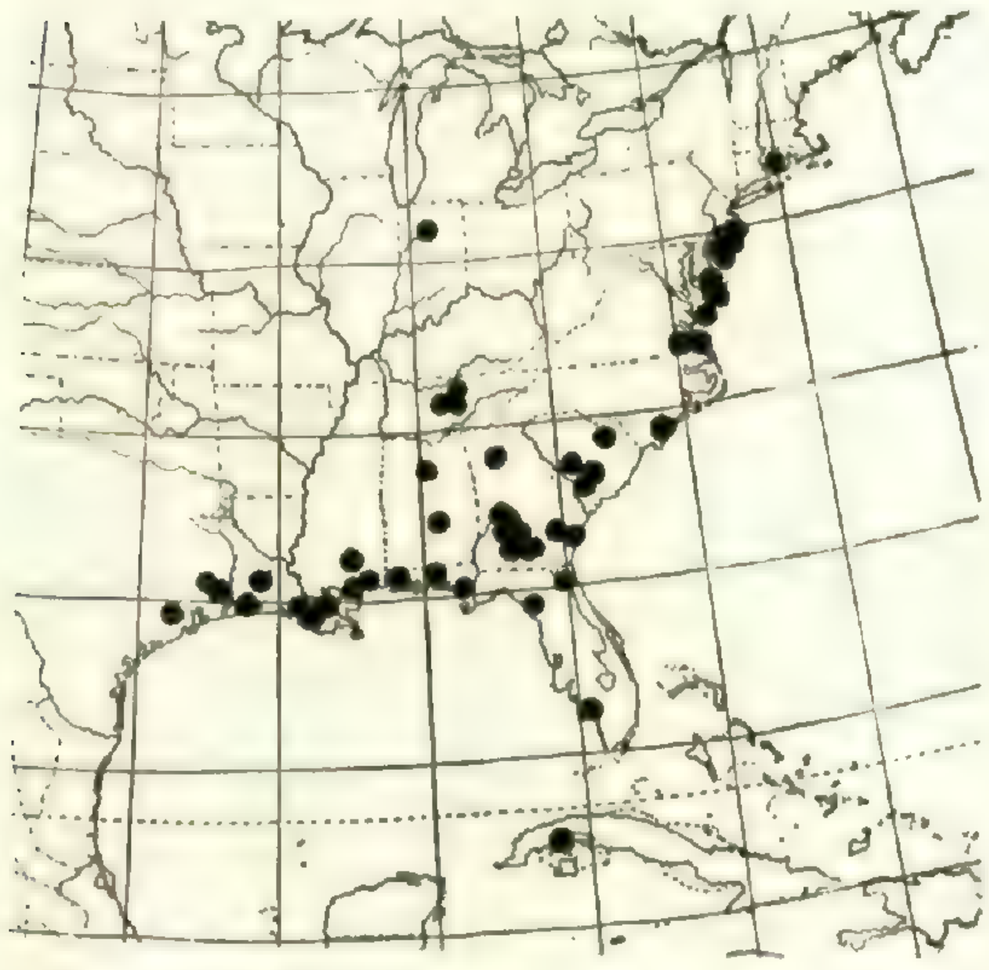
8. E. SUBCANCELLATA C. B. Clarke (PL. 461, FIG. 3). Cespitose, the rhizome, when present, white, branched-ascending: culms filiform, green, spongy, lightly punctate, sometimes quadrangular-sulcate, 2–7 cm. long: sheaths green to whitish, usually marcescent, the apex sometimes becoming filiform and divergent: spikelet many-flowered, 2–5 mm. long, scales greenish, keeled, with purplish to chestnut sides; style 3-fid: achene triangular, elliptic to obovate, 0.6–0.8 mm. long, strongly costate with truncate apex, whitish with a pearly lustre, lightly cancellate, with circular pitting: style-base narrow, depressed-apiculate: bristles rudimentary, united to form a cup-like base.—Kew Bull. Add. Ser. viii. 21 (1908).—MEXICO: Guadalajara, *Pringle* no. 3430 (TYPE K, NY); muddy places near Guadalajara, *Pringle* no. 7069 (G).

E. subcancellata was described as having culms 2–4 cm. long and spikelets scarcely 2 mm. long, but a fragment of the type sent from Kew to the New York Botanical Garden shows some spikelets approaching 4 mm. in length. This material is identical with the more robust specimen (culms up to 7 cm.; spikelets to 5 mm.) under *Pringle* no. 3430 (NY), a sheet which also includes specimens of *E. minima*. *Pringle* no. 4339 (B, NY) from Guadalajara (issued as *E. subcancellata*) is clearly *E. minima*. *E. subcancellata* is close to *E. nigrescens*, and should perhaps be included under that species.

9. E. MICROCARPA Torr. (PL. 460, FIG. 10; PL. 462, FIG. 14): MAP 7. Annual: culms 1–3 dm. high, *finely capillary: flexuous*, often quadrangular-sulcate: roots fibrous, white: sheaths inconspicuous, closely investing the culm, purple-striate at base, somewhat acuminate at

[1] This number is not listed in Sauvalle's Flora Cubana, but the material is identical with two sheets of the Wright collection (NY) labeled "*Sc. paracicularis*," hence the observation: "Species H. paraciculari (Scirpus) Wright proxima" by Boeckeler (l. c.).

apex: spikelets many-flowered, oblong to ovate, 2–7 mm. long: stamens 2 or 3: style 3-fid: scales loose, strongly keeled especially toward the apex, ovate, with a whitish margin, the green midrib bordered by brownish-red, somewhat acuminate, *all deciduous except the enlarged lowest scale which persists as a bract:* achene minute, 0.6–0.7 mm. long, (nearly 0.7 mm. in type), obovate, triangular, grayish-white or yellowish, smooth: *style-base low-conic*, gray, often reddish when young: bristles whitish to light brown, appressed, *less than half the length of the achene*.—Ann. Lyc. N. Y. iii. 312 (1836). *E. cubensis* Boeckl. Cyp. Nov. ii. 10 (1890). *E. nigrescens* Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 194 (1926) in part.—South Carolina to Louisiana; western Cuba.—South Carolina: ponds, Santee Canal, *Ravenel* (as *E. acicularia*) (NY). Georgia: muddy margin of pine-barren pond, Sumter County, *R. M. Harper* no. 550 (NY); Leesburg, *Earle* in 1895 (NY); in bed of a brook, Sycamore, Turner County, *Svenson* no. 7336 (B); gravelly or muddy borders of small streams, near Acree, Worth County, *Svenson* no. 6963. Florida: Fort Myers, *Standley* no. 14890 (NY); Jacksonville, *Curtiss* nos. 4088 (NY), 4800 (NY) and 5669 (G, NY); Wewahitchka, *Chapman* no. 2300a (G, NY); *Chapman* (NY); *Rugel* no. 279 (NY). Mississippi: Ocean Springs, *Tracy* no. 101 (NY). Louisiana: pine wood ponds on flat and wet glades, Calcasieu River, *Carpenter* no. 36 (NY); Covington, *Arsène* no. 11302 (G); New Orleans, *Ingalls* in 1834 (type, NY). Cuba: road to Coloma, Pinar del Rio, *Ekman* no. 18251 (*E. nigrescens*, det. Kükenthal[1]) (NY); *C. Wright* no. 3765 (NY) (type coll. of *E. cubensis* Boeckl.) (G, NY). Passing, especially northward, into the



Map 7. Range of Eleocharis microcarpa.

Var. filiculmis Torr. (Pl. 460, fig. 9). Culms a little *thicker*, *not flexuous:* scales *spreading*, keeled, strongly marked with purple on the sides: achenes 0.7–1 mm. long: style-base *conic-pyramidal: bristles opaque, usually equalling the achene*.—Ann. Lyc. N. Y. iii. 312 (1836). *E. Torreyana* Boeckl. Linnaea xxxvi. 440 (1869–70); Robinson & Fernald in Gray Man. ed. 7, 183, fig. 254 (1908); Britton & Brown, Ill. Fl. ed. 2, i. 316, fig. 775 (1913); Fernald, Rhodora xxxvii. 393 (1935).—Connecticut to Tennessee and Mississippi; also northern Indiana. Connecticut: Voluntown, *C. B. Graves* in 1907 (G). New Jersey: pine barrens, *Austin* (NY); Quaker Bridge, *D. C. Eaton* in

[1] Fedde, Rep. Spec. Nov. xxiii. 194 (1926)

1860 (G, NY); pine barrens, *Torrey* (TYPE, NY); Manahawkin, *Long* in 1909 (G); Egg Harbor, *H. A. Long* in 1905; Bennett, *Gershoy* no. 146 (in part) (G); Bennett, *Van Pelt* in 1908 (Ph); Cold Spring, *Long* no. 5709 (Ph); Winslow Junction, *Mackenzie* in 1921 (NY); Egg Harbor City, *Van Pelt* in 1906 (NY) and *Mackenzie* no. 5564 (NY); bogs near Bennett, *Mackenzie* no. 6564 (NY); Dennisville, *Mackenzie* in 1921 (NY); Woodbine, *Pennell* in 1906 (NY). DELAWARE: Ellendale, *Canby* (NY); Milton, *Britton* (NY); Pepper's Mill, Laurel, *Commons* (NY). MARYLAND: Salisbury, *Commons* (NY). VIRGINIA: wet peaty depressions in sandy pineland, Cape Henry, *Fernald & Long* no. 3761 (G). NORTH CAROLINA: Wilmington, *Canby* (NY); *M. A. Curtis* (two sheets, NY). SOUTH CAROLINA: Barnwell District, *Ravenel* (NY); Aiken, *Ravenel* in 1872 (NY); ditches in the low country, *M. A. Curtis* (NY); Hartsville, *W. C. Coker* (NY); *Elliott*, herb. Le Roy (NY). GEORGIA: Jesup, Wayne County, *Curtiss* nos. 3083 (G, NY), 6841 (NY); Leslie, Sumter County, *R. M. Harper* no. 421 (NY); shallow clear water, Muckalee Creek, Sumter County, *R. M. Harper* no. 533 (NY); shallow pools in granite quarries, Little Stone Mt., Dekalb County, *Svenson* no. 7505 (B). FLORIDA: *Chapman* (NY); De Funiack Springs, *Curtiss* no. 5927 (G, NY); *Buckley* in 1839 (NY). INDIANA: dry sandy roadside ditch, 2 miles S. E. of Tefft, Jasper County, *C. C. Deam* no. 46420 (D, G). TENNESSEE: in a dried-out bog, east of Altamont, Grundy County, *Svenson* no. 7337 (B); swamps and roadside pools, south of Jamestown, Fentress County, *Svenson* no. 7065 (B); muddy margin of a pond, Crossville, Cumberland County, *Svenson* no. 6912a (B). ALABAMA: Mobile, *Mohr* in 1868 (NY) and 1884 (NY); Cullman County, *Eggert* in 1897 (NY); Montgomery, *McCarthy* in 1888 (NY); De Soto Falls, *Ruth* no. 124 (NY). MISSISSIPPI: Biloxi, *Tracy* no. 3592 (NY).

Professor Fernald has pointed out (l. c.) that there is no specific distinction between *E. microcarpa* and *E. Torreyana*, and detailed study of these plants over a period of years has brought me to the same conclusion. There is, however, a marked difference in external appearance, typical *E. microcarpa* having culms as fine and flexuous as in the slenderest examples of *E. acicularis*, while the var. *filiculmis* has noticeably thicker and stiffer culms, giving the plants a strict and rigid appearance. The achenes of the two varieties show well-marked and fairly constant differences in size (achenes of the type collection of *E. microcarpa* average just under 0.7 mm.; those of the type of var. *filiculmis* average 0.8 mm. long), also in length of bristles and acuteness of the tubercle, but the color of scales seems to be of little importance. Though the var. *filiculmis* is the sole representative in the northern area, it infiltrates to some extent throughout the range of the species; whereas typical *E. microcarpa* is still unknown to me from

north of South Carolina. The collection (*Fernald & Long* no. 3761), cited from Virginia,[1] with achenes averaging 0.8 mm. long, bristles equalling the achene, and culms thick and rigid, would seem to me rather to belong with the var. *filiculmis*. Closely linked with *E. microcarpa* is a usually much taller plant with appressed whitened scales, and greenish-gray achenes with a depressed style-base, which may be called

Var. **Brittonii** n. comb. (PL. 460, FIG. 11). Culmis strictis, 1.5–10 dm. altis; squamis *adpressis, obtusis, haud carinatis, albidis* vel leviter brunneo-variegatis: achenio pyriformi, 0.6–0.8 mm. longo, ad basin valde contracto, obscure trigono, viridescenti-griseo, obscure reticulato, interdum atro-punctato: *stylobasi depressa apiculata:* setis brevibus frequenter translucentibus.—*E. Brittonii* Svenson ex Small, Man. 164 (1933). *E. tenuis* Schultes var. β Torr. Ann. Lyc. N. Y. iii. 310 (1836). *E. prolifera* Torr. Ann. Lyc. N. Y. iii. 315, 442 (1836), in part, especially p. 442. *E. microcarpa* Boeckl. Linnaea xxxvi. 439 (1869–70), e descr.—New Jersey to Louisiana and Texas. NEW JERSEY: Bennett, *Gershoy* no. 146 (in part) (G); *Long* no. 5120 (Ph), and O. H. Brown in 1915 (Ph). GEORGIA: Leesburg, *Earle* in 1895 (NY); moist pine barrens, Alapaha, *Curtiss* no. 6821 (G, NY); moist pine barrens, Sumter County, *R. M. Harper* no. 639 (G, NY); Leslie, Sumter County, *R. M. Harper* no. 407 (G); Darien Junction, McIntosh County, *Small* in 1895 (NY); in bed of a brook, Sycamore, Turner County, *Svenson* nos. 7332, (B), 7333 (B); mucky depressions in pine barrens, east of Sycamore, *Svenson* no. 7334 (B). FLORIDA: Cross City, *Small, DeWinkeler & Mosier* no. 11318 (NY); *Chapman, Eleocharis* sp. no. 3 (NY); Middle Florida, *Chapman* (as *E. prolifera*) (NY). ALABAMA: miry borders of ponds, ditches, Mobile, *Mohr* in 1895 (as *E. vivipara* Kunth) (NY); Mobile, *Sullivant* in 1848 (G). MISSISSIPPI: Augusta, *Tracy* no. 3406 (NY). LOUISIANA: moist pine land, Saint Tammany Parish, Abita Springs, *Pennell* no. 4199a (NY); New Orleans, *Ingalls* (TYPE, NY; *type* also of *E. tenuis* var. β Torr.) (NY); Covington, *Arsène* no. 12183 (NY); Tiger's Pt., W. La., *Langlois* in 1886 (NY); shallow ponds, pine woods, *Hale* no. 31 (G, NY). TEXAS: wet prairies, Houston, *E. Hall* no. 697 (June 12, 1872) (G, Ph, NY, Pom); *T. W. Thurow* in 1899 (NY); Corrigan, *Plank* in 1894 (NY); prairie near Indianola, *Ravenel* no. 95 (NY); Jasper County, *C. Wright* no. 125 (G).

This remarkable plant has the general appearance of a coarse extreme of var. *filiculmis*, but with flat scales usually of much lighter color, that remain appressed to the axis of the spikelet. In well-developed specimens, the pyriform obscurely-angled achene is a beautiful greenish gray (approximately *Court Gray* of Ridgway) with

[1] RHODORA xxxvii. 394. (1935).

rather clear reticulation and a flattened apiculate style-base, and with translucent bristles rarely exceeding half the length of the achene. Until I saw this plant growing with typical *E. microcarpa* in the long-leaf pine area of southwestern Georgia, I believed it to be a well-marked species. From robust specimens (such as *Harper* no. 639) with achenes up to 0.8 mm. long, the variety passes into the dwarf wiry plants (notably in Texas collections, cf. *E. Hall* no. 697) with brownish scales and slightly angular, often yellowish-speckled, achenes which are only 0.6 mm. long. The type of *E. tenuis* var. β Torrey, overlooked for so many years, is a large specimen closely resembling *Harper* no. 639; and here also, judging from Boeckeler's description, belongs *Drummond* no. 407 from New Orleans.

(to be continued)

New Station of Oxalis montana, forma rhodantha.—While hiking the trail from the Town of Warren, New Hampshire, to the Three Ponds last June, I had the good fortune to discover a small colony of *Oxalis montana*, forma *rhodantha* Fernald. This plant appears to be locally distributed in the White Mountains and neighboring region. It has been collected at Chesterville, Maine, (*Miss Eaton*); Manchester, Vermont, (*Grout*); White Mountain Notch (*C. E. Faxon*); Mt. Adams, New Hampshire (*Schweinfurth and St. John* in 1911); and Eden, Lamoille County, Vermont (*C. H. Knowlton*).

This new colony, not exceeding one hundred plants, grows along the trail in a sphagnous depression on Mt. Carr, Warren, New Hampshire (43° 55′ 18″ N, 71° 50′ 6″ W.) at an elevation of two thousand feet.

A few plants associated with this colony of Oxalis are: *Clintonia borealis*, *Coptis trifolia* and *Chiogenes hispidula*. Near it grow such trees as *Picea rubra*, *Abies balsamea*, *Betula lutea* and *Acer saccharum*. The species, although appearing nearby, seems not to mingle with its variety.

Specimens in my herbarium were verified as to their identification by Dr. O. E. Jennings and Dr. E. H. Graham of the Carnegie Museum Herbarium at Pittsburgh, Pennsylvania.—John A. Churchill, Pittsburgh, Pennsylvania.

CLADIUM MARISCOIDES IN SASKATCHEWAN.—A specimen recently received from Professor W. P. Fraser of the University of Saskatchewan, Saskatoon, for determination proved to be *Cladium mariscoides* (Muhl.) Torr. and seems worthy of note as representing a considerable northwestward extension of the known range of this sedge. The collection was made by A. J. Breitung, July 19, 1936, in a bog at Dahlton (about 150 miles northeast of Saskatoon), Saskatchewan. The westernmost Canadian stations recorded by Macoun (Catalogue of Canadian Plants, 2 (part 4): 108. 1888.) for the plant are Muskoka County and Point Edward (Lambton W. County), Ontario. In current manuals the species is generally represented as attaining the western limit of its range in Minnesota and, although MacMillan (Metaspermae of the Minnesota Valley, 104. 1892.) doubted the reliability of the early Minnesota reports, Professor C. O. Rosendahl informs me that he has himself collected it in the bottomlands of the Minnesota River about ten miles southwest of Minneapolis. The Dahlton, Saskatchewan, station is slightly over 800 miles northwest of this Minnesota station. In Michigan *Cladium* occurs approximately 200 miles farther north (Eagle Harbor, Keweenaw County, *F. J. Hermann* no. 8193, in Herbarium of the New York Botanical Garden)[1] than at Professor Rosendahl's locality, but this station is 200 miles farther east so that the "distance record" of Mr. Breitung's collection is not affected by it.—F. J. HERMANN, University of Michigan.

[1] Beal (Michigan Flora, 53. 1904) reported it as known only from the Lower Peninsula and presumably this was true at the time of publication of his "Additions" (Tenth Ann. Rep. Mich. Acad. Sci. 1908), but subsequently Dodge found it in the Upper Peninsula in Schoolcraft and Chippewa Counties (Publ. 31, Biol. Ser. 6, Mich. Geol. and Biol. Surv. 1921).

Volume 39, no. 461, including pages 153–192, was issued 10 May, 1937.

RHODORA

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. July, 1937. No. 463.

CONTENTS:

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. July, 1937. No. 463.

"ALFILERIA (FILAREE) SEED"

William A. Dayton

Although annual, often small, and typically of a rosette growth habit, our American species of alfileria, filaree and heronbill (*Erodium* spp.) are important spring and winter range forage plants for domestic livestock and game animals, especially on dry, warm foothill and "desert" ranges from western Texas to southern California. Together with Indian-wheat (native annual *Plantago* spp.) they are outstanding sheep "weeds" on desert lambing grounds about Phoenix, Ariz. Their curious carpels, so wonderfully fitted for the perpetuation of the species in their frequently austere environment, have attracted the attention of botanist and layman alike.[1] Knuth[2] gives the total number of species as about 60. Hanks and Small[3] attribute six species to North America, three native and three naturalized, but one of these (*E. californicum*) is regarded by most American botanists as merely a subspecies or variety of another Pacific species (*E. macrophyllum*). About eight other (Old World) species of *Erodium* have been collected at various times in this country but they are rare, local, and without economic importance; the six (or five) species listed by Hanks and Small (*op. cit.*) two decades ago are still the important "filarees" of this country.

Considerable attention has been paid to erodiums as rock-garden plants, particularly in Europe; Irving[4] has annotated 14 of the more

[1] Finn, O. B. The brace and bit plant. Sci. Amer. **139**: 426–7. 1928.

[2] Knuth, R., Geraniaceae, *in* Engler, A., and Harms, H. Die natürlichen Pflanzenfamilien **19a**: 43–66. 1931.

[3] Hanks, L. T., and Small, J. K., Geraniaceae, *in* North American Flora **25**: 3–24. 1907.

[4] Irving, W. The heronsbill family. Garden **87** (2693): 329–331. 1923.

promising ornamental species. Interest in our American species, however, is almost exclusively from the standpoints of forage and range protection. As long ago as 1909 Sampson investigated the possibility of using alfileria (*E. cicutarium*) in artificial range reseeding and has published some very significant facts discovered by that study.[1] Interest in this subject is increasing and to-day over a dozen western seed houses carry "alfileria seed," usually without distinction of species. Examination of this "seed" indicates that it is frequently a mixture of two (occasionally more than two) species. So far as this writer has yet been able to ascertain, no ready means of distinguishing

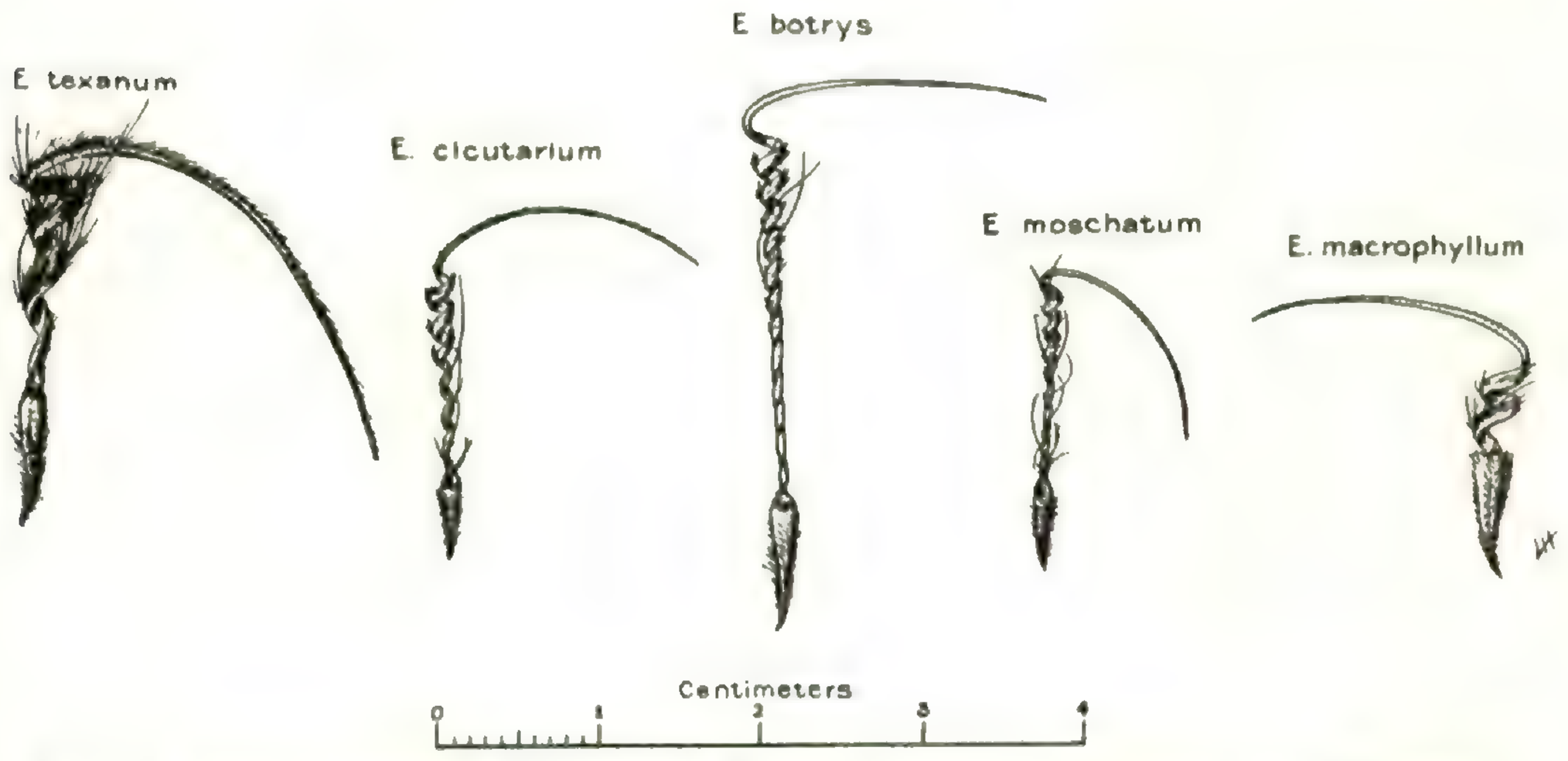


FIG. 1. Mature carpels of common West-American "alfilerias," or "filarees."

the "seed" of these common Southwestern species of *Erodium* has hitherto been published, and it seems desirable that this be done: (1) So that the buyer will be able to know what he is purchasing, and (2) To facilitate further needful studies as to the relative usefulness of the several species in various localities and under diverse conditions.

The peculiar, terminal, hygroscopic, dextrorse-spirally twisted appendage of the alfileria-filaree-heronbill carpel is variously designated by botanists as the beak, carpel tail, style-column, etc. For purposes of his key, the writer thinks it advantageous to use a different terminology, under which three sections of the carpel are recognized: (1) The *corpusculum*, or carpel-body, as distinct from its tail-like appendage; (2) the *spirillum*, or spirally coiled portion of the "beak,"

[1] Sampson, A. W. Collection and sowing of alfilaria seed. Rev. For. Serv. Invest. 2: 14–16. 1913.

and (3) the *flagellum*, or free, arcuate, flail-like terminal portion of the "beak." These portions are all readily recognizable in the mature carpels ("seeds" of the florist). Brumhard[1] was, perhaps, the first to direct attention to the characters of the scar-like foveole at the top of the carpel-body in this genus, and Eig[2] has followed his example.

CARPEL KEY FOR COMMON WEST-AMERICAN "ALFILERIAS"

Corpusculum 4 to 5 mm. long.
  Foveole inconspicuous, circular, about 0.5–0.75 mm. long.
    E. cicutarium (alfileria).
  Foveole conspicuous, shouldered, oblong, about 1.5 mm. long.
    Flagellum mostly reflexed, its span usually shorter (10–12.5 mm.) than that of *cicutarium* (about 15 mm.).
      E. moschatum (musk filaree).
Corpusculum 7 to 10 mm. long.
  Corpusculum truncate, rather uniformly and densely beset with appressed or moderately spreading, both grayish-white and tawny hairs; spirillum usually with only 2 or 3 turns.....**E. macrophyllum** (California heronbill).
  Corpusculum not truncate at apex, sparsely pubescent.
    Spirillum with numerous turns, about 18–21 mm. long; flagellum short-grayish-white-pubescent. Corpusculum hairs semi-appressed, whitish.....**E. botrys** (big heronbill).
    Spirillum usually with about 4 turns, about 8–12 mm. long; flagellum conspicuously tawny-hairy, with a span of 20 mm. or more. Corpusculum hairs spreading, both grayish-white and tawny.....**E. texanum** (Texas heronbill).

RANGE FORAGE INVESTIGATIONS,
Division of Range Research, U. S. Forest Service.

RANGE EXTENSIONS IN NORTH CAROLINA.—On July 19, 1936, while motoring near Jonas Ridge in Burke County, North Carolina, I found a small bog filled with a solid growth of *Juncus Smithii* Engelm. A few days before Dr. H. M. Jennison had shown me this very local species in the Smoky Mountains of Tennessee; otherwise I might very likely have overlooked it. It is now known from Schuylkill County, Pennsylvania, Walton County, Florida, Blount County, Tennessee (RHODORA, Vol. 37, p. 313) and from Burke County, North Carolina.

In 1933 I collected *Scrophularia lanceolata* Pursh, growing on the lower slopes of Grandfather Mountain in Avery County, North

[1] Brumhard, P. Monographische Übersicht der Gattung Erodium. Arb. Bot. Gart. Univers. Breslau, 59 pp. 1905.
[2] Eig, A. Revision of the Erodium species of Palestine. Beih. Bot. Centralbl, 50. Abt. 2, Hft. 1: 226–240. 1932.

Carolina, and again this summer I found it near Pineola in the same County. I believe this is new to the state and extends the southern limit of its range from Virginia into North Carolina. The species is not included in Small's Flora which covers North Carolina.—FRANCIS WELLES HUNNEWELL, Wellesley, Mass.

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS. IV

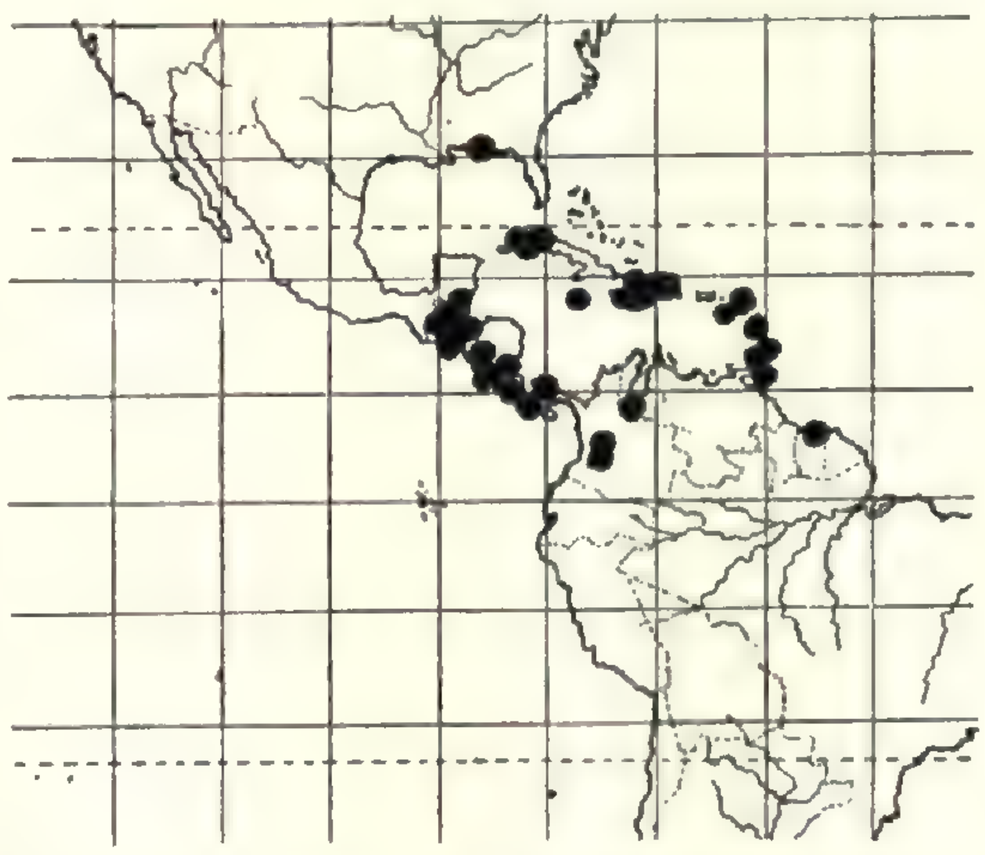
H. K. SVENSON

(*Continued from page 231*)

10. E. RETROFLEXA (Poir.) Urban (PL. 461, FIG. 11). MAP 8. Cespitose, often proliferous annual (?) with fibrous roots: culms green, filiform, *usually recurved*, 2–2.5 cm. long, flattened to deeply quadrangular-sulcate, obscurely punctate: sheath stramineous to reddish, obtuse, scarious and inflated at the summit: spikelets few- to many-flowered, the *scales usually spreading in fruit:* scales green, keeled, obtuse to acute, often with chestnut to reddish-brown sides: style 3-fid: achene 1.0–1.2 mm. long, trigonous, *cancellate*, costate, obovoid to urceolate, white or stramineous: style-base light brown, as wide and 1/3 as long as the body of the achene, *pyramidal-acuminate*, the *angles decurrent on the costae of the achene:* bristles white, shorter than the achene.—Symb. Ant. ii. 165 (1900); Britton & Wilson, Bot. Porto Rico & Virgin Is. v[1]. 92 (1923); Small, Man. 164 (1933); Uittien in Pulle, Fl. Surinam i. 112 (1934). *Scirpus retroflexus* Poir. in Lam. Encyc. vi. 753 (1804). *Cyperus depauperatus* Vahl, Enum. ii. 305 (1805). *Bacothryon retroflexum* A. Dietr. Sp. Pl. ii. 93 (1833). *Eleocharis depauperata* Kunth, Enum. ii. 140 (1837). *Chaetocyperus polymorphus* Nees & Lindl. α *depauperatus* Nees in Mart. Fl. Bras. ii[1]. 94 (1842); Liebmann, [Mexicos Halvgraes] Vidensk. Selsk. Skr. ser. 5, ii. 242 (1851). *C. niveus* Liebm. and *C. viviparus* Liebm. (l. c.). *Chaetocyperus rugulosus* Nees, Bonplandia iii. 86 (1855) [Panama]. *Heleocharis triflora* Boeckl. Flora lxiii. 437 (1880) acc. to Britton.[1] *E. Chaetaria* Britton, Journ. N. Y. Mic. Soc. iii. 105 (1889); Mohr, Contr. U. S. Nat. Herb. vi. 398 (1901); and other auths. as to American plants only.—Alabama, West Indies, and abundantly throughout the American tropics, Poiret's type coming from Porto Rico. ALABAMA: copiously about the spring, Daphne, eastern shore of Mobile Bay, Aug. 23, 1896, *Mohr* (NY, US). CUBA [all known collections are from Pinar del Rio and Havana provinces]: Pinar del Rio, *Shafer* no. 335 (NY); Sierra de Cabra, *Britton* & *Cowell* no. 9808 (NY); Rio Mestanza,

[1] Probably, however, *E. parvula* var. *anachaeta* (see RHODORA xxxi. 177 (1929) and xxxvi. 388 (1934)), conforming especially well with Boeckeler's description of the style-base "rostro minuto viridulo triangulari acuto, basi haud prominente."

Britton & Cowell no. 10153 (NY); Vinales, *Ekman* no. 18001 (G); Herradura, *Ekman* no. 17792 (G); in humidis, Anafe, Havana, *Ekman* no. 236 (G, NY); Laguna del Ariguanabo, Havana, *León* & *Edmund* no. 874a (NY) and *León* & *Nivard* no. 7622 (NY); wet savannas, Chirigota, *C. Wright*, Oct. 30, 1865 (NY); *C. Wright* no. 3764 (G, NY) and 3367 (G) in part; *C. Wright* 3377 (G) (as *Sc. natans* Grisebach). JAMAICA: Portland side, *Britton* no. 3533 (NY); Port Antonio, *A. E. Wight* no. 88 (NY); Ashkenish, *Britton & Hollick* no. 2191 (NY); 400 m. alt., Dolphin Head, *Britton & Hollick* no. 2239 (NY); New Castle, *Britton* & *Hollick* no. 1774 (NY); 2500–2800 ft. alt., Bull Head Mountains, *Harris* no. 12,266 (G, NY); growing round edges of ponds near Ewarton, *Harris* no. 8512 (NY); 2000 ft. alt., Kellits, Upper Clarendon, *Harris* no. 11,150 (CO, G, NY); Castleton Gardens, *Harris* no. 12,320 (NY); growing amongst grasses at 2500 ft. alt., Upper Clarendon, *Harris* no. 11,106 (NY); near Ewarton, *L. M. Underwood* no. 1862 (NY); Moody's Gap, *Britton* no. 3410 (NY); Troy, Cockpit Country, *Britton* no. 451 (NY); Cornwall, Lacovia, *Britton* no. 1494 (NY); plain of Westmoreland, *Purdie* (G, NY). SAN DOMINGO: *C. Wright, Parry & Brummel* no. 597 (NY); sea level to 100 m., Villa Riva, Prov. Pacificador, *Abbott* no. 557 (G, NY, US). PORTO RICO: Caquas, *O. Kuntze* in 1874 (NY); Sierra de Naguabo, *Shafer* no. 3575 (NY); Sierra de Luguillo, *Sintenis* no. 1403 (G); in mud along brook, Las Cruces, *Britton* no. 9531 (NY); Colonia San Miguel, *Britton & Shafer* no. 1630 (CO, G, NY); Sierra de Naguabo, *Britton & Cowell* no. 2108 (NY); San Juan, *Heller* no. 669 (NY); Sierra de Naguabo, *Shafer* no. 3511 (NY); Sabana Aboja, *Britton* no. 9199 (NY) and no. 9364 (NY); Yunque, *F. L. Stevens & Hess* no. 2813 (NY) and 4824 (B); wet sand, Laguna Tortuguero, *Britton* no. 9908 (NY); Monte Cerrote, *Britton & Brown* no. 5406 (NY); mountain between Guayama and Cayey, *Britton & Brown* no. 6575 (NY); Rio Piedras *Hioram* in 1914 (NY); Sierra de Loquillo, *Blanner* in 1852 (NY). ANTIGUA: *Duss* no. 77 (NY). MONTSERRAT: Gagris Mountain, about 1500 ft., *Shafer* no. 383 (NY). GUADELOUPE: *Duss* no. 3739 (CO, NY). DOMINICA: "Sylvania" 1500–1800 ft., *Cooper* no. 124 (NY); Laudat, *F. E. Lloyd* no. 329 (NY). MARTINIQUE: *Duss* no. 224 (NY) and 4521 (NY). GRENADA: Black Forest, *Broadway* in 1896 (NY). TRINIDAD: St. Augustine, *Britton, Hazen & Freeman* no. 954 (G, NY); Oropuche,



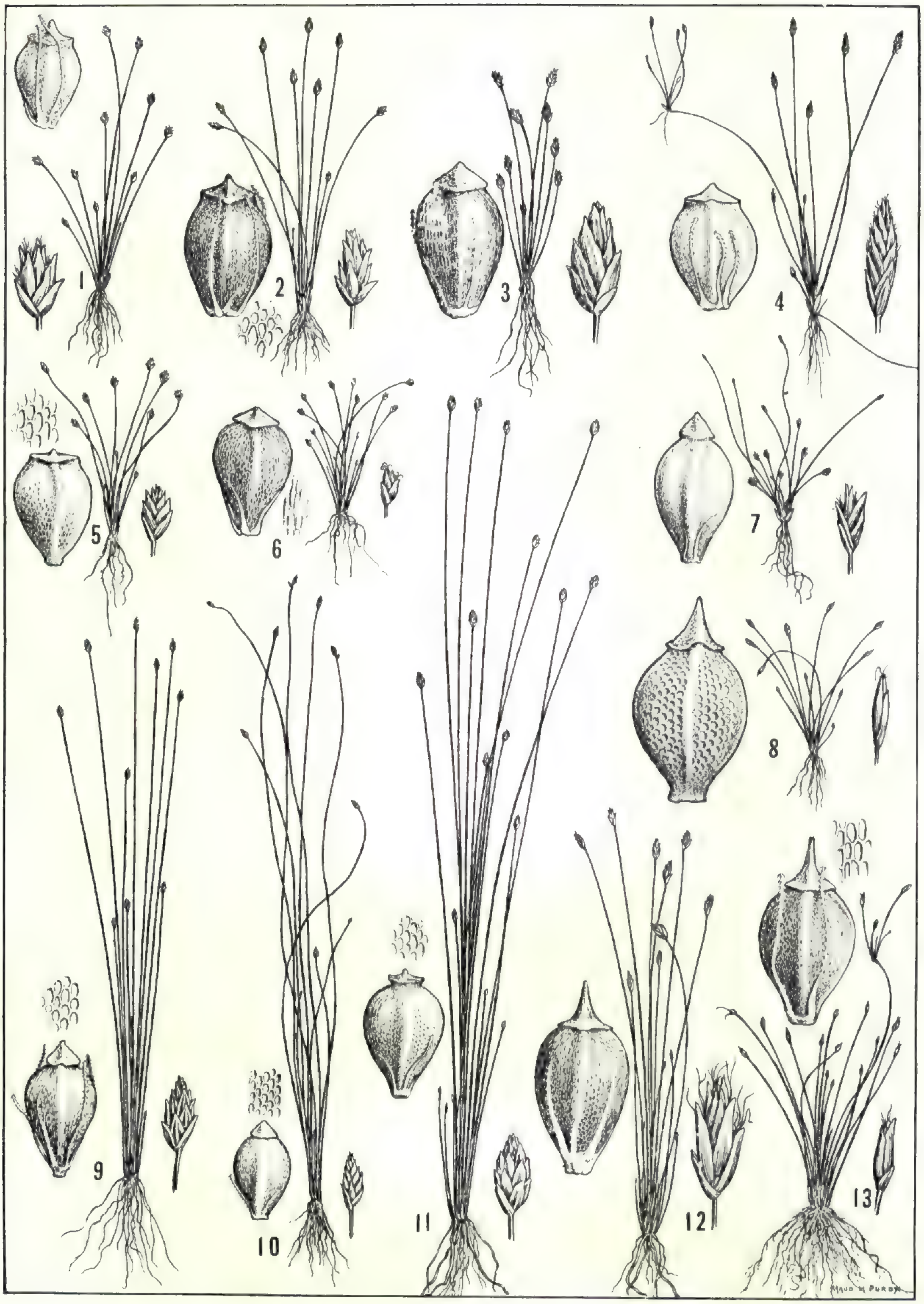
MAP 8. Range of ELEOCHARIS RETROFLEXA.

Broadway no. 7920 (B). BRITISH HONDURAS: Aquatic growing in shallow water, *Schipp* no. 690 (NY); growing at water's edge, forming dense mats, Big Creek, *Schipp* no. 192 (NY). GUATEMALA: Coban, Depart. Alta Verapaz, alt. 4300 ft., *Türckheim* no. 900 (NY, US); Quirigua, Depart. de Izabal, alt. 75–225 m., *Standley* nos. 24171 (NY) and 24277 (G, NY); Puerto Barrios, Depart. de Izabal, at sea level, *Standley* no. 24743 (NY); vic. Puerto Barrios, *Pittier* no. 369 (G, US); Quebradas, Depart. Izabal, *S. F. Blake* no. 7518 (G, US); Cubilquitz, Depart. Alta Verapaz, alt. 350 m., *Türckheim* no. 8613 (G, NY). HONDURAS: vic. of Tela, *Standley* no. 56624 (NY). SALVADOR: Ixtepeque, Depart. de San Vincente, alt. 400 m., *Standley* no. 21453 (NY); San Salvador, *Bernoulli* no. 7 (NY). NICARAGUA: Cartago [probably from Costa Rica], *Oersted* in 1846 (Cop) (TYPE of *Chaetocyperus niveus*); San Juan de Nicaragua, *Oersted* in 1846 (Cop) (as *Chaetocyperus polymorphus* β *capillaceus*); vulcano Irasee, alt. 10,000′, *Oersted* in 1847 (Cop) (as *Ch. viviparus* Nees). COSTA RICA: Rodeo, *Tonduz* no. 1619 (US); La Palma, *Tonduz* no. 12646 (US); Buenos Aires, *Tonduz* no. 4889 (Cop); Las Vueltas, *Tonduz* no. 13324 (NY). PANAMA: Colon, *Kuntze* no. 1852 (NY); Rio Tecumen, Prov. Panama, *Standley* no. 26657 (NY); El Boquete, Chiriqu, alt. 1000–1300 m., *Maxon* no. 5380 (NY, US); Laguna de Paratala, Prov. Panama, *Pittier* no. 4601 (NY, US); El Boquete, 1400 m., *Killip* no. 4533 (NY, US); near Chepo, *Pittier* no. 4559 (G, NY). VENEZUELA: Tovar, *Fendler* no. 1584 (G, NY). COLOMBIA: alt. 1500–1600 m., Dept. El Valle, *Pennell* & *Killip* no. 5981 (G, NY); San Pablo, *E. André*, alt. 1280 m., no. 4279[1] (G, NY) (as *E. tenuissima*); Dept. El Valle, *Pennell* & *Killip* no. 5309 (G, NY). SURINAM: *Schweinitz* no. 6 (NY); Paramaribo, *Hohenacker* no. 1856 (CO). BRAZIL: *Schrader* (CO) (*Scirpus punctatus* Schrader).

E. retroflexa, more frequently collected than any other small species of *Eleocharis* from the American tropics, and easily recognized by the recurved culms and trigonous cancellate achenes, is, so far as I know, not found south of Brazil, and in the United States has not been seen since Mohr's discovery of the species in Alabama in 1896.

Chaetocyperus obtusatus Nees in Mart. Fl. Bras. ii[1]. 94 (1842), the description resting wholly upon Tweedie's immature specimen in hb. Lindley, has been placed in the synonymy of *E. retroflexa* by most authors, but is maintained by Boeckeler (Linnaea xxxvi. 432 (1869–70)) under *E. acicularis*.

11. E. GLAUCA Boeckl. (PL. 461, FIG. 2). MAP 9. Semi-aquatic, *with long rootstocks* (*or stolons*): culms 2–5 cm. high, *erect*, *rigid*, *glaucous green*, irregularly sulcate: sheaths reddish, loose, scarious and marcescent at the apex: spikelets ovate to narrowly lanceolate, 2–6 mm. long, about 6–15-flowered: scales scarcely keeled, appressed, obtuse



ELEOCHARIS, SERIES TENUISSIMAE (habit × ½, spikelets × 2½, achenes × 20). FIGS. 1–4 and 7, E. MINIMA: FIG. 1, *E. Durandii;* 2, *E. Jamesonii;* 3, *E. Wrightiana;* 4, var. AMBIGUA; 7, Brazilian plant. FIG. 5, E. URCEOLATA. FIG. 6, E. OLIGANTHA. FIG. 8, E. ALVEOLATA. FIGS. 9–11, E. MICROCARPA: FIG. 9, var. FILICULMIS; 10, typical; 11, var. BRITTONII. FIGS. 12 and 13, E. BALDWINII.

to acute, with a prominent thickened green center and thin brownish sides: style 3-fid: achene trigonous, obtuse-angled, *obovate-urceolate*, 0.8 mm. long, stramineous to brownish-gray, *cancellate:* style-base low-pyramidal, apiculate in the center, light brown, *deeply 3-crested at the base:* bristles white, rudimentary.—Kjoeb. Vidensk. Meddel. 1871. 150 (1871). *E. arenaria* Benth. Journ. Bot. ii. 244 (1850); C. B. Clarke, Kew Bull. Add. Ser. viii. 106 (1908) (nomen) and Ill. Cyp. t. xxxvii, f. 8–12 (1909). *E. alveolata* Svenson, Rhodora xxxi. 241 (1929), as to Brazilian specimens.—Brazil: in vicinibus Santarem, Prov. Pará, *Spruce* "Eleocharis (Scirpidium) (3)" Aug. 1850 (G, NY) (type collection); Santarem, *Spruce* "Scirpidium (4)" Sept. 1850 (NY); vic. Pará, *C. F. Baker*, no. 416 (Pom.).

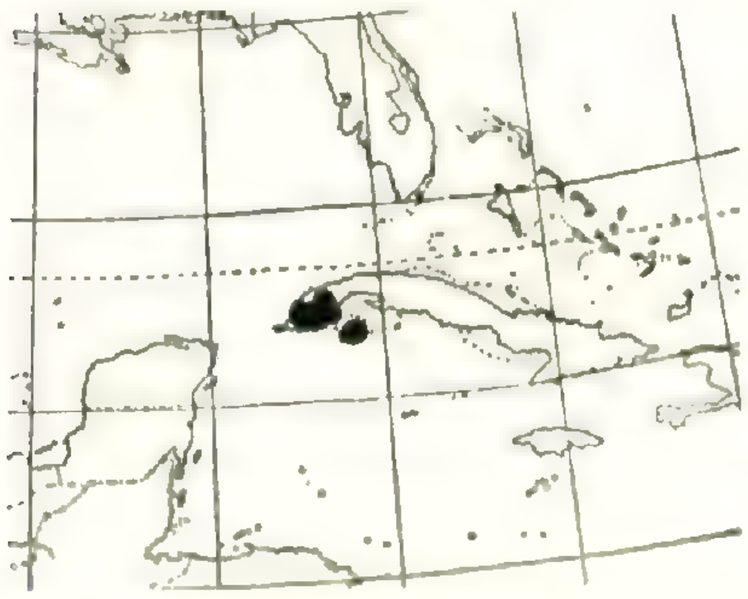
Map 9. Range of Eleocharis glauca.

This species is near *E. retroflexa*, but has erect spongy culms, longer spikelets, and smaller achenes with decidedly different tubercles. Spruce's "Eleocharis (Scirpidium (5)" (G, NY) from Santarem perhaps belongs with this species, but the material is too poor for definite determination.

Bentham's informal account of *E. arenaria*, based on a Spruce collection from Pará (1849) describes "an *Eleocharis* of the section *Chaetocyperus*, which has been distributed as new, under the name of *E. arenaria*. A further examination, however, induces me [Bentham] to suspect that it may be a mere variety of *Ch. bonariensis* Nees, differing in the number of setae, six instead of three, and the more distinctly granular achenia. It forms large patches on the sand at Caripi, and serves to bind the sand." This meagre description was amplified by Clarke's detailed illustration, thereby the species may be said to have achieved publication but much later than Boeckeler's publication of *E. glauca*. It is on the basis of Clarke's illustration, and the fact that the material was derived from the same locality, that I cite *E. arenaria* as a synonym of *E. glauca*.

12. E. alveolata Svenson (Pl. 460, fig. 8). Map 10. *Forming dense mats:* culms 2–5 cm. long, frequently *recurved*, capillary, triangular to sulcate-quadrangular, punctate: sheaths reddish brown, firm, scarious, and a little inflated at the apex: spikelets *linear*, *acute*, 2–3 mm. long, usually sterile: *scales 3–4*, linear, strongly keeled, brown with a hyaline margin: style 3-fid: achenes, *most frequently situated at the culm-bases*, acutely trigonous, 1–1.3 mm. long (including the prominent style-base), obovate, narrowed at base and apex, stipitate, shining, olivaceous to whitish, *prominently cancellate:* style-

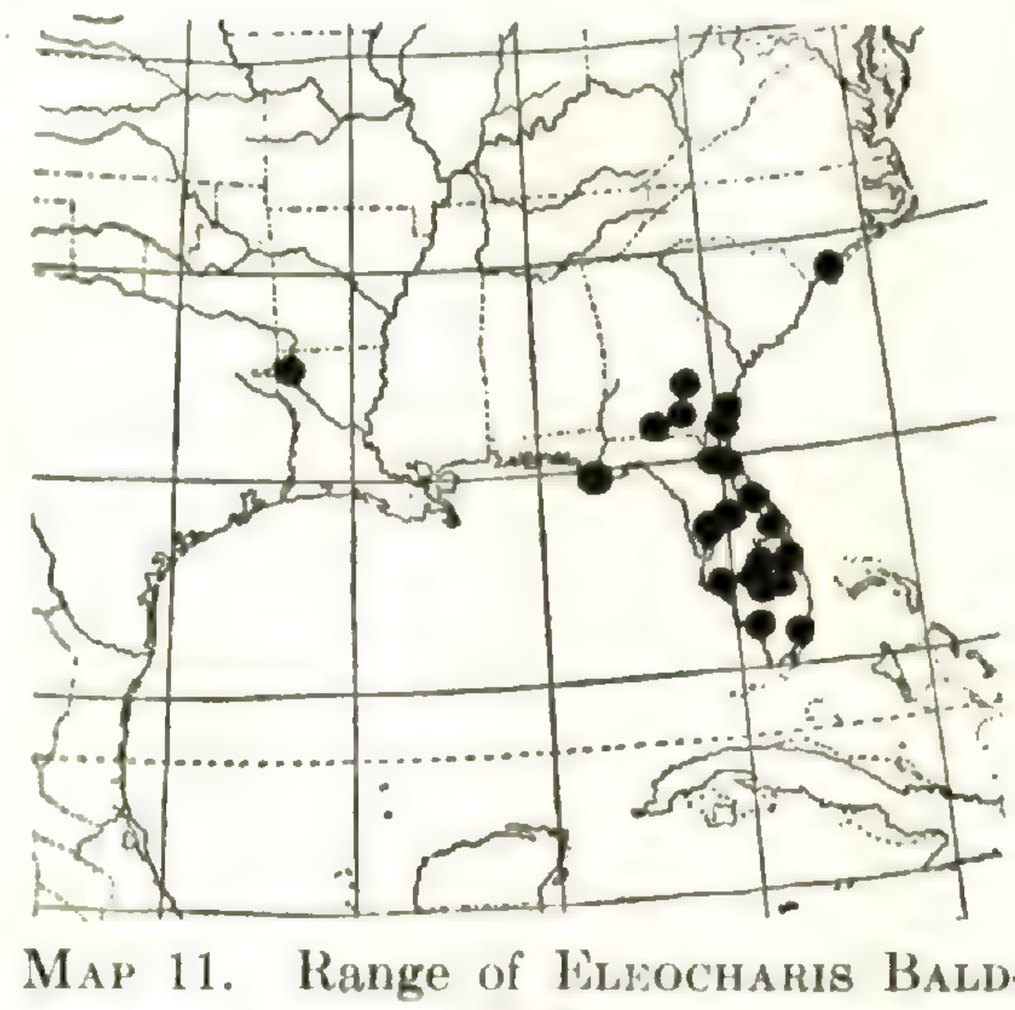
base trigonous, elongated, conical, *acuminate*, from a broad base: bristles lacking.—Rhodora xxxi. 241 (1929) excluding citations from Brazil. *Scirpus capillaceus* Griseb. Cat. Fl. Cubens. 239 (1866), not *E. capillacea* Kunth. *Heleocharis capillacea* Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 191. (1926), not Kunth.—Sandy pine-lands of Western Cuba. Pinar del Rio: Herradura, *Ekman* no. 17788 (type G) (NY, S); Mendoza, *Ekman* no. 18761 (at least in part) (NY, S); Laguna Los Indios, *Shafer* no. 10817 (NY); Laguna Jovero, *Shafer* no. 10900 (NY); Hacienda San Julian, south of Guane, *León* & *Roca* no. 6953 (NY). Isle of Pines: Laguna Santa Rosalia, *Britton*, *Britton* & *Wilson* no. 15621 (G, NY). Without locality: *C. Wright* (as *Anisostachya decipiens* (Wr.) (NY); *C. Wright* no. 3367, in part (G).



Map 10. Range of Eleocharis alveolata.

The spikelets superficially resemble those of *E. capillacea* Kunth, a species confined to tropical South America. They are nearly always sterile, a fact which has brought about confusion with *E. capillacea*.

13. E. Baldwinii (Torr.) Chapman, (Pl. 460, figs. 12, 13). Map 11. Perennial, *forming loose tufts:* rootstocks (rarely present) loosely branched-ascending, the fibrous white roots numerous: culms *usually wiry, capillary*, 3–20 cm. long, often proliferous, dull green, flattened-sulcate, punctate: sheaths prominent, red to yellow, the apex acute: spikelets *flattened, linear to ovate*, 3–6 mm. long, 3–8-flowered: scales linear, acute, strongly keeled, red to faded brown, the lowest scale much shorter: style 3-fid: achene 1 mm. long, sharply triangular, *dark olive-brown*, frequently obscurely striolate: *style-base short- to long-pyramidal*, sharply angled, subulate tipped, brownish: bristles shorter than the achene, brownish-tinged, obscurely toothed.—Fl. S. U. States 519 (1860); Small, Man. 165 (1933). *Chaetocyperus Baldwinii* Torr. Ann. Lyc. N. Y. iii. 295 (1836). *E. prolifera* Torr. Ann. Lyc. N. Y. iii. 316 (1836) (in part); Small, Fl. Se. United States 185 (1903) and Man. 165 (1933).—Sandy soil in pine



Map 11. Range of Eleocharis Baldwinii.

barrens along the coastal plain, North Carolina to Louisiana. NORTH CAROLINA: pine barren exsiccated ponds, Wilmington, *M. A. Curtis* [3 cm. high, dwarf form with basal spikelets] (NY). GEORGIA: St. Mary's, *Baldwin* in 1813 (TYPE, NY) [proliferous, spikelets 3–8-flowered]; dry sandy pine woods, Brunswick, Glynn County, *Pyron* & *McVaugh* no. 260 (B); flat pine barrens, Douglas, Coffee County, *R. M. Harper* no. 685 (G, NY); margin of cypress pond near Chatterton, Coffee County, *R. M. Harper* no. 1451 (G, NY); rather dry pine barrens, Thomas County, *R. M. Harper* no. 1176 (G, NY); pine barrens, Waycross, Ware County, *R. M. Harper* no. 670 (NY). FLORIDA: pineland-prairies, near the Sebastian River, St. Lucie County, *Small, Britton* & *DeWinkeler* no. 9211 (NY); Okeechobee prairie, north of Okeechobee City, *Small, Britton* & *DeWinkeler* nos. 9244 (NY) and 9247 (NY); Lake Okeechobee, *Small* et al. nos. 8217 (NY), 9259 (NY), 4464 (NY), 4335 (NY), 4417 (NY), and 4365 (NY); sandy shore of West Crooked Lake, Eustis, Lake County, *Nash* no. 496 (G, NY, US); in wet ditch, Branchton, *F. S. Blanton* no. 6766 (NY); in moist sandy soil near Orange Dale, St. Johns County, *Moldenke* no. 5245 (NY); moist pine barrens near Jacksonville, *Curtiss* nos. 3074 (G), and 5241 (G, NY); Miami, *Garber* in 1877 (NY); Tampa, *Britton* & *Wilson* no. 51 (NY); Tampa, *Garber* in 1877 (NY); Apalachicola, *Chapman* no. 2302a (G, NY); hard road, Brevard County, *Fredholm* nos. 5752 (G) (as *E. capillacea*), 6070 (G, NY); flatwoods, Alva, Lee County, *A. S. Hitchcock* no. 401 (G, NY) (as *E. Chaetaria*); Jacksonville, *Curtiss* no. 3074 (NY); *Chapman* (NY); without further locality: *Simpson* in 1889 (NY); *LeRoy* (NY); *Leavenworth* (NY); *Underwood* no. 1926 (NY); *Rugel* no. 62 (US). LOUISIANA: sandy silt on margin of Caddo Lake, near Oil City, Caddo Parish, *Uhler* & *Kubichek*, Sept. 23, 1934 (B).

E. Baldwinii, as Torrey long ago noted, has a superficial resemblance to *E. Chaetaria*. There is much variation in size from wiry robust plants, best developed in sandy soil, to the very dwarf material with slender, few-flowered spikelets, especially abundant in the Everglades of Florida, maintained as *E. prolifera*[1] (PL. 461, FIG. 13) by Dr.

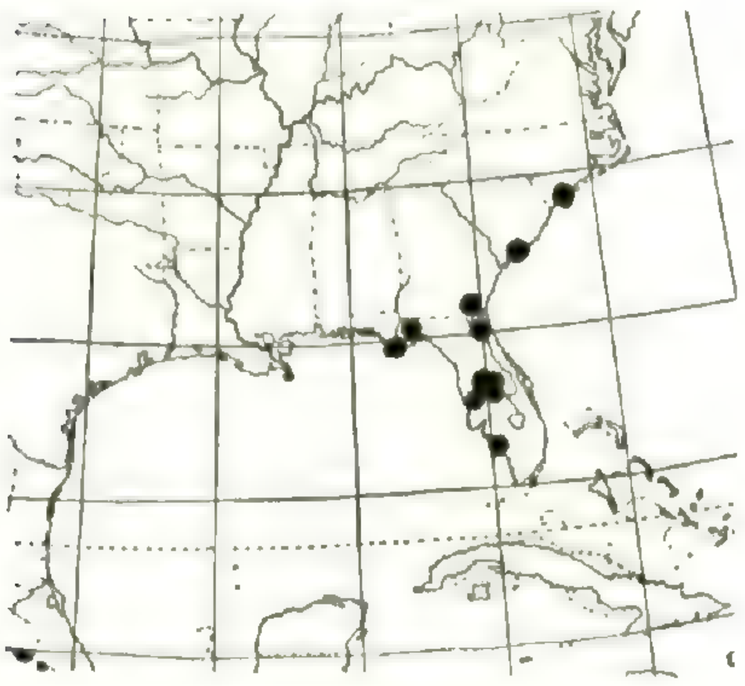
[1] ***E. prolifera*** **Torr. Ann. Lyc. N. Y. iii. 315, 442 (1836). Torrey applied this hopeless *nomen confusum*, which should be rejected, to proliferous plants in general, comprising at least three previously established species. According to my interpretation, his informal account (p. 315) applies mainly to *E. vivipara;* that on p. 442 primarily to *E. microcarpa* var. *Brittonii*. The following entities occupying 4 sheets, named *E. prolifera* by Torrey in his herbarium, are involved:**

(1). A plant with soft greenish elongated filiform culms, represented from Milledgeville, Georgia, *Boykin* in 1826 (with achenes), and from North Carolina, *M. A. Curtis;* clearly proliferous *E. microcarpa*, with achenes as in the typical form. The *Boykin* specimen is annotated as the "type" by Dr. Britton.

(2). Coarse plants, resembling *E. albida* but with strong brown roots, and lightly cancellate achenes with brownish bristles. These are *E. vivipara* Link, represented from Charleston, South Carolina, *B. D. Greene*, [with Torrey's annotation "This may be a state of my *Chaetocyperus Baldwinii* & the plant referred to in Baldwin's notes"];

Small. A clear intergradation between the extremes is apparent in the actual type of *E. Baldwinii*, which bears both small and large (3–8-flowered) spikelets.

14. E. VIVIPARA Link. (PL. 461, FIG. 12). MAP 12. Erect from a *stout often vertical rootstock* covered by the culm bases of the previous year: *roots coarse*, *deep brown:* culms 1–3 dm. high, filiform, to 0.5 mm. wide, light green, faintly punctate, deeply striate to sulcate: sheaths yellowish, often purple at base, firm, acute and frequently lightly purple-tipped at the apex: spikelets linear-cylindric, acute, many-flowered, 3–8 mm. long, *usually wholly proliferous* and seldom perfecting fruit: scales appressed, obtuse, 2 mm. long, usually without a keel, dark chestnut on the sides, with whitish hyaline margin, the lowest somewhat larger, erect and appressed to the base of the spikelet: style 3-fid: achene triangular, obovate, 1 mm. long, *dark gray*, *coarsely reticulate to cancellate:* style-base pyramidal, narrower than the achene, light gray to nearly black (if so with a whitened elevated ridge at the base): bristles reddish-brown, closely retrorse-toothed, nearly equalling the achene.—Hort. Berol. i. 283 (1827); A. Dietrich, Sp. Pl. ii. 87 (1833); Kunth, Enum. ii. 146 (1837); Boeckl. Linnaea xxxvi. 429 (1869–70); Small, Man. 164 (1933). *E. prolifera* Chapman, Fl. S. United States 516 (1860). *E. Curtisii* Small, Man. 165 (1933). *Chlorocharis vivipara* Rikli, Pringsheim Jahrb. xxvii. 564 (1895). NORTH CAROLINA[1]: Wilmington, *M. A. Curtis* (NY) (TYPE of *E. Curtisii*). SOUTH CAROLINA: Charleston, *B. D. Greene* (hb. *Torrey*, as *E. prolifera*). GEORGIA: Chesser's prairie, Okefinokee Swamp, *A. N. Leeds* no. 1753 (Ph, B); *F. Harper* no. 539 (Ph, B). FLORIDA: without loc.: *Rugel* no. 61 (NY); *Chapman* (as *E. prolifera* Torr.) (NY). Hillsboro County: Tampa,



MAP 12. Range of ELEOCHARIS VIVIPARA.

and from Florida, *Chapman*, with the notation, "This seems distinct from Dr. Boykin's plant." [An achene of *E. vivipara!* is glued on the annotation slip.]

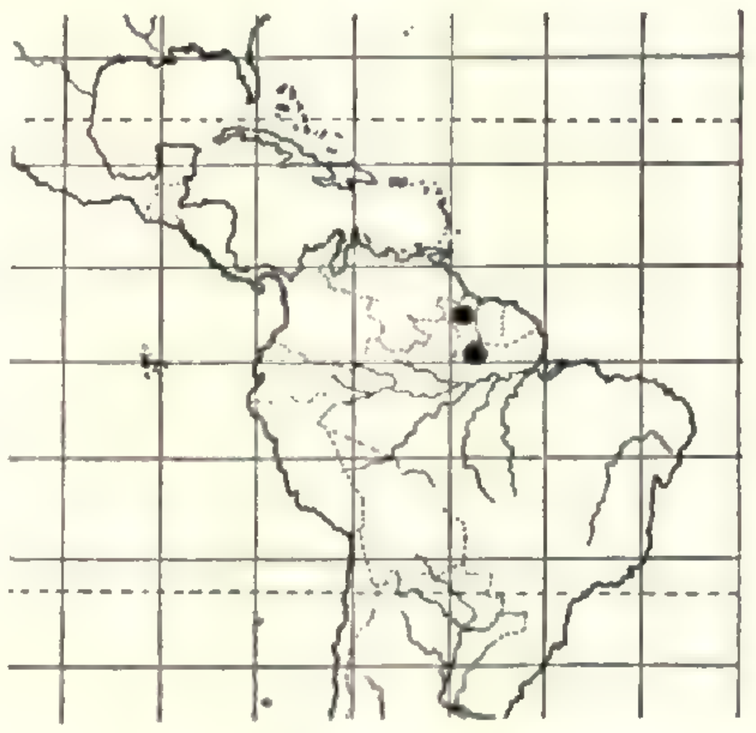
(3). Plants with filiform culms and reddish sheaths, *E. Baldwinii*, from Columbus, Georgia [*Chapman?*]

(4). An envelope, containing fruiting spikelets, labeled "Fruit. *Dr. Chapman*, Florida," (evidently the source of the description of *E. prolifera* on page 442), accompanied by drawings with the annotation "Middle Florida. Dr. Chapman," and clearly representing *E. microcarpa* var. *Brittonii* (*E. tenuis* var. β. *Torr.*). On this sheet are also a sterile plant of *E. vivipara* and a proliferous *E. Baldwinii* labeled "no. 347 *Scirpus tenuis ?* Florida. Dr. Chapman."

[1] A recent collection from Princess Anne County, Virginia, *Fernald, Long & Fogg* no. 4817, Sept. 12, 1935 (G, B), "forming the continuous turf at peaty margin of cove, southern end of Lake Joyce," extends the range of *E. vivipara* considerably to the northward.

Curtiss no. 3088 (heavily fruiting) (NY, B). Manatee County: Palma Sola, *Tracy* no. 6959 (NY), 3405 (B). Polk County: (collections by *J. B. McFarlin*, 1931): submerged on sand, Crooked Lake, no. 3378; vic. Lakeland, no. 3405 (B); Dundee Road, vic. Winter Haven, nos. 5091, 5101; east of Lake Reedy, no. 5146; high hammock, Bartow Swamp, vic. Winter Haven, nos. 5758, 5762, 5763 (NY). Lake County: drained swamp, Eustis, *Nash* no. 864 (NY). Duval County: Jacksonville, *Curtiss* nos. 4089 (NY), 4866 (NY). Leon County: Tallahassee, *N. K. Berg* (NY). Franklin County: marshy borders of ponds and streams, Appalachicola, *Biltmore Herb.* no. 3881 (NY).

The species produces mature achenes infrequently, and is often most readily identified by the coarse brown roots proceeding from thickened rootstocks. The relationship is apparently with *E. tortilis*. Through the kindness of Dr. Gager and Dr. Mattfeld, I have received from Berlin a photograph of the type of *E. vivipara* Link. Dr. Mattfeld writes that the specimen is very unsatisfactory since it has only a single spikelet containing immature flowers. By Dr. Kükenthal, it has been found identical with *E. vivipara* Kunth, based on a *Beyrich* collection from Carolina. Judging from this photograph, Link's fragmentary specimen, originating from North America and grown at the Berlin Botanic Garden, has much the appearance of *Curtiss* no. 4089 (distributed as *E. prolifera* Torr.).



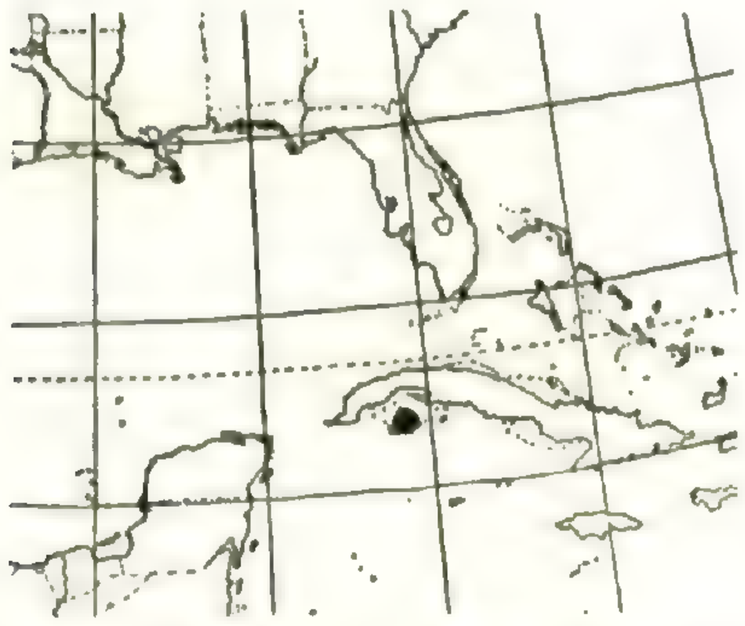
MAP 13. Range of ELEOCHARIS SUBFOLIATA.

E. Curtisii rests on a single dwarf specimen in the herbarium of the New York Botanical Garden. When examined by me in 1930 this specimen had several spikelets, but at the present writing only a fragmentary spikelet remains. The achene preserved by Dr. Small shows the same reticulated surface as in *E. vivipara* and I have no hesitation in treating *E. Curtisii* as a synonym.

15. E. SUBFOLIATA C. B. Clarke (PL. 461, FIG. 5). MAP 13. *Cespitose annual* with fibrous roots: culms capillary, rigid, 3–6 cm. long, punctate, compressed or obscurely quadrangular-sulcate: sheaths brown to purplish, somewhat inflated at the apex, *often splitting into fibrous segments:* spikelets ovate or elliptic, 3–6 mm. long, 6–10-flowered: scales keeled, subdistichous, rigid, acute, 2 mm. long, brown, greenish on the keel and with a scarious margin: style 3-fid: achene trigonous, obscurely costulate, 1 mm. long, elliptic-obovate, *brownish-gray, iridescent, lightly cancellate:* style-base small, pyramidal, grayish,

½ as wide as the achene: bristles brown, rudimentary to nearly equalling the achene.—Kew Bull. Add. Ser. viii. 22 (1908). *E. spadicea* C. B. Clarke (nomen confusum) Kew Bull. Add. Ser. viii. 21 (1908). —Brazil: ad cataractas fl. Aripicuru [a northern tributary of the R. Trombetas], Prov. Pará, *R. Spruce*, Dec. 1849 (G, K, NY). British Guiana: Drake (K, S) (as *E. Wrightiana*, det. Clarke).

The above description and figure are based upon the fertile plants represented in Spruce's collection in the Gray Herbarium, the species as described by Clarke resting mainly upon aberrant, sterile plants with coarser culms and elongated spikelets (reaching 10 mm. in length) undoubtedly the same as a specimen in the herbarium of the New York Botanical Garden. Clarke also cited under *E. subfoliata Gardner* no. 2753, from Piauhy, Brazil, a collection which I am treating as questionable *E. nigrescens* (see discussion under that species). Gardner's plant has no real connection with *E. subfoliata*, although the elongated apex of the sheath (superficially resembling the shredded apex in Spruce's aberrant specimen) may have contributed somewhat to Clarke's selection of the specific name. *E. subfoliata* has much of the outward appearance of *E. minima*, but the culms are sparser and more rigid, and the brownish-gray achenes are distinctive in their narrowed summit, deep reticulation which one might call subcancellate, and peculiar iridescence. In the Drake specimen cited, the culms are 10–15 cm. long. To *E. subfoliata* also probably belong the sterile plants from British Guiana represented by *Jenman* no. 4770 (K) and *Jenman* no. 6114 (NY), the latter determined by Boeckeler as *E. nana*.



Map 14. Range of Eleocharis grisea.

A sterile collection by *Parker* (K) from Demerara [British Guiana] with reddish-brown spikelets, labeled by C. B. Clarke as "*E. spadicea*" probably belongs here, but the only reference following the wholly inadequate description of *E. spadicea* is "Chaetocyperus albibracteatus Nees! in Nov. Act. Nat. Cur. xix. Suppl. I (1843), p. 95, partim." Upon turning to that publication, one finds merely the secondary citation of a specimen "In Guiana, Hook. Herb. Lindl." the description otherwise being based wholly on the high Andean plant known as *E. albibracteata*. Thus, if *E. spadicea* is held to have been adequately published (which I do not think is the case), the *Parker* specimen may perhaps represent the type.

16. E. GRISEA Kükenthal (PL. 465, FIG. 5). MAP 14. Culms few from a *slender creeping rhizome*, 8–10 cm. high (*0.5–1 mm. wide* in dried material), *flaccid*, compressed, obscurely sulcate and lightly punctate: sheaths light brownish-purple, the apex marcescent: spikelets ovate, 3–4 mm. long, 3–6-flowered: scales ovate-oblong, obtuse, stramineous, brownish on the sides, with a hyaline margin: style 3-fid: achene trigonous, 1 mm. long, *greenish-gray*, obovate-elliptic, prominently angled, *cancellate* with *small circular pittings:* style-base depressed-pyramidal, gray: bristles white, rudimentary, from a cup-like base.—Fedde, Rep. Spec. Nov. xxiii. 194 (1923).—CUBA: known only from a single collection, sandy pine lands, Westport, Isle of Pines, *Ekman* no. 12,077 (NY, S).

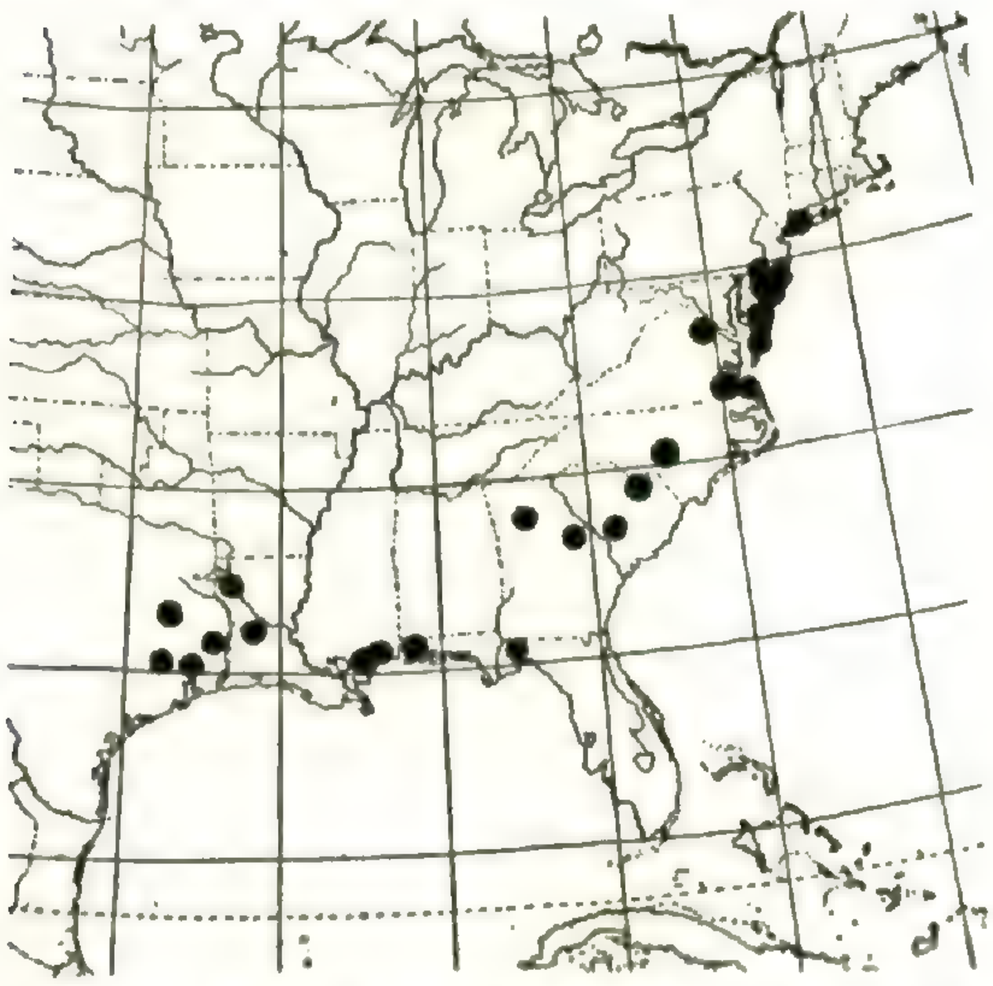
E. grisea appears to be most closely related to *E. alveolata.*

17. E. MINUTISSIMA Britton (PL. 462, FIG. 13). Densely cespitose. Culms capillary, punctulate, 1–3 cm. high, and somewhat thickened at base: roots whitish, rather coarse: spikelets ovoid, 1–2 mm. long, loosely 3–7-flowered: scales spreading, ovate, strongly keeled, green to castaneous with hyaline margins: achenes 0.5! mm. long, oblong, obovoid, iridescent, white to gray, obtusely trigonous, cancellate, the depressions tending to be horizontal as in series *Aciculares;* bristles none: style-base gray, low triangular-apiculate, ½ as wide as the achene.—Mem. Torr. Club xvi. 60 (1920).—CUBA: border of a lagoon near Pinar del Rio, *Britton, Britton* & *Gager* no. 6965 (NY).

This remarkable little species has a superficial resemblance to the smallest material contained in *C. Wright's* collection no. 3370, but the few-flowered spikelets and the peculiar markings of the achene separate it out immediately. I have seen no other material resembling it. Though some of the horizontal sculpture of the achene-surface simulates the markings of the *acicularis* group, the general aspect of the achenes and the punctate character of the culms leaves no doubt that the species belongs to the *Tenuissimae.*

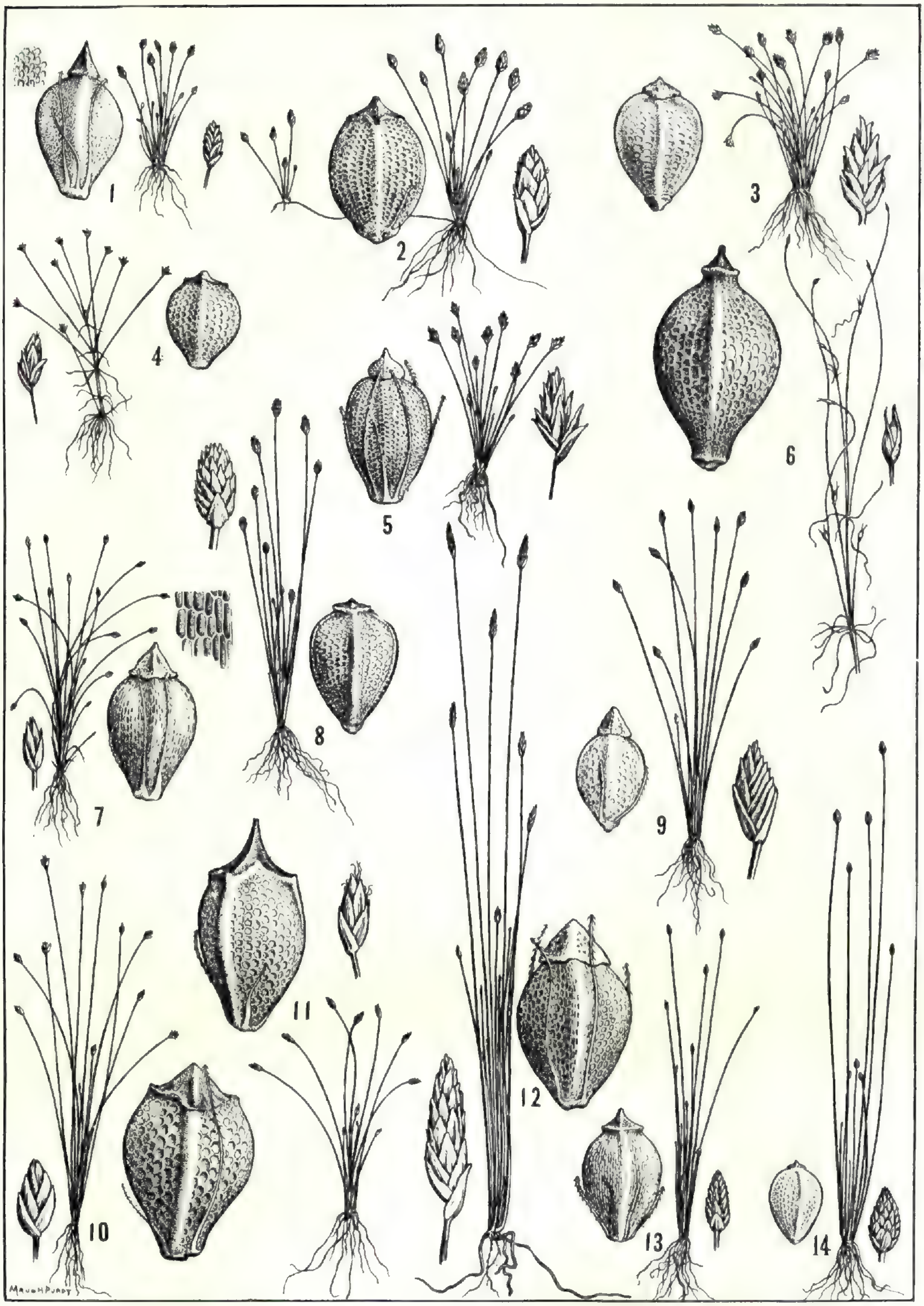
18. E. TORTILIS (Link) Schultes (Pl. 464, fig. 4) MAP 15. Perennial, *forming compact clumps: rootstocks* (when present) vertical, branched, *subligneous*, roots firm, white, thickened: culms light green, *twisted*, 2–5 dm. tall, sharply triangular: sheaths stramineous, acute at apex: spikelets ellipsoid to ovoid, 4-8 mm. long, few to many-flowered: scales 2–3 mm. long, obtuse, cartilaginous, yellow, prominently marked with dark chestnut on the sides, the margin hyaline: style 3-fid: achene 2 mm. long, bluntly to sharply trigonous, *deeply cancellate*, olivaceous to gray: 1/3 of its length occupied by the *pyramidal-subulate style-base:* bristles equalling or exceeding the achene, reddish brown, retrorsely toothed.—Mant. ii. 92 (1824); Kunth, Enum. ii. 144 (1837); Boeckl. Linnaea xxxvi. 441 (1869–70); Robinson & Fernald in Gray Man. ed. 7. 183, f. 252 (1908); Britton & Brown, Ill. Fl. 253,

fig. 589 (1896). *Scirpus tortilis* Link in Sprengel, Schrader & Link, Jahrb. i.[3] 78 (1820).[1] *Eleocharis simplex* Torr. Ann. Lyc. N. Y. iii. 306 (1836), not *Scirpus simplex* Ell. Sk. Bot. South Carolina & Georgia i. 76 (1816) nor *Eleocharis simplex* A. Dietr. Sp. Pl. ii. 78 (1833); Steudel, Syn. Cyp. 75 (1855); Britton & Brown, Ill. Fl. ed. 2, i. 316, f. 773 (1913); Small, Man. 164 (1933). *E. camptotricha* Mohr, Contrib. U. S. Nat. Herb. vi. 399 (1901).—Swamps and bogs on the coastal plain, Long Island to Texas.—New York: Rockville Center, *Bicknell* in 1903 (Alb, NY). New Jersey: Swedesboro, *Lippincott* (NY); Cold Spring, *O. H. Brown* (NY) and *Mackenzie* no. 6997 (NY); South Vineland, *Bassett* & *Long* in 1923 (NY); Cape May County, *Killip* no. 2370 (G); Dias Creek, *Van Pelt* in 1909 (G, NY). Delaware: Georgetown, Sussex County, *Britton* in 1908 (NY); *Van Pelt* in 1908 (G). Maryland: Salisbury, *Commons* in 1863 (G, NY); Salisbury, *Canby* in 1864 (G), 1866 (NY) and 1867 (NY); Ocean City, *Chickering* in 1878 (NY). Virginia: Stafford, *J. Bright* no. 1225 (D); Blackwater River, *Fernald* & *Long* no. 3764 (G). North Carolina: Southern Pines, *Blankinship* in 1895 (G); *M. A. Curtis* in 1834 (NY). South Carolina: Aiken, *Ravenel* (G, NY); Kershaw, Lancaster Co., *House* no. 2617 (NY). Georgia: wet woods, DeKalb Co., alt. 950 ft., *Harper* no. 197 (G, NY); Thomson, McDuffie Co., *H. H. Bartlett* no. 1447 (D). Florida: Aspalaga, *Chapman* (NY). Alabama: borders of ponds, ditches, Mobile, *Mohr* nos. 8, 10 (NY) (as *E. camptotricha*). Mississippi: Ocean Springs, *Tracy* no. 4818 (G); Biloxi, *C. F. Baker* in 1897 (NY).



Map 15. Range of Eleocharis tortilis.

[1] Through the kindness of Miss Ethelyn Tucker, Librarian of the Arnold Arboretum, I have a copy of Link's description in this rarely accessible publication: "*Scirpus tortilis* von Bosc aus Nord-Amerika, culmo triquetro spiraliter torto: foliis culmi similibus? spica terminali solitaria ovata ebracteata, squamis obtusis, semine triquetro setis cincto, stylo basi dilatato persistente. Ist also eine *Eleocharis* Br." As in other species published by Link in this journal (cf. Fernald, Rhodora xxxv. 260 (1933)), there has been confusion in citing the author of *Scirpus tortilis*, based on a specimen in the Willdenow Herbarium collected by Bosc in Carolina. Schultes, perhaps the only source of these names to the editors of Index Kewensis, had copied Link's description, adding incorrectly the citation, "*Scirpus tortilis* Bosc. apud Link, Jahrb. 3, p. 78"; and Kunth's revised description (1837) rested likewise on "Scirpus tortilis *Willd. herb.* no. 1174. *Link. Jahrb.* 3. 78. Scirpus spiralis *Bosc. ined.*" These citations were the source of the ambiguous names "*Scirpus tortilis* Willd." and "*Scirpus spiralis* Bosc." listed in Index Kewensis. Link was correctly named as author by Britton (1889).



Eleocharis, series Tenuissimae (habit × ½, spikelets × 2½, achenes × 20). Fig. 1, E. minima (*E. oropuchensis*). Fig. 2, E. glauca. Fig. 3, E. subcancellata. Fig. 4, E. Brainii. Fig. 5, E. subfoliata. Fig. 6, E. Naumanniana. Fig. 7, E. caespitosissima. Fig. 8, ? E. nigrescens. Fig. 9, E. amazonica. Fig. 10, E. Chaetaria. Fig. 11, E. retroflexa. Fig. 12, E. vivipara. Fig. 13, E. Schweinfurthiana. Fig. 14, E. nigrescens (*E. Perrieri*).

Eleocharis, series Tenuissimae (habit × ½, spikelets × 2½, achenes × 20). Figs. 1–3, E. minima, var. bicolor: fig. 1, *E. savannarum;* 2, *E. bicolor;* 3, *E. uncialis*, trigonous achene. Fig. 4, E. Barrosii. Figs. 5–9, E. nigrescens: fig. 5, from Cuba; 6, *E. Hildebrandtii;* 7, type specimen; 8 and 9, var. minutiflora. Fig. 10, E. trilophus. Fig. 11, E. anceps. Fig. 12, E. nana. Fig. 13, E. minutissima. Fig. 14, E. microcarpa (*E. cubensis*).

Louisiana: wet springy places in sandy fields, Shreveport, *Cocks* no. 3617 (NY); Chopin, Natchitoches Parish, *E. J. Palmer* no. 7994 (as *E. tuberculosa*) (C); *J. Hale* (G). Texas: Colmesniel, *Plank* in 1892 (NY); sandy bogs, Oakwood, Leon Co., *E. J. Palmer* no. 13413 (NY); Liberty Co., *C. Wright* (G); Hempstead, *E. Hall* no. 699 (NY, Pom) (as *E. tuberculosa*); *Hall* no. 536 (NY).

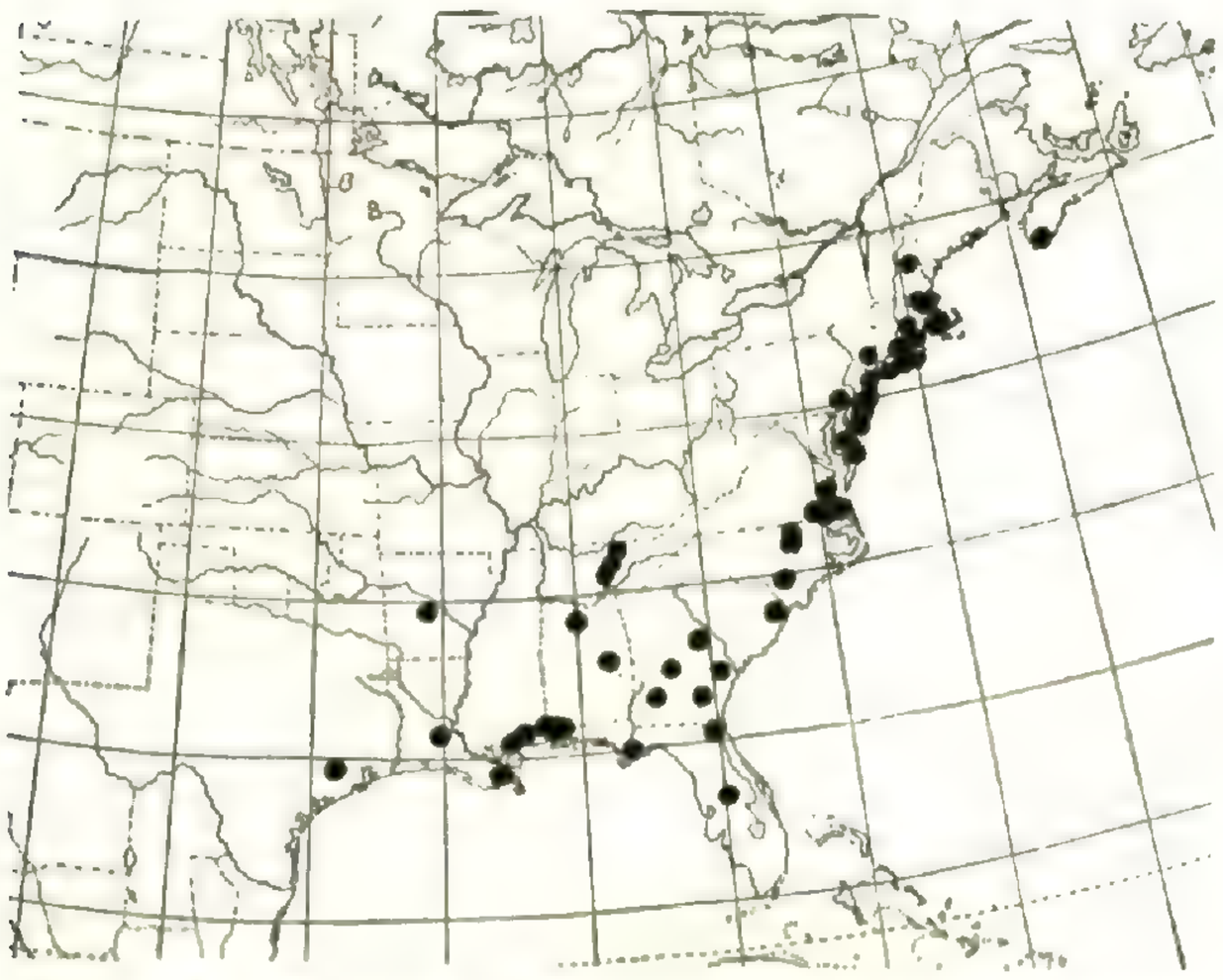
Torrey, basing his description of *E. simplex* almost entirely upon the *Curtis* specimen from North Carolina, did so with some doubt. His determination was followed by a query and the notation "Differs a little from Elliott's plant." Had he examined the Elliott specimen in his herbarium more carefully—providing the optical equipment of his day was equal to the task—Torrey would have found that the specimen, although in young condition, was exactly what he was describing as *E. tuberculosa* var. β. Through the kindness of Mr. E. Milby Burton, director of the Charleston Museum, I have seen fragments of Elliott's actual type of *Scirpus simplex* [from Georgia], with the accompanying data: "*Scirpus simplex* mihi. Hab. Ogeechee in udis. Flor." It is *E. tuberculosa* var. β Torrey, identical with the Elliott specimen in Torrey's herbarium. Mr. Burton also has kindly sent me a fragment of "*Scirpus tuberculosus*" from the Elliott collection, with the annotation "hab. in udis subsalis Flor. Ma-Aug.," a specimen which proves to be *Eleocharis albida*, just as it is represented in the Torrey herbarium.[1]

Elliott described *S. simplex* as having "scales with midrib scarcely distinct"; *S. tuberculatus* with "midrib green." From these two characteristics it is evident that Elliott's specimens had been interchanged and that Elliott himself was the source of confusion, judging from the note added by Baldwin to a specimen of *Scirpus tuberculosus* var. β, "This is certainly a variety of the *tuberculosus*, agreeing in everything except size. Mr. E. returned it to me for his *Simplex*. There must be some mistake in this business." It may also be noted that "*Scirpus simplex* Ell." collected by Beyrich at Charleston, S. C., in 1833 (K), the type collection of *E. simplex* Kunth, is *E. albida*. In view of the general confusion and the inadequacy of Elliott's de-

[1] Accompanying the specimen [hb. Torrey] is the annotation, in Torrey's hand, "This is not *S. tuberc.* but my *El. floridana.*" Of *E. albida* (l. c. p. 304) Torrey notes "This species resembles at first sight *E. capitata* [represented only by *E. flaccida!* in Torrey's herbarium], but it differs in its somewhat angular and dull nut, 3-cleft style, and much more coriaceous scales." There is no further mention of *E. floridana*, based on Dr. Ingalls' collection of *E. albida* from Barataria, Louisiana [hb. Torrey]; neither has this name nor *Scirpus floridanus* Michx., cited by Kunth in synonymy of *Scirpus pusillus* Vahl, ever come to light.

scription, it would be most unsatisfactory to overthrow the well-established name, *E. albida* Torr. Therefore *E. simplex* should remain a synonym of typical *E. tuberculosa* (Michx.) R. & S.

19. E. TUBERCULOSA (Michx.) R. & S. (Pl. 464, fig. 3). Map 16. *Coarse* cespitose plants with short vertical rootstocks, or often with only soft fibrous bases: culms *flattened*, glaucous-green, 1.5–8 dm. high: sheaths stramineous to green, closely appressed, acute at the apex: spikelets many-flowered, broadly ovoid to ovoid-lanceolate, 5–15 mm. long: scales cartilaginous, stramineous with narrow green midrib and faint to dark brown coloration on the sides: achene body 1.5 mm. long, stramineous to olivaceous, trigonous, *deeply cancellate: style-base pallid*, *mitriform*, 1.0–1.5 mm. long, obtuse to acute, often 3-lobed at base, *usually equalling* (occasionally exceeding)[1] *the achene-body* in size: bristles nearly equalling the style-base, light brown to ferrugineous.—Syst. ii. 152 (1817); Torr. Ann. Lyc. N. Y. iii. 307 (1836) (as var. β); Kunth, Enum. ii. 145 (1837); Chapman, Fl. Southern U. S. 515 (1860); Boeckl. Linnaea xxxvi. 446 (1869–70); Britton & Brown, Ill. Fl. i. 253, fig. 590 (1896); Robinson & Fernald in Gray, Man. ed. 7, 183, fig. 253 (1908). *Scirpus tuberculosus* Michx. Fl. Bor.-Am. i. 30 (1803). ?*S. tuberculatus* Elliott, Sk. Bot. So. Car. & Georgia i. 78 (1816). *Rhynchospora monostachya* Steudel, Syn. Cyp. 140 (1855). *Chlorocharis tuberculosa* Rikli, Pringsheim Jahrb. xxvii. 564 (1895).—Sandy shores and bogs, chiefly on the coastal plain, Nova Scotia and New Hampshire to Arkansas and Texas; extending inland to northern Alabama and the Cumberland Plateau of Tennessee. Nova Scotia: wet sandy beach of Harper Lake, Shelburne County, *Fernald & Long* no. 23381 (NY) and Plant. Exsicc. Gray. no. 439 (B, NY). New Hampshire: White Lake, Tamworth, *Pease* no. 19242 (Alb, G). Massachusetts: Manchester, *Oakes* (NY); Tewksbury, *B. D. Greene* (NY); in sphagnum overlying sand, margin of Round Pond, Tewksbury, *Fernald & Eames* (Pl. Exsicc. Gray. no. 139) (Alb, NY); wet sphagnous clearing near



Map 16. Range of Eleocharis tuberculosa.

[1] As in the achene examined from Michaux's type, and also fig. 253 in Robinson & Fernald, Gray, Man. ed. 7. Similar examples occur in Pl. Exsicc. Gray no. 139.

Chebacco Lake, Essex County, *Fernald, Hunnewell* & *Long* no. 8894 (NY); Swain's Pond, Melrose, *Svenson* in 1916 (B); Snipatuit Pond, Rochester, Plymouth County, *St. John* & *Hunnewell* in 1916 (NY); Ezekiel Pond, Plymouth, *Svenson* in 1928 (B). RHODE ISLAND: South Kingston, *Olney* no. 307 (NY); *Thurber* (NY). CONNECTICUT: Groton, *Bissell* in 1901 (NY); Preston, *Svenson* no. 4551 (B); New Haven, *Winton* in 1887 (NY). NEW YORK: Mt. Vernon, *Bicknell* no. 1006 (NY); Woodmere, *Bicknell* no. 1007 (NY); Ronkonkoma, *Ferguson* nos. *486 (NY, US) and *3101 (NY); Oakdale, *Ferguson* no. 7772 (NY); Montauk, *Ferguson* no. 579 (NY) (scales very dark); Central Islip, *Ferguson* no. *3055 (NY); Meadow Brook, *Ferguson* no. 434 (NY); Erastina, Staten Island, *Hollick* & *Britton* in 1888 (NY). NEW JERSEY: Egg Harbor, *Brinton* in 1889 (NY); Manchester [Lakehurst], *Porter* in 1870; *Knieskern* (NY); *Torrey* (NY); Lakewood, *Mackenzie* no. 5184 (NY); Barnegat River, *Mackenzie* no. 3697 (NY); Shark River, *Mackenzie* no. 8016 (NY); Atco, *Crawford* & *Bliss* in 1927 (NY); Pleasant Mills, *Leggett* in 1874 (NY); Bennett, *Mackenzie* no. 6571 (NY); Dennisville, *Mackenzie* in 1919 (NY); Cold Spring, Cape May, *Pennell* no. 1814 (NY). PENNSYLVANIA: on Potsdam sandstone, Willow Grove, Montgomery County, *MacElwee* no. 835 (NY). DELAWARE: upland meadows, Ellendale, *Canby* (NY); Georgetown, Sussex County, *Britton* in 1908 (NY). VIRGINIA: Cape Henry, *Leonard* & *Killip* no. *237 (B); near Virginia Beach, Princess Anne County, *Heller* no. *1164 (NY); Princess Anne County, **Heller* in 1893 (NY); west of Williamsburg, *Grimes* no. *3191 (NY); wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, Norfolk County, *Fernald* & *Long* no. 3762 (B, G). NORTH CAROLINA: Margarettsville, Northampton County, *Heller* no. *1164 (!) (NY); Weldon, **Williamson* in 1900 (NY); wet sandy soil, Clarkton, *Biltmore Herb.* no. *2301a (NY). SOUTH CAROLINA: very common in damp soil, Santee Canal, **Ravenel* (NY); ditch in wet pine barrens, south of Socastee, Horry County, *Griscom* no. *16432 (NY). GEORGIA: pine barren, Thomson, McDuffie County, *H. H. Bartlett* no. 933 (D); swamp 14 miles south of Hawkinsville, *Svenson* no. *6980 (B); near Satilla River, Lulaton, Brantley County, *Pyron* & *McVaugh* no. 313 (B); moist pine barrens, Leslie, Sumter County, *R. M. Harper* no. 640 (B, NY); Americus, *Harper* in 1897 (B, NY). FLORIDA: Jacksonville, *Curtiss* nos. *3096 (B, NY), *4090 (NY), and *4865 (NY); edge of cypress swamp, Eustis, Lake County, *G. V. Nash* no. *1688 (NY); Middle Florida, **Chapman* (TYPE of var. β Torrey, NY); Appalachicola, *Chapman* no. *2301b (NY). TENNESSEE: muddy margin of a pond, Crossville, Cumberland County, *Svenson* no. *6935 (B); bog east of Altamont, Grundy County, *Svenson* no. *7339 (B); bog, Clark Range, Fentress County *J. K. Underwood* & *A. J. Sharp* no. *2850 (B, T). ALABAMA: Auburn, Lee County, *Baker* in *1897 (NY) and *1898 (NY); Gateswood, *Tracy* no. *8663 (NY); Mobile, **Baker* in 1897 (NY); Mobile, *Tracy* no. 6960 (NY); Spring Hill, *Bush* no.

*69 (NY); wet places, Cullman County, **Eggert* in 1897 (NY); northern Alabama, **Buckley* (NY). MISSISSIPPI: Ocean Springs, *Tracy* no. *4818 (NY); moist pine barrens near Ocean Springs, *Kearney*, in 1896 (NY); Scranton, Jackson County, *Pollard* no. 1192 (NY); Biloxi, Harrison County, *Tracy* nos. 1367 (NY) & 3593 (NY); Biloxi, **Baker* in 1897 (NY). ARKANSAS: near Little Rock, **Hasse* in 1886 (NY). LOUISIANA: New Orleans, **Ingalls* (NY); shallow ponds, *Mackenzie* no. 433 (NY); rare in wet pine woods, Alexandria, *C. R. Ball* no. *516 (NY); Covington, *Arsène* no. *11250 (B, US). TEXAS: Edna, *Plank* in 1892 (NY).

Through the kindness of Professor Humbert, of the Muséum National d'Histoire Naturelle, Paris, I have examined an achene from the Michaux collection, which exhibits the divergent bristle-teeth associated with var. β Torrey. Typical *E. tuberculosa*, which occurs on Long Island and from Virginia southward, I have therefore marked with an asterisk (*) in citation of specimens. The plants with downwardly-barbed bristles, in conformity with analogous variations in *Rynchospora* (see RHODORA xxxvii. 401 (1935)), should called

Forma **retrorsa** forma nov. (PL. 464, FIG. 1). Setis retrorsum hispidis.—*E. tuberculosa* Torr. Ann. Lyc. N. Y. iii. 307 (1836); Robinson & Fernald in Gray, Man. ed. 7, 183, fig. 253 (1908). Plant. Exsicc. Gray. no. 139 (coll. *Fernald* & *Eames* in 1909 (TYPE in Gray Herb.)). The plant with smooth bristles should be called:

Forma **pubnicoensis** (Fernald) n. comb. (PL. 464, FIG. 2).—*E. tuberculosa* var. *pubnicoensis* Fernald, RHODORA xxiii. 233 (1921).—NOVA SCOTIA: Pubnico Lake, Yarmouth County, *Fernald, Long* & *Linder* nos. 20163 (G, NY) and 20164 (G, NY).

E. tuberculosa, unique in the remarkable development of the style-base, often takes complete possession of dried-out pond-holes on the coastal plain. Northward the bristle-teeth are predominantly downward-barbed. In general the southern plants tend to be robust, often with acute spikelets, but neither these characteristics nor the color of the spikelets appear to be significant.

20. ELEOCHARIS CHAETARIA R. & S. (PL. 461, FIG. 10). *Fibrous-rooted annual*, often proliferous, culms light green, 5–15 cm. high, somewhat rigid, punctate, obscurely quadrangular-sulcate: sheaths reddish, marcescent, scarious and somewhat obtuse at the apex: spikelets ovate, 2–4 mm. long, about 3–10-flowered, *scales spreading in fruit:* scales obtuse, keeled, with greenish midrib, chestnut sides, and broad scarious margin: style 3-fid: achene trigonous, 1.0–1.3 mm. long, urceolate, costulate on the angles, *deeply cancellate*, stramineous to dull gray: style-base pyramidal, as broad as the achene, *blunt at the apex*, dull brown, *the 3-crested base decurrent on the angles of the*

achene.—Syst. ii. 154 (1817); Kunth, Enum. ii. 140 (1837); Boeckl. Linnaea xxxvi. 428 (1869–70); C. B. Clarke in Hook. Fl. Br. Ind. vi. 629 (1893). *Cyperus setaceus* Retz. Obs. v. 10 (1789); Willd. Sp. i. 269 (1798); Vahl, Enum. ii. 305 (1805); Roxb. Fl. Indica, ed. Cary & Wallich, i. 190 (1820); not *Eleocharis setacea* R. Br. Prod. Fl. Nov. Holl. 225 (1810). *Scirpus pygmaeus* Lam. Ill. i. 139 (1791). *Scirpus Chaetarius* Spreng. Syst. i. 203 (1825). *Chaetocyperus Limnocharis* Nees in Wight, Bot. Ind. 96 (1834). *Chaetocyperus setaceus* Nees, Linnaea ix. 289 (1834) (nomen) and in Mart. Fl. Bras. ii[1]. 94 (1842).—India and Ceylon to the Philippine Islands. BRITISH INDIA: in graminosis humidiusculis frequens Calcuttae, *Koenig* (TYPE in hb. Univ. Lund); Silhet, hb. *Hooker & Thompson* (G, K, NY); Punjab, Dalhousie, Chamba Road, *R. R. Stewart* no. 2266 (NY); East Bengal, hb. *Griffith* no. 6210 (NY). CEYLON: Thwaites (G); Kalugammane district, *Silva* no. 292 (NY); hb. *Wight* no. 2895 (NY). INDO-CHINA: Annam, Nha-trang, *C. B. Robinson* no. 1219 (K, NY); Annam, *J. & M. S. Clemens* nos. 4079 (NY), 4165 (NY); Cambodia, *Godefroy-Lebocuf* no. 362 (K); Quanbi, Tonkin, *Balansa* no. 182 (K). MALAY PENINSULA: Selangor, *Ridley* no. 13397 (K); Singapore, *Hullett* in 1894 (K); Kelautau, *Kola Bakru* in 1917 (K). PHILIPPINE ISLANDS: Laguna, Prov. Luzon, *Curran* no. 19276 (NY) and *Ramos* no. 10049 (NY); Luzon, *Elmer* no. 14558 (G); Baguio, prov. Benguet, *R. S. Williams* no. 1231 (NY); Island of Polillo, *C. B. Robinson* no. 9029 (NY).

The type (*Cyperus setaceus*) sent to Retzius by Koenig, and consisting of a single small plant, was examined by me through the kindness of Mr. C. E. C. Fischer of Kew, who at that time had the specimen on loan from Lund University.[1] *E. Chaetaria* was likewise described from India by Lamarck (1791) (coll. *Thunberg*) as *Scirpus pygmaeus*. By many authors the corresponding American species, *E. retroflexa* Poiret, has been included with *E. Chaetaria*, but the two are clearly distinct, *E. Chaetaria* having a much lower and blunter style-base, and larger and deeper markings on the achene.

21. **E. Brainii** n. sp. (PL. 461, FIG. 4). Annua cespitosa nana, radice fibrosa: culmis 1–3 cm. longis, spongiosis, obscure sulcatis: vaginis albidis, scariosis, apice acuminatis: spiculis 1–2 mm. longis, late ovatis, 4–8-floris, glumis in fructu divaricatis, 1 mm. longis, acutis, in carina viridibus, latere rubris, margine scariosis: stylo 3-fido: achaenio 0.6 mm. longo, trigono, *truncato, nitidulo-griseo vel albescente, cancellato:* stylo-basi fusca, *multo depressa,* in medio et in angulis quoque *paullo apiculata.*—*E. Chaetaria* C. B. Clarke in Dyer, Fl. Trop. Africa viii. 408 (1902), in part.—RHODESIA: very wet vly on granite sand, alt. 4800 ft., Salisbury District, *C. K. Brain* no. 8963

[1] In this collection was also the type of *Scirpus atropurpureus*, represented by small characteristic plants, identical with *Eleocharis atropurpurea* as I have treated the species.

(TYPE in Herb. Kew, fragment (G)). NILE LAND: Seriba Ghattas, Djur, *Schweinfurth* no. 2583 (G). MOZAMBIQUE: regio orientalis, *Schlechter* no. 12232 (K).

Differs from *E. Chaetaria* in its low stature, erect but spongy culms, and in the smaller achenes, which have the style-base not decurrent at the angles. It is questionable whether *E. Chaetaria* actually occurs in tropical Africa.

22. E. SCHWEINFURTHIANA Boeckl. (PL. 461, FIG. 13). Erect from a vertical, *slightly ligneous rhizome:* culms 4–10 cm. high, light green, punctate, compressed to terete, irregularly sulcate: sheaths yellowish, marcescent: spikelets ovate, 2–3 mm. long, many-flowered: scales 1 mm. long, scarcely keeled, yellowish throughout, obtuse to slightly emarginate: style 3-fid: achene 0.7 mm. long, trigonous, the *angles scarcely costulate*, stramineous to light brown, faintly brown-striolate: style-base brown, short-pyramidal, apiculate, the *basal angles slightly overhanging the achene:* bristles light brown, obscurely toothed, *half as long as to nearly equalling the achene.*—Flora, 1879. 562 (1879). *E. microcarpa* C. B. Clarke in Durand & Schinz, Consp. Fl. Afr. v. 599 (1895), in Thistleton-Dyer, Fl. Trop. Afr. viii. 410 (1902), and in Philippine Journ. Sci. Bot. ii. 91 (1908); not Torr. *Heleocharis Perrieri* Chermezon, Bull. Soc. Bot. France lxxiii. 554 (1926) and lxxv. 287 (1928), in part.—Tropical Africa, Madagascar, Philippine Islands. NILE LAND: Seriba Ghattas, Djur [British East Africa], *Schweinfurth* no. 1949 (G, K, cotype). MADAGASCAR: Majunga, *Perrier de la Bâthie* no. 17282 (B). PHILIPPINE ISLANDS: Central Luzon, *Loher* no. 5193 (K).

This comparatively rare Old-World species stands, I believe, between *E. nigrescens* and *E. anceps.*[1] In outward aspect and in minute details of the achene, *Perrier de la Bâthie* no. 17282 and *Loher's* specimen from the Philippines appear identical with the type collection of *E. Schweinfurthiana.*

23. E. CAESPITOSISSIMA Baker (PL. 461, FIG. 7). *Dwarf,* densely cespitose annual (?), often stoloniferous: *culms 1–5 cm. long,* filiform, quadrangular-sulcate: sheaths green to purplish: spikelets obovate to oblong, 1–2 mm. long, 3–6-flowered: scales obtuse, deep brown to greenish, the lowermost prominently green-keeled: style 3-fid: achene narrowly obovate, trigonous, 1 mm. long, *light greenish-gray,* a greenish reticulum with dark brown background frequently appearing on mature achenes: style-base gray, acute-pyramidal, a little more than half as wide as the achene: *bristles* equalling the achene, white to

[1] Apparently intermediate between *E. Schweinfurthiana* and *E. anceps* is *Heleocharis Helenae* Buscalioni & Muschler in Engler, Bot. Jahrb. xlix. 461 (1913), from Banguela-See in northern Rhodesia, a species with compressed culms 8–12 cm. long and achenes "subtilissime striata," differentiated by the authors from *E. Schweinfurthiana* by "reichblühenderen Aehren und häutig gerandeten Squamae."

faintly brown-tinged, retrorsely toothed, *forming a whitish cup at the base*.—Journ. Linn. Soc. Bot. xxi. 450 (1886); Chermezon, Bull. Soc. Bot. France ser. 5, iv. 286 (1928), and Cat. Pl. Madagascar (*Cyperaceae*) 36 (1931). *E. subvivipara* C. B. Clarke in Durand & Schinz, Consp. Fl. Africa v. 601 (1895), not Boeckl.—Known only from MADAGASCAR: *Baron* no. 2242 (TYPE, K); *Perrier de la Bâthie* nos. 2689 (B) and 17953 (B).

For specimens of this rare species I am greatly indebted to Professor Chermezon.

24. E. ANCEPS Ridley (PL. 462, FIG. 11). Loosely cespitose annual with fibrous roots: culms 4–20 cm. high, *flattened (0.5–1.5 mm. wide when dry)*, sulcate, inconspicuously punctate: sheath purplish at base, apex firm, obtuse to somewhat acuminate: spikelets many-flowered, elliptic to elongate, 3–12 mm. long, 2–3 mm. wide: scales ovate, obtuse to emarginate, membranous, keeled, dull yellowish-green, often with brownish sides: style 3-fid: achenes trigonous, obovate, slightly narrowed at the summit, 0.8 mm. long, costulate, white with faint brown striolation: style-base depressed, pyramidal, apiculate in the center, grayish brown, half the width of the achene: bristles none.—Trans. Linn. Soc. ser. 2, Bot. ii. 148 (1884); C. B. Clarke in Durand & Schinz, Consp. Fl. Africa v. 596 (1895) and in Thistleton-Dyer, Fl. Trop. Africa viii. 410 (1902).—Tropical Africa.

The above description in based on a specimen obtained by *Mann* from West Tropical Africa (1859–63) no. 891 (without further locality) in the Gray Herbarium, a plant somewhat larger than Ridley described from the Welwitsch collection made in the vicinity of Pungo Andongo, Angola. *Chevalier* no. 2454 (K) from Kora Koro, Sudan, also belongs under this species.

25. E. TRILOPHUS C. B. Clarke (PL. 462, FIG. 10). Cespitose annual: *culms proliferous*, 3–6 cm. long, flaccid, *recumbent*, quadrangular: spikelets 2 mm. long, ovoid, 4–7-flowered: scales dark shining reddish-brown, the two lower scales larger and green-striate: style 3-fid: achene 1 mm. long, narrowly obovoid, white, strongly costulate, with a faint, somewhat pearly, reticulation: style-base depressed-pyramidal, the *angles decurrent on the shoulders of the achene:* bristles olive-gray, half as long as the achene.—C. B. Clarke in Thistleton-Dyer, Fl. Trop. Africa viii. 409 (1902) and in Durand & Schinz, Consp. Fl. Africa v. 601 (1895) (nomen).—UPPER GUINEA: Senegal, *Roger* no. 113 (TYPE, K).

Roger's specimen, which I examined at Kew (mixed with *E. atropurpurea*) bears the information: "Juncus. Plante annuale qui croit sur les terres humides, après d'inondation."

26. E. NAUMANNIANA Boeckl. (PL. 461, FIG. 6). *Much-branched proliferous aquatic* up to 4 dm. long: culms capillary, soft, olivaceous,

flattened to trigonous, neither striate nor sulcate: sheaths membranous, scarious and marcescent: spikelet usually proliferous, 3 mm. long, *linear* in flower, the *2 large scales* spreading in fruit: scales 3 mm. long, greenish, scarious except the green median nerve which is produced into a long acuminate tip: achene trigonous, elliptic-obovate, conspicuously *narrowed at base and constricted at apex*, 1.5 mm. long, *iridescent gray, cancellate*, lightly costate: style-base very narrow, subulate-pyramidal, dark brown: bristles none.—Engler, Jahrb. v. 92 (1884); C. B. Clarke in Durand & Schinz, Consp. Fl. Africa v. 599 (1895) and in Thistleton-Dyer, Fl. Trop. Africa viii. 411 (1902). *E. Testui* Chermezon, Bull. Soc. Bot. France lxxvii. 276 (1930).—Africa: Monrovia, Liberia, Aug. 1874 (coll. *Dr. Naumann* on the "Gazelle" Expedition); French Guinea, *Caille* no. 14957 (K, fragment in B); Gabon, *Le Testu* no. 5816 (cited by *Chermezon*).

Mr. Hutchinson has kindly given me a portion of Caille's collection, from which I have drawn the above description. From detailed comparison with Boeckeler's account, I am confident that Caille's plant is the same as *E. Naumanniana*. The structure of the thread-like culms and the peculiar one-flowered spikelets are decidedly different than in other species of *Eleocharis*, and have a strong resemblance, as C. B. Clarke has noted, to *Scirpus submersus* C. Wright. Boeckeler (l. c.) in the same way compares the form of *E. Naumanniana* with the proliferating masses of the Brazilian *E. capillacea*. With these comparisons in mind and Chermezon's description and similar comment on *Helcocharis Testui*, a plant "très curieuse . . . un épillet terminal unique, . . . puisqu' il est uniflore," I do not hesitate to place that species also under *E. Naumanniana*.

2. Miscellaneous small Species of Tropical Africa

While studying the collections at Kew in 1932, I had opportunity to make notes on several obscure species, as follows:

27. E. Kirkii C. B. Clarke in Thistleton-Dyer, Fl. Trop. Africa viii. 410 (1902), described from a specimen collected by *Kirk*, "in an island in the River Zambezi, at Victoria Falls," appears to me to be only an immature example, with only partially developed achenes, of the widespread *E. caribaea* (Rottb.) Blake.

28. E. lepta C. B. Clarke in Thistleton-Dyer, Fl. Capensis vii. 758 (1900), based on a collection by Capt. Wolley-Dod from Cape Peninsula, is represented at Kew by a plant without spikelets, having very slender culms (1.5 dm. high), resembling those of *E. capitata* var. *typica*. Of its relationship I can make out nothing.

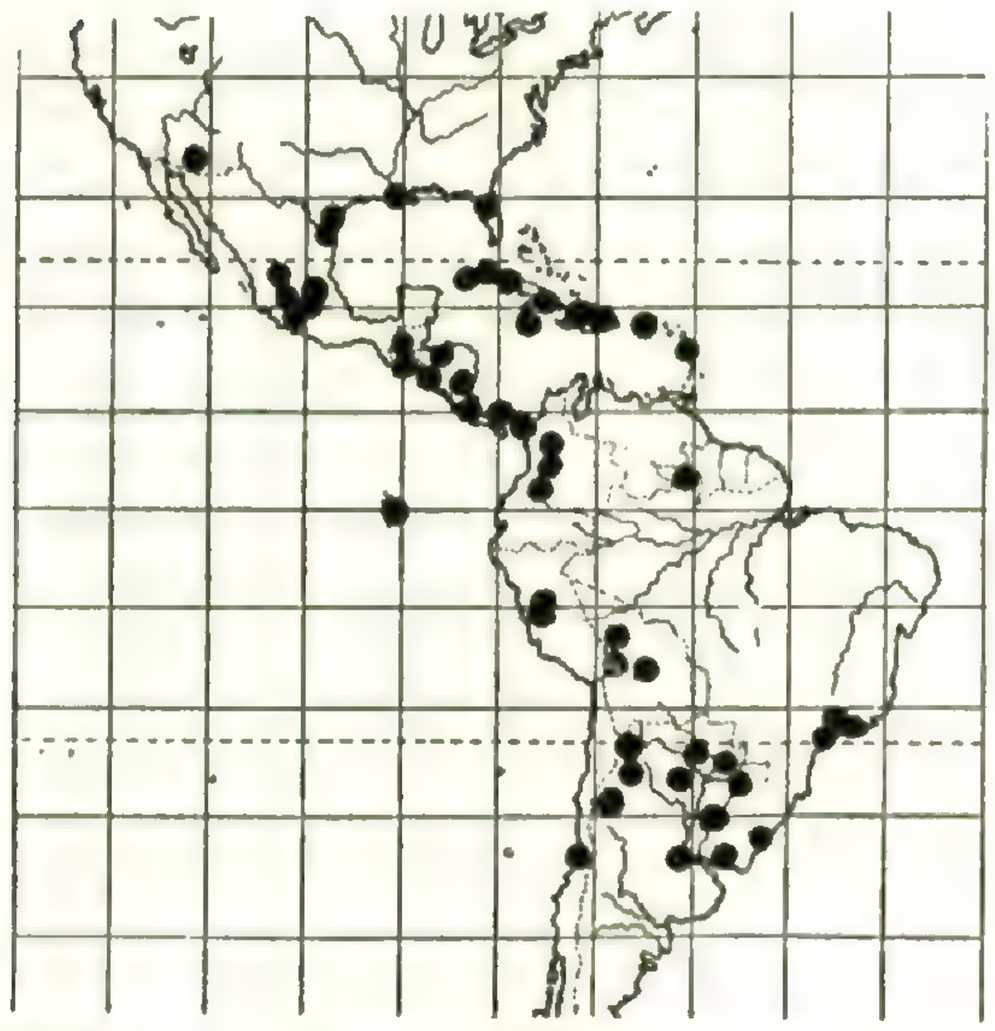
29. E. Schlechteri C. B. Clarke in Thistleton-Dyer, Fl. Capensis vii. 758 (1900); De Wildeman, Plantae Novae Herb. Hort. Thenensis i. t. 6, figs. 10–17 (1904). Coast Region: Onrust River, *Schlechter* no. 9484. The plant which I examined looks like an aberrant collection of *E. caribaea*. The turgidly biconvex achene, yellowish-olive when immature, becoming deep brown to black when ripe, has reddish setae with very short teeth and a small whitened-carunculate style-base. However, the description by Clarke "a very slender short rhizome sometimes present" and De Wildeman's notations accompanying the plate "Tiges . . . réunies en touffes rigides de long d'un rhizome" would tend to remove it from *E. caribaea;* also De Wildeman's comment on the deviation of his specimens from those described by Clarke serves further to make the situation confusing (p. 28), "La plante que nous avons figurée diffère peut-être un peu du type qui a servi à M. C. B. Clarke pour établir son espèce; en effet, on trouve assez souvent dans les épillets de la plante figurée des akènes trigones présentant sur leur face dorsale une carène assez obtuse, mais néanmoins bien visible."

3. Miscellaneous Species of North America and the West Indies

(For classification see Rhodora xxxi. 128,129 (1929)

30. E. nodulosa (Roth) Schultes (Pl. 463, fig. 2). Map 17. Erect from a coarse creeping rootstock: culms green, 1–2 mm. thick, 3–8 dm. high, terete, with numerous, usually conspicuous (sometimes nearly obsolete) *transverse septae:* sheaths elongate, stramineous (often with a purplish-red base), the truncate darkened apex with a distinct mucro: spikelet many-flowered, oblong-lanceolate, acuminate, rarely obtuse, 8–15 mm. long: scales appressed to slightly spreading, 2 mm. long, obtuse to acute, scarious throughout, light to dark brown, with a broad hyaline margin: the lowest suborbicular, firmer, and broadly scarious-margined: anthers 0.8–1 mm. long: *style 2- (not infrequently 3)-fid:* achenes 1 mm. long, broadly obovate, *biconvex*, yellow to brown or olivaceous, *distinctly pitted-reticulate: style-base flattened*, brown (½ as wide as the achene), deltoid, acute, the surface elevated at junction of achene-body: bristles ferrugineous, equalling or slightly exceeding the achene, the common base prolonged into a short stipe. —Mant. ii. 87 (1824); Kunth, Enum. ii. 156 (1837); Boeckl. Linnaea xxxvi. 468 (1869–70); Britton, Journ. N. Y. Microsc. Soc. v. 104 (1889); C. B. Clarke in Urb. Symb. Ant. ii. 67 (1900), in Engler Bot. Jahrb. xxx. Beibl. 68. 21 (1902) and Bull. Herb. Boiss. ser. 2, iii. 1013 [Pl. Hasslerianae 235] (1903); Britton & Wilson, Bot. Porto Rico &

Virgin Isls. v[1]. 91 (1923); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 445, fig. 9 (1928); Standley, Publ. Field Mus. Bot. viii[4]. 261 (1931); Ostén, Anales Mus. Hist. Nat. Montevideo, ser. 2, iii. 171 (1932). *Scirpus nodulosus* Roth, Nov. Pl. Sp. 29 (1821). *Eleogenus nodulosus* Nees in Mart. Fl. Bras. ii[1]. 104 (1842) and Bonplandia iii. 86 (1855). *Eleocharis consanguinea* Kunth, Enum. ii. 148 (1837).—Arizona to Florida; West Indies, southward to Peru and Argentina. Florida: Eustis, Lake Co., *Nash* no. 219 (G, NY), 1209 (G, NY). Louisiana: Abbeville, *Langlois* 878 (NY); New Iberia, *Tracy* in 1890 (NY); wet prairies, Lake Charles, *Cocks* no. 3129 (G). Texas: Alligator Lake, Jackson County, *Drushel* no. 9560 (B, hb. Drushel). Arizona: Santa Catalina Mts., *Pringle* in 1881 (G, NY) and 1888 (NY); Santa Catalina Mts., 2900 ft., *Thornber* 309 (Pom, US), a form with pale spikelets and scarcely septate culms. Cuba: without loc., *C. Wright* no. 3374 (G, NY); Pinar del Rio, *Britton, Britton & Wilson* no. 9654 (NY), *León & Roca* no. 6932 (NY) and *Shafer* nos. 10477 (NY), 10513 (NY), 11947 (NY); Camaguey, *Britton, Britton & Cowell* no. 13210 (NY) and *Shafer* no. 110 (G, NY); Santa Clara, *Ekman* no. 18865 (NY); Oriente, *Hioram* no. 3923 (NY). Jamaica: Lower Clarendon, *Harris* no. 12729 (G, NY); Belle Vue, *Harris* no. 12179 (G, NY). Haiti: Kalacroix, *Leonard* no. 7852 (G, NY). San Domingo: Higuey, prov. Seibo, *Taylor* no. 426 (NY). Porto Rico: *Britton, Britton & Boynton* no. 8252 (NY); *Sintenis* 3833 (G). Guadeloupe: *Duss* no. 4108 (NY). Mexico: Jalisco, San Sebastian, 1500 m. *Mexia* no. 1851 (G, NY, US); Guadalajara, *Pringle* no. 11725 (G, NY, US); Hidalgo, Mirador, *Liebmann* (G); Michoacan, Morelia, *Arsène* nos. 5649 (NY, US), 5246 (US); Morelos, Cuernavaca, 6500 ft., *Pringle* no. 6599 (G, NY, US). Guatemala: Depart. Santa Rosa, *Heyde & Lux* nos. 3549 (G, US), 3889 (G, NY, US), 6264 (G, US); Coban, 4300 ft., *Tuerckheim* no. 1266 (G, NY, US); Cubilquitz, Alta Verapaz, *Tuerckheim* 8335 (US). Costa Rica: Cartago, *Standley* no. 35462 (US); S. José, *Jimenez* no. 929 (US); Forêts du Tablazo, *Tonduz* no. 7919 (US); Alajuelita, *Tonduz* no. 8845 (G, US). Salvador: Santa Ana, Dept. Santa Ana, *Standley* no. 19680 (G, NY, US). Honduras: Dept. Comayagua, *Standley* nos. 55998 (US) and 56406 (US). Nicaragua: San Rafael del Norte, *Miller & Griscom* nos. 118 (US)



Map 17. Range of Eleocharis nodulosa.

and 130 (US). PANAMA: El Boquete, Chiriqui, 1200 m., *Killip* no. 4568 (NY, US); *A. S. Hitchcock* no. 8257 (US); between Tapia and Tecumen Rivers, *Killip* no. 4174 (NY, US); La Sabana de Panama, *Gervais* no. 164 (US); Las Sabanas, *Standley* no. 25937 (US); near Tapia River, *Maxon* & *Harvey* no. 6648 (US); between Matias Hernandez and Juan Diaz, *Standley* 32046 (US); Matias Hernandez, *Standley* no. 28858 (US); Rio Tecumen, *Standley* nos. 26631 (US) and 26718 (US); Juan Diaz, *Killip* no. 4091 (US); Chepo, *Pittier* no. 4744 (US). COLOMBIA: California, Dept. Santander, 2000 m., *Killip* & *Smith* no. 17035 (G, NY); Tolima, *Lehmann* no. 8735 (G, NY); Balsillas, *Rusby* & *Pennell* in 1917 (NY); prope Moscosio, 2028 m., *André* no. 928 (G, NY); Rio Palo Valley, Cauca, *Pittier* no. 1027 (NY, US); San Antonio, *Langlassé* no. 35 (G, US). ECUADOR: Indefatigable Is., Galapagos Isls., *Svenson* no. 241 (B, G). BOLIVIA: without loc., *Bang* nos. 2306 (G, NY, US) and 2587 (NY, US); Bermejo, 1800 m., *Fiebrig* no. 2328 (G, US); Sorata, *Mandon* no. 1402 (NY); Yapacari, *O. Kuntze* in 1892 (NY); Buena Vista, Dept. Sara, *Steinbach* no. 5278 (NY); Apolo, *R. S. Williams* no. 911 (G, NY); Sud-Yungas, Surupaya, *Buchtien* no. 403 (US); La Paz, 1700 m., *Buchtien* no. 8065 (B, US). CHILE: Santiago, *Claude-Joseph* no. 728 (US); Baireo, *Claude-Joseph* no. 3982 (US). BRAZIL: Limao, Mt. Roraima, *Tate* no. 60 (NY); Minas Geraes, *Claussen* no. 1011 (NY); Caldas, *Regnell* II no. 303½ (US); Itatiaya, 1200 m., *Kuntze* no. 33 (NY); S. Paulo, *Usteri* in 1905 (NY); without loc. *Burchell* no. 4340 (G); without loc. *Glaziou* no. 16539 (US); Viçosa, Minas Geraes, *Mexia* nos. 4851 (B, Ber) and 5171 (B, Ber); Corinto, Minas Geraes, 590 m., *Mexia* no. 5657 (B, Ber). PARAGUAY: Villarica, *Jörgensen* no. 3583 (NY, US); Paracual, *Hassler* no. 687 (NY); superioris fluminis Apa, *Hassler* no. 8382 (G); Pilcomayo River, *Morong* no. 1084 (NY, US); Luque, *Morong* no. 298b (NY, US); San Bernardino, *Rojas* no. 7371 (B, Ost). URUGUAY: Artigas, *Herter* no. 427a (G, NY, US); Toledo, Dept. Canelones, *Herter* no. 427 (G, NY, US). ARGENTINA: Posadas, Misiones, *Ekman* nos. 1254 (NY) and 1311 (NY); Oran, *Lorentz* & *Hieronymus* no. 432 (NY); Retiro, Buenos Aires, *Parodi* no. 8096 (G); Dept. Andalgala, Prov. Catamarca, *Jörgensen* no. 1766 (G); Dept. Leales, Prov. Tucuman, alt. 300 m., *Venturi* no. 460 (B, US); Dept. Burruyaco, Tucuman, 1500 m., *Venturi* no. 8837 (B, US); Dept. Chicligasta, Tucuman, 1200 m., *Venturi* no. 4011 (B, US); Oran, Prov. Salta, 650 m., *Venturi* no. 5586 (B, US).

Var. TENUIS Boeckl. Flora lxii. 160 (1879); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 447 (1928).

This variety, differing from typical *E. nodulosa* only in having reduced culms not exceeding 1 mm. in diameter (according to Barros), occurs sporadically throughout the range of the species (cf. *Ekman* no. 18865 (Cuba); *Harris* no. 12729 (Jamaica); *Duss* no. 4108 (Guadeloupe); *Ekman* no. 1311 (Argentina)). On the other hand, it is prob-

able that the slender form more closely approaches Roth's type (Brazil, coll. *Mertens*), described as having filiform culms. Some of the slender plants show practically no external sign of septation, and represent

Var. SUBNODULOSA (Steud.) Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 192 (1926). *E. submodulosa* Steud. Syn. Cyp. 81 (1855). *E. Ravenelii* Britton in Small, Fl. Southeastern U. S. ed. 2, 184 (1913).

From the United States this variation is so far represented only by *Ravenel* no. 83 (NY) from Neuces Bay near Corpus Christi, Texas (TYPE of *E. Ravenelii*) and by a collection from the Valley of the lower Rio Grande, *Buckley* in 1879–1883 (NY), but is evidently (like the var. *tenuis*) of sporadic occurrence throughout the range of the species. In Steudel's description, based upon a *Duchassaing* collection from Guatemala, the culms are said to be "subcomplanatis tenuissimis indistincte (tactu potius quam visu) subapproximato nodulosis (ultra pedalibus)." Kükenthal cites (l. c.) *Ekman* no. 2683 from Haiti as representing this variety.

According to Barros (l. c.) var. *tenuis* is a transition between typical *E. nodulosa* and *E. contracta* Maury,[1] the latter characterized by filiform, non-septate culms and trigonous achenes. The only named specimen of *E. contracta* which I have examined (Misiones, Argentina, *Ekman* no. 1252 (NY) (det. Kükenthal)) has spikelets with closely appressed scales, filiform culms, and lenticular short-bristled achenes (1.0 mm. long) but under *E. contracta* undoubtedly belongs a similar plant with trigonous achenes (Dept. Leales, Prov. Tucuman, *Venturi* no. 473 (B, US)). Differing markedly from these intergrading variations is a peculiar group of plants from Colombia which may be called

Var. **angulata** n. var. Culmis *non septatis*, 1.5–2 mm. latis (siccatis) squamis paullo divaricatis; *achaeniis trigonis*, 1.2 mm. longis, viridibus vel olivaceis, stylo-basi truncato in medio apiculato, setis achaenio aequantibus.—COLOMBIA: Guasca, *Bro. Ariste-Joseph* no. A340 (TYPE in Gray Herb.; NY, US); PERU: from 9000–10,500 ft., Huanuco, *Macbride & Featherstone* nos. 1453 (US), 2140 (US) and 3318 (US) with yellowish achenes and a pyramidal style-base.

E. nodulosa and *E. geniculata* are ordinarily among the most easily recognized species of the American tropics, due to the septate culms, but in both species plants with non-septate culms are encountered. Due to the resemblance of non-septate plants to specimens of *E.*

[1] Mém. Soc. Phys. Genève xxxi. 139, pl. 41 C. (1890); C. B. Clarke, Bull. Herb. Boiss. ser. 2, iii. 1016 (1903) (where *E. nodulosa* var. *tenuis* is considered a synonym of *E. contracta*); Barros (op. cit.) 457, fig. 14 (1928).

montana, *E. Parishii*, etc., I was of the opinion (which I do not now hold so strongly) that *E. nodulosa* and *E. geniculata* belonged with the *Truncatae*, and I leave them under that classification for want of a better group with which to ally them. The septate character of the culms of *Scirpus heteromorphus* F. Phil.,[1] based on *Lechler* no. 454 from Valdivia, Chile, led to its inclusion by C. B. Clarke under *E. nodulosa*, but the septations are of the characteristically interrupted type prevalent among the *Palustres* and the material belongs (at least the specimen which I examined at Kew) under *E. valdiviana* Philippi.

31. Eleocharis geniculata (L.) R. & S. (Pl. 463, fig. 1). Map 18. *Coarse aquatic plants*, erect from a ligneous creeping rootstock; culms *terete*, firm, green, 1–15 dm. high, *3–10 mm. wide*, with close, *usually prominent septae:* sheaths reddish, truncate at the summit, usually with an inconspicuous subulate mucro: spikelets many-flowered, lanceolate to cylindric, usually acute: scales 2 mm. long, not keeled, obtuse, thin, with an opaque brown central area and broad scarious light brown margin: *style 2- or 3-fid:* achene 1.5 mm. long, obovate, *biconvex to slightly trigonous*, yellow to brown, shining, *lightly punctate-reticulate:* style-base dark brown, flattened, lanceolate, half as long as the achene-body: bristles deep brown, nearly equalling the tubercle, their common base forming a short stipe.—Syst. ii. 150 (1817); Kunth, Enum. ii. 152 (1837); Boeckl. Linnaea xxxvi. 469 (1869–70); C. B. Clarke, Bull. Herb. Boiss. ser. 2, iii. 1016 [Pl. Hasslerianae 238] (1903); C. B. Clarke, Contrib. U. S. Nat. Herb. x. 457 (1908) and Ill. Cyp. t. xxxix. f. 22–26 (1909); Britton & Wilson, Surv. Porto Rico & Virgin Isl. v[1]. 92 (1923); Standley, Field Mus. Publ. Bot. viii[4]. 262 (1931); Uittien in Pulle, Fl. Surinam i. 113 (1934); Macbride, Publ. Field Mus. Bot. xiii. 281 (1936). *Scirpus geniculatus* L. Sp. Pl. 48 (1753). *Scirpus elegans* HBK. Nov. Gen. et Sp. i. 226 (1816). *E. elegans* R. & S. Syst. ii. 150 (1817). *Eleocharis constricta* Schultes, Mant. ii. 87 (1824); Kunth, Enum. ii. 153 (1837); Steudel, Syn. Cyp. 82 (1855). *Scirpus depressus* Vellozo, Fl. Fluminensis 35, t. xxxviii (1827), acc. to Index Kewensis. *Limnochloa crassiculmis* and *L. constricta* Nees in Mart. Fl. Bras. ii[2]. 99 (1842). ?*Eleocharis crassicaulis* [error for *crassiculmis*] Steudel, Syn. Cyp. 81 (1855). *E.*

Map 18. Range of Eleocharis geniculata.

[1] Cat. Pl. Chil. 311 (1881). *Isolepis heteromorpha* Steud. Syn. Cyp. 100 (1855).

mexicana Peyr. in Linnaea xxx. 14 (1859–60) acc. to Index Kewensis. *Chlorocharis geniculata* Rikli, Pringsheim Jahrb. xxvii. 564 (1895)—Mexico: Rio Xalcomulco, *Liebmann* (G); Michoacan & Guerrero, Sierra Madre, *Langlassé* no. 842 (G); Colima, *E. Palmer* no. 1260 in 1891 (G, NY); Tehuantepec, Vera Cruz, *C. L. Smith* no. 1060 (G, NY); Tanteyuca, *Ehrenberg* no. 208 (G); without further locality, *F. Mueller* no. 1762 (NY). Cuba: La Perla, Oriente, *Shafer* no. 8572 (NY); Cuba orientali, *C. Wright* no. 709 (as *Scirpus constrictus* Griseb.) (NY); Loma del Gato, Cobre Range of Sierra Maestra, *León, Clement* & *Roca* no. 10220 (NY); Matanzas, *Britton, Britton* & *Shafer* no. 293 (NY); San Luis, Prov. Santiago, *Pollard* & *Palmer* no. 296 (NY); Taza, Prov. Santa Clara, *León* no. 1450 (NY); Santo Domingo, Prov. Santa Clara, *Britton, Earle* & *Cowell* no. 10311 (NY). Jamaica: Hardware Gap, *G. E. Nichols* no. 87 (NY), and *Harris* no. 10900 (4075 ft.) (NY); Port Antonio, *A. E. Wight* no. 51 (NY); Balaclava, *Marble* no. 913 (NY); Inverness, Lower Clarendon, *Harris* no. 12718 (NY); near Castleton Bot. Garden, *L. M. Underwood* no. 131 (NY); Ewarton, *Underwood* no. 1867 (NY), and *Harris* no. 6723 (NY); Cinchona, *Underwood* no. 159 (NY); Liguanea Ridge, Hope Estate, *Harris* no. 11701 (C, NY); Belle Vue, near Spanish Town, *Harris* no. 12181 (NY). Haiti: Bayeux, Port Margot, *Nash* no. 326 (NY); La Barrière Couchant, *Nash* & *Taylor* no. 1074 (NY); Port au Prince, *Leonard* no. 2806 (NY); Furcy, alt. 1300 m., *Leonard* no. 4348 (NY); Gonave Island, *Leonard* no. 3266 (NY); St. Michel de l'Atalaye, Dept. du Nord, *Leonard* no. 7038 (NY). San Domingo: Bonao, Prov. La Vega, *Valeur* no. 430 (NY); Sanchez, Prov. Samana, *N. Taylor* nos. 24 (NY) and 88 (NY); without location, *C. Wright, Parry* & *Brummel* no. 596 (NY). Porto Rico: Rio Piedras, *Heller* no. 170 (NY); Mayaguez, *Britton* no. 2361 (NY); Sierra de Naguabo, *Shafer* nos. 3164 (NY), and 3438 (NY); Indiera Fria, near Maricao, *Britton, Cowell* & *Brown* no. 4534 (NY); Utuado, *Britton* & *Cowell* no. 416 (NY); Caguas, *Underwood* & *Griggs* no. 304 (NY); Cayey, *Underwood* & *Griggs* no. 280 (NY); Rio Piedra, *J. R. Johnston* no. 110 (NY); Luquillo Mts., *Britton* & *Bruner* no. 7555 (NY); Anasco, *Heller* no. 4534 (NY); Guanajibo, *Fredholm* no. 4252 (B). Guadeloupe: Duss no. 3123 (NY). Guatemala: *Tonduz* no. 845 (NY); Quebrados, Dept. Izabal, *Pittier* no. 8620 (G); Quirigua, Dept. Izabal, *Standley* no. 24162 (NY); Gualan, *C. C. Deam* no. 436 (G); El Rancho, Dept. Jalapa, *Kellerman* no. 8008 (NY); Coban, Dept. Alta Vera Paz, *Seler* no. 2403 (NY), and *Tuerckheim* no. 544 (G). Honduras: San Pedro Sula, Dept. Santa Barbara, *C. Thieme* no. 5571 (G); vic. Tela, Prov. Atlantida, *E. R. Mitchell* no. 102 (G). El Salvador: vic. San Salvador, *Standley* no. 22421 (G); Ixtepeque, Dept. San Vincente, *Standley* no. 21445 (G); Zacatecoluca, *Calderón* no. 300 (G). Costa Rica: Peralta, *Rowlee* no. 50 (NY); San Francisco de Guadalupe, *Tonduz* no. 8492 (G). Panama: Isthmus of Panama, *J. M. Bigelow* (NY); Panama-Corozal Road, *Killip* no. 4117 (NY). Venezuela: Yaritagua y Duaca, Lara,

Saer no. 322 (NY); Caracas, *Pittier* nos. 9439 (NY) and 9529 (NY), *O. Kuntze* in 1874 (NY), and *A. H. Moore* no. 20 (Cal.); Valera, *Pittier* no. 10792 (NY); Agua Fria, near Caracas, *Pittier* no. 11504 (NY); Guárico, *Pittier* no. 12471 (NY) and *Plantae Grisolanae* no. 19 (NY); Tovar, *Pittier* no. 12769 (NY); lower Orinoco, *Rusby* & *Squires* no. 337 (NY). COLOMBIA: Intendencia Meta, Villavicencio, *Pennell* no. 1507 (NY); Dept. Antioquia, Medellin, *Archer* no. 75 (B, US); Dept. Cundinamarca, Fusagasuga, *Pennell* no. 2696 (NY); Dept. Tolima, Honda, *Pennell* no. 3682 (NY); Dept. Santander, Boca Sogamoso, *Pennell* no. 3846 (NY); alt. 3500 ft., Mt. Chapon, Dept. Boyaca, *Lawrance* no. 119 (NY); Dept. Norte de Santander, Cucuta, *Killip* & *Smith* no. 20976 (NY); Dept. El Valle, La Cumbre, *Pennell* & *Killip* no. 5741 (NY); Dept. El Valle, east of Zarzal, *Pennell, Killip* & *Hazen* no. 8582 (NY); Dept. Caldas, Armenia, *Pennell, Killip* & *Hazen* no. 6641 (NY); Bonda, Santa Marta, *H. H. Smith* no. 2338 (NY); La Paila, Neogranadina-Caucana, *Holton* no. 113 (NY); Falls of the Truando, Prov. Choco, *Schott* (NY); *Mutis*, nos. 4238 (US), 2874 (US). ECUADOR: Prov. Guayas, between Guayaquil and Salinas, *A. S. Hitchcock* no. 20090 (NY); Naranjal, *Luis Mille* no. 136 (NY). PERU: Dept. Loreto, Iquitos, *Klug* no. 1286 (NY). BOLIVIA: Lake Rogagua, *Rusby* no. 1602 (NY); Beni River, *Rusby* no. 178 (NY); Velasco, *O. Kuntze* in 1892 (NY); Rio Sapucahy, Paraisopolis, Minas, *Hoehne* no. 19147 (G). BRITISH GUIANA: Bartica, Upper Mazaruni River, *Leng* in 1922 (NY); coast lands, *Jenman* no. 6110 (NY); Junction Mazaruni and Cuyuni Rivers, *Graham* no. 265 (NY). FRENCH GUIANA: Cayenne, *Broadway* no. 910 (NY). BRAZIL: Prov. Goyaz, *Glaziou* no. 22332 (NY); Paraná, Curityba, *Dusén* no. 6917 (NY); Jararaca, Pará, *Da Costa* no. 158 (NY); without locality, *Burchell* no. 9373 (NY). PARAGUAY: Pilcomayo River, *Morong* nos. 862 (NY) and 1036 (NY); San Bernardino, Rio Salado, *Rojas* no. 8640 (G); without loc., *Hassler* no. 1694 (NY). ARGENTINA: Terr. Chaco, Dept. Resistencia, 150 m. alt., *Venturi* no. 7896 (US).

A plant with the appearance of an *Equisetum* and, as described by Morong (Ann. N. Y. Acad. Sci. vii. 254 (1893), "an elegant species, 1–1½ m. high, with many stout stems from the same root, the sheaths at the base red, and the pure white feathery-looking heads 2–4 cm. long," it is apparently the only tropical *Eleocharis* which catches the eye of the general collector. As a consequence and due also to its wide range, the representation in herbaria is voluminous. It was known from the West Indies in very early times, having been described by Linnaeus (1753) as "Scirpus culmo tereti nudo, spica subglobosa terminali."[1] *Limnochloa constricta* was based on Brazilian

[1] Mr. J. E. Dandy of the British Museum has recently written me that apparently the only specimen of *Scirpus geniculatus* which Linnaeus saw was *Scirpus culmo nudo, spica terminatrice subrotunda* of Hortus Cliffortianus, from which Linnaeus drew the

material in which the culms were constricted below the spikelets and *L. crassiculmis*, also from Brazil, represented a coarse form with the septae scarcely evident. *E. singularis* was described by Steudel from *Hostman* no. 284a from Surinam, wholly because of the indefinite character of the Linnaean description.

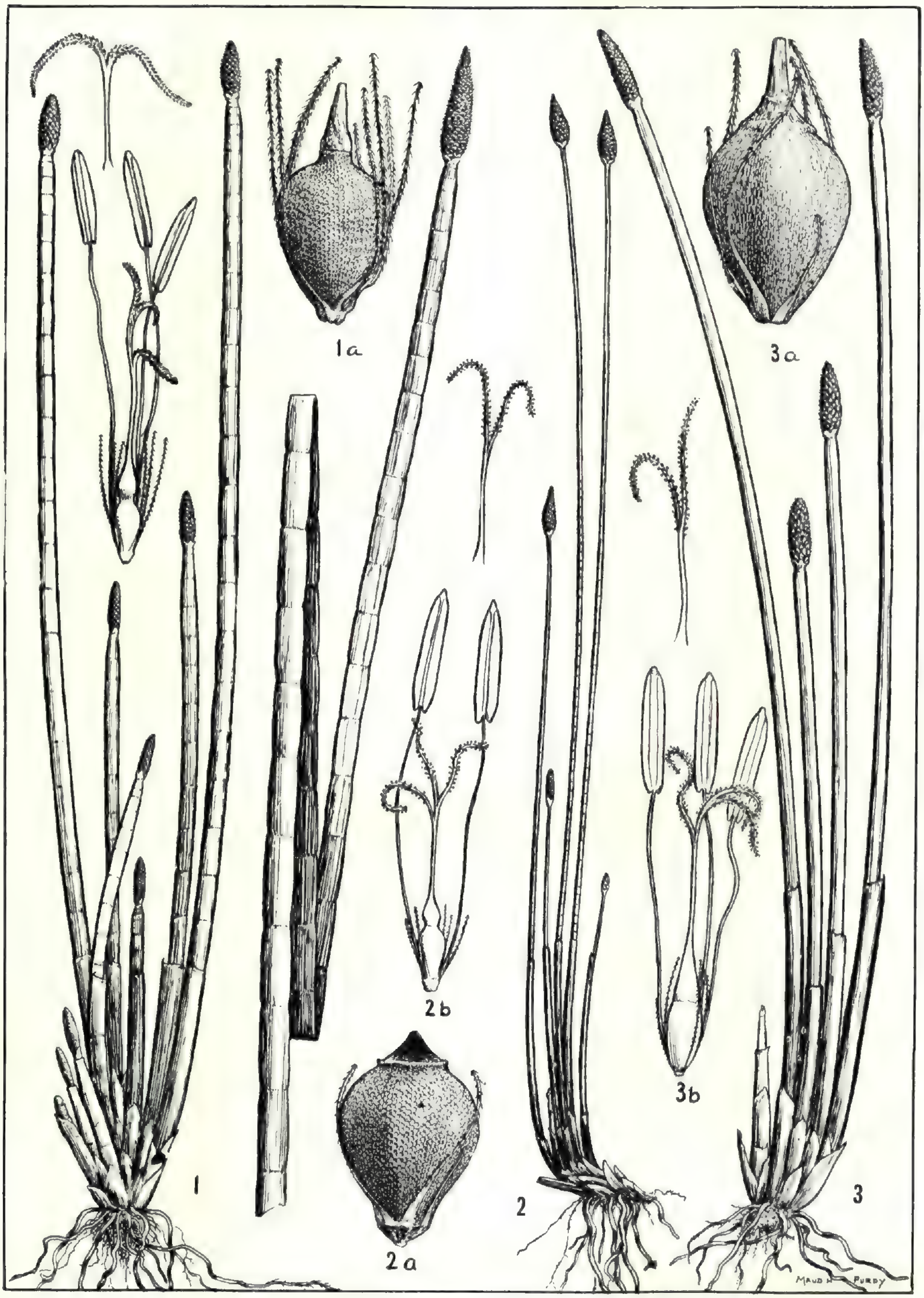
Var. DENSA (Bentham) Boeckl. (Pl. 463, FIG. 3). Culms without externally apparent septae.—Linnaea xxxvi. 470 (1869–70).—*Eleocharis densa* Bentham, Pl. Hartweg. 27 (1839); Steudel, Syn. Cyp. 82 (1855); Hemsley, Biol. Cent.-Am. Bot. iii. 455 (1885).—MEXICO: Aguas Calientes, *Hartweg* no. 242 (G, NY); marshes of the Rio Grande de Santiago near Atequiza, Jalisco, *Pringle* no. 3124 (G, NY); Durango, *E. Palmer* no. 543 in 1896 (G, NY, US); Laguna San Baltazar, Puebla, *Arsène* no. 218 (G); vic. Morelia, Michoacan, *Arsène* no. 9806 (G).

With lack of apparent septae (although the partitions are prominent internally) and achenes appearing to be less deeply reticulate than in *E. geniculata*, this plant of localized distribution in Mexico, may perhaps represent a distinct species.

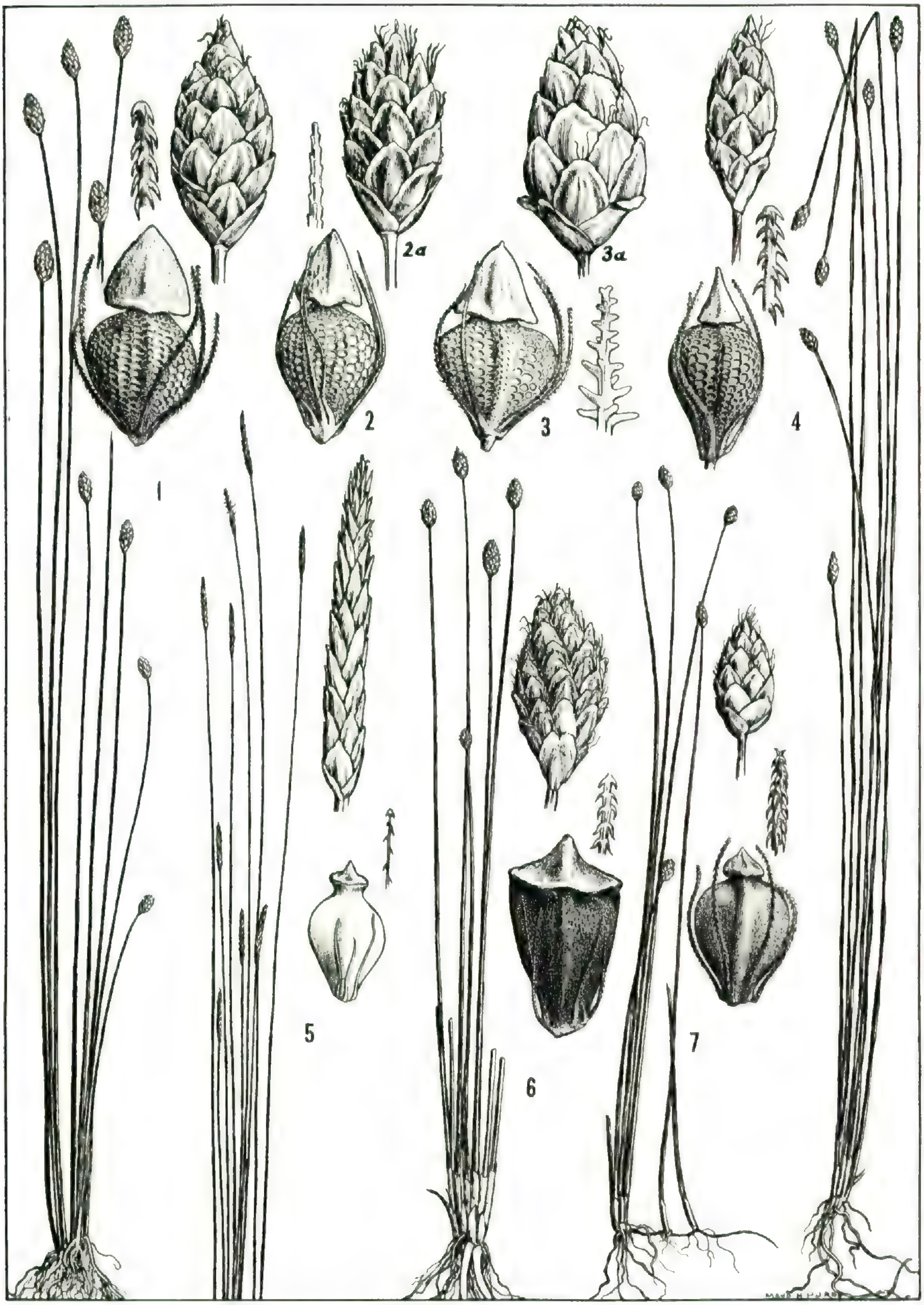
E. Parodii Barros Anales Mus. Hist. Nat. Buenos Aires xxxiv. 480, fig. 28 (1928), a well-marked species of Argentina and Uruguay, is close to *E. geniculata* and, perhaps, as Barros points out, represents *E. crassiculmis*. It also has culms practically non-septate.

32. E. RECLINATA Kunth (Pl. 465, FIG. 3). MAP 19. *Annual* (?), diffusely spreading from fibrous roots or from a thin descending rhizome: culms numerous, *of unequal length*, 0.2–4 dm. long, *usually reclining*, grayish-green, irregularly sulcate: sheath-apex soft and spreading, a short, hardened apiculate projection frequently present: spikelets cylindric-ovoid, *acute*, 2–7 mm. long, loosely 5–20-flowered: scales obtuse, with broad green keel and brownish sides, the lowest scale rounded and completely encircling the culm: stamens 2, anthers 0.4 mm. long: style 3-fid: achene obovoid to pyriform, 1.5 mm. long (including the style-base), obtusely trigonous, *light glistening olive, with minute punctulate reticulation:* the brownish style-base conic-subulate: bristles pale brown, equalling or slightly exceeding the style-base.—Enum. ii. 143 (1837); Steudel, Syn. Cyp. 75 (1855); House, N. Y. State Mus. Bull. 243–244. 43 (1921). *Scirpus intermedius* Muhl. Gram. 31 (1817), not Thuill. (1799) nor Poir. (1804). *Eleocharis intermedia* Schultes, Mant. ii. 91 (1824); Torrey, Ann. Lyc. N. Y. iii. 302 (1836); Steudel, Syn. Cyp. 75 (1855); Boeckl. Linnaea

description. This specimen (now at the British Museum) is *Scirpus caribaeus* Rottb., a name which must therefore be superseded by *S. geniculatus*. However, since Linnaeus' specific name "*geniculatus*" was derived from the Sloan reference (Sp. Pl. i. 48), based on figures representing both *E. geniculata* and *E. caribaea*, there is something to be said on both sides.

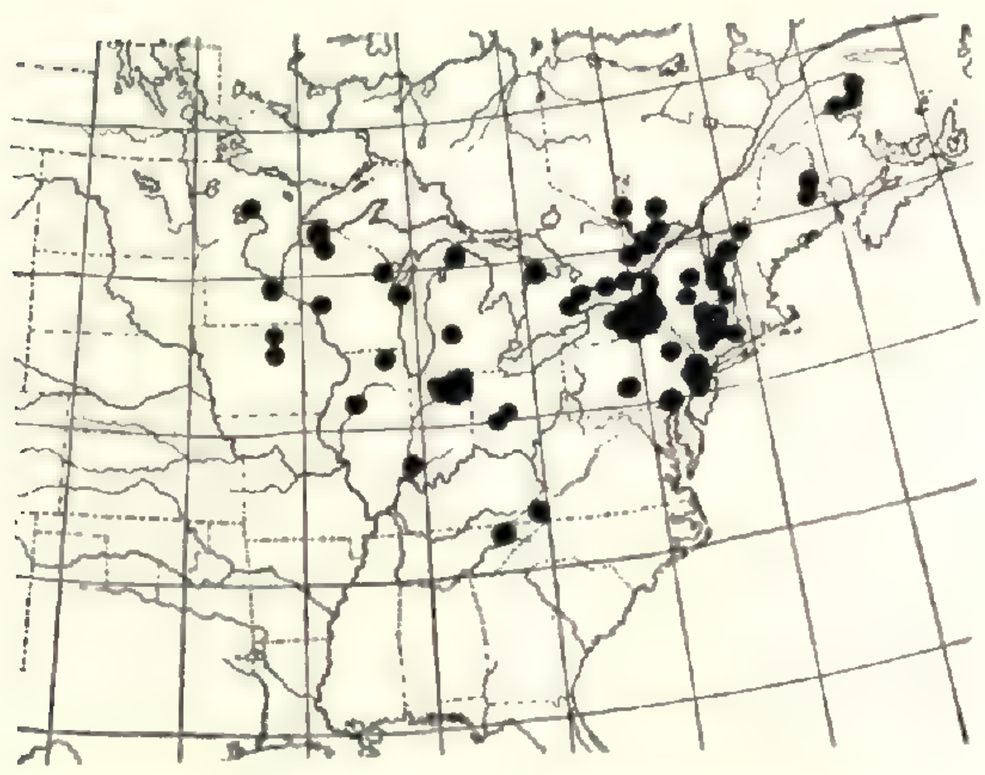


ELEOCHARIS, SERIES TENUISSIMAE (habit × ½, achenes × 20). FIG. 1, E. GENICULATA. FIG. 2, E. NODULOSA. FIG. 3, E. GENICULATA, var. DENSA.



Eleocharis, series Tenuissimae (habit × ½, spikelets × 2½, achenes × 20, except figs. 1–3 (× 10)). Figs. 1–3, E. tuberculosa. Fig. 4, E. tortilis. Fig. 5, E. cylindrica. Fig. 6, E. melanocarpa. Fig. 7, E. albida.

xxxvi. 436 (1869–70); Britton, Journ. N. Y. Microsc. Soc. v. 110 (1889); Britton & Brown, Ill. Fl. i. 255, fig. 597 (1896); Robinson & Fernald in Gray, Man. ed. 7, 184, fig. 261 (1908).—Shores of ponds and rivers, chiefly in calcareous areas, from eastern Quebec south to Tennessee, west to Minnesota. The following specimens are cited to show the range of the species; many of the numerous collections from central New York and elsewhere have been omitted. QUEBEC: Wakefield, *Marie-Victorin* no. 10280 (G); N. Wakefield, *Macoun* no. 7553 (Can); Little Cascapedia River, *Fernald, Collins* & *Pease* in 1904 (G); Dartmouth River, Gaspé County, *Collins, Fernald* & *Pease* in 1904 (G, NY). MAINE: Nadeau Lake, Fort Fairfield, *Robinson* & *Fernald*, Pl. Exsic. Gray. no. 9 (Alb, Cal, G, NY); Patten, *Fernald* in 1897 (G). NEW HAMPSHIRE: Colebrook, *Fernald* & *Pease* no. 16948 (G). VERMONT: Willoughby, *Kennedy* in 1896 (G); Lake Dunmore, *Brainerd* in 1896 (G, NY); Woodbury, *Brainerd* in 1899 (G); Brandon, *Dutton* in 1914 (G); Winooski River, Montpelier, *Brainerd* in 1899 (G); sandy border of Conn. River, Westminster, *Brainerd* in 1899 (G); Ewell's Pond, Peacham, *Blanchard* in 1884 (Alb). MASSACHUSETTS: Lanesboro, muddy inlet to Pontoosuc Lake, *Churchill* in 1918 (G). CONNECTICUT: sandbars of Conn. River, Hartford, *C. Wright* in 1882 (G); bank of lake, Salisbury, *Bissell* in 1901 (NY); Twin Lakes, Salisbury, *Bissell* in 1901 (G, NY). NEW YORK: Dryden, *Eames* & *Wiegand* no. 9343 (G); Spencer, *Eames* & *Wiegand* no. 11434 (Alb, G); Saratoga Lake, *House* no. 21892 (NY); Pine Plains, Dutchess County, *Hoysradt* in 1878 (NY); Clove, Dutchess County, *Standley* & *Bollman* no. 12323 (US); Cedar Lake, Litchfield, *Haberer* no. 1552 (Alb, G); Oneida Lake, *House* in 1903 (NY) and *Haberer* no. 1554 (Alb, G); Cedarville, Herkimer County, *Paine* (G); Fabius, Onondaga County, *Hotchkiss* no. 3536 (Alb); Sodus Bay, *House* no. 19667 (Alb); Mendon Ponds, Monroe County, *House* no. 19653 (Alb); Woodville, Jefferson County, *House* nos. 9914 and 19699 (Alb); Fenner, Madison County, *House* no. 17056 (Alb); Knickerbocker Lake, Columbia County, *C. A. Brown* no. 516 (Alb); Glenmont, Albany County, *House* (Alb); Green Island, Albany, *E. C. Howe* in 1886 (NY); Penn Yan, *Wright* (B); Penn Yan, *Sartwell* (G); Cayuga Lake, *Dudley* in 1884 (NY); Oriskany, Vasey (NY). NEW JERSEY: Sussex County, Lake Grinnell, *Britton* in 1887 (NY); South Plainfield, *Miller* no. 4 (NY); Sparta, *Mackenzie* no. 6800 (NY),



MAP 19. Range of ELEOCHARIS RECLINATA.

and *Porter* in 1887 (B); Warbasse, *Mackenzie* no. 6783 (NY); Black River, Morris County, *Mackenzie* no. 4370 (NY); Marksboro, Warren County, *Mackenzie* no. 6814 (NY). PENNSYLVANIA: Bethlehem, *Rau* in 1871 (NY, Ph); Dillerville Swamp, Lancaster, *Small* in 1889 and 1892 (NY); Pa. Furnace, Huntingdon County, *Boecking* in 1870 (NY). ONTARIO: North Wakefield, *Macoun* no. 7553 (NY, Can); Opsongo Lake, Algonquin Park, *Macoun*, no. 81021 (Can); Point Edward, near Sarnia, *Macoun* no. 81020 (Can); Cartwright, *Scott* no. 16364 (Can); Bay of Quinte, *Macoun* 32181 (Can); Toronto, *Scott* no. 25215 (Can); Snelgrove, *White* no. 59068 (Can); Belleville, *Macoun* no. 32682 (Can); Casselman, *Macoun* no. 86434 (Can); Stittsville, *Macoun* no. 86433 (Can); Moose Creek, near Ottawa, *Macoun* in 1891 (NY); Owen Sound, *Macoun* no. 34567 (G, NY); Galt, *Herriot* nos. 68518, 36 (G). MICHIGAN: Grayling, *Hicks* in 1888 (G); Munith, *Hicks* in 1893 (G). WISCONSIN: Cedar Lake, Kiel, *Fassett* & *Hoffmann* no. 16877 (B); White Potato Lake, Oconto County, *Hotchkiss* & *Kochler* no. 4329 (B); west side of Lake Chetoc, Sawyer County, *Hotchkiss* & *Kochler* no. 4367 (B); Lacrosse, *T. J. Hale* in 1861 (G); Pike River Falls, *Hasse* in 1884 (NY). ILLINOIS: Ringwood, *Vasey* (Ill, G); Peoria, *F. Brendel* (Ill, NY). OHIO: Columbus, *Riddell* (NY); Franklin County, *Werner* in 1890 (NY); Springfield, *Lea* (NY). INDIANA: Noble County: Acinda, *Deam* no. 47665 (D), and Tippecanoe Lake, *Deam* no. 21761 (D); low marl border of Deep Lake 1 mi. s. of Wolf Lake, Noble County, *Deam* no. 14665 (D, G); near Decker, Knox County, *Deam* no. 32955 (D, G); Lake of the Woods, Marshall County, *Deam* no. 21009 (D); near Knox, Starke County, *Deam* no. 42183 (D); Goose Lake, Whitley County, *Deam* no. 21763 (D); Fish Lake, Fermont, Steuben County, *Deam* no. 55417 (B); near Edgewater, Emmet County, *C. F. Fallass* in 1924 (D). MINNESOTA: Bohall Lake, Clearwater County, *N. L. Grant* no. 3251 (NY); Fort Ripley, Crow Wing County, *Rosendahl* & *Butters* no. 3602 (as *E. acicularis*) (G); *T. J. Hale* (G).

Stations shown in Iowa on the distributional map represent Charles City and Story City, from data by R. C. Cratty, Bull. Nat. Hist. State Univ. Iowa iv. 327 (1898). No substantiation of the occurrence of this species in Georgia (coll. Baldwin, cf. Torrey, l. c. p. 302) can be made, but I believe that there is a misdetermination.

Eleocharis reclinata, described by Kunth from western Virginia, "ad ripas fluvii Holston" on the basis of material collected by Beyrich[1] is the plant earlier described by Muhlenberg as *Scirpus intermedius*, a name unfortunately previously applied to at least two European species. Muhlenberg described his plant (which I have seen at Philadelphia, also at New York) as having a bifid pistil, an error perpetuated

[1] Charles Beyrich, a member of Allen's expedition to the source of the Mississippi, died at Fort Gibson in 1834.

by Kunth and Boeckeler; on the other hand I have found the number of stamens to be constantly only two. Although the apices of the sheaths tend to be soft, many will be found showing an apical projection, and this fact, together with the punctulate surface of the achene, resembling that of *E. arenicola*, places *E. reclinata* within the *Palustriformes*, subser. *Truncatae*. Plants in which the bristles are absent or rudimentary, and which differ in no other respect from typical material, are known from Oneida Lake, New York, and, in conformity with treatment of similar variations in other species of *Eleocharis*, should be called

Forma **Habereri** (Fernald) n. comb.—*E. intermedia* var. *Habereri* Fernald, Rhodora viii. 130 (1906); *E. reclinata* var. *Habereri* (Fernald) House, N. Y. State Mus. Bull. 243–244. 43 (1923).

33. E. Macounii Fernald. Resembling *E. reclinata*, but coarser: culms up to 2.5 dm. long; *spikelets 3–10 mm. long, many-flowered, the scales appressed, brownish*, with a greenish midrib; stamens 3, anthers 0.4 mm. long; style 3-fid; achene sharply trigonous to biconvex, yellow-olive, minutely reticulate, 1.4 mm. long, including the brownish *deltoid-conical style-base;* bristles light brown, exceeding the style-base.—Proc. Am. Acad. xxxiv. 497, fig. 26a (1899); Robinson & Fernald in Gray, Man. ed. 7, 185, fig. 262 (1908). Quebec: borders of marshes, North Wakefield, Sept. 13, 1893, *Macoun* no. 7552 (Can, G, NY).

This peculiar plant, known only from the original collection, in many respects suggests an aberrant *E. intermedia* and the lack of fertility (very few ripe achenes are produced) would tend to support this conclusion. Thus in Britton & Brown, Ill. Fl. ed. 2, 318 (1913) it is treated as a synonym of *E. intermedia* [*E. reclinata*]. The achenes vary from sharply trigonous to practically biconvex, but have a much fainter reticulation than is present in *E. reclinata*, and the style-base (the most characteristic feature) is short-deltoid, as compared with the long subulate style-base of *E. reclinata*. The plant much resembles a European species, *E. multicaulis*, but lacks the tendency to proliferation nearly always seen in that species, which, furthermore, has anthers as large as those in *E. palustris*. The small anthers of *E. Macounii* are identical with those of *E. reclinata*. For the present I believe it is advisable to treat *E. Macounii* as a distinct species.

34. E. cylindrica Buckley (Pl. 464, fig. 5). Culms erect from a *slender ligneous rhizome*, *filiform*, 2–3 dm. long, sulcate and angled: sheaths stramineous to light brown, truncate at the apex and conspicuously subulate-toothed: spikelets *linear-cylindric*, many-flowered, acute, 8–17 mm. long, not exceeding 2 mm. in width: scales lanceolate,

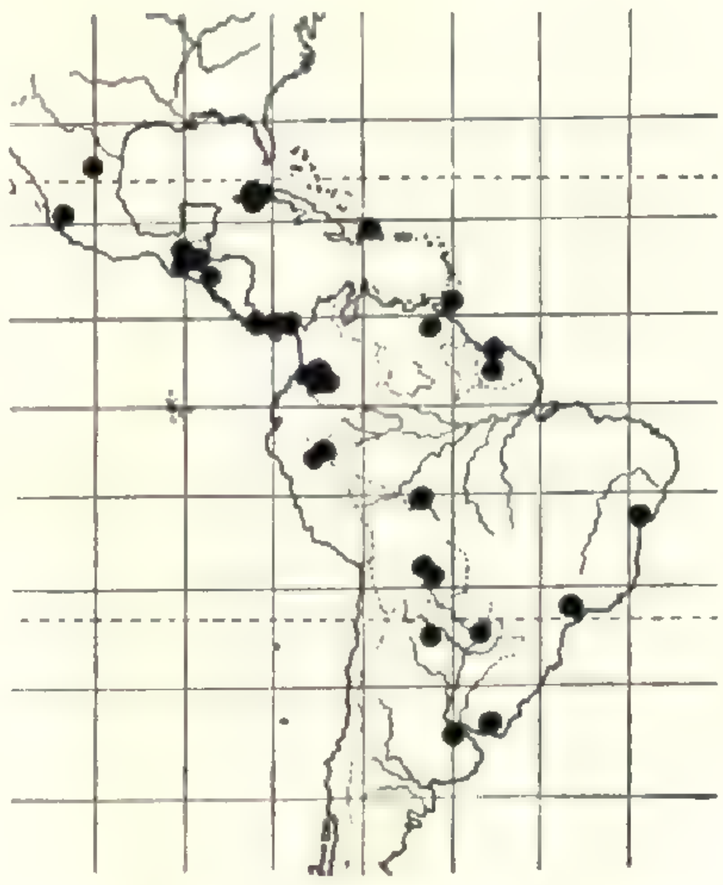
acute, chestnut brown, not strongly keeled, the scarious margins inrolled at maturity; stamens 3, anthers 0.7 mm. long: style 3-fid: achene 0.8 mm. long, dark brown, obovate, smooth to faintly reticulate, *trigonous with sharply costate angles, conspicuously narrowed at the apex:* style-base light brown, pyramidal, a little wider than the constricted apex of the achene: bristles slender, brown, much shorter than the achene.—Proc. Acad. Nat. Sci. Phila. 1862. 10 (1863); Britton, Journ. N. Y. Microsc. Soc. v. 109 (1889). *Heliocharis texana* Britton, Bull. Torr. Bot. Club xi. 87 (1884).—Texas: northern Texas, *Buckley* (type Ph, NY); Valley of the Lower Rio Grande, *Buckley* in 1879–1883 (type of *E. texana* (NY)). New Mexico: *C. Wright* no. 1935 (NY).

This poorly-known species is closely related to *E. Parishii*, which it resembles in habit and in the peculiarly constricted achenes, and also to some Argentine species, notably *E. Spegazzinii* Barros.[1] The winged angles of the achenes, and their small size bring *E. cylindrica* close also to *E. tricostata*.

35. E. filiculmis Kunth (Pl. 465, figs. 1, 2). Map 20. Erect from an ascending caudex: culms 1.5–4 dm. high, flattened and sulcate, lightly punctate, rarely as much as 1 mm. wide: sheath purplish brown to stramineous, acute, sometimes slightly inflated at the apex: spikelets ovoid-cylindric, 4-10 mm. long, many-flowered: scales obtuse to emarginate, stramineous to reddish-brown, with a lighter keel and a prominently scarious margin: anthers 0.7 mm. long: style 3-fid: achene 1.0 mm. long, trigonous with sulcate angles, glistening white, often obscurely reticulate or brown-striolate: style-base nearly as wide as the apex of the achene, irregularly pyramidal, often somewhat flattened, white to light brown, frequently with overhanging margins: bristles white, usually equalling the achene.—Enum. ii. 144 (1837); Steudel, Syn. Cyp. 75 (1855). *Scirpus sulcatus* Roth, Nov. Pl. 30 (1821), not Petit Thouars (1811). *Scirpidium sulcatum* Nees in Mart. Fl. Bras. ii[1]. 98 (1842) and in Bonplandia iii. 86 (1855). *Eleocharis sulcata* Nees, Linnaea ix. 294 (1834) (nomen) and in Kunth, Enum. ii. 157 (1837) (nomen); Boeckl. Linnaea xxxvi. 445 (1869–70); Hemsley, Biol. Cent.-Am. Bot. iii. 457 (1885); Britton, Journ. N. Y. Micr. Soc. v. 107 (1889); C. B. Clarke, Bull. Herb. Boiss. ser. 2, iii. 1015 [Pl. Hasslerianae 237] (1903); Barros, Anales Mus. Hist. Nat. Buenos Aires xxxiv. 459, fig. 16 (1928); Standley, Field Mus. Bot. Ser. viii[4]. 263 (1931); Ostén, Anales Mus. Hist. Nat. Montevideo, ser. 2a, iii. 178 (1932); Uittien in Pulle, Fl. Surinam i. 113 (1934). *Limnochloa calyptrata* Liebm. Vidensk. Selsk. Skr. v. ii. 244 (1851). *Eleocharis calyptrata* Steud. Syn. Cyp. 81 (1855); Hemsley, Biol. Cent.-Am. Bot. iii. 455 (1885). *E. Rothiana* Boeckl. Flora xliii. 3 (1860) and Linnaea xxxvi. 444 (1869–70). *Scirpus filiculmis* Schrad. ex Griseb.

[1] Anales Mus. Nat. Hist. Buenos Aires xxxiv. 474, fig. 25 (1928).

in Goett. Abh. xxiv. 311 (1879), acc. to Index Kewensis. *E. Balansaiana* Boeckl. in Flora v. 62 (1879) acc. to Barros (l. c.). *E. costaricensis* Boeckl. and *E. purpurco-vaginata* Boeckl. Allg. Bot. Zeit. ii. 34 (1896).—West Indies, Mexico, and southward to Paraguay and Argentina [Buenos Aires and other localities cited by Barros (l. c.)]. CUBA: Isle of Pines, *A. A. Taylor* no. 54 (G, NY); Nueva Gerona, Isle of Pines, *Palmer* & *Riley* no. 993 (NY); in wet savannas, near Herradura, Pinar del Rio, *Van Hermann* no. 293 (NY); pine woods, boggy places, Herradura, *F. S. Earle* no. 732 (NY); in pinelands, Herradura, *Ekman* no. 17789 (NY); Pinar del Rio, *Ekman* no. 16661 (G); palm-barrens west of Guane, Pinar del Rio, *Shafer* no. 10501 (NY). DOMINICA: Pimentel, *Abbott* no. 722 (NY). MEXICO: Quimixto, Jalisco, *Mexia* no. 1215 (NY); Saltillo, Coahuila, *Fr. Adole* no. 26 (NY); Saltillo, *Gregg* in 1897 (NY). GUATEMALA: Coban, *Tuerckheim* nos. 429 (G, NY), 1267 (NY), and 1383 (G, NY); inter Coban et Gualan, *Bernoulli* no. 801 (NY); Livingston, *Tuerckheim* no. 1219 (NY); Quebradas, Dept. Izabal, *S. F. Blake* no. 7517 (G) (as *E. elassocarpa*). EL SALVADOR: Ixtepeque, Dept. San Vicente, *Standley* no. 21452 (G, NY). PANAMA: wet fields, in dense tufts, near Matias Hernandez, Prov. Panama, *Standley* no. 28983 (NY); between Fort Clayton and Corozal, *Standley* no. 29168 (NY); Juan Diaz, Prov. Panama, *Killip* no. 4093 (NY); El Boquete, Prov. Chiriqui, *Killip* nos. 4531 (NY) and 4585 (NY); Aguadulce, Prov. Coclé, near sea level, *Pittier* no. 4896 (NY); Penonome, *R. S. Williams*, no. 301 (NY); dry fields, Chivi-Chivi, *Killip* no. 4078 (NY). VENEZUELA: Riverside, Ciudad Bolivar, *L. H. Bailey* nos. 1360 (NY), 1654 (G, NY), and 1691 (NY). TRINIDAD: Mora forest, *Broadway* no. 7351 (NY); Piarco Savanna, *Broadway* no. 2144 (NY); Guanapo, *McLean* in 1913 (NY). COLOMBIA: wet marl, alt. 1500 m., Mesa de los Santos, Dept. Santander, *Killip* & *Smith* nos. 15045 (G, NY) and 21186 (NY); Neiva, Dept. Huila, *Rusby* & *Pennell* no. 1070 (NY); Armenia, Dept. Caldas, *Pennell, Killip* & *Hazen* no. 8644 (G, NY); Buenaventura, Dept. El Valle, *Killip* no. 11682 (G, NY); without loc., *Funck* & *Schlim* in 1862 (NY). PERU: Yurimaguas, Dept. Loreto, *Killip* & *Smith* nos. 27959 (NY) and 29067 (NY); prope Tarapoto, Peruv. orientalis, *Spruce* no. 4283 (NY). BOLIVIA: Buenavista, Dept. Santa Cruz, *Steinbach* no. 6946 (NY); Yapacani, *O. Kuntze* no. 133 (NY). SURINAM: *Schweinitz* (NY). BRAZIL: Matto Grosso, *S. Moore* no. 112 (NY). PARAGUAY: Asuncion, *Morong* no. 249 (G, NY); *Hassler* no. 501 (NY); Cordillera de Villa-Rica, *Hassler* no. 8686 (G).

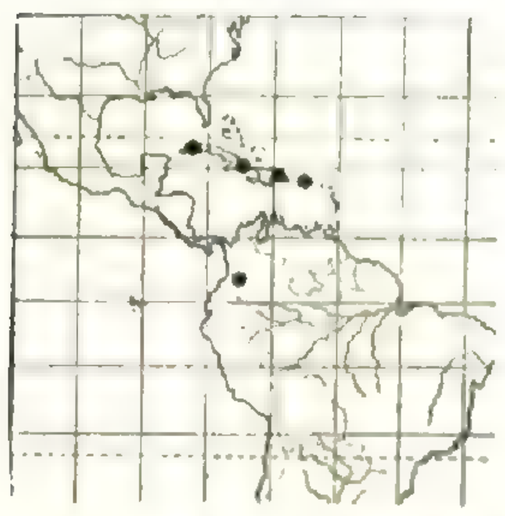


MAP 20. Range of ELEOCHARIS FILICULMIS.

The name *E. filiculmis* clearly antedates *E. sulcata* (Nees) Kunth, but I am not at all certain that it is the oldest available name, for a maze of synonymy surrounds the Brazilian plants, to be cleared up only by recourse to the herbaria of Nees and other early writers. Schrader's specimen of *Scirpus filiculmis* at Berlin, upon which *E. filiculmis* Kunth was based, was seen by Boeckeler and treated by him as a variant of *E. sulcata* "variat porro rhizomate abbreviato culmisque basi tuberascentibus." *E. Rothiana* Boeckl. was a renaming of *Scirpus sulcatus* Roth (1821) (already occupied by Du Petit-Thouars' species from St. Helena) which also received the name *Fimbristylis sulcata* Schultes, Mant. ii. 52 (1824). At least two additional names to be reckoned with are *Chaetocyperus tenuiculus* Nees, in Mart. Fl. Bras. ii[1]. 96 (1842), based on *Scirpus tenuiculus* Schrader in Schultes, Mant. ii. 74 (1824), and *Chaetocyperus emarginatus* Nees (l. c.); the former, as differentiated by Nees, having a short truncate style-base as wide as the achene, the latter with a rostriform thickened obtuse style-base. Both species came from eastern Brazil. Through the kindness of Dr. Ostenfeld, I have borrowed the type specimen of *E. calyptrata* Liebmann, which is illustrated (pl. 465, fig. 2), and which is unquestionably the same as other Central American material passing as *E. sulcata*.

E. filiculmis is the connecting link between series *Tenuissimae* and a group of larger species (*E. pachystyla*, etc.) abundantly represented in Argentina (cf. Barros l. c.), but shows also a strong resemblance to the African *E. anceps*.

36. E. PACHYSTYLA (C. Wright) Clarke (PL. 465, FIG. 4). MAP 21. Culms numerous from a *short horizontal or branched-ascending rootstock:* culms 3–5 cm. long, 1–2 mm. wide, rather soft, terete to flattened-sulcate when dry: sheaths dark reddish-brown, not loose, oblique at the herbaceous, but firm, apex: spikelets *obovoid, obtuse*, 5–7 mm. long, *often clavate at the base:* scales obtuse, thin, scarcely keeled, stramineous with brown-flecked margins, the lowest inclined to be cartilaginous: stamens 3, anthers 0.7 mm. long: style 3-fid: achene narrowly obovoid, trigonous, 1.5 mm. long (including the elongated style-base), yellowish brown, faintly striate-reticulate: style-base 1/3 as long as the achene body, *elongated, triangular-conic*, or sometimes almost falcate: bristles dark brown, retrorsely toothed, equalling the body of the achene.—Urban, Symb.



MAP 21. Range of ELEOCHARIS PACHYSTYLA.

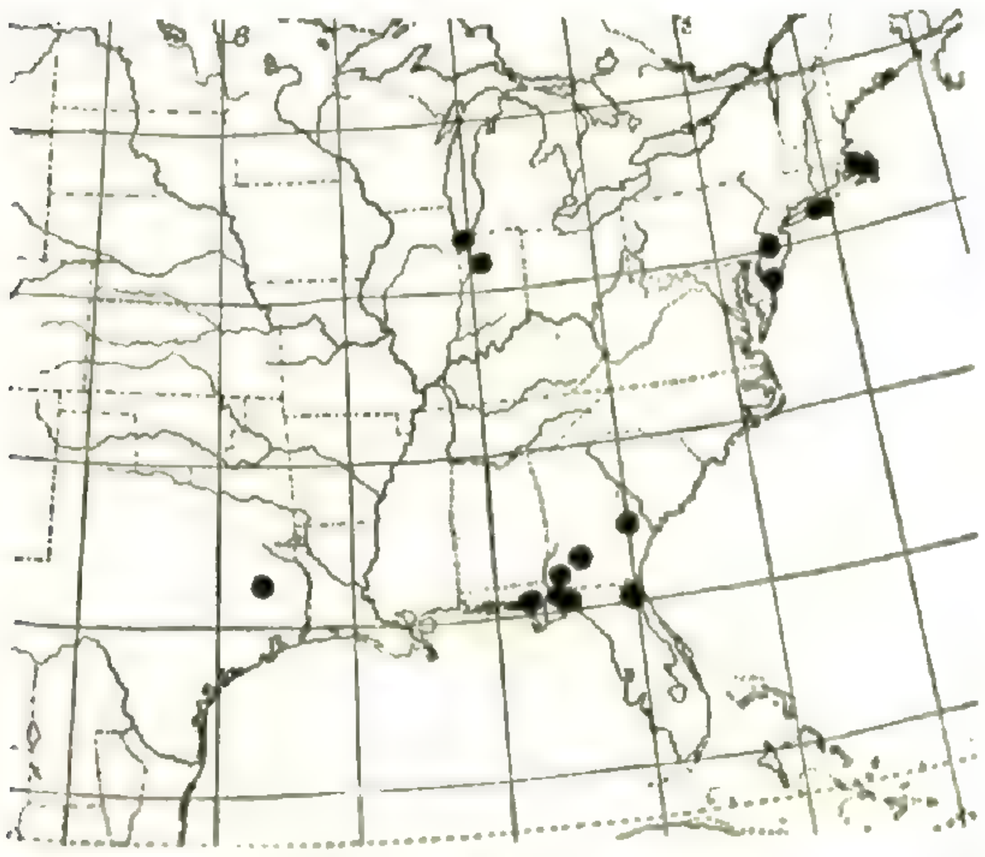
Ant. ii. 72 (1900), and in Contrib. U. S. Nat. Herb. x. 457 (1908); Britton & Wilson, Surv. Porto Rico & Virgin Isl. i. 93 (1923); Standley, Field Mus. Bot. Publ. viii. 263 (1931). *Scirpus melanocarpus* Griseb. Cat. Plant. Cubens. 239 (1886), not Torr. *Scirpus pachystylus* C. Wright in Sauvalle, Fl. Cubana 174 (1873).—CUBA: edge of ponds in pine woods, Pinar del Rio, Sept., *C. Wright* no. 3373 (TYPE coll.) (NY); muddy shore of swamp east of Laguna de la Maguina, Pinar del Rio City, *Ekman* no. 17889 (NY); Sierra de Nipe, ad pedes montis Loma Mensura, Oriente, *Ekman* no. 9106 (NY). PORTO RICO: wet white-sand, vic. Dorado, *Britton, Britton* & *Brown* no. 6674 (NY). SAN DOMINGO: *C. Wright, Parry* & *Brummel* no. 582 (NY). COSTA RICA: Cañas Gordas, alt. 1100 m., *Pittier* no. 11025 (NY). COLOMBIA: Rio Huaugubi, near Popayan, 1600–1800 m., *Lehmann* no. 38 (NY); Rio Pedro, west of Popayan, *Pennell* & *Killip* no. 7200 (NY); Aganche, Dept. El Cauca, 1150–1250 m., *Pennell* & *Killip* no. 6271 (NY). By C. B. Clarke (1908), *E. pachystyla* is cited also from Venezuela, Trinidad, Guiana and Pernambuco.

E. pachystyla seems to be connected with *E. filiculmis* (*E. sulcata*) and thereby with a group of South American species centering about *E. pachycarpa* Desv. and *E. grandis* Boeckl., both of which are well illustrated by Barros (l. c.).

The varieties *macrostachya* (?*Isolepis nudipes* Kunth) and *angusto-stachya*, based primarily on Dusén collections from southern Brazil (?) are described by Pfeiffer, Herbarium no. ii. 55 (1921).

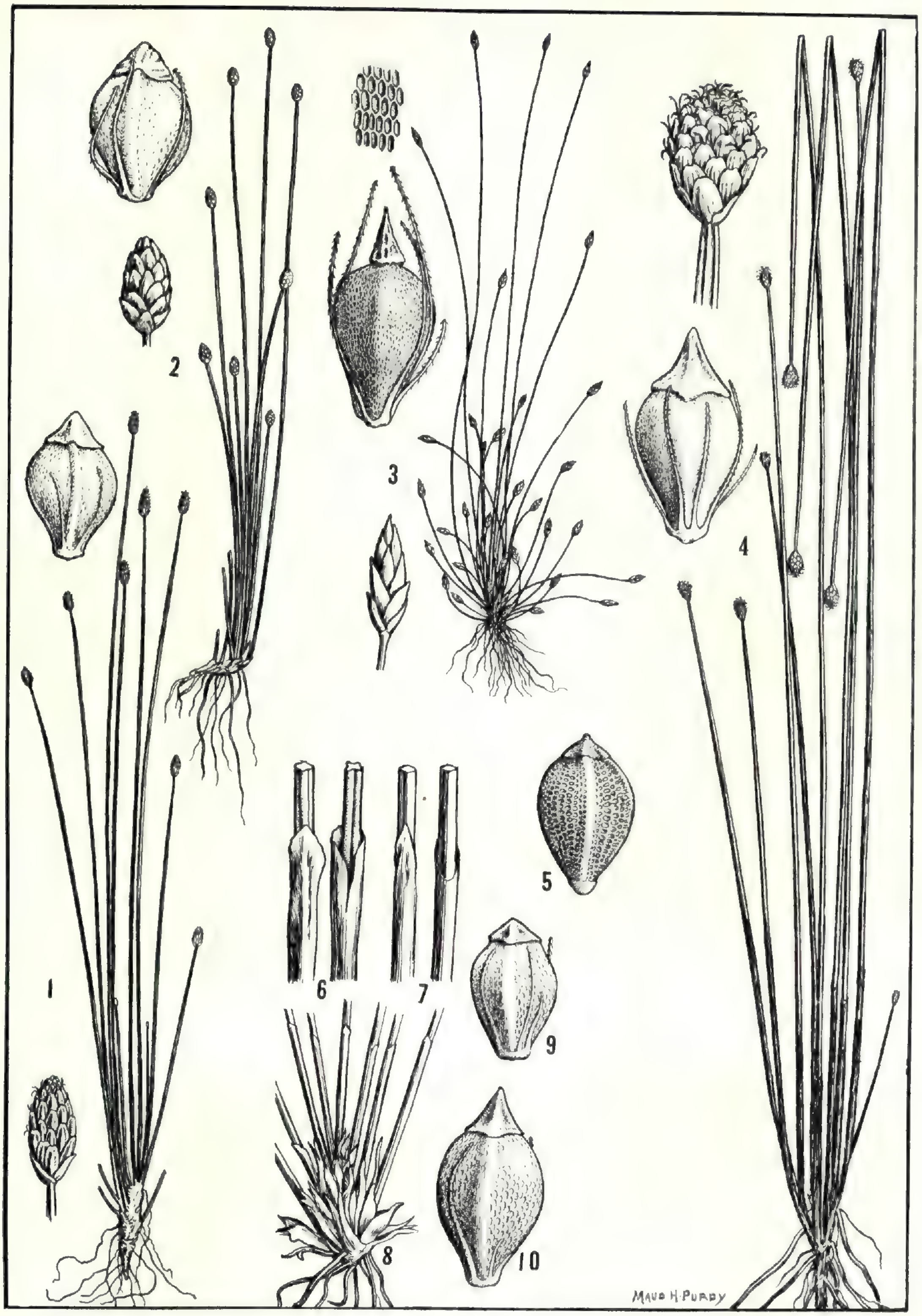
37. E. MELANOCARPA Torr. (PL. 464, FIG, 6). MAP 22. Tufted from a *short thick caudex* with thickened spongy roots, the hardened culm-bases of the previous year persistent: culms firm, *flattened*, sulcate, 2–6 dm. long, often 1 mm. wide, sometimes proliferous at the summit: sheaths truncate with a prominent subulate mucro at the apex: spikelets cylindrical-ovoid, obtuse, many-flowered, 6–15 mm. long: scales firm, obtuse, stramineous with brownish sides and broad scarious margins: stamens 3, anthers 1.5 mm. long: style 3-fid: achene 1.1 mm. long, *dark glossy brown*, trigonous, with *rounded costulate angles*, *truncate at the broadened apex*, minutely cellular: style-base pallid, low-pyramidal to nearly flat, with *prominent overhanging margin:* bristles dark brown, shorter than the achene, retrorsely toothed, often rudimentary.—Ann. Lyc. N. Y. iii. 311 (1836); Steudel, Syn. Cyp. 76 (1855); Boeckl. Linnaea xxxvi. 445 (1869–70); Britton, Journ. N. Y. Microsc. Soc. v. 107 (1889); Britton & Brown, Ill. Fl. i. 254, fig. 592 (1896); E. J. Hill in Bull. Torr. Bot. Club xxv. 392–394, t. 344 (1898); Robinson & Fernald in Gray, Man. ed. 7, 184, fig. 255 (1908); Small, Man. S. E. Flora 165 (1933).—Damp sand, along the coast, Massachusetts to Texas; also in northern Indiana.—MASSACHUSETTS: Loon Pond, Lakeville, Plymouth County, *Fernald* & *Long* no. 8897 (G, NY); West Pond, Plymouth, *Wm. Boott* in 1864 (G); in

arenosis inundatis ad Plymouth, *Oakes* (G, NY); Plymouth, *Tuckerman* (G, NY); dry upper sandy beach, Buck Pond, Harwich, *Fernald*, Plant. Exsic. Gray. no. 327 (B, Cal, G, NY); peaty margin of Small Pond, Barnstable, *Fernald* no. 8895 (NY); Half-Way Pond, Barnstable, *Fernald* & *Long* no. 16326 (G); sandy shore, Peters Pond, Sandwich, *Svenson* in 1926 (B). RHODE ISLAND: Providence (?), *Olney* (G, NY). NEW YORK: Long Pond, Wading River, *E. S. Miller* in 1871 (NY) and in 1872 (G, NY); Deep Pond, Wading River, *Ferguson* no. 1746 (NY); Artist Lake, Middle Island, *Ferguson* nos. 3155 (NY), and 5086 (NY); Lake Ronkonkoma, *Ferguson* no. 3102 (NY); Lake Ronkonkoma, *Bicknell* no. 937 (NY); Big Long Pond, Sag Harbor, *Ferguson* no. 5831 (NY); Round Pond, Sag Harbor, *Ferguson* no. 2838 (NY); Edwards Pond, Coram, *Ferguson* no. 1760 (NY). NEW JERSEY: pond, Delanco, Burlington County, *W. Stone* in 1907 (NY), *Mackenzie* no. 6044 (NY), *Van Pelt* & *Brown* in 1907 (NY), and *Long* no. 5118 (G, NY); white clay bogs, Bennett, *Mackenzie* no. 5510 (NY). GEORGIA: wet pine-barrens, Bulloch County, *R. M. Harper* no. 910 (G, NY); shallow margin of Open Pond, Decatur County, *R. M. Harper* no. 1205 (G, NY); Tifton, *Svenson* no. 6922 (B); "from Cinchona Swamp [?] or Augusta road [?]" *Baldwin* in 1817 (TYPE, NY). FLORIDA: sandy lake shore, Walton County, *Curtiss* no. 3082 (B, NY); Jacksonville, *Curtiss* nos. 5609 (B, G, NY) and 5668 (G, NY); nearly dry sink south of Tallahassee, *R. M. Harper* no. 40 (NY); Quincy, *Chapman* (NY). INDIANA: wet sandy ground, Dune Park, Porter County, *E. J. Hill* in 1894 (NY), *Umbach* nos. 3817 (NY) and 4468 (B), and *A. Chase* no. 549 (Ill.); southeast of Tefft, Jasper County, *Deam* nos. 48928 (B), 48950 (B), and 48965 (B). TEXAS: sandy bogs, Oakwood, Leon County, *E. J. Palmer* no. 13404 (B).



MAP 22. Range of ELEOCHARIS MELANOCARPA.

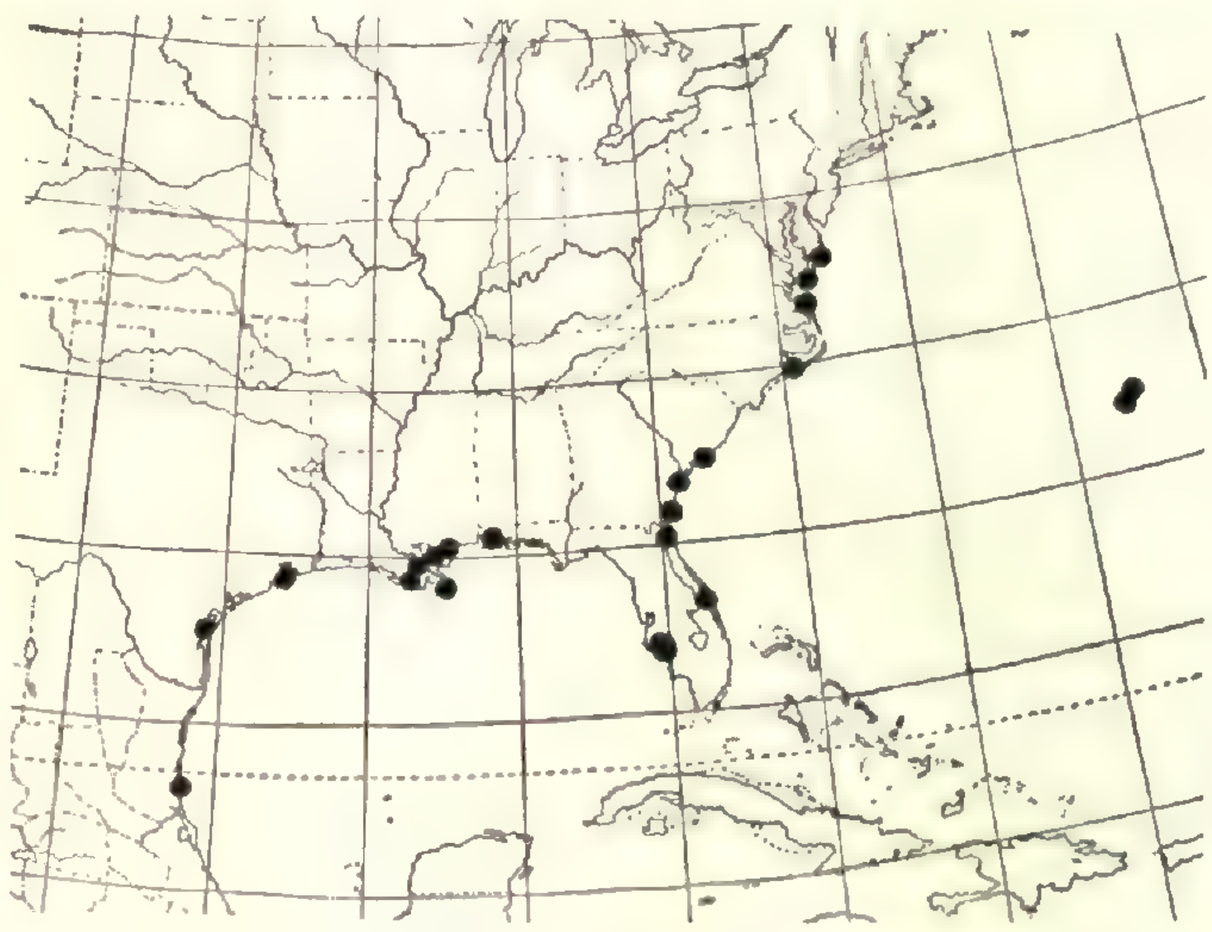
It is probable that Baldwin's type collection came from near St. Mary's, Georgia, where Baldwin lived for some time, perhaps from the Altamaha River region where Baldwin speaks of "Cinchona" [*Pinckneya pubens*] growing in the swamps [See Darlington's Reliquiae Baldwinianae, p. 333]. The proliferous state has been described from Indiana by E. J. Hill (l. c.) but such plants are not at all uncommon in the eastern part of the range, and were long ago seen by Oakes on



Eleocharis, series Tenuissimae (habit × ½, spikelets × 2½, achenes × 20). Figs. 1 and 2, E. filiculmis (fig. 2, *E. calyptrata*). Fig. 3, E. reclinata. Fig. 4, E. pachystyla. Fig. 5, E. grisea. Figs. 6–10, E. minima (sheaths, basal spikelets and achenes).

sandy pond-shores at Plymouth, one of his labels (NY) reading "in wet ground the spikes are all viviparous and it is hard to find a flowering spike. In dry ground no vivip. though many of the culms produce abortive spikes." The affinities of this localized species are obscure, but the relationship—taking into account the small size of the trigonous achenes, their dark color and obscure surface reticulation, and the coastal plain distribution of the plant—would seem closest to *E. Baldwinii*. Its isolated occurrence on the sand dunes of Lake Michigan, where it is associated with other outliers of the flora of the Atlantic Coastal Plain, has been discussed by Peattie, RHODORA xxiv. 59 (1922).

38. E. ALBIDA Torr. (PL. 464, FIG. 7). MAP 23. Tufted, from a *slender, creeping rootstock:* culms 0.5–3 dm. long, usually wiry, slender, 1 mm. wide in large specimens, lightly striate: sheaths stramineous, often with a brownish base, the apex strongly oblique, acute, somewhat cartilaginous: spikelets cylindric-ovoid, 2–10 mm. long, *obtuse:* scales white to light brown, appressed, obtuse, *cartilaginous*, scarcely keeled, the scarious margin almost lacking: stamens 3, anthers 0.8 mm. long: style 3-fid: achenes 1 mm. long, broadly obovate-trigonous, often contracted at the apex, smooth, *dull to shining brown when mature:* style-base conic-deltoid, pale brown, ¼ as wide as the achene: *bristles dark reddish-brown*, exceeding the achene, with *close-set retrorse teeth*.—Ann. Lyc. N. Y. iii. 304 (1836); Steudel, Syn. Cyp. 78 (1855); Boeckl. Linnaea xxxvi. 442 (1869–70); Britton, Journ. N. Y. Microsc. Soc. v. 108 (1889); Britton & Brown, Ill. Fl. i. 254, f. 593 (1896); Robinson & Fernald in Gray, Man. ed. 7, 184, f. 256 (1908); Small, Man. Southeastern Fl. 165 (1933). *E. simplex* Kunth, Enum. ii. 143 (1837). *E. albida* var. *Berlandieri* Britton, Journ. N. Y. Microsc. Soc. v. 108 (1889). *E. Berlandieri* C. B. Clarke in Urb. Symb. Ant. ii. 162 (1900) and Ill. Cyp. t. xxxix. figs. 17–21 (1909). *E. bermudiana* Britton, Journ. N. Y. Bot. Gard. xiii. 191 (1912), and Fl. Bermuda 52, fig. 79 (1918).—Brackish shores, Maryland to Mexico; Bermuda.



MAP 23. Range of ELEOCHARIS ALBIDA.

MARYLAND: Ocean City, *Canby* in 1893 (NY). IRGINIA: Eastville, Northampton County, *Canby* in 1868 (G); False Cape, Princess Anne County, *Fernald, Griscom* & *Long* no. 4565 (B, G) and *Fernald* & *Long* no. 3767 (B, G) (bristles unusually light). NORTH CAROLINA: Beaufort, *I. F. Lewis* no. 68 (NY) (some of *achenes* proliferous). SOUTH CAROLINA: Sullivan's Island, Charleston, *Ravenel* (G, NY); Carolina, ad rupes fluvium, *Beyrich* (Camb.) (as *E. simplex*). GEORGIA: Cumberland Island, Camden County, *R. M. Harper* no. 1550 (G, NY); Montgomery, Chatham County, *R. M. Harper* no. 1825 (G, NY); Talbot Island, *Baldwin* (TYPE, NY). FLORIDA: Appalachicola, *Chapman* (NY) and Biltmore Herb. no. 2299a (G, NY); Indian River, *Curtiss* no. 3072 (G, NY); Ft. Meyers, *J. H. Simpson* (G, NY), and *A. S. Hitchcock* no. 402 (G); Titusville, Brevard County, *Nash* no. 2312 (G, NY); Jacksonville, *Curtiss* no. 5675 (G, NY). ALABAMA: Mobile, *Mohr* in 1896 (as *E. capitata*?) (NY). MISSISSIPPI: Ship Island, *Tracy* no. 4878 (NY); Biloxi, *Tracy* no. 5335 (NY). LOUISIANA: New Orleans, *Drummond* no. 406 (G); South Pass, *Lloyd* & *Tracy* no. 392 (G, NY); New Orleans, *Dr. Ingalls* (NY); Barataria, *Dr. Ingalls* (NY). TEXAS: Neuces River, *Berlandier* nos. 2425 (TYPE coll. of *E. Berlandieri*) (G, NY), 995 (G, NY) and 3226 (G, NY); Neuces Bay, Corpus Christi, *Ravenel* nos. 7 (NY), 73 (NY); Galveston, *Reverchon* no. 2897 (NY) and *Plank* in 1892 (NY). MEXICO: Tampico, *E. Palmer* no. 570 in 1910 (Cal, G, US). BERMUDA: South Shore Road, Devonshire, *Britton* & *Brown* no. 240 (TYPE of *E. bermudiana*) (NY); Camden Marsh, *Brown, Britton* & *Bisset* no. 1898 (NY); Shelby Bay, *Harshberger* in 1905 (NY); *Moseley* (NY); Tucker's Town, *Britton* & *Brown* no. 1615 (NY).

Torrey's type specimens were small plants with culms only 6–8 cm. high, but I can seen no distinction, except in size, between these and the larger plants described as *E. Berlandieri* and *E. bermudiana.* Numerous intermediate forms occur in the southeastern United States. *E. albida* does not seem to be closely related to any other species.

EXPLANATION OF PLATE 460

(Details of surface markings accompany some of the achenes)

FIG. 1, ELEOCHARIS MINIMA (*E. Durandii*), Costa Rica, *Standley* no. 29082; 2, E. MINIMA (*E. Jamesonii*), Ecuador, *Hitchcock* no. 20087; 3, E. MINIMA (*E. Wrightiana*), Cuba, *C. Wright* no. 3369; 4, E. MINIMA var. AMBIGUA, Brazil, *Gross*, no. 20513, achene from *Salzmann* specimen (Cambridge); 5, E. URCEOLATA, Mexico, *Liebmann;* 6, E. OLIGANTHA, Cuba, *C. Wright* no. 3368; 7, E. MINIMA, Brazil, *Regnell* III, no. 1307; 8, E. ALVEOLATA, Cuba, *Ekman* no. 17788; 9, E. MICROCARPA var. FILICULMIS, New Jersey, *Svenson* no. 3459; 10, E. MICROCARPA, Louisiana, *Ingalls* (TYPE); 11, E. MICROCARPA var. BRITTONII, Georgia, *Harper*, no. 639; 12, E. BALDWINII, Georgia, *Harper* no. 1176; 13, E. BALDWINII, Florida, *Small* no. 4417.

Explanation of Plate 461

Fig. 1, Eleocharis minima (type of *E. oropuchensis*), Trinidad, *Britton, Hazen & Freeman* no. 1155; 2, E. glauca, Brazil, *Spruce;* 3, E. subcancellata, Mexico, *Pringle* no. 3430 (NY); 4, E. Brainii, Nile Land, *Schweinfurth* no. 2583; 5, E. subfoliata, Brazil, *Spruce;* 6, E. Naumanniana, French Guinea, *Caille* no. 14957; 7, E. caespitosissima, Madagascar, *P. de la Bathie* no. 17953; 8, ? E. nigrescens, Brazil, *Gardner* no. 2373; 9, E. amazonica, Brazil, *Spruce;* 10, E. Chaetaria, Ceylon, hb. *Wight* no. 2895; 11, E. retroflexa, Cuba, *Ekman* no. 236; 12, E. vivipara, Florida, *Curtiss* no. 3088; 13, E. Schweinfurthiana, Nile Land, *Schweinfurth* no. 1949; 14, E. nigrescens (*E. Perrieri*), Madagascar, *P. de la Bathie* no. 17947.

Explanation of Plate 462

Fig. 1, Eleocharis minima var. bicolor (type of *E. savannarum*), Trinidad, *Britton,* no. 2491; 2, E. bicolor, Georgia, *Harper* no. 1711; 3, E. uncialis, Florida (achene from type); 4, E. Barrosii (type from Argentina); 5, E. nigrescens, Cuba, *León & Roca* no. 6997; 6, E. nigrescens (cotype of *E. Hildebrandtii*), Africa, *Chandler* no. 1372; 7, E. nigrescens (type from Brazil); 8, E. nigrescens var. minutiflora, Cuba, *C. Wright* no. 3766; 9, E. nigrescens var. minutiflora, Cuba, *Ekman* no. 17945; 10, E. trilophus (type from Africa); 11, E. anceps, Africa, *Mann* no. 891; 12, E. nana, Brazil, *Burchell* no. 3137; 13, E. minutissima (type from Cuba); 14, E. microcarpa (type of *E. cubensis*), *C. Wright* no. 3765.

Explanation of Plate 463

Fig. 1, E. geniculata from Colombia, *Archer* no. 75 (showing habit and immature flower); 1a, *Fredholm* no. 4252, Porto Rico (achene and portion of culm); 2, E. nodulosa, Bolivia, *Fiebrig* no. 2328; 3, E. densa, Mexico, *Arsène* no. 275.

Explanation of Plate 464

Fig. 1, E. tuberculosa f. retrorsa, Massachusetts, *Oakes;* 2, E. tuberculosa f. pubnicoensis, Nova Scotia, *Fernald, Long & Linder* no. 20164; 3, E. tuberculosa (typical), Florida, *Curtiss* no. 3096; 4, E. tortilis, South Carolina, *Ravenel;* 5, E. cylindrica, *Buckley,* Valley of Lower Rio Grande, Texas; 6, E. melanocarpa, Florida, *Curtiss* no. 3082; 7, E. albida, Florida, hb. *Chapman.*

Explanation of Plate 465

Fig. 1, E. filiculmis, Panama, *Standley* no. 29168; 2, E. filiculmis (type of *E. calyptrata*), Mexico; 3, E. reclinata, Maine, *Gray Herb. Exs.* no. 9; 4, E. pachystyla, Porto Rico, *Britton, Britton & Brown* no. 6674; 5, E. grisea (cotype from Cuba). E. minima (*Hitchcock* no. 20087, Ecuador): Figs. 6, 7, sheath-apices; Fig. 8, base of plant showing basal spikelets; Fig. 9, achene from normal spikelet; Fig. 10, achene from basal spikelet.

THREE AQUATICS FROM SOUTHERN MAINE

Norman C. Fassett

Eleocharis parvula (R. & S.) Link, f. **spongiosa,** n. f., culmis spongiosis septatis ad 1 mm. diametro.—Brackish mud near low tide level, Kennebec River, Woolwich, Maine, August 16, 1933, *N. C. Fassett,* no. 16036 (type in the Herbarium of the University of Wisconsin).

This is an estuarine form with spongy culms, which so closely resembles a little sterile *Sagittaria* that it was mistaken for a member of that genus when found by Dr. H. K. Svenson and the writer on the tidal shores of the St. Lawrence River, and was, indeed, later treated as such by Dr. Svenson.[1] Its true identity is shown by a collection from Temiscouata, Quebec, *Victorin*, no. 564, in which a few of the culms bear small, apparently sterile, spikelets. In addition to its occurrence on the St. Lawrence and the Kennebec estuaries, the writer has found it on several estuaries on the northern and eastern coasts of New Brunswick and on the Sheepscot River at Alna, Maine, while Dr. Svenson has collected it on tidal mud of the Hudson River at Peekskill, New York.

PONTEDERIA CORDATA L., f. **taenia**, n. f., foliis submersis sine laminis, linearibus 3–5 mm. latis translucentibus, vel emersis cum laminis 5 mm. latis petiolisque 2–3 mm. latis.—Shallow mucky cove, Damariscotta Lake, Jefferson, Maine, August 28, 1936, *N. C. Fassett*, no. 16067 (TYPE in Herbarium of the University of Wisconsin); shallow water of a stream, Readfield, July 13, 1933, *N. C. Fassett*, no. 15893.

The leaves of Pickerelweed are variable as to the shape of the blade, and several forms have been recognized.[2] But in the form here proposed, blades are usually quite lacking, or if present are scarcely differentiated from the petiole. The plants, both as to submerged and emersed leaves, superficially suggest forms of *Sagittaria graminea*, from which they may be distinguished by the finer and less conspicuous cellular reticulation of the phyllodia.

PODOSTEMON CERATOPHYLLUM Michx. Collins Dam, West Gardiner, Maine, August 18, 1936.

The water of Cobbosseecontee Stream, before widening into a pool below Collins Dam, is a foot deep over a stony bottom, and so swift that the fisherman working his line into the pool can only with difficulty maintain his footing. The bridge below the pool went out in the floods of March, 1936, and in August the water was held back during construction of a new bridge, exposing the *Podostemon*. The suggestion of Dr. Muenscher[3] is called to mind, that perhaps this plant is not as rare as it is generally supposed to be, for its presence would ordinarily not be suspected beneath the white water of the rapids.

MADISON, WISCONSIN.

[1] RHODORA xxxi. 169 (1929).
[2] See Fernald, RHODORA xxvii. 80 (1925).
[3] RHODORA xxxiii. 166 (1931).

A NEW COLUMNEA FROM JAMAICA

Lyman B. Smith

Among several rare species of *Gesneriaceae* collected in Jamaica by Mr. Francis Welles Hunnewell, I find one *Columnea* which does not agree with any known West Indian species of that genus. It is a pleasure to name this new species after its discoverer, as follows:

Columnea **Hunnewellii**, sp. nov. (figs. 1 et 2), caulibus repentibus radicantibus, hornotinis pilis articulatis purpureis dense

Columnea Hunnewellii

obsitis; foliis 5–15 mm. longe petiolatis in pari paulo inaequalibus ellipticis basi apiceque acutis basi obliquis 3–5 cm. longis 15–24 mm. latis dentatis supra parce adpresseque pilosis obscure viridibus subtus inter nervos breve ad nervos longius pilosis pallidioribus; floribus in axillis solitariis subsessilibus; sepalis lineari-lanceolatis 11–13 mm. longis 1–2 mm. latis grosse 3–4-dentatis margine pilis longis articulatis purpureis ciliatis; corolla ex sicco rubra et striis 5 luteis longitrorsis

notata 28 mm. longa 6.5 mm. diametro subcylindrica parce pilosa sub apice paulo contracta basi dorso semigloboso-inflata, lobis erectis subaequalibus 1.5–2 mm. longis obtusis; antheris omnes inter sese cohaerentibus; bacca globosa apiculata 7 mm. diametro glabra rubra.—Jamaica: County of Middlesex, St. Ann Parish, trailing over rocks in forest, Mt. Diablo, March 12, 1936, *Hunnewell & Griscom 14481* (type, unicate, in Gray Herb.)

Columnea Hunnewellii appears to be most closely related to *C. jamaicensis* Urban, from which it differs in its coarsely toothed sepals and much smaller corolla-lobes. Its inclusion in the section *Pterygoloma* Hanst., however, will necessitate the redefinition of that section to include species with dentate sepals.

Gray Herbarium.

Braya humilis (C. A. Meyer) Robinson, var. **leiocarpa** (Trautv.), comb. nov. *Sisymbrium nanum* Bunge, var. *leiocarpum* Trautv. in Act. Hort. Petrop. v. 25 (1877). *Pilosella novae-angliae* Rydb. in Torreya, vii. 158 (1907). *Arabidopsis novae-angliae* (Rydb.) Britton in Britton & Brown, Ill. Fl. ed. 2, ii. 176 (1913), as to type. *B. humilis*, var. *novae-angliae* (Rydb.) Fernald in Rhodora, xx. 202 (1918).—M. L. Fernald.

Volume 39, no. 462, including pages 193–232, was issued 8 June, 1937.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. August, 1937. No. 464.

CONTENTS:

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. **August, 1937.** **No. 464.**

THREE AMERICAN OSCILLATORIACEAE

FRANCIS DROUET

OSCILLATORIA **luteola,** sp. nov. *O. laetevirens* of Collins, RHODORA **2**: 42. 1900 (at least in part), Phyc. Bor.-Amer. **22**: 1054. 1903; of Holden in Collins, RHODORA **7**: 172. 1905; of Tilden, Minnesota Algae **1**: 78. 1910 (in part); of Collins, Proc. Portland Soc. Nat. Hist. **2**: 260. 1911; of Taylor, Marine Algae of Florida, 45. 1928; not Crouan ex Gom. *O. formosa* of Holden, Phyc. Bor.-Amer. **15**: 710. 1900, in Collins, RHODORA **7**: 172. 1905; of Tilden, idem **1**: 80. 1910; not Bory ex Gom. *Oscillatoria* sp. of Hazen in Lewis, RHODORA **26**: 215. 1924.—Stratum luteolum vel luteo-viride, tenue, haud raro fere membranaceum, fragile, variis Oscillatoriaceis vulgo immixtis submersum vel raro emersum subaerialeque; trichomatibus in vivis pulchre luteo-viridibus, rectis, raro leviter flexilibus, fragilibus, ad genicula evidenter constrictis, numquam torulosis, 3 μ ad 5 μ crassis, apice rectis raro vix curvatis uncinatisve, brevissime attenuatis; articulis subquadratis vel diametro usque triplo brevioribus, 1.5 μ ad 5.5 μ longis; protoplasmate per totam cellulam tenui-granuloso; dissepimentis conspicuis, pellucidis, haud granulatis; cellula apicali obtuse cylindrico-conica, haud capitata, sine calyptra (v. v., v. s., v. in form.). FIG. 1. In quiet brackish pools along the eastern coast of North and South America. MAINE: Harpswell, *F. S. Collins*, 12 July 1903 (Phyc. Bor.-Amer. 1054, *W*,[1] *T*, *Y*). MASSACHUSETTS: with other algae floating in Gardiner's Ditch, Woods Hole, *Drouet 1134*, 30 June 1934 (*D*, *W*), *Drouet 1909*, 10 Aug. 1936 (TYPE in Herb. Francis Drouet; ISOTYPES: *F*, *T*, *W*, *Y*); subaerial in salt marsh, Pasque Island, Gosnold,

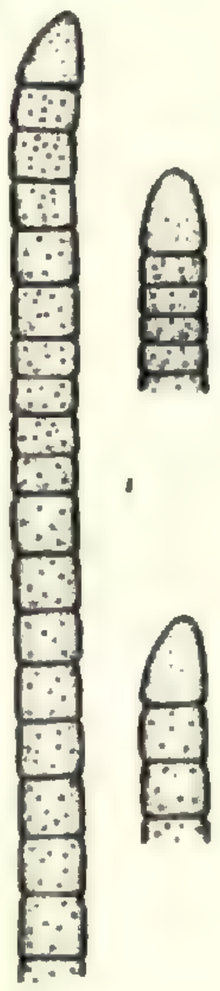

FIG. 1.

[1] Specimens are cited from herbaria by means of the abbreviations: *D* (the author's personal herbarium), *F* (Farlow Herbarium), *T* (Herbarium of Wm. Randolph Taylor), *W* (Herbarium of the Marine Biological Laboratory), *Y* (Herbarium of Yale University).

M. Ashton, 8 July 1936 (*D*); Botanical Survey of Penikese Island, Gosnold, 24 July 1923 (*W*); Penikese Island, Gosnold, *T. Hazen*, 1923 (*T*). CONNECTICUT: pool, Stratford, *I. Holden*, 27 May 1900 (Phyc. Bor.-Amer. 710, *W*, *T*, *Y*); shore of 'Fresh Pond,' Stratford, *Holden 730*, 25 Sept. 1892 (*F*), *Holden 951*, 17 June 1894 (*F*); 'Fresh Pond,' Bridgeport, *Holden 1503*, 27 May 1900 (*F*); with *O. brevis* var. *neapolitana*, Yellow Mill Bridge, Bridgeport, *Holden 948*, 10 June 1894 (*F*); Berkshire Mill Pond, Bridgeport, *Holden 42*, 22 June 1890 (*F*); brackish pool, Cook's Point, Bridgeport, *Holden 1471*, 25 June 1899 (*F*). BERMUDA: ditch in Pembroke marshes, *F. S. Collins*, 23 Aug. 1913 (sub. nom. *O. tenuis* var. *tergestina*, *F*). FLORIDA: Long Key, Dry Tortugas, *W. R. Taylor 75*, 15 June 1924 (*T*). CEARÁ: on mud of a salt marsh, Praia Formosa, Fortaleza, *Drouet 1333*, 27 July 1935 (*D*).

The trichomes lack the subacute apices characteristic of *O. laetevirens* Crouan ex Gom. as figured by Gomont (Ann. Sci. nat. VII Bot. **16**: Pl. VII, fig. 11) and by Frémy (Mém. Soc. nat. Sci. nat. & math. Cherbourg **41**: Pl. 31, fig. 12) and as seen in an authentic specimen of that species (Brest, *Crouan*) obligingly sent to me by Prof. Frémy. *O. luteola* inhabits quiet brackish water and is seldom seen in quiet salt water; *O. laetevirens* is usually collected in less quiet but strictly marine waters. The plant-mass and trichomes of the former, moreover, have a much more definitely yellow-green color than have those of the latter species. The form of the apical cell, the nature of the outer wall of the apical cell, the color, and the habitat of *O. luteola* make this species quite distinct from *O. tenuis* var. *tergestina* (Kütz.) Rabenh. ex Gom. and *O. formosa* Bory ex Gom. Other differences can be pointed out in the range in diameter of the trichomes, in the nature of the cross-walls, and in the type of granulation of the protoplasm in non-hormogonial plant masses. *O. luteola* is an often encountered alga of shallow brackish water in southern Massachusetts, commonly present in great quantity in association with *O. amphibia* Ag. ex Gom., *O. brevis* var. *neapolitana* (Kütz.) Gom., *O. margaritifera* Kütz. ex Gom., *Spirulina major* Kütz. ex Gom., *Microcoleus chthonoplastes* (Fl. dan.) Thur. ex Gom., and species of Lyngbya and Hydrocoleum. It apparently occurs in similar associations in brackish localities throughout its geographic range.

OSCILLATORIA GRANULATA Gardner,[1] Mem. New York Bot. Gard.

[1] An emended description of *O. granulata* Gardn. as seen in the type and other material cited here is offered: Stratum laete-aerugineum vel caeruleum, siccatum atroviride; trichomatibus rectis vel undulatis, saepe parallele in stratum aggregantibus, saepe inter alias algas dispersis, ad apicem sensim et longe attenuatis, truncatis, haud capitatis, ad genicula non constrictis, 3 μ ad 5 μ crassis, superne uncinatis vel spiralibus; articulis vulgo subquadratis aut diametro paullo longioribus vel brevioribus, 2 μ ad

7: 37. Pl. 8, fig. 71. 1927, New York Acad. Sci. Sci. Surv. Porto Rico **8** (2): 269. 1932; Geitler, Rabenh. Kryptogamen-Fl. **14**: 963. 1932.—In quiet fresh (rarely slightly brackish) water along the Atlantic coast of North and South America. MASSACHUSETTS: Fresh Pond, Cambridge, *W. G. Farlow*, Oct. 1879 (with and sub. nom. *O. splendida, F*); in a swampy area north of Nobska Point, Falmouth, *Drouet 1947*, 16 Sept. 1936 (*D, F, T*); in a bog, Pasque Island, Gosnold, *H. Croasdale*, 26 June 1934 (*D*); north shore of Pasque Island, Gosnold, *Drouet 1126A*, 26 June 1934 (*D, F, T, Y*); Pink Pond, Nonamesset Island, Gosnold, *H. Croasdale*, 2 July 1934 (*D*). PUERTO RICO: in a pool at the park, Santurce, *N. Wille 51 b*, 25 Dec. 1914 (TYPE in Herb. New York Botanical Garden). CEARÁ: with *O. anguina* in a pool, Barra do Ceará, Municipio de Fortaleza, *Drouet 1438*, 26 Sept. 1935 (*D*). PARAÍBA: in Açude Baixa near Campina Grande, *S. Wright 2042*, 11 Dec. 1933 (*D*).

FIG. 2.

In southern Massachusetts, this species is often collected in mixtures with other algae and seldom in relatively pure masses, and is quite common in freshwater ponds along the seashore. Gardner's type specimen in the Herbarium of the New York Botanical Garden contains rather small numbers of the trichomes described; fortunately, though the principal part of the collection has been dried from material preserved in formalin (with the trichomes somewhat distorted), a part of the material has been dried from the living condition. The original description does not adequately characterize the trichomes in this specimen. The apices are distinctly attenuated and truncate in the type material (FIG. 2) and in the other specimens cited here. The thickening of the outer membrane of the apical cell is so apparent that in material dried from formalin the upper end of the apical cell often remains distended and gives a capitate appearance to the trichome. The species seems to be most closely related to the capitate *O. amocna*.

SPIRULINA **stagnicola**, sp. nov.—Trichomata 1.5 μ ad 2.0 μ crassa, usque ad 500 μ longa, inter alias algas sparsa, in speciminibus vivis siccatisque aeruginea, flexilia, ambitu recta aut flexuosa, in spiram laxissimam regularem diametro 7.5 μ ad 11.5 μ aequantem contorta, anfractibus 1 ad 30, inter se 20 μ ad 28 μ distantibus; protoplasmate passim tenui-granuloso; apice trichomatis rotundata; pseudo-septis rufo-neutro evidentibus; pseudo-articulis subquadratis vel diametro

---

6 μ longis; protoplasmate laete-aerugineo, haud raro luteolo-viride vel chalybeo, tenui-granuloso; dissepimentis passim conspicuis, passim grosse-granulatis; cellula apicali truncata, membranam evidenter incrassatam praebente (v. s., v. v., v. in form.)

Fig. 3.

usque duplo longioribus (v. v., v. s., v. in form.). Fig. 3 Massachusetts: in brackish water, Nonamesset Island, Gosnold, *E. T. Rose*, 21 June 1936 (Type in Herb. Francis Drouet; isotypes: *F*, *T*, *W*, *Y*).

This new form was found in a brackish pond in company with *Lyngbya aestuarii* (Mert.) Liebm. ex Gom. and a variety of different Chroococcales, bacteria, and protozoa. It appears to be most closely related to *S. laxissima* G. S. West (Journ. Linn. Soc. Bot. **38**: 178. 1907) and *S. laxa* G. M. Smith (Bull. Torr. Bot. Club **43**: 481. 1916), but the measurements of the trichomes of *S. stagnicola* differ widely from those of the two latter species. When unstained, the living trichomes appear unseptate; but when stained with a dilute aqueous solution of neutral red, 'septations' become evident. The 'cells' thus produced are subquadrate or longer than wide. Individuals are not abundant in the type material and only collection.

Explanation of Figures

Fig. 1. Oscillatoria luteola sp. nov., showing typical apical portions of three trichomes (drawn from the type material, × 333).

Fig. 2. O. granulata Gardn., showing typical apical portions of two trichomes (the larger drawn from *Drouet 1126A*, from Massachusetts; the smaller from the type material from Puerto Rico, × 333).

Fig. 3. A trichome of Spirulina stagnicola sp. nov., × 333.

Osborn Botanical Laboratory of Yale University and
Department of Botany, Marine Biological Laboratory

Some Western Lepidiums in Michigan.—On June 20 and 27, 1928, Mr. Bruno Gladewitz, of Detroit, Mich., and I took botanical outings along the M. C. railroad tracks from Ypsilanti to Dexter or nearly to that place. A number of interesting plants were found. At Ypsilanti, June 20, no. 8218, was a large coarse plant that had the general appearance of *L. virginicum* but different leaves and fruit; the pubescence is also of a different character. It proved to be *L. montanum* var. *Eastwoodiae* (Wooton) C. L. Hitchcock. A similar plant with differently shaped fruit, collected at Ann Arbor on the 27th, no. 8221, is *Lepidium montanum* var. *alyssoides* (A. Gray) M. E. Jones. These plants were collected along the railroad right of way and very evidently are wanderers from the West by way of railway freight lines, much in the same way as *Lepidium perfoliatum* L., no.

5452, May 30, 1920 and *Hymenophysa pubescens* C. A. Meyer, no. 5254, May 30, 1920, both along the M. C. railway at Ypsilanti. These last two were first found by Prof. B. A. Walpole. On June 8th, 1932, Mr. Gladewitz and I found along roadsides and banks of streams at Bell Branch in Wayne Co., Mich., a plant that comes nearest to *L. densiflorum* Schrad. var. *Bourgeauanum* (Thell.) C. L. Hitchc., according to Prof. C. L. Hitchcock. The variety occurs in the Rocky Mountain region to Alaska.—O. A. Farwell, Lake Linden, Mich.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXVIII

I. NOTES ON SILPHIUM

Lily M. Perry

The genus *Silphium* ranging from the mid-Atlantic and southern States to the western prairie-region is most diverse in the South. Here the species are more numerous and, owing to the high variability of the characters, specific lines are rather difficult to determine. In an endeavor to order up the herbarium material, Gray's treatment of the genus, Syn. Fl. N. A. i.^{2} 240–242, 449 (1886), has been most helpful. Small's revisions, Fl. Se. U. S. 1240–1245 (1903) and Man. 1408–1415 (1933), have also been useful in evaluating the more recent literature.

I am indebted to Dr. H. A. Gleason of the New York Botanical Garden, Dr. W. R. Maxon of the United States National Herbarium and Dr. H. K. Svenson of the Brooklyn Botanic Garden for the privilege of examining various types and other specimens in their herbaria.

As in all genera of the *Compositae*, the heads afford the best determinative features, yet these are not too definite. The achenes are rather inconstant owing to the somewhat fickle development of the wing-apices; truncate achenes, with teeth lacking and wing-margins scarcely 0.5 mm. wide, were found in three species and in others a similar tendency was observed. Immature achenes have practically no diagnostic value in critical determinations, yet good mature ones are lacking in too many specimens. Pubescence of the chaff-tips is helpful in separating groups and in combination with other characters it may be useful in delimiting species. The ray-flowers of herbarium material are often immature or poorly pressed. Involucral bracts are

fairly reliable as to shape and, with few exceptions, their pubescence or the lack of it is significant. Leaf-arrangement may be opposite, alternate and verticillate in the same species; since this is true of more than one species, it is an unsafe and misleading, though often used, key-character. One collector notes "This stalk with some fifteen others grew from one and the same root. Seven of the stalks bore opposite leaves and nine bore three and four leaves in a whorl. That is—the seven—S. integrifolium—and the nine S. trifoliatum were one and (the same)." As a matter of fact all were *S. integrifolium*. Likewise, pubescence, a mixture of varying degrees of coarse and fine trichomes, is somewhat inconstant in quantity on stems, peduncles and leaves.

Since single characters vary widely, character-combinations have been used wherever possible as a means of determining species. In the following key it should be noted that, even when the plant as a whole is glabrous, *leaves, bracts of the involucres and chaff-tips are usually*, at least in some slight degree, *ciliate*.

a. Leaves or their petiolar bases connate-perfoliate.
  Stem glabrous: involucral bracts glabrous.....1. *S. perfoliatum.*
  Stem hirsute with widely spreading or retrorse hairs: involucral bracts pubescent.....2. *S. connatum.*

a. Leaves not connate-perfoliate....*b.*
  b. Involucral bracts foliaceous, if becoming somewhat coriaceous in age, not long-acuminate: leaves entire or variously toothed or lobed, if pinnate or bipinnatifid restricted to the basal and lower part of the stem....*c.*
    c. Involucral bracts not at all coriaceous, more or less spreading and usually squarrose at the tips: leaves distributed up the stem....*d.*
      d. Achenes with relatively broad wing (usually 2 or more mm. wide at base of sinus tapering to a margin of 1 mm. or more) and deep sinus (2–4 mm.)....*e.*
        e. Heads usually several, corymbose: leaves of firm texture, usually opposite or alternate but at times verticillate, lance- to broad-ovate, the upper sessile by a rounded or subcordate base....*f.*
          f. Bracts loosely spreading with reflexed tips, the inner broadly ovate.
            Stem, peduncles and exposed surface of involucral bracts rough-hispid.....3. *S. asperrimum.*
            Stem and peduncles glabrous and glaucous: involucral bracts glabrous on both surfaces..4. *S. speciosum.*
          f. Bracts slightly spreading with reflexed tips (heads appearing more compact than in the above named species), the inner oblong-ovate to elongate-oblong.
            Involucral bracts scabrous-pubescent (at least on the upper exposed tips) to almost glabrous: the inner ovate to oblong-ovate and acute or obtusish: wing-tips of achenes deltoid and acute or obtusish.

Involucral bracts pubescent but not glandular.....5. *S. integrifolium.*
Involucral bracts glandular-pubescent.....Var. *Deamii.*
Involucral bracts glabrous on both surfaces; the inner elongate-oblong and obtusish or rounded: wing-tips of achenes lance-acuminate.....Var. *Gattingeri.*
e. Heads few (2–5) and irregularly arranged: leaves membranous, opposite or alternate, ovate-oblong to oblong- or elongate-lanceolate....*g.*
g. Stem slender and wand-like: upper leaves few and abruptly smaller than the radical.....6. *S. gracile.*
g. Stem stouter and rigid: leaves gradually reduced in size upward.
Involucre coarsely hirsute, ciliate with trichomes about 2 mm. long.....7. *S. Reverchoni.*
Involucre somewhat scabrous or puberulent, ciliate with trichomes about 1 mm. long.
Petiolar bases of leaves scabrous-hispidulous; trichomes with markedly bulbous bases: involucral bracts ovate tending toward obovate: chaff-tips sparsely glandular-pubescent.....8. *S. Simpsonii.*
Petiolar bases of leaves hispid-hirsute: trichomes with only slightly bulbous bases: involucral bracts lanceolate to ovate: chaff-tips pubescent, not glandular.....Var. *Wrightii.*
d. Achenes with narrow wing (usually 1.5–2 mm. (rarely more) wide at base of sinus quickly tapering to a margin of 1 mm. or less) and comparatively shallow sinus (0.2 mm., rarely more)....*h.*
h. Peduncles and ovate-lanceolate involucral bracts hirsute-hispidulous.
Bracts of the involucre appressed with somewhat acuminate and usually squarrose tips: chafftips minutely glandular-pubescent.
Achenes with shallow sinus and narrow wing..9. *S. Gatesii.*
Achenes truncate and practically wingless..Forma *truncatum.*
Bracts of the involucre loosely erect with acute spreading-erect tips: chaff-tips hispidulous, not glandular.....10. *S. Mohrii.*
h. Peduncles and involucral bracts glabrous or finely pubescent....*i.*
i. Chaff-tips minutely pubescent, not glandular: outer bracts of the involucre with spreading to reflexed tips....*j.*
j. Peduncles and involucral bracts glabrous....*k.*
k. Leaves gradually reduced up the stem: achenes usually with a definite sinus....*l.*
l. Leaves hastate- or deltoid-lanceolate, long-petioled on main stem (sessile on branches): achenes suborbicular, slightly broader at apex, emarginate or with shallow sinus.....11. *S. brachiatum.*
l. Leaves lanceolate or ovate-lanceolate, all but the uppermost petioled or with petiolar base: achenes obovate or elliptic with wing-tips acute or obtusish....*m.*

m. Petioles hirsute: achenes elliptic, 9–9.5 mm. long excluding wing (11 mm. with wing).....12. *S. atropurpureum.*

m. Petioles short-ciliate or hispidulous: achenes obovate-elliptic, 6–9 mm. (av. 7 mm.) long excluding wing (8–10 mm. with wing).

Plant with at least the upper surface of the leaves pubescent: leaves chiefly verticillate though often opposite or alternate.

Achene with sinus; wing at least 0.5 mm. wide.....13. *S. trifoliatum.*

Achene truncate; wing less than 0.5 mm. wide.....Forma *praecisum.*

Plant glabrous: leaves opposite (at least in all specimens seen).....Var. *latifolium.*

k. Leaves chiefly basal, the upper greatly reduced: achenes with very shallow sinus and minute teeth.....14. *S. confertifolium.*

j. Peduncles and involucral bracts finely pubescent. 15. *S. Asteriscus.*

i. Chaff-tips minutely glandular-pubescent: involucral bracts glabrous, the outer usually with strongly reflexed tips: leaves opposite or alternate.

Stem, at least the lower part, glabrous: leaves ovate: peduncles glabrous or occasionally scabrous: achenes with rounded wing-tips or truncate.

Sinus of achenes 1–2.5 mm. deep, up to 3 mm. broad.....16. *S. dentatum.*

Achenes truncate.....Forma *nodum.*

Stem pubescent: leaves narrowly lanceolate: achenes with wing-tips at times slightly constricted at base of sinus.....Var. *angustatum.*

c. Involucral bracts becoming somewhat coriaceous in age, spreading erect, rounded at the apices: leaves basal or confined to the lower part of the stem; cauline, if present, mostly very greatly reduced....*o.*

o. Involucre 2.5–4 cm. broad; bracts in about three series, the outer only slightly shorter than the second and about half the length of the inner.

Petiole longer than the blade.

Leaves cordate, dentate.....17. *S. terebinthinaceum.*

Leaves pinnatifid or lobed.....Var. *pinnatifidum.*

Petiole shorter than the blade: leaf-blades tapering at base.....18. *S. rumicifolium.*

o. Involucre 1–2.5 cm. broad: bracts in three or four series, the inner gradually longer than the outer....*p.*

p. Leaves usually with petiole longer than the blade: achenes cuneate-obovate to obovate, 5–6.5 (–8.5) mm. long.

Leaf-blades longer than broad, variously cut or lobed or pinnatifid.

Involucres 1–2 cm. broad: leaves cut or lobed, sparsely pubescent (rarely rough pubescent) to glabrous.....19. *S. compositum.*

Involucres 1–1.5 cm. broad: leaves pinnatifid or pinnate with pinnae variously cut, glabrous....Forma *orae.*

Leaf-blades usually broader than long, merely dentate.....Var. *reniforme.*

p. Leaves with petiole shorter than or equaling the blade: achenes orbicular or suborbicular, 6–10 mm. long.

Involucre 1.5–2 cm. broad; achenes 6–8 mm. long; wing-tips somewhat triangular, at base of sinus about 2.5 mm. broad: smaller veins of leaves obvious.....20. *S. venosum.*

Involucre 2–2.5 cm. broad: achenes 8–10 mm. long; wing-tips rounded, at base of sinus 3.5–4 mm. broad: smaller veins of leaves inconspicuous. 21. *S. ovatifolium.*

b. Involucral bracts thick, becoming coriaceous in age, long-acuminate: leaves deeply pinnatifid or bipinnatifid.

Rays white: achenes oblong-oval with deep sinus (3–5 mm.) and awns tending to project beyond the wing-tips: stem 3–9 dm. high.....22. *S. albiflorum.*

Rays yellow: achenes obovate-oval with shallow sinus (2–3 mm.) and awns mostly short and inconspicuous: stems 18–24 dm. high.

Involucral bracts and peduncles hispid or scabrous, not glandular.....23. *S. laciniatum.*

Involucral bracts and peduncles hispidulous to pubescent and glandular.....Var. *Robinsonii.*

1. S. PERFOLIATUM L. Syst. ed. 10: 1232 (1759), Sp. Pl. ed. 2: ii. 1301 (1763); Gouan, Hort. Monsp. 462 (1762). *Resinocaulon perfoliatum* Lunell in Amer. Midl. Nat. v. 62 (1917). For further synonymy see Gray, Syn. Fl. i^2. 240 (1884), excluding *S. connatum* L. and *S. scabrum* Moench. Mass., Conn., Pa., Ohio, Ind., Ky., Tenn., Miss., Ill., Minn., Iowa, Mo., S. D., Neb., Kans. and Okla.

This species is so readily recognized that it seems unnecessary to cite specimens.

2. S. CONNATUM L. Mant. ii. 574 (1771); Willd. Sp. Pl. iii^3. 2332 (1804). W. Va., Va., and N. C. WEST VIRGINIA: rocky soil, Ganley Bridge, June 19, 1903, *Biltmore Herb.*, no. 4589c (US).[1] VIRGINIA: alluvial woods, along New River, near the Narrows, Giles County, *Griscom & Hunnewell*, no. 18731. NORTH CAROLINA: without data, *Schweinitz* (NY) and on the same sheet another specimen with no further data than Aug. 19, 1818, marked *S. connatum*.

Although this *Silphium* has been regarded as a mere variation of *S. perfoliatum* with hirsute stems and pubescent involucres, it is here retained as a species on account of the difference in the foliar character. In the original description Linnaeus points out that the leaves are sessile, not petiolate as in *S. perfoliatum*. Mr. Francis W. Hunnewell, who collected this species in Virginia, most kindly verified this leaf-

[1] Specimens cited are at the Gray Herbarium unless otherwise designated (NY, New York Botanical Garden; US, U. S. National Herbarium; B, Brooklyn Botanic Garden).

character and volunteered the information that the petiolate leaves are basal. Unfortunately, mature heads are too scarce for much dissection. The above citations represent all the material of this rare species in the three herbaria named.

3. S. ASPERRIMUM Hook. Comp. Bot. Mag. i. 99 (1835). *S. radula* Nutt. in Trans. Amer. Phil. Soc. vii. 341 (1840). Mo., Okla. and Texas. MISSOURI: Campbell, *B. F. Bush*, no. 6395. OKLAHOMA: Fonts, Lincoln County, August 26, 1895, *J. W. Blankinship*. TEXAS: without data, *Drummond*, no. 193, *Lindheimer*, no. 257 of Fasc. II; prairies, Dallas, *E. Hall*, no. 322; slopes and margins of creeks under thickets, New Braunfels, July, 1851, *Lindheimer*, no. 610; Sequin, *B. H. A. Groth*, no. 188; southwestern Texas, September, 1879 to October, 1880, *E. Palmer*, no. 599; western Texas, *Reverchon*, no. 89. Probably Texas (labeled N. Mex., 1852), *C. Wright*, no. 1408.

A plant fairly easy to recognize by its chiefly alternate leaves, coarse pubescence, large heads and broad-winged achenes. The following specimens are somewhat atypical, tending to have smooth stems and scabrous peduncles—OKLAHOMA: Clinton, *E. J. Palmer*, no. 12578. TEXAS: Dallas, June, 1875, *J. Reverchon;* Tarrant County, *A. Ruth*, no. 389.

4. S. SPECIOSUM Nutt. in Trans. Amer. Phil. Soc. vii. 341 (1840). *S. integrifolium*, β. *laeve* T. &. G. Fl. N. Am. ii. 279 (1842). *S. integrifolium*, var. *mesochorum* Benke in Rhodora, xxxiv. 10 (1932). Mo., Ark.?, Neb., Kans. and Okla. Plains of Arkansas, *Nuttall* (probably part of the TYPE-collection). MISSOURI: common along railroad, Sheffield, *Bush*, no. 1743; rocky woods, Southwest City, *Bush*, no. 10175. NEBRASKA: Verdigris River, *F. Clements*, no. 2724; Lincoln, August 4, 1898, *J. M. Bates* (in part); Red Cloud, July 27, 1903, *Bates*. KANSAS: prairie, Riley County, *J. B. Norton*, no. 251; banks of South Fork of Solomon River, within 5 miles of Osborne City, *C. L. Shear*, no. 179; Claflin, *H. C. Benke*, no. 5176 (TYPE-collection of *S. integrifolium*, var. *mesochorum*). OKLAHOMA: near Ponca, *G. W. Stevens*, no. 1916; Cherokee Nation, August 18, 1895, *J. W. Blankinship*.

This species is easily distinguished from *S. integrifolium* by its glabrous and glaucous stem and peduncles as well as by its larger and somewhat looser heads with more broadly ovate inner involucral bracts. Moreover, *S. speciosum* is a plant of the western prairie rather than of the central region of the United States. Possibly it intergrades with *S. asperrimum* causing the atypical specimens mentioned under that species.

5. S. INTEGRIFOLIUM Michx. Fl. Bor.-Am. ii. 146 (1803). *S. integrifolium*, var. *ternatum* Wood, Class Bk. ed. 2:336 (1847). Ind., Tenn.,

Miss., Ill., Mo. and Kans. INDIANA: sandy soils along the roadside, 2½ miles south of Purcell, *C. C. Deam*, no. 54304; sandy bank, Lake Cicotte, *R. C. Friesner*, no. 6419 (NY). MISSISSIPPI: prairies, Paenola County, August 18, 1898, *H. Eggert* (NY). ILLINOIS: without data, *Buckley;* near Olney, *R. Ridgway*, no. 787; Athens, August, 1863, *E. Hall* (B); prairies near Oquawka, *H. N. Patterson* (NY). MISSOURI: dry hills of prairie, St. Louis, *H. Eggert*, July 27, 1875, *Eggert* (B). KANSAS: Atchison County, August, 1866, *G. Scarborough* (B).

Var. **Deamii**, var. nov., var. *typicae* simillima differt involucris glanduloso-pubescentibus. Ind., Ala., Miss., Wisc., Ill., Ia., Mo. and Ark. INDIANA: right of way of railroad, ½ mile east of Dana, *Deam*, no. 54369; 1 mile east of Dana, *Deam*, no. 54376 (TYPE in Gray Herb.); along roadside, 1½ miles north of Tal, *Deam*, no. 21579; open sandy woods, East Chicago, *O. E. Lansing, Jr.*, no. 2577. ALABAMA: dry roadside thickets near Marion, September 1, 1885, *J. D. Smith.* MISSISSIPPI: Taylorville, *S. M. Tracy*, no. 8527. WISCONSIN: Milwaukee, *Lapham;* Madison, *N. C. Fassett*, no. 14970; prairies, Racine County, September, 1883, *H. E. Hasse* (NY). ILLINOIS: Fountaindale, *M. S. Bebb;* Stony Island, *H. H. Smith*, no. 6016; meadow on State St., near 81st St., Chicago, *J. M. Greenman*, no. 1969; thickets, Chicago, July 20, 1895, *W. S. Moffatt;* Champaign, August 2, 1899, *H. A. Gleason;* Bloomington, September 3, 1904, *B. L. Robinson;* Normal, August, 1886, *B. L. Robinson;* Peoria, August, 1904, *F. E. McDonald.* IOWA: Fayette, July, 1894, *B. Fink;* Deer Creek, Guthrie County, September 11, 1867, *J. A. Allen;* Keosauqua, *Pammel & Reese*, no. 1266 in part. MISSOURI: Martin City, *K. K. Mackenzie*, no. 38 (NY). ARKANSAS: Little Rock, *H. E. Hasse* (NY).

A somewhat wider geographic range and the glandulosity of the involucres are the only marked differences between var. *Deamii* (named for Mr. C. C. Deam who first called attention to the glandular pubescence of the involucres) and typical *S. integrifolium.* Mr. Weatherby very kindly examined the Michaux type at Paris in 1935 and found the involucres not glandular.

Var. **Gattingeri**, var. nov., involucri squamis ciliatis cetera glabris, interioribus elongato-oblongis obtusis exterioribus lanceolatis vel oblongo-lanceolatis; achaeniis apice lanceolato-acuminatis. TENNESSEE: Charlotte Pike, Nashville, July, 1886, *Gattinger* (TYPE in Gray Herb.).

This variety is distinguished from the typical by the glabrous involucres, the elongate-oblong and obtusish inner involucral bracts and the obovate-elliptic achenes with lance-acuminate wing-tips. Although in some specimens of typical *S. integrifolium* from Missouri the involucral bracts are almost glabrous (usually scabrous on the

upper exposed surface) the inner involucral bracts are ovate and the wing-tips of the achenes are broader; however, owing to the great variability of the character of the wing-tips and the fact that Deam's no. 54369 has very long narrow wing-tips it seems best to keep this distinctive specimen as a variety.

6. S. GRACILE Gray in Proc. Amer. Acad. viii. 653 (1873). LOUISIANA: prairies, Vinton, April 15, 1911, *R. S. Cocks* (NY); prairies, Fee, vicinity of Lake Charles, *K. K. Mackenzie*, no. 465 (NY).

TEXAS: Laporte, *Reverchon*, no. 3989; Cypress City, near Houston, *Reverchon*, no. 748; III, without data, *Drummond*, no. 193.

No other species with broad-winged achenes has so greatly reduced and remote cauline leaves.

7. S. REVERCHONI Bush in Rep. Mo. Bot. Gard. xvii. 125 (1906). TEXAS: Lindale, June, 1903, *Reverchon*.

The obvious characters of *S. Reverchoni* are the shaggy pubescence and the hirsute-hispid and long-ciliate involucral bracts. The heads are as large as some of those of *S. asperrimum*, but the former is readily distinguished from the latter by the narrowly lanceolate upper leaves as well as by the pubescence.

8. S. SIMPSONII Greene, Pittonia, iv. 44 (1899). FLORIDA: in damp ground in pine barrens, Palma Sola, July 8, 1890, *J. H. Simpson* (TYPE in U. S. Nat. Herb.); Bradentown, *S. M. Tracy*, no. 7473; hammocks, Myers, *A. S. Hitchcock*, no. 166.

The large nearly orbicular and very broadly winged achenes are a distinctive feature of this species.

Var. **Wrightii**, var. nov., petiolis et basi foliorum hispido-hirsutis; involucri squamis lanceolatis vel ovatis. LOUISIANA: without data, *Hale*. TEXAS: without data, 1848, *C. Wright* (TYPE in Gray Herb.); Kingsbury, Guadalupe County, *E. J. Palmer*, no. 11649.

Var. *Wrightii* differs from the typical in the longer pubescence of the petioles and petiolar bases, the more distinctly ovate or lanceolate involucral bracts and the non-glandular chaff-tips. Although without data, the Wright specimen, since it is a complete plant with base and mature fruit, has been chosen as the type.

9. S. GATESII Mohr in Contrib. U. S. Nat. Herb. vi. 793 (1901). Ga., Tenn., Ala., Mo., Ark. and Okla. GEORGIA: woods, west slope of Lookout Mountain, May 30, 1911, *J. R. Churchill*. TENNESSEE: fence-rows, Lookout Mountain, Aug. 29, 1883, *J. D. Smith;* dry rocky hillside, Bull Run, west of Nashville, *H. K. Svenson*, no. 7326. ALABAMA: woods, St. Bernard, June 26, 1934, *W. Wolf;* Tensaw, *S. M. Tracy*, no. 8937; without data, *Bigelow*, *Buckley*. MISSOURI: dry

rocky ground, Shannon County, July 22, 1891, *B. F. Bush;* Monteer, *Bush*, nos. 162, 6536; Pleasant Grove, *K. K. Mackenzie*, no. 350; rocky glades near Pontiac, *E. J. Palmer*, no. 33204. ARKANSAS: along Fayetteville-Goshen highway, June 26, 1923, *J. T. Bucholz* (NY). OKLAHOMA: Cherokee Nation, August 18, 1895, *J. W. Blankinship.*

The leaves of *S. Gatesii* vary greatly in width and, when the specimen shows the lower part of the stem as well as the tip, very often the upper leaves are broader than the lower. The TYPE, dry exposed sterile places, Cullman, Alabama, June 28, 1895, *C. Mohr* (US, no. 784332) is intermediate between the extremes. Achenes with a shallow sinus, somewhat acuminate involucral bracts and glandular-pubescent chaff-tips are the strongest characters of this species.

Forma **truncatum**, f. nov., achaeniis truncatis. TENNESSEE: vicinity of Nashville, August, *Gattinger* in *Curtiss N. A. Pl.*, no. 1386 (TYPE in Gray Herb.). ALABAMA: Tensaw, *S. M. Tracy*, no. 8010.

This form differs from the species only in the achenes which have a wing about 0.2 mm. wide and a truncate apex.

10. S. MOHRII Small in Bull. Torr. Bot. Cl. xxiv. 493 (1897). GEORGIA: Lookout Mountain, July, 1900, *A. Ruth* (NY). TENNESSEE: dry oak barrens, Tullahoma, *H. K. Svenson*, no. 4264; Cumberland Mountains, July, 1897, *J. M. Bain* (NY). ALABAMA: upland woods, St. Bernard, July 12, 1934, *W. Wolf*; Cullman County, Sept. 25, 1898, *Eggert* (NY).

This species is readily distinguished from *S. Gatesii*, the one most resembling it superficially, by the shaggy pubescence of the stem and leaves, the spreading-erect involucral bracts, the roundish-obovate achenes with spreading teeth and the hispid chaff-tips.

11. S. BRACHIATUM Gattinger in Bot. Gaz. ix. 192 (1884). TENNESSEE: mountain near tunnel at Cowan, Franklin County, July 14, 1867, *Gattinger*, August 15, 1886, *Gattinger* (NY); Cumberland Mountains, Franklin Co., Sept. 10, 1898, *Eggert* (NY). ALABAMA: dry woods on limestone slopes of plateau, southeast of Woodland Mills, Morgan County, *R. M. Harper*, no. 3112 (NY).

Definitely petioled leaves with truncate or subhastate bases and a very open glabrous inflorescence of small heads, involucres 1–1.7 cm. broad, 1–1.5 cm. high, are the outstanding characters of this very distinct species. Since its relationship to the remaining species of the genus is not obvious, it is interesting to note that Gattinger's collection has suborbicular achenes with the apex scarcely more than retuse and the wing about 1 mm. wide; Harper's no. 3112 has achenes

with a definite sinus and better developed wing. This is just one instance of the instability of the achene-characters.

12. S. atropurpureum Retz. in Willd. Sp. Pl. iii³. 2334 (1804). West Virginia: gravelly strand of stream, 2 miles west of White Sulphur, *L. F. & F. R. Randolph*, no. 1241. Virginia: rich dry woods, Great Neck, *Fernald, Griscom & Long*, no. 4711; Wytheville, July 25, 1875, *H. Shriver* (B).

In two of the three specimens at hand there are good elliptical achenes larger than any found in a series of specimens of *S. trifoliatum* and lacking the obovateness characteristic of those of the latter species. These achene characters and the hirsuteness of the petiole are the essential features of *S. atropurpureum*. It is surely very closely related to *S. trifoliatum* and further material may prove it to be only a variety of the latter. At present it seems best to look upon it as a rare and possibly a relic species maintaining itself in a few undisturbed spots.

13. S. trifoliatum L. Sp. Pl. ii. 920 (1753). *S. ternifolium* Michx. Fl. Bor.-Am. ii. 146 (1803). *S. ternatum* Retz. in Willd. Sp. Pl. iii³. 2333 (1804). Pa., Ohio and Ind. south to N. C. and possibly Tenn. Pennsylvania: meadows, Mercersburg, August, 1852, *T. C. Porter;* dry woods, 3 miles east of Waynesburg, *S. S. Dickey*, no. 65; Centre Co., *J. T. Rothrock*. Maryland: edge of woods along Chesapeake Canal, above Cabin John, *Leonard & Killip*, no. 663 (B). District of Columbia: Washington, September 30, 1901, *E. S. Steele*. West Virginia: dry field, White Sulphur Springs, July 4–6, 1914, *F. W. Hunnewell;* Great Cacapon, August, 1930, *W. M. Sharp;* Peter Mountain, *E. S. & Mrs. Steele*, no. 180. Virginia: about Mount Crawford, *Heller & Halbach*, no. 1291; Wytheville, August 31, 1878, *H. Shriver;* edge of woods, Clarendon, *S. F. Blake*, no. 10866; Bedford Co., August 1, 1871, *A. H. Curtiss;* Salt Pond Mountain, August, 1890, *W. M. Canby;* dry mixed woods, Little Neck, *Fernald & Long*, no. 4254; swampy woods, London Bridge, *Fernald & Long*, no. 4255. North Carolina: Asheville, *B. L. Robinson*, no. 38; open woods, Biltmore, *Biltmore Herb.*, no. 3434ᵇ. Ohio: Geauga Lake, *R. J. Webb*, no. 542; Hiram Township, July 18, 1904, *R. J. Webb;* Berea, July, 1897, *G. B. Ashcroft;* waste places, Richland County, August 18, 1893, *E. Wilkinson;* Columbus, October 1, 1904, *H. A. Gleason;* Turkey Creek bottoms, Friendship, *D. Demaree*, no. 10786. Indiana: dry clay soil along roadside, 2 miles northwest of Cherubusco, *C. C. Deam*, no. 54242; sandy roadside, about 5 miles northeast of Wolcottville, *C. C. Deam*, no. 54101; woods just north of Diamond Lake, *C. C. Deam*, no. 54136; woods on the north side of Crooked Lake, *C. C. Deam*, no. 54448.

Although the prevailing number of specimens collected have verticillate leaves, there are some, without question belonging to this species, with opposite and some with alternate leaves. As early as 1871 Curtiss collected a series of plants to show this variation in leaf-arrangement. In *Biltmore Herb.*, no. 3434[b], the achenes show a tendency to be truncate. One specimen from TENNESSEE, *Poorland Creek*, Union County, *J. K. Underwood*, no. C. C. D. 130, is cited with some hesitation. The achenes are broader and shorter than in the typical and the peduncles are sparsely hispidulous.

Forma **praecisum**, f. nov., achaeniis truncatis. VIRGINIA: Lexington, August 28, 1924, *J. R. Churchill* (TYPE in Gray Herb.).

Differing from the typical only in that the achenes are truncate and the wing-margin is reduced.

Var. LATIFOLIUM Gray, Syn. Fl. N. A. i.[2] 241 (1884). *S. laevigatum* Ph. Fl. Am. Sept. ii. 578 (1816); Ell. Sk. ii. 466 (1823). *S. glabrum* Eggert in Small, Fl. Se. U. S. 1243, 1340 (1903). S. C., Ohio, Ind., Tenn. and Ala. SOUTH CAROLINA: Santee Canal, *Ravenel.* OHIO: Berlin Heights, August 15, 1914, *L. H. MacDaniels.* INDIANA: along creek, about 3 miles north of Salem, *C. C. Deam,* no. 9410. TENNESSEE: dry fields, Grand Junction, *H. K. Svenson,* no. 4361 (B). ALABAMA: Tuscaloosa, 1878, *G. R. Vasey;* prairies, July, 1840, *Buckley;* rocky mountain sides, Blount County, August 27, 1884, *J. D. Smith;* chalk barrens, West Greenville, *Harper & Svenson,* no. 7385 (B); chalk prairie about 2 miles northwest of West Greene, *R. M. Harper,* no. 3427 (B).

The achenes and inflorescence of var. *latifolium* are not separable from those of typical *S. trifoliatum.* In all the collections noted the leaves are opposite and smooth. Unfortunately the basal leaves are lacking from all except *Harper*, no. 3427, *Harper & Svenson*, no. 7385 and *J. D. Smith.* The first two have basal leaves with very short petioles as in *S. confertifolium* but the cauline leaves are more numerous and the achenes have not the shallow sinus characteristic of those of the latter species. This character of the basal leaves is something which should be carefully observed in field work.

14. S. CONFERTIFOLIUM Small, Fl. Se. U. S. 1243, 1340 (1903). ALABAMA: Cocoa, Choctaw County, October 13, 1896, *C. Schuchert* (TYPE in New York Bot. Gard.).

At present this species is separable from *S. trifoliatum*, var. *latifolium* by the fewer and greatly reduced stem-leaves, and the shallower sinus and blunter wing-tips of the achenes. The specimens, *Harper*, no. 3427 and *Harper & Svenson*, no. 7385, make the basal

leaf-character of little value or they rightfully belong to this species and the achene character is inconstant. Too often in this genus a single specimen or two or three plants will appear to have distinctive characters which, as a matter of fact, break down in a good series of representative material.

15. S. Asteriscus L. Sp. Pl. ii. 920 (1753). *S. scabrum* Walt. Fl. Carol. 217 (1788)? *S. scaberrimum* Ell. Sk. ii. 466 (1823)? *S. helianthoides* Greene, Pittonia, iv. 43 (1899). N. C., Tenn., Ala., Mo., Ark. and Okla. North Carolina: Cullowhee, 1887, *R. Thaxter;* vicinity of Faith Post Office, Rowan County, August 14, 1891, *Small & Heller;* rich sandy bank, 10 miles south of Greensboro, *Wiegand & Manning*, no. 3322. Tennessee: Knoxville, August 29, 1900, *A. Ruth.* Alabama: no data given. Missouri: Shannon County, *B. F. Bush*, no. 34. Arkansas: low shaded woods, Hot Springs, *F. J. Scully*, no. 364. Oklahoma: near Idabel, *H. W. Houghton*, no. 3902.

A composite set of citations, recorded here with great reluctance. Of all the species of this genus of unstable characters, *S. Asteriscus* has been the most difficult to define. In the Linnean Herbarium there is no type-specimen but Dr. Gray has chosen the type thus, "Spec. ii. 920 (*Dill. Elth.* t. 37, f. 42)." On looking over the Linnean description and references, this seems logical. Hort. Cliff. 494, is without description and merely directs one's attention to the work of Dillenius. Gronovius's description is somewhat questionable, and no specimens from Virginia have been referable to this species. Granted that the Dillenian plate has been accepted as the type, the question now arises which of the entities included at some time in this species is the true *S. Asteriscus*. *S. Gatesii, S. dentatum and S. scaberrimum* all have possibilities in an attempt to match the Dillenian plate. By process of elimination *S. Gatesii* was rejected as it is not found in Carolina. It has been harder to make the choice between the other two. Unfortunately none of Elliott's types of *Silphium* are in his herbarium at the Charleston Museum and, although various leads have been followed up, the types have not been located. With the aid of specimens *S. dentatum* is reasonably easy to interpret, but *S. scaberrimum* is puzzling. Since the majority of specimens of *S. dentatum* have glabrous stems and peduncles it seems reasonable to conclude that Dillenius probably did not have this plant. *S. scaberrimum* is left. The type-locality of this species is "in the western districts of Georgia." Although the plants named *S. scaberrimum* by Dr. Gray seem to fit the description, at least superficially, they belong to an

entirely different species-relationship (assuming *S. scaberrimum* belongs in the narrow-winged achene-group) and have a different range (Texas and Louisiana). In the herbarium of the New York Botanical Garden there are specimens from the mountains of Georgia labeled *S. scaberrimum* which appear comparable to the ones above cited from North Carolina and Tennessee; so, for lack of a better disposition of this puzzling species, *S. scaberrimum* is here taken to be a synonym of *S. Asteriscus*.

16. S. DENTATUM Ell. Sk. ii. 468 (1823). *S. Elliottii* Small, Fl. Se. U. S. 1243 (1903). *S. incisum* Greene, Pittonia, iv. 45 (1899). N. C. to Ga. and Ala. NORTH CAROLINA: sandy soil near Chimney Rock, *Biltmore Herb.* no. 7415; without data, *Gray.* SOUTH CAROLINA: sandy roadside bank, 4 miles south of Kingstree, *Wiegand & Manning*, no. 3326; Greenville, July 21, 1881, *J. D. Smith.* GEORGIA: lowland by river, Athens, *L. M. Perry*, no. 1092; base of Stone Mountain, July 4, 1893, *J. K. Small;* open woods, base of Stone Mountain, *A. H. Curtiss*, no. 6515; alluvial banks of Bull Creek, 4 miles east of Columbus, September 7, 1883, *J. D. Smith;* middle Georgia, 1846, *T. C. Porter.* ALABAMA: Talladega County, *F. S. Earle*, no. 984 (TYPE of *S. Elliottii*, NY).

This is indeed a variable species but no combination of characters has been found by which it may be broken up. The specimens from North Carolina, South Carolina and the Piedmont region of Georgia have glabrous stems and peduncles, and opposite or alternate leaves. The collections, *J. D. Smith* and *Earle*, no. 984, have pubescent peduncles, and *T. C. Porter* has a pubescent upper stem. The sinus of the achenes varies from 0.5 to 1.5 mm. deep and the wing-tips are rounded or obtuse. Several specimens labeled *S. Elliottii* seem to have been collected from the same localities as *S. dentatum* and surely show no more than a variation in the leaf-margin. *S. incisum* Greene looks like an abnormal plant of this species.

Forma **nodum** (Small), comb. nov. *S. nodum* Small, Man. 1413 (1933). SOUTH CAROLINA: Charleston Neck, 1855, *L. R. Gibbes* (TYPE of *S. nodum*, NY); Troy, *J. Davis*, no. 2046. GEORGIA: McGuire's Mill, Gwinnett County, *Biltmore Herb.*, no. 7415[b].

Var. **angustatum** (Gray), comb. nov. *S. Asteriscus*, var. *angustatum* Gray, Syn. Fl. N. A. ed 2: i[2]. (suppl.) 449 (1886). *S. lanceolatum* Nutt. Trans. Amer. Phil. Soc. vii. 341 (1840). *S. angustum* Small, Fl. Se. U. S. 1244 (1903). GEORGIA: dry pine-barrens about 3 miles south of Moultrie, *R. M. Harper*, no. 1947. FLORIDA: Chattahoochee, September 3, 1884, *A. H. Curtiss* (TYPE of *S. Asteriscus*, var. *angustatum*), *Curtiss*, no. 5946; River Junction, *G. V. Nash*, no. 2379; sandy roadside by woods, 4 miles west of Madison, *Wiegand & Manning*, no. 3323.

This is a slenderer and perhaps a smaller plant than the typical. Very little of the material seen yields mature achenes; those found do not justify raising this to specific rank, although the narrowly lanceolate leaves and the pubescent stem with relatively few heads render it strikingly different from the typical in general appearance. The last cited specimen has a heavier stem, broader leaves and unusually large heads. This is perhaps owing to the cultivation it may have received on the roadside.

17. S. TEREBINTHINACEUM Jacq. Hort. Vindob. i. 16, t. 43 (1770). Ont., Mich. and Wisc. south to Tenn. and Mo. ONTARIO: Windsor, *Macoun* (NY). MICHIGAN: introduced, Burt Lake, *F. C. & M. T. Gates*, nos. 9248, 9830 (B). OHIO: Toledo, Aug. 11, 1884, *H. A. Young*. TENNESSEE: dry open ground, Knoxville, *A. Ruth*, no. 65. WISCONSIN: without data, *I. A. Lapham;* South Madison, August 30, 1893, *J. R. Churchill;* Madison, *N. C. Fassett*, no. 14975. ILLINOIS: without data, *Buckley;* South Chicago, *H. H. Smith*, no. 5736; Napierville, August 24, 1897, *L. M. Umbach;* Aurora, August, 1883, *T. E. Boyce;* Urbana, *A. S. Pease*, no. 12490; Normal, August, 1886, *B. L. Robinson;* Peoria, August, 1904, *F. E. McDonald;* Augusta, August, 1847, *S. B. Mead*. MISSOURI: Meramec Heights, *E. E. Sherff*, no. 1137; Green County, September 13, 1890, *S. Weller*.

Var. PINNATIFIDUM (Ell.) Gray. Man. ed. 1:220 (1848). *S. pinnatifidum* Ell. Sk. ii. 462 (1823). *S. chicamaugense* Canby in Bot. Gaz. xxvii. 319 (1899). Ga., Ohio, Tenn. and Ala. GEORGIA: along Chickamauga Creek, near Ringgold, August 6–12, 1895, *Small* (NY). OHIO: without data, *Sullivant*. TENNESSEE: Cedar Glades, Lavergne, *Gattinger* (NY); Rutherford County, September 7, 1898, *H. Eggert* (NY). ALABAMA: near Huntsville, October, 1843, *Rugel* (NY).

18. S. RUMICIFOLIUM Small in Bull. Torr. Bot. Cl. xxv. 145 (1898). TENNESSEE: dry sterile soil, Knoxville, *A. Ruth*, no. 4024 (TYPE in New York Bot. Gard.).

The heads of *S. rumicifolium* and of *S. terebinthinaceum* are too much alike to give the former clear-cut definition. Although the leaves are of different outline, further material is needed to justify keeping this plant as a species.

19. S. COMPOSITUM Michx. Fl. Bor.-Am. ii. 145 (1803). *S. laciniatum* Walt. Fl. Carol. 217 (1788), non L. *S. sinuatum* Banks ex Pursh, Fl. Am. Sept. ii. 577 (1816), in synon. *S. terebinthinaceum*, var. *sinuatum* Curtis in Bost. Journ. Nat. Hist. i. (reprint) 103, 127 (1834?). *S. nudicaulis* Curtis in Bost. Journ. Nat. Hist. i. 127 (1837?). *S. compositum* α. *Michauxii* T. & G. Fl. N. A. ii. 276 (1842). *S. collinum* Greene, Pittonia, iv. 44 (1899)? *S. lapsuum* Small, Man. 1411 (1933). Va. to Ga. and Tenn. VIRGINIA: dry woods, Blackwater School, *Fernald, Long & Smart*, no. 5943; dry sandy pine woods about 3 miles

southeast of Petersburg, on headwaters of Blackwater River, *Fernald, Long & Smart*, no. 5944. NORTH CAROLINA: clearings around Highlands, August 29, 1882, *J. D. Smith;* open woods, summit of Satoola Mountain, Macon County, August 30, 1882, *J. D. Smith;* Cullowhee, June–July, 1887, *R. Thaxter;* dry woodlands, near Biltmore, *Biltmore Herb.*, no. 4595b; middle country of N. C., August, 1841, *Gray & Carey*. SOUTH CAROLINA: dry oak-pine woods, 2 miles north of Kingstree, *Wiegand & Manning*, no. 3329; open woods, Caesar's Head, August 13, 1881, *J. D. Smith*. GEORGIA: North Georgia, 1875, *C. Wright;* oak woods, Augusta, July 17, 1898, *A. Cuthbert* (TYPE of *S. lapsuum*, NY). TENNESSEE: Wolf Creek, August 30, 1898, *A. Ruth*, no. 59.

The specimen collected at Caesar's Head has achenes with narrower wing than in the typical and with a tendency for the awns to disappear; some achenes are almost truncate and others have short awns. In the specimen, *C. Wright*, the leaves are as broad as or broader than long, toward var. *reniforme*, and in *A. Cuthbert* one of the plants has a scabrous upper leaf-surface. The synonymy is sufficient to indicate that this is a variable species. Several collectors have recently reclaimed this species for the manual range, but it is recorded in early botanical works by both Pursh and Curtis. The latter says "I have traced this plant through the lower part of this State [North Carolina] into Virginia and S. Carolina, and find it constantly preserving its character."

Forma **orae** (Small), comb. nov. *S. orae* Small, Man. 1411 (1933). NORTH CAROLINA: Wilmington, *M. A. Curtis* (TYPE of *S. orae*, NY); Southern Pines, July 19, 1895, *J. W. Blankinship;* dry sandy bank by woods, 12 miles west of Cary, *Wiegand & Manning*, no. 3328; Cumberland Co., 1845, *Curtis;* dry sandy soil, open woods, Rockingham, *L. F. & F. R. Randolph*, no. 1051. SOUTH CAROLINA: dry sandy oak woods, 10 miles south of Monks Corner, *Wiegand & Manning*, no. 3330.

This differs from *S. compositum* in the more finely cut or pinnatifid leaves.

Var. RENIFORME (Raf. ex Nutt.) T. & G. Fl. N. A. ii. 276 (1842); Syn. Fl. i². 242 (1884). *S. reniforme* Raf. Med. Fl. ii. 263 (1830), name only; Nutt. in Trans. Amer. Phil. Soc. vii. 342 (1840). *S. terebinthinaceum sensu* Ell. Sk. ii. 463 (1823), non Jacq. VIRGINIA: on disintegrating shale, vicinity of Millboro, August 31, 1906, *E. S. Steele*. NORTH CAROLINA: Burke, *M. A. Curtis;* Highlands, September, 1906, *T. G. Harbison*.

The first two specimens named have slightly scabrous or pubescent leaf-surfaces; the third is perfectly smooth.

20. S. VENOSUM Small in Bull. Torr. Bot. Cl. xxv. 478 (1898). GEORGIA: St. Mary's River swamp, below Trader's Hill, Charlton County, June 12–15, 1895, *J. K. Small* (TYPE in New York Bot. Gard).

A very distinct species with involucres up to 2 cm. broad and suborbicular achenes with acute wing-tips.

21. S. OVATIFOLIUM Small, Fl. Se. U. S. 1242, 1340 (1903). *S. compositum*, γ. *ovatifolium* T. & G. Fl. N. A. ii. 277 (1842); var. *ovatifolium* Gray, Syn. Fl. i². 241 (1884). FLORIDA: without data, *Chapman;* near Aspalaga, July 1843, *Rugel* (NY); dry pine barrens, near Argyle, *A. H. Curtiss*, no. 5941; dry sandy oak woods, 2 miles east of Alachua, *Wiegand & Manning*, no. 3331.

A species with markedly variable leaves but rather distinctive orbicular achenes with obtuse wing-tips and narrow sinus.

22. S. ALBIFLORUM Gray in Proc. Amer. Acad. xix. 4 (1884). TEXAS: Dallas, June, 1878, also 1883, *J. Reverchon;* dry hills, Polytechnic, July 10, 1912, *A. Ruth*, no. 71; plains, Tarrant County, June 25, 1911, *A. Ruth*, no. 71; Weatherford, *S. M. Tracy*, no. 8330.

The venation of the leaves is more noticeable in this species than in *S. laciniatum*.

23. S. LACINIATUM L. Sp. Pl. ii. 919 (1753); Robinson in Bot. Gaz. xvi. 114, 115 (1891). Wisc., Ill., Minn., south to Oklahoma and Texas. WISCONSIN: Shutesbury, July 23, 1883, *W. H. Manning*. ILLINOIS: without data, *S. B. Mead;* South Chicago, *H. H. Smith*, no. 5707; Champaign, July 26, 1899, *H. A. Gleason;* Champaign, *A. S. Pease*, no. 12410; Bloomington, August, 1886, *B. L. Robinson;* dry prairies, Peoria, July, 1890 and September, 1891, *Frank E. McDonald*. MINNESOTA: Millpond, near Pine Island, Goodhue County, July 13, 1891, *E. A. Mearns*. IOWA: Dallas County, August 1, 1867, *J. A. Allen;* prairies, Decatur County, July 21, 1897, *T. J. & M. F. L. Fitzpatrick*. MISSOURI: Nevada, *W. L. McAtee*, no. 3049. KANSAS: prairies, Riley County, *J. B. Norton*, no. 252. OKLAHOMA: near Tonkana, *G. W. Stevens*, no. 1819. TEXAS: Dallas, June, 1875, *J. Reverchon*.

A second sheet collected by *Mead* in Illinois shows the upper leaves practically entire. This appears to be only an extreme form of variable foliage.

The above collections and those of the variety below have hitherto been known as *S. laciniatum*. There is, however, a difference in the pubescence and the distribution of the two. The collections of more southern range usually have the involucres and chaff, and often the stems, copiously glandular or, in the older specimens, as if the resinous juice had oozed out in minute droplets. This would naturally be taken for the typical variety, since Linnaeus cited his type as "Mis-

sissippi. *Collinson*." Mr. C. A. Weatherby, who most obligingly examined the type for me, found the specimen was not actually collected in "Mississippi" but from a plant grown in the Upsala garden, and it was *not glandular*. This is rather surprising in view of Linnaeus's description, "Caulis . . . inferne laevis, superne tuberculis fuscis pilisque patulis albis scaber." However, the northern and more wide-spread plant is to be regarded as the typical and the southern is here set forth as var. *Robinsonii* in tribute to Dr. B. L. Robinson who, as early as 1891, carefully described this variation and asked for information concerning its range and the possible occurrence of intermediate forms.

Var. **Robinsonii**, var. nov., cauli et involucris glandulosis exigue scabro-hirsutis vel hispidis. Ky., Ala., Miss., La. and Okla. KENTUCKY: barrens, 1835, *C. W. Short* (TYPE in Gray Herb.). ALABAMA: ½ mile northwest of Rosemary, *R. M. Harper*, no. 3251 (NY); chalk barrens, West Greenville, *Harper & Svenson*, no. 7384. MISSISSIPPI: Agricultural College, Oktibbeha County, *C. L. Pollard*, no. 1333. LOUISIANA: without data, *Hale* in part. OKLAHOMA: open place in woods, near Page, *G. W. Stevens*, no. 2740.

II. THE NOMENCLATURE OF THE VERTICILLATE EUPATORIA

K. M. WIEGAND AND C. A. WEATHERBY

(Plates 466–468)

THE purple-flowered, verticillate-leaved Eupatoria of eastern North America have had a confused and highly unsatisfactory nomenclatural history. Linnaeus described two species in the group in 1753, *Eupatorium trifoliatum*, and *E. purpureum*, with an unnamed variety; and in 1755 he added a third, *E. maculatum*. For our present purposes it is not necessary to trace in detail the ineffectual struggles of Linnaeus's successors to apply his three names and to account for the different variants concerned. It will be enough to consider somewhat the work of the three American authors who have especially studied the group.

These are: Dr. Joseph Barratt,[1] the senior author of this paper,[2]

[1] Eupatoria Verticillata. Middletown, Connecticut. 1841. 1 folio sheet. For an account of this rare little work, see RHODORA xxiii. 173 (1921).

[2] RHODORA xxii. 57–70 (1920).

and Mr. K. K. Mackenzie.[1] The last two were in perfect taxonomic agreement; and although he subdivided one of three species which he knew, Barratt's treatment is in essential accord with theirs. But no two applied the Linnaean names alike. The following table shows the different nomenclatural schemes; the numbering of species is that used by Wiegand and Mackenzie.

	Barratt	Wiegand	Mackenzie
1.	E. maculatum L. E. ternifolium Ell.	E. verticillatum Lam.	E. purpureum L.
2.		E. maculatum L.	E. Bruneri Gray
3.	E. fistulosum Barratt	E. purpureum L.	E. maculatum L.
4.	E. purpureum L.	E. falcatum Michx.	E. trifoliatum L.[2]

This was a truly lamentable, indeed an intolerable, condition. Since it arose because, for various reasons, all three authors had depended chiefly on their interpretations of the descriptions and citations of Linnaeus,[3] the obvious remedy was to look up whatever specimens were back of the original literature and, whether or not they proved technically types, to treat them as such, as the only possible basis of future uniformity. Accordingly, in 1935, the junior author undertook to examine, so far as possible, the extant material concerned; and, through the kindness of the authorities of the Rijksherbarium at Leiden, the British Museum, the Linnean Society of London and the botanical establishment of Oxford University, he was able to see, we believe, all that remains. The result is happy in that it establishes beyond reasonable doubt, the claim of Linnaeus's specimens to be taken as types of his species; it is far less pleasing in that it compels a fourth arrangement of the names. But at least it places that arrangement on a definite basis of actual, existent herbarium material (the object and peculiar virtue of the "type method") and in so far may hope for permanence.

Before considering Linnaeus's own specimens, it may be well to

[1] Rhodora xxii. 157–165 (1920) and xxix. 6–9 (1927).

[2] As will later appear, each author was right as to one of the Linnaean names, none right as to more than one.

[3] Barratt, indeed, consulted Dr. Gray, then just back from his first European journey, as to the identity of the Linnaean specimens. The senior author studied poor photographs of them in the Gray Herbarium, and Mackenzie later procured others. In neither case did they prove wholly reliable guides.

How far astray one may go by the purely interpretative method is well illustrated by Mackenzie's insistence that Linnaeus's description of *E. purpureum* was drawn from a specimen of species no. 1. As will appear later, there is every evidence that the description was drawn from all the Linnaean specimens, none of which is species no. 1.

TYPE OF EUPATORIUM PURPUREUM IN HERBARIUM OF LINNAEUS

STERILE SPECIMEN OF EUPATORIUM PURPUREUM IN HERBARIUM OF LINNAEUS

clear the way by some account of those representing his synonyms. Under *E. purpureum*, Linnaeus placed citations from Colden, Gronovius, Cornut and Morison. No specimens of Colden or Cornut are known to exist. Clayton 162, the collection on which the Gronovian reference rests, cannot be found at the British Museum. Some wretched scraps of Morison's are extant—two small branches of a young inflorescence and a single detached leaf. They may be species no. 2, but are hardly to be certainly identified. Fortunately, since he merely took his plate and description from Cornut, his specimens are of little importance in determining anything. So far, then, as existing herbarium material is concerned, *E. purpureum* depends wholly on what Linnaeus himself had.

The case of *E. maculatum* is not so simple. Under *E. purpureum* β (later included in *E. maculatum*), Linnaeus cited his own Hortus Cliffortianus, Royen, Hermann, Morison and Ray. No specimens of Royen (who, in any case, merely cited Hort. Cliff.) nor of Hermann are known. A Clifford specimen is preserved at the British Museum; it is species no. 1 (*E. verticillatum* of Wiegand). Morison and Ray merely applied Hermann's phrase-name, but it is of some interest, as showing their interpretation of it, to note that Morison's specimen, though again a mere fragment, is probably species no. 1 and that the Vernon collection cited by Ray certainly is. Hermann's plate in all probability represents the same species and was so assigned both by the senior author and by Mackenzie. The variety, therefore, was originally quite consistent; had Linnaeus been content merely to raise it to specific rank, all would have been well. Unfortunately for us, he, or Juslenius, in proposing *E. maculatum*, associated with these citations a specimen or specimens from which the description was drawn and which, therefore, must determine the application of the name.

Linnaeus's own specimens are three in number. One is labelled in his hand "11. H. U. purpureum." A photograph of it, procured for us by the courtesy of the Linnean Society, is reproduced in plate 466. It will be noted that this shows a condition to be found in an occasional individual in almost any large colony of verticillate Eupatoria, in which the leaves are not exactly opposite in the whorl. The stem has been shaved off on one side to reduce thickness and one or more leaves of the lower whorl have probably been removed thereby. The leaves are rather thin, nearly glabrous and smooth above, pubescent on the

nerves beneath with weak, multicellular hairs up to 1 mm. long. The stem is greenish. The branches of the inflorescence are densely sordid-puberulous. The involucres are 6 mm. high, the corollas about 5.5 mm. long, projecting 2.5–3 mm. The inflorescence is so matted together in pressing that it is not possible to make out clearly the number of florets without detaching and dissecting a head—and one does not do that with Linnaean specimens.

Pinned to the sheet bearing this specimen is another (plate 467) containing the top of a young sterile shoot obviously of the same species. On this sheet Linnaeus has written: "genicul. purpurp."—nodes purple.

The third sheet (plate 468) is labelled, also in Linnaeus's hand, "K 11 maculatum" and at the base of the stem is written "fl. 8 maculatum." In this specimen the leaves are thicker than in nos. 1 and 2, glabrous above except for a short puberulence on the nerves. From the little of the lower surface which can be seen, they seem to be rather densely glandular and more or less pubescent beneath. The branches of the inflorescence and the stem to the first whorl of leaves are densely sordid-pubescent; below the stem is glabrous, rather evenly purple, but with faint darker lineolae. The involucre is 7.5 mm. high. Except in one or two heads the corollas are scarcely developed, but appear to be 5.5–6 mm. long.

For the sake of clarity of discussion it may be well at this point to quote the original diagnosis and description of *E. purpureum*. They are:

EUPATORIUM foliis subverticillatis lanceolato-ovatis serratis petiolatis rugosis . . .

Caulis *teres, erectus, viridis, punctis linearibus longitudinalibus purpurascentibus.* Folia *terna, quaterna, s. sena, lato-lanceolata s. lanceolato-ovata, serrata, rugosa, scabriuscula, petiolata, utrinque viridia.* Corymbus *terminalis.* Calyces *florum incarnati.* Flosculi *octo, Corollis albidis, Antheris purpureis, stylis longissimis.*

There is nothing here which could not have been taken from one or another of Linnaeus's specimens, and there are certain phrases which must have been. "Foliis subverticillatis," "caulis viridis," "folia terna" apply to specimen no. 1; "flosculi octo" is Linnaeus's own inscription on specimen no. 3; "corollis albidis" would naturally come from observation of the plant in the Upsala garden (specimen no. 1). And no such characters as these are mentioned in any of the literature cited.

The original diagnosis and description of *E. maculatum* as published in Centuria I Plantarum 27 (1755) was as follows.

EUPATORIUM (*maculatum*) foliis quinis, lanceolatis, aequaliter serratis, petiolatis, venosis.

Descr. Folia quinque ad genicula, lanceolata, aequaliter serrata. *Caulis* tenuissime maculatus. Varietas *Eupatorii purpurei* ad hoc, ut & ejus synonyma & descriptio spectant. Eupatorium enim *purpureum* foliis quaternis, lanceolato-ovatis, inaequaliter serratis, rugosis est.

Mackenzie pointed out that in editing this for the Amoenitates Linnaeus added "tomentosis" to the diagnosis and "vel sex" to the description (thus bringing them into better accord with his own specimen) and that Kalm is not cited as collector though he is so cited in other passages of the Centuria. From this and from the fact that the leaves are described as in fives but are actually in sixes in the Linnaean specimen, Mackenzie argued that the description must originally have been drawn from some other specimen. The possibility may be admitted. It may even be added that Linnaeus's account of the leaves as ovate-lanceolate in *E. purpureum* and lanceolate in *E. maculatum* is not borne out by his specimens, in which there is little difference in the shape of the leaves (and what there is rather in the reverse direction) and that this also might be interpreted as indicating the use of other material.

But all this is guess-work. It might also be *guessed* that Linnaeus drew his "quinis" from the circumstance that in his specimen no. 3 one of the leaves of the lower whorl is partly broken off behind the stem so that at first glance the whorl appears to consist of five leaves only; and that the additions in the Amoenitates were merely a perfecting of the description. And much can be explained on the ground of pure carelessness. In any case, the fact remains that Linnaeus's specimen was obviously included in his conception of the species and that it is all we now have to represent that conception. We must either take it as representative or resign ourselves to mere speculation.

Further evidence is to be found in Linnaeus's annotated and interleaved copy of the first edition of the Species Plantarum. From the original diagnosis of *E. purpureum* he has here crossed out "subverticillatis" and substituted "quaternis," and before "serratis" has inserted "inaequaliter." On the interleaf opposite he wrote: "Folia quina, ovato-lanceolata inaequaliter serrata et fere [word illegible] Genicula caulis ferruginea. Flores ut in sequenti sed panicula parva diversa."[1] Under var. β he crossed out both the citations and the

[1] Linnaeus's handwriting is here presumably hasty and far from readily legible. But with the kindly aid of Messrs. Savage and Pugsley of the Linnaean Society and Dr. Uggla of Upsala, who happened to be at Burlington House at the time, working on Linnaeus's correspondence, all but one word was definitely made out.

description following. Opposite the former he wrote in on the interleaf the diagnosis of *E. maculatum* as published in the Amoenitates. He first wrote "foliis subverticillatis" but crossed out the latter word and substituted "quinis." Below, opposite the description, he wrote: "folia [4s. crossed out] 5 ad genicula lanceolata aequaliter serrata caulis tenuissime maculatus. Ergo differt foliis aequaliter serratis."

There is no direct evidence to show whether these notes were made before or after the publication of the Centuria; in character, however, they are the memoranda of one seeking tenable marks of distinction between two contemplated species, and would, most probably, have come before. In them, the phrase "genicula caulis ferruginea" is a paraphrase of the note accompanying specimen no. 2; "panicula parva diversa" not only accurately described specimen no. 1 as contrasted with no. 3 (see plates), but could have sprung from no other extant source. The crossing out of "foliis subverticillatis" would have been the natural result of discovering, or suspecting, that this was not the normal condition. And though "aequaliter" and "inaequaliter" are not, to our eyes, accurately descriptive terms for it, there is a difference in the serration of the leaves. The teeth in specimen no. 3 are distinctly narrower, more falcate, and more sharply pointed than in nos. 1 and 2. And again this distinction could have been drawn only from these specimens or others like them.

Finally, for the second edition of the Species Plantarum, Linnaeus wrote a revised description of *E. purpureum*, omitting the phrase "punctis linearibus longitudinalibus purpurascentibus," which applied to specimen no. 3 and substituting "ad exortum petiolorum purpurascens" which describes specimens 1 and 2. The deleted phrase about the punctate stem he transferred to *E. maculatum*. Presumably through haste or carelessness he did not transfer "flosculi octo" which should also have gone; and he allowed the "folia quina" written into his notes to stand in the description, though in the formal diagnosis the number is given, correctly for specimen 2, as four.

Mackenzie argued that one should not go beyond what Linnaeus did in the first edition. With this we could agree if the subsequent changes were real changes. But if, in his later contributions, Linnaeus merely attempted to clarify his first treatment, these should be given weight. Apparently, almost certainly, this is exactly what he was trying to do.

We have, then, three specimens, two from the Upsala garden, repre-

TYPE OF EUPATORIUM MACULATUM IN HERBARIUM OF LINNAEUS

senting a plant which Linnaeus must have seen growing, and one from Kalm, whose collections he named. He certainly studied them to the extent of making descriptive notes on two of the sheets; and there is every evidence that the annotations which accompany his attempts to distinguish his two species were drawn largely from them. Nos. 1 and 2 are the only material extant to represent his conception of *E. purpureum;* and, even if other specimens were used in drawing up the original description of *E. maculatum* (as distinguished from the citations associated with it), no. 3 is all that remains. That Linnaeus's work was, by modern standards, none too accurate for these particular specimens, does not matter; what is important is that he did work with them. They have every claim to be taken as types—indeed, there is no other reasonable alternative.

Now as to their identity. The combination, in specimens 1 and 2, of solid stem with purple color only at the nodes, leaves in threes or fours, somewhat soft-pubescent beneath and with broad, but pointed, serrations, and (young) corollas 5.5 mm. long, plus the general habit, places these specimens definitely in species no. 4, *E. falcatum* of Wiegand's treatment, *E. trifoliatum* of Mackenzie's.[1] It is interesting that Torrey & Gray and later Gray himself, as judged by their text comments, interpreted *E. purpureum* in this sense, though, as shown by their joint and several determinations of specimens, they had no very clear idea of its characters and confused it with *E. fistulosum* Barratt (species no. 3). Barratt, as noted above, applied the name *E. purpureum* as did Torrey and Gray. So did Britton, Ill. Fl. ed. 2, iii. 357 (1913), at least so far as his figure and synonymy are concerned.

Specimen no. 3 is quite clearly species no. 2, *E. maculatum* of Wiegand's treatment, *E. Bruneri* of Mackenzie's. The leaves are in sixes, a number frequent also in species 3, but the stem is solid and is still faintly lineolate, the leaves are more sharply serrate than is usual in species 3 and the whole aspect is that of species 2. The florets are, as stated by Linnaeus, eight, a rather low number for species 2, but high for species 3. The length of the corollas, if accurately measured, is within the maximum for the species, as shown by several indubitable specimens in the Gray Herbarium. Coulter & Nelson, Man. Rocky Mt. Fl. 485 (1909) appear to be the only authors previous to Wiegand who have applied the name *E. maculatum* in this sense.

[1] This determination was made by the junior author in London. On his return, he submitted the photographs here reproduced and his notes, but not his determination, to the senior author who made the same determination independently.

Most writers have, following the Linnaean citations, used it for species 1.[1]

E. trifoliatum L. was based primarily on a citation from Gronovius and this on Clayton's specimen no. 620. This specimen was inspected by Blake[2] and later by the junior author. It is species 4, *E. purpureum* as we now understand it. *E. trifoliatum*, which precedes *E. purpureum* in the Species Plantarum, was apparently first united with the latter by Torrey & Gray under the name *E. purpureum*. The latter is therefore valid according to the International Rules.

The name *E. verticillatum* Lam., applied by the senior author in 1920 to species 1, cannot, unfortunately, stand under present rules. In publishing it, Lamarck cited as synonyms, under his plants α and β respectively (he did not call them varieties), *E. purpureum* and *E. maculatum* L. Since, in so doing, he failed to "adopt the earliest legitimate epithet available for the group with its particular circumscription, position and rank," or one of them, his name is illegitimate under Arts. 56 and 59 (2) of the International Rules and must be rejected. Incidentally, there is no specimen labelled *E. verticillatum* in the herbarium of Lamarck. There are two, answering fairly well to the descriptions of α and β, and labelled respectively *E. purpureum* and *E. maculatum*. The latter the junior author was not able definitely to identify; the former is species 1, *E. verticillatum* as interpreted by the senior author.

The earliest name available for the species seems to be *E. dubium* Willd. ex Poir., a name substituted by Poiret for *E. punctatum* Willd. presumably because of the earlier *E. punctatum* Lam. The specimen in Walter's herbarium of his *E. fusco-rubrum*, a name cited by Wiegand as a possible synonym of species 1, turns out to be species 4, *E. purpureum* in the sense of the present treatment. Walter's description, like that of his *Acalypha caroliniana*,[3] is too confused to be

[1] Since in this case, the junior author's determination supported that originally made, no such precaution as in the case of *E. purpureum* seemed necessary, but photograph and notes were submitted to the senior author for rechecking.

Evidence corroborative of this determination, if any is needed, might be drawn from Kalm's itinerary. He reached America in September, 1748, too late to have collected any verticillate Eupatorium in young flower. In 1749 he was, during late July and August, in the St. Lawrence valley between Montreal and Quebec, a region in which only *E. maculatum*, as here understood, is known and in which it is a common and characteristic plant. (See Louis-Marie, Fl. Man. Québec, 250 and Victorin, Fl. Laurent. 583.) At the same season in 1750, his last summer in America, he was in western New York, where *E. maculatum* is the commonest, though not the only, species of its group.

[2] See Rhodora xxix. 6 (1927).

[3] See Rhodora, xxix. 197 (1927).

applied with any certainty; perhaps in both cases he mixed material, or field observations, of different species.

A restudy by the senior author has been made of the slender forms with three leaves in a whorl, possibly more common in the southern Alleghenies but by no means confined to that region, to see if they can be held specifically distinct from *E. purpureum* (species 4), but without success as to that. They all seem to belong to the same species-concept. Slender and small specimens from various parts of the range are often 3-leaved or even 2-leaved. However, the var. *amoenum* (Pursh) Gray should be recognized. It consists of more slender plants with chiefly lanceolate leaves which are glabrous or nearly so beneath (instead of elliptic-ovate, loosely hairy beneath). It occurs in the mountains from New Jersey, Pennsylvania and West Virginia to Georgia.

The nomenclature and synonymy of the species concerned is as follows.

1. EUPATORIUM DUBIUM Willd. ex Poir. Encyc. Suppl. ii. 606 (1811), a substitute name for *E. punctatum* Willd., probably because of *E. punctatum* Lam. TYPE (of *E. punctatum* Willd.) in Herb. Berlin. *E. purpureum* β L. Sp. Pl. 838 (1753), at least as to citations. *E. maculatum* L. Cent. Pl. i. 27 (1755) and Amoen. Acad. iv. 288 (1759), as to synonymy, and of many authors. *E. verticillatum* Lam. Encyc. ii. 405 (1786) (nomen illegitimum), at least as to plant α. *E. punctatum* Willd. Enum. Pl. Hort. Berol. 853 (1809), not Mill. (1768), nor Lam. (1786). *E. ternifolium* Ell. Sk. Bot. S. Car. & Ga. ii. 306 (1822?), probably. *E. purpureum* var. *maculatum* Darl. Fl. Cestrica 453 (1837), as to description. *E. maculatum* var. β *urticifolium* Barratt, Eup. Vert. no. 2 (1841)? *E. ternifolium* var. β *vesiculosum* Barratt op. cit. no. 3. *E. purpureum* sensu Mackenzie in Rhodora xxii. 158 (1920), not L.

2. E. MACULATUM L., l. c., as to description and TYPE in herb. Linnean Society of London. *E. Bruneri* A. Gray, Syn. Fl. N. Am. i. pt. 2, 96 (1884). *E. atromontanum* A. Nels. in Bot. Gaz. xxxi. 400 (1901). *E. Rydbergi* Britton, Man. 921 (1901). *E. purpureum* var. *Bruneri* (A. Gray) B. L. Robins. in Proc. Amer. Acad. xlii. 44 (1906). *E. trifoliatum* sensu Farwell in Rep. Mich. Acad. Sci. xx. 191 (1918), not L. *E. trifoliatum* var. *maculatum* (L.) Farwell, l. c., at least as to name-bringing synonym. *E. trifoliatum* var. *Bruneri* (A. Gray) Farwell, l. c., as to name-bringing synonym.

2a. Var. FOLIOSUM (Fern.) Wieg. in RHODORA xxii. 66 (1920). TYPE in Gray Herb. *E. purpureum* var. *foliosum* Fern. in RHODORA x. 86 (1908). *E. trifoliatum* var. *foliosum* (Fern.) Farwell, l. c. *E. Bruneri* var. *foliosum* (Fern.) House in Bull. New York State Mus. ccliv. 679 (1924).

3. E. FISTULOSUM Barratt, op. cit. no. 1 (1841) and in Wood, Classb. ed. 2, 314 (1847). TYPE in herb. Wesleyan University. *E. laevigatum* Torr. in Eat. Man. ed. 2, 245 (1818), not Lam. (1786). *E. purpureum* β *angustifolium* T. & G. Fl. N. Am. ii. 82 (1841) acc. to Barratt. *E. purpureum* and *E. trifoliatum* sensu Wieg. in RHODORA xxii. 67 (1920), not L. *E. maculatum* sensu Mackenzie in RHODORA xxii. 161 (1920), not L.

4. E. PURPUREUM L. Sp. Pl. 838 (1753), excl. syn. Cornut and Morison. TYPE in herb. Linnean Society. *E. trifoliatum* L. op. cit. 837. *E. fusco-rubrum* Walt. Fl. Car. 199 (1788), as to specimen in herb. Walter, though scarcely as to description. *E. falcatum* Michx. Fl. Bor.-Am. ii. 99 (1803). *E. verticillatum* Muhl. ex Willd. Sp. Pl. iii. 1760 (1804), probably, not Lam. (1786). *E. purpureum* var. β *album* Barratt, op. cit. no. 3 (an albino form). *E. purpureum falcatum* (Michx.) Britton in Mem. Torrey Bot. Club v. 312 (1894).

4a. Var. AMOENUM (Pursh) A. Gray, Syn. Fl. N. Am. i. pt. 2, 96 (1884). TYPE not known. *E. amoenum* Pursh, Fl. Am. Sept. ii. 514 (1814). *E. maculatum amoenum* (Pursh) Britton, l. c., at least as to name-bringing synonym. *E. trifoliatum* var. *amoenum* (Pursh) Farwell, l. c., as to name-bringing synonym. The following specimens, in the Gray Herbarium, may be cited as representative. WEST VIRGINIA: valley of East Fork of Greenbrier River, Pocahontas Co., 19 Sept., 1904, *Greenman*, no. 235; wood-road, Parsons, Tucker Co., Sept. 8, 1904, *Moore*, no. 1994. NORTH CAROLINA: Swain Co., alt. 1800 ft., Aug., 1891, *Beardslee & Kofoid*. GEORGIA: without definite locality, July, 1875, *C. Wright;* rich, shady woods, Whitfield Co., alt. 750 ft., July 18, 1900, *Harper* no. 70.

III. NOTES ON DIODIA

M. L. FERNALD AND LUDLOW GRISCOM

(Plate 469)

THE VARIETIES OF DIODIA TERES.—In eastern Virginia *Diodia teres* Walt. proved to be so variable in the field that a large series has been collected. Mr. C. A. Weatherby, upon looking for Walter's type, reports that there is no Walter material of it in his herbarium at the British Museum; but he found in Paris that the type of *Spermacoce diodina* Michx., commonly referred to it, is the common and well known weed with fruits 2.9–3.6 mm. long, covered with short appressed to spreading hairs (FIG. 1) and greatly exceeded by the stipules, and the leaves without prominently setiform tips. Since the latter plant is common all the way from Florida to New Jersey we are selecting it to stand as typical of Walter's species.

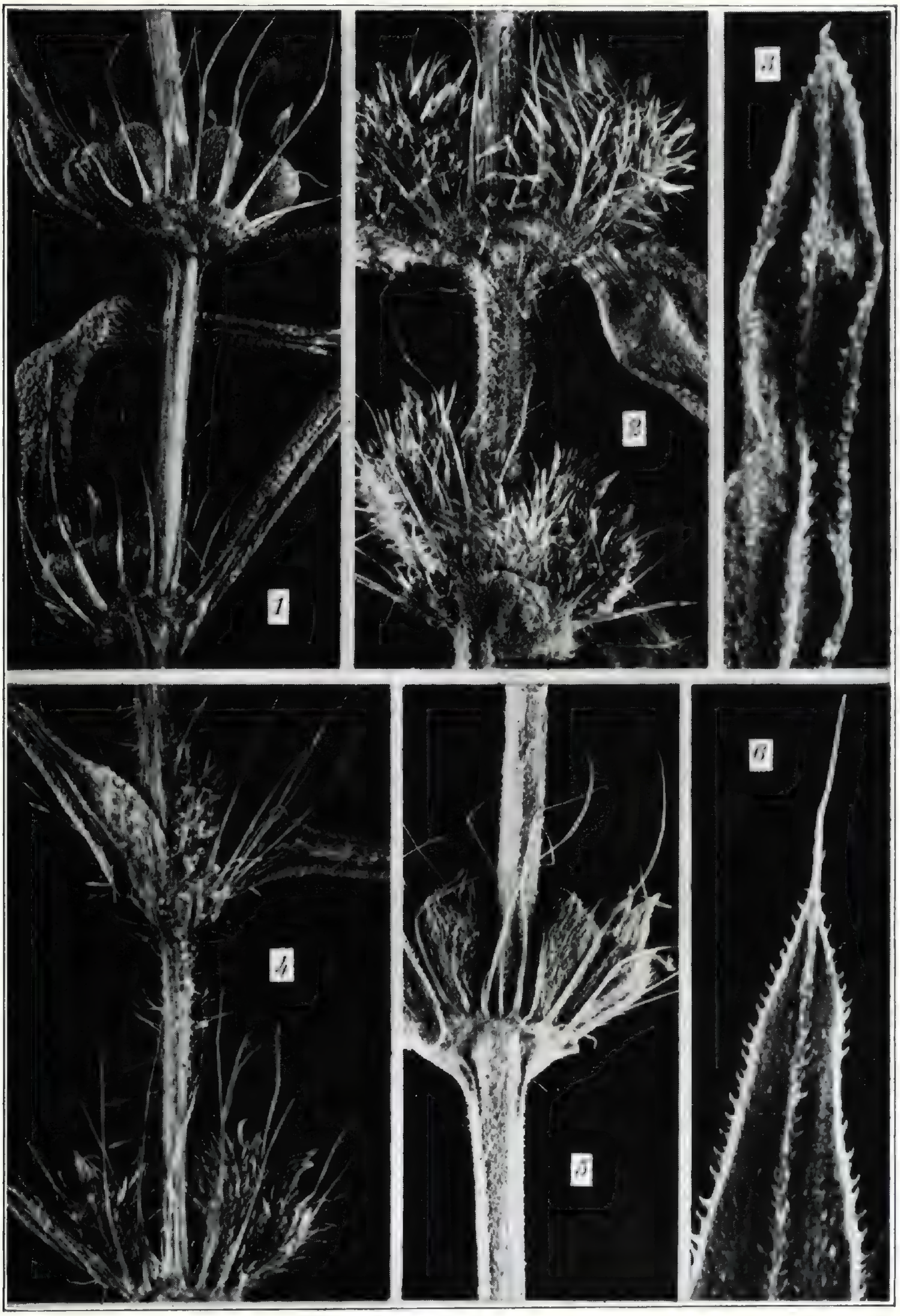

Photo E. C. Ogden.

VARIETIES OF DIODIA TERES, fruiting nodes × 5, leaf-tips × 10. FIG. 1, var. TYPICA; FIGS. 2 and 3, var. HYSTRICINA; FIG. 4, var. HIRSUTIOR; FIGS. 5 and 6, var. SETIFERA.

The most extreme departure from this type is a plant of the coastal sand of eastern Virginia, usually forming prostrate mats, with stipules shorter than to but slightly longer than the very large (3.8–5 mm. long) and divergently silvery-bristly fruits (FIGS. 2 and 3).

A third variety (FIG. 4) occurring from Florida to Mississippi and extending locally northward to North Carolina, has the long stipules of the typical form, but the fruits more spreading-hirsute and the stems conspicuously hirsute.

The commoner variation (FIGS. 5 and 6) from west of the Alleghenies, from southern Michigan to Texas, has the fruits and stipules as in typical *D. teres*, but the stems are strongly pubescent and the young leaves always terminate in a slender bristle. This plant may possibly have been described from the Mexican region, but until the very complex series from that area has been better clarified it is unsafe to identify it with any of the Mexican species. Consequently, the varietal name for it here proposed may, eventually, prove not to be the earliest name given it.

As we understand *Diodia teres* its variations may be summarized as follows.

DIODIA TERES Walt., var. **typica.** *D. teres* Walt. Fl. Carol. 87 (1788). *Spermacoce diodina* Michx. Fl. Bor.-Am. i. 82 (1803).—Very slender, erect or depressed; stem puberulent or minutely pilose; leaves without bristle-tips; stipules very much overtopping the fruits; fruits (excluding calyx-lobes) 2.9–3.6 mm. long, with short appressed to spreading stiff pubescence.—Florida to Texas, north to coast of Rhode Island, Connecticut and New York, northern New Jersey and Pennsylvania; less common west of the Alleghenies, north to Kentucky, Illinois and Missouri. FIG. 1.

Var. **hirsutior,** var. nov. (TAB. 469, FIG. 4), a var. *typica* differt caulibus fructibusque valde hirsutis.—TYPE; dry sandy soil, Duval Co., Florida, August, *A. H. Curtiss*, no. 1116 (in Gray Herb.). Extending from Florida to Mississippi and North Carolina.

Var. *hirsutior* forms a direct transition between var. *typica* and the following very extreme variety, which, if it were not for var. *hirsutior*, would appear to be a distinct species.

Var. **hystricina,** var. nov. (TAB. 469, FIG. 2 et 3), a var. *typica* differt caulibus plerumque depressis hirsutis; stipulis vix fructibus aequantibus; fructibus 3.8–5 mm. longis valde hispidis, pilis divergentibus.—Coastal sands of Northampton and Princess Anne Counties, Virginia. TYPE: sandy and argillaceous bluff and upper border of beach, Chesapeake Bay, west of Kiptopeke, Northampton Co., Virginia, October 14, 1935, *Fernald, Long & Fogg*, no. 5465.

Var. **setifera,** var. nov. (TAB. 469, FIG. 5 et 6), a var. *typica* differt

caulibus valde hirsutis; foliis immaturis apice setiferis.—Southern Michigan to Texas. TYPE: sandy plains, Peña, Texas, July 28, 1888, *Pringle*, no. 2242.

The figures are all × 5, except the leaf-tips (× 10).

THE VARIETIES OF DIODIA VIRGINIANA. In 1841 Torrey & Gray treated *Diodia virginiana* as a polymorphic species, with three primary varieties, but saying "We find so many intermediate forms between D. Virginica [i. e. *virginiana*], tetragona, and hirsuta of authors, that we can scarcely distinguish them even as varieties." And in the Synoptical Flora Gray omitted the varieties. Recently they have all been treated as species by Small, in his Manual. A study of the series in connection with our plants of southeastern Virginia shows that Torrey & Gray's treatment is the more satisfactory. The three varieties, as they conceived them and as we understand them are as follows; Small's key giving the essential characters.

DIODIA VIRGINIANA L., var. LINNAEI Torr. & Gr. Fl. ii. 29 (1841). *D. virginiana* L. Sp. Pl. 104 (1753). *D. virginica* Willd. Sp. i. 58 (1798), in part.—Florida to Texas, north to southern Illinois, Tennessee and New Jersey; casual northward.

Var. HIRSUTA (Pursh) Torr. & Gr. l. c. (1841). *D. hirsuta* Pursh, Fl. i. 106 (1814).—Florida and Alabama, north to North Carolina; also Cape May, New Jersey (August 16, 1871, *C. F. Parker;* and many later collectors).

Var. LATIFOLIA Torr. & Gr. l. c. (1841). *D. tetragona* of authors, perhaps Walt.—Florida to Louisiana, north to North Carolina.

Diodia Harperi Small, Man. 1264 (1933), described without citation of type, is a very distinct species if we correctly interpret it as represented by *Harper*, no. 1682, from Berrien Co., Georgia.

PLATE 469. DIODIA TERES Walter: FIG. 1, portion of fruiting branch, × 5, from Macon's Corner, Princess Anne County, Virginia, *Fernald & Long*, no. 5044.

Var. HYSTRICINA, n. var.: FIG. 2, portion of fruiting branch, × 5, from the TYPE, west of Kiptopeke, Virginia, *Fernald, Long & Fogg*, no. 5465; FIG. 3, tip of leaf, × 10, from the TYPE.

Var. HIRSUTIOR, n. var.: FIG. 4, portion of fruiting branch, × 5, from the TYPE, Duval County, Florida, *A. H. Curtiss*, no. 1116.

Var. SETIFERA, n. var.: FIG. 5, portion of fruiting stem, × 5, from the TYPE, Peña, Texas, *Pringle*, no. 2242; FIG. 6, tip of leaf, × 10, from the TYPE.

IV. NOMENCLATURAL TRANSFERS AND NEW VARIETIES AND FORMS

M. L. Fernald

(Plates 470–472)

Clematis virginiana L., forma **missouriensis** (Rydb.), comb. nov. *C. missouriensis* Rydb. in Britton, Man. 421 (1901). *C. virginiana*, var. *missouriensis* (Rydb.) Palmer & Steyermark in Ann. Mo. Bot. Gard. xxii. 542 (1935), the combination here ascribed to them only through leniency or courtesy, since they failed to give the essential citation of the name-bringing synonym.

In their *Annotated Catalogue of the Flowering Plants of Missouri*, Ann. Mo. Bot. Gard. xxii. no. 3 (1935) Palmer & Steyermark repeatedly made new combinations similar to their *Clematis virginiana*, var. *missouriensis*, in which THEY CITE ONLY THE NAME AND NEVER THE PLACE OF PUBLICATION OF THE DESCRIPTION upon which the combination is based. The validity of such transfers is open to serious doubt. The essential task of connecting the new combination with the fundamental diagnosis is left to all who wish to know what is meant. The International Rules seem to be clear on this point. Article 44 reads:

> The name of a species or of a subdivision of a species is not validly published unless it is accompanied (1) by a description of the group; or (2) by the citation of a previously and effectively published description of the group under another name; or (3) by a plate or figure with analyses showing essential characters; but this applies only to plates or figures published before January 1, 1908.
>
> Examples of validly published names of species.—*Onobrychis eubrychidea* Boiss. (Fl. Or. II, 546: 1872), published with a description.—*Hieracium Flahaultianum* Arv.-Touv. et Gaut., published on a label with a printed diagnosis in a set of dried plants (*Hieraciotheca gallica*, nos. 935–942: 1903).—*Cynanchum nivale* Nyman (Syll. Fl. Eur. 108: 1854–55), published with a reference to *Vincetoxicum nivale* Boiss. et Heldr. previously described.
>
> *Cynancum nivale* Nyman was published by the CITATION of the earlier and properly published *Vincetoxicum nivale* Boiss. & Heldr. WITH THE CORRECT BIBLIOGRAPHIC REFERENCE. Any one can look up the original reference and thus know what Nyman had in mind. Only the few who have the proper indices and who can take the necessary time to learn where and when Rydberg published *Clematis missouriensis* (which happened to be in the work of another author) can make out what Palmer & Steyermark mean. Technically it may (and probably should) be maintained that such new combinations are invalid. As stated, however, these combinations and others like them have often been taken up under mental protest and wholly through leni-

ency. In cases of early authors, before the rules of nomenclature had been much clarified, few would protest such leniency. In the very modern cases, with the rules clearly known and professed to be followed, the putting out of names which may by good luck barely "get by" or whose acceptance depends wholly on the good-nature and friendly consideration of other botanists, rather than upon accurate meeting of the full but simple requirements of valid publication, is not commendable. If in these days the author of a new combination cannot or will not cite the bibliographic source, he is not prepared to do accurate transferring.

Whether or not *Clematis virginiana*, var. *missouriensis* was a validly published combination, the taxonomic fact is, that it has little, if any, geographic segregation from *C. virginiana*. The key-differences given in Britton's Manual are, that *C. virginiana* has "Leaves glabrate or nearly so; achenes with a thick obtuse margin," *C. missouriensis* having "Leaves decidedly silky beneath; achenes marginless." Plenty of *C. virginiana* from Ontario, Quebec, Nova Scotia and New England has the leaves as densely and permanently "silky"-pilose beneath as in sheets specially marked by Rydberg as *C. missouriensis;* and mature fruit of the latter displays quite as prominent margins as the less pubescent plants. As a mere form with leaves densely and permanently pilose beneath it should have a designation; I cannot look upon it as a good variety.

AMERICAN PARNASSIA PALUSTRIS (PLATES 470 and 471). In 1926, misidentifying the characteristic plant of northern America, from Labrador and Newfoundland nearly across the continent, as *Parnassia palustris*, β. *multiseta* Ledeb. Fl. Ross. i. 263 (1842) and noting its many departures from typical *P. palustris* L. of Eurasia, I proposed an American and eastern Asiatic species, *P. multiseta* (Ledeb.) Fernald in RHODORA, xxviii. 211 (1926). Subsequently Dr. Eric Hultén[1] has shown that true *P. palustris*, β. *multiseta* of Ledebour, the Asiatic plant, is not different from typical *P. palustris*. At the same time Hultén was inclined to place the American plant near *P. palustris*, var. *tenuis* Wahlenberg, Fl. Lapp. 74 (1812).

Granted that the type of *Parnassia palustris*, β. *multiseta*, therefore the type of *P. multiseta*, is inseparable from typical *P. palustris* (PLATE 470) it becomes necessary to find a proper name for the wide-ranging American plant (PLATE 471, FIGS. 1–8), for it is not satisfactory to refer it to var. *tenuis* (PLATE 471, FIGS. 9–11). I have, therefore, restudied the series and agree with Hultén that the broadly dispersed American plant is best treated as a geographic variety of *P.*

[1] Hultén, Fl. Kamtch. iii. 36 (1929).

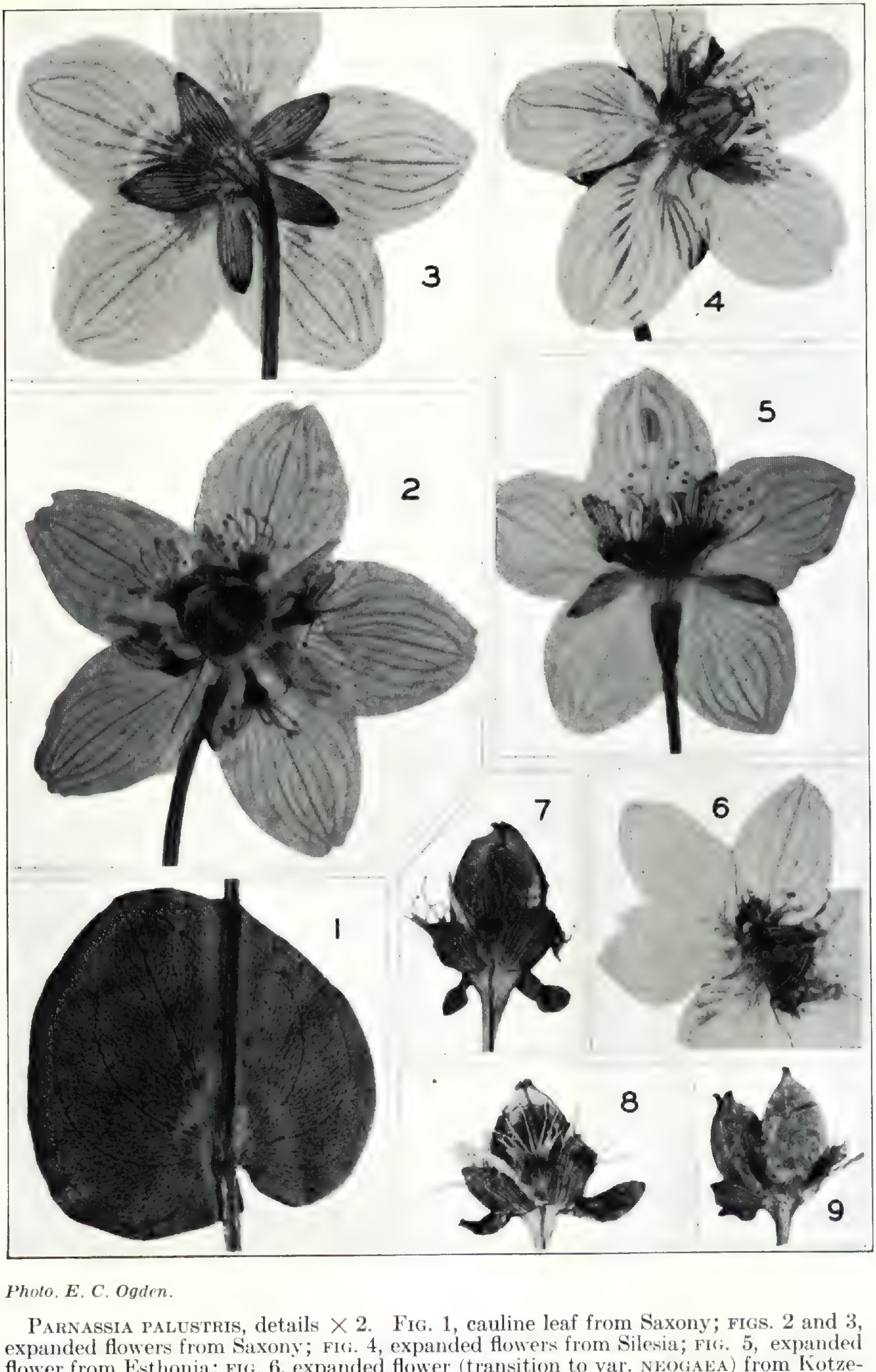

Photo. E. C. Ogden.

PARNASSIA PALUSTRIS, details × 2. FIG. 1, cauline leaf from Saxony; FIGS. 2 and 3, expanded flowers from Saxony; FIG. 4, expanded flowers from Silesia; FIG. 5, expanded flower from Esthonia; FIG. 6, expanded flower (transition to var. NEOGAEA) from Kotzebue Sound; FIG. 7, fruit from Bohemia; FIG. 8, fruit from Moravia; FIG. 9, fruit from Upper Austria.

Photo. E. C. Ogden.

PARNASSIA PALUSTRIS, vars., habit × ½, details × 2.

Var. NEOGAEA: FIG. 1, TYPE from Newfoundland; FIGS. 2–4, expanded flowers from Newfoundland; FIG. 5, expanded flower from Alaska; FIG. 6, fruit from Newfoundland; FIG. 7, fruit from Minnesota; FIG. 8, fruit from Manitoba.

Var. TENUIS: FIG. 9, cauline leaf from Jenissei; FIG. 10, expanded flower from Switzerland; FIG. 11, expanded flower from Iceland.

palustris—so strong a variety that to many it would stand unquestioned as a species. The distinctions are brought out in PLATES 470 and 471 (all details × 2) as well as can be done in view of the very slight color-contrasts in the flowers. These may be summarized as follows:

P. PALUSTRIS (typical). Cauline leaf rounded-ovate; calyx-lobes firm, oblong or elliptic, barely half as long as mature capsule, loosely ascending to reflexed in maturity; petals emarginate and apically with coarse teeth or merely round-tipped or obtuse, with about 13 conspicuous nerves and nerve-branches, soon deciduous; staminodia tapering below to narrow claws. Eurasia and Behring Sea region of Alaska. PLATE 470.

P. PALUSTRIS, var. (American). Cauline leaf deltoid-ovate, subacuminate; calyx-lobes subherbaceous, linear-lanceolate to lance-oblong, two-thirds as long to longer than capsule, less divergent or reflexed in maturity; petals rhombic-elliptic, tapering about equally to base and apex, with 7–11 faint nerves and nerve-branches, marcescent; staminodia with shorter and broader claws. Labrador to interior Alaska and locally southward. PLATE 471, FIGS. 1–8.

In the Behring Sea region of Alaska some plants are quite typical *Parnassia palustris*, others (PLATE 470, FIG. 6) show evident transition to the continental American plant. On account of the very evident transition in western Alaska between the two extremes I am treating the continental plant of North America as a geographic variety rather than as a species. It is not satisfactory to place it with var. *tenuis*. The latter plant superficially resembles ours in its cauline leaf (PLATE 471, FIG. 9) but it has much smaller flowers (FIGS. 10 and 11), with narrower petals subemarginate to broadly rounded at tip as in *typical P. palustris*, with the narrow-clawed staminodia of the latter plant, and, in anthesis, with the ovary very small. I have not seen good fruit of it. However, our generally dispersed variety of *P. palustris* is so well defined that I am calling it

PARNASSIA PALUSTRIS L., var. **neogaea**, var. nov. (TAB. 471, FIG. 1–8), foliis caulinis deltoideo-ovatis subacuminatis; calycis lobis subherbaceis lineari-lanceolatis vel late lanceolatis vel lanceolato-oblongis capsulam 2/3 aequantibus vel subaequantibus adscendentibus vel laxe patentibus; petalis rhomboideo-ellipticis ad basim et ad apicem aequaliter angustatis pallide 7–11-nervis marcescentibus; staminodiis cuneatis vel late unguiculatis.—Wet calcareous or basic soils, Labrador to Alaska, south to northwestern Newfoundland, northern Michigan, northern Minnesota, North Dakota, Wyoming and Oregon. TYPE: brookside on slaty hills back of Little Quirpon, Newfoundland, August 8, 1925, *Fernald & Gilbert* no. 28,481 (in Gray Herb.).

The many specimens cited by me as *Parnassia multiseta* in RHODORA xxviii. 211, 212 (1926), with the exception of those from the Behring

Sea region of Alaska and from Kamtchatka and that from California belong to *P. palustris*, var. *neogaea*.

PLATE 470, all details × 2. PARNASSIA PALUSTRIS L.: FIG. 1, cauline leaf, from Waldenburg, Saxony, August 17, 1879, *Rehder;* FIGS. 2 and 3, expanded flowers, from same collection as fig. 1; FIG. 4, expanded flower, from Silesia, August 2, 1888, *Gebhardt;* FIG. 5, expanded flower, from Esthonia, *Sirgo* in Eston. Pl. no. 63; FIG. 6, expanded flower, transitional to var. *neogaea*, from Kotzebue Sound, Alaska, *Charis;* FIG. 7, fruiting calyx and capsule, from Dörfel, Bohemia, Petrak, Fl. Bohem. et Morav. Esxicc., Lfg. 1, no. 69; FIG. 8, fruiting calyx and capsule, from Ochoz, Moravia, *Jirasek & Svestka*, no. 329; FIG. 9, fruiting calyx and opened capsule, from Mt. Lichtenberg, Upper Austria, *Rauscher* in Fl. Exsicc. Austr.-Hung., no. 2511.

PLATE 471, details × 2. PARNASSIA PALUSTRIS L., VAR. NEOGAEA, n. var.: FIG. 1, TYPE, × ½, from Little Quirpon, Newfoundland, *Fernald & Gilbert*, no. 28,481; FIG. 2, expanded flower, from Flower Cove, Newfoundland, *Fernald, Long & Dunbar*, no. 26,749; FIG. 3, expanded flower, from the TYPE; FIG. 4, expanded flower, from Isthmus Cove, Pistolet Bay, Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 28,480; FIG. 5, from Anvik, Alaska, *J. W. Chapman*, no. 22; FIG. 6, fruiting calyx and opened capsule, from St. Barbe, Newfoundland, *Fernald, Long & Dunbar*, no. 26,751; FIG. 7, fruiting calyx and capsule, from Turtle Lake, Minnesota, August, 1892, *Sheldon;* FIG. 8, fruiting calyx and opened capsule, from Churchill, Manitoba, *G. Gardner*, no. 481.

Var. TENUIS Wahlenb.: FIG. 9, cauline leaf, from Dudinskoje (lat. 69° 23′), Jenissei, *Tolmatchew*, no. 137; FIG. 10, expanded flower, from Switzerland, *Nigg* in Braun-Blanquet, Fl. Raet. Exsicc., no. 257; FIG. 11, expanded flower, from Skutustadir-Myvatu, Iceland, July 14, 1895, *Elizabeth Taylor*.

BAPTISIA AUSTRALIS (L.) R. Br., var. **minor** (Lehm.), comb. nov. *B. minor* Lehm. in Nov. Act. Nat. Cur. xiv. 803 (1829). *B. australis* β. Torr. & Gray, Fl. N. Am. i. 385 (1840).—Differing from typical *B. australis* in its shorter-petioled and firmer leaves, with the larger mature leaflets only 1.5–4 cm. long.—The representative of the woodland, eastern *B. australis* on rocky prairies, in ravines and in open woods from Missouri and Kansas to Texas.

B. australis, var. *minor* seems to me a good geographic variety of *B. australis*, comparable with varieties of many other species in the more open and arid region west of the Mississippi, in having firmer and smaller foliage. I get no good differences of flower or fruit to separate it from the Alleghenian *B. australis*. It is probable that this plant was partly in mind when *B. vespertina* was published. The latter appeared as *B. vespertina* Small in Rydberg, Fl. Prair. Pl. 456 (1932), with a range given like that of *B. australis*, var. *minor*, the only member of the genus there treated by Rydberg with *blue* flowers, but described as having "stipe of the pod longer than the body." No form of the blue-flowered *B. australis* has such a stipe and I have never seen one in the genus; ordinarily it is barely exserted from the calyx and one-eighth to one-tenth as long as the body. No type is cited and it is surmised that *B. vespertina* was clumsily and erroneously

described; the blue-flowered *Baptisia* of Rydberg's area has very short and upwardly dilated stipes.

As to the typification of var. *minor*, one of Lehmann's specimens of his *B. minor* is in the Gray Herbarium. It is the small-leaved southwestern extreme.

ASTRAGALUS FRIGIDUS (L.) Gray, var. **gaspensis** (Rousseau), comb. nov. *A. gaspensis* Rousseau, Contr. Lab. Bot. Univ. Montréal, no. 24: 51 (1933). PLATE 472, FIGS. 9–13.

I am quite unable to find in var. *gaspensis* constant differences from Eurasian *Astragalus frigidus* and its western North American var. *americanus* (Hook.) Watson. Only on the slightly smaller legumes can the Gaspé plant be separated from the latter, which by such conservative and universally respected students as Sir William Hooker, Torrey, Bunge, Gray and Watson was considered only an American variety of the circumboreal *A. frigidus*. This species, treated by Ledebour (Fl. Ross.) as a series of slightly differing varieties across Europe and Siberia, has at least three varieties in North America. By Marcus E. Jones the Rocky Mountain plant was taken up as a species, *A. americanus* (Hook.) Jones, but he did not separate off the Gaspé plant; neither did Rydberg (N. Am. Fl.)! But Rousseau, in his student-thesis on *Les Astragalus du Québec*, treats the Gaspé material as constituting a definite species with several reputed constant characters.

It is most difficult to understand how Rousseau got his idea of typical *Astragalus frigidus* of Europe. His comparative note is as follows:

> L'*A. gaspensis* diffère de l'*A. frigidus* de l'Europe (fig. 13) par le calice glabre, les dents calicinales non tachetées de noir, la pubescence plus légère des dents et des sinus, le pistil et le fruit glabres, le calice relativement moins long. L'*A. gaspensis* possède en outre un fruit généralement plus court et plus obtus aux deux bouts.[1]

Rousseau (p. 45) describes *Astragalus frigidus* of Europe as having "Calice: tube (long. 7 mm., circonf. 6–7.5 mm.) recouvert d'une pubescence noire; dents (long. env. 1 mm.) noires, aigues . . . . Legumes fusiformes aigus . . . recouverts d'une pubescence noire et dense." Such a description and comparative note, with emphasis upon black pubescence of the calyx-tube, black teeth and *dense* black pubescence of the "fusiform" "acute" legume, strongly contrasts with the diagnosis of *A. gaspensis:* "Calicis tubo . . . glabro; dentibus viridibus

[1] Rousseau, l. c. 54 (1933).

. . . . leguminibus ovoidibus, obtusis ad apices, . . . glabris"; and Rousseau publishes drawings (his fig. 13, here reproduced, in part, as FIGS. 6 and 11) to bring out his points.

As stated, it is not clear how Rousseau acquired his conception of true *A. frigidus*. Linnaeus in 1755, in the 2d edition of his Flora Suecica, gave a detailed account of the plant, *Phaca alpina*, which under *Astragalus*, is *A. frigidus*. His "Calyx *campanulatus, glaber, dentibus fuscis*"[1] was unequivocal. So was his account, in 1763, of the "Legumen . . . *cylindrico-ovatum, adspersum pilis raris.*"[2] A. P. Decandolle, describing *Phaca frigida* in 1802, said "Calyx . . . *pallidus, glaber.*"[3] Gradually, as material has accumulated, it has been realized that the calyx-tube may be either quite glabrous or sparsely pubescent. We accordingly find Rouy saying "Calice . . . presque glabre à la base, couvert de poils noirs au sommet";[4] and Ascherson & Graebner, "Kelch . . . am Grunde fast kahl, oberwärts schwarz behaart."[5] Of the inflorescences of European *A. frigidus* in the Gray Herbarium most show, upon careful search, a few scattered dark strigae on the calyx-tube (FIGS. 2, 3, and 5) but 10 specimens (FIG. 4) show none whatever. Sufficient search in the American material, which usually has glabrous calyx-tubes, will reveal similar trichomes. FIG. 14 is of a calyx from *Stewardson Brown*, no. 1250, from Maligne Lake, Alberta, of *A. frigidus*, var. *americanus*, which, because of its "glabrous" calyx Rousseau maintains as a species, *A. americanus*, separate from *A. frigidus*. As an absolute specific character the glabrousness is rather fickle.

The tendency to black trichomes on the borders of the calyx-teeth in the European *Astragalus frigidus* seems to be general, though very variable, some specimens barely showing it. In var. *gaspensis* (FIG. 10) the minute pubescence of the teeth is whitish. In var. *gaspensis*, too, as in var. *americanus*, the legume is glabrous, in typical *A. frigidus* and in var. *littoralis* (Hook.) Wats. it is pubescent; but in the European plant the pubescence is so short (FIG. 8) that, in first publishing *Phaca frigida*, Linnaeus said "legum . . . subpilosis";[6] and later authors specially note its shortness; "kurz rauhhaarig" (*Aschers. & Graebn.*), "courtement pubescents" (*Rouy*). In lacking this very short strigose pubescence the legumes of var. *gaspensis* can readily be

[1] L. Fl. Suec. ed. 2: 256 (no. 657) (1755).
[2] L. Sp. Pl. ed. 2: 1064 (1763).
[3] DC. Astrag. 58 (1802).
[4] Rouy, Fl. de Fr. v. 169 (1899).
[5] Aschers. & Graebn. Synop. vi². 763 (1909).
[6] L. Syst. Nat. ed. 10, ii. 1173 (1758–59).

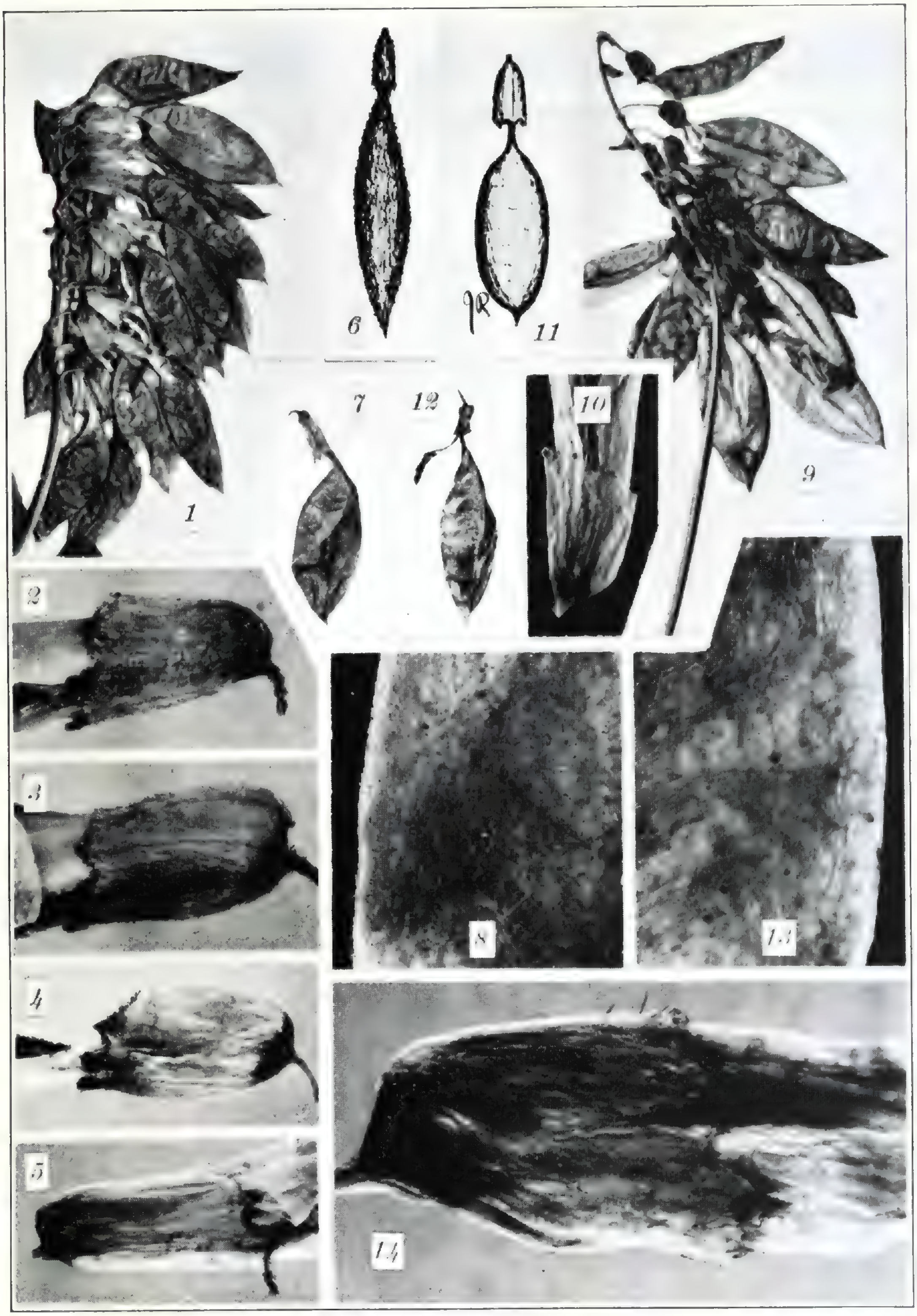

Photo E. C. Ogden.

ASTRAGALUS FRIGIDUS AND ITS AMERICAN VARIETIES

A. FRIGIDUS: FIG. 1, fruiting raceme, × 1, from Haute-Savoie; FIG. 2, calyx, × 4, from Hungary; FIG. 3, same, from Jemtland; FIG. 4, same from Lappmark; FIG. 5, same, from Jenisei; FIG. 6, Rousseau's fig. of fruit; FIG. 7, fruit, × 1, from Haute-Savoie; FIG. 8, surface of legume, × 10, from Haute-Savoie.

Var. GASPENSIS: FIG. 9, fruiting raceme, × 1; FIG. 10, calyx, × 4; FIG. 11, Rousseau's fig. of fruit; FIG. 12, fruit, × 1; FIG. 13, surface of legume, × 10.

Var. AMERICANUS: FIG. 14, calyx showing trichomes, × 10, from Alberta.

distinguished from those of the European plant; but in size and outline I do not get satisfaction in applying Rousseau's stated and illustrated differences (see FIGS. 6 and 11). FIG. 1 is a fruiting raceme of typical *A. frigidus* from Haute-Savoie; FIG. 9 a similar but riper raceme of var. *gaspensis* from the Bonaventure River, Quebec. Except for the more shrunken and smaller calyx of the Quebec plant and the lack of minute hairs on its legumes I see no appreciable difference, surely nothing specific.

So far as I can see the two American plants, *Astragalus frigidus*, var. *americanus* and var. *gaspensis* are vegetatively tall extremes of a circumboreal species, differing from the Eurasian type also in having glabrous legumes and more generally (but not always) glabrous calyx-tubes and paler calyx-teeth. In size of fruit var. *gaspensis* scarcely differs from typical *A. frigidus*, but its calyx is usually a little shorter. Var. *americanus* has the fruit rather larger (the body 2–2.5 cm. long, that of var. *gaspensis* 1.5–2.2 cm. long).

In PLATE 472, FIG. 1 is a fruiting raceme, × 1, of *Astragalus frigidus* from Haute-Savoie, 18 juillet, 1866, *Delaunay;* FIG. 9, a similar raceme of var. *gaspensis* from the Bonaventure River, Quebec, August 5–8, 1904, *Collins, Fernald & Pease;* FIG. 6, Rousseau's illustration of the fruit of *A. frigidus* (source not stated); FIG. 7, a ripe legume of *A. frigidus*, × 1, from Haute-Savoie (*Delaunay*); FIG. 11, Rousseau's illustration, × 1, of legume of his *A. gaspensis;* FIG. 12, a ripe legume, × 1, of var. *gaspensis* from the TYPE-region, Little Cascapedia River, Quebec, July 29 and 30, 1904, *Collins, Fernald & Pease;* FIG. 8, surface of legume, × 10, of *A. frigidus* (same collection as FIGS. 1 and 4); FIG. 13, surface of legume, × 10, of var. *gaspensis* (same collection as FIG. 6); FIG. 5, calyx, × 4, of *A. frigidus* from the Jenisei, *Tolmatchew*, no. 277; FIG. 4, the same from Torne Lappmark, *Alm* (*I. P. E.*, no. 6520); FIG. 2, the same from Mt. Tátra, Hungary, 1870, *Gustav;* FIG. 3, the same from Jemtland, *Sondén;* FIG. 14, calyx, × 10, of var. *americanus*, showing some pubescence on tube, from Maligne Lake, Alberta, *S. Brown*, no. 1250; FIG. 10, calyx, × 4, of var. *gaspensis*, from the TYPE-region (same as FIG. 6).

ASTRAGALUS ALPINUS L., var. **labradoricus** (DC.), comb. nov. *A. secundus* Michx. Fl. Bor.-Am. ii. 66 (1803), not DC. (1802). *A. Labradoricus* DC. Prodr. ii. 287 (1825); Rousseau, Contr. Lab. Bot. Univ. Montréal, no. 24: 24 (1933). *A. alpinus*, var. *Brunetianus* Fernald in RHODORA, x. 51 (1908), as to plant of the St. Lawrence, not as to type.

Rousseau clearly shows that the plants which I separated as *Astragalus alpinus*, var. *Brunetianus* differ in one apparently definite point: the plant of the St. Lawrence and of Lake St. John (*A. secundus* Michx. and *A. labradoricus* DC.) having the strigose legumes essentially straight and somewhat thicker than in the plant of the Restigouche and St. John valleys (also of the Kennebec and the Connecticut), which has slightly more slender and slightly falcate legumes. The

designated type of var. *Brunetianus* being *Fernald*, no. 24 from Fort Fairfield, Maine, the latter name must be reserved for the plant with arcuate legumes. I am not able fo follow Rousseau, however, in treating *A. Brunetianus* (Fern.) Rousseau, l. c. 30 (1933) and *A. labradoricus* as species distinct from the circumpolar *A. alpinus*, and, above all, as themselves specifically separate. As a normally varying circumpolar species *A. alpinus* is quite typical; scores of circumpolar species show very similar slight changes as they push southward into ecologically quite different temperate areas. Furthermore, as a species *A. alpinus* (including vars. *labradoricus, Brunetianus* and some others) stands quite clearly apart from its several allies (with plump stipitate legumes with a narrow partial septum—Rydberg's *Atelophragma*) in densely matted habit, compact raceme with rachis scarcely or barely elongating, and strongly reflexed and imbricated fruits. The varietal (to Rousseau specific) differences are those of degree of pubescence and size and a slight difference of form of the legume, not significant structural differences. Rousseau's key follows:

Légumes fortement pubescents; tube du calice (long. 3 mm.); ailes de la corolle (larg. 2.5–5 mm.) ..... 3. *A. alpinus.*
Légumes légèrement pubescents, plus grêles; tube du calice court (long. 2–2.5 mm.); ailes de la corolle (larg. max. 2.5 mm.).
  Ailes de la corolle (larg. 2–2.5 mm.); légumes droits, gonflés, oblancéolés ..... 4. *A. labradoricus.*
  Ailes de la corolle (larg. 1.5 mm.); légumes courbés, un peu aplatis ..... 5. *A. Brunetianus.*

In typical *A. alpinus* the pubescence of the legume is, indeed, denser than in the two varieties of southeastern Canada and New England; but in plenty of European (typical) *A. alpinus* I find the calyx-tube as short as or even shorter than Rousseau's 3 mm. (barely 2 mm. in Mme. Crozet-Bourgeau's material from Haute-Savoie; 2–2.5 mm. in Fiori, Béguinot & Pampanini's no. 465 from Italy; barely 2 mm. in Blytt's from Norway; 2.5 in Schrenck's from Lapland; 2.3–2.7 mm. in Tolmatschew's no. 285 from Novaja Semlia, etc.), though in some specimens the calyx-tube does reach a length of 3 mm. In boreal America likewise, it is easy to find fully flowering material of *A. alpinus* with calyx-tubes only 2–2.5 mm. long, though, as in Eurasia, they may reach a length of 3 mm.

As to the very narrow wing-petals (only 1.5 mm. broad) ascribed by Rousseau to var. *Brunetianus*, it is not without significance that the

TYPE specimen (*Fernald*, no. 24) should show wings 2.5 mm. broad and that well-prepared specimens in full anthesis from the same region (St. John valley) should have wing-petals 3 mm. broad.

Incidentally two collections from Pigeon Lake in Drummond, Bayfield County, Wisconsin, are instructive. The first, collected by *Ludlow Griscom*, June 19, 1928, closely matches Scandinavian material of *A. alpinus*, forma *arcticus* Sondén in Svensk Bot. Tidskr. i. 233 (1907) in its very large and deeply colored flowers and in the dense black or black-and-white pilosity of the legumes, but in outline the latter are quite like those of var. *Brunetianus*, in which the pubescence is sparse and short. This material, consequently, stands midway between the deepest-colored and largest-flowered extreme of *A. alpinus* and the plant with sparsely strigose and falcate legumes which has become accentuated and widespread in the valleys of New Brunswick and adjacent Quebec and of northern New England. The other series from the same station on Pigeon Lake was collected on July 28, 1934, by *N. C. Fassett* (no. 16,481) but the Fassett material is more strongly canescent throughout, the familiar response to xerophytic conditions. Furthermore, the calyx and slender arcuate legumes are copiously *white* (instead of black)- *pilose*, some legumes entirely so, others with a mixture of black. Such change, from black to white, in the trichomes of calyx and legume is not without precedent; and even Rydberg admitted to the same species plants with such diverse superficial variation. *A. eucosmus* Rob. (*Atelophragma elegans* (Hook.) Rydb.) is a species with such variation: "pod . . . black-hairy or rarely white-hairy" (Rydb. in N. Am. Fl. xxiv. 372). The calyx-tube of *A. eucosmus*, similarly, may be either black-hairy or white-hairy or (in var. *facinorum* Fern.) quite glabrous. If *A. eucosmus* (and several other species) thus fluctuates it need not surprise us to find similar fluctuations in *A. alpinus*.

ASTRAGALUS MEXICANUS A. DC., var. **trichocalyx** (Nutt.), comb. nov. *A. trichocalyx* Nutt. ex Torr. & Gray, Fl. N. Am. i. 332 (1838).

Although Rydberg, N. Am. Fl. xxiv. 461 (1929), ascribed to his *Geoprumnon mexicanum* (*Astragalus mexicanus*) calyx-"teeth subulate, 5 mm. long," while his *G. trichocalyx* (*A. trichocalyx*) is said to have them only "1.5 mm. long," I am unable to find such a difference. The several sheets of typical *A. mexicanus* in the Gray Herbarium have calyx-teeth only 2–3 mm. long. I find them as long or barely shorter in *A. trichocalyx*. The only differences of significance seem

to be the strigose-pubescent calyx and large fruit of *A. mexicanus* as against the more loosely pilose calyx and slightly smaller fruits in var. *trichocalyx*.

Astragalus neglectus (T. & G.) Sheldon, forma **limonius** (Farwell), comb. nov. *Phaca neglecta*, forma *Limonia* Farwell in Papers Mich. Acad. Sci. Arts, Lett. iii. 100 (1924).

Amphicarpa bracteata (L.) Fern., var. **comosa** (L.), comb. nov. *Glycine comosa* L. Sp. Pl. ii. 754 (1753). *A. monoica*, var. *comosa* Eaton, Man. ed. 3: 172 (1822). *A. comosa* (L.) G. Don in Loud. Hort. Brit. 314 (1830); Fern. in Rhodora, xxxv. 276 (1933). *A. Pitcheri* Torr. & Gray, Fl. N. Am. i. 292 (1838). *A. bracteata*, var. *Pitcheri* (Torr. & Gray), Fassett in Rhodora, xxxviii. 95 (1936).

Upon studying the genus in detail I agree with Fassett that the coarser and more villous plant with deeper-colored flowers is a good variety rather than a distinct species. As a variety it should take the first varietal designation used for it which, happily, is its first name, also, as a species.

Aesculus glabra Willd., forma **pallida** (Willd.), comb. nov. *Ae. pallida* Willd., Enum. Pl. Hort. Berol. 406 (1809). *Ae. glabra*, var. *pallida* K. Koch acc. to Rehder, Man. Cult. Trees and Shrubs, 580 (1927).

The form of *Aesculus glabra* with the leaflets permanently pubescent beneath is at best a forma not a geographic variety. Vars. *leucodermis* Sargent and *Sargentii* Rehder, with restricted ranges at the western border of the specific range, are true geographic varieties. Although Rehder ascribes the combination "var. *pallida*" to Karl Koch, it was apparently not proposed by him. Koch looked upon the plant as a mere form, but did not make any combination:

> Man besitzt auch eine Form, wo die Blättchen auf der Unterfläche weichhaarig sind und daher daselbst ein helleres Ansehen besitzen. Willdenow hat diese Form unter dem Namen Aesculus pallida (enum. pl. hort. Berol. 406) unterschieden, während Spach sie Pavia pallida gennant hat (ann. d. sc. nat. 2, sér. II, 54).[1]

Ae. octandra Marsh., forma **virginica** (Sarg.) comb. nov. *Ae. octandra*, var. *virginica* Sarg. Journ. Arn. Arb. ii. 119 (1920).

Differing from the yellow-flowered type only in red, pink or pinkish-creamy petals.

Ae. octandra, forma **vestita** (Sarg.) comb. nov. Ae. octandra, var. *vestita* Sarg. Journ. Arn. Arb. v. 42 (1924).

Differing from the type only in having the leaflets densely tomentulose beneath.

[1] K. Koch, Dendrol. i. 509 (1869).

An Aberrant Dodecatheon (Plate 473).—We become so accustomed to the essential stability of floral morphology as to base our classifications largely upon it. But occasionally so strong a departure from the normal occurs as to confuse the situation or at least as to throw possible new light on the progenitors of the group. A maple with 3-winged fruits, a *Linaria vulgaris* with regular flowers (peloria), a *Pyrola* with erect flowers and non-inverted anthers (*P. oxypetala* Aust.) are of this group, departures from the present-day normal so striking as to arrest the attention and all deserving special note and thoughtful consideration. The genus *Dodecatheon* is at once distinguished by its strongly reflexed perianth-segments. Nevertheless, about nine years ago a teacher and amateur botanist in Lancaster County, Pennsylvania, Miss Alice Strickler, found on limestone cliffs along Chickies Creek, in western Lancaster County, a very remarkable reversionary colony of *Dodecatheon Meadia* L. Dividing the clump and leaving half in its original station, Miss Strickler transferred a portion to her home-garden nearby, where it has subsequently been several times redivided. In the original station and in the transplanted portions the flowers have retained their original form (plate 473), slenderly campanulate, with calyx- and corolla-segments all ascending, suggesting the flower of a bellwort (*Uvularia*). A friend of Miss Strickler, Louise F. A. Tanger (Mrs. Charles Y. Tanger), who has supplied me with beautiful herbarium-material of the plant and details of its discovery, writes that the seeds are apparently not viable, a condition to be expected if pollination is dependent on the insects which regularly visit typical *D. Meadia*. A similar sterility has been noted in a parallel aberration in *Cyclamen*, this cyclamen with non-reflexed segments being perpetuated only vegetatively in cultivation (see Penzig, Pfl.-Teratol. iii. 30). Professor Ralph H. Wetmore and I have examined the pollen of the *Dodecatheon* and it seems to be perfectly good.

In the spring of 1934 Mrs. Tanger and a group of friends found the strange plant, and in 1935 and 1936 additional clumps were found at the original station and another was reported farther up-stream. The limestone cliff where the strange plant was discovered is, according to Mrs. Tanger, the best remaining station in Lancaster County for the beautiful American Cowslip, *Dodecatheon Meadia*. It is there abundant and it is earnestly hoped that every precaution will be taken to prevent its destruction. Mrs. Tanger sends two excellent photographs,

one showing typical *D. Meadia* with reflexed perianths side-by-side with the aberrant form, the other a single clump of the latter, here reproduced as FIG. 2. It is a pleasure permanently to associate with so interesting a plant the name of its discoverer, ALICE STRICKLER.

DODECATHEON MEADIA L., forma **Stricklerae** (TAB. 473) perianthii segmentis valde adscendentibus, nec reflexis, corollis hinc tubuloso-campanulatis.—PENNSYLVANIA: limestone cliffs along Chickies Creek, Lancaster County, discovered by *Alice Strickler;* TYPE, in Gray Herb., collected May 1, 1936, by *L. F. A. Tanger & Emma Groff.*

GALIUM TINCTORIUM L., var. **subbiflorum** (Wieg.), comb. nov. *G. trifidum*, var. *subbiflorum* Wieg. in Bull. Torr. Bot. Cl. xxiv. 399 (1897). *G. subbiflorum* (Wieg.) Rydb. in Bull. Torr. Bot. Cl. xxxiii. 152 (1906). *G. Claytoni*, var. *subbiflorum* (Wieg.) Wieg. in RHODORA, xii. 229 (1910).

I fully concur in Wiegand's second decision that var. *subbiflorum* belongs with *Galium Claytoni* Michx., rather than with *G. trifidum.* As I showed, however, in RHODORA, xxxvii. 445, t. 403, figs. 1 and 2 (1935), the type and the original description of *G. tinctorium* L. (1753) belong to the plant described by Michaux in 1803 as *G. Claytoni*, not to the plant (*G. obtusum* Bigel.) to which Wiegand assigned the name *G. tinctorium.* In the West, where typical *G. Claytoni* is rare or unknown, var. *subbiflorum* is tolerably clear and, considered for that area alone, might be treated as a distinct species (if it can really be kept apart specifically from *G. Brandegei* Gray); but in the Northeast (in Newfoundland, Quebec, northern New England, the Adirondacks and the Upper Great Lakes region), it and typical *G. tinctorium* have to be separated somewhat mechanically.

Volume 39, no. 463, including pages 233–276 and plates 460–465, was issued 14 July, 1937.

Dodecatheon Meadia, forma Stricklerae.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. September, 1937. No. 465.

CONTENTS:

The New England Botanical Club, Inc.

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Room 1001, 53 State St., Boston, Mass.

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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. September, 1937. No. 465.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXX

LOCAL PLANTS OF THE INNER COASTAL PLAIN OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(Plates 474–487)

Part I. Account of a Summer's Collecting[1]

Accepting the renewed invitation of Professor John W. Bailey and my former student, Professor Robert F. Smart, to make headquarters for further botanical exploration of the Coastal Plain of Virginia at the Biological Laboratory of the University of Richmond, I asked Messrs. Bayard Long and Ludlow Griscom, who had shared the work farther east, to join me in some brief excursions on the Inner Coastal Plain, adjacent to the Piedmont region of the state. Unfortunately, Griscom was able to make only one very brief and unexpectedly curtailed trip with us in August, but Long, most happily, joined me for four different collecting trips at intervals from late June to late October. President Boatwright of the University and Dean Keller of

[1] In this paper it seems unnecessary to give the authors of species if they are in Gray's Manual, ed. 7.

The maps have been prepared by Miss Katherine Fernald from the representation in the Gray Herbarium, supplemented by records in recent monographs and periodical literature. Unfortunately, for many states "common throughout" and similar generalized (and presumably erroneous) records can not be transferred with accuracy to maps. Many gaps, therefore, appear where some dots ought to be given. The herbarium of Professor Oakes Ames has supplemented the records for the *Orchidaceae* and that of the Arnold Arboretum those for ligneous plants. Doubtless some interesting stations for localized species have been overlooked and others are represented in other herbaria. The broad geographic relationships, however, will be apparent. Map 1 carries the explanatory legend.

Westhampton College had most kindly provided airy living quarters with shower-baths, so necessary in hot weather, at the latter College, then closed for summer vacation; and Professors Bailey and Smart and their cordial associates gave us an ideal place for work on our collections during the sweltering summer days, in the beautifully equipped and really cool (often chilly) basement of the Biological Laboratory, where we had superabundant table-space, large sinks and drainage-tables and plenty of water for washing off the clay substratum which adhered to most roots. Perfect conditions, after the specimens had had a preliminary pressure and release of first moisture in drying paper and had been rehandled, straightened and "salivated"[1] or otherwise prepared for final drying between corrugated ventilators, were found in the piping-hot and temporarily disused green-house on the roof. There, with temperatures always well above 100° F. and as often approaching 130°, the firmly strapped presses quickly yielded the "finished product" in thoroughly dried and only rarely discolored specimens.

In a previous paper[2] I noted the marked difference in superficial soils of the two sections of the Coastal Plain in southeastern Virginia. The outer and chiefly lower eastern third, including Princess Anne and Norfolk Counties and the Dismal Swamp, extending into easternmost Nansemond County, is overlaid by early Quaternary sands, clays and peats which usually deeply mantle the older deposits beneath, with the upper level plains rarely reaching an altitude of 9 meters (about 30 feet), though with the sand-hills back of Cape Henry attaining a height of 24 meters (80 feet). The inner and generally higher western two-thirds of the Coastal Plain in this latitude, the region south of the estuary of the James and west of Nansemond River and the Dismal Swamp (including most of Nansemond County, the Counties of Isle of Wight, Surry, Prince George, Sussex and Southampton, and the eastern borders of Greensville, Dinwiddie and Chesterfield, thence northeastward beyond the area now under consideration) has older clays, sands and peats, derived from the underlying Miocene deposits which in many stream-beds and road-cuts are abundantly displayed as a continuous pavement-like stratum of closely crowded marine shells and skeletons.

This Inner Coastal Plain ranges in elevation from practical sea-level on the lower James to 30 meters (100 feet) along the rivers near

[1] See Fernald, RHODORA, xxiii. 111 (1921).
[2] *Plants from the Outer Coastal Plain of Virginia*, RHODORA, xxxviii. 376–378 (1936).

the Fall Line, with the dry upland plains and gently rolling country reaching levels from 7.5–46 meters (25–150 feet) and sometimes more. As a result of the usually greater elevation west of the Nansemond and the Dismal Swamp the streams, cutting through the soft deposits, have produced gullies and steep banks, the latter often pitching 7.5–30 meters (25–100 feet) to the borders of the streams or to their broad wooded bottomlands and swamps ("dismals"). The superficial deposits, whether of peat, sand, clay or marl, are apparently all highly acid, but wherever a stream has cut down to or through the shell-deposits, the bottomland soils, although giving an acid reaction, are sufficiently modified by the constantly supplied lime as to support vegetations amazingly different from those of the open plains and pine woods at levels only a few meters above them. The latter habitats are distinguished by numerous Coastal Plain endemics, the former and many of the steep wooded slopes show an unexpected number of species characteristic of the richer woodlands and bottoms of the interior, many of them more typical of the Mississippi Basin. These contrasts will be further noted in the course of the following narrative of the season's itinerary and chief discoveries and will be further discussed in Part III.

During our first trip (June 19–26) Smart, most fortunately, was able to join Long and me and to drive us over much territory between Henrico County and the North Carolina line. On one day we were accompanied by his keen student, Everett S. Luttrell, and on another by one of Professor Bailey's most promising men, a young entomologist, Carroll M. Williams, who, on the three subsequent trips, became our companion, driver and efficient and tireless helper. A medical student at the University, James Thomas of Emporia, most hospitably extended us the use of his camp on Three Creek and guided us to other interesting areas; consequently we spent portions of two days on Three Creek near Drewryville, there making the acquaintance of a host of species new to my experience and several new to Long's and subsisting largely on the bountiful supply of gigantic frog's legs which our attentive host and his colored boy collected (by shooting in the night) from Three Creek.

We soon confirmed a preconception that the Piedmont area adjacent to the intertonguing Coastal Plain would yield us comparatively few species not already known from Virginia. We were primarily interested in getting the southern plants not yet recognized in

the state, chiefly that the next edition of Gray's Manual may be more authoritative at this corner of the "manual range." Consequently we made it a point to work southward into the flatter country and toward the Carolina line. The late Earl J. Grimes, when teaching at William and Mary, had explored the Peninsula of Virginia with Mrs. Grimes, who, after her husband's untimely death, published[1] a detailed list of the flora of the region immediately to the east and southeast of Richmond, the Grimes territory extending westward into Henrico County. There was, consequently, little reason for us to work in that direction. Furthermore, although many notable range-extensions had been made by the Grimes's, it seemed evident from the ultimate detailed list that the field for most profitable discovery of Coastal Plain novelties in Virginia probably did not lie north of the James River. There are some highly noteworthy Coastal Plain isolations in that area, such as *Xyris platylepis* Chapm., *Juncus caesariensis* Coville (*J. asper* Engelm.) (MAP 1) and *Hypericum setosum* L., but they are relatively few. Incidentally, *Hypericum setosum* was based exclusively upon Virginia material collected by John Clayton and a characterization by Plukenet of a plant reputed to have come from Virginia. On the whole of the Peninsula of Virginia the Grimes's got only 2 species of *Rynchospora*, a characteristic large genus of the best Coastal Plain habitats; in the region of Virginia bounded by the James, the Nansemond, the Dismal Swamp, the North Carolina line and the Fall Line, there are at least 17 species and varieties (the latter treated by many botanists as species). They got 25 species of the prevailing Coastal Plain genus *Panicum;* in the area just defined we know at least 73 (including varieties, which are maintained by Hitchcock & Chase and by Small as species). North of the James *Hypoxis* is represented only by the ubiquitous *H. hirsuta;* south of the James and the entrance to Chesapeake Bay we get 5 species in Virginia. These facts sufficiently show the contrast.

Further indicating the desirability of working out from Richmond chiefly into the Coastal Plain is the fact that the late Professor Merriman's *Flora of Richmond and Vicinity* enumerated only plants which, primarily, do not give promise of specially thrilling spots. To be sure, he omitted all grasses, sedges, rushes and trees, so that his book is most literally a "Flora," but the only three species recorded by him which might indicate a strong Coastal Plain element near Richmond

[1] Eileen Whitehead Erlanson, *The Flora of the Peninsula of Virginia*, Pap. Mich. Acad. Sci. Arts and Let. iv[1]. 115–182 (1925).

are here seriously questioned. These are *Drosera brevifolia, Helianthemum corymbosum* Michx. and *Chrysopsis gossypina* Nutt., all southern plants indicative of most interesting habitats and associations of species. Merriman gave no localities and his collections were destroyed by fire, so that there is no way now to tell just what he had before him. In five seasons of intensive botanizing, however, with rarities and specially significant species constantly in mind, my companions and I have never seen one of them,[1] though perpetually on the look-out for them, in the region from False Cape to Cape Henry, thence west to the Fall Line.

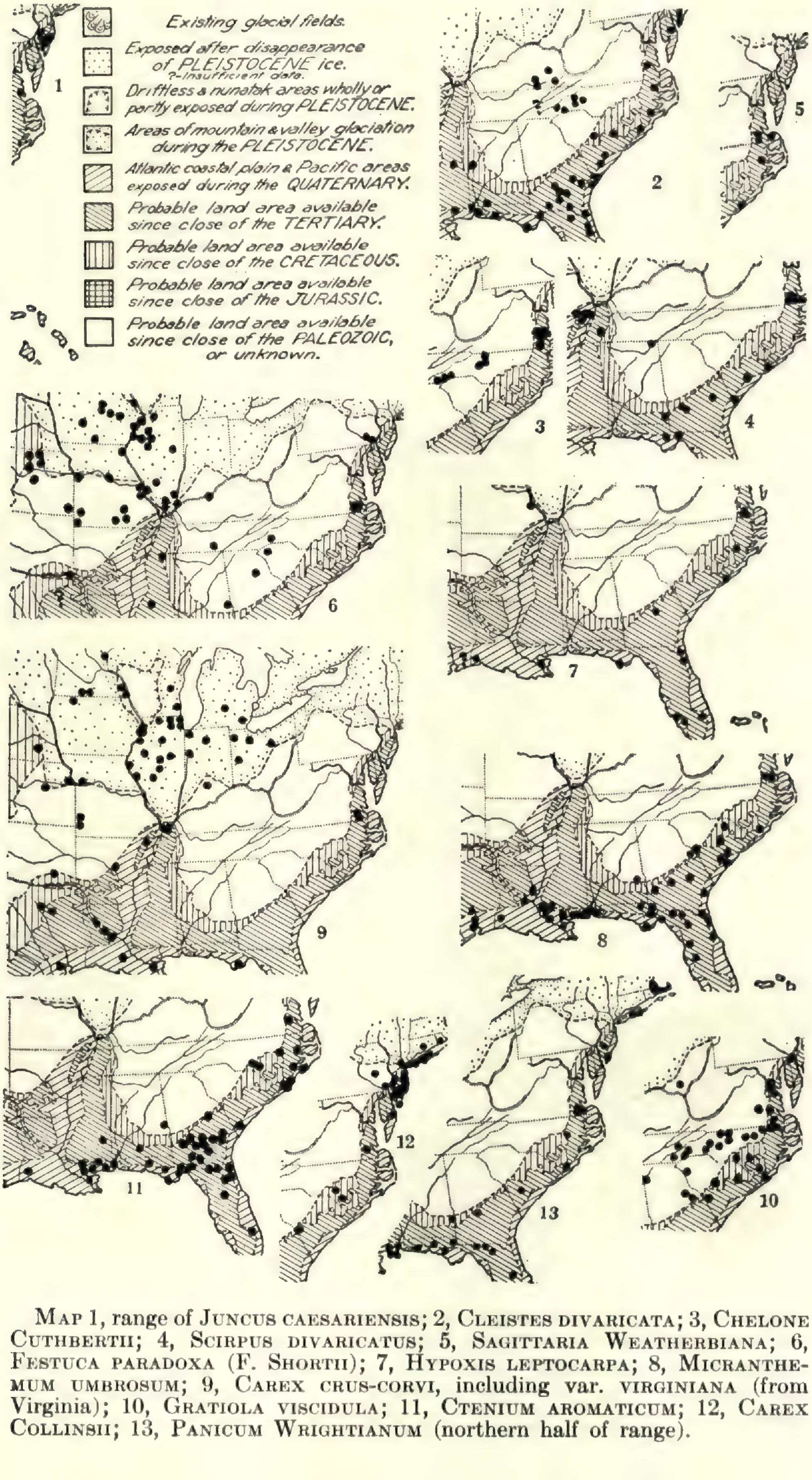
After we had breakfasted at his home, renewed the acquaintance of Mrs. Smart, changed into tramping clothes and heavily sprinkled ourselves with sulphur, for it was "chigger-time," Smart took us to a locality long known to local botanists, not far southeast of Petersburg but in Prince George County (Petersburg being in Dinwiddie County), where *Sarracenia flava* abounds. To us that seemed an indicator of good peaty openings and a distinctly southern flora. In this we were not disappointed. Passing through dry woods and clearings, attractive with purple spikes of *Psoralea psoralioides* (Walt.) Cory (*P. pedunculata*), a species with its typical form confined to the Coastal Plain of the Atlantic, but with a geographic variety characteristic of the interior of the continent (Texas to Florida, north to Kansas, Missouri, Illinois, Michigan, Ohio and the upland of North Carolina), the nondescript corollas of *Tephrosia spicata* (delicate pink on expanding, but rapidly changing to varying red and purple tones), the brilliant yellow flowers of a complex series related to *Oenothera fruticosa* and equally perplexing variations of *Euphorbia corollata*, we came upon an extensive depression, locally called a "bog," a platter-

[1] *Drosera capillaris* Poir., readily mistaken for *D. brevifolia*, occurs in several peaty depressions, at least in Dinwiddie, Prince George and Sussex Counties. It may extend slightly northward from there. But the only evidence I know of *D. brevifolia* in Virginia is undoubted material in the Gray Herbarium, collected in 1895 by J. W. Blankinship somewhere near Suffolk, and the apparently extensive colony discovered by Dr. Gerrit S. Miller in May, 1903: "common in a low moist field near the shore of Hampton Roads about three miles west of Hampton"—Proc. Biol. Soc. Wash. xvi. 102 (1903). Our parties have never found it. *Helianthemum corymbosum* is one of the most easily recognized species farther south, but we have repeatedly sought specially for it in appropriate habitats without success. The wholly different *H. canadense* is everywhere common in southeastern Virginia, though not mentioned by Merriman; it must be that he confused the names. Likewise, *Chrysopsis gossypina* (*C. pilosa* (Nutt.) Britton), named for *Gossypium*, the cotton-plant, because of its dense cottony coat, has probably been misinterpreted. It has long been credited to Virginia, but we have never met it there. Four other species and varieties of the genus are common in the southeastern counties.

like area of many acres a few meters lower than the gently merging rim, where water accumulates over winter and in early spring, but now, in late June, bone-dry and with an almost impregnable substratum of clay underlying the thin peat.

Sarracenia flava was, indeed, gratifyingly abundant and very handsome, with its stiffly erect slender yellow trumpets, but we were more interested in the carpet of the pink-flowered *Drosera capillaris* Poir. (unrecorded from north of South Carolina) upon which we walked. *Aletris aurea*, its occurrence in Virginia recently doubted, was abundant and coming into bloom; *Panicum strigosum*, rare so far north and recorded by Hitchcock & Chase only from Norfolk County, was largely hidden by the more abundant *P. consanguineum* (MAP 47), heretofore known in Virginia only from Virginia Beach, and the ubiquitous *P. lucidum*, *P. ensifolium* Baldwin (not recorded by Hitchcock from Virginia) and other species. *Tofieldia racemosa* was only in bud but abundant; but the striking orchid, with long widely divergent sepals and petals, *Cleistes divaricata* (L.) Ames (MAP 2), was as scarce as in its northernmost area, in southern New Jersey. Its present-day rarity in Virginia is clearly indicated by the fact that, in his detailed study of it Ames (Orchidaceae, fasc. vii. 21, 22) could find no Coastal Plain material from between the famous Ellendale bog in Delaware and the southeastern corner of South Carolina (though citing stations in the mountains of North Carolina). The species rests on *Arethusa divaricata* L., which was based on a Catesby plate and upon a Virginia specimen from John Clayton which Linnaeus saw and which was described by Clayton as flowering in Virginia early in July ("Palustribus initio Julii floret."—Clayton in Gronov. Fl. Virgin. 184). In fact, some local botanists believe that the type of the species came from this very station. *Asclepias rubra* and numerous other plants, familiar enough to Long, were quite new to me. *Scleria* was already in fruit and during the following week its half-dozen representatives in the area were as abundant and wide-spread as are *Carices* farther north. I have already published some of the results of our experiences with the genus.[1] *Rynchospora* was becoming recognizable. *R. rariflora*, which soon proved to be in practically all peaty depressions, and *R. microcephala* Britton were easily recognized; and *R. Torreyana* (MAP 32), which we had not previously met in Virginia and which, apparently, is not recorded from between south-

[1] See RHODORA, xxxviii. 397, 398, plate 444 (1936).



Map 1, range of Juncus caesariensis; 2, Cleistes divaricata; 3, Chelone Cuthbertii; 4, Scirpus divaricatus; 5, Sagittaria Weatherbiana; 6, Festuca paradoxa (F. Shortii); 7, Hypoxis leptocarpa; 8, Micranthemum umbrosum; 9, Carex crus-corvi, including var. virginiana (from Virginia); 10, Gratiola viscidula; 11, Ctenium aromaticum; 12, Carex Collinsii; 13, Panicum Wrightianum (northern half of range).

eastern North Carolina and New Jersey, abounded; but we were most interested in one very localized species, clearly not the ubiquitous *R. cymosa*, which it superficially resembles. Its technical characters of achene and tubercle make it a perfect match for the original material of *R. Harveyi* Wm. Boott, a characteristic species of wet prairies of Arkansas, Oklahoma and eastern Texas but already known, according to Small, to extend locally eastward into Georgia. A very common *Juncus* puzzled us. Clearly allied to *J. marginatus*, it had a subglobose or hemispherical and dense inflorescence which was unique. Not until we were putting up the specimens in the evening did we notice that it also has elongate, lash-like stolons (suggesting those of *Agropyron repens*). It was subsequently collected throughout the area and its prophylla, perianths, stamens and seeds all combine with its slenderly stoloniferous habit and rounded inflorescences to mark a very distinct new species not heretofore recognized. After a long-delayed lunch we were taken by Smart to a really wet portion of the bog, an area of inundated muddy swale and thicket, where open spots were full of *Juncus diffusissimus* Buckl. (MAP 33), a species chiefly of the Prairie States, from Indiana to Texas, but, like *Rynchospora Harveyi*, stated to come eastward to Georgia; and in one pastured corner of the swale, where *Aletris aurea* and *A. farinosa* commingled, two plants with flowers combining their distinctive traits and of a peculiar dull- or pinkish-orange color were evidently of hybrid origin. Luckily the cows had not eaten them!

This first day set a high standard of accomplishment, and we thereafter felt that we had failed to make good if we did not bring in five to ten species "new to Virginia" or at least reinstated in the flora and, as indicated in the sequel, we sometimes exceeded even the high limit then enthusiastically set. Other days were spent following up the boggy depressions chiefly in Prince George County, where *Sarracenia flava*, recognizable at a distance, was our first clue. In one or more wet spots we got *Carex vestita*, previously unknown south of the District of Columbia, and *Lachnocaulon anceps*, rare in Virginia, and, just once, a single small colony of the big-fruited *Rynchospora dodecandra* Baldw., the first north of North Carolina. In swampy thickets and woods or at their borders the recently described *Chelone Cuthbertii* Small (MAP 3), a plant known outside the Coastal Plain of Virginia only along or near the Blue Ridge of North Carolina, was frequent and eventually seen within a few miles of the North Carolina line in

Southampton County; and by streams or about springs or in ditches the recently described *Lycopus americanus*, var. *Longii* Benner,[1] unrecorded from south of New Jersey and Pennsylvania, was common, this also seen only a few miles north of North Carolina. Dry open woods and adjacent clearings yielded *Hypoxis micrantha* Pollard, only recently reported as reaching northward into Virginia, and *Buchnera americana*, a handsome plant with rich violet-purple flowers, primarily of Alleghenian and Ozarkian range and unmapped by Pennell (Scroph. E. Temp. N. Am. 478) on the Coastal Plain between northwestern Florida and northern Delaware, although he speaks (p. 477) of Clayton's having collected it in "lowland Virginia." *Silphium compositum* Michx. rose conspicuously to a height of 2 or 3 meters at the borders of woods, scattered all the way from the North Carolina line in Greensville and Southampton Counties northward nearly to Richmond (slightly south of there, along the Petersburg Pike in Chesterfield County). The species was not admitted as a Virginian by Torrey & Gray in 1842, nor in the several editions of Gray's *Manual* (1848–1908) nor in Gray's *Synoptical Flora;* nor is its extension into Virginia noted by Small in his *Flora* and *Manual.* Several collectors have reported it within the last five years as "new to Virginia"; but the records go back at least to 131 years ago, when Frederick Pursh went through the region and recorded it from "gravelly woods, . . . Virginia and Carolina." Dr. Lily M. Perry calls my attention to the fact that, in 1834 or soon thereafter M. A. Curtis, in his enumeration of plants around Wilmington, North Carolina, treating it as *S. terebinthinaceum*, var. *sinuatum*, said "I have traced this plant through the lower part of this State into Virginia and S. Carolina, and find it constantly preserving its character" (Curtis in Bost. Journ. Nat. Hist. i. 128). More detailed was the account of Lester F. Ward in 1886:

> Silphium compositum was observed near Swift creek, about six miles north of Petersburg, and became abundant on Stony creek and between the Nottaway and the Meherrin. As this species has not been previously reported north of the southern boundary of Virginia this constitutes a considerable addition to its northward range. It is so abundant all through the southern half of Virginia that it is strange that this fact should have remained so long unknown, and this and many other things indicate that very little botanical work has been done in this region. (Ward in Bot. Gaz. xi. 37).

[1] Benner in Bartonia, xvi. 46 (1935).

The fact that, after such clear demonstrations of its abundance at the inner margin of the Coastal Plain in Virginia, the finding there of *Silphium compositum* should still be looked upon as a new discovery speaks eloquently of the need for a trained taxonomist in the region (and by *trained* I mean one so familiar with vascular plants that he recognizes and promptly evaluates the unsignificant and the highly significant species when he sees them). With the *Silphium* or by themselves *Solidago yadkinensis* (Porter) Small and *S. ludoviciana* (Gray) Small[1] were often abundant, the first in full bloom, the second as yet showing no sign of flowering stems.

The "swamps" or "dismals," inundated wooded bottomlands along creeks and rivers, where Bald Cypress, *Taxodium distichum*, Water Ash, *Fraxinus caroliniana*, and the various Gums, *Liquidambar* and *Nyssa aquatica* and *N. sylvatica*, var. *biflora* (Walt.) Sarg., make a dark jungle, were the abode of several characteristic sedges, which at first "intrigued" us but which soon became monotonous: *Scirpus divaricatus* (MAP 4), reaching its northeastern limit here; *Rynchospora corniculata*, one of the most conspicuous members of the genus; *Carex louisianica* Bailey, the latter described from "Banks of the Appalachicola River" and westward, but now known inland to Missouri and southwestern Indiana and around the Coastal Plain to New Jersey; *C. gigantea*, of almost identical range; and with them *C. typhina* and *C. squarrosa*, two characteristic northern and inland species of alluvium (Quebec and western New England to Wisconsin, etc., thence southward), which we had not expected to see as every-day plants of any part of the Coastal Plain. Suggestive of the Coastal Plain occurrence of *Carex typhina* and *C. squarrosa* was the occurrence in Henrico County, at the border of a swampy forest of *Ulmus alata*, and in low woods in Sussex County of *C. Frankii*, another inland species of "Swamps and wet meadows, in calcareous districts" from Texas to Georgia, north to Pennsylvania, western New York, Ohio, Indiana, Illinois, Missouri and Kansas. As a Coastal Plain plant it seemed out of place. But so did many other species of the bottomlands and swamps or dismals farther south, along the Meherrin, Nottoway and Blackwater Rivers and their tributaries.

Our introduction to a fully developed bottomland flora was at Drewryville along Three Creek, a single stream, where we saw it, meandering through a broad alluvial bottom with open forest of

[1] See Fernald, RHODORA, xxxviii. 209 (1936).

Water Ash, *Fraxinus caroliniana*, Water Hickory or Bitter Pecan, *Carya aquatica*, River Birch, *Betula nigra*, Over-cup Oak, *Quercus lyrata*, and many other species. Near the bridge at Drewryville there are very extensive open intervales with a lush and complicated flora. Reaching there long after noon we felt it the part of discretion to eat our lunches before leaving the road. Accordingly, we sat down in the shade of Water Hickory and Over-cup Oak, beside a clump of *Sagittaria Weatherbiana* Fernald[1] of Norfolk County and the states southward (MAP 5), and across the road from a fine tree of Pumpkin Ash, *Fraxinus profunda*, which Small assigns to river-banks from Georgia and Alabama to Missouri, etc. As we lunched we discussed the identity of the unfamiliar grass on which we were sitting; it proved to be *Festuca paradoxa* Desv., long known as *F. Shortii* (MAP 6), which was named for the famous Kentucky botanist, here new to Virginia, though we afterward found it generally dispersed in rich thickets through Southampton and adjacent counties. Hitchcock's map (*Manual*) indicates a range on "Prairies" etc. from western South and North Carolina to northeastern Texas, northward into Indiana, Illinois and Iowa, with an outlying station in Pennsylvania. Hastening lunch we started to look around in the pouring rain. The thicket of tall shrubs and small trees fascinated us, a tangle of numerous variations (as to leaf-outline) of a few species, here met for the first time but soon to become very familiar: the southern *Vaccinium arboreum* and *V. Elliottii* Chapm., *Viburnum rufidulum* and *Ilex decidua*, with *Crataegus* honorably represented by two perfectly clear species, *C. Marshallii* Eggleston (*C. apiifolia* Michx., not Medic.) and another not yet worked out. Beneath this rim of shrubs and small trees the ground had to us a strange appearance, with sprawling slender leaves radiating for 2–3 dm. in loose rosettes. Digging into the mat, we found it consisting of *Hypoxis leptocarpa* Engelm. & Gray (MAP 7), the first as far north as Virginia in the East, though known in essentially the same latitude in southern Missouri. Entangled with the *Hypoxis* was a most strange *Isoëtes*, the exact identity of which I have been unable to make Mr. Weatherby divulge; and, near by, carpets of *Micranthemum umbrosum* (Walt.) Blake (MAP 8), the first from north of Wilmington, North Carolina, the plants still young and without flowers, but easily recognized. The *Carices* of all the bottomlands were there, but one delicate species, clearly of the *Laxiflorae* but

[1] RHODORA, XXXVII. 387, plates 385, 386 (1935).

quite new to us, proves to be a perfect match for the type of *Carex crebriflora* Wiegand from "Appalachicola River bottoms," a species heretofore unknown north of South Carolina. Farther out, on the broad swaley meadows and towering above most of its associates, was a splendid giant *Carex*, with broad whitish leaves and an unmistakable panicle, surely *C. crus-corvi* (MAP 9), originally described from New Orleans but now known, as stated by Mackenzie (N. Am. Fl.), in "Swamps, Florida to Texas, and northward in the Mississippi Valley to southern Michigan, southern Minnesota and eastern Nebraska." Three Creek (emptying into the Nottoway) and the Meherrin, where we collected the *Carex* next day, are pretty far (600 miles) from the easternmost Coastal Plain stations formerly known for *Carex crus-corvi;* and upon close comparison I find sufficient characters to separate the plant of Southampton County as a well-defined geographic variety but surely not as a distinct species, which its isolation might suggest. The thrills of the late afternoon were crowding us and we had hardly come into the bottomland swales before we must find our way over to the cabin which James Thomas had placed at our disposal. Very wet depressions had a tantalizing mat of young plants, some not yet in flower: *Rorippa aquatica* (Eaton) Palmer & Steyerm., so like *Proserpinaca palustris*, mixed with it, as to puzzle us, but promptly distinguished by nibbling; *Ranunculus oblongifolius*, with only the tiniest of belated flowers; *Gratiola viscidula* Pennell (MAP 10) beautifully flowering; *Echinodorus radicans* (MAP 16), recognized by its leaves; and *Hydrolea quadrivalvis*, beginning to show flowering buds. This, too, was technically "new to Virginia"; the old basis for including Virginia as the northeastern limit of its range being a collection of Heller's made in 1893 (no. 1162) on the border of Northampton County, North Carolina, with the annotation on the North Carolina label: "On the Va. line." *Hydrolea* is now well demonstrated as a Virginia plant, for Long and I later got it, flowering and fruiting, in Sussex County as well. *Panicum roanokense*, with bluish-green flaccid leaves, abounded; but the species with it puzzled us, until we found a few precocious panicles which showed it to be *P. hians* Ell., the first evidence of the species extending northward into Virginia (Florida to Texas and New Mexico, northward into Oklahoma, southeastern Missouri and, now, southeastern Virginia).

It took until midnight and a second long session next morning to get our material merely into papers; and after a hot-weather breakfast

of fruit, cornbread, slabs of country ham, eggs, about a dozen frog's legs apiece, each seeming as large as the drumstick of a broiler-chicken, and coffee, we lingered about the cabin until noon! The small pond-like expansion of Three Creek by the cabin, the bathing pool for those brought up on the red or brown water of the region, was covered with a Cow Lily. This soon proved to be the southern species which, when originally published, was, by the International Rules, correctly called *Nymphaea fluviatilis* Harper; later, according to the International Rules as interpreted at Brussels, correctly called *Nymphozanthus fluviatilis* (Harper) Fernald; and now, owing to the inconsistent consistency of professional rule-makers, forced by the decision of the International Congress at Amsterdam in 1935 to be called (still correctly!) *Nuphar fluviatile* (Harper) Standley. Those are the sad truths which will be elucidated on a succeeding page; the happier truth is that the range of *N. fluviatile* is now extended northward into Virginia. The dry pine woods were a joy to northerners, with their broad carpets of the pale-leaved trailer, *Breweria humistrata*, and the deeply palmated leaves and really handsome white flowers of *Cnidoscolus stimulosus* (Michx.) Engelm. & Gray; and in a patch of rich woods bordering the bottomland near the cabin we found fruiting material of the small southern Pawpaw, *Asimina parviflora* (Michx.) Dunal, its range extended north from North Carolina. We subsequently found it also in southwestern Nansemond County.

The alluvium of Nottoway River at Courtland was briefly visited. The strange *Isoëtes* was also there making solid turf in otherwise plantless open depressions; but the number of species not already seen was limited, although we there made the acquaintance of *Paronychia Baldwinii* (T. & G.) Chapman, the first from north of North Carolina, but by no means the last, for it later proved to be a characteristic plant in sandy borders of woods throughout most of Southampton, Sussex and Isle of Wight Counties. Similarly, the bottomlands above Haley's Bridge on the Meherrin gave us a repetition of the rich flora of the Nottoway system (including Three Creek), with *Crataegus Phaenopyrum* and a few other species we had not already seen. The Black Walnut, *Juglans nigra*, here had elongate fruits, the rare form which was described in 1785 by Humphrey Marshall as "*Juglans nigra oblonga. Black oblong fruited Walnut*" which "resembles the former so as scarcely to be distinguished from it, except by the fruit, which is oblong or oval." It is scarcely a geographic variety

but, rather, a notable form.[1] We had been unfortunate in reaching the Meherrin just at twilight, but the eye-straining glimpse we got convinced us that the area from Haley's Bridge southeastward will repay prolonged exploration.

In three weeks Long and I were back for our second canvass of the region (July 18–28). The heat had been accumulating and thunder showers, especially south of the James and the Appomattox, were of daily occurrence. Smart, involved in teaching in the Summer School, could go out with us on only one day, but Carroll Williams proved a competent and always willing companion and helper, happy to use the noon-hours sweeping for butterflies and the evening hours to drive us home, while we too often dozed, or afterward to linger toward midnight, helping clean the specimens to be cared for next morning. Another young man, Braxton Townsend of Petersburg, familiar with all the country south of the Appomattox and with a keen knowledge of the local flora derived in part from his grandfather, a correspondent of Asa Gray, most kindly guided us to spots which, in his young boyhood, had been choice habitats, but where, due to artificial draining, most of the once abundant rarities are now gone. He also gave us another day, helping in the collecting, and we greatly regretted that we could not have him regularly with us.

At the beginning of this second trip we resolved to follow the old Jerusalem Plank Road, running from Petersburg to Courtland (once called Jerusalem), and thence to push on to the Carolina line, reasoning, obviously, that the southernmost border of the state would furnish the larger proportion of novelties in the flora. The spirit was willing and the reasoning was logical enough, but the flesh weakened when we got three or four miles out of Petersburg and we decided to take a glimpse at the *Sarracenia flava* station in northwestern Prince George County where Smart had guided us to so many novelties. We had hardly left the main road when it seemed advisable to take a peep on the north side of the back road at a bushy swale, on the other side at a broad and open sphagnous swale, cleared for the running of a power-line. In the first habitat we promptly came upon the boreal *Glyceria canadensis*, the first from south of Maryland, and *Carex bullata*, the first from Virginia. Nearly everything there suggested a swampy thicket of New England; but across the road, the Rynchosporas and the fine carpet of *Lycopodium alopecuroides* (MAP 49) promised a dis-

[1] JUGLANS NIGRA L., forma **oblonga** (Marsh.), comb. nov. *J. nigra oblonga* Marsh. Arb. Amer. 67 (1785).

tinctively southern habitat. *Ludwigia hirtella, linearis* and *glandulosa* were abundant on the swale, and at its border there was no mistake about *Rhexia ciliosa*, with its tiny bristly-ciliate leaves and erect, campanulate flowers. When, in 1935, Griscom and I published our study of *Rhexia*, we could get no conclusive evidence of *R. ciliosa* from north of North Carolina[1]; but it has a good station in Prince George County, and later Long and I found very limited ones in Isle of Wight and Nansemond Counties. On the larger open bog with the *Sarracenia* scattered plants of *Hypericum setosum* L. occurred but we did not there find its true home, though in October we discovered a *real* station for it in southern Nansemond. Grimes collected *H. setosum* near Williamsburg and reported it (RHODORA, xxiv. 151) as "new to Virginia." That was a natural inference from its omission from northern manuals but, as a matter of fact, as already noted on p. 324, the type was a Virginian collection of John Clayton's. A coarse grass which we had noticed in June was in flower, *Ctenium aromaticum*, a characteristic southern plant (MAP 11) which, when we tramped through it, justified its specific name. The day being intolerably hot and sticky and we already tired from an over-night train-ride, we returned to the coolness of the laboratory, there to care for our specimens, that we might get an early start on the 19th for the North Carolina line.

Passing without too much temptation through Chesterfield and Prince George Counties, we were just crossing the line into Sussex County, when, tiring of the monotonous ride, we got out to stretch our legs by going down an open pastured slope to a bit of boggy woods. This spot, on a small tributary of the Nottoway running through Jones Hole Swamp, at once stopped our southward progress. Fed by cold springs breaking through the plastic clay and marl, it was the last remnant of a truly wet, wooded sphagnous bog, the best we have yet explored in Virginia. Cows and pigs had almost a monopoly of the place and, although the clumsy and intimately inquisitive sows had wallowed everywhere and had uprooted most of the clumps of *Sarracenia flava* and *S. purpurea*, var. *venosa* (Raf.) Fern.,[2] they had not wholly destroyed everything. Tumbling, slipping and wallowing through the saturated clay and *Sphagnum*, we found all we could handle in typical species of southern bogs, with *Xyris* in abundance; the largest of the series being *X. ambigua* Beyrich, which from now on

[1] See Fernald & Griscom, RHODORA, xxxvii. 170 (1935).
[2] RHODORA, xxxviii. 233 (1936).

proved to be common (though not previously known north of North Carolina) and always very handsome in fresh flower, its petals large for the genus. On one margin of the bog, with the largest and handsomest of *Drosera capillaris* we have met, another *Xyris*, very tiny, occurred, low, with short, blue-green, membranous foliage, very small spikes and bristle-form scapes which, upon pulling, promptly disarticulated at base, in the manner of the boreal *X. montana*. This was *X. Curtissii* Malme (*X. neglecta* Small) at the first station recorded north of Georgia. *Carex Collinsii* Nutt. (MAP 12), also new to Virginia, was pushing its characteristic inflorescences (but now over-ripe) through the bushes; and the new *Juncus*, discovered in June, was so finely developed that we here made a large type-series. In the spring-heads a small pondweed was growing. Pulling out a handful and tossing it, mixed with *Utricularia gibba*, into the collecting box as merely *Potamogeton capillaceus* Poir. (heretofore unknown between Delaware and North Carolina), I was proceeding, when Long, as usual not satisfied to accept an off-hand identification, mildly asked if I had ever seen *P. capillaceus* with stiffly acicular and ascending submersed leaves; as he knew it it always has them flaccid and loosely divergent. That was surely the case, so we pulled in two more handfuls and when we separated it out and floated it next day we discovered that it also has subligneous black rhizomes. Its fruits are those of *P. capillaceus* but the plant, which we reexamined on a subsequent day, has none of the axillary rounded spikes of true *P. capillaceus*. It is a most distinct variety but, with no appreciable difference in fruits, I can hardly call it a distinct species.

We had left the car, to stretch our legs, at 10 o'clock. At 2:30, remembering that we had started a second time for the Carolina line and had not yet covered a quarter of the distance from Petersburg, we woke Carroll who, after hours of collecting butterflies, was blissfully forgetting the heat, and ate lunch, sharing the crusts with our now very familiar co-rooters. This area in Sussex County supports no village, but on the topographic sheet it seemed to be called Coddyshore, a name we had never heard. Wishing to be reassured, we asked an elderly colored resident, "What do you call this community?" and promptly received the reply, "Homeville." Upon our protesting that Homeville is at least ten miles away, he replied, "Well, then, call it Sussex County, Virginia." On our labels we are calling it Coddyshore, Sussex County.

Renewing the southward journey, we succeeded in driving at least six miles, when, about four miles northwest of Homeville, we were attracted by unspoiled dry pine woods where there must be good southern species. There were; but the plants which really astonished us were two northern and inland types, both fruiting and living happily with their southern associates. These were *Lycopodium tristachyum* and *L. complanatum*, var. *flabelliforme*, both characteristic of the Canadian flora.

Carroll, attracted to the border of a cultivated field by the masses of white flowers of Rose Mallow, *Hibiscus Moscheutos*, was busily sweeping with his net. Going over to tell him we were ready to start, I promptly changed my mind and shouted to Long to come and help me. At one end of the low field was an undisturbed and wet bit of bog, occupying perhaps an acre but clearly the last remnant of what must originally have been a shallow bog-pond toward a mile long. The *Hibiscus* was there because it was wet and because of a water-hole which extended through the area. Great masses of the beautiful *Sabatia campanulata* (L.) Torr. of the southern Appalachian Upland and the Northern Coastal Plain at first attracted me; then equally extensive clumps of *Hypericum denticulatum* Walt., var. *ovalifolium* (Britton) Blake, of the New Jersey Pine Barrens. It was altogether disconcerting, there were so many novel plants, but when Long came we each knelt in a pivotal spot and by collecting in a circle of ten-foot radius disentangled the less obvious species: a complicated series of variations of *Lycopodium inundatum*;[1] *Viola lanceolata*, var. *vittata* (Greene) Weath. & Grisc.[2] (*V. vittata* Greene), the northern limit given by Small as North Carolina; *Panicum Wrightianum* Scribn. (MAP 13), a species known at intervals from Central America and Cuba to southeastern Massachusetts, but not recorded by Hitchcock & Chase nor in Hitchcock's *Manual* from Virginia, though abundant here and afterward found by us twice in Isle Wight County. Intimately mixed with these and a series of species of *Rynchospora* and *Scleria* was a tussock-forming member of the former genus, with capillary leaves and culms widely sprawling under the taller plants. Superficially somewhat suggesting several of the finer-leaved southern species, its fruits seem specifically different from those of any now recognized and I shall describe and illustrate it in Part II. At one end of the bog and along

[1] See RHODORA, XXXVIII. 382 (1936).
[2] RHODORA, XXXVI. 48 (1934).

the water-hole and ditch the most distinct of all the genus, *Panicum hemitomon*, "Maidencane" (map 14), abounded, its inflorescences mostly reduced by grasshoppers to mere champings, but interesting because this tropical species (Brazil to Cape May, New Jersey) has not been recorded from Virginia. It is abundant and at this point closely borders the main automobile road. Sharing the water-hole and ditch were other good things, including *Hydrolea quadrivalvis*, here, as along Three Creek, all spineless, whereas the species farther south is commonly (but not always), spiny, and *Rynchospora caduca* Ell., which we had had in Princess Anne and Norfolk Counties and later found at another station in Sussex; but the best plant of the water-hole is *Leersia hexandra* Swartz, a tropical species known to Hitchcock (*Man.*) only northward to North Carolina.

It was 6 o'clock and, obviously, the state line was not to be reached this day, but we did hope at least to see Homeville, four miles away, not because of its size, but because it is a route-junction and possessor of a railroad station, therefore on the maps. But that had to be the limit. Long, noting across the road from *Panicum hemitomon* a cut-over cypress-swamp, ventured into it, soon to return with material of the handsome new species which I have already described as *Panicum mundum*.[1] Turning back at the little group of houses constituting Homeville, Carroll drove, while Long and I slept, back to Richmond, or to the University, which is actually beyond Richmond, in Westhampton. We had with us at least eleven plants new to Virginia, four of them new to science!

The day Townsend took us to the stations where his grandfather had shown him many local and rare species, we saw, sadly and impressively, an example of what is more and more happening to the bogs and swamps of the Coastal Plain. He had not visited these spots for some years; in the meantime deep ditching has lowered the water-table and what were once splendid bogs are now dried-out remnants, invaded by aggressive pines and oaks, with the open bogs he remembered now quite ruined and most of the then interesting plants now extinct. In these young invading pine woods southwest of Petersburg, in Dinwiddie County, a few struggling and hopelessly shaded plants of the two species of *Sarracenia*, *S. flava* and *S. purpurea*, var. *venosa*, still lingered and with them their obvious hybrid, × *S. Catesbaei* Ell., which had not been known in Virginia. *Panicum strigosum*, *Lach-*

[1] Rhodora, xxxviii. 392, pl. 443 (1936).

nocaulon anceps and a few other choice species of the old bog persisted as the rarest of unhappy remnants; but, all in all, the pines and oaks of the newly dried-out and recently invaded area are rapidly conquering. It is certainly a pity that Man so selfishly or shortsightedly is bent on spoiling the treasures which future generations must do without; but in eastern Virginia he is doing just what he does everywhere else, looking upon his temporary profits as outweighing all else. Here, so far as we could see, the total advantage to Man of the ruinous ditching was approximately the same as in many other such areas, practically *nil*.[1]

On the 22nd, starting again toward North Carolina, we successfully passed Homeville, but near Littleton one of the rare depressions of unplowed land gave good promise. We there re-collected several choice species and met for the only time in the summer the very striking *Polygala ramosa*, a slender-stemmed plant with a broad and dense lemon-yellow inflorescence, which, upon drying, changes to blackish- or livid-green. The white-flowered *Sabatia paniculata* and the very similar pink-flowered *S. brachiata* abounded, as usual in southeastern Virginia in dry, not wet, clay and, to set us puzzling, there was an albino of the latter; and in the dry sand and clay two of my own species, *Cyperus hystricinus* and *C. dipsaciformis*, were maturing. It was gratifying to recognize them outside the herbarium.

Reaching Courtland for lunch, we were undecided which of several possible routes to take but, impressed by the possibilities of an area called Cypress Bridge, for the topographic map showed extensive bottomland and cypress swamp there, we voted in its favor. We actually did not reach the Bridge that day! The dry and sandy Yellow Pine woods had a finely developed display of *Rhynchosia*, *Desmodium* and other genera of unspoiled sandy woods, with *Cyperus retrorsus* Chapm., var. *Nashii* (Britton) Fern. & Grisc. of Cape Henry (and Florida), abundant, and *Paronychia Baldwinii*, *Brewcria humistrata* and many other southern species now in fine flower. *Penstemon australis* Small (in fruit) and *Panicum mutabile* Scribn. & Sm. (MAP 15), both also near their northern limits, were equally abundant; and

[1] In April, 1937, we were distressed to find the remnant of bog four miles northwest of Homeville, the only known station for the new *Rynchospora* and the one known Virginia station for *Panicum hemitomon*, *Leersia hexandra* and other species, burned over and going under the plow. Next day our station southeast of New Bohemia, the only one in the state for the relic *Juncus brachycarpus* (see p. 346) and one of the few for *Cynoctonum Mitreola* and *Lobelia glandulifera*, was, likewise, being burned off. Still more scientifically significant relics destroyed!

we now got in full flower the common Everlasting of the region, *Gnaphalium obtusifolium*, var. *praecox* Fern.[1] When I described this southern early-flowering variety from South Carolina, Georgia and Alabama, the only evidence of it from Virginia was an old specimen of Rugel's, without stated locality. It is the only *Gnaphalium* of its group seen by us in Greensville, Southampton, Sussex and Isle of Wight Counties; in September and October typical late-flowering *G. obtusifolium*, so common in Princess Anne County and on the Eastern Shore, was nowhere seen. In 1899 the late Eugene P. Bicknell published the first of a series of studies of the genus under the alliterative title: "*Studies in Sisyrinchium—1: Sixteen new Species from the Southern States.*" In all our Virginia field-work we have yearned to secure a species so sibilantly set before the southern student of systematic botany. At last we were successful. Everywhere at the border of the sandy woods there was a plant thoroughly different from any we had met in Virginia. It was described by Bicknell as *Sisyrinchium carolinianum*, from "Western North Carolina and central South Carolina to Georgia, Alabama and Mississippi," the name subsequently altered to *S. fibrosum* Bicknell (1903) because of the prior use of the name he first gave. *S. fibrosum* soon became an every-day sight in dry sandy woods of Southampton, Sussex and Isle of Wight Counties; but whether it is specifically separable from *S. arenicola* Bicknell (1899), originally described from New Jersey and Long Island, seems very doubtful.

Starting next day where we had adjourned the night before, we spent most of the time on the bottomland bordering the cypress swamp, and when, in late afternoon, we crossed Cypress Bridge, we lingered to enjoy the view, so exotic to northern eyes, the quiet blackish water of the Nottoway there broadly expanded as a clear mirror about an apparent island and framed by giant cypresses with their bulging bases and innumerable tall "knees," the water bordered by the splendid *Hibiscus militaris* in full bloom, the surface a mat of *Nuphar fluviatile* in flower. That eminently southern landscape is permanently engraved on our memories. The margin of the inundated cypress swamp kept us busy until dark. We were delighted to collect species we had never before seen flowering, such as *Physostegia denticulata* and *Sabatia calycina*. *Panicum agrostoides*, var. *ramosius* (Mohr) Fern., recently discussed and illustrated by me[2] was puzzling

[1] Rhodora, xxxviii. 231, pl. 434 (1936).
[2] Rhodora, xxxviii. 390, pl. 442 (1936).

on account of its silvery-green panicles of slender spikelets and its perfectly smooth and membranous, elongate leaves. *Viola affinis*, the ordinary simple-leaved form, abounded; but equally abundant was a plant wholly resembling it but with deeply palmated foliage, *V. affinis*, var. *chalcosperma* (Brainerd) Griscom,[1] heretofore known only from Florida. *Hypoxis leptocarpa* (MAP 7), gigantic plants, some requiring folding to go on standard herbarium-sheets, and the strange *Isoëtes* of Three Creek and the Nottoway higher up abounded; and *Echinodorus radicans* (MAP 16), now in flower and fruit, was not trailing, as we expected it to do, but had high-arching or doming, many-whorled inflorescences which developed leafy tufts when the tips touched the water or mud. *Lysimachia* (*Steironema*) *radicans*, already reported from Virginia but not represented in the Gray Herbarium from east of the Mississippi Valley, was there but we did not get into its real home, seeing only two individuals. We were impressed by the membranous and quite smooth leaves of *Tovara virginiana* (L.) Adans.(*Polygonum virginianum* L.), and when we dug plants found that they had unusually slender and elongate rhizomes. Subsequent study shows that the plant of the long-drowned bottomlands of all this area constitutes a well defined new variety.

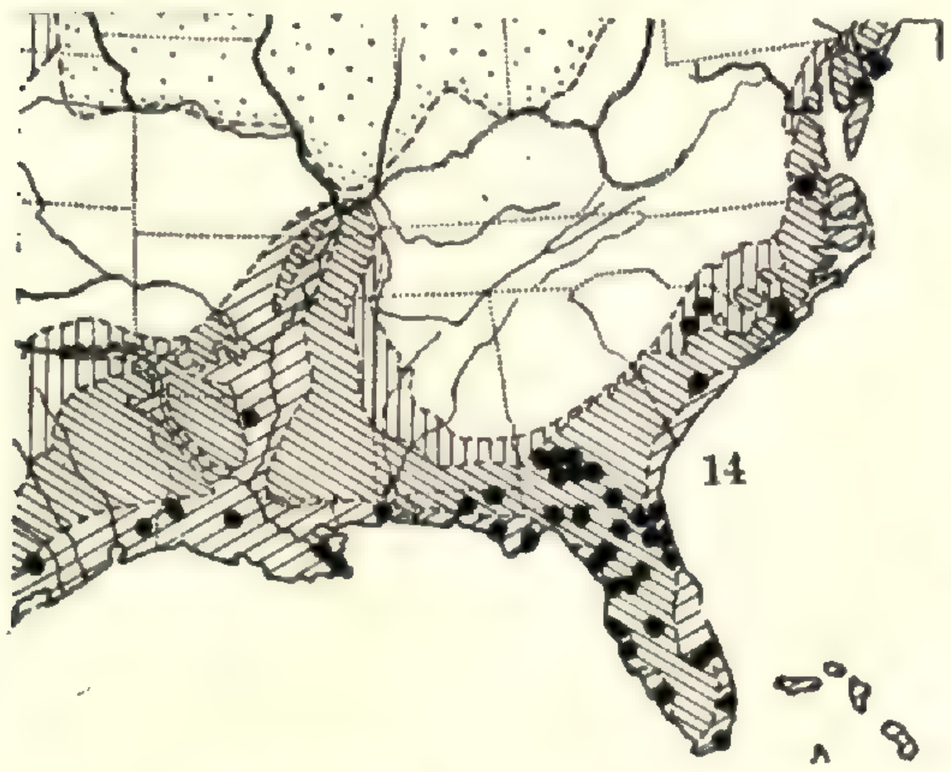
It was dark when we crossed the Bridge but we had to look upon one dryish, sandy alluvial bank. *Eragrostis hypnoides* was beautiful, with long repent flowering stems, and Long soon held up one solitary and dwarfed individual of *Paspalum dissectum*, not mapped by Hitchcock (*Man.*) from between Georgia, Tennessee and southern Illinois on the one hand and Maryland on the other. We all crept in the darkness over the alluvium but it was Long, or course, who found the next plant, only this was *P. fluitans* Ell. (MAP 17), the species called by Hitchcock, in Gray's *Manual*, *P. mucronatum*, and erroneously merged by Chase in her monograph and, following her, by Hitchcock in his *Manual* with the very different tropical *P. repens* Bergius. The identity of these plants will be fully discussed in Part II. The present interest is that Chase and, after her, Hitchcock, have given its northern limits as in South Carolina, Kentucky, southern Indiana, Illinois, Missouri and Kansas. In September we found the real Virginian home of *P. fluitans*, on the alluvium of the Nottoway near Courtland.

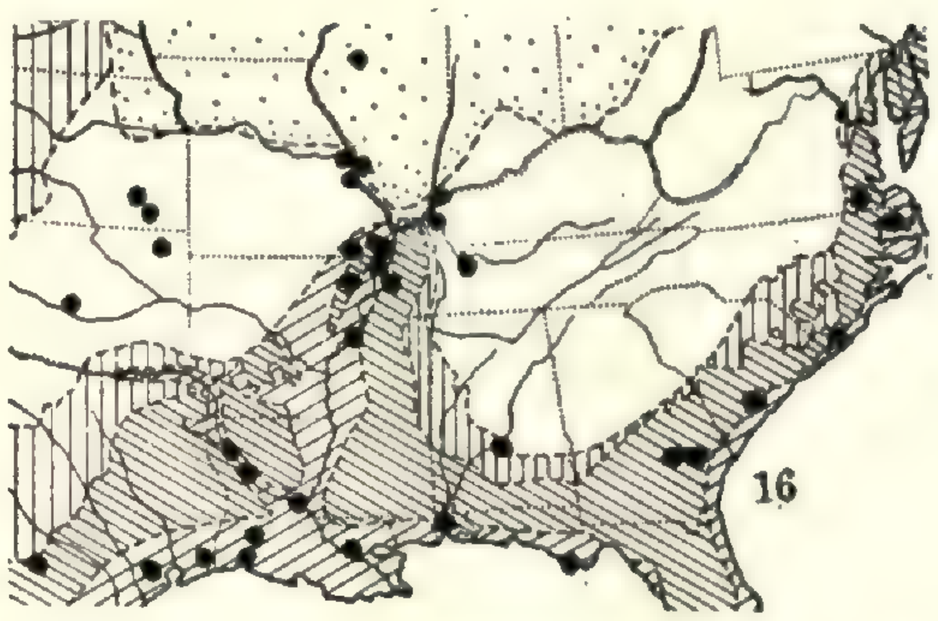
Deciding that the two species of *Paspalum* and other species which

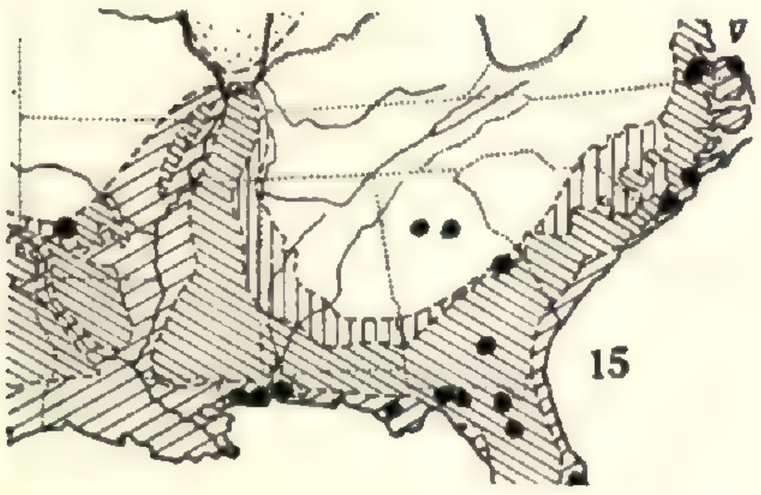
[1] RHODORA, XXXVIII. 49 (1936).

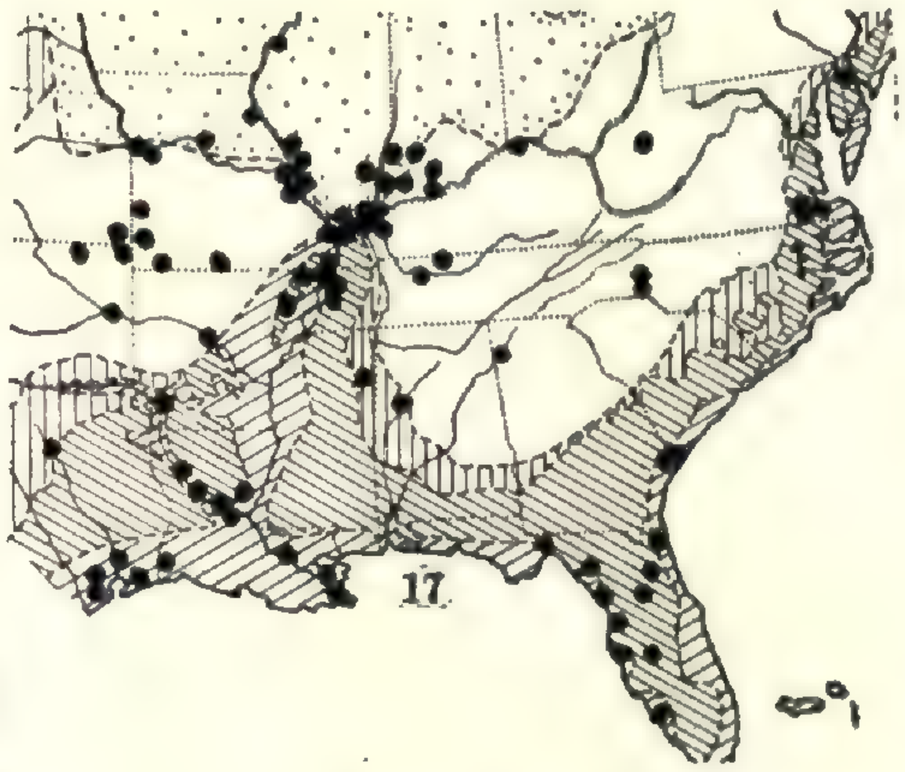
should grow with them must be on broader alluvial expanses up-river, we headed next afternoon for the Nottoway near Lumberton, where the map indicated a large pond-like expanse. But our new objective was never reached. Not far from Homeville we came to a small remnant of a once extensive boggy thicket, now drained nearly dry; but the few square rods still remaining damp and unplowed have a good colony of *Rynchospora caduca* and, best of all, an abundance of the tall *Lythrum lanceolatum* Ell., heretofore known only from Florida to Oklahoma and Texas, north to South Carolina. What a locality this must originally have been! Near by the dry woods of hickory and oak had a singular grass, combining the characters of *Panicum commutatum* and *P. Boscii*, var. *molle*. Until we get more we will leave it at that. The comparatively rich woods were full of *Clematis ochroleuca*, *Carex striatula* Michx., *Scrophularia marilandica*, the upland *Houstonia tenuifolia* and other species we saw nowhere else during the summer, and some of the shrubby oaks were *Quercus stellata*, var. *Boyntoni* (Beadle) Sargent (*Q. Boyntoni* Beadle), the range given by Small (*Man.*) as "Appalachian Valley, Ga. and Ala." Darkness was coming on and I was going back to the road well satisfied with the short afternoon's results, when Long shouted, "Oh! come and see the greatest thing you ever saw." Supposing he was joking, I continued, but his "five, six, eight, nine, ten" piqued my curiosity and I went back to a spot within three feet of where I had blindly stumbled through, to gaze on a beautiful flowering colony of *Hexalectris spicata* (MAP 18), the handsome Giant or Crested Coral-root, which occurs from Mexico and Arizona to Florida, northward to Missouri, Indiana and, rarely, Maryland, but with only four stations (Grimes's two near Williamsburg, Miss Rathbun's in Fauquier Co. (see Wherry, Journ. Wash. Acad. Sci. xvii. 36) and Gregory's in Amherst Co. (Claytonia, i. 14)) heretofore known in Virginia. That was a great climax for a great afternoon!

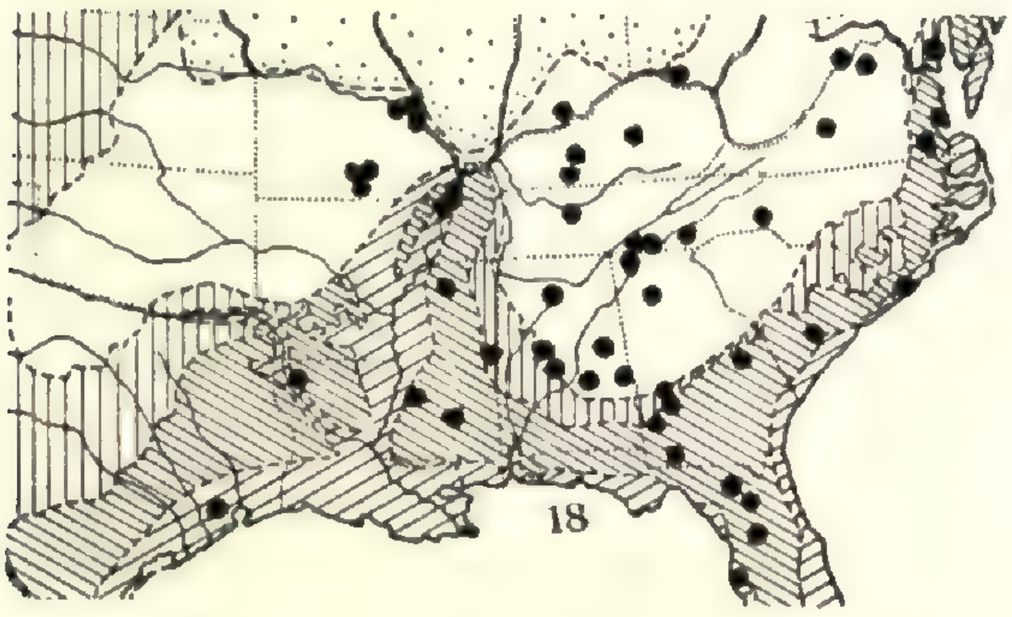
Next day, fortunately, Smart could join us. Since he wished to photograph *Hexalectris*, we took him, under oath never to divulge the station, to Homeville to see it. Then we proceeded as far as the Nottoway River, southwest of Burt. The alluvial woods, where we botanized after lunch, had the usual Coastal Plain and continental sedges of many bottomlands, but we were really amazed here to find *Carex Grayii* (MAP 19), for, like *C. squarrosa* and *C. typhina* with it, it is primarily a plant of the rich interior of the continent. On the opposite

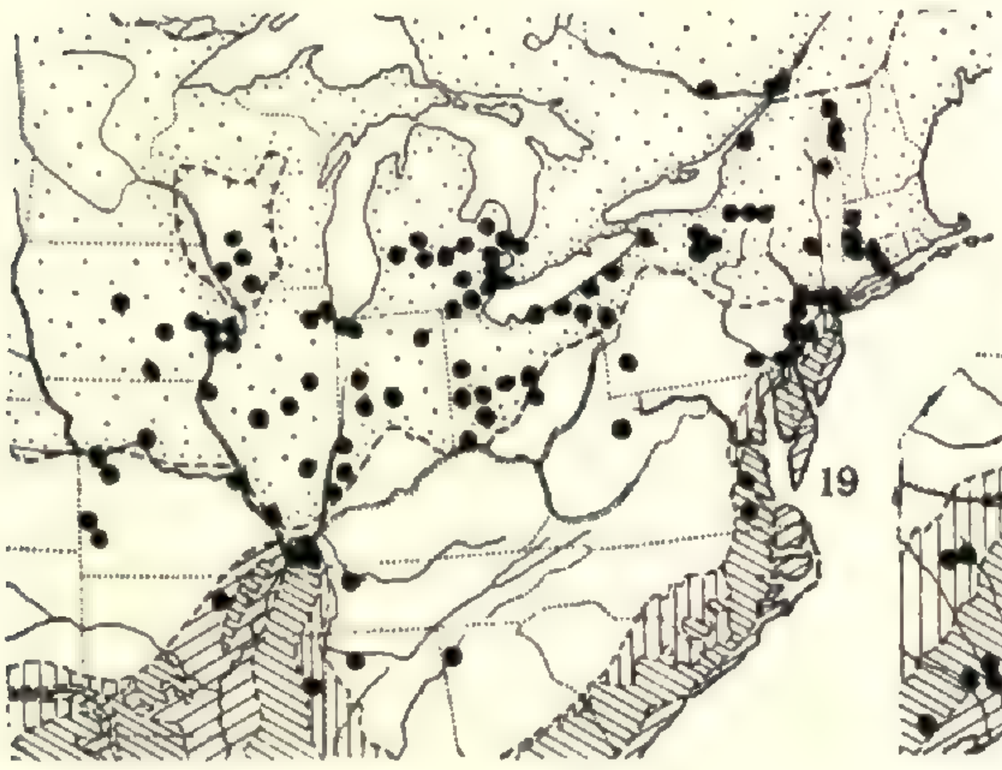


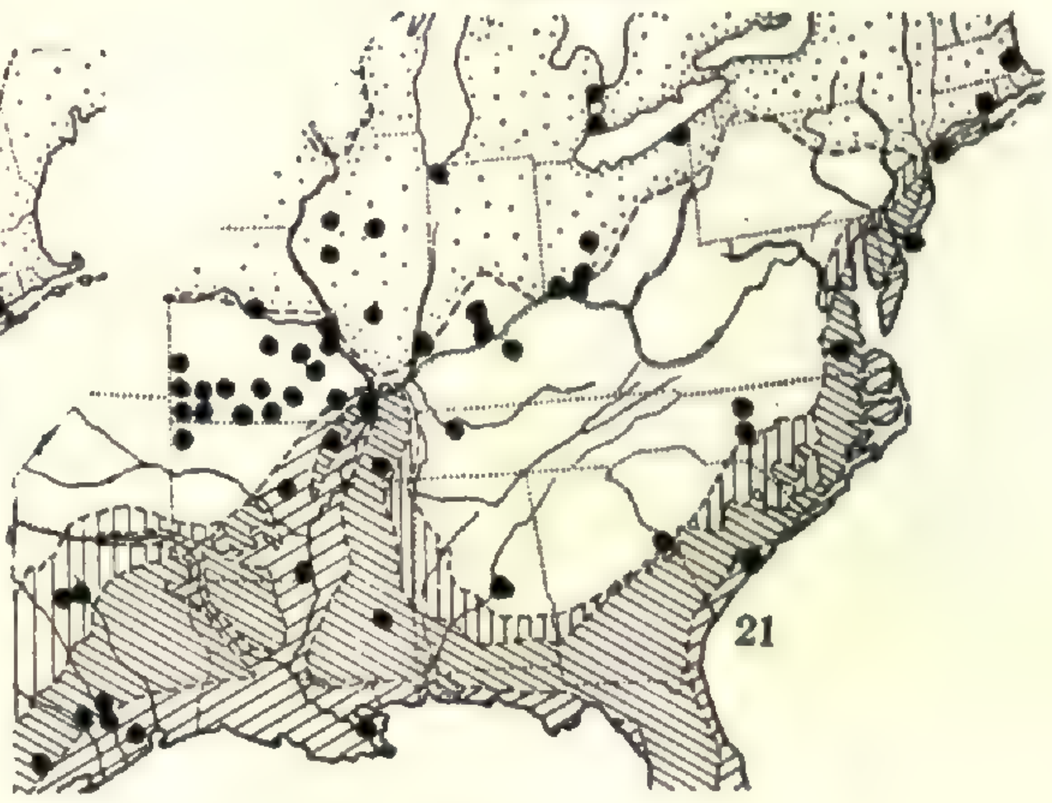












Map 14, range of Panicum hemitomon (northern extension); 15, Panicum mutabile; 16, Echinodorus radicans (northern half of range); 17, Paspalum fluitans; 18, Hexalectris spicata (northeastern area); 19, Carex Grayii; 20, Lobelia glandulifera; 21, Juncus brachycarpus.

alluvial bottom Long came upon a large colony of a very strange *Geum*. In general it is nearest related to *G. canadense*, var. *Grimesii* Fern. & Weath.[1], but its very small heads are on very short divergent peduncles and overtopped by the leaves, and its tiny achenes are even smoother than in var. *Grimesii*. It will be described as new in Part II. These were good indicators of what could be found under advantageous conditions, but it was a sweltering and breathless day and the inclination to tramp was diminished. Riding seemed more inviting, so, remembering the North Carolina line, we went on to Cypress Bridge, stopping to collect still another strange *Isoëtes* there, and proceeded southward as far as Sunbeam and a little beyond. Turning at dusk, still two miles within Southampton County, we crossed the Nottoway at Monroe Bridge, stopped to collect specialties in the dark at Sycamore Bend and, proceeding along a dirt road near there, saw within the beam from the headlight a fine colony of the white- or pink-flowered *Cirsium Nuttallii* (DC.) Gray, leaning out from the thicket. It is not comfortable to dig thistles and to fold tall specimens of them in the dark; and Carroll was amazed at our recognizing a novelty after dark. Our reply, "Why not after dark? We left Sunbeam half-an-hour back," may have been undignified but we should not have wished to pass *Cirsium Nuttallii*, for it had never been recorded from north of South Carolina.

The Jerusalem Plank Road and its arteries, such as we had followed, had supplied a rich harvest of relics and rarities, but there are other trunk-roads with their numerous arteries, which we had not even seen, and we had not set foot in the Counties of Surry and Isle of Wight, nor this year in Nansemond. So, having followed one road until we knew at least every house upon it, we decided to swing farther to the southeast, in the direction of Waverly, Windsor and Suffolk. There were two days in which to cover approximately 1500 square miles of new territory, and we started for Suffolk, foolishly imagining that we should run express the entire distance. But even before we had finished the daily monotonous trip from Richmond to Petersburg, whence we entered the more productive areas, we spied *Rhexia ventricosa* Fern. & Grisc.,[2] of Princess Anne and Norfolk Counties, in a peaty spot north of Swift Creek. *Rynchospora Wrightiana* Boeckl., which, when we got it near Virginia Beach, was new to the state, here abounded; and *Eupatorium leucolepis*, unrepresented in the Gray

[1] Rhodora, xxiv. 49 (1922).
[2] Rhodora, xxxvii. 172, pl. 346 (1935).

Herbarium from between South Carolina and Delaware, was recognizable, though young. Since its discovery by Rich and Knowlton in 1908 a plant of Plymouth County, Massachusetts and Washington County, Rhode Island has regularly passed as this species. I had never before met true *E. leucolepis* in the field and was startled by its divergence from the plant of southern New England. In part II I shall designate the latter as a strongly marked and isolated northern variety.

A few miles southeast of New Bohemia, in Prince George County, there is a small swale which we passed the first day, but the second, attracted by some spectacular plant, investigated. A *Xyris*, suggesting *X. torta* Sm. (*X. flexuosa* of authors), but with elongate and pointed, instead of round-tipped spikes and with chestnut-brown and almost chestnut-sized bulbs, seemed strange. Fortunately we took a good series, for it is undescribed, and in late August we re-collected it and added a station in Isle of Wight County. A *Lobelia*, not yet in flower, was obviously the southern *L. glandulifera* (Gray) Small (MAP 20), in October found more abundantly and in fruit nearer Petersburg. In his recently published study of the genus, McVaugh cited an old specimen "collected by Pursh in 1806 in Greensville or Southampton County"[1] and, still farther north, he had seen the species from James City and Hanover Counties, while to the south it occurs on the Coastal Plain, just over the Virginia line, in Pasquotank County, North Carolina. Otherwise, as McVaugh's map shows, *L. glandulifera* is a Piedmont and mountain species of interior and western North Carolina and eastern Tennessee; but 600 miles to the southwest of our area there is a second Coastal Plain concentration of it, in southwestern Georgia and northwestern Florida. Such a map as McVaugh's (our MAP 20) suggests a movement in two directions from the old Appalachian center to the young Coastal Plain. This rather general type of dispersal will be slightly considered in Part III, although it has already been outlined several times and is receiving constant recognition.[2] Leaving that for the present, it was certainly gratifying to feel that in our summer's collecting we had been so closely on the trail of the pioneer botanist, Frederick Pursh, 131 years ago (see p. 329). *Cynoctonum Mitreola* was associated with the *Lobelia*, our first col-

[1] RHODORA, xxxviii. 288 (1936).

[2] See, for instance, Fernald, *Specific Segregations and Identities in some Floras of eastern North America and the Old World*, RHODORA, xxxiii. 25–63 (1931); and Braun, *Some Relationships of the Flora of the Cumberland Plateau and Cumberland Mountains in Kentucky*, RHODORA, xxxix. 193–208 (1937).

lection of it in Virginia, though it had already been known in the state and we later found it along the Blackwater in Isle of Wight County. In fact, John Clayton got *Cynoctonum Mitreola* somewhere in the state and it was definitely listed by Gronovius (ed. 2: 27) as *Ophriorrhiza foliis ovatis*, with *Mitreola* as a synonym.

Another plant we were delighted to collect near New Bohemia was *Juncus brachycarpus* (MAP 21), for this neat species gives us one of the most typical cases of segregation to the east and to the west of the ancient Appalachian core of eastern America. It occurs, always locally, from eastern Texas to Alabama and, perhaps, northwestern Florida (cited by Buchenau but unknown to Small), thence north through Arkansas, Missouri, western Tennessee, Kentucky and the Ohio Valley, into Illinois, southern Michigan and the region of Lake Ontario. East of the Appalachian axes it is even more scattered: Savannah River bottoms near Germain's Island, Columbia County, Georgia (*Harper*); near Charleston, South Carolina (*Beyrich*); High Point, Guilford County, North Carolina (*Canby*), well back in the Piedmont, and south of Ashboro, Randolph County, North Carolina (*Wiegand & Manning*), essentially as far inland; our station on the Inner Coastal Plain of Virginia; in white sand, Cape May, New Jersey (*O. H. Brown*); Freeport, on the Coastal Plain of Long Island (*Ferguson*); Ocean Beach, New London County, Connecticut (*Graves*), possibly there a local adventive; and, at the extreme northeastern limit of Tertiary deposits of the Coastal Plain, "in rich red friable soil like Potomac River soil," Scituate, Massachusetts (*Kennedy*).[1] When he originally described the species from "the Mississippi Valley," George Engelmann doubted its occurrence on the Atlantic slope, saying, "also, if the locality is correctly reported, near Charleston, S. C., *Beyrich*." The doubt now seem sufficiently removed and it becomes clear that the rarity of *Juncus brachycarpus* is presumably accounted for by its being a "relic-species" of considerable antiquity.

Three to four miles northwest of Waverly the pinelands are largely unspoiled. Many good series of local species were here collected, though most of them were no longer new to us. *Polygala Harperi* Small, with more compact inflorescences than the common *P. Curtissii* and paler coloring, was frequent in the area, either slender and subsimple or coarser and bushy-branched. It is not recorded from north of Georgia, though it was collected but not recognized as a novelty by

[1] For an enumeration of the then known stations on the Atlantic slope see O. H. Brown, Bartonia, no. 7: 23, 24 (1914).

the late A. B. Seymour near Waverly in 1891, many years before the discovery of the type of *P. Harperi*. One wet depression supports a fine colony of *Aletris aurea*, mixed with *Tofieldia racemosa* (also collected by Seymour in 1891) and *Iris prismatica*,[1] which, farther north, we look for near the coast; and across this boggy area we found the tall and handsome southern *Zigadenus glaberrimus* flowering. A small field within this pineland had been plowed and left fallow and, as usual under such circumstances, there was great stimulation (cultivation) of such species as tolerate disturbance. Attracted by an unusually showy display of the ubiquitous *Coreopsis verticillata*, we went to see what it was and found with it a heterogeneous display, including *Oenothera fruticosa*, var. *Eamesii* (Robins.) Blake, a characteristic extreme supposed to be endemic in southwestern Connecticut, and var. *humifusa* T. F. Allen, an equally extreme plant of Montauk Point, Long Island!

At various stops from here on we collected rare species (*Panicum Wrightianum*, *Lachnocaulon anceps*, etc.) almost every time we thought we could spare five minutes from the "express" run to Suffolk. Slightly east of Ivor there is a conspicuous stand, at the border of once swampy woods and near an artificial ditch, of *Catalpa speciosa*,

[1] There is an opportunity for what someone has called "micronyms" in *Iris prismatica*. In the greatest storehouse of such names we are told of the extensive genus *Iris*, that there are "Fully 100 species." 96 are recognized in the limited area covered and more than 80 of them are newly described from southern Louisiana. 3 Linnean species are admitted, 2 of Walter's, 1 of Pursh's, 1 of Ker-Gawler's and 1 of Mackenzie & Bush's. The remaining 88 are recent segregates by Small or, in some cases, Alexander. The "specific" differences are indicated in the keys:

Perianth red, orange-red, or copper-red . . . . . *I. subfulva* Small.
Perianth mauve, violet or purple . . . . . *I. regifulva* Alexander.

Or again:

Perianth intense magenta-purple . . . . . *I. purpurisatta* Small.
Perianth vinaceous . . . . . *I. viridivinea* Small.

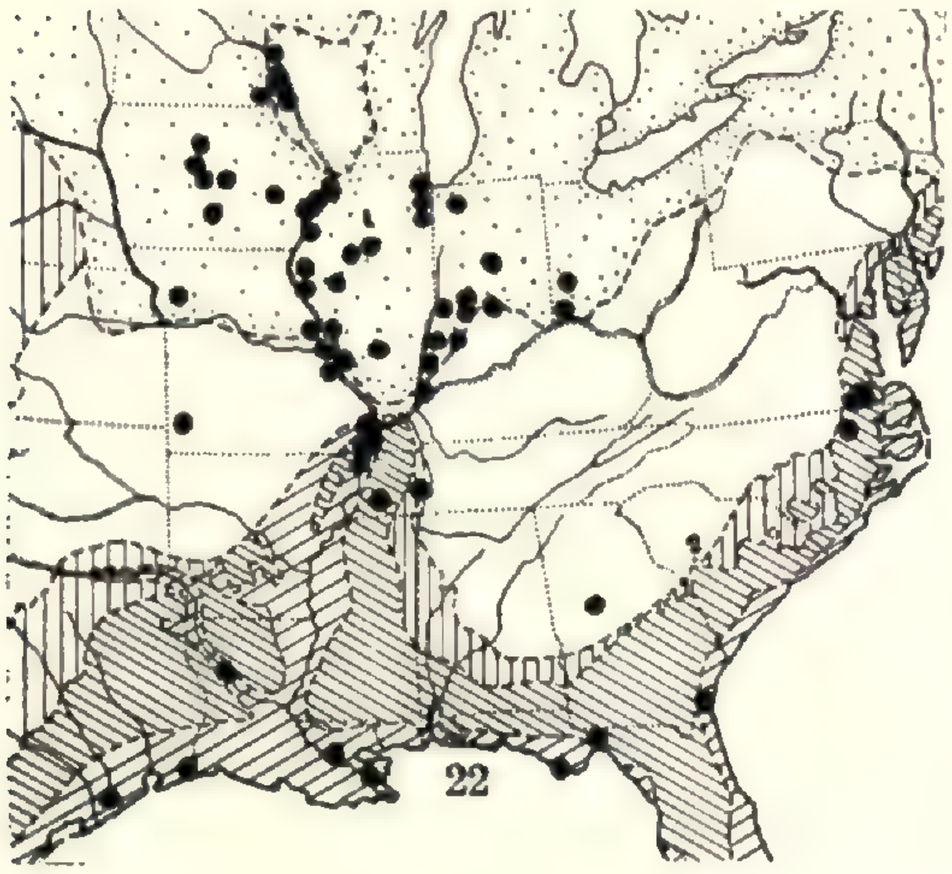
Furthermore, "Albino flowers occur in the various species." With 96 of the "Fully 100 species" allowed to the genus *Iris* thus accounted for, the problem remains as to which 4 or possibly more of all the old-line species (those of Aitcheson, Aiton, Ascherson & Sintenis, Baker, Barbey, Bertolini, Bieberstein, Boissier, Brotero, Bunge, Carrière, Dammann, DeCandolle, Douglas, Dykes, Eastwood, Ehrhart, Fedtschenko, Fischer, Foster, Franchet & Savatier, Gray, Henriques, Herbert, Heuffel, Hoffmann, Hooker filius, Janka, Ker-Gawler, Kerner, Lamarck, Lange, Lindley, Linnaeus, Maximowicz, C. A. Meyer, Micheli, Nuttall, Pallas, Poiret, Regel, Reichenbach filius, Schrenk, Schott, Siebold, Stapf, Thunberg, Tineo, Torrey, Wallich, Watson, Willdenow and C. H. Wright) are allowed to stand in making up the full 100.

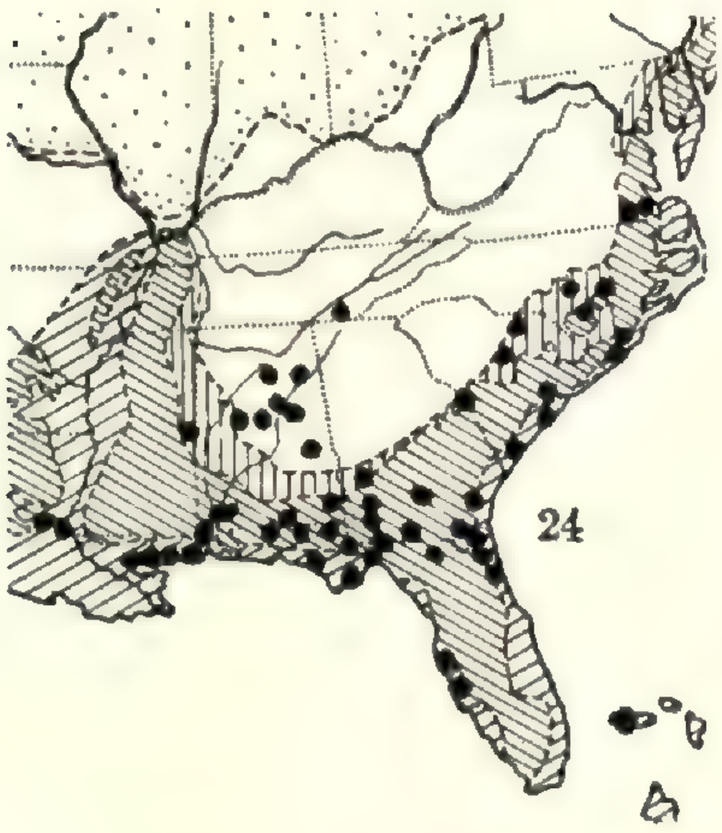
It is interesting to note that what at New York have been called "chloronyms" are less acceptable: "The native plant of the southern Appalachian mountains appears to be almost identical with the European one [*Convallaria majalis*]. . . . The native American plant usually has a shorter inflorescence, and has larger bracts and an oblate seed." The *native* American species is *C. majuscula* Greene.

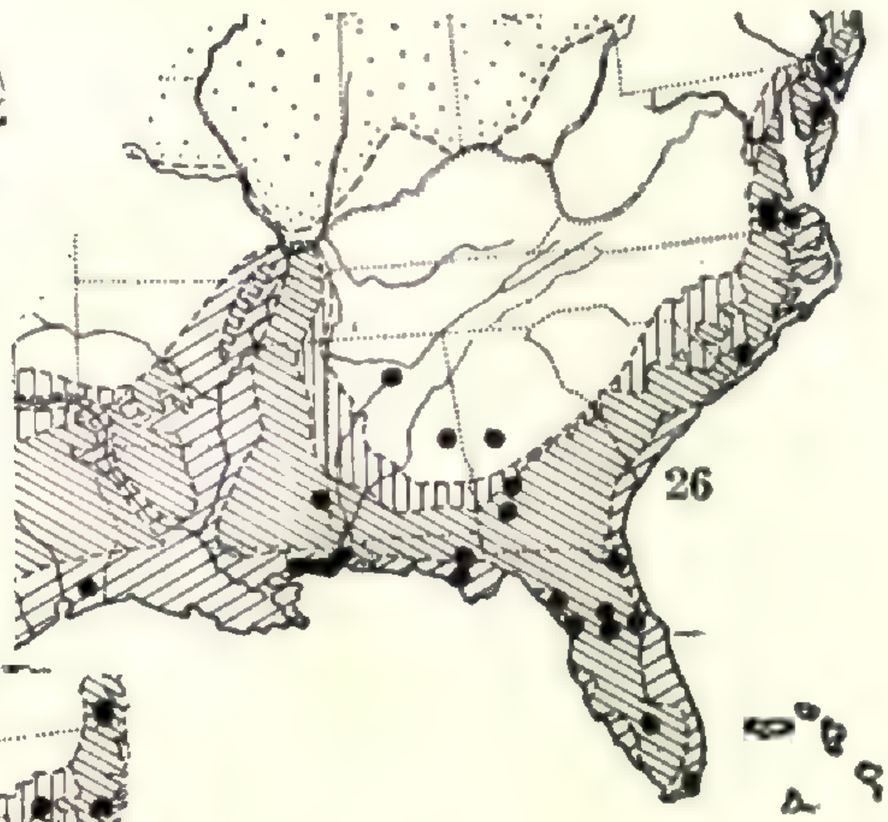
a mid-western species, not supposed to grow naturally east of the Mississippi Valley, here very striking on account of the pendulous, cylindric pods up to 4.5 dm. long. Presumably originally planted, the tree is now thoroughly naturalized.

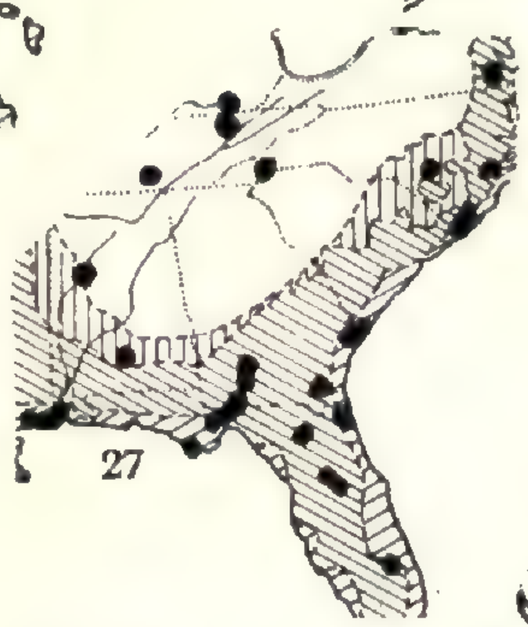
The wooded Warwick Swamp, where the Suffolk road crosses it, and the bottomland of the Blackwater, west of and at Zuni (the 1 pronounced like the personal pronoun), have many of the choice bottomland plants we had seen elsewhere, but here we made our first bow to *Leersia lenticularis* (MAP 22), handsome (quite distinguished) and with none of the highly objectionable qualities of the semicosmopolitan *L. oryzoides*. In August we saw it, fully developed, on many bottomlands, there the exclusive member of the genus; nevertheless, the range given in Hitchcock's *Manual* is from eastern Texas and Louisiana northward to Minnesota and Wisconsin, with the easternmost stations in Florida, Georgia, South Carolina, Kentucky and Indiana. Along Fontaine Creek, emptying into the Meherrin, it is equally abundant, and, remembering that 131 years ago Frederick Pursh botanized through this country, it seemed to us improbable that he could have overlooked so conspicuous a plant. And he surely did not. Pursh explicitly records it from North Carolina and Virginia!

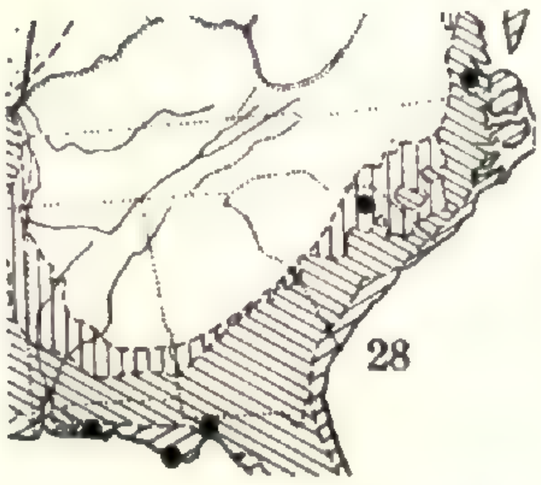
"In wet gravelly woods in Illinois and Virginia. 2[4]. July. *v. v.* This singular and elegant grass I found on the islands of Roanoak river in North Carolina, and observed it catching flies in the same manner as *Dionæa muscipula:* the valves of the corolla are nearly of the same structure as the leaves of that plant. I communicated specimens with this particular circumstance to Dr. B. S. Barton of Philadelphia, who has made mention of it in a paper on the irritability of plants."—Pursh, Fl. Am. Sept. i. 62 (1814). In view of Pursh's observation, which gave origin to the English name "Catch-fly Grass," made in Virginia and North Carolina, it is at least significant of the inadequacy of botanical collections from southeastern Virginia, that both states should be omitted from the mapped range of the species in Hitchcock's Manual. Its Virginia occurrence has been noted in Gray's Manual since the 2nd. edition. *Carex* was mostly out of season, dead-ripe and unrecognizable, but in these wooded swamps, inundated during much of the spring, one very tall and handsome species was just beginning to flower (with young anthers). In August, when mature, it proved to be *C. Joorii* Bailey, originally described from Louisiana, but now known to have the austro-riparian range we had come to expect,

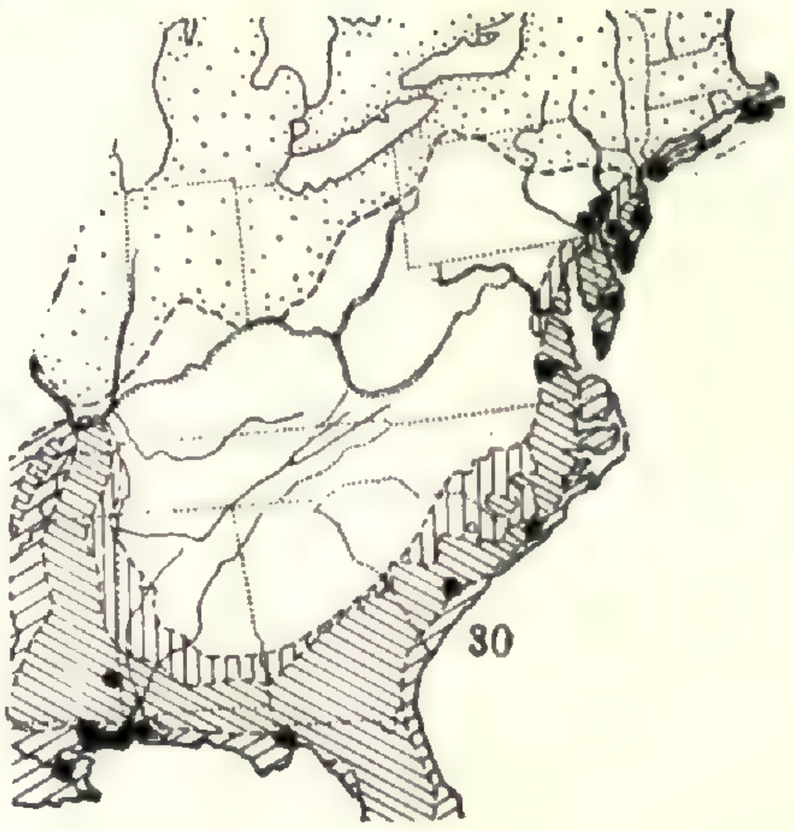












Map 22, range of Leersia lenticularis; 23, Schwalbea americana (including australis); 24, Seymeria cassioides; 25, Carex Barrattii; 26, Aristida virgata; 27, Habenaria blephariglottis var. conspicua; 28, Juncus abortivus; 29, Arenaria caroliniana; 30, Agrostis elata.

Florida to eastern Texas, north to southeastern Missouri, western Tennessee and eastern Virginia, in this case reaching Maryland.

At the border of the dry, sandy pine woods slightly east of Zuni all the *Stylosanthes biflora* was tall, slender and conspicuously villous-hirsute with horizontally divergent hairs, and south of Zuni it later proved to be the regular representative of the genus in dry pine barrens. This localized plant of Isle of Wight County is var. *hispidissima* (Michx.) Pollard & Ball. When Michaux described it in 1803 as *S. hispida*, var. β. *hispidissima*, he did not differentiate its range from that of his *S. hispida*, var. α. *nudiuscula* (typical smooth-stemmed *S. biflora* (L.) BSP.): "in Virginia et Carolina." Later botanists, during the more than a century and a third since Michaux got it, have not accumulated much of it in the larger public herbaria. In the Gray Herbarium there is a single old specimen collected by Rugel somewhere in southeastern Virginia and another said to have come from somewhere in North Carolina. The scarcity of material of it from the East is further attested by the recognition in both editions of Small's *Flora*, where very few varieties were honored as such, of "A campestrian form, with hirsute stems, . . . *S. biflora hispidissima.*" The inland and western range of the plant, as indicated in the Gray Herbarium, is from Alabama to Texas, and "Arizona or New Mexico,"[1] north to Indiana, Illinois, Missouri and Oklahoma. Its occurrence essentially where Michaux found it is now demonstrated and we at last have a good series from a limited area in Virginia. In fact, Linnaeus's *Trifolium biflorum* Sp. Pl. 773 (1753), on which *Stylosanthes biflora* rests, was a mixture. The specimen in his own herbarium on which he based his diagnosis is, as shown by a photograph supplied by Mr. Spencer Savage, Assistant Secretary of the Linnean Society of London, the smooth-stemmed plant, but the Clayton plant described by Gronovius and cited by Linnaeus, *Trifolium caule piloso*, is, as shown by a photograph sent by Mr. Ramsbottom, Keeper of Botany in the British Museum, the best kind of *S. biflora*, var. *hispidissima.* Incidentally, var. *hispidissima* has recently been collected in eastern Maryland by Dr. Robert Tatnall. We shall soon have a real "range" for it far removed from its "campestrian" one. Whether it is actually isolated in the East, as so many plants seem to be, or whether the seeming gap between its Maryland, Virginia and North Carolina area and that north of the Gulf of Mexico will be

[1] Specimen collected by W. F. Parish (no. 314) in August, 1883 and sent to Asa Gray thus labeled.

bridged by collections from South Carolina and Georgia I am not situated to say. The bicentric range, as it now stands, is typical for much of the Coastal Plain flora, as made evident in these notes.

By shutting our eyes to tempting spots we got as far as Windsor (but not to Suffolk), for we had set our minds upon looking into some of the "pocosons" which so generally appear on the topographic sheets from southeastern Isle of Wight and Nansemond Counties to South Carolina. We had trimmed our time, this last day, to our own disadvantage in determining whether these great pocosons, so definitely limited on the Virginia sheets to this area, have distinctive floras. The only one we sighted, String-of-Logs Pocoson, was badly altered by cutting and fire where we saw it and we did not have a fair sample. Aiming to try Devil's Pocoson, reached by old dirt roads, we encountered the usual nonconformity between dirt roads on the maps of "horse-and-buggy days" and the "stream-lined" boulevards which alone appear on most current maps. Quickly losing our way, we drove through Boaz and Carrsville and ignominously brought up in the city of Franklin! The obvious way home for most normal individuals was via Courtland, 10 miles away, thence by the very familiar Jerusalem Plank Road; but, having set our faces this last day in another direction, we could not tolerate further anticlimax and defeat. Consequently we chose to drive after dark by a dirt road northward to Zuni, a back road which was destined on our next two trips to be our most used artery through the country. Near Walters we suddenly realized that we were passing through as beautiful and unspoiled pineland as we had anywhere met. It was dark but, getting out to investigate, we promptly walked into a carpet of the tropical *Crotalaria rotundifolia*, here at its northern limit. Obviously the region must be explored on the next trip.

In three weeks we were back again at the University of Richmond for a third period (August 19–28) and, to our delight, Griscom was with us. It had been getting hotter, and Smart, possibly desiring to cool off, had gone after the Summer School for a vacation in the lower Mississippi Valley in Arkansas, while Bailey, with similar motives, had gone still farther south. The laboratory was not functioning as such, but, with Carroll still our companion and helper, we did what we could to keep the place busy through the climax of the hot spell. It was too hot for the chiggers, at least they were quiescent or indolent; and we daily drank up gallons of water. Even the most assertive

discourager in the party of eating and drinking between meals was officially recorded (by the cashier) as putting away 85c worth of refrigeration in a single forenoon; yet by the end of the day we were completely dehydrated.

Profiting by the experience in July, when for nine days we had pecked our way toward North Carolina without getting there, we now reversed the procedure and drove, via the Emporia road, until we crossed the line into Greensville County. By that time we yearned to look at some plants. So, easing up a little on our rigid plan, for we counted on lunching in town and it was now only 10 o'clock, we stopped a few miles north of Emporia. The sandy clearing was full of *Cirsium virginianum*, *Helianthus angustifolius*, the usual complex series in *Lespedeza*, and other late-flowering species now beginning to show color; and a small *Lechea*, at this late date just in flower, puzzled us. Dr. Hodgdon, the monographer of the genus, could see nothing in the flowering material, however, but *L. minor*, and, when we went out of our way in October to secure fruit, that, too, was of ordinary *L. minor*. We were specially pleased to find an abundance of fruiting *Schwalbea americana* (MAP 23), not because it is new to Virginia, for it was described from Virginian material from Clayton, but because the eastern monographer of the family, by logic which I cannot follow, has been doubting[1] its occurrence so far south. With it and certainly "new to Virginia" was the delicate yellow-flowered *Seymeria cassioides* (Walt.) Blake (MAP 24), a plant of the ancient high tablelands of southeastern Tennessee and northern Alabama, whence it spreads out to the young Coastal Plain from Louisiana to Florida (and the Bahamas), thence north to southeastern North Carolina, and now found in southeastern Virginia.

Still awaiting lunch time, we drove eastward from Emporia, aiming for bottomlands of Three Creek, having their richness at Drewryville in June still in mind. Crossing Caney Branch, we stopped to look over the rich woods there. One species is worth recording, a Buckeye in fruit, with very pubescent lower leaf-surfaces and irregular toothing which I can match only in *Aesculus discolor* Pursh, which Rehder (Man. Cult. Trees and Shrubs) cites as growing from Georgia to Missouri and Texas; flowering material may alter the identification. The bottomlands of Three Creek, where we went upon them, had been at least temporarily spoiled for us by heavy cutting of the timber,

[1] Pennell, Scroph. E. Temp. N. Am. 486 (1935).

but in a thicket not far from James River Junction there was a very tall and handsome *Pycnanthemum*. Its pale-pink or lilac corollas were so large and its whorls of flowers so broad that it suggested a *Monarda*, but it is a Coastal Plain extreme of the montane *P. pycnanthemoides*, a species so distinguished from its allies that Leavenworth originally described it as a member of another genus. The plant of Greensville County will be further discussed in Part II.

After lunch we drove without stop until we came to the North Carolina line south of Fontaine Creek, a few miles southwest of Haley's Bridge. The bottomlands of Fontaine Creek are comparatively narrow but here we introduced Griscom to many of the choice plants we already knew (*Leersia lenticularis*, *Panicum agrostoides*, var. *ramosius* and *P. stipitatum*, *Scirpus divaricatus*, *Rynchospora corniculata*, *Carex Joorii*, *Rorippa aquatica*, *Ilex decidua*, etc.). These were mostly in fine condition and it was a delight to get superior material of them and to exhibit them to an appreciative audience. *Sagittaria australis* (J. G. Sm.) Small, seen by us nowhere else, was abundant; and Long, with a bachelor's uncanny interest in Mistletoe, *Phoradendron flavescens*, insisted on risking his neck in climbing out from a treacherous foot-hold in order to collect it from a host new to him, *Betula nigra*.

Having actually crossed the state line we could now start out to investigate the pine woods, noted by us in the dark, between Zuni and Franklin. On the way there our first stop was at the boggy depression in the pinelands northwest of Waverly, in order to show Griscom *Aletris aurea* and to see if anything new was coming into flower. The only prize was weather-worn material, which couldn't have been quite so far gone in July, when we overlooked it, of *Carex Barrattii* Schwein. & Torr. (MAP 25), apparently the first from Virginia. Taking the road south from Zuni, we soon came to the dammed-up brook in the woods. Here we tried our luck, getting a few desirable but scarcely notable plants. Along the road here, however, as in open woods near Kilby and near Yorktown, where Long, Fogg and I had collected it a year before, there was a fruiting species of Privet. Its small, membranous, and (when dried) caducous leaves show it to be *Ligustrum sinense* Lour., recorded by Small as an escape in southern Louisiana. Much farther north, in southeastern Virginia, it is making itself quite at home. A little farther on we stopped to investigate the roadside ditches, where *Lipocarpha maculata* and a complex series of species of *Hypericum* abound. Among the latter was *H. dissimulatum*

Bicknell, apparently not previously found in Virginia, though next day we found it abundant at the station of *Juncus brachycarpus* near New Bohemia. Long and Griscom wandered across some swales while I followed a wood-road, where, mixed with the common *Juncus repens* in a pocket of *Sphagnum*, *Proserpinaca pectinata* abounded. We have met it nowhere else in eastern Virginia nor is it represented in the Gray Herbarium from the state; it was, however, collected in Virginia by Clayton, his material, according to Asa Gray's memorandum, being a mixture of *P. palustris* and *P. pectinata*. Kearney also reported it from Northwest in Norfolk County. The party of two brought in a series of *Xyris*, *X. difformis* and *X. ambigua*, and a few plants of the new one which Long and I had got in July near New Bohemia. We all went back for more and during the quest found *Desmodium tenuifolium* T. & G., which has not been recorded from north of North Carolina.

Moving on to the south we came to extensive white sands in the open, suggestive in their small way of the dunes of the outer coast, in Princess Anne County, toward 50 miles away. And here, in the interior, were *Panicum Commonsianum* and *Cyperus filiculmis*, var. *oblitus* Fern. & Grisc.[1] of Cape Henry and, new to us, the southern *Aristida virgata* (MAP 26). Searching the dry woods for novelties and collecting variations of *Panicum lanuginosum* and *Paspalum setaceum*, which were here very abundant, and the first ordinary northern (even Hudsonian) Sheep Laurel, *Kalmia angustifolia*, we had ever seen on the Coastal Plain of Virginia, we were soon rewarded by great clumps with lilac-pink heads suggesting those of *Liatris* but in broad corymbs, the stems of the plants cespitose and without bulbous bases. This was surely something novel for us, our first representative in the "manual range" of the southern genus *Carphephorus*, in this case *C. bellidifolius* (Michx.) T. & G. By this time it was getting dark, but wanting to show Griscom the carpets of *Crotalaria rotundifolia*, we drove on toward Walters; and there, sharing the sands with the *Crotalaria*, were great carpets of another southern legume, *Zornia bracteata*, the branches trailing and intricately entangled; yet the description in one of our handbooks says "stems 1–7 dm. tall." Near-by, in the thicket, Griscom collected *Sanicula canadensis*, var. *floridana* (Bickn.) H. Wolff (*S. floridana* Bickn.), cited by Small as extending north only to South Carolina. Long, at the same time, was over the bank in rich

[1] Rhodora, xxxvii. 153, pl. 343 (1935).

woods, collecting woodland species of *Agrimonia* (*A. rostellata* and *A. microcarpa* Wallr.) and with them a single individual of *Galium uniflorum* Michx., which, when we got it in Princess Anne and Northampton Counties, was an extension north from South Carolina.

On the 22nd we returned to the Zuni-Walters territory. A colored farmer, seeing me with a handful of *Xyris* on the 20th, had said, "If you want to get a lot of that plant you'll find plenty in the bogs over that way," indicating the direction of Blackwater River. Since bogs were what we were seeking, we stopped at his home on the second trip and made further inquiries. He was away, but fortunately his wife had many times gone fishing in the Blackwater and told of dozens of little pond-holes in the sandy woods back of and beyond the next farm. At the next farm the description of the country was confirmed and, following the cart-road to which we were directed, we entered one of the botanical paradises of the summer, and confirmed an often forgotten axiom: it pays to ask the native.

The thin woods of *Pinus Taeda* and *Quercus laevis* Walt. (*Q. Catesbaei* Michx.)[1] were carpeted with white sand, with a dense thicket of the usual shrubs of sandy woods, but wherever there was an opening exciting herbs were growing. *Carphephorus bellidifolius* abounded and on the more open sands *Euphorbia Ipecacuanhae* occurred, some colonies with oval, others with linear leaves, all, of course, long past fruiting. Ordinarily they are looked upon as mere variants, with different leaf-forms, but the drying-presses told a new story: under the best of conditions the linear-leaved plant was thoroughly dry and stiff in two days; the oval-leaved one took a week. I was happy to collect these plants, which seemed interesting to me; but, while I was thus wasting time, Long shouted "Here's Pyxie" and Griscom replied "Here's another *Liatris*-like thing"; and, before I could reach either of them, there came the report: "*Seymeria cassioides* again." And so it went. We had stumbled into what we had sought for four years, real unspoiled pine barren in Virginia. *Pyxidanthera barbulata* literally carpeted the ground in many areas, at the first station discovered between southern New Jersey and North Carolina; *Carphephorus tomentosus* (Michx.) T. & G. was a second species of a genus, which, two days before, had been "new to Virginia," *C. tomentosus* not represented in the Gray Herbarium from north of Bladen County in southeastern North Carolina; *Seymeria cassioides* (MAP 24), already

[1] The oak, at its northern limit, not noted by us at the time, but found in April, 1937, to be the regular species of the area.

found with *Schwalbea americana* (MAP 23) in Greensville County, was here very abundant; its recorded northern limits otherwise in eastern and southeastern North Carolina. The wonderful cespitose *Xyris* of white sands, true *X. flexuosa*, as shown by Harper,[1] the plant with large spiraling castaneous bulbs, stiff and slender spiraling leaves and large acutish spikes of showy flowers (*X. arenicola* Small) soon appeared, again at its first station between New Jersey and North Carolina. In sphagnous depressions and thickets *Zigadenus glaberrimus* and *Sarracenia purpurea*, var. *venosa* were both scattered, *Panicum Clutei* was frequent and *Habenaria blephariglottis*, var. *conspicua* (MAP 27) was just flowering. Where the cart-road leads through an extensive sphagnous depression (undoubtedly one of the pond-holes of early spring) two plants specially pleased us: *Rynchospora distans* (Michx.) Vahl, heretofore recorded only from the West Indies and Florida to South Carolina; and *Juncus abortivus* Chapm. (MAP 28), a beautiful, tall relative of the northern *J. pelocarpus*, with coarse rhizomes (*J. pelocarpus*, var. *crassicaudex* Engelm.), primarily of Florida but known, very rarely indeed, northward to a single station in Darlington County, South Carolina (Coker, Plant Life of Hartsville, S. C., 28).

Long epitomized the situation as we all were conceiving it: "This is real botanizing!" Thirst, hunger and heat had been forgotten, though toward 3 o'clock we returned to the car, but, still wanting more, the insatiable hunter for rarities poked into one of the open bare white patches and brought us a collection of *Arenaria caroliniana* (MAP 29), the first from between New Jersey and southeastern North Carolina.

That had to suffice for the day's collecting in the pine barren. Driving on to our terminal of two days earlier, we proceeded to Walters. On the way one stop was made to look into a patch of rich woods, with clay substratum. Immediately Griscom called "Come here, isn't this *Ponthieva?*" Surely it was: *Ponthieva racemosa* (Walt.) Mohr., a tropical plant, growing from South and Central America and the West Indies north to North Carolina, and heretofore known in Virginia only as collected by John Clayton[2] and at Grimes's and Wherry's stations (presumably near where Clayton got it). In late

[1] R. M. Harper, Torreya, v. 128 (1905).

[2] Asa Gray, studying Clayton's herbarium in 1839, made the memorandum against Clayton's *Orchis palmata maxima autumnalis* in Gronov. Fl. Virgin. ed. 2: 137 (1762), "*Cranichis multiflora*," i. e. *Ponthieva racemosa*.

August it was in young bud but Long and I got mature fruit in October. At the foot of the slope where *Ponthieva* grows (a station of fifty or more plants) the rare *Malaxis floridana* (Chapm.) Kuntze, sometimes united with the coarser green-flowered West Indian *M. spicata* Swartz, was growing, its pale orange to vermilion flowers just expanding. At the only other Virginia stations, in Gloucester County, where it was found by Miss Jennie S. Jones[1], and in the neighborhood of Williamsburg,[2] it grows in shell marl. At our station the neighboring brook had doubtless cut through the superficial acid sands to the Miocene shell-beds; at least the subsoil was argillaceous, as Long and I discovered in April of this year when, during a heavy rain, the road at this point became dangerously slippery and we begged Carroll to turn back.

This was Griscom's last day with us and, since he must take the night train north from Richmond, it was necessary to abbreviate the programme; but we took a last hour to drive over to Joyner's Bridge, which crosses the Blackwater. The sandy woods there still had *Carphephorus bellidifolius* and several other species which, two days before, had been so thrilling; and there we got for the first and only time all summer the slender *Trichostema linearе*, surely a local species in Virginia, ours being the first in the Gray Herbarium from between Maryland and Florida. Another plant which greatly interested us was a stout and broad-leaved herb, almost a shrub, obviously Euphorbiaceous, but new to us, *Stillingia sylvatica*, which was collected by Heller, in 1893, "near Franklin" but in Isle of Wight County, probably at this very station.

We greatly missed Griscom's stimulating comradeship, and next day, with a vast collection to care for and tired and needing to make up sleep, we did not venture out. On Monday[3] we returned to the area south of Zuni, examined, with good success but without making specially notable new discoveries, several segments of the pine-barren area, and went on to examine the bottomland of the Nottoway at Courtland. Driving through the village of Lee's Mill, east of Franklin, we were delayed by the passing of a freight train at a grade-crossing.

[1] See Wherry, Journ. Wash. Acad. Sci. xviii. 215 (1928).

[2] Morris & Eames, Our Wild Orchids, 340, 352 et seq. (1929).

[3] I think it was on this day, before we had left the Laboratory, that Mr. Bernard McCray, an enthusiastic amateur, arrived with his car full of freshly caught rattlers and copper-heads for Bailey's herpetological collections. The safe transfer of this lively and quite untamed menagerie to the cages on the top floor of the building made us thankful that we dealt with nothing more dangerous than *Rhus Toxicodendron* and Cat Briers.

Getting out to utilize the precious minute, we promptly collected two weedy plants of the roadside which still puzzle us, one a species of *Cenchrus* which we had earlier found near Zuni, the other a *Diodia* which it is difficult to match. The bottomland near Courtland, which we reached at twilight, was so evidently worth while that we resolved to return to it next day.

So, after getting our presses in order, we started for our last day together in the field, to visit old spots where, on earlier trips, we had noted plants of interest coming on, and to collect on the bottomland near Courtland. Stopping to get a good fruiting set of *Rhexia ciliosa* at our first station for it; again visiting a depression near Gary Church, to collect the autumnal state of a plant with all the characters of the glabrous *Panicum lucidum*, except that it is pubescent and the leaves opaque instead of lustrous; then driving, conscientiously, over to the Nottoway beyond Burt to get mature material of the strange *Geum*, we reached Courtland for a good afternoon along the river.

The wooded bottomland had the usual lush vegetation, with fruiting *Gonolobus* festooning some of the trees, and a tall, diffusely branched and small-headed *Boltonia*, which we had earlier found with Griscom, rather scantily, near Stony Creek, here abundant, an apparently undescribed species which had been represented in the Gray Herbarium only from southeastern South Carolina. *Hypericum petiolatum*, as usual, was abundant in the swampier areas, but we were more interested in a plant strongly resembling it but with quite sessile and somewhat clasping leaves, the flowers structurally like those of *H. petiolatum* and borne in the same way. This was what I had been looking for, the plant described by Walter in 1788 from South Carolina or Georgia as *H. tubulosum*, by Spach in 1836 from Louisiana as *Elodea Drummondii*, and by Small in 1898 as *Triadenum longifolium*. Now we definitely have it from Virginia, a June collection from swamps of the Appomattox being too young for positive identification. I have recently discussed the plant as *H. petiolatum*, var. *tubulosum* (Walt.) Fern.[1]

On the bottomland of the Nottoway there are here many open sandy depressions where water has stood, but in August largely dried out or with only tiny central pools. The margins of such pools and rills gave us all we could handle until dark. *Axonopus furcatus*, familiar to us in Princess Anne County, was abundant. So was *Panicum*

[1] Fernald, Rhodora, xxxviii. 436 (1936).

hians, now with fully developed panicles and more representative than the young material collected in June on Three Creek. *Cyperus densicaespitosus* Mattf. & Kükenth. (*Kyllinga pumila*), *Lipocarpha maculata*, *Hemicarpha micrantha* and other nice sedges (some of which are not yet certainly identified) were here, and with them *Eleocharis acicularis*. The latter would hardly be worth mentioning from farther north; but Svenson, in his *Monographic Studies of the Genus Eleocharis*, states the southern limit in the East as "Pennsylvania, West Virginia"[1] etc. At last we were in the home of *Paspalum fluitans* (MAP 17), its only previous definite Virginia station being that at Cypress Bridge, where one starved individual was found (p. 341). But we were most pleased with a matted plant with the narrow opposite leaves with stipular bases and with the characteristic axillary fruits of the *Rubiaceae*. This is *Oldenlandia Boscii* (DC.) Chapman, its previous known range, as given by Small, being from Florida to Texas, north to South Carolina, Tennessee and Arkansas, a neat little species to detect in the dusk and a fitting climax to Long's and my last field-day together for several weeks.

Actually there was a little more collecting. The presses were full and needed overhauling and we were thoroughly tired, overheated and dehydrated; but in mid-afternoon all the plants were cared for and there were still three or four hours of daylight left. Persuading Long, who had lost more sleep, aqueous solutions and avoirdupois than I, that it was his duty to stay at home and get to bed in decent season, Carroll and I made as swift a journey as the traffic laws of the state would allow to reconnoitre new territory. Driving without stop until well south of Franklin, we went south on the main road toward the Carolinas but, finding the country immediately south of Franklin too much cleared or altered, we swung over to the Blackwater, near Oak Grove School, and crossed the draw-bridge at South Quay. The west bank of the river supports a cypress swamp, a habitat usually monotonous and unproductive. This one, however, is bordered by a thicket of *Cyrilla racemiflora*, which reaches its northern limit here or very near here (numerous old collections from about Franklin and reported by Ward from just south of Emporia); and there were splendid thickets of the handsome *Lyonia lucida* (Lam.) C. Koch,[2] which I

[1] Svenson, RHODORA, xxxi. 185 (1929).

[2] Although *Cyrilla* has racemes of white flowers and the corollas of *Lyonia lucida* range from white to pink, I did not notice *Itea virginica* with them. The latter shrub is so generally abundant that its presence in or absence from a special habitat is

had not previously seen west of the Dismal Swamp. *Paspalum Boscianum* and the usual sedges of open argillaceous alluvium abounded, but I was looking for loose sand and a continuation southward of the pine barrens where we had found so much. Expressing my hopes to the draw-tender, I received the reassuring reply, accompanied by a general sweep of his arm toward Nansemond County: "Thar's a powerful lot of right smart sand over thar."

Proceeding in the general direction indicated, we took a sandy road southward toward Factory Hill, near the North Carolina line. Passing much farmed land, we eventually stopped where the wet thicket of the roadside was bordered with a rich vegetation, many of the species only rarely seen by us before; the one specially worth record being *Coreopsis gladiata* Walt., a southern species of "swamp and low pinelands," not previously known in Virginia. It was already so dark that we could make out the plants only by their silhouettes; but *Triodia flava*, var. *Chapmani* (Small) Fern. & Grisc.[1] was so distinct against the horizon and a *Crataegus* with tiny leaves and with already red fruits about as broad as the leaves, was so evident at the borders of dry woods that I took them and registered the area as one for a visit next time. We reached the dormitory just before midnight, having driven 85 miles (and stopped for supper) after finishing the evening's botanizing.

It was mid-October before I could leave Cambridge again. Long met me at Richmond and Carroll was again ready to help us during our collecting (October 16–20). In Massachusetts and southeastern Pennsylvania the autumn had thus far been about normal; but at our first stop, in Chesterfield County, to collect mature *Eupatorium leucolepis* in the depression north of Swift Creek, we were disheartened. Frost had wilted nearly everything, and we must work against odds in seeing novelties among the blackened and frozen vegetation. The hot Coastal Plain, at least from Chesterfield to Greensville, Southampton and Surry Counties, was closing its summer abruptly; and collecting became mere gleaning of the few specialties still recognizable. We were three weeks late! In the pinelands northwest of Waverly even *Prenanthes autumnalis* Walt. often had its fresh flow-

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ordinarily of little significance; except that in a much-used manual we are told of *Itea* that "This shrub often grows intermixed with other shrubs which produce an abundance of racemes of white or pale-pink flowers." *Cyrilla racemiflora* and *Lyonia lucida* supply the correct color-combination.

[1] Rhodora, xxxvii. 133 (1935).

ering heads decaying after frost-bite, but enough hardy individuals could be found to make a decent series. At the boggy depression there, where so many good things had earlier been found, *Gentiana Saponaria* was now flowering, and there was a colony of *Solidago graminifolia* var. *polycephala* Fern. (*S. polycephala* Fern.) at a new southern limit. Everywhere, whether in dry open places or in depressions, the splendid *Aster grandiflorus*, with small and firm leaves, loosely branching habit and superb large heads with royal-purple to roseate rays, abounded. For a species locally so abundant it has a very weak representation in northern herbaria, perhaps because of its very late flowering. Southeast of Ivor we looked over a wooded slope above a small stream. It will yield many species in early spring, for there was an assemblage of rich woodland types, among them *Uniola sessiliflora* Poir., which we had seen only in the very richest woods of Princess Anne County.

Coming the first afternoon, after the stops already recorded, to the area of pine barrens south of Zuni, we resolved to try new cross-sections in them. At the border of the loose white sand, where the plants of coastwise dunes had been found in August, the woods yielded another of the species of *Crataegus* which, in this part of Virginia, seem more recognizably definite than are the heterogeneous progeny of doubtful parentage "which have sprung up in the last three centuries 'on the derelict farms'" of New England and New York. Across the road, in the more definite pine barrens, we found *Zigadenus glaberrimus* more widely dispersed than we had supposed, and with it *Sarracenia flava*, which we had not seen in August. *Carphephorus tomentosus*, too, proved to be fairly abundant; and just at dusk, when we could hardly see, I came upon a single plant which puzzled me. Obviously of the *Polygonaceae*, it looked like *Polygonella*, but not any known in the "manual range." I had found one plant, and Long, for obvious reasons, wanting another, we sought in the increasing darkness on hands and knees, repeatedly returning, as a check, to the site of the one original plant. Finally, with Long's jocose reproof, "You've destroyed the locality," following me, I gave up and went as far as darkness would permit in search of something different. Returning after half-an-hour, I heard Long's gleeful shout: "I've put up 17 sheets so far." There, fully occupying one of the open plats of sand, and apparently only one,[1] was a solid carpet of *Polygonella*.

[1] In April, 1937, the plant was seen to be more generally dispersed in the area.

It proves to be *P. polygama* (Vent.) Engelm. & Gray, and this is the first station for it north of southeastern North Carolina (the Wilmington region). Again our great find was at twilight!

Returning on the second day, we stopped near Walters, to collect the fruit of *Ponthieva racemosa*, then drove to Joyner's Bridge to secure fruiting material of *Gerardia* and other difficult genera, which in August were too young. At the border of swampy woods the two gentians, *Gentiana Saponaria* and *G. parvifolia* (Chapm.) Britton, were growing, the range of the latter now extended inland from Princess Anne County and the Eastern Shore. It is a very handsome species, the dark-blue, short and broad corollas open at summit. When he studied *Gentiana* for the *Synoptical Flora* Asa Gray scarcely knew *G. parvifolia* (*G. Elliottii* Chapm., not *G. Elliottea* Raf.) and he certainly did not know that it extends northward almost to Maryland. From the original description of *G. Saponaria* L., "corollis . . . campanulatis ventricosis," and its "*Habitat* in Virginia" it has seemed as if Linnaeus might have had some *G. parvifolia* before him. This proves to be the case. My friends at the Linnean Herbarium and at the British Museum have supplied me with a beautiful series of photographs of the critical specimens. Happily, the sheet in Linnaeus's own herbarium marked by him *G. Saponaria* is that species as now understood; but the Clayton material which Gronovius had described "*Gentiana* floribus ventricosus campanulatis erectis quinquefidis, foliis ovato-lanceolatis" is a mixture of *G. Saponaria*, *G. villosa* and *G. parvifolia*. *Leersia*, too, was puzzling; surely, the genus is not yet clearly understood. At the margin of the Blackwater *Micranthemum umbrosum* (MAP 8) was flowering, the prostrate mats with their tiny flowers hidden from above, borne from the axils and projecting into the mud; and, in collecting this very neat species at its second station in Virginia, we pulled in, as a stranded "weed," a bit of *Cynoctonum Mitreola*.

Driving into Franklin for lunch, we were struck by the superabundance, about waste places or in open lots at Lee's Mill and across the river in Franklin, of *Tagetes minuta* L., a tropical pungent-aromatic annual of South America, reported by Small as naturalized in North Carolina. There is enough near Franklin to supply all the herb gardens of the country. And with *Tagetes* a *Cyperus* new to us was abundant: *C. globulosus* Aubl.,[1] another tropical species here evidently adventive.

[1] See Fernald & Griscom, RHODORA, xxxvii. 153 (1935).

Driving toward Factory Hill, we reached the point where Carroll and I had been forced by darkness to quit in August. With *Coreopsis gladiata* one of the always puzzling species of *Helenium* was growing; and at the border of dry woods there was a very slender *Andropogon* of the group with *A. Elliottii*. It puzzled us, so we collected 15 sheets of it and now we are glad that we did. It is *A. Elliottii* var. *gracilior* Hack. Small, treating it as *A. gracilior* (Hack.) Nash, assigns it the range: "Fla. to Miss." Our plant seems quite like the Florida type. Coming to the cypress swamp which borders Somerton Creek we ventured in, although it was already getting dark. While I was puzzling over a *Polygonum*, as yet unidentified, Long picked up a couple of sterile plants, uprooted by hogs, of *Dryopteris celsa* (Wm. Palmer) Small, the isolated southern fern, allied in some characters to *D. Goldiana*, in others to *D. cristata*, but abundantly distinct. Restricted to cypress swamps, it has apparently not been much known in Virginia outside the Dismal Swamp. Consequently we were not satisfied with the sterile and broken material the hogs had provided for us. Search for fifteen minutes outside the hog-wallow yielded a large fruiting clump at the base of a cypress; and in thankfulness we carefully set the two rescued roots in a safe place.

On the 18th, most fortunately, Smart and one of the zoologists of his department were able to join us. It was two months since we had been on the *Sarracenia flava* bog southeast of Petersburg, so we decided to return there. This time we got into a section of it which we had not previously visited and there we at once came upon *Eriocaulon decangulare*. With it *Lobelia glandulifera* (MAP 20) was growing and also *Scleria setacea* Poir., previously known to us in Virginia only in Princess Anne and Northampton Counties; and *Agrostis elata* Pursh (MAP 30), quite like the original material from southern New Jersey, impressed us with a character which, along with several others,[1] clearly distinguishes it from *A. perennans*, with which Hitchcock united it. In the autumn the latter makes abundant leafy basal shoots, whence, presumably, its specific cognomen; in the former such shoots seem not to develop. *Aster concolor*, now beautifully flowering, was very abundant, both in the dry clay above and in damper clay and peat of the bog. Very variable in size of leaf, it led us to hope that the variation is significant; but apparently it is not. In the drier open fields it is accompanied by the handsome purple *Leptoloma cognatum*,

[1] See Fernald, RHODORA, XXXV. 211 (1933).

a species we had not previously met on the Coastal Plain of Virginia and which Hitchcock (*Manual*) does not map from the state; and in crossing the wetter part of the bog we were impressed by an *Andropogon* different from any we had seen. Fortunately we took some, for it is a perfect match for authentic material of *A. Mohrii* Hackel, the first collection from north of North Carolina.

A brief visit to the spring-fed wooded bog at Coddyshore yielded no novelties; so, wishing to get fruit of the *Lechea* near Emporia, which had puzzled us by its late flowering, we drove directly there, with just time enough before dark to secure the needed but disappointing series (see p. 352) and to collect *Muhlenbergia capillaris*, one of the rarest species in the northeastern states, which not one of us had ever seen growing.

Returning the next afternoon to Factory Hill, we proceeded to the North Carolina line, swung slightly into that state and back into Virginia, ending our afternoon's collecting southwest of Whaleyville. South of Factory Hill there are sandy pine woods, which, earlier in the season and with time for proper exploration, would yield great results or, at least, would show what great results could have been achieved before the interference of Man. A few shrubs of *Asimina parviflora*, with leaves even broader than the most extreme in the Gray Herbarium, a single clump of *Amianthium muscaetoxicum* and two individuals at the border of wetter woods of the superb *Gentiana Porphyrio*, the first, at least in the Gray Herbarium, from between South Carolina and southern New Jersey except, of course, from Wilmington, North Carolina, indicated what had been here before the inevitable and, to the native flora, ruinous ditching. Mildly impressed by the very full and scarcely lobed leaves of a Black Oak, *Quercus velutina*, we unenthusiastically picked some sprigs. That was fortunate for they closely match authentic specimens of var. *missouriensis* Sarg., of Missouri and Arkansas. Similarly, near Whaleyville, where we followed a side-road through what had been extensive boggy woods, the woods are now dried out, with only tell-tale remnants of *Panicum mattamuskeetense* (MAP 31) to show that they were once wet; and at the border of the deep roadside trench just enough individuals of the old bog flora are left to be pathetic remnants of real colonies of *Rhexia ciliosa*, *Hypericum setosum*, *Prenanthes autumnalis* and other fine species which our descendants may never have a chance to see in their native haunts.

There was only one day more and we had not once set foot on a tidal shore nor in a brackish marsh or fresh estuary. Brackish and salt marshes seemed to be plenty in the county of Surry, slightly north of Waverly, where we had earlier found a hospitable and comfortable home for our work. Seeking shelter there for the night, we went in the morning directly to Claremont Wharf, on the James River. The sandy shore there was almost bare of vegetation, though we did get a bit of *Lilaeopsis chinensis*, so we drove on to the beach outside Sunken Meadow, an area which will repay prolonged investigation. The steep banks of the James here have a good Alleghenian flora and back of the beach or in the thickets such continental types as *Astragalus canadensis* and *Smilax hispida* were fruiting. A few days earlier we had tasted the berries of *Smilax tamnifolia* and found their thin pulp to have the flavor and sweetness of dates. Not so the black berries of *S. hispida;* they are intensely bitter. The long pond shut off by the beach and running far up Sunken Meadow will yield good things. Where we saw it, its waters were covered with *Wolffia punctata* and *Wolffiella floridana*, just as we had found them together on the Eastern Shore.[1] A *Bidens* of the perplexing *laevis*-group abounded with the tropical *Polygonum densiflorum* Meisn.[2]

This area not supplying the brackish marshes and estuarine swales we had hoped for, we went on to Swann Point, thence by an unimproved wood-road to Cross Creek Landing. There we gazed upon a typical salt marsh, with impenetrable miles of *Spartina* and other uninteresting plants. Seeing from a tree-top a margin of the salt marsh which was not too dense, we there tried our luck. Everything had been frosted; but one gigantic *Panicum*, with old fruit, is puzzling enough to suggest the importance of a visit there earlier in the season another year. And we certainly shall wish younger and better specimens of *Verbena scabra* which was here, dead-ripe but with all the crucial characters, which Dr. Lily M. Perry, monographer of the genus, has verified; for, although examining the material in all the important herbaria of the country, she has never before seen the tropical *V. scabra* from north of Wilmington, North Carolina.[3]

Wishing to get back to the alluvial bottoms and banks of the Nottoway, where in August we found so many interesting plants, we drove after lunch to Courtland, stopping south of Waverly for some

[1] See Rhodora, xxxviii. 400 (1936).
[2] See Weatherby, Rhodora, xxv. 20 (1923).
[3] See Rhodora, xxxviii. 442 (1936).

collections of a strange *Chrysopsis* and of other puzzling plants. The border of the cypress swamps above the bridge crossing the Nottoway yielded fine fruit of several species which we had collected in the summer, but the open shores, where we expected so many species, had been severely chilled. Brown and limp, the plants were difficult to distinguish, though we worked until dark among them. Singularly enough, the tropical weeds, *Tagetes minuta* and *Heliotropium indicum*, were quite green, with abundant fresh flowers; but the indigenous herbs of shores, bars and sand-spits, such as *Eragrostis hypnoides*, which is native as far north as Maine, Quebec, Ontario and British Columbia, were brown, lifeless, frost-killed rags. Summer, even in southernmost Virginia, was over and it was time to go home.

(*To be continued*)

COCCOMYXA IN THE UNITED STATES.—Both Collins in Tufts Coll. Stud. **4**(7): 77 (1918) and Smith in *Fresh Water Algae of the United States*, 368 (1933) based their reports of *C. dispar* Schmidle, Ber. d. d. bot. Ges. **19**: 23 (1901), upon the single specimen from New Hampshire cited below. What is evidently the same alga was found during the summer of 1936 forming an abundant greenish stratum on woodwork in the spray of waste water from Cahoon's Ice House near Falmouth, Massachusetts. This appears to check in every respect with the material authenticated by Schmidle in Migula, Cryptog. Austr. & Helvet. exs. **26** & **27**: 88, 'Hirschberg bei Schmalkalden, Thüringen, *T. Reinstein*, Oct. 1905' (Herb. W. R. Taylor, Herb. N. Y. Bot. Gard.). Prof. G. M. Smith has also examined a portion of this Falmouth collection. Specimens seen from the United States:

NEW HAMPSHIRE: on tree trunks, Chocorua, *W. G. Farlow*, Sept. 1916 (Farlow Herb.). MASSACHUSETTS: subaerial on sides of trough in spray of waste water, Ice Pond, Falmouth, *E. T. Rose & Drouet 1900*, 24 July 1936 (Herb. M. B. L., Herb. F. Drouet, Farlow Herb., Herb. W. R. Taylor, Herb. Yale Univ., Herb. N. Y. Bot. Gard., Herb. Mo. Bot. Gard., G. M. Smith, G. W. Prescott). NEW YORK: on log in woods, Orient, *R. Latham*, 20 June 1914 (Herb. N. Y. Bot. Gard.). PENNSYLVANIA: rocks above Chelton Av. entrance, Wissahickon Creek, Philadelphia, *W. R. Taylor*, 17 Oct. 1920 (Herb. W. R. Taylor).—FRANCIS DROUET, Marine Biological Laboratory, Woods Hole, Mass.

THE FUNGI OF NANTUCKET. CENTURY I[1]

E. F. Guba

Introduction

Nantucket is the name of a town, island, and county, a part of Massachusetts. The county comprises the islands of Nantucket, Tuckernuck, Muskeget, and a small group, the Gravelly Islands, all lying east of the island of Martha's Vineyard and some 28 miles at sea directly south of the peninsula of Cape Cod. Nantucket Island, the largest, averages about 14 miles long east and west, and 2½ miles wide north and south, comprising about 30,000 acres. The outline of the island has been compared to a human stomach, a lamb chop, and an implement known as a billhook. Tuckernuck, the second in size, contains about 1260 acres, and Muskeget about 300 acres.

This island county is part of the extreme terminal moraine of the ice sheet that covered the northern part of our continent during the glacial period. In its physical constitution it is like New Jersey and Long Island and the coast-line extending south. In the composition of its higher flora this relationship is also strikingly suggested. The lands are composed mainly of glacial drift, sand, pebbles, and some boulders. They are broken up into hills, plains, ponds, bogs, deciduous woods, and pines. The charm of the dwarf deciduous trees, the heath-land, pond, salt marsh, beach, and dune vegetation is unsurpassed. The highest land is 91 feet at Saul's Hills and 105 feet at Sankaty Head. Anyone with a heart attuned to Nature cannot fail to find amid the solitude of these elevations a benediction and lasting joy. The northward curve of the isotherm and the proximity of the Gulf Stream account largely for the softness of its climate. Nevertheless, the almost treelessness of the island is an indication of the barren porous soil and the frequent beating winds and storms.

Small in area but rich in the variety of plants, many of which are rare or little known on the New England mainland, this island has for many years been a mecca for botanists and other scientists. Brought to fame by the whaling industry, this one-time prospering

[1] Contribution No. 268 of the Massachusetts Agricultural Experiment Station. I am gratefully indebted to the Nantucket Maria Mitchell Association, organized to honor the greatness of Maria Mitchell and to promote astronomy and the natural sciences on Nantucket, for their kindly and generous coöperation in making this study possible; especially to Miss Grace Wyatt, its director of Natural Science, for her interest in the pursuit of this work and assistance in the identification of host material.

community cherished then a great interest in local botany. Attesting to this fact were the existence of such organizations as the Maria L. Owen Society for the Protection of the Flora of Nantucket (previous to 1901), a class for the study of botany (previous to 1882), and in more recent and present time the Natural Science Department of the Nantucket Maria Mitchell Association (organized in 1903). When the whaling industry prospered in the first half of the 19th century, this island had its botanist, geologist, conchologist and others, and each in addition to acquiring foreign collections maintained collections from the island itself. The elaborate herbarium with other scientific treasures were swept away by the great fire of 1846.

The stimulus indicated by these early interests and endeavors culminated in the first list of indigenous plants of Nantucket in 1888, and with much suggestion of lament the author, Maria L. Owen, in the concluding part of her book states, "Here the catalogue must close with no record of the Lichens or Fungi. These two orders offer an unexplored field to any who will enter it." Some years later, (1901), Sarah Winthrop Smith in expressing a keen appreciation and admiration of the beauty and charm of the flora of Nantucket but apparently unwilling to admit, or lacking the faculty to discern, the presence of parasitic fungi and their effect on the health of the vegetation, remarked, "The great beauty of the flowers is due largely to the absence of blight or smut." Later, Jones in his convincing commentary denying the traditional claim of the existence of forest trees on Nantucket as a source of architectural timber wrote, "The trees of this island appear to die of rot before they attain any great age. . . . There is also the possibility that the mildews or mycelium fungi that exist on the island are inimical to prolonged tree growth." Jones's labors with cultivated plants and his interest in horticulture provided him with the faculty for noting their diseases.

There is a published record of only one fungus from Nantucket, and as far as the writer is aware no collections of fungi have ever been made. To Pelluet belongs the credit for reporting the parasitic occurrence there of *Exobasidium oxycocci* Rostr. on the American cranberry, *Vaccinium macrocarpon* Ait., and the huckleberry *Gaylussacia dumosa* (Andr.) T. & G. Specimens were collected in June and July, 1926, from the Taupaushaw Swamp region. Thus, half a century after the appearance of Maria L. Owen's appeal for a study of the fungi, nothing has been done.

In view of the lack of knowledge of the fungi of this relict and peculiar flora, and the circumscribed limits of these lands which render possible the attainment of some degree of completeness in achieving a knowledge of the entire composition of this division of its flora, the writer became thoroughly interested. It has been written, "Of all the earth's surfaces the islands are the aristocrats." The fungous flora of Nantucket, rich as it is with interest and surprises, cannot escape this commendation. Dotted with ponds and bogs and sometimes enshrouded by heavy fogs and storms, conditions obtain here which are especially favorable for a rich fungous flora and for epidemics of plant diseases.

All of the collections and identifications of material are by the author except where indicated otherwise. It is the plan to issue the material in sets of centuries. The fleshy fungi must necessarily be omitted from these sets. However, one complete set including the fleshy fungi will be deposited in the herbarium of the Nantucket Maria Mitchell Association, Nantucket, Massachusetts, for permanent record and reference.

Century I

1. Armillaria mellea (Vahl) Quél. Common in Hidden Forest. Sept. 30, 1936.

2. Albugo bliti (Biv.) O. Kuntze. On living leaves of *Amaranthus retroflexus* L. General in cultivated fields and gardens. Sept. 13, 1935.

3. Bacterium apii Jagger. On leaves of *Apium graveolens* L. (cult. celery) Nantucket town in vegetable garden. Sept. 13, 1935.

4. Boletus granulatus L. In pine woods along road to Polpis outside of town. Oct. 1, 1936.

5. Botrytis cinerea Pers. On stems of *Callistephus chinensis* Nees. In nursery on Madaket Rd. outside of the town. Aug. 13, 1936. The occasion for some loss through rotting of the stems.

6. Botrytis paeoniae Oud. On living leaves of *Paeonia officinalis* Retz. in town and in nurseries on the island. Sept. 16, 1935.

7. Calvatia gigantea (Batsch.) Fr. Around Chadwick's Folly at Squam. Oct. 1, 1936. Of rather frequent occurrence here.

8. Cercospora beticola Sacc. On living leaves of *Beta vulgaris* L. Polpis in vegetable garden. Sept. 11, 1935.

9. Cercospora clavata (Gerard) Cke. On living leaves of *Asclepias syriaca* L. Sept. 16, 1935.

10. Cercospora nymphaeacea C. & E. On living leaves of *Castalia odorata* (Ait.) W. & W. In pond at Madaket. Sept. 18, 1935.

11. Clavaria pulchra Pk. In pine woods. Sept. 1936. Coll. by J. C. Kimball. Det. by D. H. Linder.

12. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. On needles of *Pinus rigida* Mill. The Larch Woods at Miacomet Pond. Coll. by E. F. Guba and I. H. Crowell. May 30, 1936. Strangely the fungus was generally confined to but a single tree and no more could be found in spite of diligent search in the same locality and elsewhere on the island at the time noted.

13. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. On leaves of *Solidago graminifolia* (L.) Salisb. General. Sept. 13, 1835.

14. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. On living leaves of *Solidago rugosa* Mill. Sept. 12, 1935. General over the island. E. F. Guba & G. Wyatt.

15. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. On *Solidago rugosa* × *sempervirens*. Polpis Harbor. Sept. 12, 1936.

16. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. On living leaves of *Solidago sempervirens* L. Long Pond. Sept. 13, 1935. E. F. Guba & G. Wyatt. Common along the beaches and inlets and very destructive in some locations. The host appears to be hybridized more than is at present recognized by taxonomists as is evidenced by striking variations in the degree of susceptibility.

17. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. On living leaves of *Solidago tenuifolia* Pursh. Woods near Hummock Pond. Sept. 13, 1935. E. F. Guba & G. Wyatt.

18. CONIOTHYRIUM CONCENTRICUM (Desm.) Sacc. On leaves of *Yucca filamentosa* L. in private garden at Polpis. Aug. 12, 1936.

19. CONIOTHYRIUM FUCKELII Sacc. On canes of cultivated raspberry, *Rubus idaeus* L. (var. Latham). On farm at south end of Hummock Rd. Aug. 13, 1936.

20. COPRINUS MICACEUS (Bull.) Fr. On lawn over stump in town. Sept. 30, 1936.

21. DICTYOPHORA DUPLICATA (Bosc) Ed. Fisch. In pine woods east of town. Oct. 1, 1936.

22. DIPLOCARPON ROSEUM Wolf. On living leaves of *Rosa virginiana* Mill. Polpis. Sept. 13, 1936. E. F. Guba & G. Wyatt.

23. ENTOMOSPORIUM MACULATUM Lév. On leaf-blades and petioles of *Amelanchier canadensis* (L.) Medic. (of Bicknell's Flora; *A. laevis* Wiegand). In "Woods" near Hummock Road. Sept. 12, 1935. The fungus was responsible for general premature defoliation.

24. ENTOMOSPORIUM MACULATUM Lév. On leaves and fruit of *Cydonia oblonga* Mill. Aug. 15, 1936. Common among individual garden trees in town.

25. ERYSIPHE CICHORACEARUM DC. On living leaves of *Cucumis sativus* L. in vegetable gardens in town. Sept. 10, 1935.

26. ERYSIPHE CICHORACEARUM DC. On living leaves of *Helianthus tuberosus* L. Sept. 13, 1935. Common.

27. ERYSIPHE CICHORACEARUM DC. On living leaves of *Plantago major* L. Common in town. Sept. 12, 1935.

28. ERYSIPHE CICHORACEARUM DC. On leaves and stems of *Phlox paniculata* L. in gardens about the town. Aug. 15, 1936.

29. Erysiphe cichoracearum DC. On living leaves and stems of *Rudbeckia hirta* L. in waste places near the waterfront. Aug. 15, 1936.

30. Erysiphe cichoracearum DC. On living leaves of *Zinnia elegans* Jacq. In nursery and gardens. Sept. 10, 1935.

31. Erysiphe polygoni DC. On leaves and stems of *Baptisia tinctoria* (L.) R. Br. The Larches near Miacomet Pond. Sept. 16, 1935.

32. Erysiphe polygoni DC. On living leaves of *Lathyrus maritimus* (L.) Bigel. "Haul-over." Aug. 16, 1936.

33. Erysiphe polygoni DC. On living leaves of *Trifolium pratense* L. The "dump," Nantucket town.

34. Exoascus communis Sadebeck. On fruits of cultivated *Prunus* (plum). In town. May 31, 1936. The plums on this tree are a total loss each year.

35. Exoascus varius Atk. On leaves of *Prunus serotina* Ehrh. South end of Hummock Rd. Aug. 16, 1936.

36. Exobasidium vaccinii (Fckl.) Wor. On *Rhododendron viscosum* (L.) Torr. Hidden forest. May 30, 1936. E. F. Guba & I. H. Crowell.

37. Exobasidium vaccinii (Fckl.) Wor. On *Vaccinium corymbosum* L. The Larch Woods. May 30, 1936. E. F. Guba & I. H. Crowell.

38. Gloeosporium decolorans E. & E. On living leaves of *Acer rubrum* L. Polpis. Sept. 16, 1936.

39. Gymnoconia Peckiana (Howe) Trotter. On leaves of *Rubus flagellaris* Willd. (dewberry). East of town along Wauwinet Rd. and elsewhere. E. F. Guba & I. H. Crowell. May 29, 1936.

40. Guiguardia aesculi (PK.) Stewart. On living leaves of *Aesculus hippocastanum* L. Sept. 10, 1935. Present each year on the few trees in town.

41. Gymnosporangium clavipes C. & P. I. On leaves, fruits and twigs of *Amelanchier canadensis* (L.) Medic. (*A. laevis* Wieg.) Wauwinet Rd. beyond junction of Sconset Rd. E. F. Guba & I. H. Crowell. May 29, 1936.

42. Gymnosporangium clavipes C. & P. I. On fruit and spines of *Crataegus crus-galli* L. Nantucket town. Sept. 10, 1935.

43. Gymnosporangium clavipes C. & P. I. On fruits of *Crataegus oxyacantha* L. in private garden, Vestal Street. Aug. 12, 1936.

44. Gymnosporangium clavipes C. & P. I. On fruits and twigs of *Cydonia oblonga* Mill. in private garden, Vestal Street. Aug. 12, 1936.

45. Gymnosporangium clavipes C. & P. I. On twigs of *Juniperus virginiana* L. Wauwinet Rd. E. F. Guba & I. H. Crowell. May 29, 1936.

46. Gymnosporangium nidus-avis Thaxter. On *Juniperus virginiana* L. Wauwinet Rd. beyond junction of Sconset Rd. E. F. Guba & I. H. Crowell. May 29, 1936. Det. by I. H. Crowell.

47. HETEROSPORIUM GRACILE (Wal.) Sacc. On leaves of *Iris versicolor* L. In private garden, Polpis. Aug. 12, 1936.

48. HYGROPHORUS MARGINATUS Pk. Hidden Forest. Oct. 1, 1936. Det. by C. J. Gilgut.

49. HYGROPHORUS MINIATUS (Scop.) Schroet. In pine woods. Sept. 1936. Coll. by J. C. Kimball. Det. by D. H. Linder.

50. HYPHOLOMA SUBLATERITIUM Schaeff. Sept. 20, 1936. Coll. by E. V. Seeler. Det. by D. H. Linder.

51. LACCARIA TRULLISATA (Ellis) Pk. In sand basins on "Haulover." Aug. 15, 1936. Det. by L. C. C. Kreiger.

52. LOPHODERMIUM PINASTRI (Schrad.) Chev. On blighted needles of *Pinus rigida* Mill. Sconset and Wauwinet Rds. May 30, 1936. E. F. Guba & I. H. Crowell. General over the island. The unfavorable conditions of soil and climate predispose the needles to infection. The heavy casting of the needles is quite adverse to the best growth of this pine.

53. MACROSPORIUM SAPONARIAE Pk. On living leaves of *Saponaria officinalis* L. South of town in the "dump." Sept. 10, 1935.

54. MARASMIUS OREADES (Bolt.) Fr. Growing in abundance in cow pasture at south end of Hummock Rd. Sept. 30, 1936. Det. by C. J. Gilgut.

55. MICROSPHAERA ALNI (DC.) Wint. On living leaves of *Syringa vulgaris* L. Nantucket town. Sept. 13, 1935.

56. MICROSPHAERA ALNI (DC.) Wint. var. VACCINII (S.) Salmon. On living leaves of *Catalpa bignonioides* Walt. Nantucket town. Sept. 15, 1935.

57. NECTRIA CINNABARINA (Tode) Fr. On stems of *Cytisus scoparius* (L). Link. Nantucket, the "dump." Sept. 10, 1935.

58. PERONOSPORA EFFUSA (Grev.) Rabh. On living leaves of *Chenopodium album* L. In vegetable garden on Madaket Rd. outside the town. Aug. 15, 1936.

59. PERONOSPORA HALSTEDII Farl. On leaves and stems of *Erechtites hieracifolia* (L.) Raf. Long Pond at Madaket Rd. Aug. 16, 1936.

60. PESTALOTIA ADUSTA E. & E. On leaves of *Prunus serotina* Ehrh. "The Woods." Sept. 16, 1936. E. F. Guba & G. Wyatt.

61. PHRAGMIDIUM AMERICANUM (PK.) Diet. On living leaves of *Rosa virginiana* Mill. Banks of swamps at Polpis. Sept. 19, 1935. Common elsewhere around ponds and woods.

62. PHYLLOSTICTA AMICTA E. & E. On blighted leaves of *Arctostaphylos uva-ursi* (L.) Spreng. General over the island and doing much damage to this favored plant. May 30, 1936.

63. PHYLLOSTICTA HIBISCINA E. & E. On living leaves of *Hibiscus moscheutos* L. Great Neck along Long Pond. Sept. 16, 1935.

64. PILEOLARIA TOXICODENDRI (Berk. & Rav.) Arth. On foliage and petioles of *Rhus Toxicodendron* L. Hidden Forest. May 31, 1936.

65. PLASMOPARA VIBURNI Pk. On living leaves of *Viburnum pubescens* (Ait.) Pursh (V. *venosum* Britt.) Sept. 16, 1935.

66. Polyporus versicolor (Linn.) Fries. On dead log, Hidden Forest. Sept. 13, 1935.

67. Polystictus pergamenus Fr. On unidentified log in Hidden Forest. Sept. 14, 1935. Det. by D. Linder.

68. Polystictus versicolor (L.) Fr. On dead log of *Prunus* (cherry), Hidden Forest. May 31, 1936.

69. Psalliota campestris (L.) F. Nantucket at the "dump." Sept. 14, 1935. Common in pastures on the island.

70. Puccinia antirrhini Diet. & Holw. On living leaves of *Antirrhinum majus* L. In nurseries and gardens. Sept. 10, 1935.

71. Puccinia bardanae (Wallr.) Cda. On living leaves of *Arctium minus* Bernh. In farm yard on main highway near Polpis; also at Madaket. Sept. 10, 1935.

72. Puccinia graminis Pers. On leaves and stems of *Agrostis alba* L. On farm at south end of Hummock Rd. Aug. 13, 1936.

73. Puccinia graminis Pers. On leaves and stems of *Phleum pratense* L. South end of Hummock Rd. Aug. 16, 1936.

74. Puccinia investita Schw. On *Gnaphalium polycephalum* Michx. Sept. 18, 1935. Common all over the island and killing off the lower leaves.

75. Puccinia menthae Pers. On leaves and stems of cultivated mint, *Mentha arvensis* L. in nursery on Madaket Rd. outside of the town. Aug. 10, 1936.

76. Pucciniastrum myrtilli (Schum.) Arth. On living leaves of *Vaccinium pennsylvanicum* Lam. Miacomet Pines. Sept. 18, 1935. E. F. Guba & G. Wyatt.

77. Ramularia tulasnei Sacc. On living leaves of *Fragaria virginiana* Duch. In open spaces in the woods, around Hummock Pond. Aug. 12, 1936.

78. Rhytisma andromedae-ligustrinae (S.) Wilson & Seaver. On living leaves of *Lyonia ligustrina* (L.) DC. Sept. 16, 1935.

79. Rhytisma concavum Ell. & Kell. On living leaves of *Ilex verticillata* (L.) Gray. Sept. 16, 1935. General on the island; common around Hidden Forest and in the "Woods." E. F. Guba & G. Wyatt.

80. Rhytisma vaccinii (S.) Fr. On living leaves of *Vaccinium vacillans* Kalm. Polpis. Sept. 18, 1935.

81. Septoria atropurpurea Pk. On leaves of *Aster* Sp. Coskata Thicket. July 13, 1936. Coll. by G. Wyatt.

82. Septoria oenotherae Westd. On living leaves of *Oenothera biennis* L. South of town and along the Hummock Rd. Sept. 17, 1935.

83. Septoria polygonorum Desm. On living leaves of *Polygonum persicaria* L. The "dump," south of town. Sept. 15, 1935.

84. Septoria rubi Westd. On leaves of *Rubus idaeus* L. var. Latham (cultivated raspberry). South end of Hummock Rd. Aug. 15, 1936. Epidemic.

85. Septoria rubi Westd. On living leaves of *Rubus flagellaris*

Willd. (dewberry) near pine grove at end of Hummock Rd. Aug. 12, 1936.

86. Scleroderma vulgare Hornem. Pine woods near Hummock Pond. Sept. 14, 1935. Det. by C. J. Gilgut.

87. Sclerotinia fructicola (Wint.) Rehm. On fruits of *Prunus maritima* Wang. Along roadside of Polpis. Sept. 11, 1935. Common in 1935 but more in 1936.

88. Sphaeropsis malorum Pk. On leaves and twigs of *Pyrus malus* L. On old seedling in Hidden Forest. E. F. Guba & I. H. Crowell. May 29, 1936. Tree badly defoliated by the fungus as early as this date. The twigs were also badly infested.

89. Sphaeropsis quercina Cke. & Ellis. On twigs and branches of *Quercus ilicifolia* Wang. Entrance to Hidden Forest. May 29, 1936.

90. Sphaeropsis viscosa Cke. & Ellis. On leaves of *Pyrus arbutifolia* (L.) L. f. Coskaty Thicket. July 13, 1936. Coll. by G. Wyatt.

91. Tranzschelia pruni-spinosae (Pers.) Diet. O and I. On living leaves of *Anemone quinquefolia* L. Hidden Forest. May 30, 1936.

92. Tranzschelia pruni-spinosae (Pers.) Diet. II and III. On living leaves of *Prunus serotina* Ehrh. Hidden Forest. Sept. 18, 1935. E. F. Guba & G. Wyatt.

93. Uncinula necator (S.) Burrill. On leaves of *Psedera quinquefolia* (L.) Greene. Nantucket town. Sept. 13, 1935.

94. Uromyces phaseoli (Pers.) Wint. var. typica Arth. On leaves of *Phaseolus vulgaris* L. var. *humilis* Alef. In vegetable gardens. Aug. 15, 1936. Epidemic and general causing considerable damage.

95. Uromyces fallens (Desm.) Kern. On living leaves of *Trifolium pratense* L. The "dump," Nantucket town and around cottages about the island. Sept. 10, 1935.

96. Uromyces hedysari-paniculati (Schw.) Farl. On leaves of *Desmodium obtusum* (Muhl.) DC. E. F. Guba & G. Wyatt. Sept. 13, 1935.

97. Uromyces hyperici (Spreng.) Curt. On living leaves of *Hypericum perforatum* L. In field south of town. Sept. 11, 1935.

98. Uromyces limonii (DC.) Lev. On living leaves of *Limonium carolinianum* (Walt.) Brit. Madaket Harbor. E. F. Guba & G. Wyatt. Sept. 13, 1935. Very common and destructive to the lower leaves. Always encountered on my walks to Coskaty over the "Haul-over" from Wauwinet.

99. Uromyces trifolii (Hedw.) Lev. On living leaves of *Trifolium repens* L. near Children's Beach and about cottages along the water front. Aug. 16, 1936.

100. Ustilago avenae (Pers.) Jens. On *Avena sativa* L. On farm at end of Hummock Rd. Aug. 15, 1936.

Host-Index to Century I

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BERBERIS **amplectans** (Eastw.) comb. nov. *Mahonia amplectans* Eastwood, Proc. Cal. Acad. IV **20**: 145. 1931.

This species seems to have been overlooked by authors. Neither Abrams, Phytologia **1**:89–94. 1934 (Mahonias of the Pacific States) nor Munz, Manual of So. Calif. Bot., 1935, mentions it.

It seems to be most closely related to *Berberis pumila* Greene from which it differs in the mostly orbicular cordate-based leaflets. The overlapping of the lobes of the leaflet-bases is very striking. The marginal prickles vary from 14 to 27 per leaflet. The upper surface of the leaflets is dull and the lower surface is duller and papillate. The pairs of leaflets are sufficiently discrete that they overlap little if at all, except the terminal pair which usually overlaps the terminal leaflet considerably. These additional characters are drawn from the type. The label reads: 66 Berberis pinnata Lag. Rootstocks brilliant yellow. "Oregon Grape," 1–2 ft. tall. One locality along a streamway. Not in bloom. Garnet Queen Mine, Sta. Rosa Mts., Nov. '04, Blanche Trask, Coll. This locality is on the west slope of Santa Rosa Mt., Santa Rosa Mts., Riverside Co., Calif. Alt. ca. 6,200 ft. Township 7 South, Range 5 East, San Bernardino Meridian. See U. S. G. S. topographic map, Indio Special, California.—LOUIS C. WHEELER, Gray Herbarium.

Volume 39, no. 464, including pages 277–320 and plates 466–473, was issued 13 August, 1937.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Vol. 39. October, 1937. No. 466.

CONTENTS:

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. **October, 1937.** **No. 466.**

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XV.

Norman C. Fassett

Ribes missouriense Nutt., var. **ozarkanum**, n. var., foliorum laminis, marginibus exceptis, infra supraque glabris; setis longioribus petiolorum plerumque simplicibus. Type from Arkansas: sandstone cliff near White River, Goshen, Washington County, April 20, 1936, *N. C. Fassett*, no. 18020.

The leaves of *R. missouriense* (*R. gracile* of authors, not Michx.) are, throughout the greater part of its range, pilose above and below. Examination of material in the Missouri Botanical Garden yields 16 sheets of the glabrous plant, which proves to be localized from central Missouri to northwestern Arkansas. The writer has collected it three times in northwestern Arkansas and adjacent Missouri, and found it to be sometimes associated with typical *R. missouriense*. The petiolar trichomes, which are fringed in the widespread plant, are often simple in var. *ozarkanum*.

Lathyrus venosus Muhl., var. **arkansanus**, n. var., planta non hirtella; stipulis 13–15 mm. longis, 4–5 mm. latis; floribus 12–13 mm. longis.—Arkansas: Potter, April 23, 1930, *H. C. Benke*, no. 5494 (type at Missouri Botanical Garden); rocky hills about Little Rock and on Saline River, May, 1837, *Geo. Engelmann*, no. 1046 (Missouri Botanical Garden).

The described varieties of *L. venosus*[1] have flowers 15–20 mm. long, while this apparently rare plant of western Arkansas is much smaller-flowered. It is not possible to tell from which of the two places named on the label the Engelmann specimen was taken. There are two

[1] See Butters & St. John, Rhodora xix. 156–159 (1917).

Saline Rivers in Arkansas, one of which is very near Potter. The specimen cited as type had, according to the label, rose-purple corollas. Whether or not this color is correlated with the small size will have to be determined in the field.

Oxalis violacea L., var. **trichophora,** n. var., petiolorum capillis copiosis patentibus multicellulis saepe glandulis terminatis. Type from Fayetteville, Arkansas, April 24, 1935, *N. C. Fassett*, no. 17168, in the Herbarium of the University of Wisconsin.

This plant, in which the petioles have a dense covering of multicellular gland-tipped hairs, nearly replaces the typical glabrous form in northwestern Arkansas, where it has been studied by the writer. The only individuals of this species encountered in two days' collecting in northern Mississippi were var. *trichophora*. Examination of material in the Missouri Botanical Garden, the Field Museum, the Gray Herbarium, and the University of Arkansas, shows it to be developed in the central part of the range of the species, in a band from southern Pennsylvania and Virginia westward to Missouri and Arkansas. The only specimen seen from a northern state was from Wallingford, Vermont.

Scutellaria parvula Michx., var. **australis**, n. var., foliis eglandulosis, marginibus planis, nervis subtus setis sparsis (10 per mm. aut pauciores) 0.5–1 mm. longis obsitis. Type from sandstone ledges near White River, Goshen, Arkansas, April 20, 1936, *N. C. Fassett*, no. 18063.—Northwestern Missouri and south-central Illinois to Tennessee and southern Alabama, westward through Kansas, Oklahoma, and Arkansas to eastern Texas.

In var. *mollis* (= typical *S. parvula*[1]) the glands appear as superficial resinous atoms and the pubescence is closely crowded (20 or more hairs per mm.) along the veins; the length of the hairs is usually equal to once or twice the diameter of the vein, and the ovate blades have definitely revolute margins. In var. *ambigua* (Nutt.) Fernald the glands are much smaller and sunken, the pubescence is so reduced that it is scarcely more than a scabrosity on the veins, and the blades are narrower and more revolute. In var. *australis* the glands are usually quite absent, the hairs are much less numerous (seldom as many as 10 per millimeter along the veins) than in var. *mollis*, and several times as long as the diameter of the vein; the margins of the blades are flat or very slightly revolute.

A microscopic examination of the pubescence of these plants, by

[1] See Fernald, Rhodora iii. 198–201 (1901).

my student, Miss Catherine Mose, gives the following results: *S. parvula* var. *mollis* has two kinds of hairs, the first 2–3 (rarely –4)-celled, gland-tipped, smooth, 100–200 mu long, the second 1–2-celled, eglandular, curving, smooth or papillate. Var. *ambigua* has hairs 1–2-celled, 50–75 mu. long, minutely papillate. Var. *australis* has gland-tipped 5–7-celled hairs 500 mu or more long, 60 mu in diameter at base and tapering, and a second type which are unicellular, eglandular, perfectly cylindrical, 800 to 1000 mu or more long and 10 mu in diameter. In addition there are a few of the second type of var. *mollis*, 100 mu or less long, papillate or smooth.

The writer wishes to express appreciation to the curators of the Missouri Botanical Garden and of the herbarium of the University of Arkansas for loans of material, and to Mrs. F. R. Jones for studying the material of *Scutellaria* at the Field Museum.

Madison, Wisconsin.

LOCAL PLANTS OF THE INNER COASTAL PLAIN OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from page 366*)

Part II. Enumeration and Discussion of Noteworthy Species Collected

In the following notes the procedure of the last two papers on Virginia is followed, of recording such species and stations as seem to be significant in working out a fuller knowledge of the flora of the state. Although primarily a record of collections made in 1936, note is made of earlier or later collections in a few cases.[2] The names of species newly recorded (or seemingly so) from the state are preceded by an asterisk. In some cases revisions of groups suggested by the work on our plants have been included; and in many cases illustration has

[1] To save space the collectors are indicated (except in formal descriptions and revisions) by initials: *F. &. G.* (*Fernald & Griscom*); *F. G. & L.* (*Fernald, Griscom & Long*); *F. & L.* (*Fernald & Long*); *F. L. & F.* (*Fernald, Long & Fogg*); *F. L. & S.* (*Fernald, Long & Smart*).

[2] In two weeks of field work in the same area in September, 1937, Mr. Long and I collected at new stations more than 100 species here noted (*Ctenium aromaticum, Panicum hemitomon, Xyris Curtissii, Cleistes divaricata, Spiranthes ovalis*, etc.). These new stations and records for 70 species new to Virginia, collected in early April and in mid-September, 1937, must await publication until a later paper.

seemed important to clarify the discussions. The photographs have been made chiefly by E. C. Ogden, the cost covered in part by a grant from the Milton Fund for Research, in part from an appropriation from the Division of Biology of Harvard University, in part by the Gray Herbarium. The large expense of reproducing the photographs has been generously met, as several times before, by my most helpful and self-effacing companion, whose keenness in following up and detecting rare species is unequaled, Bayard Long.

Dryopteris celsa (Wm. Palmer) Small. Nansemond County: inundated cypress swamp along Somerton Creek, near Factory Hill, *F. & L.*, no. 6750. See p. 363.

Equisetum hyemale L., var. affine (Engelm.) A. A. Eaton. Surry County: open sandy thicket by James River, Clermont Wharf, *F. & L.*, no. 6754.

Hardly to have been expected on the Coastal Plain; presumably derived from farther up the James.

Lycopodium complanatum L., var. flabelliforme Fern. Sussex County: dry sandy pine woods about 4 miles northwest of Homeville, *F. & L.*, no. 5971. See p. 337.

L. tristachyum Pursh. With the latter, no. 5970. See p. 337.

This and the latter are northern species, seeming quite out of place among the austral species with which they grew.

*Potamogeton capillaceus Poir., var. **atripes**, var. nov., rhizomate stolonibusque subrigidis atratis; foliis submersis anguste linearibus firmis adscendentibus nec subcapillaribus et flaccidis, 2–3 cm. longis, ad nervum medium ubique lacunosis lacunis utrinque 2–3-seriatis.—Virginia: in clay of spring-head in wooded sphagnous bog, Coddyshore,[1] Sussex County, July 20, 1936, *Fernald & Long*, no. 5976.

In its black and almost ligneous rhizome and in its firm and dark, instead of very elongate and flaccid submersed leaves ("like floss-silk"—*Morong*), var. *atripes* is a striking departure from *Potamogeton capillaceus*. The greater development of lacunae in these submersed leaves and the absence of the usual subglobose spikes from their axils are noteworthy characters; but occasionally some submersed leaves of the delicate-leaved *P. capillaceus* have extra rows of lacunae and the absence of the short submersed spikes is not really distinctive, for otherwise typical *P. capillaceus* may sometimes bear only the elongate upper spikes. As a striking variety, however, var. *atripes* is worthy

[1] The locality "Coddyshore" is taken from the government topographic map, although the name seems to be unfamiliar to the present colored inhabitants (see p. 336). The little bog is in a depression west of the Jerusalem Plank Road, barely south of the northern boundary of Sussex County.

separation. It grows in very plastic Tertiary clay (highly acid), whereas typical *P. capillaceus*, which we have never seen from Virginia, is a plant of sandy, gravelly or peaty bottoms. See p. 336.

SAGITTARIA WEATHERBIANA Fern. SOUTHAMPTON COUNTY: in pools, sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5591. SUSSEX COUNTY: shallow pools in woods, Warwick Swamp, northwest of Waverly, *F. & L.*, no. 5978. See p. 331 and MAP 5.

Extension inland from Norfolk County.

ECHINODORUS RADICANS (Nutt.) Engelm. Bottomlands of the Nottoway and its tributary, Three Creek, in SOUTHAMPTON COUNTY: Courtland and Cypress Bridge, *F. & L.*, nos. 6452 and 5980. See pp. 332 and 341 and MAP 16.

The roots (rarely well represented in herbaria) bear abundant fusiform or sausage-shaped structures suggesting the "tubers" on some species of *Eleocharis*.

BROMUS PURGANS L. SUSSEX COUNTY: border of dry sandy woods, 4 miles south of Stony Creek, *F. G. & L* , no. 6519.

Usually a plant of rich interior habitats; here on the inner edge of the Coastal Plain.

*FESTUCA PARADOXA Desv. (*F. Shortii* Kunth). SOUTHAMPTON COUNTY: sandy alluvial bottomlands of Three Creek, Drewryville, and dry woods, thickets and clearings along Three Creek, *F. L. & S.*, nos. 5634 and 5635; open argillaceous thickets south of Courtland, *F. L. & S.*, no. 3636. SUSSEX COUNTY: dry sandy, hickory and oak woods, Burt, *F. & L.*, no. 6035. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5637. See p. 331 and MAP 6.

A typical plant of the prairies and bottoms of the interior of the country, most surprising to find in abundance and in various habitats on the Atlantic Coastal Plain.

*GLYCERIA CANADENSIS (Michx.) Trin. PRINCE GEORGE COUNTY: bushy swamp southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6034. See p. 334.

A characteristic species of Newfoundland, eastern Canada and the northernmost states, here growing with *Carex bullata* (also new to Virginia), within a short distance of the northernmost known stations for *Ctenium aromaticum*, *Andropogon Mohrii*, *Rynchospora dodecandra*, *Aletris aurea*, *Rhexia ciliosa* and numerous other distinctively austral species.

MUHLENBERGIA CAPILLARIS (Lam.) Trin. GREENSVILLE COUNTY: sandy clearing north of Emporia, *F. L. & S.*, no. 6775. See p. 364.

Agrostis elata (Pursh) Trin. Prince George County: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6776. See p. 363 and map 20.

Aristida virgata Trin. Sussex County: dry pine and oak woods about 3 miles southwest of Waverly, *F. & L.*, no. 6774. Isle of Wight County: dry sandy pine barrens, south of Zuni, *F. G. & L.*, nos. 6509 and 6511. See p. 354 and map 26.

Recorded by Hitchcock, *North American Species of Aristida*, Contr. U. S. Nat. Herb. xxii. 579 (1924) only from the Dismal Swamp.

A. dichotoma Michx., var. Curtissii Gray. Greensville County: dry sandy clearings and borders of woods along Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6510.

Recorded by Hitchcock, l. c. 536, only from Bedford County, the type region. Our station is well out on the Coastal Plain.

Ctenium aromaticum (Walt.) Wood. Prince George County: argillaceous and siliceous boggy depression southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6031. See p. 335 and map 11.

Leersia lenticularis Michx. Southampton County: sandy alluvial woods, bottomland of Blackwater River, southeast of Ivor, *F. & L.*, no. 6026. Greensville County: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6506. See pp. 348 and 353 and map 22.

*L. hexandra Swartz. Sussex County: sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6027. See p. 338.

*Leptoloma cognatum (Schultes) Chase. Prince George County: dry sandy clearings about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6763. Southampton County: dry open ground, Courtland, *F. & L.*, no. 6764. See p. 363.

*Paspalum dissectum L. Southampton County: open sandy alluvial bank of Nottoway River, below Cypress Bridge, *F. & L.*, no. 5981. See p. 341.

A single specimen, doubtless washed down from a more suitable habitat (not yet discovered) up-river.

Paspalum fluitans (Ell.) Kunth, Rév. Gram. i. 24 (1829). *Ceresia fluitans* Ell. Sk. Bot. S. C. and Ga. i. 109, pl. 6, fig. 4 (1816). *P. mucronatum* Muhl. Descr. Gram. 96 (1817). *P. natans* Le Conte in Journ. de Phys. lxxxxi. 285 (1820). *P. Frankii* Steud. Syn. Pl. Glum. i. 19 (1854). *P. repens*, as to plant of United States, *sensu* Chase in Contrib. U. S. Nat. Herb. xxviii. 31 (1929) and *sensu* Hitchc. Man. Grasses U. S. 579 (1935). Southampton County: open sandy alluvial bank of Nottoway River, below Cypress Bridge, *F. & L.*, no. 5982; open sandy borders of pools and depressions in bottomland of Nottoway River, Courtland, *F. & L.*, no. 6460. Plate 474, figs. 6–13. See pp. 341 and 359 and map 17.

Although the northeastern limit is stated by Mrs. Chase and, after her, by Hitchcock as in South Carolina, it is to be noted that *Paspalum fluitans* was treated by Gray, Man. ed. 2: 576 (1856), as growing in "River-swamps, Virginia, S. Ohio, Illinois and southward." The Virginia record of Gray was based presumably on a plant of Rugel in the Gray Herbarium, without statement of locality but with a label, written by Rugel and exactly similar to his more complete ones from Western Branch (in Norfolk County, near Portsmouth). Incidentally the late Edward Tatnall, in his Catalogue of the Plants of Newcastle County, Delaware, 91 (1860) listed *P. fluitans* from "an exsiccated pond; J. W. Andrews. Rare," with the special comment: "A native of the Southern States, but evidently indigenous in the locality named, which has been a number of years submersed."[1]

The plant of the southeastern Coastal Plain and the Mississippi Basin passed, correctly, as *Paspalum fluitans* through the four succeeding editions of Gray's Manual, there properly described as "Annual," but in the 7th edition (1908), the late Professor Hitchcock, responsible for the treatment of the *Gramineae*, took up the later name *P. mucronatum* Muhl. (1817) and incorrectly cited its synonym as "*P. fluitans* Ell.", rather than *P. fluitans* (Ell.) Kunth; Elliott (1816) having called the plant *Ceresia fluitans.*

Throughout this period *Paspalum fluitans*, the annual (possibly sometimes perennial) lanceolate-leaved plant of the eastern United States, was correctly maintained as an endemic species. In 1929, however, in her *North American Species of Paspalum* (Contrib. U. S. Nat. Herb. xxviii. Pt. 1), Mrs. Chase merged it, without explanation, with the tropical American *P. repens* Bergius, describing it, without qualification, as "perennial"; "sheaths . . . in all a prominent erect auricle on either side at summit"; "blades . . . 10 to 20 cm. long and 12 to 15 mm. wide, sometimes as much as 27 cm. long and 2.5 cm. wide"; "spikelets . . . 1.4 to 2 mm. long . . . pubescent with soft spreading hairs to glabrous." In this description one can hardly recognize the "Annual" of the United States, correctly described by Hitchcock in Gray's Manual, ed. 7, with "*blades* lanceolate, 2.5–15 cm. long, 6–14 *mm. wide* [sometimes as narrow as 3 mm.]" and "*spikelets* . . . about 1.5 *mm. long, sparsely pubescent with minutely glandular hairs.*"

[1] Mr. Long writes me that, at the Philadelphia Academy there are sheets of characteristic *Paspalum dissectum* from Newcastle County. These may have been misidentified as *P. fluitans* by Tatnall. Dr. Robert Tatnall so believes. The dot on MAP 17 for Delaware is, consequently, open to doubt.

As treated by Mrs. Chase, and subsequently by Hitchcock, the aggregate *Paspalum repens* has an extraordinarily disrupted range: Florida to eastern Texas, north to South Carolina, southern Indiana,[1] Illinois, Missouri and Kansas; Jamaica; southeasternmost Mexico and Central America (Tabasco and Guatemala southward); and tropical South America. With broad gaps in the range, from Jamaica to Florida and from Tabasco (tropical) to eastern Texas, as indicated by Mrs. Chase's citation of specimens, it has seemed to me important to check the question, to determine whether *P. fluitans* has been correctly treated by most botanists for more than a century as an endemic species of the United States or whether it is wisely merged with a geographically remote tropical species.

Mrs. Chase gives detailed statements regarding the types of the species she merges under *Paspalum repens*. *P. repens* itself was from Surinam (Dutch Guiana) and Mrs. Chase's identification of it with the characteristic South American plant is unquestioned: "Bergius' detailed description, especially the statement that the mouth of the sheath is bidentate, referring to the prominent auricles characteristic of this species, and the plate, leave no doubt as to its identity. The spikelets are not said to be pubescent so that it is to be assumed those of Bergius' specimen are glabrous."

The other South American plants referred by Mrs. Chase to *Paspalum repens* are three. *P. gracile* Rudge (1805), from Guiana, is shown in the plate with the characteristic slender auricles at the summit of the sheath, but it differs from most South American specimens, according to Mrs. Chase, in that "The spikelets are minutely pubescent." *P. pyramidale* Nees (1829), from Brazil (beautifully described "Vaginae . . . apice utrinque in dentem lanceolatum acuminatum . . . excurrentes. . . . Folia . . . firma, pedem ad pedem cum quadrante longa 6–8 lineas lata. . . . Spiculae . . . glabrae, . . . ¾ lineae longae, . . . Antherae fulvae") was clearly the coarse South American plant. *P. bistipulatum* Hochst. (1854), from Surinam, was named obviously for the "ligula in appendices 2 stipulaceas elongata"; and Mrs. Chase, examining the type, reports that it "has glabrous spikelets."

[1] Although Ohio (like Virginia) has been omitted from recent statements of range, the "S. Ohio" of Gray, Man. ed. 2, is supported by an old specimen in the Gray Herbarium marked simply "Ohio. Herb. Torr." It is not improbable that this was received from Thos. G. Lea and actually came from the Kentucky side of the Ohio River, at Covington—See E. Lucy Braun, *The Lea Herbarium and the Flora of Cincinnati*, Am. Midl. Nat. xv. 16 (1934).

The South American plant, true *Paspalum repens* (FIGS 1–5), is, then, comparatively coarse, with long leaves, the summit of the sheath bearing (as shown or described by all authors of supposed new species) elongate lanceolate "stipule"-like auricles (FIGS. 1–3), and the spikelets (FIGS. 4 and 5) are usually glabrous.

Mrs. Chase justly emphasizes the long lanceolate or falcate auricles which surmount the sheaths of *Paspalum repens*. If the temperate North American annual is identical with the tropical American perennial, it seems very strange that its stipular auricles should be nearly or quite suppressed. In much of the material from the United States (*P. fluitans*) I fail to find them, but occasionally (FIGS. 6–10) they are represented by weak deltoid projections 1–3 mm. long. Walter (1788), who mistook *P. fluitans* for *P. paniculatum* L., did not mention them; neither did Elliott, whose *Ceresia fluitans* was accurately described: "*Root* annual? . . . *Leaves* 2–3 inches long, 4–5 lines wide, . . . *Calyx*, glumes . . . sprinkled with hair, . . . *Anthers* white." Muhlenberg (1817), correctly describing the "Cal[yx] 2-valvis . . . puberulis" of his *P. mucronatum*, did not note prolonged auricles; neither did LeConte (1820), in describing his *P. natans*, nor Steudel in characterizing his *P. Frankii* (1854), although he looked sharply enough at his New Orleans plant to describe the "spiculis . . . puberulis." In short, I find the original diagnoses of the various botanists who have proposed new names for the plant of the United States consistent and quite in agreement with my own observations that "the prominent auricles characteristic of this species [*P. repens* of South America]" are not at all characteristic of *P. fluitans* of the eastern United States.

The most important distinctions between our *Paspalum fluitans* and the tropical American *P. repens* are indicated in the succeeding paragraphs. In view of the possible misinterpretations I am showing the details of the two species in PLATE 474.

P. REPENS Bergius. Coarse perennial; leaf-blades linear-lanceolate, firm and opaque (translucent when long submersed), the principal ones 1.5–4 dm. long, 0.8–2.5 cm. broad; summit of sheath (until readily broken off) bearing a pair of lanceolate or lance-falcate attenuate auricles 5–13 mm. long; the flange at base of the blade broad, with a broadly rounded sinus; spikelets 1.8–2.2 mm. long, glabrous or rarely pubescent; anthers oblong, fulvous (rarely pale), about 1 mm. long. Tropical America. FIGS. 1–5.

P. FLUITANS (Ell.) Kunth. Weak annual, perhaps sometimes perennial; leaf-blades lanceolate, thin and translucent, the principal ones 0.25–3 dm.

long, 3–25 mm. broad; summit of sheath exauriculate or with thin deltoid auricles up to 3 mm. long; the flange at base of blade narrow, with a narrow sinus; spikelets 1.2–1.7 mm. long, viscid-pilose; anthers subquadrate, whitish, 0.3–0.4 mm. long. Eastern United States. Figs. 6–13. Map 17.

Panicum strigosum Muhl. Dinwiddie County: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, no. 5996. Prince George County: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5596. See pp. 326 and 338.

Reported by Hitchcock & Chase only from Norfolk County.

P. consanguineum Kunth. Prince George County: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5597; border of dry woods east of Prince George, *F. L. & S.*, no. 5598. Sussex County: depressions in argillaceous field north of Littleton, *F. & L.*, no. 5998. Southampton County: damp clearing in sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 5999. See p. 326 and map 47.

Extensions inland from Princess Anne County.

P. nitidum Lam. Nansemond County: dry sandy pine woods south of Factory Hill, *F. & L.*, no. 6769.

Extension inland from Princess Anne County.

P. mattamuskeetense Ashe. Henrico County: exsiccated peaty clearing, Westover Hills, *F. & L.*, no. 6001. Prince George County: swampy woods west of New Bohemia, *F. L. & S.*, no. 5601. Nansemond County: damp sandy and peaty woods and margins of bordering ditch, southwest of Whaleyville, *F. & L.*, no. 6768. See p. 364 and map 31.

P. mattamuskeetense Ashe, var. **Clutei** (Nash), comb. nov. *P. Clutei* Nash in Bull. Torr. Bot. Cl. xxvi. 569 (1899). Isle of Wight County: moist or sphagnous depressions in sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6482. See p. 356.

Panicum lucidum Ashe, var. **opacum**, var. nov., foliis opacis strigoso-pilosis; spiculis 1.5–1.8 mm. longis.—Prince George County, Virginia: argillaceous and siliceous boggy depression north of Gary Church, June 25, 1936, *Fernald, Long & Smart*, no. 5606, August 25, 1936, *Fernald & Long*, no. 6484 (type in Gray Herb.; isotypes in Herb. Phil. Acad., Herb. Univ. Richmond and elsewhere).

Panicum lucidum, one of the almost ubiquitous and most characteristic species of boggy spots on the coastal plain of Virginia, has lustrous and glabrous leaves and spikelets ranging from 1.8 to 2.1 mm. long. The plant here described, with smaller spikelets, has exactly the habit of *P. lucidum* but its leaves are opaque and definitely strigose-pilose, the hairs on the young foliage bullate at base. It forms a dense

growth in an extensive boggy depression, where it is associated with several localized species: the new *Juncus* described on a later page, an unusually pubescent form of *Panicum longifolium* Torr., *Scleria minor* (Britt.) W. Stone, *Xyris ambigua* Beyrich, *Sarracenia flava* L., etc. In other similar boggy depressions of the area all *Panicum lucidum* seemed to be the typical glabrous plant. See p. 358.

*P. Wrightianum Scribn. Sussex County: sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6005. Isle of Wight County: wet peaty margin of pine woods about 3 miles southeast of Zuni, *F. & L.*, no. 6006; wet woodroads and borders of low woods, Boaz, *F. & L.*, no. 6007. See pp. 337 and 347 and map 13.

The extreme height given by Hitchcock (*Man.*) is 4 dm. Our material from Boaz is 7.5 dm. high.

P. Commonsianum Ashe. Isle of Wight County: dry sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6492. See p. 354.

Extension inland from Cape Henry.

P. ensifolium and Allies in Southeastern Virginia.

Three separable entities occur in southeastern Virginia, all of which I have been referring without differentiation to *Panicum ensifolium* Baldwin, the one first described. They can be sorted into three piles, agreeing with *P. albomarginatum* Nash, *P. trifolium* Nash and *P. ensifolium* (true). I am not wholly convinced of their specific value, but, until they can be given more thorough study, they may be treated as species. All the collections of my parties have been distributed under the blanket name *P. ensifolium*.

P. albomarginatum Nash. Princess Anne County: damp sandy and peaty depressions back of the dunes, Rifle Range, south of Rudy Inlet, *F. & L.*, nos. 3682 and 3683, *F. G. & L.*, no. 4539 (reported, Rhodora, xxxvii. 391, as *P. ensifolium*). Prince George County: dry sandy woods and clearings about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5618; border of swampy woods west of New Bohemia, *F. L. & S.*, no. 5619. Henrico County: exsiccated argillaceous swale, Libbie Avenue, Westhampton, *F. L. & S.*, no. 5620.

Recorded by Hitchcock & Chase only from the Dismal Swamp.

*P. trifolium Nash. Sussex County: dry pinelands about 4 miles northwest of Waverly, *F. & L.*, nos. 6010 and 6011. Prince George County: dry sandy woods and clearings about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5617; exsiccated argillaceous depression southeast of Petersburg, on headwaters of Blackwater River, *F. & L.*, no. 6009.

*P. ensifolium Baldwin. Sussex County: depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6012. Prince George County: sphagnous tussocks in argillaceous and siliceous boggy depression north of Gary Church, *F. L. & S.*, no. 5621. See p. 326.

P. scabriusculum Ell. Prince George County: swampy woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. L. & S.*, no. 5628. Southampton County: sandy wooded swamp southwest of Cypress Bridge, *F. & L.*, no. 6016.

P. commutatum Schultes, var. **Joorii** (Vasey), comb. nov. *P. Joorii* Vasey, U. S. Dept. Agric. Div. Bot. Bull. viii. 31 (1889). Frequent in swampy woods.

P. mutabile Scribn. & Sm. Southampton County: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, nos. 6021 and 6022. See p. 339 and map 15.

Extension inland from Cape Henry.

*P. hians Ell. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5594; open sandy borders of pools and depressions, bottomland of Nottoway River, Courtland, *F. & L.*, no. 6479. See pp. 332 and 359.

*P. hemitomon Schultes. Sussex County: dominant at margin of sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 5985. See p. 338 and map 14.

*Miscanthus sinensis Anderss. Isle of Wight County: sandy roadside near Walters, *F. & L.*, no. 7656. Nansemond County: locally abundant on sandy roadside north of Factory Hill, *F. & L.*, no. 6757.

*Andropogon Mohrii Hackel. Prince George County: argillaceous and siliceous boggy depression, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6758. See p. 364.

A. virginicus L., var. tenuispatheus (Nash.) Fern. & Grisc., forma hirsutior (Hackel) Fern. & Grisc. Isle of Wight County: moist or sphagnous depressions in sandy pine barrens, south of Zuni, *F. & L.*, no. 6760.

Extension inland from Northampton County.

*A. Elliottii Chapm., var. gracilior Hackel. Nansemond County: dry sandy woods, Factory Hill, *F. & L.*, no. 6761. See p. 363.

Cyperus filiculmis Vahl, var. oblitus Fern. & Grisc. Isle of Wight County: dry sandy pine barrens south of Zuni, *F. G. & L.*, no. 6525. See p. 354.

Extension inland from Princess Anne County.

C. retrorsus Chapm., var. Nashii (Britton) Fern. & Grisc. Southampton County: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6044. See p. 339.

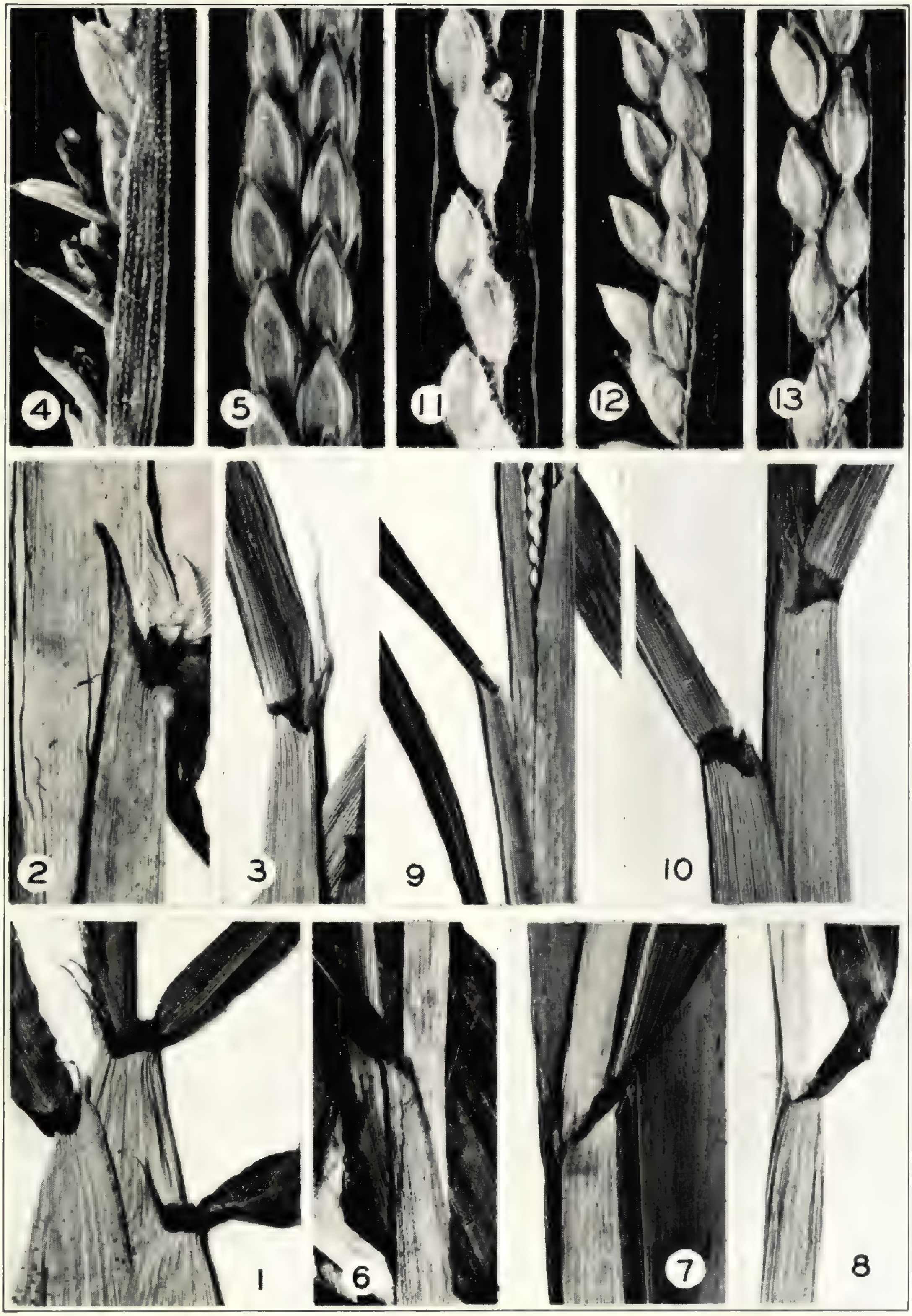

Photo. E. C. Ogden.

PASPALUM REPENS: FIGS. 1–3, summits of leaf-sheaths, × 2: FIG. 1, from Paraguay; FIG. 2, from Brasil; FIG. 3, from Venezuela. FIGS. 4 and 5, spikelets, × 10: FIG. 4, from Paraguay; FIG. 5, from Brasil.

P. FLUITANS: FIGS. 6–10, summits of leaf-sheaths, × 2: FIG. 6, from Missouri; FIG. 7, from Illinois; FIG. 8, from Indiana; FIG. 9, from Virginia; FIG. 10, from Florida. FIGS. 11–13, spikelets, × 10: FIG. 11, from Florida; FIG. 12, from Illinois; FIG. 13, from Virginia.

Photo. E. C. Ogden.

RYNCHOSPORA TRICHOPHYLLA: FIG. 1, portion of TYPE, × ⅖; FIG. 2, inflorescence, × 2; FIGS. 3 and 4, achenes, × 20.
R. FILIFOLIA: FIG. 5, inflorescence, × 2, from ISOTYPE; FIG. 6, achene, × 20.
R. WRIGHTIANA: FIG. 7, inflorescence, × 2, from Virginia; FIG. 8, achene, × 20.
R. FUSCOIDES: FIG. 9, inflorescence, × 2, from Florida; FIG. 10, achene, × 20.

Extension inland from Cape Henry.

C. GLOBULOSUS Aubl. (*C. echinatus* (Ell.) Wood). ISLE OF WIGHT COUNTY: sandy waste ground and roadsides, Lee's Mill, *F. & L.*, no. 6785. See p. 362. For discussion of this species see Fernald & Griscom, RHODORA, xxxvii. 154 (1935).

*ELEOCHARIS ACICULARIS (L.) R. & S. SOUTHAMPTON COUNTY: open sandy borders of pools and depressions, bottomland of Nottoway River, Courtland, *F. & L.*, no. 6535. See p. 359.

E. OBTUSA (Willd.) Schultes, var. JEJUNA Fern. SOUTHAMPTON COUNTY: sandy alluvial bottomland of Nottoway River, Courtland, *F. & L.*, no. 6786.

Extension inland from Princess Anne County.

E. OBTUSA, var. ELLIPSOIDALIS Fern. ISLE OF WIGHT COUNTY: open sandy swale, Boaz, *F. & L.*, no. 6047; sandy roadside ditch south of Zuni, *F. G. & L.*, no. 6533. SOUTHAMPTON COUNTY: argillaceous ditch south of Sebrell, *F. & L.*, no. 6046.

Extension south from the Williamsburg region. The Sebrell material is very obviously perennial, with stout old caudices.

SCIRPUS DIVARICATUS Ell. Very characteristic of alluvial bottomlands northward to PRINCE GEORGE COUNTY. See p. 330 and MAP 4.

HEMICARPHA MICRANTHA (Vahl) Britton. SOUTHAMPTON COUNTY: open sandy borders of pools and depressions, bottomland of Nottoway River, Courtland, *F. & L.*, no. 6540. See p. 359.

LIPOCARPHA MACULATA (Michx.) Torr. Open alluvium, ditches, etc., frequent in SUSSEX, ISLE OF WIGHT and SOUTHAMPTON COUNTIES, often with and easily confused with CYPERUS DENSICAESPITOSUS Mattf. & Kükenth. (*Kyllinga pumila* Michx.). See p. 359.

*RYNCHOSPORA DODECANDRA Baldw. PRINCE GEORGE COUNTY: argillaceous and siliceous swale south of The Crater, *F. L. & S.*, no. 5652. See p. 328.

R. GRACILENTA Gray. Frequent in damp or peaty depressions or in low pinelands, SUSSEX, PRINCE GEORGE and DINWIDDIE COUNTIES.

R. GRACILENTA, var. DIVERSIFOLIA Fern. Less general. PRINCE GEORGE COUNTY: sphagnous boggy swale southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6060. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond), about 4 miles northeast of Homeville, *F. & L.*, no. 6061. ISLE OF WIGHT COUNTY: wet peaty margin of pine woods about 3 miles southeast of Zuni, *F. & L.*, no. 6064.

Extension inland from Princess Anne County.

*RYNCHOSPORA **trichophylla**, sp. nov. (TAB. 475, FIG. 1–4), planta densissime caespitosa laxa, culmis filiformibus laevissimis laxe diffusis 1.5–6 dm. longis; foliis vix 1 mm. latis involutis; cymis corymbiformibus 1 vel 2 erectis, terminalibus 6–15 mm. latis laxis;

spiculis brunneis oblongo-lanceolatis 4–4.3 mm. longis subsessilibus; squamis exterioribus oblongo-ovatis obtusis cuspidatis, interioribus ellipticis subacutis; achaeniis planis rotundato-obovatis lucidis 1.8–2 mm. longis 1.4–1.5 mm. latis; setis antrorse barbellatis quam achenium brevioribus vel eum fere aequantibus; tuberculis albidis anguste deltoideis acutis 1–1.3 mm. longis.—Virginia: sandy and peaty depression (exsiccated shallow pond), west of Jerusalem Plank Road, about 4 miles northwest of Homeville, Sussex County, July 19 and 20, 1936, *Fernald & Long*, nos. 6063 (type in Gray Herb., isotype in Herb. Phil. Acad.), 6081. See p. 337.

Rynchospora trichophylla, in its promptly involute and delicately subcapillary leaves and small cymes, closely resembles several other species of the Coastal Plain of the eastern United States, especially *R. gracilenta* Gray, *R. Wrightiana* Boeckl., *R. filifolia* Torr., *R. distans* (Michx.) Vahl and *R. fuscoides* C. B. Clarke. From *R. gracilenta*, illustrated in Rhodora, xxxvii. t. 390 (1935) it differs at once in its very short perianth-bristles, which ally it with *R. Wrightiana*. The latter, however, (figs. 7 and 8) has smaller spikelets (2–3.5 mm. long) and achenes, with the round-tipped tubercle only about 0.5 mm. long. *R. filifolia* (figs. 5 and 6), likewise, has smaller spikelets, its perianth-bristles greatly exceed the very small (1–1.3 mm. long) achene, and its broadly triangular short tubercle is serrulate. *R. trichophylla* has the achene and short perianth-bristles of the southern *R. distans*, but its spikelets and its tubercles are very much longer than in the plant currently passing as *R. distans*. In size and shape of achenes *R. trichophylla* also suggests *R. fuscoides* (figs. 9 and 10); but the latter species has long bristles and a very prolonged and serrulate tubercle. I am unable to place the plant here described with any defined species.

Although *Rynchospora trichophylla* is as yet known from only a single locality it is presumably of broader range. The station where it occurs, along with several other plants which we met nowhere else in Virginia, is the last undisturbed remnant (of perhaps an acre) of what originally must have been a shallow boggy depression or pond extending over probably a hundred acres of lowland.

In our experience the slender-leaved species of *Rynchospora* were singularly restricted in their occurrence from Chesterfield and Prince George Counties to the North Carolina line. Usually a single such species characterizes each undisturbed depression; only rarely were two together. *R. rariflora* (Michx.) Ell., not closely related to the others, is common; so is *R. gracilenta* or its coarser var. *diversifolia* Fernald. But *R. Wrightiana*, to which *R. trichophylla* is most closely

related, was found in only two of the full dozen such depressions examined, one in Chesterfield County, the other in southern Sussex, several miles south of the station of *R. trichophylla*. Subsequently *R. distans* (Michx.) Vahl was found at a single station in Isle of Wight County, there associated with many species elsewhere unknown in Virginia. The evident localization of the three latter species in Virginia is indication that *R. trichophylla*, like *R. Wrightiana* (West Indies and Florida to Princess Anne and Chesterfield Counties, Virginia), will probably be found to have a broad distribution.

R. MICROCEPHALA Britton. Frequent in peaty depressions and borders of swampy woods, from PRINCE GEORGE COUNTY southward and southeastward.

R. WRIGHTIANA Boeckl. CHESTERFIELD COUNTY: exsiccated argillaceous swale west of Petersburg Turnpike, north of Swift Creek, *F. & L.*, no. 6084. SUSSEX COUNTY: depressions in argillaceous field north of Littleton, *F. & L.*, no. 6085. See p. 344.

Extension inland from Princess Anne County.

R. RARIFLORA (Michx.) Ell. Frequent in peaty depressions in PRINCE GEORGE and ISLE OF WIGHT COUNTIES, the culms varying from 0.5–6 dm. long, the cymes with 1 to 10 spikelets. See p. 326.

Inland extension from Princess Anne County.

R. CYMOSA Ell., var. GLOBULARIS Chapm. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6071; depression in sandy field, southwest of Burt, *F. & L.*, no. 6072.

Extension inland from Princess Anne County.

*R. HARVEYI W. Boott. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5647, very scarce. See p. 328.

*R. DISTANS (Michx.) Vahl. ISLE OF WIGHT COUNTY: moist or sphagnous depressions in sandy pine barrens, south of Zuni, *F. G. & L.*, nos. 6544 and 6545. See p. 356.

*R. TORREYANA Gray. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depression southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5658, *F. & L.*, no. 6075; sandy and peaty swale southeast of Prince George, *F. L. & S.*, no. 5659; argillaceous and siliceous boggy depression north of Gary Church, *F. L. & S.*, no. 5660. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6076; depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6077. See p. 326. MAP 32.

R. CADUCA Ell. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville,

F. & L., no. 6092; wet sandy thicket, Burt, *F. & L.*, no. 6093. See pp. 338 and 342.

Extension inland from Norfolk County.

Scleria ciliata Michx., var. **Elliottii** (Chapm.), comb. nov. *S. Elliottii* Chapm., Fl. So. U. S. 531 (1860). *S. pauciflora*, δ. *Elliottii* Wood, Bot. and Fl. issue of 1873: 368 (1873); Britt. in Ann. N. Y. Acad. Sci. iii. 234 (1885).

Typical *Scleria ciliata, slender, with leaves but 1–2.5 mm. wide and soon revolute in drying, and with sparse fascicles, smooth or smoothish scales and very short ciliation of the bracts, is rare so far north as Virginia. Our only collection is from Isle of Wight County: dry sandy woods south of Zuni, *F. & L.*, no. 6548.

Var. Elliottii, coarser, with flat leaves 3–6 mm. wide, fuller and more crowded inflorescences, pubescent scales and almost fimbriate-ciliate bract-bases, is occasional: Henrico County: exsiccated argillaceous swale, Libbie Avenue, Westhampton, *F. L. & S.*, no. 5664. Sussex County: sandy and peaty depression (exsiccated shallow pond) about 4 miles northwest of Homeville, *F. & L.*, no. 6100; dry sandy woods and clearings, same locality, *F. & L.*, no. 6101. Isle of Wight County: dry sandy woods south of Zuni, *F. & L.*, no. 6547. Nansemond County: about Suffolk, *Heller*, no. 969.

Although Core[1] cites two collections of *Scleria ciliata* from Virginia, it should be noted that he reduces *S. Elliottii* without qualification to it. One of his citations is the *Heller* collection, which is of characteristic var. *Elliottii;* the other a collection from the interior which I have not seen. In the Gray Herbarium typical slender *S. ciliata* is not represented from between southeastern Virginia and southern South Carolina.

S. pauciflora Muhl.

Since Core, in his *American Species of Scleria*, Brittonia, ii. no. 1 (1936), does not differentiate between the essentially glabrous typical *Scleria pauciflora* and the very pubescent var. *caroliniana*, it is worth while noting the ranges of the two. Of the 4 Virginia collections cited by Core, 3 are in the Gray Herbarium. Two of these are typical *S. pauciflora*, which seems to be the wide-spread plant of the state.

S. pauciflora (typical). Represented by specimens from James City, Henrico, Prince George, Sussex and Nansemond Counties; also Bedford County.

S. pauciflora, var. caroliniana (Willd.) Wood. Nansemond, Sussex and Prince George Counties, several collections.

[1] Core, *The American Species of Scleria*, Brittonia, ii. 67 (1936).

Photo. E. C. Ogden.

CAREX CRUS-CORVI: FIG. 6, inner band and summit of leaf-sheath, × 5, from Illinois; FIG. 7, inner face of perigynium, × 10, from Arkansas; FIG. 8, outer face of perigynium, × 10, from Arkansas.

Var. VIRGINIANA, all figs. from TYPE: FIG. 1, panicle, × 1; FIG. 2, inner band and summit of leaf-sheath, × 5; FIGS. 3 and 5, inner faces of perigynia, × 10; FIG. 4, outer face of perigynium, × 10.

Photo. E. C. Ogden.

JUNCUS LONGII: FIG. 1, TYPE, × ⅖; FIG. 2, tip of stolon, × 1; FIG. 3, young fruits, × 8; FIG. 4, seed, × 40.

J. MARGINATUS: FIG. 5, base, showing stolon, × 1, from Virginia; FIG. 6, base of cespitose plant, × 1, from Maine; FIG. 7, fruits, × 8, from Virginia; FIG. 8, seeds, × 40, from Nova Scotia.

J. BIFLORUS: FIG. 9, rhizome, × 1, from Georgia; FIG. 10, fruits, × 8, from Virginia; FIG. 11, seeds, × 40, from Massachusetts.

S. SETACEA Poir. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6787. See p. 363.

*CAREX CRUS-CORVI Shuttlew., var. **virginiana**, var. nov. (TAB. 476, FIG. 1–5), foliis subcoriaceis albido-glaucis, vaginis firmis albidis vix rubro-punctatis ore firmo; paniculis griseo- vel glauco-viridibus; squamis albidis; perigyniis glauco-viridibus vix flavescentibus dorso obsolete paucinerviis ventre enerviis.—Rich alluvial bottomlands, Southampton County, VIRGINIA: sandy alluvium, bottomlands of Three Creek, Drewryville, June 22 and 23, 1936, *Fernald, Long & Smart*, no. 5677 (TYPE in Gray Herb.; ISOTYPES in Herbs. Phil. Acad. and Univ. Richmond); wooded bottomland of Meherrin River, above Haley's Bridge, June 23, 1936, *Fernald, Long & Smart*, no. 5956. See p. 332 and MAP 9.

It was, naturally, very surprising to find *Carex crus-corvi*, a characteristic plant of the Mississippi Basin and of the Gulf Coastal Plain eastward to the Apalachicola in northwestern Florida, abundantly represented on bottomlands of the Inner Coastal Plain of Virginia, isolated from the west by the full breadth of the Appalachian Upland and from the south by a distance of about 600 miles. In these rich bottoms, with their abundant beds of fossil shells and consequent supply of calcium, many other plants of the rich interior are found (see p. 323) but ordinarily their isolation is not so complete. *Carex crus-corvi* is one of the most distinct and conspicuous members of the genus. If it occurs in the alluvium of the Appalachian Valley, the Blue Ridge and the Piedmont (between the Blue Ridge and the Coastal Plain) or if it is found along the east-flowing rivers from northern Florida to Virginia it has not been reported, whereas plenty of small and inconspicuous species are there well known.

Typical *Carex crus-corvi* (FIGS. 6–8) is a less glaucous plant than var. *virginiana*, with less coriaceous leaves, the ventral band of the sheath, to quote Mackenzie's characterization in the North American Flora,"thin, strongly purplish-dotted . . . not thickened . . . at mouth." In var. *virginiana* the thickish white and usually undotted band (FIG. 2) is firm to the orifice and there somewhat thickened. The panicle and mature perigynia of typical *C. crus-corvi* are yellowish-green or yellowish-brown; the scales usually with brownish sides; the outer face of the perigynium (FIG. 8) is prominently nerved quite over the bulbous base, the inner face (FIG. 7) either nerved or nerveless. In var. *virginiana* the panicle is grayish- or bluish-green, the scales whitish, the outer face of the grayish-green perigynium

(fig. 4) only obscurely nerved and with the conspicuous whitish bulbous base scarcely nerved, the inner face (figs. 3 and 5) nerveless, and the stipe is shorter than in typical *C. crus-corvi*.

Completely isolated, apparently, and with some striking characters to separate it from the continental type, *Carex crus-corvi*, var. *virginiana* might be considered by some a distinct species. The differences are not, however, always so sharp as shown in the selected figures. Sometimes inland plants of typical *C. crus-corvi* have subcoriaceous leaves, sometimes the purple dots of the sheath are obscure, and the inner face of the perigynium may sometimes be nerveless. As pronounced and isolated derivatives from a common ancestral type the two plants are closely related but long-enough separated to have made a beginning toward specific differentiation.

C. striatula Michx. Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6111. See p. 342.

*C. crebriflora Wieg. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5682. See p. 332.

C. oxylepis Torr. & Hook. Chesterfield County: wooded river-swamp along Appomattox River, near Hopewell, *F. L. & S.*, no. 5684. Collected by Grimes; probably in most alluvial soils. Maturing early and easily overlooked.

*C. Barrattii Schwein. & Torr. Sussex County: swampy depression in pineland, about 4 miles northwest of Waverly, *F. G. & L.*, no. 6550. See p. 353 and map 25.

C. Joorii Bailey. Characteristic of the bottomlands and wooded swamps northward at least to New Kent County. See p. 348.

*C. vestita Muhl. Henrico County: exsiccated argillaceous swale, Libbie Avenue, Westhampton, *F. L. & S.*, no. 5686. Prince George County: swampy woods west of New Bohemia, *F. L. & S.*, no. 5687. See p. 328.

The southern colonies of *Carex vestita* are in decidedly moist or even wet habitats, whereas in New England and New York the plant is usually, though not always, in dry sand and gravel. Mackenzie, in the North American Flora, gives the habitat "Open dry sandy woods and thickets," reflecting his experience with the plant in the latitude of New York. I have sought in vain for any clear morphological differences to separate the two series.

*C. Collinsii Nutt. Sussex County: spring-fed, wooded, argillaceous sphagnous bog, headwaters of Jones Hole Swamp, north of Coddyshore, *F. & L.*, no. 6118. See p. 336 and map 12.

*C. BULLATA Schkuhr. PRINCE GEORGE COUNTY: bushy swamp southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6119. See p. 334.

C. FRANKII Kunth. HENRICO COUNTY: border of wet deciduous woods, Curles Neck Farm, *F. L. & S.*, no. 5691. SUSSEX COUNTY: rich low woods, near Moore's Mill, *F. & L.*, no. 6115. See p. 330.

C. SQUARROSA L. Alluvial woods and river-swamps, frequent from CHESTERFIELD COUNTY to southwestern SUSSEX COUNTY. See pp. 330 and 342.

C. TYPHINA Michx. Alluvial woods and river-swamps, general from PRINCE GEORGE COUNTY to SOUTHAMPTON COUNTY. See pp. 330 and 342.

C. GRAYII Carey. SUSSEX COUNTY: with the two latter in sandy alluvial woods, bottomland of Nottoway River, southwest of Burt, *F. & L.*, no. 6117. See p. 342 and MAP 19.

C. LOUISIANICA Bailey. Abundant in alluvial woods and river-swamps. See p. 330.

ERIOCAULON DECANGULARE L. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6790. See p. 363.

LACHNOCAULON ANCEPS (Walt.) Morong. DINWIDDIE COUNTY: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, no. 6120. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. L. & S.*, no. 5698. ISLE OF WIGHT COUNTY: wet peaty margin of pine woods about 3 miles southeast of Zuni, *F. & L.*, no. 6121. See pp. 328 and 347.

Recorded by Pursh from Virginia, as *Eriocaulon villosum* Michx.

*XYRIS TORTA Sm., var. **macropoda** var. nov., bulbo castaneo lucido 1–2 cm. diametro 1.5–2 cm. alto; scapis solitariis vel binis 3–6 dm. altis; spicis anguste ellipsoideo-ovoideis subacutis 0.9–1.8 cm. longis; sepalis lateralibus apice vix barbellulatis.—Peaty and boggy depressions in the coastal plain, southeastern VIRGINIA: exsiccated argillaceous swale, about 3 miles southeast of New Bohemia, Prince George County, July 28, 1936, *Fernald & Long*, no. 6131, August 22, 1936, *Fernald, Griscom & Long*, no. 6562 (TYPE in Gray Herb.; ISOTYPES in Herb. Phil. Acad., Herb. Griscom and elsewhere); siliceous and argillaceous swaley thicket south of Zuni, Isle of Wight County, August 20, 1936, *Fernald, Griscom & Long*, no. 6561. See pp. 345 and 354.

Typical *Xyris torta* has much smaller and commonly paler and more numerous bulbs (4–10 mm. in diameter, 5–12 mm. high) commonly clustered and forming tufts (on old crowns up to 50 scapes); its spikes are thicker-ovoid, 5–12 mm. long and rounded at the summit; its lateral sepals usually have a few trichomes tufted at the tip. Typical

X. torta occurs from Massachusetts to Minnesota, south to Virginia, the mountains of Georgia, Arkansas and Texas. In southeastern Virginia it is occasional and some of our collections show transition to var. *macropoda*. Some of the material from Arkansas and Texas suggests the latter but its bases are too poorly collected for positive identification.

My reasons for treating the more northern and inland plant as typical *X. torta* are the facts that the original material was collected by Kalm and that Smith emphasized the "globose" and obtuse spikes.

*X. AMBIGUA Beyrich. PRINCE GEORGE COUNTY: sphagnous boggy swale southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6122; argillaceous and siliceous boggy depression north of Gary Church, *F. L. & S.*, no. 5700, *F. & L.*, no. 6560. SUSSEX COUNTY: spring-fed, wooded, argillaceous sphagnous bog, headwaters of Jones Hole Swamp, north of Coddyshore, *F. & L.*, no. 6126; swampy depression in pineland, about 4 miles northwest of Waverly, *F. G. & L.*, no. 6558. ISLE OF WIGHT COUNTY: peaty swales and margins of woods south of Zuni, *F. & L.*, no. 6124, *F. G. & L.*, no. 6559. See pp. 335 and 354.

Xyris ambigua and *X. difformis* are the two large species of *Xyris* throughout southeastern Virginia. *X. ambigua* has firm and opaque leaves and the lateral sepals with ciliolate keel; *X. difformis* has softer and (when dry) translucent leaves and the keel of the lateral sepals toothed rather than ciliolate.[1]

*X. CURTISSII Malme (*X. neglecta* Small). SUSSEX COUNTY: spring-fed, wooded, argillaceous sphagnous bog, headwaters of Jones Hole Swamp, north of Coddyshore, *F. & L.*, nos. 6125 and 6791. See p. 336.

*X. FLEXUOSA Muhl. (*X. arenicola* Small). ISLE OF WIGHT COUNTY: dry sandy pine barrens south of Zuni, *F. G. & L.*, no. 6563, *F. & L.*, no. 6792. See p. 356.

*JUNCUS ABORTIVUS Chapm. ISLE OF WIGHT COUNTY: moist or sphagnous depressions in sandy pine barrens south of Zuni, *F. G. & L.* no. 6566, the specimens distributed as *J. pelocarpus*, var. *crassicaudex* Engelm., the original name of the plant. See p. 356 and MAP 28.

J. ELLIOTTII Chapm. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5705. SUSSEX COUNTY: depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6139.

[1] ***Xyris elata*** **Chapman has been reported by Mrs. Erlanson from Queen's Creek, York County, Virginia. It has also been reported from Cape May, New Jersey. The Queen's Creek plant, as represented in the Gray Herbarium, like Grimes's plant from Poplar Springs, Charles City County, is *X. platylepis* Chapman, a species with very characteristic large bulb, with the lowermost leaves reduced to short and firm bulb-scales. The Cape May plant is to me characteristic *X. Smalliana* Nash (not the northern *X. Congdoni* Small) at the only station yet known north of North Carolina.**

Extensions inland from Princess Anne and Elizabeth City Counties.

*J. BRACHYCARPUS Engelm. PRINCE GEORGE COUNTY: exsiccated argillaceous swale about 3 miles southeast of New Bohemia, *F. & L.*, no. 6137. See pp. 346 and 339 and MAP 21.

*J. DIFFUSISSIMUS Buckley. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5707. ISLE OF WIGHT COUNTY: ditch, Carrsville, June 15, 1927, *Wiegand & Manning*, no. 750. See p. 328. MAP 33.

*JUNCUS (§ GRAMINIFOLII) **Longii**, sp. nov. (TAB. 477, FIG. 1–4), planta valde stolonifera; rhizomate horizontaliter elongato gracile et flexile, stolonibus subterraneis chordiformibus numerosis deinde 0.5–2 dm. longis 1.5–3 mm. crassis paleas lanceolatas fuscas hyalinas gerentibus, internodiis 0.5–1 cm. longis; caulibus foliisque ut in *J. marginato* Rostk.; caulibus 1–3 firmis gracilibus 4–7.5 dm. altis; foliis coriaceis atroviridibus angustissime linearibus; inflorescentiis compactis hemisphericis vel oblatis 1–3 cm. altis 1–4 cm. latis; glomerulis 2–4-floris; bracteis florum ovatis hyalinis mucronatis; floribus 2.5–3.5 mm. longis olivaceo-brunneis; sepalis (tepalis externis) ovato-lanceolatis acuminato-subulatis olivaceis; petalis (tepalis internis) elliptico-oblongis obtusis olivaceo-brunneis margine late albido-hyalinis; staminibus 3; antheris purpureis 0.8 mm. longis filamentis duplo brevioribus deciduis; capsulis perianthium paullo superantibus ellipsoideo-obovoideis nitidis imperfecte triseptatis; seminibus luteis lanceolato-fusiformibus 8–12-costatis apicibus rufescentibus inaequaliter albido-caudatis.—Damp or exsiccated argillaceous depressions, southeastern VIRGINIA: argillaceous and siliceous boggy depression about 3 miles southeast of Petersburg, on headwaters of Blackwater River, Prince George County, June 25, 1936, *Fernald, Long & Smart*, no. 5711; argillaceous and siliceous boggy depression north of Gary Church, Prince George County, June 25, 1936, *Fernald, Long & Smart*, no. 5712; exsiccated argillaceous swale about 3 miles southeast of New Bohemia, Prince George County, July 28, 1936, *Fernald & Long*, no. 6148; boggy woods near head of Old Town Creek, southwest of Petersburg, Dinwiddie County, July 22, 1936, *Fernald & Long*, no. 6145; damp bushy pasture, southwest of Petersburg, Dinwiddie County, July 22, 1936, *Fernald & Long*, no. 6146; spring-fed wooded sphagnous bog, Coddyshore, Sussex County, July 20, 1936, *Fernald & Long*, no. 6144 (TYPE in Gray Herb.; ISOTYPES in Herb. Phil. Acad. and elsewhere); depression in argillaceous field north of Littleton, Sussex County, July 22, 1936, *Fernald & Long*, no. 6147. See pp. 328 and 336.

An old specimen without base, collected "*In vicinis* Washington, D. C." by *Lester F. Ward*, August 5, 1877, is characteristic *Juncus Longii*. The data at hand fail to show whether it came from Maryland, the District of Columbia or Virginia.

Juncus Longii is at once distinguished from its nearest allies, *J. marginatus* Rostk. and *J. biflorus* Ell., by its characteristic base, *J. marginatus* having a short and thick rhizome (FIG. 5) which often becomes densely knotty, forming tussocks (FIG. 6). *J. biflorus*, likewise, has a very stout and knotty rhizome (FIG. 9). In *J. biflorus* the long anthers harden and persist and become conspicuous after anthesis (FIG. 10), in *J. marginatus* (FIG. 7) and *J. Longii* the short anthers shrivel and drop or become hidden after anthesis. In both *J. biflorus* (FIG. 10) and *J. marginatus* (FIG. 7) the bracts below the flowers are firm and lance-attenuate or -subulate; in *J. Longii* (FIG. 3) they are thinner, broader and less tapering. In both *J. biflorus* (FIG. 10) and *J. marginatus* (FIG. 7) the green center of the petal is clearly separated from the hyaline margin by a brown band; in *J. Longii* (FIG. 3) this band is wanting. In *J. biflorus* the reddish-castaneous seeds (FIG. 11) are ellipsoid-fusiform, 10–16-ribbed and with usually dark-colored short tails; in *J. marginatus* (FIG. 8) the seeds are paler-brown, plumper many-ribbed and with short tails or apiculations; but in *J. Longii* the yellow seeds (FIG. 4) are very slender, fewer-ribbed and with definite white tails.

Juncus biflorus, with short and thick rhizomes with at most thick finger-like stolons, is characteristic of damp sands, peats, ditches and other such habitats, where elongation of stolons might ordinarily be looked for; *J. marginatus*, likewise, is in damp habitats, not unfavorable to elongation of rhizomes and stolons. But all the habitats where we found the slenderly stoloniferous *J. Longii* were, during the dry early summer of 1936, dried and sun-baked clays, which, although in winter and early spring boggy or inundated, at the period of most active vegetative development are almost arid (at least severely exsiccated).[1] The development in such conditions of slender and cord-like stolons is a clear indication that *J. Longii* is far-removed from *J. biflorus* and *J. marginatus*.

TOFIELDIA RACEMOSA (Walt.) BSP. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5713, *F. & L.*, no. 6150. SUSSEX COUNTY: Waverly, July 20, 1891, *A. B. Seymour*, no.

[1] In August, at one of the characteristic stations of *Juncus Longii*, a depression which in southeastern Virginia passes as a "bog" and which is Sphagnum-carpeted and inhabited by *Sarracenia flava* L. and other "bog" plants, we attempted to dig the bases of *Xyris ambigua*. The plastic clay substratum was so hard and sun-baked that we promptly broke the oak handle of a botanizing pick. It is through such a soil that the slender and flagelliform stolons of *Juncus Longii* creep!

13; depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6151. See pp. 326 and 347.

AMIANTHIUM MUSCAETOXICUM (Walt.) Gray. NANSEMOND COUNTY: dry sandy pine woods south of Factory Hill, *F. & L.*, no. 6794. See p. 364.

ZIGADENUS GLABERRIMUS Michx. SUSSEX COUNTY: depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6152. ISLE OF WIGHT COUNTY: moist or sphagnous depressions in sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6569. See pp. 347, 356 and 361.

ALETRIS AUREA Walt. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5719; similar habitat, on headwaters of Blackwater River, *F. L. & S.*, no. 5720. SUSSEX COUNTY: depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6161. See pp. 326, 347 and 353.

*A. AUREA × FARINOSA. A few plants with the two parents, the raceme denser and with longer perianths than in *A. aurea*, the flowers burnt-orange or saffron in color.—PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5721. See p. 328.

*SMILAX HERBACEA L., VAR. LASIONEURA (Hook.) DC. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4357.

A plant of the interior, the range, under *Nemexia lasioneuron* (Hook) Rydb., given by Small: "Blue Ridge and more northern provinces, Ga. to Ala., Colo., Wyo., and Ont." On Great Neck associated with some other notable plants of the interior: *Menispermum canadense, Dentaria laciniata, Gentiana villosa, Erigeron pulchellus, Silphium atropurpureum* (MAP 42), *Senecio aureus*, etc.

S. HISPIDA Muhl. SURRY COUNTY: sandy thicket, Sunken Meadow Beach, *F. & L.*, no. 6797. See p. 365.

An inland and upland species, rare on the Coastal Plain.

DIOSCOREA QUATERNATA (Walt.) Gmel., var. **glauca** (Muhl.), comb. nov. *D. glauca* Muhl. Cat. 92 (1813), *nomen subnudum*, validated by Bartlett in U. S. Dept. Agr. Bur. Pl. Ind. Bull. no. 189: 10 and 13 (1910). HENRICO COUNTY: rich woods, Malvern Hill, *F. L. & S.*, no. 5731.

I can find no character of flower or fruit to separate *D. glauca*, as interpreted by Bartlett, from the green-leaved *D. quaternata*. The plants of southeastern Virginia may have the leaves green and glabrous beneath, typical *D. quaternata* (Williamsburg, *Grimes*, no. 3527), pale or slightly glaucous and quite glabrous beneath (our no. 5731 cited above) or pale beneath and also sparsely pilose (Williamsburg,

Grimes, no. 3526). Bartlett illustrates the rhizome of *D. glauca* as coarsely branched and contorted "often forked and with many short lateral branches equal in diameter to the rhizome, usually contorted and forming dense masses," while his description of typical *D. quaternata* assigns it "Rhizomes about 1 cm. in diameter, straight or sometimes forked, with few or no short lateral branches." Our material with leaves obviously pale beneath was most carefully dug. The specimen retained at the Gray Herbarium shows a strictly simple and rather slender rhizome nearly 2 dm. long, bearing the flowering stem of the current year and the stubs of stems of two preceding years. In other words, this material, good *D. glauca* in the pale lower leaf-surface, is good *D. quaternata* in its simple rhizome. The very large capsules, mostly 2.5–3 cm. long and definitely as long as or longer than broad (ellipsoid to obovoid) distinguish this species in fruit, and its seeds 1.8 cm. broad, with the translucent pale-brown wing broader than the orbicular embryo (5 mm. in diameter) clearly mark *D. quaternata* (including *glauca*) as a species. Unfortunately, Bartlett, with the assembled material before him, did not describe the seeds but he laid undue weight on the presence or absence of trichomes on stem or leaf, characters of much less stability than those of the seed.

*D. HIRTICAULIS Bartlett, l. c. 17 (1910). PRINCE GEORGE COUNTY: argillaceous and siliceous swale south of The Crater, *F. L. & S.*, no. 5730; argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6799. JAMES CITY COUNTY: sphagnous swamp at Longhill, 5 miles west of Williamsburg, *Grimes*, no. 3803. MAP 34.

Dioscorea hirticaulis strongly suggests the more pubescent-leaved extreme of *D. villosa* L. (*D. paniculata* Michx., at least as interpreted by Bartlett).[1] Its lower leaf-surfaces are more closely, almost velvety,

[1] Michaux's *Dioscorea paniculata*, including all *Dioscorea* known to him from "Canada ad Carolinam," can not be exactly identified without a photograph of Michaux's material, which I now await. I am interpreting *D. villosa*, in absence of a specimen in the Linnean Herbarium called by him *D. villosa*, as based on the Virginia (the left-hand one) plant of Clayton (or Gronovius) which he had before him. One Clayton specimen is of the plant long known as *D. villosa* (*D. paniculata*); another (on the right), mounted with it, *looks* like *D. hirticaulis*.

Mr. C. A. Weatherby, now in Europe, thus reports (two months since the preceding lines went into type) upon a comparison of specimens sent him: "as for *Dioscorea villosa*, the right-hand (upper specimen) on the Clayton sheet in the British Museum has the stem perfectly glabrous except for puberulate patches just above the axils; the rachis of the inflorescence is minutely scabrous; and the under surface of the leaves densely pubescent with short hairs. In size, shape and length, and length and distribution of pubescence your no. 6799 [*D. hirticaulis*] is an excellent match for them. In the left-hand specimen the leaves are young. The lower surface is rather densely pubescent along the veins and veinlets with very short hairs, distinctly shorter than

canescent-pilose and the blades are all relatively small. The name comes from the fact that there are a few short trichomes scattered along some internodes of the stem, these not occurring on the internodes of *D. villosa*. These characters alone would be of little significance; but the inflorescences and the seeds show points of undoubted importance. In *D. villosa* the staminate panicles, when fully developed, are lax, with slender internodes 1–4 mm. long separating the small glomerules of flowers; in *D. hirticaulis* the staminate panicles do not loosen, the slightly larger glomerules remaining subapproximate. The pistillate inflorescences (when well developed) of *D. villosa* are elongate and 5–18-flowered; those of *D. hirticaulis* much shorter and only 1–4-flowered. The capsules of the two are only slightly different: in *D. villosa* subglobose to short-obovoid, from about as long as broad to slightly shorter, 1.5–2.5 cm. long; in *D. hirticaulis* reniform to oblate-obovoid, barely as long as broad, 1.2–1.8 cm. long. The seeds (mature ones known to me only from our no. 6799, collected October 18) of *D. hirticaulis* furnish the best character. In *D. villosa* they are thin and hyaline, the very broad whitish to pale brown wing strongly contrasting with the dark oval embryo (3–5 mm. broad); in *D. hirticaulis* they are firm or subcoriaceous, uniformly dark brown, with a firm band extending from about the embryo nearly to the margin, the thin (but dark) wing only 1 mm. broad.

Unfortunately, most collected material of *Dioscorea* is without ripe fruit. In view of the strikingly different seeds of the three species which occur in eastern Virginia it will be important to secure good fruit of *D. floridana* Bartlett. Immature fruit of it, with the quite immature ellipsoid-obovoid capsules 3 cm. long, shows the young seeds to resemble those of *D. villosa* in their whitish hyaline broad margin but to have suborbicular embryos.

*D. VILLOSA L., forma **glabrifolia** (Bartlett), comb. nov. *D. paniculata*, var. *glabrifolia* Bartlett, l. c. 15 (1910.) *D. villosa glabrifolia* (Bartlett) W. Stone, Pl. So. N. J. 358 (1912). Our only Vir-

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in either specimen of *D. villosa* which you sent. The plant is otherwise glabrous except for puberulent patches at the axils. For good measure I looked up the Linnean specimen also, though I believe it is not the type. I suppose the one concerned is that labeled by Linnaeus, presumably by mistake, '6 K[alm] *sativa*.' It seems tobe good staminate *D. villosa* as we have understood it. Only a little of the lower leaf-surface shows; that little is rather densely pubescent with comparatively long hairs, most like those of the St. John specimen [no. 2650] from Long Island which you sent. The inflorescence is paniculate." Even though a part of the Clayton material was *D. hirticaulis*, the other part was apparently *D. villosa* as usually interpreted. It is better so to leave it.

ginia specimen from Prince George County: sandy and peaty swale southeast of Prince George, *F. L. & S.*, no. 5729.

Whereas *D. quaternata*, var. *glauca* seems to have a broad range outside that of *D. quaternata* (typical) and to satisfy the requirement of a geographic variety, *D. villosa*, forma *glabrifolia* is scattered through the range of the plant with lower leaf-surfaces pubescent.

*Hypoxis leptocarpa Engelm. & Gray. Southampton County: sandy alluvium of Three Creek, Drewryville, *F. L. & S.*, no. 5732; similar habitat, bottomland of Nottoway River, above and below Cypress Bridge, *F. & L.*, nos. 6163 and 6164. See pp. 331 and 341 and map 7.

H. micrantha Pollard. Prince George County: dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. L. & S.*, no. 5733. See p. 329.

Iris prismatica Pursh. Henrico County: exsiccated argillaceous swale, Libbie Avenue, Westhampton, *F. L. & S.*, no. 5735. Sussex County: depressions in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6170. See p. 347.

Northward *Iris prismatica* is nearly coastal in range, but southward it takes to the Appalachian Upland. In southeastern Virginia it is well back on the Coastal Plain and in the Piedmont.

*Sisyrinchium arenicola Bicknell (*S. fibrosum* Bicknell). Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6168. Isle of Wight County: dry sandy yellow pine and oak woods near Walters, *F. & L.*, no. 6169. Southampton County: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6167. Noted elsewhere in these three counties. See p. 340.

After detailed study I am unable to separate the southern *Sisyrinchium fibrosum* from the northern *S. arenicola*. The two constitute a single species with a range wholly characteristic for many species.

*Canna flaccida Salisb. Isle of Wight County: thriving in rubbish (garden refuse) at border of swampy woods, String-of-Logs Pocoson, north of Windsor, *F. & L.*, no. 6172.

Habenaria blephariglottis (Willd.) Torr., var. conspicua (Nash) Ames. Isle of Wight County: moist or sphagnous depressions in sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6574. See p. 356 and map 27.

Cleistes divaricata (L.) Ames. Prince George County: scattered in argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5742. See p. 326 and map 2.

Excessively rare north of Florida. Should be scrupulously guarded against extermination.

*Spiranthes ovalis Lindl. Henrico County: woods along stream, rare, campus of University of Richmond, Westhampton, October, 1932, *H. M. Walton.*

A thoroughly typical species of the interior of the United States (west of the Appalachian axis), here within the edge of the Piedmont bordering the Coastal Plain.

Ponthieva racemosa (Walt.) Mohr. Isle of Wight County: rich loamy wooded slope north of Walters, *F. G. & L.*, no. 6577. See pp. 356 and 362.

Malaxis floridana (Chapm.) Kuntze. Isle of Wight County: rich loamy wooded slope north of Walters, *F. G. & L.*, no. 6579. See p. 357.

Although *Malaxis floridana* has recently been placed in the synonymy of the West Indian *M. spicata* Swartz, I can hardly feel that they are identical. *M. floridana*, originally *Microstylis floridana* Chapman, from Apalachicola, is now known, as a local plant, from Florida to Virginia. Its details were beautifully shown by Mrs. Ames in Ames, Contrib. Ames Bot. Lab. no. 1, pl. vi (1904). She there correctly showed the resupinate lip as broadly cordate, with obtuse basal auricles and tapering gradually to the subacute apex. Chapman originally described the "lip round-auriculate-cordate, abruptly narrowed and entire at apex"—Chapm. Fl. So. U. S., 454 (1860). Morris & Eames, Our Wild Orchids, 352 (1929), from fresh material say "wide cordate, with pointed tip and pair of pronounced basal auricles partly embracing the column." In describing the lip of *M. floridana* Ames, l. c. 15, said "lip pale orange-vermilion, entire"; Morris & Eames say of the Virginia plant "central shield of lip orange, drying vermilion; margins and auricles yellow and more or less hyaline"; our own field note says "pale orange."

Nevertheless Swartz, giving a very detailed account of his *Malaxis spicata*, described the lip as yellow-green, 3-lobed with the median lobe longer, acuminate ("*Labellum luteo-viride* . . . superne adscendens trilobum, lobo medio longiore, acuminata."—Swartz. Fl. Ind. Oc. iii. 1442) and he so illustrated it. Fawcett & Rendle, Fl. Jam. i. 42, 43 (1910) question Swartz's account, saying "the lateral lobes are not evident", but they clearly describe the lip of the West Indian plant "lip broadly elliptical, with a prominent linear-oblong apical lobe." Drs. Lyman B. Smith and A. R. Hodgdon, who twice collected *M. spicata* in Cuba while we were getting *M. floridana* in Virginia, tell me that the lip is greenish (certainly not orange or vermil-

ion); and all the West Indian material which is in good condition shows a prolonged linear-oblong tip; and at each side a subtruncate or shoulder-like flange which might easily be taken as two short lateral lobes. Mr. Charles Schweinfurth suggests that these flanges are due to inrolling of the margin. That they occur in the broadly elliptical green lip of the West Indian plant and not in the broadly cordate-ovate orange to vermilion lip of the continental plant is surely significant.

Hexalectris spicata (Walt.) Barnh. Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6182. See p. 342 and map 18.

Salix longipes Shuttlew., var. venulosa (Anderss.) Schneider. Norfolk County: boggy swale by Northwest River, near Northwest, *F. G. & L.*, no. 4624.

Recorded by Schneider from the Dismal Swamp.

Quercus stellata Wang., var. Margaretta (Ashe) Sarg. Sussex County: dry sandy woods, Burt, *F. & L.*, nos. 6189 and 6190.

Q. stellata Wang., var. Boyntoni (Beadle) Sarg. Sussex County: shrubs 1–1.5 m. high at border of dry sandy woods, Burt, *F. & L.*, no. 6191. See p. 342.

Q. prinoides Willd. Sussex County: dry sandy woods and thickets, north of Moore's Mill, *F. & L.*, no. 6188.

The only colony seen by us in southeastern Virginia.

*Q. velutina Lam., var. missouriensis Sarg. Nansemond County: dry sandy pine and oak woods south of Factory Hill, *F. & L.*, no. 6807. See p. 364.

Q. rhombica Sarg. Isle of Wight County: moist or sphagnous depressions in sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6585. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5765.

Recorded by Sargent from the Dismal Swamp.

Polygonum tenue Michx. Isle of Wight County: border of sandy yellow pine and oak woods north of Walters, *F. G. & L.*, no. 6588.

The only time noted by us on the Coastal Plain of Virginia.

*Tovara virginiana (L.) Adans., var. **glaberrima**, var. nov., foliis utrinque glaberrimis vel deinde glabratis membranaceis; rhizomate gracile elongato.—Alluvial woods and bottomlands of Nottoway River system, Sussex, Southampton and Greensville Counties, Virginia: siliceous and argillaceous alluvium bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *Fernald & Long*, no. 6201; rich low woods near Moore's Mill, July 19 and 25, 1936, *Fernald & Long*, no. 6202; sandy alluvial woods, bottom-

land of Nottoway River, southwest of Burt, July 25, 1936, *Fernald & Long*, no. 6203 (TYPE in Gray Herb., ISOTYPE in Herb. Phil. Acad.); moist clearing, bottomland of Three Creek, north of James River Junction, *Fernald, Griscom & Long*, no. 6591.

Typical *Tovara virginiana*, throughout its broad American range, has the rhizome heavy and knotty, often forming an unpressable mass, and its leaves are strigose above and often scabrous. The plant of the bottomlands of the Nottoway system is striking in its smooth foliage and the slender and cord-like rhizomes. See p. 341.

*POLYGONELLA POLYGAMA (Vent.) Engelm. & Gray. ISLE OF WIGHT COUNTY: open white sand in dry pine barrens, south of Zuni, *F. & L.*, no. 6809. PLATE 478, FIGS. 6–8.

A very localized station, the first known north of Wilmington, North Carolina. See p. 361.

The exact identity of *Polygonella polygama* needs clarification. Michaux originally collected the plant in dry sands somewhere in the Carolinas (in aridissimis Carolinae). From his seed the plant was grown in the Cels Garden near Paris and fully described and beautifully illustrated as *Polygonum polygamum* by Ventenat, Descr. Pl. Nouv. Cult. Jard. Cels, 65, t. 65 (1800), who said "découvert par Michaux dans les sables arides de la Caroline." Three years later Michaux's own specimens were described as *Polygonella parvifolia*, the type of the new genus *Polygonella* Michx. Fl. Bor.-Am. ii. 240 (1803). As shown by Ventenat's plate and by a portion of the Michaux type, long ago presented to Asa Gray, *Polygonella polygama* (FIGS. 6–8) is the bushy-branched and comparatively low plant with spatulate or oblanceolate leaves (FIG. 7), the larger ones 2–3 mm. broad, the strongly ascending branches with many ascending slender spiciform racemes (FIG. 6), the latter simple or forking. Ventenat's description was to the point: "GRAPPES simples, situées dans les aisselles des feuilles et au sommet des rameaux, représentant par leur ensemble une panicule globuleuse." The ochreolae (FIG. 8) are scarious and nearly uniform in texture and after the fall of the fruit the pedicels rarely show. This plant, true *Polygonella polygama*, with dilated leaves up to 3 mm. broad (Ventenat gave the measurement as merely 3 mm.) is represented in the Gray Herbarium only by the fragment of Michaux's type of *Polygonella parrifolia*, by two collections from near Wilmington, North Carolina (1883, *Dr. Wood;* pine barrens, October 8, 1897, *Biltmore Herb.*, no. 717a) and by the new and overripe material from Virginia. It is not known where Michaux collected

his material. His chief Carolina center was, of course, Charleston, whence we have no material, but he visited Wilmington and made collections of *Dionaea* and other specialties of the region.

In its essential characters true *Polygonella polygama* is very like *P. Croomii* Chapm. (figs. 9 and 10), which occurs on sands from southeastern North Carolina (bare dry sand, White Lake, Bladen County, October 6, 1933, *Oosting*, no. 33,648, as *P. polygama*) to northern Florida. The only differences I can find are the much narrower leaves and slightly more prolonged tips of the ochreolae in *P. Croomii*. The two plants seem to me extremes of one species. I am accordingly treating the narrower-leaved plant as

Polygonella polygama (Vent.) Engelm. & Gray, var. **Croomii** (Chapm.), comb. nov. *P. Croomii* Chapm. Fl. So. U. S. 387 (1860). Figs. 9 and 10.

The Florida plant (figs. 1–3) which generally passes as *Polygonella polygama* is coarser and taller, with horizontally or at least widely divergent open branching, the divergent branches bearing many short and divergent racemes; the leaves (fig. 2) are oblanceolate or spatulate, the larger ones 3–5 mm. broad; the ochreolae are subcoriaceous, with strongly differentiated broad margin (fig. 3) and after the fall of the fruit the stubs of the pedicels are more often evident, projecting from the ochreolae. I am unable to separate this divaricately branched Florida plant with dilated leaf-blades from *P. brachystachya* Meisn. (figs. 4 and 5), with linear- or linear-spatulate leaves, except by its broader blades. Just as the more northern *P. polygama* has a broad-leaved (var. *typica*) and a narrow-leaved variety (var. *Croomii*), so the Florida *P. brachystachya* has a broad-leaved and a narrow-leaved extreme. The broad-leaved plant I am calling

Polygonella brachystachya Meisn., var. **laminigera**, var. nov. (tab. 478, fig 1–3), foliis dilatatis oblanceolatis vel spathulatis, primariis 3–5 mm. latis. Type: sandy soil, Indian River, Florida, September, *A. H. Curtiss*, no. 2433 (in Gray Herb.).

*Paronychia Baldwinii (T. & G.) Chapm. Southampton County: open sand and gravel, bank of Nottoway River, Courtland, *F. L. & S.*, no. 5771; border of dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6204. Sussex County: border of dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6205. Isle of Wight County: border of dry sandy woods near Joyner's Bridge, *F. G. & L.*, no. 6592. See pp. 333 and 339.

*Arenaria caroliniana Walt. Isle of Wight County: open areas in dry sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6595. See p. 356 and map 29.

*Nuphar fluviatile (Harper) Standl. Southampton County: muddy pool in Three Creek, Drewryville, *F. L. & S.*, no. 5772; quiet water of Nottoway River at Sycamore Bend, *F. & L.*, no. 6207. See pp. 333 and 340.

On p. 333 I jeered slightly at the inconsistency of rule-makers. The Linnean *Nymphaea* contained several elements which are now considered different genera. After subsequent botanists had dismembered the original *Nymphaea* of 1753, usage through many years retained *Nymphaea* for the many-petaled Water Lilies and *Nuphar* for the Spatter Docks or Cow Lilies. By the dictates of the International Congress at Vienna (1905), however, it was thought that we must use *Nymphaea* for the Spatter Docks and *Castalia* for the Water Lilies. Such usage became established in the work of all who conscientiously followed the International Rules of 1905. Then Conard, disliking to give up *Nymphaea* in its long-established sense, succeeded in demonstrating that Linnaeus himself had eventually restricted *Nymphaea* as Conard had hoped. Every one following the International Rules, consequently, now restricts *Nymphaea* to the Water Lilies. To those not too well informed on nomenclatural detail that seemed to leave *Nuphar* (late 1808 or early 1809) for the Spatter Docks.

However, the scholarly bibliographer, in his prime the Keeper of Botany at the British Museum, the late James Britten, pointed out in 1888 that "L. C. Richard's name *Nymphosanthos* [*Nymphozanthus*], proposed by him (Anal. du fruit, p. 68 (May, 1808) . . . would take precedence of *Nuphar*" (Journ. Bot. xxvi. 7 (1888)). This fact should have been known to those who undertook at Brussels (1910) to rule upon details of nomenclature (especially of *Nomina conservanda*). Nevertheless, when an effort was there made to conserve *Nuphar*, that name was ruled out from conservation (Actes III^me^ Congrès Internat. Bot. Brux. 1910: i. 81). Since *Nuphar* was not conserved it, naturally, had to take its chance, like every other name, under the binding rule of priority. Consequently, in Rhodora, xxi. 184 (1919), I took up *Nymphozanthus*, as explicitly required by the International Rules, especially after the refusal at Brussels to conserve *Nuphar;* and other conscientious defenders of the International Rules, such as Schinz, Thellung and Keller, correctly took up *Nymphozanthus*. Dr. T. A. Sprague, militant defender of what he believes the Rules mean, refers to my strict following of the International Rules of 1905 and 1910 as follows: "to reject, as Fernald has done, an

old-established name such as *Nuphar* (late 1808 or early 1809) in favour of *Nymphozanthus* (May, 1808) *before** it has been decided whether *Nuphar* is to be conserved or not, is to follow the strict letter of the Rules while ignoring their spirit.

"* It is true that the name *Nuphar* was struck off the list of new nomina conservanda adopted at Brussels, but this was because it was anticipated that the name could be retained under the unaltered operation of the International Rules. A new situation has since arisen owing to the discovery that *Nuphar* is antedated by *Nymphozanthus*."—T. A. Sprague, Bot. Soc. and Exch. Club Brit. Isl. Rept. viii. pt. v. 926 (1926).

The "discovery" that *Nymphozanthus* had right of way was not made subsequently to the Brussels Congress. As pointed out, it was emphasized by James Britten in the Journal of Botany, British and Foreign. That those who ruled out *Nuphar* at Brussels were not familiar with the content of that cosmopolitan journal was "too bad," especially since James Britten's successor both at the British Museum and as editor of the Journal of Botany had long been a member of the International Commission on Nomenclature.

Now, however, at Amsterdam, in 1935, *Nuphar* has finally got conserved! It is hoped, however, that in the future those who have been honored by the Congresses by appointment to legislative commissions will not go out of their way to upbraid sincere followers of the Rules, if perchance they take up an earlier valid name for some other which has failed of conservation. If a name has been rejected from conservation, it should not be treated as conserved, even if the rejection involved only partial knowledge of the facts in the case!

Since the chief specialist on nomenclature at Kew feels that in cases like *Nymphozanthus* the spirit, rather than the letter of the rules, should prevail, what will he say of the following procedure of the Director of Kew? Hooker & Arnott published an austral species as *Crantzia attenuata* in 1833. Two-thirds of a century later Coulter & Rose published *Lilaeopsis carolinensis* (1897). Nevertheless, in Sir Arthur W. Hill's *Genus Lilaeopsis*, Journ. Linn. Soc. Bot. xlvii. 535 (1927) the later name, *L. carolinensis* (1897), is upheld, while the earlier name required by the International Rules, *C. attenuata* (1833), is made a synonym of it (or on p. 537 treated as a variety of it). Since *literal* following of the International Rules in some cases has been condemned at Kew, the question arises, whether Kew practice (as

Photo. E. C. Ogden.

POLYGONELLA POLYGAMA: FIG. 6, two plants, × ⅕, from North Carolina; FIG. 7, leaves, × 2, from Virginia; FIG. 8, old rachis, × 10, from Virginia.

P. POLYGAMA, var. CROOMII: FIG. 9, leaves, × 2, from North Carolina; FIG. 10, old rachis, × 10, from North Carolina.

P. BRACHYSTACHYA: FIG. 4, leaves, × 2, from Florida; FIG. 5, old rachis, × 10, from Florida.

P. BRACHYSTACHYA, var. LAMINIGERA: FIG. 1, two plants (TYPE), × ⅕; FIG. 2, leaves, × 2; FIG. 3, old rachis, × 10.

Photo. E. C. Ogden.

GEUM CANADENSE, var. BREVIPES: FIG. 1, TYPE, × ⅖; FIG. 2, portion of fruiting head, showing style-tips, × 10; FIG. 3, mature achene, × 10.
Var. GRIMESII: portion of summit, × ⅖, of TYPE.

exemplified in Hill's nomenclature of *Lilaeopsis*) is sometimes preferably following the *spirit* of the Rules. To the uninitiated it looks as if Hill was still working under the good and sensible old "Kew Rule," which, unfortunately, was rejected at Vienna in 1905 and has not been officially revived.

*Ranunculus ambigens Wats. Chesterfield County: ditch bordering wooded river-swamp along Appomattox River, near Hopewell, *F. L. & S.*, no. 5775.

In a recent study, Rhodora, xxxviii. 174 (1936), I indicated that the southernmost specimens I had seen were from Delaware, Maryland and Tennessee.

Clematis ochroleuca Ait. Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6208. See p. 342.

The only station known to us on the Coastal Plain of southeastern Virginia.

*Asimina parviflora (Michx.) Dunal. Southampton County: swampy woods along Three Creek, Drewryville, *F. L. & S.*, no. 5779. Nansemond County: dry sandy woods, Factory Hill, *F. & L.*, no. 6815. See pp. 333 and 364.

Menispermum canadense L. Princess Anne County: rich woods, Great Neck, *F. & G.*, no. 4407.

Our only station in the southeastern counties.

Rorippa aquatica (Eaton) Palmer & Steyermark. Southampton County: wet depressions in sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5781. Seen on the bottomland of Fontaine Creek, Greensville County. See pp. 332 and 353.

Sarracenia purpurea L., var. venosa (Raf.) Fern. *S. purpurea venosa* Wherry, as subsp. Dinwiddie County: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, no. 6211. Sussex County: spring-fed wooded argillaceous sphagnous bog, headwaters of Jones Hole Swamp, north of Coddyshore, *F. & L.*, no. 6210. Isle of Wight County: sphagnous depression in sandy pine woods south of Zuni, *F. & L.*, no. 6600. See pp. 335, 338 and 356.

*× S. Catesbaei Ell. With the preceding and the following, a well marked hybrid. Dinwiddie County: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, nos. 6214 and 6215. See p. 338.

S. flava L. Several stations in eastern Dinwiddie, Prince George, Sussex and Isle of Wight Counties. See pp. 325, 326, 328, 334, 335, 338 and 361.

*Drosera capillaris Poir. Dinwiddie County: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, no. 6217. Prince George County: argillaceous and siliceous boggy

depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5786; similar habitat, headwaters of Blackwater River, *F. L. & S.*, no. 5785. Sussex County: spring-fed wooded argillaceous sphagnous bog, headwaters of Jones Hole Swamp, north of Coddyshore, *F. & L.*, no. 6216; sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6218. See pp. 326 and 336.

Crataegus. Report withheld for the present. Several numbers distributed, doubtless under wrong names!

*Geum canadense Jacq., var. **brevipes**, var. nov. (tab. 479, fig. 1–3), planta humilis gracilisque; caulibus 2–4.5 dm. altis glabrescentibus superne glanduloso-puberulis; foliis membranaceis, imis mediisque pinnatis remote 2–3-jugis foliolis minutis intermediis munitis; foliis superioribus pinnatis vel simplicibus longe petiolatis pedunculos axillares valde superantibus; pedunculis filiformibus 1–2.5 cm. longis nudis vel minute bracteatis puberulis; sepalis extus puberulis; stylorum internodiis superioribus glabris vel inconspicue et brevissime hispidulis, carpellis 50–60, maturis 3–4 mm. longis (stylo excluso) glabris vel ad apicem sparse barbatis.—Virginia: sandy alluvial woods, bottomland of Nottoway River, southwest of Burt, Sussex County, July 25, 1936, *Fernald & Long*, no. 6224 (type in Gray Herb., isotype in Herb. Phil. Acad.), August 25, 1936, *Fernald & Long*, no. 6605. See pp. 344 and 358.

Var. *brevipes* has the smooth carpels (fig. 3), the nearly smooth upper internode of the style and the minutely puberulent stems much as in var. *Grimesii* Fernald & Weatherby in Rhodora, xxiv. 49 (1922). The latter (fig. 4), like all the other varieties of *Geum canadense*, has the leaves rapidly reduced upward to simple blades, the naked peduncles elongate and greatly overtopping the subtending leaves, and the lower pinnate leaves rarely with reduced intermediate leaflets.

*G. canadense Jacq., var. camporum (Rydb.) Fern. & Weath. in Rhodora, xxiv. 49 (1922). Princess Anne County: rich woods, Cedar Island, *F. G. & L.*, no. 4653, distributed as var. *Grimesii*.

The Cedar Island plant is the most extreme state of var. *camporum*, with copious pubescence, matched only in specimens from Nebraska, Kansas and Oklahoma.

The Type of Cassia marilandica (Plates 480 and 481). From pre-Linnean times two quite distinct species were grown in European gardens, both from the eastern United States but not distinguished as specifically different by Linnaeus, who in 1753 included them both in his *Cassia marilandica*. In 1904[1] the late John H. Shafer clearly dis-

[1] J. H. Shafer, *The American Sennas*, Torreya, iv. 177–181 (1904).

tinguished the two, treating as *C. marilandica* a northeastern plant of alluvium and rich thickets with sparsely but usually definitely villous summit, with a slenderly clavate gland at the base of the petiole, with linear-setaceous stipules, with inflorescences many-flowered, with ovaries densely and intricately long-villous, with the legumes loosely villous, their segments as long as broad, the seeds flat and orbicular-quadrate. As a separate species Shafer clearly defined a glabrous or minutely hirtellous plant, with the petiolar glands lower and broader (sessile or nearly so), stipules linear-lanceolate, inflorescences mostly few-flowered, ovaries with short appressed pubescence, legumes glabrous or short-hirtellous, their segments much shorter than broad, and the seeds plump and obovoid. This species, *C. Medsgeri* Shafer, grows in more sterile and drier habitats and flowers somewhat later than his *C. marilandica* and is of more southern and broader range.

Unfortunately, Shafer did not determine which of the two plants Linnaeus had before him when he published *Cassia marilandica* L. Sp. Pl. 378 (1753). The Linnean treatment of that date was as follows:

> *marilandica.* 16 Cassia foliolis octojugatis ovato-oblongis aequalibus, glandula baseos petiolorum. *Hort. cliff. 159. Hort. ups. 100. Roy. lugdb. 467.*
> Cassia mimosae foliis, siliqua hirsuta. *Dill. elth. 351. t. 260. f. 339.*
> Cassia marilandica, pinnis foliorum oblongis, calyce floris reflexo. *Mart. cent. 23. t. 23.*
> *Habitat in* Virginia, Marilandia. ♃

Most singularly, Shafer, as already implied, made no attempt, apparently, to learn just what Linnaeus had before him. Instead of interpreting *C. marilandica* by the material in Linnaeus's own herbarium at the time of his preparation of Species Plantarum, ed. 1 (1753) and that described in Linnaeus's own works, Hortus Cliffortianus and Hortus Upsaliensis, he went to Dillenius (1732) in order to decide what Linnaeus had before him in 1753! Shafer said:

> Just what Linnaeus had is not clearly defined by his description or by most of his citations; Dillenius' "Cassia mimosae [foliis,] siliqua hirsuta" and plate, however, is clearly the flat-seeded form and may be considered as establishing this as the true *Cassia Marilandica* L. Martyn's plate, also cited by Linnaeus, is characterless.[1]

From the pubescence of stem, petioles and ovary there can be no question that Dillenius had the plant to which Shafer restricted the

[1] Shafer, l. c. 178.

name *Cassia marilandica*. But turning to the true Linnean material, his own specimen, labeled by his own hand[1] when *C. marilandica* was published, it is equally without doubt that Linnaeus himself had the smooth and few-flowered *C. Medsgeri*. Mr. Savage has kindly sent me the photograph (our PLATE 480) of the plant which Linnaeus had when preparing Species Plantarum (1753). Its stem and petioles are so smooth as to appear glabrous, the petiolar gland (seen on the 1st, 2d and 4th petioles from the base) is of the low dome-form of extreme *C. Medsgeri* and its leaflets and its sparse inflorescence are most characteristic. In Species Plantarum Linnaeus gave no new diagnosis, merely referring to his own earlier treatments and to the accounts and plates of other authors which he thought to belong with his.

The Linnean specimen, it will be noted, was one from the Clifford Garden; in other words the Hortus Cliffortianus plant which Linnaeus had was *C. Medsgeri*. Although Shafer found Martyn's plate, cited by Linnaeus, "characterless" for the hairy *C. marilandica*, it assumes some character when checked with the Linnean type-specimen of *C. marilandica* and with Shafer's material of his own *C. Medsgeri*: a glabrous plant with very sparse inflorescence, the stipules lanceolate, the petiolar gland (see one of the upper leaves on the right in Martyn's plate) low and sessile. The plant illustrated by Martyn was sent in 1723 to Peter Collinson and cultivated in the Chelsea Garden. In its distinctive characters it so closely matches the plant which Linnaeus had from the Clifford Garden in 1737 and in 1753 that it was probably all from one source. Incidentally, Martyn called the glabrous plant with lanceolate stipules, sessile petiolar glands and few flowers *Cassia marilandica*. That seems to be the source of the name which Linnaeus took over. The Linnean treatment in his Hortus Upsaliensis adds nothing; and Royen simply copied from Hortus Cliffortianus. If we are to base our interpretation of mixed Linnean species by the material he had prior to publication and which he properly identified, rather than by the plates of other authors which he incorrectly associated with it (and this, naturally, is the only logical course), there is no doubt that CASSIA MARILANDICA L. (1753) is the smooth plant which was described as *C. Medsgeri* Shafer (1904).

In confusing the glabrous and the pubescent species Linnaeus and

[1] In PLATE 480 the labeling from Hort. Cliff. at the top and "*marilandica*" at the bottom are in the hand of Linnaeus. Sir James Edward Smith, years later, took the unfortunate liberty to cross out Linnaeus's own identification and to write "*ligustrina* J. E. S."

TYPE of CASSIA MARILANDICA in LINNEAN HERBARIUM, courtesy of Mr. SPENCER SAVAGE.

Photo. E. C. Ogden.

CASSIA HEBECARPA: FIG. 1, portion of TYPE, × 2/5; FIG. 2, base of petiole, showing gland and stipule, × 4; FIG. 3, ovary, after anthesis, × 2; FIG. 4, legumes, × 1.

his predecessors were doing no worse than all the American botanists for a century and a half following 1753. To Shafer belongs the credit for clearly demonstrating the confusion which had existed. It now becomes necessary to find the proper name for the pubescent plant with clavate petiolar glands, full inflorescences, long-villous ovaries and long-segmented legumes which Shafer misidentified as *Cassia marilandica;* and, singularly enough, there seems to have been no distinctive name (and that a polynomial) since Dillenius. It is true that in the North American Flora, xxiii[4]. 257, Britton & Rose, treating all the sections of *Cassia* in true Brittonian and Rosean fashion as genera, cite under *Ditremexa marilandica* (L.) Britton & Rose two synonyms: *Cassia acuminata* Moench, Meth. 273 (1794) and *C. reflexa* Salisb. Prodr. 326 (1796). Moench's *C. acuminata* was described with "calycibus lanceolatis acuminatis pilosis: pinnis linearibus acuminatis; stipulis lanceolatis trinerviis" etc. This is surely not a recognizable diagnosis of our pubescent plant with its elliptic or narrowly obovate round-tipped usually glabrous sepals, its oblong and obtuse to subacute leaflets and its 1-nerved setiform stipules. Only by the unfortunate citation under *C. acuminata* of *C. marilandica* as a synonym would any one knowing the latter plant or that which has passed for it think of associating Moench's diagnosis with it. The only other name given by Britton & Rose is Salisbury's *C. reflexa.* That was a mere substitute for *C. marilandica* L. and it has no value. Rafinesque, likewise, simply renamed *C. marilandica* (in its undifferentiated sense) *Senna riparia,* saying "I would call this species *Senna riparia,* the name of *Marilandica* being . . . improper; it was given to it because sent first from Mariland to Europe" —Raf. Med. Fl. i. 94 (1828). It seems to be necessary, therefore, to name the plant treated by Shafer as *C. marilandica.* I am calling it

Cassia **hebecarpa,** sp. nov. (tab. 481), planta habitu *C. marilandica* simillima; caulibus supra sparse villosis; stipulis linearisetaceis; glandula a basin petioli clavata stipitata; foliolis oblongis vel oblongo-lanceolatis; racemis axillaribus terminalibusque plus minusve paniculatis; ovariis dense longeque villosis, villis implexis; leguminibus linearibus 7–12 cm. longis sparse villosis, segmentis elongatis; seminibus suborbicularibus.—Alluvial or rich thickets, southwestern Maine to Wisconsin, south to western North Carolina and Tennessee. Type: damp thicket, Newton, Massachusetts, August 6, 1898, *W. P. Rich,* in Gray Herb.

Fig. 1, type-specimen, × 2/5; fig. 2, base of petiole and axillary peduncle, showing petiolar gland and stipule, × 4; fig. 3, slightly

developed ovary, × 2; FIG. 4, group of mature legumes, × 1. The ovary, legumes and seed are well illustrated by Shafer, Torreya, iv. 180, fig. 1 (a–d) as *C. marilandica* (1904); similar details of *C. marilandica* (*C. Medsgeri*) are shown in Shafer's fig. 2.

We have not yet met *Cassia hebecarpa* on the Coastal Plain of Virginia.

C. MARILANDICA (*C. Medsgeri*) we have from SUSSEX COUNTY: border of dry sandy woods, 4 miles south of Stony Creek, *F. G. & L.*, no. 6609; dry woods along Gray's Creek, near Cross Creek Landing, south of Swann Point, *F. & L.*, no. 6821.

THE TYPE OF BAPTISIA TINCTORIA. *Baptisia tinctoria* (L.) R. Br. rests upon *Sophora tinctoria* L. Sp. Pl. 373 (1753). Linnaeus gave an original diagnosis of his own and cited earlier descriptions of Gronovius, Plukenet and Ehret. So long as *B. tinctoria* was treated as an unvarying species no one troubled about looking up the type in the Linnean herbarium. In 1903, however, Small separated off a southern plant of Coastal Plain dispersal as *B. Gibbesii* Small, Fl. Se. U. S. 599, 1331 (1903) and I later treated it as *B. tinctoria*, var. *Gibbesii* (Small) Fernald in RHODORA, XXXVIII. 424 (1936). Now, however, I have through Mr. Savage a photograph of the plant which Linnaeus had before him when preparing his diagnosis, consequently the TYPE of the species. With its largest leaflets only 1.1 cm. long by 5.5 mm. broad, all narrowly cuneate or with concaved bases, and with fully developed flowers only 1.1 cm. long, the type is very characteristic *B. Gibbesii* or *B. tinctoria*, var. *Gibbesii*. The coarser and more widespread plant is, consequently, left without a name. I am treating the two extremes as follows:

BAPTISIA TINCTORIA (L.) R. Br. in Ait. Hort. Kew. ed. 2. iii. 6 (1811). *Sophora tinctoria* L. Sp. Pl. 373 (1753). *B. Gibbesii* Small, Fl. Se. U. S. 599, 1331 (1903). *B. tinctoria*, var. *Gibbesii* (Small) Fernald in RHODORA, XXXVIII. 424 (1936). Leaflets narrowly cuneate or with slightly concave sides below the broad summit, the larger ones 0.8–1.8 cm. long, 0.5–1 cm. broad; flowers 1–1.3 cm. long; bodies of mature fruits 0.5–1 cm. long, strongly rounded at base and summit.—Coastal Plain, Georgia to Virginia and less characteristically to Rhode Island. Passing into

Var. **crebra**, var. nov., folioliis primariis 1.5–4 cm. longis, 0.8–1.8 cm. latis late cuneatis marginibus vix concavis; floribus 1.3–1.6 cm. longis; fructibus maturis 0.8–1.5 cm. longis apice attenuatis.—South Carolina to Louisiana, north to southwestern Me., southern New Hampshire, southern Vermont, New York, southern Ontario, southern Michigan and southeastern Minnesota. TYPE: open spots in de-

ciduous woods, Wilbraham Mt., Wilbraham, Massachusetts, 26 July, 1927, *F. C. Seymour*, no. 679, in Gray Herb.

In both typical *Baptisia tinctoria* and var. *crebra* the terminal racemes are short, 0.3–1, very rarely –1.5 dm. long. In the mountains, at least from Pennsylvania to western Virginia, there is a remarkable development of the species, with the foliage of var. *crebra* but with the primary raceme 3–4.5 dm. long (thus suggesting *B. alba*), the flowers large (1.5–1.6 cm. long) for the species. This I am calling

B. TINCTORIA, var. **projecta**, var. nov., var. *crebra* simillima; racemis primariis 3–4.5 dm. longis; floribus 1.5–1.6 cm. longis.—PENNSYLVANIA: laurel woods, hilltop, Warriors Mark, Huntingdon County, June 27, 1924, *K. M. Wiegand*. VIRGINIA: dry woods, Hot Springs, Bath County, July 1, 1917, *F. W. Hunnewell, 2nd*, no. 4694 (TYPE in Gray Herb.).

CROTALARIA ROTUNDIFOLIA (Walt.) Poir. NANSEMOND COUNTY: sandy field about one mile east of Suffolk June, 1893, "new to northern range," *Heller*, no. 936.[1] ISLE OF WIGHT COUNTY: dry sandy yellow pine and oak woods near Walters, *F. & L.*, no. 6229; open spots in sandy pine and oak woods south of Zuni, *F. & L.*, no. 6610. See pp. 351 and 354.

C. PURSHII DC. NANSEMOND COUNTY: about Suffolk, 1893, *Heller*, no. 1107 as *C. sagittalis;* Suffolk, 1895, *J. W. Blankinship.* ISLE OF WIGHT COUNTY: dry sandy pine and oak woods about 1 mile southeast of Zuni, *F. & L.*, no. 6233. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5805. See pp. 351 and 354.

DESMODIUM RHOMBIFOLIUM (Ell.) DC. NORFOLK COUNTY: Northwest, 1893, *Heller*, no. 1348.[2] ISLE OF WIGHT COUNTY: sandy pine and oak woods south of Zuni, *F. & L.*, no. 6613.

*D. TENUIFOLIUM T. & G. ISLE OF WIGHT COUNTY: argillaceous and siliceous swales and swaley thickets, south of Zuni, *F. G. & L.*, no. 6616. See p. 354.

LESPEDEZA PROCUMBENS Michx., var. ELLIPTICA Blake in RHODORA, xxvi. 26, fig. 1 (1924). GREENSVILLE COUNTY: sandy clearing north of Emporia, *F. G. & L.*, no. 6618.

Blake's type was from Fairfax County. He also cited material from Campbell County.

(To be continued)

[1] See Heller, Bull. Torr. Bot. Cl. xxi. 22 (1894).
[2] See Heller, l. c. 23 (1924).

A New Variety of Elymus virginicus L.—While working over the specimens of *Elymus virginicus* L. at Field Museum two specimens were found which strikingly differed from all other specimens. So far as the material available is concerned, these specimens may be regarded as a geographic variety. The description of the new variety follows:

Elymus virginicus L. var. **micromeris**, var. nov. Culmi dense caespitosi innovationibus associati, erecti, graciles, 46–71 cm. alti; folia plana, pilis brevibus ad nervos aliquos supra scabra, in acumen angustata, 1–5.5 mm. lata, 5–19 cm. longa; spicae erectae, plerumque e vaginis longe exsertis, 5–6 mm. latae, 3.2–7 cm. longae; spiculae 8–11.5 mm. longae; glumae valde nervosae, induratae, pallidae, basi enervosae et extrorsum curvatae, acuminatae vel in aristam rectam 1–1.5 mm. longam attenuatae, scabrae, usque 1 mm. latae, 7.5–13.2 mm. longae; lemmata inferne glabra et enervia, superne scabra et nervosa, in aristam rectam 3.5–13 mm. longam attenuata.—North Dakota: Peninsula of Lake Ibsen, Leeds, July 28, 1900, *J. Lunell* (type in Herb. Field Mus.). South Dakota: Forest City, 1897, *David Griffiths* 267.

Elymus virginicus L. var. **micromeris**, var. nov. Culms in dense clumps with innovations, erect, slender, 46–71 cm. tall; blades flat, scabrous, with short hairs along some veins on the upper surface, tapering to a point, 1 to 5.5 mm. wide, 5 to 19 cm. long; spikes erect, most of them well exserted from the sheath, 5 to 6 mm. wide, 3.2 to 7 cm. long; spikelets 8 to 11.5 mm. long; glumes strongly nerved, indurate, pale, nerveless and bowed out at base, acuminate or tapering to a straight point 1 to 1.5 mm. long, scabrous, 1 mm. or less wide, 7.5 to 13.2 mm. long; lemmas glabrous and nerveless below, scabrous and nerved above, tapering to a straight awn 3.5 to 13 mm. long.

E. virginicus var. *micromeris* may be distinguished in its general aspect from *E. virginicus* L. and its varieties examined, by its shorter and narrower glumes and spikes; and from all except *E. virginicus* var. *halophilus* (Bickn.) Wiegand by its shorter and more slender culms.

The narrow glumes, indurate at the base, suggest *E. riparius* Wiegand, but they are slightly bowed out. The form differs further from *E. riparius* in having erect spikes, and the entire plant is shorter and less robust.

The inclusion in or exsertion of the spike from the sheath, which was used in Fernald's key to some varieties of *E. virginicus* (Rhodora **35**: 197, 198. 1933), proved a helpful character in separating these specimens from small-sized forms of *E. virginicus*.

The combination of awnless to short-awned glumes and distinctly awned lemmas was not found in groups examined having slender culms and small spikes (e. g., *E. virginicus* var. *halophilus*).—Hazel M. Schmoll, Field Museum, Chicago, Illinois.

SOME NEW PLANTS FROM TEXAS[1]

V. L. Cory

Polygonella **Parksii** sp. nov., planta annua viridis levis; caule gracile basi simplice supra valde ramoso 60–160 cm. alto; foliis ad 8 mm. longis filiformibus ad anguste ovatis, laminis latioribus grosse sinuate dentatis; ochreis viridibus ad apicem pallidis 4–8 setis pallidis vel brunneis 2–3 mm. longis munitis; sepalis deinde contractis patentibusque achaenium pallidum 2 mm. longum apertis.

Root annual, the plant appearing as a rosette in January, beginning to bloom the first of June, and continuing in bloom till the first of October; stem slender, simple below, copiously branched above, terete, smooth, 60–160 cm. tall, and up to 4 mm. in diameter; branches green, terete, mostly 1–2 mm. in diameter, bearing both foliage and flowers; leaves smooth, up to 8 mm. long, filiform to linear-spatulate or narrowly ovate, the wider blades sinuately and coarsely toothed, the lower half narrowed and jointed to the ocreae near its top; ocreae green, distally pale, lacerate with 4–8 pale to brown bristles, which are usually 2–3 mm. long; flowers borne in spike-like racemes, some flowers being sessile or subsessile, the others short-pedunculate; peduncles slender, wiry, mostly branched, the pedicels short, up to 3 mm. long, mostly spreading to recurved; ocreolae imbricated; calyx 5-parted in early bloom with the 2 outer sepals shorter but similar to the 3 inner sepals, which are about 3 mm. long, all 5 sepals changing as the fruit develops, the 2 outer sepals spreading or becoming reflexed and almost minute in size, the 3 outer sepals becoming shorter, broader, papery, prominently dark-nerved and concealing the achene or with the styles only exserted, then shrinking to half the length and nearly half the breadth of the achene, finally spreading to completely disclose achene, or eventually deciduous; achenes light-brown, narrowly winged on angles, fully 2 mm. long, and 1.2–1.4 mm. broad.—Type specimen, No. 15500, is deposited at the Gray Herbarium. It was collected September 25, 1935, in northern Atascosa County, Texas, along State Highway No. 66, at about twelve miles north of Pleasanton, where it was growing in a flat between two ridges, a former valley between two dunes.

It occurs only where the sand has been disturbed, either by the wind, the plow, or in road grading, the last circumstance being the case at

[1] Printed at the author's expense to secure immediate publication.—Eds.

the type locality, where the newly located State Highway No. 66 has opened up virgin areas. Its known distribution is the Carrizo sand ridges of the counties of Atascosa and Wilson, the extreme separation of collection-localities being about thirty miles. This plant is named for its discoverer, my friend and coworker, Mr. H. B. Parks, who is in charge of the State Apicultural Research Laboratory, near San Antonio, Texas.

Of the species of *Polygonella* occurring in the United States this plant appears to be more closely related to *P. ciliata* Meisn. Among other characteristics our plant differs from that species in its shorter and broader leaves, its shorter achene, and in its achene being wholly exposed at maturity.

Sisymbrium **texanum**, sp. nov., planta annua vel biennis glabra ad 25 cm. alta; foliis pinnatifidis petiolatis plerumque 5 cm. longis segmentis obtusis, petiolis exauriculatis; pedicellis plerumque 4–7 mm. longis valde divergentibus; capsulis sessilibus vel subsessilibus, ad 4 cm. longis 1.5 mm. latis.

Plant annual, possibly biennial, from a long taproot, which is up to 5 mm. in diameter at the crown; stem branched at or close to the base, the branches spreading-ascending, smooth, terete, finely striate, 15–25 cm. long, and usually less than 3 mm. in diameter; leaves irregularly and deeply pinnatifid, petioled, mostly about 5 cm. long, the blade 3 times as long as the petiole; leaf-segments mostly obtuse; petioles not auriculate; upper leaves similar, somewhat reduced, the lobes narrower; sepals smooth, spatulate to oblong-obovate, 4 mm. long, scarious-margined; petals white, 5 mm. long, the claw as long as the blade; filaments slender, dilated at the base, about 5 mm. long, or slightly exceeding the petals; anthers apiculate, about 2 mm. long, recurved; stigma subentire; in fruit the inflorescence occupies three-fourths of the stem; pedicels widely divergent, mostly 4–7 mm. long; pods spreading or ascending, smooth, sessile or subsessile, up to 4 cm. long and 1.5 mm. broad, beaked by style 1–2 mm. long; seeds minutely pitted, flattened, ovate, 1.5 mm. long and 1 mm. broad.

Type specimen, No. 18564, is deposited at the Gray Herbarium. It was collected April 13, 1936, on the narrow flood-plain of Terlingua Creek, at about 18 miles on an airline north of Terlingua, Texas.

This plant is related to *Sisymbrium auriculatum* A. Gray, and, among other particulars, differs therefrom in being entirely smooth, in that the petioles are not lobed at the base, and in the shorter pedicels.

Saxifraga **Reevesii**, sp. nov., planta perennis basi cormiformi; scapo 15–25 cm. alto virescente deinde purpurascente plus minusve glanduloso-piloso; foliis rosulatis ca. 3 cm. longis 10–15 mm. latis

ovalibus basi spathulatis, floribis 4 mm. latis breviter pedunculatis dense cymulosis cymulis 3–5-floris; petalis albidis spathulato-obovatis ad 4 mm. longis 1.25 mm. latis; carpellis 3, deinde purpurascentibus.

Plant perennial, scapose from a corm-like rootstock; scape 15–25 cm. tall, 1–2 mm. broad, greenish, becoming purplish, glandular-pilose, sometimes sparsely so; leaves basal, mostly 10 or more, mostly about 3 cm. long and 10–15 mm. broad, oval and with a spatulate base which is as much as 3 mm. broad and ¼ to ⅓ as long as the blade, glandular-ciliate especially towards the base, otherwise smooth, entire to undulate or irregularly and obscurely dentate; inflorescence cymose, compactly clustered, the branches as much as 1 cm. long before dividing into branchlets and subtended by linear-lanceolate bracts which are 4–6 mm. long, each branchlet and each flower subtended by a similar bract; flowers short-pedicellate and short-pedunculate, in compact clusters of 3–5, terminating the branchlets, mostly about 4 mm. broad; petals white, spatulate-obovate, up to 4 mm. long and 1.25 mm. broad, exceeding the calyx by about 1 mm.; calyx 2.5–3.5 mm. long; calyx–lobes erect, about half as long as the calyx-tube, ovate, obtuse, reddish or purplish at maturity; stamens 10, with filiform filaments; ovary nearly free from the calyx; carpels normally 3, 2-celled, united at the base, the tips widely divergent and becoming purplish.

I take pleasure in naming this plant in honor of its collector, Dr. R. G. Reeves, Professor, Department of Biology, A. & M. College of Texas, College Station, Texas. TYPE SPECIMEN No. 21047 was collected February 19, 1937, near College Station, Brazos County, TEXAS, by Dr. Reeves, and it is deposited at the Gray Herbarium. This plant grows in central and eastern Texas on Lufkin soils, commonly in open places or in old and abandoned fields.

This plant differs from other species of the genus in that it normally develops 3 follicles instead of 2. In other respects it is somewhat intermediate between *S. texana* Buckl. and *S. virginiensis* Michx., but possibly nearer the former, from which it differs in the other respects that its scape is glandular-pilose and its foliage is glandular-ciliate, at least towards the base. Its peculiarity in fruiting is sufficient to set it apart as a distinct species.

ASTRAGALUS **terlinguensis**, sp. nov., planta annua; caule basi ramoso ramibus ad 30 cm. longis strigosis; foliolis ca. 19 ovalibus ellipticis vel obovatis ad 1 cm. longis 3 mm. latis utrinque strigosis; racemis 2–6-floris; corollis 8–9 mm. longis apice purpureis; leguminibus confertis glabris turgidis adscendentibus 10–12 mm. longis 3 mm. latis leviter arcuatis, sutura inferiora sulcata.

Plant annual; stem numerously branched and rebranched at the base, the branches spreading, decumbent, or prostrate, 15–30 cm.

long, less than 2 mm. broad, strigose, striate; leaves ascending or somewhat spreading, 2–4 cm. long, the rachis strigose; stipules lance-subulate, about 4 mm. long, sparsely ciliate; leaflets 15–21, not infrequently 19, oval, elliptic, or obovate, up to 1 cm. long and 3 mm. broad, retuse, truncate, or rounded at the apex, strigose on both surfaces; peduncles 1.5–3 cm. long; racemes very short, 2–6-flowered; bracts lance-subulate, 1–2 mm. long; calyx strigose; calyx-tube 2.5 mm. long; calyx-teeth subulate, 2.5–3 mm. long, or as long as or longer than the calyx-tube; corolla purple-tipped, 8–9 mm. long; pod glabrous, turgid, ascending, 10–12 mm. long, 3 mm. broad, slightly and evenly arched, sulcate on the lower suture, containing 10 or more seeds, usually crowded in compact clusters of 3 or more.—Type specimen, No. 18584, collected April 13, 1936, in the narrow flood-plain of Terlingua Creek about two miles above the mouth of Alamo de Caesario Creek and about eighteen miles on an airline north of Terlingua, Texas, is deposited at the Gray Herbarium.

This plant, while closely related to *A. Nuttallianus* DC. and, in the past, apparently referred to that species, differs from it and others closely related in that group sometimes segregated as the genus *Hamosa*, in its short, crowded, ascending pods. Apparently it occurs over the watershed of Terlingua Creek, hence its specific name. Over much of the large extent of Brewster County, nearly 3,800,000 acres, its kindred species is *A. Emoryanus* (Rydb.) Cory. The latter species recently has been shown by Dr. F. P. Mathews, in charge of the Loco Weed Laboratory of the Texas Agricultural Experiment Station at Alpine, Texas, as being toxic to livestock. If opportunity affords the species described herewith will be tested as to possible toxicity to livestock.

Gaura filiformis Small, var. **Munzii**, var. nov., ab var. typica differt hypanthio sepalis patente pubescentibus, pilis ca. 1 mm. longis.

Plant biennial of perennial, 75–100 cm. tall, diffusely branched above, the branches slender, spreading-ascending; stems terete, up to 5 mm. in diameter, pubescent below with appressed or incurved hairs, becoming hirsute above; leaves numerous, linear-lanceolate, entire or finely serrate, mostly 2–4 cm. long and 7 mm. broad or less, strigose on both surfaces; inflorescence paniculate; panicle up to 15 cm. long and 5 cm. broad; buds densely villous; sepals about 10 mm. long, densely villous, the hairs about 1 mm. long; hypanthium about 8 mm. long, villous, the hairs about 1 mm. long; petals pink, at least in age, obovate, clawed, 7–8 mm. long; anthers linear, 4 mm. long; fruit 8–9 mm. long, subsessile, or with stout terete base less than 2 mm. long, sharply 4-angled, the wings not auricled, at first densely villous, becoming somewhat glabrate in age, but always, even at full maturity, at least strigillose, and sometimes with scattering villous hairs.—

TYPE SPECIMEN, No. 20179 was collected September 17, 1936, in the Coastal Prairie region of TEXAS, in Chambers County, about 6½ miles north of High Island. The type is deposited in the Gray Herbarium, and cotype material is deposited in the herbarium of Pomona College, Claremont, California. The other collection known is my No. 11399 from 6½ miles south of Alvin in Brazoria County, TEXAS, also in the Coastal Prairie region, but about fifty miles westerly of the type locality.

This variety differs from the typical form of the species in that the pubescence of the sepals and hypanthium is spreading instead of appressed; and it differs from an unpublished variety of Dr. Munz in that the pubescence of the sepals and hypanthium is about 1 mm. instead of less than 0.5 mm. long, and in that the hairs are not gland-tipped. This variety is named in honor of Dr. P. A. Munz, my friend, in recognition of his prompt and sympathetic assistance to us in our studies of the groups of plants in which he is especially interested.

PHLOX DRUMMONDII Hook., var. **littoralis**, var. nov., planta annua; ramibus adscendentibus diffuse patentibus ad 60 cm. longis vix 1.5 mm. crassis; floribus paucis laxe dispositis.

Plant annual; stem branched at base and above, the branches ascending and diffusely spreading, up to 60 cm. long and less than 1.5 mm. thick; flowers few and not crowded together in cymose clusters; pubescence, leaves, and floral and fruiting characters similar to the species.—TYPE SPECIMEN, No. 20393, was collected May 19, 1936, at one and three-fourths miles southwest of Aransas Pass, in San Patricio County, TEXAS, where it occurred in some abundance growing more or less in the shade of trees well within a quarter mile of the shore. This number, and No. 20574, collected May 20, 1936, at Flour Bluff, below Corpus Christi in Nueces County, where it was growing more exposed to the sun and closer to the shore, are deposited at the Gray Herbarium.

The growing plant does not suggest the species, the differences being in the elongated, slender, spreading stems, and in the few flowers, which are disposed singly or in twos or more instead of being crowded together in cymose clusters. The individual flower, and the fruit as well, is that of the species, hence this seemingly distinct plant appears to merit no more than varietal distinction. This plant has been found only along the Gulf Coast of Texas, both above and below Corpus Christi, hence the varietal name.

PECTIS **texana**, sp. nov., planta annua 10–15 cm. alta; caule basi dichotomo-ramoso; foliis linearibus 2 cm. longis 1 mm. latis basi setoso-ciliatis setis 4–6; capitulis pedunculatis solitariis vel paucis (2–4);

pedunculis gracilibus 4–30 mm. longis longioribus monocephalis; floribus disci 3 mm. longis tubo corollae breve; achaeniis ca. 3 mm. longis hirsutulis; pappo coronoformi aristatis, aristis plerumque 2 mm. longis; achaeniis disci plerumque 1-aristatis, achaeniis florum ligulatarum 3-aristatis.

Plant a diffuse, glabrous annual, divided at the base into several slender branches, which are branched in turn, the branchlets terminating in an inflorescence, forming a low (10–15 cm. high) growth which is covered in the blooming season by numerous small heads of showy, yellow flowers; leaves opposite, linear, apiculate, about 2 cm. long and 1 mm. wide, dotted on the margins by more or less regularly spaced, prominent sunken glands, midrib impressed above, prominent below, rounded and pale, the body of the blade green, puncticulate, the margins involute, near the base bristly-ciliate with 4–6 soft, scarious lobes or bristles, which are about 2 mm. long; heads small, axillary, pedunculate, in clusters of 1–4; peduncles slender, 4–30 mm. long, the longer peduncles bearing solitary heads; involucres turbinate, 4–4.5 mm. high, 2–3 mm. broad; involucral bracts in 1 series, usually 8, narrowly linear, strongly involute and round-ribbed, with a conspicuous apical gland; ray-flowers about 8, ligule elliptical-oblong, about 4 mm. long and 2.5 mm. broad, the basal portion, sparsely glandular with stalked glands; disk-flowers about 12, the corollas 3 mm. long, the corolla-tube short, one-third the length of the throat and limb, sparsely glandular with stalked glands; achenes slender, terete, 3 mm. or slightly more long, grayish, hirsutulous; pappus a paleaceous crown with 1 or more awns, the awns mostly 2 mm. long or more, the disk-achenes usually with 1 awn and the ray-achenes with 2–4 awns, usually 3.—Type specimen, No. 15382 was collected at the Ranch Experiment Station near the southern line of Sutton County, Texas, August 7, 1935, and is deposited at the Gray Herbarium.

At first this plant was determined for me by one botanist as *P. tenella* A. Gray. Until a ranchman sent in material for determination because of the belief that it was toxic to livestock it was so considered, but then it was seen not to fit that species. Later the material was determined elsewhere as *P. angustifolia* Torr., but clearly it is not that species. It is nearest *P. tenella*, but differs in that the heads are larger, fewer, longer-pedunculate, and that the awns of the pappus are less well-developed, and in that a fringed pappus-cup always is more or less evident. In habit this plant is most like *P. papposa* Harv. & Gray of the Big Bend of Texas and on westward and southward. As we know this plant it is found only on the Edwards Plateau of Texas, and there it is confined to a belt extending from near Rocksprings on the south to near Christoval on the north. We know it

only as growing on stony clay soils, frequently on solid limestone shelves covered with a thin layer of soil, or frequently growing in cracks of the solid exposed limestone rock. This plant is an attractive one when in full bloom, whereas most of the other species of Pectis in Texas cannot readily be so considered.

Texas Agricultural Experiment Station,
Sonora, Texas

GRASS STUDIES. II. ADDITIONS TO THE FLORA OF ARKANSAS[1]

Etlar L. Nielsen

An extensive survey of the grass flora of Arkansas was undertaken during the summer of 1936. Eight of the species represented in the collections are not recorded in Hitchcock's Manual (1935) as occurring in this state. Brief note is therefore made of the extension of range of these species.

Eragrostis refracta (Muhl.) Scribn. Five miles west of Rosston, Nevada County. Sept. 9, 1936. *Nielsen* no. 4387.

Festuca versuta Beal. Rocky woods. Edens Bluff, about 8 miles southeast of Rogers, Benton County. May 30, 1936. *Nielsen* nos. 3772 and 3780.

Agropyron Smithii Rydb. Roadside, ¼ mile north of Dairy Building, University of Arkansas, Fayetteville, Washington County. July 1, 1936. *Nielsen* no. 4039. A dense colony of this species has become established on the shoulder of the highway. Scattered individuals of A. repens (L.) Beauv. (June 30, 1936. *Nielsen* no. 4030) occur along a fenceline in the same locality. No dense colonies of this species were found either here or at the University Experimental Farm located about 2 miles farther north. The species last mentioned is not new to Arkansas.

Brachyelytrum erectum (Schreb.) Beauv. Woods, Pulaski County. July 1884. *F. L. Harvey;* Wooded banks, Crowley's Ridge near Wynne, Cross County, Sept. 9, 1926. *E. J. Palmer* no. 31667; Fayetteville, Washington County. Oct. 1933. *D. M. Moore* no. 33084; Moist woods, Devils Den State Park, near Winslow, Washington County, May 31, 1936. *Nielsen* no. 3806; same locality, Aug. 1, 1936. *Nielsen* no. 4331; also gorge one mile west of Weedy Tower, U. S. F. S., Ozark National Forest. Aug. 2, 1936. *Nielsen* no. 4344. Branner and Coville (1891) accredit Nuttall to have originally reported this species for the state.

[1] Research Paper No. 463. Journal Series, University of Arkansas.

Aristida ramosissima Engel. Roadside, west of Rice Branch Experimental Station, Stuttgart, Arkansas County. July 17, 1936. *Nielsen* no. 4196.

Paspalum longipilum Nash. Bono, near Damascus, Faulkner County. July 17, 1936. *L. M. Humphrey* no. 4222.

Panicum albomarginatum Nash. Warren, Bradley County. July 15, 1936. *Nielsen* no. 4153.

Panicum Gattingeri Nash. Banks of Spring River, below Wahpeton Inn. Hardy, Fulton County. Oct. 4, 1936. *Nielsen* no. 4466.

The writer is indebted to Mrs. Agnes Chase, Smithsonian Institution, Washington, for her aid in the identification of many of the specimens collected. Duplicate sets of the writer's collections are deposited in the U. S. National Herbarium, Smithsonian Institution, in the Herbarium of the University of Minnesota, and in the Herbarium of Agronomic Plants, University of Arkansas.

University of Arkansas.

References

Branner, John C. and Coville, F. V. 1891. A list of the Plants of Arkansas. Annual Report of State Geologist, pp. 155–262.

Hitchcock, A. S. 1935. Manual of the Grasses of the United States. U. S. D. A. Miscellaneous Publ. No. 200.

A Supplement to DeToni's Sylloge.—Phycologists will welcome the first part of Giuseppe DeToni's supplement[1] to his father's *Sylloge Algarum*. The work when complete is expected to cover the entire field of algae; this first fascicle is concerned with 100 recent names of Myxophyceae. The fascicles appear unbound, with the pages (14 x 18.5 cm.) separate. Thus it is possible to assemble the pages in alphabetical or systematic order with those of future fascicles. A separate page is devoted to each new name published since the appearance of the *Sylloge*, with citation of the valid description in accordance with the International Rules, a copy of the original Latin description, reference to the type specimen, and a list of comments made by later students. The student may lament the brevity of citation of type specimens and the omission of reference to herbaria in which these types are likely to be found. On the other hand, such information has not always been made available in original publications by recent students. On the whole, so much valuable data has been here collected together in a small space that the work will be almost indispensable to students of a field lately so fertile for the description of new forms.—Francis Drouet, Department of Botany, Marine Biological Laboratory.

[1] DeToni, J. 1937. Diagnoses algarum novarum post Sylloges editionem descriptarum. I. Myxophyceae, Cent. I. Published by the author, Brescia.

Volume 39, no. 465, including pages 321–376, was issued 1 September, 1937.

RHODORA

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. November, 1937. No. 467.

CONTENTS:

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. **November, 1937.** **No. 467.**

THE VARIATIONS OF PSORALEA PSORALIOIDES

FLORENCE L. FREEMAN

In identifying a collection of plants from Kentucky it became apparent that *Psoralea psoralioides* of the interior of the United States is different in many respects from the plant of the Atlantic Coastal Plain. At the suggestion of Professor Fernald I have studied the species. My conclusions are here presented.

PSORALEA PSORALIOIDES (Walt.) Cory, var. **typica**. Floral bracts, calyces and leaflets pubescent, conspicuously glandular-dotted: legumes and stipules glandular-dotted: bracts convex, suborbicular, abruptly caudate, 6–10 mm. long, 2–5 mm. wide, with attenuate cauda 3–5 mm. long: calyx 3–5 mm. long, averaging 3.5 mm., with triangular-ovate lobes; its ventral lobe 1.6–2.6 mm. long; dorsal lobes 1–2 mm. long: leaflets 0.6–2 mm. wide, 2–5 cm. long, about 4–5 times longer than broad.—*Trifolium psoralioides* Walt., Fl. Car. 184 (1788), type lost. *Hedysarum pedunculatum* Mill. Gard. Dict. ed 8, no. 17 (1768) in part. *Psoralea melilotoides* Michx. Fl. Bor.-Am. ii. 58 (1803). *P. Melilotus* Pers. Syn. ii. 347 (1807). *P. pedunculata* (Mill.) Vail, Bull. Torr. Bot. Cl. xxi. 114 (1894), not *P. pedunculata* Ker. Bot. Reg. t. 228 (1817), which is *P. sericea* Poir. *Orbexilum pedunculatum* (Mill.) Rydberg, N. Am. Fl. xxiv. 7 (1919). *P. psoralioides* Cory in RHODORA, xxxviii. 404 (1936).—Dry sand and clay of the Coastal Plain states, from Virginia to Georgia. The following are characteristic. VIRGINIA: Carson, *Fernald, Long & Smart*, 1936, no. 5809; Petersburg, *Fernald, Long & Smart*, 1936, no. 5808; Waverly, *Fernald & Long*, 1936, no. 6234; Kilby, *Fernald, Long & Fogg*, 1935, no. 4890; Henrico Co., *Randolph*, 1922, no. 423; Suffolk, *A. A. Heller*, 1893, no. 959; Williamsburg, *Weatherby*, 1921, no. 3755. NORTH CAROLINA: Williamston, *Wiegand & Manning*, 1927, no. 1531; Wilson, *Randolph*, 1922, no. 736. SOUTH CAROLINA: Society Hill, *Donnell-Smith*, 1884;

Summerville, *A. C. Hexamer & F. W. Maier*, 1888; Columbia, *K. A. Taylor*, 1890. Georgia: Valdosta, *Curtiss* 1899, no. 6473.

Although Walter's type of *Trifolium psoralioides* is said to have been lost (Vail, Bull. Torr. Bot. Cl. xxi. 114 (1894)), I assume that he had the Atlantic Coastal Plain plant with broad and glandular bracts, this plant occurring in Walter's region and his description emphasizing "bracteis cordatis cum acumine." Mr. C. A. Weatherby, who has kindly examined for me the Miller material of *Hedysarum pedunculatum*, states that it is a mixture of the preceding and the following.

Var. **eglandulosa** (Ell.), comb. nov. Habit and appearance similar to var. *typica:* floral bracts, calyx, and peduncle more pubescent, often villous, bracts and calyx especially so on margins; these, as well as legumes, stipules, and leaflets less conspicuously glandular-dotted, often without glands: bracts ovate-acuminate, seldom convex, smaller, 5–8 mm. long, 1.3–2.4 mm. wide: calyx tending to be larger, 3–6 mm. long; the lobes longer and more narrowly acute; ventral lobe 2.4–3.8 mm. long; dorsal ones 2–3 mm. long: leaflets narrower, generally 4–7 times longer than broad.—*Melilotus psoralioides* Nutt. Gen. ii. 104 (1818) in part, not *Trifolium psoralioides* Walt. *P. eglandulosa* Ell. Bot. N. C. & Ga. ii. 198 (1824).—Higher altitudes of the Southeastern States, in South Carolina and Georgia, ranging westward as far as Texas, thence northward to Ohio, Indiana, Illinois, Missouri and Kansas. North Carolina: Macon, *Harbison*, 1903. South Carolina: *Beck;* Saluda, *Weatherby*, 1932, no. 6138. Georgia: Lagrange, *S. M. Tracy*, 1905, no. 9085; Lookout Mt., *Fuller*, 1906; Gwinnett Co., *Small*, 1893; Maysville, *Buckley*, no. 1. Ohio: Bloomingville, *Mosely*, 1896. Indiana: Marengo, *Deam*, 1919, no. 27844; New Albany, *Deam*, 1913, no. 13225. Kentucky: Russelville, *Palmer*, 1920, no. 17753; New Haven, *Weatherby*, 1933, no. 6359. Tennessee: Madison Co., *S. M. Bain*, 1892, no. 56; Pikeville, *E. B. Harger*, 1934, no. 7805. Alabama: Lagrange, *Hatch;* "Lousiana br." *T. M. Peters;* Auburn, *C. F. Baker*, 1898, no. 6435. Mississippi: Kosciusco, *Weatherby*, 1933, no. 6298. Illinois: Olney, *R. Ridgway*, 1919, no. 799; Makanda, *Gleason*, 1903; Marion Co., *Bebb*. Missouri: St. Louis, *Sherff*, 1910, no. 229; Webb City, *Palmer*, 1903; Montier, *Bush*, 1894, no. 77; Sleeper, *Lansing*, 1911, no. 2908; Kimmswick, *Churchill*, 1918; Cedar Gap, *Lansing*, 1911, no 2989. Louisiana: *Hale*. Kansas: Cherokee Co., *Hitchcock*, 1896, no. 654. Oklahoma: Talihina, *Palmer*, no. 39377. Texas: Silver Lake, *J. Reverchon*, 1900, no. 1943; *Wright*.

Specimens of the extreme of this variety, *i. e.* with narrow leaflets, small deciduous bracts, large calyces and no glands, are mainly from the Mississippi Basin. Transitional forms, having some of these characters and lacking others, have been collected in the highlands

of North Carolina, South Carolina, and Georgia, as well as in the more western part of the range: Kentucky, Tennessee, Alabama, and Mississippi, also Kansas, Oklahoma, and Texas, often mingling with those of the Mississippi Basin extreme.

Nuttall, in 1818, transferred *Trifolium psoralioides* Walt. to *Melilotus*, and applied the name to a plant occurring in Carolina, Florida, also common in the open forests of Ohio, Kentucky and Tennessee, remarking that "the entire absence of glands, the minuteness of the carina, and the fruit decide this plant to be a *Melilotus*." It is evident, then, that Nuttall had two plants in his *Melilotus psoralioides*.

In 1824, Elliott, in describing *Psoralea eglandulosa* as a new species, said, "It is probably the plant described by Mr. Nuttall, but its affinity to the preceding species [*P. melilotoides* Michx.] in habit and in every character except the glands induces me to retain it in this genus." Since then Vail, in 1894, combined the species *P. eglandulosa* with *P. pedunculata* (Mill.) Vail without comment.

Var. **gracilis** (Chapm.), comb. nov. Slender, of delicate habit: leaflets small, 5–9 mm. wide, 2–4 cm. long: inflorescence slightly smaller: the glandular dots, the large abruptly caudate bracts and the small calyces as in the typical form of the species.—*Psoralea melilotoides* Michx. β *gracilis* (Chapm.) T. & G., Fl. N. Am. i. 303 (1838), based on *P. gracilis* Chapm. in T. & G., N. Am. Fl. i. 303, as synonym. *P. gracilis* Small, Fl. Se. U. S. 623 (1903). *Orbexilum gracile* (Chapm.) Rydb. N. A. Fl. xxiv. 7 (1919).—Dry sandy soil of Georgia, extending southward into Florida.—GEORGIA: Graymont, *Harper*, 1901, no. 805; Chatham Co., *Harper*, 1903, no. 1818; Altamaha R., *Thurber*. FLORIDA: *Chapman*.

Rydberg, in describing this plant as a species of *Orbexilum*, states that the stipules are longer, 5–8 mm., than those of *P. psoralioides* (*O. pedunculatum* (Mill.) Rydb.), which he says are 4–5 mm. long; he also mentions a difference in the calyx-lobes, those in *P. psoralioides* "lanceolate, slightly longer than the tube, the lowest one slightly longer than the rest"; those in var. *gracilis* (*O. gracile* (Chapm.) Rydb.) described with "upper 4 lobes triangular, shorter than the tube, the lowest lanceolate and a little longer than the tube." In the specimens which I examined at the Gray Herbarium, I found that the stipules of *P. psoralioides* and var. *gracilis* measured about the same; those of the larger plant are 4–6 mm. long, those of the smaller 3–5 mm. long. The character of the calyx-lobes holds true, but it is not

limited to the variety. Throughout our specimens of *P. psoralioides* the same trait is repeatedly found.

A slender habit, similar to that of var. *gracilis*, is found among some of the highland plants which have the larger calyx, absence of glands, small bracts, etc. of var. *eglandulosa*. This depauperate type so imperceptibly merges into the slender-leaved, more robust variety that I have made no attempt to separate it as an entity.

Radcliffe College

SOME NOTEWORTHY PLANTS OF TENNESSEE

E. B. Harger

In the fall of 1933 and again in May, 1934 I had opportunity to collect in Tennessee, and although only a few days were available for collecting, the results summarized below seem of sufficient interest to warrant publication.

Much of the time was spent near Pikeville, where the Sequatchie Valley, an eroded anticline, cuts through the Cumberland Plateau and offers the chance to collect both on the mountain sides and on the Plateau proper. Other collecting was near Erin, about 75 miles northwest from Nashville, with side trips to the banks of the Tennessee River at Camden and Pine Bluff.

In most of this region the valleys are calcareous, while the uplands show a flora indicative of more acid soils.

The only comprehensive work on the flora of this region is Gattinger's Flora of Tennessee, which was published in 1901, and, as is natural after the lapse of so much time, is incomplete in the light of later collections. This is cited below as *Gattinger*. Reference has also been made as far as possible to later reports in various publications and to specimens in the Gray Herbarium.

Specimens of all species mentioned in this paper have been deposited in the Gray Herbarium and compared there with specimens in that collection.

Panicum laxiflorum Lam., var. strictirameum (Hitchc. & Chase) Fern. Dry pasture, Clarksville, Montgomery Co., May 19, 1934. No. 7859.

Not reported from Tennessee and no specimens seen from north of Auburn, Alabama and Jackson, Mississippi.

SPHENOPHOLIS FILIFORMIS (Chapm.) Scribn. Dry, open woods on the Cumberland Plateau at about 2,000 ft. elevation, Van Buren Co., May 13, 1934. No. 7762.

Reported from Chester Co., *Gattinger*, but no specimens from Tennessee seen. All other specimens examined are from the Coastal Plain and those from the southeast have somewhat larger spikelets than those in this collection. Those from farther west match it closely and were given an unpublished varietal name by Vasey. Further study may show this to be a definite geographic trend.

CAREX LEAVENWORTHII Dewey. Along streams, head of Sequatchie Valley, Cumberland Co., May 18, 1934, no. 7823, and Erin, Houston Co., May 19, 1934, no. 7834.

"E. Tenn." *Gattinger*, and collected by H. K. Svenson in Cheatham Co.

CAREX VIRESCENS Muhl. Limestone ledges near Wells Creek, Erin, Houston Co., May 22, 1934. No. 7906.

Not previously reported from Tennessee. *C. virescens* of *Gattinger* is probably *C. Swanii*.

CAREX ABSCONDITA Mackenzie (*C. ptychocarpa* Steud.). Rich woods at base of mountain northwest of Pikeville, Bledsoe Co., May 16, 1934. No. 7827.

Not previously reported from Tennessee.

CAREX PLANTAGINEA Lam. Steep moist hillside woods at Falls Creek Falls, Van Buren Co., May 13, 1934. No. 7749.

Reported only from the extreme eastern part of the state.

TRILLIUM RECURVATUM Beck. Rich limestone woods at head of Sequatchie Valley, Cumberland Co., May 16, 1934. No. 7818.

Reported from Clarksville and Jackson and from Tipton Co. Anderson, Rhodora **36**: 126.

URTICA CHAMAEDRYOIDES Pursh. Rich woods on limestone at Yellow Creek, Montgomery Co., May 20, 1934. No. 7879.

All descriptions of this species call it annual, but the plants of this collection seem to be plainly from a perennial root, as in other specimens examined.

ASARUM RUTHII Ashe. Dry woods at base of Walden Ridge near Pikeville, Bledsoe Co., May 14, 1934. No. 7782.

Hiawassee Valley, *Gattinger;* specimen in the Gray Herbarium from Knoxville.

ASARUM MEMMINGERI Ashe. Dry woods near Caney Creek Falls, Van Buren Co., at about 2,000 ft. elevation, May 13, 1934. No. 7741.

Not reported from Tennessee, but some material from the state in the Gray Herbarium appears to be of this species.

Delphinium virescens Nutt. Thin dry soil on limestone by roadside at Lebanon, Wilson Co., May 23, 1934. No. 7905.

What was undoubtedly this species was also seen in a similar situation near McMinnville. Probably the same as *D. carolinianum* of *Gattinger*.

Sanguinaria canadensis L., var. rotundifolia (Greene) Fedde. Limestone ledges, Erin, Houston Co., May 18, 1934, no. 7835, and May 22, 1934, no. 7903.

Collected in Carroll Co., by *H. K. Svenson*. Perhaps the common form in the region.

Philadelphus inodorus L., var. grandiflorus (Willd.) A. Gray. Woods on the bank of the Tennessee River at Rockport, Benton Co., May 21, 1934. No. 7892.

From the specimens seen this would seem to intergrade with the species. Knox Co., *Gattinger*.

Philadelphus latifolius Schrad. Limestone bluff of Harpeth River west of Nashville, Davidson Co., May 13, 1934. No. 7808.

Philadelphus hirsutus Nutt. Side of gorge at Caney Creek Falls, Van Buren Co., May 13, 1934. No. 7743.

Cocke Co., *Gattinger*.

Robinia Elliottii (Chapm.) Ashe. Top of precipice of Sewanee conglomerate northwest of Pikeville, Bledsoe Co., about 1,800 ft. elevation, May 13, 1934. No. 7758.

Robinia Boyntonii Ashe. Woods by Caney Creek Falls, Van Buren Co., about 2,000 ft. elevation, May 13, 1934. No. 7761.

Baptisia leucantha Torr. & Gray. Roadside near stream about 8 miles south of Camden, Benton Co., May 21, 1934. No. 7891.

Not previously reported from Tennessee.

Thermopsis mollis M. A. Curtis. Dry woods on Cumberland Plateau west of Whitwell, Marion Co., at about 1,800 ft. elevation, May 14, 1934. No. 7788.

No published report from Tennessee seen. Of two collections in the Gray Herbarium from Lookout Mountain, one is definitely stated to have been in the state.

Euphorbia mercurialina Michx. Along roadside in dry woods, Walden Ridge near Pikeville, Bledsoe Co., at about 1,500 ft. elevation, May 14, 1934. No. 7769.

Acer pennsylvanicum L. Gorge of Falls Creek at the falls, Van Buren Co., May 13, 1934. No. 7750.

Reported only from the Great Smoky Mountains, *Gattinger*. Growing at the same station with *Carex plantaginea* and *Viola blanda* in the central part of the Cumberland Plateau.

STYRAX GRANDIFOLIA Ait. Roadside in woods south of Dover, Stewart Co., May 20, 1934. No. 7782.

Not before reported from Tennessee, but growing here only 15 miles south of the Kentucky line.

HYDROPHYLLUM MACROPHYLLUM Nutt. Rich limestone woods, Montgomery Co., May 19, 1934, No. 7876.

Sumner Co., *Gattinger*.

PHACELIA BICKNELLII Small. Limestone bluff at Erin, Houston Co., May 18, 1934. No. 7844.

Collected in Davidson Co. near Nashville by *E. J. Palmer*.

HEDEOMA HISPIDA Pursh. Dry pasture, Clarksville, Montgomery Co., May 19, 1934. No. 7856.

Not reported from Tennessee nor included in Small's Flora. Collected in Mississippi by *C. A. Weatherby*. Apparently spreading as a weed.

SCUTELLARIA OVATA Hill. Limestone talus, bank of the Tennessee River at Pine Bluff, Stewart Co., May 20, 1934. No. 7883.

SCUTELLARIA NERVOSA Pursh. Damp woods at Rockport, Benton Co., near the Tennessee River, May 21, 1934. No. 7893.

Sumner Co., *Gattinger*. Collected at Clarksville by *E. J. Palmer*.

PENSTEMON CALYCOSUS Small. Limestone ledge by roadside, Clarksville, Montgomery Co., May 19, 1934. No. 7864.

Apparently frequent in central Tennessee. A good garden perennial, producing its large, red-purple flowers in ample panicles.

PENSTEMON BREVISEPALUS Pennell. Erin, Houston Co., May 18, 1934, no. 7806, and May 22, 1934, no. 7868.

An extension of range northwestward from the stations cited by Pennell.

COREOPSIS LANCEOLATA L. Dry woods near the Tennessee River, Humphreys Co., May 21, 1934. No. 7887.

Not before reported from Tennessee.

COREOPSIS CRASSIFOLIA Ait. Dry woods near the Tennessee River, Humphreys Co., May 21, 1934. No. 7886.

Nashville, *Gattinger*. Growing with the preceding species and appearing like a form of it.

COREOPSIS AURICULATA L. Rather dry cherty bank by roadside at

base of Walden Ridge near Pikeville, Bledsoe Co., May 18, 1934. No. 7777.

Greenbrier, Robertson Co., *Gattinger*.

SERINIA OPPOSITIFOLIA (Raf.) Kuntze. Field by Wells Creek, Erin, Houston Co., May 18, 1934. No. 7833.

No published report seen. Collected in Hardin Co. by *C. A. Weatherby* and on Lookout Mountain by *J. R. Churchill*.

OXFORD, CONNECTICUT

NAJAS GRACILLIMA IN INDIANA AND MICHIGAN—In discussing the distribution of *Najas gracillima* in a recent paper,[1] I stated that search for the species should now be made "in the area between Tioga Co., N. Y. and Wisconsin." At the time of that writing, no specimens had been seen from this central region, but recently Mr. C. C. Deam has called to my attention the collection of this *Najas* by R. M. Kriebel in Lawrence Co., Indiana. Mr. Kriebel has kindly contributed specimens for my study. This material is unquestionable *N. gracillima* with the very narrow leaves, scarious spiny-toothed auricled leaf-bases and typical slender seeds. I may cite two collections: *R. M. Kriebel*, no. 3477, in association with *Elodea canadensis*, *Bacopa rotundifolia* and *Rotala ramosior*, in a sinkhole pond 7 miles south of Bedford, Lawrence Co., Ind. and *R. M. Kriebel*, no. 1922, with *Potamogeton diversifolius* in a pond 5 miles southeast of Bedford. Part of no. 1922 was sent to the Gray Herbarium. These collections seem particularly significant, since Lawrence Co. is south of the center of Indiana and hence represents the southernmost station known for this species in the country west of Maryland.

I now can also report the definite occurrence of *N. gracillima* in Michigan. Mr. F. J. Hermann collected the species in shallow water in Third Sister Lake, three miles west of Ann Arbor, Washtenaw County, on August 19, 1936. The sheet (*Hermann*, no. 8374), which is to be deposited in the Gray Herbarium, was kindly loaned to me for study. The material is typical in all respects.

It is expected that careful search will reveal *N. gracillima* at other places between New York and Wisconsin.—ROBERT T. CLAUSEN, Bailey Hortorium, New York State College of Agriculture, Ithaca, N. Y.

[1] Clausen, R. T. Studies in the genus *Najas* in the northern United States. RHODORA **38**: 333–345. pl. 437 and 438. 1936.

LOCAL PLANTS OF THE INNER COASTAL PLAIN OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from page 415*)

Zornia bracteata (Walt.) Gmel. Southampton County: "Plentiful in a dry sandy field at Franklin,"[1] 1893, *Heller*, no. 1029, "new to northern range." Isle of Wight County: forming broad carpets, border of sandy yellow pine and oak woods north of Walters, *F. G. & L.*, no. 6624. See p. 354.

Stylosanthes biflora (L.) BSP., var. hispidissima (Michx.) Pollard & Ball. Isle of Wight County: dry sandy pine and oak woods about 1 mile southeast of Zuni, *F. & L.*, no. 6241; similar habitat near Walters, *F. & L.*, no. 6242. See p. 350.

Lathyrus venosus Muhl. Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6244.

This species, like several others with it, seen only once on the Coastal Plain.

*Lathyrus hirsutus L. Henrico County: roadside, entrance to University Heights, Westhampton, *F. L. & S.*, no. 5814.

A European species becoming established in several parts of this country.

*Galactia Macreei M. A. Curtis in Bost. Journ. Nat. Hist. i. 120 (1837). *G. pilosa*, β. *Macreei* (M. A. Curtis) Torr. & Gray, Fl. N. Am. i. 287 (1838), as β. "*Macraei.*" Princess Anne County: climbing 1–2.5 m., thickets and woods, Dam Neck, *F. & L.*, no. 3978; wet thicket near outlet of Rainey's Pond, Sand Bridge, *F. & L.*, no. 3980; both distributed as *G. volubilis* (L.) Britton. Corolla delicate pink, with purple center.

Galactia Macreei is one of three species which have been passing as *G. volubilis*. Linnaeus based his *Hedysarum volubile* L. Sp. Pl. 750 (1753) upon the plate of *H. trifolium scandens* of Dillenius, Hort. Elth. 173, t. 143, which, in absence of other material, must stand as type. The Dillenian plate at once suggests *G. mollis* Michx. (1803), as recognized by Miss Vail in Bull. Torr. Bot. Cl. xxii. 507 (1895). In the latter species, however, the dense pubescence of stem, petioles, and peduncles ascends or points upward; in *G. volubilis* and its allies it is reflexed, as in the Dillenian plate. The distinctions between *G. Macreei* and *G. volubilis* follow.

G. volubilis. Pubescence of stem, etc., loosely spreading or loosely reflexed: leaflets oval to oval-oblong, the larger 1–3 cm. broad: peduncles

[1] See Heller, l. c. 23 (1894).

and flowering rachises stiff, pilose, in the best-developed racemes 3–11 cm long, floriferous nearly to base, the true peduncles only 1 mm.–3.5 cm. long; the groups of flowers 0.5–2 cm. apart: full-grown flower-buds, just before expansion, slightly curved; the beak (sepal-tips) about 1/3 length of body: calyx spreading-pilose, 4–5.5 mm. long: the basal bracts ovate: corolla pink, essentially unicolorous; keel-petals 6–7 mm. long (in var. *mississipiensis* Vail 6–10 mm.): legumes densely spreading-pilose, 2–5.5 cm. long.—Dry thickets and borders of woods, Florida to Texas, north to Long Island, Indiana, Missouri and Kansas.

G. Macreei (isotype in Gray Herb.). Pubescence of stem, etc., minute, retrorsely strigillose: leaflets oblong, the larger 0.5–2 cm. broad: peduncles and flexuous rachises filiform, retrorsely strigillose or glabrous, in the best-developed racemes 0.7–3 dm. long, flowering only well above the base; the true peduncles 3–7 cm. long; the groups of flowers 1.5–4 cm. apart: full-grown flower-buds with longer and more falcate beak: calyx subappressed-pilose, 6–10 mm. long, its basal bracts linear- or lance-subulate: corolla pink, with deep purple center; the keel-petals 9–10 mm. long: legumes minutely strigose, 3–7 cm. long.—Damp or wet thickets, pond-margins and low woods, Florida to Texas, north on Coastal Plain to southeastern Virginia.

When Miss Vail, l. c., said "*Galactia Macreei*, the type specimen of which is preserved in Herb. Columbia College, is merely a very slender filiform-racemed variation" of *G. volubilis*, she evidently did not make close comparisons of the details. At that time she treated *G. pilosa*, var. *angustifolia* T. & G., l. c. (1838) as *G. volubilis*, var. *intermedia* Vail. l. c. 508, changing the name because of an earlier *G. angustifolia* Kunth, Mimos. t. 56 (1824). *G. pilosa*, var. *angustifolia* T. & G. and *G. volubilis*, var. *intermedia* are *G. parvifolia* A. Richard, Essai Fl. Cuba, i. 414 (1845). Should it be felt that this smaller plant of the West Indies and southern Florida, with short racemes and legumes, is only a variety of *G. Macreei* it is clear that the latter name, published in 1837, has precedence over *G. parvifolia* (1845). The varietal name, *G. pilosa*, var. *angustifolia* T. & G. (1838), in no way based upon *G. angustifolia* Kunth (1824), would be the correct one to take up.

When Torrey & Gray changed the spelling of Curtis's species, from near Wilmington, North Carolina, from the original *Macreei* to "*Macraei*", as *G. pilosa* β. *Macraei*, they presumably associated it with the Canadian W. F. Macrae, who sent plants to them, one of which was named for him as *Corallorhiza Macraei* Gray, Gray citing him as "*W. F. Macrae.*" In their preface (xiii) Torrey & Gray acknowledged the help of the Canadian "Mr. Macrae." As a matter of fact, Curtis, as indicated on his p. 84, was naming his *Galactia* for a Carolina botanist: "Several [species] are furnished by Dr. McRee, from his plantation, at Rocky Point, a few miles north of Wilming-

ton." In a note on this North Carolina botanist, Barnhart[1] completes the data: JAMES FERGUS MCREE (1794–1869), born near Wilmington, M. D. (College of Physic. and Surg., N. Y.), 1814.

*LINUM FLORIDANUM (Trel.) Planch. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5817. SUSSEX COUNTY: dry argillaceous field north of Littleton, *F. & L.*, no. 6251. For discussion see Fernald, RHODORA, xxxvii. 429, pl. 396, figs. 11–14 (1935).

*POLYGALA HARPERI Small. SUSSEX COUNTY: Waverly, 1891, *A. B. Seymour*, no. 6; grassy roadside southeast of Waverly, *F. & L.*, no. 6258; dry pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6261. See p. 346.

P. RAMOSA Ell. SUSSEX COUNTY: depressions in argillaceous field north of Littleton, *F. & L.*, no. 6263. See p. 339.

STILLINGIA SYLVATICA L. ISLE OF WIGHT COUNTY: "collected in Isle of Wight County, near Franklin," 1893, *Heller*, no. 921; border of dry sandy woods near Joyner's Bridge, *F. G. & L.*, no. 6627. See p. 357.

*AESCULUS DISCOLOR Pursh. GREENSVILLE COUNTY: large shrub in bottomland woods along Caney Branch, east of Emporia, *F. G. & L.*, no. 6633. See p. 352.

CYRILLA RACEMIFLORA L. SOUTHAMPTON COUNTY: about Franklin, 1893, *Heller*, no. 1032, "new to northern range"; Franklin, 1909, *W. W. Eggleston*, no. 4917; margin of cypress swamp by Blackwater River, near Oak Grove School, *F. & L.*, no. 6630. Several collections from Norfolk County. See p. 359.

HIBISCUS MILITARIS Cav. Seen by us only along the Nottoway River in SOUTHAMPTON COUNTY: Cypress Bridge, *F. & L.*, no. 6274; Courtland, *F. & L.*, no. 6834. See p. 340.

HYPERICUM SETOSUM L. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depression southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5844, *F. & L.*, no. 6278. NANSEMOND COUNTY: damp sandy and peaty woods and margin of bordering ditch, southwest of Whaleyville, *F. & L.*, no. 6836. See pp. 324, 335 and 364.

*H. DENTICULATUM Walt., var. OVALIFOLIUM (Britton) Blake. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond) about 4 miles northwest of Homeville, *F. & L.*, no. 6837. See p. 337.

*H. DISSIMULATUM Bickn. PRINCE GEORGE COUNTY: exsiccated argillaceous swale about 3 miles southeast of New Bohemia, *F. G. & L.*, no. 6638. ISLE OF WIGHT COUNTY: sandy roadside ditch south of Zuni, *F. G. & L.*, no. 6639. See p. 353.

*H. PETIOLATUM Walt., var. TUBULOSUM (Walt.) Fern. in RHODORA,

[1] Jour. N. Y. Bot. Gard. xxi. 167 (1920).

xxxviii. 436 (1936). *Triadenum longifolium* Small. Southampton County: sandy wooded bottomland of Nottoway River, Courtland, *F. & L.*, no. 6646. See p. 358.

Lechea.

Pending the publication in the next volume of Rhodora of Dr. Hodgdon's monograph of *Lechea*, the Virginia records are withheld.

*Viola affinis Le Conte, var. chalchosperma (Brainerd) Griscom. Southampton County: siliceous and argillaceous alluvium bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *F. & L.*, no. 6289. See p. 341.

*Viola lanceolata L., var. vittata (Greene) Weath. & Grisc. Sussex County: sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6290. See p. 337.

*Lythrum lanceolatum Ell. Sussex County: wet sandy thicket, Burt, *F. & L.*, no. 6295. See p. 342.

Rhexia ventricosa Fern. & Grisc. Prince George County: fallow argillaceous field east of Prince George, *F. L. & S.*, no. 5855. Chesterfield County: exsiccated argillaceous swale west of Petersburg Turnpike, north of Swift Creek, *F. & L.*, no. 6301. See p. 344.

R. mariana L., var. purpurea Michx. Prince George County: sphagnous boggy swale southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6300.

Extension from Southampton and Norfolk Counties.

R. ciliosa Michx. Prince George County: dryish upper border of sphagnous boggy swale, about 3 miles southeast of Petersburg, at head of Poo Run, *F. & L.*, nos. 6296 and 6626. Isle of Wight County: sphagnous depression in sandy pine woods south of Zuni, *F. & L.*, no. 6625. Nansemond County: damp sandy and peaty woods and margin of bordering ditch, southwest of Whaleyville, *F. & L.*, no. 6841. See pp. 335, 358 and 364.

Ludwigia hirtella Raf. Locally abundant in peaty depressions and boggy swales of Chesterfield, Prince George, Sussex and Nansemond Counties. See p. 335.

L. linearis Walt. Prince George County: sphagnous boggy swale, about 3 miles southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6652. Southampton County: sandy wooded swamp southwest of Cypress Bridge, *F. & L.*, no. 6306. See p. 335.

*Oenothera fruticosa L., var. humifusa T. F. Allen. Sussex County: fallow ploughed field in pineland, about 4 miles northwest of Waverly, *F. & L.*, no. 6440, *F. G. & L.*, no. 6657. See p. 347.

*Oe. fruticosa, var. Eamesii (Robinson) Blake. Sussex County: with the preceding, *F. & L.*, no. 6439, *F. G. & L.*, no. 6658. See p. 347.

Proserpinaca pectinata Lam. Isle of Wight County: swampy depressions in sandy woods, south of Zuni, *F. G. & L.*, no. 6660. See p. 354.

Photo. E. C. Ogden.

LYSIMACHIA LANCEOLATA: FIG. 1, base, × 1, from North Carolina; FIG. 2, calyx, × 4, from Virginia; FIG. 3, bases of cauline leaves, × 4, from North Carolina; FIG. 4, rosette-leaf, × 4, from Pennsylvania.

L. HYBRIDA: FIG. 5, base, × 1, from Massachusetts; FIG. 6, bases of cauline-leaves, × 4, from New Jersey; FIG. 7, calyx, × 4, from New Jersey.

Photo. H. G. Fernald.

GALIUM CIRCAEZANS, var. TYPICUM: FIG. 1, one of the TYPE specimens, × ½, courtesy of Professor H. HUMBERT; FIG. 2, lower leaf-surface, × 5, of plant from Georgia. Var. HYPOMALACUM: FIG. 3, TYPE, × ½; FIG. 4, lower leaf-surface, × 5.

Sanicula gregaria Bickn. Chesterfield County: wooded river-swamp along Appomattox River, near Hopewell, *F. L. & S.*, no. 5866.

*S. canadensis L., var. floridana (Bickn.) H. Wolff. Isle of Wight County: dry sandy yellow pine and oak woods north of Walters, *F. G. & L.*, no. 6661. See p. 354.

Hydrocotyle Canbyi C. & R. Isle of Wight County: along ditch bordering swampy woods, east of Joyner's Bridge, *F. & L.*, no. 6846.

Extension inland from Princess Anne County.

H. ranunculoides L.f. Surry County: margin of pond in cypress swamp, Sunken Meadow Beach, *F. & L.*, no. 6845. Sussex County: pool in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6314.

Extension inland from Princess Anne County.

Oxypolis rigidior (L.) C. & R. Prince George County: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6848.

The only time seen by us south of the James.

Kalmia angustifolia L. Isle of Wight County: "near Franklin," 1893, *Heller*, no. 1124; dry sandy woods and pine barrens south of Zuni, *F. G. & L.*, nos. 6665 and 6666. See p. 354.

The only area in the southeastern counties in which we have seen this essentially northern (even Hudsonian) species. The Isle of Wight material is transitional to the glandless southern extreme:

K. angustifolia L., var. **carolina** (Small), comb. nov. *K. carolina* Small, Fl. Se. U. S. 886, 1336 (1903). The only Virginia material of the variety seen by me is from region of Dismal Swamp, *Biltmore Herb.*, no. 1344[c].

Lyonia lucida (Lam.) C. Koch. Southampton County: margin of cypress swamp by Blackwater River, near Oak Grove School, *F. & L.*, no. 6667. See p. 359.

*Gaylussacia dumosa (Andr.) Torr. & Gray, var. Bigeloviana Fernald. Prince George County: border of dry woods east of Prince George, *F. L. & S.*, no. 5874.

The copiously glandular northern extreme. In the pine-barren areas only typical southern *G. dumosa* was seen.

Vaccinium Elliotii Chapm. Tall, often tree-like shrub up to 3.5 m. high, abundant in thickets and along streams in Southampton County. See p. 331.

*Pyxidanthera barbulata Michx. Isle of Wight County: dry sandy pine barrens, south of Zuni, *F. G. & L.*, no. 6669, *F. & L.*, no. 7137. See p. 355.

Galax aphylla L. To the few Coastal Plain stations add Isle of Wight County: rich wooded bank of Blackwater River near Joyner's Bridge, *F. G. & L.*, no. 6668.

Lysimachia radicans Hook. (*Steironema radicans* (Hook.) Gray.) Southampton County: siliceous and argillaceous alluvium bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *F. & L.*, no. 6332, distributed as *L. lanceolata*, var. *hybrida*. See p. 341.

Lysimachia radicans, characterized by its sprawling or arching habit, with the prolonged stems rooting at nodes and soon reclining, with long-petioled and membranaceous lanceolate to lance-ovate blades, and with small nodding flowers 8–12 mm. long, the calyx-lobes only 3–5 mm. long and exceeded by the capsule, has been standing in our manuals as a plant of Virginia. In the Gray Herbarium *L. radicans* has heretofore been represented only from the Mississippi drainage, Mississippi to eastern Texas, northward to western Tennessee and Missouri. Our material, though very inadequate, can be matched only in that species, but it shows an inclination to whorled leaves and its flowers are all solitary on simple peduncles in the axils of the primary leaves, instead of being borne on axillary branches as in most true *L. radicans*. Fuller material may show the plant of southeastern Virginia to be distinct.

The Identity of Lysimachia lanceolata (Plate 482). In preparing the Synoptical Flora of North America Asa Gray revived the genus *Steironema* Raf. for an American group, which some later authors, for instance Knuth[1] and Handel-Mazzetti,[2] treating the genus from a world-viewpoint, have put back as a section or a subsection into *Lysimachia*. Handel-Mazzetti shows that the characters relied upon to keep American *Steironema* apart break down in some Chinese species of *Lysimachia*, and that *Steironema* "cannot be treated as a different genus as has been done recently by some American botanists." Returning *Steironema* to *Lysimachia* is simple enough; the difficulty is in identification of some of the older types.

When Gray reviewed the plants which he treated as *Steironema lanceolatum* (Walt.) Gray, based upon *Lysimachia lanceolata* Walt. Fl. Carol. 92 (1788), he made it an inclusive species without clearly defined varieties. He published the combinations in 1876, in Proc.

[1] Knuth in Engler, Pflanzenr. iv[237]. 257, 276 (1905).

[2] Handel-Mazzetti in Notes, Roy. Bot. Gard. Edinb. xvi. 52 (1928) and in Die Pflanzenareale, 2 Riehe, v. Karten 44–49 (1929).

Am. Acad. xii. 63, but his definitions were published in the Synoptical Flora:

S. lanceolátum, Gray. Stems erect, a foot or two high, simple or paniculately branched, somewhat angled: leaves lanceolate or linear, an inch or two long, tapering into a short and margined ciliate petiole or attenuated base; the radical and sometimes lowest cauline from oblong to orbicular, small: corolla about two thirds inch in diameter; its divisions conspicuously erose and cuspidate-acuminate, slightly exceeding the lanceolate calyx-lobes.—Proc. Am. Acad. l. c. *S. heterophylla,* Raf. l. c. *S. florida,* Baudo, l. c., chiefly. *Anagallis lutea,* &c., Pluk. Alm. t. 333, f. 1. *Lysimachia lanceolata,* Walt. Car. 92. *L. hybrida & heterophylla,* Michx. Fl. i. 126. *L. ciliata,* var., Chapm. Fl. 280. *L. decipiens,* Bertoloni, Amoen.—Low grounds and thickets, western parts of Canada to Florida, and Nebraska to Louisiana. Polymorphous; the extremes in the following varieties, the first of which verges to the two preceding species.

Var. hýbridum. Cauline leaves mostly petioled, from oblong to broadly linear.—*Lysimachia lanceolata,* var. *hybrida,* Gray, l. c. *L. hybrida,* Michx. l. c. *L. heterophylla,* Ell., Nutt., &c.—Commoner northward and westward.

Var. angustifólium. Stems more branched, a span to 2 feet high: cauline leaves linear, acute at both ends, more sessile, a line or two broad.—*L. angustifolia,* Lam. Ill. i. 440, not Michx. *L. heterophylla,* Michx. l. c. *L. quadriflora,* Ell., hardly of Bot. Mag.—The more marked form mainly southward.[1]

In his earlier paper Gray had noted that "The species are not easy to define, as they incline to run into each other." This attitude toward them may account for Gray's inclusion of *Lysimachia heterophylla* Michx. Fl. Bor.-Am. i. 126 (1803) in the synonymy of both his *Steironema lanceolatum* (typical) and his var. *angustifolium* (Lam.) Gray, which rested upon *L. angustifolium* Lam. Ill. i. 440 (1797?). Subsequent authors, leaving *Steironema lanceolatum* much as defined by Gray, have separated *S. heterophyllum* (Michx.) Raf. from it as a species. There are certainly two well defined species included in Gray's general concept. In dry to moist open woods or thickets or in swales and on shores, but mostly in dryish habitats in the South, from Florida to Louisiana, northward into Pennsylvania, Ohio, southern Michigan and Wisconsin, is a species which for the time being may be called

No. 1. Stems slender and firm, 0.5–7 dm. high, from elongate cord-like or filiform rhizomes and stolons, simple or with ascending branches (the latter often abbreviated); basal leaves often rosulate, oblong, elliptic or rounded, petioled; middle and upper leaves linear to lanceolate or narrowly oblong, bristly-ciliate at base, sessile or subsessile,

[1] Gray, Synop. Fl. N. Am. ii. 61, 62 (1878).

pale beneath; calyx-segments firm, their lateral nerves not evident. Figs. 1–4.

Farther north, extending from Quebec to western Ontario and North Dakota, southward through the northeastern states and more locally to Florida and Texas, is a coarser plant of wet shores, sloughs and swamps. This may be called

No. 2. Stems stoutish, from a soft base, without stolons or slender rhizomes, 0.2–1.5 m. long, ascending or, when very elongate, becoming procumbent, the autumnal basal rosettes sessile or on short thick offshoots; cauline leaves linear-lanceolate to oblong, mostly petioled, green on both sides, the petiole, but rarely the blade, somewhat ciliate; calyx-segments herbaceous, 3-nerved. Figs. 5–7.

No. 1 is the plant described very clearly, though briefly, by Michaux (1803) as *Lysimachia:*

> HETEROPHYLLA. L. gracilis, glabra: foliis oppositis; imis suborbiculatis et brevi-petiolatis; superioribus linearibus, sessilibus, basi ciliolatis: floribus cernuis.
> *Obs.* Flores omnino Lysimachiae *ciliatae.*
> Pluck. *mantiss.* t. 333. fig. I. Affinis.
> *Hab.* in Georgia.[1]

It had with almost equal clarity been defined some years earlier by Lamarck as

> 1977 LYSIMACHIA *angustifolia.*
> L. foliis linearibus, basi ciliatis, sessilibus; pedunculis unifloris; corollis calyce brevioribus.
> E Carolina. *D. Fraser.*[2]

These, it will be noted, were both included by Gray under his *Steironema lanceolatum*, var. *angustifolium*, although *L. heterophylla* Michx. was also put by him under typical *S. lanceolatum*.

Both nos. 1 and 2 may have leaves of any outline from linear or linear-lanceolate and very narrow through broader-lanceolate to oblong. It becomes evident that Gray, not cognizant of the very different bases and other characters of nos. 1 and 2, was merely putting plants with "leaves lanceolate or linear, . . . tapering into a short . . . petiole" into his *Steironema lanceolatum;* those with "cauline leaves linear, . . . more sessile, a line or two broad" into his var. *angustifolium;* and those with "Cauline leaves mostly petioled, from oblong to broadly linear" into his var. *hybridum*, based on *Lysimachia hybrida* Michx. The really diagnostic characters were

[1] Michx. Fl. Bor.-Am. i. 127 (1803).
[2] Lam. Ill. i. 440 (1797 or earlier).

not noted by him. It consequently becomes significant, in going back to Walter's original account of his *L. lanceolata* to read:

> *lanceolata* foliis lanceolatis subsessilibus, petalis acumine terminatis.[1] 2.

The subsessile leaves and the abundance of our no. 1 (*L. angustifolia* Lam. and *L. heterophylla* Michx.) in Walter's territory and the rarity there (if it occurs at all) of our no. 2 make Gray's own examination of the Walter type of utmost importance. Studying Walter's herbarium on February 9th, 1839, Gray, with more modern American specimens for comparison, made the memorandum: "*Lysimachia lanceolata!* = mine from Michigan." This Michigan specimen, ticketed "HERB. A. GRAY" and marked in Gray's hand: "Michigan State Coll.", is very typical broad-leaved *L. angustifolia* Lam. or *L. heterophylla* Michx., showing clearly the cord-like rhizome, the round-tipped basal leaves, the subsessile ciliate-based cauline ones with the characteristic grayish sheen beneath, and the firm sepals. This plant, positively identified by Gray in 1839 with Walter's type, seems to settle the identity of *L. lanceolata* Walt. Singularly enough, however, in the Synoptical Flora, where he relied primarily on leaf-outline, Gray so far forgot his comparison of 1839 as to ticket the Michigan specimen as "*Steironema lanceolatum*, var. *hybridum*," thus making the already confounded confusion still worse!.

With no. 1 of page 439 reasonably settled as LYSIMACHIA LANCEOLATA Walt., the proper name must be found for no. 2, the coarser, thick-stemmed nonstoloniferous plant with middle and upper leaves more petioled and green beneath, and with herbaceous 3-nerved calyx-lobes. Apparently the oldest name for it is L. HYBRIDA Michx. Fl. Bor.-Am. i. 126 (1803). There is no reasonable doubt of the identity. Michaux was distinguishing our no. 1 as his *L. heterophylla*. His *L. hybrida* has "foliis oppositis, longe petiolatis, lanceolatis, basi sensim acutis; petiolo ciliato," etc.; and when I examined it in 1903, familiar only with the coarse plant of New England, I made the note: "*hybrida*. The common *lance*-leaved plant."

Some of the more recent names of Rafinesque, Greene and others doubtless designate variations in leaf-outline of the heteromorphic *Lysimachia lanceolata* and *L. hybrida*. I leave their interpretation to those who see value in them. One of Greene's proposed species of the

[1] Walt. Fl. Carol. 92 (1788).

group is *Steironema pumilum*. In Rydberg's Flora of the Prairies and Plains is the following key:

"Leaf-blades mostly ovate or ovate-lanceolate, rounded or subcordate at the base; . . . . . 1. *S. pumilum.*
Leaf-blades mostly lanceolate, cuneate at the base; . . . 2. *S. ciliatum.*"

Nevertheless, *S. ciliatum* is thus described just below: "blades ovate or lanceolate, . . . , acute, rounded, truncate, or subcordate at the base."

Lysimachia lanceolata is local in southeastern Virginia. James City County: margin of dried-up pond ½ mile south of Ewell, *Grimes*, no. 4481. Henrico County: exsiccated argillaceous swale, Libbie Avenue, Westhampton, *F. L. & S.*, no. 5888, distributed as *L. heterophylla*. Sussex County: rich oak woods near Moore's Mill, *F. & L.*, no. 7139.

*Fraxinus profunda Bush. Norfolk County: gum swamps and wet woods near Indian Creek, *F. & G.*, no. 4690, distributed as *F. pennsylvanica*. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5891. See p. 331.

Heretofore known from Louisiana to Georgia, north in the lower regions to Illinois, Indiana and Ohio.

Fraxinus caroliniana Mill., var. **pubescens** (M. A. Curtis), comb. nov. *F. platycarpa*, β. *pubescens* M. A. Curtis in Am. Journ. Sci. ser. 2, vii. 408 (1849). *F. Rehderiana* Lingelsheim in Engler, Pflanzenr. iv[243]. 42 (1920). *F. caroliniana*, var. *Rehderiana* (Lingels.), Sargent in Journ. Arn. Arb. ii. 173 (1921).—Quite as common as the glabrous-leaved typical *F. caroliniana*.

*Ligustrum sinense Lour. York County: border of dry woods, 2 miles south of Yorktown, *F. L. & F.*, no. 4991. Nansemond County: dry sandy woods and adjacent clearings, *F. L. & F.*, no. 4990. Isle of Wight County: border of dry sandy woods south of Zuni, *F. G. & L.*, no. 6670. See p. 353.

Cynoctonum Mitreola (L.) Britton. Prince George County: exsiccated argillaceous swale about 3 miles southeast of New Bohemia, *F. & L.*, no. 6339. Isle of Wight County: muddy margin of Blackwater River, near Joyner's Bridge, *F. & L.*, no. 6851. See pp. 345, 346 and 362.

Sabatia paniculata (Michx.) Pursh. Frequent in dry argillaceous fields, thickets and clearings of Chesterfield and Sussex Counties. See p. 339.

The milk-white corollas always change to yellowish or saffron-colored in the herbarium. Thinking that quick drying might save the color, we employed this method, but specimens which seemed

satisfactory when they came from press had lost their whiteness in a few weeks.

S. BRACHIATA Ell. SUSSEX COUNTY: sandy woods and clearings northwest of Homeville, *F. & L.*, no. 6344; dry argillaceous field north of Littleton, *F. & L.*, no. 6345; seen in abundance near Waverly. See p. 339.

Typical *Sabatia brachiata* has very handsome rosy-pink corollas. Occasional albinos are found, which in the field (see p. 339) strongly suggest *S. paniculata.* Their corollas however, are larger and they do not change to saffron-color after drying. The albino may be called

*S. BRACHIATA, forma **candida**, f. nov., corollis albidis.—VIRGINIA: Waverly, July 20, 1891, *A. B. Seymour*, no. 33, as *S. paniculata;* dry argillaceous field north of Littleton, July 22, 1936, *Fernald & Long*, no. 6346 (TYPE in Gray Herb.). See p. 339.

S. CALYCINA (Lam.) Heller. SOUTHAMPTON COUNTY: in swampy ground, Franklin, 1893, *Heller*, no. 1114[1]; border of muddy pool in Three Creek, Drewryville, *F. L. & S.*, no. 5895; siliceous and argillaceous alluvium bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *F. & L.*, no. 6348. ISLE OF WIGHT COUNTY: sandy alluvial woods, bottomland of Blackwater River, Zuni, *F. & L.*, no. 6349. See p. 340.

S. CAMPANULATA (L). Torr. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depression southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 6350. SUSSEX COUNTY: sandy and peaty depression (exsiccated shallow pond), about 4 miles northeast of Homeville, *F. & L.*, no. 6351. See p. 337.

Typical *Sabatia campanulata* or *Chironia campanulata* L. (1753), upon which it rests, is, as shown by a photograph supplied by Mr. Savage, the plant which ranges from Massachusetts to eastern Virginia, thence taking to the mountains of North and South Carolina and southward to southern Georgia and Alabama. In this plant the primary cauline leaves are oblong-linear to lanceolate, the pedicels are naked or only slightly bracted, the linear calyx-segments (except in small secondary flowers) 1–2 cm. long, the corolla-segments 1–1.7 cm. long. On the Coastal Plain from Florida to Louisiana and North Carolina occurs *S. gracilis* Michx., which is commonly reduced outright to *S. campanulata.* In its best development, however, it is smaller throughout, with the lower cauline leaves linear, the upper very narrowly so, the pedicels mostly leafy-bracted, the linear-acicular calyx-segments 6–14 mm. long, the corolla-segments 6–14 mm. long. The material from southeastern Virginia stands midway

[1] See Heller, l. c. 24 (1894).

between most typical *S. campanulata* and *S. gracilis*, having the narrow leaves and calyx-segments of the latter but many of the pedicels naked, and the long calyx and large corolla of the former. This transitional series in southeastern Virginia makes it clear that *S. gracilis* should be treated as a geographic variety:

Sabatia campanulata (L.) Torr., var. **gracilis** (Michx.), comb. nov. *Chironia gracilis* Michx. Fl. Bor.-Am. i. 146 (1803).

Gentiana Porphyrio J. F. Gmel. Nansemond County: very rare at border of dry sandy pine woods south of Factory Hill, *F. & L.*, no. 6852. See p. 364.

Bartonia paniculata (Michx.) Muhl. Prince George County: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6860. Nansemond County: damp sandy and peaty woods and margin of bordering ditch, southwest of Whaleyville, *F. & L.*, no. 6859.

Trachylospermum difforme (Walt.) Gray. Frequent in damp thickets and at borders of wet woods, northward to Henrico County: exsiccated argillaceous swale, Libbie Avenue, Westhampton, *F. L. & S.*, no. 5897.

Here noted because not included in Merriman's *Flora of Richmond and Vicinity*.

Asclepias rubra L. Prince George County: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5901; similar habitat on headwaters of Blackwater River, *F. L. & S.*, no. 5902. See p. 326.

Acerates viridiflora (Raf.) Eaton. Prince George County: dry pineland west of Prince George, *F. & L.*, no. 5900.

The only time seen by us in the southeastern counties.

Breweria humistrata (Walt.) Gray. Frequent in dry sandy woods and openings, Southampton and Sussex Counties. See pp. 333 and 339.

Hydrolea quadrivalvis Walt. Sussex County: water-hole in sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, nos. 6362 and 6671. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5864. See pp. 332 and 338.

Although the species appears in manuals as a native of Virginia, our collections seem to be the first from north of the extreme southern boundary of the state. Heller's collection (no. 1162) of 1893, the previous basis, is slightly equivocal. It bears a label, headed "Plants of Northeastern North Carolina. Collected near Margarettsville, Northampton Co.," but the label bears the annotation "On the Va. line."[1]

[1] See Heller, l. c. 25 (1894).

Photo. E. C. Ogden.

EUPATORIUM ALBUM, var. TYPICUM: FIG. 1, leaf, × 2, from Virginia; FIG. 2, involucre, × 4, from New Jersey.

Var. GLANDULOSUM: FIG. 3, involucre, × 4, from South Carolina.

Var. MONARDIFOLIUM: FIG. 4, portion of TYPE, × ⅖; FIG. 5, leaf, × 2, from North Carolina; FIG. 6, involucre, × 4, from TYPE.

Var. SUBVENOSUM: FIG. 7, leaf, × 2, from TYPE; FIG. 8, involucre, × 4, from TYPE.

Photo. E. C. Ogden.

EUPATORIUM LEUCOLEPIS: FIG. 1, characteristic foliage, × ⅖, from New Jersey; FIG. 2, stem and leaf-bases, × 4, from Virginia.

Var. NOVAE-ANGLIAE: FIG. 3, type, × ⅖; FIG. 4, stem and base of median leaf, × 4; FIG. 5, stem and upper leaves, × 4.

HELIOTROPIUM EUROPAEUM L. HENRICO COUNTY: waste places and roadsides, Richmond, *F. L. & S.*, no. 5904.

H. INDICUM L. SOUTHAMPTON COUNTY: sandy alluvial bottomland of Nottoway River, Courtland, *F. & L.*, no. 6862. See p. 366.

ONOSMODIUM VIRGINIANUM (L.) A. DC. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5905.

The only time seen in the southeastern counties.

*VERBENA SCABRA Vahl. SURRY COUNTY: border of tidal marsh along Gray's Creek, near Cross Creek Landing, south of Swann Point, *F. & L.*, no. 6863. See p. 365.

*TRICHOSTEMA DICHOTOMUM L., var. **puberulum** Fernald & Griscom, var. nov., caulibus puberulis, ramis similibus vel minute glandulosis vix pilosis.—Mississippi to Florida, north locally to southeastern Virginia. TYPE: Duval County, Florida, *Curtiss*, no. 1976 (in Gray Herb.).

The only material we have seen from north of Florida is our collection from Cedar Hill, NORFOLK COUNTY, no. 2884. All material seen from Florida and Mississippi is clearly of this variety.

Typical *T. dichotomum* L., as ascertained by Mr. C. A. Weatherby on studying the type and as shown by a photograph of it sent from the Linnean Society, is the common and wide-spread plant which has much longer (pilose) pubescence and abundant, usually longer-stalked, glands. Transitional material is common from southern Cape May, New Jersey to southeastern Virginia.

T. LINEARE Walt. ISLE OF WIGHT COUNTY: dry sandy yellow pine and oak woods north of Walters, *F. G. & L.*, no. 6675; border of dry sandy woods near Joyner's Bridge, *F. G. & L.*, no. 6676. See p. 357.

PHYSOSTEGIA DENTICULATA (Ait.) Britton. SOUTHAMPTON COUNTY: siliceous and argillaceous alluvium bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *F. & L.*, no. 6368. ISLE OF WIGHT COUNTY: sandy alluvial woods, bottomland of Blackwater River, Zuni, *F. & L.*, no. 6369. See p. 340.

PYCNANTHEMUM CLINOPODIOIDES T. & G., NORFOLK COUNTY: border of rich woods, south of Great Bridge, *F. L. & F.*, no. 5021. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, nos. 5023–5025. SUSSEX COUNTY: sandy woods and clearings northeast of Homeville, *F. & L.*, no. 6380.

An inland species rare on the Coastal Plain.

*PYCNANTHEMUM PYCNANTHEMOIDES (Leavenworth) Fernald, var. **viridifolium**, var. nov., foliis primariis subtus viridescentibus vix canescentibus hispidis; calycis dentibus apice sparse setosis.—Greensville County, VIRGINIA: in clay at border of a dry thicket, near James River Junction, August 19, 1936, *Fernald, Griscom & Long*, no. 6678

(TYPE in Gray Herb.; ISOTYPES in Herb. Phil. Acad., Herb. Griscom and elsewhere). See p. 353.

Typical *Pycnanthemum pycnanthemoides* of the mountains from Virginia and Kentucky to Georgia and Alabama, has, as originally described by Leavenworth (as *Tullia pycnanthemoides* from eastern Tennessee) the leaves whitened beneath. Their lower surfaces are canescent with minute soft pubescence and the calyx-lobes are abundantly supplied with setae. Var. *viridifolium* is a coastal-plain extreme, with the large oval leaves and the very large lilac-purple and conspicuously spotted corolla of the mountain plant, but only the uppermost or bracteal leaves are whitened, the others green and rather coarsely hispid beneath, while the calyx-teeth have only a single (rarely more) terminal bristle. Exactly the same variation is represented in the Gray Herbarium by an old specimen (without locality but presumably near Santee Canal) from *H. W. Ravenel;* and one of Asa Gray's collections (again without stated locality) shows mixed with more characteristic *P. pycnanthemoides* from "Mts. Carol. 1843," a specimen with the green leaves and the pubescence of var. *viridifolium* but with the more bristly calyx-teeth of the mountain plant.[1]

P. VIRGINIANUM (L.) Durand & Jackson. SUSSEX COUNTY: wet sandy thicket, Burt, *F. & L.*, no. 6376.

The only time seen in the southeastern counties.

LYCOPUS EUROPAEUS L. SURRY COUNTY: roadside by sandy thicket, Sunken Meadow Beach, *F. & L.*, no. 6865.

*L. AMERICANUS Muhl., var. LONGII Benner. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5910. SUSSEX COUNTY: water-hole in sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, nos. 6382 and 6681. NANSEMOND COUNTY: ditches bordering sandy woods, Factory Hill, *F. & L.*, no. 6682. See p. 329.

*MICRANTHEMUM UMBROSUM (Walt.) Blake. SOUTHAMPTON COUNTY: sandy alluvial bottomlands of Three Creek, Drewryville, *F. L. & S.*, no. 5913. ISLE OF WIGHT COUNTY: muddy margin of Blackwater River, near Joyner's Bridge, *F. & L.*, no. 6866. See pp. 331 and 362 and MAP 8.

CHELONE CUTHBERTII Small. PRINCE GEORGE COUNTY: swampy woods west of New Bohemia, *F. L. & S.*, no. 5911. SOUTHAMPTON

[1] In studying this series it has been found necessary to make the following combination:

PYCNANTHEMUM **Beadlei** (Small), comb. nov. *Koellia Beadlei* Small in Bull. Torr. Bot. Cl. XXV. 470 (1898).

County: sandy wooded swamp southwest of Cypress Bridge, *F. & L.*, no. 6388. See p. 328 and map 3.

Penstemon australis Small. Southampton County: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6384; sandy thickets and openings along Nottoway River at Sycamore Bend, *F. & L.*, no. 6386. Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6385. Isle of Wight County: dry sandy yellow pine and oak woods near Walters, *F. & L.*, no. 6387. See p. 339.

Slight northern extension.

Scrophularia marilandica L. Sussex County: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6383. See p. 342.

The only time seen in the southeastern counties.

*Seymeria cassioides (Walt.) Blake. Greensville County: sandy clearing north of Emporia, *F. G. & L.*, no. 6690. Isle of Wight County: dry sandy pine barrens south of Zuni, *F. G. & L.*, no. 6691, *F. & L.*, no. 6867. See pp. 352 and 355 and map 24.

Buchnera americana L. Prince George County: dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. L. & S.*, no. 5918, *F. & L.*, no. 6736.

Apparently the first known station on the Coastal Plain of Virginia, unless Clayton, whose explorations extended west to the Shenandoah Valley, got it in the eastern counties. See p. 329.

Schwalbea americana L. Greensville County: sandy clearing north of Emporia, *F. G. & L.*, no. 6695. See p. 352 and map 23.

Our material is very mature, much of the fruit already disintegrating, but on the lower internodes and on the intact fruiting calyces the characteristic reflexed hairs are apparent and the anterior sepals are blunt, as reputed in the northeastern series of specimens, which Pennell treats as typical *Schwalbea americana*. In his detailed discussion of the group Pennell cites *S. americana* as occurring from "Massachusetts and New York to Maryland and perhaps Virginia"—Pennell, Scroph. E. N. Am. 486 (1935). He there states that *S. americana* was "Based wholly upon Gronovius' Flora Virginica 71. 1743, where the plant is described and typified by Clayton's number 33 from Virginia. This, seen in Herb. British Museum (Natural History) at London, is the northern species now considered. How Clayton obtained the plant, and even whether it came from Virginia is uncertain, since Gronovius' label quotes this remark of his: 'A plant very uncommon, wholly unknown to me: though I think it agrees in most respects with the Clandestina of Tournefort,' while another slip states: 'Mr. Clayton of Virginia An. 1734. Numb. 33', doubtless recording the year of receipt by Gronovius."

The statement of Clayton that the plant was "wholly unknown to me" apparently simply meant that he did not recognize it, not that he had received it from some source outside Virginia; and his statement hardly justifies doubt of his having personally collected the plant. At least, we now know *Schwalbea americana* from Virginia, whence it was described, although it is possible that Clayton secured it farther to the north in the state, our station being in one of the southernmost counties (bordering North Carolina). From Clayton's map of Virginia, however, it is evident that he was cognizant of the region southward, he showing the Nottoway River (his no. 48) with its tributary, the Blackwater (no. "49 Nigra aqua").

Pennell separates the more southern material (North Carolina and Kentucky to Florida and Louisiana) as *Schwalbea australis* Pennell in Proc. Acad. Nat. Sci. Phila. lxxi. 289 (1920). His key-differences, in his later treatment, are as follows:

"A. Pubescence of stem, pedicels, and calyx consisting of upcurved, usually shorter hairs; leaf-blades elliptic-oval, usually about 1.5 cm. wide, usually more obscurely veined; anterior calyx-lobes acute or acutish.....1. *S. australis.*

AA. Pubescence of stem, pedicels, and calyx consisting of recurved hairs; leaf-blades elliptic-lanceolate, rarely over 1 cm. wide, usually evidently veined; anterior calyx-lobes obtuse.....2. *S. americana.*"

The more extreme specimens are well marked but minute "upcurved" pubescence occurs on some Massachusetts specimens; in fact, a fine specimen in the Gray Herbarium from Sandwich, Massachusetts, has such pubescence and Pennell has annotated it in the herbarium as *Schwalbea australis.* Its anterior calyx-lobes, however, are blunt as in *S. americana,* but its oval leaves are 2 cm. broad, extreme even for *S. australis* and surely for *S. americana* as defined. Although in the Gray Herbarium Pennell correctly marked this embarrassing plant as *S. australis,* he cites it as *S. americana.* I do not see how it and *Curtiss,* no. 6742, TYPE of *S. australis,* essentially differ; the latter, as represented in the Gray Herbarium, likewise has its lower leaves 2 cm. broad. Narrower-leaved plants do occur in both the North and the South but of the 7 southern sheets (*S. australis*) 4 have their broadest leaves only 8–13 mm. broad, while the majority of northern plants show their broadest leaves 7–12 mm. broad. I am unable to separate two varieties and much less two species.

PEDICULARIS LANCEOLATA Michx. CHESTERFIELD COUNTY: wooded

river-swamp along Appomattox River near Hopewell, *F. L. & S.*, no. 5919.

Slight extension southward.

[UTRICULARIA VIRGATULA Barnhart. In a previous paper, RHODORA, xxxviii. 444 (1936), I recorded the station in Northampton County as "An important discovery, giving us a station intermediate between Cape May, New Jersey and Florida and Cuba." Dr. S. F. Blake kindly calls my attention to a station recorded in Hitchcock & Standley's *Flora of the District of Columbia and Vicinity*, 255 (1919) near Suitland, about as far west of Cape May as the Savage Neck station is to the south. I apologize for overlooking the record, somewhat obscured under the alias *Stomoisia virgatula*.]

*CATALPA SPECIOSA Warder. SOUTHAMPTON COUNTY: border of dry woods, Ivor, probably original trees planted but now well naturalized, *F. & L.*, no. 6396, *F. G. & L.*, no. 6696. See p. 347.

THE TYPE OF GALIUM CIRCAEZANS (PLATE 483). *Galium circaezans* consists of two well defined geographic varieties. The wide-ranging plant of the North, from Maine and southwestern Quebec to Minnesota and Nebraska, south in the uplands to interior North Carolina, Kentucky, Missouri and Oklahoma, is coarser than the southern extreme, its larger leaves 2–5 cm. long and 1–2.5 cm. broad, their nerves conspicuously long-hirsute beneath. In the South, from Florida to Texas, the plant is more slender and with smaller and less pubescent leaves, the larger ones only 1.5–2.5 cm. long by 0.7–1.4 cm. broad, the nerves beneath sparingly short-hispid to glabrous. This southern extreme meets the northern in Virginia and elsewhere, extending very locally to Rhode Island, Connecticut, New York, Kentucky and southern Michigan. Impressed by the general occurrence of the small- and smoother-leaved extreme in the South, it has seemed important to determine just what Michaux had before him when he described *G. circaezans* from Carolina. Through the great courtesy of Professor Humbert and the skill of M. Cintract I now have a remarkably clear photograph of the type (FIG. 1). It consists of three fruiting stems of the southern extreme, its blunt, oval leaves 1.5–2 cm. long by 7–12 mm. broad, with very short and scattered hispidity on the veins beneath. It was perfectly described by Michaux, "foliis quaternis, ovalibus, . . . margine ciliato nervisque (armato oculi) hirsutulis"; and it is the blunt-leaved form of the nearly smooth plant described as *G. circaezans* var. *glabrum* Britton, from eastern New York.

Since typical *Galium circaezans* is the chiefly southern extreme with

small and sparsely hispid to glabrous leaves, the more northern extreme may be called

GALIUM CIRCAEZANS Michx., var. **hypomalacum**, var. nov. (TAB. 483, FIG. 3 et 4), foliis majoribus 2–5 cm. longis 1–2.5 cm. latis, nerviis subtus longe hirsutis.—Dry woods, southern Quebec to Minnesota, south to the uplands of North Carolina, Kentucky, Missouri and Oklahoma. TYPE: open dry woods, Peoria, Illinois, July, 1903, *F. E. McDonald* in Gray Herb.

The bibliography of typical *Galium circaezans* follows.

GALIUM CIRCAEZANS Michx., var. **typicum.** *G. circaezans* Michx. Fl. Bor.-Am. i. 80 (1803). *G. boreale?* Walt. Fl. Carol. 87 (1788), not L. *G. circaeoides* R. & S. Syst. iii. 256 (1818). Var. *glabrum* Britton in Bull. Torr. Bot. Cl. xxi. 32 (1894). Var. *glabellum* Britton, Mem. Torr. Bot. Cl. v. 303 (1894).

In plate 483, prepared by Henry G. Fernald, FIG. 1 is one of the TYPE specimens of var. TYPICUM, × ½; FIG. 2, the lower leaf-surface of var. TYPICUM, × 5, from Marietta, Georgia, *R. N. Larrabee*. FIG. 3 is the TYPE of var. HYPOMALACUM, × ½; FIG. 4 the lower surface of a leaf, × 5.

HOUSTONIA TENUIFOLIA Nutt. SUSSEX COUNTY: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6400. See p. 342.

*H. LANCEOLATA (Poir.) Britton. NANSEMOND COUNTY: Suffolk, July 15, 1895, *J. W. Blankinship.*

A species of the interior of the continent, Alabama to Oklahoma, north to Kentucky, Illinois and Missouri. On the Atlantic slope, locally from eastern Virginia to southern Maine.

Only station seen for this and several companion species on the Coastal Plain.

*OLDENLANDIA BOSCII (DC.) Chapm. SOUTHAMPTON COUNTY: open sandy borders of pools and depressions, bottomland of Nottoway River, Courtland, *F. & L.*, no. 6700. See p. 359.

SYMPHORICARPOS ORBICULATUS Moench.

The frequent statement that *Symphoricarpos orbiculatus* is naturalized or a garden escape eastward does not apply to southeastern Virginia. From Dinwiddie to Surry County and southward it is a consistent part of the native thickets and undergrowth. In fact, it was recorded from Virginia by Pursh, in 1814, as *Symphoria glomerata.*

LOBELIA GLANDULIFERA (Gray) Small. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6877; exsiccated argillaceous swale about 3 miles southeast of New Bohemia, *F. & L.*, nos. 6406 and 6876. See pp. 339, 345 and 363 and MAP 20.

The Varieties of Eupatorium album (Plate 484). *Eupatorium album* L., distinguished at a glance by its oblanceolate, narrowly obovate, broadly oblong or narrowly ovate leaves and its prolonged acuminate or attenuate scarious involucral bracts, has proved somewhat perplexing in the field. Upon studying all the material at hand the species seems to resolve itself into four geographic varieties, three of them strongly defined, the fourth perhaps better treated as a forma, though, because of a certain geographic segregation, I am, for the present, maintaining it as a variety. For a beautifully clear photograph of the type of *E. album* I am indebted to the well-known kindness of Mr. Spencer Savage, Assistant Secretary of the Linnean Society of London. As I understand the species it breaks as follows:

a. Principal leaves spatulate, oblanceolate or narrowly obovate, obtuse, narrowed at base, they and the stem villous or strongly pilose.
Involucre glandless or essentially so . . . . . Var. *typicum.*
Involucre copiously dark-glandular . . . . . Var. *glandulosum.*
a. Principal leaves oblong, oblong-lanceolate or narrowly oblong-ovate, acute, the broad bases more rounded, their pubescence short and sparse or wanting.
Leaves firm, the larger with 10–20 prominent coarse teeth on each margin, pinnately veined . . . . . Var. *monardifolium.*
Leaves submembranaceous to firm, the larger with 3–10 low teeth on each margin or entire, triple-nerved from the base . . . . . Var. *subvenosum.*

Var. **typicum.** *E. album* L. Mant. 111 (1767).—Dry or sandy woods, thickets and clearings, Coastal Plain, New Jersey to Cape Charles, Virginia, locally inland to the District of Columbia; along or on the mountains, South Carolina and Georgia, extending out to the Coastal Plain in South Carolina, northwestern Florida and southeastern Alabama. Figs. 1 and 2. Map 35.

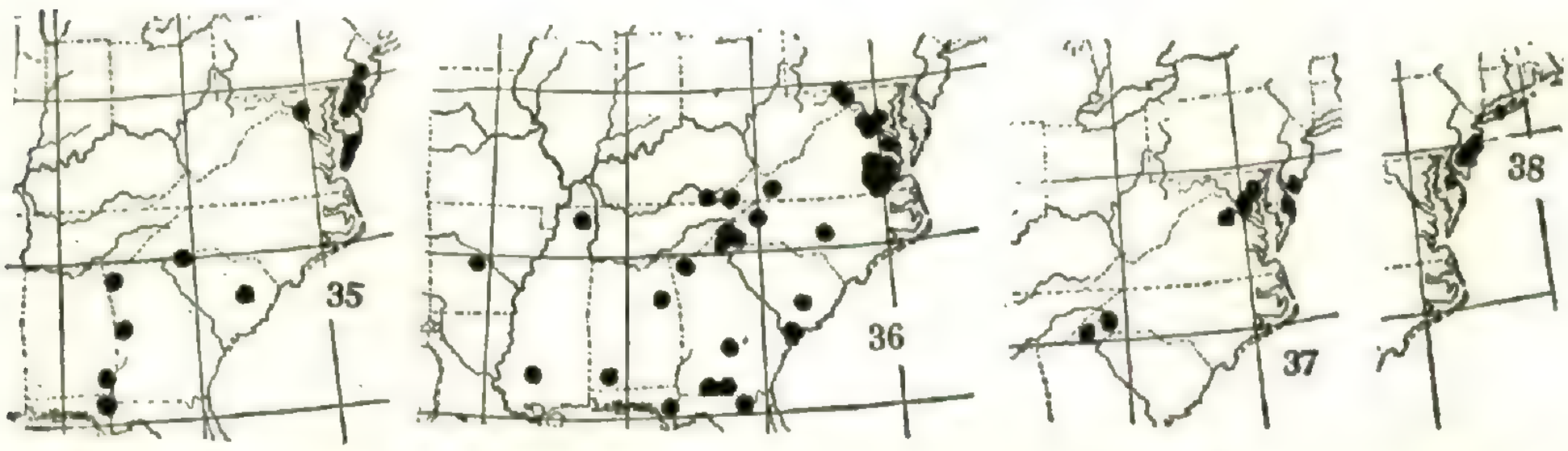
In our Virginia field-work we have seen var. typicum (with glandless or essentially glandless involucres) only on the Eastern Shore where it is abundant. We have never met it or any variety of the species in the two southeastern counties; but from Nansemond County to the Fall Line all the plants (very many) which we have seen have copiously glandular involucres and belong to the next.

*Var. **glandulosum** (Michx.) comb. nov. *E. glandulosum* Michx. Fl. Bor.-Am. ii. 98 (1803). *E. stigmatosum* Bertol. Misc. v. 15, t. 5 (1846).—From the Inner Coastal Plain and Piedmont of Maryland and Virginia to central Arkansas, south to northern Florida, southern Alabama, southern Mississippi and (?) Louisiana. Fig. 3. Map 36.

Michaux's diagnosis, "calycibus 5-floris, creberrime glanduloso-punctatis, lineari-subulatis," supported by a photograph of his type

("in aridis sylvarum Carolinae") secured by the late Dr. Robinson, leaves no doubt as to the identity of his *E. glandulosum*. Similarly Bertolini's beautiful plate and his "squamis . . . linearibus, acuminatis . . . nigropunctatis" satisfactorily identify his *E. stigmatosum*. In our Virginia field-work we did not meet var. *glandulosum* on the Eastern Shore, where var. *typicum* abounds; conversely, although var. *glandulosum* abounds on the Inner Coastal Plain, we met no satisfactory var. *typicum* there.

*Var. **monardifolium**, var. nov. (TAB. 484, FIG. 4–6), foliis oblongis vel oblongo-lanceolatis vel anguste oblongo-ovatis firmis scabris basi rotundatis apice acuminatis margine grosse serratis vel serrato-dentatis, dentibus utrinque 10–20.—Cape May, New Jersey and adjacent Delaware; Prince George County, Maryland to western



MAP 35, range of EUPATORIUM ALBUM var. TYPICUM; 36, var. GLANDULIFERUM; 37, var. MONARDIFOLIUM; 38, var. SUBVENOSUM.

North Carolina. NEW JERSEY: dry, sandy soil, Cape May Point, August 26, 1922, *Fogg*, no. 195. DELAWARE: oak copse, Rehoboth, September 5, 1908, *J. R. Churchill*. MARYLAND: dry soil, between Muirkirk and Contee, September 5, 1910, *A. H. Moore*, no. 4823; gravelly field, near Chillum, September 24, 1926, *S. F. Blake*, no. 9723 (TYPE in Gray Herb.). VIRGINIA: wooded ridge north of Beverley, Fauquier Co., September 29, 1935, *H. A. Allard*, no. 994. NORTH CAROLINA: Burke Co., *Buckley* (cited by Gray in Synop. Fl. as doubtfully his var. *subvenosum*); moist grounds near Biltmore, September 2, 1897, *Biltmore Herb.*, no. 399[b]; woodlands near Biltmore, September 14, 1909, *Biltmore Herb.*, no. 3816.[b] MAP 37.

When he described *Eupatorium album*, var. *subvenosum* from Long Island and the Pine Barrens of New Jersey Asa Gray cited the Burke County plant with doubt; and on the sheet he noted "Leaves less 3-nerved." This is indeed the case and with the coarser and more abundant teeth and the harsher and firmer leaf-surfaces the pinnate venation well sets off var. *monardifolium*. Its limited and rather inland range, as thus far known, and its isolation at Cape May and in ad-

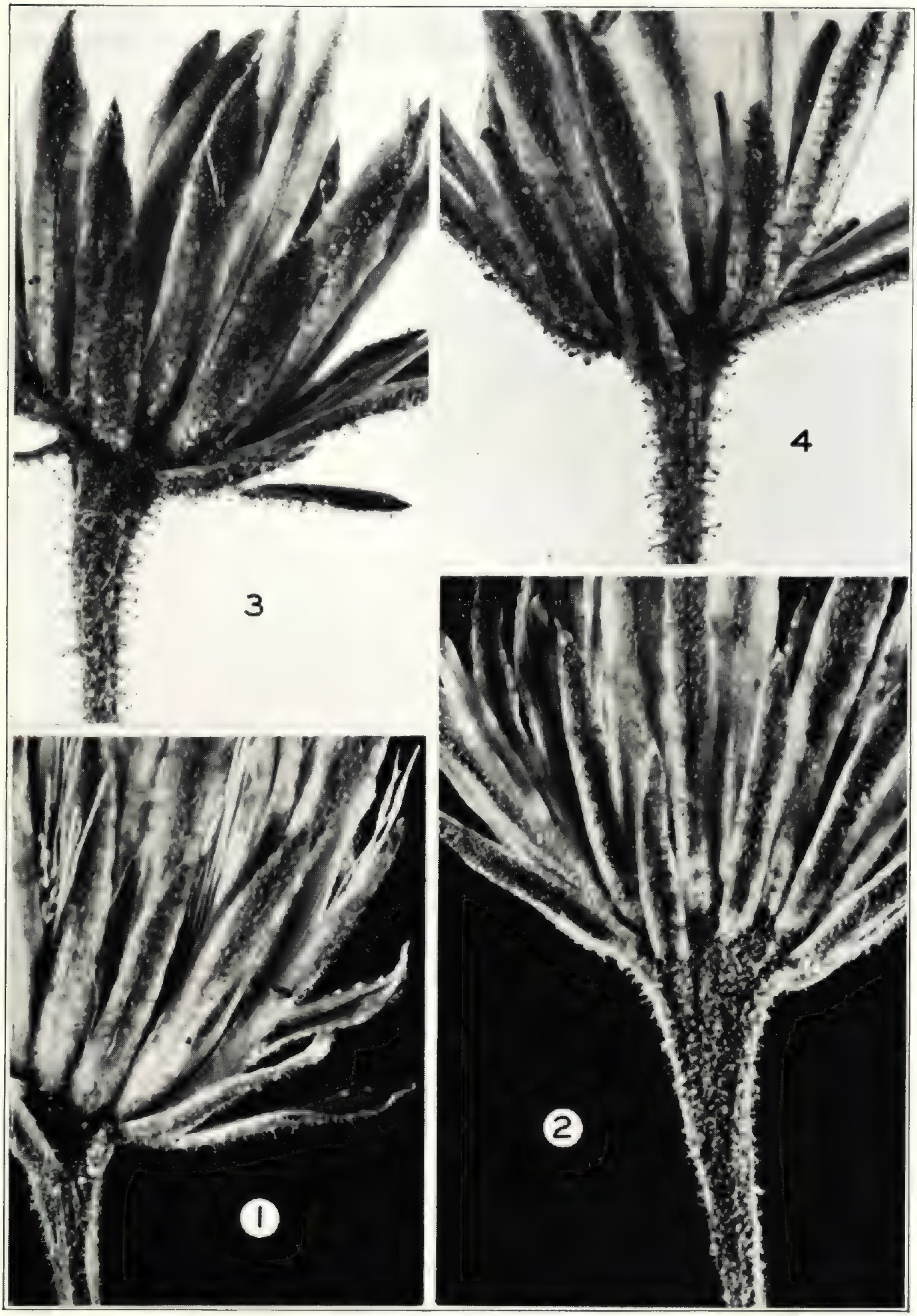


Photo. E. C. Ogden.

CHRYSOPSIS MARIANA, both figs. × 8: FIG. 1, involucre from New Jersey; FIG. 2, from Virginia.

Var. MACRADENIA, both figs. × 8: FIG. 3, involucre from Waverly, Virginia (TYPE); FIG. 4, from near Williamsburg, Virginia.

Photo. E. C. Ogden.

RUDBECKIA HIRTA: FIG. 4, lower surface of leaf, × 10, from Rhode Island.
Var. SERICEA: FIG. 3, lower surface of leaf, × 10, from North Dakota.
Var. CORYMBIFERA: FIG. 1, TYPE, × ⅖; FIG. 2, lower surface of leaf, × 10.

jacent Delaware are interesting in view of the considerable continental element in the Cape May flora, as emphasized by Stone and others.

Var. SUBVENOSUM Gray, Synop. Fl. N. Am. i^2. 98 (1884).—Known only from pine-barrens of Long Island, New Jersey and Delaware. FIGS. 7 and 8. MAP 38.

*EUPATORIUM LEUCOLEPIS (DC.) Torr. & Gray. CHESTERFIELD Co.: exsiccated argillaceous swale west of Petersburg Turnpike, north of Swift Creek, *F. & L.*, nos. 6408, 6878. PRINCE GEORGE Co.: argillaceous and siliceous boggy depression, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 6879. See pp. 344 and 360.

The first collections, apparently, from between South Carolina and Delaware. See p. 345. The Virginia plant, like the material from South Carolina, Georgia, Florida, Alabama and Louisiana is quite like the typical plant of Delaware and New Jersey. The species was based on *E. glaucescens*, β *leucolepis* DC. Prodr. v. 177 (1836). This was the characteristic New Jersey plant, as shown by a photograph of the type secured by the late Dr. B. L. Robinson in 1905.

The plant of southern Rhode Island and southeastern Massachusetts which has passed as *Eupatorium leucolepis* is a strongly defined geographic variety which I am calling

EUPATORIUM LEUCOLEPIS (DC.) Torr., var. **novae-angliae**, var. nov. (TAB. 485, FIG. 3–5), caulis internodiis superioribus pilosis; foliis plerumque planis subacuminatis acute serratis dentibus subpatentibus subtus pilosis vel hispidis; venis lateralibus primariis subtus elevatis basi longe decurrentibus.—Pond-shores, Plymouth Co., Massachusetts and Washington County, Rhode Island. MASSACHUSETTS: shore of Smelt Pond, Kingston, August 30, 1908, *W. P. Rich & C. H. Knowlton;* muddy margin, Micajah's Pond, Plymouth, September 13, 1925, *L. B. & F. E. Smith, jr.;* edge of Triangle Pond, Plymouth, August 26, 1928, *Griscom*, no. 12,706 (exceptionally small-leaved); gravelly upper beach of King Pond, Plymouth, August 30, 1928, *Fernald & Griscom*, no. 1076; damp sandy shore of Loon Pond, Lakeville, August 26, 1913, *Fernald & Long*, no. 10,492 (TYPE in Gray Herb.). RHODE ISLAND: sandy and peaty shore, southern end of Long Pond, South Kingstown, September 5, 1914, *Collins & Fernald*, no. 11,444; granitic gravel and sand about small pond east of Long Pond, South Kingstown, September 5, 1914, *Collins & Fernald* in Pl. Exsicc. Grayanae, no. 280.

In typical *Eupatorium leucolepis* (FIGS. 1 and 2) the pubescence of the stem is much finer than in var. *novae-angliae*, a cinereous puberulence (FIG. 2); the leaves are commonly plicate and blunt, with sup-

pressed or appressed low teeth (FIG. 1), the lower surface minutely and canescently puberulent (FIG. 2) or subglabrous, and the triple nervation starts at the base of the leaf (FIG. 2). Ordinarily the leaves are smaller and they decrease in size more rapidly up to the inflorescence. In var. *novae-angliae* the upper internodes and the lower leaf-surfaces have longer and coarser pubescence, the usually flat leaves are subacuminate, usually larger and more gradually decreasing in size to the summit of the stem, sharply serrate, and the 2 strong lateral nerves, producing the "triple-nerving," leave the midrib well above the base, their lower one-fourth or one-fifth being decurrent along the midrib.

FIG. 1 is of a plant of typical *Eupatorium leucolepis*, × 2/5; FIG. 2 an internode and the bases of leaves, × 4. Var. *novae-angliae* is similarly shown: FIG. 3 the TYPE, × 2/5; FIG. 4 internode and leaf-bases, × 4.

It is noteworthy that the New England stations of the variety are all in the areas which recent studies indicate were uninvaded by Wisconsin ice. The migration to or from southern New England over the now submerged continental shelf was in pre-Pleistocene or in an early Pleistocene inter-glacial epoch, antedating the Wisconsin. The southern and the northern areas have, consequently, been long enough separated to establish marked varietal differences; but the involucres, achenes and corollas show no constant differences which we should demand if the two plants were to be considered specifically separate.

KUHNIA EUPATORIOIDES L. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5930.

The only time seen by us in the southeastern counties.

*CARPHEPHORUS BELLIDIFOLIUS (Michx.) T. & G. ISLE OF WIGHT COUNTY: dry sandy pine barrens south of Zuni, *F. G. & L.*, no. 6707, *F. & L.*, no. 6883; border of dry sandy woods near Joyner's Bridge, *F. G. & L.*, no. 6708. See pp. 354, 355 and 357.

*C. TOMENTOSUS (Michx.) T. & G. ISLE OF WIGHT COUNTY: open white sand in dry pine barrens, south of Zuni, *F. G. & L.*, no. 6709, *F. & L.*, no. 6882. See pp. 355 and 361.

LIATRIS SQUARROSA (L.) Willd. Frequent in HENRICO COUNTY. Otherwise seen by us only in PRINCE GEORGE COUNTY: dry sandy open soil south of Petersburg, *F. & L.*, no. 6416.

CHRYSOPSIS GRAMINIFOLIA (Michx.) Nutt. All material collected by us on the EASTERN SHORE and in PRINCESS ANNE COUNTY, westward to ISLE OF WIGHT and NANSEMOND COUNTIES is the glandless typical form of the species. In Prince George County all colonies examined are the glandular

C. GRAMINIFOLIA, var. ASPERA (Shuttlew.) Gray. PRINCE GEORGE COUNTY: dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. & L.*, no. 6711; dry sandy pine woods about 3 miles northwest of Disputanta, *F. & L.*, no. 6418; border of argillaceous and siliceous boggy depression north of Gary Church, *F. & L.*, no. 6712.

*CHRYSOPSIS MARIANA (L.) Nutt., var. **macradenia**, var. nov. (TAB. 486, FIG. 3 et 4), pedunculis involucrisque grosse glandulosis, glandulis plerumque stipitatis sordidis vel fuscis.—Virginia and West Virginia to the mountains of North Carolina. The following are characteristic. VIRGINIA: 1 mile northwest of Williamsburg, October 19, 1920, *Grimes*, no. 3191; dry pine and oak woods about 3 miles southwest of Waverly, October 20, 1936, *Fernald & Long*, no. 6885 (TYPE in Gray Herb.; ISOTYPE in Herb. Phil. Acad.); woods near Hopewell Gap, Bull Run Mts., September 22, 1935, *H. A. Allard*, no. 932. WEST VIRGINIA; dry clay soil, Clintonville, Greenbrier County, August 13, 1922, *L. F. & F. R. Randolph*, no. 1297. NORTH CAROLINA: barrens, alt. 3000 ft., Swain Co., August 20, 1891, *Beardslee & Kofoid;* Waynesville, September 25, 1897, *T. G. Harbison;* below Satulah Mt., Highlands, September 2, 1902, *E. E. Magee.*

Typical and wide-spread *Chrysopsis mariana* has minute cinereous glandularity (FIGS. 1 and 2) on the involucre and peduncles, the glands varying from short-stipitate to subsessile and in all the material I have seen from southern New York, New Jersey, Pennsylvania, Delaware, Maryland, the East Shore and Princess Anne and Norfolk Counties, Virginia, and southward into Florida, also from Ohio to Alabama and Mississippi, the minute glands are pale. Familiar with the typical plant with minute and pale glandularity, we were at once struck by the heavy and dark glands of var. *macradenia.* The specimens at hand suggest the familiar Allegheny-Blue Ridge-Coastal Plain affinity.

In Florida *Chrysopsis mariana* passes insensibly into the local extreme with involucre viscid-puberulent and barely glandular. This is

C. MARIANA, var. **floridana** (Small), comb. nov. *C. floridana* Small, Fl. Se. U. S. 1183, 1339 (1903).

In PLATE 486 peduncles and bases of involucres, × 8, of the two varieties which occur in Virginia are shown to make clear the differences.

SOLIDAGO FISTULOSA Mill. Common in the easternmost counties, its western limit in this region seems to be in ISLE OF WIGHT COUNTY: along ditch bordering swampy woods, east of Joyner's Bridge, *F. & L.*, no. 6889.

S. GRAMINIFOLIA (L.) Salisb., var. POLYCEPHALA Fern. SUSSEX COUNTY: swampy depression in pinelands about 4 miles northwest of Waverly, *F. & L.*, no. 6891. See p. 361.

*S. GYMNOSPERMOIDES (Greene) Fern. NORTHAMPTON COUNTY: open thicket back of salt marsh, east of Eastville, *F. & L.*, no. 5528.

A characteristic species of the prairie region from Minnesota to Nebraska, south to Louisiana and Texas. Its isolation in the East very surprising but singularly paralleled in a few cases, such as *Eleocharis Lindheimeri* (MAP 58) at False Cape.

*BOLTONIA *sp.*

The plant referred to on p. 358 is an undescribed species otherwise known only from southeastern South Carolina. Its publication awaits completion of an extended study of the genus.

ASTER CORDIFOLIUS L. SURRY COUNTY: border of woods, Clermont Wharf, *F. & L.*, no. 6895.

Apparently an intrusion into the Coastal Plain by way of the James River.

*GNAPHALIUM SPATHULATUM Lam. HENRICO COUNTY: waste places and roadsides, Richmond, *F. L. & S.*, nos. 5940 and 5941.

G. CALVICEPS Fern. DINWIDDIE COUNTY: roadside at border of sandy woods near Carson, *F. L. & S.*, no. 5942. Also noted but not collected near Hopewell, CHESTERFIELD COUNTY.

Extension inland from Cape Henry region.

GNAPHALIUM OBTUSIFOLIUM L., var. PRAECOX Fern. Common in borders of dry sandy woods and thickets in GREENSVILLE, SOUTHAMPTON, SUSSEX and ISLE OF WIGHT COUNTIES. See p. 340.

SILPHIUM COMPOSITUM Michx. Borders of dry sandy woods and in sandy clearings, frequent northward to CHESTERFIELD and PRINCE GEORGE COUNTIES. See p. 329.

HELIOPSIS HELIANTHOIDES (L.) Sweet, var. **solidaginoides** (L.) comb. nov. *Silphium solidaginoides* L. Sp. Pl. 920 (1753).

Photographs kindly sent me by Mr. Savage and by Mr. Ramsbottom of the material in the Linnean Herbarium and similar material in Clayton's herbarium at the British Museum show *Silphium solidaginoides* to be a small-headed southern extreme of *Heliopsis helianthoides*. Besides the Clayton collection the following have been examined.

VIRGINIA: dry wooded slope, Tutters Neck Pond, southeast of Williamsburg, September 24, 1921, *Grimes*, no. 4462; rich woods, Great Neck, Princess Anne County, September 5, 1935, *Fernald & Long*, no. 5122. WEST VIRGINIA; near Miller School, Lincoln County, July 2, 1929, *W. Va. Univ. Bot. Exped.* GEORGIA: open field by Dixie Lake, 2 miles east of Athens, June 21, 1934, *L. M. Perry*, no. 1092. ALABAMA: locality not stated, *Gates*.

Var. *solidaginoides* differs from the wide-ranging typical *Heliopsis helianthoides* in its very small heads and thinner and basally more tapering leaves. In typical *H. helianthoides* the firm leaves are commonly (though not always) more rounded at base; the central and largest heads are much coarser, with the outer bracts 3–6 mm. broad, the disk 1–1.6 cm. high and 1.7–2.5 cm. broad; the ligules are 5–8 mm. broad; the disk-corollas 4–5 mm. long with prolonged lobes; the achenes also 4–5 mm. long.

Heliopsis helianthoides, var. *solidaginoides* in its small heads and achenes approaches the southern *H. gracilis* Nutt. (1841) = *H. minor* (Hook.) Mohr (1901). The latter is a slender more or less decumbent plant with much smaller leaves (1–3 cm. broad), smaller heads and shorter achenes. It occurs from Georgia and Florida to Arkansas and Louisiana. It was *H. laevis*, var. *minor* Hook. Comp. Bot. Mag. i. 98 (1835), described from Drummond's material from Louisiana, a good sheet of which is before me. When Farwell made the combination *H. helianthoides*, var. *minor* (Hook.) Farwell in Mich. Acad. Sci. Rep. xix. 260 (1917) for a monocephalous Michigan plant it is probable that his material was not like that from Louisiana.

*Rudbeckia hirta, var. **corymbifera**, var. nov. (tab. 487, fig. 1 et 2), villosis; caulibus valde corymboso-ramosis, ramibus erectis foliosis, pedunculis abbreviatis (1–5 cm. longis); ligulis 1–2 cm. longis.—Argillaceous fields and clearings of Chesterfield and Prince George Counties, Virginia. Type: argillaceous field, Half-way House, Chesterfield County, Virginia, June 20, 1936, *Fernald, Long & Smart*, no. 5947 (in Gray Herb., isotypes in Herbs. Phil. Acad. and Univ. Richmond); also from same station (topotypes), *Fernald, Long & Smart*, no. 4946 and *Fernald & Long*, no. 6432.

Var. *corymbifera* departs at once from the other varieties of *Rudbeckia hirta* in its leafy erect branches at the summit of the stem and in its very short or almost suppressed peduncles. In its extreme development (fig. 1) it is unusually villous and the lower surfaces of the leaves have a dense and very soft pubescence (fig. 2) suggesting that of var. *sericea*,[1] but longer. Typical *R. hirta*, var. *sericea*, var. *monticola*[2] and var. *Brittonii*[3] all have long naked peduncles, the first or leading head of the stem standing high on a peduncle 6–35 cm.

[1] **Rudbeckia hirta L., var. sericea (T. V. Moore), comb. nov.** ***R. sericea*** **T. V. Moore in Pittonia, iv. 178 (1900).**

[2] **R. hirta L., var. monticola (Small), comb. nov.** ***R. monticola*** **Small in Torreya i. 67 (1901).**

[3] **R. hirta L., var. Brittonii (Small), comb. nov.** ***R. Brittonii*** **Small in Mem. Torr. Bot. Cl. iv. 130, t. 79 (1894).**

long. In order to show the relationship of var. *corymbifera* I am appending the following key.

a. Heads definitely peduncled, the first or leading head of the primary axis on a naked peduncle becoming 6–35 cm. long (1/5–1/2 height of the plant) above the uppermost well developed leaf. . . . *b.*

b. Basal leaves oblanceolate, 1–3 (–5) cm. broad; cauline leaves from linear-lanceolate to lance-elliptic or oblanceolate, the lowest sessile ones 0.5–2 (–3) cm. broad, entire or nearly so.

Pubescence of the lower leaf-surfaces variously spreading, with broad open glabrous areas between the conspicuous green bulbous bases of the trichomes. . . . . *R. hirta* (typical).

Pubescence of both leaf-surfaces closely appressed (or chiefly so), the crowded hairs chiefly parallel with the midrib, with minute or obscure pale bulbous bases. . . . Var. *sericea.*

b. Basal leaves ovate to rhombic-oval, 2.5–7 cm. broad; cauline leaves mostly with ovate blades, the lowest sessile ones (2–) 2.5–6.5 cm. broad, usually coarsely toothed.

Inner bracts of involucre linear or linear-lanceolate. . . Var. *monticola.*

Inner bracts of involucre oblong. . . . . Var. *Brittonii.*

a. Heads subcorymbose, on short leafy erect branches, the central head on a peduncle only 1–5 cm. long (1/60–1/15 the height of the plant); leaves as in typical *R. hirta* in outline. . . . . Var. *corymbifera.*

FIG. 4 is of characteristic pubescence, × 10, of the lower surface of a leaf of typical *Rudbeckia hirta* from Rhode Island, to show the scattered trichomes and their large bulbous bases; FIG. 3 is of characteristic pubescence of the lower surface of var. *sericea*, and FIG. 2 that of var. *corymbifera.*

These three varieties of *Rudbeckia hirta* all become weedy; and typical *R. hirta* and var. *sericea* have spread generally over the Northeastern States and eastern Canada. So far as we yet know, var. *corymbifera* is restricted to the inner border of the Coastal Plain in Virginia. Vars. *monticola* and *Brittonii* are more conservative woodland plants, the former occurring from Berkshire County, Massachusetts to Illinois, south to Georgia and Alabama, the latter from western Virginia and West Virginia to Alabama. I am taking as var. *Brittonii* the plant described and illustrated by Small, originally from "southern slopes of White Rock Mountain," one of "the highest points in Virginia." Something seems to have slipped, for in Small's *Manual* (1933) his *R. Brittonii* is given the restricted range, "Ala. [bama] to Tenn. [essee]".[1]

[1] In organizing the material of *Rudbeckia* I have found it necessary to make the following transfers.

R. SUBTOMENTOSA Pursh, forma **Craigii** (Sherff), comb. nov. Var. *Craigii* Sherff in RHODORA, XIV. 164 (1912).

R. TRILOBA L., var. **Beadlei** (Small), comb. nov. *R. Beadlei* Small, Fl. Se. U. S. 1258 (1903).

HELIANTHUS MOLLIS Lam. SUSSEX COUNTY: locally abundant on railroad bank about 3 miles southeast of Waverly, *F. & L.*, no. 6433.

*BIDENS CONNATA Muhl., var. FALLAX (Warnst.) Sherff. SUSSEX COUNTY: swale at border of woods, 4 miles south of Stony Creek, *F. G. & L.*, no. 6729.

*COREOPSIS GLADIATA Walt. NANSEMOND COUNTY: thickets and ditches bordering sandy woods, Factory Hill, *F. & L.*, nos. 6728 and 6906. See pp. 360 and 363.

*TAGETES MINUTA L. SOUTHAMPTON COUNTY: roadside south of Courtland, *F. L. & S.*, no. 5949; sandy alluvial bottomland of Nottoway River, Courtland, *F. & L.*, no. 6913. ISLE OF WIGHT COUNTY: sandy waste ground and roadsides, Lee's Mill, *F. & L.*, no. 6912. See pp. 362 and 366.

ARTEMISIA LUDOVICIANA Nutt., var. GNAPHALODES (Nutt.) T. & G. ISLE OF WIGHT COUNTY: spreading about old house-site bordering dry sandy woods, south of Zuni, *F. & L.*, no. 6916.

*CIRSIUM NUTTALLII DC. SOUTHAMPTON COUNTY: sandy thickets north of Sycamore Bend, *F. & L.*, no. 6438. See p. 344.

PRENANTHES AUTUMNALIS Walt. Frequent in dry or moist pinelands, PRINCE GEORGE, SUSSEX, ISLE OF WIGHT and NANSEMOND COUNTIES. See p. 360.

(*To be continued*)

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XVI

NORMAN C. FASSETT

XYRIS **papillosa,** n. sp., foliis 12 cm. vel minus longis, apice obtusis vel rotundatis basi exterioribus papillosis; scapis 3.5 cm. vel minus longis; capitulis ovoideis; bracteis eroso-denticulatis; sepalis lateralibus mucronulatis carinis apice erosis.—Lake Windigo (or Bass Lake), Hayward, WISCONSIN, July 28, 1934, *J. J. Davis* (TYPE in Herb. Univ. of Wis.).

X. PAPILLOSA, var. **exserta,** n. var., bracteis inferioribus carinis viridibus; sepalis superioribus apice exsertis, carinis integris vel subintegris.—Woodruff, WISCONSIN, August 8, 1936, *J. J. Davis* (TYPE in Herb. Univ. of Wis.).

Immature seeds of the Woodruff plant are about 750 μ long, as compared to a length of 500 μ in *X. caroliniana,* and they appear as if the longitudinal markings would at maturity be of a coarser type than those of *X. caroliniana,* somewhat suggesting those of *X. torta.* *X. caroliniana,* perhaps the closest relative of *X. papillosa,* is found as far northwest as the dunes region at the head of Lake Michigan.

Woodruff is almost 320 miles northwest of that region, while Hayward is about 410 miles from the dunes and some 90 miles west of Woodruff.

X. papillosa was collected by Dr. Davis on the last of his many trips to Hayward, and the material of var. *exserta* was found in his office, among the few collections left unstudied by him at the time of his death in February, 1937. Unfortunately, his data did not include the name of the lake, of which there are very many about Woodruff.

The members of the genus *Xyris* in the Great Lakes region may be distinguished as follows:

a. Upper scales with a terminal tuft of castaneous multicellular hairs; lateral sepals ciliate; plant bulbous ..... *X. torta.*
a. Scales entire or erose; lateral sepals erose, denticulate or entire; plant not bulbous ....*b.*
b. Plants with slender rootstocks, forming a turf; heads narrowly ellipsoid; scales brown throughout; (lateral sepals with tips exserted; lowest scale winged) ..... *X. montana.*
b. Plants without rootstocks; head broadly ellipsoid; scales with a central green area ....*c.*
c. Scales entire except for tearing with age; lateral sepals not mucronulate; leaves smooth, tapering to acute or acuminate usually straight tips ..... *X. caroliniana.*
c. Scales denticulate; lateral sepals mucronulate; lower leaves papillate especially toward the base, abruptly narrowed to obtuse or rounded tips which are usually turned to one side ....*d.*
d. Sepals erose on the wing above, the tips not exserted; lowest scale thickened but rarely winged ..... *X. papillosa.*
d. Sepals nearly or quite entire, the tips often exserted; lowest scale with a green wing ..... *X. papillosa* var. *exserta.*

STELLARIA **muscorum**, n. sp., caulis laxis, 4.5 dm. vel minus longis, bifurcatis, pedunculis axillaribus; foliis spathulatis 2–4 cm. longis; pedunculis 4–5.5 cm. longis; sepalis 3-costatis, 3 mm. longis, marginibus scariosis; petalis 5–7 mm. longis, oblongis, apice dentatis; antheris globosis, 0.3 mm. diametro; seminibus 1 mm. diametro, laevibus lucentibusque.—Stems lax, reaching 4.5 dm. in length, dichotomously branching, with a peduncle between each pair of branches; leaves spatulate, 2–4 cm. long; peduncles becoming 4–5.5 cm. long; sepals 3-ribbed, 3 mm. long, scarious-margined; petals 5–7 mm. long, oblong, toothed at the apex; anthers spherical, 0.3 mm. in diameter; seeds 1 mm. in diameter, smooth and shining.—Wet springy limestone cliff, Dripping Springs, Delaware Co., OKLAHOMA, April 19, 1936, *N. C. Fassett & V. M. Watts*, no. 18030 (TYPE in Herb. Univ. of Wis.).

S. muscorum, appearing as an Ozarkan homologue of the Alleghenian *S. fontinalis*, resembles that species in its dichotomous branching, spatulate leaves, and 3-ribbed sepals, but differs in the

possession of petals, its larger anthers (those of *S. fontinalis* being only about 0.1 mm. in diameter, and in its larger, smooth seeds (those of *S. fontinalis* being 0.5 mm. in diameter and pebbled).

The habitat of *S. fontinalis* is described as "on the cliffs of the Kentucky River and Elkhorn Creek; forming mats in wet places where the water of springs flows over."[1] *S. muscorum* is at the head of a deep ravine, among mosses which are constantly dripping with water from crevices in the rock and from the fine spray of a waterfall.

To Mr. C. A. Weatherby, who first recognized the affinities of this species, the writer is deeply grateful.

ANEMONELLA THALICTROIDES (L.) Spach, f. **chlorantha**, n. f., sepalis viridibus, basi albis.—Damp limestone cliff, Brighton, MISSOURI, April 24, 1937, *N. C. Fassett*, no. 18606 (TYPE in Herb. Univ. of Wis.).

In this form the ordinarily white or pink sepals are green and of leaf-like texture except for a small white area at the base.

MADISON, WISCONSIN.

DID SYMPHORICARPOS ALBUS COME ORIGINALLY FROM CANADA?—The common snowberry, long known as *Symphoricarpos racemosus*, was described by Linnaeus as *Vaccinium album*[2] in Species Plantarum i. 350 (1753), and originated from Kalm's collection, the habitat being given as "Pensylvania." But if we take into consideration one of Kalm's letters[3] written to Linnaeus in 1751, the actual place of origin may well be Canada and not Pennsylvania. This letter, written from Åbo in Finland, contains descriptive notes on six species of *Vaccinium* found in North America, the last one being as follows:

"6. *Vaccinium baccis albis insipidis.* So har jag kallat en liten buske som jag fan växande på höga mullbacker vid sidan af Laurence flod i Canada d. 22 Aug. 1749." [So I have called a little bush which I found growing on the high hills beside the St. Lawrence River in Canada on the 22nd of August, 1749.] Kalm goes on to say that though the appearance was in general that of a *Vaccinium*, he felt quite uncertain about the genus, since only mature fruit was available, which resembled that of *Cornus herbacea* [*C. suecica*] in taste, but which was so insipid as to be inedible.

[1] Short & Peter, Transylv. Journ. Med. vii. 600 (1836).
[2] See Blake, RHODORA xvi. 117 (1914).
[3] J. M. Hulth, Bref och Skrifvelser af och till Carl von Linné i[8]. 80 (1922). Uppsala.

From his notes in diary form we know that Kalm arrived at Quebec on August 5, 1749,[1] and that he collected extensively in the surrounding country, but unfortunately no entries were made for August 22. However, from the cited correspondence it seems fairly clear that the snowberry came originally from Canada.—H. K. Svenson, Brooklyn Botanic Garden.

TWO NEW SPECIES OF ARCTOSTAPHYLOS FROM THE ROCKY MOUNTAINS

Reed C. Rollins

New roads in many portions of the west have recently opened to botanical exploration areas previously unvisited. Such a road, facilitating travel in a little known region, brought to attention the two new species of *Arctostaphylos* described below.

The Uncompahgre Plateau, from which the two species were obtained, is unique as a somewhat isolated structural uplift. The plateau reaches an elevation of more than ten thousand feet, the upper reaches of which support a luxuriant vegetational cover. Proceeding to lower levels, one is amazed at the rapid transformation to an arid-transitional flora. On the north and western slopes of the plateau, among and adjacent to the Ponderosa Pines, *Arctostaphylos pinetorum* and *A. coloradensis* are to be found in abundance. Both species are gregarious, the former often forming extensive thickets on the "breakish" points of the plateau.

Arctostaphylos **pinetorum**, sp. nov. Shrub 1–2 m. high, forming dense beds 10 meters to 0.8 kilometer (half-a-mile) in diameter; stems erect or somewhat spreading, 3–10 cm. in diameter toward base, intricately and widely branched above; exfoliating bark of stems and branches dark brownish-red; branchlets and petioles glandular-puberulent; leaves erect or divergent, green, ovate, obtuse at both ends or rarely acutish at apex, entirely glabrous or often minutely glandular near base; blade 2–4 cm. long, 1.5–2.5 cm. wide; inflorescence loosely paniculate, flowers few; bracts and rachis minutely glandular-puberulent; bracts subulate to broadly lanceolate, acute; pedicels glabrous, 2–6 mm. long; corolla white to rose, 5–8 mm. long; sepals orbicular and rounded at apex, scarious-margined; mature berry creamy white to yellowish-brown, round to depressed-globose, shining and glabrous, flesh farinaceous; nutlets 3–5, usually coalescent, smooth, light brown in color.

[1] Travels into North America, ed. Forster 445 (1772).

Frutex 1–2 m. alta; caulibus erectis, divaricato-ramosis; ramis vetustioribus rubidis, glabris; ramis junioribus et petiolis glanduloso-puberulentibus; foliis erectis vel divaricatis, viridibus, glabris, ovatis; laminis 2–4 cm. longis, 1.5–2.5 cm. latis; inflorescentiis paniculatis; bracteis rachique glanduloso-puberulentibus; bracteis subulatis vel lanceolatis; pedicellis 2–6 mm. longis, glabris; corolla alba vel roseo-alba, 5–8 mm. longa; sepalis orbiculatis; drupis maturis, subalbis, glabris, depresso-globosis vel rotundis.—COLORADO: 3 miles west of Cold Spring Ranger Station, Uncompahgre Plateau, T 50 N, R 16 W, Mesa Co., Sept. 1, 1936, *Rollins 1586* (TYPE in Gray Herb.); Buckeye Basin, Montrose Co., July 20, 1912, *Walker 324* (G[1]); rocky hillsides, Paradox, Montrose Co., Nov. 20, 1912, *Walker 567* (G), *Utah:* among Lodgepole Pines, Stillwater Fork, Uinta Mts., Summit Co., July 15, 1926, *Payson 4975* (G); in lodgepole forest, Uinta Mts., Aug. 13, 1931, *Greenman 4645* (G).

Although similar in many respects and probably most closely related to the Sierran *Arctostaphylos patula* Greene, this species differs in having conspicuously glandular-puberulent branchlets, a loose paniculate inflorescence of few flowers, rather uniformly ovate leaves which are nearly always erect or erect-spreading, creamy to yellowish-brown, mealy berries and a strikingly gregarious habit. These features together with a wide geographic separation, serve effectively to distinguish *A. pinetorum.*

A puzzling phenomenon concerning the berries of *Arctostaphylos pinetorum,* is the apparent dehiscence which occurs while they are still attached. The flesh curls back along indefinite lines leaving the bony nutlets exposed. That this feature is not an anomaly cannot be definitely stated; however, the fact that it was repeatedly scrutinized and generally observed in the field would lend support to such an assertion.

ARCTOSTAPHYLOS **coloradensis**, sp. nov. Shrub 3–6 dm. high forming dense beds 3–10 meters in diameter; stems spreading or decumbent, 1–2 cm. in diameter toward base, intricately and irregularly branched; exfoliating bark dark red, glabrous; branchlets and petioles glandular-puberulent; leaves erect, divergent or often pendulous, obovate, not cuspidate-mucronate, glabrous or minutely glandular toward base; blades 2–3 cm. long, 1–1.5 cm. wide; petioles 4–7 mm. long; inflorescence congested-paniculate; bracts and rachis glandular-puberulent; bracts lanceolate-attenuate, the lower foliaceous, oblong and acute; pedicels glabrous, 2–4 mm. long; sepals orbicular, scarious-margined; berry globose, bright red when mature; nutlets roughened, single-ribbed dorsally, more or less coalescent; flowers unknown.

[1] Gray Herbarium.

Frutex 3–6 dm. alta; caulibus ramosis, divaricatis vel decumbentibus; ramis vetustioribus rubidis, glabris; ramis junioribus et petiolis glanduloso-puberulentibus; foliis divaricatis vel erectis, viridibus, glabris, obovatis vel spathulatis, apice non cuspidatis, non mucronatis; laminis 2–3 cm. longis, 1–1.5 cm. latis; petiolis 4–7 mm. longis; paniculis congestis; bracteis inferioribus foliaceis, oblongis, apice acutis, superioribus lanceolatis, glanduloso-puberulis; sepalis orbiculatis; drupis globosis, glabris; pedicellis glabris, 2–4 mm. longis; floribus ignotis.—COLORADO: 3 miles west of Cold Spring Ranger Station, Uncompahgre Plateau, Mesa Co., Sept. 1, 1936, *Rollins 1587* (TYPE in Gray Herb.).

Arctostaphylos coloradensis is most closely re'ated to *A. nevadensis* Gray, of the high mountains of middle California and northward, with which it agrees in pubescence and leaf-shape. The proposed species differs from *A. nevadensis* chiefly in having uniformly larger leaves which are rounded at the apex and neither cuspidate nor mucronate and in its more robust, upright habit, often reaching a height of two feet. The plants are, in general, gregarious, forming round beds rather than a continuous carpet of forest floor cover. The procumbent branches often root and send up new shoots, thus spreading the plants in a circular manner.* The wide disparity in geographic distribution of these related species virtually completes the separation.

The range of *Arctostaphylos pinetorum* and *A. coloradensis* as indicated by the specimens cited, seems to center in the north-central portion of the Colorado Plateau Province. These species then, may be considered integrants of the Rocky Mountain flora.

GRAY HERBARIUM,
HARVARD UNIVERSITY.

[1] During the past summer, a reexamination of these two species for evidence of root-enlargement and crown-sprouting was made. Four plants of *A. pinetorum* and two of *A. coloradensis* were excavated, but none of the plants showed an appreciable root-enlargement of any sort. Crown-sprouting apparently does not take place, nor is such an adaptation required for survival, since forest fires have not been known to occur in the area, at least for the last hundred years.

Volume 39, no. 466, including pages 377–424 and plates 474–481, was issued 9 October, 1937.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. December, 1937. No. 468.

CONTENTS:

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

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Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. December, 1937. No. 468.

LOCAL PLANTS OF THE INNER COASTAL PLAIN OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from page 459*)

Part III. Phytogeographic Considerations

The flora of the Coastal Plain of Virginia is far more complex than has been generally recognized. Without attempting at this time a general discussion of all the floristic elements, it seems desirable to take up certain features which do not require prolonged consideration.

1. The Pine-Barren Flora. The idea has been much propagated, that Virginia has few of the characteristic species which give special interest to the Pine Barrens of New Jersey and the region centering on Wilmington in southeastern North Carolina. This idea has been specially developed by the southern botanist, Dr. R. M. Harper, who, having known some of the more concentrated pine barrens farther south, has seen, from the moving express train, little to interest him in eastern and southeastern Virginia. His verdicts follow: "The coastal plain of Delaware, Maryland and Virginia seems to lack many of the species common in New Jersey and the southern pine-barrens, though some of them will probably be reported when those parts are better explored."[1] "Of the country between Norfolk and Emporia there is little to be said . . . More swamps and bogs were seen west of Norfolk . . . but no true pine-barrens"[2]; "For some reason not altogether obvious, the flora of those parts of

[1] R. M. Harper, as reported in Torreya, vii. 44 (1907).
[2] R. M. Harper, Torreya, ix. 220, 221 (1909).

the eastern United States where either *Pinus Taeda* or *Pinus echinata* is the most abundant tree is rather uninteresting, as it consists of comparatively few and widely distributed species; and such regions are consequently not much frequented by botanists and not often described in botanical literature"[1]; "The pine-barrens of New Jersey and those of the southeastern states have been celebrated botanizing grounds for a century or more; but in the corresponding regions between the Delaware and Roanoke Rivers [the lower Roanoke River in North Carolina] there seem to be very few typical pine-barren plants, or other species, which are not more common elsewhere. It is not surprising therefore that comparatively little has been published about this region."[2]

Handicapped, then, by the abundance of either *Pinus Taeda* or *P. echinata*, the Coastal Plain of southeastern Virginia should not, by Harper's interpretation, be worth visiting by a botanist. Nevertheless, in search for a productive area for range-extensions and novelties, I have been there at intervals in four successive summers, Long has had three seasons and Griscom parts of two; we have just been busy with still another year of thrilling discoveries and range-extensions. Areas of true pine barren, resembling those of New Jersey or southeastern North Carolina are, indeed, limited in extent and very few in eastern Virginia, and they are not seen nor explored from express trains. The best and most typical pine barren we yet know lies between the two railroads from which Harper made his chief observations in riding between Portsmouth and Petersburg and, again, between Portsmouth (or Norfolk) and Emporia. There we get, scattered in the half-shade of *Pinus Taeda* or *P. echinata*, such pine-barren plants, mostly already noted (and here mentioning only a few) as *Panicum lancearium*, *Rynchospora distans*, *Scleria ciliata* Michx., var. *Elliottii* (Chapm.) Fern., *Xyris flexuosa* (*arenicola*), *Juncus abortivus* (MAP 28), *Zigadenus glaberrimus*, *Quercus laevis* (*Catesbaei*), *Polygonella polygama*, *Arenaria caroliniana* (MAP 29), *Crotalaria rotundifolia* and *Purshii*, *Zornia bracteata*, *Desmodium tenuifolium*, *Euphorbia Ipecacuanhae*, *Rhexia ciliosa*, *Proserpinaca pectinata*, *Kalmia angustifolia*, *Pyxidanthera barbulata*, *Breweria humistrata*, *Trichostema lineare*, *Penstemon australis*, *Seymeria cassioides* (MAP 24), *Carphephorus tomentosus* and *bellidifolius* and *Helianthus angustifolius*.

[1] Harper, l. c. 217 (1909).
[2] Harper, l. c. 217, 218 (1909).

In the area south of the James and Chesapeake Bay and east of the main Seaboard Air Line, whence other car-window botanizing was done, many other worth-while pine-barren or pine-land species occur: *Andropogon Mohrii*, *Panicum strigosum*, *consanguineum* (MAP 47), *nitidum*, *longiligulatum*, *albomarginatum* and *mutabile* (MAP 15), *Agrostis elata* (MAP 30), *Ctenium aromaticum* (MAP 11), *Rynchospora fascicularis*, *Wrightiana* and *Torreyana* (MAP 32), *Carex Barrattii* (MAP 25), *Xyris ambigua* and *Curtissii*, *Lachnocaulon anceps*, *Eriocaulon decangulare*, *Tofieldia racemosa*, *Aletris aurea*, *Hypoxis sessilis* and *micrantha*, *Cleistes divaricata* (MAP 2), *Quercus cinerea*, *Asimina parviflora*, *Drosera brevifolia*, *Baptisia villosa*, *Rhynchosia tomentosa*, *Linum floridanum*, *Polygala Harperi* and (superabundant) *lutea* (MAP 45), *Cnidoscolus stimulosus*, *Ilex vomitoria*, *Hypericum setosum* and *denticulatum* var. *ovalifolium*, *Centella repanda*, *Lyonia lucida*, *Vaccinium Elliottii*, *Sabatia brachiata*, *Gentiana Porphyrio*, *Asclepias rubra*, *Schwalbea americana* (MAP 23), *Eupatorium leucolepis*, *Solidago pinetorum* and *fistulosa*, *Aster gracilis*, *Coreopsis gladiata*, etc., etc.

Such lists seem pretty good to one whose demands for a pine-barren flora are not too exacting. In fact, of the "*Characteristic Pine Barren Species*" of New Jersey enumerated by Stone in his *Plants of Southern New Jersey*, nearly all which could be expected so far south as Virginia are found in our area of the state. Stone enumerates 176 distinctive pine-barren species. Many of these are northern types (*Schizaea pusilla*, *Potamogeton confervoides*, *Eleocharis Robbinsii*, *Carex livida*, etc.), extending *down* to New Jersey from Newfoundland, Nova Scotia or New England. Excluding these and the few endemics of New Jersey and Delaware, we find that all but 16 of Stone's listed southern specialties of the New Jersey Pine Barrens, which do not extend north of New Jersey, actually occur in Virginia, in spite of the poor reputation given the latter area. 22 such species have been added by our parties to the known flora of Virginia and it is safe to predict that some of the others may be found. Conversely, checking the species in Small's *Manual* which are designated as growing in "pine-land" south of Virginia, it is gratifying to note that at least 115 such species[1] reach their northern known limits in eastern Virginia. Incidentally, we already have 30 endemic flowering plants in eastern Virginia, and some still unsettled collections may well add to the the number. These figures should help counteract the unfavorable estimates

[1] Many more have been added during 1937.

of the flora already quoted. New Jersey has been intensively and extensively botanized; so have the regions centering on Wilmington, North Carolina and Charleston, South Carolina; Virginia is still largely a botanically untouched field. In spite of the host of keen botanists from Pursh, Conrad, Nuttall, Collins, Pickering and others of their period and the Smiths (A. H. and C. E.), Canby, Parker and their contemporaries to Stone, Long and the others who have studied every square mile of southern Jersey, new discoveries are still being made in the Pine Barrens and elsewhere in southern New Jersey. Similarly, Walter, Elliott, M. A. Curtis, Ravenel and many others gave great impetus to study of the regions near Wilmington and near Charleston. But the Old Dominion has drifted along since the days of Clayton (two centuries ago) with no outstanding native student of the flora. With the awakening now going on real activity is hoped for.

Many of the southern Coastal Plain species which occur in southeastern Virginia have not been generally recognized as occurring north of southeastern North Carolina—the region centering upon Wilmington. Whether they are actually so isolated is a problem for the botanists of North Carolina. Others seem as yet to be unknown between South Carolina and southeastern Virginia, while others appear in Virginia to be still farther from their southeastern centers. These cases, which need not here be enumerated, suggest the need of extensive field-work also on the Coastal Plain between Virginia and Georgia.

Parenthetically, so to speak, it is impossible to overlook one aspect of the implication of utter poverty in interesting plants of the Coastal Plain of Virginia, already noted in the quotations in the opening paragraph of this section. The watching of vegetation from a moving train is and long has been a regular diversion of field-botanists but it is Harper who has so far developed the art as to draw considerable deductions from observations thus swiftly made and without verifying specimens.[1] A milder form of the sport is botanizing without

[1] The following titles of papers are suggestive:

Car-window Notes on the Vegetation of the Delaware Peninsula and southern Virginia. Torreya, ix. 217–226 (1909).

A quantitative Study of the more conspicuous Vegetation of the Coastal Plain, as observed in traveling from Georgia to New York in July. Bull. Torr. Bot. Cl. xxxvii. 405–428 (1910).

Notes on the Distribution of some Plants observed in traveling through the Coastal Plain from Georgia to New York in July, 1909. Bull. Torr. Bot. Cl. xxxvii. 591–603 (1911).

slowing down from a speeding automobile, "rumble-seat botany" as Dr. Lincoln Constance calls it. A slower period gave us the "horse-and-buggy" glimpser. Like the more up-to-date methods, even "horse-and-buggy" identifying was subject to possible error. For instance, in the paper of the late Lester F. Ward, already referred to, the author gave an account of a driving trip through Richmond and Petersburg to the Roanoke River in North Carolina. "My familiarity with the flora of Washington and vicinity rendered it both easy and interesting to note the more conspicuous changes . . . , and my notes were almost wholly confined to this aspect of the question. They were usually taken from the carriage, without stopping to make special researches"[1] and in the preceding paragraph it is stated that the notes were made "usually without collecting specimens." The notes are interesting and many of the identifications are unquestioned, but Ward's "Rubus cuneatus . . . [which] In the valley of the Nottoway river . . . has the habit of the northern blackberry and forms dense brambles . . . to the height of six or eight feet" would be clearer, in the light of present interpretations of *Rubus*, if he had made specimens! But horse-and-buggy and rumble-seat botanizing, without slowing down to collect specimens, as well as botanizing from the express train are all obsolescent. Witness the following: "These records, which are altogether right, must in fact be due to observations made from a sea-plane in 1924, as no old-time land-crab botanist has before 1931 visited these tracts."[2] As an "old-time land-crab botanist," I still find the old-time methods of exploring a flora the best. The "buggy," the railroad train and the automobile are invaluable aids, so long as they do not lead to inertia and superficiality, but land-crabbing is necessary if one wants to find the rarer and phytogeographically most interesting plants.[3]

A superficial Study of the Pine-barren Vegetation of Mississippi. Bull. Torr. Bot. Cl. xl. 551–567 (1914).

Five hundred Miles through the Appalachian Valley. Torreya, xiii. 241–245 (1913).

Car-window Notes on the Vegetation of the Upper Peninsula. Ann. Rep. Mich. Acad. Sci. xv. 193–198 (1913).

Southern Louisiana from the Car-window. Torreya, xx. 67–76 (1920).

A six-hour Cross-section of the Vegetation of southern Ontario. Torreya, xxvii. 1–8 (1927).

[1] L. F. Ward, *Notes on the Flora of Eastern Virginia*, Bot. Gaz. xi. 32 (1886).

[2] Scholander in Skrifter om Svalbard og Ishavet, Nr. 62: 28 (1934). I am indebted to Dr. Nicholas Polunin for directing my attention to Scholander's apt characterization.

[3] Returning to Massachusetts from southeastern Virginia, where I had been seeing the scarlet-orange *Asclepias lanceolata*, I caught a brilliant flash from the train as we crossed the boggy meadows near Kingston, Rhode Island. Positive of the identifica-

2. PHYTOGEOGRAPHIC RELATIONS OF THE CHARACTERISTIC PLANTS OF THE COASTAL PLAIN OF VIRGINIA. Reference has repeatedly been made to the very intimate commingling of the open pinelands and oak barrens with the richer woods, bottomlands and brooksides through much of the area. The obvious and presumably chief factor in the maintenance of this intimate interlocking of pine-barren and rich-woods or bottomland types of vegetation is the deposit of marine (calcareous) shells which underlies most, if not all, the country. Where the superficial soils are thoroughly leached the oxylophytes of the pine barrens and peats prevail. Where the brooks and rivers have cut down to the accessible lime, even though the soil, presumably on account of accumulated carbon-dioxide and humic acids, may give an acid reaction, the plants of "rich woods," "rich bottoms" and "calcareous soils" have their opportunity. The chemical, physical and biological balances are so extremely delicate and so complicated that it would be bold for one not a physical chemist to venture an evaluation of them; but it is fairly certain that only in regions where a supply of calcium is readily available in the subsoils would we find so obvious an interlocking of the calcicolous and the oxylophytic types. Even the almost ubiquitous Bald Cypress, *Taxodium distichum*, of the swamps, swampy bottoms and dismals, occurs, according to Wherry (in Small's Manual), "often over calcareous subsoil"; but Post Oak, *Quercus stellata*, he restricts to "usually sterile and acid soil," although *Hexalectris* (MAP 18), which at our station is in the humus of *Quercus stellata*, is, according to Wherry, a plant of "Rich soil." In this connection it is worth noting that Gattinger said of it (as *Bletia aphylla*) in Tennessee "Always under pines!"[1] At one of our two stations for *Carex Frankii* of "calcareous districts," there is an unusual abundance of the Cranefly Orchid, *Tipularia unifolia*, which, according to Wherry, occurs "in acid soil." In many wooded swamps and bottomlands *Carex typhina* of "rich alluvial woods, in calcareous districts" closely associates with its near relative, *C. squarrosa* of "Swampy woods, in acid soils" and with *C. louisianica* of "acid soils"; while along the Nottoway *C. Grayii* (MAP 19) of "Rich alluvial woods in calcareous districts" mingles with them all in the shade of trees of "calcareous" or of "acid" soil without sharp differ-

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tion, I induced Mr. Weatherby to drive with me to the area and only reluctantly admitted that what I had seen from the speeding train was merely dwarf *Lilium superbum!*

[1] Gattinger, Tenn. Fl. 84 (1887).

entiation. Stepping from a carpet of *Crotalaria rotundifolia* of the dry, sandy woods to a depression a few feet below it, one may find himself in a damp thicket of *Gaylussacia dumosa* of "Acid swamps" or, near-by, descending ten feet from a similar *Crotalaria* carpet, he may be standing in *Malaxis floridana* of "calcareous soil."[1]

We, naturally, try to reduce plant-habitats to a limited number of categories but we should exercise caution and frankly admit our present ignorance of the crucial factors. The late George Harvey, trenchent and far-seeing critic of economic, political and social follies, wrote in one of his editorials on classificatory tendencies of sociologists: "There is no especial harm and there is much mental exercise to be obtained from reducing all mortality to these theoretical types—no especial harm, that is, supposing that one bears in mind what a constant whopper is involved in the reduction of any individual to a type."[2]

It surely seems, on the Coastal Plain of Virginia, that we are not yet able to separate with the specious satisfaction we get in some areas of more sharply contrasted soils the calcicolous from the calcifuge plants or otherwise to designate quite clear ecological types. There are many woodlands of *Quercus stellata* and *Carya alba* throughout southeastern Virginia but in only one have we yet found *Hexalectris spicata* (MAP 18), *Clematis ochroleuca* and *Houstonia tenuifolia*. Low boggy depressions are numerous, yet no botanist since Clayton had brought forward vouchers for *Cleistes divaricata* (MAP 2) in the state until we collected a few plants in one single such depression. Much of the sandy flat back of the outer beach from Cape Henry to False Cape shows a repetition of seemingly identical habitats, yet in that whole stretch we have found only one limited colony each of *Hypoxis Longii*, *H. sessilis*, *Juncus megacephalus*, *Eleocharis Lindheimeri* (MAP 57) and several other most definite species. Damp pine woods

[1] Similarly contradictory commingling of calcicolous and calcifuge (or oxylophytic) species may be seen in marl-bogs and marl-ponds farther north. Nadeau Lake in the township of Limestone, Aroostook County, Maine, is a deep bed of lime-marl, the only station known in the state for the strictly calcicolous *Potamogeton filiformis*, the marly border a carpet of *Eleocharis pauciflora* and other typical calcicoles. Nevertheless, commingled with them and evidently quite at home are the most characteristic oxylophytes of the region: *Drosera rotundifolia*, *Sarracenia purpurea*, *Chamaedaphne calyculata*, *Ledum groenlandicum*, *Andromeda glaucophylla*, etc. Exactly similar commingling of the two usually exclusive series may be witnessed in the marl-bogs of the Bruce Peninsula or on the lime-barrens of western Newfoundland. The lime is there for the plants which require it; its presence, so long as there is abundant CO_2, does not keep out the oxylophytes.

[2] Harvey's Weekly, ii. no. 47, pp. 12, 13 (Nov. 22, 1919).

are frequent, yet in such a habitat we have but once seen *Amianthium muscaetoxicum* and *Gentiana Porphyrio*, the latter so conspicuous that we could hardly have missed it. And so on, with one habitat after another; over and over again they seem superficially indistinguishable from others where quite unique colonies of plants are found. The fact, that one can never tell until he actually examines every natural spot what rare or strictly localized plant is there, adds to the zest of exploration and more than counterbalances the discomforts caused by heat, thirst, chiggers and deer-flies.

It is, of course, evident enough that clearing, cultivation, pig- and cow-pasturing and ditching have ruined much of what Banister, Clayton and others of two centuries ago found about them. The number of rarities undetected in Virginia since their day until the active exploration of the Coastal Plain by Grimes and those who have followed him is notable. Other species collected by Clayton, especially conspicuous trees and shrubs, not known through modern specimens from the state, make a challenging list. They may have been exterminated from the flora of the state; but success in discovering many species which Clayton collected but which have been little if at all known in the larger herbaria of the East gives confidence that the other Virginian plants known to Clayton may yet be rediscovered in the state. In 1839, Asa Gray, purchasing in London the 2^{d} edition of the *Flora Virginica*, based by Gronovius upon John Clayton's collections, went through the Clayton material (now preserved at the British Museum) and made annotations of the identities. These annotations, added to the citations of Clayton's specimens by Linnaeus, give us Virginia records for hundreds of species; in fact, in the 1st edition of *Species Plantarum* (1753) Linnaeus based 371 species upon Virginian types (largely Clayton's). With the aid of Gray's notes, added to the Linnean references, we know that Clayton collected many of the species which are now most localized in eastern Virginia. These include the following: *Sagittaria subulata, Sacciolepis striata, Eriocaulon decangulare, Tofieldia racemosa, Cleistes divaricata, Ponthieva racemosa, Polygonum glaucum, Arabis virginica, Sarracenia flava* ("Hic vulgo Side sadle flower, in Carolina Boreali Trumpet flower vocatur"—*Clayton*), *Zanthoxylum Clava-Herculis, Ilex decidua, Stewartia Malachodendron, Ludwigia brevipes*,[1] *Lilaeopsis chinensis*

[1] In the 2d edition Gronovius had two species of *Ludwigia* on p. 20. One was *L. alternifolia*, described by Clayton: "Anonymos flore luteo specioso caduco," etc. The other was contrasted with it as follows:

("Hydrocotyle foliis brevioribus, linearibus obtusis"), *Sabatia dodecandra*, *Cynoctonum Mitreola* ("Rubia spicata parva alba," etc.), *Buchnera americana*, *Schwalbea americana*, *Erigeron vernus*, *Aster grandiflorus*, *Tetragonotheca helianthoides*, *Krigia Dandelion* and *Prenanthes autumnalis*. It is, therefore, not improbable that the following, discovered in Virginia by Clayton, may be reinstated as present members of the flora: *Smilax lanceolata*, *Burmannia biflora* ("Burmannia aquatica pusilla, flore purpureo pulchro . . . Loca amat paludosa. Floret Septembri. *Clayt. n. 248*"), *Cocculus carolinus*, *Persea Borbonia* (known in Delaware), *Schrankia microphylla* ("Mimosa . . . floribus & siliquis in capitula rotunda congestis"), *Aeschynomene virginica* (known in Delaware and Maryland),[1] *Hypericum denticulatum* (typical), *Marshallia trinervia* ("*Erigeron caule simplicissimo, saepius bifloro, folio caulino semiamplexicaule.*"—Gronovius, ed. 2: 122; identified by Gray as *Marshallia*).

As already emphasized, the species making up the indigenous flora of the Coastal Plain in southeastern Virginia are by no means of uniform occurrence. Many are almost ubiquitous types: *Woodwardia areolata*, *Pinus Taeda*, *Juniperus virginiana*, *Triodia flava*, *Panicum scoparium*, *Tripsacum dactyloides*, *Eleocharis microcarpa*, *Rynchospora cymosa*, *Carex abscondita* Mackenzie, *Juncus setaceus* and *marginatus*, *Smilax rotundifolia* and *glauca*, *Habenaria cristata*, *Saururus cernuus*, *Myrica cerifera*, *Betula nigra*, *Carpinus caroliniana*, *Quercus alba*, *nigra* and *phellos*, *Morus rubra*, *Ulmus americana*, *Phoradendron flavescens*, *Polygonum opelousanum* Ridd. and *setaceum*, *Magnolia virginiana*, *Liriodendron Tulipifera*, *Cercis canadensis*, *Desmodium lineatum*, *Lespedeza Stuevei*, *Centrosema virginianum*, *Polygala incarnata*, *Vitis cinerea* var. *floridana* Munson, *V. rotundifolia*, *Ascyrum stans*, *Hypericum petiolatum*, *Ludwigia alternifolia*, *Jussiaea*

LUDWIGIA caule repente, foliis obverse ovatis petiolatis.

Ludwigia parva aquatica repens: caule succulento glabro rubente: floribus ex alis foliorum egressis dilute luteis, tetrapetalis, fugacissimis, vix conspicuis: foliis rubentibus venosis glabris lucidis, ad finem rotundis, ex adverso binis: vasculo folioso, in quatuor loculamenta diviso. *Clayt. n. 775.*

Asa Gray did not know what to make of it, but marked "Agrees with descr." In view of the occurrence of *L. brevipes* from Cape Henry to False Cape and westward to northern Norfolk County, the identification seems fairly definite.

[1] Most fortunately Clayton, who usually supplied no statement of locality on the specimens which Gronovius and, after him, Linnaeus had, did give for *Aeschynomene* the explicit: "In aquosis ad ripam fluminis Rappahanock Comitu Middlesexiae." Modern specimens from Virginia should soon be available. The beautiful specimen of Clayton's, for a photograph of which I am indebted to Messrs. Ramsbottom and Dandy of the British Museum, shows foliage and fruit.

decurrens, *Nyssa aquatica*, *Cornus stricta*, *Hydrocotyle umbellata*, *Leucothoe racemosa*, *Oxydendrum arboreum*, *Vaccinium stamineum*, *Diospyros virginiana*, *Symplocos tinctoria*, *Fraxinus caroliniana* Mill., *Gelsemium sempervirens*, *Gentiana parvifolia*, *Salvia lyrata*, *Pycnanthemum aristatum*, *Bacopa acuminata*, *Gratiola virginiana* (*sphaerocarpa*), *Mimulus alatus*, *Gerardia virginica* (*flava*) and *G. purpurea*, *Galium obtusum* var. *filifolium* (Wieg.) Fern., *Viburnum nudum*, *Elephantopus nudatus* and *tomentosus*, *Eupatorium capillifolium*, *rotundifolium* and *coelestinum*, *Chrysopsis mariana*, *Solidago odora*, *altissima* and *tenuifolia*, *Sericocarpus linifolius*, *Aster dumosus* var. *coridifolius*, *Baccharis halimifolia*, *Pluchea foetida*, *Gnaphalium purpureum*, *Helianthus atrorubens*, *Helenium tenuifolium*, *Cacalia atriplicifolia*, *Senecio tomentosus*, etc., etc.

The majority, however, are restricted in occurrence, their restrictions varying from local abundance in one or few small areas to single tiny colonies or individuals.[1] In other words, a considerable proportion of the flora has the characteristics of either a relic-flora, left over but not dominating in an area from which it has been largely destroyed, or a pioneering flora which has not succeeded in competition with more aggressive and dominating species. The cases of *Eleocharis Lindheimeri* (MAP 57), *Juncus megacephalus*, *Amianthium muscaetoxicum*, *Hypoxis Longii*, *Hexalectris spicata* (MAP 18), *Clematis ochroleuca*, *Gentiana Porphyrio* and *Houstonia tenuifolia*, already cited, are typical for at least 300 species in eastern Virginia. In order to gain a clear impression of the distinctive components of the flora of this area we may very briefly note the major geographic relationships of the Coastal Plain plants (excluding the strictly maritime species and those of general occurrence both on the Coastal Plain and in the Piedmont). As I at present understand the more noteworthy plants of the Virginian Coastal Plain they fall into seven major groups, five of the groups with parallel subdivisions. The species with only 1–3 very small stations on the Coastal Plain of the state are indicated by an asterisk. Weedy species, such as *Eragrostis hirsuta*, *Aristida oligantha*, *Cenchrus spp.*, *Fimbristylis Baldwiniana*, *Sagina decumbens*, *Arabis virginica*, *Polypremum procumbens* and *Eupatorium capillifolium*, are omitted.

[1] Since the maps were engraved our explorations in September, 1937, have revealed one or more additional stations for many rare species. The southeastern Virginian occurrence is, consequently, not thoroughly displayed in the following MAPS: 2, 10, 11, 13, 14, 15, 26, 30, 31, 32, 34 and 39.

I. Occurring wholly or chiefly on the Embayed Northern Half of the Coastal Plain or Extensions from it (Cape Lookout, North Carolina to Nova Scotia). Such plants as **Dryopteris celsa* (Wm. Palmer) Small, **Panicum mattamuskeetense* var. *Clutei* (Nash) Fern., *P. columbianum* var. *oricola* (Hitchc. & Chase) Fern., *Andropogon virginicus* var. *abbreviatus* (Hackel) Fern. & Grisc., *Cyperus Grayii*, *Eleocharis obtusa* var. *ellipsoidalis* Fern., *E. ambigens* Fern. (map 39) and *E. capitata* var. *typica* Svenson and *var. *pseudoptera* Weatherby, *Scleria minor* (Britton) Stone, **Carex Walteri* Bailey var. *brevis* Bailey, **C. vestita* and **C. Barrattii* Schwein. & Torr. (map 25), **Juncus caesariensis* Coville (map 1), **Cassia nictitans* var. *hebecarpa* Fern., *Hypericum dissimulatum* Bicknell, *Viola Brittoniana*, **V. pectinata*, *Rhexia ventricosa* Fern. & Grisc., **Ludwigia sphaerocarpa* var. *jungens* Fern. & Grisc., *L. brevipes* (Long) E. H. Eames, *Oenothera fruticosa* vars. **humifusa* and **Eamesii*, **Gaylussacia dumosa* var. *Bigeloviana* Fern., *Lycopus americanus* var. *Longii* Benner and **Solidago graminifolia* var. *polycephala* Fern.

To this flora primarily of the Embayed Atlantic Coastal Plain belong, of course, the endemics of eastern Virginia: **Potamogeton capillaceus* var. *atripes* Fern., **Aristida lanosa* var. *macera* Fern. & Grisc., **Panicum lucidum* var. *opacum* Fern., **P. mundum* Fern.,[1] **Psilocarya scirpoides* var. *Grimesii* Fern. & Grisc., **Carex crus-corvi* var. *virginiana* Fern., **Rynchospora trichophylla* Fern., **Xyris torta* var. *macropoda* Fern., **Juncus Griscomi* Fern., *J. Longii* Fern., **Hypoxis Longii* Fern., *Tovara virginiana* var. *glaberrima* Fern., **Geum canadense* var. *brevipes* Fern., **Ammannia Koehnei* var. *exauriculata* Fern., *Bumelia lycioides* var. *virginiana* Fern., **Pycnanthemum pycnanthemoides* var. *viridifolium* Fern., **Bacopa obovata* (Raf.) Fern.,[2] *Diodia teres* var. *hystricina* Fern. & Grisc., **Solidago Elliottii* var. *pedicellata* Fern., **Aster spectabilis* var. *suffultus* Fern., *Gnaphalium calviceps* Fern. and **Rudbeckia hirta* var. *corymbifera* Fern.; and at least eight additional local and as yet undescribed endemics discovered since this went to press.

IA. Like I but with Colonies also on the Appalachian Upland or along the Appalachian Valley. A limited sub-group, which would be considerably extended if some notable species of New Jersey (not yet known in eastern Virginia) were included. In eastern Virginia are *Panicum meridionale* (map 46; also IB), **Helonias bullata* (map 40), **Malaxis Bayardi* Fern., **Parnassia asarifolia* (map 41), *Rubus Enslenii*, *Linum intercursum* Bicknell, *Galax aphylla*, *Lechea racemulosa* (also IB), *Viola Stoneana*, **Sabatia campanulata* (L.) Torr., **Stachys hyssopifolia*, *Chelone Cuthbertii* Small (map 3), **Gerardia decemloba* Greene, **Houstonia tenuifolia*, **Liatris graminifolia* var. *Smallii* (Britton) Fern. & Grisc., *Chrysopsis mariana* var. *macradenia* Fern., *Aster gracilis*, **Gnaphalium obtusifolium* var. *micradenium* Weatherby (see also IB), **Silphium atropurpureum* Retz. (map 42) and **Heliopsis helianthoides* var. *solidaginoides* (L.) Fern.

IB. Like I but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). A small sub-group in Virginia, containing *Panicum meridionale* (map 46) and its var. *albemarlense* (Ashe) Fern. (map 43), *Cardamine pensylvanica* var. *Brittoniana* Farwell, *Lechea racemulosa* (also IA), **Gnaphalium obtusifolium* var. *micradenium* Weatherby (see also IA) and **Bidens coronata* var. *tenuiloba* (Gray) Sherff.

[1] Dr. Blomquist informs me that he has found *Panicum mundum* in North Carolina.

[2] **Bacopa obovata** (Raf.), comb. nov. *Macuillamia obovata* Raf. Aut. Bot. 44 (1840).

II. Confined to the Atlantic Coastal Plain, extending from its Sea-Island Half (south of Cape Lookout) or Extensions from it or from the West Indies or Florida north to Virginia or northward. Such plants as **Sagittaria Weatherbiana* Fern. (map 5), **Triodia flava* var. *Chapmani* (Small) Fern. & Grisc., *Panicum mattamuskeetense* (map 31), **Andropogon ternarius* var. *glaucescens* (Scribn.) Fern. & Grisc., **A. virginicus* var. *glaucopsis* (Ell.) Hitchc., **Cyperus retrorsus* var. *Vashii* (Britton) Fern. & Grisc., *C. filiculmis* var. *oblitus* Fern. & Grisc., *Eleocharis quadrangulata* (typical), **Rynchospora distans* (Michx.) Vahl, *R. Wrightiana* Boeckl. and *R. Torreyana* (map 32), *Carex leptalea* var. *Harperi* (Fern.) Stone, *C. Mitchelliana* M. A. Curtis, **C. bullata* Schkuhr, **Juncus megacephalus*, *Dioscorea hirticaulis* (map 34), **Malaxis floridana* (Chapm.) Kuntze, **Polygonella polygama* (Vent.) Engelm. & Gray, **Baptisia alba* and *B. tinctoria* (*B. Gibbesii* Small), *Tragia urens* var. *lanceolata*, *Rhus copallina* (typical), **Gordonia Lasianthus*, **Viola esculenta* Ell., *Rhododendron atlanticum* (Ashe) Rehder, **Pyxidanthera barbulata*, *Fraxinus caroliniana* var. *pubescens* (M. A. C.) Fern., *Asclepias lanceolata* and var. *paupercula* (Michx.) Fern., *Teucrium canadense* (*litorale*), **Trichostema lineare* and **T. dichotomum* var. *puberulum* Fern. & Grisc., **Gerardia racemulosa* and **G. obtusifolia* (Raf.) Pennell, *Galium obtusum* var. *filifolium* (Wieg.) Fern., **Lobelia elongata* Small and **L. glandulosa* Walt., **Carphephorus tomentosus* (Michx.) T. & G. and **C. bellidifolius* (Michx.) T. & G., **Liatris graminifolia* var. *lasia* Fern. & Grisc., *Solidago puberula* var. *pulverulenta* (Nutt.) Chapm., *S. pinetorum* Small and **S. austrina* Small, *Aster subulatus* var. *euroauster* Fern. & Grisc., **Gnaphalium obtusifolium* var. *Helleri* (Britton) Blake and *Arnica acaulis*.

IIA. Like II but with Colonies also on the Appalachian or Ozark Upland. **Carex Collinsii* Nutt. (map 12),[1] **Trillium pusillum* (Ozark Plateau), *Iris prismatica*, **Quercus stellata* var. *Boyntoni* (Beadle) Sarg., *Asarum virginicum*, **Stewartia pentagyna*, *Rhexia mariana*, **Kalmia angustifolia* var. *caroliniana* (Small) Fern.,[2] *Gratiola viscidula* Pennell (map 10), *Gerardia setacea*, **Vernonia glauca*, *Solidago yadkinensis* (Porter) Small, *Aster grandiflorus* and *A. dumosus* var. *coridifolius* and *Coreopsis verticillata*.

IIB. Like II but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). *Panicum Commonsianum* var. *Addisonii* (Nash) Stone, *Fuirena squarrosa*, *Scleria pauciflora* var. *caroliniana* and *Carex alata*. Doubtless others.

III. On the East Gulf Coastal Plain (eastern Louisiana and Mississippi to southwestern Georgia or northwestern Florida) and the Sea-Island Half of the Atlantic Coastal Plain, extending north to Virginia or beyond. Such species as **Pinus serotina*, **Taxodium adscendens* Brongn., *Chamaecyparis thyoides*, *Sagittaria latifolia* var. *pubescens*, *Calamagrostis cinnoides*, **Agrostis elata* Pursh (map 30), **Panicum caerulescens*, *P. Wrightianum* Scribn. (map 13) and *P. Commonsianum*, **Andropogon Elliottii* var. *gracilior* Hackel, **Eleocharis vivipara* Link, *Lipocarpha maculata*, **Rynchospora dodecandra* Baldw.,

[1] Mr. Neil Hotchkiss kindly calls my attention to a station in Prince Georges County, Maryland, omitted from map 12.

[2] On p. 437 the spelling *carolina*, which Small first used, was followed. However, on his p. 1336 he changed to caroliniana, the spelling which, since it accompanied the citation of the type, should prevail.

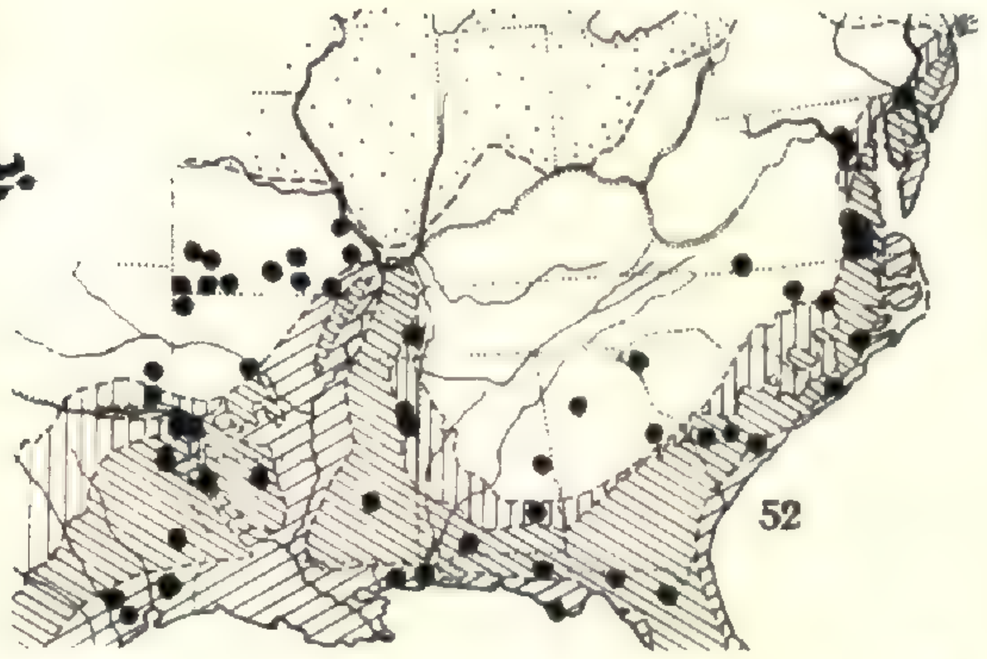
Scleria nitida Willd., **Xyris Curtissii* Malme, **Juncus abortivus* Chapm. (MAP 28), **Zigadenus glaberrimus*, *Smilax tamnifolia*, *Zephyranthes Atamasco*, *Sisyrinchium arenicola*, **Ponthieva racemosa* (Walt.) Mohr, *Myrica Curtissi* Cheval., *Quercus stellata* var. *Margaretta* (Ashe) Sarg. and **Q. laevis* Walt., **Arenaria caroliniana* (MAP 29), *Nuphar fluviatile* (Harper) Standl., **Asimina parviflora* (Michx.) Dunal, *Sarracenia purpurea* var. *venosa* (Raf.) Fern., **Wisteria frutescens* (MAP 44), **Desmodium rhombifolium* (Ell.) DC., **Polygala Harperi* Small, *P. Nuttallii* and *P. lutea* (MAP 45), **Ilex coriacea* (Pursh) Chapm., *Kosteletzkya virginica*, **Stewartia Malachodendron*, **Hypericum setosum* L., **Ammannia Koehnei*, *Rhexia mariana* var. *purpurea* Michx. (*R. Nashii* Small), *Proserpinaca palustris* (*P. platycarpa* Small), **Leucothoe axillaris*, *Lyonia ligustrina* var. *foliosiflora* and *L. lucida* (Lam.) C. Koch, **Osmanthus americanus* (L.) Benth. & Hook., **Sabatia Elliottii*, **S. dodecandra*, **S. difformis* (L.) Druce (*S. lanceolata* T. & G.) and *S. paniculata*, *Gentiana parvifolia* (Chapm.) Britton, **Hydrolea quadrivalvis*, *Lippia lanceolata*, *Pycnanthemum aristatum* and var. *hyssopifolium*, **Utricularia virgatula* and **U. juncea*, **Dyschoriste oblongifolia*, **Eupatorium cuneifolium* Willd., *Solidago fistulosa* and *S. caroliniana* (L.) BSP., *Gnaphalium obtusifolium* var. *praecox* Fern., *Polymnia Uvedalia* var. *floridana* Blake, *Silphium compositum* Michx., **Marshallia trinervia*, **Helianthus Schweinitzii* T. & G., **Coreopsis delphinifolia* and **C. gladiata* Walt., **Bidens mitis* (Michx.) Sherff, **Cirsium Nuttallii* (DC.) Gray and *Prenanthes autumnalis* Walt.

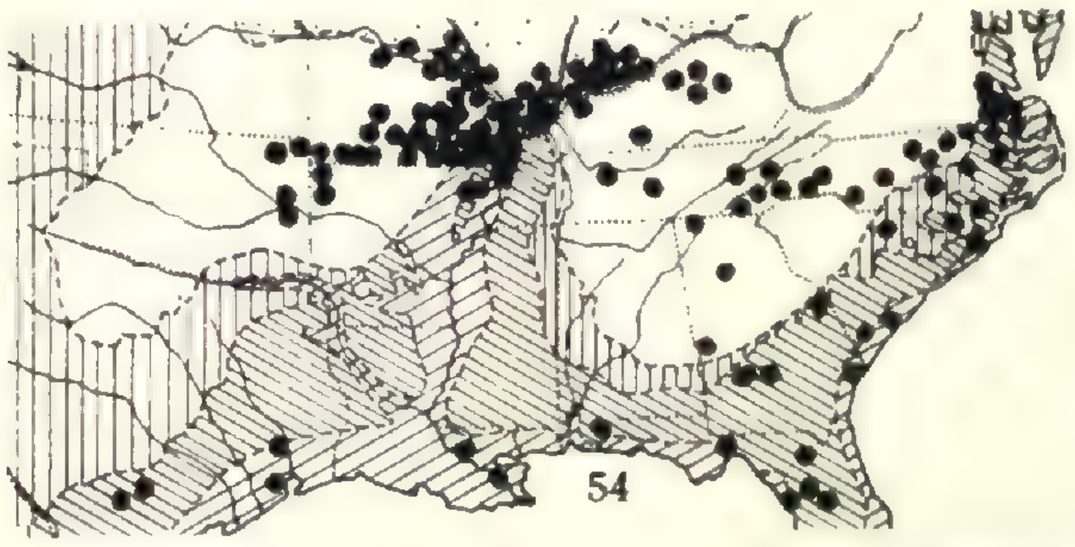
IIIA. LIKE III BUT WITH COLONIES ON THE APPALACHIAN OR THE OZARK UPLAND. *Orontium aquaticum*, **Habenaria blephariglottis* var. *conspicua* (MAP 27), **Cleistes divaricata* (L.) Ames (MAP 2), **Asarum arifolium*, *Sarracenia flava*, *Lechea Leggettii* (also IIIB), **Monotropsis odorata*, *Penstemon australis* Small, *Lobelia glandulifera* (Gray) Small (MAP 20), and *L. Nuttalli*, *Eupatorium album* (MAP 35), *Liatris graminifolia* and **Tetragonotheca helianthoides*.

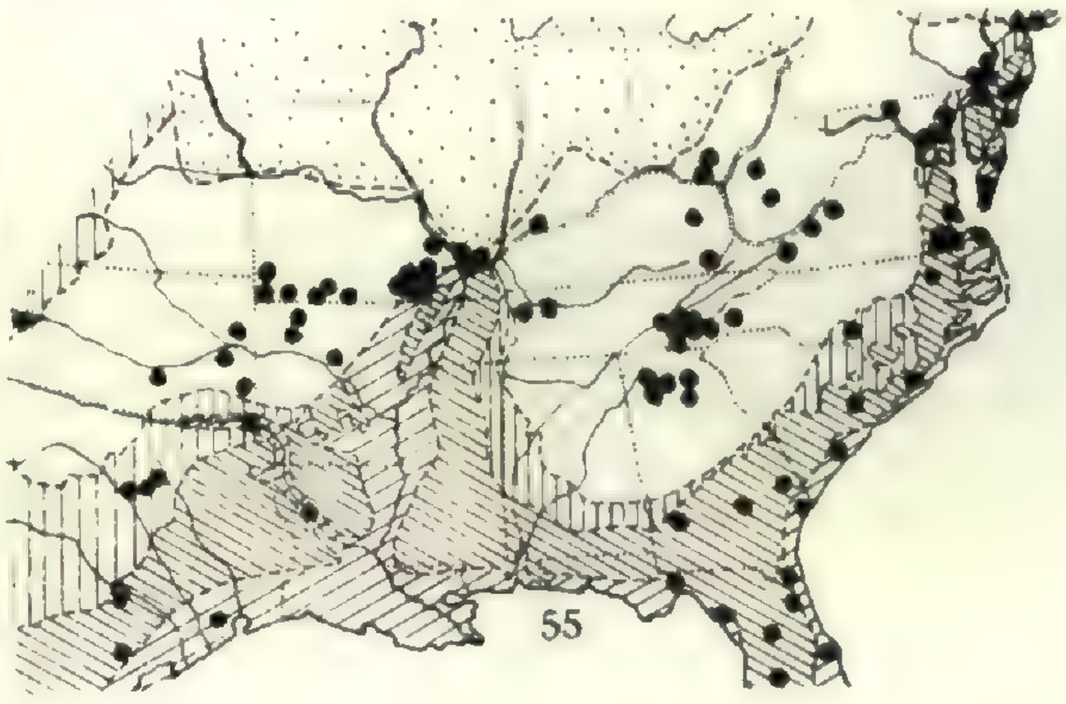
IIIB. LIKE III BUT WITH ISOLATED COLONIES NEAR OR ABOUT THE GREAT LAKES (CHIEFLY LAKE MICHIGAN). *Aristida tuberculosa*, *Panicum virgatum* var. *cubense* and *Lechea Leggettii* (also IIIA).

IV. ON THE GULF COASTAL PLAIN BOTH EAST AND WEST (TEXAS, ARKANSAS OR WESTERN LOUISIANA TO SOUTHWESTERN GEORGIA OR NORTHWESTERN FLORIDA) AND THE SEA-ISLAND HALF OF THE ATLANTIC COASTAL PLAIN, EXTENDING NORTH TO VIRGINIA OR BEYOND. The largest element in the flora, consisting in part of **Pinus palustris* and *P. Taeda*, **Typha truxillensis* HBK., *Sagittaria falcata* Pursh, *Arundinaria tecta*, *Eragrostis refracta*, **Uniola sessiliflora* Poir., *Danthonia sericea*, **Sporobolus virginicus*, **Ctenium aromaticum* (MAP 11), **Leersia hexandra*, *Paspalum distichum*, **P. setaceum* var. *supinum* (Bosc) Trin. and *P. Boscianum*, **Panicum longifolium* var. *Combsii* (Scribn. & Ball) Fern., **P. anceps* var. *rhizomatum* (Hitchc. & Chase) Fern., **P. strigosum*, *P. aciculare*, *P. consanguineum* (MAP 47), *P. roanokense*, **P. longiligulatum*, *P. albomarginatum*, *P. trifolium*, **P. ensifolium*, *P. lancearium*, **P. mutabile* (MAP 15) and *P. scabriusculum*, *Sacciolepis striata*, *Axonopus furcatus*, *Erianthus contortus*, **Sorghastrum Elliottii* (Mohr) Nash, **Andropogon Mohrii* and *A. virginicus* var. *tenuispatheus* (Nash) Fern. & Grisc., **Cyperus haspan* var. *americanus* Boeckl., *C. sabulosus* Mart. & Schrad., **C. retrorsus* var. *Deeringianus* (Britt. & Sm.) Fern. & Grisc., *C. hystricinus*, **Eleocharis albida* and *E. tortilis*, **Dichromena colorata*, *Rynchospora gracilenta*, *R.*

Map 31, range of Panicum mattamuskeetense; 32, Rynchospora Torreyana; 33, Juncus diffusissimus; 34, Dioscorea hirticaulis; (for maps 35–38 see Eupatorium in Part II); 39, Eleocharis ambigens; 40, Helonias bullata; 41, Parnassia asarifolia; 42, Silphium atropurpureum; 43, Panicum meridionale var. albemarlense; 44, Wisteria frutescens; 45, Polygala lutea; 46, Panicum meridionale; 47, Panicum consanguineum; 48, Arenaria lanuginosa (northern half of range).







Map 49, range of Lycopodium alopecuroides (northern area); 50, Panicum verrucosum; 51, Polygala cruciata including the southern var. cuspidata; 52, Panicum Ravenelii; 53, Scleria oligantha; 54, Ulmus alata; 55, Clitoria mariana.

microcephala, **R. fascicularis* (Michx.) Vahl, *R. rariflora*, **R. cymosa* var. *globularis* Chapm., *R. caduca* and *R. inexpansa*, **Cladium jamaicense* Crantz, **Scleria ciliata*, *Carex styloflexa*, **C. crebriflora* Wieg., **C. venusta* var. *minor*, *C. glaucescens* Ell. and *C. folliculata* var. *australis* Bailey, *Xyris ambigua* Beyr., **X. platylepis* Chapm., *X. difformis* and **X. flexuosa* (*arenicola*), **Eriocaulon decangulare* and **E. compressum*, **Pontederia lanceolata* Nutt., *Tillandsia usneoides*, *Juncus repens*, **J. polycephalus* Michx., *J. Elliottii* Chapm., *Tofieldia racemosa*, **Aletris aurea*, *Smilax laurifolia*, *S. Walteri*, **Hypoxis sessilis* L., **H. micrantha* Pollard, **Burmannia biflora*, *Habenaria cristata*, *Myrica cerifera*, *Quercus virginiana*, **Q. rhombica* Sarg. and **Q. cinerea* Michx., *Paronychia Baldwinii* (T. & G.) Chapm., **Arenaria lanuginosa* (Michx.) Rohrb. (map 48), *Persea palustris* (Raf.) Sarg., **P. Borbonia*, *Drosera capillaris* Poir., **D. brevifolia*, *Decumaria barbara*, **Schrankia microphylla*, **Crotalaria Purshii*, **C. rotundifolia*, *Tephrosia spicata*, **Baptisia villosa*, **Zornia bracteata*, **Desmodium tenuifolium* T. & G., *Rhynchosia erecta*, **Galactia Macreei*, *Zanthoxylum Clava-Herculis*, **Polygala ramosa*, *Cnidoscolus stimulosus*, *Cyrilla racemiflora*, *Ilex vomitoria*, *Vitis cinerea* var. *floridana* Munson,[1] **Ascyrum Hypericoides* (typical).[2] *Hypericum nudiflorum*, *Viola emarginata* and **V. lanceolata* var. *vittata* (Greene) Weath. & Grisc., *Lythrum lineare* and **L. lanceolatum* Ell., **Rhexia ciliosa*, *Ludwigia hirtella*, *L. linearis*, **L. pilosa* Walt. and **L. alata* Ell., *Hydrocotyle Canbyi*, *H. verticillata* and *H. ranunculoides*, *Centella repanda* (Pers.) Small, **Sanicula canadensis* var. *floridana* (Small) H. Wolff, *Eryngium aquaticum*, *Nyssa sylvatica* var. *biflora* (Walt.) Sarg. and var. *dilatata* Fern., *Gaylussacia dumosa* (typical), *Vaccinium Elliottii*, *Gelsemium sempervirens*, **Cynoctonum Mitreola*, *Sabatia calycina*, *Gentiana villosa*, **Bartonia verna*, *Dichondra repens* var. *carolinensis* (Michx.) Choisy, *Breweria humistrata*, **Verbena scabra* Vahl, **Physalis maritima* M. A. Curtis, *Bacopa acuminata* (Walt.) Robinson, **B. Monnieria* var. *cuneifolia* (Michx.) Fern., **Micranthemum umbrosum* (Walt.) Blake (map 8), *Utricularia subulata*, **Justicia ovata* Walt., **Oldenlandia Boscii* (DC.) Chapm., *Galium uniflorum* Michx., *G. hispidulum*, *Elephantopus nudatus*, **Eupatorium leucolepis*, *E. rotundifolium* and var. *lanceolatum* (Muhl.) Fern. & Grisc. (*E. verbenaefolium*), *Chrysopsis graminifolia* and var. *aspera* (Shuttlew.) Gray, *Solidago tortifolia*, *Aster concolor*, **Erigeron vernus*, *Baccharis halimifolia*, *Senecio tomentosus* and *Cirsium horridulum*.

IVA. Like IV but with Colonies on the Appalachian or the Ozark Upland. *Woodwardia areolata*, *Lycopodium alopecuroides* (map 49), **Panicum hemitomon* (map 14),[3] *Aristida virgata* (map 26), *Eleocharis microcarpa* Torr. (incl. var. *filiculmis* Torr. (*E. Torreyana*), see also IVB) and *E. tuberculosa*, *Lachnocaulon anceps*, *Centrosema virginianum*, *Lechea minor* (also IVB), *Ascyrum stans*, *Symplocos tinctoria*, *Bartonia paniculata* *Gratiola pilosa*, **Seymeria cassioides* (Walt.) Blake (map 24), *Schwalbea americana* (map 23), *Viburnum scabrellum* Chapm., *Eupatorium album* var. *glandulosum* (Michx.) Fern. (map 36), *E. aromaticum* and *E. rotundifolium*

[1] See Rhodora, xxxviii. 426 (1936).

[2] See Rhodora, xxxviii. 432 (1936).

[3] Since map 14 was published I have learned through Mr. Neil Hotchkiss that "*Panicum hemitomon* has within the past two years been found in the Blue Ridge in Augusta County, Virginia, and on the Cumberland Plateau, Grundy County, Tennessee."

var. *ovatum* (Bigel.) Torr. (*E. pubescens*) and *Solidago ludoviciana* (Gray) Small.

IVB. Like IV but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). *Woodwardia areolata* (also IVA), *Panicum verrucosum* (map 50), *P. lucidum* and *P. auburne*, *Eleocharis microcarpa* Torr. (also IVA), *Carex Longii* Mackenz., *Lechea minor* (also IVA), *Polygala cruciata* (map 51)[1] and *Hydrocotyle umbellata*.

V. On the Gulf Coastal Plain both East and West, extending inland toward or beyond the Head of the Mississippi Embayment into eastern Missouri, southern Illinois or western Kentucky and sometimes up the Mississippi, Missouri or Ohio into Iowa, Illinois, Indiana or Ohio; also on the Sea-Island Half of the Atlantic Coastal Plain, extending north to Virginia or beyond. The second largest element in the flora, consisting, in part, of *Polypodium polypodioides*, *Pinus echinata*, *Taxodium distichum*, *Echinodorus radicans* (map 16), **E. tenellus*, **Limnobium Spongia*, *Arundinaria gigantea*, *Festuca sciurea*, *Eragrostis hirsuta*, **Triodia stricta*, *Agrostis hyemalis* (Walt.) BSP.,[2] **Muhlenbergia capillaris*, *Aristida lanosa*, *Leptochloa filiformis*, *Gymnopogon ambiguus*, *Phalaris caroliniana*, **Paspalum dissectum*, *P. laeve* and vars., *P. floridanum*, *P. setaceum* and *P. ciliatifolium*, **Panicum hians*, *P. anceps*, *P. laxiflorum* (incl. *P. xalapense*), **P. nitidum* and **P. annulum*, *Erianthus alopecuroides*, *E. giganteus*, *Andropogon ternarius*, **A. virginicus* var. *tetrastachyus*, *A. Elliottii*, **Cyperus paniculatus* Rottb. and *C. dipsaciformis*, *Rynchospora corniculata* and *R. cymosa*, *Scleria ciliata* var. *Elliottii* (Chapm.) Fern., *Carex stipata* var. *maxima* Chapm. (*C. uberior*), *C. amphibola*, **C. flaccosperma* Dewey, **C. oxylepis*, *C. debilis*, *C. Joorii* Bailey, *C. louisianica* Bailey and *C. gigantea*, *Lemna valdiviana* and *L. perpusilla*, *Wolffiella floridana*, *Commelina virginica* (*hirtella*), *Heteranthera reniformis*, *Juncus setaceus*, *J. biflorus* Ell. and *J. debilis*, **Amianthium muscaetoxicum*, *Smilax Bona-nox*, **Hypoxis leptocarpa* (map 7), **Dioscorea quaternata* and *var. *glauca*, *Salix longipes* Anderss. var. *Wardii* (Bebb.) Schneider, *Carya aquatica*, *Carpinus caroliniana* (typical),[3] *Quercus lyrata*, *Q. Prinus* (*Michauxii*), *Q. falcata*, *Q. nigra* and *Q. phellos*, *Celtis laevigata* Willd., *Polygonum opelousanum* Riddell and **P. densiflorum* Meisn., **Cabomba caroliniana*, *Ranunculus oblongifolius* and *R. pusillus*, *Clematis crispa*, **Cocculus carolinus*, *Itea virginica*, *Crataegus Phaenopyrum* and *C. Marshallii* Egglest., *Rubus trivialis*, *Desmodium ochroleucum* and *D. lineatum*, *Galactia regularis*, *Rhynchosia tomentosa*, *Strophostyles umbellata*, **Linum floridanum* (excl. *intercursum*),[4] *Polygala Curtissii*, **Crotonopsis elliptica* Willd., *Vaccinium arboreum*, *V. virgatum* var. *tenellum*, **Styrax americana*, **S. grandifolia*, *Fraxinus caroliniana*, *Chionanthus virginica*, *Sabatia brachiata*, *Euphorbia Ipecacuanhae*, **Stillingia sylvatica*, **Callitriche Austini*, *Ilex decidua*, *Berchemia scandens*, **Ampelopsis arborea*, *Ascyrum Hypericoides* var. *oblongifolium* (Spach) Fern., **Hypericum denticulatum* var. *ovalifolium* (Britton) Blake, *H. petiolatum* and *var. *tubulosum* (Walt.) Fern.[5] *Lud-*

[1] Much of the material from Florida to Mississippi, north into the mountains of Kentucky, is var. *cuspidata* (H. & A.) Wood (*P. ramosior* (Nash) Small).

[2] Excluding the more northern and later-flowering *A. scabra* Willd. See Rhodora, xxxv. 207, pl. 246, figs. 1 and 2 (1933).

[3] See Rhodora, xxxvii. 424, t. 394 (1935).

[4] See Rhodora, xxxvii. 430, t. 396, figs. 11–14 (1935).

[5] See Rhodora, xxxviii. 426 (1936).

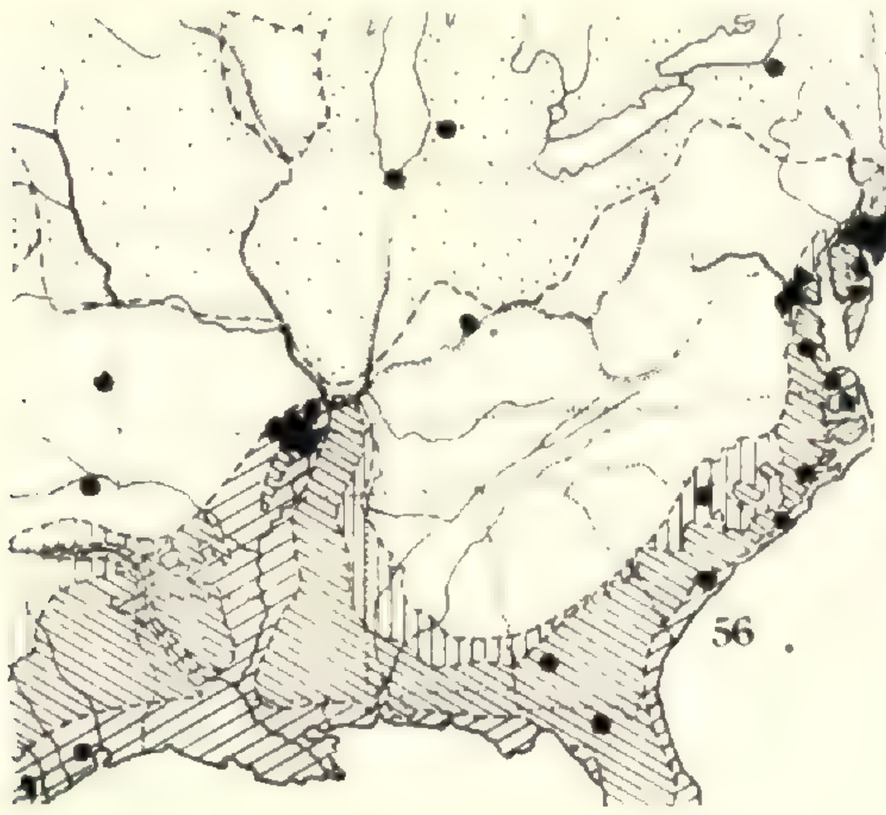
wigia glandulosa, *Myriophyllum pinnatum*, *Ptilimnium capillaceum*, *Nyssa aquatica*, *Cornus stricta*, *Lyonia mariana*, **Fraxinus profunda*, *Trachylospermum difforme*, *Asclepias variegata* and **A. rubra*, **Verbena canadensis*, **Lippia nodiflora*, *Callicarpa americana*, *Scutellaria integrifolia*, *Physostegia denticulata*, *Salvia lyrata*, **Pycnanthemum albescens*, *Oldenlandia uniflora*, *Diodia virginiana*, *Viburnum rufidulum*, *Melothria pendula*, *Elephantopus tomentosus*, **Eupatorium incarnatum* and *Cirsium virginianum*.

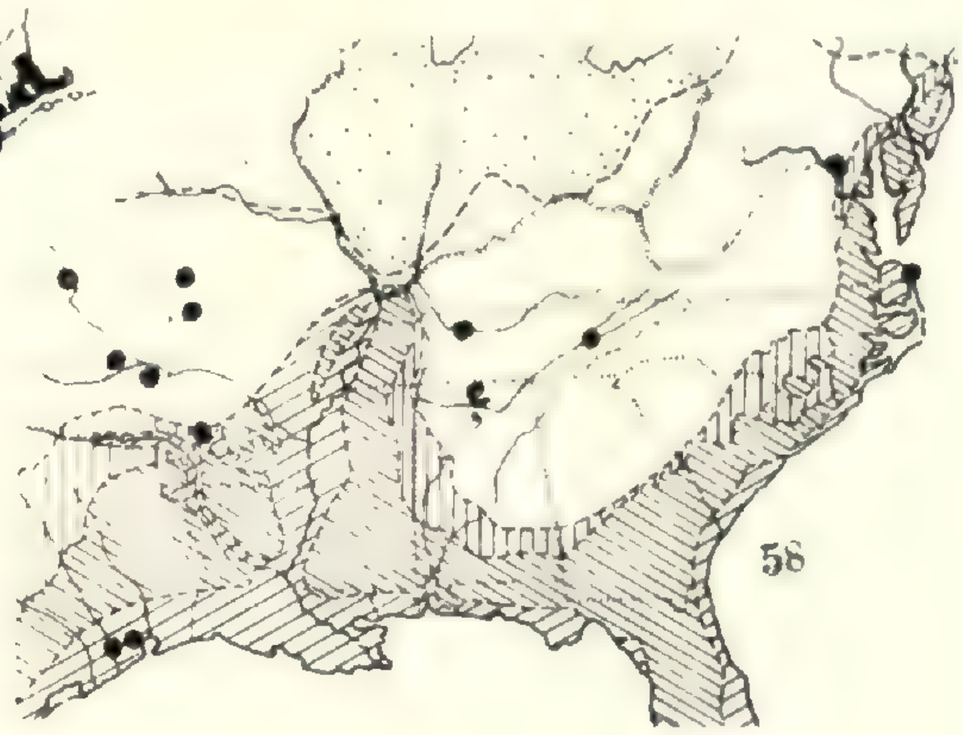
VA. Like V but with Colonies on the Appalachian or Ozark Upland. **Paspalum fluitans* (map 17), *Panicum Ravenelii* (map 52), *Scirpus divaricatus* (map 4), **Scleria oligantha* (map 53), *Xyris torta* J. E. Sm. (see also VB), **Juncus diffusissimus* (map 33), *Smilax glauca*, **Hexalectris spicata* (map 18), *Castanea pumila*, *Quercus marilandica*, *Ulmus alata* (map 54), *Phoradendron flavescens*, **Ranunculus palmatus* Ell., *Sanguinaria canadensis* var. *rotundifolia* (Greene) Fedde (Ozarks), *Desmodium laevigatum*, *Galactia volubilis*, *Clitoria mariana* (map 55), *Phyllanthus caroliniamus*, *Gentiana Saponaria*, **Obolaria virginica*, *Rhus Toxicodendron* (*quercifolia*), *Ilex opaca*, *Aesculus Pavia*, *Ascyrum Hypericoides* var. *multicaule* (Michx.) Fern., *Hypericum gymnanthum*, *Passiflora lutea* and *P. incarnata*, **Nyssa sylvatica* var. *caroliniana*, **Onosmodium virginianum*, *Campsis radicans* (L.) Seem. (*Tecoma*), *Bignonia capreolata*, *Diodia teres*, *Viburnum nudum*, *Elephantopus carolinianus*, *Eupatorium cuneifolium* var. *semiserratum*, *Liatris squarrosa*, *Chrysopsis mariana*, *Solidago erecta*, *S. rugosa* var. *celtidifolia* (Small) Fern. and **S. nemoralis* var. *Haleana* Fern., *Erigeron ramosus* var. *Beyrichii*, *Pluchea foetida* and *P. viscida* (Raf.) House (*petiolata*), *Gnaphalium purpureum*, *Rudbeckia laciniata* var. *humilis*, *Helianthus atrorubens* and *H. angustifolius*, *Bidens laevis* and *Krigia Dandelion*.

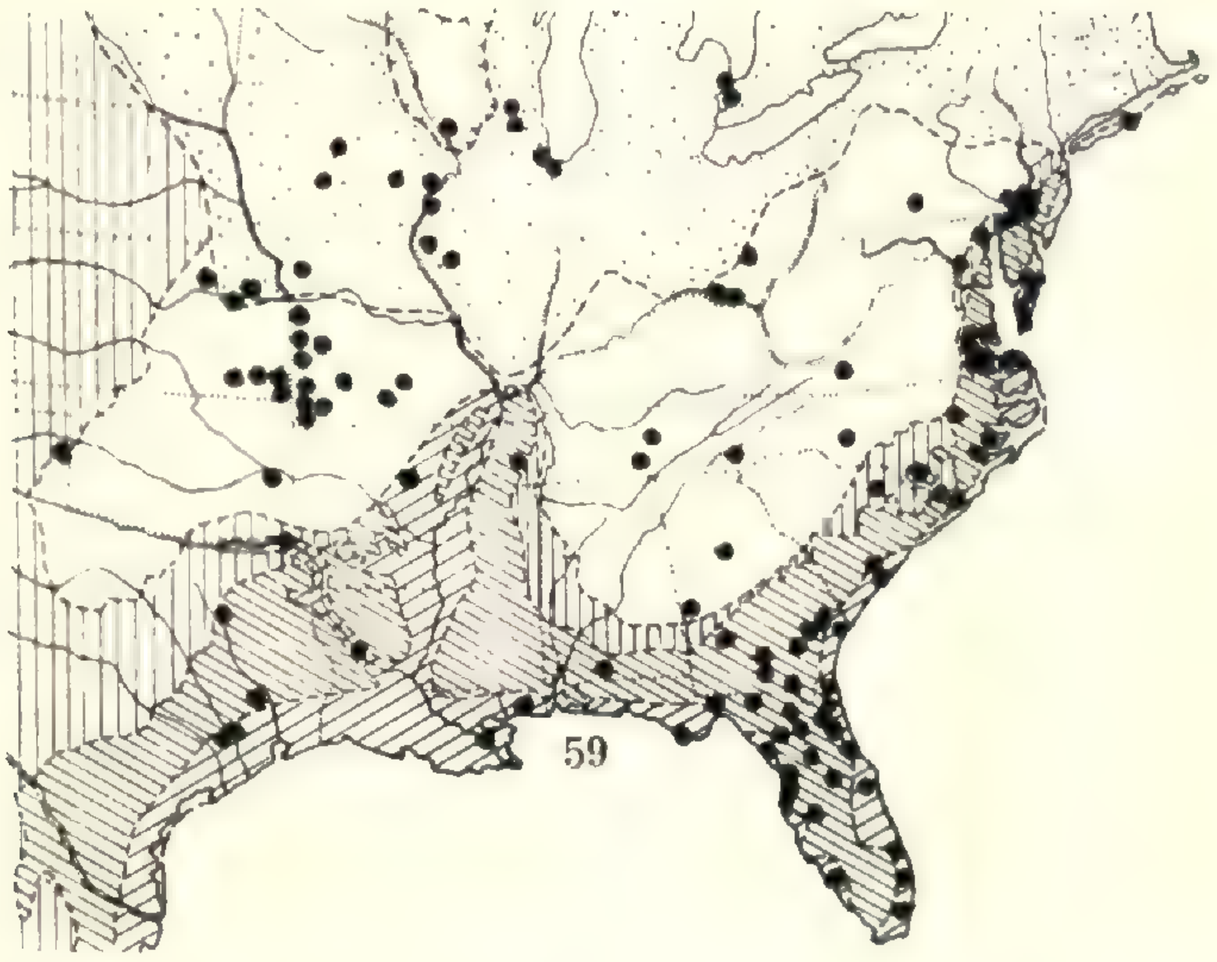
VB. Like V but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). **Panicum spretum*, *Fuirena hispida*, **Rynchospora macrostachya* (map 56), **Scleria setacea* Poir., *Xyris torta* (see VA), *Juncus scirpoides*, *Polygonum setaceum*, **Hottonia inflata*.

VI. Primarily on the Gulf Coastal Plain, with only local Colonies on the Atlantic Coastal Plain or its Extensions. **Cyperus Halei* Torr., **Rynchospora Harveyi* W. Boott, *Stylosanthes biflora* var. *hispidissima*, **Aesculus discolor* Pursh, *Viola affinis* var. *chalcosperma* (Brainerd) Griscom, **Lysimachia radicans* Hook., **Cephalanthus occidentalis* var. *pubescens* and **Triosteum angustifolium*.

VII. Primarily of the Interior of the Continent, often of the Prairie Region or Bottomlands northwest or west of the Appalachian Upland and prevailingly north of the Gulf Coastal Plain or in rich Areas of the North; isolated often by the Appalachian Upland or from the North in Areas on the Atlantic Coastal Plain or its Extensions. *Festuca paradoxa* Desv. (map 6), **Leersia lenticularis* (map 22), **Cyperus Engelmanni*, **Eleocharis Lindheimeri* (Clarke) Svenson (map 57), **Carex crus-corvi* (incl. var. *virginiana;* see map 9), **C. decomposita*, **C. Frankii*, *C. typhina*, *C. squarrosa* and **C. Grayii* (map 19), **Wolffia punctata*, **Juncus brachycarpus* (map 21), **Smilax herbacea*, var. *lasioneuron* (Hook.) A. DC., **Dioscorea villosa*, **Spiranthes ovalis* (at the junction of the Coastal Plain and the Piedmont), **Quercus velutina* var. *missouriensis* Sarg., **Iresine rhizomatosa* Standley (map 58), **Magnolia tripetala*, **Gillenia trifoliata* and **G. stipulata*,







MAP 56, range of RYNCHOSPORA MACROSTACHYA; 57, ELEOCHARIS LINDHEIMERI; 58, IRESINE RHIZOMATOSA; 59, POLYGALA INCARNATA (excluding Mexican area).

Psoralea psoralioides (Walt.) Cory (perhaps better in VA), **Lespedeza acuticarpa*, **Lathyrus venosus*, *Polygala incarnata* (map 59), **Viola villosa*, **Buchnera americana*, *Symphoricarpus orbiculatus*, **Kuhnia eupatorioides* and **Solidago gymnospermoides*.

A great number of these plants, it must be again emphasized, are highly localized on the Coastal Plain of Virginia, with only one to three known and usually very small stations. Scharff tellingly says of Bermuda, "it is manifest that although that most destructive of all creatures, 'man', has played havoc with the native animals and plants, largely exterminating them, a recognizable residue has survived from remote times;"[1] so in eastern Virginia some remnants are left to throw light on their probable geographic history. In the present discussion one may pass groups I–V as typical Coastal Plain plants which are to be expected. Groups VI and VII and subgroups A and B under I–V are the more interesting; and, were we to take in the Coastal Plain flora northward to Long Island and southward into the Carolinas, several very striking additions to these isolated floras would be recorded.

The members of subgroups IA to VA, with colonies on the Appalachian Upland (or sometimes the Ozark Upland), are probably more numerous than here indicated. Every serious exploration in these areas brings new cases to attention and I have doubtless wrongly classified a great many. These plants are of peculiar interest because, occurring on the old and now elevated core of eastern North America, they seem to be true relics of the Cretaceous or early Tertiary flora which, upon the elevation of the old Cretaceous peneplain from its sea-level status, partially moved outward to the newly available Coastal Plain. This general situation has been discussed or outlined several times and more and more the evidence accumulates that many species now characteristic of the Coastal Plain were formerly on the ancient core of eastern North America, in our latitude the Appalachian and Ozarkian Uplands.[2] Some students maintain that Coastal Plain species are moving into the ancient uplands. They may be right in this interpretation. In general, however, it seems to me more probable that plants and animals of long-established and conservative groups should have moved out from the ancient lands during pro-

[1] Scharff, Distribution and Origin of Life in America, 194 (1912).

[2] See in this connection Fernald, *Specific Segregations and Identities in some Floras of Eastern North America and the Old World*, Rhodora, xxxiii. 25–63 (1931)—Contrib. Gray Herb. no. XCIII; and Braun, *Some Relationships of the Flora of the Cumberland Plateau and Cumberland Mountains in Kentucky*, Rhodora, xxxix. 193–208 (1937).

nounced changes due to uplift and have entered the newer or younger areas as they became available for occupation, than that groups already conservative should have arisen upon the very young areas and then have intruded themselves successfully into the old regions where ancient series of species were already in possession. For example, in 1931, I cited "*Cleistes divaricata* (*Pogonia divaricata*), . . . a typical species of the Coastal Plain, . . . well known from high tablelands of the southern Appalachians"[1] and included it among species with relic colonies in the ancient area. Pennell, however, doubts its antiquity on the Appalachian Upland, saying:

> There can be no doubt that among the many illustrations cited by Professor Fernald many must be representatives of this ancient flora. Thus, *Amianthium*, *Xerophyllum*, and *Helonias* have all the expected features of ancient genera, few species, small or widely disrupted ranges, while all belong to tribes of the Liliaceae that show the primitive features of three distinct styles and septicidal dehiscence of the capsule; also, none of these have special mechanism for rapid seed-dispersal. But when upon the same list of characteristically Coastal Plain genera that occur also on the "high Appalachian crests and tablelands" we note *Calopogon* and *Cleistes*, genera with the highly modified floral structure of the Orchidaceae and seeds fitted by their minute size for carriage to long distances by wind, we can but ask whether these may not have passed inland from the lowland to the highland, at a relatively recent time. Certain it is that our study of the relations of the southern Appalachians and Coastal Plain has shown that migration may occur in either direction.[2]

Just why *Cleistes* (MAP 2) is so youthful a plant that, before the tilting off of the Miocene sea from the continental margin, it could not have been on the Appalachian core, Pennell does not make clear. It belongs to a group of the *Orchidaceae* which surely antedates the availability to plants of the Coastal Plain. Its own immediate alliance, the plants which have long been treated as *Pogonia*, has *Pogonia* itself geographically segregated between Atlantic North America and eastern Asia, while other members of its tribe are in Australia and other regions with most ancient floras.

In view of Pennell's belief that *Cleistes* is too recent a plant to have moved from the old land to the young Coastal Plain, it is at least significant that Small, in his *Manual* (1933) should have selected this monotype as the one illustration he gives of a movement out from the mountains to the coast! Discussing *Cleistes divaricata*, Small (p. 375)

[1] Fernald, l. c. 40 (1931).
[2] Pennell, Scroph. E. Temp. N. Am. 588, 589 (1935).

writes: "After the seas which deposited the Coastal Plain strata retreated, this plant spread to the seacoast, but still maintained a foothold in the mountains." Again (Addisonia, xviii. 39) he says: "*Cleistes* is perhaps a very ancient type. Its altitudinal range indicates a migration from the ancient highlands where it still maintains a foothold." It is also significant that in Kentucky, Professor Lucy Braun should find that "*Pogonia* (*Cleistes*) *divaricata* . . . is found near the headwaters of the Cumberland River between Pine and Black Mountain . . . and at the western margin of the Cumberland Plateau . . . on sandstone knobs or monadnocks of the undissected portions of the plateau, which are remnants of the Cumberland Peneplain. All three stations are far removed from the Coastal Plain and from the Southern Appalachians. *Schwalbea australis* Pennell [which on p. 448 I have shown to be really inseparable from *S. americana;* see MAP 23] is another Coastal Plain species found with *Cleistes* on the monadnocks of the Cumberland Plateau . . . and one which is a pronounced disjunct."[1] Professor Braun further shows, quoting chiefly from the physiographer, Fenneman, that "The last base-level which was general over this area—*except* for *certain* monadnocks—was that known as the Schooley or Cumberland Peneplain. . . . physiographers now date it as 'not older than Miocene'"[2]; and, considering the possibility of migration from or to the Coastal Plain, she concludes that "The occurrence of the other species [other than *Itea virginica* and *Quercus phellos*, which she thinks might have moved up from the Mississippi embayment] on undissected remnants of the plateau or on monadnocks and their wide separation from the general area of their ranges, point to the relic interpretation."[3] Incidentally, Pennell, commenting on the disrupted range of *Chelone Cuthbertii* (Coastal Plain of Virginia, mountains and Appalachian Valley of North Carolina; see MAP 3) feels that "its apparent local occurrence in such diverse environments suggests considerable antiquity."[4]

It is, of course, probable that some species of the Coastal Plain have moved up the valleys into the upland; but such upland species as *Trillium pusillum*, *Parnassia asarifolia* (MAP 41), *Stewartia pentagyna*, *Galax aphylla*, *Houstonia tenuifolia*, *Lobelia glandulifera* (MAP

[1] Braun, l. c. 197, 198 (1937).
[2] Braun, l. c. 201.
[3] Braun, l. c. 204.
[4] Pennell, l. c. 181.

20), *Silphium atropurpureum* (MAP 42) and many others with only solitary or few stations on the Coastal Plain seem to be parallel with *Cleistes divaricata* (MAP 2), species which have ventured from the upland very slightly into the lowland area or which, coming slightly down to the coast, have not been able there to dominate the flora. Logically, furthermore, others, like *Orontium aquaticum*, *Linum intercursum*, *Sabatia campanulata*, *Chelone Cuthbertii* (MAP 3), etc., which southward take to the upland but northward are chiefly on the Coastal Plain, seem also to have moved toward the coast from the mountains. Returning for a moment to *Cleistes divaricata*, since that species has become the text, so to speak, it is notable that at least north of Florida on the Coastal Plain the plant nowhere shows that reproductive capacity and pioneering tendency which is so evident in many youthful plants and in those newly in possession of virgin habitats. From the northern end of its range we get this statement regarding it (as *Pogonia divaricata*):

"This splendid Orchid was apparently first collected in the State by D. C. Eaton, at Batsto (in 1860?), and again July 7, 1864, at Quaker Bridge, by W. H. Leggett. From that time on there is no evidence of its having been found in New Jersey until June 30, 1909, when the writer discovered a small colony of plants near Bennett, Cape May Co., N. J. These specimens were not growing out in the wet bog where *P. ophioglossoides* abounded, but in a dryer spot near the edge, well concealed among various sedges, grasses, etc. They bloomed again in 1910 and produced seed, although the farmer's scythe passed within a couple of feet of them and they narrowly escaped being transformed into hay."—W. Stone, Pl. So. N. J. 371 (1912).

At the only Virginia station known[1] prolonged search might show eight or ten very isolated individuals. Proceeding to Georgia, we find the outstanding authority on that state saying "not common . . . Rarely as many as a dozen specimens can be seen at one time." R. M. Harper, Phytogeogr. Sketch Altamaha Grit Reg.—Ann. N. Y. Acad. Sci. xvii. 254 (1906). Its scarcity on the Coastal Plain north of Florida, although suggesting that it is there also a relic (or relict) does not suggest that it has recently been invading the mountains from these weak and scattered coastal stations.

Similarly, the plants of subgroups IB–VB, with colonies in northern

[1] Another station with three individuals was found in September, 1937.

Indiana or other areas near Lake Michigan, seem, as emphasized by me in 1931 (Fernald, l. c.) to be species which originally moved out from the old Appalachian centers both northwestward and eastward or southward. Some of the species, like *Woodwardia areolata*, *Fuirena squarrosa* and *Xyris torta*, still have relic-colonies on the mountains. Others have no known upland stations, but almost every year limited colonies of additional species of subgroups B are being found in the upland.

Group VI, consisting of a few plants which occur primarily on the Gulf Coastal Plain or its extensions northward, but east and northeast of southwestern Georgia or northwestern Florida are highly localized, may eventually be merged with Groups V and VII. Most of the plants of the group are rather technical species or varieties which may eventually be found in the region between Virginia or adjacent North Carolina and northwestern Florida. *Juncus diffusissimus* (MAP 33), for instance, although, according to Small, extending eastward only to Georgia, was collected in Florence and Berkeley Counties, South Carolina, by Wiegand and Manning (nos. 751 and 752) in 1927, and even in southeastern Virginia (no. 750).

Group VII is the most interesting and least explicable element in the flora, plants of the rich valleys, bottomlands or other habitats of the interior, but sometimes of the North, isolated, often by hundreds of miles, in southeastern Virginia. *Carex crus-corvi* (MAP 9), with its Virginian variety hundreds of miles removed from the primary area of the species, is typical of the group. *Eleocharis Lindheimeri* (MAP 57), has a single small area (False Cape) in Virginia; otherwise its eastern limits are in Michigan and in Texas. Similarly, *Solidago gymnospermoides*, characteristic of a thicket bordering salt marsh in Northampton County, is primarily a species of sands and prairies from Minnesota to Louisiana and westward. Others, like *Juncus brachycarpus* (see p. 346 and MAP 21), have a few upland stations; while the oxylophytic *Buchnera americana* is primarily on the Appalachian and Ozarkian Uplands, with relatively few stations in the lowland. Some of the species of Group VII are, then, clearly such as have radiated out of the ancient Appalachian or Ozarkian Uplands. Others, especially the plants of rich, calcareous alluvium, belong more clearly in the prairie-bottomland flora. Whether the ranges of these species are actually so disrupted as they now seem may well be doubted. Exploration of the calcareous bottoms on or

near the Coastal Plain of the Carolinas may show their seemingly isolated eastern stations to connect, interruptedly, with the bottomland stations of the interior. Here is a real challenge to those who are situated to carry on field-work in the Carolinas. The plants of the rich interior bottoms, having found the valleys of the Meherrin, Nottoway, or other streams in southeastern Virginia, are there able to thrive, as pointed out in the opening paragraphs, side-by-side with oxylophytes, apparently because of the layer of Miocene shells which occurs only slightly beneath the surface. Farther south, where the calcareous and acid soils are similarly intermixed the same floristic conditions are likely to be found.

Explanation of Plates 474–487

Plate 474. Paspalum repens Bergius. Figs. 1–3, summits of leaf-sheaths, × 2: fig. 1, from Central Paraguay, *Morong*, no. 282; fig. 2, from Pará, Brasil, July 17, 1935, *Stillman Wright;* fig. 3, from Caicara, Venezuela, *Haman*, no. 4. Figs. 4 and 5, spikelets, × 10: fig. 4, from same plant as fig. 1; fig. 5, from same plant as fig. 2.

P. fluitans (Ell.) Kunth. Figs. 6–10, summits of leaf-sheaths, × 2: fig. 6, from Jasper, Missouri, September 16, 1908, *E. J. Palmer;* fig. 7, from Oquawka, Illinois, *Patterson;* fig. 8, from Decker, Indiana, *Deam* in Amer. Gr. Nat. Herb., no. 902; fig. 9, from Courtland, Virginia, *Fernald & Long*, no. 6460; fig. 10, from Istachatta, Florida, *A. H. Curtiss*, no. 5970. Figs. 11–13, spikelets, × 10: fig. 11, from same plant as fig. 10; fig. 12, from same plant as fig. 7; fig. 13, from same plant as fig. 9.

Plate 475. Rynchospora trichophylla, n. sp.: fig. 1, portion of plant, × ⅖, from 4 miles northwest of Homeville, Virginia, *Fernald & Long*, no. 6063 (type); fig. 2, inflorescence, × 2, from type; figs. 3 and 4, achenes, × 20, from type.

R. filifolia Torr.: fig. 5, inflorescence, × 2, from isotype, North Carolina, *M. A. Curtis;* fig. 6, achene, × 20, from isotype.

R. Wrightiana Boeckl.: fig. 7, inflorescence, × 2, from Littleton, Virginia, *Fernald & Long*, no. 6085; fig. 8, achene, × 20, from no. 6085.

R. fuscoides C. B. Clarke; fig. 9, inflorescence, × 2, from Jacksonville, Florida, *A. H. Curtiss*, no. 4874; fig. 10, achene, × 20, from no. 4874.

Plate 476. Carex crus-corvi Shuttlew.: fig. 6, inner band and summit of leaf-sheath, × 5, from Augusta, Illinois, *Mead;* fig. 7, inner face of perigynium, × 10, from central Arkansas, *F. L. Harvey*, no. 24; fig. 8, outer face of perigynium, × 10, from same collection.

Var. virginiana, n. var., all figs. from type-collection: fig. 1, panicle, × 1; fig. 2, summit of sheath, × 5; figs. 3 and 5, inner faces of perigynia, × 10; fig. 4, outer face of perigynium, × 10.

Plate 477. Juncus Longii, n. sp.: fig. 1, type-specimen, × ⅖, from Coddyshore, Sussex County, Virginia, *Fernald & Long*, no. 6144; fig. 2, tip of stolon, × 1, from the type; fig. 3, young fruits, × 8, from headwaters of Blackwater River, Virginia, *Fernald, Long & Smart*, no. 4711; fig. 4, seed, × 40, from the type.

J. marginatus Rostk.: fig. 5, base, showing stolons, × 1, from Courtland, Virginia, *Fernald & Long*, no. 6567; fig. 6, base of cespitose plant, × 1, from Orono, Maine, August 24, 1897, *Fernald;* fig. 7, fruits, × 8, from Williamsburg, Virginia, *Grimes*, no. 3704; fig. 8, seeds, × 40, from Shelburne, Nova Scotia, *Fernald & Long*, no. 23,640.

J. BIFLORUS Ell.: FIG. 9, rhizome, × 1, from Pembroke, Bryan County, Georgia, *Harper*, no. 1846; FIG. 10, fruits, × 8, from Homeville, Virginia, *Fernald & Long*, no. 6149; FIG. 11, seeds, × 40, from Brewster, Massachusetts, *Fernald*, no. 16,572.

PLATE 478. POLYGONELLA POLYGAMA (Vent.) Engelm. & Gray: FIG. 6, two plants, × 1/5, from Wilmington, North Carolina, *Biltmore Herb.*, no. 717[a]; FIG. 7, leaves, × 2, from south of Zuni, Virginia, *Fernald & Long*, no. 6809; FIG. 8, old rachis, showing the scarious ochreolae, × 10, from no. 6809.

P. POLYGAMA, var. CROOMII (Chapm.) Fernald: FIG. 9, leaves, × 2, from White Lake, Bladen County, North Carolina, *Oosting*, no. 33,648; FIG. 10, old rachis, showing the scarious ochreolae, × 10, from no. 33,648.

P. BRACHYSTACHYA Meisner: FIG. 4, leaves, × 2, from Myers, Florida, *Hitchcock*, no. 309; FIG. 5, old rachis, showing the firm ochreolae with coriaceous borders and exserted pedicels, × 10, from no. 309.

P. BRACHYSTACHYA, var. LAMINIGERA, n. var.: FIG. 1, two plants, × 1/5, from Indian River, Florida, *A. H. Curtiss*, no. 2433 (TYPE); FIG. 2, leaves, × 2, from TYPE; FIG. 3, old rachis, × 10, from TYPE.

PLATE 479. GEUM CANADENSE Jacq., var. BREVIPES, n. var.: FIG. 1, TYPE, × 2/5, from Nottoway River, southwest of Burt, Sussex County, Virginia, *Fernald & Long*, no. 6224; FIG. 2, portion of fruiting head, to show style-tips, × 10, from no. 6224; FIG. 3, mature achene, × 10, from type station, *Fernald & Long*, no. 6605.

Var. GRIMESII Fernald & Weatherby: FIG. 4, portion of summit of TYPE, × 2/5, from near Williamsburg, Virginia, *Grimes*, no. 3605.

PLATE 480. TYPE of CASSIA MARILANDICA L., in Linnean Herbarium (kindness of Mr. SPENCER SAVAGE).

PLATE 481. CASSIA HEBECARPA, n. sp.: FIG. 1, top of plant, × 2/5, from Newton, Massachusetts, *W. P. Rich* (TYPE); FIG. 2, base of petiole, showing gland and stipule, × 4, from TYPE; FIG. 3, ovary, after anthesis, × 2, from TYPE; FIG. 4, legumes, × 1, from Sheffield, Massachusetts, September 25, 1899, *Ralph Hoffmann*.

PLATE 482. LYSIMACHIA LANCEOLATA Walt.: FIG. 1, characteristic base, × 1, from Greensboro, North Carolina, *Wiegand & Manning*, no. 2484; FIG. 2, calyx, × 4, from Ewell, Virginia, *Grimes*, no. 4481; FIG. 3, bases of cauline leaves, × 4, from same plant as fig. 1; FIG. 4, rosette-leaf, × 4, from Allegheny County, Pennsylvania, *Shafer*, no. 1534.

L. HYBRIDA Michx.: FIG. 5, base, with autumnal rosette, × 1, from Saugus, Massachusetts, *Fernald & Svenson*, no. 1016; FIG. 6, bases of cauline leaves, × 4, from Bennett, New Jersey, *Gershoy*, no. 564; FIG. 7, calyx, × 4, from no. 564.

PLATE 483. GALIUM CIRCAEZANS Michx. and var. HYPOMALACUM, n. var. Explained on p. 450.

PLATE 484. EUPATORIUM ALBUM L., var. TYPICUM: FIG. 1, leaf, × 2, from Eastville, Virginia, *Fernald & Long*, no. 5492; FIG. 2, involucre, × 4, from Newfield, New Jersey, *Tidestrom*, no. 8066.

Var. GLANDULOSUM (Michx.) Fernald: FIG. 3, involucre, × 4, from Bluffton, South Carolina, September, 1879, *Mellichamp*.

Var. MONARDIFOLIUM, n. var.: FIG. 4, portion of TYPE, × 2/5, from near Chillum, Maryland, *Blake*, no. 9723; FIG. 5, leaf, × 2, from near Biltmore, North Carolina, *Biltmore Herb.*, no. 399[b]; FIG. 6, involucre, × 4, from the TYPE.

Var. SUBVENOSUM Gray: FIG. 7, leaf, × 2, from the TYPE, Middle Island, Long Island, New York, September 4, 1871, *E. S. Miller;* FIG. 8, involucre, × 4, from the TYPE.

PLATE 485. EUPATORIUM LEUCOLEPIS (DC.) Torr. & Gray: FIG. 1, characteristic foliage, × 2/5, from Hampton Furnace, New Jersey, September 10, 1914, *C. D. Fretz;* FIG. 2, stem and leaf-bases, × 4, from north of Swift Creek, Chesterfield County, Virginia, *Fernald & Long*, no. 6408.

Var. NOVAE-ANGLIAE, n. var.: FIG. 3, TYPE, × 2/5, from Loon Pond, Lakeville, Massachusetts, *Fernald & Long*, no. 10,492; FIG. 4, stem and base of

median leaf, × 4, from Smelt Pond, Kingston, Massachusetts, August 30, 1908, *Rich & Knowlton;* FIG. 5, stem and upper leaves, × 4, from TYPE.

PLATE 486, involucres × 8. CHRYSOPSIS MARIANA (L.) Nutt.: FIG. 1, from Atsion, New Jersey, *Gershoy*, no. 688; FIG. 2, from Savage Neck, Northampton County, Virginia, *Fernald & Long*, no. 5505.

Var. MACRADENIA, n. var.: FIG. 3, from the TYPE, southwest of Waverly, Virginia, *Fernald & Long*, no. 6885; FIG. 4, from northwest of Williamsburg, Virginia, *Grimes*, no. 3191.

PLATE 487. RUDBECKIA HIRTA L.: FIG. 4, lower surface of leaf, × 10, from Middletown, Rhode Island, July 3, 1909, *E. F. Williams.*

Var. SERICEA (T. V. Moore) Fernald: FIG. 3, lower surface of leaf, × 10, from Leeds, North Dakota, July 21, 1896, *Lunell.*

Var. CORYMBIFERA, n. var.: FIG. 1, TYPE, × ⅖; FIG. 2, lower surface of leaf, × 10, from TYPE.

EXTENSIONS OF RANGE AND A NEW SPECIES IN CAREX[1]

FREDERICK J. HERMANN

SEVERAL species of *Carex* collected by the writer in Utah and Colorado in 1933 which are apparently new to one or the other of those states may now be put on record as occurring there, and one new species calls for description. The species to be enumerated from Utah, all from the Uinta Mountains in the northeastern corner of the state, are not included in Tidestrom's "Flora of Utah and Nevada" (Contr. U. S. Nat. Herb. **25**. 1915) nor are they recorded for the state by Mackenzie in his recent monograph of the North American species of the genus (N. Am. Fl. **18**, parts 1–7. 1931–5) with the exception of *C. illota, C. atrata* and *C. physocarpa* which will be included here to establish definite locality records for these species. Neither of the two species from Colorado, which were collected on the White River Plateau, are ascribed to that state by Mackenzie.

The Utah reports represent range extensions principally from the north or east, the Colorado from the north and west.

Herbaria in which specimens supporting the records have been deposited are represented as follows: California Academy of Sciences (CA); Carnegie Museum (CM); Gray Herbarium (G); Herbarium of F. J. Hermann (H); University of Michigan (M); Missouri Botanical Garden (Mo); National Herbarium (N); New York Botanical Garden (NY); Philadelphia Academy of Natural Sciences (P); Rocky Mountain Herbarium (R); State College of Washington (W).

[1] Paper from the Department of Botany of the University of Michigan no. 623.

Utah

Carex vallicola Dewey. Daggett Co.: aspen grove, east slope of Eagle Creek Canyon, 2 miles west of Green Lakes, alt. 7200 ft., July 12, no. 4860 (H).

C. brunnescens (Pers.) Poir. Duchesne Co.: boggy north shore of Third Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,100 ft., July 21, no. 5183 (CA; CM; G; H; Mo); wet border of pond in spruce grove north of First Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 10,600 ft., July 23, no. 5224 (H; NY; R).

C. illota Bailey. Duchesne Co.: abundant on edge of streamlet in moist meadow just above timber line, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,300 ft., July 18, no. 4954 (CA; G; H; M; Mo; N; P; R; W); boggy north shore of Third Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,100 ft., July 21, no. 5180 (H; NY).

C. praticola Rydb. Duchesne Co.: crevices among boulders, rocky shore of Fourth Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,200 ft., July 20, no. 5096 (CA).

C. obtusata Liljebl. Daggett Co.: bank of stream tributary to Carter Creek in open aspen grove, alt. 8300 ft., July 11, no. 4788 (CA; G; H; Mo; R).

C. Drummondiana Dewey. Duchesne Co.: grassy, rock moraine bordering cold pond in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,340 ft., July 19, no. 4999 (H; Mo).

Reported by Mackenzie only from Alberta and Colorado.

C. misandra R. Br. Duchesne Co.: wet, grassy shore of small lake in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,350 ft., July 19, no. 5027 (CA; G; H; Mo; R).

A boreal species ranging from Greenland to Quebec and Alaska; farther south known previously only from central Colorado.

C. podocarpa R. Br. Duchesne Co.: grassy bank of cold pond in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,340 ft., July 19, no. 4988 (CA; H).

Wyoming is the southernmost state cited by Mackenzie for this species.

C. Nelsonii Mackenzie. Duchesne Co.: wet, grassy shore of small lake in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,300 ft., July 19, no. 5043 (H; Mo.). Summit Co.: tundra on N. W. ridge of Lamotte Peak, alt. 11,800 ft., August 18, no. 5992 (H).

A western extension; previously known only from Colorado and Wyoming.

C. **pelocarpa**, sp. nov. (§Atratae). Dense caespitosa e rhizomatibus crassis brevibus; culmi 2.6–4.1 dm. alti, laevigati, acute triangu-

lares, tenues, cernui, folia superantes; folia frondosa 3–6 plerumque basi aggregata, laminis crassis rigidulis, marginibus aliquantulum revolutis, ad apicem attenuatum minute serrulatis, vaginis albidis; spicae 2–5 ovoideae, 7–10 mm. longae, 5–7 mm. latae, sessiles in capitulum terminale confertae, spica terminalis gynaecandra laterales femineae bracteis brevibus una vel duabus; squamae oblongo-lanceolatae, acutae vel acuminatae, laeves, atro-purpureae perigyniis maxime angustiores; perigynia ovata, late ovata vel suborbiculata, 3.5–4.5 mm. longa, 2.5–3 mm. lata, valde complanata, membranacea, nitidissima laevesque, atro-purpurea, basi sessilia abrupte in rostrum bidentem 0.5–1 mm. longum contracta; achaenia triangularia ellipsoidali-ovoidea longe stipitata.

Densely cespitose from short, stout rootstocks; culms 2.6–4.1 dm. high, smooth, sharply triangular, slender and nodding, not at all stiff, two to three times the length of the leaves, more or less purplish-tinged and fibrillose at the base, the dried-up leaves of the previous year conspicuous; leaves with well-developed blades 3–6 to a fertile culm, mostly clustered at the base, the blades 5–24 cm. long, 1.5–4 mm. wide, thick and firm, light green, flat with somewhat revolute margins, channeled or slightly triangular toward the attenuate, strongly minutely serrulate apex, the midrib prominent, minutely serrulate ventrally toward the apex, the sheaths white-hyaline and very membranaceous ventrally, the ligule generally as wide as long but highly variable and often imperfect; spikes (2–5) generally 3, ovoid, 7–10 mm. long, 5–7 mm. wide, very closely-flowered, closely aggregated into a dense terminal head 14–19 mm. long, 13–17 mm. wide, the terminal gynaecandrous, the lateral pistillate; head subtended by an open bract averaging 5 mm. long, a second bract frequently present 10–20 mm. below the head, 25–30 mm. long, not exceeding the head, with short, colored, open sheath; scales oblong-lanceolate, acute to acuminate, the midrib more or less conspicuous, at least toward the tip, smooth, dark reddish-purple, not at all hyaline-margined or rarely slightly so toward the apex, the pistillate scales much narrower than the perigynia and generally shorter or equaling them but those toward the apex of the spike usually somewhat exceeding the perigynia; perigynia ovate to broadly ovate or suborbicular, 3.5–4.5 (averaging 4) mm. long, 2.5–3 (averaging 3) mm. wide, strongly flattened, appressed or ascending, 2-ribbed (the marginal), otherwise nerveless, membranaceous, smooth and not at all ciliate-scabrous, dark reddish-purple and very glossy, the margins sometimes straw-colored, rounded and sessile at the base, very abruptly short-beaked, the beak 0.5–1 mm. long, bidentate, dark purple to black; achenes triangular, elipsoid-ovoid, 1.5–1.75 mm. long, 0.8–0.9 mm. wide, long-stipitate, stramineous, finely granular, apiculate and jointed with the included style; stigmas 3, slender, white.—Duchesne Co.: dry, rocky shore of Fourth Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,200 ft., July 20, 1933, no. 5094 (CA; G; H); barren, rocky, S. E. slope of

Mt. Emmons, alt. 12,300 ft., July 20, 1933, no. 5143 (CA; H; P). Summit Co.: tundra on N. W. ridge of Lamotte Peak, alt. 11,800 ft., August 15, 1933, no. 5983 (CA; NY—Type).

C. pelocarpa is apparently endemic in the Uintas where it is locally frequent above timber line. Its large, dark and glistening heads nodding on slender flexuous culms are a striking characteristic in the field. In its smooth perigynia, stipitate achenes and clustered spikes it is related to *C. Helleri* Mackenzie of California and western Nevada. From that species it differs in its flexuous, entirely smooth culms, its shorter, broader and more closely congested heads, shorter spikes (7–10 mm. long, in *C. Helleri* 10–20 mm. long), shorter and broader scales (in *C. Helleri* even the lowermost scales conspicuously exceed the perigynia) which are less firm, not aristate, and with the less conspicuous midrib prominent only toward the tip, in its larger perigynia and in the markedly longer stipe of the achene. The short, aggregated spikes and generally broadly-ovate to suborbicular, strongly flattened perigynia simulate those of *C. nova* Bailey, a species of moister habitats in the Uintas, but from this it is readily set off by its long-stipitate achenes, its glossy, erect or ascending perigynia which are smooth-, not at all ciliate-scabrous-, margined, its much more deeply bidentate perigynium-beaks, its acuminate scales with more or less prominent midrib, its slender culms and nodding inflorescence, and its narrower, ovoid rather than suborbicular heads in which the individual spikes stand out conspicuously. In *C. nova* the sessile spikes are generally so closely congested into the stiffly erect head that the inflorescence superficially resembles a single spike, a semblance which is heightened at maturity by the widely spreading perigynia. *C. albo-nigra* Mackenzie and *C. Nelsonii* Mackenzie, the other sessile-spiked species of § *Atratae* found in the Uinta Mountains, differ from *C. pelocarpa*, among many other characters, in their erect heads and much larger and broader, blunt scales (often covering the perigynia in *C. albo-nigra* and conspicuously hyaline-margined), in their narrower, strongly granular-roughened perigynia and merely substipitate achenes; the former in its stiff, erect and relatively stout culms which are roughened above; the latter in its loosely cespitose habit and sub-inflated perigynia.

Associated plants were few in the arid, rocky habitat of *Carex pelocarpa* at its type station on Lamotte Peak. *Sieversia turbinata* (Rydb.) Greene was the dominant species here; *Gentiana Romanzovii*

Ledeb., *G. monantha* A. Nels., *Salix saximontana* Rydb., *Castilleja occidentalis* Torr., *Kobresia Bellardi* (All.) Degland and *Lychnis Kingii* S. Wats. were occasional in nearby crevices, but the only associates characterizing also the stations for the species on Mt. Emmons were *Senecio Fremontii* T. & G., *Mertensia Bakeri* Greene and *Cystopteris fragilis* (L.) Bernh. On the steep, rocky shore of Fourth Chain Lake *Castilleja rhexifolia* Rydb., *Erigeron acris* L., var. *debilis* Gray, *Cryptogramma acrostichoides* R. Br., and *Carex praticola* Rydb. shared its habitat, while on the higher barren slopes of Mt. Emmons these gave place to *Festuca ovina* L., var. *brachyphylla* (Schult.) Piper, *Erigeron compositus* Pursh and its variety *incertus* A. Nels., *Castilleja viscida* Rydb., *Polemonium viscosum* Nutt., *Chaenactis Douglasii* H. & A., var. *alpina* Gray, *Smelowskia calycina* (Stephan.) C. A. Meyer, *Artemisia Michauxiana* Bess. and *Penstemon uintahensis* Pennell.

C. ATRATA L. DUCHESNE CO.: rocky, alpine meadow at timber line, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,300 ft., July 18, nos. 4965 (CA; H) and 4965½ (G; H; Mo; R).

C. PHYSOCARPA Presl. DUCHESNE CO.: grassy bank of cold pond in tundra above Chain Lakes, S. E. slope of Mt. Emmons, alt. 11,340 ft., July 19, nos. 5013 (H), 5018 (H; Mo), 5029 (G), 5031 (R), and 5039 (CA; H). SUMMIT CO.: wet, grassy shore of Duck Lake, N. W. slope of Lamotte Peak, alt. 10,200 ft., August 15, no. 5937 (H).

COLORADO

C. JONESII Bailey. GARFIELD CO.: edge of spruce woods in low, moist meadow along trail to "Flat Top" above Trappers' Lake, alt. 10,500 ft., August 2, no. 5589 (CA; H).

Recorded by Mackenzie from Washington, Oregon, California and Wyoming.

C. NEUROPHORA Mackenzie. GARFIELD CO.: wet, open bank of White River ¼ mile north of Trappers' Lake, alt. 9450 ft., July 29, no. 5444 (G; H; Mo).

A northwestern species known to Mackenzie from Washington, Oregon, Idaho, Montana and Wyoming.

UNIVERSITY OF MICHIGAN.

NOTES ON EUPHORBIA

Louis C. Wheeler

Euphorbia glyptosperma Engelm., Bot. Mex. Bound Survey **2**: 187. 1869.

The only hint Engelmann gave as to the basis of this species was: "E. polygonifolia, *Hook. Fl. Bor. Am.* fide spec. auctoris *non Linn.*" In Engelmann's herbarium, now at Missouri Botanic Garden, are two specimens from Hooker's herbarium. They are E. glyptosperma. Both specimens are rather fragmentary to be used as types even though they do show beyond question that *E. polygonifolia, sensu* Hooker, is *E. glyptosperma.* There is another specimen in the Engelmann herbarium labeled as this species in what I take to be Engelmann's hand. It was collected at Fort Kearney on the Platte, July, 1856, *Henry Engelmann.* I choose this specimen as the type since it was probably in Geo. Engelmann's hands when he described the species and it is a good specimen. Fort Kearney is not on modern maps but it is shown on the map of the Territory of the United States from the Mississippi River to the Pacific Ocean in the Pacific Railroad Reports vol. 11, as being very close to the present town of Newark, Kearney Co. Nebraska. It is diagonally across the Platte River from the present town of Kearney.

Euphorbia manca A. Nelson, Bot. Gaz. **47**: 437. 1909. *Tithymalus mancus* (A. Nelson) Heller, Muhl. **9**: 67. 1913. The type: Mancos, Colorado, *C. F. Baker, F. S. Earle, & S. M. Tracy, No. 23,* June 23, 1898 (Herb. Univ. of Wyoming), differs in no respect from many California specimens of *Euphorbia crenulata.* There is one point in the description by which it appears to differ: "inflorescence once or twice trichotomous:". The terms of the description are based partly on mistaken observation and partly on use of terminology which may be confusing. "Once trichotomous" refers to the three-rayed inflorescence as I choose to describe it. "Twice trichotomous" must have been based on the assumption that if the first branching of the inflorescence were trichotomous the succeeding branchings would also be. Unfortunately the rays of the inflorescence in section *Tithymalus* are almost invariably dichotomous as they are in this case. The characters used in the key to separate *E. crenulata* and *E. manca* simply do not hold.

Gray Herbarium

THE IDENTITY OF LOBELIA GLANDULOSA Walt.—It has not been generally recognized that much of the description of *Lobelia glandulosa* Walt. Fl. Carol. 218 (1788) can apply only to *L. puberula* Michx. Fl. Bor.-Am. ii. 152 (1803). Walter's diagnosis was as follows:

> *glandulosa* 5. caule erecto subpiloso, foliis oblongis obtuse sublanceolatis subdentatis longitudine florum, flor. axillaribus solitariis purpureis pedunculis brevibus, bracteis 2 glandula terminatis, capsulis villosi, *calycis laciniis dentatis* longis suberectis.

The subpilose stem and the oblong, obtuse leaves apply only to *L. puberula*, but the dentate calyx-lobes belong only to *L. glandulosa* as currently understood. The balance of the description might apply to either species. Accordingly we asked Mr. C. A. Weatherby, on his visit to London in 1935, to examine Walter's specimens. He reported that there are three pieces on the sheet: one clearly *L. puberula* Michx., another (described by Walter as *L. siphilitica?*) which is the broad-leaved extreme of *L. elongata* Small, and a third, which is the narrow-leaved extreme of *L. elongata.* Mr. Weatherby could find nothing agreeing with Walter's "*calycis laciniis dentatis,*" i. e. the plant which, since Elliott, has regularly passed as *L. glandulosa.* However, in the Gray Herbarium there is a full raceme of such a plant, with definitely dentate calyx-lobes, which was labeled by Asa Gray as follows; "*Lobelia* Walt. *L. glandulosa* fl.! Cf. no. 2 in notes." This specimen is in a pocket labeled in Gray's hand: "Herb. Walter! See notes."

The pertinent facts are as follows. Asa Gray examined the Walter Herbarium in February, 1839, and left a small book of notes upon it. Under *Lobelia glandulosa* there is the following comment: "I take fl. fr. specimen verum, but the cal. segments are entire. A loose spec. without specific name—a smooth plant—agrees better with descr [iption] as to calyx (no. 2)." It becomes apparent, therefore, that the only element which Walter had with "*calycis laciniis dentatis*" was given to Asa Gray. In view of the fact that this is the only extant type of the Walter plant with dentate calyx-lobes, the plant definitely accepted by Elliott, Gray and McVaugh as *L. glandulosa*, the name should stand for this element. A portion of the inflorescence has been returned to the British Museum.—M. L. FERNALD AND LUDLOW GRISCOM.

Volume 39, no. 467, including pages 425–464 and plates 482–487, was issued 5 November, 1937.

ERRATA

Page 22, line 37; for *sempervvrens* read *sempervirens.*
Page 62, line 19; *for* ♂ *read* ☿ ; *for* ○ *read* ♀ .
Page 62, line 20; *for* ○ after all three names *read* ♀ .
Page 62, line 21; *for* ○ *read* ♀ .
Page 195, line 6; *for* (2) *read* (3).
Page 195, line 7; *for* (3) *read* (2).
Page 233, line 5; for "ALFILERIA (FILAREE) SEED" *read* ALFILERIA (FILAREE) "SEED."
Page 264, line 22; *for* Acinda *read* Alcinda.
Page 264, line 28; *for* Fermont *read* Fremont *and for* ; near *read* . MICHIGAN: near.
Plates 463, 464 and 465; in caption *omit* SERIES TENUISSIMAE.
Page 309, line 4; *for* 472 *read* 473.
Page 311, line 13; *for* as long to *read* as long as to.
Page 312, line 9: for Petrak read *Petrak.*
Page 321, line 21; *for* KATHERINE *read* KATHARINE.
Page 337, line 31; *for* Isle Wight *read* Isle of Wight.
Page 341, line 27; *for* or *read* of.
Page 399, line 22; *for* LASIONEURA *read* LASIONEURON.
Page 437, line 26; *for* **carolina** read **caroliniana** and for *carolina* read *caroliniana.*

INDEX TO VOLUME 39

New scientific names are printed in full-face type