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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

CXIII

By M. L. FERNALD

DATES OF ISSUE

Pages 165 to 182, plates 412 to 416 . . . . . 2 May, 1936
" 201 to 239, " 417 to 434 . . . . . 13 June, 1936

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXIII.

M. L. Fernald

(Plates 412–434)[1]

During the studies necessary in a thorough revision of Gray's *Manual* much new or newly interpreted matter is inevitably accumulated. The following items assembled during the past two years are here published in the more extended form which, of course, will be impossible in the condensed work, when eventually finished. In a few cases, the new *Potamogeton* for instance, plants slightly outside the manual-range are discussed.

I. A NEW PONDWEED FROM TENNESSEE

In May, 1933, Professor H. M. Jennison, swimming across Clear Fork River in Morgan County, Tennessee, found himself dragging ashore strands of a flowering pondweed, of which he brought material to the Gray Herbarium. In my recent *Linear-leaved North American Species of Potamogeton*[2] there was no provision for Jennison's plant, unless under *P. bicupulatus*. The material was barely in flower, but it lacked the rounded axillary lower spikes and had much longer-peduncled emersed spikes and larger floating leaves with 9–23, instead of 5–7 nerves. The plant not being *P. bicupulatus*, I suggested the possibility that it might be the long unknown and wholly provisional

[1] The photography and preparation of the engraver's blocks have been made possible through grants to the author from the Milton Fund for Research and the Wyeth Fund of the Division of Biology, both of Harvard University. The cost of reproduction in Rhodora has been most generously defrayed by Mr. Bayard Long.

[2] Mem. Am. Acad. xvii[1].—Mem. Gray Herb. no. iii. (1932).

P. Purshii Tuckerm. Am. Journ. Sci. ser. 2, vi. 228 (1848). Now, thanks to the activity of Dr. H. K. Svenson, we have a fine suite of material of Jennison's plant in fruit and some in flower showing that it is a species unique in many characters and as closely allied to the subsection *Nuttalliani* (*P. epihydrus* Raf.) as to the subsection *Hybridi* (*P. bicupulatus* Fern., *P. capillaceus* Poir., etc.), in fact standing midway between those two American subsections. Its adnate stipules and linear-filiform, flaccid, submersed leaves without lateral nerves show, also, that it is not wholly unrelated to the primitive subgenus *Coleogeton*.

As to the name *Potamogeton Purshii*, I expressed myself in 1932. The name was published as a provisional one of Tuckerman's, meant to clinch the naming of the species, should some one later carefully work it out:

> The upshot was that upon Pursh's sterile and perhaps unidentifiable specimen Tuckerman made a provisional species: "Should the fruit confirm its apparent claims to be considered a species, it may not inappropriately take the name of *P. Purshii*."
>
> The type of *P. Purshii* has not been studied by subsequent authors and many guesses have been made as to its identity. On account of its inclusion by Tuckerman under his discussions of *P. Claytonii* it has often been supposed to belong with that (*P. epihydrus*, var. *Nuttallii*); but the submersed leaves, as described by Tuckerman, are altogether too narrow. Graebner in Engler, Pflanzenr. iv[11]. 45 (1907) took up *P. Purshii* of "Virginia and Carolina" without question for the boreal species, *P. Oakesianus* Robbins (Newfoundland and the Labrador Peninsula to the Adirondacks, etc., south to New Jersey). Obviously, *P. Purshii* cannot be the latter more northern plant; and its identification must await study of the type. Tuckerman deposited material in many herbaria of his time and the type of *P. Purshii* has not yet been located.
>
> As already stated, *provisional* names, such as *P. Purshii*, are a nuisance. Their authors put them forward in order to occupy the field in case they eventually prove to be worth taking up. Unfortunately, the proposition put forward at the International Congress at Cambridge to reject such names as not validly published, did not win the support it deserved. Until we are allowed to reject such names they will always be a source of uncertainty and instability. The more sources of doubt we can eliminate the sounder will be our nomenclature. In this case, however, with *P. Oakesianus* not found in Virginia and Carolina, it is not probable that the ill-advised name *P. Purshii* will be more than a recurring annoyance.

Although these provisional names were not excluded at the International Congress at Cambridge (1930), they were, most happily, ruled out at Amsterdam (1935). The vague and unsatisfactorily published *Potamogeton Purshii* thus disappears and the question whether Jennison's and Svenson's material belongs to it becomes merely an academic

Photo. E. C. Ogden.

POTAMOGETON TENNESSEENSIS: FIG. 1, fruiting top, × 1; FIG. 2, submersed foliage, × 1; FIG. 3, stipule and base of submersed leaf, × 10; FIG. 4, upper half of submersed leaf, × 10, by transmitted light; FIG. 5, fruiting spike, × 4; FIGS. 6 and 7, mature fruits, × 10.

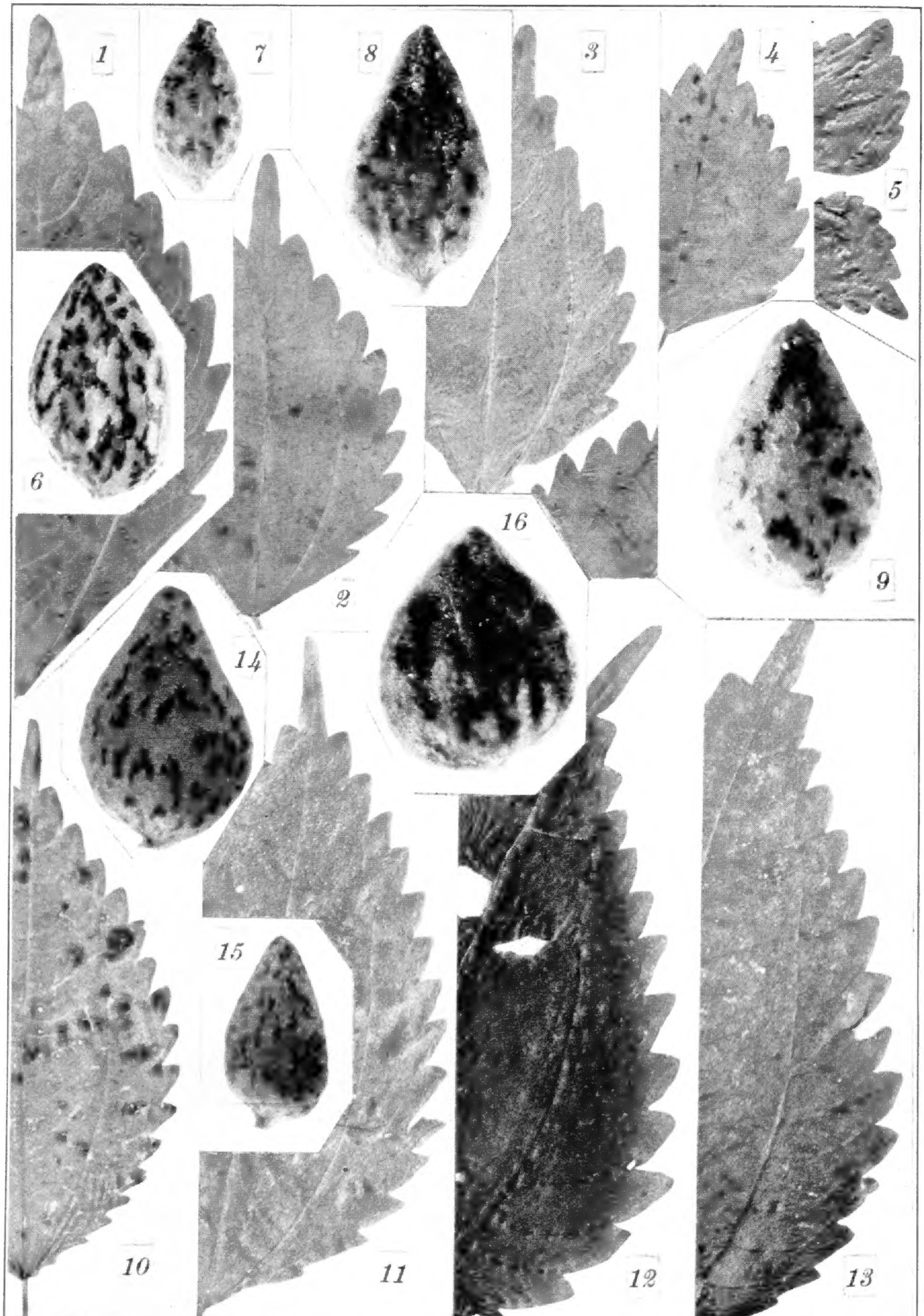

Photo. E. C. Ogden.

PILEA PUMILA, leaf-margins, × 1, seeds, × 20: FIG. 1, from Vermont; FIG. 2, from Maine; FIG. 3, from Quebec; FIG. 4, from Maine; FIG. 5, from Prince Edward Island; FIGS. 6 and 7, from Maine; FIGS. 8 and 9, from Massachusetts.

P. PUMILA, var. DEAMII: FIG. 10, from Indiana (ISOTYPE); FIG. 11, from Indiana; FIG. 12, from Ohio; FIG. 13, from Georgia; FIG. 14, from Indiana; FIG. 15, from New York

P. FONTANA: FIG. 16, from Indiana.

one except for the geographic interest of knowing whether Tuckerman's plant of "slow flowing streams of Virginia and Carolina" is the same. At any rate, the Tennessee plant may appropriately take the name

POTAMOGETON **tennesseensis,** sp. nov. (TAB. 412), caulibus tenuissimis ad 1.5 mm. diametro 3–6 dm. longis subsimplicibus vel valde ramosis; foliis submersis flaccidis lineari-filiformibus 0.2–0.6 mm. latis uninerviis vel obsolete trinerviis valde lacunatis apice attenuatis basi stipulis hyalinis convolutis obtusis adnatis; foliis natantibus lanceolatis vel lanceolato-oblongis acutis, petiolis plerumque quam lamina foliorum valde longioribus, laminis 2–4 cm. longis 5–13 mm. latis 9–23-nerviis, nervis subtus impressis; pedunculis crassis clavatis 3–8 cm. longis adscendentibus; spicis cylindricis 1–2.2 cm. longis, maturis 4.5–6 mm. crassis; connectivis unguiculatis 2 mm. longis limbo oblatis 1.5 mm. latis; fructu quadrato-orbiculato a latere compresso 3-carinato 2.5–3 mm. longo 2–2.5 mm. lato, basi truncato 0.8–1 mm. lato, dorso semi-orbiculato alato-carinato, carina acuta 0.5–0.8 mm. lata, integra vel remote obtuseque dentata, carinis lateralibus acutis integris, ventre convexo obtusanguli, lateribus inter carinis lateralibus latis planis, rostro marginale erecto 0.4 mm. longo.—TENNESSEE: Clear Fork River, 1 mile north of Rugby, Morgan County, May 28, 1933, *H. M. Jennison,* no. 33–139 (flowering material); abundant in eddies of a rapid stream, Clear Fork, Clarkrange, 20 miles south of Jamestown, Fentress County, July 11, 1935, *H. K. Svenson,* no. 6756 (TYPE in Gray Herb.; isotypes in Herb. Brooklyn Bot. Gard. and elsewhere); Daddy's Creek, by mill south of Crossville, Cumberland County, July 20, 1935, *J. K. Underwood & A. J. Sharp,* no. 2961.

Potamogeton tennesseensis, known only from streams of the Cumberland Plateau, at altitudes from 1400 feet (Rugby) to about 1900 feet (Crossville), is a remarkably interesting plant. It bridges the gap which has hitherto clearly separated the *Hybridi,* a purely American subsection of § *Axillares,* and the subsection *Nuttalliani* (*P. epihydrus* Raf.), widely dispersed over temperate North America and reported (though doubted) from Japan. In its almost capillary, submersed leaves (FIG. 2) adnate to the bases of the stipules (FIG. 3) and in the production late in the season of tufts of subcapillary leaves (FIG. 1) from among the dilated ones it inevitably suggests *P. capillaceus* Poir. and the local Alleghenian *P. bicupulatus* Fernald of the *Hybridi;* and the adnate stipules and simple leaf-structure also suggest *P. filiformis* and other members of subgenus *Coleogeton.* Its floating leaves, too, suggest those of *P. capillaceus* and *P. bicupulatus* but they are larger and with 9–23 nerves, the dilated leaves of *P. capillaceus* having 3–7, of *P. bicupulatus* 5–7 nerves. In the number of nerves

these leaves of *P. tennesseensis* more nearly approach those of *P. Spirillus* Tuckerman (5–15) and of *P. diversifolius* Raf. (7–15), but in those species the dilated leaves are blunt or emarginate and the narrowly ribbon-like submersed leaves blunt and at base more adnate to the stipules. In the *Hybridi* all the species have few-flowered and subglobose, sessile or barely peduncled spikes in the axils of the submersed leaves; these are quite wanting in *P. tennesseensis.* In the *Hybridi* all the species have the elongate upper spikes on peduncles but 0.2–3 cm. long and the sepaloid connectives 0.5–1 mm. long (the peduncles of *P. tennesseensis* 3–8 cm. long, the connectives 2 mm. long). In all the *Hybridi* the fruits are strongly compressed laterally, beakless or with beak a minute tooth, the form of the spiral embryo is clearly evident through the thin coat, and the fruits, 1–2.2 mm. long, are usually strongly toothed on the dorsal keel; *P. tennesseensis* has less compressed fruits (FIGS. 5–7) with thick coat completely hiding the form of the embryo, the beak erect and stout, the dorsal and sharp lateral keels entire or essentially so and the mature fruits 2.5–3 mm. long. In the Alleghenian *P. bicupulatus,* which it superficially resembles, the fruits have the sides, between the coarsely dentate-sinuate lateral keels and the ventral margin, cup- or crater-like; in *P. tennesseensis,* however, the sides are essentially flat and the low lateral keels entire.

P. tennesseensis, therefore, can hardly be placed in the subsection *Hybridi;* but when we turn to the *Nuttalliani* we meet with the need, if we are to place it there, of redefining the subsection. The submersed leaves of the *Nuttalliani* are ribbon-like and up to 1 cm. broad, with free hyaline stipules; but otherwise, in dilated leaves, thickened base of stem, elongate peduncles, uniform spikes and fruits, *P. tennesseensis* is better placed with *P. epihydrus* than anywhere else in our pondweeds. The general shape of the fruits, with thin, entire dorsal and lateral keels and essentially flat faces, as well as the stout, though short, beak and the curve of the embryo (not shown in the plate) all place it there.

In view of the well known concentration on the Cumberland and other Plateaus of eastern Tennessee and adjacent areas of the old Appalachian upland of relic-species of many groups (animals as well as plants), I am inclined to look upon *Potamogeton tennesseensis* as a persistent remnant of the ancestral series from which the American subsection *Nuttalliani* and the other American subsection *Hybridi*

have diverged, the first toward the development of ribbon-like and quite free submersed blades, the second retaining the adnation of the leaf-bases and stipules and the slender submersed blades but developing the small submersed (cleistogamous?) spikes and the thinner-walled fruits which characterize the subsection.

II. PILEA IN EASTERN NORTH AMERICA

PILEA PUMILA (L.) Gray, var. **Deamii** (Lunell), comb. nov. *Adicea Deamii* Lunell in Am. Midl. Nat. iii. 10 (1913). PLATE 413, FIGS. 10–15.

The late Dr. J. Lunell proposed to split the temperate North American members of the genus *Pilea* Lindl. (*conserved name*), as *Adicea* Raf., into five species. His *A. fontana* and *A. opaca*, both described from Pleasant Lake, Benson County, North Dakota, have black or blackish fruits, his *A. Nieuwlandii*, *A. Deamii* and *A. pumila* (L.) Raf. having the fruits green to stramineous. The latter series was split on size and degree of branching of plant and size of fruit, both characters which, in an annual weedy group, are very unstable. Individuals with simple stems and low stature (15–25 cm.) were called *A. Nieuwlandii*, those with the stem taller and branching from base were treated as *A. Deamii* and *A. pumila;* but no provision was made for plants with low stature and branching stems and for individuals with simple and tall (sometimes 5–6 dm. high) stems, such as are familiar to every observant field-botanist. As typical *A. pumila* Lunell chose a series of plants from the Potomac Valley, with "Stem reaching a length of 6 dm., with later on spreading branches" and with the leaves 8–16-toothed on each margin. Lunell was not much influenced by the elementary facts, that the basic *Urtica pumila* L. Sp. Pl. 984 (1753) had its "*Habitat in* Canada" and with "Caulis *digiti altitudine,* simplex," for he dismissed these matters as "indicating that Linnaeus made his description from an immature or poorly nourished specimen"; but, getting material of a "Planta 15–25 cm. alta, simplex . . . Folia . . . dentibus 4–7 crasse crenato-serrata," Lunell did not hesitate to describe it as a new species, *A. Nieuwlandii*. Now, it so happens that the Canadian material before me (11 nos.) has stems varying from a "finger's length and simple (Caulis *digiti altitudine,* simplex)" to taller and branching, 0.6–4.5 dm. high, and the leaves have 3–9 coarse rounded teeth on each margin. This is unquestionably *Urtica pumila* L., therefore *Pilea pumila* (L.) Gray.

Typical *Pilea pumila*, with leaves usually cuneate at base and with the largest blades with 3–11 coarse rounded teeth (FIGS. 1–5) is common in southern Canada, from Prince Edward Island to southern Ontario, extending south to Pennsylvania (and locally to Virginia), Tennessee, Iowa and South Dakota. In the South, from Florida to eastern Texas, extending northward to western New York, Ohio, Indiana, Illinois, Missouri and Kansas, *P. pumila* has the leaves (FIGS. 10–13) more often rounded at base, the teeth usually less rounded or even acute and those of the larger leaves numbering 11–17. It is this plant of wide southern and inland range that Lunell described as *Adicea Deamii* "Folia . . . dentibus 6–12 crasse crenato-serrata, basi cuneata vel rotundata," for, although Lunell gave a maximum of 12 serrations, an ISOTYPE in the Gray Herbarium shows the larger leaves (FIG. 10) with 16. By its more commonly round-based leaves with more numerous and commonly less rounded teeth *P. pumila*, var. *Deamii* is well distinguished from typical *P. pumila;* but too many transitions occur to allow their separation as species. Their fruits (FIGS. 14, 15) are of similar shape and smoothness or with quite similar purplish markings.

As to the black-fruited plants called by Lunell *Adicea fontana* and *opaca*, it is notable that they came from the same locality, the former "found on a narrow strip along the boggy margin of a rill, in deep shade, . . . in the woodland of Pleasant Lake, Benson County, North Dakota"; the latter "in damp, but drained soil, well shaded, somewhat distant from the rill where the preceding species thrives." The plant of the boggy and unfavorable habitat grew 4–8 cm. high and was simple (the very reaction of *P. pumila* under such conditions), with "seeds 1.5 mm. long"; while the plant of better "drained soil" near-by reached a height of 3 dm. and branched and its seeds were slightly larger; therefore two species! Rydberg has taken up both of them, as *Pilea opaca* (Lunell) Rydb. in Brittonia, i. 87 (1931) and *P. fontana* (Lunell) Rydb. l. c., but in my own work I am uniting them as *P. fontana* (the name with page-priority), a species characterized by firm and hardly lustrous opaque small leaves, with relatively short petioles, the black fruits (FIG. 16), as pointed out to me by Mr. C. C. Deam, pale-margined and roughened by low knobs or bosses. It occurs from North Dakota to Nebraska, extending eastward to western New York. Frequent immature specimens of *P. pumila* have the young fruits darkened in drying, but *ripe* fruits seem to be always pale.

III. MEMORANDA ON RANUNCULUS

RANUNCULUS FLABELLARIS Raf., forma **riparius**, nom. nov. *R. delphinifolius*, forma *terrestris* Glück, Beihefte Bot. Centralbl. xxxix. Abt. ii. 328 (1923), nec *R. delphinifolius*, f. *terrestris* (Gray) Blake, RHODORA, xv. 164 (1913). PLATE 414, FIGS. 5 and 6.

Unfortunately, the name *Ranunculus delphinifolius* Torr. is not the earliest one available. One of the first definitions of the large Yellow Water-Crowfoot of America was by Jacob Bigelow, Fl. Bost. 139 (1814), who gave a very detailed and accurate account of it, but supposed it to be the Old World *R. fluviatilis* Willd. Our plant is wholly distinct from *R. fluviatilis*, as Bigelow's clear description shows, and the always watchful Rafinesque promptly seized his opportunity. In his review of Bigelow he went through the simplest motions necessary for the designation of a new species; but these were technically enough:

> *Ranunculus fluviatilis*, Big. is *R. flabellaris*, Raf. n. sp.—Raf. in Am. Mo. Mag. ii. no. v. 344 (March, 1818).

In view of the very detailed description given by Bigelow there is no question of the validity of *Ranunculus flabellaris* Raf. (March, 1818). The next name, the one currently in use, is *R. delphinifolius* Torrey in Eaton, Man. ed. 2: 395 (late Spring of 1818). This was put out by Amos Eaton with proper diagnosis and the explanatory note: "A new species by Dr. Torrey; though he suspects it may be a variety of fluviatilis." Subsequently, in Torr. & Gray, Fl. i. 20 (1838) and in his own Fl. N. Y. i. 14 (1843), Torrey treated *R. fluviatilis* Big. and *R. delphinifolius* Torr. as identical; and there seems no reason to doubt their identity. The only question is that of the dates of publication of *R. flabellaris* Raf. and *R. delphinifolius* Torr., both regularly cited simply as "1818." Rafinesque's name was in the March number of The American Monthly Magazine, this preceded by a number designated as of February, 1818, and followed by one for April, 1818; there is no obvious reason to doubt the date.

Eaton's Manual, ed. 2, bears the formal record of copyright, so frequent at that time and so rare today. Richard R. Lansing, Clerk of the Northern District of New York, made the legal memorandum:

> BE IT REMEMBERED, That on the twelfth day of May, in the forty-first year of the Independence of the United States of America, WEBSTERS and SKINNERS, of the said district, have deposited in this office, the title of a book, the right whereof they claim as proprietors, in the words following, to wit: "A Manual of Botany of the Northern and Middle States . . . By Amos Eaton, A. M. . . . Second edition, corrected and enlarged."

Eaton's Manual, ed. 2, was issued two months or more later than the March number of The American Monthly Magazine. It is probable that it was not actually distributed to the public until some time later. The copy in the library of the Gray Herbarium has this dedication on the title-page:

To Dr. Jacob Bigelow, Presented by his friend The Author, Albany, Aug. 4th, 1818.

Further evidence of the date of issue of Eaton's 2d edition is found on his p. 502, where begin the Additions and Corrections: "After 432 pages were struck off, I received Nuttall's genera of North American plants." This is significant, for Nuttall's Genera of North American Plants . . . to the year 1817, was entered for copyright at Philadelphia on April 3d, 1818:

BE IT REMEMBERED, That on the third day of April, in the forty-second year of the Independence of the United States of America, A.D. 1818, Thomas Nuttall of the said district, has deposited in this office the title, etc.

It is impossible not to note the discrepancy in the two registrations: Eaton's in the District of Northern New York in May, "in the forty-first year of the Independence of the United States"; Nuttall's in the District of Pennsylvania in April, "in the forty-second year of the Independence of the United States." This, surely, reflects only a difference in the method of calculation, not a full year's difference in the copyrights. That Eaton's 2d edition was still only in manuscript in late 1817 is shown by the letters from various dignitaries dated "Northampton, (Mass.) Nov. 24th, 1817" and used by Eaton in his Preface (p. 12).[1]

The reason for giving a new formal name instead of transferring *Ranunculus multifidus*, var. *terrestris* Gray, Man. ed. 5: 41 (1867), the nomenclatural type of *R. delphinifolius*, f. *terrestris* (Gray) Blake, l. c. (1913), must be clarified. Gray, l. c. (1867), described *R. multifidus*, var. *terrestris* from a collection made at Ann Arbor, Michigan by Miss Clark. It

differs from the ordinary emersed forms by the stems ascending from the base and paniculately several-flowered at the summit, where the leaves are reduced to oblong or linear bracts; no immersed dissected leaves.—Ann Arbor, Michigan, on muddy banks, *Miss Clark*.

[1] Of this letter Eaton said "It is only the last paragraph, which can be interesting to the public." The "interesting" paragraph follows:

"As his class consisted chiefly of ladies, and as these branches of learning have not hitherto generally engaged the attention of the sex; we take the liberty to state, that, from this experiment [Eaton's lectures to them], we feel authorized to recommend these branches as a very useful part of female education."

Every one has assumed that Gray had before him the common terrestrial form (PLATE 414, FIGS. 5 and 6) of *Ranunculus delphinifolius* Torr. (or *R. flabellaris* Raf.). Consequently, we have had the names for the terrestrial form of the latter: *R. lacustris*, var. *terrestris* (Gray) MacMillan, Metasp. Minn. Val. 247 (1892); *R. delphinifolius*, var. *terrestris* (Gray) Farwell, Ann. Rep. Comm. Parks & Boulev. Detroit, xi. 63 (1900); and the combination by Blake above noted. In general it seems to have occurred to none of these authors (nor to myself when I gave a new name to a similar plant) carefully to check the Clark material from Ann Arbor, the type of *R. multifidus*, var. *terrestris* Gray, distinctly marked by him in the Gray Herbarium. This type (our PLATE 415, FIGS. 1–3) does not belong to the coarse *R. flabellaris* or *delphinifolius*, as has been universally assumed, but is the small-flowered plant which was described as *R. Purshii* Richardson, var. *prolificus* Fern. RHODORA, xix. 135 (1917). The comparatively southern *R. flabellaris* (plate 414, FIGS. 1–4) and the more northern *R. Purshii* have very positive differences:

R. FLABELLARIS: Submersed leaves 0.3–1.5 dm. long, ternately decompound into linear-filiform segments; sepals 5–8 mm. long; petals 0.6–1.7 cm. long; anthers oblanceolate to oblong, 1–1.5 mm. long, only slightly broader than the clavate filaments; fruiting heads 8–13 mm. long; mature achenes prominently corky-thickened at base and along the ventral margin, including the beak 2.5–3.5 mm. long.—Maine to Washington, south to North Carolina, Arkansas, Kansas and California.

R. PURSHII: Submersed leaves nearly orbicular, 1.5–8 cm. broad, with 3–5 cuneate linear-cleft lobes; sepals 2.5–4 mm. long; petals 3.5–5 mm. long; anthers ellipsoid, 0.5–1 mm. long, twice as broad as the slender filaments and sharply differentiated; mature achenes not at all or but slightly corky-margined, 1.5–2 mm. long.—Labrador Peninsula to Alaska and Siberia, south to Nova Scotia, northern Maine, Michigan, Iowa, North Dakota, New Mexico and Oregon.

The type of *Ranunculus multifidus*, var. *terrestris* Gray (PLATE 415, FIGS. 1–3) belongs very definitely with *R. Purshii* (FIGS. 5–8), not with *R. flabellaris* (PLATE 414, FIGS. 1–4) and, as already noted, it is the upright paniculate-branched *R. Purshii*, var. *prolificus*. Singularly enough, the name *R. multifidus*, var. *terrestris* Gray cannot be made the basis for a varietal or formal combination under *R. Purshii*, since, in 1842, Ledebour described the terrestrial and creeping form (*R. limosus* Nutt.) of *R. Purshii*, with thick and subglabrous to villous 3–5-parted leaves as *R. Purshii*, var. *terrestris* Ledeb. Fl. Ross. i. 35 (1842) and this plant has been taken up as *R. Purshii*, f. *terrestris* (Ledeb.) Glück, l. c. 330 (1923).

RANUNCULUS AMBIGENS Wats. In 1879 Sereno Watson defined the

coarse, decumbent perennial of wet clay in the northeastern United States, the plant with lance-attenuate and very sharp-pointed leaves, as *Ranunculus ambigens* Wats. Proc. Am. Acad. xiv. 289 (1879). The plant had formerly been confused with the western *R. alismaefolius* Benth. and with the chiefly European (but in Newfoundland and Nova Scotia) *R. Flammula* L. So far as shown by the specimens in the Gray Herbarium, *R. ambigens* occurs from Maine to Illinois, south into Delaware, Maryland and Tennessee; and it is at once distinguished by its coarse, elongate, creeping stem rooting at the nodes, its upper and median leaves long-acuminate, and its achenes tipped by a subulate beak 0.6–1.5 mm. long. There is absolutely no question as to the identity of *Ranunculus ambigens;* and the name was correctly used by Watson & Coulter in Gray, Man, ed. 6, and by Gray in the Synoptical Flora.

In Britton & Brown, Ill. Fl. ii. 76 (1897) the plant is satisfactorily illustrated under the name *Ranunculus obtusiusculus* Raf. Med. Rep. ser. 2, v. 359 (1808); and under this name the species has been known by those who have neither had access to Rafinesque's illustration of his *R. obtusiusculus* nor appreciated the pertinent comments upon it in the Synoptical Flora. The latter memoranda are to the point:

R. OBTUSIÚSCULUS, Raf. l. c. is equally indeterminable, even with the help of a tracing from an original sketch, possessed by the N. Y. Academy of Sciences, which is probably not true to nature, representing cauline foliage of *R. pusillus*, from an annual root, 5-merous polyandrous flowers with persistent linear-lanceolate sepals and a long style.—Gray, Syn. Fl. i^{1}. 20 (1895).

A tracing from Rafinesque's figure of his plant shows a slender straight erect stem and single annual root, also linear-lanceolate sepals, all at variance with the stout decumbent commonly geniculate and copiously rooting stem and ovate sepals of the present species. Gray, l. c. 27 (1895).

Rafinesque's original diagnosis is here given:

10. Ranunculus obtusiusculus, obtuse ranunculus; stem upright, simple; leaves petiolated, lanceolated, semi-obtuse, flowers few, terminal. In New-Jersey in marshy places.

That Rafinesque's drawing of an *annual,* with bluntish leaves, leafy-bracted peduncles, gamopetalous corolla, linear or linear-lanceolate sepals, and rounded obovate petals (his fig. 2), is not a recognizable illustration of *R. ambigens*, which is a coarse and obvious perennial, with attenuate leaves, bractless peduncles, ovate sepals and distinct (as in all the genus) oblong petals, should be obvious. Whether Rafinesque's drawing was made from actual material before him may

Photo. E. C. Ogden.

RANUNCULUS FLABELLARIS: FIG. 1, fruiting branch, × 5/12; FIGS. 2 and 3, centers of flowers, × 1; FIG. 4, achene, × 10.
R. FLABELLARIS, forma RIPARIUS: rosette, × 5/12; stranded branch, × 5/12.

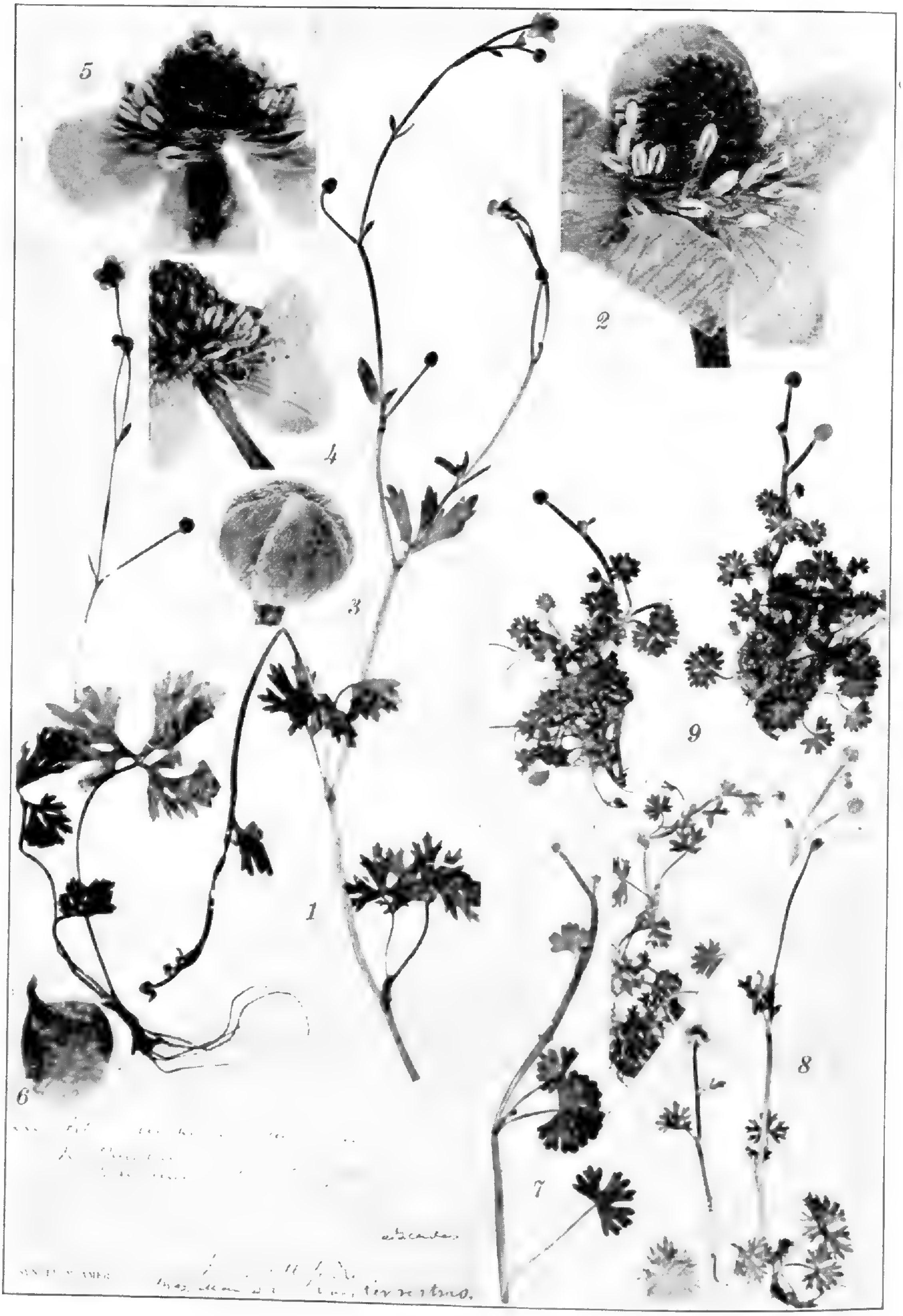

Photo. E. C. Ogden.

RANUNCULUS PURSHII: FIG. 5, flower, × 4; FIG. 6, achene, × 10; FIGS. 7 and 8, flowering branches, × 5/12.

R. PURSHII, var. PROLIFICUS: FIG. 1, TYPE of *R. multifidus*, var. *terrestris*, × 5/12; FIG. 2, flower, × 4, from the latter; FIG. 3, bud, × 4, from the latter; FIG. 4, flower. × 4, from another Michigan station.

R. PURSHII, forma TERRESTRIS: FIG. 9, three plants, × 5/12.

well be doubted; at least the drawing is so unlike anything now known in Nature that it is probably futile to guess about it, as futile as in many other Rafinesquian propositions. Except for the alternate leaves the drawing of the habit could as well have been made from a vague recollection of *Lysimachia* (*Steironema*) *lanceolata* as from *Ranunculus ambigens*. At any rate, to reject the carefully described *R. ambigens* and to take up for it the wholly vague *R. obtusiusculus* leads directly away from clarity into hopeless obscurity.

Ranunculus laxicaulis (Torr. & Gray) Darby, Bot. So. States, 204 (1860), the name taken up in Gray's Manual, ed. 7, may or may not be *R. ambigens*. Darby's own description of a plant from "Ditches Car. to Geo. July" suggests it in some points but Darby's material is unknown; nomenclaturally his species rests upon *R. Flammula*, β. *laxicaulis* Torr. & Gray, Fl. N. Am. i. 16 (1838), the account of which follows:

β. *laxicaulis:* stem weak, much branched; leaves all entire; lowest ones elliptical-oblong, upper ones linear; petals oblong, attenuate at the base, three times as long as the calyx . . . β. Milledgeville, Georgia, *Dr. Boykin!*

The Boykin specimen, type of *R. Flammula*, β. *laxicaulis* is not at the Gray Herbarium and Dr. Gleason writes me that it cannot be found in the Herbarium of the New York Botanical Garden. Nor have I seen in either herbarium any material from the Atlantic States from south of Delaware and Maryland, although there is a specimen without detailed data at New York said on the copied label to be from Georgia. This, however, is one of the many unlocalized sheets from Chapman, too many of which are open to doubt. The petals of *R. ambigens* only slightly exceed the sepals (sepals 5–7 mm. long, petals 5–8 mm. long); but Torrey & Gray described the "petals . . . three times as long as the calyx." They also had "a weak much branched" plant with "leaves all entire," not a convincing description of the coarse stem (0.5–2 cm. thick at base), simple or only slightly forking, of *R. ambigens*, which has the middle and upper leaves toothed. Their description suggests *R. oblongifolius* Ell.; at least it is unwise to maintain *R. laxicaulis* for the undoubted *R. ambigens*.

RANUNCULUS RHOMBOIDEUS VERSUS R. OVALIS. *Ranunculus rhomboideus* Goldie in Edinb. Phil. Journ. vi. 329—Reprint, 11—, pl. xi. fig. 1 (1822), well described and clearly illustrated by its discoverer, who found it "In dry sandy fields, near Lake Simcoe, Upper Canada

[Ontario Co., Ontario]," is a wide-ranging prairie species which occurs from eastern Alberta to Colorado, thence across the prairies to Ontario, Michigan and Illinois. Goldie correctly showed it with characteristically toothed leaves and it has regularly been thus correctly described or illustrated by later authors. In 1814 Rafinesque gave a characteristically inexact and unrecognizable description of

Ranunculus ovalis. Feuilles radicales à longs pétioles, ovales, entières, velues, aigues, les caulinaires rares sessiles lancéolées, fleurs terminales peu nombreuses. *Dans le Canada et Genessee.*—Raf. Précis des Découvertes, 36 (1814), reprinted in Desv. Journ. de Bot. iv. (or vi.), 268 (1814).

A. P. DeCondolle, to whom Rafinesque sent many of his species, could make nothing of *Ranunculus ovalis* and placed it in his "*Ranunculi non satis noti*"—DC. Prodr. i. 43 (1821); but, unfortunately, Hooker, although taking up *R. rhomboideus* Goldie, tried to keep apart from it as species two variations which subsequent experience shows to be mere phases of *R. rhomboideus.* These phases of one species, treated by Hooker as three species, were *R. rhomboideus*, *R. ovalis* "*Rafin.* . . . ?" and *R. brevicaulis* Hook. Fl. Bor.-Am. i. 13, t. vii. A (1829). Hooker gave a good plate of what he took to be Rafinesque's *R. ovalis* as his t. vi B, a fine representation of luxuriant *R. rhomboideus,* which looks as if it might almost have come from Goldie's series of specimens. Hooker, showing the regularly dentate and obtuse basal leaves of *R. rhomboideus,* made the comment: "This species is not at variance with the short character given in Journ. de Bot. of Rafinesque's *R. ovalis,* except that he states the cauline leaves to be lanceolate; by which he means, perhaps, that the segments are so." To render the interpretation of Rafinesque's account more thorough he should have added: "and except that Rafinesque said 'Feuilles radicales . . . entières, . . . aigues', by which he meant, perhaps, radical leaves dentate, obtuse, and except that Rafinesque's plant came in part from Genessee (a county of northwestern New York, organized in 1802), whence no collections have ever been known to the botanists of the State of New York."

The identity of Rafinesque's *Ranunculus ovalis* is utterly vague; but to take up his name of a plant with entire and acute basal leaves and lanceolate cauline ones, a plant said to come from Genessee, for the well defined *R. rhomboideus,* seems like straining for vagueness and inaccuracy. This, however, is done in the Illustrated Flora, where the plant called *R. ovalis,* without interrogation, is shown and described

with "basal leaves . . . crenate or slightly lobed, obtuse, . . . upper cauline leaves . . . deeply divided . . . into 3–7 linear or oblong obtuse lobes"; and the range given, correctly, definitely excludes Genessee. My reasons for maintaining *R. rhomboideus* need no further statement.

RANUNCULUS SEPTENTRIONALIS Poir., var. **caricetorum** (Greene), comb. nov. *R. caricetorum* Greene, Pittonia, v. 194 (1903). *R. sicaeformis* Mackenzie & Bush in Torreya, vi. 123 (1906).

The wide-ranging *Ranunculus septentrionalis* varies, like most members of § *Eurananunculus*, in the degree of pubescence and the direction of its trichomes. It may be quite glabrous, sparingly to copiously appressed-pubescent or sparingly to copiously spreading-hirsute. In the large series from eastern Canada and the northeastern states westward to Manitoba and Nebraska I get no clear lines by which to differentiate the smoother and the more hirsute extremes. Either quite glabrous or very densely hirsute plants occur in Quebec, New England and the Great Lakes region. Var. *caricetorum*, confined so far as I have seen material, to the region from south-central Ohio to Missouri, Iowa and Minnesota, has the densest of hirsuteness and this is largely retrorse. In the great density and reflexing of its pubescence the variety is unique; but I find no other characters to separate it from the general run of hirsute or hispid *R. septentrionalis*.

In the effort to brace the specific claims of the retrorsely hirsute plant overemphasis has been given the glabrousness of some specimens of *Ranunculus septentrionalis*. Thus, in his Flora of the Prairies and Plains, Rydberg gives the key differences:

Stem glabrous or nearly so	17. *R. septentrionalis.*
Stem decidedly hispid	18. *R. caricetorum.*

R. caricetorum Greene, Pittonia, v. 194 (1903) was described from "the region of the Great Lakes, from perhaps Ontario to Iowa and Minnesota, . . . diagnosis . . . from material of my own gathering in southern Wisconsin in 1888, and in southern Michigan in 1902": "commonly very hirsute, at least as to petioles and lower part of stem, otherwise sparingly hirsute-pubescent." Rydberg maintains *R. caricetorum*, correctly reducing *R. sicaeformis* (as *R.* "*sicaefolius*") to it. The two are identical, but Greene said nothing of the copious retrorse pubescence on leaves and peduncles exhibited by his type-material, and also by the type and the other Missouri specimens of *R. sicaeformis*. Greene said of his Great Lakes plant,

"commonly very hirsute, at least as to petioles and lower part of stem, otherwise sparingly hirsute-pubescent," so that it is clear that he did not understand the true character of his type. Just such plants as Greene's description implies are common about the Great Lakes, thence north to Hudson Bay and east to New England and Quebec. But Mackenzie & Bush were more explicit, saying the "whole plant very strongly whitish or yellowish hispid-pubescent." Besides the type material, they cited also a specimen from Hennepin Co., Minnesota. The latter is like the type of *R. caricetorum*, a photograph of which has been most generously presented to the Gray Herbarium by Dr. Stuart K. Harris, who secured it while visiting Greene's herbarium in 1935. As I view the plants, there is little significance to the degree of pubescence on the stems and petioles; but the plant with dense and *retrorse* pubescence in the southwestern edge of the specific range is very definite.

As to Rydberg's characterization of *Ranunculus septentrionalis* as having "Stem glabrous or nearly so," it is significant that Poiret, in his original description of *R. septentrionalis* said very definitely: "*caule petiolisque basi hirsutis*" and "les tiges . . . velues ou pubescentes à leur partie inferieure." A tracing of Poiret's type in the Gray Herbarium settles its specific identity.

RANUNCULUS FASCICULARIS Muhl., var. **apricus** (Greene), comb. nov. *R. apricus* Greene, Pittonia, iv. 145 (1900).

Very distinct in the region from Mississippi to Oklahoma and Texas, Greene's *Ranunculus apricus* passes northward very clearly into *R. fascicularis*, the plants from Michigan to Iowa having to be somewhat arbitrarily sorted.

IV. THE NOMENCLATURE OF SASSAFRAS

Enough changes have recently been made in the "proper" specific name of *Sassafras* to suggest that its nomenclature partakes of its nature, as reflected in the illegitimate names *Laurus variifolia* Salisb. and *L. diversifolia* Stokes. One of the most recent discussions of the names is that of Blake, *Note on the proper Name for the Sassafras*, RHODORA, XX. 98 (1918). There Blake pointed out, correctly, that the name *Laurus variifolia* Salisb. (1796) was a mere substitute for *L. Sassafras* L. (1753) and, since there was already a valid specific epithet under *Laurus*, Salisbury's name was illegitimate. Blake, therefore, concluded that "The valid name to replace it is SASSAFRAS

Photo. E. C. Oaden.

ARUNCUS: fruits × 7; flowers and seeds × 10; leaf-tips × 1.

A. ALLEGHENIENSIS: FIG. 1, over-ripe fruit from ISOTYPE, Baltimore, Maryland; FIG. 2, fruits from Allegheny Co., Pennsylvania; FIG. 5, flowers from District of Columbia; FIG. 8, seeds from West Virginia.

A. ALLEGHENIENSIS, var. PUBESCENS: FIG. 4, fruits from Illinois.

A. SYLVESTER: FIG. 3, fruit from France; FIG. 6, calyx from Hungary; FIG. 7, seed from Austria; FIG. 9, fruits from Oregon; FIG. 10, flowers, showing obovate petals, from Salisburgia; FIG. 11, flowers, with narrow petals, from Vancouver Island; FIG. 12, tip of leaflet, from British Columbia; FIG. 13, tip of leaflet, from Czechoslovakia.

Photo. E. C. Ogden

SOLIDAGO MULTIRADIATA: FIG. 1, plant, × 1, from Labrador. S. MULTIRADIATA, var. PARVICEPS: FIG. 2, TYPE, × 1.

OFFICINALE Nees & Eberm. . . . (1831)." Unfortunately, however, Blake's usually keen logic suffered a momentary and unprecedented lapse, for immediately after asserting that the earliest *valid* name was published in 1831, he made a varietal combination under it, *S. officinale*, var. *albidum* (Nutt.) Blake, based upon Nuttall's species, *Laurus* (*Euosmus*) *albida*, published in 1818. So far as I can yet determine the first *valid* specific epithet for the aggregate species was that of Nuttall and I see no way, under the International Rules, to avoid taking up for the variable species the combination *Sassafras albidum* (Nutt.) Nees, Syst. Laurin. 490 (1836). The bibliography follows:

SASSAFRAS ALBIDUM (Nutt.) Nees, Syst. Laurin. 490 (1836); Raf. Aut. Bot. 86 (1840). LAURUS (EUOSMUS) ALBIDA Nutt. Gen. i. 259 (1818). *Evosmus albida* "Nutt." acc. to Spreng. Syst. ii. 267 (1825) as synonym. *Tetranthera albida* (Nutt). Spreng. Syst. ii. 267 (1825). *Euosmus albida* "Nutt." acc. to Jackson, Ind. Kew. ii. 914 (1893). *S. variifolium*, var. *albidum* (Nutt.) Fernald in RHODORA, XV. 16 (1913). *S. albidum*, var. *glaucum* Nieuwl. in Am. Mid. Nat. iii. 347 (1914). *S. officinale*, var. *albidum* (Nutt.) Blake in RHODORA, XX. 99 (1918).

Var. **molle** (Raf.) comb. nov. *Laurus Sassafras* L. Sp. Pl. 371 (1753). *L. Salsafraz* Noronha in Verh. Batav. Gen. v. (1790), Art. iv. 19, modification in spelling. *L. variifolia* Salisb. Prodr. 344 (1796), substitute for *L. Sassafras* (illegitimate). *L. diversifolia* Stokes, Bot. Mat. Med. ii. 426 (1812), substitute for *L. Sassafras* (illegitimate). *S. officinarum* J. S. Presl. Rostl. ii. 68 (1825), not seen. *Persea Sassafras* (L.) Spreng. Syst. ii. 270 (1825). *S. officinale* Nees & Eberm. Handb. Med.-Pharm. Bot. ii. 418 (1831). *S. rubrum* Raf. Sylva Tell. 134 (1838), name only (application inferred). *S. triloba* Raf. Aut. Bot. 85 (1840), based on *Laurus Sassafras*. S. TRILOBA Raf., var. MOLLIS Raf. Aut. Bot. 85 (1840). *S. Sassafras* (L.) Karst. Pharm.-Med. Bot. 505 (1882). *S. variifolium* (Salisb.) Ktze. Rev. Gen. ii. 574 (1891). *Euosmus Sassafras* (L.) "Nutt." acc. to Jackson, Ind. Kew. ii. 914 (1893). *S. Laurus* Macloskie in Torreya, v. 198 (1905). *S. Sassafras officinale* (Nees & Eberm.) Clute in Am. Bot. xi. 72 (1906).

The application of Rafinesque's *Sassafras triloba*, var. *mollis* to the tree with soft-pubescent leaves is clear from his diagnosis: "fol. sepe integris villosis mollis, florib. laxis."

V. MEMORANDA ON ARUNCUS

ARUNCUS ALLEGHENIENSIS Rydb., var. **pubescens** (Rydb.) comb. nov. *A. pubescens* Rydb. N. Am. Fl. xxii[3]. 256 (1908). PLATE 416, FIG. 4.

The indigenous plants of eastern North America stand well apart from the Old World and western American representatives of *Aruncus*. The wide-ranging Eurasian *A. sylvester* Kostel. (1844) = *Spiraea Aruncus* L. (1753) and *A. Aruncus* (L.) Karst. (1882), has the brownish follicles (FIG. 3) 2.5–3 mm. long, with style (deciduous) 0.3–0.5 mm. long; seeds (FIG. 7) 2.2–2.6 mm. long, with empty tails one-third to one-half as long as the body, the surface coarsely reticulate. Its staminate flowers (FIG. 6) have the calyx-lobes broadly lanceolate, elongate and comparatively thin, displaying the evident midrib; and its leaflets (FIG. 13) are usually very thin, doubly sharp-serrate and long-caudate. The Alleghenian plant, *A. allegheniensis*, however, has the leaflets, although similar, tending to shorter-toothed margin and less elongate tip; but its fundamental differences are in the flower and fruit. The calyx-lobes (FIG. 5) are firm (drying dark), broader and more deltoid, without evident midrib; the olivaceous follicles (FIGS. 1 and 2) 1.5–2 mm. long, with style 0.5–0.8 mm. long; the seeds (FIG. 8) 1.5–2 mm. long, with much shorter or obsolete tails and finer reticulation.

So far as I can make out, *Aruncus pubescens* is an interior variety of *A. allegheniensis*, differing in its heavier and dull (rather than lustrous) foliage, a tendency to greater pubescence on the leaflets, and follicles slightly more slender and elongate (subcylindric and 1.7–2.5 mm. long, instead of semi-ovoid and 1.5–2 mm. long). Plants with the lower leaf-surfaces soft-pubescent occur in the Alleghenies: Allegheny Co., Pennsylvania (*Schafer*, no. 639), Washington, D. C. (*Steele et al.*), Baltimore, Maryland (*P. V. LeRoy*, 1867, ISOTYPE of *A. allegheniensis*), Pulaski Co., Virginia (*Small*) and Glasgow, Virginia (*E. B. Bartram*); but all other material seen by me from Virginia, West Virginia, North Carolina, Kentucky and Tennessee has the lower surfaces quite glabrous. In the more slender-fruited var. *pubescens* (Illinois and Iowa to Arkansas and Oklahoma) the leaflets may, likewise, be either very pubescent, as defined by Rydberg, or quite glabrous beneath: Mikanda, Illinois (*Gleason*), St. Louis, Missouri (*Sherff*, no. 235); and, by a fatality which often pursues those who are incautious in designating types, the MacDonald material from Peoria designated as the TYPE of *A. pubescens* (with leaves "rather copiously hairy beneath") displays no more pubescence than the LeRoy material from Baltimore (in both cases as represented in the Gray Herbarium) which seems to be an ISOTYPE of *A. allegheniensis* (separated from *A. pubescens* by

"leaflets . . . glabrous or nearly so beneath"). The really distinctive character of var. *pubescens*, centering on the Ozark Plateau, is that its follicles are more slender than in typical *A. allegheniensis* of the Appalachian Upland.

The wide-ranging plant of the Pacific slope, from northern California to Alaska, is separated by Rydberg as *Aruncus acuminatus* (Dougl.) Rydb. in N. Am. Fl. xxii³. 255 (1908), the name coming from Douglas's manuscript *Spiraea acuminata*, which had been cited by Hooker in the synonymy of *S. Aruncus* (= *Aruncus sylvester*). This Pacific American plant has the large follicles (FIG. 9), seeds and calyces of the Eurasian *A. sylvester* (or *A. Aruncus*), but Rydberg stated their "specific" differences as follows:

Petals of the staminate flowers broadly rounded-obovate, about ⅘ as broad as long; leaflets lanceolate with long acumination ..... 1. *A. acuminatus.*

Petals of the staminate flowers spatulate, ⅖–⅗ as broad as long; leaflets ovate, with shorter acumination..... 2. *A. Aruncus.*

Unfortunately the difference in shape of petals relied upon by Rydberg can be quickly reversed, FIG. 11 showing flowers, × 10, from Vancouver Island (of *A. acuminatus*) with spatulate petals, FIG. 10, flowers from Salisburia with them much broader!

As to the acumination of the leaflets I see no difference; FIG. 13 is a tip of a leaflet of *A. sylvester* from Europe, FIG. 12 one of *A. acuminatus* from America. The calyx-lobes of the western American plant are also quite like those of the Eurasian (FIG. 6). So are the follicles (FIG. 9), the styles and the seeds. In other words, *Aruncus sylvester* of Eurasia occurs also in western North America; while in the ancient Ozark and Appalachian uplands a species with smaller and more olivaceous follicles, longer styles, smaller seeds and firmer calyx occurs. It is unfortunate that, in defining the latter, Rydberg ignored the significant calyx-lobes, styles and seeds and over-stressed the fickle characters of pubescence.

Several names of early date are cited by Rydberg as synonyms under *Aruncus*, in the North American Flora; consequently, by some who have not understood the situation, one of them, *A. vulgaris* Raf. Sylva Tell. 152 (1838), has been used on herbarium-labels. Under *Aruncus*, Rafinesque, in 1838, published two names: "Type *A. vulgaris* and *Americanus*." No diagnoses were given and no previous descriptions were cited; the two names of Rafinesque are absolute *nomina nuda* and have no further nomenclatural status. Rydberg cites, with

doubt, as synonyms of his *A. allegheniensis*, the three following: *Spiraea Aruncus*, β. *hermaphrodita* Michx. Fl. Bor.-Am. i. 294 (1803); *S. Aruncus*, β. *americana* Pers. Syn. ii. 46 (1806); and *S. americana* Steud. Nom. Bot. 805 (1821). These all rest on one type, Persoon merely having substituted β. *americana* for Michaux's name and Steudel (bunglingly) resting his *S. americana* on the same plant. Now, ARUNCUS DOES NOT HAVE THE FLOWERS HERMAPHRODITE and when Michaux got hold of a plant in the Alleghenies which looked like the European *Spiraea Aruncus* but differed "floribus . . . hermaphroditis-fertilibus" he called it var. *hermaphrodita*. *Astilbe biternata* (Vent.) Britton, of the *Saxifragaceae*, does have hermaphrodite flowers. It grows side-by-side with *Aruncus allegheniensis* and so completely mimics it that only by detailed examination of the flowers and fruits can the two be readily separated. *Spiraea Aruncus*, β. *hermaphrodita* of Michaux was, as to the defined characters, *Astilbe*. This was the judgment of Torrey & Gray, in 1840: "The variety with perfect flowers, first mentioned by Michaux, is probably Astilbe decandra (Tiarella biternata, *Vent.*), which in habit strikingly resembles this plant."—Torr. & Gr. Fl. N. Am. i. 417 (1840). If *Spiraea Aruncus*, β. *hermaphrodita* Michx. is *Astilbe*, then, automatically, *S. Aruncus*, β. *americana* Pers. and *S. americana* Steud. are likewise *Astilbe;* and perhaps *Aruncus americanus* Raf. may, by inference, be also associated with *Astilbe*. At least, Rydberg was quite justified in giving the Alleghenian species a new and properly defined name.

Very recently further confusion has been made by a Japanese botanist, Hara, who unjustifiably adopts Rafinesque's NOMEN NUDUM *Aruncus vulgaris* to displace *A. sylvester* and then coins for the Alleghenian plant the unfortunate combination *A. vulgaris*, var. *americanus* (Pers.) Hara, Bot. Mag. (Tokyo), xlix. 115 (1935), entirely ignoring the fact that Persoon's *Spiraea Aruncus*, var. *americana* and all names dependent upon it are substitutes for *S. Aruncus*, β. *hermaphrodita* Michx., which is *Astilbe* of the *Saxifragaceae*.

(*To be continued*)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXIII.

M. L. Fernald

(*Continued from page 182*)

VI. STUDIES IN SOLIDAGO

Solidago petiolaris Ait. The late K. K. Mackenzie substituted for *S. petiolaris* the name *S. Milleriana* Mackenz. in Small, Man. 1350, 1503 (1933), on the first cited page giving in marks of quotation as a synonym of his new name "*S. petiolaris* Ait.", on p. 1503 "Solidago Milleriana Mackenzie. *Solidago petiolaris* Authors, not Ait." The inference is clear that Mackenzie thought that *S. petiolaris* Ait. has been misidentified by American authors. Aiton's species had been received at Kew from Philip Miller; consequently, if the plant which has passed regularly as Aiton's *S. petiolaris* is not what Aiton had from Miller, it seems a somewhat tangled philosophy which produces for it the name *S. Milleriana*. I do not know Mackenzie's reason for supposing that his *S. Milleriana* is not *S. petiolaris* Ait. The characterization of the latter was brief and clear:

> S. caule erecto villoso, foliis ellipticis scabriusculis petiolatis, racemis erectis elongatis.

Mackenzie's *S. Milleriana* has

> Stem . . . strict, closely short-hispid above, . . . : leaf-blades oblong-oval, . . . scabrous-hispidulous above, sparsely pubescent beneath . . . : heads 7–8 mm. high: involucral bracts lanceolate, acute, appressed-pubescent, all except the inner with spreading tips.

Aiton did not describe the involucre; but portions of Aiton's type, presented to Asa Gray in 1881 and now preserved in the Gray Herbarium, show the very distinctive heads with lance-attenuate, pubescent bracts, and the oblong or elliptic, entire leaves with scabrous upper surface, minutely pilose lower surface and scabrous-ciliolate margins exactly as in *S. Milleriana*. In brief, *S. petiolaris* Ait., as shown by the original material, was well described by its author and is exactly the plant correctly called *S. petiolaris* by Gray in the Synoptical Flora. It is identical with *S. Milleriana* Mackenzie and the latter name is a synonym which might well have been avoided.

SOLIDAGO MULTIRADIATA Ait., var. **parviceps**, var. nov. (TAB. 417, FIG. 2), forma typica recedit involucro parvo 3–4(–5) mm. longo bracteis circa 15.—QUEBEC: damp calareous cliff, "Monts Appalaches, near Cape Rosier, Gaspé Co., July 9, 1931, *G. L. Stebbins, jr.* (TYPE in Gray Herb.)

Typical *Solidago multiradiata* (FIG. 1) which abounds on the Labrador Peninsula, in northeastern, northern and western Newfoundland and on the outer coast and the higher mountains of the Gaspé Peninsula, reaching its southern limit on St. Paul Island, Nova Scotia (*Perry & Roscoe*, no. 382), varies in stature from dwarfs of scarcely measurable height to luxuriant clumps 4.5 dm. high; but, whether dwarf or gigantic (for the species) the involucres remain large (5–7 mm. long) with 20–30 bracts. Var. *parviceps*, a local plant of Gaspé, reaches its most extreme development (FIG. 2) on the cliffs of the "Monts Appalaches" (the hills between Grand Grève and Cape Rosier) but essentially identical specimens, mixed with more typical *S. multiradiata*, were collected on Mt. Albert by Victorin, Rolland, Brunel & Rousseau in 1923 (no. 17,585) and transitional material had been secured on Mt. Albert in 1881 by John A. Allen, and in 1906 by Fernald & Collins (no. 753). This transitional series indicates that var. *parviceps* is a variety rather than a distinct species.

SOLIDAGO DECUMBENS Greene, var. **oreophila** (Rydb.), comb. nov. *S. oreophila* Rydb. Mem. N. Y. Bot. Gard. 1. 387 (1900).

Solidago oreophila was not described by Rydberg, when he published it, but it is here interpreted as the common extreme of *S. decumbens* growing in the Rocky Mountains lower down than the typical *S. decumbens*. The latter has few heads in a subcorymbiform thyrse and is the alpine extreme of the wide-ranging species, found from 9,000–13,100 feet (2750–4000 m.), on the mountains from Wyoming to New Mexico. At lower levels it passes insensibly into the taller

Photo. E. C. Ogden

SOLIDAGO DEAMII: FIG. 1, TYPE, × 5/12; FIG. 2, head from TYPE, × 5; FIG. 3, disk-floret from TYPE, × 5.

S. RANDII: FIG. 4, head, × 5, from Maine; FIGS. 5 and 6, florets, × 5, from same specimen.

S. RACEMOSA, var. GILLMANI: FIG. 7, rosette-leaf from the original Gillman material, × 5/12.

Photo. E. C. Ogden

SOLIDAGO SIMULANS: FIG. 1, TYPE, × $^2_5$; FIG. 2, involucre of TYPE, × 5; FIG. 3, disk-flower from TYPE, × 5; FIG. 4, disk-corolla, with 2 lobes laid back, × 5; FIG. 5, achene from TYPE, × 10.

S. ULIGINOSA: FIG. 6, involucre, × 5, from Quebec; FIG. 7, disk-corolla, × 5, from same specimen; FIG. 8, achene, × 10, from same specimen.

S. AUSTRINA: FIG. 9, involucre, × 5, from North Carolina.

var. *oreophila* which has a longer, more racemiform thyrse, with the heads tending to be slightly smaller. In the States from New Mexico to Wyoming (the area where the alpine typical *S. decumbens* occurs) var. *oreophila* extends from subalpine areas into the timber ("in timber," "pine woods," "dry pine ridge," "subalpine slopes," "dry hillsides," etc.), its altitudinal range given on the labels as 6560–10,000 feet (2000–3050 m.). Many sheets, such as *Clokey* nos. 2895 and 3896 and *Clements* no. 300, show embarrassingly transitional series and such a sheet as *C. F. Baker's* no. 718, with the elongate thyrse and small heads of var. *oreophila* was identified by Greene as his *S. decumbens;* and the names have been very frequently reversed by those who should rightly apply them if the series can be resolved into two real species. North of Wyoming var. *oreophila* comes down to much lower levels, extending out to the Saskatchewan plains and northward to the valleys of Yukon. My interpretation of *S. oreophila* is supported by the statement of Dr. Aven Nelson, under *S. decumbens:* "*S. oreophila* Rydb. . . . is merely the larger form from the lower stations."[1]

Greene included both extremes in his original *S. decumbens,* Pittonia, iii. 161 (1897), giving an inclusive description of the "Very common species of the Rocky Mountains of Colorado and northward, in subalpine and alpine situations, but occupying dry slopes or summits; forming the greater part of Gray's *S. humilis,* var. *nana.*" I am, accordingly, taking up *S. decumbens* in the sense of the alpine extreme which Gray chiefly had as his *S. humilis,* var. *nana,* this interpretation conforming to the later views of Rydberg and others.

As stated, Rydberg originally gave no diagnosis, but he gave sufficient clues so that it is evident that his *Solidago oreophila* was intended for the plant of the Rocky Mountain area with slender and elongate thyrse. His publication was as follows:

Solidago oreophila; *Solidago stricta* Hook. Fl. Bor. Am. **2:** 4, mainly, 1834; not Ait., 1789; *S. humilis* Gray, Syn. Fl. **1**[2]**:** 148, partly, as to the Rocky Mountain plant [Man. R. M. 153]; not Pursh.

At an altitude of about 2000 m.

MONTANA: Gap in the belt Mountains above White's Gulch, 1882, *Canby.*

With no diagnosis *Solidago oreophila* must go back for its typification to the earlier defined entities. The Rocky Mountain element placed by Gray under *S. humilis* is clear, so also is the Carlton House plant of

[1] Nelson in Coult. & Nels. New Man. Bot. Centr. Rky. Mts. 505 (1909).

Drummond, cited by Hooker under his inclusive *S. stricta*, for material of the latter sent by Hooker to Asa Gray was included by Gray under his *S. humilis*. Thus it is possible, with the aid of his subsequent descriptions, to interpret what Rydberg meant by *S. oreophila;* but such slipshod publication of new species is not to be recommended to others.

SOLIDAGO ROANENSIS Porter, var. **monticola** (T. & G.), comb. nov.
S. Curtisii T. & G., β.? *monticola* T. & G. Fl. N. Am. ii. 200 (1838).
S. monticola T. & G. ex Chapm. Fl. 209 (1860), not Jord. (1857).
S. alleghaniensis House in Am. Midl. Nat. vii. 131 (1921).

Typical *Solidago roanensis* Porter, Bull. Torr. Bot. Cl. xix. 130 (1892), has the thyrse very dense, except sometimes at base; the involucre greenish and herbaceous to membranous and 5–5.5 mm. long; and the ligules deep-yellow. It is confined to the highest mountains of western North Carolina and adjacent Georgia, extending slightly northward into southwestern Virginia. When he described it as a species Porter was familiar with *S. monticola*, to which it has generally been reduced, yet he made no mention of nor comparison with the latter plant; and Asa Gray wrote upon a sheet of the large *S. roanensis* distributed as *S. monticola* from Roan Mountain (*J. D. Smith*): "Yes. I could not have thought it." Nevertheless there seems to be no clear line to separate it and the smaller *S. monticola* and even in Mackenzie's treatment in Small's Manual the two are united. Var. *monticola*, with a broader range, often at lower altitudes, from Maryland to Kentucky, southward to Georgia and Alabama, is smaller throughout, the slender thyrse or the slender racemiform branches (when a panicle is developed) more open; the involucres 4–5 mm. long, usually paler; and the ligules paler yellow or even whitish.

SOLIDAGO (§VIRGAUREA) **Deamii**, n. sp. (TAB. 418, FIGS. 1–3), *S. Randii* similis; caule 4–5 dm. alto supra minute piloso; foliis coriaceis pallidis glabris, basilaribus rosulatis obovatis apice rotundatis grosse serrato-dentatis basi late petiolatis, laminis 3.5–5.5 cm. longis 2–3.5 cm. latis; foliis caulinis 35–40, imis subpetiolatis oblanceolatis serratis, mediis superioribusque sessilibus minoribus integris acutis; inflorescentia thyrsoidea densa 1 dm. longa 4 cm. diametro; pedicellis nullis aut 1–8 mm. longis strigoso-pilosis; involucris cylindrico-campanulatis 6–9 mm. longis; bracteis stramineis chartaceis obtusis, 4-seriatis, exterioribus viridicostatis, costa dilatata, interioribus elongatis; disci floribus circa 12, lobis corallae 2 mm. longis; ligulis 8 luteis; antheris 2.7–3 mm. longis; achaeniis immaturis strigoso-pilosis.

—INDIANA: in a blow out at end of Section Line Road 2 miles east of Tremont, Porter Co., September 14, 1923, *C. C. Deam*, no. 39,707 (TYPE in Gray Herb.).

Solidago Deamii (FIG. 1) has the strongly coriaceous foliage of *S. speciosa* Nutt., but its strongly toothed and short-petioled radical leaves and its pubescent achenes promptly distinguish it from the smallest extremes of *S. speciosa*, which has long-petioled and entire or but slightly toothed radical leaves and glabrous achenes. In habit and in the crowded, sessile or short-pedicelled heads *S. Deamii* is suggestive of *S. Randii* (Porter) Britton, of northern New England, southern Quebec and northeastern New York; but *S. Randii* has submembranous dark-green foliage, the involucres (FIG. 4) smaller (5–6 mm. long), with thinner and narrower bracts, the orange-yellow disk-corollas (FIGS. 5 and 6) with shorter lobes and shorter (1.5–2 mm. long) anthers, the corolla-lobes and anthers (FIG. 3) of *S. Deamii* being much longer. *S. Deamii* is also related to *S. racemosa* Greene, var. *Gillmani* (Gray) Fern., but that has the leaves submembranaceous, the radical (FIG. 7) elongate-oblanceolate and acute, the heads mostly long-pedicelled and the involucral bracts narrower.

SOLIDAGO **simulans**, sp. nov. (TAB. 419, FIGS. 1–5), planta *S. uliginosam* simulans; caule crasso glabro 8 dm. alto; foliis subcoriaceis glaberrimis eciliatis, basilaribus late oblanceolatis acutis 3–3.5 dm. longis 4.5–5 cm. latis crenato-dentatis basi attenuatis petiolo alato; foliis caulinis circa 20, imis elongatis petiolatis mediis superioribusque sessilibus minoribus lanceolatis integris acutis; inflorescentia cylindrico-thyrsoidea densa 2 dm. longo 3 cm. diametro ramis glabris brevis capitulis 3–10 gerentibus; pedicellis glabris 3–4 mm. longis; involucris cylindrico-campanulatis 6–7 mm. longis; bracteis stramineis chartaceis, 4-seriatis, exterioribus lanceolato-deltoideis subacutis, interioribus oblongis vel oblongo-lanceolatis obtusis vel subacutis; disci floribus 9, tubo 2 mm. longo, fauce 2.5 mm. longo, lobis 2 mm. longis; ligulis 7, 1.5 mm. latis; achaeniis maturis lineari-cylindricis 8–10-costatis strigoso-hirtellis 3.3–3.5 mm. longis.—Macon County, NORTH CAROLINA: moist rocks on the high mountains of Macon County, near Highlands, September 15, 1897, *Biltmore Herb.*, no. 5730 (TYPE in Gray Herb.); Wild Cat Ridge, Highlands, October, 1902, *E. E. Magee.*

Solidago simulans so closely resembles *S. uliginosa* Nutt. that it has been mistaken for it. It differs at once in its glabrous inflorescence, larger involucres (FIG. 2), long throat and limb and short tube of the disk-corolla (FIGS. 3 and 4) and much longer definitely pubescent achenes (FIG. 5); the branches of the thyrse and the pedicels of achenes (FIG. 5); the branches of the thyrse and the pedicels of of *S. uliginosa* being hirtellous, the involucre (FIG. 6) only 4–5 mm.

long and with narrower bracts, the disk corollas (FIG. 7) with relatively longer tube and shorter throat and limb, the achenes (FIG. 8) only 1.5–2 mm. long and usually glabrous. *S. simulans*, as yet known only from the high mountains of Macon County, North Carolina, is to be watched for elsewhere along the Blue Ridge. It is the extreme southern and montane representative of *S. uliginosa*, which crosses eastern Canada from Labrador to Manitoba, and reaches its southeastern limit in West Virginia (Gormania, alt. 2500 feet, *Svenson*, no. 4449).

Solidago simulans might, by current treatments, be traced to *S. austrina* Small. It differs from the latter in many characters: leaves with quite smooth margins (in *S. austrina* scabrous-ciliolate), the basal 3–3.5 dm. long and 4.5–5 cm. broad (in *S. austrina* 0.7–1.5 dm. long and only 1–2.5 cm. broad); cauline leaves about 20, attenuate-tipped, the median 1 dm. or more long (those of *S. austrina* 30–60, the middle and upper bluntish or with blunt callous tip, the median 3–5 cm. long); inflorescence dense, its racemes cylindric, not secund (in *S. austrina* lax and open with strongly secund racemes); involucre cylindric-campanulate, 6–7 mm. high, with chartaceous bracts, the outer lance-deltoid and acutish not conspicuously continued down the pedicels (in *S. austrina* the broader campanulate involucre (FIG. 9) shorter, with firm, green, oblong, obtuse bracts continuing indistinguishably down the pedicels); disk-corollas 6.5 mm. long (in *S. austrina* 3.7–4.5 mm.); mature achenes 3.3–3.5 mm. long (in *S. austrina* 2–3 mm.).

SHIFTING OF NAMES VERSUS ACCURATE IDENTIFICATIONS (PLATE 420). It is a commonplace to note that long-continued cultivation of plants, particularly if they be of naturally plastic groups and placed side-by-side with scores of their relations, renders them in some ways unlike the indigenous ancestors from which they were in part derived. This observation, though trite, is important in connection with the species of *Solidago* early proposed in Europe from plants which had long grown in the gardens. In his masterly and cautious life-long studies of the genus Asa Gray repeatedly commented on the impossibility of satisfactorily identifying with wild American plants most of the garden forms described by Willdenow, Miller and some other European authors. Occasionally the types of species described by Aiton from plants not too long grown and mixed with other species at Kew can be safely identified; but too many of Miller's types, from plants long grown in the old Chelsea Garden, are better allowed to

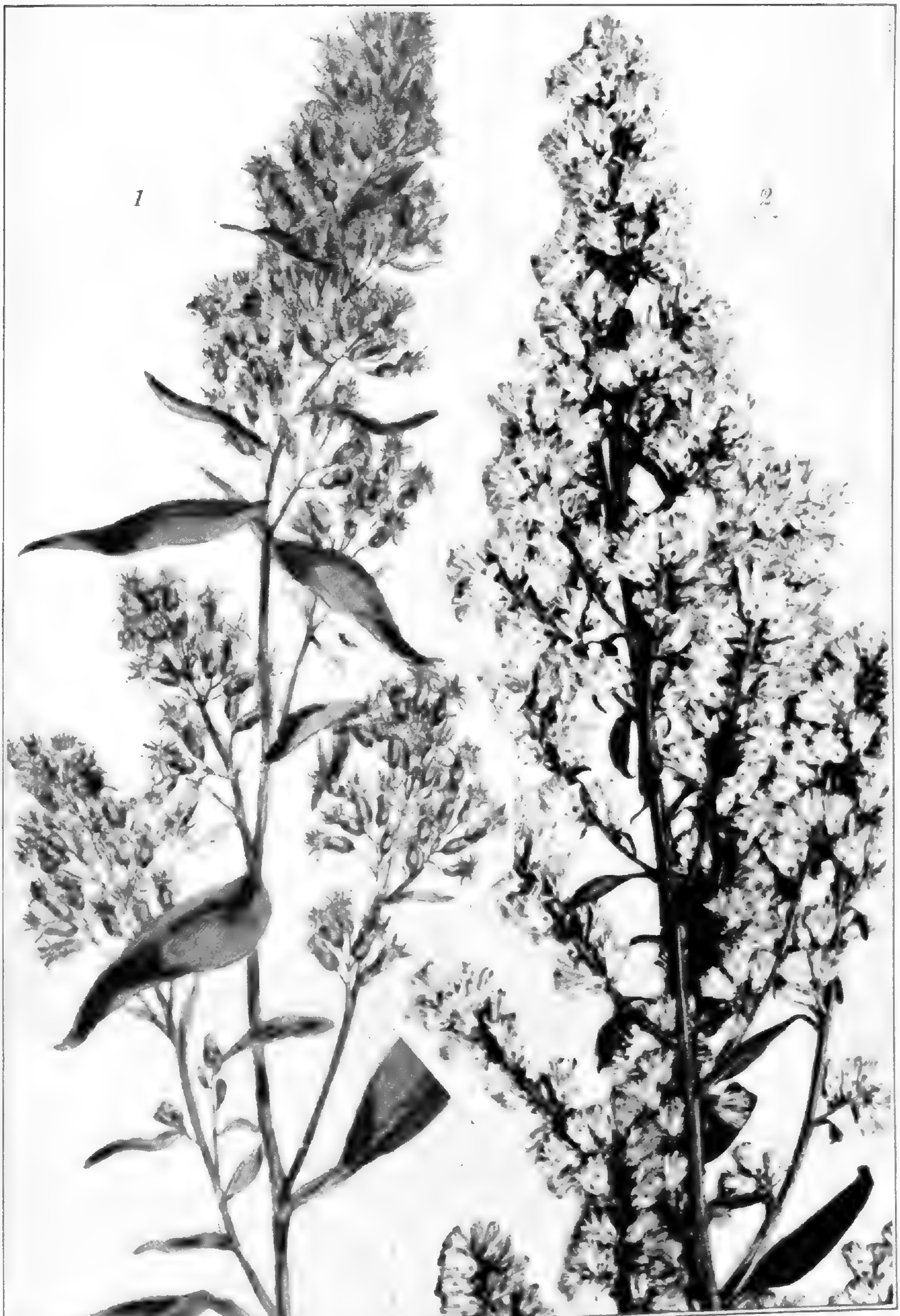

Photo. E. C. Ogden

SOLIDAGO CONFERTA: FIG. 1, inflorescence, × 1, after Miller.
S. SPECIOSA: FIG. 2, upper half of inflorescence, × 1, from Massachusetts.

Photo. E. C. Ogden

SOLIDAGO NEUROLEPIS: FIG. 1, TYPE, × $\frac{2}{5}$; FIG. 2, lower surface of leaf, × 10, from TYPE; FIG. 3, involucre, × 5, from TYPE; FIG. 4, achene, pappus and disk-corolla, × 10, from TYPE.

sleep where they lie. Among Miller's species which Gray, with the most profound knowledge of the types and their proper interpretation, refrained from placing as an identifiable American species was *S. conferta*.

Nevertheless, in recent years this name has been taken up with confident assurance to displace a perfectly valid and clearly typified name which had had a full century of accurate usage. One of the most definite species of eastern North America is *S. speciosa* Nutt., a tall (up to 2 m.) plant with coriaceous leaves and a thyrse made up of stiffish spiciform racemes of sessile or subsessile heads. The upper half of a characteristic inflorescence from Sheffield, Massachusetts (*F. Walters*) is shown, × 1, in PLATE 420, FIG. 2. But in RHODORA, xxix. 17–19 (1927), the late Kenneth K. Mackenzie took up to replace Nuttall's perfectly familiar and unquestioned *S. speciosa* the name *S. conferta* Mill., asserting that

> This species has been neglected because Miller failed to refer back to his finely illustrated work above referred to [Miller, Figs.] . . . In that work he . . . fully described (p. 170) under the same polynomial as in his later work and with practically identical description . . . the same species. . . . his beautiful colored plate 254, fig. 2, one of the few colored plates of *Solidago* ever published, makes the identification of his species very certain.
>
> *Solidago conferta* Miller is the species which many years later was called *Solidago speciosa* by Nuttall, and we must adopt the appropriate name of Miller instead of Nuttall's excellent name.

Most unfortunately many recent students have followed Mackenzie in discarding *S. speciosa* (PLATE 420, FIG. 2) for *S. conferta* (FIG. 1) and Mackenzie's characteristic positiveness would seem to justify such a procedure. Most of our students are not in a position to weigh such matters and they accept the latest pronouncement without healthy skepticism. Since Miller's plate 254, fig. 2, which unquestionably was his *S. conferta*, was to Mackenzie "very certain"ly *S. speciosa* I am reproducing the inflorescence, × 1, as fig. 1, beside the upper half (fig. 2) of a characteristic thyrse of *S. speciosa*. Miller's plant was described by him correctly as having "The Flowers [*i. e.* heads] . . . produced in single *loose* Spikes from the lower Part of the Stalk at the Wings of the Leaves"—Mill. l. c. 170 (italics mine; the reference to *loose* spikes overlooked, or at least not mentioned by Mackenzie). The accurate characterization by Miller of the loose spikes and the very clear plate, showing the small heads on long filiform pedicels and the long foliaceous divergent bracts, are to me

very convincing reasons for not identifying Miller's garden plant, cultivated in England, with the American *S. speciosa;* and Mackenzie's certainty that the latter name should be thrown aside should serve as a caution to those who, it sometimes seems, are inclined to be more iconoclastic than precise in their identifications of old types.

What American species, if any, was the primary basis of *Solidago conferta* Mill. I do not know. The decidedly non-secund branches of the thyrse place it in the § *Virgaurea* which occurs abundantly in Europe. *S. uliginosa* Nutt. sometimes has the heads on long pedicels but never, so far as I have seen, divergent broadly lance-attenuate leafy bracts; and in the American allies of the European *S. Virgaurea* L. I know none which could safely be forced into *S. conferta.* My own inclination is to leave it, along with many which were specially noted by Gray, as a garden plant of Europe (reputedly of American origin) which cannot be positively identified with any species known to us in the wild.

Other cases of Mackenzie's unjustifiable abandonment of clearly typified and long established names for those which must always be open to question occur. The one here discussed and illustrated should suffice to put students of our flora on guard against such needless and groundless shifting of names.

SOLIDAGO JUNCEA Ait., forma **scabrella** (Torr. & Gray), comb. nov. *S. arguta,* γ. *scabrella* Torr. & Gray, Fl. N. Am. ii. 414 (1842). *S. juncea,* var. *scabrella* (Torr. & Gray) Gray, Syn. Fl. i². 155 (1884).

Supposed by Gray to be confined to the central states, but now known eastward to the limits of the specific range (Quebec and Virginia). The smooth-leaved typical *S. juncea* also extends as far west and southwest as the scabrous form.

S. JUNCEA Ait., forma **ramosa** (Porter & Britton), comb. nov. *S. juncea,* var. *ramosa* Porter & Britton in Bull. Torr. Bot. Cl. xviii. 368 (1891).

Originally from western New Jersey and adjacent Pennsylvania, Ohio and West Virginia, this form with erect branches occurs sporadically throughout the range of the species, at least eastward to New Brunswick and west to Michigan. It is a striking form but hardly a true geographic variety.

SOLIDAGO ARGUTA Ait., forma **tomophylla**, forma nov., foliis caulinis obovatis apice rotundatis vel subtruncatis margine grosse inciso-serratis.—NEW YORK: open pasture-slopes at 2100 feet alt.,

Maplecrest (Big Hollow), Green Co., August 26, 1931, *H. K. Svenson*, no. 4668 (TYPE in Gray Herb.).

Forma *tomophylla* is an extraordinary departure from typical *Solidago arguta;* but I can look upon it only as a sporadic variation such as occurs in several other species, exaggeration of the teeth appearing in individuals of *S. hispida* Muhl., *S. puberula* Nutt., *S. multiradiata* Ait., *S. Cutleri* Fern., *S. Randii* (Porter) Britton and numerous others. In *S. arguta,* forma *tomophylla,* however, the outline of the leaf is also aberrant. The sheet in the Gray Herbarium was collected on an excursion of the Torrey Botanical Club and the label says "Common on open pasture slopes, exposed to the south." In mid-August, 1935, Mr. E. C. Ogden and I searched the south-facing slopes above Maplecrest for it without success. *S. juncea* Ait. was abundant, *S. arguta* less so; but, if forma *tomophylla* still grows there, it successfully evaded us.

SOLIDAGO LUDOVICIANA (PLATE 422, FIGS. 2–5). In 1842, knowing the species only from about ten fragmentary specimens, Torrey & Gray treated *Solidago Boottii* Hook. as an all-inclusive species of five defined varieties. Later these varieties, originally designated without names, have received varietal and specific cognomens; and, with fuller material and understanding of their ranges, they are now practically all recognized as definite Alleghenian, Piedmont and Coastal Plain species. One of the latter has been not well understood, and since it is one of the most definite of the complex group it seems important to attempt clarification of it. Torrey & Gray had from Louisiana and Texas plants which they doubtfully placed with *S. Boottii* as

ε? glabrous; stem stout; leaves rigid, oblong, less acuminate, the lower serrate with spreading teeth; racemes dense, very numerous, forming an ample compound panicle.—T. & G. Fl. N. Am. ii. 214 (1842).

In 1882 Gray said under *S. Boottii*

> Var. LUDOVICIANA is a dubious form, with larger heads and leaves.—Gray, Proc. Am. Acad. xvii. 195 (1882).

but in the Synoptical Flora he was more definite:

> Var. **Ludoviciana,** Gray, l. c. Perhaps a distinct species, stouter, tall, rather large-leaved: lower leaves and lower part of the stem sometimes roughish-hirsute or hispidulous with many-jointed hairs, or glabrous: heads larger, even 4 lines long!—*S. Boottii,* var. ε, partly, Torr. & Gray, l. c.—W. Louisiana, *Hale.*—Gray, Synop. Fl. 1². 154 (1884).

Even as left by Gray in 1884 his *Solidago Boottii,* var. *ludoviciana* consisted of a plant with "lower leaves . . . roughish-hirsute or

hispidulous with many-jointed hairs" and another with them glabrous. A large series accumulated in recent years shows that the plants with hirsute leaves and those with them glabrous are, apparently, well defined species: the hirsute one *S. strigosa* Small, Fl. Se. U. S. 1198, 1339 (1903), correctly described with "blades strigose"; the glabrous one *S. ludoviciana* (Gray) Small, l. c. 1199, 1339 (1903), based on *S. Boottii*, var. *ludoviciana* Gray. Of the *Hale* material from western Louisiana marked by Gray as *S. Boottii*, var. *ludoviciana* there are two sheets: the one in the Torrey Herbarium is glabrous (TYPE of *S. ludoviciana* Small) and bears Gray's memorandum, "My specimen of this is hirsute"; the one in the Gray Herbarium is hirsute and bears Gray's memorandum, "The specimen in Hb. Torr. of var. ε? is glabrous." Small having selected the glabrous plant of Hale to stand as the type of *S. ludoviciana*, that point is satisfactorily settled, the hirsute plant of Hale being *S. strigosa* Small. There are, as stated, many collections of both species now in the Herbarium of the New York Botanical Garden, where I have studied them, and in the Gray Herbarium; but, unfortunately, the late K. K. Mackenzie, rapidly becoming blind and suffering from a long-borne infection, apparently could not see them clearly, for at New York several sheets with the characteristic hirsuteness of *S. strigosa* were labelled by Mackenzie "*S. ludoviciana.*" But the most puzzling confusion due to Mackenzie's distressing eye-sight in his later years arises in another connection.

Perplexed by certain inadequate specimens of the plant of southern New Jersey which has there passed as possibly *Solidago yadkinensis* (Porter) Small, I appealed to Mr. Bayard Long, who stated that the New Jersey plant has remained a problem for twenty-five years, a species readily recognizable and carefully accumulated in the local herbarium of the Academy of Natural Sciences of Philadelphia. Mr. Long kindly sent for study a large series of the New Jersey plant, a species of open sandy woods and thickets. In foliage, inflorescence, involucres, pappus, corollas and achenes it is a close match for *S. ludoviciana*, but all carefully collected New Jersey material has abundant filiform stolons and the autumnal rosettes have clearly arisen from such stolons. Otherwise the plant also superficially resembles *S. yadkinensis*, *S. Boottii* Hook. and *S. strigosa* Small.

In Mackenzie's treatment of *Solidago* in Small's Manual the three latter species, as well as *S. juncea* Ait., *S. arguta* Ait. and *S. Harrisii* Steele, all come under his *Argutae*, defined "Plant without long hori-

zontal stolons," etc. The other plants of similar aspect would seem to constitute Mackenzie's *Vernae:* "Plants with long slender horizontal stolons," etc. The *Vernae* of Mackenzie are assigned two species, *S. verna* M. A. Curtis and the new *S. tarda* Mackenzie in Small, Man. 1355, 1509 (1933). I have studied at New York and now have on loan the type of *S. tarda.* In every way it is matched by the freely stoloniferous New Jersey material which is otherwise identical with the type of *S. ludoviciana.* Consequently, it is most significant to find that carefully collected material of *S. ludoviciana* displays the stolons (*A. A. & E. G. Heller,* no. 4122 from Arkansas and *E. J. Palmer's* no. 31714a from Gumwood, Texas—distributed without identification). The identity of *S. tarda* with *S. ludoviciana* seems sufficiently clear. Late in the autumn it produces filiform stolons (FIG. 2); but no material in the two large herbaria studied shows any such tendency in *S. yadkinensis,* the only species with which it might be confused, but from which *S. ludoviciana* differs in having the basal leaves broader and more abruptly contracted at base and less acuminate, the involucres (FIG. 3) even larger, 5–8 mm. high (against 5–6.5), the pappus (FIGS. 4 and 5) 4–5 mm. long (in *S. yadkinensis* 3–4), the disk-corollas (FIG. 4) 4.5–5.5 mm. long (in *S. yadkinensis* 4–4.5) and the achenes (FIG. 5) 2–2.8 mm. long (against 1.5–2.2). Incidentally the flowering periods of the two are quite different. *S. yadkinensis,* chiefly an Alleghenian and Piedmont species, flowers early: July 24–31 in Virginia, late June to early August in North Carolina, August in Georgia, the type, in fruit, collected at the Falls of the Yadkin on August 18th. *S. ludoviciana* is a species chiefly of the Coastal Plain, from Arkansas and eastern Texas to Georgia and in eastern Virginia (locally) and southern New Jersey (more frequently). In New Jersey the specimens in anthesis (rare in the woods, more frequent in the open) were collected from September 4 to October 6; the type of *S. tarda,* barely in flower, was collected in Clarke Co., Georgia on October 20th. There is, then, a difference of several weeks in the flowering periods of the two species.

Although the production of filiform stolons seems to be a specific trait of *Solidago ludoviciana* and their non-production a character of *S. yadkinensis, S. Boottii, S. Harrisii* and *S. arguta,* the character should be used with caution. In all the material of *S. verna,* including the type collection of M. A. Curtis, at Cambridge and at New York I can find no stolons, yet Mackenzie certainly inferred them when he

defined the *Vernae* "with long slender horizontal stolons." In *S. strigosa* which he placed in the *Argutae* "without long horizontal stolons," there are 16 sheets before me. Of these, 13 are either broken off or jerked up, showing no well collected bases; but in *Caroline Dormon's* no. 1 from Natchitoches Parish, Louisiana, the carefully dug base shows the filiform stolons, quite like those of *S. ludoviciana*. On account of these stolons which he specially noted on the sheet, Mackenzie identified the collection as *S. tarda*, but the basal leaves have the characteristic pubescence of *S. strigosa*, not the glabrous surfaces of *S. tarda* (i. e. *S. ludoviciana*). Nevertheless *S. strigosa* can hardly be treated as hirsute *S. ludoviciana*. Its involucres are only 3.5–4.5 mm. high (in *S. ludoviciana* 5–8), its pappus only 2.5–4 mm. long (in *S. ludoviciana* 4–5) and its disk-corollas only 3.5–4 mm. long (in *S. ludoviciana* 4.5–5.5).

The quick way to tell the eastern *Solidago juncea* Ait. from the western *S. missouriensis* Nutt. is by their bases: *S. missouriensis* (with narrow "triple-nerved" leaves), even when pulled up displays filiform stolons; *S. juncea* (with the broader leaves not "triple-nerved") practically never has such stolons. Nevertheless, in the sandy south-eastern section of Massachusetts (Cape Cod, Martha's Vineyard, etc.) *S. juncea* with characteristic foliage, involucres and achenes, frequently develops stolons as slender and elongate as does the regularly stoloniferous *S. missouriensis*.

The character, therefore, is one to be used only after critical study and abundant experience. The development of filiform stolons in the late-flowering *Solidago ludoviciana* (*S. tarda*) seems to be a character of value in separating it from the early-flowering *S. yadkinensis*, which, as Messrs. Long, Fogg and I were able to check in eastern Virginia, bears a large rosette on a stout caudex, from which finally the flowering stem arises.

SOLIDAGO **neurolepis**, sp. nov. (TAB. 421 et TAB. 422, FIG. 1), *S. strigosae* similis; caule 1–1.5 m. alto glabro vel superne sparse piloso, foliis subcoriaceis supra glabris vel minute scabridulis subtus ad nervos hispidis vel glabratis; foliis rosulatis longe petiolatis petiolis marginatis, laminis oblongo-ovatis 8–17 cm. longis 4.5–10.5 cm. latis grosse serratis, dentibus apice subulatis, basi rotundatis apice acuminatis; foliis caulinis 30–40 imis mediisque oblongo-ovatis vel -obovatis subsessilibus grosse acuteque serratis, superioribus reductis integris; inflorescentia paniculata laxa ramis remotis adscendentibus vel patentibus secundis, inferioribus ad apicem floriferis, superioribus per totam longitudinem floriferis; pedicellis brevibus erectis; involucris

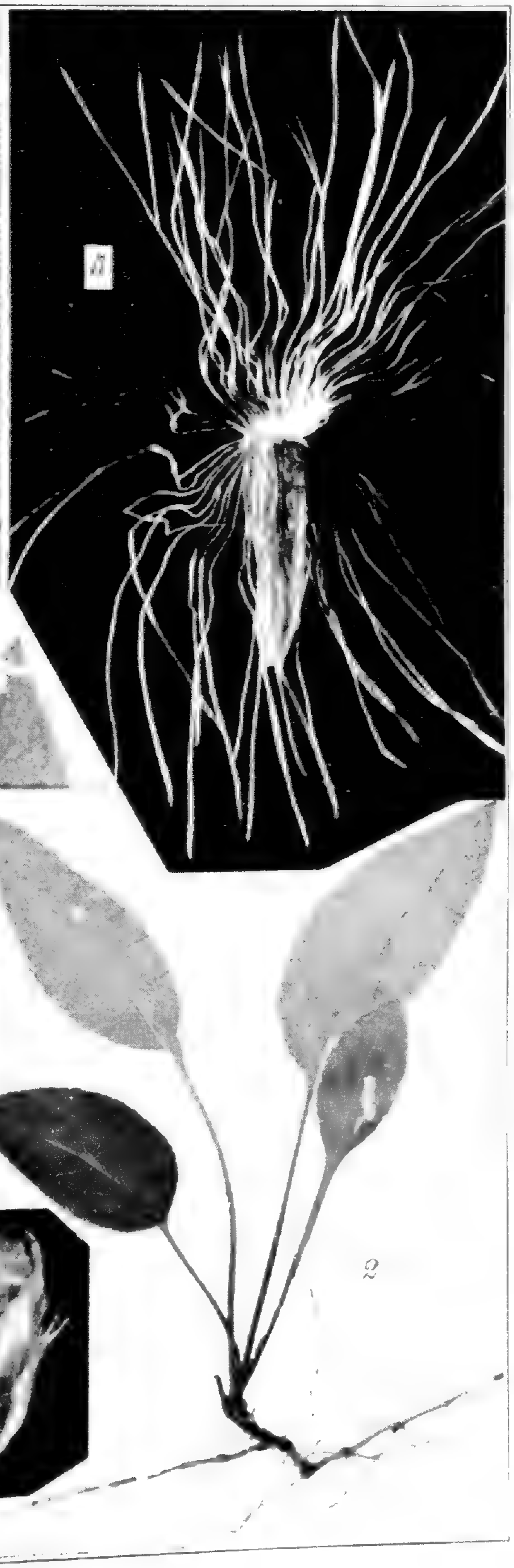

Photo. E. C. Ogden

SOLIDAGO NEUROLEPIS: FIG. 1, basal rosette, × $\frac{2}{5}$, from TYPE.
S. LUDOVICIANA: FIG. 2, basal rosette, × $\frac{2}{5}$, from Virginia; FIG. 3, involucre, × 5, from TYPE; FIG. 4, disk-flower, × 10, from Texas; FIG. 5, achene and pappus, × 10, from New Jersey.
S. JUNCEA: FIG. 6, involucre × 5, from Massachusetts.

Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. TYPICA: plants, × 2/5, from South Carolina.

cylindricis 3.5–4.5 mm. altis, bracteis stramineis valde inaequalibus, exterioribus perbrevibus lanceolato-attenuatis, intermediis lanceolato-attenuatis valde costatis costa glutinosa, interioribus linearibus subacutis vel obtusis; disci floribus 4 vel 5, tubo 1–1.5 mm. longo, fauce 1 mm. longo, lobis 0.6–0.8 mm. longis; ligulis 3 vel 4 ca. 0.3 mm. latis; pappi setis 2–2.5 mm. longis; achaeniis maturis 1.3–1.5 mm. longis strigosis.—MISSOURI: dry bank, open woods, Oronogo, Jasper Co., August 29, 1920, *E. J. Palmer*, no. 18,863, distributed as *S. juncea* var. *scabrella*.

Solidago neurolepis, presumably on account of its large basal rosettes (PLATE 422, FIG. 1), was mistaken by Palmer for *S. juncea* and later, by Mackenzie, for *S. ludoviciana*. *S. juncea*, however, has the basal leaves narrower and more tapering at base, without the bristly ciliation of the nerves beneath; its cauline leaves are narrower and more rapidly decreasing upward; its involucre (PLATE 422, FIG. 6) hemispherical, with oblong and blunt bracts, its disk-flowers about 10 and its ligules 8–12. *S. neurolepis* is sufficiently distinct from it in the rounder-based leaves, with characteristic pubescence (PLATE 421, FIG. 2) beneath, the broad and sharply toothed median cauline leaves, the slender heads (FIG. 3) with attenuate bracts and the few flowers. *S. ludoviciana*, as shown on p. 210, has the base (PLATE 422, FIG. 2) with filiform rhizomes and stolons, the leaves quite glabrous, the campanulate involucres (FIG. 3) very large (5–8 mm. high), with oblong and obtuse bracts, with midrib dilated upward, the disk-corollas (FIG. 4) 8–10 and 4.5–5.5 mm. long, the ligules about as numerous and unusually broad, the achenes (FIG. 5) 2–3 mm. long, with pappus 4–5 mm. long.

In habit and large rosette-leaves with veins hispid or hirsute beneath *Solidago neurolepis* is somewhat like *S. strigosa* Small, but that species, like *S. ludoviciana*, is slenderly stoloniferous, and its heads are much fuller than in *S. neurolepis* and with obtuse linear-oblong bracts.

THE VARIATIONS OF SOLIDAGO ELLIOTTII (PLATES 423–425). *Solidago Elliottii* Torr & Gray was originally conceived as a plant of North and South Carolina and Georgia, its type being a specimen from Parris Island collected by Stephen Elliott. Among other characters it had "leaves . . . oblong-lanceolate or elliptical, mucronate-acute or somewhat acuminate . . . veiny, . . . , heads in crowded recurved racemes." It was supposed to be the *S. elliptica* of Elliott, not Ait. At the same time Torrey & Gray

supposed a more northern plant to be *S. elliptica* Ait., but subsequently Gray cast doubt on the identity of Aiton's *S. elliptica* with any indigenous American plant: "Cultivated from early times in European gardens, not identified as indigenous";[1] and at that time he referred the northern plant to the southern *S. Elliottii*, a course which has been followed by most later students. The only doubt of this identity seems to be the comment by Mackenzie in Small's Manual in his treatment of *S. Elliottii:* "This species seems to be known only from the original specimen from Parris Island, S. C. Specimens ranging all the way from eastern Georgia to eastern Canada have been erroneously referred to it."

Material of the original Parris Island plant preserved in the Torrey Herbarium (with fragments in the Gray Herbarium) agrees with much other material from South Carolina in having elliptical short-tipped, not long-acuminate leaves, and a panicle with strongly divergent or recurving racemes.

In these two characters it is quite distinct from the plant of swamps from Delaware to eastern Massachusetts and Nova Scotia. The latter has the leaves mostly narrower and long-acuminate and the panicle with strongly ascending to barely spreading branches and the foliaceous bracts are usually more developed. Some collections, especially from Rhode Island, strongly approach the South Carolina plant in habit but they have the leaves prolonged as in the usual New England plant. In the details of the heads I find essentially no difference. The South Carolina material (true *S. Elliottii*) has the involucre 4.5–5.5 mm. high, its median bracts 0.8–1 mm. broad, the disk-corollas 4.5–5.5 mm. long with lobes 1.5–2 mm. long, the pappus 3.5–4.5 mm. long and the ripe achenes 1.5–1.8 mm. long. The northern series shows similar measurements, with slightly more variation (due to more abundant material): involucre up to 6.5 mm. high and disk-corollas 4–5 mm. long. There is certainly not enough difference to keep the two series apart as species.

In eastern Virginia *Solidago Elliottii* is represented by a plant with the foliage much as in the northern variety but with a pyramidal open panicle with spreading branches and long pedicels, the former character reminiscent of true *S. Elliottii.* But this Virginian plant has the involucres and flowers small for the species: involucres 3.5–4.5 mm. high, with the median bracts only 0.5 mm. broad, disk-corollas

[1] Gray, Syn. Fl. N. A. 1^2. 143 (1884).

Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. ASCENDENS: TYPE, × 2/5.

Photo. E. C. Ogden

SOLIDAGO ELLIOTTII, var. PEDICELLATA: TYPE, × 2/5.

4–4.2 mm. long, pappus only about 3–3.5 mm. long, and achenes only 1.2 mm. long. It thus approaches *S. rugosa* Mill., var. *sphagnophila* Graves, but that has the small involucres (3–4 mm. long) crowded and short-pedicelled, the smaller disk-corollas (2.5–3.5 mm. long) with lobes only about 1 mm. long, and the short pappus (2–2.5 mm. long) of *S. rugosa.* I am, therefore, tentatively treating the plant of eastern Virginia as a variety of *S. Elliottii.*

Farther south, in Florida, *Solidago Edisoniana* Mackenzie has the aspect of the northern variety of *S. Elliottii,* with the foliose panicle with strongly ascending branches, but its leaves are firmer and more prominently toothed. Its involucres, disk-corollas, and pappus give the same measurements and proportions, except that the pappus may be a fraction of a millimeter longer.

It seems to me, therefore, that *Solidago Elliottii* is best treated as a polymorphous species of the Coastal Plain and adjacent provinces, characterized as a species by its glabrous stems, rachis and foliage, and its large heads (involucre 3.5–6.5 mm. high), broadish, blunt bracts (the median 0.5–1 mm. wide), long disk-corollas (4–5.5 mm. long) with lobes 1.5–2 mm. long, long pappus (3–5 mm. long) and large ligules (0.5–1 mm. broad). It seems to have four geographic varieties:

S. Elliottii Torr & Gray, var. **typica.** *S. Elliottii* Torr. & Gray, Fl. N. Am. ii. 218 (1842); Gray, Syn. Fl. i.[2] (1884), as to southern plant only; Mackenzie in Small, Man. 1358 (1933).—Swamps of North and South Carolina and Georgia. Plate 423.

Var. **ascendens,** var. nov. (tab. 424), foliis oblanceolatis vel oblongis acuminatis submembranaceis; ramis panicularum valde ascendentibus; involucris 4.5–6.5 mm. altis breviter pedicellatis, bracteis mediis 0.7–1 mm. latis; disci corollis 4–5 mm. longis lobis 1.5–2 mm. longis; antheris 1.5–2 mm. longis; pappi setis 3.5–4.5 mm, longis; achaeniis 1.5–1.8 mm. longis.—Swamps and wet thickets, Delaware to eastern Massachusetts; western Nova Scotia. Type: sandy thicket, Harwich, Massachusetts, September 21, 1927, *M. L. Katharine and H. G. Fernald* in Pl. Exsicc. Gray. no. 492 (in Gray Herb.).

Var. *ascendens* is the plant which was mistakenly called *Solidago elliptica* Ait. by Gray. It has generally passed as *S. Elliottii* in the northern Manuals. Freely hybridizing with *S. rugosa* and *S. rugosa,* var. *sphagnophila. S. Elliottii,* var. *divaricata* Fernald, Rhodora, xvii. 7 (1915) is a hybrid of var. *ascendens* and *S. rugosa,* var. *typica.*

Var. **pedicellata,** var. nov. (tab. 425), foliis oblanceolatis vel

elliptico-lanceolatis acuminatis, membranaceis; ramis panicularum laxe patentibus; involucris 3.5–4.5 mm. altis longe pedicellatis, bracteis mediis 0.5 mm. latis; disci corollis 4–4.2 mm. longis; pappi setis 3–3.5 mm. longis; achaeniis 1.2 mm. longis.—Eastern Virginia. TYPE: border of wet pine woods, Eastville, October 12, 1935, *Fernald & Long*, no. 5520 (in Gray Herb.)

A plant in young bud only, from bushy clearings and borders of woods west of Hampton, Virginia (*Fernald, Long & Fogg*, no. 5091) is apparently the same.

Var. **Edisoniana** (Mackenzie), comb. nov. *S. Edisoniana* Mackenzie in Small, 1358 (1933).

THE SOLIDAGO RUGOSA COMPLEX (PLATES 426–430). Probably no aggregate-species of *Solidago* in America, unless it be the *canadensis* group, is more baffling in its variations than *S. rugosa* Mill. (including *S. aspera* Ait.) Already difficult enough as a series of plants, its elucidation has not been helped by the interpretation of the late K. K. Mackenzie.[1] Wandering through the mazes of the always vague and often inconclusive pre-Linnean accounts and drawings of plants in European gardens prior to 1753, the initial date of our nomenclature, he concluded that the plant which Linnaeus had cultivated at Upsala and described as *S. altissima*, "SOLIDAGO paniculata-corymbosa, racemis recurvis, floribus adscendentibus, foliis enerviis subintegerrimis,"[2] is *S. rugosa* Mill. Early botanists had identified our inclusive *S. rugosa* as *S. altissima*, but Asa Gray, after a life-time of actual study of the original specimens in *Solidago*, settled the matter for all who wish it settled by showing that *S. altissima* must stand for the relative of *S. canadensis* "with thicker and more obscurely triple-nerved leaves than ordinary *S. Canadensis*"; and that the specimen in the much altered and disturbed Linnean herbarium of today, bearing the name *S. altissima* and belonging to *S. rugosa*, was so labeled by Sir J. E. Smith after the death of Linnaeus and cannot be accepted as in any way the Linnean type: "A specimen ticketed . . . by Smith '*altissima*', is the species which has so long [erroneously] passed as *S. altissima*, viz. *S. rugosa*."[3] In the study referred to, Gray concluded that for the plant (our *S. rugosa*) which had erroneously passed as *S. altissima* "we must now fall back to the oldest and in the main most appropriate name, *S. rugosa*, Mill. Dict."[4]

[1] Mackenzie in RHODORA, xxix. 75 (1927).
[2] L. Sp. Pl. ii. 878 (1753).
[3] Gray, Proc. Am. Acad. xvii. 177 (1882).
[4] Gray, l. c. 180.

Gray's decisions were based upon a thorough and dispassionate weighing of the complicated evidence and nothing is gained by attempts to overthrow his decisions merely on the basis of sophisticated bibliographic twists without fuller knowledge of the actual specimens which Linnaeus had before him. Incidentally it should be noted that the original Linnean account (Hortus Upsal. 259) in 1748 said of his *S. altissima* "foliis enerviis integerrimis," a phrase altered in 1753 (our starting point) by changing *integerrimis* to *subintegerrimis.*

The original (1748) account by Linnaeus amplified the brief diagnosis by a series of comparisons with the preceding species, *S. canadensis* L.

> Obs. *Praecedenti valde affinis a qua differt:* 1. Foliis *crassioribus, margine vix vel parum scabris, superficie vix manifeste* trinervi. 2. Caule *duplo altiore, seu quadrupedali.* 3. Tempore *florendi seriore, scilicet octobri.*

Mackenzie's own description of *S. rugosa* (his "*S. altissima*") in Small's Manual reads: "leaf-blades . . . sharply-serrate, . . . thin, prominently veined." Surely, it is most difficult to coordinate Mackenzie's "*S. altissima*" (*S. rugosa*), with sharply serrate, thin, prominently veined leaves with the Linnean account of a plant with entire (or subentire), thick leaves with veins not apparent. Gray's wise decision should be accepted as definitely settling the specific identities; nothing but confusion follows by insisting that by entire, thick and veinless Linnaeus really meant sharply serrate, thin and prominently veined!

As to Mackenzie's insistence that *Solidago altissima* L. is not the tall thick- and often entire-leaved plant with which Gray and afterward I, merely following Gray, identified it, it is noteworthy that the original Linnean account said that the plant flowers later (in October) than *S. canadensis* and that it came from Maryland. As represented in the Gray Herbarium *S. canadensis* is little shown from Maryland southward, while *S. altissima* of Gray's and my own interpretation is more abundant, being the most abundant species of eastern Maryland and Virginia. The *flowering* material bears the following dates:

S. CANADENSIS. From Maryland, September 16; from West Virginia, September 5 and 10.

S. ALTISSIMA. From Maryland, September 16 and 24; from West Virginia, September 22, October 3 and 19; from Virginia, September 23, October 14 and 20.

I see no grounds for upsetting the use of *S. altissima* for the plant so treated in Gray's Manual.

There is, however, the necessity to settle just which of the numerous variations within the complex series we call *Solidago rugosa* Philip Miller had. So long as the group was treated merely as "Polymorphous, not readily sorted into definable varieties," Gray's treatment in the Synoptical Flora, the question could be passed. But now that we know the thin-leaved plant with elongate and acuminate, sharply serrate, smooth or merely villous-backed blades to have the involucral bracts also thin and elongate (linear-lanceolate and tapering to tip) and to have a broad northern range, while the plants with thicker, firmer and more rugose and harshly scabrous leaves have the involucral bracts commonly linear and round-tipped, and are prevailingly of southern range, the exact identity of Miller's plant becomes important.

Probably there is no type extant for *Solidago rugosa.* Miller's description (species no. 25, Gard. Dict. ed. 8) is not wholly satisfactory, especially his *entire* leaves; but the garden plant was said to have come from New England, to have hairy, round stems 2½ feet high, lanceolate, rough leaves, "those on the lower part are two inches long, and half an inch broad, but are gradually smaller to the top," panicle loose, with long lower branches with intermixed leaves. This, in view of Miller's lack of understanding of more technical characters in *Solidago,* is well enough and nothing will be gained by changing the interpretation of *S. rugosa* as now generally understood. William Aiton (or presumably Solander), who was a contemporary of Miller and had material of his species growing at Kew, supposed *S. rugosa* to be *S. altissima* L., as already sufficiently emphasized. Aiton divided the "*S. altissima*" growing then at Kew into five unnamed varieties, his *S. altissima* ε being what was then understood by Miller's contemporaries as *S. rugosa,* a plant with the habit and narrow-based and acuminate leaves of northern *S. rugosa* but with the margins entire or only barely toothed. That this garden material is quite like the plant which Miller had there can be little doubt. It is the extreme of ordinary *S. rugosa,* as currently understood, with the least developed toothing. The other plants which Aiton associated with it, his *S. altissima* vars. α, β, γ and δ, are slight variations of the same thing, differing in breadth of leaf, toothing of the margin and elongation of panicle-branches. I have before me photographs of all these trivial variations which I took at the British Museum in 1903. They all belong to *S. rugosa* as usually interpreted. In 1814 Pursh took

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. TYPICA: FIG. 1, plant, × 2/5, from Connecticut; FIG. 2, internode and leaf-bases, × 5, from Maine; FIG. 3, lower surface of leaf, × 10, from Nova Scotia; FIG. 4, involucre, × 5, from same specimen.

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. VILLOSA: FIG. 1, inflorescence, × $\frac{2}{5}$, from Quebec; FIG. 2, inflorescence, × $\frac{2}{5}$, from Magdalen Islands; FIG. 3, internode and base of leaf, × 5, from Newfoundland; FIG. 4, involucre, × 5, from same plant as FIG. 1.

up three of Aiton's unnamed varieties and assigned them names under *S. altissima*, with the pregnant comment: "It is a very variable species, and scarcely two individuals look alike." Another of Aiton's varieties, his *S. altissima* ε, which Aiton had considered to be *S. rugosa* Mill. (Aiton's material closely matching Miller's description), was treated by Pursh unequivocally as *S. rugosa;* and another, *S. altissima* β. of Aiton, (said by Aiton to be *S. pilosa* Miller) Pursh treated as synonymous with his new *S. villosa*. The type of Aiton's *S. altissima* β=*S. pilosa* Mill., however, is only a slight transition toward the type of *S. villosa* Pursh, photographs of both being before me.

Typical *Solidago rugosa* passes into the ecological var. *villosa*, which was *S. villosa* Pursh. These two plants, predominantly northern and of damp habitats, have usually villous stems, lanceolate to narrowly ovate or oblanceolate, usually sharply serrate leaves which are narrowed to base and acuminate at tip, rather thin, only slightly harsh above, villous-hirsute on the loose but not prominently rugose veins beneath, and their involucral bracts are thin (subherbaceous), greenish and linear or linear-lanceolate and tapering or only subobtuse at tip.

In drier, often quite dry, habitats of the South, extending into the warmer parts of the North, there is another series, *S. aspera* Ait. and *S. celtidifolia* Small, with the stems scabrous-puberulent or short-hirsute (rarely villous); the leaves from lanceolate to rounded-ovate and firm, harshly scabrous above, coarsely rugose-veiny and scabrous-hirsute beneath, the bases mostly rounded and the margins with low or crenate teeth. In these two plants the involucral bracts are rather firm, linear to linear-oblong and usually round-tipped. In their extreme developments they would seem to constitute a separate species, but, unfortunately, too many transitions in leaf-outline, toothing, and involucres occur to allow me to treat them as specifically distinct from *S. rugosa*. Their corollas, pappus and achenes are, likewise, not materially different and I am looking upon them as a pair of somewhat xerophytic austral varieties. This interpretation is strengthened by the fact that the type and a few other extreme specimens of *S. celtidifolia* have the involucral bracts as slender and as thin as in the more northern typical *S. rugosa*, but decidedly longer.

Another series which is quite baffling is the group of glabrous plants which was set off as *Solidago rugosa*, var. *sphagnophila* by Graves in 1904 and, eleven years later, as *S. aestivalis* Bicknell. When Bicknell

described this glabrous plant as a species he correctly characterized it as

> closely related to *S. rugosa*, but having a much earlier flowering period, . . . three to five weeks in advance of *S. rugosa* and much of it . . . past flowering at the time the latter begins to bloom. The close relationship of *S. aestivalis* to *S. rugosa* is evident enough, and examples are not wanting that suggest either that the two are sometimes intergradient or that they occasionally hybridize. Nevertheless it would be little doubted, I think, by anyone coming to know *S. aestivalis*, that it was essentially distinct, and long ago it became to me an authentic and, from its early time of flowering, a particularly interesting member of the golden-rod group. Its smooth and purple striate-angled stem is notably at contrast with the more terete and papillate-hirsute or villous stem of normal *S. rugosa*, although its smoothness may not be taken as a strictly determining character, for *S. rugosa* occasionally passes into glabrate forms; but such divergent plants, as I have met with them on Long Island, are obviously only local variations from the type not at all to be correlated with the normally glabrous stemmed *S. aestivalis*. In view of such variations, however, the characters of the latter might be given less weight did not its definitely earlier flowering period, both in its beginning and ending, imply a very pronounced remove from identity with the broadly similar *S. rugosa*.[1]

Bicknell's discussion will be seconded by all who know the smooth plant of the Coastal Plain and the Piedmont; its early flowering is very real, but the flowering season, as shown in the abundant herbarium material from southern New England, overlaps that of *S. rugosa* more than he found to be the case on Lond Island. The striate-angling of the stem is evident in most material, though occasionally not apparent, and too often in both the northern and inland villous-stemmed *S. rugosa* and in the southern scabrous-hispid *S. aspera* the pronounced angles can be seen (obscured only by the presence of a blanketing pubescence). In plates 426 to 429 I show such stems from the different plants of the group, merely to indicate the difficulty encountered in applying this character as a truly distinctive one.

Bicknell's characterization calls for involucral "bracts linear-oblong to linear, obtuse" as in *S. aspera* and much of *S. celtidifolia*, and in slightly more than half of the material in the Gray Herbarium that is the case; but in the remainder, including some of the type-collection of *S. rugosa*, var. *sphagnophila*, the bracts are as narrow and attenuate as in the most ideal *S. rugosa*. Yet it can scarcely be maintained that Dr. Graves's variety is different from Bicknell's species. Graves's original account called for "Stems . . . angular-striate, very

[1] Bicknell, Bull. Torr. Bot. Cl. xlii. 561, 562 (1915).

smooth, usually dark red or purple . . . involucre . . . its bracts . . . linear-subulate to oblong-linear, acute or obtuse" and Graves gave a discussion very similar to that of Bicknell eleven years later!

As to whether it should be looked upon as specifically distinct from *S. rugosa* there might be an honest difference of opinion, but on account of the discovery of a few plants showing intermediate characters it seems best to regard it as a well marked variety of that species. . . . Not the least interesting feature of this variety is its time of flowering. It is one of our early goldenrods, following close after *S. juncea*, Ait., and *S. odora*, Ait., and antedating *S. rugosa* in the same neighborhood by at least four weeks. This past summer it began to bloom about August first, was well in flower a week or ten days later, and by the end of the month—at a time when the species was barely beginning—the variety was practically out of bloom. . . .

It is readily distinguished from the species by its perfectly smooth, more striate and usually darker stem, and its relatively smooth leaves. Its early flowering season and its habitat also constitute significant points of distinction.[1]

There is much to say for recognizing *Solidago aestivalis* as a species, but I am so constituted that I cannot accept as true species in *Solidago* plants without definite morphological differences. I have vainly sought stable characters of corollas, achenes, pappus and anthers, such as clearly separate these plants from *S. Elliottii* and such as separate all other habitally similar but morphologically distinct species. I should welcome the designation of such characters by those who prefer to call *S. aestivalis* a species; but I am forced, until a new light is shed on the question, to treat *S. aestivalis* as *S. rugosa*, var. *sphagnophila* Graves.

The following brief summary gives the conclusions I reach in studying the group of *Solidago rugosa*. Since the group is so complex I have felt it important for clarity to illustrate each of the varieties I recognize. I have also added some details of involucres, etc. which may be of service.

S. RUGOSA Mill., var. **typica.** *S. rugosa* Mill. Gard. Dict. ed. 8, no. 25 (1768); Pursh, Fl. ii. 337 (1814), and later authors in part. *Virga aurea Novae Angliae, rugosis foliis crenatis* Dill. Hort. Elth. 416, t. cccvii. fig. 396 (1732), very similar to Miller's description and to the Hort. Kew material which Aiton, and after him Pursh, considered *S. rugosa;* the name used by Miller probably derived from Dillenius or from Hermann before him. *S. pilosa* Mill., l. c. no. 9 (1768), as interpreted by Aiton. *S. virginiana* Mill., l. c. no. 11 (1768), as inter-

[1] Graves, RHODORA, vi. 83, 184 (1904).

preted by Aiton and by Pursh. *S. recurvata* Mill. l. c. no. 28 (1768), as interpreted by Aiton and by Pursh. *S. altissima* Ait. Hort. Kew. iii. 212 (1789),[1] including vars.; Pursh, l. c. 336 (1814); Torr. & Gray, Fl. ii. 216 (1842), in part; Mackenzie in RHODORA, xxix. 75 (1927) and in Small, Man. 1358 (1933), not L. Sp. Pl. ii. 878 (1753). *S. altissima*, α. *vulgaris*, β. *recurvata* (Mill.) and γ. *virginiana* (Mill.) Pursh, l. c. (1814). *S. altissima*, var. *rugosa* (Mill.) Torr. Fl. N. Y. i. 363 (1843).—Stem sordid-villous, without or with decurrent lines running down the stem from the leaf-bases and midribs; leaves lanceolate to narrowly ovate or oblanceolate, acuminate, gradually tapering at base, commonly sharp-serrate with coarse teeth, usually rather thin and loosely veiny, not conspicuously rugose, more or less villous beneath; the median leaves 0.5–1.3 cm. long; the upper leaves gradually reduced in size, 1–7 cm. long, 0.5–1.5 cm. broad, much shorter than the long curving lower branches of the usually broadly pyramidal panicle; involucres 3–4 mm. high, their bracts linear or linear-lanceolate, thin, greenish, attenuate to bluntish.—Damp open soil, thickets and borders of woods and streams, Newfoundland to Ontario, south to western Virginia, West Virginia and Louisiana, abundant northward, less so southward. Flowering August–October. Passing into vars. *villosa*, *aspera* and *sphagnophila*. PLATE 426.

Vars. *glabrata* and *laevicaulis* Farwell, Am. Midl. Nat. ix. 277 (1925) have the characteristic pubescence through the panicle and on the lower leaf-surfaces, but their stems below the panicle are glabrous.

Var. VILLOSA (Pursh) Fernald in RHODORA, x. 91 (1908). *S. villosa* Pursh, Fl. ii. 537 (1814). *S. altissima*, var. *villosa* (Pursh) Torr. Fl. N. Y. i. 363 (1843), at least as to source of name.—Panicle elongate-pyramidal to cylindric, the lower lateral racemes nearly equaled to overtopped by the large (0.5–1 dm. long, 1–3.5 cm. broad) subtending leaves; involucres as in var. *typica*, often slightly larger; pubescence as in var. *typica* or longer and more copious.—Low grounds, Newfoundland to Ontario, often the abundant form, becoming infrequent southward to Virginia, West Virginia, Ohio and Michigan. Flowering from early July (northward) to October (southward). PLATE 427.

Var. SPHAGNOPHILA Graves in RHODORA, vi. 183 (1904). *S. aestivalis* Bickn. in Bull. Torr. Bot. Cl. xlii. 561 (1915).—Stems glabrous, often purplish, commonly with prominent stripe-like ridges decurrent from the bases of the leaves; leaves glabrous, lanceolate to narrowly elliptic, rather firm, appressed-serrate, the median 0.6–1.2 dm. long, the upper reduced; panicle much as in var. *typica* or more compact, its rachis and branches glabrous or only sparsely pubescent; involucral bracts linear-lanceolate to linear-oblong, acute or obtuse.—Swampy, often boggy, habitats, southern Maine to North Carolina. Flowering through August and September. PLATE 428.

[1] Aiton's treatment taken over for the most part by Willd. Sp. Pl. iii³. 2058 (1804) with the acknowledgment: "*Varietatem α. tandum vidi, a Clariss. Aiton indicatas vero non.* W.

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. SPHAGNOPHILA: FIG. 1, plant, × $\frac{2}{5}$, from TYPE-collection; FIG. 2, internode and base of leaf, × 5, from TYPE-collection; FIGS. 3 and 4, involucres × 5, from TYPE-collection.

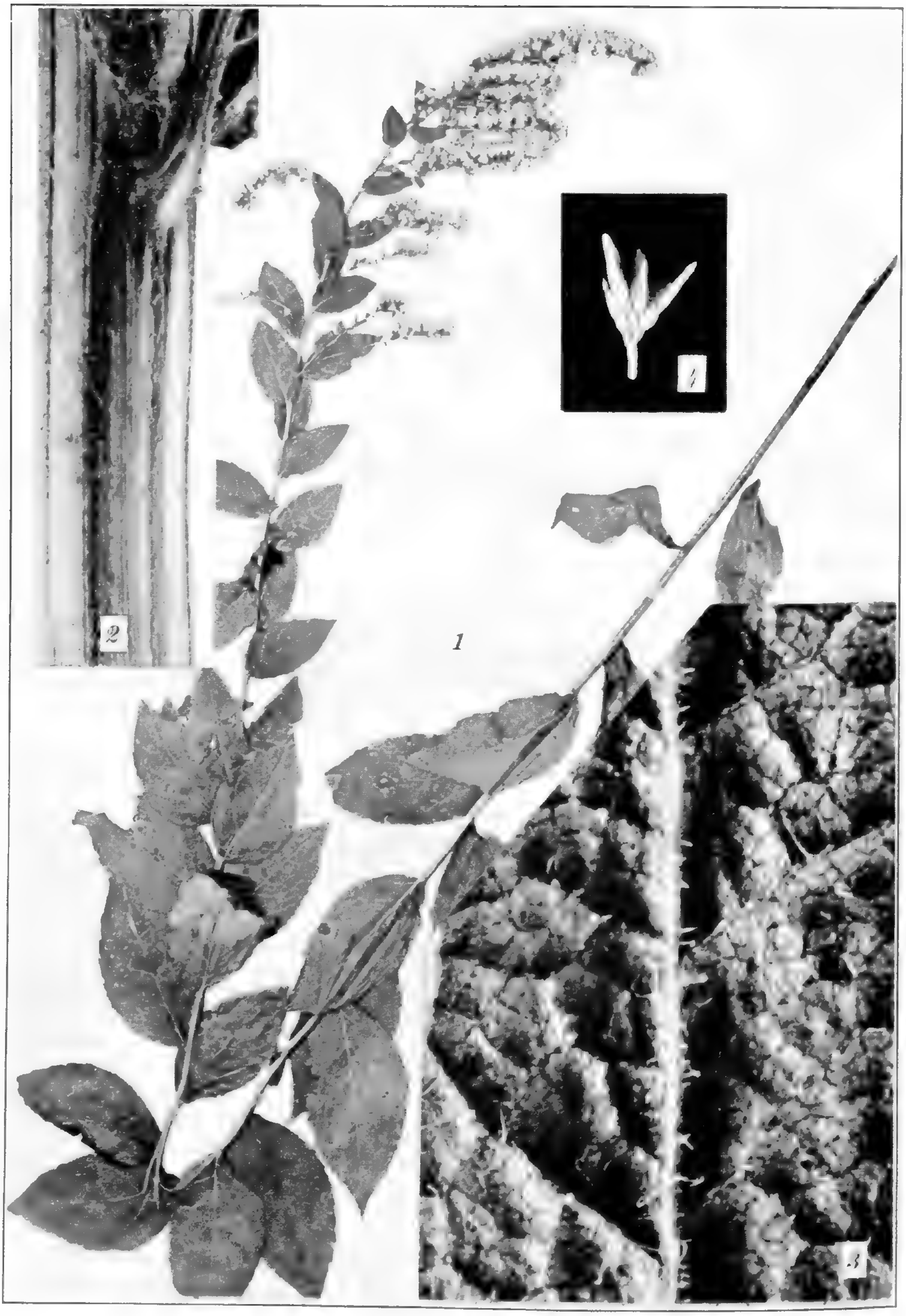

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. ASPERA: FIG. 1, plant, × 2/5, from Massachusetts; FIG. 2, internode and leaf-base, × 5, from Connecticut; FIG. 3, lower surface of leaf, × 10, from Connecticut; FIG. 4, involucre, × 5, from same specimen as FIG. 3.

Var. ASPERA (Ait.) Fernald in RHODORA, xvii. 7 (1915). *Virga aurea Americana aspera* Dill. Hort. Elth. 411, t. cccv. fig. 392 (1732). *S. aspera* Ait. Hort. Kew. iii. 212 (1789); Willd. Sp. Pl. iii³. 2057 (1804); Pursh, Fl. 535 (1814), and later authors. *S. altissima* ε, Torr. & Gray, Fl. ii. 217 (1842).—Stems scabrous-puberulent or short-hispid, rarely glabrous, terete or only occasionally angulate-striate; leaves oval or elliptic to lanceolate, rounded at base, subacute to short-acuminate, low-serrate to crenate, sometimes coarsely serrate, scabrous on both surfaces, thick and strongly rugose, the lower surface hispid; median leaves 2.5–10 cm. long, 1.2–4 cm. broad; panicle pyramidal, usually longer than broad, its ascending to spreading branches densely floriferous throughout or the lower sometimes merely leafy-bracted below, the reduced rameal leaves elliptic to lanceolate and acute; involucres 3–4 mm. high; their principal bracts firm, straminеous to pale-green, linear-oblong and round-tipped, 0.4–0.8 mm. broad. —Dry to damp open soil or thin woods and thickets, Florida to Texas, north to southern Maine, Ohio, Michigan and Missouri. Flowering from mid-August to October. PLATE 429.

Although var. *aspera* often appears quite distinct and, as already noted, is of generally more southern range and of drier habitats than var. *typica*, I find altogether too many transitions to justify maintaining it as a species. In view of the consistent and correct application of Aiton's name *aspera*, derived from Dillenius (1732), for more than two centuries, I am purposely maintaining the name in the varietal category, although extreme literalists, who place more weight on the letter of rules than their spirit, might urge my making a new combination based upon *S. aspera* var. *axillaris* Farwell, Rep. Mich. Acad. Sci. xiv. 189 (1913). Needless confusion would result by abandoning the bicentenarian and perfectly understood name *aspera* in its broadly inclusive sense and substituting, on a technicality, a name which was not so intended but which was definitely made subordinate to *aspera* and meant for a minor variation of it. I decline to be technically literal and to make a fetish of minor rules where only confusion and misunderstanding would result. Others, who look upon nomenclature as the end, not the means, will take another view.

Var. *aspera* passes into the following:

Var. **celtidifolia** (Small), comb. nov. *S. celtidifolia* Small, Fl. Se. U.S. 1198, 1339 (1903), and later authors.—Similar to var. *aspera* but the panicle very lax, its few distant very prolonged and divergent branches (up to 4.5 dm. long) floriferous chiefly above the middle, their bracteal leaves elliptic to oval; involucres 3.5–5.5 mm. long, the inner bracts often prolonged, linear, obtuse or acute, often membranaceous. —Dry to moist open woods, clearings and thickets, Georgia to Texas,

north to Virginia, southern Indiana and Arkansas. Flowering through September and October. PLATE 430.

SOLIDAGO AURICULATA Shuttleworth ex Blake in Journ. Wash. Acad. Sci. xxi. 326 (1931). *S. amplexicaulis* Torr. & Gray, Fl. N. Am. ii. 218 (1842), not Martens in Bull. Acad. Brux. viii. 67 (1841). *S. auriculata* Shuttleworth ex Gray, Syn. Fl. N. Am. 1². 153 (1884), as synonym. *S. notabilis* Mackenzie in Small, Man. Se. Fl. 1353, 1509 (1933).

Mackenzie, in publishing *Solidago notabilis* in 1933, must have overlooked the proper publication in 1931 by Blake of Shuttleworth's manuscript name *S. auriculata*. The latter, validated by Blake, is correct; the former is a synonym.

THE VARIETIES OF SOLIDAGO NEMORALIS (PLATE 431). As I understand the species, *Solidago nemoralis* Ait. has three strongly defined geographic varieties, probably all of which have been treated as species but which show altogether too much intergradation. Typical *S. nemoralis*, the wide-ranging plant (a New Jersey specimen in the Gray Herbarium matched with the type by Asa Gray and Francis Boott), has the basal leaves broadly oblanceolate to spatulate-obovate; and the principal cauline ones decrease gradually in size to the summit, the upper reduced ones being narrowly oblanceolate. The heads are crowded on the branches of the panicle and vary with habitat and exposure from subsessile to more definitely short-pedicelled.

On the Prairies and Plains much of *Solidago nemoralis* has the leaves narrower, the basal narrowly oblanceolate to lance-linear, the upper cauline linear-oblanceolate or linear. This plant of the Plains has the heads (FIGS. 3–5) usually large for the species, though equally large heads (FIGS. 7–9, 11, 12) are often found in the more eastern plant, and the pedicels are often quite evident. This was first described in 1836 as *S. decemflora* DC. Prodr. v. 332 (1836), a sheet of the type number (*Berlandier*, no. 1924) in the Gray Herbarium being (except for greater discoloration) a good match for the type of *S. longipetiolata* Mackenzie & Bush in Trans. Acad. Sci. St. Louis, xii. 87, t. xvi (1902). Much of the latter plant, furthermore, seems to me inseparable from the type-collection of *S. diffusa* Nelson in Bull. Torr. Bot. Cl. xxv. 378 (1898), which, because the name is a later homonym, was altered to *S. pulcherrima* Nelson, l. c. 549 (1898). As far west as Wyoming this extreme of *S. nemoralis* is apparently rare, though it is now known

to reach Montana, Utah and Arizona, for in publishing it Nelson said "It is seemingly quite local as nothing approaching it has been secured in several years' collecting in the state." Nelson also added the illuminating footnote: "Dr. Rydberg suggests that this is the *S. nemoralis* of most of the Western Reports and states that its range extends from Kansas to the Saskatchewan. It is so very different from the eastern *S. nemoralis* that I had not associated the two at all."

The isotype of *Solidago pulcherrima* in the Gray Herbarium has the involucral bracts (FIG. 5) obtuse, the isotype of *S. longipetiolata* has them also obtuse (FIG. 3) but not quite so round-tipped, and the isotype of *S. decemflora* has them (FIG. 4) as in the Mackenzie & Bush type, or slightly acutish. In publishing *S. longipetiolata* Mackenzie & Bush specially emphasized the narrower leaves and the larger heads, which constitute the chief differential characters of the plant of the Plains, but they also said "Distinguished from *S. nemoralis* Ait. by . . . more imbricated involucre, with sharper scales, lower height, more simple inflorescence and much more pubescent achenes." As to the "lower height," they assigned their plant a height of "3–6 dm.", while Nelson had given for his earlier *S. diffusa* "stems 6–8 dm. long." Specimens distributed by Bush as his and Mackenzie's *S. longipetiolata* are 8 dm. high, and large specimens of it from Arkansas are 1.3 m. high. Such a height as the latter for *S. nemoralis* would be unusual and plenty of eastern material from arid and wind-swept habitats is depressed and with stems only 1–2 dm. long. The panicle of the western material is commonly more slender and with less divergent branches than in much of the eastern, but it is altogether too easy to find either form of panicle east or west. As to the "sharper scales" of the plant of the Plains it is significant that Rydberg, not averse to weak species, should have specially separated all the members of the series (*S. nemoralis, S. longipetiolata* and *S. pulcherrima*) from the slenderly stoloniferous *S. mollis*, etc. by "Bracts . . . obtuse."[1] Incidentally, although *S. nemoralis* has the bracts most commonly obtuse, the futility of trying to draw too fine a distinction on this character is shown by the occurrence of plenty of broad-leaved *S. nemoralis* on the Atlantic slope with acutish scales (FIGS. 6, 11, 12). In PLATE 431 I am showing involucres from various areas which should make this point clear; they are all of the same magnification (× 5). FIG. 3, as explained, is from an isotype of *S. longipetiolata*,

[1] Rydb. Fl. Prair. Pl. 792 (1932).

FIG. 4 from an isotype of *S. decemflora* and FIG 5 from an isotype of *S. pulcherrima*. Certainly it is not easy to find fundamental differences to separate these involucres from nos. 7 (from Virginia), 8 (from Pennsylvania), 9 (from Maryland) and 10 (from Rhode Island); and, surely, it is difficult to make out, as Mackenzie & Bush, maintained, that the western has "sharper scales." FIG. 3, from the isotype of *S. longipetiolata* shows them obtuse enough; but FIG. 6 is from a specimen from Maine, FIG. 11, from one from New York and FIG. 12 from one from Prince Edward Island. The plants from which these were taken show no other points of difference to separate them from plants of the Atlantic slope which supply FIGS. 7–10. Similarly with the achenes; I find no appreciable difference. I am, therefore, unable to maintain the plant of the Plains as a species. It seems to me rightly called

S. NEMORALIS Ait., var. **decemflora** (DC.), comb. nov. *S. decemflora* DC. Prodr. v. 332 (1836). *S. diffusa* Nelson in Bull. Torr. Bot. Cl. xxv. 378 (1898), not Gray (1861). *S. pulcherrima* Nelson, l. c. 549 (1898). *S. longipetiolata* Mackenzie & Bush in Trans. Acad. Sci. St. Louis, xii. 87, t. xvi. (1902).—Western Ontario to northern Alberta, south to Kentucky, Arkansas, Texas and Arizona.

In his earlier work Asa Gray interpreted *Solidago decemflora* as *S. radula* Nutt. ("Probably what I referred to S. decemflora, in *Pl. Lindh. 2, p. 222*, likewise belongs here"—Gray, Pl. Wright. i. 95 (1852)); but when he had studied the Berlandier material from Texas, TYPE of *S. decemflora*, he made the correction under his discussion of *S. nemoralis:* "Some of the specimens have narrowly lanceolate leaves, and are S. decemflora DC.!"—Gray l. c. 94.

While botanizing on the "East Shore" of Virginia, in October, 1935, Messrs. Long, Fogg and I were much impressed with the woodland plant which, at least in Northampton County, largely replaces the widespread *Solidago nemoralis*. The latter has the leaves gradually decreasing in size up to the inflorescence, the upper ones being narrowly oblanceolate, and the heads are subsessile or with only very short pedicels and crowded nearly to the bases of the divergent panicle-branches. The plant of pine woods on the Cape Charles Peninsula has the lower cauline leaves as in typical *S. nemoralis* but about midway on the stem they are abruptly reduced in size and altered in form, continuing to the summit as subuniform spatulate-obovate bracteiform leaves. The inflorescence, too, is comparatively lax, with the heads mostly on obvious pedicels up to three times the

Photo. E. C. Ogden

SOLIDAGO RUGOSA, var. CELTIDIFOLIA: FIG. 1, ISOTYPE of *S. celtidifolia* Small, × $^{2}_{5}$; FIG. 2, involucre, × 5, from Arkansas; FIG. 3, involucre, × 5, from ISOTYPE; FIG. 4, involucre, × 5, from Virginia.

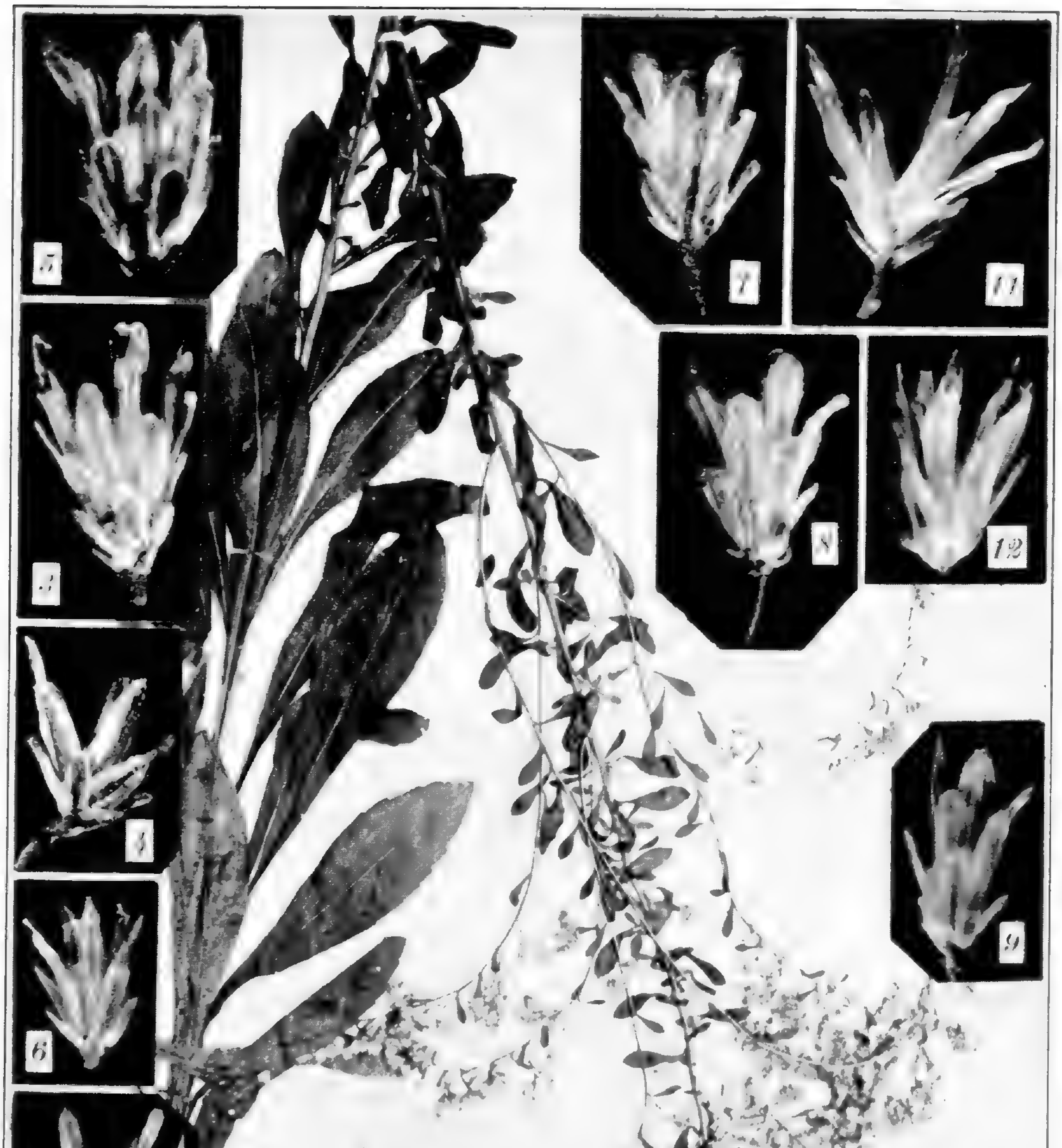

Photo. E. C. Ogden

SOLIDAGO NEMORALIS, involucres, × 5: FIG. 6, from Maine; FIG. 7, from Virginia; FIG. 8, from Pennsylvania; FIG. 9, from Maryland; FIG. 10, from Rhode Island; FIG. 11, from New York; FIG. 12, from Prince Edward Island.

Var. DECEMFLORA, involucres, × 5: FIG. 4, from ISOTYPE; FIG. 3, from ISOTYPE of *S. longipetiolata;* FIG. 5, from ISOTYPE of *S. pulcherrima.*

Var. HALEANA: FIG. 1, TYPE, × ⅖; FIG. 2, involucre, × 5, from TYPE.

length of the involucre and borne at the tips of the strongly ascending branches. In pubescence, basal and lower cauline leaves, involucres, flowers and achenes the plant is good *S. nemoralis*, its departures being in the reduction and shape of the upper leaves and the looser inflorescence with long ascending leafy branches. Exactly similar plants are in the Gray Herbarium from dry pine-barrens north of Leslie, Georgia (*Harper*, no. 1722), from Louisiana (*Hale*) and from eastern Texas (San Felipe de Austin, *Drummond*, no. 111), while they are strongly approached by material from the cedar glades of Tennessee (*Gattinger*) and from "barrens of Kentucky" (Short). The Texas, Louisiana and Kentucky specimens (along with one from Michigan which I should not place with them) constituted *S. nemoralis*, γ. of Torrey & Gray, with "leaves more scabrous; the upper short, obovate-spatulate." Unfortunately, Torrey & Gray assigned no name to this remarkable southern variety and I cannot find that it has been named, unless it is what Elliott meant when he described *S. cinerascens* Schweinitz in Ell. Sk. ii. 375 (1824). The typification of *S. cinerascens* is mixed between Elliott's own material from Georgia actually described and material, undescribed, which he had received from Schweinitz: "The plant I have described agrees in most respects with specimens sent me under this name from Salem, North-Carolina, by Dr. Schweinitz." In view of this confusion, the very indefinite condition of the Elliott plants and his characterization of the leaves as "long, linear-lanceolate," it is unwise to use for our variety the name given by Elliott to some similar plant; his "*leaves* . . . , the upper distant and small" and his "peduncles . . . longer than the involucrum" sound like it, but it is safer to designate a new type. I am calling the extreme plant of the Southeast

S. NEMORALIS Ait., var. **Haleana**, var. nov. (TAB. 431, FIGS. 1 et 2), foliis caulinis inferioribus oblanceolatis 3–15 cm. longis, superioribus valde reductis spathulatis distantibus 0.5–3 cm. longis; ramibus panicularum ascendentibus apice recurvatis; racemis laxis pedicellis elongatis.—Texas to Georgia, north to Kentucky and eastern Virginia. TYPE: Louisiana, *Dr. Josiah Hale*, included under *S. nemoralis*, γ. Torr. & Gray. Our Virginia material, not so extreme as the type, is from sandy pine woods at and east of Eastville, *Fernald & Long*, nos. 5524, 5525; dry pine woods north of Capeville, *Fernald, Long & Fogg*, no. 5526.

IN PLATE 431, FIG. 1 is the type of var. *Haleana*, × ⅖, FIG. 2 an involucre, × 5; the other figures show involucres, × 5, as already explained.

SOLIDAGO RADULA Nutt., var. **laeta** (Greene), comb. nov. *S. laeta* Greene, Pittonia, v. 138 (1903).

Although *Solidago laeta* is not sharply differentiated from *S. radula*, a series of plants extending from Texas into Missouri has the involucral bracts broader and shorter (PLATE 432, FIGS. 4 and 5) than in the widely distributed typical *S. radula* (FIG. 3). FIG. 3 shows the involucre, × 5 of typical *S. radula* from Grand Tower, Illinois (*Gleason*, no. 1844), FIG. 4, an involucre from an isotype of *S. laeta* (*Tracy*, no. 8137) and FIG. 5 the most extreme involucre of var. *laeta* (*Cory*, no. 4738), more extreme than in the type, which is somewhat transitional.

Another variation from typical and average *Solidago radula*, also in the southwestern corner of the specific range, Louisiana and eastern Texas to Missouri, has the panicle as broad and with as divergent branches as in the most extreme forms of *S. radula*, but the involucral bracts very slender. Whereas var. *laeta* is the extreme of the specific aggregate with broadest bracts, this is the tendency with the narrowest. I am calling it

S. RADULA Nutt., var. **stenolepis**, var. nov. (TAB. 432, FIGS. 1 et 2), a var. *typica* recedit bracteis involucri angustioribus, interioribus anguste linearibus 0.3–0.5 mm. latis.—Missouri, Louisiana and Texas. MISSOURI: rocky open woods, limestone hills, near Carthage, Jasper Co., October 2, 1922, *E. J. Palmer*, no. 22,161 (TYPE in Herb. New York Botanical Garden). LOUISIANA: Cameron, September, 1906, *R. S. Cocks*, no. 1727. TEXAS: prairies, Houston, September 18, 1917, *E. J. Palmer*, no. 12,739.

In its very narrow involucral bracts var. *stenolepis* departs from typical *Solidago radula* just as occasional aberrant plants of *S. nemoralis* will sometimes do. In the latter cases the departure seems due to some outside factor; in var. *stenolepis* it has every appearance of being normal.

The type of var. *stenolepis* bears an unpublished specific name written by the late K. K. Mackenzie. His judgment of it may eventually prove correct; as yet I have been unable to find any definite characters of habit, foliage, flowers and fruit which seem to be specific. Another sheet of specimens marked by Mackenzie as belonging to his unpublished species is so different in many characters that I am unable to cite it under var. *stenolepis*. Other sheets sent out by collectors under the unpublished binomial are likewise far removed from the type of var. *stenolepis*. The name given by Mackenzie but not published is so similar to *S. bracteata* Bush (1918) that its formal

publication would lead to confusion. I am, therefore, not using it. PLATE 432, FIG. 1 shows the type of var. *stenolepis*, × 2/5. In FIG. 2 the involucre is shown, × 5, the same magnification as FIGS. 3–5.

SOLIDAGO **Jacksonii** (O. Ktze.), comb. nov. *S. corymbosa* Ell. Sk. ii. 378 (1822 or 1823), not Poir. Encyc. Suppl. v. 461 (1817). *Aster Jacksonii* O. Ktze., Rev. Gen. i. 316 (1891).

VII. MEMORANDA ON ANTENNARIA

ANTENNARIA **munda**, sp. nov. (TAB. 433). PLANTA FOEMINEA; foliis rosulatis spathulatis vel anguste spathulato-obovatis, apice rotundatis, petiolatis, lamina 2–6 cm. longa 1.3–5 cm. lata, 3–5-nervia supra minute canescenti-tomentulosa; stolonibus assurgentibus vel procumbentibus foliis terminalibus rosulatis; caulibus floriferis crassis 1–4 dm. altis dense tomentosis; foliis caulinis 6–15, imis oblanceolatis vel late lanceolatis vel anguste oblongis 4.5–8 mm. latis, mediis superioribusque lanceolatis attenuatis apice subulatis, subulo 0.6–1.4 mm. longo; capitulis 5–20 glomerulatis vel dense corymbosis, corymbis subglobosis 2–4.5 cm. diametro; involucris 8–10 mm. altis; bracteis 3–4-seriatis, basi brunneis vel purpurascentibus, exterioribus anguste oblongis apice obtusis erosis lacteis, bracteis interioribus angustatis acutis; corollis 5.5–7 mm. longis; stylo rufescente exserto bifido; achaeniis maturis 1.5–1.8 mm. longis; pappi setis longioribus 8–9 mm. longis. PLANTA MASCULA (rarissima); parva, 1 dm. alta; corymbis densis 1.5–2.7 cm. latis; involucris 5 mm. altis; bracteis patentibus ovalibus lacteis apice erosis; pappi setis apice dilatatis integris vel undulatis.—Sandy, gravelly or sterile rocky fields and open woods, rarely damp meadows, central Maine to the Ottawa valley, Quebec, west to Thunder Bay Distr., Ontario, south to Massachusetts, Connecticut, northeastern Pennsylvania, central and western New York, northern Indiana and Minnesota. TYPE: sandy wooded slope, Orono, Maine, May 31, 1901, *Fernald* (in Gray Herb.)

Antennaria munda, named for its neat and comparatively elegant appearance as well as for its nearly spherical inflorescence, is the plant which has erroneously passed as *A. occidentalis* Greene. The latter was merely the prairie specimens of *A. fallax* Greene, Pittonia, iii. 321 (1898). Greene published *A. fallax* as occurring only in the District of Columbia; and he separated from it, on the next page (322) the plant "of the Illinois prairie region, and apparently westward to Kansas. . . . The species, as to the typical plant of central Illinois, was too hastily by me concluded to form a part . . . of what I have now named *A. fallax*" (*Greene*, l. c.). Described as "very similar" to *A. fallax* but with "cymose panicle of large female heads more open than in either," Greene's *A. occidentalis* can have

nothing to do with the more northern *A. munda*, which has been erroneously referred to it. Numerous sheets designated by Greene as *A. occidentalis* clearly demonstrate its essential identity with *A. fallax*, one of the most widely distributed species.

Antennaria munda was early supposed to be *A. Farwellii* Greene, l. c. 347 (1898). Several specimens from Mr. Farwell and a collection made by *Fernald & Pease* (no. 3552) at the type station show it to be a unique species, as yet known only from Keweenaw Co., Michigan and from the Bruce Peninsula, Ontario, a singular localization if those cytologists are correct who maintain that the parthogenetic species are modern "throw-offs" which have been rapidly spreading since the Wisconsin glaciation. The basal leaves (FIG. 3) of *A. Farwellii* are so very characteristic in their subtruncate summits, with the sides abruptly narrowed to a concave curve, that I am showing them in the plate with *A. munda*.

ANTENNARIA FALLAX Greene, var. **calophylla** (Greene), comb. nov. *A. calophylla* Greene Pittonia, iii. 347 (1898).

The southernmost representative of *Antennaria fallax* is striking in its very rounded or rounded-ovate rosette-leaves. The generally more northern *A. fallax* has the leaves rhombic-ovate to -obovate and tapering above to a subacute tip. The variety ranges from Georgia to Texas, coming north to North Carolina, Indiana, Illinois and Missouri, in the northern states passing insensibly into *A. fallax*.

ANTENNARIA NEGLECTA Greene, forma **simplex** (Peck), comb. nov. *A. neglecta*, var. *simplex* Peck, Bull. N. Y. State Mus. lxvii. Bot. vi. 33 (1903).

The unusual plants of *Antennaria neglecta* with a single terminal pistillate head are strikingly unlike the common plant with glomerulate to spiciform or racemose inflorescences, but the colonies occur sporadically and have no definite range.

ANTENNARIA NEODIOICA Greene, var. **argillicola** (Stebbins), comb. nov. *A. virginica*, var. *argillicola* Stebbins, RHODORA, xxxvii. 232 (1935). *A. virginica* Stebbins, l. c. 230 (1935).

Var. *argillicola* is well marked by its combination of often low stature, very narrow cauline leaves, relatively small pistillate involucres and the abundant staminate plants with involucres shorter than in the very few and rare staminate plants which are known in *A. neodioica* and its other varieties. The herbarium-specimens sent out indicate that Dr. Stebbins originally treated both his *A. virginica* and

its var. *argillicola* as separate species, though in his paper he treated them as a single species. In some characters *A. virginica* is the greater departure from *A. neodioica* var. *attenuata* Fernald, Proc. Bost. Soc. Nat. Hist. xxviii. 245 (1898), in having the pistillate involucres "4.5–6.5 mm." high (Stebbins, p. 231), though changed by Stebbins on p. 234 to "5–6.5," whereas his var. *argillicola* was described on p. 232 with them "5.–6.5 mm." high, changed on p. 234 to "5–7." The change of measurements on the two pages seems to reflect the lack of fundamental differences in the two; and, although in his tabulation of characters on p. 234 Stebbins makes the involucres of the almost strictly pistillate and wide-ranging northern *A. neodioica* var. *attenuata* vary from "7–8" mm. high, it is easy to find northern tall plants of var. *attenuata* with them down to 5.5–7 mm., these too much overlapping the upper measurements given by Stebbins for his *A. virginica*. Furthermore, the small rosette-leaves of the bisexual Alleghenian plants are easily matched by those of the unisexual northern series. As a notable variety of Alleghenian range with both sexes well developed it is definite. As a distinct species it shows altogether too much overlapping of characters. Phylogenetically it may be, as Stebbins maintains, the bisexual and fertile progenitor of the widely dispersed northern and parthenogenetic var. *attenuata*. If, however, we are to follow Stebbins's principle and to distinguish as species the bisexual and the parthenogenetic series which show no other appreciable differences, it should be noted that the northeastern *A. Parlinii* and *A. fallax* are chiefly parthenogenetic, though southward frequently bisexual.

VIII. VARIETIES OF GNAPHALIUM OBTUSIFOLIUM

GNAPHALIUM OBTUSIFOLIUM L., var. **praecox**, var. nov. (TAB. 434, FIGS. 1–3), foliis supra glabris lucidisque; panicula elongata cylindracea vel thyrsoidea ramis vix furcatis; glomerulis hemisphaericis 1.2–2 cm. diametro; involucris 6–7 mm. altis.—Virginia to Georgia and Alabama. VIRGINIA; without stated locality (presumably near Portsmouth), *Rugel*. SOUTH CAROLINA: sandy roadside by pine woods, 2 miles east of Walterboro, Colleton Co., July 17, 1927, *Wiegand & Manning*, no. 3301 (TYPE in Gray Herb.). GEORGIA: sandy field, 4 miles southwest of Hinesville, Liberty Co., July 23, 1927, *Wiegana & Manning*, no. 3302; dry bank, River Road, Athens, August 5, 1929, *J. H. Pyron*. ALABAMA: dry oak-pine thicket, 10 miles north of Dothan, Houston Co., August 11, 1927, *Wiegand & Manning*, no 3305.

Var. *praecox*, in its elongate inflorescence and very early flowering

is a striking departure from typical *Gnaphalium obtusifolium* and, when better understood, may prove to be specifically separable. *G. obtusifolium* is highly variable. The typical plant (FIG. 4) has a strongly corymbiform inflorescence, the larger plants with elongate and commonly forking branches; its leaves (FIG. 5) are commonly, though not always, glandular or glandular-papillate above, and, as in var. *praecox* (FIG. 2), its stems and branches are closely white-lanate. In the coastal plain area from York Co., Maine and Cape Cod, Massachusetts to eastern Virginia, and locally in the interior in western New York, Kentucky, Missouri and Michigan, var. *micradenium* Weatherby, RHODORA, XXV. 22 (1923), has the non-tomentose stem (FIG. 6) and the narrow leaves (FIG. 7) minutely glandular-puberulent. From the Cape Charles region to Florida var. *Helleri* (Britton) Blake, RHODORA, XX. 72 (1918), has the stem (FIG. 8) glandular-villous, the leaves (FIG. 9) very broad and thin, and the glomerules rather lax (often with long-pedicelled heads).

Typical *Gnaphalium obtusifolium* is a late-flowering plant. The material in the Gray Herbarium shows the flowering period (heads in anthesis) from southern New England to Florida as follows:

Massachusetts	August 14–November 21
Rhode Island	August 19–October 3
Connecticut	August 23–October 10
New Jersey	August 29–October 5
Pennsylvania	August 22–October 1
Virginia	August 26–October 12
North Carolina	September 4–October 30
Florida	August 2–November 23

Var. *micradenium* is also late-flowering:

Maine	August 29
Massachusetts	August 21–October 7
New Jersey	September 6–October 13
Maryland	September 5–October 2
Virginia	September 9–October 12

The few collections at hand of var. *Helleri* also indicate late-flowering:

Virginia	September 29–October 12
South Carolina	October

Contrasted with this universal late-summer and autumn flowering of most of the varieties of *Gnaphalium obtusifolium*, the material at hand of var. *praecox* clearly indicates a much earlier flowering period.

South Carolina	July 17
Georgia	July 23–August 5
Alabama	August 11

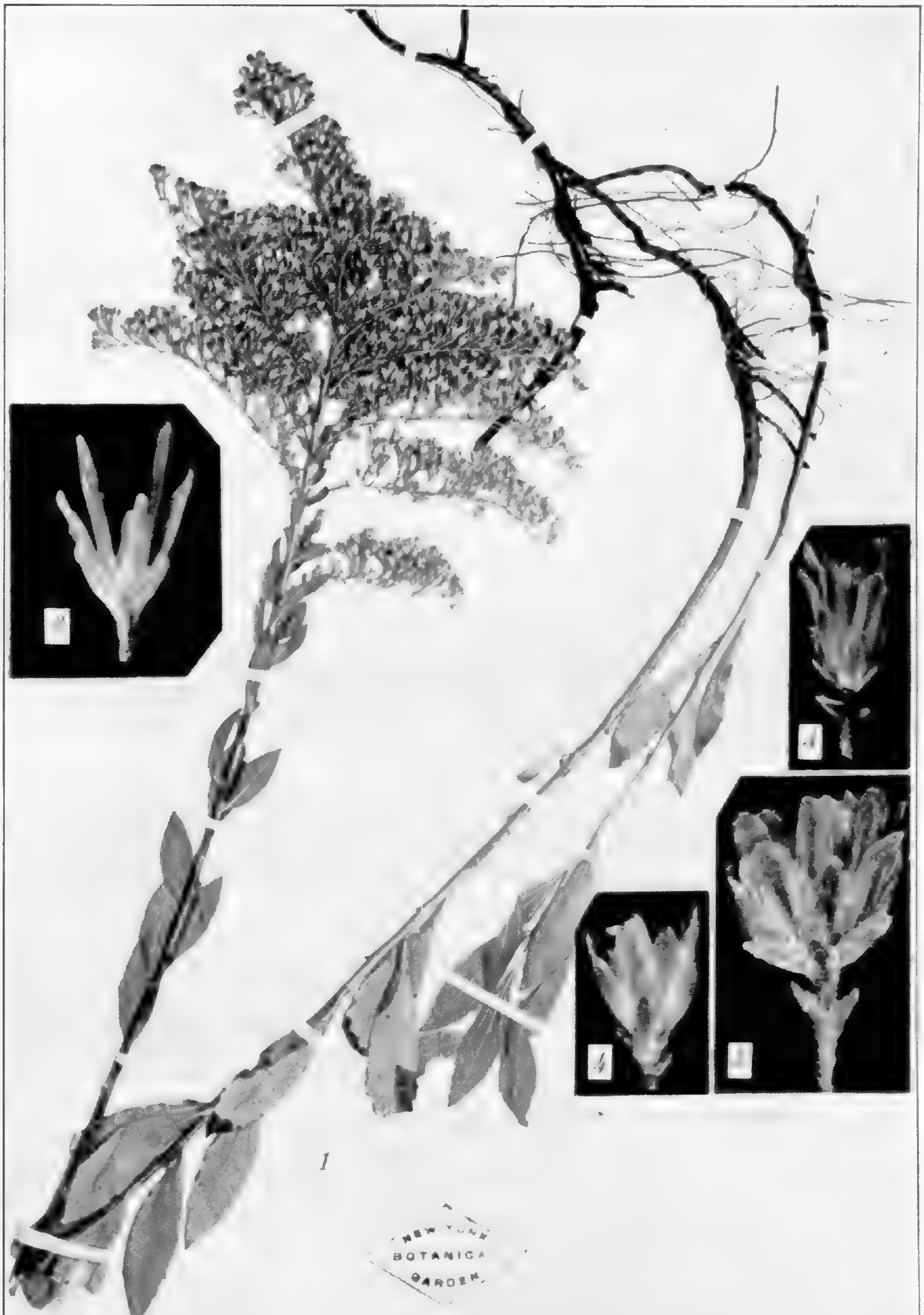

Photo. E. C. Ogden

SOLIDAGO RADULA: FIG. 3, involucre, × 5, from Illinois.
Var. LAETA: FIG. 4, involucre, × 5, from ISOTYPE; FIG. 5, involucre, × 5, from Texas.
Var. STENOLEPIS: FIG. 1, TYPE, × $\frac{2}{5}$; FIG. 2, involucre, × 5, from TYPE

Photo. E. C. Ogden

ANTENNARIA MUNDA: FIG. 1, portion of small pistillate plant, × 1, from Vermont; FIG. 2, portion of staminate plant, × 1, from Vermont.
A. FARWELLII: FIG. 3, characteristic basal leaves, × 1, from Michigan.

Nevertheless, search for technical characters in flowers and achenes has failed to reveal them. The achenes and the corollas of vars. *Helleri* and *praecox* are minutely larger than in typical *G. obtusifolium* and var. *micradenium*, but the differences are so slight that I cannot yet consider them significant. Further collections and fuller knowledge may show them to be constant.

IX. MINOR FORMS AND TRANSFERS

SARRACENIA PURPUREA L., var. **venosa** (Raf.) comb. nov. *Sarazina venosa* Raf., Aut. Bot. 33 (1840). *S. purpurea venosa* (Raf.) Wherry in Bartonia, XV. 3 (1933).

While visiting the Gray Herbarium in January, 1931, Mrs. Agnes M. Ayre, familiar with the typical northern *Sarracenia purpurea* (the national flower of Newfoundland, designated by Queen Victoria), called my attention to the very broad hoods and short pitchers of the southern material as contrasted with the northern specimens of the species. Afterward, knowing his interest in this spectacular group, I called the matter to the attention of Dr. Wherry, and in 1933 in Bartonia he clearly differentiated the southern and northern plants. Although preferring the vague trinomial to the clear designation of the category in his formal transfer, Wherry stated in the preceding paragraph that the plants "are here classed as subspecies." For those of us who prefer the Linnean term *varietas* for such geographically segregated but confluent extremes it becomes necessary to re-transfer the name. The term variety, as used by such discriminating recent taxonomists as the late C. E. Moss, the late Otto Holmberg and countless others of the past (Linnaeus, Willdenow, Roemer, DeCandolle, Kunth, Schlechtendal, Hooker, Torrey, Gray and scores of others), is reasonably clear. The term subspecies is used in so many ways as to be vague. I, therefore, consistently use *varietas* when I mean a geographically somewhat segregated extreme.

PTELEA TRIFOLIATA L., forma **pubescens** (Pursh), comb. nov. *P. trifoliata*, β. *pubescens* Pursh, Fl. Am. Sept. i. 107 (1814).

SAXIFRAGA OPPOSITIFOLIA L., forma **albiflora** (Lange), comb. nov. Var. *albiflora* Lange, Consp. Fl. Groenl. 66 (1880). Subsp. *euoppositifolia* Engl. & Irmsch., var. *typica*, subvar. *albiflora* (Lange) Engl. & Irmsch. in Engl. Pflanzenr. iv[117]. 624 (1919).

For a mere occasional albino, forma *albiflora* seems to have been overweighted with terminology.

HAMAMELIS VIRGINIANA L., forma **parvifolia** (Nutt.), comb. nov.

H. virginica, γ. *parvifolia* Nutt. Gen. i. 107 (1818); *H. virginiana*, β. *parvifolia* (Nutt.) T. & G. Fl. i. 597 (1840).

For discussion see Fernald, RHODORA, xxiii. 265 (1921).

CERCIS CANADENSIS L., forma **glabrifolia**, n. f., foliis utrinque glabris.—Throughout the general range of the typical form of the species, which has the young leaves pubescent beneath, the mature ones somewhat so.—TYPE: wooded hillsides, near Washington, D. C., April 20 and May 15, 1896, *E. S. Steele* (in Gray Herb.).

Cercis canadensis may have the leaves white-pubescent beneath when expanding, only slightly pilose beneath or quite glabrous. There seems to be no geographic segregation of the glabrous extreme. As originally described by Linnaeus *C. canadensis* was assigned "foliis cordatis pubescentibus." The late E. L. Greene made much of this description:

> But he who would give to this East North American tree its phytographic deserts, and determine whether it is to be resolved into several varieties or a number of species, must encounter at the outset one grave difficulty, that of the real applicability of the Linnaean name. To the thing which he named *C. Canadensis* he attributed pubescent leaves. Now the great bulk of the material existing in our largest herbaria under that name exhibits foliage that at first and second view impresses one as being glabrous. When you examine the leaf in every part with a magnifier you still find the upper face glabrous, and the lower usually so, in the main, but with some hirtellous hairs along the veins, next the base of the leaf. In only a few instances have I found some scattered hairs between the veins beneath; in a greater number both faces are totally glabrous. L i n n a e u s writes the leaves of his shrub as pubescent, without qualification. He knew the shrub in young condition both in the garden of Cliffort, and in that at Upsala. The seeds were reputed to have come from Canada or Virginia. No cercis with leaves "pubescent," unqualifiedly so and plainly so, is to-day known from eastern America. No American botanist, describing any so-called *C. Canadensis* has ever reiterated, in relation to such "shrub or tree, that phrase of L i n n a e u s foliis . . . pubescentibus."[1]

Approximately half the specimens in the Gray Herbarium have the leaves pubescent beneath and many do not require a lens to disclose the hairs. As to Greene's rhetorical and thoroughly typical statement, "No American botanist, describing any so-called *C. Canadensis* has ever reiterated . . . that phrase of L i n n a e u s foliis . . . pubescentibus," it is evident that Greene made no attempt to see whether they had! In 1785, Humphrey Marshall (Arb. Amer. 32) distinctly said "a little downy underneath"; Michaux (1803) gave a similar account; Pursh (1814) had *C. canadensis* "foliis . . . ad

[1] Greene in Fedde, Repert. xi. 108 (1912).

axillas nervorum villosis" and var. β, *pubescens*, "C. foliis . . . subtus pubescentibus." Passing many later and accurate accounts we come to Sargent's Silva, iii. 95 (1892): "leaves . . . glabrous . . . or . . . more or less pubescent below." Enough said!

ERIGERON PULCHELLUS Michx., var. **Brauniae**, n. var., paginis foliorum glaberrimis marginibus ciliatis, foliis rosulatis imisque integris vel undulatis; caule glabro vel sparsissime piloso.—KENTUCKY: sandy open woods, Ohio-Kinniconick Divide, Lewis Co., May 7, 1932, *E. Lucy Braun* (TYPE in Gray Herb.).

The wide-ranging *Erigeron pulchellus* Michx. has the stem and usually the lower surfaces of the radical and lower cauline leaves villous and at least the lower (sometimes the upper) blades coarsely dentate. Professor Braun's plant comes from a region of localized endemics and I find nothing like it in other collections from the Ohio-Kentucky-Tennessee area.

I refrain from displacing the well established *Erigeron pulchellus* Michx. (1803) by a doubtful name of Schoepf (1787). In his Materia Medica Americana, David Schoepf published diagnoses (as foot-notes) of several newly described plants. In no case, except possibly the *Erigeron*, did he give any specific epithet to accompany the new diagnosis, merely the generic name: *Asclepias* (p. 30), *Solidago* (p. 123), *Aristolochia* (p. 131). In all cases, except the *Erigeron*, where colloquial names were given they came *after* the specific epithet and the diagnosis, thus:

> 258. TANACETUM *vulgare* foliis bipinnatis incisis serratis. *Linn. Sp. pl.* 1184 . . . —*Tansey.*

In the single exceptional case of the *Erigeron* we get

> 261. ERIGERON.—*Robert's Plantain. Bethlehemi.* Erigeron. *Linn. Amoen. acad.* 4. *p.* 514. LOC. Pensylvania—*Perennis.* PHARM. *Erigerontis* Rad. Herba.

and as a foot-note a detailed and very characteristic diagnosis of *E. pulchellus*. The unusual position of the latin *Bethlehemi*, after *Robert's Plantain* and separated by a long dash from the generic name, and Schoepf's modesty, in not assigning any specific epithets to his other newly described species, lead me to conclude that *Bethlehemi* was not intended as a specific name. I am, therefore, not disturbing the familiar and properly published name *E. pulchellus*, the type of which is a very full sheet in the Michaux herbarium.

TANACETUM VULGARE L., forma **crispum** (L.), comb. nov. *T. vulgare*, β. *crispum* L. Sp. Pl. 845 (1753).

The common form of Tansy with crisped foliage is a forma rather than a true variety.

EXPLANATION OF PLATES 412–434

PLATE 412. POTAMOGETON TENNESSEENSIS, n. sp.: FIG. 1, fruiting top of plant, × 1, from Clear Fork, Tennessee, *Svenson*, no. 6756, TYPE; FIG. 2, branch with submersed foliage, × 1, from the TYPE; FIG. 3, stipule and base of submersed leaf, × 10, from the TYPE; FIG. 4, upper half of submersed leaf, by transmitted light, × 10, from the TYPE; FIG. 5, fruiting spike, × 4, from the TYPE; FIGS. 6 and 7, mature fruits, × 10, from the TYPE.

PLATE 413. PILEA PUMILA (L.) Gray, FIGS. 1–9: FIG. 1, leaf-margin, × 1, from Wallingford, Vermont, July 30, 1907, *Kennedy;* FIG. 2, from Dover, Maine, *Fernald*, no. 382; FIG. 3, from Ironside, Quebec, *Victorin*, no. 15,811; FIG. 4, from Abbot, Maine, *Fernald & Long*, no. 13,514; FIG. 5, from Southport, Prince Edward Island, *Fernald & St. John*, no. 7322; FIG. 6, seed, × 20, from Orono, Maine, September 3, 1889, *Fernald;* FIG. 7 (smallest seed seen), from Abbot, Maine, *Fernald & Long*, no. 13,514; FIG. 8, from Westford, Massachusetts, *Emily F. Fletcher;* FIG. 9, from Concord, Massachusetts, September 27, 1896, *Williams*.

Var. DEAMII (Lunell) Fernald, FIGS. 10–15: fig. 10, leaf-margin, × 1, from Lancaster, Wells Co., Indiana, August 24, 1902, *Deam*, ISOTYPE; FIG. 11, from Lake Everett, Indiana, *Deam*, no. 22,076; FIG. 12, from Garrettsville, Ohio, *Webb*. no. 640; FIG. 13, from Cuthbert, Georgia, *Harper*, no. 1745; FIG. 14, seed, × 20, from Fountain Co., Indiana, *Deam*, no. 22,132A; FIG. 15, from Sandy Creek Township, New York, *Fernald, Wiegand & Eames*, no. 14,258.

P. FONTANA (Lunell) Rydb.: FIG. 16, seed, × 20, from Big Chapman Lake, Indiana, *Deam*, no. 21,987.

PLATE 414. RANUNCULUS FLABELLARIS Raf.: FIG. 1, fruiting branch, × 5/12, from Belmont, Massachusetts, *Pease*, no. 11,849; FIG. 2, center of flower, to show stamens, × 4, from Concord, Massachusetts, *St. John*, no. 657; FIG. 3, center of flower, × 4, from Grand Isle Co., Vermont, May 24, 1931, *Knowlton;* FIG. 4, achene, × 10, from Greenwich, Massachusetts, July 13, 1931, *A. S. Goodale*.

R. FLABELLARIS, forma RIPARIUS Fernald: FIG. 5, rosette, × 5/12, from Block Island, Rhode Island, *Fernald, Hunnewell & Long*, no. 9511; FIG. 6, emersed branch, × 5/12, from North Guilford, Connecticut, July 13, 1904, *W. R. Dudley*.

PLATE 415. RANUNCULUS PURSHII Richardson: FIG. 5, flower, to show stamens, × 4, from Bonaventure River, Quebec, July 31, 1902, *Williams & Fernald;* FIG. 6, achene, × 10, from Dundee, Prince Edward Island, *Fernald, Long & St. John*, no. 7485; FIG. 7, flowering branch, × 5/12, from no. 7485; FIG. 8, flowering branches, × 5/12, from Electric Peak, Montana, *Rydberg & Bessey*, no. 4106.

R. PURSHII, var. PROLIFICUS Fernald: FIG. 1, type of *R. multifidus*, var. *terrestris* Gray, × 5/12, from Ann Arbor, Michigan, 1862, *Miss Clark;* FIG. 2, flower, × 4, from the latter; FIG. 3, bud, to show sepals, × 4, from the latter; FIG. 4, flower, to show stamens, × 4, from Alpena, Michigan, July 15, 1895, *C. F. Wheeler*.

R. PURSHII, forma TERRESTRIS (Ledeb.) Glück: three plants, × 5/12, from Leeds, North Dakota, June 11, 1900, *Lunell*.

PLATE 416. ARUNCUS, fruits × 7; flowers × 10; seeds, × 10; leaf-tips, × 1. A. ALLEGHENIENSIS Rydb.: FIG. 1, fruits (over-ripe) from Baltimore, Maryland, 1867, *P. V. LeRoy* (ISOTYPE); FIG. 2, fruits, showing long styles, from Beaver Creek, Allegheny Co., Pennsylvania, *J. A. Schafer*, no. 639; FIG. 5, flowers, showing the firm calyx, from opposite Georgetown, District of Columbia, May 28, 1889, *Churchill;* FIG. 8, seeds, from near Prince, Monongalia Co., West Virginia, *E. L. Core*, no. 4009.

A. ALLEGHENIENSIS, var. PUBESCENS (Rydb.) Fernald: FIG. 4, fruits, showing slender follicles and long styles, from Augusta, Illinois, *S. B. Mead.*

A. SYLVESTER Kosteletzsky: FIG. 3, fruits, from La Grave, Haute-Alpes, France, *Mathonnet*, no. 1065; FIG. 6, calyx, showing the thin lobes with evident midrib, from near Fiume, Hungary, June 15, 1869, *A. M. Smith;* FIG. 7, seed, from the Carpathian Mts., Austria, *John Ball;* FIG. 9, fruits, from Silverton, Oregon, *J. C. Nelson*, no. 1894 (*A. acuminatus* (Dougl.) Rydb.); FIG. 10, flowers, showing rounded-obovate petals, from near Juvaviam, Salisburgia, *Eysn* in Fl. Exsicc. Austro-Hung., no. 2416; FIG. 11, flowers, showing spatulate petals, from District of Renfrew, Vancouver Island, *Rosendahl & Butters*, no. 66 (*A. acuminatus*); FIG. 12, tip of leaflet, from Asulkan Valley, Glacier, British Columbia, *S. Brown*, no. 601 (*A. acuminatus*); FIG. 13, tip of leaflet from Marienthal, Czechoslovakia, *Petrak*, Fl. Bohem. Morav. Exsicc. no. XI. 1055.

PLATE 417. SOLIDAGO MULTIRADIATA Ait.: FIG. 1, plant, × 1, from Rowsell Harbor, Labrador, *Abbe & Odell*, no. 534.

Var. PARVICEPS, n. var.: FIG. 2, plant, × 1, from "Monts Appalaches," Gaspé Co., Quebec, July 9, 1931, *Stebbins* (TYPE).

PLATE 418. SOLIDAGO DEAMII, n. sp.: FIG. 1, plant, × 5/12, from Porter Co., Indiana, *Deam*, no. 39,707 (TYPE); FIG. 2, head, × 5, from TYPE; FIG. 3, disk-floret, × 5, from TYPE.

S. RANDII (Porter) Britton: FIG. 4, head, × 5, from the type-region, Mt. Desert Island, Maine, September 2, 1892, *Edward L. Rand;* FIGS. 5 and 6, florets, × 5, from the same material.

S. RACEMOSA Greene, var. GILLMANI (Gray) Fernald: FIG. 7, rosette-leaf, × 5/12, from the original Gillman material.

PLATE 419. SOLIDAGO SIMULANS, n. sp.: FIG. 1, plant, × ⅖, from Macon Co., North Carolina, *Biltmore Herb.*, no. 5730; FIG. 2, involucre, × 5; FIG. 3, disk-flower, × 5; FIG. 4, disk-corolla, with 2 lobes laid back, × 5; FIG. 5, achene, × 10; all from the TYPE.

S. ULIGINOSA Nutt.: FIG 6, involucre, × 5, from Magog, Quebec, *Pease*, no. 1485; FIG. 7, disk-corolla, × 5, from no. 1485; FIG. 8, achene, × 10, from no. 1485.

S. AUSTRINA Small: FIG. 9, involucre, × 5, from Falls of the Yadkin River, North Carolina, August 18, 1892, *Small.*

PLATE 420. SOLIDAGO CONFERTA Mill.: FIG. 1, inflorescence, × 1, from the original colored plate in Miller, Figures of Plants, ii. t. ccliv. fig. 2 (1760).

S. SPECIOSA Nutt.: FIG. 2, upper half of inflorescence, × 1, from Sheffield, Massachusetts, August 31, 1915, *F. Walters.*

PLATE 421. SOLIDAGO NEUROLEPIS, n. sp.: FIG. 1, plant, × ⅖, from Oronogo, Jasper County, Missouri, *E. J. Palmer*, no. 18,863 (TYPE); FIG. 2, lower surface of leaf, × 10, from the TYPE; FIG. 3, involucre, × 5, from the TYPE; FIG. 4, achene, pappus and disk-corolla, × 10, from the TYPE.

PLATE 422. SOLIDAGO NEUROLEPIS, n. sp.: FIG. 1, basal rosette, × ⅖, from the TYPE.

S. LUDOVICIANA (Gray) Small: FIG. 2, basal rosette, × ⅖, from northwest of Oyster, Northampton Co., Virginia, *Fernald, Long & Fogg*, no. 5512; FIG. 3, involucre, × 5, from Louisiana, *Hale* (TYPE); FIG. 4, disk-flower, × 10, from Palestine, Anderson County, Texas, *E. J. Palmer*, no. 12,813; FIG. 5, achene and pappus, × 10, from Bennett, Cape May County, New Jersey, *Long*, no. 7945.

S. JUNCEA Ait.: FIG. 6, involucre, × 5, from West Tisbury, Massachusetts, *F. C. Seymour*, no. 1542.

PLATE 423. SOLIDAGO ELLIOTTII Torr. & Gray, var. TYPICA: plants, × ⅖, from Beaufort District, South Carolina, 1885, *Mellichamp.*

PLATE 424. SOLIDAGO ELLIOTTII, var. ASCENDENS, n. var.: TYPE, × ⅖, from Harwich, Massachusetts, *M. L., Katherine & H. G. Fernald* in Pl. Exsicc. Gray. no. 492.

PLATE 425. SOLIDAGO ELLIOTTII, var. PEDICELLATA, n. var.: TYPE, × ⅖, from Eastville, Virginia, *Fernald & Long*, no. 5520.

PLATE 426. SOLIDAGO RUGOSA Mill., var. TYPICA: FIG. 1, plant, × ⅖, from Esker Point, Groton, Connecticut, September 7, 1903, *C. B. Graves;* FIG. 2, internode and leaf-bases, showing decurrent lines, × 5, from Bingham, Maine, August 29, 1902, *Collins & Chamberlain;* FIG. 3, lower surface of leaf, × 10, from Baddeck, Nova Scotia, *Fernald & Long*, no. 22,702; FIG. 4, involucre, × 5, from no. 22,702.

Plate 427. SOLIDAGO RUGOSA Mill., var. VILLOSA (Pursh) Fernald: FIG. 1, inflorescence, × ⅖, from Rivière du Loup, Quebec, August 3, 1902, *Williams & Fernald;* FIG. 2, inflorescence, × ⅖, from Grindstone Island, Magdalen Islands, *Fernald, Long & St. John*, no. 8123; FIG. 3, internode and base of leaf, showing decurrent lines, × 5, from St. John's, Newfoundland, *Fernald, Long, & Dunbar*, no. 27,128; FIG. 4, involucre, × 5, from same plant as FIG. 1.

PLATE 428. SOLIDAGO RUGOSA Mill., var. SPHAGNOPHILA Graves: FIG. 1, plant, × ⅖, from Fog Plain Brook, Waterford, Connecticut, August 9, 1903, *Graves* (TYPE-collection); FIG. 2, internode and base of leaf, showing decurrent lines, × 5, from TYPE-collection; FIGS. 3 and 4, involucres, × 5, from TYPE-collection.

PLATE 429. SOLIDAGO RUGOSA Mill., var. ASPERA (Ait.) Fernald: FIG. 1, plant, × ⅖, from Chilmark, Massachusetts, *F. C. Seymour*, no. 1362; FIG. 2, internode and leaf-base, showing decurrent lines, × 5, from Franklin, Connecticut, September 1, 1911, *R. W. Woodward;* FIG. 3, lower surface of leaf, × 10, from Sunkipaug, East Lyme, Connecticut, September 16, 1904, *Graves;* FIG. 4, involucre, × 5, from same specimen as FIG. 3.

PLATE 430. SOLIDAGO RUGOSA Mill., var. CELTIDIFOLIA (Small) Fernald: FIG. 1, ISOTYPE of *S. celtidifolia* Small, × ⅖, from Biloxi, Mississippi, *Tracy*, no. 5058; FIG. 2, involucre, × 5, from Pulaski Heights, Arkansas, *Demaree*, no. 8181; FIG. 3, involucre, × 5, from ISOTYPE; FIG. 4, involucre × 5, from Capeville, Virginia, *Fernald, Long & Fogg*, no. 5522.

PLATE 431. Habit, × ⅖; involucres, × 5. SOLIDAGO NEMORALIS Ait.: FIG. 6, involucre, from South Harpswell, Maine, *Greenman*, no. 3502; FIG. 7, from Peters Mountain, Virginia, *Steele & Steele*, no. 275; FIG. 8, from Reading, Pennsylvania, September, 1890, *H. M. Cushman;* FIG. 9, from Ammendale, Maryland, *Hyacinth*, no. 1717; FIG. 10, from Providence, Rhode Island, August, 1844, *Thurber;* FIG. 11, from Hudson Falls, New York, September 25, 1896, *S. H. Burnham;* FIG. 12, from Malpeque, Prince Edward Island, July 26, 1904, *J. Fowler.*

Var. DECEMFLORA (DC.) Fernald: FIG. 4, involucre from an ISOTYPE, Texas, *Berlandier*, no. 1924; FIG. 3, from ISOTYPE of *S. longipetiolata* Mackenzie & Bush, Jackson Co., Missouri, August 19, 1897, *Mackenzie;* FIG. 5, from ISOTYPE of *S. pulcherrima* Nelson, Platte Canon, Wyoming, *Nelson*, no. 2761.

Var. HALEANA, n. var.: FIG. 1, TYPE from Louisiana, *Joshua Hale;* FIG. 2, involucre from TYPE.

PLATE 432. Habit × ⅖; involucres, × 5. SOLIDAGO RADULA Nutt.: FIG. 3, involucre from Grand Tower, Illinois, *Gleason*, no. 1844.

Var. LAETA (Greene) Fernald: FIG. 4, involucre from ISOTYPE of *S. laeta* Greene, from Weatherford, Texas, *Tracy*, no. 8137; FIG. 5, involucre of extreme plant, from Boot Springs, Chisos Mts., Texas, *Cory*, no. 7238.

Var. STENOLEPIS, n. var.: FIG. 1, TYPE, from near Carthage, Jasper Co., Missouri, *E. J. Palmer*, no. 22,161; FIG. 2, involucre from TYPE.

PLATE 433. ANTENNARIA MUNDA, n. sp.: FIG. 1, portion of small pistillate plant, × 1, from Middlebury, Vermont, May 16, 1899, *Brainerd*, no. 29; FIG. 2, portion of staminate plant, × 1, from Middlebury, Vermont, May 10, 1902, *Brainerd.*

A. FARWELLII Greene: FIG. 3, characteristic basal leaves, × 1, from Keweenaw Co., Michigan, *Farwell*, no. 78.

PLATE 434. GNAPHALIUM OBTUSIFOLIUM L. FIG. 4, characteristic inflorescence, × ⅖, from East Jaffrey, New Hampshire, September 2, 1901, *E. F. Williams;* FIG. 5, upper surface of leaf, × 10, from the same collection.

Var. PRAECOX, n. var.: FIG. 1, type, × ⅖, from Waterboro, South Carolina, *Wiegand & Manning*, no. 3301; FIG. 2, portion of stem, × 10, from the TYPE; FIG. 3, upper surface of leaf, × 10, from the TYPE.

Var. MICRADENIUM Weatherby: FIG. 6, portion of stem, × 10, from Williamsburg, Virginia, *Grimes*, no. 4351; FIG. 7, upper surface of leaf, × 10, from same collection.

Var. HELLERI (Britton) Blake: FIG. 8, portion of stem, × 10, from Eastville, Virginia, *Fernald & Long*, no. 5550; FIG. 9, upper surface of leaf, × 10, from same collection.

Photo. E. C. Ogden

GNAPHALIUM OBTUSIFOLIUM: FIG. 4, characteristic inflorescence, × $^2/_5$, from New Hampshire; FIG. 5, upper surface of leaf, × 10, from same collection.

Var. PRAECOX: FIG. 1, TYPE, × $^2/_5$; FIG. 2, portion of stem, × 10, from TYPE; FIG. 3, upper surface of leaf, × 10, from TYPE.

Var. MICRADENIUM: FIG. 6, portion of stem, × 10, from Virginia; FIG. 7, upper surface of leaf, × 10, from same collection.

Var. HELLERI: FIG. 8, portion of stem, × 10, from Virginia; FIG. 9, upper surface of leaf, × 10, from same collection.

INDEX

New scientific names are printed in full-face type

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1. STUDIES IN THE BROMELIACEAE,—VII.

By Lyman B. Smith.

(*Plates I–II.*)

Most of the new species here proposed are the outcome of studies made in preparation of a treatment of the *Bromeliaceae* for the North American Flora. Particularly noteworthy among them is a small but rich collection made in Mexico State by Mr. George B. Hinton and deposited at Kew.

Studies at the great herbaria in Brussels, Liége and Paris in the summer of 1935 have yielded a number of critical notes the first part of which are published here. There are also a few notes on material in American herbaria.

Billbergia macrolepis, spec. nov., metralis vel ultra (si inflorescentia pendula erigitur); foliis ad 12 dm. longis; vaginis magnis, ellipticis; laminis lineari-triangularibus, longe acuminatis, 3 cm. latis, spinis subrectis ad 3 mm. longis dissite armatis, ad apicem inermibus, dense minuteque albido-lepidotis, cinereo-viridibus, dorso maculis albis magnis ornatis; scapo pendulo, 3–4 mm. diametro, dissite albido-floccoso, mox glabrescenti; scapi bracteis erectis, imbricatis, lanceolatis, acuminatis, ad 24 cm. longis, membranaceis, rubris, albido-floccosis; inflorescentia simplicissima, cylindrica, ad 4 dm. longa, laxe multiflora, tota dense albido-farinosa; bracteis florigeris patentibus vel reflexis, anguste oblongis vel supremis ovatis, obtusis apiculatisque, ad 35 mm. longis, supremis exceptis ovarium aequantibus vel superantibus, membranaceis, siccis atro-brunneis; floribus suberectis vel patentibus, sessilibus; sepalis symmetricis, late ovatis, late acutis apiculatisque, aequalibus, 10 mm. longis, 8 mm. latis, coriaceis, valde nervatis; petalis linearibus, acutis, ad 43 mm. longis, 4 mm. latis, virentibus, per anthesin spiraliter revolutis, basi ligulis binis grosse crenatis auctis; ovario subgloboso, 15 mm. longo, sulcis magnis mox glabris aucto, tubo epigyno 3 mm. longo; ovulis medium inter apicemque affixis. Pl. I, fig. 6.

COSTA RICA: Puntarenas: Buenos Aires, alt. 200 m., 1892, *H. Pittier 6608* (Brux, phot. G). PANAMA: Panama: drowned forest along Rio Chagres, between junction with Rio Pequení and with Rio Indio, alt. 66 m., 1934, *Steyermark & Allen 16789* (G, type; Mo); Rio Tapia, 1923–4, *Standley 30665* (US).

In Mez's recent revision of *Billbergia* in the Pflanzenreich, this species keys down to the vicinity of *B. pallidiflora* and *B. mexicana*, from which it is immediately distinguishable by its large floral bracts.

Since the tomentum is easily rubbed off the ridges of the ovary it soon resembles *B. Porteana* in this regard, but again differs in its large floral bracts.

Bromelia humilis Jacq. Enum. Stirp. Vindob. 306 (1762); Misc. ii. 325 (1781); Ic. Pl. Rar. i. t. 60 (1781–6). *B. Karatas* L. sensu HBK. Nov. Gen. i. 297 (1816), non L. (1753). *B. lasiantha* Willd. ex R. & S. Syst. vii. 1233 (1830), in synon.; Mez in DC. Mon. Phan. ix. 28 (1896); Boldingh, Fl. Ned. West-Ind. 142 (1913).

TRINIDAD: Chacachacare, 1890, *J. H. Hart 3751* (NY, Trin, phot. G). CURAÇAO: 1909–10, *Boldingh 5249; 5250* (NY); rocky thicket, Rif, 1913, *Britton & Shafer 3093* (US, NY, phot. G). VENEZUELA: SUCRE: Cumana, *Humboldt & Bonpland 563* (P, type of *B. lasiantha;* phot. G); top of hill vicinity of Cristobal Colon, 1923, *Broadway 464* (G); CARABOBO: forming dense patches everywhere in xerophilous formation, vicinity of El Palito, 1920, *H. Pittier 9091* (G, NY, US); LARA: in colonies in thorn-bushes, near Barquisimeto, 1923, *H. Pittier 11186* (G).

Despite the beautiful plate which Jacquin published of his *Bromelia humilis*, its identity has become sadly confused. Mez[1] has identified it with a different plant illustrated by Antoine[2] under the name *B. humilis* and then proceeded to describe the real *B. humilis* on the basis of Antoine's plate. Antoine's plant had strongly recurving leaves and inner bracts and the tomentum of its inflorescence was coarse, brown and spreading. True *B. humilis* as illustrated by its author has stiff leaves and inner bracts, the leaves nearly and the bracts quite straight, and the tomentum of the inflorescence is a fine snow-white closely appressed felt. Using these characters, *B. humilis* comes to the same place in Mez's keys as the later *B. lasiantha*, and since no distinction is found between them, *B. lasiantha* must be reduced to synonymy.

The above citations of specimens will help to establish the identity of *B. humilis*.

Catopsis mexicana, spec. nov., 6 dm. alta si inflorescentia erigitur; foliis lanceolatis, acuminatis, 4 dm. longis, 7 cm. latis, planis, obscure brunneo-punctulatis, verruculosis, margine scariosis, vagina laminaque vix distinctis; scapo gracili, arcuato, glabro; scapi bracteis erectis, internodia multo superantibus, foliaceis; inflorescentia subpendula, subdense 3-pinnata, plus quam 3 dm. longa, glabra; bracteis primariis latissime ovatis, longe acuminatis, quam rami axillares multo breviori-bus; spicis graciliter longeque stipitatis, subsecundis, ad 1 dm. longis, dense florigeris; bracteis florigeris squamiformi-ovatis, sepala ad ca.

[1] Mez in DC. Mon. Phan. ix. 26 (1896); in Engl. Pflanzenr. [Heft 100] iv. fam. 32, 26 (1934).

[2] Ant. Brom. 38, t. 22–23 (1884).

⅓ aequantibus; floribus hermaphroditis, suberectis; sepalis elliptico-oblongis, valde asymmetricis, 9 mm. longis; petalis ligulatis, asymmetricis, albidis, paulo exsertis; stylis 3, brevibus sed distinctis. Pl. I, figs. 10–11.

MEXICO: Mexico: Dist. Temascaltepec, Tejupilco, alt. 1340 m., 1933 *G. B. Hinton 4692* (K, type; phot. G).

Catopsis subulata, spec. nov., ca. 3 dm. alta; foliis multis, pseudobulbum ellipsoideum efformantibus, 15–20 cm. longis, obscure brunneo-punctulatis; vaginis amplis, ellipticis, quam laminae subduplo longioribus, valde distinctis; laminis anguste triangularibus, acuminatis, base vix 1 cm. latis, involuto-subulatis, contortis; scapo erecto, folia multo superantibus; scapi bracteis dense imbricatis, lanceolatis, acuminatis, involuto-subulatis, ad apicem versus recurvatis; inflorescentia 2–3-pinnata, densa vel subdensa, ovoidea vel pyramidali, 6–13 cm. longa, glabra; bracteis primariis quam rami axillares multo brevioribus, late ovatis, acuminatis, involutis, apice recurvatis; ramis erectis vel patentibus, simplicibus vel infimis spicas 3 digitatas praeditis; spicis breve stipitatis, cylindricis, dense florigeris, 2–5 cm. longis; bracteis florigeris late ovatis, acutis, per anthesin quam sepala distincte brevioribus, tenuibus, nervatis; floribus hermaphroditis, suberectis; sepalis obovatis, valde asymmetricis, 9 mm. longis; petalis oblongis, obtusis, inclusis, albidis; staminibus inaequalibus; stylo brevi. Pl. I, fig. 12.

MEXICO: Chiapas: on oak trees, mountains near Fenia (?), *Purpus 335* (US, type; phot. G); *10335* (UCal; phot. G). GUATEMALA: "in the market at Guatemala," 1860, *S. Hayes* (G).

In the form of its inflorescence *Catopsis subulata* appears most nearly related to *C. compacta* but differs from the latter in its narrow involute leaf-blades and bracts and in its included petals.

Neoregelia Binoti (Ant.), comb. nov. *Karatas Binoti* Ant. Phyto-Iconogr. t. 34 (1884). *Aregelia Binoti* Mez in DC. Mon. Phan. ix. 82 (1896).

Neoregelia Pineliana (Lem.), comb. nov. *Nidularium Pinelianum* Lem. in Ill. Hort. vii. 71 (1860). *Karatas Morreniana* Ant. Phyto-Iconogr. t. 35 (1884). *Aregelia Morreniana* Mez in DC. Mon. Phan. ix. 72 (1896). *Neoregelia Morreniana* L. B. Smith in Contrib. Gray Herb. civ. 79 (1934). *Aregelia Pinceliana* Mez in Engl. Pflanzenr. [Heft 100] iv. fam. 32, 40 (1934).

Neoregelia princeps (Bak.), comb. nov. *Karatas princeps* Bak. Brom. 10 (1889). *Aregelia princeps* Mez in DC. Mon. Phan. ix. 75 (1896).

Neoregelia tristis (Beer) L. B. Smith in Proc. Am. Acad. lxx. 153 (1935). *Nidularium elegans* E. Morr. ex Bak. Brom. 5 (1889), in synon. *Aregelia elegans* Mez in DC. Mon. Phan. ix. 69 (1896).

Mez separated *Aregelia tristis* from *A. elegans* on the basis of its not having the leaves spotted below, yet Beer described them as strongly crossbarred and a cultivated specimen in the herbarium at Berlin-Dahlem shows the same marking and is checked as *Aregelia tristis* by Mez. No other distinctions obtain for *A. elegans*, judging from Morren's beautiful plate at Kew.

Pitcairnia aequatorialis, spec. nov., acaulis, ultra 1 m. alta; foliis dimorphis, exterioribus e vagina suborbiculari castanea in laminam aciculiformem pectinatam productis, interioribus inflorescentiam subaequantibus, per aetatem deciduis, base persistenti serrata, lamina lineari, integerrima, nullo modo petiolata, 14 mm. lata, filiformi-acuminata, supra glabra, subtus parce albido-floccosa; scapo erecto, gracili, glabro; scapi vaginis erectis, lanceolatis, acuminatis, supremis quam internodia paulo brevioribus; inflorescentia laxissime racemosa, 4 dm. longa, glaberrima; bracteis florigeris ovato-lanceolatis, acuminatis, submembranaceis, infimis pedicellos superantibus; floribus magnis, divergentibus; pedicellis gracilibus, 2 cm. longis; sepalis anguste triangularibus, longe acuminatis, 3 cm. longis, vix carinatis, luteis; petalis inaequalibus linearibus, acutis, ca. 7 cm. longis, pallide luteis; staminibus exsertis, antheris linearibus, 15 mm. longis; ovario ad ¾ supero; seminibus utroque polo caudatis. Pl. I, fig. 3.

ECUADOR: *Rose* (G, TYPE).

The species is described from material which flowered at the New York Botanical Garden. It is most nearly related to *P. lutescens* of Ecuador, but differs in its glabrous inflorescence and elongate pedicels.

Pitcairnia flexuosa, spec. nov., acaulis, 25–45 cm. alta; foliis multis, pseudobulbum ellipsoideum 5 cm. longum efformantibus; vaginis suborbicularibus, castaneis, lucidis, mox glabris; laminis dimorphis, alteris ad spinas planas brunneas retrorse aculeatas reductis, alteris viridibus, linea recta transversa deciduis, linearibus, filiformi-acuminatis, ultra 25 cm. longis, 3–4 mm. latis, dissite minuteque tomentoso-lepidotis, mox glabratis; scapo erecto, gracillimo, glabro; scapi bracteis ovatis vel lanceolatis, parvis, supremis remotis vel internodia solum laminis elongatis filiformibusque superantibus; inflorescentia simplicissima, laxe racemosa, 1–2 dm. longa, glabra; axe gracili, flexuoso; bracteis florigeris lanceolatis, acuminatis, pedicellos subaequantibus vel quam ei multo brevioribus; floribus plerumque

adscendentibus; pedicellis gracilibus, 10–15 mm. longis; sepalis angustissime triangularibus, acuminatis, 2 cm. longis; petalis lingulatis, acutis, nudis, 4 cm. longis, rubris; staminibus petala subaequantibus; antheris linearibus, 9 mm. longis; ovario ⅔ supero, ovulis longe caudatis. Pl. I, fig. 7.

MEXICO: Mexico: Dist. Temascaltepec, Guayabal, on cliff, alt. 790 m., 1933, *G. B. Hinton 3948* (K, TYPE; phot. G).

On account of its slender habit and relatively short floral bracts, *Pitcairnia flexuosa* appears most nearly related to *P. Palmeri*, but is easily distinguished by its ascending flowers and glabrous inflorescence.

Pitcairnia Hintoniana, spec. nov., acaulis, 8 dm. alta, base stolonibus propagata; foliis multis, bulbose rosulatis; vaginis late ovatis, atro-brunneis, lucidis, pallide floccoso-lepidotis, mox glabratis; laminis dimorphis, alteris persistentibus, ad spinas brunneas retrorse aculeatas reductis, alteris viridibus, linea recta transversa deciduis, linearibus, acuminatis, 4 dm. longis, 13 mm. latis, supra glabris, subtus pallide floccoso-lepidotis, supra lineam integris; scapo erecto, ca. 6 mm. diametro, glabro; scapi bracteis erectis, infimis foliaceis, alteris ovatis, acutis vel acuminatis, plerumque quam internodia brevioribus; inflorescentia simplicissima, laxe racemosa, 2 dm. longa; axe valido, glabro; bracteis florigeris late ovatis, apiculatis, pedicellos aequantibus vel quam ei paullo brevioribus, submembranaceis, valde nervatis; floribus erectis vel divergentibus; pedicellis gracilibus, glabris, 15–20 mm. longis; sepalis oblongo-lanceolatis, asymmetricis, acutis, 35 mm. longis, 7 mm. latis, glabris; petalis linearibus, sine ligulis basalibus, 9 cm. longis, 1 cm. latis, albis, obtusis, apice tomentoso-lepidotis; staminibus inclusis, antheris linearibus, 15 mm. longis; ovario plus quam ½ supero. Pl. I, figs. 8–9.

MEXICO: Mexico: Dist. Temascaltepec, Chorrera, alt. 1230 m., 1932, *G. B. Hinton 2040* (K, TYPE; phot. G).

Pitcairnia Hintoniana belongs in the group of species about *P. Karwinskyana*. Its flowers are larger than those of any of its relatives, but its great distinction is its lepidote petals.

Pitcairnia puyoides L. B. Smith in Field Mus. Pub. Bot. xi. 147 (1936). Pl. I, figs. 4–5.

Pitcairnia secundiflora, spec. nov., acaulescens, florifera 2 dm. alta; foliis paucis, fasciculato-rosulatis, homomorphis, persistentibus, 23 cm. longis, bene petiolatis, integerrimis, subtus dissite tomentoso-lepidotis; vaginis ovatis, parvis, exterioribus atro-castaneis; petiolis 3–4 cm. longis; laminis elliptico-oblongis, late acutis, apiculatis, 2 cm. latis, siccis chartaceis; scapo erecto, perdissite tomentoso-lepidoto, 2

mm. diametro; scapi bracteis quam internodia brevioribus, ovatis, acutis, membranaceis, dissite adpresso-lepidotis; inflorescentia simplicissima, laxe racemosa, secunde florigera, 5 cm. longa, glabra; bracteis florigeris eis scapi similibus, cum floribus secunde versis, pedicellos superantibus; floribus patentibus; pedicellis gracilibus, 1 cm. longis; sepalis lanceolatis, filiformi-acuminatis, uncinatis, 2 cm. longis, 4 mm. latis, valde alatim carinatis et carinis per pedicellum decurrentibus; petalis linearibus, 35 mm. longis, basi ligula magna oblonga truncata serrata auctis; ovario subgloboso, 7 mm. longo, ⅔ supero; ovulis caudatis. Pl. I, figs. 1–2.

MEXICO: Chiapas: table land about Ocuilapa, alt. 1130–1260 m., 1895, *E. W. Nelson 3065* (US, type; phot. G).

Tillandsia § **Platystachys**, as noted in Proc. Am. Acad. lxx. 156–7 (1935), includes § *Pityrophyllum*. To the evidence there noted should be added *T. erubescens* Schdl. as a species occasionally developing a depauperately compound inflorescence. *T. ionantha*, a synonym of *T. erubescens*, is pictured in Bot. Mag. t. 5892 with an inflorescence of 2-flowered spikes. This picture is copied in Mez's latest monograph although the inflorescence is described there as simple.

Tillandsia chaetophylla Mez in DC. Mon. Phan. ix. 726 (1896). *T. subulata* E. Morr. ex Bak. Brom. 170 (1889), nomen; Mez in DC. Mon. Phan. ix. 726 (1896), non Vell. (1825).

It is not possible to distinguish satisfactorily between *T. chaetophylla* and *T. subulata* on the basis of the relative thickness of the leaf-blades, nor does any other distinction appear. Furthermore, the name *T. subulata* can not stand according to the present International Rules of Nomenclature because of Vellozo's earlier homonym. The loss of the name is a welcome clarification in a genus containing also a *subulifera* and a *subalata*.

Tillandsia ignesiae Mez in Bull. Herb. Boiss. ser. 2, iii. 143 (1903).

MEXICO: Mexico: Dist. Temascaltepec, Nanchititla, 1935, *G. B. Hinton 3762; 7780* (K); Michoacan or Guerrero: Monte de Santa Ignes (flowers), Las Seneguias (fruit), alt. 1500 m., 1898, *Langlassé 93* (G, US, P).

The Langlassé or type collection of this species in the Gray Herbarium shows a single flower which was obviously well past anthesis when collected and in which the stamens are included. The much ampler material collected by Hinton shows the same condition in flowers of all stages of development. Consequently the species belongs in the Section *Allardtia* instead of in *Platystachys* where it was provisionally assigned before the stamens were known. Its relation-

ship is evidently in the vicinity of *T. chontalensis*, but it stands out even in sterile condition on account of the fine spreading hair-like scales of the leaves.

Tillandsia paraensis Mez in Fl. Bras. iii. pt. 3, 586, t. 109 (1894). *Vriesea sanctae-crucis* S. Moore in Trans. Linn. Soc. ser. 2, iv. 491 (1895). *Tillandsia sanctae-crucis* S. Moore ex Mez in DC. Mon. Phan. ix. 710 (1896).

BRAZIL: PARÁ: 1826, *Siber 68* (Brux, TYPE; phot. G); AMAZONAS: Humayta, near Livramento, 1934, *Krukoff 6774* (NY); ACRE TERRITORY: near the mouth of the Rio Macauhan, a tributary of the Rio Yaco, lat. 9° 20′ S., long. 69° W., 1933, *Krukoff 5499* (G, NY); MATTO GROSSO: epiphytic, near Santa Cruz, *S. Moore 361* (BM, type of *Vriesea sanctae-crucis;* phot. G); Utiarity, 1909, *Hoehne 2032* (MN Rio, phot. G); Rio Juruena, 1911, *Hoehne 5162; 5163* (MN Rio); Buritizinho, below Mt. Itapirapuan, 1894, *Lindman A 3379* (S, phot. G). BOLIVIA: LA PAZ: Santa Ana, Bopi River, alt. ca. 400 m., 1921, *O. E. White 1087* (NY, phot. G); INDEFINITE: *Bang 159a e. p.* (K, NY, phot. G).

Tillandsia paraensis and *T. sanctae-crucis* have been separated on the basis of the former having laxer spikes and a less bulbous leaf-rosette, yet I fail to observe such distinctions in comparing photographs of the types. Doubtless the great distance between the two type localities made it seem as if the two species must be distinct, but since then several other collections have appeared as indicated above and have demonstrated that it is a case of a single very widespread species.

Tillandsia tenuispica André in Rev. Hort. lx. 567 (1888).

VENEZUELA: MÉRIDA: near Mérida in moist forest, alt. ca. 1800 m., 1931, *E. Reed 96* (US).

This appears to be the first record of this rare species outside Colombia.

Vriesia haplostachya (Wright), comb. nov. *Tillandsia haplostachya* Wright ex Sauvalle in Anal. Acad. Habana, viii. 73 (1871); Wright & Sauvalle, Cat. Fl. Cub. 169 (1873). Pl. II, fig. 6.

Since the type of this species has not been observed previously by any specialist on the *Bromeliaceae* and since its original description failed to include most of the essential information, its identity has always been in doubt. Mez doubtfully referred it to *V. macrostachya*,[1] although from the name "haplostachya," meaning one-ranked, it might have been inferred that the flowers are secund. Actually the species is most closely related to *V. viridiflora*, the leaves and general habit of the two being practically identical. *V. haplostachya*, however, has a much stouter scape, subfoliaceous scape-

[1] Mez in DC. Mon. Phan. ix. 602 (1896).

bracts and much longer and relatively narrower sepals. In view of the former confusion regarding the species the following decription is appended:

Foliis 4–6 dm. longis, perobscure punctulato-lepidotis; vagina elliptica, ampla, laminam subdimidio aequantia; lamina ligulata, acuminata, plana, 6 cm. lata; scapo erecto, 7–8 mm. diametro, glabro; scapi vaginis dense imbricatis, subfoliaceis, ellipticis, acuminatis, ad apicem versus dense punctulatis et siccis rugulosis; inflorescentia simplicissima, secunde 12–22-flora, 20–35 cm. longa; bracteis florigeris cum floribus secundis, latissime ovatis, obtusis, ecarinatis, cucullatis, sepala aequantibus, obscure multinervis punctulatisque; floribus crasse breviterque pedicellatis; sepalis elliptico-oblongis, obtusis, 35 mm. longis, coriaceis; petalis ligulatis, verisimiliter obtusis, 5 cm. longis, viridibus, basi ligulis binis magnis auctis; staminibus inclusis; capsula 45 mm. longa, acuminata.

CUBA: ORIENTE: near the village of Monte Verde, 1859, *Wright* (G); Serra de Nipe on the border of Rio Piloto, 1914, *Ekman 3363* (S).

Vriesia heliconioides (HBK.) Hook. ex Walp. Ann. Bot. iii. 623 (1853). *Tillandsia heliconioides* HBK. Nov. Gen. i. 293 (1816). *T. disticha* Willd. ex Schult. f. in R. & S. Syst. vii. 1226 (1830), non HBK. (1816). *Vriesia disticha* O. Ktze. Rev. Gen. iii. 304 (1898), as to material cited, not as to *Renealmia disticha* L.

First Kuntze, then Standley, and finally Mez have taken up *Vriesia disticha*, a combination on *Renealmia disticha* L., as including *Vriesia heliconioides*. Although none of them explain the reason for their action, it undoubtedly dates from Mez's first monograph where *Renealmia disticha* was cited as a synonym of the later *Vriesia heliconioides*. If the two were the same *Vriesia disticha* would be the correct name, but the type of *Renealmia disticha* is not even a *Vriesia*. Linnaeus[1] based it on a single citation: "Sloane jam. t. 122. f. ult." The plate consists of three figures, the first being of *Tillandsia tenuifolia* and the second and third of *T. usneoides*. Actually *Renealmia disticha* was based on the first figure as its description, particularly the words: "fol. . . . rectiusculis," indicates.

It is possible that Mez confused *Renealmia disticha* with *Tillandsia disticha* Willd. which was published as a synonym of *Tillandsia heliconioides*, but there is nothing to indicate that *T. disticha* was published as a combination for there is no reference to any name-bringing synonym.

Finally, if Kuntze and subsequent authors thought *Renealmia*

[1] Ed. 10. 974 (1759).

disticha and *Tillandsia heliconioides* were the same thing, why did they cite material and ranges for only *T. heliconioides* and omit all mention of Jamaica, the type-locality of *R. disticha*?

2. NOTES ON SOUTH AMERICAN ORCHIDACEAE,—I.

By Lyman B. Smith,
Gray Herbarium of Harvard University

and Stuart K. Harris,
College of Liberal Arts of Boston University.

(*Plate II.*)

The purpose of this series is to record some of the numerous noteworthy species of orchids which are constantly turning up in collections from the remoter parts of South America, particularly in the Andean regions. The present article is based wholly on the collections of Prof. Martín Cárdenas from Bolivia.

The authors are indebted to Prof. Oakes Ames for the loan of critical material for comparison and to Mr. Charles Schweinfurth for many helpful suggestions.

Bulbophyllum Weberbauerianum Kränzl. in Fedde Rep. Nov. Spec. i. 85 (1905).

BOLIVIA: Cochabamba: prov. Ayopaya, Sailapata, on dry logs, alt. 2000 m., 1935, *Cárdenas 3294* (G, Ames).

The Bolivian material cited above agrees in all particulars with the detailed description of the type except that the flowers are purple drying to red instead of "brunneoflavi." So far as known this is the first record of the species from Bolivia.

Bulbophyllum tricolor, spec. nov., rhizoma repenti, simplici; pseudobulbis remotiusculis, erectis, ovoideis, 10–15 mm. longis, apice monophyllis, ex sicco nitide aureis, profunde sulcatis; foliis linearibus, basi haud angustatis, teretibus, subfalcatis, 4 cm. longis, 3–4 mm. diametro; scapo adscendenti, gracili; scapi bracteis tenuiter membranaceis, albidis; inflorescentia arcuato-recurvata, laxe spicata; rhachi gracili; bracteis florigeris anguste ovatis, acuminatis, floribus subdimidio brevioribus, membranaceis, albidis; floribus sessilibus; sepalis erectis, 6 mm. longis, albidis, uninervulosis, lateralibus valde obliquis, usque ad basin liberis; petalis lineari-lanceolatis, acutis, quam sepala paulo brevioribus, minutissime serrulatis, lilacinis; labello supero, carnosulo, superne recurvo, papilloso, fulgide aureo,

lobis lateralibus minutis, dentiformibus, erectis, triangularibus, acutis, integris, lobo intermedio valde producto, subtereti; disco basi breviter unisulcato; columna brevi, dente postico minutissimo, brachiis anticis erectis, triangulari-subulatis.

BOLIVIA: Cochabamba: prov. Ayopaya, Sailapata, alt. 2000 m., 1935, *Cárdenas 3295* (G, Ames).

This pretty little species with its brightly tricolored flowers is most nearly related to *B. rupicolum* Barb. Rodr., but its flowers are larger with lilac petals and deep orange fleshy subterete lip.

Pachyphyllum Cardenasii, spec. nov., caulibus simplicibus vel ramosis, curvulis, ad 14 cm. longis; foliorum vaginis arcte amplectentibus, paucinervatis; laminis patentibus falcatis, complicatis, ad 1 cm. longis, subcuspidatis, crasse carnosis, margine minutissime erosis; racemis 3–4-floris, quam folia bene brevioribus; bracteis ovatis, acutis, 2 mm. longis; pedicellis gracilibus cum ovariis trialatis; floribus pallide luteis; sepalis lanceolatis, acutis, carinatis, aequalibus, 3 mm. longis; petalis lanceolatis, acutis; labello anguste ovato, carnoso, apice calloso-incrassato, callis 2 parvis fere medio in disco auctis; gynostemio obtuse trilobato vel fere orbiculari. Pl. II, figs. 3–5.

BOLIVIA: Cochabamba: prov. Ayopaya, Sailapata, epiphytic, alt. 3000 m., *Cárdenas 3289* (G, Ames).

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3. TWO NEW SPECIES FROM MEXICO.

By Lyman B. Smith.

Euphorbia (**Chamaesyce**) **trichocardia**, spec. nov., substricta, 1 dm. alta, dense molliterque cinereo-tomentosa; caulibus fasciculatis, gracillimis, pauce ramosis; foliis oppositis, laxis, late cordatis, acutis, asymmetricis, 5 mm. longis, breve petiolatis, integris; involucris in axillis supremis paucis vel solitariis, breviter pedicellatis, extus glabris, intus albo-tomentosis; glandulis 4, transverse ellipticis, atro-viridibus, appendice subintegra, subaequilata, alba; semine tetragono, albo.

MEXICO: Nuevo Leon: Sierra Madre Oriental, San Francisco Canyon, about 15 miles southwest of Pueblo Galeana, *C. H. & M. T. Mueller 293* (G, type).

Apparently this species is closely related to *E. melanadenia* Torr., but the tomentum is loose and spreading, the involucres are glabrous outside and the glands are green instead of black.

Asclepiodora zanthodacryon, spec. nov., 3–5 dm. alta; caudice

lignoso; caulibus fasciculatis, simplicibus, gracilibus, puberulis; foliis oppositis, laxis, linearibus, ad 15 cm. longis, 4 mm. latis, subsessilibus, glabris; pedunculo communi gracili, 5 cm. longo, puberulo; umbellis in axillis solitariis, laxe 6–8-floris; bracteolis parvis, linearibus, deciduis; pedicellis gracillimis, 15 mm. longis, puberulis; floribus conspicuis; sepalis anguste lanceolatis, acutis, 4 mm. longis; petalis per anthesin patentibus, late ovatis, acutis, 1 cm. longis, purpureis, anguste albo-marginatis, cucullis magnis, crasse ovoideis, fulgide aureis, cum petalis patentibus, gynostegio longe superatis; squamis staminum deltoideis, inflexis et apicem planum gynostegii obtegentibus; polliniis pendulis, anguste ovoideis.

MEXICO: NUEVO LEON: Sierra Madre Oriental, about 15 km. southwest of Pueblo Galeana, *C. H. & M. T. Mueller 371; 514; 816* (G, TYPE); *1020.*

This species differs from all others of the genus in having the distal end of the hood lower than the axial. In all but the form of the hood it appears very close to *A. circinalis* (Dcne.) Fourn.

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4. ON THE TYPES OF DESVAUX'S AMERICAN SPECIES OF FERNS.

BY C. A. WEATHERBY.

THE fundamental task of fixing accurately the application of the older names of American plants through examination of type-specimens in European herbaria, though begun by Asa Gray nearly a century ago and more than ever needed as specific lines are more and more closely drawn and critical groups restudied, is yet far from completed. Particularly is this the case with tropical American ferns; and in that field the work of Desvaux has presented especially large lacunae of inadequate knowledge.

Desvaux was not one of the great pioneers in pteridology; his scheme of classification was not profound and had no great influence on his successors. But he set up some genera—*Gymnogramma* and *Cyclophorus*, for instance—which have survived and, what concerns us more, he had access to many of the rich collections—those of Dombey, Commerson, Joseph de Jussieu, de Tussac, etc.—already gathered in French herbaria in his time. Numerous species, now familiar, but then novelties, and some still little known, passed under his eyes; many of them he described. He has a nomenclatural importance, if no other.

In his two major articles relating to ferns[1] and in three short papers in his Journal de Botanique Appliquée Desvaux proposed about 180 species attributed to America. It would not be true to say that his work was neglected; but it was difficult to follow. His descriptions, though accurate as far as they go, are brief and, like so many older ones, omit details later deemed essential. His data of locality are frequently very general and by no means always correct. He never cited collectors; authentic material, where it exists, has been, therefore, hard to identify as such. Until 1896, when it was presented to the Muséum d'Histoire Naturelle at Paris, his personal herbarium remained in the possession of his family, presumably more or less inaccessible.

Nevertheless, a few of his species were early accepted and their names correctly applied by Kunze and Hooker, partly on the basis of specimens sent by him to Greville. Mettenius seems to have made an earnest attempt at interpretation; he guessed, not always happily, at a good many species and was able to examine authentic material of a few and to place them accurately. In more recent years Hieronymus, Christensen and Maxon have fixed the status of a few more. But none of these investigators saw more than a few types; and an unusually large proportion of Desvaux's species have been misunderstood or left as frankly doubtful. In the general herbarium at the Paris Museum, now conveniently housed in the fine and spacious new botanical building, I was able to find, in 1935, 135 of his types and to determine most of those seen. A more extended search than I had time to make, especially in the older, segregated herbaria, such as that of Jussieu, would, I believe, bring more of them to light—possibly all, though some of the species may have been founded on literature alone.

The actual type-specimens are often fragmentary; in many cases, however, they can be correlated with others in the Paris herbarium, obviously of the same collections and also named by Desvaux; and from these latter, missing characters can be ascertained. The types are accompanied by rather elaborate labels in Desvaux's handwriting giving bibliography, synonymy when called for and statements of habitat not infrequently more definite than those in his published work. These labels were evidently written at some time subsequent to the publication of the Prodrome; they not only cite it, but occasion-

[1] "Observations sur quelques nouvelles Genres de Fougères et sur plusieurs Espèces nouvelles de la même Famille," Gesellsch. Naturforsch. Freunde Berlin Mag. v. 297–330, t. VII, figs. 4–7 (1811) and "Prodrome de la Famille des Fougères," Mém. Soc. Linn. Paris, vi. 171–337 (1827).

ally give references not included in it. Such characteristic labels make it relatively easy to detect the type sheets.

The results I reached are summarized in the following list. As will readily be seen, I have not solved all the questions arising from Desvaux's work. But it has seemed worth while to publish a report now and to set down everything, both success and failure. Accordingly, all of Desvaux's names for American species, arranged alphabetically for convenience of reference, are included, whether or not I have seen the types. All determinations of types are likewise given, even if they merely repeat (and, I hope, confirm) ascriptions already made. To save space, only dates of publication are given, except where new combinations are required; full data are, of course, readily accessible in the Index Filicum. In each case, Desvaux's name is placed first, followed by needful synonymy and discussion. The name to be accepted for the species concerned, whether Desvaux's or another's, is printed in small capitals, except for new combinations which are, as is customary, in bold-face type.

As in all such investigations, some regrettable changes of name have resulted; happily, their number is not large. It may be regarded as unfortunate for Desvaux, but from the point of view of stability of nomenclature it is a welcome circumstance, that in 1811 he described a considerable number of species already proposed by Willdenow the year before and again in 1827 a number put forward by Kaulfuss in 1824. The mortality is greatest among the names of Hooker and Kunze; even there, it is not disturbingly great.

I am much indebted to the authorities of the Paris Museum for the privilege of examining the specimens here reported upon and to various members of its staff, especially M. R. Metman, for numerous courtesies and for aid; and to Dr. William R. Maxon of the United States National Herbarium for the use of certain critically determined specimens there and for generously given suggestion and information.

Acrostichum aculeatum Desv. (1811). PITYROGRAMMA CHRYSOPHYLLA (Sw.) Link. *A. chrysophyllum* Sw. (1801). *A. chrysophyllum* β *pumilum* Desv. (1827).—The type specimen, mounted on the same sheet with several other fronds of varying leaf-form, but readily identifiable from the description and the placing of the label, is a single dwarfed frond with lamina about 9 cm. long. The "aculeae" are short, blunt projections on the stipe, appearing like stumps of pinnae broken off with healed tissue over the fracture. Just what their nature may be is not apparent, but they are plainly abnormal growths.

Acrostichum chrysoconium Desv. (1827). Pityrogramma chrysoconia (Desv.) Maxon. *P. flexilis* (Klotzsch) Domin?—Apparently a good species, similar in habit and in its pale rachis and costae to *P. Ornithopteris*, but with yellow indument.

Acrostichum dicksonioides Desv. (1827). Polybotrya osmundacea H. & B. (1810).—A rather finely dissected form. Desvaux's epithet was printed as "*diksonioides*" but in view of the fact that there are a good many obvious misprints in the "Prodrome" and that the label reads "dicksonioides," I feel justified in restoring the more correct spelling.

Acrostichum luteum Desv. (1827). *Notholaena lutea* (Desv.) Moore.—The type consists of 3 detached, badly pressed and withered fronds, with the stipes broken off. To Desvaux's description may be added that the lamina is linear in outline, 7.5–9 cm. long, with 5–8 pairs of distant, pinnatifid pinnae, the longest less than 1 cm., with 2–5 pairs of rounded obovate segments. The veins are visible above and stop a little short of the margin which is modified into a very narrow cartilaginous band. The pinnae are decurrent in a narrow, reddish line along the black rachis. Moore was no doubt correct in transferring the species to *Notholaena;* I am, however, unable to place it more definitely.

Acrostichum martinicense Desv. (1811). *Elaphoglossum martinicense* (Desv.) Moore.—A glabrous-fronded species of *Elaphoglossum* with thick, short-repent rhizome covered with narrowly linear, long-attenuate, soft, bright-brown scales, entire or with a few narrow teeth or fimbriae. The stipe bears similar but narrower and more fimbriate scales. The lamina is acute at base and apex, 7.5–11.5 cm. long by 2–4 cm. wide, about as long as the stipe or in fertile fronds considerably shorter.

Maxon[1] suggested that *A. martinicense* might be the same as his *Elaphoglossum Underwoodianum* and, following this clue, Christensen[2] has reduced *E. Underwoodianum* to *E. martinicense*. This is not correct; the two differ markedly in characters of rhizome and scales and in size and shape of lamina. *E. martinicense* belongs in the general group of *E. pteropus;* a definite determination of its status must await the much-needed monographic study of the genus.

Acrostichum petiolosum Desv. (1811). Elaphoglossum petiolosum (Desv.) Moore.—Correctly applied to the Andean plant represented by *Lehmann* 4481.

Acrostichum Plumieri Desv. (1827). Elaphoglossum petiolatum (Sw.) Urban. *A. petiolatum* Sw. (1788).—Desvaux's original de-

[1] Sci. Surv. Porto Rico and Virgin Isl. vi. 398 (1926).
[2] Ind. Fil. Suppl. III. 104 (1934).

scription, as published, gives no locality, merely citing a plate of Plumier; the type specimen, however, is labelled "habitat in Caribaeis."

Acrostichum tenellum Desv. (1827). ELAPHOGLOSSUM HORRIDULUM (Kaulf.) J. Sm. *A. horridulum* Kaulf. (1824).

Acrostichum tereticaulon Desv. (1811).—Type not seen.

Adiantum acuminatum Desv. (1811).—Type not seen.

Adiantum cassioides Desv. (1827).—Type not seen. According to Kunze quoted by Hooker[1] and followed by Christensen in the Index Filicum, this is *A. serrato-dentatum* Willd. with larger and thinner pinnules than usual—probably at least approaching the typical form of Willdenow's species. Desvaux himself suggests this relationship by his comparison with his *A. obtusum* (which see).

Adiantum elatum Desv. (1811). A. LATIFOLIUM Lam. (1788).

Adiantum falcinellum Desv. (1811).—Type not seen.

Adiantum obtusum Desv. (1811). A SERRATO-DENTATUM Willd. (1810).—Desvaux's plant is the common form of the species; Willdenow's type a rather extreme state. Desvaux's original description gives no locality; his label reads "Habitat in Gujane?"

ADIANTUM PETIOLATUM Desv. (1811).—Type not seen, but the name probably applied correctly in the sense of *A. Kaulfussii* Kze. (1848).

Adiantum rotundatum Desv. (1827).—Type not seen.

Allantodia costalis Desv. (1827).—In the Prodrome Desvaux apparently published this as a new species, with a description and no synonymy. On his label, however, he cites *Asplenium costale* Sw. as a synonym. It therefore becomes doubtful whether *Allantodia costalis* was intended as anything more than a transfer of Swartz's species. Desvaux's specimen is, as suspected by Christensen,[2] *Diplazium pectinatum* (Fée) C. Chr., from Jamaica. His name, if a transfer, was incorrectly applied to this species; if independent, it cannot be used under *Diplazium* because of *D. costale* (Sw.) Presl (1836).

Alsophila Dombei Desv. (1827).—Type not seen.

Alsophila millefolium Desv. (1827).—Type not seen.

Anemia obtusa Desv. (1811).—Type not seen. From the description, the plant must have been either *A. flexuosa* (Sav.) Sw. or *A. imbricata* Sturm. In the Prodrome Desvaux cites *A. hirsuta* sensu Raddi, Syn. Fil. Bras. 4 (1819), not Sw., as a synonym. Raddi's description and citations, however, seem to apply to the true *A. hirsuta.*

[1] Sp. Fil. ii. 19 (1858).

[2] In Urban, Symb. Ant. ix. 324 (1925) and Ind. Fil. Suppl. III. 75 (1934).

Aspidium continuum Desv. (1811). DRYOPTERIS GONGYLODES (Schk.) O. Ktze. *A. gongylodes* Schk. (1809).—Desvaux's plant is the pubescent form.

Aspidium cuspidatum Desv. (1827).—Type not seen. The description might have been taken from Plumier.

Aspidium lepidotrichum Desv. (1811). DRYOPTERIS NEMOROSA (Willd.) Urban. *A. nemorosum* Willd. (1810).—Desvaux himself, Prod. 261, made this reduction. His label gives the locality Santo Domingo.

Aspidium longifolium Desv. (1811). TECTARIA MARTINICENSIS (Spreng.) Copel. *A. martinicense* Spreng. (1804).—A form with enlarged terminal pinna having two pairs of long lobes at the base and smaller, narrow, irregular lobes on the margins of the main division. The label gives the locality Hispaniola.

Aspidium macrolepidum Desv. (1827).—A rather large plant of the group of *Polystichum aculeatum*. The rhizome-scales are about 1 cm. long, lance-linear, entire, with narrow brown margins and dark, sclerotic center. They pass, on the stipe, into brown, thin scales of like shape and size and on the rachis into smaller ones which may be either all brown or with a dark center. The rachis also bears narrow, pale-brown scales lacerate at base which pass into fibrils on the pale lower surface of the pinnules. The auricles of the pinnules are blunt and short. The serrations are also short, cartilaginous-tipped but not spinescent. The veins are 2–3-forked, pale and evident on the upper surface but not beneath. The indusia are large, entire, brown with a dark central spot.

These details may aid in placing the plant; its status, however, can be finally determined only by critical study of the difficult group to which it belongs.

Aspidium melanopodon Desv. (1811). TECTARIA LATIFOLIA (Forst.) Copel. *Polypodium latifolium* Forst. (1786).—The locality, Straits of Magellan, given by Desvaux is erroneous; his specimen, collected by Commerson, must have come from that explorer's Polynesian material.

Aspidium melanorhizum Desv. (1827).—Type not seen. Possibly based on the citation from Plumier given.

Aspidium multisorum Desv. (1827). TECTARIA MARTINICENSIS (Spreng.) Copel. *A. martinicense* Spreng. (1804).—The type is a small, but otherwise quite representative, individual.

Aspidium orbiculatum Desv. (1811). POLYSTICHUM ORBICULATUM (Desv.) Gay.—On his label Desvaux cites *Polypodium rigidum* Hook.

& Grev. as a synonym and I am inclined to think him right. Certainly his specimen (a small one, best matched in the material I have seen by *Pennell* 9808 from Colombia) belongs with an Andean group, not with the plant of southern Chile and Patagonia to which Christ[1] applied the name *P. orbiculatum*. Christensen[2] suspected as much, but had not seen Desvaux's type.

Aspidium parallelum Desv. (1827). TECTARIA TRIFOLIATA (L.) Cav. *Polypodium trifoliatum* L. (1753).

Aspidium pedatum Desv. (1827). CAMPTODIUM PEDATUM (Desv.) Fée.—Correctly interpreted. The label gives Jamaica as the place of collection.

Asplenium angustatum Desv. (1827).—Type not seen. Very probably only a renaming of *A. laxum* Raddi, not R. Br., cited in synonymy. The description is Raddi's, slightly paraphrased, and the locality is that given by him.

Asplenium anomalum Desv. (1827).—Type not seen. Possibly only a new name for *A. ambiguum* Raddi, not Schk.

Asplenium auricularium Desv. (1827). A. SEMICORDATUM Raddi (1825).—Not at all the Andine plant of the immediate group of *A. lunulatum* to which the name was applied by Mettenius.

Asplenium brasiliense Desv. (1827). A. REGULARE Sw. (1817).—Here again Desvaux's species was misunderstood by Mettenius, who placed it under *A. semicordatum*.

Asplenium concisum Desv. (1827).—A renaming, for no apparent reason, of *A. dareoides* Desv. (which see).

Asplenium coriaceum Desv. (1827).—The type is a small and poorly developed specimen of *A. falx* Desv. (which see).

ASPLENIUM DAREOIDES Desv. (1811). *A. magellanicum* Kaulf. (1824). *A. concisum* Desv. (1827).—The type is a rather large specimen with oblong-lanceolate lamina, at first sight appearing unlike most herbarium material of the species, but identical in all technical characters. Christensen and Skottsberg (and Bertero before them) had the same form from Juan Fernandez. They remark that it resembles *A. Adiantum-nigrum* and that the more common, smaller and broader-fronded form looks more like *A. Ruta-muraria*. I have not seen Kaulfuss's type; but since he compares it to *A. Ruta-muraria*, it probably belongs with the second of the above forms, as Christensen and Skottsberg also suppose. The two, however, are not specifically distinct; Desvaux's earlier name must be

[1] Ark. för Bot. iv. no. 12, 3 (1905).
[2] Ark. för Bot. x. no. 2, 19 (1910).

taken up. He himself cites *A. magellanicum* in synonymy on his label.

Asplenium denticulosum Desv. (1811).—Type not seen by me; Alston, however, has seen what he believes to be the type in the herbarium of Jussieu, and refers it to DIPLAZIUM CRISTATUM (Desrouss.) Alston (*D. arboreum* (Willd.) Presl; *D. Shepherdii* (Spreng.) Link).[1]

Asplenium falx Desv. (1827). A. EROSUM L. (1759).—The Linnaean species is here taken in the sense of Mettenius,[2] not in that of Christensen[3] and Hieronymus[4] (= *A. dimidiatum* Sw.). As in several other cases,[5] it was actually founded, not on the plate of Sloane cited in the Systema, ed. 10, but on specimens collected by Patrick Browne in Jamaica and duly referred to in the second edition of the Species Plantarum. The type sheet in the herbarium of Linnaeus, labelled "Aspl. erosum" by him and bearing the symbol "C" which indicates a species inserted in the Systema, is a mixture. It contains a well-developed, fruiting frond of *A. falx* and a juvenile plant of *A. dimidiatum* Sw. with a bit of rootstock and four young and very small, sterile fronds. Christensen did not see this sheet and he was mistaken in supposing that both specimens on the duplicate sheet which he studied in the Swartz herbarium were *A. dimidiatum*. An excellent full-size photograph of the Swartzian material (lent me through the kindness of Dr. Maxon, who arrived long ago at the conclusion here set forth) shows that, as in Linnaeus's own sheet, one is *A. dimidiatum*, one *A. falx*. The former is a better specimen than that of Linnaeus, but still small and little cut for the species; the latter much poorer and, as Christensen notes, badly pressed.

Linnaeus's description seems to have been drawn to include both elements. It would seem that, having only juvenile or stunted material of *A. dimidiatum*, he regarded *A. falx* as the mature and fully developed condition of the same species. The fact that he cited Sloane's plate 33, figure 2, would indicate that he had *A. falx* mainly in mind, for, though it actually represents a form of *A. auritum*, it resembles *A. falx* far more than *A. dimidiatum*.

A. erosum, then, was, like many Linnaean species, a mixture, in which the plant later named *A. falx* by Desvaux was a predominating ele-

[1] Journ. Bot. lxxxiv. 173 (1936).
[2] Abh. Senckenb. Naturf. Ges. iii. 157 (1859).
[3] Ark. för Bot. ix. no. 11, 14 (1910).
[4] Hedwigia lxi. 35 (1919).
[5] E.g. *Asplenium radicans*, discussed by Christensen, Vidensk. Selsk. Skrift. ser. 7, x. 218 (1913).

ment. Mettenius applied the Linnaean name to that element. In so doing (whether consciously or not makes no differenee), he avoided disturbing the generally accepted name, *A. dimidiatum* Sw. There was no occasion whatever for changing his perfectly correct typification, accepted in later standard works; Christensen would probably not have changed it had he seen the type sheet. Hieronymus merely followed Christensen as to *A. erosum;* what he accomplished was to point out, on the basis of manuscript notes by Mettenius made subsequent to the publication of the monograph of *Asplenium*, the correct identity of *A. falx* and *A. coriaceum* Desv.

Asplenium macrocarpum Desv. (1827). A. MONANTHES L. (1767).

Asplenium obtusilobum Desv. (1811). A. CUNEATUM Lam. (1786).—Desvaux's plant is a form with broad segments only shallowly crenate-dentate above. The habitat given, with doubt, in the original publication was the Isle of Bourbon, but on the label this is changed to tropical America.

ASPLENIUM PERUVIANUM Desv. (1827).—The type is a wretched scrap; it is, however, associable with a good specimen collected by Dombey. This shows a small, pinnate-fronded, cespitose fern, not (in this individual) proliferous, with relatively large (up to 4 mm. long), red-brown rhizome-scales, composed of thick-walled, oblong to linear cells with narrow lumina. The petiolules are thick and pale; the nerves apparently flabellately branched, the branches simple for some distance below the apex, not reaching the margin. The sori are broad-oblong; the indusia pale brownish, thin and entire.

This is probably a good species, but in a critical group and as yet imperfectly known.

Asplenium rhomboidale Desv. (1827).—Type not seen; perhaps based wholly on the cited synonyms of Lamarck and Plumier. The description could have been drawn from the latter's plate.

ASPLENIUM SESSILIFOLIUM Desv. (1811).—The type is sheet no. 1265 in herb. Jussieu. The name is at present correctly applied.

Asplenium virens Desv. (1827). A. LAETUM Sw. (1806).

Athyrium Dombei Desv. (1827).—Type not seen.

Azolla arbuscula Desv. (1827).

Azolla densa Desv. (1827).—No specimens bearing this name or the preceding are to be found in the Desvaux herbarium. The two specimens of *Azolla* therein are named by Desvaux *A. caroliniana* and *A. filiculoides;* the sheets bear an annotation by Kuhn affirming these determinations.

BLECHNUM BRASILIENSE Desv. (1811).—Type missed by me,

though probably to be found in the herbarium of Jussieu. In all probability the current application of the name is correct.

Blechnum pubescens Desv. (1827).—Type not seen.

Botrychium cuneatum Desv. (1827).—Type not seen. The plate of Schkuhr cited is *B. dissectum* Spreng., f. *obliquum* (Muhl.) Fern., *B. obliquum* Muhl. (1810). Desvaux gave no habitat; Schkuhr's plant came from Pennsylvania.

Cheilanthes elegans Desv. (1811). C. MYRIOPHYLLA Desv. (1811).—The type is the merest scrap, the end of a very young pinna with six pairs of pinnules. It is mounted with the lower side glued to the sheet; as seen from above, with the scales forming a background to the segments, it looks quite like Desvaux's illustration.[1] The young scales are "rufescent" as described; in the older type of *C. myriophylla* they are bleached whitish.

A frond in the herbarium of Joseph de Jussieu, two pinnae of which are missing, is probably of the same collection, though not labelled by Desvaux.

CHEILANTHES MYRIOPHYLLA Desv. (1811).—Correctly understood. The type is a good specimen; its label gives the habitat as Peru.

Cincinalis ferruginea Desv. (1811). NOTHOLAENA TRICHOMANOIDES (L.) R. Br. *Pteris trichomanoides* L. (1753).—The type is a large specimen so densely hairy on the lower surface that the white indument is concealed. It is far from being *N. bonariensis*, with which Desvaux's name was so long associated.

Cincinalis tomentosa Desv. (1811). NOTHOLAENA TOMENTOSA Desv. (1813). *N. hypoleuca* Kze. (1834).—The type agrees with a sheet of Dombey's labelled "Concepcion, 1782."

CYATHEA TUSSACII Desv. (1827).—Correctly interpreted by Maxon.[2]

Cystopteris jamaicensis Desv. (1827). DRYOPTERIS NOTHOCHLAENA Maxon (1922). Not *Dryopteris jamaicensis* (Bak.) C. Chr. (1905).—It is easy to see how Desvaux mistook the scale at the side of the sorus in this species for a cystopteroid indusium; it is much less easy to understand how anyone who had read Desvaux's description, calling, among other things, for paleaceous rachis and costae, could have referred his plant to *C. fragilis*. Yet Hooker[3] did this and has been followed by everyone since.

Desvaux gave the habitat of his species as Cuba and Jamaica. The Cuban element would presumably be *Dryopteris hemiptera*

[1] In Journ. Bot. Appl. ii. t. xiii, fig. 1 (1813).
[2] N. Am. Fl. xvi. 73 (1909).
[3] Sp. Fil. i. 198 (1846).

Maxon, but in view of Desvaux's choice of name, the Jamaican would naturally be taken as the type and his two specimens actually are the Jamaican plant. His specific epithet cannot be used under *Dryopteris*, but must be taken up under *Stigmatopteris*.

Cystopteris translucens Desv. (1827).—The luxuriant, finely dissected phase of the *Cystopteris fragilis* complex which occurs in the Andes of Peru, Ecuador and perhaps Colombia and which will probably receive some taxonomic recognition when the South American members of the group are monographed. *Macbride* 3638 from Chaglia, Peru, and part of Mille's material distributed as from "locis umbrosis altiplanis ad Riobamba, Ecuador," 1921, match Desvaux's type fairly well. His specimen (a single lamina) has the lowest pinnae unusually long, so that superficially it resembles a frond of *C. sudetica*. A frond of some *Athyrium* is mounted on the same sheet, but Desvaux's description is obviously drawn from the *Cystopteris*.

Danaea longifolia Desv. (1811). D. NODOSA (L.) Sm. *Acrostichum nodosum* L. (1753).—The Linnaean name was long applied to what we now know as *D. elliptica*.

Darea triloba Desv. (1813). ASPLENIUM CRISTATUM Lam. (1786).

Davallia magellanica Desv. (1811).—Type not seen. Very likely not American.

Dicksonia domingensis Desv. (1827).—Type not seen.

Didymoglossum decipiens Desv. (1827). TRICHOMANES BIPUNCTATUM Poir. (1808).—The American localities cited by Desvaux are no doubt erroneous.

Didymoglossum magellanicum Desv. (1827). HYMENOPHYLLUM MAGELLANICUM Willd. ex Kze. (1847).—Type seen and species correctly placed by van den Bosch. So far as can be made out from the citations of Kunze and Klotzsch,[1] Desvaux and Willdenow independently applied the same specific epithet to the same plant; but the latter's herbarium name may have been a transfer of Desvaux's.

Diplazium curvatum Desv. (1827). D. UNILOBUM (Poir.) Hieron. *Asplenium unilobum* Poir. (1811).

DIPLAZIUM MACROPHYLLUM Desv. (1827). *Asplenium Desvauxii* Mett. (1859), as to name-bringing synonym. *A. procerum* Sod. (1908).—Kunze[2] took up Desvaux's name, with doubt, for a plant collected by Poeppig and Mettenius (followed by Hieronymus) applied it positively to *Lechler* 2158. I have seen neither of these collections; Mettenius's illustration, however, shows unequal, obtuse or merely acute basal segments, of a type which seems not to occur in

[1] Linnaea xviii. 533 (1844).
[2] Linnaea, ix. 93 (1834)

true *D. macrophyllum*, and a simpler venation. Desvaux's type is excellently matched by *Couthouy* 43 from Ecuador; this represents the plant to which his name should be applied.

DIPLAZIUM OBTUSUM Desv. (1827).—Probably correctly applied by Hieronymus in Engler, Bot. Jahrb. xxxiv. 457 (1901). The type, however, a single glabrous pinnule with oblong-falcate, obtuse segments, 2-forked veins and long sori reaching close to both costa and margin, does not agree in all details with *Eggers* 14881, cited by Hieronymus as representative.

Diplazium tenue Desv. (1827).—Type not seen.

Doodia blechnoides Desv.—Type not seen.

Grammitis angustata Desv. (1827).—Type not seen; only doubtfully ascribed to America by Desvaux.

Grammitis magellanica Desv. (1811). POLYPODIUM BILLARDIERI (Willd.) C. Chr. *G. Billardieri* Willd. (1810).—Desvaux cites *P. gramineum* sensu Poir., not Sw., as a synonym, but his description is original.

Gymnogramma aspidioides Desv. (1827). DRYOPTERIS ASPIDIOIDES (Willd.) C. Chr. *Ceterach aspidioides* Willd. (1810).—Desvaux does not cite Willdenow and gives an original description. This appears to be another case where two authors have independently chosen the same epithet for the same species. The habitat "Brazil" is apparently erroneous; it may have misled Dr. Christensen when, in the Index Filicum, he assigned Desvaux's species to the synonymy of *D. polypodioides*. It may be noted in this connection that the original data of collection accompanying Desvaux's specimens are often on small detached slips which are now glued to the sheets but which might easily have become misplaced before mounting.

Gymnogramma chaerophylla Desv. (1811). ANOGRAMMA CHAEROPHYLLA (Desv.) Link.—Type not seen, but the current application of the name almost certainly correct.

Gymnogramma diplazioides Desv. (1827). DRYOPTERIS LINKIANA (Presl) Maxon. Not *D. diplazioides* (Moritz) Ktze. (1891).—The species was correctly interpreted by Christensen[1] but, as pointed out by Maxon,[2] Desvaux's epithet cannot be used under *Dryopteris*.

Gymnogramma peruviana Desv. (1811). PITYROGRAMMA TARTAREA (Cav.) Maxon. *Acrostichum tartareum* Cav. (1802).—Desvaux's own specimen consists of a single pinna, but on the label of another sheet from the Vaillant herbarium, determined by him as "Peruviana Desv." he wrote: "le type est dans l'herbier de M. Jussieu." The

[1] Dansk. Vidensk. Selsk. Skrift. ser. 7, iv. 312 (1907).

[2] Journ. Wash. Acad. Sci. xiv. 199 (1924).

type thus indicated is sheet no. 1009 in the Jussieu herbarium. It is a not uncommon phase of *P. tartarea* with the lowest pinnae considerably elongated, giving the lamina a deltoid outline, and with their larger pinnules pinnatifid. It may be noted that Desvaux misunderstood *P. tartarea*, applying that epithet, as his labels show, to a phase of *P. calomelanos*.

The correct name for the species to which Kunze[1] and subsequent authors have applied Desvaux's epithet, appears to be PITYROGRAMMA **Schaffneri** (Fée), n. comb. *Ceropteris Schaffneri* Fée, Mém. Fam. Foug. viii. 80 (1857).

Hemionitis brasiliana Desv. (1827). ANTROPHYUM BRASILIANUM (Desv.) C. Chr.—Type not seen. Desvaux, however, in proposing this name, was redescribing *H. reticulata* sensu Raddi, not Forst.; his diagnosis fits accurately enough the plant later described as *A. subsessile* Kze. (1837).

Hemionitis cajanensis Desv. (1811). ANTROPHYUM CAJANENSE (Desv.) Spreng.

Hemionitis gigantea Desv. (1827).—Type not seen. Although its habitat is given as the island of St. Thomas in the West Indies, this is probably not American.

HEMITELIA CRUCIATA Desv. (1827).—Examination of the type confirms Maxon's conclusion[2] that it belongs with the group to which he applied the name *H. spectabilis* Kze. (1848); but I am not altogether clear as to specific limits therein. Desvaux's specimen—a portion showing eight sterile pinnae, perhaps taken from near the tip of a frond—has very small and narrow pinnae for the group. Their venation, however (well represented in Hooker, Sp. Pl. i. t. 14A), is more complicated than in many larger fronds referred to *H. spectabilis*. In this respect and in its close-set, almost imbricate, segments, the specimen matches well a fragment of *Poiteau* 139, the type of *H. Leprieurii* Kze. (1844), preserved in the United States National Herbarium. Desvaux's name must apparently displace *H. Leprieurii* and also *H. spectabilis* if, as seems likely, that is conspecific with it.

Hemitelia cyatheoides Desv. (1827).—A glabrous plant (except for stiff, incurved hairs on the costae above) of the section *Euhemitelia*, which, so far, I have been unable to correlate with any material I have seen. Very likely a good, but neglected, species.

HEMITELIA STIGMOSA Desv. (1827). *H. guianensis* Hook: (1844).

Humata scandens Desv. (1827). *Odontosoria scandens* (Desv.) C. Chr.—This appears inseparable from *O. uncinella* (Kze.) Fée. That

[1] Farrnkr. i, t. 32 (1841–42).
[2] Contr. U. S. Nat. Herb. xvi. 47 (1912).

species, however, is not known except in the West Indies; Desvaux's plant is said to come from Peru and his references to that country, generally based on Dombey's collections, are for the most part correct. The chances are that there is an error here and that Desvaux's name will have to replace Fée's; but in view of the ambiguous origin of his plant, I hesitate to make the reduction.

HYMENOPHYLLUM ENDIVIAEFOLIUM Desv. (1827). *H. multiflorum* Rosenst. (1913).—So referred by Mr. C. V. Morton, who has made a study of the South American species of *Hymenophyllum.*

HYMENOPHYLLUM MICROCARPUM Desv. (1827). —This has been correctly interpreted.

Hymenophyllum pyramidatum Desv. (1827). —The type is a sterile plant of the group of *H. sericeum,* scarcely to be placed without special and critical study.

Hymenophyllum venustum Desv. (1827). H. HIRSUTUM (L.) Sw. *Trichomanes hirsutum* L. (1753).

LINDSAEA BRASILIENSIS Desv. (1811). *L. dentata* Fée (1872–73). – The Brazilian plant often referred to *L. guianensis.*

Lindsaea elata Desv. (1811). L. STRICTA (Sw.) Dryand. *Adiantum strictum* Sw. (1788).

Lindsaea imbricata Desv. (1811). L. STRICTA (Sw.) Dryand.

LINDSAEA PORTORICENSIS Desv. (1811).—Apparently correctly interpreted in current literature, as by Maxon, Sci. Surv. Porto Rico and Virgin Isl. vi. 489 (1926).

Lomaria acuta Desv. (1827). BLECHNUM ACUTUM (Desv.) Mett. – There is no specimen in the Desvaux herbarium, but one of the Dombey collection, labelled by Desvaux, may stand as the type. Without seeing the Poeppig specimen on which *Lomaria cuspidata* Kze. (1834) was based, I cannot be sure whether or not Mettenius was right in considering it the same as Desvaux's plant, but it seems dubious. In any case, Desvaux's species will stand and is well represented by *Buchtien* nos. 5128 and 2222 in the United States National Herbarium.

Lomaria magellanica Desv. (1811).—Type not seen.

Lomaria Plumieri Desv. (1811).—Type not seen.

Lomaria serrulosa Desv. (1827).—No specimen was found in the Desvaux herbarium. There is a specimen in the Dombey collection labelled *L. serrulosa;* but its scales are entire and it can hardly be taken as the type.

Lomaria squamulosa Desv. (1827). BLECHNUM LOXENSE (HBK.) Hieron. *Lomaria loxensis* HBK. (1815). –Again, no type was found

in the Desvaux herbarium, but two sheets in the Dombey collection, both fertile only, as described, represent the species. Hieronymus[1] correctly placed it in the synonymy of *B. loxense*.

Meniscium acrostichoides Desv. (1827). –Type not seen; perhaps not American.

Meniscium longifolium Desv. (1827). DRYOPTERIS LONGIFOLIA (Fée) Hieron. *Meniscium longifolium* Fée (1872–73).—Fée does not mention Desvaux and apparently described the same species under the same name. Since Hieronymus, in transferring the species to *Dryopteris*, based his new combination on Fée's name, his action must apparently stand and Fée remain as the parenthetical author-citation. To transfer Desvaux's earlier, but identical, epithet to *Dryopteris* would create a technical homonym.

At least, that is the easiest way. The case, like that of *Lathyrus maritimus*,[2] furnishes an amusing instance of the homonym rule lost among the accidents of name-making and going about in circles. Fée's combination was both a later homonym and a later synonym and quite illegitimate. Hieronymus ought not to have taken it up. But he did; and by doing the wrong thing effectually prevented anyone else from doing the right one—unless, as might be argued, his own combination is illegitimate, and the right thing is to coin a wholly new one. So far, I have resisted the temptation to do so.

Mertensia brasiliana Desv. (1813). GLEICHENIA PECTINATA (Willd.) Presl. *Mertensia pectinata* Willd. (1804).—Desvaux's type is the short-pinnuled form of the species common in South America and presumably true *G. pectinata*, since the type came from Caracas.

Mertensia elata Desv. (1827). GLEICHENIA PECTINATA (Willd.) Presl.—The West Indian form with long pinnules.

Mertensia ferruginea Desv. (1811). GLEICHENIA BIFIDA (Willd.) Spreng. *Mertensia bifida* Willd. (1804).

Mertensia fulva Desv. (1827).—Type not seen.

Mertensia simplex Desv. (1827). GLEICHENIA SIMPLEX (Desv.) Hook.—Correctly interpreted.

Mertensia squamulosa Desv. (1813). *Gleichenia squamulosa* (Desv.) Moore.—The type is apparently part of a large specimen of *G. pedalis* (Kaulf.) Spreng.; at least, I know of nothing else which it can be. Desvaux's label gives the habitat as: "America australi (Termae Chili)." Since, however, there may be doubt of the determination, I hesitate to displace the well-established *G. pedalis* without further examination of authentic material.

[1] Hedwigia xlvii. 240 (1908).

[2] See Fernald in Rhodora xxiv. 177 ff. (1932).

Monogramma furcata Desv. (1811).—No specimen seen. Probably only a renaming of *Grammitis graminoides* Sw. because of the very similar epithet already used by Desvaux in *Monogramma graminea*. The brief diagnosis is apparently original, but could have been drawn wholly from the plate of Swartz cited.

Monogramma linearifolia Desv. (1811). COCHLIDIUM LINEARIFOLIUM (Desv.) Maxon—Correctly interpreted.

Nephrodium albescens Desv. (1827). DRYOPTERIS PATENS (Sw.) O. Ktze. *Polypodium patens* Sw. (1788).—Type seen and referred as above by Christensen. It has glabrescent indusia, in that respect approaching *D. patens*, var. *dependens* C. Chr.

Nephrodium chaerophylloides Desv. (1827). DRYOPTERIS SPINULOSA var. DILATATA (Hoffm.) Watt. *Polypodium dilatatum* Hoffm. (1796).—Desvaux's specimen is a foliose and very badly dried frond; he seems to have been misled by its peculiar appearance. However, he gave the habitat "Porto Rico" with doubt.

Nephrodium clypeolutatum Desv. Mém. Soc. Linn. Paris vi. 258 (1827). DRYOPTERIS **clypeolutata** (Desv.), n. comb. *Aspidium L'Herminieri* Kze. ex Mett. Pheg. u. Asp. 85 (1858).—Mettenius's later note in the Berlin Herbarium, mentioned by Christensen,[1] to the effect that Desvaux's and Kunze's species are the same, was quite correct. Desvaux's epithet must be taken up. His specimen belongs to the form of the species without long hairs—*Aspidium Capitainei* Fée according to Christensen.

Desvaux's published description gives the habitat Jamaica. According to Maxon, the species is not now known from that island, though Mettenius l. c. assigns to it a Jamaican collection by Breutel. On Desvaux's label the habitat appears as "in Antillis"—a change which may be a correction.

Nephrodium crenatum Desv. (1827). NEPHROLEPIS RIVULARIS (Vahl) Mett. *Polypodium rivulare* Vahl (1807).

Nephrodium guianense Desv. (1827). NEPHROLEPIS BISERRATA (Sw.) Schott. *Aspidium biserratum* Sw. (1801).—Desvaux's specimen is of the pubescent form and has unusually narrow pinnae.

Nephrodium Kunthii Desv. (1827).—Based wholly on *Aspidium patens* Kunth "excl. syn." Desvaux's specimen is a single pinna, obviously from a plant of the group of *Dryopteris patens*, but hardly to be accurately determined.

Nephrodium plumiferum Desv. (1827). DRYOPTERIS UNITA (L.) O. Ktze.—The South American locality is no doubt erroneous.

[1] Vid. Selsk. Skrift. ser. 7, x. 165 (1912).

Nephrodium Poiretii (1827).—Based on *Polypodium pubescens* sensu Poir., not L., but with an original description. Desvaux's specimen consists of part of a damaged pinna only and is not identifiable. It is not improbable that by search in the herbaria of Humboldt and of Poiret this fragment and that of *N. Kunthii* could be traced to the specimens from which they came and their identity determined. When that is done, Desvaux may prove to have anticipated some of the more recent segregates in the group of *D. patens*.

Nephrodium Raddii Desv. (1827). DRYOPTERIS FALCICULATA (Raddi) O. Ktze. *Aspidium falciculatum* Raddi (1819).—Desvaux's epithet was published as "raddi" but is spelled on the label as here given. *A. invisum* sensu Raddi, not Sw. is cited as a synonym, but Desvaux gives an original description with which his specimen agrees.

Neuropteris elegans Desv. (1827). SACCOLOMA ELEGANS Kaulf. (1820).—No specimen seen, but Desvaux's illustration leaves no doubt as to the identity of his plant. He does not cite Kaulfuss and gives an apparently original description, but may possibly have been transferring the latter's species.

NOTHOLAENA PERUVIANA Desv. (1827). *N. Brackenridgei* Baker (1868, in synon.); Maxon, Smithson. Misc. Coll. 65, no. 8. 7 (1915).

Notholaena Tectaria Desv. (1827). N. SINUATA (Lag.) Kaulf. *Acrostichum sinuatum* Lag. (1806).—A form with the lower pinnae distinctly petiolulate, the older rhizome-scales very dark brown and subsclerotic and those of the lamina with fewer and shorter cilia than usual.

Ophioglossum pedunculosum Desv. (1811).—Certainly not the Old World relative of *O. reticulatum* to which Prantl applied the name. The specimens appear to represent a broad-leaved form of the group of *O. ellipticum;* for its certain placing, critical study with more material than is at present available in America, or perhaps anywhere, is needed.

Phorolobus domingensis Desv. (1827).—Type not seen. The description might have been drawn from Plumier's plate.

Polypodium abruptum Desv. (1827). DRYOPTERIS PYRAMIDATA (Fée) Maxon. *Goniopteris pyramidata* Fée (1866). Not *Dryopteris abrupta* (Kze.) O. Ktze. (1891).

Polypodium ambiguum Desv. (1827).—Type not seen.

POLYPODIUM ARTICULATUM Desv. (1827). *P. Caceresii* Sod. (1893). —A good species of the group of *P. fraxinifolium,* characterized by its few, relatively broad pinnae and its lanceolate, entire, long-acuminate,

clathrate, somewhat iridescent, grayish-brown rhizome scales, which are 8 mm. long.

Polypodium avenium Desv. (1814). P. PERCUSSUM Cav. (1802).—Reduced by Desvaux himself in the Prodrome.

Polypodium barbatum Desv. (1827). DRYOPTERIS PULVERULENTA (Poir.) C. Chr. *P. pulverulentum* Poir. (1804). *D. Karsteniana* (Klotzsch) Hieron.

Polypodium cajanense Desv. (1811). P. CILIATUM Willd. (1810).

POLYPODIUM CAPILLARE Desv. (1811). *P. graveolens* Baker (1877).—Desvaux's label gives the habitat as Jamaica. Maxon's suggestion[1] that *P. capillare* might be the same as *P. graveolens* proves entirely correct.

Polypodium caribaeum Desv. (1811). DRYOPTERIS SUBINCISA (Willd.) Urban. *Polypodium subincisum* Willd. (1810).—The scales in Desvaux's specimen are definitely not toothed; otherwise it is good *D. subincisa*.

Polypodium contractum Desv. (1827). DRYOPTERIS SPECTABILIS (Kaulf.) C. Chr. *Polypodium spectabile* Kaulf. (1824).—Desvaux's label gives the habitat as "in regno chilense," not Peru, as in the Prodrome.

Polypodium cordatum Desv. (1827). P. TECTUM Kaulf. (1824).

Polypodium elongatum Desv. (1827). P. PERCUSSUM Cav. (1802).—A narrow-fronded form, the lamina 26 cm. long by 2 cm. wide.

Polypodium excelsum Desv. (1827). DRYOPTERIS EXCELSA (Desv.) C. Chr., as defined in Dansk. Vidensk. Selsk. Skrift. ser. 8, vi. 54 (1920).

Polypodium funiculosum Desv. (1827). P. LYCOPODIOIDES L. (1753).—The label gives Porto Rico as habitat. Desvaux applied the name *P. lycopodioides* to *P. vacciniifolium* L. & F.

Polypodium giganteum Desv. (1827).—Type not seen.

Polypodium glandulosum Desv. (1811). *Dryopteris glandulosa* (Desv.) C. Chr. (1913), not O. Ktze. (1891).—Christensen's combination is, of course, quite untenable; but I am not, at present, able to select a certain substitute. According to Christensen's synonymy, *Phegopteris Plumieri* J. Sm. (1854) would be the earliest available name; it was, however, very sketchily published and seems to have been based wholly on Plumier's plate 21, of dubious identity. Until it can be ascertained whether there exists anything to fix the application of Smith's name, it had best be left in abeyance. Much more authentic is *Goniopteris rostrata* Fée (1866) from Guadeloupe. This is adequately

[1] Contr. U. S. Nat. Herb. xvii. 600 (1916).

described, well illustrated and based on a cited specimen; and, though Desvaux gave no locality for his type except "Antilles," it is likely to have come, like Fée's, from the French islands. Fée's name should probably be taken up; but the group is somewhat critical and actual comparison of authentic material is desirable.

Polypodium heteroclitum Desv. (1811). DRYOPTERIS HETEROCLITA (Desv.) C. Chr.—The label gives Jamaica as habitat. The type sheet contains two fronds, the larger and more pubescent of which is, from the description, the type of *P. heteroclitum;* the other, though not directly so labelled, almost certainly represents *P. involutum* Desv. Desvaux himself (Prod. 239) reduced the latter to *P. heteroclitum.*

Polypodium hirsutum Desv. Gesell. Naturf. Freunde Berlin Mag. v. 317 (1811). HEMITELIA **hirsuta** (Desv.), n. comb. *H. Parkeri* Hook. (1844).

Polypodium hirtisorum Desv. (1811). P. PILOSELLOIDES L. (1753).

Polypodium involutum Desv. (1811). DRYOPTERIS HETEROCLITA (Desv.) C. Chr., which see.

Polypodium jamaicense Desv. (1811). DRYOPTERIS CONCINNA (Willd.) O. Ktze. *Polypodium concinnum* Willd. (1810).

Polypodium Kunthii Desv. (1827).—The type consists of a bit of rather stout repent rhizome and two fertile fronds. The former is densely covered with linear-attenuate, hair-tipped, remotely serrulate scales, brown at base, whitish above, with narrow, elongate cells. The lamina is not glabrous, as described, but bears on the lower surface scattered, whitish scales with deeply lacerate-fimbriate, broad, peltate base abruptly contracted into a long, filiform tip. There are filiform scales among the sporangia. The plant is not *P. rosmarinifolium* HBK., to which species it is referred in the Index Filicum; it appears to be nearer to *P. ciliatum*, but I cannot, at present, place it definitely.

Polypodium lanigerum Desv. (1811).—This also I am unable to place exactly. It belongs in the group of *P. sericeo-lanatum* and is very likely a good species, as Mettenius supposed. I have not seen the material which he referred to it, but his description calls for a lanceolate or oblong-lanceolate lamina 3–8 inches long and for sparsely setose sporangia. Desvaux correctly describes his plant as having a linear lamina 18 inches long; and the sporangia are not setose. It seems, therefore, doubtful if Mettenius interpreted the species correctly. It certainly is not his *P. concinnum*, which is given as a synonym in the Index Filicum.

Neither Desvaux's specimen nor the much more ample sheet of Dombey has a rhizome. Among the specimens I have seen, one in the United States National Herbarium collected by Sodiro at Pichincha in August, 1901, and distributed as *P. dependens*, best matches Desvaux's type.

POLYPODIUM MEGALOPHYLLUM Desv. (1827).—Desvaux's sheet contains only a drawing and a manuscript diagnosis; another sheet labelled by him, which should serve as type, contains a good specimen, said to have come from Rio Negro, Brazil. The current application of the name (= *P. Schomburgkianum* Kze. (1842)) is correct.

Polypodium microdontum Desv. (1811). ALSOPHILA MICRODONTA Desv.—Correctly interpreted as the equivalent of *A. ferox* Presl. The type is labelled as from Cayenne.

Polypodium microlepidum Desv. (1827). P. PERCUSSUM Cav. (1802).—A luxuriant state.

POLYPODIUM MONOSORUM Desv. (1811).—Correctly interpreted in the Index Filicum as equivalent to *P. onustum* Hook. (1845). Desvaux's specimen is a single well-developed pinna; he refers on the label to another specimen in the herbarium of Jussieu.

Polypodium nitens Desv. (1827). DRYOPTERIS NITENS (Desv.) C. Chr. Dansk. Vidensk. Selsk. Skrift. ser. 7, x. 142 (1913) (which see).

POLYPODIUM PERUVIANUM Desv. (1827).—Correctly interpreted by Hooker & Greville (to whom Desvaux sent a specimen) and by subsequent authors.

Polypodium Plumieri Desv. (1811). DRYOPTERIS OPPOSITA (Vahl) Urban. *P. oppositum* Vahl (1807).

POLYPODIUM REMOTUM Desv. (1827). *P. leucosticton* Kze. sens. strict. (1847).—*P. leucosticton* has been treated in rather a broad sense[1] and several segregates from it may well be recognized. Desvaux's specimen, however, is typical *P. leucosticton*, at least as that is now understood by Maxon.

Polypodium resiniferum Desv. Gesell. Naturf. Freunde Berlin Mag. v. 317 (1811). DRYOPTERIS **resinifera** (Desv.) n. comb. *Nephrodium panamense* Presl, Rel. Haenk. i. 35 (1825). *D. panamensis* (Presl) C. Chr. Dansk. Vidensk. Selsk. Skrift. ser. 7, iv. 292 (1907).

Polypodium retrofractum Desv. (1827). P. CHNOODES Spreng. (1822).

Polypodium runcinatum Desv. (1827).—Type not seen.

POLYPODIUM SESSILIFOLIUM Desv. (1827). *P. surucuchense* Hook. (1837).—Desvaux's name has been applied in this sense, quite

[1] See Maxon, Contr. U. S. Nat. Herb. xvii. 572 (1916).

correctly, by Hieronymus.[1] The epithet was published as "sessifolium," but was corrected on the label of the type specimen.

Polypodium Sloani Desv. (1827). DRYOPTERIS REPTANS (Gmel.) C. Chr. *Polypodium reptans* Gmel. (1791).

Polypodium sparsisorum Desv. (1811).—Type not seen. Perhaps not American; the habitat is queried in the original publication.

Polypodium venosum Desv. (1811). P. LYCOPODIOIDES L. (1753).—Of the three specimens on the type sheet, only one has the venation obvious; the others are indistinguishable from the type of *P. funiculosum*. In view of the description, the specimen first mentioned should be taken as the type of *P. venosum*. It is the continental form of *P. lycopodioides*, once segregated by Maxon as *P. prominulum*, but later reduced by him. Even if the species be revived, Desvaux's name cannot be used because of *P. venosum* Lour. (1790).

Polypodium venustum Desv. (1811).—A plant of the section *Eupolypodium* which I cannot definitely place. The type consists of an apparently young plant with short, erect rhizome and 3 cespitose fronds. The rhizome-scales are linear-attenuate, filiform-tipped, entire, blackish or dark brown, without pale margins; their cells are narrow and elongate. The lamina is decurrent as a narrow wing or line nearly or quite to the base of the stipe; it is villous with soft, articulate, many-celled hairs. Stipe, rachis and costae are fuscous-castaneous beneath, at least in the older fronds. The veins are once forked. There are hairs among the sporangia, but these are apparently not setose. *Johnston* 167 from Margarita Island, distributed as *P. elasticum*, is apparently the same. The type is accompanied by a slip reading "Antilles."

Pteris acuminata Desv. (1811).—Type not seen. Referred by Maxon[2] to *P. pungens* Willd. (1810), with which Desvaux compared it.

PTERIS CHILENSIS Desv. (1811).—Type not seen, but the species seems to have been correctly interpreted by Hooker and subsequent authors.

PTERIS CORIACEA Desv. (1827).—Correctly interpreted.

Pteris latiuscula Desv. (1827). PTERIDIUM LATIUSCULUM (Desv.) Hieron.—Correctly applied to the common bracken of northeastern North America. The type specimen is accompanied by a ticket, perhaps in La Pylaie's hand, bearing an unpublished varietal name and the habitat "T[erre] N[euve]et St. Pierre."

Pteris lonchitoides Desv. (1827). LONCHITIS HIRSUTA L. (1753).—A glabrate form.

[1] Hedwigia, xlviii. 263 (1914).

[2] Sci. Surv. Porto Rico and Virgin Isl. vi. 434 (1926).

Pteris notholaenoides Desv. Mém. Soc. Linn. Paris vi. 298 (1827). CHEILANTHES **notholaenoides** (Desv.) Maxon, n. comb. *Cheilanthes micromera* Link, Hort. Berol. ii. 36 (1833).—Dr. Maxon, who had already worked out the identity of Desvaux's species, kindly allows me to publish his new combination.

Pteris ovata Desv. Mém. Soc. Linn. Paris vi. 301 (1827). PELLAEA **ovata** (Desv.), n. comb. *Pteris flexuosa* Kaulf. ex Schlecht. & Cham. Linnaea, v. 614 (1830). *Pellaea flexuosa* (Kaulf.) Link, Fil. Sp. 60 (1841).—An unfortunate, but unavoidable, change of name. Desvaux's type is a young, but unmistakable, specimen.

Pteris pectinata Desv. (1811).—Type not seen.

Pteris pilosiuscula Desv. (1827). P. DECURRENS Presl (1822).

Pteris reticulata Desv. (1811).—Type not seen.

Pteris siliculosa Desv. (1811).—Type not seen. It may be remarked, however, that although Hooker[1] referred Desvaux's species to the Asiatic *Onychium auratum* Kaulf. and has been generally followed, the habitat "America australis" may possibly be correct. There is in northern Chile a species of *Cryptogramma*, not known to Hooker and little known even now, described by Philippi as *Pellaea fumariaefolia*, which Desvaux may conceivably have had.

Pteropsis elongata Desv. (1827).—Type not seen.

Pteropsis vittarioides Desv. Mém. Soc. Linn. Paris vi. 219 (1827). VITTARIA **vittarioides** (Desv.), n. comb. *V. Ruiziana* Fée, Mém. Fam. Foug. iii. 16, t. 3, fig. 3 (1851–52).

Salvinia affinis Desv. (1827).—Type not seen. Probably correctly referred to *S. auriculata* Aubl.

TRICHOMANES ARBUSCULA Desv. (1827). *T. Bancroftii* Hook & Grev.—Correctly applied in current literature.

Trichomanes brasiliense Desv. (1827).—The type sheet contains specimens of two species, both of the general habit of *T. pyxidiferum*. One has a bit of rhizome with short and inconspicuous trichomes, bearing two fronds with spreading pinnae. The leaf-tissue is rather thick and dark-olivaceous; the rachis and costae are fuscous. The cells are nearly isodiametric and thick-walled. The indusia are subcylindric, about 1.8 mm. long by 0.5 mm. wide at the base of the spreading limb, which is about 0.3 mm. wide.

The other specimen consists of a bit of rhizome with abundant blackish trichomes and one frond. This has a stipe 2 cm. long and a lamina 6.5 cm. long, with the pinnae ascending. The leaf-tissue is pale-olivaceous, rather thin, with isodiametric to short-oblong,

[1] Sp. Fil. ii. 121 (1858).

rather thin-walled cells; the rachis and costae are concolorous. The indusia are shorter and proportionately broader than in the other specimen, about 1.2 mm. long by 0.4 mm. wide, with a spreading limb about 0.4 mm. wide.

There is nothing in Desvaux's description to show from which of his specimens it was taken; his figure, however, (Mém. Soc. Linn. Paris vi. t. VII, fig. 4) was clearly drawn from the first mentioned. That specimen should be taken as the type. This was van den Bosch's conception of the species; he determined as *T. brasiliense* a like specimen from Trinidad, coll. *Crueger*, now at Kew. Further comparison of authentic material will probably show Desvaux's species to be identical with *T. eximium* Kze. (1847), treated by Hieronymus[1] as a variety of *T. diaphanum* HBK. (1825).

The second specimen agrees well with one from the Serra do Mar, Paraná, coll. *Dusén*, Nov. 7, 1914, no. 665a, and determined by Christensen as *T. emarginatum* Presl.

Trichomanes compressum Desv. (1811). T. RIGIDUM Sw. (1788).—According to its label, the type came from Hispaniola.

Trichomanes elatum Desv. (1827). T. DACTYLITES Sod. (1893). Not *T. elatum* Forst. (1786).

Trichomanes longifolium Desv. (1811).—Type not seen.

Trichomanes millefolium Desv. (1827). T. ELEGANS Rich. (1792).—The type is a small specimen; Desvaux himself, on a later label, referred it to *T. elegans*.

TRICHOMANES PEDICELLATUM Desv. (1811).—Correctly interpreted in current literature as equivalent to *T. brachypus* Kze. (1834).

Trichomanes quercifolium Desv. (1811). T. POLYPODIOIDES L. (1753).—The type sheet contains three specimens, labelled as from Cayennne, St. Thomas and Porto Rico respectively. All are *T. polypodioides*.

Trichomanes spicisorum Desv. (1811). T. OSMUNDOIDES DC. ex Poir. (1808).—So reduced by Desvaux himself in the Prodrome.

TRICHOMANES TRIGONUM Desv. (1811).—Correctly interpreted as equalling *T. Kaulfussii* Hook. & Grev.

Trichomanes venustum Desv. (1827). T. RUPESTRE (Raddi) v. d. B. *Hymenophyllum rupestre* Raddi (1825).—The type represents a form with rather narrow segments.

[1] Engler, Bot. Jahrb. xxxiv. 424 (1904).

5. A NEW MEXICAN CAREX

By C. A. Weatherby

Carex Mackenziana, sp. nov. Caespitosa, rhizomate breve. Culmi 6–10 dm. alti basin versus crassi superne tenuiores laeves folia valde superantes. Folia pluria basin culmi versus aggregata glabra, vaginis laxis castaneo-tinctis, laminis 10–30 cm. longis 5–6 mm. latis planis longe acuminatis siccatis multi-striatis margine nervisque primariis scaberulis; folium unicum minus 9–15 cm. longum 3–4 mm. latum in medio culmo insidens. Spicae 3–5 supremis totius masculis vel flores femineos paucos irregulariter positos gerentibus exceptis androgynae lineari-cylindraceae 3–5 cm. longae 4–6 mm. diametro, inferiores late distantes singulae pendulae, superiores approximatae interdum geminatae adscendentes, pedunculis gracillimis ad 4 cm. longis. Bractea ima vagina 4–5 cm. longa clausa paene ad orificem herbacea, lamina anguste lineari ad. 8 cm. longa ornata; bracteae superiores similes sed reductae, omnes laminiferae. Squamae oblongo-ovatae acutae obtusiusculae vel breviter mucronatae perigynia subaequantes stramineae vel albidae hyalinae, vitta mediana viridi trinervata. Perigynia 30–50 ellipsoidalia vel subobovoidea 3.5–4 mm. longa c. 1.75 mm. lata prominenter binervata, lateribus enervia vel leviter pauci-nervata, basi achaenium laxe amplectentia siccata sicut alata, apice in rostrum 0.5–0.75 mm. longum laeve demum bidentatum subabrupte desinentia, obscure puncticulata sparse strigoso-puberulentia vel glabrescentia angulis ciliolata. Stigmata tria fusca gracilia elongata. Achaenia ovoidea c. 2.5 mm. longa 1.5 mm. lata flavescentia trigona laevia basi rotundata apice lata apiculata, lateribus concavis.

MEXICO: State of Nuevo Leon: common in moist oak wood, Sierra Madre Oriental about 15 miles southwest of Galeana, June 28, 1934, *C. H. & H. T. Mueller*, no. 892.

In its long-sheathing lower bract, and rather slender, drooping androgynous spikes, this species seems clearly a member of Mackenzie's series *Viridiflorae*, most nearly allied to *C. perlonga* Fernald. From that species it differs in several characters—the smooth sheaths; the comparatively thick, short, usually single spikes, the lowest very remote; the ellipsoid and short-beaked somewhat puberulent perigynia about equalling the scales; and the slender, elongate, dark stigmas.

Mr. Mackenzie's key to the series *Viridiflorae* may be thus rewritten to include *C. Mackenziana*.

Culms loosely cespitose, the rhizome elongate; perigynia scarcely beaked . . . . . *C. pertenuis.*
Culms densely cespitose from a short rootstock; perigynia definitely beaked.
Principal leaf-blades 2–4 mm. wide, channeled above and more or less keeled below, sparsely short-hirsute; perigynium oblong-obovoid, the beak ciliate-serrulate . . . . . *C. viridiflora.*
Principal leaf-blades 3.5–5.5 mm. wide, flat, glabrous; pergynium-beak smooth.
Sheaths hispidulous; spikes 8–12 cm. long; perigynia spindle-shaped, glabrous, with beak 1.5 mm. long . . . . . *C. perlonga.*
Sheaths smooth; spikes 3–5 cm. long; perigynia ellipsoid, sparsely puberulent, the beak 0.5–0.75 mm. long . . . . . *C. Mackenziana.*

It is surely appropriate to dedicate to the late Mr. Mackenzie a well-marked species in the genus with which he worked so long and to the understanding of which he added so much.

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6. NOTES ON NOMENCLATURE IN IRIDACEAE

By Robert C. Foster

These notes embody a number of nomenclatural changes in *Iridaceae,* changes, for the most part, made necessary either by the priority rule or by the rule concerning later homonyms within a genus. A rigid application of this latter rule will, perforce, result in many alterations of specific names. Where the earlier name belongs to a plant which is a valid species, there seems no legitimate objection to changing the later name. On the other hand, where the earlier homonym is recognized as a synonym, it seems unfortunate that the later-named plant must be renamed, or that the use of the specific name is barred within a genus. For example, in 1787 Thunberg transferred *Ferraria undulata* L. to *Moraea,* a change which has been unacceptable to later workers. Yet, this brief and incorrect sojourn in *Moraea* will, under the present rules, prevent the use of the specific name *undulata* for any species of *Moraea.*

By no means all the errors discovered are considered here. It has not yet been possible to investigate some as fully as is necessary. In other cases, taxonomic study seems desirable before changing names. A hasty survey of *Gladiolus* showed the presence of nearly fifty later homonyms in that genus. They are not treated here, since the genus is being monographed by Mrs. Louisa Bolus. In so large and difficult a group it seems especially preferable to make nomenclatural changes only after taxonomic study. Finally, since taxonomic studies have not been possible, changes in status have been avoided in the present work.

For friendly criticism and assistance during the course of this work, I am particularly indebted to Professor M. L. Fernald, Mr. C. A. Weatherby, and Miss Marjorie W. Stone of the Gray Herbarium.

1. HELIXYRA

The late N. E. Brown, in 1929, revived and characterized the genus *Helixyra* of Salisbury, making eight new combinations and describing four new species, Trans. Roy. Soc. S. Afr. xvii. 348–350. When Salisbury erected the genus *Helixyra*, in Trans. Hort. Soc. Lond. i. 305 (1812), he placed in it only one species, *H. flava* Salisb. Neither genus nor species was described, but the latter was merely a new name given to the plant which Ker had previously described as *Moraea longiflora*, Bot. Mag. t. 712 (1804), this name being cited as a synonym of *H. flava*. The change in specific name was, of course, unwarranted. In addition, *M. longiflora* Ker was published without the generic characterization usually provided for these plates. In its place, reference was made to three earlier figures of *Moraea* in the Botanical Magazine, namely, *M. flexuosa* Linn. f., t. 695 (1803), *M. edulis* (Linn. f.) Ker, t. 613 (1803), and *M. unguiculata* Ker, t. 593 (1802). Of these, only the last-named plate contained a generic characterization of *Moraea* Mill., at least as Ker understood that genus, in part. Under the circumstances it seems impossible to argue that *Helixyra* was validly published by reference to a "previously and effectively published description of the genus under another name," Internat. Rules Bot. Nomencl. (ed. 3), Art. 42 (2). If such a position should be maintained, however, *Helixyra* still remains invalid. In giving the generic character for *M. unguiculata*, Ker specifically made the genus *Vieusseuxia* of De la Roche, Descr. Pl. Nov. 31 (1766), synonymous with it and its immediate relatives. A generic character applicable to *M. unguiculata*, whether *Vieusseuxia* be regarded as a separate genus or as a subgenus of *Moraea*, cannot also be applicable to *M. longiflora* and used to validate *Helixyra*. For, as Salisbury correctly recognized, *M. longiflora* is generically distinct from *Moraea*. Since *M. unguiculata* and *M. longiflora* are not congeneric, we have here the reverse of the situation mentioned, not the same genus under another name, but a different genus under the same name. Because of this generic distinction, too, the third portion of Article 42 cannot be used to validate *Helixyra*. Finally, since, Salisbury was not describing a new species, it does not seem possible to use Article 43 to validate the name.

For over a century, until 1929 apparently, the name *Helixyra* has

been used for a subgenus of *Moraea*, containing, among other species, *M. longiflora* Ker. This has been done by Baker in Journ. Linn. Soc., Bot. xvi. 132 (1877), Handbk. Irid. 48, 57–58 (1892), and Flor. Cap. vi. 10 (1896), Bentham and Hooker, Gen. Pl. iii. 689 (1883), Pax in Engler and Prantl, Pflzfam. ii (5). 146 (1888), and Diels in Engler and Prantl, Pflzfam. (ed. 2) xva. 500 (1930). It should be noted that Baker in 1877 included *Moraea Sisyrinchium* (L.) Ker in this subgenus, making *Gynandriris* of Parlatore, Nuov. Gen. e Spec. Monocot. 49 (1854), synonymous with *Helixyra*, although in 1892 he treated *Gynandriris* as a portion of the genus *Iris*. Restoring generic rank to *Helixyra*, N. E. Brown (1929, l. c.), like Baker, made *Gynandriris* Parl. synonymous with *Helixyra*, after giving a detailed decription of the latter genus for the first time in its history, thus making it *Helixyra* Salisb. ex N. E. Brown.

On the score of nomenclature, Brown's treatment of *Helixyra* seems open to some criticism. In Journ. Linn. Soc., Bot. xlviii. 39 (1928), he used the name without characterization of the genus in making a new combination, *Helixyra setifolia* (Linn. f.) N. E. Br., a thing which he rectified in the following year by including *H. setifolia* (Linn. f.) N. E. Br. in his treatment of the genus. In this treatment, incidentally, he included the plant known variously as *Iris Sisyrinchium* L. or *Moraea Sisyrinchium* (L.) Ker, making the new combination, *H. Sisyrinchium* (L.) N. E. Br. He retained *H. flava* Salisb. as the type of the genus, ignoring the fact that this name apparently has no standing, having been improperly given to *Moraea longiflora* upon its transfer to *Helixyra* by Salisbury, and then made the valid new combination *H. longiflora* (Ker) N. E. Br., but kept both names as separate entities in his treatment of the genus.

More important still is the fact already mentioned, that he treated *Helixyra* Salisb. ex N. E. Br. and *Gynandriris* Parl. as synonymous. If this be correct, and it seems to be, the proper name for the genus is *Gynandriris*, since that is the first validly published generic name which properly includes the plant upon which Salisbury, and after him N. E. Brown, based the invalid genus *Helixyra*. On nomenclatural grounds the following treatment of the genus is proposed, without attempting a complete synonymy. Lack of material has prevented, for the time being, a taxonomic study of more than two species.

GYNANDRIRIS, Parlatore, Nuov. Gen. e Nuov. Spec. Piant. Monocot. 49 (1854). *Helixyra* Salisb., Trans. Hort. Soc. Lond. i. 305 (1812); nomen nudum; ex. N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 348 (1929).

GYNANDRIRIS SISYRINCHIUM (L.) Parl., l. c., 52, type of the genus. *Iris Sisyrinchium* L., Sp. Pl. i. 40 (1753). *Moraea Sisyrinchium* (L.) Ker in Kon. and Sims, Ann. Bot. i. 241 (1805). *Iris fugax* Tenore, Fl. Nap. i. 15, t. 4 (1811). *Diaphane edulis* Salisb., Trans. Hort. Soc. Lond. i. 304 (1812). *Moraea Tenoreana* Sweet, Brit. Flow. Gard. ii. t. 110 (1825). *Moraea fugax* Tenore, Fl. Nap. iv. 10 (1830).

G. **Burchellii** (Baker), comb. nov. *Moraea Burchellii* Baker, Handbk. Irid. 57 (1892). *Helixyra Burchellii* (Baker) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **cladostachya** (Baker), comb. nov. *Moraea cladostachya* Baker, Handbk. Irid. 58 (1892). *Helixyra cladostachya* (Baker) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **elata** (N. E. Br.), comb. nov. *Helixyra elata* N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **longiflora** (Ker), comb. nov. *Moraea longiflora* Ker, Bot. Mag., t. 712 (1804). *Helixyra flava* Salisb., Trans. Hort. Soc. Lond. i. 305 (1812). *Helixyra longiflora* (Ker) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **Mossii** (N. E. Br.), comb. nov. *Helixyra Mossii* N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 350 (1929).

G. **propinqua** (N. E. Br.), comb. nov. *Helixyra propinqua* N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **Rogersii** (Baker), comb. nov. *Moraea Rogersii* Baker, Handbk. Irid. 57 (1892). *Helixyra Rogersii* (Baker) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

In the same article in which this species was transferred from *Moraea* to *Helixyra*, Brown described another *Moraea Rogersii* N. E. Br., as a new species. This is, of course, a later homonym of Baker's species, and therefore it must be renamed, in the absence of a synonym:

MORAEA **trifida**, nom. nov. *Moraea Rogersii* N. E. Br. (non Baker), Trans. Roy. Soc. S. Afr. xvii. 344 (1929).

The name has been given because this species, as a member of the subgenus *Vieusseuxia*, on the authority of N. E. Brown, l. c., has petals which are tripartite in the upper portion.

GYNANDRIRIS **setifolia** (Linn. f.), comb. nov. *Iris setifolia* Linn. f., Suppl. 99 (1781). *Iris setacea* Thunb., Diss. Irid. 20, t. 1 (1782). *Moraea setacea* (Thunb.) Ker in Kon. and Sims, Ann. Bot. i. 240 (1805). *Moraea xerospatha* MacOwan ex Baker, Flor. Cap. vi. 529 (1897). *Moraea setifolia* (Linn. f.) Druce, Rep. Bot. Exch. Cl. Brit. Isles, 1916: 636 (1917). *Helixyra setifolia* (Linn. f.) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **simulans** (Baker), comb. nov. *Moraea simulans* Baker, Handbk. Irid. 58 (1892). *Helixyra simulans* (Baker) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **spicata** (N. E. Br.), comb. nov. *Helixyra spicata* N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **spiralis** (Baker), comb. nov. *Moraea spiralis* Baker, Handbk. Irid. 57 (1892). *Helixyra spiralis* (Baker) N. E. Br., Trans. Roy. Soc. S. Afr. xvii. 349 (1929).

G. **torta** (L. Bol.), comb. nov. *Moraea torta* L. Bol., S. Afr. Gard. xvii. 418 (1927). *Helixyra torta* (L. Bol.) T. T. Barnard, Iris Yrbk. (1932): 52 (Iris Society of England).

II. IRIS

IRIS AUREA Lindl. in Bot. Reg. xxxiii. t. 59 (1847).

This name was preceded by *I. aurea* Raf. in Atl. Journ. i. 80 (1830) and by *I. aurea* Link, Enum. Hort. Berol. i. 59 (1821). The former name was given to a variant of *I. Pseudacorus* L., while Link's name was apparently given to one of the innumerable color forms of *I. halophila* Pall. Lindley's plant, if specific status is to be retained, must be renamed I. CROCEA Jacquemont ex Baker (in synon.) in Gard. Chron. (II) vi. 584 (1876), which is the only synonym I have found.

IRIS TRIPETALA Walt., Fl. Carol. 66 (1788).

Seven years before the publication of Walter's species, the younger Linnaeus described an *Iris tripetala*, Suppl. 97 (1781). Although this was removed to *Moraea* by Ker, Bot. Mag. t. 702 (1803), it remains as a bar to Walter's name. The earliest synonym available is I. TRIDENTATA Pursh, Fl. Amer. Sept. i. 30 (1816).

IRIS FOLIOSA Mackenzie & Bush in Trans. Acad. Sci. St. Louis xii. 80 (1902).

This species, which is easily confused with *I. hexagona* Walt., is, in its most characteristic forms, undoubtedly distinct. It is necessary, however, to rename it I. BREVICAULIS Raf., Fl. Lud. 20, no. 55 (1817). This clear and unmistakable description of the plant now known as *I. foliosa* was amplified slightly by Rafinesque in his New Flora, part 2, p. 93 (1837). Unlike some of the other descriptions of *Iris* species given by Rafinesque, these are definite and recognizable.

IRIS NEPALENSIS D. Don, Prodr. Fl. Nep. 54 (1825).

One year before the description of Don's species, an *I. nepalensis* Wall. was described in Lindley's Botanical Register, t. 818 (1824). To judge from the figure and the description, this plant is merely a form of *I. germanica* L. In spite of certain differences in description and coloring, Don's plant seems conspecific with I. DECORA Wall., Pl. As. Rar. i. 77, 76 (1830), and probably should take that name as the earliest available synonym.

IRIS COERULEA B. Fedtsch. in Bull. Herb. Boiss. ser. 2, iv. 917 (1904).

This name is a later homonym of *I. coerulea* Spach, Hist. Veg. Phan. xiii. 50 (1846), a plant which does not seem separable from *I. pumila* L. As there seems to be no synonym available for Fedtschenko's species, I am renaming it

Iris **albomarginata,** nom. nov. *I. coerulea* B. Fedtsch. in Bull. Herb. Boiss. ser. 2, iv. 917 (1904), not Spach (1846).

The name has been chosen with reference to the white margins of the leaves, a characteristic of several of the species of the *Juno* section.

III. ACIDANTHERA

Acidanthera unicolor Hochst. ex Baker in Journ. Linn. Soc., Bot. xvi. 160 (1877).

I have been unable to trace this name beyond the date and reference given above. According to Baker, who gave no description, the name is based upon *Schimper*, no. 2304 of Schimper's Pl. Abyss. In this case, the name is invalid, unless two or more species were sent out under this number, since in Linnaea xxxiv. 697 (1866) Ascherson and Klatt described a *Tritonia Schimperi*, basing the species upon *Schimper*, no. 2304. As there seems to be no record of the previous use of the specific name *Schimperi* in *Acidanthera*, the plant accordingly becomes

Acidanthera **Schimperi** (Aschers. & Klatt), comb. nov. *Tritonia Schimperi* Aschers. & Klatt in Linnaea, xxxiv. 697 (1866).

Acidanthera gracilis Pax in Engler's Bot. Jahrb. xv. 154 (1893). This species is based upon *Hildebrandt*, no. 2015, the type from which Baker described *Acidanthera zanzibarica*, in his Handbk. Irid. 188 (1892). In spite of the priority of Baker's name, he himself placed it in the synonymy of *A. gracilis* Pax, in Flor. Trop. Afr. vii. 359 (1899), in which he was followed by Ind. Kew. Suppl. i. 5 (1902). Unless the generally accepted date of publication of Baker's Handbook of the Irideae is incorrect, the earlier name should be restored to use.

Acidanthera platysepala Baker in Journ. Bot. xiv. 339 (1876). In Flor. Cap. vi. 131 (1896), Baker gave as a synonym of this species *Gladiolus longicollis* Baker, which he had described in Journ. Bot. xiv. 182 (1876). If this species is indeed an *Acidanthera*, the earlier specific name must be restored, so that it becomes

Acidanthera **longicollis** (Baker), comb. nov. *Gladiolus longicollis* Baker in Journ. Bot. xiv. 182 (1876).

Ixia tubulosa Burm. f., Fl. Cap. Prodr. 1* (1768). Burmann's specimens were examined a few years ago by N. E. Brown, who re-

ported, Kew Bull. (1929): 137, that of the four, two are *Babiana tubulosa* (Burm. f.) Ker, Gen. Irid. 154 (1827), one is *Acidanthera flabellifolia* (De la Roche) N. E. Br., l. c., and one is *Acidanthera tubulosa* (Houtt.) N. E. Br., l. c.

In the original description, Burmann included two varieties, without separating them by name or by letter. The second mentioned, "foliis latioribus, petiolis foliorum longitudine contractis," with flowers "rufescentes maculis rubris," Brown takes as the type of the species, presumably because there are two specimens. Since it is a *Babiana*, he identified it with *Babiana tubulosa* (Burm. f.) Ker, which is correct, as Ker's reference, l. c., to Burmann shows. Of the two remaining specimens, Brown identified one as *Acidanthera flabellifolia* (De la Roche) N. E. Br., but the fourth, also an *Acidanthera*, could not be matched in the Kew Herbarium. It is this specimen which is the center of a nomenclatural tangle. Brown states that this is the plant from which fig. 2 of t. 78 in Houttuyn, Handleid. vol. 12 (1780) was drawn, the drawing being life-sized and very exact. Since it represents an *Acidanthera* and not a *Babiana*, Brown has named it *Acidanthera tubulosa* (Houtt.) N. E. Br. In his text, however, Houttuyn, l. c., p. 36, cites Burmann's description of *Ixia tubulosa*, showing that he was not describing a new *Ixia tubulosa*, but was reproducing Burmann's plant from one of Burmann's own specimens. This is further shown by the coloring of the flowers in the figure, which are "rufescentes maculis rubris," the coloring, that is, of the two specimens of *Babiana* which Brown regards as the type of *I. tubulosa* Burm. In other words, Houttuyn's plant is simply an incorrectly colored drawing of one of the four specimens upon which Burmann based his specific concept, *Ixia tubulosa*.

To segregate two species from one specific concept and give them the same specific name is clearly impossible. Since Ker was the first to use the name *tubulosa* in a new combination based upon Burmann's name, later segregates from Burmann's species cannot use that specific name, even if they are in different genera. The situation is further complicated by the fact that Baker, Journ. Linn. Soc., Bot. xvi. 160 (1877), Handbk. Irid. 186 (1892), and Flor. Cap. vi. 132 (1896), made a new combination, *Acidanthera tubulosa*, based on this same figure of Houttuyn. Brown, who has examined the specimens, states that the plant described by Baker is not the same as the Burmann specimen back of the Houttuyn figure, but is *Gladiolus exscapus* Thunb., Prodr. 184 (1800), which Baker had transferred to *Acidanthera* as *A. exscapa* (Thunb.) Baker in Berl. Monat. xix. 15 (1876). In

Flor. Cap. vi. 132 (1896), *A. exscapa* is made a synonym of *A. tubulosa* (Houtt.) Baker. This latter name is, of, course, open to the same objections nomenclaturally as Brown's *A. tubulosa*, and since it is, in addition, based upon a misidentification of the plant described with Houttuyn's figure, it is quite reasonable to accept Brown's suggestion that this be called *A. exscapa* (Thunb.) Baker, apparently the first legitimate synonym. At the same time, Brown's *A. tubulosa*, also, must be renamed, and no legitimate synonym seems available. My understanding of the nomenclature of the segregates from *Ixia tubulosa* Burm. f. is as follows:

BABIANA TUBULOSA (Burm. f.) Ker, Gen. Irid. 154 (1827). *Ixia tubulosa* Burm. f., Fl. Cap. Prodr. 1* (1768), in part.

ACIDANTHERA FLABELLIFOLIA (De la Roche) N. E. Br. in Kew Bull. (1929): 137. *Ixia flabellifolia* De la Roche, Descr. Pl. Nov. 20 (1766). *Ixia tubulosa* Burm. f., Fl. Cap. Prodr. 1* (1768), in part.

ACIDANTHERA **picta**, nom. nov. *Ixia tubulosa* Burm. f., Fl. Cap. Prodr. 1* (1768), in part; Houttuyn, Handleid. xii. t. 78, fig. 2 (1780). *Acidanthera tubulosa* (Houtt.) Baker in Journ. Linn. Soc., Bot. xvi. 160 (1877), and Handbk. Irid. 186 (1892), as to name, but not as to plant described. *Acidanthera tubulosa* (Houtt.) N. E. Br. in Kew Bull. (1929): 137.

This is Burmann's first variety, "foliis instar junci. . .Flores spicati distichi post evolutionem secundi in prima albescentes teneriores. . .; amborum tubi tripollicares filiformes," preceded by the diagnosis "spathis appressis lanceolatis, tubis florum filiformibus."

In accordance with Brown's suggestion, Baker's plant becomes

ACIDANTHERA EXSCAPA (Thunb.) Baker, Berl. Monat. xix. 15 (1876). *Gladiolus exscapus* Thunb., Prodr. 184 (1800). *Acidanthera tubulosa* (Houtt.) Baker in Journ. Linn. Soc., Bot. xvi. 160 (1877), and Handbk. Irid. 186 (1892) as to plant described.

IV. TRITONIA

GLADIOLUS LONGIFLORUS Linn. f., Suppl. 96 (1781); Thunb., Diss. Glad. 19 (1784).

Of the Thunbergian specimens of *Gladiolus longiflorus*, N. E. Brown, Journ. Linn. Soc., Bot. xlviii. 24–25 (1928), states that they are actually specimens of *Tritonia*, and proposes for them the name *Tritonia longiflora* (Linn. f.) N. E. Br., since *Tritonia longiflora* Ker, Kon. and Sims, Ann. Bot. i. 228 (1805), belongs in the genus *Ixia*. As Ker had made a valid new combination in 1805, bringing the specific name *longiflora* into the genus *Tritonia*, Brown's name is a

later homonym and cannot stand. The history of the two species involved in the name *Tritonia longiflora* appears to be as follows.

In 1805, Ker transferred an *Ixia longiflora* to *Tritonia*, referring only to Bot. Mag. t. 256. This figure, published in 1794 as *Ixia longiflora*, gives two synonyms: *Ixia longiflora* of Aiton's Hort. Kew. i. 58 (1789); and *Gladiolus longiflorus* Linn. f., Suppl. 96 (1781). Aiton described it as "Ixia foliis ensiformi-linearibus strictis, tubo filiformi longissimo," and gave as synonyms *Ixia longiflora* Berg., Cap. 7 (1767), *Ixia paniculata* De la Roche, Descr. Pl. Nov. 26 (1766), and *Gladiolus longiflorus* Linn. f., l. c., and Thunb., l. c. Upon which of these was Aiton's *I. longiflora* based? In the synonymy, Bergius' species was cited first; furthermore, its diagnosis and description are alone in calling the perianth-tube "filiformis," a point which Aiton mentions in his diagnosis. The other three writers cited by Aiton do not use this term either in diagnosis or description. Aiton's plant, then, is probably *I. longiflora* Berg.

Nor was Aiton alone in considering *I. longiflora* Berg. and *Gladiolus longiflorus* Linn. f. identical. Thunberg, l. c., p. 24, gives in the synonymy of his *G. longiflorus* the same three names which Aiton later cited in synonymy. Nevertheless, Thunberg said of his plant, l. c., p. 20, "Facies Ixiae, sed tubus curvus et situs limbi separat," and, as Brown found on examination of Thunberg's specimens, the plant in question is a *Tritonia*. On the other hand, from the detailed and careful description given by Bergius, it would appear that his plant is indeed an *Ixia*.

Thunberg, and Aiton following him, regarded *I. longiflora* Berg. and *I. paniculata* De la Roche as identical. De la Roche's description is somewhat less detailed than that of Bergius, but his figure seems carefully drawn and about life-sized. Bergius' description and De la Roche's figure agree so closely in detail that, *ex descr.*, it would appear that the two are the same. In that case, De la Roche's name has priority. Incidentally, *I. paniculata* was described, and, therefore, presumably figured, from living plants, according to De la Roche.

In view of the preëmption of the name *Tritonia longiflora*, the Linnaean and Thunbergian plant must be renamed upon its transfer to *Tritonia*, in the apparent absence of a legitimate synonym. Accordingly it becomes

TRITONIA **longituba**, nom. nov. *Gladiolus longiflorus* Linn. f., Suppl. 96 (1781); Thunb., Diss. Glad. 19 (1784). *Tritonia longiflora* (Linn. f.) N. E. Br. in Journ. Linn. Soc. xlviii. 25 (1928).

TRITONIA COOPERI Baker, Handbk. Irid. 192 (1892). In Journ.

Bot. xiv. 237 (1876), Baker described a *Morphixia Cooperi*, which is now known as *Ixia Cooperi* Baker, the change having been made by Baker himself, Handbk. Irid. 166 (1892). Before this was done however, the plant in question had been renamed *Tritonia Cooperi* (Baker) Klatt, Ergänz. 24 (1882), a validly published new combination. After transferring this plant to *Ixia* (of which *Morphixia* is now recognized as a subgenus), Baker described a new species, naming it *Tritonia Cooperi*, Handbk. Irid. 192 (1892), basing it upon *Cooper*, no. 3182. As a later homonym of *Tritonia Cooperi* (Baker) Klatt, *T. Cooperi* Baker must be renamed. Since there is apparently no synonym available, I have named it

TRITONIA **quinquenervata**, nom. nov. *Tritonia Cooperi* Baker, Handbk. Irid. 192 (1892).

TRITONIA ROSEA Klatt in Linnaea xxxii. 760 (1863). This is a later homonym of *Tritonia rosea* (Jacq.) Ait., Hort. Kew. i. 91 (1810), based upon *Gladiolus roseus* Jacq., Ic. ii. 261, Coll. v. 22 (1796), a plant which, after being placed in *Gladiolus*, *Tritonia*, *Montbretia*, and *Houttuynia*, seems to have settled down as *Acidanthera capensis* (Houtt.) Benth. ex Baker, Handbk. Irid. 187 (1892). *T. rosea* Klatt must be renamed and an available synonym seems lacking. Therefore, I am renaming it

TRITONIA **rubro-lucens**, nom. nov. *T. rosea* Klatt in Linnaea xxxii. 760 (1863).

IXIA UNDULATA Burm. f., Fl. Cap. Prodr. 1 (1768). This plant has been removed to *Tritonia* and named *T. undulata* (Burm. f.) N. E. Br., Kew Bull. (1929): 137, but there are difficulties involved in the acceptance of this. Baker had previously made the same combination, *T. undulata* (Burm. f.) Baker in Journ. Linn. Soc., Bot. xvi. 163 (1877), citing Burmann's plant and also *Ixia crispa* Linn. f., Suppl. 91 (1781) in synonymy. After examining specimens and considering Baker's synonymy, Brown stated that the plant named *T. undulata* (Burm. f.) Baker was indeed identical with *Ixia crispa* Linn. f., but was not identical with *Ixia undulata* Burm. f. He therefore transferred the Linnean plant to *Tritonia*, renaming it *T. Thunbergii* N. E. Br., since there was already a *T. crispa* (Linn. f.) Ker, based upon *Gladiolus crispus* Linn. f., Suppl. 94 (1781). The nomenclature should be as follows:

TRITONIA THUNBERGII N. E. Br. in Kew Bull. (1929): 137. *Ixia crispa* Linn. f., Suppl. 94 (1781). *Tritonia undulata* (Burm. f.) Baker in Journ. Linn. Soc., Bot. xvi. 163 (1877), and Handbk. Irid. 191 (1892), as to plant described.

TRITONIA UNDULATA (Burm. f.) Baker in Journ. Linn. Soc., Bot. xvi.

163 (1877), and Handbk. Irid. 191 (1892), as to name but not as to plant. *Ixia undulata* Burm. f., Fl. Cap. Prodr. 1 (1768). *Tritonia undulata* (Burm. f.) N. E. Br. in Kew Bull. (1929): 137.

V. IXIA

Ixia Rochensis (Ker) L. Bol. in Journ. Bot. lv. 133 (1929). This new combination was based upon *Tritonia Rochensis* Ker in Bot. Mag. t. 1503 (1812), and is a later homonym of *Ixia Rochensis* Ker in Bot. Mag. t. 598 (1802). *I. Rochensis* was transferred to *Geissorhiza* by Ker, in Kon. and Sims, Ann. Bot. i. 224 (1805), but its brief existence in *Ixia* will, nevertheless, force the renaming of *I. Rochensis* (Ker) L. Bol. In the absence of an available synonym I am naming it

Ixia **Bellendeni**, nom. nov. *Tritonia Rochensis* Ker, in Bot. Mag. t. 1503 (1812). *Ixia Rochensis* (Ker) L. Bol. in Journ. Bot. lvii. 133 (1929).

The specific name recalls John Bellenden Ker.

Ixia erecta Thunb., Diss. Ixia, 16 (1783). According to N. E. Brown, Journ. Linn. Soc., Bot. xlviii. 46 (1928), who has examined the Thunberg specimens, this plant is quite distinct from *Ixia erecta* Berg., Cap. 5 (1767), which is a synonym of *I. polystachya* L., Sp. Pl. i. 51 (1762). Since that is so, Thunberg's name is a later homonym and the plant is here renamed

Ixia **avellana**, nom. nov. *Ixia erecta* Thunb., Diss. Ixia, 16 (1783).

The name is given because of Thunberg's description of the bulb as "magnitudine avellanae."

Ixia ovata (Andr.) Sweet, Hort. Brit. (ed. 1) 499 (1827). The plant which in many treatments has been called *Geissorhiza excisa* (Linn. f.) Ker in Kon. and Sims, Ann. Bot. i. 223 (1805), based on *Ixia excisa* Linn. f., Suppl. 92 (1781), is apparently conspecific with *Ixia ovata* Burm. f., Fl. Cap. Prodr. 1 (1768). Although Burmann's name has been cited in the synonymy of *Ixia excisa* and *Geissorhiza excisa* since 1802 at least, it was not until 1906 that the plant was properly named *Geissorhiza ovata* (Burm. f.) Aschers. and Graebn., Synops. iii. 540 (1906). Burmann's name, however, stands as a bar to *Ixia ovata* (Andr.) Sweet, which is based upon *I. capitata* var. *ovata* Andr., Bot. Rep. i. t. 23 (1790). Apparently unaware that Sweet had made this change in status, Klatt made the same change to *Ixia ovata* (Andr.) Klatt, Ergänz. 62 (1882), basing it upon a reference to Andrews' plate. Sweet's name is here changed to

Ixia **conferta**, nom. nov. *Ixia capitata* var. *ovata* Andr., Bot. Rep. i. t. 23 (1790). *I. ovata* (Andr.) Sweet, Hort. Brit. (ed. 1) 499 (1827). *I. ovata* (Andr.) Klatt, Ergänz. 62 (1822).

VI. LAPEYROUSIA

LAPEYROUSIA MONTANA Hutchinson in Kew Bull. (1921): 403. This name is a later homonym of *L. montana* Klatt, Ergänz. 25 (1882). As there seems to be no available synonym, it is here renamed

LAPEYROUSIA **nigeriensis**, nom. nov. *L. montana* Hutchinson in Kew Bull. (1921): 403, not Klatt (1882).

LAPEYROUSIA MONTEIROI Baker in Flor. Trop. Afr. vii. 355 (1898). As a synonym of this species, Baker cites, l. c., *Anomatheca angolensis* Baker in Journ. Bot. xiv. 337 (1876). Obviously, the plant should not have been renamed in making the transfer to *Lapeyrousia*, and accordingly it becomes

LAPEYROUSIA **angolensis** (Baker), comb. nov. *Anomatheca angolensis* Baker in Journ. Bot. xiv. 337 (1876).

LAPEYROUSIA SETIFOLIA (Linn. f.) N. E. Br. in Journ. Linn. Soc., Bot. xlviii. 30 (1928). This name is based upon *Gladiolus setifolius* Linn. f., Suppl. 96 (1781); Thunb., Diss. Glad. 18 (1784). Since the transfer to *Lapeyrousia* was not made until 1928, however, N. E. Brown's name is a later homonym of *L. setifolia* Harms in Engler's Bot. Jahrb. xxx. 278 (1901). If the two species are distinct, it becomes necessary to rename *L. setifolia* (Linn. f.) N. E. Br. Search for an available synonym shows that Baker, Handbk. Irid. 170 (1892), placed *Gladiolus setifolius* Linn. f. in the synonymy of *Lapeyrousia divaricata* Baker, Journ. Bot. xiv. 337 (1876). If *G. setifolius* and *L. divaricata* are identical, and, in the absence of specimens, I am unable to consider this point, Baker's name must be used for the plant under discussion. That a name given to a species of *Lapeyrousia* in 1901 should force the abandonment of the same name for a species described in 1781 and shown, correctly, in 1892 to belong to *Lapeyrousia* is unfortunate, but under the present rules there is no alternative.

VII. MORAEA

MORAEA APHYLLA De Wildeman in Ann. Mus. Congo, ser. 4, ii. 21 (1913). This is a later homonym of *M. aphylla* Linn. f. Suppl. 99 (1781). I am renaming it

MORAEA **unifoliata**, nom. nov.

MORAEA AURANTIACA Baker in Fl. Trop. Africa vii. 575 (1898). This is a later homonym of *M. aurantiaca* A. Dietr. Sp. Pl. ii. 485 (1833) and since there seems to be no available synonym, I am renaming it

MORAEA **viscosa**, nom. nov. The new name refers to the fact that

the branches are viscous below the spathes, as Baker pointed out in his original description.

MORAEA GRACILIS Baker in Trans. Linn. Soc. ser. 2, i. 272 (1878). A new name must be found for this species, which is a later homonym of *M. gracilis* (Licht.) A. Dietr. Sp. Pl. ii. 478 (1833). With reference to the shape of the ovary, I suggest

MORAEA **clavata**, nom. nov.

MORAEA UNDULATA Ker, Gen. Irid. 43 (1827). This is a new name given by Ker to *Moraea crispa* Thunb., Diss. Mor. 13 (1787), apparently because of a new combination made by Ker in 1810. In that year, he transferred *Iris crispa* Linn. f., Suppl. 98 (1781), to *Moraea*, making it *M. crispa* (Linn. f.) Ker in Bot. Mag. t. 1284 (1810). Apparently, Ker reasoned that, since the specific name *crispa* had been first used by Linnaeus fil., it should take precedence over Thunberg's name, despite the fact that Ker's new combination bringing the Linnaean name into *Moraea* was not made for over twenty years after Thunberg had described his *M. crispa*. Since this is incorrect, Thunberg's plant should have its original name restored, *Moraea crispa* Thunb., non (Linn. f.) Ker.

Even if Ker had been correct in changing the name, his choice for a new name was unfortunate, since *M. undulata* Ker is a later homonym of *M. undulata* (L.) Thunb., Diss. Mor. 14 (1787), based upon *Ferraria undulata* L., Sp. Pl. ii. 1353 (1763). Thunberg's new combination has not been retained, and the plant is generally regarded as belonging in *Ferraria*. Nevertheless, its temporary stay in *Moraea* will prevent use of the specific name *undulata* for any species of *Moraea*.

Although Ker was incorrect in changing Thunberg's name, he was correct in transferring *Iris crispa* Linn. f. to *Moraea*, so that it is this plant which must be renamed. The first legitimate synonym seems to be MORAEA DECUSSATA Klatt, Ergänz. 33 (1882). Making *M. crispa* (Linn. f.) Ker a synonym, Klatt incorporated, almost verbatim, large portions of Ker's description of this plant in his own description.

VIII. MISCELLANY

ANTHOLYZA ZAMBESIACA Baker, Handbk. Irid. 232 (1892). It was pointed out by N. E. Brown, Trans. Roy. Soc. S. Afr. xx. 277 (1932), that this species was originally described from a mixture which included leaves of a species of *Vellozia*, a portion of the stem of some iridaceous plant, and flowers which are identical with those of *Antholyza magnifica* Harms, in Warb. Kunene-Zamb. Exped. 201 (1903).

In view of the identity of the flowers, Brown preferred to retain Baker's specific name in making the transfer to his new genus *Petamenes*, as *P. zambesiacus* (Baker) N. E. Br., l. c. Since that time, however, the adoption of the new rules for botanical nomenclature forces the rejection of names based upon mixtures. For that reason, this species must be renamed

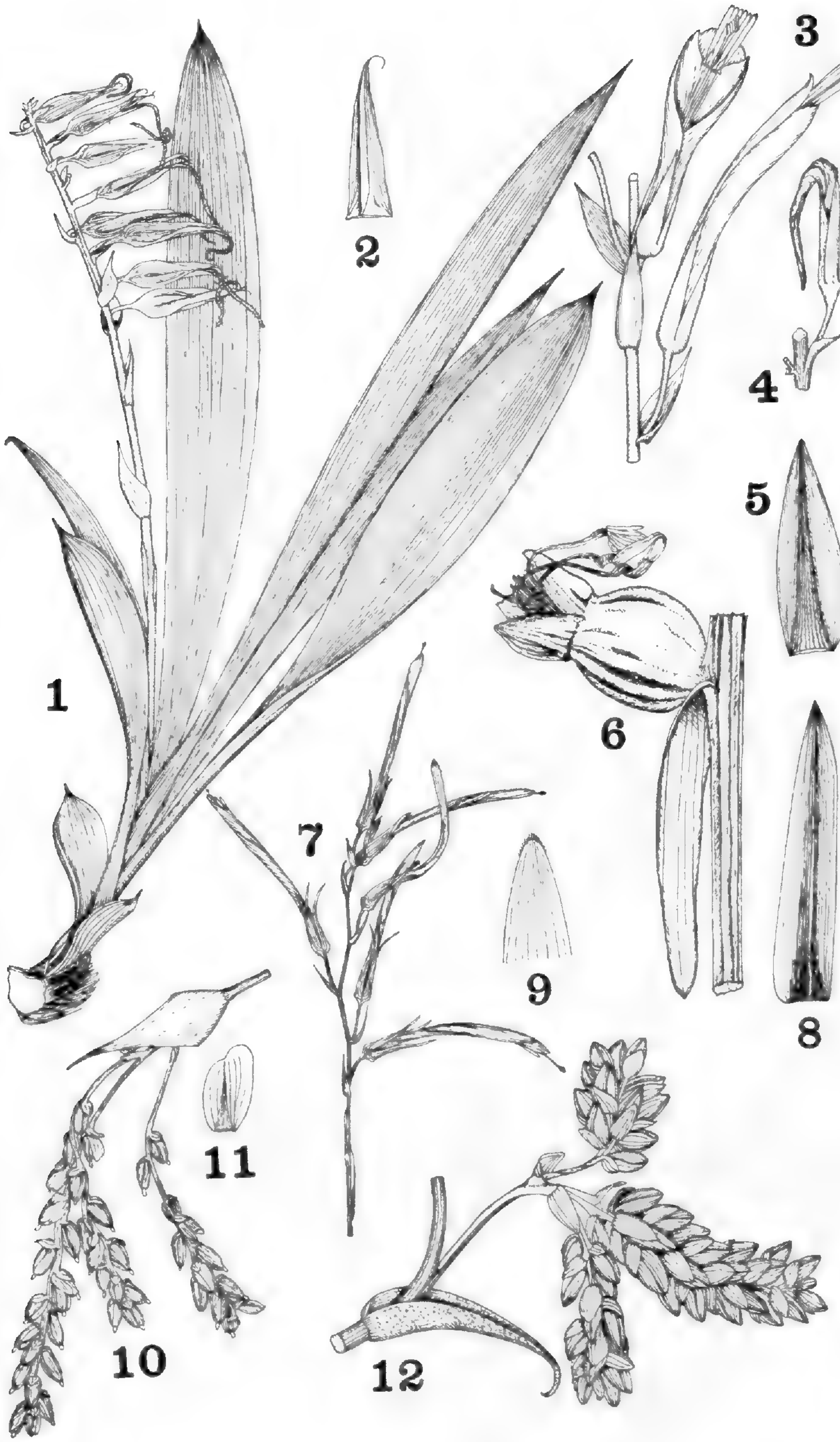
PETAMENES **magnifica** (Harms), comb. nov. *Antholyza magnifica* Harms, in Warb. Kunene-Zamb. Exped. 201 (1903). *Antholyza zambesiaca* Baker, Handbk. Irid. 232 (1892). *Petamene szambesiacus* (Baker) N. E. Br. in Trans. Roy. Soc. S. Afr. xx. 277 (1932).

ARISTEA CYANEA De Wild., Plant. Bequaert. i. 51 (1921). A later homonym of *A. cyanea* Ait., Hort. Kew. i. 67 (1789), this plant is here renamed

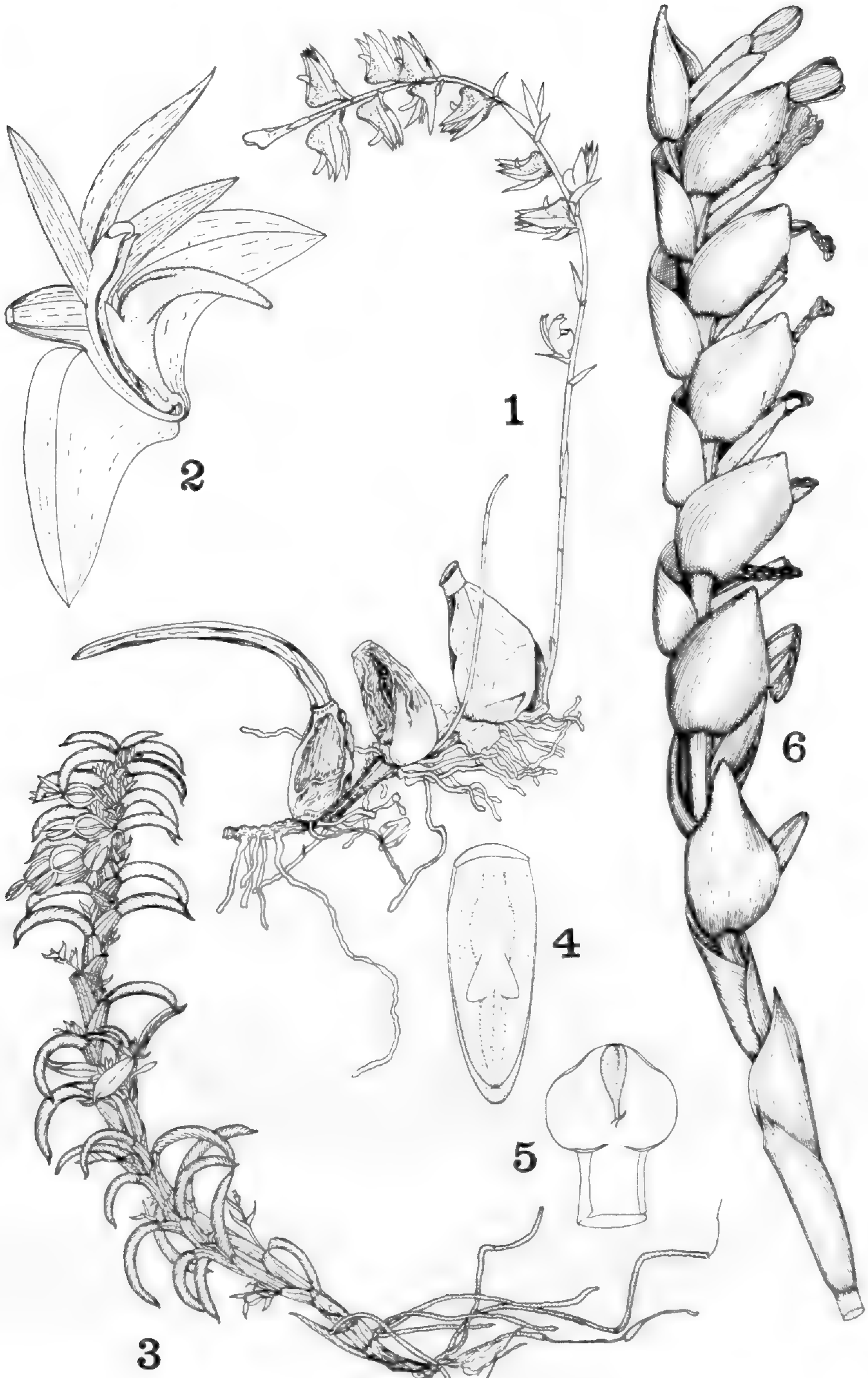
ARISTEA **stipitata**, nom. nov. *A. cyanea* De Wild., Plant. Bequaert. i. 51 (1921), not Ait. (1789).

GEISSORHIZA SCHLECHTERI Baker in Bull. Herb. Boiss. ser. 2, i. 863 (1901). This species was somewhat inadequately described from *Schlechter*, no. 4701, collected in the Transvaal. A sheet of this collection in the Gray Herbarium agrees with Baker's description, and is clearly not *Hesperantha Baurii* Baker, as labelled by the collector. Dissection of one of the flowers showed that the style-branches are about twice the length of the undivided style, indicating that the plant is a *Hesperantha*, as its collector believed. Accordingly, it becomes

HESPERANTHA **Schlechteri** (Baker), comb. nov. *Geissorhiza Schlechteri* Baker in Bull. Herb. Boiss. ser. 2, i: 863 (1901).



Figs. 1–2. PITCAIRNIA SECUNDIFLORA L. B. Sm.
Fig. 3. PITCAIRNIA AEQUATORIALIS L. B. Sm.
Figs. 4–5. PITCAIRNIA PUYOIDES L. B. Sm.
Fig. 6. BILLBERGIA MACROLEPIS L. B. Sm.
Fig. 7. PITCAIRNIA FLEXUOSA L. B. Sm.
Figs. 8–9. PITCAIRNIA HINTONIANA L. B. Sm.
Figs. 10–11. CATOPSIS MEXICANA L. B. Sm.
Fig. 12. CATOPSIS SUBULATA L. B. Sm.



Figs. 1–2. BULBOPHYLLUM TRICOLOR Sm. & Harris.
Figs. 3–5. PACHYPHYLLUM CARDENASII Sm. & Harris.
Fig. 6. VRIESIA HAPLOSTACHYA (Wright) L. B. Sm.

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CXV

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By M. L. FERNALD

DATES OF ISSUE

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PLANTS FROM THE OUTER COASTAL PLAIN OF VIRGINIA

M. L. Fernald

(Plates 440–452)

Continuing[1] our field work in easternmost Virginia, my companions and I made four brief excursions in 1935 to the outer Coastal Plain; and during the season of 1936, as the guests of my former student, Professor Robert F. Smart at the University of Richmond, we have, similarly, had four trips to the inner Coastal Plain, adjacent to the Piedmont region of the state. In this report the plants of special significance collected in 1935 are chiefly discussed; in a later paper those of 1936 will be considered.

Geologically, the Coastal Plain in the southeastern corner of Virginia has two sharply differentiated areas: west of the Dismal Swamp the region consists of Tertiary deposits, with beds of Miocene fossil shells underlying the superficial sands, clays and peats; east of the Dismal Swamp and south of the entrance to Chesapeake Bay the Tertiary beds are deeply buried under Quaternary sands and clays. The reflection in the flora of this difference in surface soils is vivid and will be more fully considered in a succeeding paper. There is, of course, a general floral similarity and the majority of species are identical in the two areas: *Pinus Taeda*,[2] *Taxodium distichum*, *Arundinaria tecta*, *Uniola laxa*, *Danthonia sericea*, *Tripsacum dactyloides*, *Cyperus pseudovegetus*, *ovularis* and *lancastriensis*, *Eleocharis simplex* and *tuberculosa*, *Rynchospora corniculata*, *cymosa* and *inexpansa*, *Carex styloflexa*, *abscondita* Mackenzie and *verrucosa*, *Xyris caroliniana* and *difformis*, *Commelina virginica*, *Juncus setaceus*, *debilis*, *scirpoides* and *marginatus*, *Smilax rotundifolia*, *Bona-nox* and *Walteri*, *Iris virginica*, *Habenaria cristata*, *Tipularia discolor*, *Saururus cernuus*, *Populus heterophylla*, *Carya alba* and *glabra*, *Myrica cerifera*, *Carpinus caroliniana*, *Betula nigra*, *Fagus grandifolia*, *Quercus alba*, *falcata*, *nigra*, *phellos* and *stellata*, *Morus rubra*, *Magnolia virginiana*,

[1] See Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189 (1935)—Contrib. Gray Herb. no. CVII. Also Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413, 423–554 (1935)—Contrib. Gray Herb. no. CIX.

[2] Authors are given only for names not in Gray's Manual.

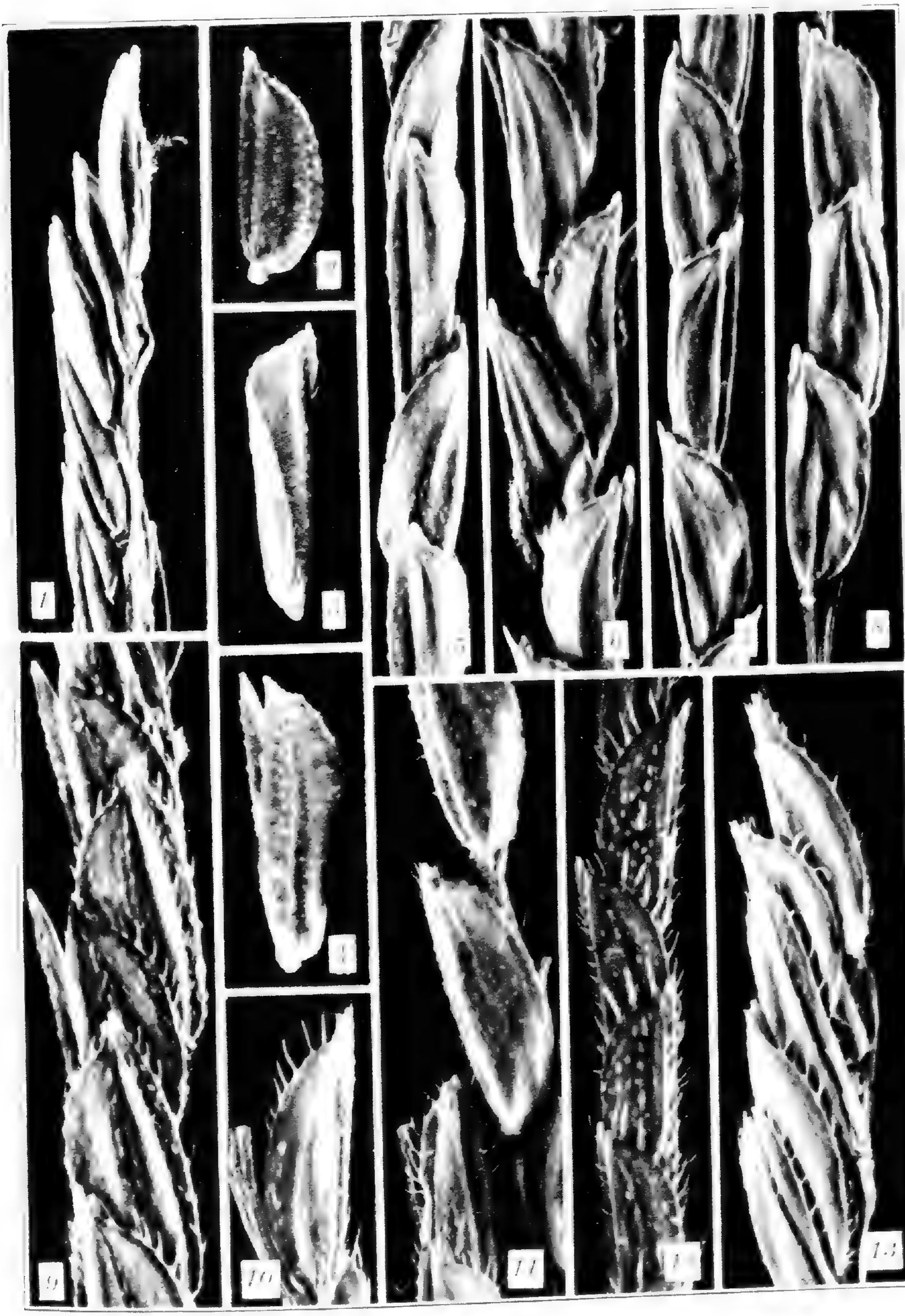

Photo. E. C. Ogden

Spikelets of LEERSIA VIRGINICA, × 10. FIGS. 1–8, typical L. VIRGINICA; FIGS. 3 and 4, from TYPE of the species; FIG. 5, from TYPE of L. IMBRICATA. FIGS. 9–13, var. OVATA.

Photo. E. C. Ogden.

FIG. 1. PANICUM DICHOTOMIFLORUM; FIG. 2, var. GENICULATUM; both × 2/5.

Itea virginica, Liquidambar Styraciflua, Rosa palustris, Tephrosia spicata, Desmodium nudiflorum, viridiflorum and *lineatum, Clitoria mariana, Centrosema virginianum, Polygala incarnata, Rhus copallina, Ilex glabra, Euonymus americanus, Berchemia scandens, Vitis rotundifolia, Hibiscus Moscheutos, Ascyrum stans, Hypericum petiolatum, Helianthemum canadense, Passiflora incarnata, Ludwigia alternifolia* and *glandulosa, Aralia spinosa, Cornus stricta, Nyssa aquatica, Oxydendrum arboreum, Vaccinium stamineum, Diospyros virginiana, Symplocos tinctoria, Fraxinus caroliniana, Gelsemium sempervirens, Sabatia angularis, Asclepias variegata, Ipomoea pandurata, Callicarpa americana, Scutellaria ovalifolia* Pers., *Monarda punctata, Mimulus alatus, Gratiola pilosa, Bacopa acuminata, Bignonia capreolata, Oldenlandia uniflora, Viburnum nudum, Lobelia puberula, Elephantopus nudatus* and *tomentosus, Eupatorium coelestinum, Chrysopsis graminifolia, Solidago pinetorum* Small, *Aster gracilis, Pluchea foetida, Helianthus atrorubens, Verbesina occidentalis* and *Pyrrhopappus carolinianus.* These and hundreds of others abound in their proper habitats both east and west of the Dismal Swamp.

To the eastward, on the outer half of the Coastal Plain in Norfolk and Princess Anne Counties, other scores of species are found which we do not know on the inner half of the Coastal Plain in Virginia or which are there highly localized. Some of these have been noted in two preceding papers; others are here to be specially discussed. This large flora, in Virginia restricted to or best developed in the two southeastern counties, includes such very characteristic plants as *Pinus serotina, Typha truxillensis* HBK., *Sagittaria falcata* Pursh, *Triglochin striata, Limnobium Spongia, Uniola paniculata, Sacciolepis striata, Cyperus Haspan, Eleocharis quadrangulata, Fimbristylis puberula* and *Baldwiniana* (Schultes) Torr., *Fuirena squarrosa, Rynchospora fascicularis* (Michx.) Vahl, *Cladium jamaicense* Crantz, *Scleria setacea* Poir., *Lemna valdiviana, Myrica pensylvanica* Loisel., *Quercus virginiana* and *cinerea* Michx., *Arenaria lanuginosa* (Michx.) Rohrb., *Ranunculus hederaceus* and *pusillus, Persea palustris* (Raf.) Sarg., *Drosera intermedia* Hayne, *Decumaria barbara, Crataegus Youngii* Sarg., *Linum medium* var. *texanum* (Planch.) Fern., *Zanthoxylum Clava-Herculis, Ilex vomitoria, Ampelopsis arborea, Viola pectinata, Ludwigia pilosa* Walt. and *brevipes* (Long) E. H Eames, *Eryngium aquaticum, Centella repanda* (Pers.) Small, *Vaccinium*

macrocarpon, *Sabatia gracilis*, *Asclepias lanceolata*, *Dichondra repens* Forst. var. *caroliniensis* (Michx.) Choisy, *Lippia nodiflora* and *lanceolata*, *Bacopa Monnieria* var. *cuneifolia* (Michx.) Fern., *Galium hispidulum*, *Lobelia elongata* Small, *Eupatorium serotinum*, *Erigeron vernus* and numerous others. Some of these are obviously controlled by proximity to the sea, but brackish water extends far up the James and its tributaries, nearly to the Fall Line, and dry white sands with plants characteristic of Cape Henry occasionally occur inland.

West of the Dismal Swamp, from Nansemond County to the Fall Line, the characteristic or distinctive plants are more numerous. In 1935 this area was only slightly examined, chiefly in the region of Kilby (west of Suffolk), but even in that brief half-day the contrast with Norfolk and Princess Anne Counties was striking, in the occurrence of such plants (not seen by us farther east) as *Polypodium polypodioides*, *Pinus echinata*, *Uniola latifolia*, *Gymnopogon ambiguus*, *Fuirena hispida*, *Scleria pauciflora*, *Uvularia puberula*, *Aletris farinosa*, *Hypoxis micrantha* Pollard, *Iris verna*, *Habenaria ciliaris*, *Malaxis n. sp.*, *Ulmus alata*, *Asarum virginianum*, *Psoralea pedunculata*, *Rhynchosia erecta* and *tomentosa*, *Polygala Curtissii*, *Lyonia mariana*, *Vaccinium virgatum* var. *tenellum*, *Solidago yadkinensis*, *Aster patens* and *linariifolius*, *Parthenium integrifolium* and *Arnica acaulis*. These species, all occurring westward into either Southampton, Greensville, Sussex, Dinwiddie, Prince George or Chesterfield County or into more than one of them, consequently belong to the very extensive flora more particularly examined in 1936, to be discussed in a later paper.

Our collecting trips in easternmost Virginia in 1935 were four. In May (4–8) Mr. Ludlow Griscom and I centered again at Virginia Beach and drove over as much territory in Princess Anne and Norfolk as the limited time would allow. Spring vegetation was in its prime, with some species already passed or passing, and again we were impressed by the Alleghenian element in the flora of these coastal counties, such inland plants as *Liparis liliifolia*, *Dentaria laciniata*, *Oxalis violacea*, *Galax aphylla* and *Carex digitalis* seeming almost out of place. *Carex* was already in good condition and we were able to extend the ranges northward into Virginia of *C. flaccosperma* and *C. folliculata* var. *australis* Bailey (*C. Smalliana* Mackenz.). *Arisaema* presented new problems for solution and some other questions arose, to be dealt with in this or in a subsequent series of studies with Mr. Griscom.

In June (16–21) Mr. Bayard Long was, happily, able to join us. The same general area, with a flora strikingly unlike the spring flowers of our earlier trip, was again covered. The rich woodlands of Great Neck and of Little Neck (projecting into Lynnhaven Bay) yielded further surprises, including a remarkable new *Juncus*, simulating *J. effusus*, but with the capsule strongly beaked as in the famously localized *J. gymnocarpus* Coville. A strange *Bumelia*, discovered by Griscom and me in young foliage in May, was now coming into flower (collected by Long and me in mature fruit in September). One of the most productive trips included a brief landing at the southern end of Cedar Island, in Back Bay. Here, bordering marshes characterized by *Phalaris caroliniana* Walt. and other good species, the low woods, cut off from the open Atlantic only by the sandy outer bar of False Cape, suggested bottomlands of the rich Alleghenian forest, with lush tangles of *Elymus villosus* Muhl. and other Alleghenian types. Most surprising, however, was the occurrence of *Iresine rhizomatosa* Standl., a species heretofore known only from the interior (Texas to Kansas, east to Alabama and western Maryland). Obviously, Cedar Island needs more attention.

In September (5–13) Griscom, unfortunately, was unable to join us but we had a happy substitute in Professor John M. Fogg of the University of Pennsylvania, who joined Long and me with his car at Virginia Beach. Although Griscom and I had centered here in September, 1933, when we covered only the immediate vicinity, subsequent visits had introduced us to many stations in Princess Anne and Norfolk Counties, where the late-summer and autumn-flowering *Compositae*, *Gramineae* and *Cyperaceae* were bound to be interesting. This proved to be the case and when we were obliged to leave it was with full realization of the many spots where real discoveries can yet be made.

During this trip we ventured westward into Nansemond County, as already noted, and returning to Philadelphia and Cambridge, we crossed from Norfolk (or Willoughby Neck) to Old Point, thence to Yorktown and Fredericksburg. This was new territory for us, but, realizing that the Peninsula of Virginia (between the lower James to the south and the lower York to the north) had been well studied by the late Earl J. Grimes and Mrs. Grimes (later Mrs. Erlanson), we expected no special novelties. Having two hours of daylight which could be used, we decided to look for an unspoiled spot near Hampton.

In this we were partly successful; at least the clearing and peaty thicket where we stopped had its original flora largely undisturbed and, quite unwittingly, we added a considerable number of local species to the lists of the Grimes's collections[1]: *Lycopodium alopecuroides*, *Andropogon Elliottii*, *Cyperus sabulosus* Mart. & Schrad., *Rynchospora cymosa*, *Lechea Leggettii*, *Helianthus angustifolius*, and a remarkable and very handsome new *Aster*, to be described toward the end of this paper—a good two-hour's gleaning. Nearby, in disturbed soil, the Asiatic *Arthraxon hispidus* var. *cryptantherus* (Hack.) Houda, new to Virginia, was abundant.

It was already twilight when we approached Yorktown; but we were tempted to take a look at one or two of the "bays" or peaty and sandy depressions in the woods. Such depressions seemed to us the counterparts of the kettle-holes of Cape Cod, doubtless of different origin but with resultant belts of similar wet and successively drier and drier sand. One was filled with the giant *Rynchospora corniculata*, not in any of the Grimes lists. Another (the only one we had time to search, on hands and knees in essential darkness), close to the road, made us think of Cape Cod, through the abundance of *Stachys hyssopifolia*, not in the Grimes lists. Here, likewise new to the Peninsula, were other species: *Solidago pinetorum* Small and *Pluchea viscida* (Raf.) House (*P. petiolata* Cass.). Several such "bays" were noted in the dark, to the south of Yorktown; and after the moon rose we saw more to the northwest of Gloucester (John Clayton's home). On Cape Cod every such depression has its peculiarly localized species; if this be so on the peninsulas of Virginia, as it doubtless is, there will be good botanizing there for years to come.

With only limited time and then only by "cutting" classes, I was able to get off for a short time in October (11–16). Long was with me, for, with his detailed knowledge of Coastal Plain plants and their proper habitats and his unequalled persistence and skill in finding them, no critical botanizing in eastern Virginia can be wholly successful without him. Fogg joined us Saturday night with his car. This time we economized time by stopping north of Cape Charles, instead of crossing Chesapeake Bay to the southeastern counties. Here, on the Eastern Shore, we had a most interesting center at historic and

[1] See (1) Grimes, *Some Plants of the Virginia Coastal Plain*, Rhodora, xxiv. 148–152 (1922); (2) Weatherby, *Critical Plants of Atlantic North America*, Rhodora, xxv. 17–23 (1923); (3) Eileen Whitehead Erlanson, *The Flora of the Peninsula of Virginia*, Pap. Mich. Acad. Sci. Arts and Let. iv[1]. 115–182 (1924).

fascinating Eastville. We got essentially to the tip of Cape Charles (Kiptopeke) and left that area with the regret we had so often felt on having to quit, that there was a great deal yet to do. Many of the species which come north to Cape Henry are unknown on Cape Charles; several, supposed to reach their northern limit south of the Bay, are actually found north of it: *Andropogon virginicus*, var. *tenuispatheus* (Nash) Fern. & Grisc., *Paspalum setaceum* var. *supinum* (Bosc.) Trin., *Panicum anceps* var. *rhizomatum* (Hitchc. & Chase) Fern., *Axonopus furcatus*, *Uniola paniculata*, *Rynchospora inexpansa*, *Nothoscordum bivalve*, *Quercus virginiana*, *Zanthoxylum Clava-Herculis*, *Galium uniflorum*, etc. But the most interesting species are those southern types which we do not know in Princess Anne and Norfolk Counties but which are in Northampton or Accomac County to the north. To this series belong the following: *Najas guadalupensis* (but extending locally to Massachusetts), *Wolffia punctata* (first in the East north of Florida), *Baptisia alba* (stations discovered by Dr. Robert Tatnall), a new variety of *Cassia nictitans* (otherwise known only near Elizabeth City, North Carolina), *Polygala lutea* (common *west* of Norfolk County), *Ludwigia palustris* var. *nana* Fern. & Grisc. (the first north of Georgia, but subsequently found to be common *west* of Norfolk County), *Utricularia virgatula* Barnh. (locally north to Long Island), *Aster concolor* (locally north to Martha's Vineyard), *Solidago ludoviciana* (Gray) Small (frequent west of Norfolk County and in southern New Jersey), and *S. tortifolia*, common (one station in Princess Anne County). Extensions southward were also noted, particularly of *Cyperus Engelmanni* (first south of New York), abundant in close proximity to *Wolffia punctata* at its northern limit in the Atlantic States. Another plant of extraordinary interest was *Carex arenaria*. Ordinarily ranked as a casual and non-persistent introduction in America, *Carex arenaria* forms, from Savage Neck to Kiptopeke (or at least in both areas) an apparently indigenous element in the sand-dune vegetation, forming a turf near the crests of wooded dunes or in the shade of the dwarfed pines. It appeared as native as the strictly endemic plants with which it grows and did not seem to us to have the aggressive and non-fastidious habits of successful modern introductions. Leaving Eastville with the usual regret that we had failed to visit many areas which would have yielded additional novelties, we closed the field work for 1935 and the detailed study of the collections began.

In the following notes I have followed the procedure of the last paper on Virginia, of recording such species and stations as seem to be significant in the working out of a fuller knowledge of the flora of the state. Although primarily a record of collections made in 1935, note is made of earlier or later collections in a few cases. 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. In many cases illustration has seemed important to clarify the discussions. The photographs have been made by E. C. Ogden, the cost covered largely by a grant from the Milton Fund for Research, in part by an appropriation from the Wyeth Fund of the Division of Biology, both of Harvard University. The drawings of *Malaxis* were made by Ruth Peabody Rossbach. The large expense of reproducing the photographs has been most generously met by my companion on most of the trips and the modest discoverer of most of the specialties, Bayard Long.

Enumeration of Noteworthy Species Collected[1]

Lycopodium alopecuroides L. Apparently very local in eastern Virginia, not collected by Kearney or by Grimes. Elizabeth City County: peaty depressions in woods and bushy clearings west of Hampton, *F. L. & F.*, no. 4738. Prince George County: sphagnous boggy swale southeast of Petersburg, at head of Poo Run, *F. & L.*, no. 5969.

Lycopodium inundatum L.

So far as is shown in the Gray Herbarium *L. inundatum* is represented in the Coastal Plain of Virginia only by vars. adpressum Chapm. and Bigelovii Tuckerm. The two have been much confused. In general var. *adpressum* has the mature strobiles only 3–6 mm. thick, with tightly appressed sporophylls; var. *Bigelovii* having strobiles 5–13 mm. thick, with loosely ascending to finally spreading sporophylls. The two definitely merge and var. *Bigelovii* clearly passes northward into typical *L. inundatum*. The Virginia collections before me are as follows.

Var. adpressum Chapm. Arlington County: clay pit, near Rosslyn, *Blake*, no. 8936 (as *L. adpressum*). Northampton County:

[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* in June and October, 1936).

moist depressions in sand dunes, Savage Neck, *F. L. & F.*, no. 5172 (as var. *Bigelovii*). James City County: moist ditch, northwest of Williamsburg, *Grimes*, no. 3908 (as var. *Bigelovii*). Dinwiddie County: boggy woods near head of Old Town Creek, southwest of Petersburg, *F. & L.*, no. 5968. Sussex County: sandy and peaty depression, about 4 miles northwest of Homeville, *F. & L.*, no. 5967; spring-fed wooded sphagnous bog, Coddyshore, *F. L. & S.*, no. 6753. Princess Anne County: shallow water, Cape Henry, *L. F. & F. R. Randolph* (as *L. alopecuroides*); damp sandy flats back of the dunes, Rifle Range, *F. & L.*, no. 3616 (as var. *Bigelovii*).

Var. Bigelovii Tuckerm. Arlington County: clay pit, near Rosslyn, *Blake*, no. 8937 (as *L. alopecuroides*). Sussex County: sandy and peaty depression, about 4 miles northwest of Homeville, *F. & L.*, no. 5966. Princess Anne County: wet peaty depressions in sandy pineland, the Desert, Cape Henry, *F. & L.*, no. 3615.

Selaginella apoda (L.) Fern. Not collected by either Kearney or Grimes. Frequent in the eastern counties, chiefly in rich woods and sandy alluvium; numerous collections.

Pinus virginiana Mill. Not noted by Kearney; rare in the two southeastern counties but frequent on the Eastern Shore and in the region from Nansemond County westward. Princess Anne County: a small stand in dry woods at the tip of Little Neck, *F. & L.*, no. 4740.

*Sparganium androcladum (Engelm.) Morong (*S. lucidum* Fern. & Eames). See Fernald, Rhodora, xxiv. 27 (1922). Princess Anne County: shallow water, northwest branch of Salt Pond, *L. F. & F. R. Randolph*, no. 468 (as *S. americanum*); swale back of the dunes, Sand Bridge, *F. G. & L.*, no. 4531.

Range extended south from Pennsylvania. Earlier records (Kearney, etc.) of *S. androcladum* belong to the branched state of *S. americanum* Nutt.

Najas guadalupensis (Spreng.) Morong. Northampton County: sandy margin of the largest pond in the woods back of the dunes, Savage Neck, *F. L. & F.*, no. 5174.

Ruppia maritima L., var. longipes Hagstrom. Not recorded by Kearney. Princess Anne County: fresh to slightly brackish water of Back Bay, off north end of Knott's Island, July 23, 1918, *R. M. Harper;* Back Bay, off Cedar Island, *F. G. & L.*, no. 4532.

Potamogeton pectinatus L. Not recorded by Kearney. Abundant in fresh to slightly brackish water of Back Bay, July 23, 1918, *R. M. Harper*, also 1935, *F. G. & L.*, no. 4533.

P. pulcher Tuckerm. Princess Anne County: brook entering Nowney Creek, Back Bay, *F. G. & L.*, no. 4535. Norfolk County: in a stream near Cornland, *F. & G.*, no. 4295.

Although *Potamogeton pulcher* is not listed by Kearney, it is probable that his *P. lonchites* from the Dismal Swamp belongs here. The species is frequent west of the Dismal Swamp.

Triglochin striata Ruiz & Pavon. Princess Anne County: muddy banks and open spots in swales along North Landing River, near Creed's, *F. L. & F.*, no. 4741.

Although known locally in Delaware, and reported from Virginia (by Buchenau), ours is the first material in the Gray Herbarium from between Delaware and Florida, except a sheet of Canby's which might have come from anywhere between Delaware and Cape Charles. Not noted by Kearney.

Sagittaria latifolia Willd., var. pubescens (Muhl.) J. G. Sm. Princess Anne County: open swamp near Oceana, *F. & L.*, no. 4743.

Not recorded by Kearney and surely local in the two southeastern counties; frequent in the counties west of the Dismal Swamp.

*Limnobium Spongia (Bosc) Richard. Princess Anne County: in water of cove, southern end of Lake Joyce, *F. & G.*, no. 4296 (young foliage, in May, floating, the blades conspicuously inflated beneath), *F. L. & F.*, no.. 4744 (flowering and fruiting, in September, the newer leaves erect and without inflation).

First material in the Gray Herbarium from between Georgia and Delaware. I find no record from Virginia.

Vallisneria americana Michx. Princess Anne County: small plants drifted ashore, southern end of Lake Joyce, *F. L. & F.*, no. 4745.

Not recorded by Kearney.

Eragrostis hirsuta (Michx.) Nees. Recorded as common in Princess Anne and Norfolk Counties in Rhodora, xxxvii. 134 (1935). Also common in Northampton County: Eastville, *F. & L.*, no. 5219; Kiptopeke, *F. L. & F.*, no. 5220.

Uniola paniculata L. Northampton County: sandy beach of Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5221.

Hitchcock (Man. 180) states the northern limit as Cape Henry.

U. sessiliflora Poir. To Grimes's station in James City County add Princess Anne County: rich dry woods, Great Neck, *F. G. & L.*, no. 4559, *F. & L.*, no. 4799. Southampton County: rich woods, southeast of Ivor, *F. & L.*, no. 6777.

Kearney recorded it (as *Uniola longifolia*) from Virginia Beach.

Melica mutica Walt. Princess Anne County: rich woods, Cedar Island, *F. G. & L.*, no. 4560.

A notable colony, in the low woods of Cedar Island in Back Bay, at the outer margin of the Coastal Plain. The habitat given by Hitchcock (Man. 203) is "Rocky woods." Cedar Island is fully 85 miles east of the Fall Line in Greensville County, where the nearest

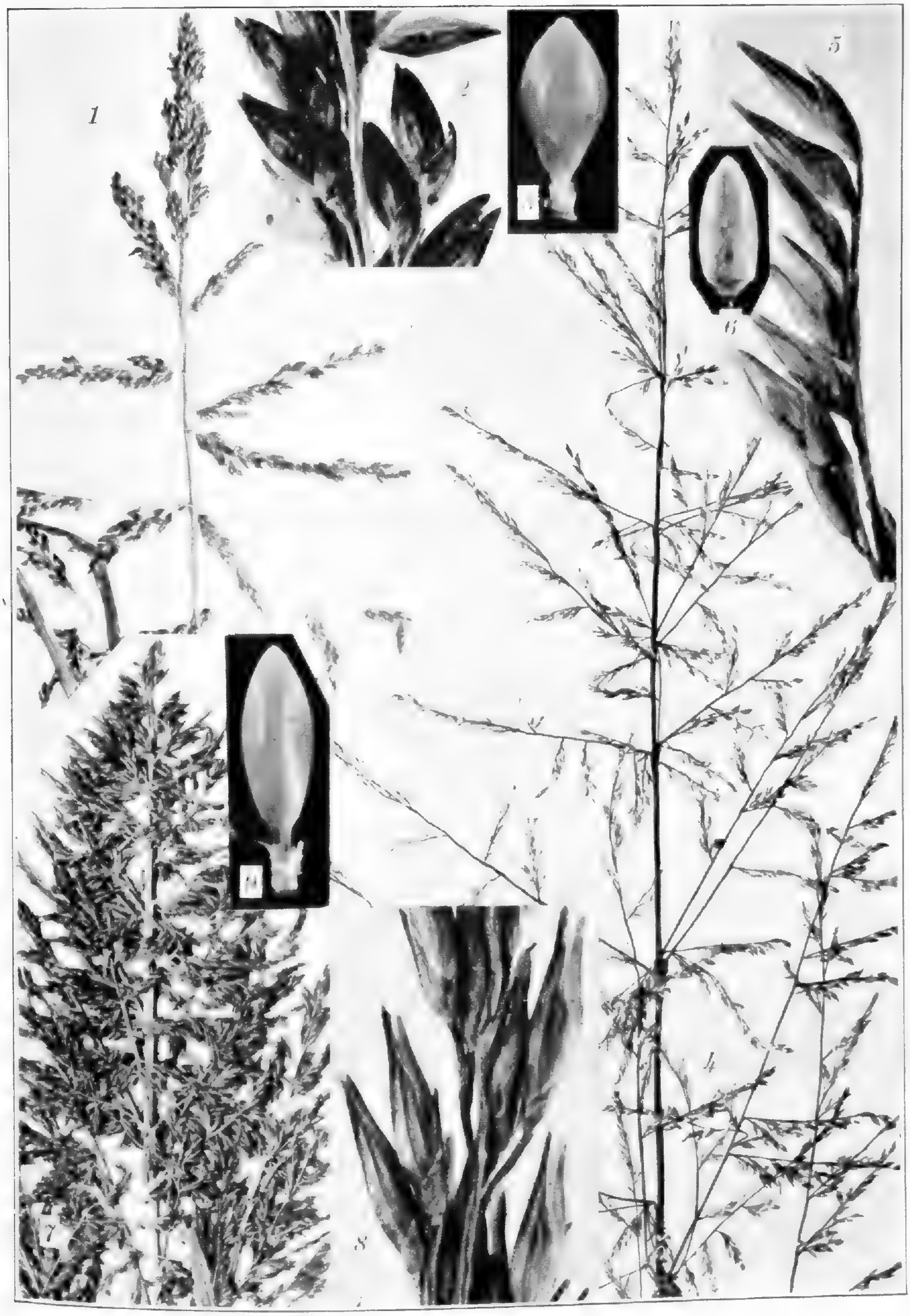

Photo. E. C. Ogden.

PANICUM AGROSTOIDES: FIG. 1, portion of panicle, × 1; FIG. 2, SPIKELETS, × 10; FIG. 3, fruit, × 20.

P. AGROSTOIDES, var. RAMOSIUS: FIG. 4, portion of panicle, × 1; FIG. 5, spikelets, × 10; FIG. 6, fruit, × 20.

P. STIPITATUM: FIG. 7, portion of panicle, × 1; FIG. 8, spikelets, × 10; FIG. 9, fruit × 20.

Photo. E. C. Ogden.

PANICUM MUNDUM: FIG. 1, plant (TYPE), × $\frac{2}{5}$; FIG. 2, vernal panicle, × 1; FIG. 3, lower internode, node and base of sheath, × 10; FIG. 4, upper sheath, × 10; FIG. 5, three spikelets, × 10.

P. CRYPTANTHUM: FIG. 6, spikelet, × 10.

P. ACULEATUM: FIG. 7, spikelet, × 10.

"rocks" are found. Virginia Beach, Kearney's station, is likewise on the outer margin of the state.

TRIODIA FLAVA (L.) Hitchc., var. CHAPMANI (Small) Fern. & Grisc. in RHODORA, XXXVII. 133 (1935). To the station recorded at Cape Henry add NANSEMOND COUNTY: dry sandy woods along Pitch Kettle Creek, north of Lake Kilby, *F. L. & F.*, no. 4795; dry sandy woods, Factory Hill, *F. &. L.*, no. 6518.

ELYMUS VILLOSUS Muhl. (*E. striatus* of Am auth., not Willd.). See Fernald, RHODORA, XXXV. 193 (1933). PRINCESS ANNE COUNTY: rich woods, Cedar Island, *F. G. & L.*, no. 4554.

Extraordinarily large (1.2 m. high), with leaves 1 cm. broad and inflorescences 1.5 dm. long; a species of rich woods of the interior, here at the outer margin of the Coastal Plain. Not listed by Kearney.

AGROSTIS ELATA (Pursh) Trin. For discussion of specific characters see Fernald, RHODORA, XXXV. 211 (1933). NORTHAMPTON COUNTY: peaty clearing, south of Townsend, *F. L. & F.*, no. 5212.

ARISTIDA PURPURASCENS Poir., var. MINOR Vasey. For discussion of characters see Fernald & Griscom, RHODORA, XXXVII. 136 (1935). NORTHAMPTON COUNTY: dry sandy pine woods, Eastville, *F. & L.*, no. 5210.

Extension north from Norfolk County.

PHALARIS CAROLINIANA Walt. PRINCESS ANNE COUNTY: border of brackish marsh, Cedar Island, *F. G. & L.*, no. 4547.

Not recorded by Kearney.

THE VARIETIES OF LEERSIA VIRGINICA (PLATE 440, all FIGS. × 10). In Princess Anne County *Leersia virginica* Willd. is represented by two quite dissimilar plants. One, a delicate plant of damp rich woodlands and their bordering ditches, has the whitish-green spikelets (FIGS. 1 and 2) very minutely and remotely setulose-puberulent, with margins smooth or at most very short-ciliolate; the other, a coarser plant of river-swales, almost as coarse as *L. oryzoides* (L.) Swartz, has the spikelets (FIG. 9) greener, rather larger, with more prominent ribbing and a positive ciliation of elongate hairs or bristles.

Study of a large series of material shows that *L. virginica* throughout much of its range breaks into the two variations which we noted in Virginia. The size of plant, breadth of leaf and size of spikelet vary in both, but one series (FIGS. 1–8) has the spikelets with smooth or barely ciliolate margins, the other (FIGS. 9–13) has the margins coarsely ciliate-hispid. In view of this strong divergence it is important to know which extreme formed the basis of *L. virginica* Willd. Sp. Pl. i. 325 (1797). It is also necessary to identify the type

of *L. imbricata* Poir. in Lam. Encyc. Suppl. iii. 329 (1813). Fortunately this is quickly possible, through the fact that on his last trip to Europe, in 1935, the late Professor A. S. Hitchcock secured fragments for the National Herbarium from each of them. These have been most generously loaned me by Mrs. Agnes Chase. Figs. 3 and 4 shows spikelets from the type of *L. virginica* at Berlin, × 10, fig. 5 those of the type of *L. imbricata* at Paris, × 10. That they are both the extreme with essentially smooth-margined spikelets is evident. Fig. 6 shows spikelets (unusually large) of typical *L. virginica* from near Montreal (*Victorin*, no. 24,361); fig. 7 from New York (Vaughans, Aug. 4, 1897, *Burnham*); figs. 1 and 2 from Virginia (*Fernald & Long*, no. 4781) and fig. 8 from Illinois (Peoria, August, 1903, *McDonald*). Mrs. Chase informs me that "*Leersia ovata* Poir., which has been referred to *L. lenticularis*, is *L. virginica* with cilia on the lemma about 0.5 mm. long." The extreme plant with bristly-ciliate spikelets should, therefore, be called

*Leersia virginica Willd., var. **ovata** (Poir.), comb. nov. *L. ovata* Poir. in Lam. Encycl. Supp. iii. 329 (1813).

Fig. 9 shows the spikelets of var. *ovata* from North Landing River, Virginia, *Fernald, Long & Fogg*, no. 4782; fig. 10 from Ithaca, New York, *Metcalf*, no. 1576; fig. 11 from Lancaster Co., Pennsylvania, *Heller*, no. 4796; fig. 13 from Fort Snelling, Minnesota, *Mearns*, no. 770; and fig. 12 from Apalachicola, Florida, *Chapman*.

Digitaria filiformis (L.) Koeler, var. villosa (Walt.) Fern. in Rhodora, xxxvi. 19 (1934). Northampton County: crest of sandy and argillaceous bluff along Chesapeake Bay, Old Town Neck, *F. L. & F.* no. 5193. Nansemond County: dry sandy bank along Pitch Kettle Creek, north of Lake Kilby, *F. L. & F.*, no. 4759.

Not listed by Kearney.

Axonopus furcatus (Flügge) Hitchc. Northampton County: moist peaty depression in pine woods south of Townsend, *F. L. & F.*, no. 5207; Southampton County: open sandy borders of pools and depressions in bottomland of Nottoway River, Courtland, *F. & L.*, no. 6470.

Extensions north and west from Princess Anne County.

Paspalum setaceum Michx., var. supinum (Bosc) Trin. (*P. supinum* Bosc). See Fernald, Rhodora, xxxvii. 390 (1935). Northampton County: dry sandy pine woods, Eastville, *F. & L.*, no. 5192.

Extension north from Cape Henry.

P. dilatatum Poir. Northampton County: dry sandy and

argillaceous pine woods back of the shore-bluff, west of Kiptopeke, *F. L. & F.*, no. 5191; grassy roadside, Eastville, *F. & L.*, no. 5190.

Slight northern extension. Although Mrs. Chase, N. Am. Sp. Pasp. (Contrib. U. S. Nat. Herb. xxviii.), 172, extends the range north to New Jersey, the extension is based only on material from waste land in Camden in 1882, where the plant was not indigenous nor persistent.

P. Boscianum Flügge. Princess Anne County: wet, argillaceous thickets and ditches, Rosemont, *F. & L.*, no. 4756. Southampton County: sandy alluvium, bottomland of Blackwater River, near Oak Grove School, *F. & L.*, no. 6462. Nansemond County: roadside ditch, Factory Hill, *F. & L.*, no. 6765.

Recorded by Mrs. Chase only from Norfolk County and the Dismal Swamp. The colloquial name "Bull Grass," coupled with the specific name and that of its author, ameliorates the tediousness of an often dry subject.

Panicum dichotomiflorum Michx., var. **geniculatum** (Wood), comb. nov. Plate 441, fig. 2. *P. miliaceum ?* Walt. Fl. Carol. 72 (1788), not L. (1753). *P. geniculatum* Ell. Sk. i. 117 (1816), as to plant described, not Muhl. (1813). *P. retrofractum* Delile in Desv. Opusc. 96 (1831). *P. proliferum*, β. *geniculatum* Wood, Am. Bot. Fl. ed. of 1873: 392 (1873).

Even after the segregation of the hispid-sheathed and coarse Floridan and Bahaman var. *bartowense*[1] and the slender and small-flowered northern var. *puritanorum* Svenson in Rhodora, xxii. 154, figs. 1–5 (1920), *Panicum dichotomiflorum* Michx. consists of two very distinct but usually unrecognized geographic varieties in temperate North America. In New England and much of the coastwise region, extending locally into the interior, the common plant (no. 1, our fig. 2), when well developed, has a coarse and geniculate stem, with enlarged lower nodes, inflated lower and primary sheaths, panicles eventually borne at most of the nodes, the peduncle included in the sheath or only short-exserted, the stiffish branches of the panicle soon horizontally divergent to finally reflexed, the spikelets rather crowded. Just appearing in New England, as a weed of railroad yards and roadsides, apparently coming from the West, is a very different plant (no. 2, our fig. 1): more slender, less geniculate, the culms more ascending, with sheaths little if at all inflated, the nodes less enlarged, the terminal panicles becoming long-exserted

[1] Panicum dichotomiflorum Michx., var. **bartowense** (Scribn. & Merr.), comb. nov. *P. bartowense* Scribn. & Merr. in U. S. Dept. Agric. Div. Agrost. Circ. xxxv. 3 (1901).

(0.5–2 dm.), their capillary branches all ascending at maturity (not divergent or reflexed) and with fewer and less crowded spikelets; the aspect of the plant being that of *P. capillare* L. As represented in the Gray Herbarium, no. 2 is rare in southern New England and New York; the other specimens are from Pennsylvania, District of Columbia, West Virginia, western Virginia and our recent collection from eastern Virginia (wet argillaceous thickets and ditches, Rosemont, no. 4761), western North and South Carolina, interior Georgia, northern Florida, southern Ontario, Indiana, Kentucky, Tennessee, Illinois, Iowa, Missouri, Arkansas, Louisiana, Kansas, Oklahoma, Texas and California; generally an inland range. No. 1, on the other hand, is the commoner coastwise plant of the East: Nova Scotia, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Ohio, Mississippi, Illinois, Iowa, Missouri, Louisiana and Oklahoma. Being weeds, either of them is likely to spread, but the greater abundance of no. 1 in the coastal states is clear.

Panicum dichotomiflorum of Michaux, Fl. Bor.-Am. i. 48 (1803) was no. 2 of this discussion:

> DICHOTOMIFLORUM. P. erectum, glabrum: panicula ramos alternos culmumque terminate, dichotome (*absque rachi commune*) ramosissima; ramis prolixis, setaceis: floribus oblongis, acuminatis.
> *Obs.* Habitus fere *P. capillaris.*
> *Hab.* in occidentalibus montium *Alleghanis.*

In 1788, Walter mistook our no. 1 for *Panicum miliaceum* L., the Old World annual:

miliaceum?	7.	Panicula patente, culmo ramoso geniculato decumbente, staminibus flavis, pistillis purpureis,

the patent panicle and geniculate habit as well as the region (eastern South Carolina) making this apparent. Muhlenberg caught the second character and published the name *P. geniculatum* Muhl. Cat. 8 (1813) as a substitute for *P. dichotomiflorum* Michx., excluding Michaux's habitat and giving only "Pens. . . . Car. Georg." That Muhlenberg probably had our plant no. 1 is evident but nomenclaturally his *P. geniculatum* must rest on *P. dichotomiflorum* (our no. 2). In 1816, Elliott beautifully described as *P. geniculatum* the

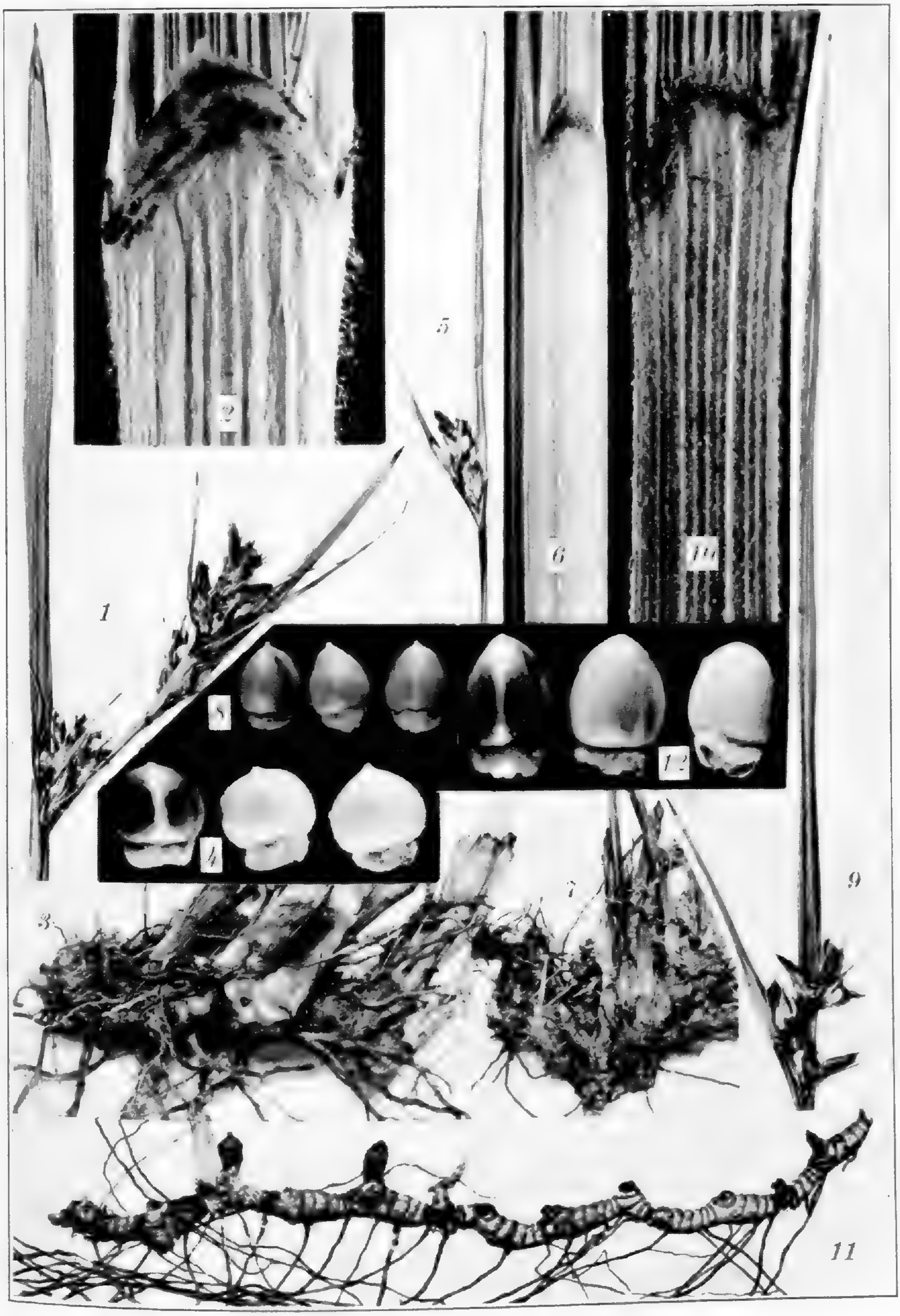

Photo. E. C. Ogden.

SCLERIA TRIGLOMERATA: FIG. 1, inflorescence, × 1; FIG. 2, summit of leaf-sheath, × 10; FIG. 3, rhizome, × 1; FIG. 4, nutlets, × 5.
S. MINOR: FIG. 5, inflorescence, × 1; FIG. 6, summit of sheath, × 10; FIG. 7, rhizome, × 1; FIG. 8, nutlets, × 5.
S. NITIDA: FIG. 9, inflorescence, × 1; FIG. 10, summit of sheath, × 10; FIG. 11, rhizome. × 1; FIG. 12, nutlets, × 5.

Photo. E. C. Ogden.

JUNCUS GRISCOMI: FIG. 1, plant (TYPE), × ⅖; FIG. 2, portion of inflorescence, × 1; FIG. 3, fruit, × 6; FIG. 4, seeds, × 20.
J. EFFUSUS, var. COSTULATUS: FIG. 5, fruits, × 6.
J. GYMNOCARPUS: FIG. 6, fruit, × 6.

common coastwise plant, ascribing the name to Muhl. Cat. but giving a clear interpretation of the synonymy: "P. dichotomiflorum? Mich. 1. p. 48. P. miliaceum, Walt. p. 72." Elliott's "culmo assurgenti, geniculato . . ; paniculis terminalibus, axillaribusque, diffusis, patentibus; vaginis foliorum inflatis" are unequivocal; but, unfortunately, he called his beautifully characterized plant *P. geniculatum* Muhl., which, as already shown, was a substitute-name for *P. dichotomiflorum*. Delile's *P. retrofractum*, too, the type from Carolina, was the same as the plants of Walter and of Elliott; his "panicula laxa: ramis retroflexis divaricatis apice floriferis" makes that clear.

The first varietal name for our no. 1, the plant described by Walter as *Panicum miliaceum*, by Elliott as *P. geniculatum*, and by Delile as *P. retrofractum*, is the name published by Alphonso Wood in 1873: *P. proliferum*,

β. **geniculàtum.** Culm thick, geniculate below; pan. dense. Marshes.

Used in this rank, var. *geniculatum* is correct, for it is the first varietal name published for the plant. Wood did not mention Muhlenberg nor Elliott; therefore his name cannot be taken as based upon *Panicum geniculatum*, Muhlenberg's substitute for typical *P. dichotomiflorum*. If Wood had cited Muhlenberg the case would be different and there would then be justification for the assumption of Hitchcock & Chase: "This is probably based on *P. geniculatum* Ell., though that name is not mentioned."[1] When, in 1788, Walter described our plant, he called it *P.* "*miliaceum?*", the mark of interrogation indicating that he was doubtfully identifying it with the already published *P. miliaceum* L. In this instance, with no author cited, Hitchcock & Chase made a singular reversal in their reasoning: "Since Walter does not give Linnaeus as authority nor use his diagnosis, this is evidently intended as a new species."[2] Walter gave no authorities for the species in his *Flora Caroliniana;* but the new species were indicated by italics, the old ones not. Thus, under *Panicum* Walter had the following Linnean names, all properly indicated by typography as not new, though with new diagnoses: *alopecuroideum, italicum, hirtellum, dimidiatum, capillare, miliaceum?, latifolium* and *brevifolium*. Even though Walter misinterpreted the Linnean names in some cases, the fact remains that he was clearly differentiating between the old and the wholly new names.

[1] Hitchc. & Chase, Contr. U. S. Nat. Herb. xv. 49 (1910).
[2] Hitchc. & Chase, l. c. 48.

Although Hitchcock & Chase cite in the synonymy of their all-inclusive *Panicum dichotomiflorum* some varietal names older than that of Wood, only one might be thought identical with var. *geniculatum*. This is *P. chloroticum* Nees, var. *agreste* Nees in Trin. Gram. Pan. 236 (1826) from Brazil; but the Brazilian material shows that this has the upper leaves more evenly linear nearly to the short tip, var. *geniculatum* having them long-attenuate.

P. PHILADELPHICUM Bernh. PRINCESS ANNE COUNTY: dry argillaceous fields and bushy clearings, Rosemont, *F. & L.*, no. 4760. NANSEMOND COUNTY: sandy wood-road, Factory Hill, *F. & L.*, no. 6472.

Not collected by Kearney or the Grimes's.

P. AMARULUM Hitchcock & Chase. NORTHAMPTON COUNTY: sandy beach of Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5196.

Not cited by Hitchcock and Chase from the Eastern Shore.

*P. AGROSTOIDES Spreng. PRINCESS ANNE COUNTY: argillaceous ditches at borders of woods south of Virginia Beach, *F. & L.*, no 4768.

Not recorded by Hitchcock & Chase nor by Hitchcock (Man.) from Virginia. Our material is transitional to the next.

*PANICUM AGROSTOIDES Spreng., var. **ramosius** (Mohr), comb. nov. *P. elongatum ramosior* Mohr, Contrib. U. S. Nat. Herb. vi. 357 (1901). PLATE 442, FIGS. 4–6.

The plant (FIGS. 4–6) of bottomlands and alluvium of wooded swamps from Nansemond County at least to Southampton and Greensville Counties, Virginia, scarcely suggests the typical northern *Panicum agrostoides* (FIGS. 1–3). The latter, typified by Hitchcock and Chase by a specimen from Pennsylvania, has the culms strongly compressed, 2–9 dm. high, with pale nodes, the sheaths often longer than the internodes, the blades firm; the terminal panicles 0.8–2.5 dm. long, their branches and branchlets densely floriferous with crowded purple to bronze ellipsoid, acute to short-acuminate spikelets (FIG. 2) 1.7–2.2 mm. long and 0.8–1 mm. in diameter. The fruits are barely stalked (FIG. 3). This plant occurs in typical form from central Maine to western New York and Maryland, more locally to North Carolina and Missouri.

Most of the material from the Mississippi and the adjacent drainages and from the southern and southeastern Coastal Plain is like the plant which we met in the valleys of the Blackwater, Nottoway and Meherrin in southeastern Virginia. In this Coastal Plain-Mississippi Basin plant the culms are less compressed, 0.5–1.5 m. high, with dark

mostly exserted nodes, the leaf-blades membranaceous, the panicles green to drab or lead-color (only when exposed to strong light slightly purple), the terminal ones 1.5–4 dm. long, their branches and branchlets loosely floriferous with green to lead-colored (rarely purple) lanceolate to lance-ovoid attenuate or slender-tipped spikelets (FIGS. 4 and 5) of the same length as in typical *P. agrostoides* but more slender (0.5–0.8 mm.) in diameter. The fruits (FIG. 6) are slightly more slender, approaching those of *P. stipitatum* but even shorter-stiped than in the northern plant. That this is the plant which Mohr had there can be no question. His characterization was perfect:

> Stem stouter and taller than in the type, fully 3 feet long, reclining, smooth leaves, 2 feet and over in length, sheaths shorter than the internodes; panicle large, widely spreading, pyramidal, 12 to 18 inches long; lower branches 4 to 5 inches long; secondary branches rather distant, mostly in pairs; spikelets as in the type, pale. By these permanent characters a well marked variety.

That Mohr associated his variety with *P. elongatum* Pursh, not Salisb. (*P. stipitatum* Nash) seems natural. Its slender-tipped and comparatively elongate spikelets, often subsecund along the branchlets, suggest that species; but *P. agrostoides* var. *ramosius* has the barely stipitate fruits and the smooth or smoothish leaf-surfaces of *P. agrostoides*, the quite definite *P. stipitatum* (FIGS. 7–9) having harsh and subrigid leaves, very stiff and contracted panicles with stiffly divergent branchlets of subsecund slender spikelets, and the fruits (FIG. 9) very definitely stipitate.

Hitchcock & Chase were conscious to some degree of *Panicum agrostoides* var. *ramosius* but they did not clearly differentiate it. Their comments in their discussion of *P. agrostoides* apply to it. Referring to some specimens from Georgia, Florida and Texas they said: "In the following specimens the spikelets are more or less secund on the branchlets, giving the panicles much the aspect of those of *P. stipitatum*, . . . "; again, discussing other specimens from Georgia, Florida and Alabama (Mohr's type) they referred to them as "Unusually loosely flowered, open-panicled specimens, such as that named *P. elongatum*, var. *ramosius*."

So different are these plants of the southern Coastal Plain and of the Mississippi Basin from typical northern *Panicum agrostoides* that they seem to me a strongly defined variety. In order to make clear the characters of the plants discussed I have asked Mr. Ogden to display their essential characters in PLATE 442.

The following collections from Virginia belong to PANICUM AGROSTOIDES, var. RAMOSIUS. GREENSVILLE COUNTY: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6473. SOUTHAMPTON COUNTY: sandy, wooded bottomland of Nottoway River, Courtland, *F. & L.*, no. 6474; sandy alluvium, bordering cypress swamp, bottomland of Nottoway River, above Cypress Bridge, *F. & L.*, no. 5990; sandy alluvium, wooded bottomland of Blackwater River, southeast of Ivor, *F. & L.*, no. 5992. ISLE OF WIGHT COUNTY: sandy alluvium, wooded bottomland of Blackwater River, Zuni, *F. & L.*, no. 5991. NANSEMOND COUNTY: sandy wood-road, Factory Hill, *F. & L.*, no. 6475.

P. ANCEPS Michx., var. RHIZOMATUM (Hitchc. & Chase) Fern. in RHODORA, XXXVI. 73 (1934). NORTHAMPTON COUNTY: dry pine woods near Capeville, *F. L. & F.*, no. 5195.

Extension north from Cape Henry.

P. VILLOSISSIMUM Nash, var. PSEUDOPUBESCENS (Nash) Fern. in RHODORA, XXXVI. 79 (1934). NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4773. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5616.

Not recorded by Hitchcock & Chase from the state.

*PANICUM (sub–§ SCOPARIA) **mundum**, sp. nov. (TAB. 443, FIG. 1–5), planta dense cespitosa 0.5–1.4 m. alta; culmis firmis basi 0.7–3 mm. diametro; internodiis elongatis 6–15, imis villosis, villis cinereis adscendenti-patentibus ad 2 mm. longis, internodiis superioribus cinereo-puberulis vel breviter pilosis vel glabratis; nodis valde divergenter barbatis; foliis rosulatis basilaribus late lanceolatis firmis glabris 2–4 cm. longis 8–15 mm. latis 45–60-nerviis; foliis caulinis primariis 6–15 anguste lanceolatis firmis glabris 6–15 cm. longis 8–13 mm. latis, basi rotundatis ciliatis ciliis basi bullatis, apice attenuatis, vaginis glabris vel papillato-bullatis margine apiceque ciliatis, ligulis densis ad 1 mm. longis; paniculis primariis deinde exsertis ellipsoideo-ovoideis 7–12 cm. longis 5–10 cm. diametro, rhachi patenter piloso vel glabratis, ramibus adscendentibus, pedicellis elongatis glabris; spiculis pubescentibus subgloboso-obovoideis vel -ellipsoideis apice rotundatis vel obtusis 1.8–2.2 mm. longis 1–1.2 mm. diametro, gluma inferiore deltoideo-ovata subacuta 0.4–0.6 mm. longa, superiore lemmateque sterili aequilongis valde costatis fructus lucidos paullo superantibus; statu autumnali sparse ramoso, ramibus adscendentibus, paniculis terminalibus 1–6 cm. longis.—Sussex and Princess Anne Counties, VIRGINIA: (SUSSEX CO.) peaty clearing at border of cypress (*Taxodium*) swamp, 4 miles northwest of Homeville, July 20, 1936, *Fernald & Long*, no. 6017, August 25, 1936, *Fernald & Long*, no. 6499 (TYPE in Gray Herb., ISOTYPES in Herbs. Phil. Acad., Univ. Richmond and elsewhere); (PRINCESS ANNE CO.) sandy and peaty meadows, Rifle Range, south of Rudy Inlet, and peaty meadows south of Dam Neck, June 16, 1935, *Fernald, Griscom & Long*, nos. 4542, 4541 (distributed as *P. nitidum*).

Panicum, subgen. *Dichanthelium*, sub- § *Scoparia* consists of a few species with tall culms and with numerous nodes and primary leaves. Besides the usually common and widely dispersed *P. scoparium* Lam., it has been recognized as having only three local species: *P. scabriusculum* Ell., one of the very local plants of the Coastal Plain; *P. aculeatum* Hitchc. & Chase, one of the rarest members of the genus; and *P. cryptanthum* Ashe, whose half-dozen or so restricted stations are scattered from Texas to southern New Jersey. It is, therefore, to be expected that other highly localized "relic" species of the subsection are hidden in favorable habitats on the Coastal Plain.

Panicum mundum is one of the neatest and most definite of species. At once distinguished from the coarser and common *P. scoparium* by its glabrous foliage, small and plump spikelets and sparsely branching habit, it finds its nearest relationship with *P. aculeatum* and *P. cryptanthum*. From them both it is at once distinguished by its copiously pubescent culms (FIG. 3), heavily bearded nodes (FIG. 3) and small round-topped to barely acute, pubescent, obovoid or thick-ellipsoid spikelets (FIG. 5); the other two species having the acute spikelets decidedly more slender and longer, in *P. aculeatum* 3 mm. long and pubescent (FIG. 7), in *P. cryptanthum* 2.2–2.4 mm. long and glabrous (FIG. 6).

The type of *Panicum mundum* comes from an area with many strikingly localized plants. Mr. Long and I had spent some time in a peaty depression where occur many species hitherto unknown or but rarely found in Virginia (*Panicum hemitomon* Schultes, *P. Wrightianum* Scribn., *Leersia hexandra* Swartz, *Rynchospora caduca* Ell., *R. n. sp.* (to be described in a later paper), *Scleria Elliottii* Chapm., *Drosera capillaris* Poir., *Hypericum denticulatum* Walt. var. *ovalifolium* (Britton) Blake, *Sabatia campanulata* (L.) Torr., *Hydrolea quadrivalvis* Walt., etc.). Finally, realizing that our intended destination was far ahead, we were about to start southward, when we noted that, across the road, the boggy area merged into the remnant of a cypress swamp. Anxious to get started, I somewhat impatiently awaited my companion, who had "poked into" the cypress thicket, but he soon returned with the first collection of the astonishing *Panicum*. A month later I personally collected a series of the autumnal state from a different stool of the species.

The two numbers from Princess Anne County (Rifle Range and Dam Neck), both young, greatly puzzled us when they were collected.

In 1935, not feeling competent to propose a new species in *Panicum*, subgen. *Dichanthelium*, I tried to avoid the inevitable by forcing them into the very different *P. nitidum* Lam. Now that another colony, sixty or seventy miles to the west, has been found and the plant collected in full anthesis and in its autumnal state, the essential similarity to it of the coarse plant of Princess Anne is apparent. From *P. nitidum* the new species is strikingly different in its coarser and much taller culms copiously pubescent on the lower internodes (in the slender *P. nitidum* glabrous), in the great number of primary leaves and internodes, in its more pubescent and plumper spikelets, and in its very sparsely and stiffly branched autumnal state, the autumnal state of *P. nitidum* being as densely and intricately branched as in *P. microcarpon* Muhl. or as in *P. dichotomum* L. As in *P. nitidum*, the sheaths of *P. mundum* are often conspicuously viscid-spotted. The great number of primary leaves in the better developed plants and the strong pubescence of *P. mundum* seem to place it in subsection *Scoparia*. In other traits and through the less developed individuals it approaches subsection *Dichotoma*.

In the Princess Anne area, just as in the type-locality, *Panicum mundum* is also a member of a strikingly localized flora. The swales, sands, peats and ponds of Dam Neck and the Rifle Range are essentially confluent. They are the home of usually limited colonies of such plants (rare or local in Virginia) as *Axonopus furcatus* (Flügge) Hitchc., *Eleocharis ambigens* Fern., *Rynchospora fascicularis* (Michx.) Vahl and *R. Wrightiana* Boeckl., *Juncus Elliottii* Chapm., the endemic *Hypoxis Longii* Fern., the excessively rare *H. sessilis* L., *Viola pectinata* Bickn., *Hydrocotyle Canbyi* C. & R., *Gentiana parvifolia* (Chapm.) Britton., *Asclepias lanceolata* Walt. var. *paupercula* (Michx.) Fern. and *Erigeron vernus* (L.) T. & G.

Sacciolepis striata (L.) Nash. Princess Anne County: swales back of the dunes, Rifle Range, *F. & L.*, no. 4264; open clay of fields and thickets, Virginia Beach, *F. G. & L.*, no. 4546; fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4775.

Mature culms very brittle.

Setaria magna Griseb. Princess Anne County: border of salt marsh, arm of Lynnhaven Bay at Third Street Bridge, Great Neck, *F. & L.*, no. 4777; fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4778.

At both stations in recently disturbed soil, suggesting recent introduction. Not noted by Kearney.

*Arthraxon hispidus (Thunb.) Makino, var. cryptantherus (Hackel) Houda. Elizabeth City County: roadside ditches bordering peaty depressions in thin woods and bushy clearings west of Hampton, *F. L. & F.*, no. 4758; seen in a similar habitat a few miles farther north.

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!

Andropogon Elliottii Chapm. Elizabeth City County: peaty depression in thin woods and bushy clearings, west of Hampton, *F. L. & F.*, no. 4747—not collected by Grimes. Northampton County: frequent to common.

A. virginicus L., var. tenuispatheus (Nash) Fernald & Griscom in Rhodora, xxxvii. 142 (1935). Extended north from Princess Anne County to Northampton County: peaty clearing south of Townsend, *F. L. & F.*, no. 5181.

*A. virginicus, var. tenuispatheus, forma hirsutior (Hackel) Fernald & Griscom, l. c. Extended north from Georgia to Northampton County: moist peaty depressions in pine woods south of Townsend, *F. L. & F.*, no. 5180.

Cyperus sabulosus Mart. & Schrad. Not collected by Grimes. Elizabeth City County: peaty depressions in thin woods and bushy clearings, west of Hampton, *F. L. & F.*, no. 4809. A frequent weed in Northampton County: Eastville, *F. & L.*, no. 5224.

*C. Iria L. As pointed out by Fernald & Griscom in Rhodora, xxxvii. 147, 148 (1935), the common form of *C. Iria* in southeastern Virginia is var. *Santonici* (Rottb.) Fern. & Grisc. We now have true *C. Iria* from Princess Anne County: clearing in rich dry woods, Little Neck, *F. & L.*, no. 4810.

*C. Engelmanni Steud. Northampton County: sandy border of pond in woods back of the dunes, Savage Neck, *F. L. & F.*, no. 5228.

The first record, apparently, of the species in the coastwise Atlantic States from south of Massachusetts and New York, where it is local and isolated from the Mississippi drainage. The pond where *Cyperus Engelmanni* abounds is one of a group of small ponds with two other extraordinarily local species abounding. See notes on *Wolffia punctata* and *Wolffiella floridana*.

*Eleocharis prolifera Torr. Princess Anne County: forming

continuous turf at the peaty margin of a cove, southern end of Lake Joyce, *F. L. & F.*, no. 4817.

Cited, with doubt, by Kearney from sterile material collected at Cape Henry. The plant seen by us (*F. & L.*, no. 3761) in fruit at Cape Henry was *E. microcarpa* Torr.

*E. flaccida (Reichenb.) Urban, var. olivacea (Torr.) Fern. & Grisc. in Rhodora, xxxvii. 155 (1935). Northampton County: boggy swale bordering swampy woods south of Kendall Grove, *F. L. & F.*, no. 5235. Isle of Wight County: moist depressions in sandy pine barrens south of Zuni, *F. & L.*, no. 6532.

Extension south from New Jersey.

Fuirena hispida Ell. Nansemond County: springy and sandy depressions, Kilby, *F. L. & F.*, no. 4822. Thence frequent west to the Fall Line.

Not listed by Kearney, who notes *F. squarrosa* Michx., a species common in Princess Anne County and on the Eastern Shore but not seen by us to the westward.

Rynchospora corniculata (Lam.) Gray. York County: filling a small depression or "bay," about four miles south of Yorktown.

Examined but not taken, since we did not realize that it is not in Grimes's collection. Occasional in the most southern counties, from Princess Anne westward.

R. cymosa Ell. Elizabeth City County: peaty depressions in thin woods and bushy clearings west of Hampton, *F. L. & F.*, no. 4827; common in the southern counties from Princess Anne to the Fall Line.

Not collected by Grimes.

R. microcephala Britton. See Fernald, Rhodora, xxxvii. 404, 405, t. 391, figs, 4 and 5 (1935). Princess Anne County: fresh to brackish swale along North Landing River, near Creed's, *F. L. & F.*, no. 4830.

Recorded only from Norfolk County, but frequent westward to the Fall Line.

R. inexpansa (Michx.) Vahl. Northampton County: moist peaty depression in pine woods south of Townsend, *F. L. & F.*, no. 5246.

Extension north from Princess Anne County, where it is common, thence west to the Fall Line.

Cladium jamaicense Crantz. To the few recorded stations add Princess Anne County: fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4832.

Photo. E. C. Ogden.

MALAXIS BAYARDI: FIG. 1, four plants (TYPE), × 1; FIG. 2, portion of raceme, × 10.
M. UNIFOLIA: FIG. 3, raceme, × 1.

The three recorded stations (Kearney's at Northwest, Fernald & Long's near Blackwater River, tributary to North Landing River (see RHODORA, XXXVII. 405) and this station near Creed's) are on the estuaries of small rivers entering the northwest head of Curratuck Sound.

SCLERIA TRIGLOMERATA AND ITS ALLIES (PLATE 444).—In southeastern Virginia the plants with cellular-reticulate 3-angled hypogynium, no tubercles, and lustrous, smooth, white, cream-colored, drab or marbled achenes, occur as three clearly defined species, all of which are reduced outright in Core's treatment[1] to *Scleria triglomerata*. The three occur in close proximity to one another, two of them often closely intermingled in the same habitats. Consequently, if they are mere phases of one species, it is singular that they should be so sharply distinguished by clear morphological characters, without intergrading in the same habitats. Study of the series in the Gray Herbarium shows that the three have several definite characters each and that their broad ranges are quite different, although in the Coastal Plain from New Jersey to North Carolina they all come together.

Without a very critical examination of the type of *Scleria triglomerata* Michx. Fl. Bor.-Am. ii. 168 (1803) it is impossible to say which of the three he had. Upon examining it many years ago Asa Gray made the pencilled memorandum regarding the material: "Very poor." Consequently, its exact identity can presumably be made out only by one very intimately acquainted with minute details of the plants. For the time being I am retaining the name *S. triglomerata* for the coarsest of the three plants (FIGS. 1–4), the species of wide range to which the name has been most generally applied since the monograph of Torrey. *S. nitida* Willd. in Kunth, Enum. ii. 350 (1837), with emphasis given the "rigid" slender leaves and the OVATE-subglobose achenes, is taken up for a Coastal Plain species with these characters. In 1855 Steudel, Syn. Pl. Cyp. 174, described from South Carolina a *S. flaccida*. From his diagnosis alone it might be either of the two above noted. The third species is the excessively slender *S. minor* (Britton) Stone, Rep. N. J. State Mus. for 1910: 283 (1911).

As I understand these three species, they are distinguished as follows.

[1] E. L. Core, Am. Sp. Scleria, Brittonia, ii. 63 (1936).

a. Membranous band on ventral side of leaf-sheath glabrous or nearly so below the sharply separated glabrous to puberulent ligule; rhizome forking, in no. 1 forming a knotty mass.
Plant pale- or yellow-green; culms 2.5–6 mm. thick at base; leaves 5–8 mm. broad, linear and scarcely narrowed up to the short tip, glabrous or the sheaths and midribs beneath pilose; achenes subglobose to oblate, strongly rounded at summit, nearly or quite as broad as long, 2–2.5 mm. high, 2–2.7 mm. broad (FIGS. 1–4)..... 1. S. *triglomerata.*
Plant bluer-green; culms 1–2 mm. thick at base; leaves 1–2.5 mm. broad, attenuate to long slender tips, glabrous or merely scabrous; achenes subglobose to ovoid, 1–1.8 mm. high, 1.2–1.8 mm. broad (FIGS 5–8)..... 2. *S. minor.*

a. Membranous band puberulent or tomentulose, not sharply differentiated from the puberulent or tomentulose ligule; rhizome usually simple and elongate; plant blue-green, with linear-attenuate leaves 2–6 (rarely –8) mm. broad, puberulent to glabrous, scarcely pilose; achenes ovoid or ovoid-subglobose, longer than thick, (2–)2.8–3.3 mm. long, 2–2.8 mm. broad (FIGS. 9–12)..... 3. *S. nitida.*

1. S. TRIGLOMERATA Michx. Fl. Bor.-Am. ii. 168 (1803), at least in sense of Torrey, Ann. Lyc. N. Y. iii. 372 (1836) and most later authors.—Eastern Massachusetts to southern Ontario, Wisconsin and Iowa, south to Florida, Alabama, Mississippi, Louisiana and Texas.—Common in southeastern Virginia, especially west of the Dismal Swamp. PLATE 444, FIGS. 1–4.

2. *S. MINOR (Britton) W. Stone, Rep. N. J. State Mus. for 1910: 283 (1911). *S. triglomerata*, var. *gracilis* Britton, Ann. N. Y. Acad. Sci. iii. 230 (1885), not *S. gracilis* Ell. (1824). *S. triglomerata*, var. *minor* Britton in Britton & Brown, Ill. Fl. i. 282 (1896).—Southern New Jersey to North Carolina.—In Virginia frequent to common in peaty or boggy depressions at least of Henrico and Prince George Counties. HENRICO COUNTY: exsiccated swale near Byrd Airport, *F. L. & S.*, no. 5666. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depressions, about 3 miles southeast of Petersburg, at head of Poo Run, *F. L. & S.*, no. 5665; argillaceous and boggy depression north of Gary Church, *F. L. & S.*, no. 5667. FIGS. 5–8.

3. S. NITIDA Willd. in Kunth, Enum. ii. 350 (1837), ex char.—New Jersey to Florida, thence to Mississippi, chiefly in dry sandy woods and thickets.—The Virginia material in the Gray Herbarium is as follows. PRINCESS ANNE COUNTY: dry oak woods, Cape Henry, *F. & G.*, no. 2771 (as *S. triglomerata*, var. *gracilis*). NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4833 (as *S. triglomerata*). ISLE OF WIGHT COUNTY: dry sandy pine and oak woods about 1 mile southeast of Zuni, *F. & L.*, no. 6094; dry sandy pine barrens south of Zuni, *F. G. & L.*, no. 6549; dry sandy yellow pine and oak woods near Walters, *F. & L.*, no. 6095. JAMES CITY COUNTY: sandy soil in thicket, 2½ miles west of Williamsburg, *Grimes*, no. 3843 (as *S. triglomerata*). BEDFORD COUNTY: July 1, 1871, *A. H. Curtiss*. FIGS. 9–12.

S. SETACEA Poir. NORTHAMPTON COUNTY: boggy swale bordering swampy woods south of Kendall Grove, *F. L. & F.*, no. 5247.

Not recorded from Virginia by Core, Am. Sp. Scleria, Brittonia, ii. no. 1 (1936); noted from Princess Anne County in RHODORA, xxxvii. 405 (1935).

CAREX ARENARIA L. NORTHAMPTON COUNTY: sandy woods among the dunes, Savage Neck, *F. & L.*, no. 5249; crest of sandy and argillaceous bluff, Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5250.

Appearing in every way like an indigenous element of the vegetation; seeming to us like a relic on our coast comparable with the many limited colonies from New England to Newfoundland of species which abound in western Europe. Our experience does not support the statement of the late K. K. Mackenzie in the North American Flora, xiii. 39 (1931): "adventive from Europe. . . . Scarcely well enough established to be treated as a member of the North American flora."

C. STIPATA Muhl., var. UBERIOR Mohr (*C. uberior* (Mohr) Mackenz.). Common in swampy woods of NORFOLK and PRINCESS ANNE COUNTIES: east of Little Creek, *F. & G.*, no. 4322.

Presumably the plant intended by Kearney's citation of *C. stipata*.

C. LAEVIVAGINATA (Kükenth.) Mackenz. PRINCESS ANNE COUNTY: swampy woods east of Little Creek, *F. & G.*, no. 4320.

C. SEORSA E. C. Howe. PRINCESS ANNE COUNTY: swamp east of Little Creek, *F. & G.*, no. 4316.

C. HOWEI Mackenz. PRINCESS ANNE COUNTY: wet swale east of Little Creek, *F. & G.*, no. 4315.

*C. FLACCOSPERMA Dew. NORFOLK COUNTY: gum swamp near Cornland, *F. & G.*, no. 4343.

Extension north from North Carolina.

*C. STRICTA Lam. PRINCESS ANNE COUNTY: by creek in gum swamp, west of Pungo, *F. & G.*, no. 4323.

Not seen from Virginia by Mackenzie in preparing the treatment of *Carex* for the North American Flora.

*C. FOLLICULATA L., var. AUSTRALIS Bailey (*C. lonchocarpa* Willd., *C. Smalliana* Mackenz.) NORFOLK COUNTY: alluvial woods near Cornland, *F. & G.*, no. 4347. Frequent in bottomlands and swamps westward to the Fall Line.

Not seen from north of South Carolina by Mackenzie in preparing the treatment of *Carex* for the North American Flora.

*C. RIPARIA Curtis, var. LACUSTRIS (Willd.) Kükenth. (*C. lacustris*

Willd.). Princess Anne County: by creek in gum swamp, west of Pungo, *F. & G.*, no. 4346.

Not seen from south of Delaware and the District of Columbia by Mackenzie in preparing the treatment of *Carex* for the North American Flora.

I am not able to follow Mackenzie in specifically separating the North American *Carex lacustris* from the Old World *C. riparia.* I find myself more in accord with Francis Boott, William Boott, Bailey and Kükenthal in treating it as one of the variations of a semi-cosmopolitan species. Mackenzie's differentiation of the American *C. lacustris* and *C. hyalinopsis* Steud. (*C. riparia*, var. *impressa* S. H. Wright) as species apart from *C. riparia* is not clarified by his characterization (p. 436) of the American *C. lacustris* as having "staminate . . . scales oblong-obovate, obtuse, retuse or emarginate, mucronate," followed on the next page by the explanation, that "In *Carex lacustris*, . . . the staminate scales are cuspidate or awned, while in the other two species they are retuse and mucronate."

*Wolffiella floridana (J. D. Sm.) Thompson. Apparently common in quiet waters of ponds and pools, Princess Anne County: creek between the ponds, Dam Neck, *F. & G.*, no. 4352; Rainey's Pond, *F. G. & L.*, no. 4601; Lake Joyce, *F. G. & L.*, no. 4600. Northampton County: forming dense stranded carpets at borders of small ponds in woods back of the dunes, Savage Neck, *F. L. & F.*, no. 5252, in one pond making a continuous band outside the equally continuous inner zone of *Wolffia punctata.* Surry County: abundant in the pond, Sunken Meadow Beach, *F. & L.*, no. 6789.

*Wolffia punctata Griseb. A species of southern and inland range, occurring from the West Indies and Florida to Texas, north in the interior to northwestern New York (Irondequoit Bay), southern Ontatio and southern Michigan. Northampton County: floating in greatest profusion in a small pond in woods back of the dunes, Savage Neck, inclosed by a broad marginal zone of *Wolffiella floridana.* Surry County: abundant in the pond, Sunken Meadow Beach, *F. & L.*, no. 6788.

First stations in the coastwise region north of Florida. See note under *Cyperus Engelmanni.*

Tillandsia usneoides L. Frequent in the southeastern counties, reaching its northern limit, apparently, in Northampton County: abundant on many species of deciduous trees, Eastville, *F. & L.*, no. 5256.

*Eichornia crassipes (Mart.) Solms. Princess Anne County: in water of cove, southern end of Lake Joyce, *F. L. & F.*, no. 4842.

It is to be hoped that this, the Water Hyacinth, will not spread, as it does in the Gulf States, and thus obliterate *Limnobium* and other rare species of Lake Joyce.

*Juncus (§ Genuini) **Griscomi**, sp. nov. (tab. 445, fig. 1–4), planta dense cespitosa habitu *J. effuso* var. *costulato* simillima; caulibus erectis teretis mollibus laete viridibus medulla continua repletis circa 1 m. altis basi 2–3 mm. diametro; cataphyllis arcte vaginatis fulvescentibus membranaceis opacis, supremis 9–11 cm. longis apice rotundatis subuliferis subulo 3–4 mm. longo; inflorescentiis anthelatis laxis regulariter brachiatis 3–8 cm. latis floribus remotis; bracteis infimis teretis erectis 0.8–2 dm. longis; prophyllis chartaceis pallidis lanceolato-ovatis apice attenuato-subulatis; floribus 3–3.6 mm. longis; sepalis (tepalis externis) firmis viridescentibus lanceolato-attenuatis apice subulatis valde costatis margine anguste hyalinis 0.4–0.6 mm. latis; petalis (tepalis internis) simillimis subbrevioribus; staminibus 3 sepalis ⅓ brevioribus; antheris linearibus filamentis paullo longioribus, filamentis apice rufescentibus; capsulis perianthia subaequantibus trigono-oblongis olivaceis nitidis subcoriaceis tricoccis apice rotundato-truncatis valde mucronatis, rostro mucroniformi firmo 0.3–0.5 mm. longo; seminibus 0.6 mm. longis aureo-brunneis inaequaliter ellipsoideis breviter apiculatis, apiculis purpurascentibus, obscure transversim reticulatis.—Princess Anne County, Virginia: about a spring in woods, Little Neck, June 17, 1935, *Fernald, Griscom & Long*, no. 5604 (type in Gray Herb.; isotypes in Herbs. Phil. Acad., Griscom, and elsewhere).

Juncus Griscomi, although superficially suggesting *J. effusus* L., var. *costulatus* Fernald, at once attracted us by its greener color and more open inflorescences and especially by the strong and prominent beaks of the capsules. In *J. effusus* (including its varieties) the capsule (fig. 5) is emarginate or depressed at tip and beakless. In having a definitely beaked capsule *J. Griscomi* suggests the very localized relic, *J. gymnocarpus* Coville (*J. Smithii* Engelm. (1868), not Kunth (1841)), a species known only locally on the Appalachian plateaus of Pennsylvania and Tennessee, with a Coastal Plain area in northwestern Florida. But *J. Griscomi* is not very closely related to *J. gymnocarpus*, which has elongate rhizomes and a hard, usually indehiscent, ovoid to spherical capsule (fig. 6) much longer than the short perianth, and 6 stamens.

In having a beaked or mucronate capsule *Juncus Griscomi* also suggests *J. inflexus* L. (*J. glaucus* Ehrh.), an Old World species somewhat naturalized in North America, but *J. inflexus* is much more slender and glaucous, with stricter inflorescences, smaller and more

fuscous flowers, 6 stamens and more tapering castaneous capsules. The affinity of *J. Griscomi* is, clearly, with *J. effusus*, but its strongly mucronate capsules at once separate it from all forms of that aggregate species. As yet we know it only from the type-station, an extensive springy depression where the localized *Juncus* abounds.

J. ROEMERIANUS Scheele. Common in Princess Anne County, this species extends north at least to NORTHAMPTON COUNTY: border of salt marsh, Old Town Neck, *F. L. & F.*, no. 5260.

Small (Man.) states its northern limit as North Carolina; already recorded by Erlanson from the James River.

J. REPENS Michx. NORTHAMPTON COUNTY: moist dune-hollows, Savage Neck, *F. L. & F.*, no. 5267. In the Gray Herbarium an old specimen from NANSEMOND COUNTY: Suffolk, October 26, 1831, *Wm. Darlington*. Frequent westward to Southampton, Sussex and Prince George Counties.

NOTHOSCORDUM BIVALVE (L.) Britton. Recorded from Princess Anne County by Kearney; not listed by Grimes or Erlanson. The following specimens in the Gray Herbarium indicate northward extensions. ELIZABETH CITY COUNTY: Fortress Monroe, May, 1877, *Thos. Morong;* Hampton, May 4, 1894, *J. R. Churchill;* boggy meadow near sea, Buckroe, *B. L. Robinson*, no. 354. NORTHAMPTON COUNTY: upper border of salt marsh near Kiptopeke, *F. L. & F.*, no. 5268.

*HYPOXIS MICRANTHA Pollard. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4847. PRINCE GEORGE COUNTY: dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, *F. L. & S.*, no. 5733. Previously collected in FAIRFAX COUNTY: moist gravelly soil, hillside thicket north of Occoquan, *L. F. & F. R. Randolph* (distributed as *H. hirsuta*).

The first records from north of North Carolina.

IRIS VIRGINICA L. Common in swamps and along streams from Princess Anne County westward to the Fall Line; many collections.

*LISTERA AUSTRALIS Lindl. PRINCESS ANNE COUNTY: rich pine woods, Creed's, *F. & G.*, no. 4373; rich pine woods, Munden, *F. & G.*, no. 4374.

Not recorded by Wiegand, Bull. Torr. Bot. Cl. xxvi. 165 (1899) from the state.

*MALAXIS **Bayardi**, sp. nov. (FIG.-TEXT. 1 et TAB. 446, FIG. 1 et 2), planta habitu *M. unifoliae* simillima 1.2–2.5 dm. alta; cormo 1–1.5 cm. diametro; vaginis basilaribus 2, imis perbrevibus chartaceis apice subtruncatis, superioribus herbaceis 1–2.5 cm. longis apice obliquis; folia laminifera vagina 4–8 cm. longa, lamina elliptica 2.3–5.5 cm. longa 1.2–2.5 cm. lata; pedunculo 3–7 cm. alto; racemo in anthesi linear-

cylindrico 5–12 cm. longo 5–10 mm. diametro; bracteis ovatis 1–1.5 mm. longis basi decurrentibus; pedicellis adscendentibus 2–4.5 mm. longis; floribus numerosis viridescentibus 2.5–3.5 mm. longis; sepalis lateralibus ovato-lanceolatis obliquis obtusis 1.2–1.7 mm. longis, sepalo medio lineari-oblongo circa 2 mm. longo; petalis linearibus quam sepala media brevioribus; labio late cordato-deltoideo 2.5 mm. longo 2.2–2.5 mm. lato lobis basalaribus subdivergentibus 1–1.4 mm. longis, lobis terminalibus lateralibus deltoideis 0.4–0.6 mm. longis, lobo medio 0.2–0.3 mm. longo.—VIRGINIA: dry sandy woods and adjacent clearings, Kilby, Nansemond County, September 11, 1935, *M. L. Fernald, Bayard Long & John M. Fogg, Jr.*, no. 4851 (TYPE in Gray Herb.; ISOTYPES in Herbs. Phil. Acad. and Univ. Penn.). NORTH CAROLINA: Blowing Rock, Watauga County, August 5, 1893, *B. L. Robinson*, no. 97 in part (mixed with and distributed as *Microstylis ophioglossoides* Nutt.).

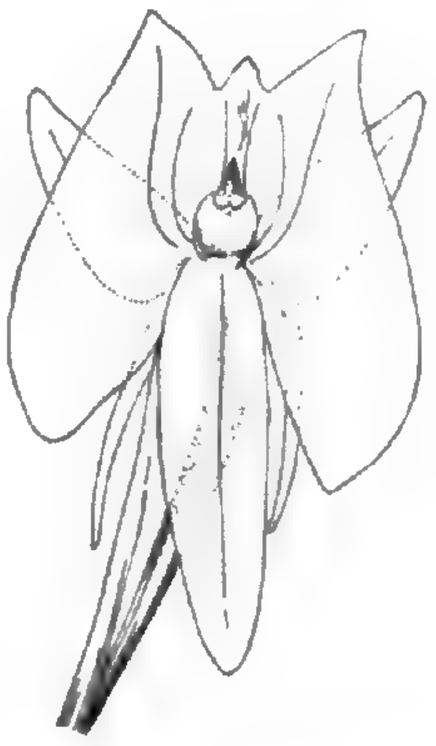

FIG. 1. FLOWER OF MALAXIS BAYARDI, laid open, × 10.

Malaxis Bayardi (for its discoverer, BAYARD LONG) is a highly localized plant, but is presumably of broader range through the southeastern states than the two collections at hand would indicate. The sheet from Blowing Rock, in the Blue Ridge of northwestern North Carolina, contains 2 plants of *M. unifolia* Michx. (*Microstylis ophioglossoides* Nutt.) and two of the newly described species, mixed and apparently not differentiated by Dr. Robinson in collecting them. At the type-locality, Kilby, *M. Bayardi* was found under the thicket bordering pine (*Pinus echinata*) and oak woods in the Coastal Plain of southeastern Virginia.

Long, Fogg and I, venturing westward from our centre in Princess Anne County, found northern Nansemond County occupied largely by a different flora (see p. 378). With very limited time at our disposal, we were collecting small series of each interesting plant. Long, reaching under the overhanging shrubs, collected a specimen of the strange *Malaxis* and called our attention to it. My own enthusiasm to help was promptly diminished through an attack by ants upon my bare arms; but Long and Fogg between them secured sufficient specimens for a good type-series.

The nearest relatives of *Malaxis Bayardi* are the common North American *M. unifolia* Michx. (FIG. 3 and TEXT-FIG. no. 2) and *M. Grisebachiana* Fawc. & Rendle, of the West Indies. Both of the latter species have thick- or oblong-cylindric spikes. That of *M.*

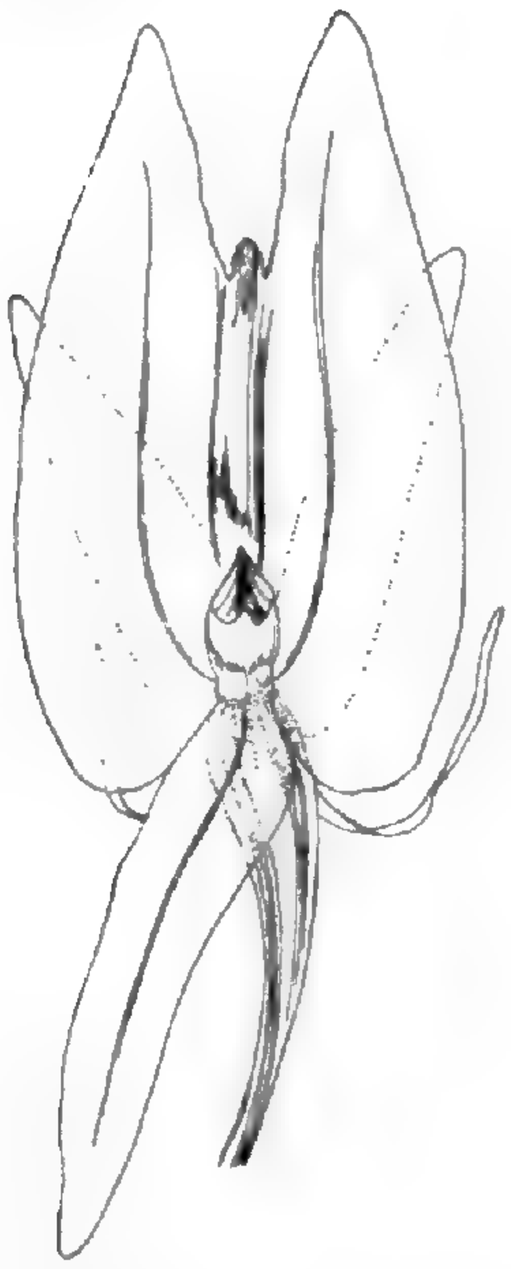

FIG. 2. FLOWER OF MALAXIS UNIFOLIA, laid open, × 10.

unifolia, when fully expanded, 1–10 cm. long and 1.3–2.5 cm. thick, with mature divergent pedicels 4–8 mm. long. In *M. unifolia* the larger flowers (FIG. 3 and TEXT-FIG. 2) have the oblong-oval lip shallowly cordate at base, with the 2 lateral apical lobes elongate, the central one a tiny tooth. The West Indian *M. Grisebachiana*, as shown by the illustrations (Fawcett & Rendle, Fl. Jam. i. t. 6, figs. 18–23) and by the West Indian specimens, has a short and thick raceme like that of *M. unifolia*, but an almost quadrate short-oblong lip only 1.75 mm. broad and with comparatively short basal lobes.

In its very slender raceme *Malaxis Bayardi* suggests the calcicolous boreal *M. brachypoda* (Gray) Fern. in RHODORA, XXVIII. 176 (1926) and XXXV. 241, t. 253, figs. 1–4 (1933); but *M. brachypoda* has the leaf nearly basal, yellowish and larger flowers, narrower bracts, and drooping cordate lip with prolonged entire tip.

(*To be continued*)

Photo. E. C. Ogden.

VARIETIES OF PARONYCHIA FASTIGIATA, all figs. × 10: FIGS. 2–6, var. TYPICA; FIGS. 6 and 7, var. PALEACEA; FIG. 8, var. NUTTALLI; FIGS. 9–11, var. PUMILA. FIG. 1, P. CANADENSIS.

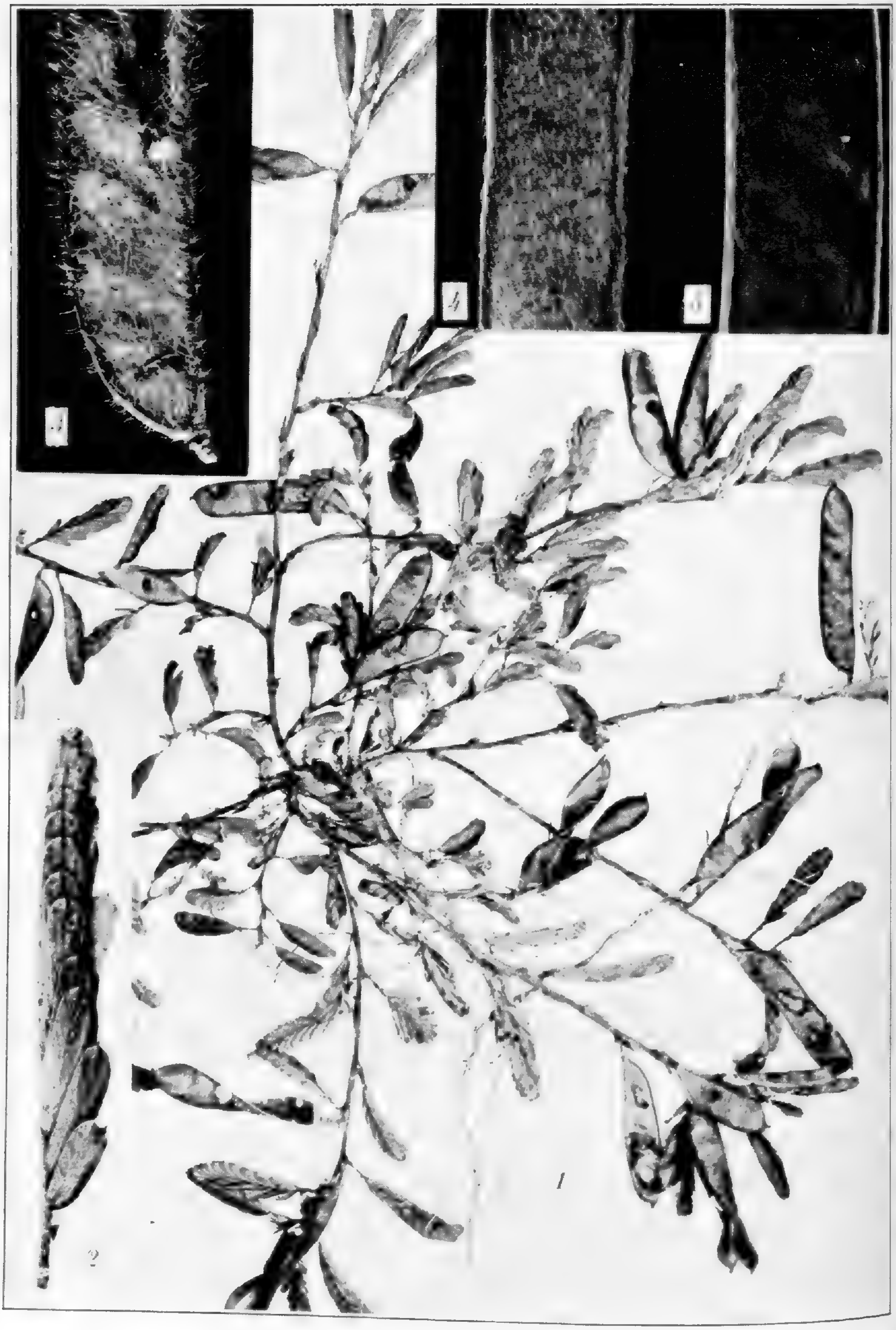

Photo. E. C. Ogden.

VARIETIES OF CASSIA NICTITANS, details × 4: FIG. 1, var. HEBECARPA, plant, × 1; FIG. 2, leaf; FIG. 3, surface of legume; FIG. 4, surface of legume of C. NICTITANS; FIG. 5, of var. LEIOCARPA.

PLANTS FROM THE OUTER COASTAL PLAIN OF VIRGINIA

M. L. FERNALD

(*Continued from page 404*)

OSTRYA VIRGINIANA (Mill.) K. Koch, var. **lasia**, var. nov., ramulis dense subpersistenterque villosis.—Coastal Plain from Florida to Texas, north to Virginia, and less characteristically and more rarely to southeastern Massachusetts, inland through the Mississippi Basin to western Tennessee, southern Illinois, Iowa and South Dakota. TYPE: Lake City, Columbia County, Florida, July 11–19, 1895, *G. V. Nash*, no. 2158 (in Gray Herb.).

The Virginia collections are as follows: HENRICO COUNTY: Richmond, May 5, 1894, *J. R. Churchill.* PRINCESS ANNE COUNTY: rich dry woods, Little Neck, *Fernald, Griscom & Long*, no. 4627. NORFOLK COUNTY; dry rich woods, east of Gertie, *Fernald, Griscom & Long*, no. 4628.

Typical *Ostrya virginiana*, with the new branchlets glabrous or merely sparsely pilose and glabrate (or stipitate-glandular but otherwise glabrous in forma *glandulosa* (Spach) Macbr.) is the characteristic northern tree, occurring from Nova Scotia to Manitoba, south to the interior of Virginia, the uplands of Georgia and Tennessee, Missouri and Oklahoma. Var. *lasia* takes its place in lower areas of the southern Coastal Plain. Forma *glandulosa* occurs sporadically throughout the range of the glabrous-twigged typical *O. virginiana*.

Mr. C. A. Weatherby, who, in 1935, sought the type of *Carpinus virginiana* Mill. Gard. Dict. ed. 8, upon which the name *Ostrya virginiana* rests, reports that there seems to be no clearly identifiable specimen to stand as the type. I am, therefore, accepting the smoother extreme of the species.

In 1841 Spach defined two variations of our hop-hornbeam, *O. virginica* Willd., α. *glandulosa* and β. *eglandulosa* Ann. Sci. Nat. sér. 2, xvi. 246 (1841). His var. *glandulosa* was properly reduced to formal rank as *O. virginiana*, forma *glandulosa* (Spach) Macbr., Field Mus. Pub. Bot. iv. 192 (1929). In so doing Macbride seems to have left Spach's *O. virginica* β. *eglandulosa* to stand as typical *O. virginiana*.

QUERCUS VIRGINIANA Mill. NORTHAMPTON COUNTY: a single shrub in peaty clearing south of Townsend, *F. L. & F.*, no. 5292. Extension north from Cape Henry.

*Q. CINEREA Michx. PRINCESS ANNE COUNTY: small trees among the sand dunes, Cape Henry, *F. L. & F.*, no. 4863.

Extension north from North Carolina.

CELTIS LAEVIGATA Willd. (*C. mississippiensis* Bosc). PRINCESS ANNE COUNTY: dry wooded slope near Third Street Bridge, Great Neck, trees 10 m. high, *F. & L.*, no. 4866; rich woods, Cedar Island, *F. G. & L.*, no. 4630, distributed as *C. occidentalis*, var. *submembranacea* Fern. Passing to

C. LAEVIGATA, var. SMALLII (Beadle) Sarg. (*C. occidentalis*, var. *submembranacea* Fern. in RHODORA, XXXVII. 425 (1935)). To the station on Knott's Island add the following, also in PRINCESS ANNE COUNTY: rich woods, Cedar Island, trunks up to 6 dm. in diameter, *F. G. & L.*, no. 4631; dry wooded slope near Third Street Bridge, Great Neck, *F. & L.*, no. 4867. SOUTHAMPTON COUNTY: wooded bottomland of Meherrin River, above Haley's Bridge, *F. L. & S.*, no. 5767.

ASARUM ARIFOLIUM Michx. PRINCESS ANNE COUNTY: rich pine woods, Munden, *F. & G.*, no. 4387; pine woods, Creed's, *F. & G.*, nos. 4388, 4389.

Evidently rare in Virginia; not seen by us farther north nor west.

POLYGONUM DENSIFLORUM Meisn. (*P. portoricense* Bertero). See Weatherby, RHODORA, XXV. 20 (1923). PRINCESS ANNE COUNTY: peaty margin of cove, southern end of Lake Joyce, *F. L. & F.*, no. 4872, as *P. portoricense*. SURRY COUNTY: margin of pond in cypress swamp, Sunken Meadow Beach, *F. & L.*, no. 6810.

Not recorded by Kearney.

P. CRISTATUM Engelm. & Gray. NORTHAMPTON COUNTY: dry sandy and argillaceous pine woods back of the shore-bluff, west of Kiptopeke, *F. L. & F.*, no. 5300. SUSSEX COUNTY: dry sandy hickory and oak woods, Burt, *F. & L.*, no. 6200; border of dry sandy woods, 4 miles south of Stony Creek, *F. G. & L.*, no. 6590.

Not recorded by Kearney, Grimes nor Erlanson.

*SALICORNIA MUCRONATA Bigel. NORTHAMPTON COUNTY: border of salt marsh east of Eastville, *F. & L.*, no. 5303.

First collection in the Gray Herbarium from Virginia; not recorded by Kearney, Grimes nor Erlanson.

S. EUROPAEA L. PRINCESS ANNE COUNTY: salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, *F. & L.*, no. 4876.

Not recorded by Kearney.

S. AMBIGUA Michx. PRINCESS ANNE COUNTY: moist sand, 1 mile east of Lynnhaven Inlet, *L. F. & F. R. Randolph*, no. 437; salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, *F. & L.*, no. 4875.

Not listed by Kearney.

*IRESINE RHIZOMATOSA Standl. PRINCESS ANNE COUNTY: rich woods, Cedar Island, *F. G. & L.*, no. 4635.

Described by Standley as occurring in Texas, Oklahoma, Kansas, Missouri, Alabama, and Tennessee, with the type-collections from Plummers Island in the Potomac in Montgomery County, Maryland. Standley specially noted the remarkable northeastern isolation on Plummers Island, saying:[1]

> The occurrence of the plant upon Plummers Island is of great interest, for the station is the northernmost locality now known for the species and for the genus. It seems probable that seeds have been brought down by the Potomac from some locality in the mountains, although the genus is not known upon the east slope of the Alleghenies; or perhaps the plants are the last survivors of ancestors which had a wider range in Maryland and Virginia. There are several colonies of the plant upon Plummers Island consisting of numerous individuals, but in 1915 only two or three plants flowered.

Cedar Island, in Back Bay, is on the outer Coastal Plain, 145 miles southeast of Plummers Island. It is not probable that seeds have recently been arriving there, without colonies starting in intermediate spots. I strongly endorse Standley's suggestion that the Plummers Island "plants are the last survivors of ancestors which had a wider range in Maryland and Virginia." The isolation of the species on Cedar Island favors this interpretation; it is quite parallel with numerous other isolations on the Coastal Plain.

NOTES ON PARONYCHIA, § ANYCHIA (PLATE 447, all figs. × 10).—*Anychia* Michx. Fl. Bor.-Am. i. 112 (1803) is a strictly North American group. Commonly kept apart as a genus, it met the challenge of Fenzl as early as 1840, the latter great student of the *Caryophyllales* reducing it to *Paronychia* Adans. as *Paronychia*, § *Anychia* (Michx.) Fenzl in Endlicher, Gen. 958 (1840). Although most American botanists have retained *Anychia* as a genus, Mr. J. Francis Macbride, in 1915, entered an unpublished binomial for one of our species on a sheet in the Gray Herbarium and made the memorandum: "*Anychia* and *Anychiastrum* are not to be retained. Old World species [of *Paronychia*] show pedicelled perianths and the bracts of *Anychia*"; and in 1934 Pax & Hoffmann in Engler & Prantl, Nat. Pflanzenfam. ed. 2, xvi[c]. 300 (1934) followed Fenzl in treating *Anychia* as a section of *Paronychia*. With this treatment I find myself in sympathy; consequently I am not able to follow Small in breaking *Anychia* into three genera.

[1] Standley, Proc. Biol. Soc. Wash. xxviii. 173 (1915).

In his Manual Small illustrates his ideas of generic differences in this series. *Anychia* has "Sepals with narrow margins, hooded and mucronate" and "Styles short, united" as contrasted with *Anychiastrum* Small with sepals "broad, with a wide hood at the apex and a short stubby mucro" and with "Styles elongate, united, separating and partly deciduous in age"; and *Nyachia* Small has "Sepals with broad wing-margins, hooded and with a thick umbo" and "Styles very short, distinct." Comparison of the illustrations on pages 480 and 481 of Small's Manual show the "short stubby mucro" of the sepals of *Anychiastrum* to be longer than and as sharp as in *Anychia* and the upper calyces of each series of drawings so similar as to be essentially inseparable, while the lower calyx under *Anychia* is so like both calyces under *Nyachia* that the reputed GENERIC differences are not evident. Furthermore, all three have the sepal-tip hooded or cucullate. If the degree of sharp-pointing is considered a generic difference, what shall we say about *Anychia canadensis* (L.) Ell. and *A. polygonoides* Raf., both included by Small under *Anychia,* while the very similar *A. divaricata* Raf. appears as *Anychiastrum montanum* Small? As originally described by Small (Torreya, x. 231) the sepals of the latter (FIGS. 9–11) are "abruptly pointed at the apex, . . . without prominent apical cusps." But in the most extreme form (FIG. 8) of *Anychia polygonoides* (*A. Nuttalli* Small) the sepals end in a positive awn or cusp 0.2 mm. long, while in *A. canadensis* the flat round-tipped sepals (FIG. 1) are even less mucronulate than in *Anychiastrum montanum.* As a stable GENERIC character the degree of pointing of the sepals is extremely weak.

Similarly with the styles. Although *Anychia* is separated from *Anychiastrum* by having "Styles short, united," as opposed to "elongate, united, separating . . . in age," the lower right-hand flower of *Anychia* in Small's Manual is shown with the 2 styles wholly distinct, as in *Nyachia.* Those who find clarity and intellectual stimulus in the recognition of such "genera" are free to do so; unless they further clarify them, however, they can hardly expect others to follow them. Personally, I agree with Pax & Hoffmann in reducing *Anychiastrum*, *Anychia* and *Nyachia* to *Paronychia.*

Paronychia § *Nyachia* (Small) Pax & Hoffm. l. c. (1934), based on *Nyachia* Small in Torreya, xxv. 11 (1925), consists of a single unique species from the sands of Florida. This is *Nyachia pulvinata* Small, which became *Paronychia pulvinata* (Small) Pax & Hoffm. l. c. The

latter name, however, is a later homonym, for Pax & Hoffmann overlooked the Rocky Mountain *P. pulvinata* Gray (1864). Under *Paronychia*, *Nyachia pulvinata* may become *P. chartacea*.[1]

Paronychia, § *Anychia* consists of two species. One of them, *P. canadensis* (L.) Wood, Class Bk. 1861: 262 (1861) at least as to type, *Queria canadensis* L., is a clear-cut species, with glabrous stems, capillary branches, thin elliptic leaves, very short stipules and stipular bracts, flat essentially ribless round-tipped sepals and much exserted subglobose capsules (FIG. 1) with distinct styles. The other species is usually coarser, the stem puberulent or minutely pilose, the leaves oblanceolate to narrowly obovate or narrowly elliptic, the stipules and stipular bracts attenuate and comparatively conspicuous, the sepals (FIGS. 2–8) usually corrugated (always so in age except sometimes in one variety), mucronulate- to subulate-tipped, the capsule included or barely exserted, obovoid, with the styles united at least below. This second species is the heteromorphic series now passing as *Anychia polygonoides* Raf. and *Anychiastrum montanum* Small.

Anychia polygonoides occurs in four geographic varieties:

Var. *a* (FIGS. 2–5). Stem stiffly erect or ascending, the older and larger plants with broad flabelliform outline, the branchlets rather densely flowering; leaves grayish-green, often minutely serrulate toward the sharp tip, those of the primary axis 1–2 cm. long; stipular bracts subtending the flowers lance-attenuate, shorter than the calyx; sepals definitely corrugated, with minute white mucronulate tips; styles united, much shorter than the ovary.—Massachusetts to Wisconsin, south to Florida and Texas.—Passing insensibly to var. *b* and through diffuse and greener plants to var. *d*. *Anychia polygonoides* Raf.

Var. *b* (FIGS. 6 and 7). Similar to var. *a;* stipular bracts equaling or overtopping the flowers.—Delaware and Pennsylvania to Illinois and Tennessee.

Var. *c* (FIG. 8). Similar to var. *a* or more depressed and divergently bushy-branched; sepals with subulate awns 0.2 mm. long.—Huntingdon, Adams and Franklin Cos., Pennsylvania. *Anchyia Nuttalli* Small.

Var. *d* (FIGS. 9–11). Diffusely to horizontally branched, forming low and intricate mats, greener; leaves barely if at all serrulate, the larger (primary) ones only 0.7–1.2 cm. long; stipular bracts ovate-

[1] PARONYCHIA **chartacea,** nom. nov. *Nyachia pulvinata* Small in Torreya, xxv. 12 (1925). *P. pulvinata* (Small) Pax & Hoffm. in Engler & Prantl. Pflanzenr. Aufl. 2, xvi[c]. 300 (1934) not *P. pulvinata* Gray in Proc. Acad. Nat. Sci. Phila. for 1863: 58 (1864).

lanceolate, shorter than to about equaling flowers; sepals less corrugated to plane, blunt, very minutely mucronulate; united styles nearly or quite as long as ovary.—Pennsylvania to Georgia and Alabama. *Anychiastrum montanum* Small.

That the first three varieties are variations of one species there is likely to be little question. The fourth (*Anychiastrum montanum*) is more remote from the others through its diffuse habit, greener and smaller foliage, broader stipular bracts, blunter and less corrugated sepals and longer style-column. But numerous plants with the characteristic gray-green foliage are diffuse and several of them have the style enough elongated to make a strong approach to typical *Anychiastrum montanum*, while such plants as *Hunnewell & Griscom*, no. 15,169 from Three-Top Mt., Shenandoah Co., Virginia, with the scarcely corrugated sepals (FIG. 11) and the long style of *Anychiastrum montanum*, has the ascending habit of typical *Anychia polygonoides* (my var. *a*). Furthermore, such a diffusely branched plant as *C. C. Deam's* no. 7540, from Clark Co., Indiana, with the habit and small green leaves of *Anychiastrum montanum*, has the corrugated sepals and the short style (FIG. 5) of var. *a*. Such specimens indicate that *Anychiastrum montanum*, in its best development, is only one of the extremes of a variable species. Incidentally, it has a number of names much earlier than that given by Small. These and the other names given to the pubescent-stemmed species will now be discussed.

In determining the proper names for these four varieties, we at once meet a familiar difficulty: Rafinesque proposed several species. The first series was published in Rafinesque's Atlantic Journal (1832) and included four species:

1. *Anychia Polygonoides*, Raf. discovered, 1818. Stem dichotomous, lax, erect, puberulent; leaves patent, linear cuneate, acute, nearly smooth, stipules lanceolate; flowers solitary in dichotomy, subpedicellate, erect. From the mountains Alleghany, and estival like the three following, six inches high.

2. *Anychia fastigiata*, Raf. disc. 1820. Stem dwarfish, erect, puberulent, subdichotome, fastigiate; leaves adpressed, linear cuneate, acute; flowers crowded, fastigiate, secund, subsessile. From Kentucky, one or two inches.

3. *Anychia conferta*, Raf. disc. 1821. Stem erect, dichotome, puberulent; leaves linear cuneate, acute, serrulate; flowers crowded, fastigiate, bracteate, pedunculate. From knobs of Kentucky, annual, three or four inches.

4. *Anychia lateralis*, Raf. disc. 1821. Stem procumbent, dichotome, divaricate; leaves remote, short, linear cuneate, entire; branchlets uni-

lateral; flowers sessile, lax or remote. Arid hills of Kentucky, one to three inches.[1]

In 1838 Rafinesque added somewhat to his characterizations of 1832, in the New Flora of North America, iv. 42 (1838). He had one additional name which concerns us:

835. Anychia divaricata R. stem decumbent puberulent very branched and divaricate, leaves oblong acute smooth, stipules ovate acute, flowers crowded striate sessile segments of calix nervose.—A very distinct sp. blended as usual with Queria or A. canadensis, branches so divaricate as to be sometimes almost reflexed, leaves 3 lines long one broad, flowers small quite crowded at the end of branchlets. Found from the Alleghany Mts. to Kentucky on hills, estival, stems spreading 6 to 10 inches.[2]

Anychia polygonoides, *fastigiata* and *conferta* are, with reasonable certainty, either my var. *a* or *b;* without mention by Rafinesque of the stipular bracts it is now impossible to say which. *A. lateralis* suggests my var. *d*, but it came from "arid hills of Kentucky," whence we do not know *Anychiastrum montanum*, and it might have been a habit-form of *Anychia polygonoides*. *Anychia divaricata* with its "branches so divaricate as to be sometimes almost reflexed" seems to be my var. *d* and in 1911 Steele[3] took up *Anychia divaricata* in this sense, gave a detailed and accurate[4] account of it and cited characteristic specimens. There is no question that *Anychia divaricata* Raf. *sensu* Steele is *Anychiastrum montanum*. After his very discerning discussion of *Anychia divaricata* Steele remarked: "I leave it to Doctor Small, who is already acquainted with this plant, to transfer it to Anychiastrum, if he sees fit." Small, however, had already (the year before) described the plant as a wholly new species of his *Anychiastrum*.

One other name must be considered. When Wood published the combination *Paronychia canadensis* (L.) Wood in 1861 for the upright plant with "style none," he defined a variety which is surely *A. divaricata* Raf. *sensu* Steele or *Anychiastrum montanum*. This variety of *Paronychia canadensis* was

β. pumila. Dwarf, a few inches (2–4′) high, the lvs. reduced in propor; tion, very pubescent; stems short-jointed, tufted, fls. sessile, glomerate-

[1] Raf. Atl. Journ. 16 (1832).
[2] Raf. New Fl. iv. 42 (1838).
[3] Steele, Contrib. U. S. Nat. Herb. xiii. 363 (1911).
[4] Steele slipped into one unfortunate inaccuracy, citing *Anychia divaricata* Raf. as published in "Neogenyton 4: 42. 1825." Neogenyton was published in 1825, but it consisted of only 4 pages and did not include *Anychia*. Steele was confused by the name given by Rafinesque to part iv. of his New Flora (1838); this part was designated by its author "Neobotanon."

style as long as the ovary (at least in specimens from Md. sent by Mr. H. Shriver).[1]

From among the early specific names of Rafinesque's, *Anychia polygonoides* has been selected and validated as applying to the common plant with flabelliform or fastigiate habit, pubescent stem, corrugated sepals and united styles. This name, however, cannot be taken over into *Paronychia* on account of *P. polygonoides* Muschler in Engl. Bot. Jahrb. xlv. 459 (1911). *A. fastigiata* and *A. conferta* were apparently conspecific with *A. polygonoides* (merely smaller plants) and I am, therefore, selecting the former of the two for retention. Since it is not now possible to determine with certainty whether Rafinesque had the variety with shorter or with longer stipular bracts I am applying his name to the wider-ranging and generally commoner var. *a*.

As I understand this complex species it should bear the following names. The characters are given on p. 418.

PARONYCHIA **fastigiata** (Raf.), comb. nov., var. **typica**. *Anychia fastigiata* Raf. Atl. Journ. 16 (1832). *A. polygonoides* Raf. l. c., not *Paronychia polygonoides* Muschler (1911). *A. conferta* Raf. l. c. Var. *a* of p. 418. FIGS. 2–5.

Var. **paleacea**, var. nov. (FIGS. 6 et 7), stipulis elongatis, bracteis stipularibus calyces aequantibus vel superantibus.—Delaware and Pennsylvania to Illinois and Tennessee. TYPE: dry soil, Mt. Cuba, Delaware, July 30, 1875, *A. Commons* in Gray Herb. (distributed as *A. canadensis*).

Var. **Nuttalli** (Small), comb. nov. *Anychia Nuttalli* Small in Torreya, xxv. 60 (1925).—Mountains of Pennsylvania. FIG. 8.

Var. **pumila** (Wood), comb. nov. *Anychia canadensis*, β. *pumila* Wood, Class Book, 1861: 263 (1861). *A. divaricata* Raf. New Fl. iv. 42 (1838) at least as interpreted by Steele, Contrib. U. S. Nat. Herb. xiii. 363 (1911). *Anychiastrum montanum* Small in Torreya, x. 230 (1910). *Plagidia montana* (Small) Nieuwl. in Am. Midl. Nat. iii. 115 (1913). *Paronychia montana* (Small) Pax & Hoffm. in Engl. & Prantl, Pflanzenr. Aufl. 2, xvi^{c}. 300 (1934). FIGS. 9–11.

SILENE CAROLINIANA Walt. PRINCESS ANNE COUNTY: sandy pine woods, scarce, Creed's, *F. & G.*, no. 4390.

Not listed by Kearney and evidently very local in southeastern Virginia.

CERATOPHYLLUM DEMERSUM L. PRINCESS ANNE COUNTY: in water at margin of Lake Joyce, *F. L. & F.*, no. 4638. SURRY COUNTY: margin of pond in cypress swamp, Sunken Meadow Beach, *F. & L.*, no. 6814.

[1] Wood, Class Book, 1861: 263 (1861).

Not listed by either Kearney or Erlanson; but presumably of wide dispersal in ponds and pools.

RANUNCULUS PUSILLUS Poir. The following material is in the Gray Herbarium from the Coastal Plain of Virginia.—ELIZABETH CITY COUNTY: pools at Hampton, May 12 and 13, 1877, *Thos. Morong;* marshy border of woods between Buckroe and Hampton, *B. L. Robinson,* no. 301. PRINCESS ANNE COUNTY: mud of wooded swamp, Oceana, *F. & G.*, no. 4393; pools in gum swamp, west of Pungo, *F. & G.*, no. 4394; border of gum swamp, Land of Promise, *F. & G.*, no. 4395; border of wet clay ditch, Virginia Beach, *F. & G.*, no. 4396. NORFOLK COUNTY: alluvial woods near Cornland, *F. & G.*, no. 4397.

Not listed by Kearney nor Erlanson; but doubtless overlooked because of its early maturing, the plant being a quickly maturing annual or biennial which is completely disintegrated by early June.

*RANUNCULUS PALMATUS Ell. NORFOLK COUNTY: ditch, Cedar Hill, *F. & G.*, no. 4398. CHESTERFIELD COUNTY: wooded river-swamp along Appomattox River, near Hopewell, *F. L. & S.*, no. 5777.

First records from north of South Carolina.

MENISPERMUM CANADENSE L. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4407.

Not listed by Kearney nor Erlanson.

PERSEA PALUSTRIS (Raf.) Sarg. (*P. pubescens* (Pursh) Sarg.) NORTHAMPTON COUNTY: low deciduous and mixed woods, Eastville, *F. & L.*, no. 5307; woods north of Cheriton, *R. R. Tatnall,* no. 1810.

Extension north from Cape Henry.

*BENZOIN AESTIVALE (L.) Nees, var. PUBESCENS Palmer & Steyermark. PRINCESS ANNE COUNTY: rich dry woods, Great Neck, *F. & L.*, no. 4880. CHESTERFIELD COUNTY: wooded river-swamp along Appomatox River, near Hopewell, *F. L. & S.*, no. 5780.

Although Palmer & Steyermark indicate the pubescent-leaved southern Spice Bush as extending north, in the East, only to South Carolina, it reaches New Jersey and eastern Pennsylvania.

SANGUINARIA CANADENSIS L., var. ROTUNDIFOLIA (Greene) Fedde. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4411. ISLE OF WIGHT COUNTY: rich sandy and loamy wooded slope north of Walters, *F. G. & L.*, no. 6599, less characteristic.

Typical *Sanguinaria canadensis,* with the leaf becoming 1–2.8 dm. broad, the margins of the broad basal lobes and summits of the narrower ones coarsely dentate or crenate, occurs from eastern Quebec to Manitoba and North Dakota, southward to northern Florida,

Tennessee, Arkansas and Oklahoma. Southward it passes into the there more frequent var. *rotundifolia*, with mature leaves only 0.7–1.8 dm. broad, firmer, unlobed or lobed, the margin without dentations or barely undulate. This southern extreme reaches northeastward to New Jersey and Pennsylvania.

*Capsella Bursa-pastoris (L.) Medic., var. bifida Crépin. Northampton County: common weed in cultivated field, Eastville, *F. & L.*, no. 5308.

A very marked variation, with large and deeply notched fruit.

Dentaria laciniata Muhl. Princess Anne County: rich woods, Great Neck, *F. & G.*, no. 4413.

Listed by neither Kearney nor Erlanson.

Agrimonia platycarpa Wallr. Northampton County: dry sandy pine woods, Eastville, *F. & L.*, no. 5314; dry pine woods south of Kendall Grove, *F. L. & F.*, no. 5315. Isle of Wight County: rich sandy and loamy wooded slope north of Walters, *F. G. & L.*, no. 6606. Sussex County: sandy and loamy woods south of Pleasant Grove Church, *F. & L.*, no. 6225.

Not recorded by Kearney nor by Erlanson.

Cassia nictitans L., var. **hebecarpa**, var. nov., (tab. 448, fig. 1–3), caulibus laxe ramosis vel depressis; foliolis 10–15-jugis glabris vel ciliolatis valde approximatis 4–7 mm. longis; leguminibus villoso-hirsutis, villis divergentibus ad 1 mm. longis.—Coast of Virginia and North Carolina. Virginia: crest of sandy and argillaceous bluff along Chesapeake Bay, Old Town Neck, Northampton Co., October 13, 1935, *Fernald, Long & Fogg*, no. 5316 (type in Gray Herb., isotypes in Herbs. Phil. Acad. and Univ. Pa.); North Carolina: Elizabeth City, August 26, 1893, *Boettcher*, no. 291.

Typical *Cassia nictitans* has the surfaces of the legumes (fig. 4) covered with minute incurved-appressed hairs and the longer and less approximate leaflets glabrous, the rachis either glabrous or appressed-pubescent. In its villous-hirsute legumes the newly proposed var. *hebecarpa* suggests var. *Mohrii* (Pollard) Macbr., but that more southern extreme has the leaf-surfaces positively pubescent.

On Pine Mountain in Bell County, Kentucky, Kearney collected the extreme in the series of variations of *Cassia nictitans*, the plant of Bell County having the legume quite glabrous. This extreme may be called

C. nictitans L., var. **leiocarpa**, var. nov. (tab. 448, fig. 5), leguminibus glabris.—Kentucky: Pine Mountain, Bell Co., September, 1893, *T. H. Kearney*, no. 496 (type in Gray Herb.).

*BAPTISIA TINCTORIA (L.) R. Br., var. **Gibbesii** (Small), comb. nov. *B. Gibbesii* Small, Fl. Se. U. S. 599, 1331 (1903).

Although Small restricts his *Baptisia Gibbesii* to South Carolina, plants with the small fruits rounded at summit, instead of larger and tapering, are in the Gray Herbarium from scattered points on the Coastal Plain, from Georgia (dry pine woods near Belair, Richmond Co., *Harper*, no. 1315) to Rhode Island (Wickford, August 28, 1908, *G. G. Kennedy*).

The collections from Virginia indicate rather general occurrence. NORTHAMPTON COUNTY: dry clearing bordering pine woods south of Kendall Grove, *F. L. & F.*, no. 5319. PRINCESS ANNE COUNTY: clay field near Lynnhaven, *F. G. & L.*, no. 4658. PRINCE GEORGE COUNTY: argillaceous and siliceous boggy depression north of Gary Church, *F. L. & S.*, no. 5804. SOUTHAMPTON COUNTY: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6227.

Although var. *Gibbesii* in extreme development is well marked, there are altogether too many transitional specimens to hold it specifically apart from the larger-fruited *B. tinctoria*.

CROTALARIA SAGITTALIS L. Frequent in sandy woods and clearings, NORTHAMPTON, ELIZABETH CITY, PRINCE GEORGE, and SUSSEX COUNTIES.

The statement current in our manuals that *Crotalaria sagittalis* is ANNUAL is misleading. Northward and frequently southward it flowers as an annual, but in eastern Virginia it is more often a stout-based and obvious perennial.

PSORALEA PSORALIOIDES (Walt.) Cory. (*P. pedunculata* (Mill.) Vail, not Poir.) NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4890; and frequent westward to the Fall Line.

Listed by Kearney only from North Carolina.

WISTERIA FRUTESCENS (L.) Poir. NORFOLK COUNTY: climbing high at border of gum swamp, near Cornland, *F. & G.*, no. 4438.

Not listed by Kearney nor Erlanson; first representative in the Gray Herbarium from Virginia. The species was recorded from Virginia by André Michaux in 1803, his record repeated by Pursh, Torrey & Gray and others. It is now certainly rare in the state.

DESMODIUM PAUCIFLORUM (Nutt.) DC. PRINCESS ANNE COUNTY: rich dry woods, Great Neck, *F. & L.*, no. 4893.

Not listed by Kearney.

D. ROTUNDIFOLIUM (Michx.) DC. ELIZABETH CITY COUNTY: bushy clearings and borders of woods west of Hampton, *F. L. & F.*,

no. 4897. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4896. Thence west to the Fall Line.

Not listed by Kearney.

D. PANICULATUM (L.) DC., var. PUBENS T. & G. PRINCESS ANNE COUNTY: open sands back of the dunes, Rifle Range, south of Rudy Inlet, *F. & L.*, no. 5901, growing with var. ANGUSTIFOLIUM T. & G. (var. *Chapmani* Britton), our no. 5900, a variety recorded by Kearney. ISLE OF WIGHT COUNTY: sandy pine and oak woods south of Zuni, *F. & L.*, no. 6615.

Not recorded by Kearney nor by Erlanson.

D. LINEATUM (Michx.) DC. NORTHAMPTON COUNTY: dry pine woods east of Eastville, *F. & L.*, no. 5330. PRINCESS ANNE COUNTY: dry argillaceous fields and bushy clearings, Rosemont, *F. & L.*, no. 4894; pine woods, Macon's Corner, *F. & L.*, no. 4895. Thence west to the Fall Line.

Noted by Kearney (as *Meibomia arenicola* Vail) only from Virginia Beach.

*LESPEDEZA STIPULACEA Maxim. Abundant by many roadsides from PRINCESS ANNE COUNTY (Cape Henry, *F. & G.*, no. 2836, as *L. striata*) inland at least to ISLE OF WIGHT COUNTY (Zuni, *F. & L.*, no. 6239) and north to STAFFORD COUNTY (Aquia Church, *F. L. & F.*, no. 4913).

Thoroughly naturalized.

RHYNCHOSIA ERECTA (Walt.) DC. NORTHAMPTON COUNTY: dry sandy pine woods, Eastville, *F. & L.*, no. 5339. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4922). Thence west to the Fall Line.

Not recorded by Kearney.

*OXALIS STRICTA L., forma **viridiflora** (Hus), comb. nov. *Oxalis stricta viridiflora* Hus in Mo. Bot. Gard. Ann. Rep. xviii. 99 (1907). VIRGINIA: open sandy border of roadside ditch, Savage Neck, Northampton Co., October 11, 1935, *Fernald & Long*, no. 5341.

The form of *Oxalis stricta* with green petals appears sporadically through the range of the species and should rank as a *forma* rather than as a geographic variety, the variations to which the term *varietas* is more and more restricted. When he published it with a trinomial Hus spoke of it as a variety; and it has so been treated by other writers.

ZANTHOXYLUM CLAVA-HERCULIS L. NORTHAMPTON COUNTY: sandy and argillaceous bluff and upper border of beach, Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5342.

Extension north from Cape Henry. A beautifully developed colony of trees.

*MELIA AZEDARACH L. NORTHAMPTON COUNTY: many fruiting trees, border of pine woods north of Kendall Grove, *F. L. & F.*, no. 5357. SOUTHAMPTON COUNTY: border of wooded bottomland of Meherrin River, above Haley's Bridge, *F. L. & S.*, no. 5820.

Generally cultivated as China Berry or "Mahogany"; now naturalized through seeding from old trees. Small (Man.) gives the northeastern limit as North Carolina. Kearney listed the species as "perhaps planted" and Erlanson's record of a "Flourishing tree in Williamsburg" is inconclusive.

POLYGALA CURTISSII Gray. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 4925. Thence common westward and northwestward to the Fall Line.

Not listed by Kearney nor Erlanson.

P. CRUCIATA L. NORTHAMPTON COUNTY: boggy swale bordering swampy woods, south of Kendall Grove, *F. L. & F.*, no. 5347. SUSSEX COUNTY: Waverly, *A. B. Seymour*, no. 8. SOUTHAMPTON COUNTY: sandy border of wooded swamp about 3 miles northwest of Ivor, *F. & L.*, no. 6262.

Noted by Erlanson only from Henrico County; evidently local.

EUPHORBIA OBTUSATA Pursh. PRINCESS ANNE COUNTY: roadside, Land of Promise, *F. & G.*, no. 4446. HENRICO COUNTY: cultivated field, May 13, 1911, *J. R. Churchill.* SOUTHAMPTON COUNTY: wooded bottomland of Meherrin River, above Haley's Bridge, *F. L. & S.*, no. 5830.

Not listed by either Kearney or Erlanson.

ILEX VOMITORIA L. NORTHAMPTON COUNTY: south shore of Old Plantation Creek, 4 miles south-southwest of Bayview, *R. R. Tatnall*, no. 1796; peaty clearing south of Townsend, *F. L. & F.*, no. 5354.

Extension north from Princess Anne County.

*VITIS CINEREA Engelm., var. FLORIDANA Munson in Rev. de Vitic. vi. 424 (1896). *V. Simpsoni* Munson in Proc. Soc. Prom. Agr. Sci. viii. 59 (1887); Small, Man. Se. Fl. 838 (1933); Bailey, Gentes Herb. iii. 205 (1934). *V. austrina* Small, Fl. Se. U. S. 775, 1334 (1903).—Common and very conspicuous, climbing high in alluvial woods and wooded swamps of southeastern Virginia. The following specimens, representative of many stations, have been collected. ELIZABETH CITY COUNTY: thickets, Buckroe, *B. L. Robinson*, no. 348, as *V. aestivalis*. NEW KENT COUNTY: thicket by Chickahominy River, near Providence Forge, *F. G. & L.*, no. 6635. PRINCE GEORGE COUNTY: river-swamp of Blackwater River, north of Disputanta,

F. L. & S., no. 5842. GREENSVILLE COUNTY: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6634. NANSEMOND COUNTY: border of inundated cypress swamp along Somerton Creek, Factory Hill, *F. & L.*, no. 6831. NORFOLK COUNTY: Portsmouth, *Rugel*, specimen marked by Engelmann "*Vitis aestivalis* foliis indivisis" and by Bailey "*V. aestivalis*"; border of woods, northeast of Northwest, *F. G. & L.*, no. 4673. PRINCESS ANNE COUNTY: border of gum swamp, Oceana, *F. G. & L.*, no. 4672; rich woods, Cedar Island, *F. G. & L.*, no. 4674.

In Gray's Synoptical Flora, i. fasc. 2: 425 (1897) Bailey cited *Vitis cinerea* var. *floridana* only from "Manatee Co., Florida, and apparently also in Arkansas" and separated it, as had Munson in 1896, from *V. cinerea* with "ash-gray leaves and the gray tomentum of the young growth" by its "Growing tips rusty-tomentose, as are sometimes the veins on the under sides of the leaves; cluster longer-peduncled and more compound." *V. cinerea*, a wide-ranging species of the Mississippi Basin and Gulf Coastal Plain, was cited as coming east to northern Florida. In his Manual Small admits *V. cinerea* for Florida and cites *V. Simpsoni* as occurring only on that peninsula. In his latest consideration of the group, his *Species of Grapes peculiar to North America*, Gentes Herbarum, iii. fasc. iv. (1934), Bailey elevates *V. Simpsoni* to specific rank (with *V. cinerea*, var. *floridana* correctly cited as a synonym), with the range "Southern Georgia and Florida according to Munson; I have a specimen . . . ticketed as native in southeastern Arkansas . . . I have seen it at Augusta, Georgia and southward . . . ; to be expected in the Carolinas." Not only is this characteristic *Vitis* "to be expected in the Carolinas"; in the Gray Herbarium it is well represented by thoroughly characteristic material from SOUTH CAROLINA (rich woods, Abbeville District, June, 1855, *Hexamer & Maier;* Santee Canal, *Ravenel;* both identified by Bailey as *V. aestivalis*) and from NORTH CAROLINA (thicket along edge of swamp, Edenton, *L. F. & F. R. Randolph*, no. 611, as *V. aestivalis*). In southeastern Virginia it abounds and "strikes one in the eye" through its rufescent shoots with the characteristically uncleft and long-tipped blades projecting over the roads from many or most rich swampy woodlands. Thoroughly characteristic plants of it can be seen clambering over the trees in a moist depression near the Biological Laboratories of the University of Richmond.

When Mr. Long and I called the attention of our hosts, Professors John W. Bailey and Robert F. Smart to this conspicuous climber,

unrecorded from north of southern Georgia, Professor Bailey promptly responded: "Why, that's Pigeon Grape. It grows everywhere in the lower Mississippi Valley." He was essentially correct. The only shadow of difference I can find to separate var. *floridana* from *V. cinerea* is its rufescence. The tendrils and foliage are otherwise identical, the thyrse, whether in flower or fruit, shows quite parallel variation and the length of the peduncle, emphasized by Bailey, gives me nothing diagnostic. The stones of ripe fruits collected by Long and me in mid-October exactly match those of material from Engelmann himself of his *V. cinerea.* It is significant that Munson, whose experience with southern grapes was unequaled, abandoned *V. Simpsoni* as a species and treated it as *V. cinerea,* var. *floridana.* Two sheets of Simpson's material sent by Munson to the Gray Harbarium are important. They were originally labeled by him *Vitis Simpsoni,* "Rusty Winter Grape" or "Rusty Cinerea." On one sheet Munson, on September 24, 1889, wrote "should be only a variety of *V. cinerea.* T. V. M. 9/24 '89." On the other sheet he crossed out the name *V. Simpsoni* and substituted "*V. cinerea,* var."

Until something more positive than rufescence (which is often not very obvious) instead of cinereousness is put forward I am unable to maintain *Vitis Simpsoni* as a species.[1] But as a variety of the wide-ranging *V. cinerea* of the Mississippi Basin and Gulf Coastal Plain it is most interesting. The occurrence of types largely developed in the latter regions but with continuous or even quite isolated or restricted areas on the Atlantic Coastal Plain is becoming more and more apparent. This *Vitis* is another case in point.

STEWARTIA MALACHODENDRON L. Two Virginia sheets are in the Gray Herbarium, one from ACCOMAC COUNTY, 1886, *Ellis Mears;* the other from NORFOLK COUNTY, *F. & G.*, no. 4455.

[1] Nor am I able to treat as distinct species *Vitis aestivalis* Michx. (1803) and *V. argentifolia* Munson (1887), the plant which has been passing, erroneously as shown by Bailey, l. c. 197, as *V. bicolor* LeConte, not Raf. Every field-botanist I have known, who is familiar with the two from southern New England to Pennsylvania and Virginia, has expressed the view that *V. argentifolia* ("*V. bicolor*") is merely a less rufescent and more glaucous and glabrate-leaved northern, inland and upland variety of the more pubescent and more rufescent *V. aestivalis*, which, in the northern half of its range, occurs at low altitudes. The name, *V. aestivalis*, var. *bicolor*, incorrectly ascribed by Britton & Brown, Ill. Fl. ii. 409 (1897) to "LeConte, Wats. & Coult. in A. Gray, Man. Ed. 6, 113. 1890," can not be used, in the first place because our plant is not *V. bicolor* LeConte, in the second place because neither LeConte nor Watson & Coulter ever published a *V. aestivalis*, var. *bicolor*. The combination was made by Britton & Brown in synonymy. The smoother and glaucous plant is VITIS AESTIVALIS Michx., var. **argentifolia** (Munson), comb. nov. *V. argentifolia* Munson in Proc. Soc. Prom. Agr. Sci. viii. 59 (1887).

Photo. E. C. Ogden.

AMMANNIA KOEHNEI: FIGS. 1 and 2, TYPE, × ½; FIG. 3, upper leaf-bases, × 2.
A. KOEHNEI, var. EXAURICULATA: FIG. 4, plant from TYPE-COLLECTION, × ½; FIG. 5, upper leaf-bases, × 2.

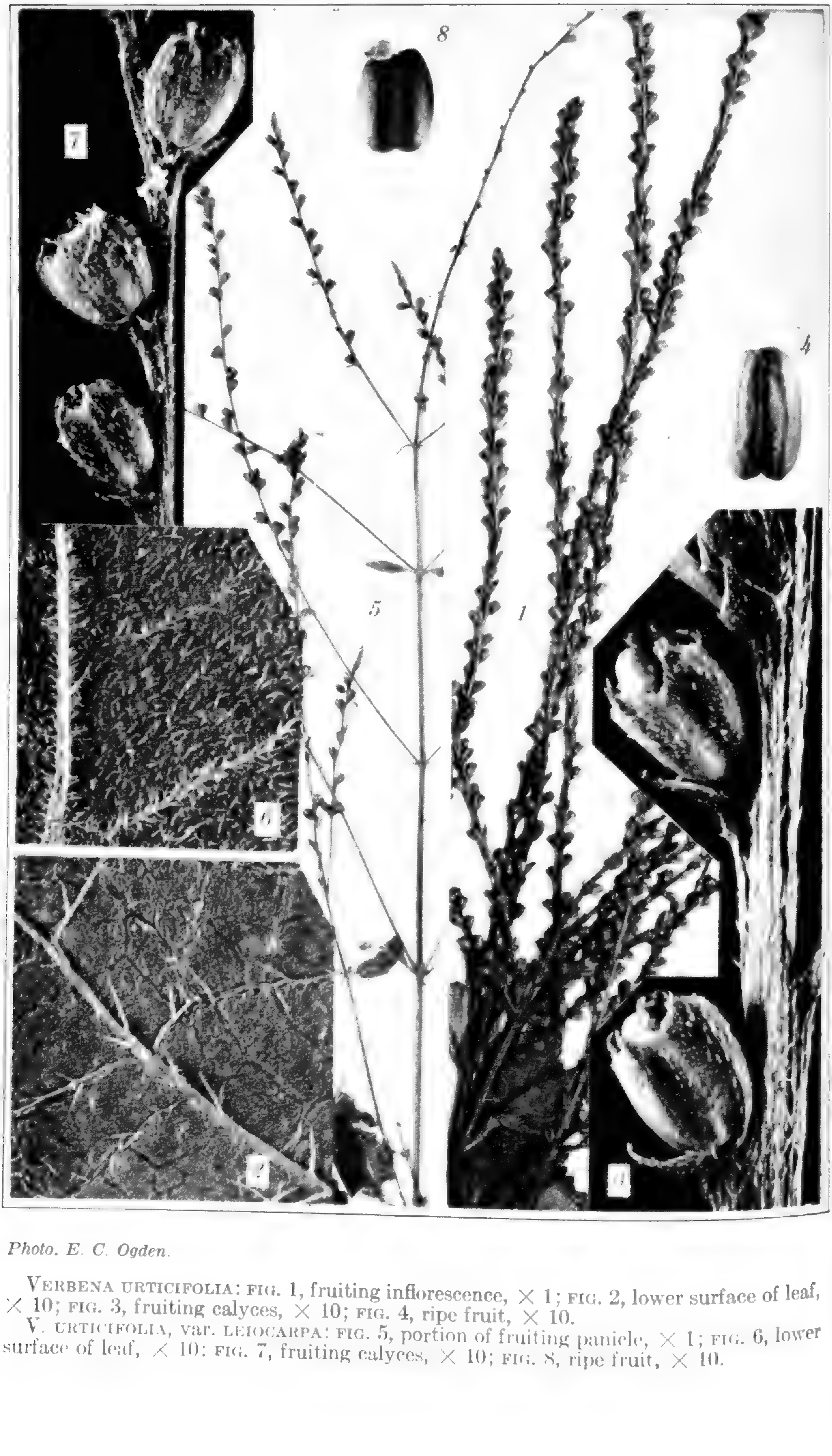

Photo. E. C. Ogden.

VERBENA URTICIFOLIA: FIG. 1, fruiting inflorescence, × 1; FIG. 2, lower surface of leaf, × 10; FIG. 3, fruiting calyces, × 10; FIG. 4, ripe fruit, × 10.

V. URTICIFOLIA, var. LEIOCARPA: FIG. 5, portion of fruiting paniele, × 1; FIG. 6, lower surface of leaf, × 10; FIG. 7, fruiting calyces, × 10; FIG. 8, ripe fruit, × 10.

It is wiser not to publish the exact localities. Too many people, and among them many botanists, will immediately dig up and take home to die mature or old individuals of rare and local plants, which, left undisturbed in their natural haunts, would survive for future generations, If people lack consideration for others it is better not to show them rare plants. *Stewartia Malachodendron* is now very rare in Virginia (or elsewhere), doubtless due to removal of shrubs for their beautiful flowers. The species was sent from Virginia to the Earl of Bute (Stuart or Stewart) and others, who were cultivating it as early as 1741. In that year, in his *Decem Plantarum Genera,* Linnaeus described it as *Stewartia* (with the plate referred to as *Stevartia*) from material derived from Virginia, the plate drawn by Ehret ("Icon plantae manu Ehretii"), and he stated that dried specimens had been sent by John Clayton to Gronovius. In 1743 or 1748, in Marc Catesby's *Natural History of Carolina,* etc. Append. 13, t. 13, it was proposed as a new genus *Steuartia.* As to the date of this publication, Pfeiffer, Nomenclator, gives 1743, but the copy of it at the Museum of Comparative Zoology at Harvard contains the penciled memorandum that it came out in 1748. The latter date, as will be shown, is probably correct. Catesby said "For this elegant plant I am obliged to my good friend *Mr. Clayton,* who sent it me from *Virginia,* and three months after its arrival it blossomed in my garden at *Fulham,* in *May* 1742." Of importance in establishing the date is a letter from John Mitchell quoted by Catesby:

SIR,
The Plant which you shewed me by the name of *Steuartia,* I take to be a new genus of Plants, the same that I called *Malachodendron.*

This item is significant, for in his *Plantarum quaedam Genera recens condita et in Virginia observata* (1748), with no mention of Catesby, Mitchell published his *Malachodendron,* whence Linnaeus derived his specific epithet. He would hardly have written to Catesby in 1742 or 1743 of the plant "that I called *Malachodendron*" five years or more before he published it.

Catesby, calling the shrub *Steuartia,* not mentioning Linnaeus's *Stewartia* of 1741 and implying the publication of a brand new genus, said: "The Right honourable and ingenious Earl of *Bute* will, I hope, excuse my calling this new genus of Plants after his name." Catesby's beautiful colored plate represents a branch with four expanded flowers, an opened capsule and freed seed, a bird called *Regulus cristatus* and a waspish insect called *Vespa Ichneumon.* This plate,

signed "MC," has the air of originality. Nevertheless, the Ehret plate published by Linnaeus in 1741, "G. D. Ehret delin.," is so like the upper half of the Catesby plate of 1748 (but in black and white), with the drawings of the capsule and seed only slightly different, that the two plates obviously originated with one artist!

In Catesby's original account (1748) the generic name was spelled *Steuartia*. This was repeated in the edition revised by George Edwards, in 1754. But in an edition of 1771, with the Appendix numbered consecutively with vol. ii, page 13 and plate 13 of the original and the 1754 editions becoming page 113 and plate 113, the name was altered to *Stuartia*. Linnaeus, however, in 1753, our starting point, held to his own *Stewartia*.

THE VARIETIES OF ASCYRUM HYPERICOIDES. *Ascyrum Hypericoides* L. has long been recognized as a polymorphic species and many binomials have been proposed for forms within its specific bounds. On the other hand, Coulter, after maintaining[1] two species, *A. Crux-Andreae* L. and *A. Hypericoides* L., gave up the separation and united all the forms as *A. Hypericoides*, saying "they cannot be separated even varietally . . . and the attempt to maintain two distinct species seems untenable. In any event, the North American plant should bear its original Linnaean name."[2]

Our experience in eastern Virginia indicated that some recognition of geographic varieties is desirable. The commoner plant of the Coastal Plain there has tall and erect or strongly ascending stems up to 9 dm. high and usually unbranched or only sparsely branched at base, but with flowering branches from most of the middle and upper axils; with the primary leaves oblong-oblanceolate, 2–3 cm. long by 5–9 mm. broad; the outer sepals broadly ovate and commonly subcordate, in maturity 10–15 mm. long by 7–10 mm. broad. This tall shrubby plant is characteristic of pine woods and borders of mixed or deciduous woods in the easternmost counties (Princess Anne, Norfolk, Northampton and Accomac), extending inland at least across the Coastal Plain; and, although most material has accumulated from eastern Virginia, this coarsest Coastal Plain extreme is represented by occasional specimens from south to Florida, west to Mississippi, inland to Tennessee and Missouri and north to Worcester County, Maryland.

[1] Coulter in Bot. Gaz. xi. 80, 81 (1886).
[2] Coulter in Gray, Syn. Fl. N. Am. i. 283 (1897).

Much less common in easternmost Virginia is the low, suffruticose plant which extends northward to New Jersey and Nantucket and which ranges broadly through the southern states. In this extreme the suffruticose stem reclines or spreads into low diffuse mats with the new flowering branches 1–2 (rarely –3) dm. long; its larger oblong-oblanceolate leaves are 1–2.3 cm. long by 4–9 mm. wide; the outer sepals elliptic, oval or oblong-ovate and rounded at base, 5–11 mm. long by 3–7 mm. broad. This smaller, lower and diffuse plant was not seen by us in Princess Anne and Norfolk Counties, but we got it in Nansemond, York and Northampton, and in the counties immediately westward and it is represented in the Gray Herbarium from many counties across the state quite to its westernmost border (ascending to 3500 feet).

Extending from Virginia to Florida and the West Indies, westward to Texas and Mexico there is a third extreme, a shrub often as tall as the largest extreme of the series but with leaves linear-oblong or linear-oblanceolate, with crowded axillary fascicles and undeveloped branchlets. In this most southern extreme the principal leaves are 0.5–2 cm. long but only 2–4 (rarely –5) mm. wide; its larger sepals vary from oblong-elliptic to ovate, 5–11 mm. long by 3–5 mm. broad.

Although conspicuously different in their extremes, these three strong trends merge in all characters. I have vainly sought for any satisfactory characters in capsules and seeds and I am forced to the conclusion reached by Coulter, that they are not specifically separable. As already noted, however, I feel that they should be designated as well marked geographic varieties.

As first published by Linnaeus, Sp. Pl. 787 (1753), *Ascyrum* consisted of three species, two of which concern us. The first was *A. Crux-Andreae,* based on *Hypericoides ex terra mariana, floribus exiguis luteis* of Plukenet, "which plant proves upon inspection to be Hypericum mutilum L.!"—Torr. & Gray, Fl. N. Am. i. 672 (1840). Subsequently Linnaeus altered his conception of *A. Crux-Andreae,* in Sp. Pl. ed. 2: 1107 (1763) by taking from his citations under his original *A. Hypericoides* a Gronovian reference to the wide-spread low plant of the United States and transferring it to *A. Crux-Andreae.* In this revised sense Torrey & Gray and many later authors took up the latter name, but such a procedure is no longer justified, since *A. Crux-Andreae* of ed. 1 was merely *Hypericum mutilum.*

Ascyrum Hypericoides of L. Sp. ed. 1 was a mixture, which was

clearly discussed by Torrey & Gray. Said to come from Virginia, it rested partly upon the Virginian plant of Gronovius, which in the 2d edition Linnaeus transferred to *A. Crux-Andreae*, in part upon a Clifford specimen (not now preserved), in part upon *Hypericoides frutescens erecta* of Plumier (the narrow-leaved West Indian plant) and in part upon a Plukenet plant which is *A. stans* Michx.; certainly a most confused concept. By removing in his 2d edition the Gronovian plant and by deliberately adding to the citations under *A. Hypericoides* Patrick Browne's Jamaican shrub with "foliis linearibus," to which he gave priority of place, Linnaeus established the fact that he ultimately intended principally the linear-leaved shrub of the West Indies. In his monographic and very discerning study of the *Hypericaceae, Prodromus d'une Monographie de la Famille des Hypéricinées* (1820), Choisy (p. 61) thus interpreted *A. Hypericoides* and he was followed in the still more extensive but less discerning monograph of Spach.[1] It seems right to follow this interpretation. Spach, however, distinguished the continental plant with linear leaves from the West Indian as *A. linifolium* but the two seem scarcely separable.

The low and matted or diffuse half-shrub of wide range, extending north to southeastern Massachusetts, was first clearly designated as *Ascyrum multicaule* Michx. Fl. Bor.-Am. ii. 77 (1803). Spach gave it several names and it has recently passed on the continent of North America as typical *A. Hypericoides*.

The tall and largest extreme, which occurs from Florida to Mississippi northward on the Coastal Plain to Maryland and inland from Mississippi to the low country of western Tennessee (Carroll Co.) and southeastern Missouri (Dunklin Co.), seems to be *Ascyrum oblongifolium* Spach, Hist. Nat. Vég. v. 461 (1836). His "Plante très-semblable à l'espèce précédente par le porte, mais plus grande dans toutes ses parties. Rameaux inférieurs munis de ramules florifères à presque toutes les aisselles . . . Feuilles en general 2 fois plus grandes que celles de l'espèce précédente" are points which indicate this identity.

As I understand *Ascyrum Hypericoides*, it consists of the following leading varieties.

Ascyrum Hypericoides, var. **typicum.** *A. Hypericoides* L. Sp. Pl. 788 (1753) as to Plumier's plant (*Hypericoides frutescens erecta, flore luteo*), ed. 2: ii. 1108 (1763); Spach, Hist. Nat. Vég. v. 458 (1836). *A. Crux-Andreae*, β. *angustifolium* Nutt. Gen. ii. 16 (1818). *A. lini-*

[1] Spach, Hist. Nat. Vég. v. 458 (1836).

folium Spach, Hist. Nat. Vég. v. 459 (1836).—Ascending shrub with very crowded linear-oblong to linear-oblanceolate leaves, with numerous axillary fascicles and short sterile branchlets; larger leaves 0.5–2 cm. long, 2–4 (–5) mm. wide; larger sepals oblong-elliptic to ovate, 5–11 mm. long, 3.5–9 mm. wide.—West Indies and Florida to Texas and Mexico, north to Bermuda, Virginia and Tennessee.

I have seen no thoroughly characteristic material from Virginia but Choisy, Prodr. Monogr. Hypéric. 61 (1821), under his *A. Crux-Andreae*, β. "foliis oblongo-linearibus angustioribus" (based upon Nuttall's variety), cited it "E Virginiâ (v. s. sp. in h. D. C.)." Much of the material from the inner Coastal Plain of Virginia is transitional between var. *typicum* and var. *oblongifolium*, and *Fernald & Long*, no. 6275, from south of Zuni, Isle of Wight County, is a near approach to var. *typicum*.

Var. **multicaule** (Michx.), comb. nov. *A. multicaule* Michx. Fl. Bor.-Am. ii. 77 (1803). *A. helianthemifolium* Spach, Hist. Nat. Vég. v. 460 (1836). *A. spathulatum* Spach, l. c. 462 (1836). *A. Crux-Andreae* sensu Torr. & Gray, Fl. i. 156 (1838), 672 (1840) and subsequent auth., not L. Sp. Pl. i. 787 (1753).—Low and diffuse or matted, the slender ascending leafy branches 1–2 (–3) dm. long, flowering from the tips and the uppermost axils; larger leaves oblong-oblanceolate, 1–2.3 cm. long, 4–9 mm. broad; outer sepals elliptic, oval or oblong-oblanceolate, rounded at base, 5–11 mm. long, 3–7 mm. broad.—Georgia to eastern Texas, north to Nantucket Island, Massachusetts, New Jersey, Pennsylvania, District of Columbia, West Virginia, Kentucky, southern Illinois, Missouri and Kansas.

Var. **oblongifolium** (Spach), comb. nov. *A. oblongifolium* Spach, Hist. Nat. Vég. v. 461 (1836). –Stems erect or ascending, solitary or few, 3–9 dm. high, simple or but sparsely branched at base, with flowering (often quite elongate) branches from most of the middle and upper axils; leaves oblong-oblanceolate, the primary ones in distant pairs, the larger 2–3 cm. long, 5–9 mm. broad; outer sepals broadly ovate, usually cordate or subcordate at base, 10–15 mm. long, 7–10 mm. broad.—Coastal Plain, Florida to Mississippi, north to eastern Maryland, western Tennessee and southeastern Missouri.

The Varieties of Hypericum § Elodea. The Marsh St. Johnsworts consist of two clearly defined species, *Hypericum virginicum* L. and *H. petiolatum* Walt., the former wide-ranging from Florida to Newfoundland and eastern Canada, thence westward to Manitoba and Nebraska, the latter typical of cypress- or gum-swamps of the South. A third plant, somewhat intermediate in aspect, in having sessile instead of petioled leaves but with the floral characters of *H. petiolatum*, occurs from Florida to Louisiana and northward into

southern Virginia, southern Ohio, southern Indiana and Missouri. This is *H. tubulosum* Walt. (1788), *Elodea Drummondii* Spach (1836) and *Triadenum longifolium* Small (1898).

The southern material of *Hypericum virginicum* has the mature (fruiting) styles 2–3 mm. long, continuing the gradually tapering capsule, and the mature sepals lanceolate, acute and 5–7 mm. long. This plant occurs from Florida north on the Coastal Plain and in the Piedmont to the lower altitudes of New England and Nova Scotia, inland to Ohio. The more northern material, from Newfoundland and the southern slope of the Labrador Peninsula to Manitoba, Minnesota and Nebraska, all has shorter styles, when mature only 0.5–1 (–2) mm. long, the capsule often plumper and more rounded at summit, though sometimes attenuate, the mature sepals usually oblong or elliptic and rounded or blunt at tip and only 2.5–5 mm. long. The seeds of the northern series average minutely longer than in the southern and in color they are commonly paler and their reticulation is a little fainter; but these characters break in a long series and so many of the long-styled plants have blunt sepals, so many of the short-styled have them acute that I cannot find the constancy I look for in true species. In foliage, too, the two exactly resemble one another. I am, therefore, looking upon them as two very well defined geographic varieties, the long-styled southern and coastwise plant with lanceolate acute sepals being typical *H. virginicum*, which was described by Linnaeus from Pennsylvania and which had the "Calyx *acutus*."

The northern extreme was beautifully described from Canadian specimens as *Elodea Fraseri* Spach in Ann. Sci. Nat. sér. 2, v. Bot. 168 (1836): "sepalis ellipticis vel oblongis, obtusis; . . . stylis (sub anthesi) ovario subduplo brevioribus." As a northern variety it becomes

Hypericum virginicum L., var. **Fraseri** (Spach), comb. nov. *Elodea Fraseri* Spach in Ann. Sci. Nat. sér. 2, v. Bot. 168 (1836).—Newfoundland and Canadian Labrador to Manitoba, south to Nova Scotia, northeastern and central Massachusetts, Connecticut, central Pennsylvania, northern Indiana, northern Illinois, Iowa and Nebraska.

As shown in the Gray Herbarium and the Herbarium of the New England Botanical Club, all material from Florida to New Jersey and all from Rhode Island belongs to typical *Hypericum virginicum;* furthermore, all specimens from Newfoundland, the Labrador Peninsula, Quebec, Magdalen Islands, Prince Edward Island, New Bruns-

wick, Ontario, Vermont, Michigan, Indiana, Minnesota, Iowa and Nebraska are var. *Fraseri*. In Nova Scotia, Maine, New Hampshire, Massachusetts, Connecticut, New York and Pennsylvania both varieties are found, but they there usually show clear segregation into southern or lowland and northern or upland series. In Nova Scotia, with its well known admixture of Canadio-Alleghenian and Coastal Plain floras, both are common, but in several counties with little or no development of Coastal Plain plants (Victoria, Pictou, Colchester, Cumberland, and Halifax and on Sable Island) only var. *Fraseri* has been collected. In Maine the long-styled typical *H. virginicum* is in the southern and coastal counties, extending inland to southern Penobscot, Kennebec and Androscoggin; but var. *Fraseri* alone is in the northern three-fourths of the state, extending more locally into the southern counties. In New Hampshire typical *H. virginicum* is in the southern counties (Rockingham, Merrimac and Cheshire), var. *Fraseri* extending over the state. From Massachusetts nearly all the collections are of typical *H. virginicum*, but var. *Fraseri* is represented from the extreme northeastern corner of the state and from the upland of Worcester County. Similarly, from Connecticut most specimens are of typical *H. virginicum*, but var. *Fraseri* is represented from Franklin and Waterbury. The representation from New York and Pennsylvania is too small for generalization, but typical *H. virginicum* extends inland at least to Washington, Chenango and Seneca Counties, New York, with var. *Fraseri* south at least to Washington, Oneida and Cortland Counties. From eastern Pennsylvania all the material is typical *H. virginicum*, the var. *Fraseri* being in the Gray Herbarium only from Center County.

As stated in the first paragraph, the plant recently proposed as a new species, *Triadenum longifolium* Small in Bull. Torr. Bot. Cl. xxv. 140 (1898) (as *T. longifolia*), was well characterized by Walter at the time he published his *Hypericum petiolatum*. Walter recognized three species of this section:

**Stamina in 3 phalangibus. Flores rubescentes. Glandulae inter phalanges.

campanulatum 9. floribus trigynis, pedunculis trifidis axillaribus oppositis, corollis *campanulatis patulis, staminibus laevissime basi coalitis*, foliis oblongis obtusis sessilibus.

tubulosum 10. floribus trigynis, *corollis tubulosis*, staminum corporibus plusquam ad medium connatis, foliis sessilibus.

petiolatum 11. floribus trigynis, staminum corporibus ad medium usque connatis, *foliis petiolatis*.[1]

[1] Walt. Fl. Carol. 191 (1788).

Walter's *Hypericum campanulatum* was, obviously, *H. virginicum* L.; his *H. petiolatum* was, as obviously, the plant generally so called; his *H. tubulosum* differed from the latter by the very character used by Small in his Manual to distinguish his own *Triadenum longifolium;* "Leaf-blades sessile, truncate or subcordate at base." In the series of *H. petiolatum* in the Gray Herbarium there is great diversity, some plants showing petioles 1.5 cm. long, others up to 1 cm., still others only 0.5 cm., and still others only 2 or 3 mm. Rugel's material in the Gray Herbarium, bearing the data quoted by Small for the type of his *Triadenum longifolium,* has the lower and median leaves quite like those of *H. petiolatum* except for their lack of petioles. In the series before me it is possible to go from plants with sessile and basally narrowed leaves to those with most of them subamplexicaul. Bush's no. 6312 from Campbell, Missouri and Hale's material from Louisiana have the several upper pairs of leaves with broadly rounded to subclasping bases. I can find no floral differences. On the bottomlands of the Nottoway River in Greensville County, Virginia, Mr. Bayard Long and I had the opportunity to compare them side-by-side. The flowers were essentially alike, both with *recurving* small petals. I am, therefore, calling the sessile-leaved plant

Hypericum petiolatum Walt., var. **tubulosum** (Walt.), comb. nov. *H. tubulosum* Walt. Fl. Carol. 191 (1788). *Elodea Drummondii* Spach in Ann. Sci. Nat. sér. 2, v. Bot. 167 (1836)—"foliis . . . caulinis rameisque inferioribus oblongo-spathulatis, sessilibus; superioribus ovalibus vel oblongis, amplexicaulibus, basi cordatis." *Triadenum longifolium* Small in Bull. Torr. Bot. Cl. xxv. 40 (1898).

Small, in his original publication of *Triadenum longifolium,* said "The sepals are lanceolate and acuminate, as contrasted with the oblong, obtuse sepals of *T. petiolatum.*" To some extent the difference in sepal-shape parallels that in the two extremes of *Hypericum virginicum;* in the isotype in the Gray Herbarium of *T. longifolium* the sepals are the narrowest and most attenuate I have seen, but in the Bush material, above cited, from Campbell, Missouri, a plant with the foliage-characters of most extreme *T. longifolium,* the sepals are as broad and as blunt as in the best *H. petiolatum.*

Viola Stoneana House. Princess Anne County: rich dry woods, Little Neck, *F. G. & L.*, no. 4677.

Apparently the southern limit.

*V. esculenta Ell. Norfolk County: dry roadside bank, near Gertie, *F. & G.*, no. 4465.

First from north of South Carolina.

*V. AFFINIS Le Conte, var. LANGLOISII (Greene) Griscom. NORFOLK COUNTY: sandy bank, east of North Landing, *F. & G.*, no. 4457.

First from north of northern Florida.

V. SAGITTATA Ait. PRINCESS ANNE COUNTY: clay of roadside, east of Little Creek, *F. & G.*, no. 4464.

Not noted by Kearney.

*AMMANNIA KOEHNEI Britton, var. **exauriculata**, var. nov. (TAB. 449, FIG. 4 et 5), planta perennis basi prolongato decumbenti; foliis spathulatis vel late oblanceolatis omnibus basi attenuatis vel angustatis, superioribus nec basi dilatato-subcordatis; petalis nullis.—VIRGINIA: fresh to brackish swales along North Landing River, near Creed's, Princess Anne County, September 9, 1935, *Fernald, Long & Fogg*, no. 4954 (TYPE in Gray Herb., ISOTYPES in Herbs. Phil. Acad. and Univ. Penn.).

Var. *exauriculata* is a very extreme departure from typical *Ammannia Koehnei* in having all the leaves narrowed to base (FIG. 5) and in having a prolonged and decumbent base (FIG. 4). Typical *A. Koehnei* (FIGS. 1 and 2) has the erect or ascending stem rising directly from the annual base and its upper leaves are auriculate or subcordate-clasping (FIG. 3). Although the wide-ranging plant sometimes has small petals, they are, as originally described by Britton, "fugacious," so much so that it is an exceptional plant which displays them. Our material seems to be quite apetalous, but it is so mature that petals, if they occurred, would have fallen. I get no difference of calyx and seeds between the two. I am consequently treating the plant of North Landing River as a variety. The typical annual *A. Koehnei* is 0.8–5 dm. high; the loosely ascending or reclining leafy stems of var. *exauriculata* are 2.5–7 dm. long.

North of Florida typical *Ammannia Koehnei* is a very localized plant. I have before me all the material in the Herbarium of the New York Botanical Garden, kindly sent by Dr. Gleason. This, with the representation in the Gray Herbarium, comes from the following scattered stations:

NEW JERSEY: Hackensack Marshes, *Torrey, Leggett.*

VIRGINIA: tidal marsh, Carter's Creek, at south shore of York River, *Grimes*, no. 4271.

NORTH CAROLINA: sand banks near Beaufort, *I. F. Lewis*, no. 189; "Sea islands," *M. A. Curtis.*

FLORIDA: shores of river near Jacksonville, *Curtiss*, no. 5133; shores and ditches, Indian River, *Curtiss*, no. 949; Titusville, *Nash*,

no. 2288; swamps, Okeechobee region, Brevard County, *Fredholm*, no. 5982; sandy shore, Orange County, *Fredholm*, no. 5426; pinelands near Felsmere, *Small*, no. 8881; pineland, Fort Myers, *J. F. Standley*, no. 392; Terra Ceia Island, *Simpson*, no. 407; Key West, *Blodgett*.

Mississippi: Heron Island, *Tracy*, no. 6424.

Ludwigia glandulosa Walt. Recorded in Rhodora, xxxvii. 433 (1935) from a single station in Norfolk County, the first record from north of South Carolina. Now known to be frequent from Princess Anne County westward to the Fall Line. The following specimens are before me. Princess Anne County: wet argillaceous thickets and ditches, Rosemont, *F. & L.*, no. 4960. Nansemond County: roadside ditch at border of woods, Magnolia, *F. L. & F.*, no. 4963. Southampton County: argillaceous ditch south of Sebrell, *F. & L.*, no. 6309. Greensville County: sandy alluvium, bottomlands of Fontaine Creek, southwest of Haley's Bridge, *F. G. & L.*, no. 6653. Prince George County: swampy clearing near Gary Church, *F. & L.*, no. 6307; alluvial woods of Second Swamp, north of Baxter Crossing, *F. & L.*, no. 6308. New Kent County: ditches near Providence Forge, *F. G. & L.*, no. 6654, the northernmost recorded station.

*L. alata Ell. Princess Anne County: fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4960.

First from north of North Carolina.

L. brevipes (Long) E. H. Eames. Additional station in Princess Anne County: peaty margin of cove, southern end of Lake Joyce, *F. L. & F.*, no. 4964.

*L. palustris (L.) Ell., var. nana Fern. & Grisc. in Rhodora, xxxvii. 176, t. 349, figs. 6 and 10 (1935). Accomac County: depression in clearing in pine woods, 3½ miles north of Accomac, *F. L. & F.*, no. 5390. Prince George County: swampy clearing near Gary Church, *F. & L.*, no. 6310. Sussex County: water-hole in sandy and peaty depression (exsiccated shallow pond), about 4 miles northwest of Homeville, *F. & L.*, no. 6311. Noticed but not collected at numerous stations from Prince George, Sussex and Southampton Counties to Nansemond County.

Extension north from southern Georgia.

Myriophyllum pinnatum (Walt.) BSP. Frequent in Princess Anne County: shallow water, south end of Fresh Pond, *L. F. & F. R. Randolph*, no. 483; ditch near Sigma, *F. G. & L.*, no. 4680; border of brackish marsh, Cedar Island, *F. G. & L.*, no. 4681.

Not listed by Kearney nor by Erlanson.

Eryngium aquaticum L. To the few recorded stations add Princess Anne County: fresh to brackish swales along North Landing River, near Creed's, *F. L. & F.*, no. 4967.

Lilaeopsis chinensis (L.) Kuntze. To the few recorded Virginia stations add Princess Anne County: muddy banks and open spots

in swales along North Landing River, near Creed's, *F. L. & F.*, no. 4972. SURRY COUNTY: turfy tidal shore of James River, Claremont Wharf, *F. & L.*, no. 6847.

RHODODENDRON ATLANTICUM (Ashe) Rehder. Frequent in dry woods, oak scrub and pinelands, from PRINCESS ANNE to SUSSEX COUNTY: many nos.

Not noted by Kearney nor by Erlanson.

R. NUDIFLORUM (L.) Torr. Swampy woods, common in PRINCESS ANNE and NORTHAMPTON COUNTIES: many nos.

Not noted by Kearney.

GALAX APHYLLA L. PRINCESS ANNE COUNTY: rich woods east of Little Creek, *F. & G.*, no. 4490, *F. L. & F.*, no. 4985. ISLE OF WIGHT COUNTY: rich wooded bank of Blackwater River, near Joyner's Bridge, *F. G. & L.*, no. 6668.

Not mentioned by Kearney.

LIMONIUM NASHII Small, var. TRICHOGONUM Blake. NORTHAMPTON COUNTY: border of salt marsh east of Eastville, *F. & L.*, no. 5409.

L. CAROLINIANUM (Walt.) Britton, var. ANGUSTATUM (Gray) Blake. PRINCESS ANNE COUNTY: salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, *F. & L.*, no. 4986.

Not listed by Kearney.

*HOTTONIA INFLATA L. PRINCESS ANNE COUNTY: pool in gum swamp, west of Pungo, *F. & G.*, no. 4491.

First specimen in the Gray Herbarium from between southern New Jersey and Georgia.

BUMELIA LYCIOIDES (L.) Gaertn. f., var. **virginiana**, var. nov., foliis ramorum fertilium oblanceolatis, 1.3–2.8 cm. latis, apicibus valde rotundatis.—VIRGINIA: edge of tidal marsh, Carter's Creek, York River, August 20, 1921, *E. J. Grimes*, no. 4269; Sewell's Point, Norfolk County, June 28, 1872, *A. H. Curtiss;* dry wooded slope near 3d Street Bridge, Great Neck, Princess Anne County, May 5, 1935, *Fernald & Griscom*, no. 4492 (young foliage), June 17, 1935, *Fernald, Griscom & Long*, no. 4688 (young flower-buds), September 5, 1935, *Fernald & Long*, no. 4987 (fruit), TYPE in Gray Herb.; rich dry woods, Little Neck, Princess Anne County, September 6, 1935, *Fernald & Long*, no. 4988.

Bumelia lycioides rests, nomenclaturally, upon *Sideroxylon lycioides* L. Sp. Pl. ed. 2: 279 (1762), said to grow in "Canada." Linnaeus cited references from Duhamel de Monceau and Boerhaave but his species must rest primarily on his own *Lycioides*, Hort. Cliff. 488. In Hortus Cliffortianus Linnaeus stated that the tree came from the East Indies or perhaps from Africa ("Crescit vel in India Orientali?

vel potius in Africa?"). It is now generally recognized as the characteristic Carolina Buckthorn of the southern United States.

The tree usually passing as *Bumelia lycioides* has the mature leaves of the fruiting branches (excluding those of the sprouts and leading shoots) elliptic-oblong to narrowly obovate, tapering to a blunt but subacuminate apex, and becoming 2–3.8 cm. broad. This tree, occurring from Florida to Texas, extends north into North Carolina, western Kentucky, southern Illinois, southern Missouri and Kansas. The tree of southeastern Virginia always, so far as known (from four areas), has the leaves of the fertile branches strongly rounded at apex and when mature only 1.3–2.8 cm. broad, and so far as we yet know this tree with narrower and round-tipped leaves occurs only at this northeastern limit of the specific range.

In view of the original obscurity as to the geographic source of *Lycioides*, I asked Mr. C. A. Weatherby to determine, while in England in the summer of 1935, just what Linnaeus had before him. He reports that there is no Clifford specimen at the British Museum, but that in the Linnean Herbarium the material marked in the hand of Linnaeus "*lycioides*" is of the characteristic southern tree with the narrowly obovate leaves abruptly narrowed to a blunt apex; a photograph secured by Mr. Weatherby confirms this identification. Incidentally, Mr. Weatherby determined that *Sideroxylon laeve* Walt. Fl. Carol. 100, is also the more southern tree with subacuminate leaves. In this connection it is at least noteworthy that Sargent, in the Silva, should have described the leaves as "acute and rounded at apex" but that Faxon's plate[1] should have shown the flowering branch of var. *virginiana*, with the leaves unquestionably round-tipped. This drawing was obviously made from the Curtiss material from Norfolk County.

Whether or not the specific name "*lycioides*" should be written with a capital or a small initial is debatable. By the International Rules, Recommendation no. XLII, the specific epithet takes a capital initial when taken from a generic name. The question is whether *Lycioides* of Linnaeus, Hortus Cliffortianus, *was* a generic name. At the end of his Class XXV in the latter work, Linnaeus, after properly treating unquestioned genera, such as *Cycas, Trapa, Conocarpus, Liquidambar, Zanthoxylum*, etc., had a nondescript category "Oidea," for plants of which he did not have the necessary flowers to place them in the

[1] Sargent, Silva, v. t. ccxlviii.

regular genera. He treated these as *hypothetical* genera, giving them provisional names indicating their similarity to recognized genera: *Oleoides*, *Cannoides*, *Lycioides*, etc., the last "*Facies perfecte Lycii, tristis*," etc. If *Lycioides* be considered a generic name, then the specific name repeating it should be given a capital initial. The fact, that in publishing *Sideroxylon lycioides* Linnaeus used a small initial, has only a minor bearing on the question, for in some other cases Linnaeus used lower-case initials for old generic names used as specific epithets. I am keeping, however, to the long established usage. It might be thought by some that Linnaeus, whose names and often quite inconsistent and frequently unidentifiable species are usually overglorified, was violating the provisions of the 1935 rules in publishing hypothetical or provisional genera. I leave the decision on that point to those who are better able to solve such problems.

FRAXINUS PENSYLVANICA Marsh. NORFOLK COUNTY: gum swamps and wet woods near Indian Creek, *F. G. & L.*, no. 4690. Thence westward to the Fall Line.

Not listed by Kearney.

GENTIANA PARVIFOLIA (Chapm.) Britton. NORTHAMPTON COUNTY: wet pine woods, Eastville, *F. & L.*, nos. 4714, 4717; by brook in swampy woods south of Kendall Grove, *F. L. & F.*, no. 4515. ACCOMAC COUNTY: border of low woods, 2 miles south of Painter, *F. L. & F.*, no. 5416; border of low woods, 1½ miles north of Temperanceville, *F. L. & F.*, no. 5418. Westward to ISLE OF WIGHT and western NANSEMOND COUNTIES.

Extensions north and west from Princess Anne County.

G. VILLOSA L. PRINCESS ANNE COUNTY: rich dry woods, Great Neck, *F. & L.*, no. 4993; rich woods, Virginia Beach, *F. L. & F.*, no. 4994. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, nos. 4995, 4997.

Not listed by Kearney.

IPOMOEA LACUNOSA L. PRINCESS ANNE COUNTY: grassy roadside, Pleasant Ridge, *F. L. & F.*, no. 5008; roadside-banks and fence-rows near Creed's, *F. L. & F.*, no. 5009.

Not listed by Kearney nor by Erlanson.

PHLOX PANICULATA L. PRINCESS ANNE COUNTY: roadside-banks and fence-rows near Creed's, *F. L. & F.*, no. 5012.

Not listed by Kearney nor by Erlanson.

*VERBENA URTICIFOLIA L., var. **leiocarpa** Perry & Fernald, var. nov. (TAB. 450, FIG. 5–8), foliis subtus minute velutino-hirtellis, pilis longioribus vix 0.3 mm. longis; ramis floriferis filiformibus laxe

adscendentibus vel divergentibus puberulis; bracteis 0.5–1 mm. longis; calycibus maturis 1.7–2 mm. longis puberulis; coccis 1.5 mm. longis lucidis dorso planis.—Eastern Virginia to South Carolina, rarely northward to Connecticut. CONNECTICUT: damp woods, Wethersfield, *Charles Wright.* NEW JERSEY: sandy loam by Maurice River, Port Elizabeth, November 8, 1936, *Long.* VIRGINIA: rich woods, Virginia Beach, September 10, 1935, *Fernald, Long & Fogg,* no. 5013 (TYPE in Gray Herb.); rich sandy and loamy wooded slope north of Walters, August 20 and 22, 1936, *Fernald, Griscom & Long,* no. 6674; border of dry sandy woods, 4 miles south of Stony Creek, August 19, 1936, *Fernald, Griscom & Long,* no. 6673; rich woods southeast of Ivor, October 16, 1936, *Fernald & Long,* no. 6864. NORTH CAROLINA: moist ground, Durham Co., August 26, 1932, *H. L. Blomquist,* no. 149. SOUTH CAROLINA: damp gum-oak woods, 1 mile north of Kingstree, Williamsburg Co., July 11, 1927, *Wiegand & Manning,* no. 2714.

Common and wide-ranging typical *Verbena urticifolia* has the leaves strigose-hirsute on the veins beneath (FIG. 2) with stiff hairs up to 1–1.3 mm. long, or glabrate; the mature inflorescence (FIG. 1) with usually stiffly ascending strigose branches; mature calyx (FIG. 3) strigose, 2–2.3 mm. long, the subtending bract 1–1.5 mm. long; mature nutlets (FIG. 4) about 2 mm. long and definitely corrugated or ribbed on the back. Var. *leiocarpa,* on the other hand, has the thin leaves (FIG. 6) velutinous or subvelutinous beneath with minute hairs only very rarely 0.3 mm. long; the panicle (FIG. 5) lax, with loosely ascending to divergent puberulent, filiform mature branches; the mature calyx (FIG. 7) at most 2 mm. long and puberulent, with very short (0.5–1 mm. long) bract; and the tiny nutlets (FIG. 8) only 1.5 mm. long and quite smooth on the back. Although an old and undated sheet from Connecticut is in the Gray Herbarium, no other material is found there or in the extensive local collection of the New England Botanical Club from north of New Jersey.

Verbena urticifolia, var. *leiocarpa,* although having the same general lax habit as *V. SCABRA Vahl, collected by *Fernald & Long* in SURRY COUNTY, October, 1936 (border of tidal marsh along Gray's Creek, near Cross Creek Landing, south of Swann Point, no. 6863, the first collection from north of Wilmington, North Carolina), may be readily distinguished in flower by the bilobed character of the stigma, the stigmatic surface being subtended by one sterile lobe. In *V. scabra,* on the other hand, the stigmatic surface lies between two almost equal sterile lobes. The fruiting calyx of *V. urticifolia,* var. *leiocarpa* is only slightly divergent from the rachis and the nutlets are smooth; whereas, in *V. scabra* the fruiting calyx is strongly divergent and the

nutlets reticulate above. Furthermore, after drying, the plants in question are easily separable on foliar character, the upper surface of the leaves of *V. urticifolia*, var. *leiocarpa* being much less harsh to the touch than those of *V. scabra*.

V. CANADENSIS (L.) Britton. PRINCESS ANNE COUNTY: roadside bank, Creed's, *F. & G.*, no. 4496.

In Dr. Perry's *Revision of the North American Species of Verbena* (Ann. Mo. Bot. Gard. xx. 316 (1933)) recorded northward only to North Carolina but Small (Man.) extends the range to Virginia.

STACHYS HYSSOPIFOLIA Michx. YORK COUNTY: exsiccated clay-bottomed pond in woods, 2 miles south of Yorktown, *F. L. & F.*, no. 5016.

Not listed by Erlanson. According to Epling, Prelim. Revis. Am. Stachys, in Fedde, Repert. Sp. Nov. Reg. Veg. Beih. lxxx. 71 (1934) the species "ranges from Eastern Massachusetts along the coast to New Jersey and Delaware, thence inland to eastern Pennsylvania. It occurs also in the Appalachian system in northern Virginia and in western North Carolina." Our station is, therefore, the first on the Coastal Plain south of Delaware.

S. TENUIFOLIA Willd. PRINCESS ANNE COUNTY: wet argillaceous thickets and ditches, Rosemont, *F. & L.*, no. 5017.

Not listed by Kearney nor by Erlanson.

HEDEOMA PULEGIOIDES (L.) Pers. NORTHAMPTON COUNTY: dry clearing bordering pine woods, south of Kendall Grove, *F. L. & F.*, no. 5435.

Not listed by Kearney nor by Erlanson.

*LINARIA CANADENSIS (L.) Dumont, forma **cleistogama**, f. nov., corollis minutis tubulosis vel subconicis e calyce vix exsertis clausis.—VIRGINIA: sandy pineland, Cape Henry, May 4, 1935, *Fernald & Griscom*, no. 4498 (TYPE in Gray Herb.; ISOTYPES in Herbs. Griscom and Phil. Acad.); sandy woods and openings, False Cape, June 20, 1935, *Fernald, Griscom & Long*, no. 4698.

Late in the season the flowers of *Linaria canadensis* may become greatly reduced in size, though morphologically normal. Forma *cleistogama* at Cape Henry and at False Cape was abundant in the dry sand, the vernal flowers quite insignificant and completely closed, forming a blunt cap above the ovary.

GERARDIA DECEMLOBA Greene. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5034.

Not listed by Kearney. The easternmost Virginia station given by

Pennell, Proc. Acad. Nat. Sci. Phila. lxxxi. 208 (1929), is New Bohemia in Prince George County. Kilby is 50 miles southeast of New Bohemia, well out on the Coastal Plain.

*[Utricularia virgatula Barnhart. Northampton County: moist dune-hollows, Savage Neck, *F. L. & F.*, no. 5450.

An important discovery, giving us a station intermediate between Cape May, New Jersey and Florida and Cuba. When he published the species in Bull. Torr. Bot. Cl. xxxiv. 580 (1907) Barnhart had seen material only from Long Island, from Cape May and from Florida and Cuba, the "resemblance [of the latter to the Long Island and Cape May material] is indeed so close that I am unable to name any character by which they may be distinguished. . . it seems better to refer the material from Cuba and Florida provisionally to *U. virgatula.*" On Savage Neck several other species, far isolated from their allies occur: *Cyperus Engelmanni* at its first station south of New York (see p. 395), *Carex arenaria* of Atlantic Europe (see p. 399), *Wolffia punctata* at its first coastwise station north of Florida (see p. 400) and *Cassia nictitans* var. *hebecarpa*, otherwise known only in North Carolina (see p. 423).

Epifagus virginiana (L.) Bart. Princess Anne County: under *Fagus*, dry woods west of Pungo, *F. & G.*, no. 5037.

Not listed by Kearney.

Houstonia purpurea L., forma **pubescens** (Britton), comb. nov. *H. purpurea*, var. *pubescens* Britton, Mem. Torr. Bot. Cl. iv. 125 (1894).—Our material is from Northampton County: dry pine woods east of Eastville, *F. & L.*, no. 5470.

Forma *pubescens* at Eastville and at a number of other stations occurs with or near to typical smoother *Houstonia purpurea.* It seems to be a pubescent form, rather than a geographically isolated variety.

*Cephalanthus occidentalis L., var. pubescens Raf. Princess Anne County: wet argillaceous thickets, Rosemont, *F. & L.*, no. 5047. Elizabeth City County: marshy borders of woods between Buckroe and Hampton, *B. L. Robinson*, no. 445.

First in the Gray Herbarium from north of Georgia.

Galium uniflorum Michx. Recorded from Princess Anne County, new to Virginia, in Rhodora, xxxvii. 446 (1935). Range now extended northward and westward. Northampton County: sandy woods back of dunes, Savage Neck, *F. & L.*, no. 5457; dry pine woods south of Kendall Grove, *F. L. & F.*, no. 5458. Isle of Wight

Photo. E. C. Ogden.

ASTER SPECTABILIS, var. SUFFULTUS, × ⅓.

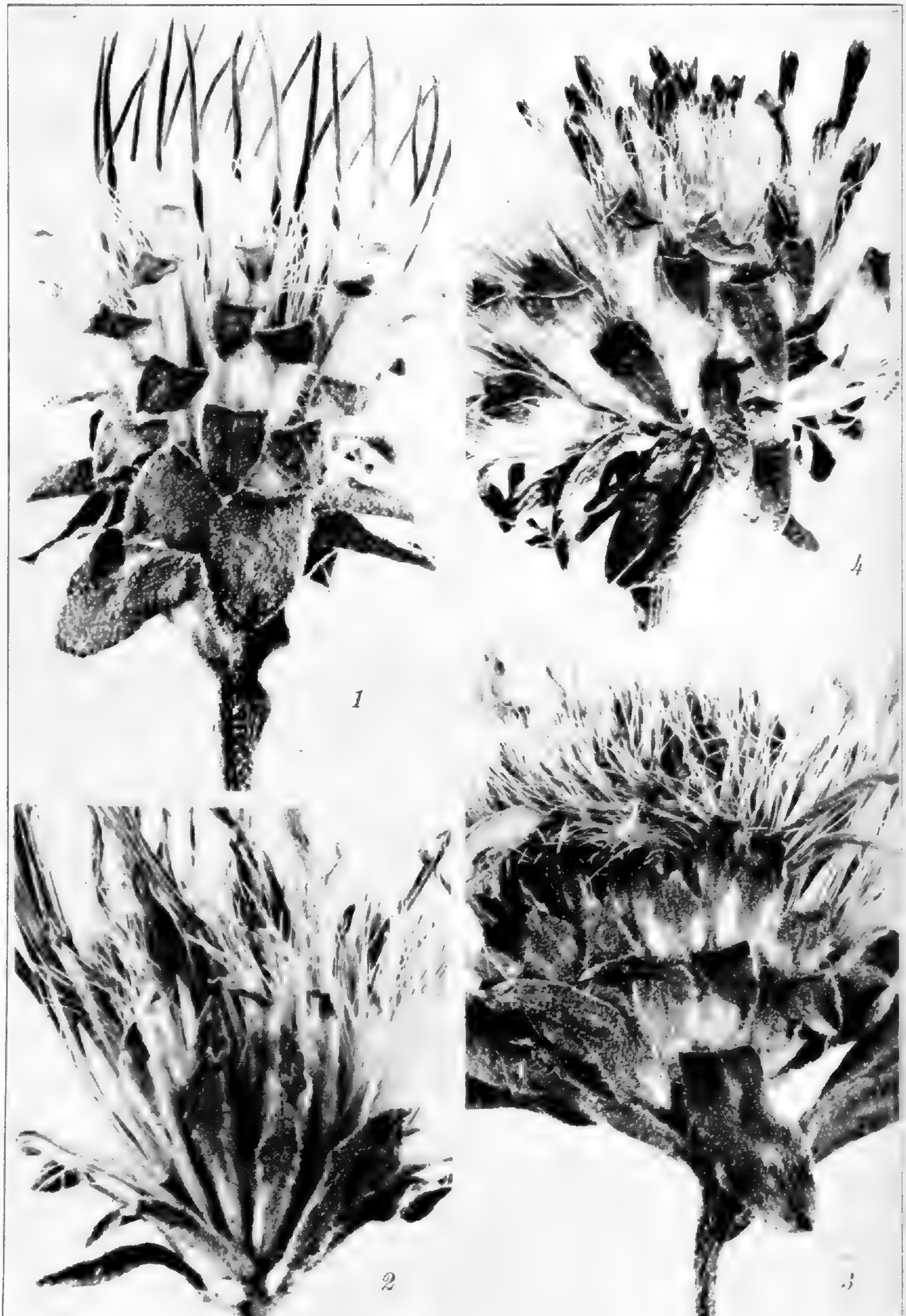

Photo E. C. Ogden.

INVOLUCRES OF ASTER, × 4: A. SPECTABILIS, FIGS. 2 and 3; A. SPECTABILIS, VAR. SUFFULTUS, FIG. 1; A. CURTISII, FIG. 4.

County: rich sandy and loamy wooded slope north of Walters, *F. G. & L.*, no. 6697.

Ripe fruit purple-black, succulent.

Viburnum prunifolium L. Prince George County: border of rich dry woods, Great Neck, *F. G. & L.*, no. 4705. Norfolk County: damp thicket, Cedar Hill, *F. & G.*, no. 4508. Thence west to the Fall Line.

Not recorded by Kearney from east of Nansemond County.

Lobelia elongata Small. To the type-locality, Northwest in Norfolk County, cited by McVaugh in Rhodora, xxxviii, 286, add Princess Anne County: brackish marsh by North Landing River, Pungo Ferry, *F. & G.*, nos. 2946, 2947, also at same station (near Creed's),[1] *F. L. & F.*, no. 5053.

Elephantopus carolinianus Willd. Princess Anne County: rich woods, Virginia Beach, *F. & G.*, no. 2896, *F. L. & F.*, no. 5058. Nansemond County; dry sandy woods along Pitch Kettle Creek, north of Lake Kilby, *F. L. & F.*, no. 5059. Thence west to the Fall Line.

Not listed by Kearney.

E. tomentosus L. Princess Anne County: rich woods, Virginia Beach, *F. L. & F.*, no. 5056. Thence westward to the Fall Line. Northampton County: in *Pinus Taeda* forests about Cape Charles, *Tidestrom*, no. 11,595; dry sandy pine woods, Eastville, *F. & L.*, no. 5480.

Not listed by Kearney. The species is not recorded for Maryland by Shreve. We found it in some abundance, when, returning by car to Philadelphia, we stopped at twilight to collect *Nyssa sylvatica*, var. *biflora* (Walt.) Sarg., near its northern limit. At the base of a tree covered with *Bignonia capreolata*, also near its northern limit, *Elephantopus tomentosus* was abundant: border of gum swamp, south of Beaver Dam, along Wagram Creek, Worcester County, Maryland, *F. L. & F.*, no. 5574.

Elephantopus tomentosus L., forma **rotundatus**, forma nov., foliis rotundato-obovatis vel rotundato-ovalibus.—Virginia: dry

[1] Although appearing on the contour-sheet as Pungo Ferry, this region supports no ferry. Visiting it in 1935, Long, Fogg, and I wished to secure a boat. The locked boat on the river evidently pertained to the nearest house. Accordingly, untying the gate, I walked across the field to the door. Upon knocking, I was seized by my right calf by a yapping dog. As soon as the women folks had dragged her off and administered the necessary slaps my errand was transacted. If I wanted a boat "Bub" must be asked. "Bub," six feet tall and asleep at high-noon with his bare feet overhanging a bed in the kitchen, awoke and said: "Ask Paw." "Paw," roused from another bed, agreed, for sufficient pay, to let us take the boat. The compensation and a gift of grapes for all the family sweetened the atmosphere: "De nex time you alls want de boat dat bitch'll know enough to let you alone."

clearing bordering pine woods south of Kendall Grove, Northampton Co., October 13 and 15, 1935, *Fernald, Long & Fogg*, no. 5482 (TYPE in Gray Herb.).

Typical *Elephantopus tomentosus* has the narrowly to broadly obovate rosette-leaves tapering at base and once-and-a-half to thrice as long as broad, and its cauline bracteal leaves narrow and small. Forma *rotundatus*, with its round-based and round-tipped short rosette-leaves and broad and numerous cauline ones is a striking departure from it. This extreme variation may have resulted from clearing of the land but all the plants in a clearing of many acres were essentially uniform. A similar specimen in the Gray Herbarium, without rosette-leaves, but with the lower cauline one strongly rounded at both ends or even subcordate, was sent from Mississippi by Dr. Crockett (through C. W. Short, who commented on the "odd leaf").

SOLIDAGO PUBERULA Nutt., var. PULVERULENTA (Nutt.) Chapm. Noted in RHODORA, xxxvii. 447 (1935) from PRINCESS ANNE COUNTY. Range extended to ELIZABETH CITY COUNTY: bushy clearings and borders of woods west of Hampton, *F. L. & F.*, no. 5083.

S. PINETORUM Small. Recorded in RHODORA, l. c. 448 from PRINCESS ANNE, HENRICO and PITTSYLVANIA COUNTIES. Range extended slightly north to YORK COUNTY: border of dry woods, 2 miles south of Yorktown, *F. L. & F.*, no. 5086. Common inland to the Fall Line.

S. YADKINENSIS (Porter) Small. See Fernald, RHODORA, xxxviii. 211 (1936). NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5084; Suffolk, July 24, 1872, *A. H. Curtiss*, as *S. Boottii*, also *Heller*, no. 1127, as *S. Boottii*. Frequent westward to the Fall Line and beyond.

Flowering chiefly in late June and July.

S. LUDOVICIANA (Gray) Small. See Fernald, l. c. 200, pl. 422, figs. 2–5 (1936). NORTHAMPTON COUNTY: dry pine woods northwest of Oyster, *F. L. & F.*, no. 5512. JAMES CITY COUNTY: old grown-up field, south of Williamsburg, *Grimes*, no. 4445, as *S. Boottii*. PRINCE GEORGE COUNTY: dry sandy woods and clearings west of New Bohemia, *F. L. & S.*, no. 5932; dry woods, Blackwater School, *F. L. & S.*, no. 5933.

Very late-flowering, in late September and October.

S. NEMORALIS Ait., var. HALEANA Fernald, l. c. 227, pl. 431, figs. 1 and 2 (1936). NORTHAMPTON COUNTY: dry pine woods near Capeville, *F. L. & F.*, no. 5526; *F. & L.*, nos. 5524 and 5525, from Eastville, are less characteristic.

S. TORTIFOLIA Ell. Recorded in RHODORA, xxxvii. 448 (1935) from PRINCESS ANNE COUNTY, where local. NORTHAMPTON COUNTY: common in dry pine woods, many nos., one plant on Savage Neck (*F. & L.*, no. 5517) being an evident hybrid with *S. odora*.

It is probable that the northeastern limit of range of *Solidago tortifolia* is in Northampton or Accomac County. It has been cited from Maryland on the basis of the confusing blanket-label of the late William M. Canby: "EASTERN SHORE OF MARYLAND AND VIRGINIA." Under this label Canby distributed abundant material. Very similar specimens in the Gray Herbarium bear the memorandum in the hand of Asa Gray: "Northampton Co., Virginia. E. Shore, 1867. *W. M. Canby.*"

S. ELLIOTTII T. & G., var. PEDICELLATA Fernald in RHODORA, XXXVIII. 215. pl. 425 (1936). The TYPE is from NORTHAMPTON COUNTY: border of wet pine woods, Eastville, *F. & L.*, no. 5520. Immature specimens from near Hampton (*F. L. & F.*, no. 5091) apparently belong with it.

Very late, flowering in mid-October.

*ASTER SPECTABILIS Ait., var. **suffultus**, var. nov. (TAB. 451 et TAB. 452, FIG. 1), planta 6–9 dm. alta; pedunculis glanduloso-pilosis; involucris subcylindrico-campanulatis 1.4–1.6 cm. altis; bracteis ca. 8-seriatis valde squarrosis, apicibus exteriorum valde foliaceis ovatis margine glanduloso-ciliatis.—VIRGINIA: bushy clearings and borders of woods, west of Hampton, September 13, 1935, *Fernald, Long & Fogg*, no. 5096 (TYPE in Gray Herb.).

Typical *Aster spectabilis*, occurring from eastern Massachusetts to Delaware and Maryland and reappearing in the Carolina mountains, is usually 2.5–6 (rarely –8) dm. high; with campanulate or (when dry) campanulate-hemispheric involucres (PL. 452, FIGS. 2 and 3) 0.8–1.4 cm. high; the bracts in about 6 series, the outer with oblong or oblanceolate, herbaceous tips loosely ascending to slightly squarrose. Isolated southward, on the southern coast of North Carolina, var. *cinerascens* Blake in RHODORA, XXX. 226 (1928), differs from typical *A. spectabilis* in its cinereous-hirsute and less glandular indument, but the involucres are otherwise much as in the more northern typical *A. spectabilis*. Var. *suffultus*, also isolated from the continuous range of *A. spectabilis*, has an involucre almost as suggestive of *A. Curtisii* T. & G. (PL. 452, FIG. 4) as of *A. spectabilis*, but *A. Curtisii* is a thin- and glabrous-leaved plant, with glandless and glabrous, broad involucres. *A. spectabilis*, var. *suffultus* has the glandular peduncles and involucres and the characteristic scabrous foliage of *A. spectabilis*.

Torrey & Gray, Fl. ii. 108 (1841), extended the range of *A. spectabilis* south to Florida. This is extremely doubtful. The Torrey & Gray material in the Gray Herbarium which was reputed to come from Florida was labeled in Gray's hand "Florida? *Croom*" and "β.", which

means that it was *A. spectabilis*, β. T. & G., l. c. with "flowering branches, or peduncles, few and slender, mostly simple, pilose with slender hairs as well as glandular-pubescent." This plant, type of *A. spectabilis*, β., is Blake's var. *cinerascens;* and it is significant that above his original "Florida? *Croom*" Gray later wrote in pencil "Perhaps N. Car." That is more probable.

Another old sheet in the Gray Herbarium, identified by Gray as *A. surculosus*, is marked "Herb. Raf. [inesque], 1842. Locality unrecorded." This consists of a plant of *A. spectabilis*, var. *cinerascens* and a characteristic top of the newly proposed var. *suffultus*. It is possible that Rafinesque had, presumably buried under some other genus, names for both these plants.

ASTER GRACILIS Nutt. PRINCESS ANNE COUNTY: argillaceous clearings and borders of woods, Virginia Beach, *F. & L.*, no. 5097. NANSEMOND COUNTY: about Suffolk, *Heller*, no. 1140; dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5098. Thence west to the Fall Line.

Not recorded by Kearney from Virginia.

A. GRANDIFLORUS L. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5099. Thence west to the Fall Line and northward at least to HANOVER COUNTY: October 10, 1890, *T. C. Porter.*

An October-flowering species, very handsome. Not noted by Kearney.

A. CONCOLOR L. NORTHAMPTON COUNTY: sandy and argillaceous bluff and upper border of beach, Chesapeake Bay, west of Kiptopeke, *F. L. & F.*, no. 5531. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5100. Thence west to the Fall Line.

Not recorded by Kearney nor by Erlanson.

*ASTER CONCOLOR L., forma **lasiocaulis**, f. nov., caulibus villosis, villis patentibus; foliis plus minusve villosis.—VIRGINIA: dry sandy and argillaceous pine woods back of the shore-bluff, west of Kiptopeke, October 14, 1935, *Fernald, Long & Fogg*, no. 5532 (TYPE in Gray Herb.; ISOTYPES in Herbs. Phil. Acad. and Univ. Penn.).

Typical *Aster concolor* (no. 5531), with minute canescent-puberulent or -sericeous coat, abounds on the steep outer bluff along Chesapeake Bay, west of Kiptopeke, and there shows no departure from the ordinary form. Forma *lasiocaulis* makes a pure colony back from the bluff, in woodland humus, where, at some seasons, the ground must be positively wet. The extreme development of pubescence may,

perhaps, be a response to these unusual conditions, typical *A. concolor* being a decided xerophyte.

A. PATENS Ait. NORTHAMPTON COUNTY: dry sandy and argillaceous pine woods back of the shore-bluff, west of Kiptopeke, *F. L. & F.*, no. 5533. NANSEMOND COUNTY: dry sandy woods and adjacent clearings, Kilby, *F. L. & F.*, no. 5101. Thence locally west to the Fall Line.

Not recorded by Kearney from southeastern Virginia.

ERIGERON PULCHELLUS Michx. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4513.

Recorded by Kearney only from Suffolk.

E. PHILADELPHICUS L. PRINCESS ANNE COUNTY: rich woods, Cedar Island, *F. G. & L.*, no. 4707.

Not noted by Kearney.

*E. RAMOSUS (Walt.) BSP., var. BEYRICHII (Fisch. & Mey.) Trel. PRINCESS ANNE COUNTY: dry mixed woods, Little Neck, *F. & L.*, no. 4236. DINWIDDIE COUNTY: border of dry sandy woods near Carson, *F. L. & S.*, no. 5938. SOUTHAMPTON COUNTY: dry sandy oak and pine woods northeast of Cypress Bridge, *F. & L.*, no. 6425.

Quite like the Beyrich material in the Gray Herbarium. Strikingly different from common *E. ramosus* in its very reduced foliage, small heads and often violet rays. It also flowers later. Not noted by Kearney nor by Erlanson.

*E. BONARIENSIS L. (*E. linifolius* Willd.) NORFOLK COUNTY: sandy roadside near Gertie, *F. G. & L.*, no. 4709.

Extension north from South Carolina.

SILPHIUM ATROPURPUREUM Retz. PRINCESS ANNE COUNTY: rich dry woods, Great Neck, *F. G. & L.*, no. 4711.

One of the rarest of species. Dr. L. M. Perry, who is studying the genus, tells me that she has seen only three sheets: one in the Alleghenies near White Sulphur, Greenbrier County, West Virginia; one from Wytheville, Wythe County, Virginia, between the Alleghenies and the Blue Ridge; and our collection from Princess Anne County.

HELIANTHUS ANGUSTIFOLIUS L. ELIZABETH CITY COUNTY: bushy clearings and borders of woods west of Hampton, *F. L. & F.*, no. 5144. Frequent from Nansemond County to the Fall Line.

Not listed by Erlanson.

BIDENS DISCOIDEA (T. & G.) Britton. NORTHAMPTON COUNTY: swampy woods near Martin's Siding, *F. L. & F.*, no. 5558. PRINCESS ANNE COUNTY: damp peaty depressions, Cape Henry, *F. & L.*, no. 5134. Frequent westward to the Fall Line, usually on fallen logs and stumps in swamps.

Not noted by either Kearney or Erlanson.

SENECIO AUREUS L. PRINCESS ANNE COUNTY: rich woods, Great Neck, *F. & G.*, no. 4517.

Not listed by Kearney.

KRIGIA DANDELION (L.) Nutt. PRINCESS ANNE COUNTY: open clay, borders of thickets, Virginia Beach, *F. & G.*, no. 4518.

Not listed by Kearney nor by Erlanson.

EXPLANATION OF PLATES 440–452

PLATE 440. Spikelets of LEERSIA VIRGINICA Willd. Sufficiently explained on pp. 385 and 386.

PLATE 441. PANICUM DICHOTOMIFLORUM Michx.: FIG. 1, plant, × ⅖, from Clinton, Maryland, September 28, 1921, *Th. Holm.*

P. DICHOTOMIFLORUM, var. GENICULATUM (Wood) Fernald: small plant, × ⅖, from Eastham, Massachusetts, September 24, 1913, *F. S. Collins.*

PLATE 442. PANICUM AGROSTOIDES Spreng.: FIG. 1, portion of panicle, × 1, from near New York, *Gray, N. Am. Gram. Cyp.* no. 32; FIG. 2, spikelets, × 10, from Bristol, Pennsylvania, August 5, 1922, *W. M. Benner;* FIG. 3, grain, × 20, from Constantia, New York, *Fernald, Wiegand & Eames*, no. 14,147.

P. AGROSTOIDES, var. RAMOSIUS (Mohr) Fernald: FIG. 4, portion of panicle, × 1, from Fontaine Creek, Virginia, *Fernald, Griscom & Long*, no. 6473; FIG. 5, spikelets, × 10, from no. 6473; FIG. 6, grain, × 20, from Factory Hill, Virginia, *Fernald & Long*, no. 6475.

P. STIPITATUM Nash: FIG. 7, portion of panicle, × 1, from Centreville, Delaware, August 18, 1866, *Commons;* FIG. 8, spikelets, × 10, from same specimen; FIG. 9, grain, × 20, from same specimen.

PLATE 443. PANICUM MUNDUM, n. sp.: FIG. 1, portion of plant in autumnal state, × ⅖, from 4 miles northwest of Homeville, Virginia, *Fernald & Long*, no. 6499 (TYPE); FIG. 2, terminal vernal panicle, × 1, from type-station, *Fernald & Long*, no. 6017; FIG. 3, summit of lower internode, bearded node and base of sheath, × 10, from TYPE; FIG. 4, sheath of upper leaf, showing viscid spots, × 10, from TYPE; FIG. 5, three spikelets, × 10, from TYPE.

P. CRYPTANTHUM Ashe: FIG. 6, spikelet, × 10, from Wilmington, North Carolina, August 28, 1905, *A. S. Hitchcock.*

P. ACULEATUM Hitchc. & Chase: FIG. 7, spikelet, × 10, from Takoma Park, District of Columbia, July 27, 1904, *Agnes Chase* (ISOTYPE).

PLATE 444. SCLERIA TRIGLOMERATA Michx.: FIG. 1, inflorescence and characteristic short-tipped bracts, × 1, from south of The Crater, Prince George County, Virginia, *Fernald, Long & Smart*, no. 5662; FIG. 2, summit of inner side of sheath, × 10, from South Sudbury, Massachusetts, August 8, 1899, *W. P. Rich;* FIG. 3, rhizome and bases of culms, × 1, from Buckroe, Virginia, *B. L. Robinson*, no. 336; FIG. 4, achenes, × 5, from same plant as FIG. 2.

S. MINOR (Britton) W. Stone: FIG. 5, inflorescence, with characteristically tapering bracts, × 1, from head of Poo Run, Prince George County, Virginia, *Fernald, Long & Smart*, no. 5665; FIG. 6, summit of inner side of sheath, × 10, from no. 5665; FIG. 7, rhizome and bases of culms, × 1, from no. 5665; FIG. 8, achenes, × 5, from no. 5665.

S. NITIDA Willd.: FIG. 9, inflorescence, with characteristically tapering bracts, × 1, from south of Zuni, Virginia, *Fernald, Griscom & Long*, no. 6549; FIG. 10, summit of inner side of sheath, × 10, from no. 6549; FIG. 11, characteristic rhizome, × 1, from no. 6549; FIG. 12, achenes, × 5, from no. 6549.

PLATE 445. JUNCUS GRISCOMI, n. sp.: FIG. 1, portion of plant, × ⅖, from Little Neck, Virginia, *Fernald, Griscom & Long*, no. 4604 (TYPE); FIG. 2, por-

tion of inflorescence, × 2, from the TYPE; FIG. 3, fruit, × 6, from the TYPE; FIG. 4, seeds, × 20, from the TYPE.

J. EFFUSUS L., var. COSTULATUS Fernald: FIG. 5, fruits, × 6, from the TYPE, Clement Pond, Barrington, Nova Scotia, *Fernald, Long & Linder*, no. 20,654.

J. GYMNOCARPUS Coville: FIG. 6, capsule, × 6, from an ISOTYPE, Broad Mountain, Schuylkill County, Pennsylvania, August 24, 1866, *C. E. Smith.*

PLATE 446. MALAXIS BAYARDI, n. sp.: FIG. 1, four plants, × 1, from Kilby, Virginia, *Fernald, Long & Fogg*, no. 4851 (TYPE); FIG. 2, portion of raceme, × 10, from the TYPE.

M. UNIFOLIA Michx.: FIG. 3, raceme, × 1, from Cuthbert, Georgia, *Harper*, no. 1892.

PLATE 447. VARIETIES OF PARONYCHIA FASTIGIATA (Raf.) Fernald, all figs. × 10. P. FASTIGIATA, var. TYPICA: FIG. 2, fruits from Clark County, Indiana, *Deam*, no. 7585; FIG. 3, fruits from Burlington, Massachusetts, August 26, 1900, *E. F. Williams;* FIG. 4, flowers and fruit from Waterford, New York, *House*, no. 13,354; FIG. 5, flowers and fruit from Clark County, Indiana, *Deam*, no. 7540.

Var. PALEACEA, n. var.: FIG. 6, flowers from Mt. Cuba, Delaware, July 30, 1878, *Commons* (TYPE); FIG. 7, flowers from Allegheny Mts., *Steele & Steele*, no. 26.

Var. NUTTALLI (Small) Fernald: FIG. 8, fruits from Blue Ridge Summit, Pennsylvania (type-locality), 1886, *Tatnall.*

Var. PUMILA (Wood) Fern.: FIG. 9, fruit from Allegheny Mts., *Steele & Steele*, no. 3; FIG. 10, flowers and fruits from Kate's Mt., Greenbrier County, West Virginia, September 4, 1920, *Marion S. Franklin;* FIG. 11, fruits from Three-Top Mt., Shenandoah County, Virginia, *Hunnewell & Griscom*, no. 15,169.

P. CANADENSIS (L.) Wood: FIG. 1, fruit from Danvers, Massachusetts, August 14, 1887, *J. H. Sears.*

PLATE 448. CASSIA NICTITANS L.: FIG. 4, surface of legume, × 4, from Cape Henry, Virginia, *Fernald & Griscom*, no. 2830.

C. NICTITANS L., var. HEBECARPA, n. var.: FIG. 1, plant, × 1, from TYPE-COLLECTION, Old Town Neck, Northampton County, Virginia, *Fernald, Long & Fogg*, no. 5316; FIG. 2, leaf, × 4, from the TYPE; FIG. 3, surface of legume, × 4, from the TYPE.

C. NICTITANS L., var. LEIOCARPA, n. var.: FIG. 5, surface of legume, × 4, from the TYPE, Pine Mountain, Bell County, Kentucky, *Kearney*, no. 496.

PLATE 449. AMMANNIA KOEHNEI Britton: FIGS. 1 and 2, plants, × ½, from Hackensack Meadow, New Jersey, *Torrey* (TYPE in Herb. N. Y. Bot. Gard.); FIG. 3, bases of upper leaves with axillary flowers (one petal showing), × 2, from Jacksonville, Florida, *A. H. Curtiss*, no. 5133.

A. KOEHNEI, var. EXAURICULATA, n. var.: FIG. 4, small plant, × ½, from North Landing River, Virginia, *Fernald, Long & Fogg*, no. 4954 (TYPE); FIG. 5, bases of upper leaves and axillary flowers, × 2, from the TYPE.

PLATE 450. VERBENA URTICIFOLIA L.: FIG. 1, portion of characteristic fruiting inflorescence, × 1, from West Cambridge, Massachusetts, September 29, 1894, *B. L. Robinson;* FIG. 2, lower surface of leaf, × 10, from Lancaster, Pennsylvania, August 29, 1900, *Heller;* FIG. 3, fruiting calyces, showing the bracts, × 10, from Dedham, Massachusetts, August 22, 1897, *E. F. Williams;* FIG. 4, ripe fruit, × 10, from Belmont, Massachusetts, September 27, 1891, *Walter Deane.*

V. URTICIFOLIA, var. LEIOCARPA Perry & Fernald, n. var.: FIG. 5, portion of fruiting inflorescence, × 1, from Virginia Beach, Virginia, *Fernald, Long & Fogg*, no. 5013 (TYPE); FIG. 6, lower surface of leaf, × 10, from the TYPE; FIG. 7, fruiting calyces and bracts, × 10, from the TYPE; FIG, 8, ripe fruit, × 10, from the TYPE.

PLATE 451. ASTER SPECTABILIS Ait., var. SUFFULTUS, n. var. TYPE SPECIMEN, × ⅓, from Hampton, Virginia, *Fernald, Long & Fogg*, no. 5096.

PLATE 452. Involucres of ASTER, × 4. FIG. 1, A. SPECTABILIS Ait., var.

SUFFULTUS, n. var., from TYPE SPECIMEN. FIG. 2, A. SPECTABILIS Ait., from Orleans, Massachusetts, *Fernald*, no. 694; FIG. 3, A. SPECTABILIS from Brookline, Massachusetts, September 12, 1889, *Faxon*. FIG. 4, A. CURTISII Torr. & Gray, from Haywood County, North Carolina, September, 1897, *E. E. Magee*.

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CXVI

ARABIS IN EASTERN AND CENTRAL NORTH AMERICA

By MILTON HOPKINS

DATES OF ISSUE

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" 106–148 and Plates 457 and 458..... 5 April, 1937
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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. *phylopetala*. 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.

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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.*

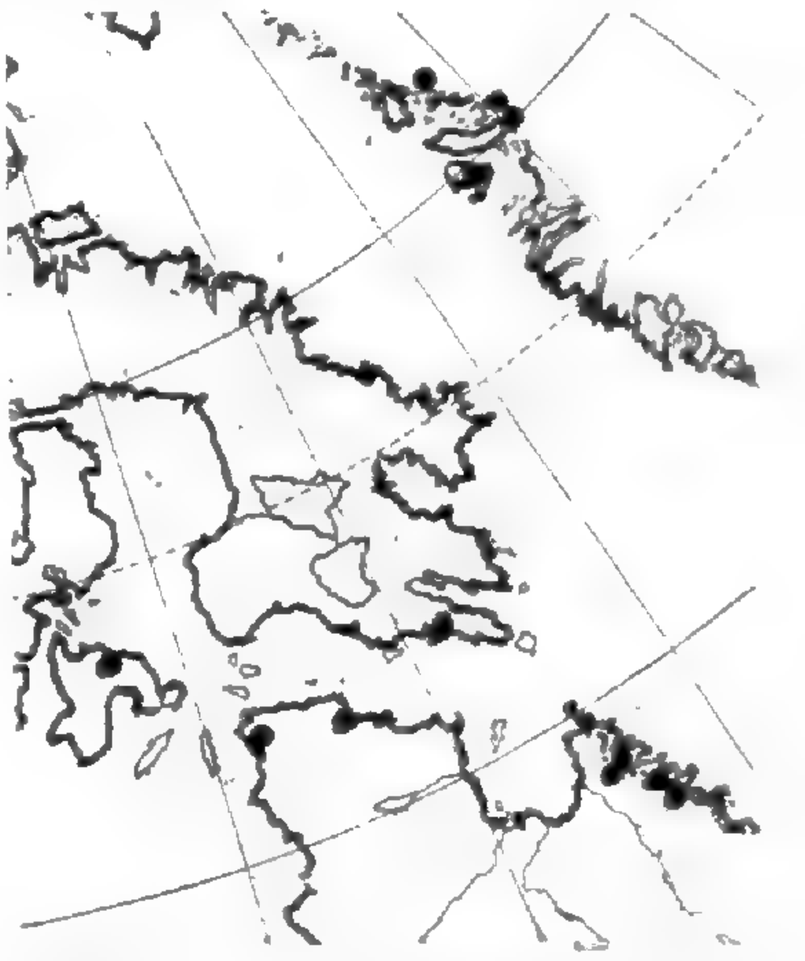
u. Siliques one-nerved at least to the middle and usually beyond; petals not exceeding 1.5 mm. broad at apex....*v.*

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*.

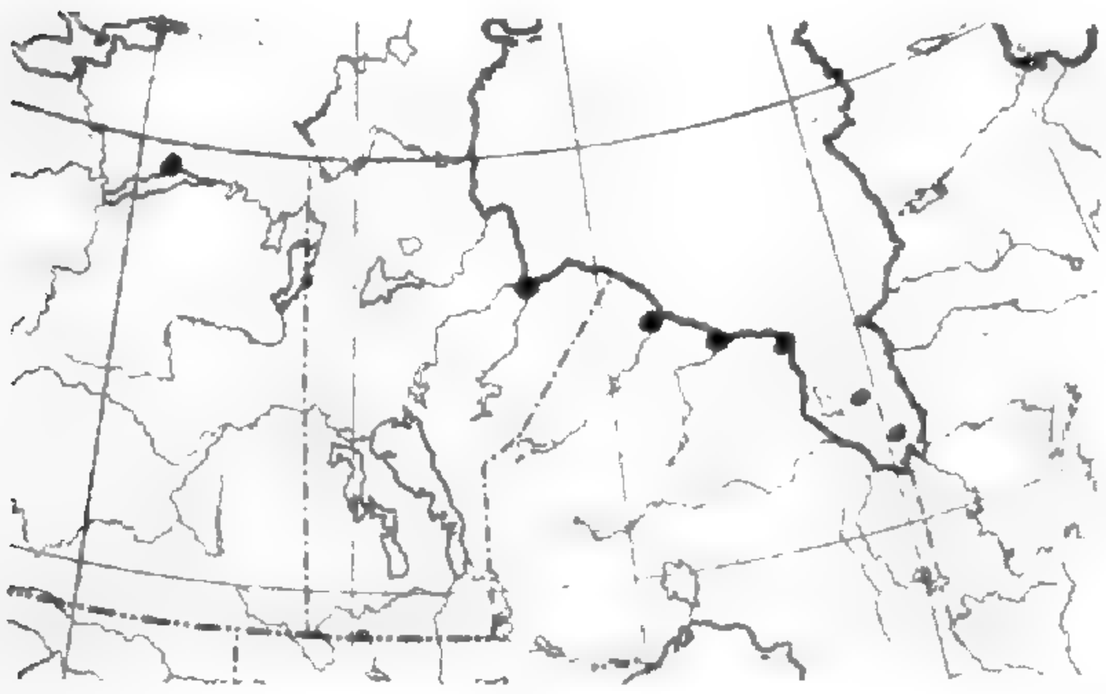
1. A. ARENICOLA (Richards.) Gelert. Perennial from a branching caudex: stem decumbent or erect, branching from the base or simple, low, 12–16 cm. high, glabrous, often purplish at base passing to green above; radical leaves firm, tough or subcoriaceous, numerous, spatulate to oblanceolate, 2–5 cm. long, 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. *arcnicola*.[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.

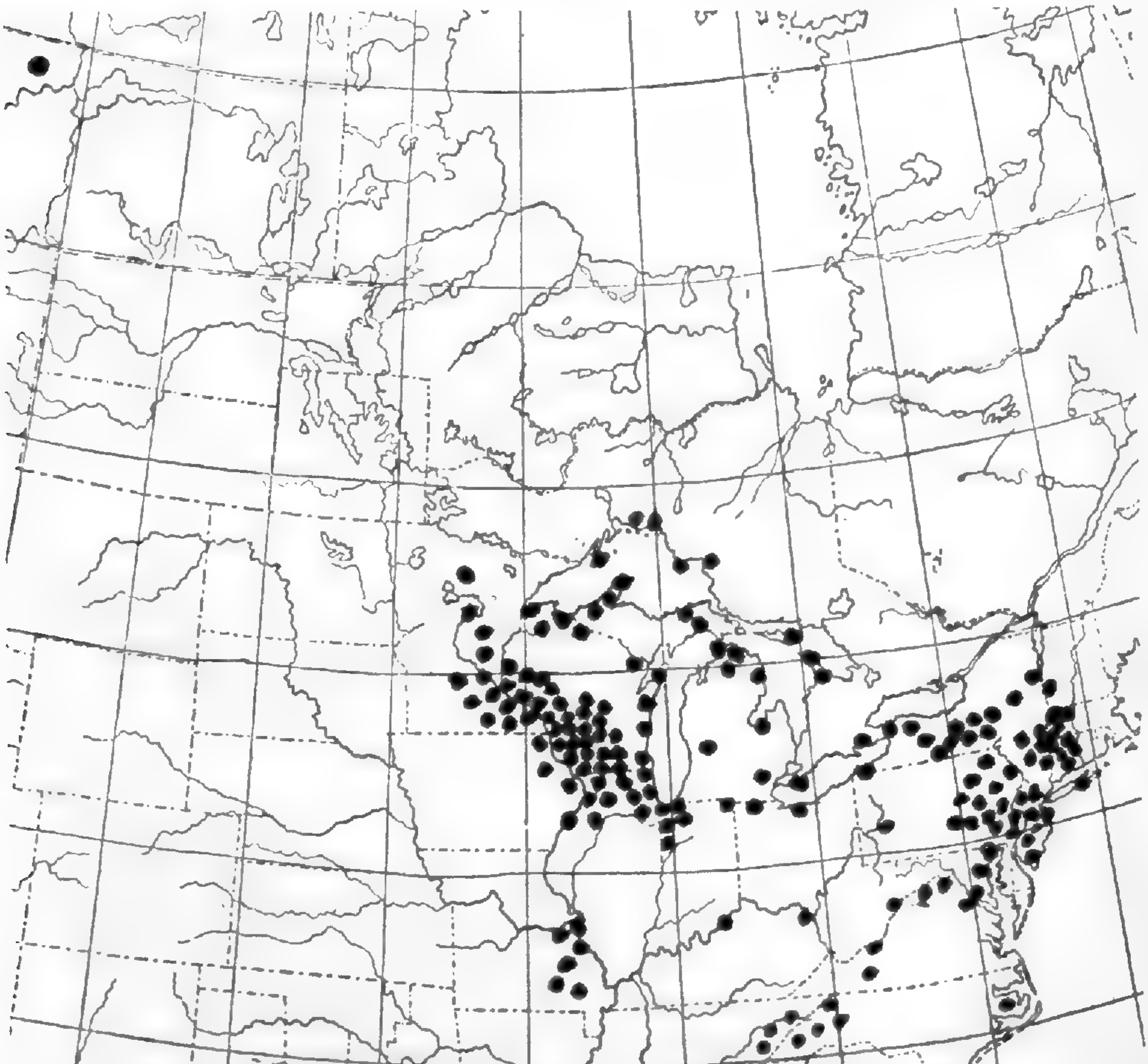
4. A. LYRATA L. Biennial northward, passing to perennial southward: stem ascending, 7–36 cm. high, more or less slender, branching from the base and somewhat above the base, hirsute at base with simple and bifurcate hairs, soon becoming glabrous above or more rarely glabrous throughout: radical leaves 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.

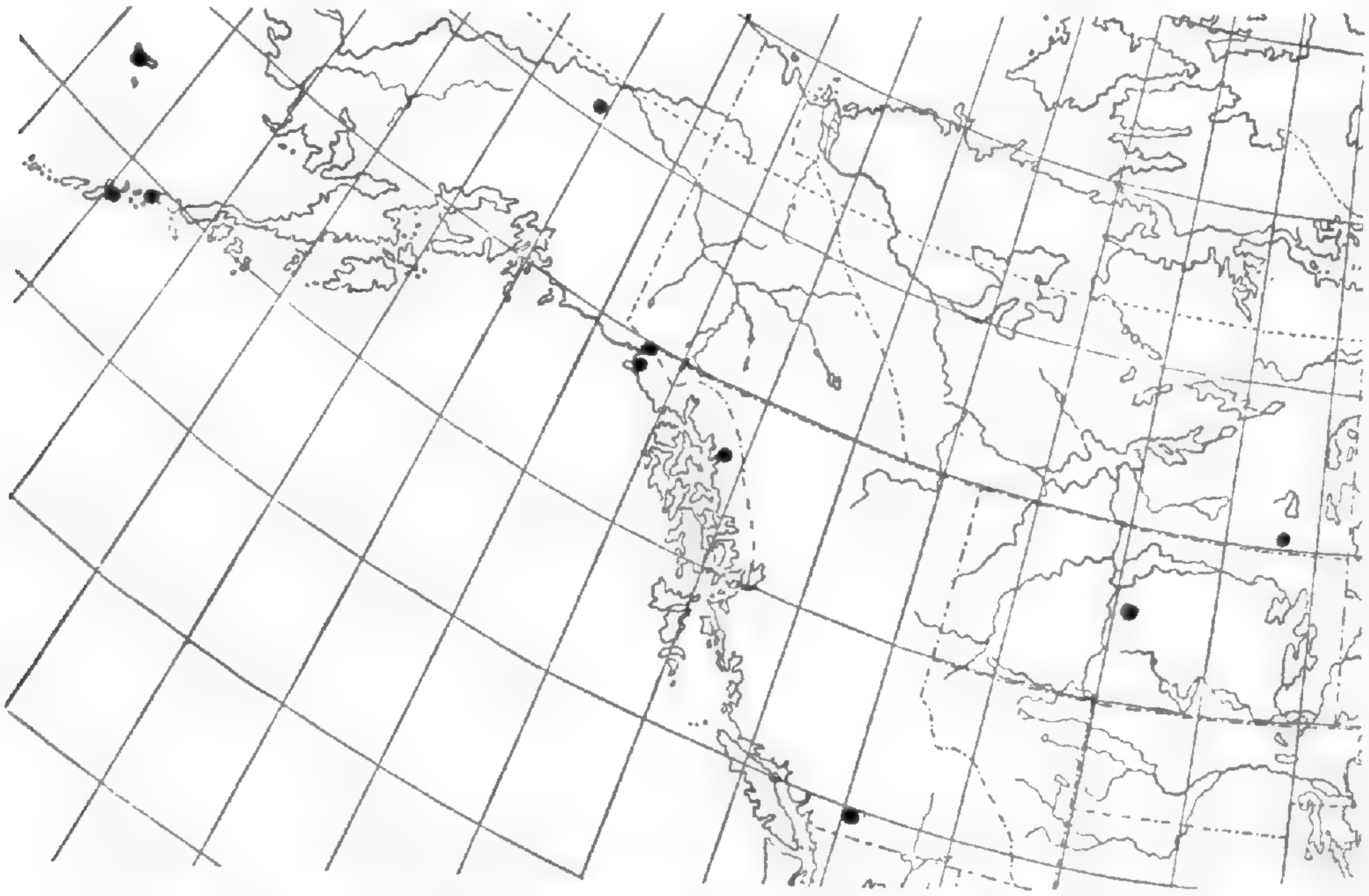
on compacted shell, 10 miles s. of Newbern, Craven Co., *Weatherby*, no. 6,092. Georgia: northern Georgia, *Vasey*, 1878 [Phil.] Ontario: Niagara, *Macoun*, no. 33,785; railroad embankment, Jack Fish, Thunder Bay Distr. *Pease & Bean*, no. 23,535; Hay Bay, Tobermory, Bruce Co., *Krotkov*, no. 7,466; 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., *C. 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-

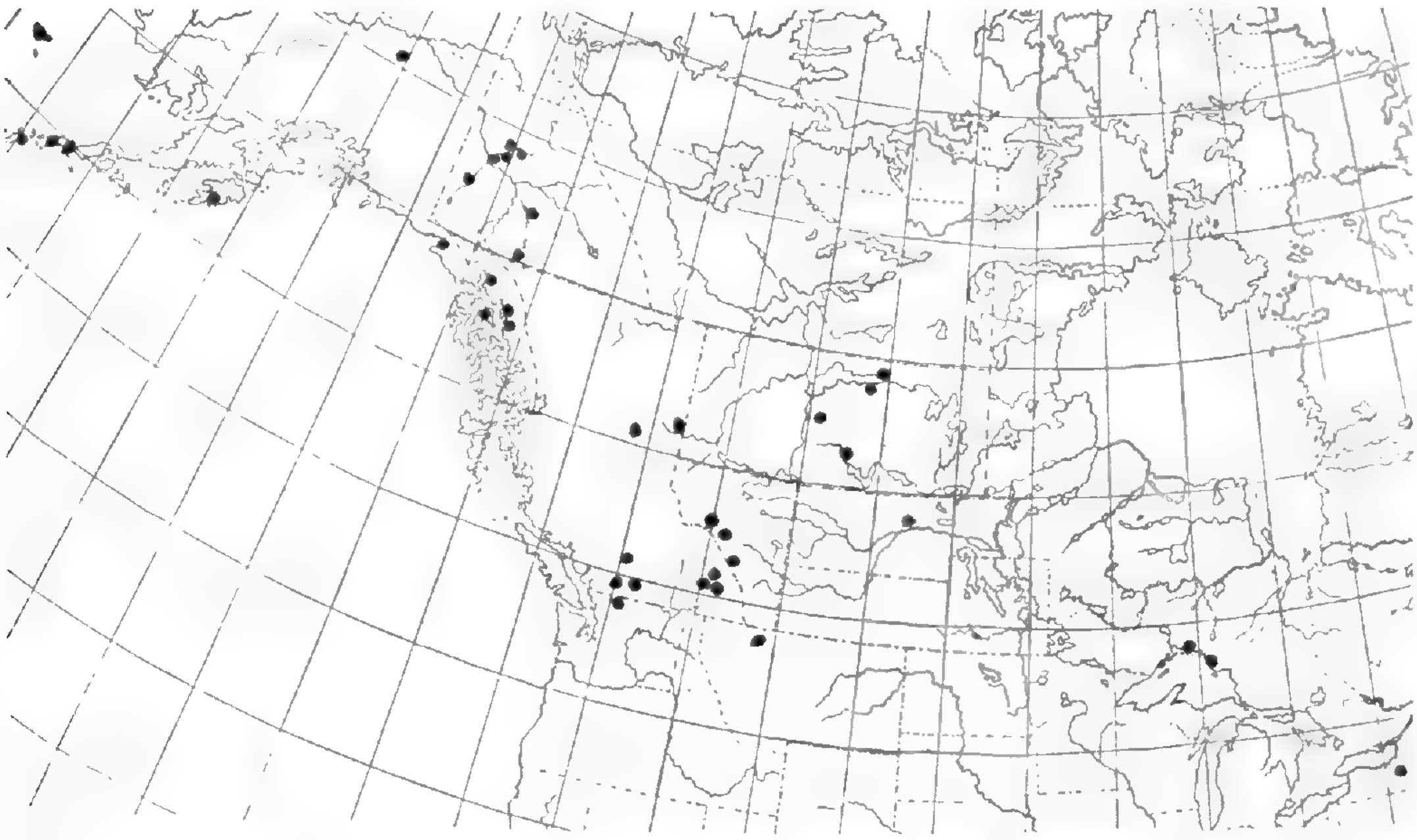


Map 6. Range (American) of Arabis lyrata, var. kamchatica.

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* ε *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-

enantment 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.*)

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.*

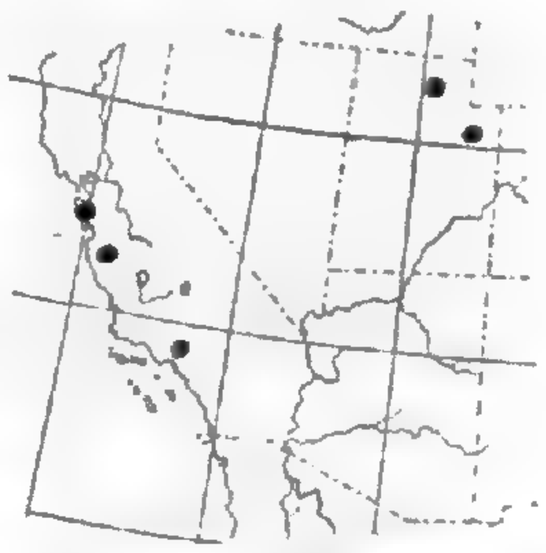
Var. **typica**. *A. glabra* (L.) Bernh. Syst. Verz. Erf. 195 (1800); Britton & Brown, Ill. Fl. ii. 150 (1897); Britton, Man. Fl. 465 (1901); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Nelson & Coulter, New Man. Rocky Mt. Bot. 226 (1909); Frye & Rigg, Nw. Fl. 189 (1912); Piper & Beattie, Fl.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

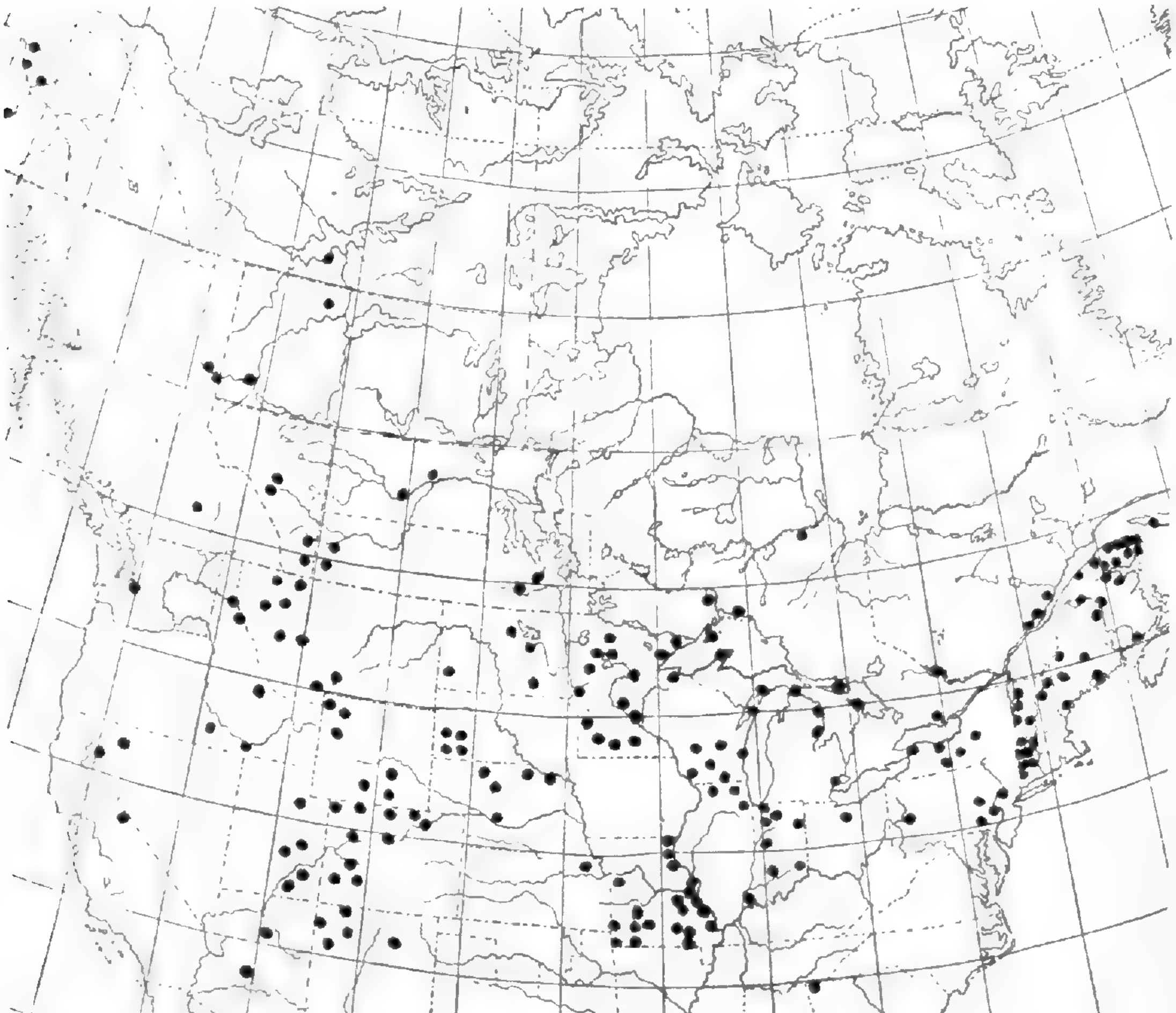
6. A. **pycnocarpa**, sp. nov. (Tab. 458, fig. 1–3), planta biennis: caulibus erectis, gracilibus, simplicibus, vel ramosis inferne et superne, 1.5–8 dm. altis, inferne dense vel sparse hirsutis superne hirsutulis vel glabris, pilis simplicibus et bifurcatis, subadpressis vel patentibus: foliis radicalibus 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., *Krotkor*, 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].



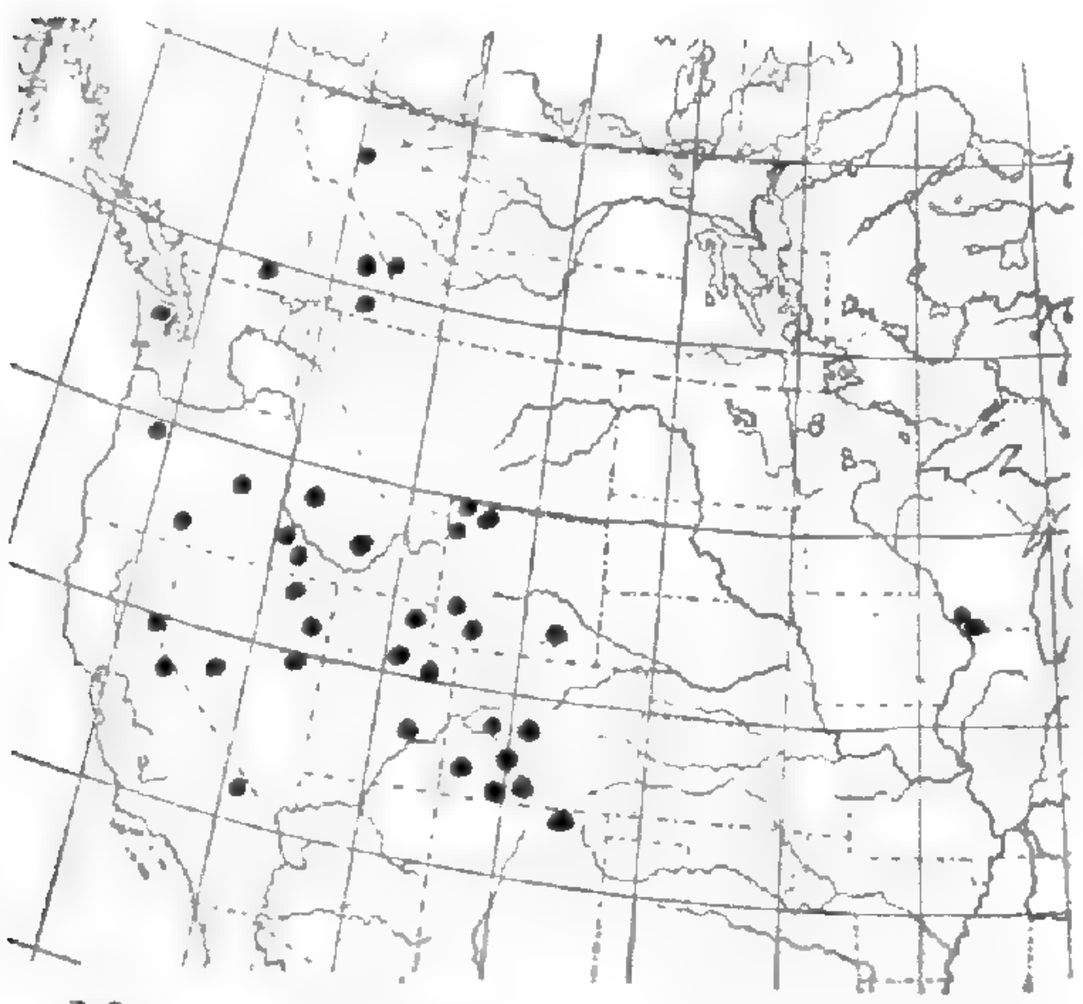
Map 9. Range of Arabis pycnocarpa, var. typica.

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.

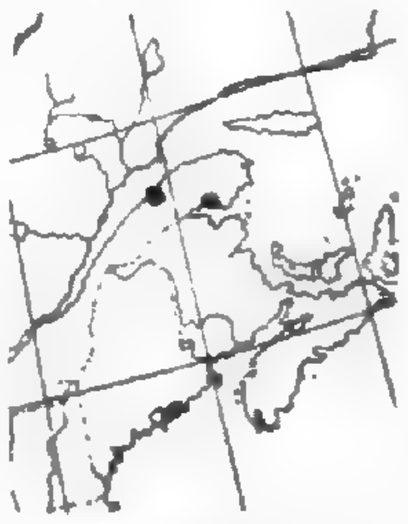
Var. **glabrata** (T. & G.), n. comb. Slender; stem glabrous to sparingly hirsute at base, glabrous above: radical and lower cauline leaves glabrous to sparingly hirsute, middle and upper cauline leaves glabrous: sepals membranaceous.—*A. hirsuta*, β *glabrata* T. & G., Fl. N. Am. i. 80 (1838).—Southwestern 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.

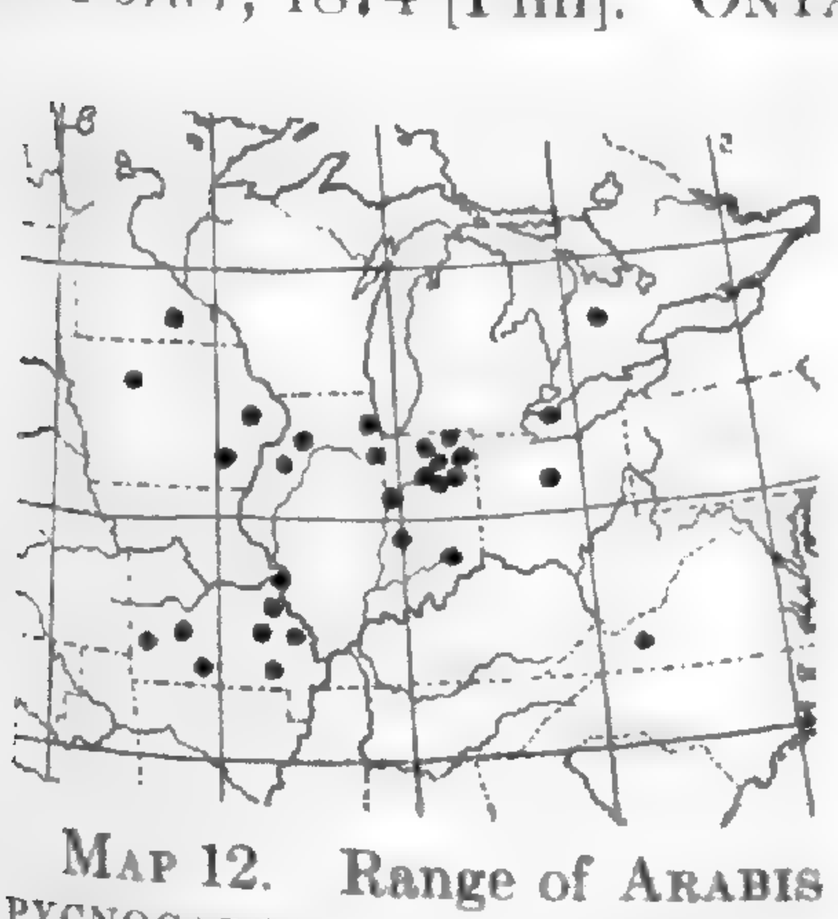
ravine, Ely, Duck Creek Canyon, *A. E. Hitchcock*, nos. 1,389 & 1,391 [US]; moist ravines, vicinity of Austin, *A. E. Hitchcock*, no. 733 [US]. New Mexico: dry hills, vicinity of Raton, Colfax Co., *Standley*, no. 6,350 [US]. California: Cottonwood Creek, White Mts., Mono Co., *Coville & Funston*, no. 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.

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.



Map 11. Range of Arabis pycnocarpa, var. reducta.

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, *F. 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. orata* 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.

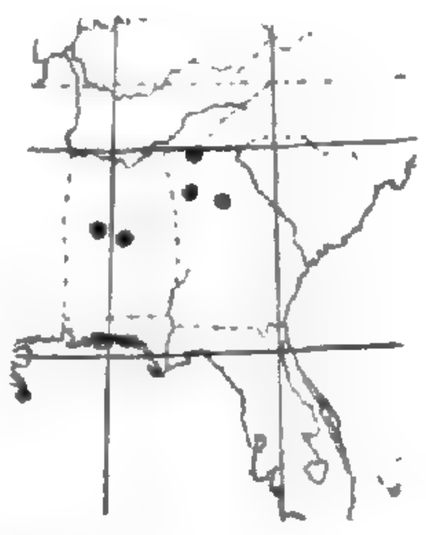
[3] *A. rupestris* Nutt. and *A. Eschscholtziana* Andrz.

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.

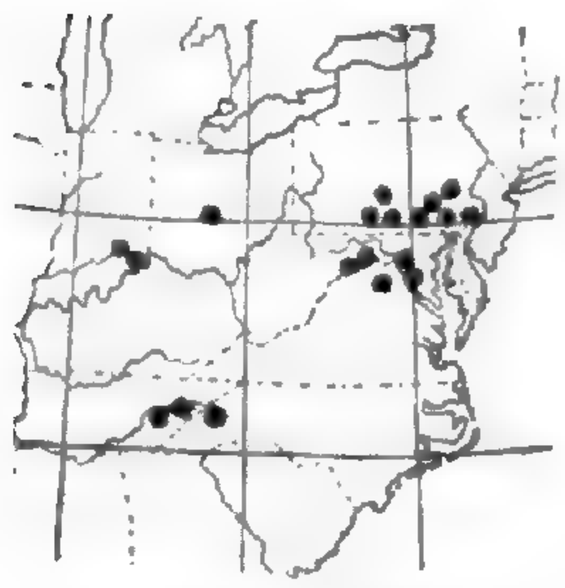


MAP 13. Range of ARABIS GEORGIANA.

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).

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 Äste 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

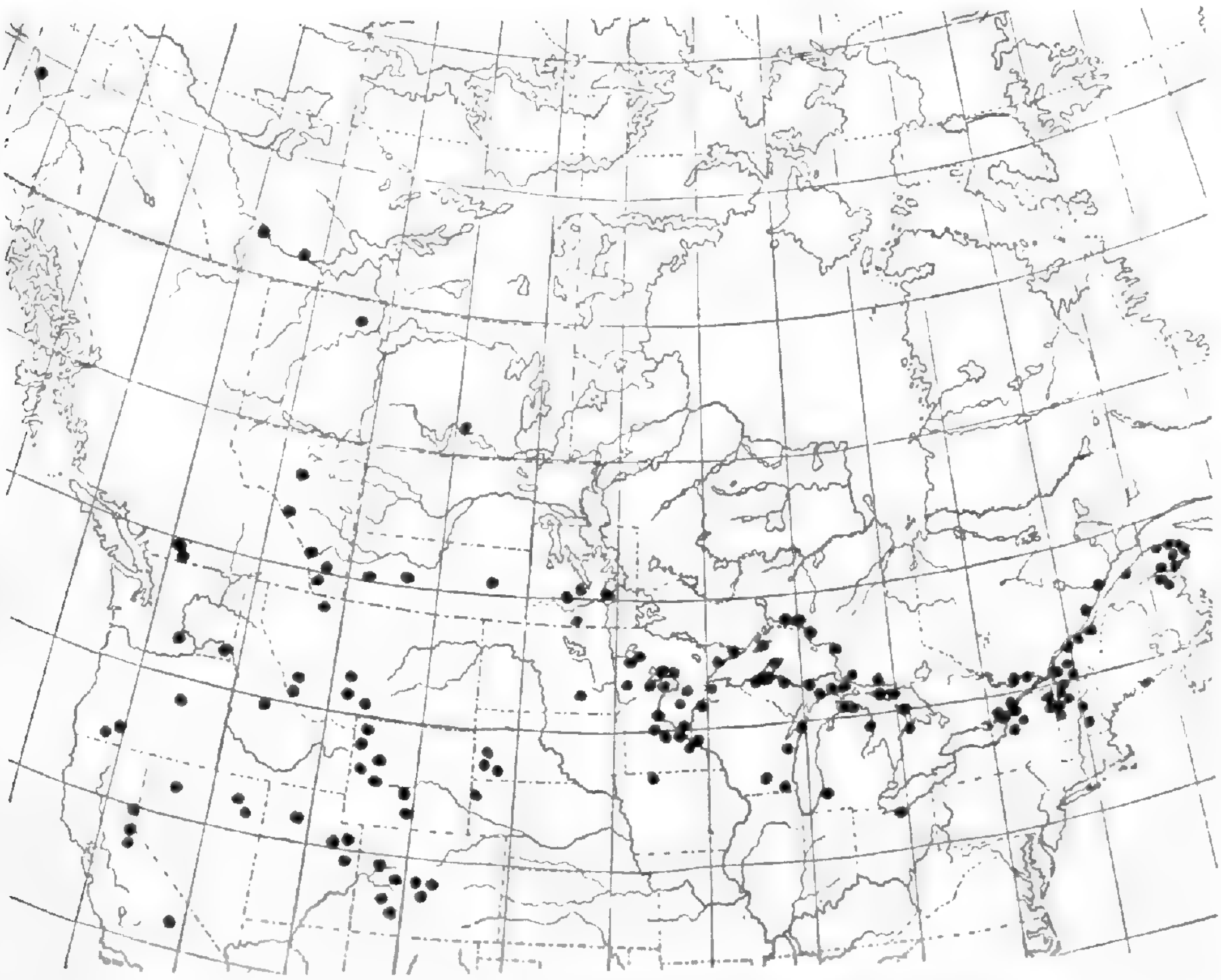
[1] Abromeit, l. c.

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



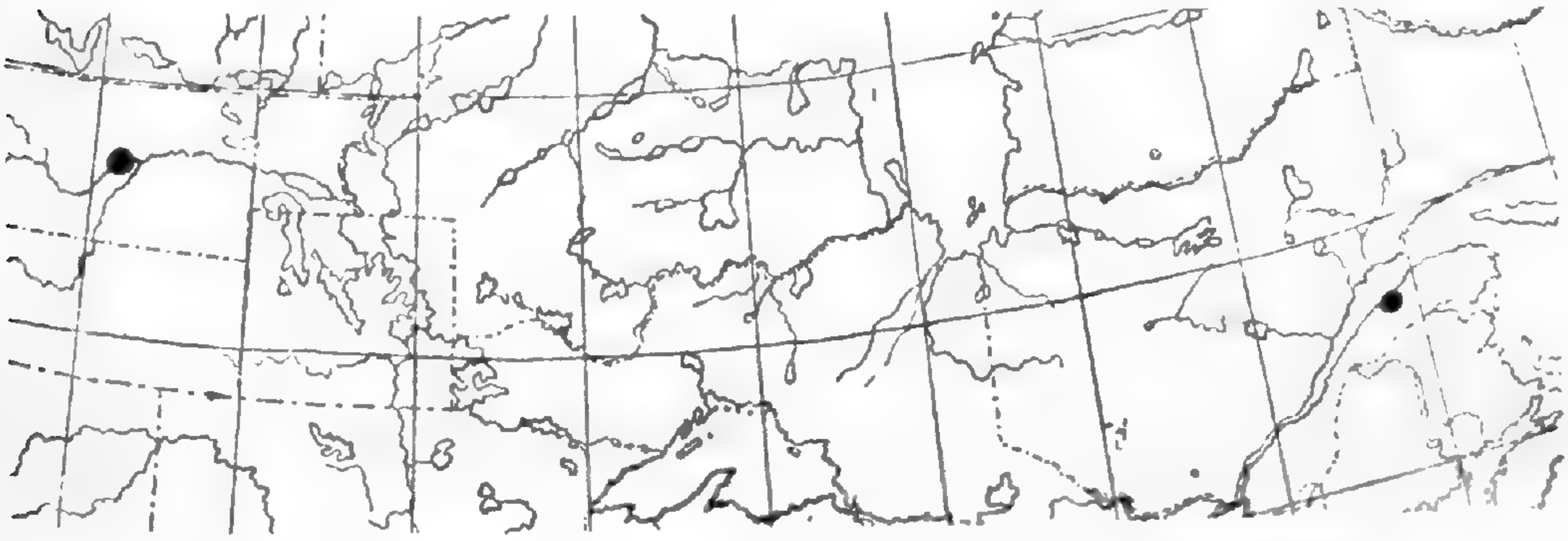
MAP 16. Range of ARABIS DIVARICARPA, var. TYPICA.

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.

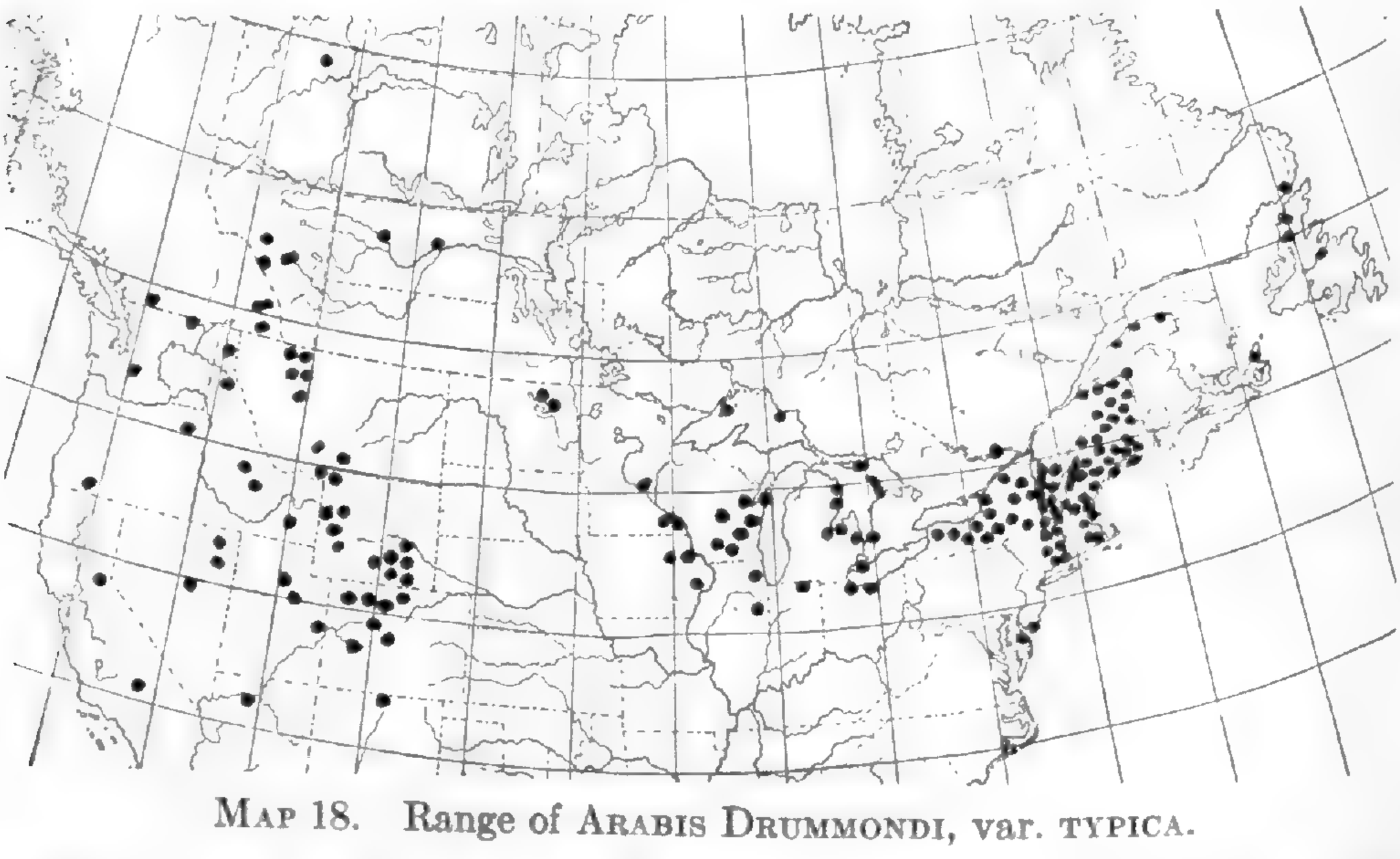
Var. *stenocarpa* has very narrow siliques (0.75–1.25 mm. broad), whereas the typical form of the species has them broader (1.25–2.35 mm.). Except for the station at Bic, Quebec, where both forms of the plant grow in close proximity, the only other locality for var. *stenocarpa* which I have been able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

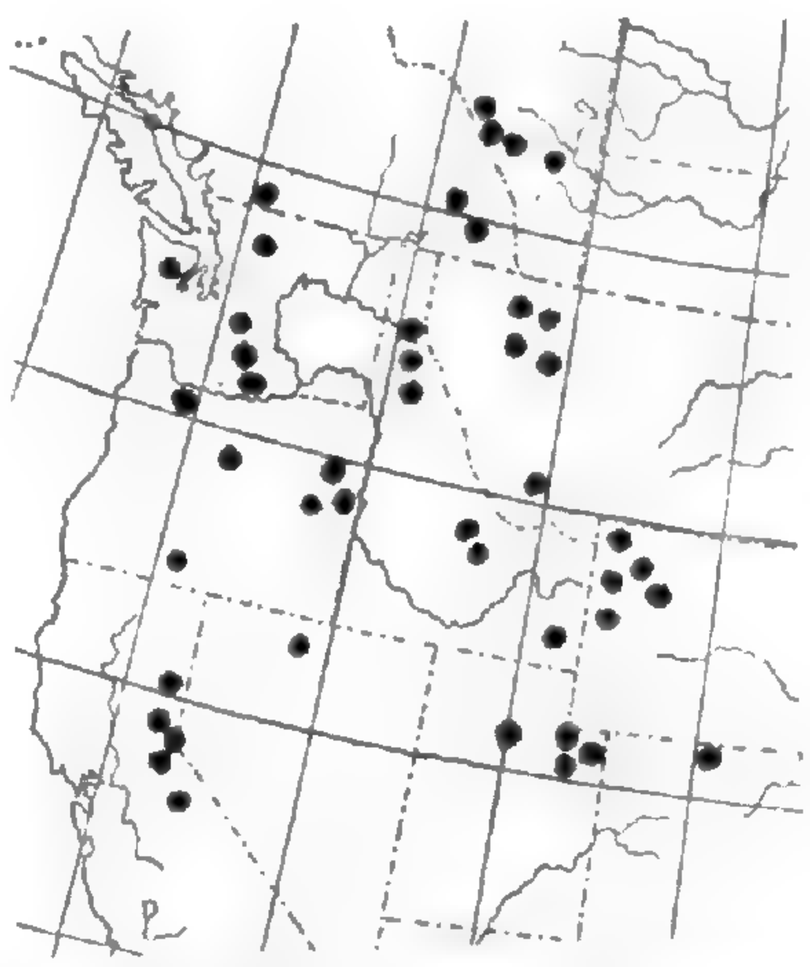
June 1878; west base of Fall Mt., Walpole, *Fernald*, no. 102. Vermont: Round Mt., Shrewsbury, *Eggleston*, no. 1,025; rocky talus, Fairlee, *Pease*, no. 20,300 [Amh]; gravelly river bank, South Vernon, *Fernald & Floyd*, 11 May 1912. Massachusetts: river bank, Tewksbury, *C. H. Knowlton*, 9 May 1903 (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.



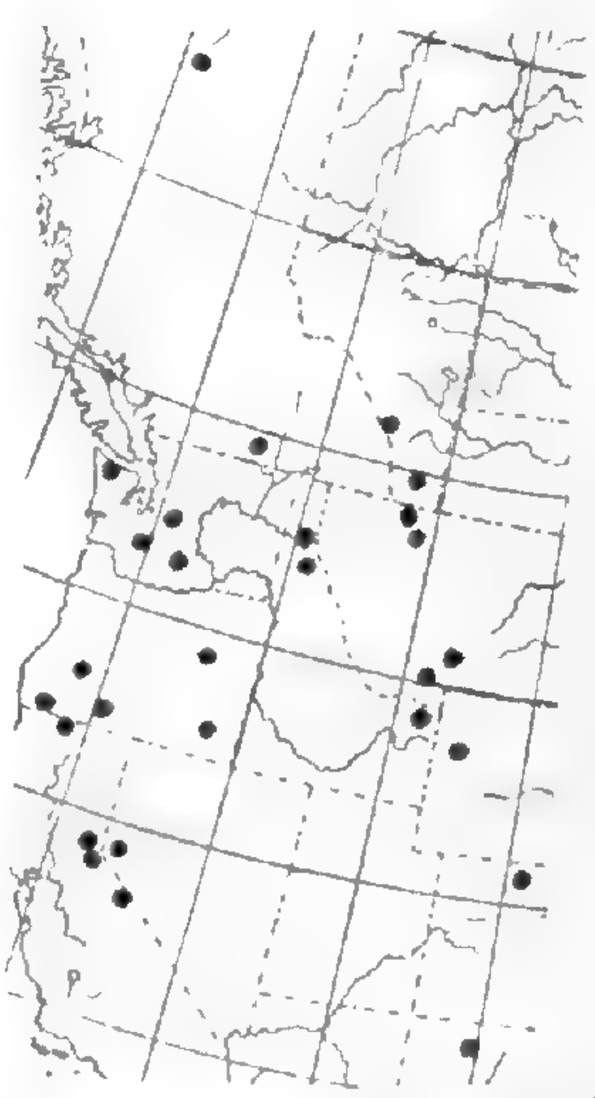
MAP 19. Range of ARABIS DRUMMONDI, var. ALPINA.

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.

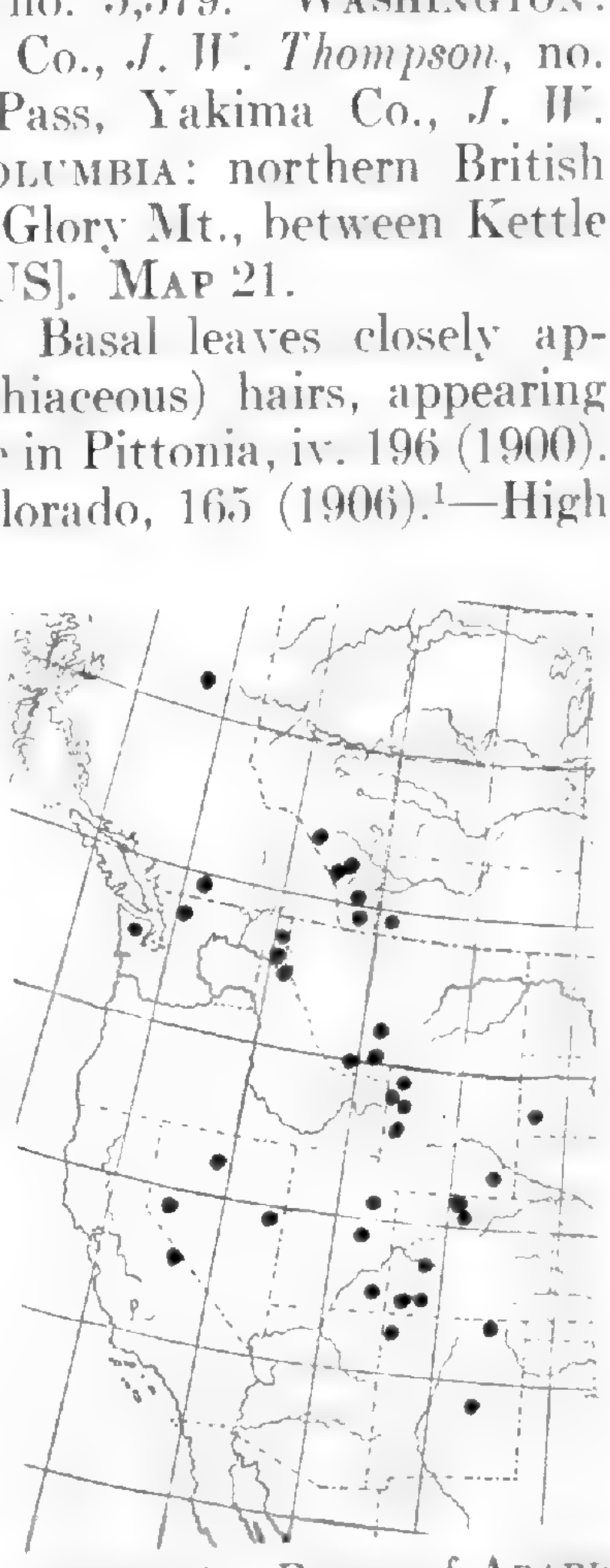
Var. **pratincola** (Greene), comb. nov. Base of stem and radical leaves minutely stellate-pubescent, otherwise similar to var. *typica*.—*A. pratincola* Greene in Fedde, Rep. Spec. Nov. v. 244 (1908).—Alberta and British Columbia south to New Mexico and California. The following are characteristic. 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. Pellut*, 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-



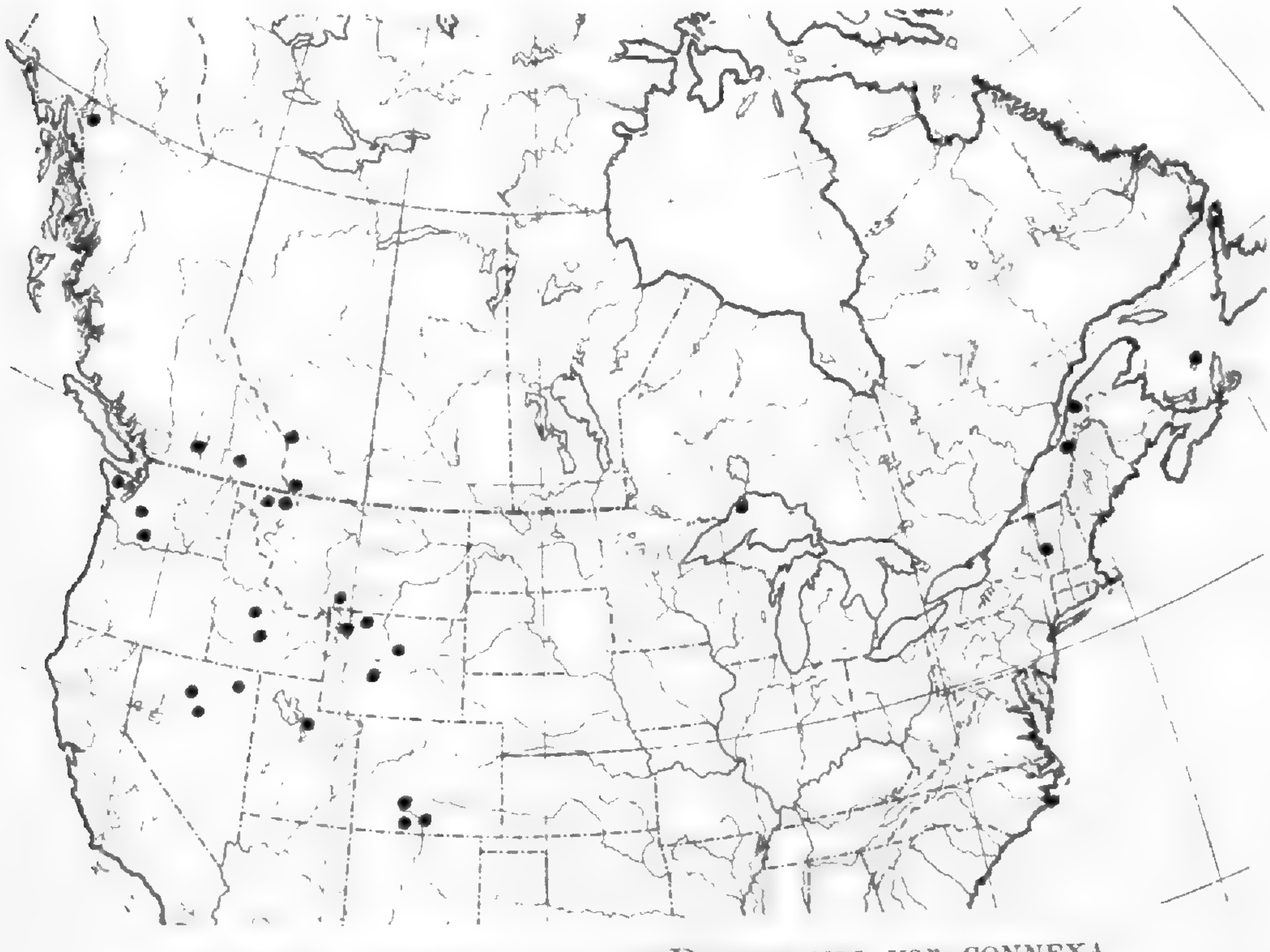
MAP 22. Range of ARABIS DRUMMONDI, var. OXYPHYLLA.

[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. *oreophila*, 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*)

[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).

ARABIS IN EASTERN AND CENTRAL NORTH AMERICA

MILTON HOPKINS

(*Continued from page 148*)

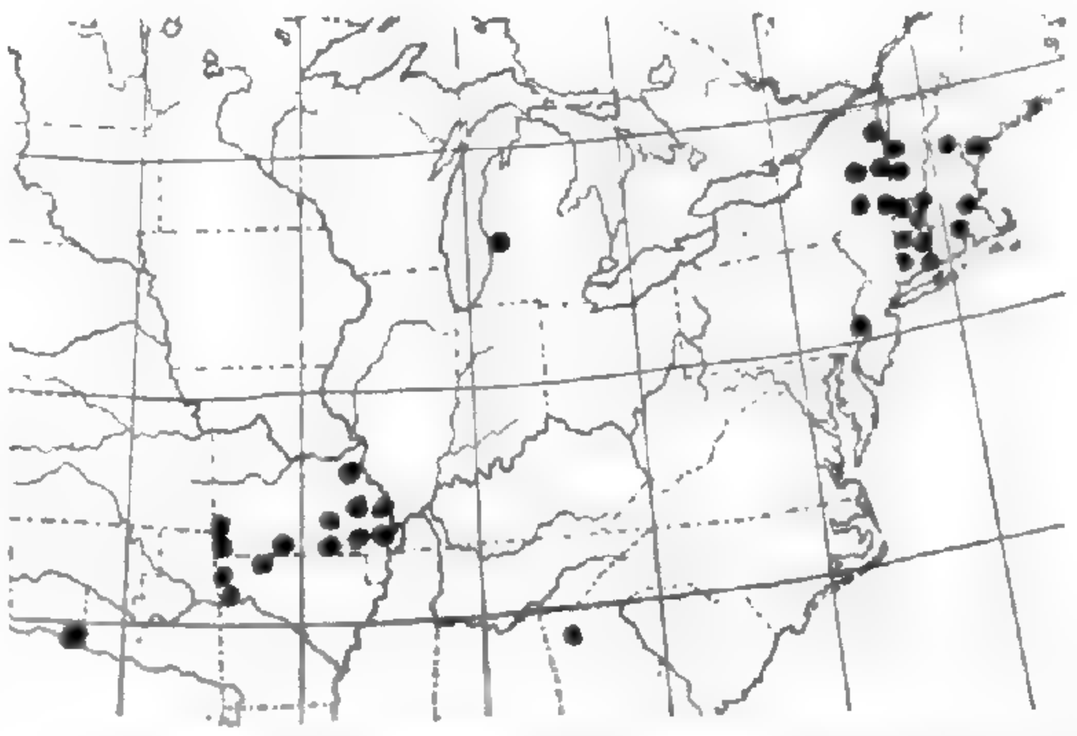
12. A. VIRIDIS Harger. Biennial from a spreading tap-root: stem 2–5 dm. high, branched at base or above or more rarely simple, leafy, averaging 25 internodes to the first flower, glabrous throughout, (pubescent in the var.) bright green: radical leaves rosulate, lanceolate

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.*

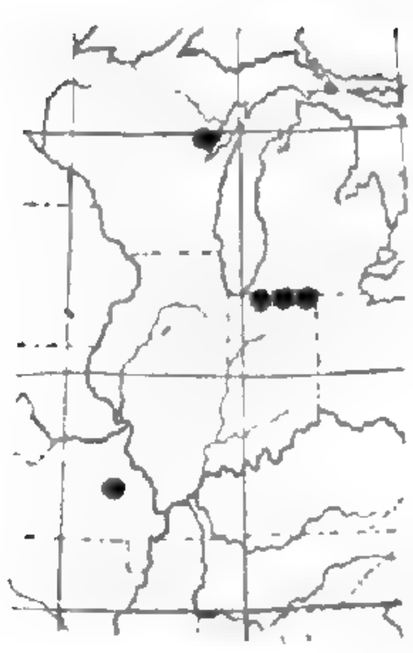
Var. **typica.**—*Arabis viridis* Harger in Rhodora, xiii. 37 (1911); Britton & Brown, Ill. Fl. ed. 2: ii. 181 (1913); Taylor in Mem. N. Y. Bot. Gard. v. 348 (1915). *A. laevigata* var. β *laciniata* T. & G., Fl. N. Am. i. 82 (1838); Britton, Man. 464 (1901).—Cliffs, ledges or rocky woods, New England, 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. lacvigata*, 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. lacrigata* 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. lacvigata* 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. lacrigata* 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,

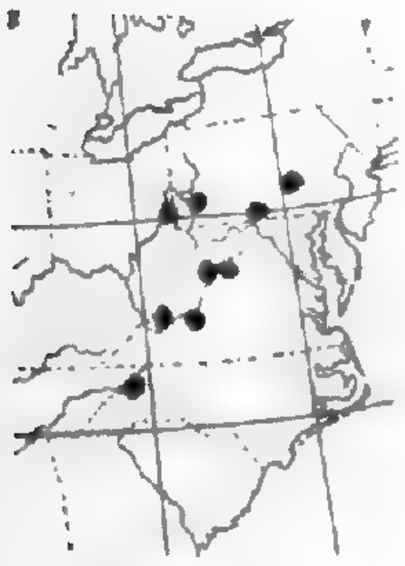
[1] Farwell in Rep. Mich. Acad. Sci. xix. 248 (1917).

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*.

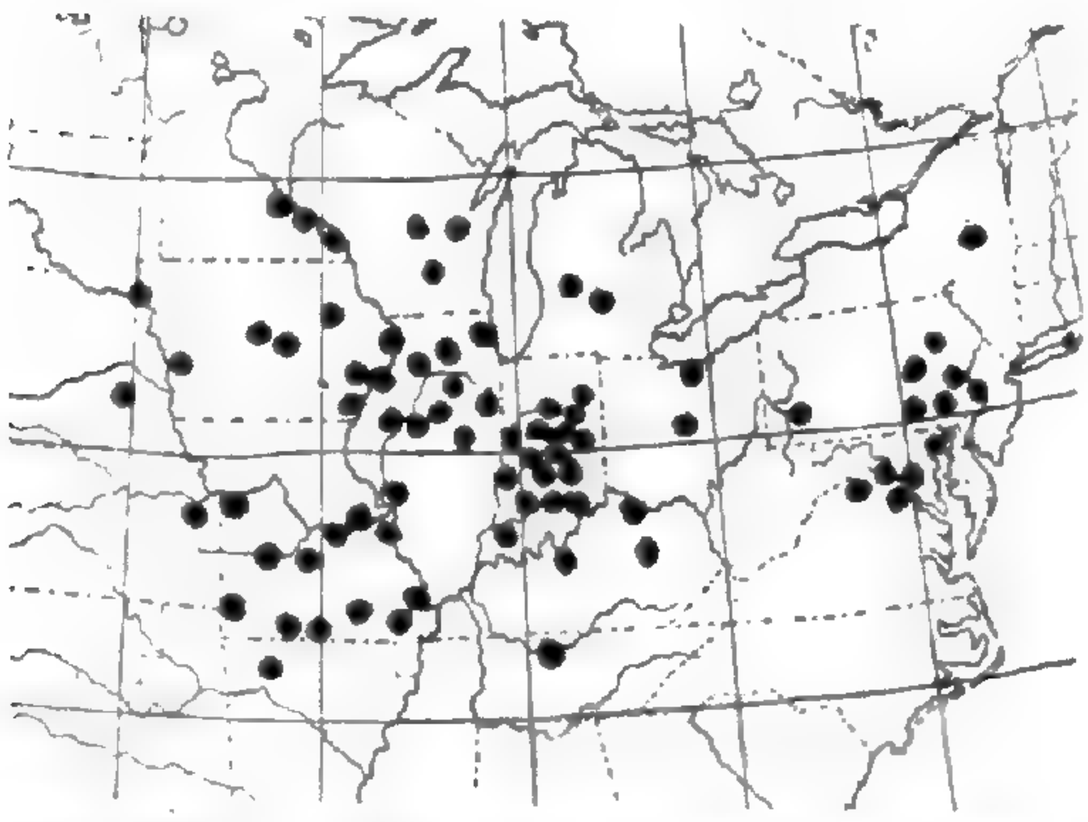
I sent several plants to the National Herbarium and Mr. E. C. Leonard checked them as *Arabis laevigata* . . . The plant seemed to me to resemble *A. serotina* Steele in Britton and Brown. I sent specimens to Dr. Wherry of the Department of Botany at the University of Pennsylvania. He checked the plant 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).

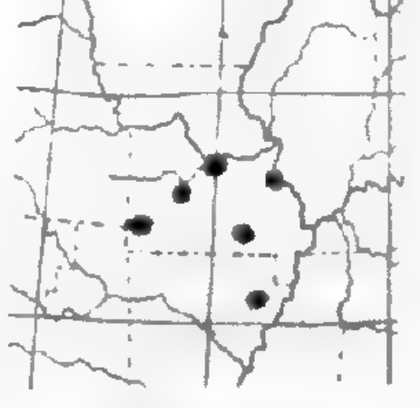
ascending, coarsely pubescent with simple and forked trichomes, 2–3.5 mm. long at maturity; style short and stocky, 0.25–1 mm. long, often as broad as long; seeds oblong to subelliptical, in one row, wingless, averaging 1 mm. long, 0.5 mm. broad.—Fl. N. Am. i. 80 (1838); Eaton & Wright, N. Am. Bot. ed. 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.

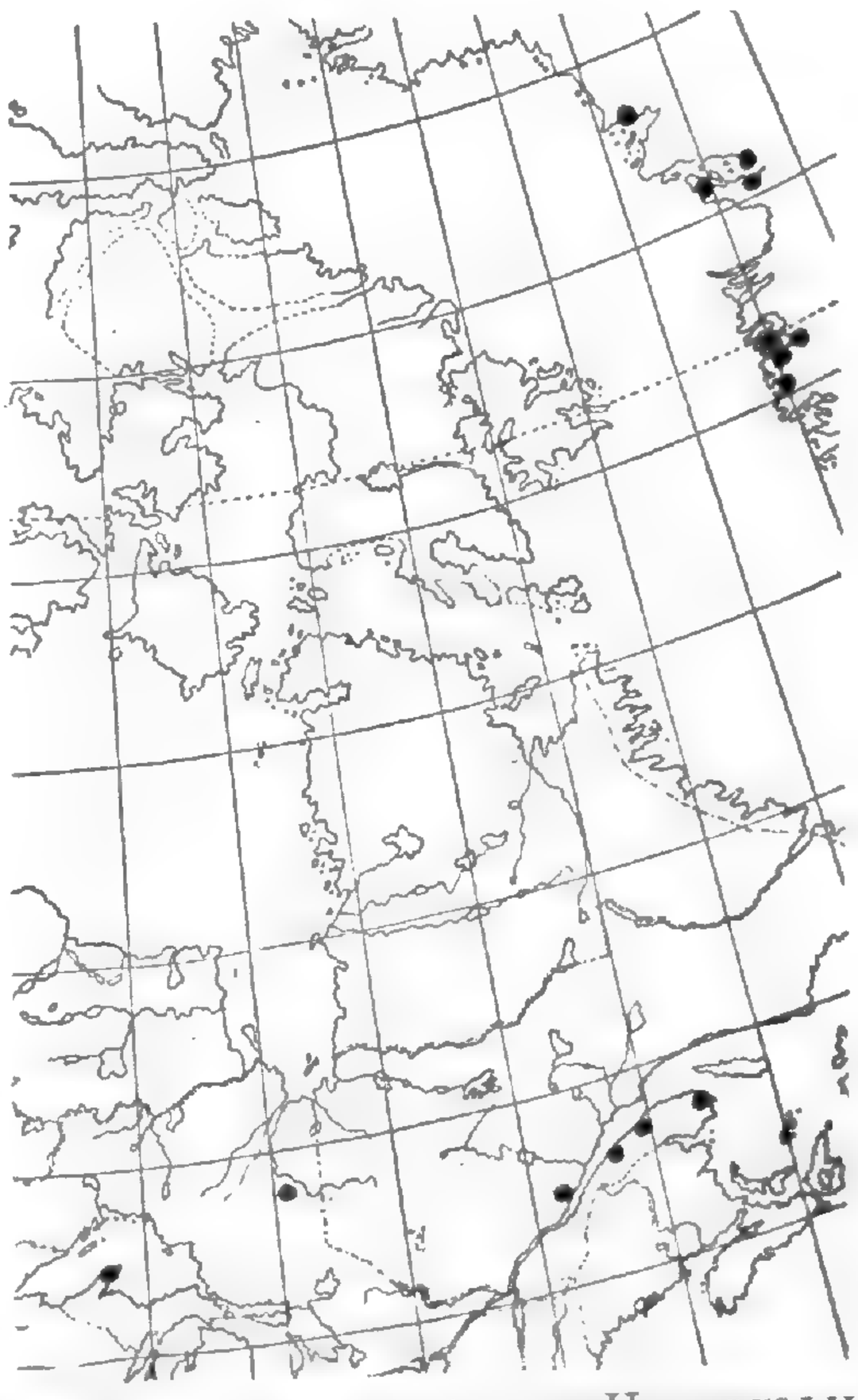
It seems rather remarkable that this interesting form of pubescence has seemingly escaped comment in the past. Torrey & Gray undoubtedly noticed it, although they failed to describe it completely, for they say in their description of the plant, "the pubescence (particularly of the under surface of the 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. i. 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).

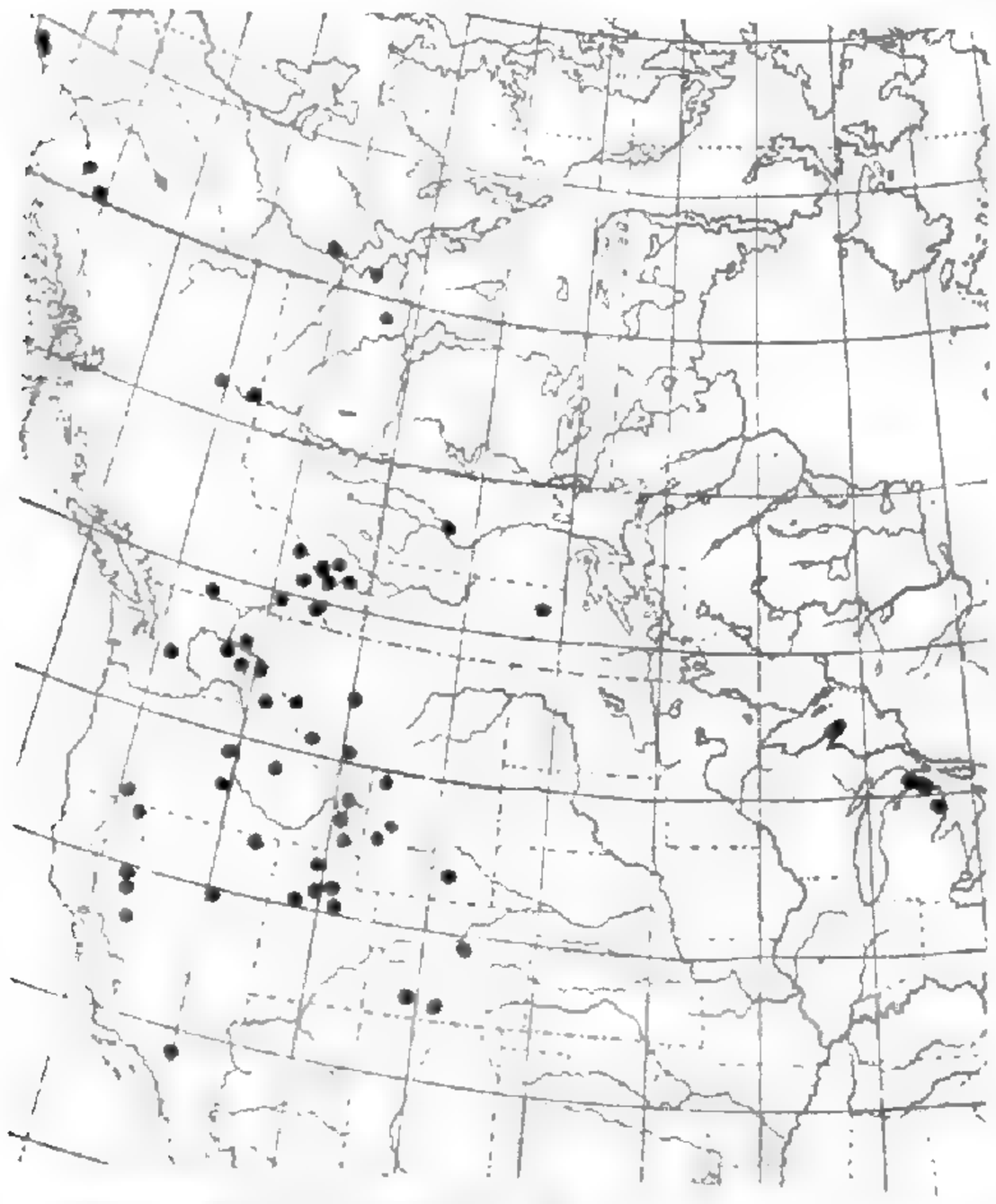
reduced it to a variety of *A. sagittata*,[1] and Torrey & Gray included it as a variety of *A. hirsuta*,[2] which they considered to be identical with *A. sagittata* DC. But I have felt that it was wiser to omit it from the synonomy of any species.

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

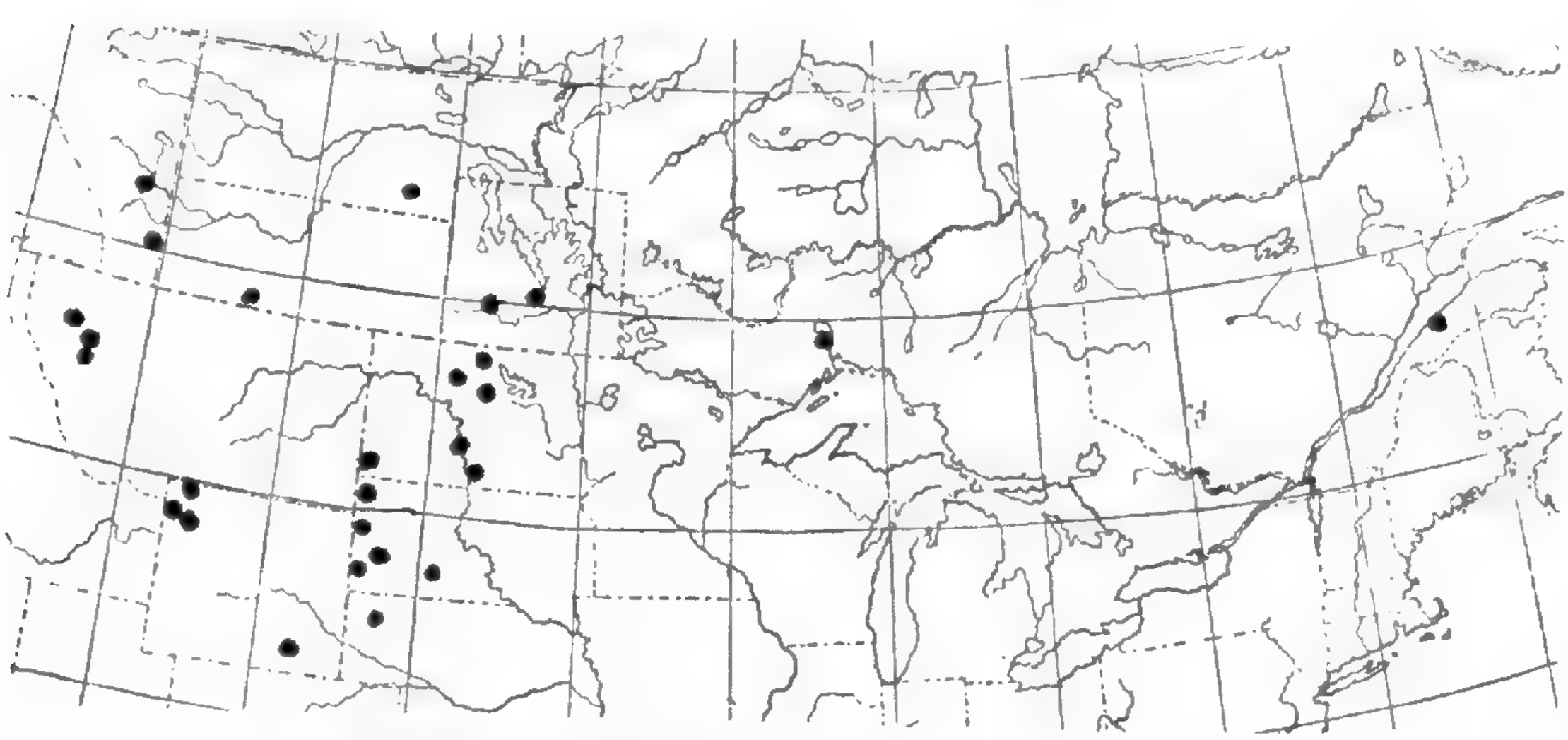
[1] Greene, discussing the plant in Pittonia, iv. 188 (1900) says: "I note that Mr. Howell, in his Northwestern Flora, has taken up the name *A. retrofracta*, but, as it appears from the description, for a plant very different from this [Graham's *A. retrofracta*]." Howell's description seems to tally 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.

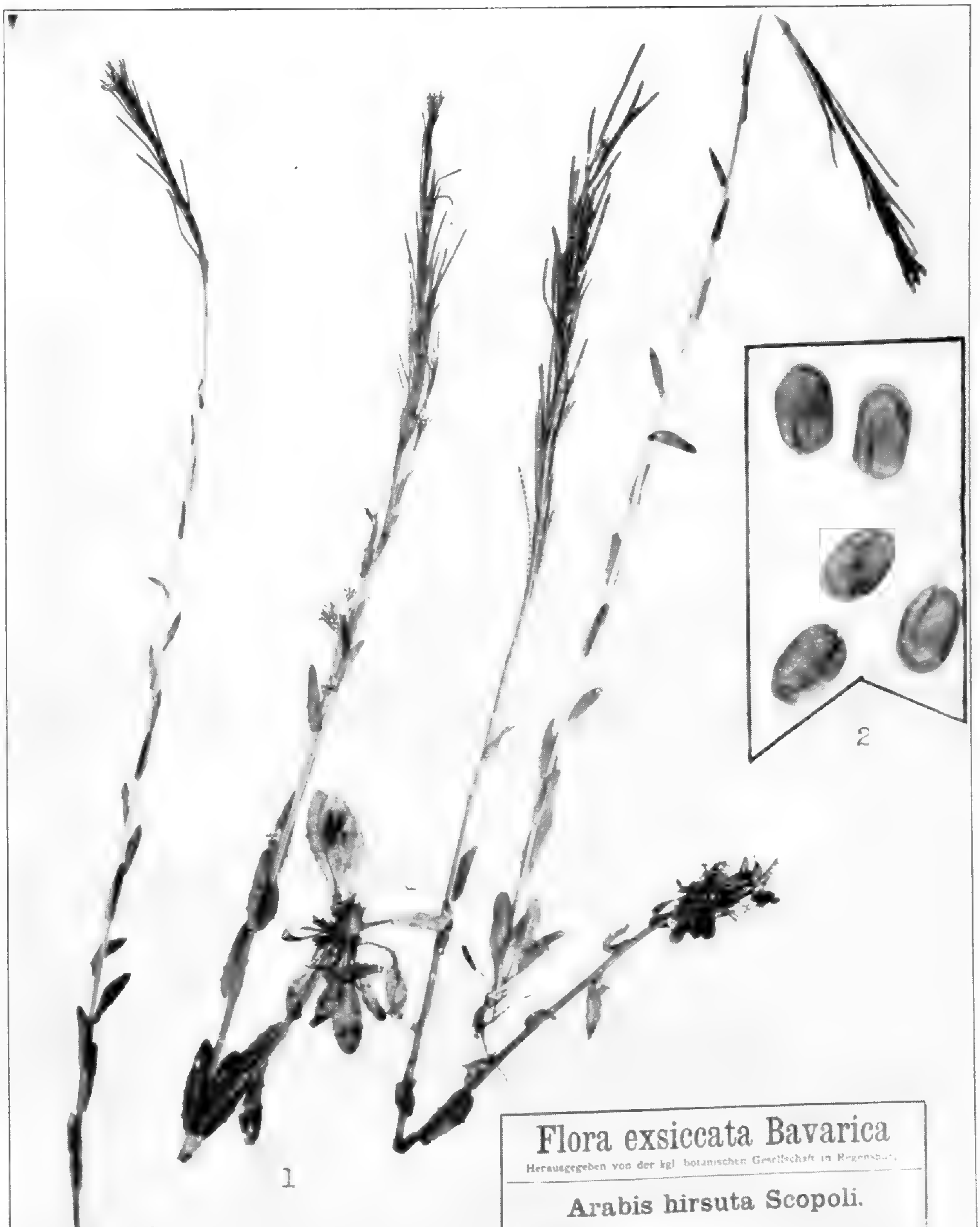
A. pendulocarpa is easily confused with *A. retrofracta* Graham,

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

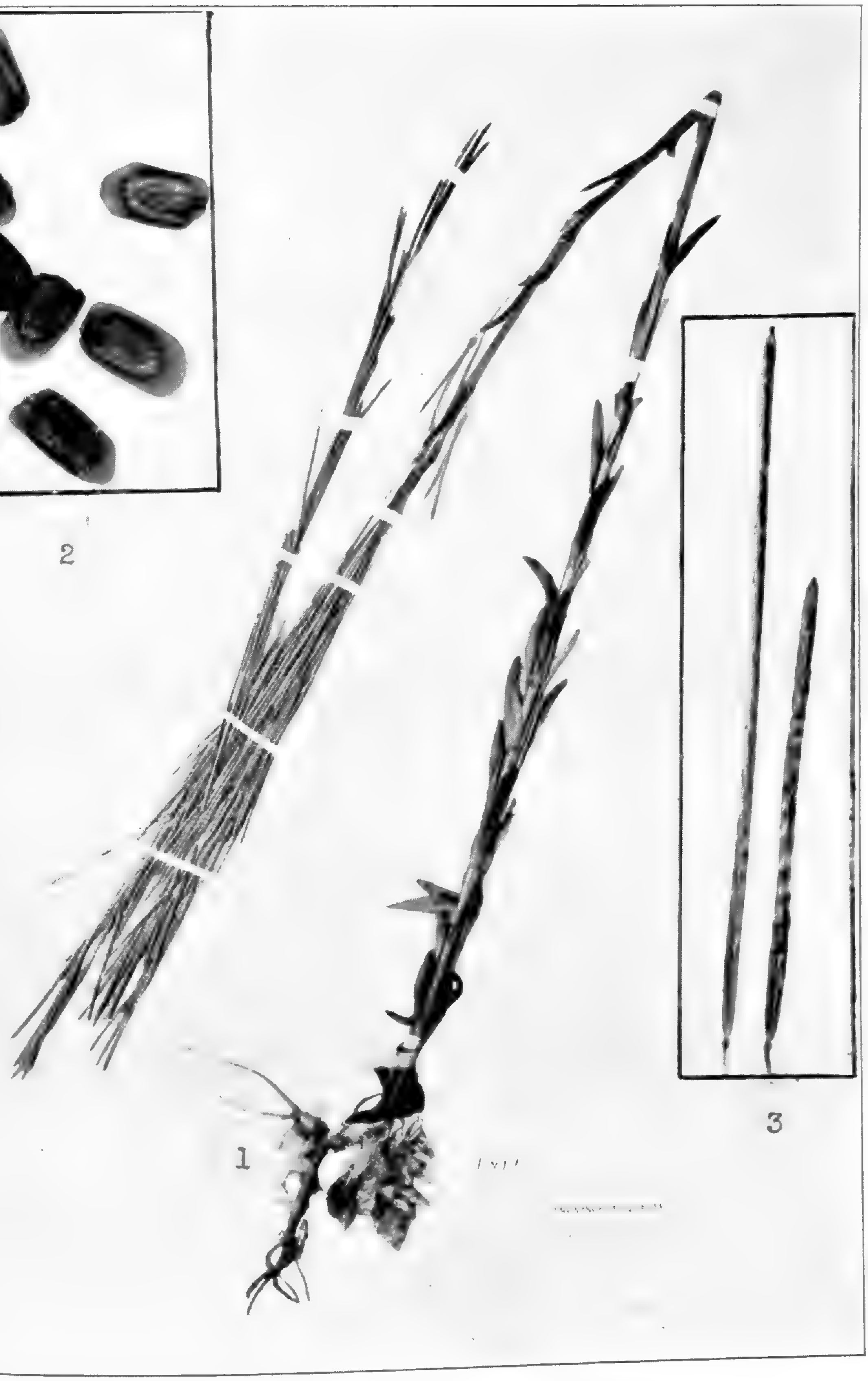
PLATE 457. A. HIRSUTA (L.) Scop. FIG. 1, habit of plant, × 1, from Bavaria, Germany, *Fischer*, 9 June 1900; FIG. 2, seeds, × 10, from the same plant.

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.



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

2



1

3

ARABIS PYCNOCARPA: FIG. 1, type-specimen, × 2/5; FIG. 2, seeds, × 10; FIG. 3 (left), fruit, × 2.

A. HIRSUTA: FIG. 3 (right), fruit, × 2.

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1937.

1. STUDIES IN THE BROMELIACEAE,—VIII.

By Lyman B. Smith.

(*Plates I–II.*)

Aechmea Kienastii E. Morr. ex Mez in DC. Mon. Phan. ix. 243 (1896). *?Ae. tillandsioides* Bak. sensu Mez in DC. Mon. Phan. ix. 242 (1896), as to Central American material. *Ae. bracteata* Gris. sensu Standley in Pub. Bot. Field Mus. x. 126, t. 17 (1931), non Gris. (1864).

MEXICO: without further locality, 1880, *hort. Jacob Makoy* (Liége, TYPE; phot. G); OAXACA: Tepinapa, alt. 200 m., 1919, *Reko 4055* (US); TABASCO: Rancho Juarez, Tenosique, alt. 120 m., 1892, *Beristain 7909* (G). BRITISH HONDURAS: on forest trees, Big Creek, 1929, *Schipp 98* (G); El Cayo, 1931, *Bartlett 12081* (Mich); Yalóch to El Cayo, 1931, *Bartlett 12860* (Mich); Gracie Rock, Sibun River, 1935, *Gentle 1581* (Mich); on trees, plantation 6 miles north of Maskall, 1936, *O'Neill 8509* (CathU). GUATEMALA: eastern portions of Vera Paz and Chiquimula, 1885, *Watson 353* (G); PETEN: Uaxactun, 1931, *Bartlett 12329* (Mich); El Paso, 1932, *Lundell 1637* (Mich); ALTA VERAPAZ: Cubilquitz, alt. 350 m., 1902, *von Tuerckheim in herb. J. D. Smith 8324* (G); IZABAL: Boca del Polochic, 1889, *J. D. Smith 1823* (G). HONDURAS: ATLANTIDA: Lancetilla Valley near Tela, alt. 20–600 m., 1927–8, *Standley 52998* (US, FM). PANAMA: 1860, *Hayes* (NY); westerly arm of Quebrada Salamanca, alt. 75 m., 1934, *Dodge, Steyermark & Allen 17030* (Mo). COLOMBIA: SANTANDER: near Puerto Berrio, between Carare and Magdalena Rivers, alt. 100–700 m., 1935, *Haught 1639* (G).

Mez contrasted *Ae. Kienastii* with 15–30-flowered spikes with the earlier *Ae. tillandsioides* with 12-flowered spikes.[1] Under both species he cited material from Central America. In working with the comparatively extensive series of collections cited above, it became more and more evident that the plants with few-flowered spikes were nothing but reduced material of those with many-flowered spikes. However, instead of having to reduce *Ae. Kienastii* to synonymy, it is possible to redefine it and *Ae. tillandsioides*, as follows:

Inflorescence simple or densely compound: spikes subfasciculate. *Ae. Kienastii.*
Inflorescence very laxly compound: spikes remote. . . . . *Ae. tillandsioides.*

The above division may seem of scarcely more specific significance than that used by Mez, yet in all the material I have examined it shows a sharp geographic correlation, with *Ae. Kienastii* becoming a species of southern Mexico, Central America and northern Colombia, while *Ae. tillandsioides* is restricted to Guiana and Amazonian Brazil. As yet I have been unable to examine any of the Central American specimens which Mez cited under *Ae. tillandsioides*, but in view of the consistent behavior of what I have seen, it is probable that they also are reduced material of *Ae. Kienastii.*

[1] Mez in DC. Mon. Phan. ix. 185 (1896) and in Engl. Pflanzenr. iv. Fam. 32, 117 (1934).

Aechmea multiflora, spec. nov., epiphyta, acaulis, 5 dm. alta; foliis imperfecte cognitis, inflorescentiam superantibus, laminis ligulatis, acutis, pungentibus, ultra 1 dm. latis, supra glabris, subtus densissime minuteque pallido-lepidotis, spinis atris subrectis ad 2 mm. longis laxe armatis; scapo erecto, valido; scapi vaginis dense imbricatis, foliaceis, basi atro-castaneis et dense badio-lepidotis, supremis valde reductis et in eas florum transeuntibus, recurvatis, crassis, rigidis, denticulatis, involucram formantibus; inflorescentia simplicissima, dense spicata, valde multiflora, crasse subcylindrica, late obtusa, 15 cm. longa, 11 cm. diametro; bracteis florigeris rectis, oblongis, acuminatis, 45 mm. longis, flores subaequantibus, 1 cm. latis, parte superiore subcoriacea, brunnea, denticulata, sparse lepidota, parte inferiore tenui, pallida, integra, glabra; floribus sessilibus, valde complanatis; sepalis subtriangularibus, valde asymmetricis, 2 cm. longis, pungentibus, crassis, atro-castaneis, dense appresso-lepidotis, petala omnino involventibus, liberis; petalis oblongis, acutis, ex sicco albis, basi ligulis binis obliquis auctis; staminibus inclusis, serie II cum petalis ad 3 mm. connata, antheris linearibus, 1 cm. longis; ovario gracili, 25 mm. longo, tubo epigyno infundibuliforme, 5 mm. longo, placentis fere toti interno loculorum angulo affixis. Pl. I, figs. 1–3.

BRAZIL: Bahia: forests of the Rio Grongogy Basin, alt. 100–500 m., 1915, *H. M. Curran 297* (US, type; phot. G).

Aechmea multiflora is related to *Ae. Fernandae* and *Ae. rubiginosa*. It differs from *Ae. Fernandae* in its elongate scape and from *Ae. rubiginosa* in its basally thin floral bracts and strongly asymmetric sepals.

Catopsis delicatula, spec. nov., solum juvenilis cognita, 28 cm. alta; foliis paucis, subfasciculato-rosulatis, ad 27 cm. longis, obscure brunneo-punctulatis, extimis valde reductis; vaginis parvis, ellipticis, haud distinctis; laminis lineari-triangularibus, longe acuminatis, basi 12 mm. latis, planis; scapo erecto, gracillimo, glabro; scapi vaginis erectis, internodia multo superantibus, angustissime lanceolatis, subfiliformi-acuminatis; inflorescentia laxe paniculata, submultiflora, 13 cm. longa; axi geniculato; bracteis primariis eis scapi similibus, infimis spicas juveniles axillares subaequantibus, supremis valde reductis; spicis patentibus, ad 4 cm. longis vel paulo ultra, laxe paucifloris; bracteis florigeris late ovatis, 4 mm. longis, quam sepala brevioribus, perobscure punctulato-lepidotis; floribus patentibus; sepalis ellipticis, valde asymmetricis, 5 mm. longis; petalis lingulatis, late acutis, 6 mm. longis; staminibus valde inaequalibus. Pl. I, figs. 4–5.

GUATEMALA: RETALHULEU: San Felipe, alt. 670 m., 1923, *Rojas 445* (US, TYPE; phot. G).

From the material at hand it is impossible to tell whether the lower primary bracts equal the axillary branches or not at maturity, but in either case *Catopsis delicatula* is separable by its small indistinct leaf-sheaths and filiform-acuminate lower primary bracts. The stamens and pistil appear about equally developed, but the flower is still too young to show for sure that both are functional.

Catopsis floribunda (Brongn.), comb. nov., 4–7 dm. alta; foliis multis, dense rosulatis, strictis, 2–4 dm. longis, obscure punctulato-lepidotis, nullo modo cretaceis; vaginis ellipticis, laminis dimidio bis omnino aequalibus, basi pallide castaneis; laminis anguste triangularibus, acuminatis, basi 15–30 mm. latis, planis vel per aetatem involutis; scapo erecto, 2–4 mm. diametro, glabro; scapi bracteis erectis, internodia superantibus, infimis foliaceis, supremis ex ovato angustissime triangularibus; inflorescentia laxe paniculata, 15–40 cm. longa, plerumque multiflora, glabra; bracteis primariis scapi bracteis supremis similibus, plerumque quam ramorum axillarium bases steriles multo brevioribus; ramis strictis, simplicibus vel infimis divisis; spicis graciliter longeque stipitatis, subdense 8–36-floris, ad 16 cm. longis base inclusa; bracteis florigeris subpatentibus, late ovatis, obtusis, 3–5 mm. longis, quam sepala bene brevioribus, prominenter nervatis, viridibus, margine lato per aetatem atro-brunneo; floribus suberectis; sepalis valde asymmetricis, late ellipticis, 4–6 mm. longis; petalis ellipticis, obtusis, 7 mm. longis, albis; staminibus distincte inaequalibus; serie II cum petalis ad 1.5 mm. connata; ovario crasse ellipsoideo; stylo subnullo; capsula graciliter ovoidea, acuta, 9–11 mm. longa.—Southern Florida, British Honduras, Costa Rica, West Indies, Venezuela.—*Pogospermum floribundum* Brongn. in Ann. Sci. Nat. ser. 5, i. 328 (1864), nomen provis. *Catopsis nutans* Gris. as to description and most of the material cited, not as to name-bringing synonym.

GUADELOUPE: *Perrotet* (P); *Beaupertuis* (P). MARTINIQUE: *Plée* (P, TYPE).

As explained further on in this paper, the name *Catopsis nutans* was misapplied to this species. The only name now available, *Pogospermum floribundum*, was published as a nomen provisorium so that it seems best to ensure the validity of the new combination by appending a Latin description. Fortunately Brongniart indicated clearly the specimens on which he based *Pogospermum floribundum*, so that there is no confusion in its identity as there has been in that of *Catop-*

sis nutans. Since no type was designated I have arbitrarily chosen the Plée collection.

Catopsis Lundelliana, spec. nov., 25–30 cm. alta; foliis multis, dense subgloboseque rosulatis, 1 dm. longis, dense obscureque punctulato-lepidotis; vaginis anguste ovatis vel ellipticis, 15–30 mm. longis, nullo modo inflatis; laminis linearibus, acuminatis, basi 5 mm. latis, ex sicco ad apicem versus involuto-subulatis; scapo erecto, gracillimo, glabro; scapi bracteis erectis, internodiis longioribus, ex lanceolato longe acuminatis; inflorescentia e ramis 3–4 laxe paniculata, 7–12 cm. longa; bracteis primariis scapi bracteis supremis similibus, quam ramorum axillarium bases steriles brevioribus; spicis divergentibus, rectis, laxissime subtristichifloris, ad 95 mm. longis; bracteis florigeris late ovatis, obtusis, tenuibus, prominenter nervatis, quam sepala multo brevioribus, obscure punctulato-lepidotis; floribus suberectis; sepalis obovatis, obtusis valde asymmetricis, 5 mm. longis, tenuibus, prominenter nervatis, obscure pallido-lepidotis; petalis paulo exsertis, late ellipticis, obtusis; staminibus inaequalibus; stylo brevi sed distincto. Pl. I, figs. 6–8.

BRITISH HONDURAS: El Cayo District: Valentin, epiphytic in advanced woods, limestone valley, 1936, *Lundell 6256* (G, TYPE).

Catopsis Lundelliana seems most nearly related to *C. juncifolia*, but differs from the description of that species in its small narrow flat leaf-sheaths.

Catopsis montana, spec. nov., 6 dm. alta; foliis multis, cyathiformi-rosulatis, 40–45 cm. longis, pulvere cretaceo obtectis; vaginis ellipticis, laminis subaequalibus sed haud distinctis, obscure brunneo-punctulatis; laminis lineari-lanceolatis, acuminatis, ad 33 mm. latis, planis; scapo erecto, gracili, glabro; scapi vaginis erectis, infimis, subfoliaceis, dense imbricatis, supremis ex ovato longe acuminatis, internodia aequantibus; inflorescentia laxe paniculata, multiflora, 25 cm. longa; bracteis primariis eis scapi similibus, quam ramorum bases steriles bene brevioribus; ramis infimis paupere divisis, divergentibus, ramis supremis simplicibus, patentibus; spicis breve stipitatis, 3–8 cm. longis, laxe multifloris; bracteis florigeris late ovatis, subacutis, 3 mm. longis, quam sepala multo brevioribus, prominenter nervatis; floribus subpatentibus, verisimiliter hermaphroditis; sepalis late ellipticis, valde asymmetricis, ala laterali extensa 6 mm. longis; petalis ellipticis, obtusis, 6 mm. longis sed paulo exsertis, flavis; staminibus paulo inaequalibus; stylo brevi sed distincto. Pl. I, figs. 9–10.

CUBA: PINAR DEL RIO: in the region of the Mogotes in Sierra de Viñales on vertical rocks at the summit of a peak, 1933, *Ekman 16555* (G, TYPE).

The specimen on which this species is based was confused with *C. floribunda*, but differs in having the leaf-blades subligulate instead of narrowly triangular and the spikes short-stipitate and spreading.

Catopsis nitida (Hook.) Gris. Fl. Br. W. Ind. 599 (1864); Mez in DC. Mon. Phan. ix. 620 (1896) and in Engl. Pflanzenr. iv. Fam. 32, 426 (1935). *Tillandsia nitida* Hook. Exot. Fl. iii. t. 218 (1827). Pl. I, fig. 12.

The presence or absence of a very short style has been used by Mez to distinguish *C. nitida* from *C. sessiliflora*. Not being able to follow the distinction or to substitute clear-cut habital characters, I reduced *C. nitida* to synonymy. Now I find that there is a definite distinction in the form of the sepals which correlates with the habital tendencies. *C. nitida* has sepals that are straight on the lower right side and the wing higher than the apex while *C. sessiliflora* has them well rounded there and the wing even with the apex (cf. Pl. I, fig. 11). In habit *C. nitida* tends to have relatively large strict leaves in a cylindrical rosette and a fairly ample inflorescence, while *C. sessiliflora* tends to have smaller leaves that curve outward toward the apex and a simple or 2–3-branched inflorescence.

Catopsis nutans (Sw.) Gris.—Cuba, Jamaica, Vera Cruz to Ecuador and Venezuela.—Fl. Brit. W. Ind. 599 (1864), as to name-bringing synonym. *Tillandsia nutans* Sw. Prodr. 56 (1788), and Fl. Ind. Occ. i. 588 (1797). *T. vitellina* Lk., Kl. & Otto, Ic. Pl. Hort. Berol. 101, t. 40 (1842–4). *C. fulgens* Gris. in Goett. Nachr. for 1864, 21 (1865). *C. vitellina* Bak. in Journ. Bot. xxv. 176 (1887).

JAMAICA: probably collected about 1785, *William Wright* (BM, TYPE; phot. G).

It has always seemed puzzling that the species to which Grisebach and later Mez applied the name *Catopsis nutans*, namely *C. floribunda*, should have nothing nutant about it. Its leaves are strict and its inflorescence, bracts, branches and flowers all erect or suberect. In trying to locate the type of *C. nutans*, I first made inquiries at Stockholm where Prof. Samuelsson kindly lent me a specimen labelled *Tillandsia nutans* in Swartz's handwriting. This, however, was *Catopsis Berteroniana* and showed no more nutant characters than *C. floribunda*. At the same time Prof. Samuelsson called my attention to the fact that specimens at the British Museum were more often than not the real types of Swartz's species, since Swartz had worked there and at the then separate Banks herbarium in preparing his Prodromus.

Through the kindness of Mr. J. E. Dandy I obtained from the

British Museum a photograph of what is undoubtedly the type of Swartz's *Tillandsia nutans*. This collection by William Wright consists of a complete but old specimen of the species that has until now gone under the later name of *Catopsis fulgens* Gris. and a small inflorescence of *C. Berteroniana*. The *C. fulgens* specimen has the inflorescence so decurved that its apex lies 12 cm. below the level of the plant's base, so that "nutans" would be one of the most natural specific names to choose for it. Then notice how much better the original description fits *C. fulgens:*

"Tillandsia, spicis subdivisis nutantibus, floribus distinctis ovatis; foliis ovato-lanceolatis membranaceis; caule subnudo."

"Spicis" is used in the sense of the whole inflorescence and "subdivisis" means few-branched. Compare the Wright specimen with its inflorescence of two branches with simple or few-branched *C. fulgens* and then with the usually much-branched *C. Berteroniana* and *C. floribunda*. "Foliis ovato-lanceolatis" implies that the sheath and blade of the leaf are not distinct enough to be noted separately nor the blade narrowly triangular as would both be the case in *C. floribunda*. "Caule subnudo" implies a scape with lax bracts, again much more applicable to *C. fulgens* than to the other two.

Swartz's fuller characterization of the species in his Florae Indiae Occidentalis adds little of specific value, though "Bracteae . . . flosculos includentes" is nearer the relatively large floral bracts of *C. fulgens* than those of *C. floribunda*. In one instance, "petala . . . alba," Swartz evidently used the *C. Berteroniana* material as the other is so old as to have lost its orange-yellow petals.

In making the combination *Catopsis nutans*, Grisebach largely took over Swartz's description but added and italicized: "Leaves . . . narrowly acuminate." Also he included *T. Berteroniana* Schult. f. as a synonym and failed to cite any material of either Swartz or William Wright. What he did cite was actually *C. floribunda*. Obviously he had no understanding of the species which he transferred. Mez followed Grisebach's lead, although he examined the William Wright collection, annotating the whole sheet as *C. Berteroniana*.

Catopsis vitellina as shown in the original plate under *Tillandsia vitellina* is the same as *C. nutans*. Mez evidently kept it separate on the basis of its unequal stamens, in spite of the fact that the plate showed perfect flowers. So far as known the whole genus has unequal stamens.

Guzmania guatemalensis, spec. nov., 6 dm. alta, verisimiliter acaulis; foliis plus quam 6 dm. longis; vaginis magnis, ovatis; laminis

lingulatis, acutis apiculatisque, 45 mm. latis; scapo erecto, 7 mm. diametro; scapi vaginis foliaceis, erectis, dense imbricatis; inflorescentia laxissime paniculata, subpyramidata, 25 cm. longa, glabra; bracteis primariis latissime ovatis, late acutis vel apiculatis, rami axillari florem secundum solum attingentibus; ramis simplicibus, adscendentibus vel patentibus, 10–12 cm. longis, laxissime 10–12-floris; rhachi fere recta; bracteis florigeris latissime ellipticis, obtusis, 2 cm. longis, quam sepala multo brevioribus, inflatis, nullo modo carinatis, subcoriaceis, laevibus, ex sicco stramineis; floribus patentibus; pedicellis crassis, 4 mm. longis; sepalis ellipticis, obtusis, 25 mm. longis, ecarinatis, inter sese ad 10 mm. connatis; petalis 33 mm. longis. Pl. I, fig. 13.

GUATEMALA: ALTA VERAPAZ: Chama, alt. 330 m., 1920, *H. Johnson 391* (US, TYPE; phot. G).

Very few species of *Guzmania* are characterized by the combination of highly connate sepals and compound inflorescence as is *G. guatemalensis*. In my key to the genus,[1] *G. guatemalensis* comes out with *G. Scherzeriana*, but differs in having neither acuminate primary bracts nor carinate floral bracts as in the latter species.

Guzmania Sneidernii, spec. nov., caulescens, stolonibus procreans; foliis plurimis, erectis, ad 5 dm. longis, perobscure punctulato-lepidotis; vaginis densissime imbricatis, ovatis, 20–25 mm. longis, basi atro-castaneis lucidisque; laminis angustissime linearibus, longe acuminatis, 5 mm. latis, planis; scapo gracillimo, leviter curvato; scapi bracteis erectis, dense imbricatis, supremis ellipticis, breve caudatis, viridibus, rubro-striatis, nullo modo foliaceis; inflorescentia erecta, simplicissima, pauciflora; bracteis florigeris erectis, latissime ellipticis, late acutis vel apiculatis, 4 cm. longis, 3 cm. latis, membranaceis, fulgide rubris; floribus erectis, subfasciculatis; sepalis 7 cm. longis, ad 35 mm. in tubum anguste cylindricum subcoriaceum connatis, inde liberis in laminis late ellipticis obtusis convolutis petaloideis fulgide aureis dilatatis; petalis profunde inclusis, verisimiliter juvenilibus. Pl. I, fig. 14.

COLOMBIA: CAUCA: in primaeval forest, La Costa, District of El Tambo, alt. 1500 m., 1936, *Kjell von Sneidern 695* (S, TYPE; phot. G).

Guzmania Sneidernii is most nearly related to *G. obtusiloba*, but differs in not having the scape-bracts foliaceous and in the ampler floral bracts and larger flowers.

Guzmania stenostachya, spec. nov., acaulescens: foliis 10–20, subfasciculato-rosulatis, 3–4 dm. longis, inflorescentiam aequantibus

[1] Contrib. Gray Herb. xcviii. 19 (1932).

vel superantibus, dimidia parte basali striis tenuibus purpureis ornatis; vagina ovata, 9 cm. longa, brunneo-punctulata; lamina lineari, acuta, 10–17 mm. lata, subglabra: scapo erecto, gracili: scapi bracteis erectis, dense imbricatis, infimis foliaceis, supremis late ellipticis, apiculatis, rubris; inflorescentia simplicissima, graciliter cylindrica, sublaxa, pauciflora, 12 cm. longa, verisimiliter ca. 15 mm. diametro per anthesin, ad apicem versus sterili; bracteis florigeris eis scapi similibus sed non vel minute apiculatis, 3–4 cm. longis, amplis, sepala multo superantibus, erectis, subinflatis, chartaceis: floribus graciliter brevi-pedicellatis; sepalis symmetricis, late ellipticis, subtruncatis, 16 mm. longis, liberis, membranaceis; capsula graciliter clavata, acuta, 3 cm. longa. Pl. I, fig. 15.

COSTA RICA: HEREDIA: epiphytic, Yerba Buena, northeast of San Isidro, alt. ca. 2000 m., 1926, *Standley & Valerio 50174* (US, TYPE; phot. G); CARTAGO: San Geronimo, alt. 1500 m., 1909, *P. Biolley f. 17374* (US, phot. G).

In my treatment of *Guzmania* (Contrib. Gray Herb. xcviii. 18) this species runs down to *G. monostachia* from which it differs in its membranaceous sepals, elliptic floral bracts and very slender few-flowered inflorescence.

Guzmania subcorymbosa, spec. nov., acaulescens, 3–6 dm. alta: foliis multis, dense cyathiformi-rosulatis, plerumque ad basin versus striis tenuibus purpureis longitudinalibus ornatis; vagina ovata, 7 cm. longa, dense brunneo-punctulata, saepe plus minusve castanea; lamina angustissime triangulari, acuminata, 10–15 mm. lata, supra glabra, subtus obscure punctulata; scapo erecto, gracili; scapi bracteis erectis, dense imbricatis, foliaceis: inflorescentia composita, pauciramosa, digitata subcorymbosaque, viridi; bracteis primariis ovatis, acutis, spicas axillares dimidio aequantibus, coriaceis, laevibus: spicis subellipsoideis, sessilibus vel subsessilibus, dense 3–10-floris, 25 mm. longis, basi prophyllum unicum auctis: bracteis florigeris ovatis, late acutis vel obtusis, quam sepala paulo sed distincte brevioribus, coriaceis, valde convexis, nullo modo carinatis, subglabris: floribus subsessilibus; sepalis ellipticis, acutis, 10–12 mm. longis, aequaliter brevi-connatis, valde carinatis, coriaceis; petalis albis; capsula anguste cylindrica, 3 cm. longa, coma brunnea. *G. compacta* Mez, sensu L. B. Smith in Contrib. Gray Herb. xcviii. 32 (1932), quoad plantas costaricanas columbianasque, non Mez (1896). Pl. I, fig. 16.

COSTA RICA: GUANACASTE: El Arenal, alt. 485–600 m., 1926, *Standley & Valerio 45110* (US, phot. G); Naranjos Agrios, alt. 600–700 m., 1926, *Standley & Valerio 46434* (US). PANAMA: Gatun, 1914, *Corbett* (hort. NY, G). COLOMBIA: EL VALLE: wooded cliffs of Dagua Valley, Cordoba, alt. 80–100 m., 1922, *Killip 5059* (G, TYPE; US).

Guzmania subcorymbosa is closely allied to *G. compacta* with which I confused it, but differs in its narrower green spikes and subcorymbose instead of ovoid inflorescence. In the cultivated material the spikes are longer and the inflorescence laxer making the plant still less like *G. compacta* in appearance.

Guzmania Wrightii, spec. nov., e fragmentis solum cognita, minime 7 dm. alta; foliis ignotis; scapo recto, 8 mm. diametro, glabro; scapi bracteis erectis, dense imbricatis, sublingulatis, acutis, ad 12 cm. longis, perobscure punctulato-lepidotis; inflorescentia simplicissima, ca. 2 dm. longa, dense cylindrica; bracteis florigeris imbricatis, late ovatis, acutis, ad 75 mm. longis, coriaceis, punctulatis, infimis, sepala multo superantibus; floribus erectis; pedicellis crasse cylindricis, 8–9 mm. longis; sepalis ellipticis, obtusis, 35 mm. longis, 17 mm. latis, coriaceis, leviter nervatis; petalis staminibusque ignotis. Pl. I, figs. 17–18.

CUBA: Oriente: near Monte Verde, *C. Wright 1523 e. p.* (G, type).

This is indeed poor material on which to base a new species, but there is enough to show that it is a *Guzmania* unlike any previously described species and totally different from anything known from the West Indies. It is much more nearly related to *G. mucronata* Mez of Venezuela than to any other species, but differs from it in its broader obtuse sepals.

Hechtia Kl. The following synopsis will serve to unite compactly the various changes and additions which I am proposing in the genus. The key is frankly artificial, practically nothing being known about the relationship of the species. The plants are dioecious and the differences between the sexes are often so extreme that it is necessary to key them separately. For instance Mez[1] has distinguished *H. stenopetala, Galeottii, Pringlei* and *tehuacana* from other species solely on the character of acute petals when this character applies to only the pistillate plants.

The one bright aspect of the problem is the restricted distribution of most of the species, and even this is dimmed by several species described from cultivation with no knowledge of where they were collected.

1. Floral bracts and sepals drying uniformly roseate with no hyaline margin.
2. Spikes densely flowered: floral bracts equaling or exceeding the sepals: petals white . . . . . 1. *H. dichroantha.*
2. Spikes laxly flowered: floral bracts much shorter than the sepals: petals red.

[1] Mez in Pflanzenr. iv. Fam. 32, 352 (1935).

3. Scape-bracts much exceeding the internodes, foliaceous. 2. *H. Desmetiana.*
3. Scape-bracts much shorter than the internodes, vaginiform.
4. Flowers subsessile. . . . . 3. *H. rosea.*
4. Flowers distinctly pedicellate. . . . . 4. *H. Meziana.*

1. Floral bracts and sepals brown, stramineous or hyaline (roseate in *H. elliptica* and *H. scariosa* but with hyaline margins).
5. Floral bracts flat, much shorter than the sepals, or if convex then shorter than the pedicels: flowers distinctly pedicellate in most species.
6. Leaves densely serrulate with teeth not more than 0.5 mm. long: plant delicate, less than 1 m. high: inflorescence very lax.
7. Sepals subtriangular, broadest at base: flowers 5 mm. long. . . . . 5. *H. Purpusii.*
7. Sepals ovate, broadest about ⅓ above base: flowers 3 mm. long. . . . . 6. *H. lindmanioides.*
6. Leaves laxly and coarsely serrate or where not known the plant coarse and over 1 m. high.
8. Inflorescence densely cylindric: branches simple or 3-parted at base, not over 12 cm. long and usually much less.
9. Branches densely flowered.
10. Rhachis compressed, even or faintly sulcate: branches usually 3-parted from the base. . . . . 7. *H. podantha.*
10. Rhachis subterete with fine ridges decurrent from the flowers: branches simple, erect. . . . . 8. *H. subalata.*
9. Branches laxly flowered: pedicels slender, 3–8 mm. long. . . . . 9. *H. pedicellata.*
8. Inflorescence pyramidal or if subcylindric then lax with elongate branches.
11. Key to pistillate plants.
12. Ovary almost wholly inferior.
13. Racemes 10–15 cm. long: flowers reflexed. 10. *H. guatemalensis.*
13. Racemes 3–7 cm. long. . . . . 11. *H. epigyna.*
12. Ovary nearly or quite superior.
14. Floral bracts shorter than the pedicels: racemes evenly flowered in most cases.
15. Pedicels not articulated with the rhachis.
16. Pedicels slenderly cylindric, 4–8 mm. long: seeds slenderly long-caudate. . . . 12. *H. montana.*
16. Pedicels stoutly obconic, 3.5 mm. long: seeds with a thick blunt wing. . . . . 13. *H. Roseana.*
15. Pedicels articulated with the rhachis.
17. Carpels even except for a median ridge: pedicels strongly triquetrous. . . . . 14. *H. glabra.*
17. Carpels reticulate: pedicels sulcate, subterete. . . . . 15. *H. reticulata.*
14. Floral bracts much exceeding the very short pedicels at anthesis: racemes interrupted and more or less moniliform: flowers strict.
18. Rhachis slender, even or faintly angled 16. *H. stenopetala.*
18. Rhachis stout, deeply sulcate. . . . . 17. *H. Galeottii.*
11. Key to staminate plants.

19. Pedicels 6–7 mm. long: primary bracts broadly ovate, apiculate.....11. *H. epigyna.*
19. Pedicels not more than 3 mm. long.
20. Sepals acute.
21. Stamens included.....12. *H. montana.*
21. Stamens exserted.
22. Sepals much thickened toward base: pedicels stout: racemes interrupted..18. *H. suaveolens.*
22. Sepals uniformly membranaceous: pedicels slender: racemes slightly or not at all interrupted.....19. *H. reflexa.*
20. Sepals broadly obtuse, rarely apiculate.
23. Petals 5 mm. long: inflorescence amply tripinnate: racemes laxly flowered....10. *H. guatemalensis.*
23. Petals 1.5–4 mm. long.
24. Rhachis strongly compressed throughout.
25. Stamens included: floral bracts equaling or shorter than the pedicels.....14. *H. glabra.*
25. Stamens exserted: floral bracts exceeding the pedicels.....20. *H. Conzattiana.*
24. Rhachis compressed only at base.
26. Rhachis slender, even or faintly angled.
27. Stamens included.....21. *H. sphaeroblasta.*
27. Stamens exserted.....16. *H. stenopetala.*
26. Rhachis stout, deeply sulcate.....17. *H. Galeottii.*
5. Floral bracts strongly convex, ample, always exceeding the pedicels and usually concealing much of the sepals.
28. Flowers 8–10 mm. long: floral bracts stramineous or roseate with broad scarious margins.
29. Sepals at least as broad as long.
30. Sepals acute, 6 mm. long.....22. *H. texensis.*
30. Sepals obtuse, 3.5 mm. long.....23. *H. mexicana.*
29. Sepals much longer than broad.
31. Sepals elliptic, obtuse: leaves splashed with bright rose.....24. *H. elliptica.*
31. Sepals acute: leaves green.
32. Floral bracts and sepals roseate with broad scarious margins.....25. *H. scariosa.*
32. Floral bracts pale stramineous.....26. *H. zacatecae.*
28. Flowers 5–7 mm. long.
33. Sepals acute.
34. Leaves densely lepidote on both sides.....27. *H. argentea.*
34. Leaves glabrous above.....28. *H. capituligera.*
33. Sepals obtuse.
35. Spikes lax except at extreme apex, elongate....29. *H. Schottii.*
35. Spikes dense, abbreviated.
36. Primary bracts broadly ovate or suborbicular, narrowed abruptly to a long-acuminate apex, serrulate, concealing much of the very short axillary branch: capsules glabrous.....30. *H. confusa.*
36. Primary bracts lanceolate or narrowly triangular, inconspicuous.
37. Sepals as broad as long with distinct lateral nerves.....31. *H. glomerata.*
37. Sepals much longer than broad with very faint lateral nerves.

38. Leaves all coarsely serrate.....32. *H. Ghiesbreghtii.*
38. Leaves (only the inner known) finely serrulate.....33. *H. gamopetala.*

1. **H. dichroantha** J. D. Smith in Bot. Gaz. xlii. 299 (1906). Pl. I, figs. 19–20.

GUATEMALA: Baja Verapaz: slopes above Rio Quililá near Santa Rosa, alt. 1600 m., 1905, *O. F. Cook s. n.* (US, type; phot. G).

2. **H. Desmetiana** (Bak.) Mez in DC. Mon. Phan. ix. 551 (1896). *Dyckia Desmetiana* Bak. in Bot. Mag. cxx. t. 7340 (1894).

MEXICO (?): plant from *Peacock's* collection, cult. Kew Gardens, 1893 (K, type; phot. G).

3. **H. rosea** E. Morr. ex Bak. Brom. 140 (1889).

MEXICO: *cult. Liége* (Liége, type; phot. G).

The exact origin of both *Hechtia rosea* and *Desmetiana* is unknown, but they resemble *H. Meziana* so closely that it seems likely that they came from extreme southern Mexico or adjacent Guatemala.

4. **H. Meziana** L. B. Smith, auct.: capsulis ad 2 cm. longis; carpellis 5 mm. diametro, laevibus, atro-brunneis, mox discretis; seminibus angustis, cauda elongata excepta 5 mm. longis.—L. B. Smith in Proc. Am. Acad. lxx. 149, t. 1, figs. 2–3 (1935).

The above characters are from an undated unnumbered United States National Museum specimen collected in the type locality by Purpus. It may even be part of the type collection.

5. **H. Purpusii** Brandegee, emend.: floribus 5 mm. longis; sepalis late subtriangularibus, obtusis; petalis ellipticis, 4 mm. longis; staminibus inclusis.—Brandegee in Pub. Bot. Univ. California, vii. 325 (1920).—Pl. I, figs. 21–23.

MEXICO: Vera Cruz: on steep rocks, Barranca de Tenampa, 1919, *Purpus 8420* (♀ UCal, type; G); Paso de la Milpa, Jalapa, 1884, *Com. Geogr. Explor. Rep. Mex. 224* (♂ FM).

6. **H. lindmanioides,** spec. nov., e fragmentis plantae femineae solum cognita, florifera ut videtur infra metralis; foliis 3 dm. longis; vaginis suborbicularibus, 3 cm. longis, valde incrassatis, glabris; laminis anguste triangularibus, 2 cm. latis, longe caudato-acuminatis, dentibus 0.5 mm. longis dense serrulatis, supra dissite subtus dense adpresseque pallido-lepidotis; scapo ignoto; inflorescentia laxissime tripinnatim paniculata, glabra; bracteis primariis triangularibus, acuminatis, ad 13 mm. longis; ramis gracillimis, ad 2 dm. longis, basi sterili 3–5 cm. longa; racemis 3–10 cm. longis, laxissime florigeris; bracteis florigeris lineari-lanceolatis, 2 mm. longis, quam pedicelli

multo brevioribus, hyalinis; floribus patentibus, 3 mm. longis; pedicellis gracillimis, 3–4 mm. longis; sepalis ovatis, obtusis, 1.4 mm. longis, uninerviis, subhyalinis; petalis latissime ellipticis, obtusis, 2.3 mm. longis, ex sicco albidis; ovario ovoideo, 1.5 mm. longo, supero, glabro; stylo subnullo. Pl. I, figs. 24–26.

MEXICO: Vera Cruz: dry stony slopes, Barranca de Consoquitla near El Fortin, 1842, *Liebmann 7951* (FM, type; phot. G).

7. **H. podantha** Mez in DC. Mon. Phan. ix. 549 (1896). *H. Liebmannii* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 6 (1901). *H. tehuacana* Robinson in Proc. Bost. Soc. Nat. Hist. xxxi. 265 (1904). Pl. I, figs. 27–28.

MEXICO: *cult.* (Vienna, type; not seen); Hidalgo: limestone hills near Pachuca, alt. 2400 m., 1898, *Pringle 6932* (♂ ♀ G); Cerro Ventoso above Pachuca, alt. 2600 m., 1902, *Pringle 11188* (♂ ♀ G); Morelos: lava fields near Cuernavaca, alt. 2400 m., 1900, *Pringle 9200* (♂ G); Puebla: Chinantla, 1841, *Liebmann s. n.* (♀ Copenhagen, type of *H. Liebmannii;* phot. G); calcareous hills near Tehuacan, alt. 1700 m., 1901, *Pringle 8578* (♂ ♀ G, type of *H. tehuacana*); near El Riego, Tehuacan, 1905, *Rose & Painter 10005* (♂ G).

The pedicels vary greatly in this species even in a single raceme, and in the pistillate plants they enlarge considerably after anthesis. *Pringle 8578* has pedicels from 1 to 3 mm. long in one raceme, thus eliminating Mez's basis for distinguishing it from the other two. It also has material of both sexes with the staminate showing broadly obtuse petals and the pistillate acute ones, thus destroying Mez's distinction between *H. podantha* and *H. Liebmannii.*

The material from Puebla on certain minor points accords better with Mez's description of *H. podantha* than do *Pringle 6932* and *11188* which he cites under it with the type. The Pringle numbers have smaller more nearly acute sepals and an inflorescence that is tripinnate only at base if at all. Consequently I feel that the three names are conspecific and that any varietal segregation that may follow with ampler material will still leave all three together in the typical variety.

8. **H. subalata**, spec. nov., e fragmentis plantae femineae solum cognita; laminis foliorum anguste triangularibus, minime 36 cm. longis, 15 mm. latis, pungentibus, supra glabris, subtus lineatim adpresse pallido-lepidotis, valdissime repandis, dentibus ipsis gracilibus, 3 mm. longis, flavis vel brunneis; inflorescentia cylindrica, 36 cm. longa, 6–7 cm. diametro, fructu glabra; bracteis primariis anguste triangularibus, acuminatis, 25 mm. longis, subchartaceis; ramis simplicibus, erectis, non ultra 1 dm. longis, fere ad basin dense florigeris, fructu 25 mm. diametro; rhachi crassa, e lineis e floribus decurrentibus subalatis; bracteis florigeris latissime ovatis, obtusis, 4

mm. longis, pedicellos superantibus, erosis, laevibus, basi incrassatis, pallide brunneis; floribus erectis vel suberectis; pedicellis validis, triquetris, sulcatis, cum rhachi articulatis, 2 mm. longis; sepalis late ellipticis, obtusis, 3.5 mm. longis, laevibus, margine hyalino excepto pallide brunneis, erosis; petalis late triangularibus, acutis, 4.5 mm. longis, albis; stylo subnullo; capsula ovoidea, acuta, 11 mm. longa; carpellis laevibus; seminibus linearibus, apice longe caudatis. Pl. I, fig. 29.

MEXICO: DURANGO: Sierra Madre, 1897, *Rose 3467* (US, TYPE; phot. G); ZACATECAS: San Juan Capistrano, 1897, *Rose 3556* (G).

9. **H. pedicellata** Watson in Proc. Am. Acad. xxvi. 155 (1891). Pl. I, figs. 30–31.

MEXICO: JALISCO: ledges of barranca near Guadalajara, 1889, *Pringle 2970* (♀ G, TYPE); dry rocky bluffs of barranca near Guadalajara, 1891, *Pringle 3934* (♂ G, ♀ US).

10. **H. guatemalensis** Mez, auct.: planta feminea verisimiliter 2 m. alta; bracteis primariis integris vel rarissime serrulatis; floribus femineis reflexis; pedicellis validis, 1 mm. longis; ovario fere omnino infero; capsula ellipsoidea, 5–8 mm. longa, glabra, prominenter reticulata; seminibus brevissime caudatis.—Mez in Fedde, Rep. Nov. Spec. iii. 14 (1906). Pl. I, figs. 32–33.

GUATEMALA: ZACAPA: in thicket on north side of the Rio Motagua, Gualan, alt. 200 m., *Deam 6274* (♀ US); GUATEMALA: San Bernardo, between Trapiche Grande and Las Canoras, alt. 600 m., 1905, *H. Pittier 137* (♂ US, TYPE; phot. G). SALVADOR: ACHUAPÁN: 1921, *Padilla 41* (♂ US); along the Rio Paz near Paso de Santa Cruz, 1922, *Standley 20331* (♀ US, G); SALVADOR: La Cebadilla, 1922, *Calderón 1221* (♀ US, phot. G).

11. **H. epigyna** Harms in Notizblatt, xii. 531 (1935). Pl. I, figs. 34–37.

MEXICO: TAMAULIPAS: Jaumave, 1930, *H. W. Vieneck 81* (♂ ♀ B, TYPE; frag. G); same, 1933, *Rozynski 741* (♂ G).

The Rozynski material agrees exactly with the flowers kindly sent me by Prof. Harms and with the detailed description of *H. epigyna* except that its leaves are pale-appressed-lepidote beneath instead of glabrous. This discrepancy may be due simply to its being younger material than the type.

12. **H. montana** Brandegee in Erythea, vii. 9 (1899). *H. pedicellata* Watson sensu I. M. Johnston in Proc. Calif. Acad. Sci. ser. 4, xii. 995 (1924), non Watson (1891). Pl. I, figs. 38–40.

MEXICO: BAJA CALIFORNIA: San Jose del Cabo, 1897, *Brandegee s. n.* (♂ ♀ UCal, TYPE; phot. G); same, 1911, *Rose 16501* (♀ US); rocky ledges

above 300 m., Sierra Giganta, behind Escondido Bay, 1921, *Johnston 4106* (♀ G); SONORA: near Hermosillo, 1910, *Rose, Standley & Russell 12474* (♀ G); main canyon east of La Palma, 50 miles north of Guaymas in Sierra Libres, 1933, *Wiggins 6475* (♀ US); slopes above San Carlos Bay about 8 miles north of Guaymas, 1934, *Ferris 8747* (♀ US); SINALOA: foothills of the Sierra Madre near Colomas, 1897, *Rose 1806* (♀ G, US).

Hechtia montana has been confused with *H. pedicellata* largely on account of the slenderly pedicellate pistillate flowers. *H. montana* has a much broader and laxer inflorescence and its capsules are elliptic with the base acute and partly inferior, while the capsules of *H. pedicellata* are wholly superior with a broadly rounded or subtruncate base. The staminate racemes of *H. montana* are dense, those of *H. pedicellata* very lax.

13. **H. Roseana**, spec. nov., e fragmentis plantae femineae solum cognita, verisimiliter ultra 1 m. alta; foliis 5 dm. longis, utrinque minute pallideque adpresso-lepidotis et prominenter nervatis; laminis anguste triangularibus, acuminatis, pungentibus, 4 cm. latis, dentibus spinosis, 15–40 mm. distantibus, rubro-brunneis, uncinatis, 4–6 mm. longis; bracteis primariis triangulari-ovatis, filiformi-acuminatis, 25 mm. longis, racemorum bases steriles subaequantibus; ramis simplicibus, ad 14 cm. longis, subdensis, subsecundifloris, glabris; rhachi gracili, tereti, laeve; bracteis florigeris triangulari-ovatis, acutis, 2 mm. longis, quam pedicelli bene brevioribus et eorum basin adnatis, carinatis et nervo mediano valde incrassato; floribus suberectis; pedicellis crasse obconicis, 3.5 mm. longis; sepalis late triangulari-ovatis, acutis, 3.5–4 mm. longis, basi valde incrassatis, nervo mediano prominenti; petalis late triangulari-ovatis, acutis, sepalos aegre superantibus, albis; capsula ovoidea, acuta, 12 mm. longa; carpellis atro-brunneis, sublucidis, obscurissime corrugatis sed non reticulatis; seminibus ellipticis, ala magne crassa inclusa 4 mm. longis. Pl. I, figs. 41–42.

MEXICO: PUEBLA: near Tehuacan, 1905, *Rose, Painter & Rose 9970* (US, TYPE; phot. G).

14. **H. glabra** Brandegee in Univ. Calif. Pub. Bot. vii. 325 (1920). Pl. I, figs. 43–45.

MEXICO: VERA CRUZ: Barranca de Panoaya, 1919, *Purpus 8506* (♀ UCal, TYPE; G, DH); Zacuapan, 1920, *Purpus 8522* (♂ ♀ G); Cameron, 1921, *Purpus 8938* (♀ G).

15. **H. reticulata**, spec. nov., e fragmentis plantae femineae solum cognita sed verisimiliter magna; foliis ultra 3 dm. longis; lamina lineari-triangulari, 3 cm. lata, spinis uncinatis 4 mm. longis et 10–15 mm. distantibus armata; inflorescentia laxe bipinnata, magna; bract-

eis primariis triangularibus, filiformi-acuminatis, 15 mm. longis, quam ramorum bases steriles brevioribus; racemis brevi-stipitatis, cylindricis, laxe multifloris, ad 15 cm. longis; bracteis florigeris late deltoideis, acuminatis, pedicellos aequantibus vel eis brevioribus; floribus patentibus; pedicellis teretibus, gracilibus, 4 mm. longis, profunde sulcatis; sepalis deltoideis, filiformi-acuminatis, basi incrassatis, 4 mm. longis sed apice per aetatem deciduo; petalis anguste deltoideis, acuminatis, 5 mm. longis; ovario minute infero, stylo brevi sed distincto; capsula ovoidea, acuta, 1 cm. longa, atro-brunnea, carpellis grosse irregulariterque reticulatis; seminibus 5 mm. longis, linearibus, ala lateri angustissima apice lata brevique aucta. Pl. I, fig. 46.

MEXICO: Colima: Manzanillo, 1891, *Palmer 1352* (G, type; FM); Manzanillo Bay, near Manzanillo, 1925, *Ferris 6111* (DH).

16. **H. stenopetala** Kl. in Gartenz. iii. 401 (1835). *H. Besseriana* Hort. Verschaff. Cat. n. 18 (1874). *H. cordylinoides* Bak. in Bot. Mag. cvii. t. 6554 (1881). *H. Pringlei* Robinson & Greenman in Am. Journ. Sci. ser. 3, i. 167 (1895). Pl. i, figs. 47–50.

MEXICO: 1880, *Hort. Kew* (♂ K, type of *H. cordylinoides;* phot. G); Puebla: hills behind El Riego, Tehuacán, 1919, *Reko 4243* (♀ US); Oaxaca: calcareous hills near Oaxaca, 1894, *Pringle 4637* (♂ ♀ G, type of *H. Pringlei;* BM); 6 miles above Dominguillo, alt. 1500–2000 m., 1894, *Nelson 1591* (♂ G); near Cuicatlan, alt. 550–750 m., 1894, *Nelson 1607* (♀ G); between Totolapa and San Carlos, alt. 900–1150 m., 1895, *Nelson 2556* (♂ US); Santa Catarina Canyon, alt. 1000 m., 1901, *Conzatti & González 1167* (♂ G); near Tomellin, 1906, *Rose & Rose 11361* (♀ G); between Mitla and Oaxaca, 1906, *Rose & Rose 11296* (♀ US); Dept. Etla, Las Sedas, alt. 2000 m., 1907, *Conzatti 1811* (♀ US); Alturas San Pablo Huitzo, alt. 1700 m., 1907, *Conzatti 1999* (♀ G, FM); Tomellin Canyon, Amoloyas, alt. 1800 m., 1907, *Conzatti 2006* (♂ FM); high mesa east of Oaxaca, 1923, *Smyth 145* (♂ ♀ US).

17. **H. Galeottii** Mez in Fedde, Rep. Spec. Nov. xvi. 71 (1919). Pl. I, figs. 51–52.

MEXICO: Oaxaca: *Galeotti 5440* (type, not seen); dry slopes, Tomellin Canyon, alt. 1500 m., 1897, *Pringle 6703* (cotype no., G, BM).

18. **H. suaveolens** E. Morr. ex Mez in DC. Mon. Phan. ix. 550 (1896). Pl. I, fig 53.

MEXICO (?): 1882, *Hort. Bot. Leod.* (♂ Liége, type; phot. G).

19. **H. reflexa**, spec. nov., e fragmentis plantae masculinae solum cognita, 2 m. alta (! Langlassé); foliis 4 dm. longis, grosse uncinato-serratis (! Langlassé); scapo apice tereto, 5 mm. diametro; scapi bracteis e basi parva suborbiculari lineari-caudatis, 15 mm. longis; inflorescentia glabra; bracteis primariis eis scapi similibus, ramorum bases steriles aequantibus vel paulo superantibus; ramis reflexis, ad

14 cm. longis, simplicibus vel basi ramulis paucis parvis auctis, dense florigeris, paulo vel haud interruptis; bracteis florigeris lanceolato-ellipticis, acutis, quam sepala paulo brevioribus, membranaceis; floribus patentibus; pedicellis gracilibus, 0.5–0.7 mm. longis; sepalis triangulari-ovatis, acutis, 1.5 mm. longis, subhyalinis, brunneis, nigro-punctatis, omnino membranaceis; petalis ellipticis, obtusis, 2.5 mm. longis, albis; staminibus exsertis. Pl. I, figs. 54–55.

MEXICO: Michoacan or Guerrero: rocky slopes, San Salvador, alt. 650 m., 1898, *Langlassé 238* (US, type; phot. G).

20. **H. Conzattiana**, spec. nov., e fragmentis plantae masculinae solum cognita, verisimiliter 1 m. alta; foliis ad 37 cm. longis, supra laevibus et mox glabris, subtus prominenter nervatis et dense lepidotis; vaginis ovatis, 4 cm. longis, brunneis; laminis lineari-triangularibus, acuminatis, pungentibus, 13 mm. latis, spinis uncinatis ad 2 mm. longis laxe armatis; scapo tereti, 5 mm. diametro, minime 2 dm. longo, glabro; scapi bracteis e triangulari-ovato linearibus, rubris, late hyalino-marginatis, dense pallido-lepidotis, supremis parvis remotisque; inflorescentia laxa, glabra; bracteis primariis ovatis, breve caudatis vel apiculatis, ad 13 mm. longis; ramis simplicibus, patentibus, 7–11 cm. longis, fere ad basin dense florigeris, rhachi tota compressa, valde sulcata; bracteis florigeris ellipticis, late acutis vel obtusis, 2–2.5 mm. longis, pedicellos superantibus, erosis, brunneis, membranaceis; floribus patentibus; pedicellis subcylindricis, 1.5 mm. longis; sepalis late ellipticis, obtusis, 2 mm. longis, pallide brunneis, nigro-punctatis, omnino membranaceis, integris vel paulo erosis; petalis ellipticis, obtusis, 4 mm. longis, albis; staminibus exsertis. Pl. I, fig. 56.

MEXICO: Oaxaca: Dist. Cuicatlan, Camino de Chiquihuitlán, Las Tres Aguas, alt. 1300 m., 1919, *Conzatti & Gómez 3501* (US, type; phot. G).

21. **H. sphaeroblasta** Robinson in Proc. Am. Acad. xxxv. 323 (1900). Pl. I, fig. 57.

MEXICO: Guerrero: Tlapa, alt. 1200 m., 1894, *Nelson 2044* (♂ G, type).

22. **H. texensis** Watson in Proc. Am. Acad. xx. 374 (1885). Pl. I, figs. 58–59.

UNITED STATES: Texas: Brewster Co.: on limestone bluffs in the Great Bend of the Rio Grande, 1883, *Havard 85* (♀ G, type); Boquillas, 1901, *V. Bailey 354* (US); top of limestone hill near Boquillas, *E. D. Schulz 4215* (♀ FM); Starr or Zapata Co.: between Roma and Zapata on the road from Brownsville to Laredo, 1931, *McKelvey 1784* (G).

23. **H. mexicana**, spec. nov., e planta feminea solum cognita, ca. 2 m. alta; foliis fere metralibus; vaginis suborbicularibus, glabris,

lucidis, castaneis; laminis anguste triangularibus, acuminatis, pungentibus, supra glabris lucidisque, subtus niveo-lepidotis, saepe repandis, dentibus validis, rectis vel uncinatis, ad 1 cm. longis, brunneis, 2–4 cm. distantibus; scapo ca. 15 mm. diametro, aetate glabro; scapi bracteis triangularibus, acuminatis, subchartaceis, dorso minutissime denseque albo-lepidotis, supremis quam internodia bene brevioribus; inflorescentia magna, laxe bipinnatim paniculata, anguste pyramidata; bracteis primariis eis scapi similibus, ad 15 mm. longis; racemis patentibus, subdensis, saepe interruptis, ad 15 cm. longis, infimis stipitatis; bracteis florigeris late ovatis, acutis, sepalis subdimidio aequantibus, brunneis, hyalino-marginatis, nervatis, dense pallido-lepidotis; floribus subsessilibus, patentibus; sepalis latissime ovatis, obtusis, mucronatis, 3.5 mm. longis, brunneis, nervatis, lepidotis; petalis ovatis, 6 mm. longis, albis; capsula ovoidea, acuta, 1 cm. longa; carpellis atro-castaneis, laevibus, sublucidis, sparse lepidotis; seminibus apice longe angusteque caudatis. Pl. I, fig. 60.

MEXICO: San Luis Potosi: Dept. Valles, Sierra del Abra, alt. 200 300 m., *Maury 6593* (FM, type; G).

24. **H. elliptica**, spec. nov., e planta masculina solum cognita, ad 5 dm. alta; foliis 27 cm. longis; vaginis late ovatis, 25 mm. longis, flavis vel castaneis, serrulatis, glabris; laminis anguste triangularibus, acuminatis, pungentibus, 1–2 cm. latis, pulchre ampleque roseo-pictis, dense adpresseque niveo-lepidotis sed supra mox glabris, dentibus laxis, 4 mm. longis, rectis vel uncinatis, atro-castaneis; scapo gracili, valde compresso, mox glabro; scapi bracteis parvis, ovatis, acutis, tenuibus, supremis remotis; inflorescentia laxe bipinnatim paniculata, 2 dm. longa, pallido-lepidota; bracteis primariis eis scapi similibus, quam spicas axillares bene brevioribus; spicis suberectis, densis vel subdensis, 2–5 cm. longis, 1 cm. diametro; bracteis florigeris suborbicularibus, apiculatis, sepala fere aequantibus, tenuissimis, roseis et late hyalino-marginatis, erosis; floribus suberectis, subsessilibus; sepalis ellipticis, obtusis, 5 mm. longis, trinervatis, late hyalino-marginatis; petalis ellipticis, obtusis, 8 mm. longis, extus pallido-lepidotis, ad 3 mm. connatis; staminibus inclusis. Pl. I, figs. 61–62.

MEXICO: Coahuila: Saltillo, 1898, *Palmer 205* (G, type).

25. **H. scariosa**, spec. nov., e plantis masculinis solum cognita, verisimiliter 2 m. alta vel ultra; foliis 35 cm. longis; vaginis late ovatis, 4 cm. longis, ad apicem versus denticulatis, pallide brunneis,

lucidis; laminis anguste triangularibus, 2 cm. latis, supra glabris, subtus dense adpresseque pallido-lepidotis; scapo gracili, glabro; scapi bracteis supremis ovatis, acuminatis, quam internodia brevioribus; inflorescentia laxe pyramidata, 55 cm. longa, minute pallido-lepidota; bracteis primariis eis scapi similibus, 25 mm. longis; ramis multo divisis, ad 16 cm. longis, prope basin compressis; racemis dense spiciformibus vel prope basin laxis; bracteis florigeris late ovatis, acuminatis, quam sepala paulo brevioribus, atro-roseis et late scarioso-marginatis; floribus patentibus; pedicellis brevissimis, obconicis; sepalis ellipticis, acutis, 6 mm. longis, 1–5-nervatis, atro-roseis et late scarioso-marginatis; petalis ellipticis, obtusis, 9 mm. longis, ad 3 mm. connatis; staminibus inclusis, valde inaequalibus; ovarii reliquo ultra ½ supero. Pl. I, figs. 63–64.

MEXICO: Coahuila: limestone ledges, hills near Jimulco, 1885, *Pringle 72* (G, type); Parras, 1905, *Purpus 1101* (FM, phot. G).

26. **H. zacatecae**, spec. nov., e fragmentis solum cognita sed verisimiliter satis magna; foliis ad 3 dm. longis; vaginis late ovatis, ca. 5 cm. longis, quam laminae paulo latioribus, dense serrulatis, stramineis, glabris, laevibus lucidisque; laminis anguste triangularibus, acuminatis, pungentibus, 2 cm. latis, dense adpresseque niveo-lepidotis, supra mox glabris, dentibus uncinatis 5–6 mm. longis flavis vel atro-castaneis laxe serratis; scapo gracili, mox glabro; scapi bracteis late ovatis, apiculatis, supremis parvis, remotis; inflorescentia laxe bi- vel tripinnatim paniculata, pallide subfloccoso-lepidota; bracteis primariis eis scapi similibus; ramis suberectis, ad 17 cm. longis; bracteis florigeris late ovatis, acuminatis, sepala subaequantibus, nervatis, membranaceis, stramineis, late hyalino-marginatis; floribus masculis subsessilibus; sepalis ovatis, acutis, 5–6 mm. longis, membranaceis, petalis ellipticis, obtusis, 8 mm. longis, albis, extus sparse lepidotis; staminibus inclusis; capsulis ovoideis, acutis, 1 cm. longis; carpellis laevibus. Pl. I, figs. 65–66.

MEXICO: Zacatecas: high ridges, Cedros, 1908, *Kirkwood 5* (G, type; FM); Zacatecas, *Lloyd 125* (G).

27. **H. argentea** Bak. ex Hemsl. Biol. Centr.-Am. Bot. iii. 317 (1884) and in Bot. Mag. cxxii. t. 7460 (1896).

MEXICO: 1870, *Hort. Kew.* (K, type; phot. G).

28. **H. capituligera** Mez in DC. Mon. Phan. ix. 546 (1896). Pl. I, figs. 67–68.

MEXICO: San Luis Potosi: sandy soil near Morales, 1877, *Schaffner 501* (G); near San Luis Potosi, alt. 1800–2400 m., 1878, *Parry & Palmer 877* (G).

So far as can be determined from the original description the above specimens are conspecific with *Hechtia capituligera*.

29. **H. Schottii** Bak. in Hemsl. Biol. Centr.-Am. Bot. iii. 318 (1884). *H. bracteata* Mez in DC. Mon. Phan. ix. 550 (1896). *H. myriantha* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 6 (1901). *H. macrophylla* Greenman in Field Col. Mus. Pub. Bot. ii. 247 (1907). Pl. I, figs. 69–70.

MEXICO: VERA CRUZ: Barranca de Santa Maria Tlatetla (el Fortin) near Mirador, 1842, *Liebmann s. n.* (♂ Copenhagen, type of *H. myriantha;* phot. G); Carrizal, 1901, *E. A. Goldman 712* (♂ US, type of *H. macrophylla;* phot. G); Fortin, 1919, *Purpus 8505* (♂ G); Cameron, 1921, *Purpus 8628* (♂ G); La Palmilla, 1934, *Purpus 16359* (♂ G, FM); YUCATAN: Cerro de Maxcanu, 1865, *Schott 645* (♀ FM; BM, TYPE; phot. G); Xcholac, *Gaumer 578* (♂ FM); Maxcanu, 1917, *Gaumer 23839* (♂ ♀ G, FM); indefinite, 1917–21, *Gaumer 24449* (♀ FM).

The description of *Hechtia bracteata* agrees too closely with the staminate specimens of *H. Schottii* to allow its being keyed out. Also these specimens come from very near Orizaba, the type locality of *H. bracteata*.

30. **H. confusa**, spec. nov., ca. 8 dm. alta; foliorum laminis sublinearibus, acuminatis, pungentibus, 25 cm. longis, 6–7 mm. latis, crassis, supra glabris, subtus dense adpresseque niveo-lepidotis; scapo 7 mm. diametro, tereti, albido-flocculoso, mox glabro; scapi bracteis e late ovato longe lineari-caudatis, internodia multo superantibus sed scapum haud obscurantibus; inflorescentia anguste sublaxeque cylindrica, ca. 5 dm. longa, albido-flocculosa, mox glabra; bracteis primariis e latissime ovatis vel suborbicularibus acuminatis, 3 cm. longis, ramos axillares plerumque superantibus et magno ex parte obscurantibus, tenuibus, nervatis, serrulatis; ramis simplicibus, dense subcapitatis; bracteis florigeris late ovatis, obtusis vel late acutis, quam sepala paulo brevioribus, valde convexis, brunneis, laevibus; florum pedicellis brevibus sed distinctis, crassis, triquetris; sepalis ovatis, obtusis, masculis 3 femineis 4 mm. longis; petalis late ovatis, obtusis, quam sepala paulo longioribus, albidis; staminibus inclusis; capsulis crasse ovoideis, 8 mm. longis, glabris laevibusque, atro-castaneis; seminibus anguste alatis. Pl. I, figs. 71–72.

MEXICO: PUEBLA: dry calcareous hills, La Cañada near Tehuacan, 1897, *Pringle 7479* (♂ ♀ G, TYPE).

The above plant was originally labelled *H. argentea* with which it has scarcely anything in common. Its flowers and their pedicels greatly resemble those of *H. podantha* but its floral bracts throw it in the other half of the key.

31. **H. glomerata** Zucc. Pl. Nov. Hort. Monac. iv. 240, t. 6 (1840). *Dasylirion pitcairniaefolium* Karw. & Zucc. in Gartenzeit. vi. 258 (1838), non *Hechtia pitcairniaefolia* Verlot (1868). *Yucca pitcairniaefolia* Hort. ex Zucc. loc. cit. 257, in synon. Pl. I, figs. 73–74.

MEXICO: 1853, *Hort. Monac.* (♀ Munich, phot. G).

The original material of this species was collected by Karwinsky somewhere in southern Mexico, probably in Oaxaca or its vicinity. It seems almost certain that the herbarium material cited above is a direct descendant of the plant described by Zuccarini, yet a careful dissection shows the sepals broadly obtuse or apiculate and not acuminate as one would infer from his illustration.

32. **H. Ghiesbreghtii** Lem. in Ill. Hort. x. t. 378 (1863); Hook. f. in Bot. Mag. xcvi. t. 5842 (1870). *H. Morreniana* Mez in DC. Mon. Phan. ix. 547 (1896).

UNITED STATES: Texas: Zapata Co.: gravel soil on hills midway between Roma and Napato, alt. 150 m., 1927, *Runyon 92* (♂ US, phot. G); Starr Co.: Cockfield Formation and Fayette Sandstone, between Roma and Starr Co. line, 1932, *Clover 523* (Mich). MEXICO: 1871, *Hort. Saunders* (♂ K, phot. G); 1872, *Hort. Makoy* (♀ Liége, type of *H. Morreniana;* phot. G); Tamaulipas: Sierra de San Carlos, Cerro Tres Vetas near San José, alt. 800 m., 1930, *Bartlett 10358* (♀ US, phot. G); same, *Bartlett 10383* (♂ US, phot. G); San Luis Potosi: *D'Aoust 681* (P, phot. G); Hacienda Teotillos, 1905, *Palmer 609* (♂ ♀ G, FM, Mo).

The original description and illustrations are so vague that I am relying largely on the plate in the Botanical Magazine in characterizing and keying the species.

33. **H. gamopetala** Mez in DC. Mon. Phan. ix. 549 (1896). Pl. II, figs. 1–3.

MEXICO: "prope El Banco," *Ehrenberg 1001 e. p.* (Berlin, type; frag. G).

I am indebted to Prof. Harms for the fragments of the type used to make the illustrations cited above. They show definitely that the sepals are obtuse and not acute as described. The union of the petals is not a particularly distinctive character, occurring as it does in the staminate flowers of several species of *Hechtia.*

Pitcairnia amblyosperma, spec. nov., 8 dm. alta; basi et foliis exterioribus ignotis, interioribus metralibus vel ultra, haud petiolatis; vaginis suborbicularibus, parvis, brunneis, prominenter nervatis, membrana e lepidibus badiis formata obtectis; laminis linearibus, filiformi-acuminatis, 2 cm. latis, integerrimis, supra glabris, subtus membrana e lepidibus pallidis formata obtectis; scapo erecto, 5 mm. diametro, sparse minuteque albido-floccoso; scapi bracteis erectis, lanceolatis, filiformi-acuminatis, supremis internodia

aequantibus vel eis paulo brevioribus; inflorescentia simplicissima, laxe quaquaverse florigera, 3 dm. longa, sparse floccculosa; bracteis florigeris subtriangularibus, acuminatis, pedicellos aequantibus vel paulo superantibus, membranaceis; floribus patentibus; pedicellis gracilibus, ad 2 cm. longis; sepalis oblongis, acutis, planis, 2 cm. longis; petalis imperfecte solum cognitis, minimum 4 cm. longis, basi ligula magna bidentata auctis, ex sicco aureis; ovario semisupero; ovulis ala unica dorso-apicali obliqua praeditis; seminibus apice cauda lata plana obtusa praeditis. Pl. II, figs. 4–7.

MEXICO: Puebla: Tlacuilotepec, 1913, *Salazar* (US, type; phot. G).

Pitcairnia amblyosperma from the form of its ovules must belong to the Section *Schweideleria*, but with its elongate linear leaves it differs markedly from any species previously described there.

Pitcairnia calatheoides, spec. nov., subacaulis, florifera 8 dm. alta; foliis dimorphis, alteris ad vaginas late ellipticas vel suborbiculares atro-brunneas reductis, alteris magnis, viridibus, glabris; petiolis 8–9 dm. longis, gracilibus, inermibus; laminis oblanceolatis, basi cuneatis, in apice parvo acuminato abrupte contractis, 35–40 cm. longis, 15 cm. latis, minute reticulatis; scapo erecto, gracili, rubro, sparse floccoso-lepidoto; scapi bracteis ovatis, acuminatis, supremis exceptis quam internodia multo brevioribus; inflorescentia simplicissima, densa, 15 cm. longa, sparse albido-lepidota; bracteis florigeris patentibus, lanceolatis, acuminatis, ad 3 cm. longis, pedicellos multo superantibus, chartaceis, prominenter nervatis; floribus erectis vel divergentibus; pedicellis gracilibus, 6 mm. longis; sepalis lanceolatis, acutis, 23 mm. longis, haud carinatis, subchartaceis; petalis linearibus, obtusis, apiculatis, 5 cm. longis, fulgide aureis, basi ligula oblonga obtusa 1 cm. longa auctis; staminibus inclusis, antheris linearibus, 1 cm. longis; ovario ½ infero; ovulis haud caudatis. Pl. II, figs. 8–11.

PERU: San Martín: forest, Juan Jui, Alto Rio Huallaga, alt. 400–800 m., 1936, *Klug 4237* (FM, G, type).

This species is very closely related to *Pitcairnia undulata* from which it differs in its longer narrower floral bracts, shorter pedicels and orange-yellow flowers.

Pitcairnia cubensis (Mez), comb. nov. *P. latifolia* Soland. var. *cubensis* Mez in DC. Mon. Phan. ix. 396 (1896). *Hepetis latifolia* Raeuschel var. *cubensis* Mez, loc. cit. 974. Pl. II, figs. 12–13.

CUBA: Camaguey (?): Farallones, La Catalina, *Wright 689* (type no.; G, BM); Oriente: Sierra Maestra, on steep cliffs at Rio Yara, alt. 150 m., 1915, *Ekman 5631* (S); Bayate, Picote (foothills of Sierra de Nipe), on steep shady

rocks, 1916, *Ekman 7400* (S); Represa del Guaso, Guantánamo, 1918, *Hioram 2238* (La Salle); terrestrial, vicinity of Loma del Gato, Sierra Maestra, alt. 900 m., 1921, *León, Clement & Roca 10130* (La Salle).

In addition to the characters noted by Mez, *Pitcairnia cubensis* differs from typical *P. latifolia* in its oblong obtuse sepals and in its winged rather than caudate seeds.

Pitcairnia cylindrostachya, spec. nov., acaulis, florifera 4 dm. alta; foliis multis, bulbose rosulatis; vaginis late ovatis, 4 cm. longis, atro-castaneis, glabris lucidisque; laminis linea recta transversa deciduis, linearibus, acuminatis, 3–5 dm. longis, basi 14 mm. latis, supra glabris, subtus pallide floccoso-lepidotis; scapo erecto, 4 mm. diametro, floccoso-lepidoto; scapi bracteis erectis, dense imbricatis et scapo fere omnino obscurantibus, floccoso-lepidotis, infimis subfoliaceis, supremis e late ovato acuminatis; inflorescentia simplicissima, densissime angusteque cylindrica, 10–15 cm. longa, 15–20 mm. diametro, floccoso-lepidota; bracteis florigeris erectis, dense imbricatis, e late ovato acuminatis, ad 3 cm. longis, sepala aequantibus vel superantibus, late convexis, subcoriaceis, pallide roseis, sublaevibus; floribus subsessilibus, gracilibus; sepalis lanceolatis, acuminatis, 20–25 mm. longis; petalis linearibus, 6 cm. longis, rubris, nudis; ovario fere omnino supero; ovulis longe caudatis. Pl. II, figs. 14–15.

MEXICO: Jalisco: rocky bluffs of barranca near Guadalajara, 1891, *Pringle 3884* (G, type; Mich, BM); near Guadalajara, 1903, *Rose & Painter 7401* (G).

Pitcairnia cylindrostachya has ample scape-bracts which nearly or quite conceal the scape and subcoriaceous floral bracts, while its nearest relative, *P. Micheliana*, has lance-triangular scape-bracts which expose much of the scape and thin floral bracts. *P. cylindrica* probably has reduced spiniform leaf-blades as well as the type described but I have not observed them yet.

Pitcairnia densiflora Brongn. in Hort. Univ. vi. 228 (1845).

MEXICO: Vera Cruz: wet rocks, Zacuapan, 1917, *Purpus 8037* (G, UCal).

Like many of the showier forms of the *Bromeliaceae*, *Pitcairnia densiflora* was described from cultivation with very vague indication of its point of origin. In this case the original description gave nothing more than "Mexico." The above citation serves to place the species geographically.

Pitcairnia oaxacana, spec. nov., ad 6 dm. alta; basi et foliis exterioribus ignotis, interioribus fere 7 dm. longis, subpetiolatis; vaginis ellipticis, parvis, pallidis; laminis lineari-lanceolatis, acuminatis, 3 cm. latis, tenuibus, maturitate glabris; scapo erecto, 3.5 mm.

diametro, sparse albido-floccoso, mox glabris; scapi vaginis ex elliptico acuminatis, praeter infimis valde remotis; inflorescentia simplicissima, laxe subpauciflora, 9–15 cm. longa; bracteis florigeris ovatis, acuminatis, quam pedicelli bene brevioribus, membranaceis; floribus patentibus, secunde versis; pedicellis gracilibus, ad 9 mm. longis, sparse albido-floccosis; sepalis anguste oblongis, acutis, 24 mm. longis, mox glabris, rubris; petalis lingulatis, ad 58 mm. longis, basi ligula auctis, rubris; ovario semisupero; ovulis longe caudatis. Pl. II, figs. 16–17.

MEXICO: OAXACA: Cafetal Calvario, alt. 600 m., 1917, *B. P. Reko 3383* (US, TYPE; phot. G).

In Mez's monograph in the Pflanzenreich this species keys down to the vicinity of *P. meridensis* from which it differs in its secund flowers and short pedicels. It does not seem to be closely related to any known Mexican species.

Pitcairnia oblanceolata, spec. nov., verisimiliter caulescens; foliis erectis, paucis; vaginis late ovatis, 3–4 cm. longis, atro-castaneis, membrana crassa e lepidibus badiis formata obtectis; petiolis distinctis, validis, canaliculatis, spinis atris 3 mm. longis, dense armatis; laminis oblanceolatis, acutis, 85 cm. longis, 125 mm. latis, planis, glabris, medio anguste canaliculatis; scapo valido, 3 dm. longo; scapi bracteis erectis, densissime imbricatis, alteris subfoliaceis, alteris vaginaeformibus, ellipticis, caudatis, magnis, membrana badia obtectis; inflorescentia simplicissima, densissime spicata, cylindrica, 3 dm. longa, 3 cm. diametro; bracteis florigeris stricte erectis, latissime ellipticis, acutis, 8 cm. longis, sepala multo superantibus, ex sicco castaneis, chartaceis; floribus brevissime crasseque pedicellatis; sepalis oblanceolatis, late acutis apiculatisque, 45 mm. longis, 10 mm. latis, tenuissimus; petalis staminibusque ignotis. Pl. II, fig. 18.

COSTA RICA: cataracts of San Ramon, 1931, *Brenes 13512* (FM, TYPE; phot. G).

Owing to the lack of good flowers this species can not be placed with certainty, but its habit is so unusual that there can be no doubt of its being new. The very broad leaf-blades, distinct petioles and irregularly mixed types of scape-bracts suggest relationship with *P. nigra* which, however, has recurved floral bracts.

Pitcairnia pteropoda, spec. nov., acaulis, florifera fere 3 dm. alta; foliis multis, bulbose rosulatis; vaginis suborbicularibus, 2 cm. longis, atro-castaneis, lucidis; laminis dimorphis, alteris persistentibus, ad spinas brunneas aculeatas reductis, alteris viridibus, linea recta transverse deciduis, linearibus, acuminatis, 4–6 dm. longis, 7–15 mm. latis, mox glabris, supra lineam integris; scapo erecto, 4 mm. diametro,

glabro; scapi bracteis erectis, quam internodia longioribus sed scapum non omnino obtegentibus, lanceolatis vel ovatis, longe acuminatis; inflorescentia simplicissima, sublaxe racemosa, 11–16 cm. longa, secunde florigera, aetate glabra; bracteis florigeris erectis, eis scapi similibus, 2 cm. longis, pedicellos bene superantibus; floribus secunde patentibus vel paulo recurvatis; pedicellis 10–14 mm. longis, valde aplanatis et cum basi sepalorum alatis; sepalis anguste triangularibus, acuminatis, 15–18 mm. longis, nervatis; petalis defloratis solum cognitis, ad 5 cm. longis, nudis; ovario ¾ vel ultra supero; seminibus utraque polo longe caudatis. Pl. II, fig. 19.

MEXICO: MICHOACAN: Urupan, 1899, *Holway 3619* (G, TYPE); Torullo, 1926, *Reiche 160* (Mun, phot. G).

Pitcairnia pteropoda is obviously related to *P. Palmeri*, but is easily distinguished by its large floral bracts and flattened alate pedicels.

Pitcairnia Purpusii, spec. nov., acaulis, florifera 55 cm. alta; foliis multis, bulbose rosulatis; vaginis late ovatis, 4 cm. longis, atro-castaneis, glabris; laminis linea recta transversa deciduis, linearibus, acuminatis, 5–7 dm. longis, 17 mm. latis, supra glabris, subtus dissite pallideque floccoso-lepidotis, integris; scapo erecto, 3.5 mm. diametro, floccoso; scapi bracteis magnis, ovatis, longe subfiliformi-caudatis, internodia superantibus, floccosis, viridibus; inflorescentia simplicissima, laxe spicata, subdistiche florigera, 23 cm. longa, dense albido-floccosa; rhachi flexuosa; bracteis florigeris ovatis, acutis vel acuminatis, chartaceis, prominenter nervatis, infimis sepala aequantibus vel superantibus, alteris multo brevioribus; floribus suberectis, subsessilibus; sepalis lanceolatis, acutis, 25 mm. longis, posticis carinatis; petalis linearibus, 6 cm. longis, intus nudis, rubris; staminibus inclusis; stylo exserto; ovario fere omnino supero; ovulis caudatis. Pl. II, figs. 20–21.

MEXICO: CHIAPAS: on shaded rocks, creek east of Monserrate, *Purpus 295* (US, TYPE; phot. G).

This species differs from *P. Calderonii*, its nearest relative, in its lanceolate acute sepals and wholly lax subdistichous inflorescence.

Pitcairnia Roseana, spec. nov., foliorum vaginis ignotis; laminis linea recta transversa deciduis, linearibus, acuminatis, 4 dm. longis, 13 mm. latis, supra lineam integris, supra glabris, subtus e lepidibus linearibus pallidis dense subtomentosis; scapo recto, 5 mm. diametro, dense adpresseque albo-lanato; scapi bracteis erectis, dense imbricatis, late ovatis, membrana e lepidibus pallidis formata obtectis, infimis longe angusteque subfoliaceo-caudatis et inflorescentiam

aequantibus; inflorescentia simplicissima, dense cylindrica, 24 cm. longa, 2 cm. diametro; bracteis florigeris erectis, late ovatis, acuminatis, sepala superantibus, subcoriaceis, nervatis vel sublaevibus, membrana e lepidibus pallidis formata obtectis; floribus sessilibus, erectis; sepalis lanceolatis, acutis, 22 mm. longis, dense albo-floccosis, posterioribus valde carinatis; petalis linearibus, 5 cm. longis, rubris, intus nudis; staminibus inclusis; ovario ultra ¾ supero; ovulis caudatis. Pl. II, figs. 22–23.

MEXICO: DURANGO: without further locality, 1897, *Rose 2325* (G, TYPE).

Pitcairnia Roseana with its dense inflorescence of sessile flowers is closely related to *P. Michcliana* and *P. cylindrostachya*, but differs from them in its very elongate lower scape-bracts and the membrane-like covering of coalesced scales on its floral bracts.

Pitcairnia Samuelssonii, spec. nov., 15 dm. alta vel ultra; foliis multis, fasciculato-rosulatis; vaginis suborbicularibus, 20–25 mm. longis, atro-castaneis; laminis dimorphis, alteris ad spinas atras uncinato-serratas reductis, alteris viridibus, persistentibus, ad 8 dm. longis, linearibus, acuminatis, basi paulo angustatis, 8–18 mm. latis, supra glabris, subtus membrana e lepidibus albidis formata obtectis, serratis, dentibus 1 mm. longis vel paulo ultra, ad basin foliorum versus densis, alibi laxis vel laxissimis; scapo erecto, 7–10 mm. diametro, minutissime albido-floccoso, mox glabro; scapi bracteis quam internodia multo brevioribus, triangulari-ovatis, acuminatis, albido-flocculosis; inflorescentia simplici vel pauce ramosa, 3–6 dm. longa; bracteis primariis parvis; ramis laxe racemosis; bracteis florigeris ovatis, acutis, quam pedicelli brevioribus vel eos aequantibus, albido-flocculosis; floribus per anthesin suberectis, per aetatem reflexis; pedicellis gracilibus, 1 cm. longis; sepalis oblongis, obtusis, 21 mm. longis, ecarinatis, albido-flocculosis; petalis linearibus, obtusis, 5–7 cm. longis, aureis vel albidis, basi ligula parva semiorbiculari auctis; staminibus paulo exsertis; ovario ½ supero; ovulis apice dorsoque oblique alatis. Pl. II, figs. 24–26.

HAITI: on sunny dry slope in gully, xerophytic region, San Michel, alt. 450 m., 1905, *Nash & Taylor 1422* (NY, phot. G); Dép. de l'Artibonite, Ennery, on cliffs on the road to Plaisance, 1924, *Ekman H2475* (S); Central Plaine, Hinche, Savane Papaye, in gulches, alt. 250 m., 1926, *Ekman H6017* (S, TYPE; phot. G); Massif du Nord, Hinche, Morne Juan-Gomez, sterile rills, alt. 600 m., 1926, *Ekman H6178* (S, phot. G); Massif de la Selle, Port-au-Prince, Morne de l'Hôpital at St. Roch, chalky limestone, alt. 400 m., 1926, *Ekman H7125* (S, G).

Pitcairnia xanthocalyx, with which *P. Samuelssonii* has been confused, has scape-bracts much longer than the internodes, sepals only 15 mm. long, and long-caudate ovules.

Pitcairnia saxicola, nom. nov. *P. fulgens* Dene. sensu Warsz. in Otto & Dietr. Gartenzeit. xix. 137 (1851), non Dene. (1850). *P. splendens* Warsz. op. cit. 176 (1851), non Hort. ex Poit. in Rev. Hort. iii. 157 (1836).

Pitcairnia spicata (Lam.) Mez. *P. fulgens* Dene. in Linden's Cat. 18 (1850), nomen; and ex A. Dietr. in Otto & Dietr. Gartenzeit. xix. 25 (1851), non Dietr. Gart. Lex. 2 Nachr. vii. 44 (1837). *P. Decaisnei* C. Koch in Ind. Sem. Hort. Berol. app. 5 (1857).

In both his monographs[1] Mez maintains *Pitcairnia fulgens* Dene. as a valid species of the Section *Eligulatae*. Yet the first description of the species says flatly: "petalis basi . . . squamatis." The plant was said to come from Guadeloupe and to have "racemo dense spicato" and "grossen Brakteen . . . welche die Hälfte der Blumen bedecken, über einen Zoll lang, einen halben Zoll breit." If we can assume the locality as correct the species is almost inescapably the same as *P. spicata*.

What Mez described under *P. fulgens* Dene. may well be the same as the earlier *P. fulgens* Dietr. The specimen cited by Mez from the Boissier-Barbey Herbarium fits his description but does not appear to be specifically different from *P. flammea* Lindl. and so probably originated in Brazil and not in Cuba as surmised.

Pitcairnia sylvestris, spec. nov., e fragmentis solum cognita, caulescens; foliis paucis, erectis; vaginis late ovatis, ca. 3 cm. longis, atro-castaneis, membrana e lepidibus badiis formata obtectis, mox glabris; petiolis gracilibus, 4 dm. longis, canaliculatis, dentibus atris 1 mm. longis armatis; laminis obovatis, ultra 4 dm. longis, fere 2 dm. latis, late acutis, basi acuminatis, planis, mox glabris, inter nervos reticulatis; scapo ignoto; inflorescentia verisimiliter simplicissima, minime 26 cm. longa, dense racemosa, subsecundiflora; axi valido, ferrugineo-lanato; bracteis florigeris patentibus, triangularibus, acuminatis, ad 4 cm. longis, pedicellos bene superantibus sed quam sepala brevioribus, chartaceis, ferrugineo-lanatis, mox glabris; floribus patentibus; pedicellis gracilibus, 1 cm. longis; sepalis angustissime triangularibus, subulato-acuminatis, 48 mm. longis, chartaceis, glabris, valde nervatis, basi dense papillosis; petalis lineari-spathulatis, apice late truncatis apiculatisque, 75 mm. longis, basi ligula magna oblonga obtusa praeditis, ex sicco rubris; staminibus inclusis; ovario $\frac{2}{3}$ supero; ovulis longissime caudatis. Pl. II, fig. 27.

COLOMBIA: Cauca: in primaeval forest, La Costa, District of El Tambo, alt. 1200 m., 1936, *Kjell von Sneidern 939* (S, type; phot. G).

[1] Mez in DC. Mon. Phan. ix. 430 (1896) and in Pflanzenr. iv. Fam. 32, 259 (1935).

The broad thin leaf of this species suggests an inhabitant of deep forest. Without the scape it is impossible to place it in Mez's treatment, yet a careful check of all species or their descriptions reveals nothing that appears close to it. Few species have such large sepals or such broad leaves and apparently none have papillae on the sepals like those of *P. sylvestris*. The specimen consists of part of the stem with a complete leaf attached and the top of the inflorescence. These may not belong together but it seems reasonably certain that they do.

Thecophyllum acuminatum, spec. nov., epiphytum, acaule vel breviter caulescens, 24–35 cm. altum; foliis multis, dense cyathiformi-rosulatis, ca. 15 cm. longis, rectis; vaginis ovato-ellipticis, 5 cm. longis, atro-castaneis, pallide punctulato-lepidotis; laminis ligulatis, acuminatis, planis, 15 mm. latis, viridibus, concoloribus; scapo erecto, gracili, brunneo-punctulato; scapi vaginis foliaceis, erectis, dense imbricatis; inflorescentia subcapitata, 35 mm. longa, 75 mm. diametro, densa; bracteis primariis ex ovato acuminatis, viridibus, flores bene superantibus, infimis flores geminos in axillis gerentibus; ramis abortivis; bracteis florigeris late ellipticis, ad 12 mm. longis, quam sepala bene brevioribus, membranaceis, dense brunneo-punctulatis; floribus subsessilibus; sepalis late ellipticis, obtusis, 14 mm. longis, 11 mm. latis, tenuiter coriaceis, brunneo-punctulatis; petalis ignotis. Pl. II, figs. 28–29.

COSTA RICA: San José: on tree, La Palma, alt. ca. 1600 m., 1924, *Standley 38276* (US, type; phot. G); on tree, La Hondura, alt. 1200–1500 m., 1926, *Standley & Valerio 51909* (US).

Thecophyllum acuminatum is most nearly related to *T. viride*, but differs from it in its narrow acuminate leaf-blades and bracts and short subcapitate inflorescence.

Thecophyllum Standleyi, spec. nov., epiphytum, verisimiliter acaule, ad 5 dm. altum; foliis 4 dm. longis, densissime obscureque lepidibus praeter centrum brunneum totis pallidis obtectis; vaginis magnis, ovato-ellipticis, in specimine typico quam laminae haud atrioribus; laminis ligulatis, acutis, planis, 3–4 cm. latis, viridibus, concoloribus; scapo erecto, glabro; scapi vaginis erectis, dense imbricatis, infimis foliaceis, supremis ex ovato acuminatis, rubris, densissime pallido-lepidotis; inflorescentia cylindrica, 2 dm. longa, 6 cm. diametro, densa; bracteis primariis eis scapi similibus, patentibus vel ad apicem versus recurvatis, flores semper geminos in axillis gerentibus et bene superantibus; ramis abortivis; bracteis florigeris late ovatis, acutis, 12 mm. longis, quam sepala bene brevioribus, carinatis, tenuibus, minutissime lepidotis; floribus subsessilibus; sepalis ovatis, obtusis cucullatisque, 20 mm. longis, 11 mm. latis,

obtuse carinatis, coriaceis, pallido-lepidotis, liberis; petalis immaturis solum cognitis, ligulatis, viridibus, basi ligulis binis auctis. Pl. II, figs. 30–31.

COSTA RICA: San José: on tree in paramo thicket, Cerro de las Vueltas, alt. 2700–3000 m., 1925–6, *Standley & Valerio 43573* (US, type; phot. G).

Thecophyllum Standleyi is readily distinguished from its nearest relative, *T. stenophyllum*, by its ovate sepals and relatively large floral bracts.

Tillandsia Andrieuxii (Mez), comb. nov. *T. Benthamiana* Kl. var. *Andrieuxii* Mez in DC. Mon. Phan. ix. 736 (1896).

Tillandsia Mauryana, spec. nov., pulvinata, acaulis, 10–12 cm. alta; foliis plurimis, dense rosulatis, arcuatim recurvatis, 7–8 cm. longis, dense grosseque furfuraceis; vaginis inconspicuis, parvis, ferrugineo-lepidotis; laminis anguste triangularibus, acuminatis, subpungentibus, planis, 7 mm. latis, subtus carinatis, cinereo-lepidotis; scapo brevissimo; scapi bracteis foliaceis, dense imbricatis, recurvatis; inflorescentia dense digitata e 3–5 spicis; bracteis primariis lanceolatis, acuminatis, quam spicae axillares brevioribus, dense lepidotis; spicis suberectis, lanceolatis, acutis, 3 cm. longis, 1 cm. latis, complanatis, dense 6-floris; bracteis florigeris ovatis, acutis, 13 mm. longis, sepala aequantibus vel paulo superantibus, acute carinatis, chartaceis, lepidibus magnis cinereis subpatentibus obtectis; floribus subsessilibus; sepalis lanceolatis, acutis, 12 mm. longis, chartaceis, grosse cinereo-lepidotis, posticis ad 1 mm. connatis; petalis linearibus, obtusis, 14 mm. longis, siccis flavo-viridibus; staminibus styloque inclusis. Pl. II, figs. 32–33.

MEXICO: Hidalgo: Cañada de Meztitlan, alt. 1300–1500 m., 1891, *P. Maury 5747* (G, type; FM).

Tillandsia Mauryana closely matches *T. chontalensis* and *T. ignesiae* in its corolla and stamens, but differs sharply from them in its very short scape and inconspicuous leaf-sheaths.

Tillandsia melanocrater, spec. nov., acaulis, haud ultra 25 cm. alta; foliis plurimis, subpatentibus, rosulatis, 15–20 cm. longis, utrinque densissime minuteque adpresso-lepidotis; vaginis late ovatis, valde conspicuis, atro-castaneis; laminis lineari-triangularibus, longe acuminatis, pungentibus, basi 8 mm. latis, planis; scapo erecto vel adscendenti, gracili; scapi bracteis erectis, dense imbricatis, late ovatis, lepidotis, infimis vel fere omnibus lineari-laminatis; inflorescentia simplici vel paupere digitata; bracteis primariis scapi supremis similibus, quam bracteae florigerae vix majoribus; spicis variabilis, e anguste oblongis et acutis ad late ellipticis et obtusis, 4–9 cm. longis,

valde complanatis, ad basin versus bracteis sterilibus saepe auctis; rhachi gracili, fere recti; bracteis florigeris erectis, imbricatis, sed saepe rhachin non omnino obscurantibus, ovatis, acutis vel obtusis apiculatisque, 20–25 mm. longis, 9–12 mm. latis, sepala superantibus, quam internodia 3–6-plo longioribus, valde carinatis, coriaceis, laevibus, glabris vel ad apicem versus parce lepidotis; floribus subsessilibus; sepalis lanceolatis, acutis, posticis alte connatis; petalis tubuloso erectis, angustis, 30–35 mm. longis, violaceis; staminibus styloque exsertis; capsulis graciliter cylindricis, acutis, 3 cm. longis. Pl. II, fig. 34.

GUATEMALA: Alta Verapaz: Coban, alt. 1350 m., 1908, *Tuerckheim II 2186* (G, US). COSTA RICA: Cartago: Cartago, 1887, *Cooper 261* (US, type; phot. G); northwest slope of Cerro Carpintera above La Union de Tres Rios, alt. 1320–1700 m., 1929, *Dodge & Thomas 5425* (G); Guanacaste: along Rio Liberia near Hacienda Santamaria, alt. 640–680 m., 1930, *Dodge & Thomas 6371* (G). PANAMA: Canal Zone or vicinity, westerly arm of Quebrada Salamanca, alt. 70 m., 1934, *Dodge, Steyermark & Allen 17033* (G); drowned forest of Quebrada Ancha, alt. 70 m., 1934, *Dodge & Steyermark 17033a* (G).

In publishing Morren's *Tillandsia melanopus*,[1] Mez noted two elements without naming either and designated as typical the first which consisted of only one collection, *Pfau 254*. An examination of this specimen in the herbarium at Liége shows that it is not separable from *T. punctulata*. Consequently there is no choice but to reduce typical *T. melanopus* to synonymy and choose a name for Mez's second element which is a valid species. The number selected as a type under the new species is one of those originally cited by Mez.

Tillandsia (§ **Platystachys?**) **Mexiae**, spec. nov., epiphyta, acaulis, florifera 25 cm. alta; foliis imperfecte cognitis, verisimiliter inflorescentiam superantibus, densissime adpresseque cinereo-lepidotis; vaginis late ovatis, 5 cm. longis, atro-castaneis; laminis anguste triangularibus, pallidis, 18 mm. latis; scapo erecto, 4 mm. diametro; scapi bracteis foliaceis, erectis, densissime imbricatis, longe caudato-acuminatis, inflorescentiam multo superantibus; inflorescentia dense bipinnatim paniculata, ovoidea, 8 cm. longa, dense cinereo-lepidota; bracteis primariis late ovatis, spicas subdimidio aequantibus, earum laminis angustissime linearibus, spicas infimas multo superantibus; spicis late ellipticis, acutis, 45 mm. longis, 4-floris, valde complanatis; bracteolis florigeris erectis, dense imbricatis, ovatis, acuminatis, ad 35 mm. longis, sepala aequantibus vel superantibus, valde carinatis, membranaceis, rubris; floribus subsessilibus; sepalis ovatis, acuminatis, 3 cm. longis, membranaceis, dense pallido-lepidotis,

[1] Mez in DC. Mon. Phan. ix. 680 (1896).

posticis ad 5 mm. connatis; petalis staminibusque ignotis. Pl. II, figs. 35–36.

MEXICO: JALISCO: on tree near stream, Arroyo de los Hornos, Hacienda del Ototal, Sierra Madre Occidental west of San Sebastian, alt. 1500 m., 1927, *Mexia 1838* (US, TYPE; phot. G).

In habit, *Tillandsia Mexiae* somewhat resembles *T. macrochlamys* but its relatively short primary bracts throw it with very different species. In Mez's key it runs down to the vicinity of *T. Valenzuelana* but differs from it and all related species in its very short broad spikes. It is indeed a pleasure to name this distinctive species in honor of one who has added much to our knowledge of tropical American botany by her indefatigable efforts.

Vriesia Tuerckheimii (Mez), comb. nov. *Tillandsia Tuerckheimii* Mez in Urb. Symb. Ant. vii. 174 (1912); Urb. Symb. Ant. viii. 91 (1920); Harms in Notizbl. x. 798 (1929). Pl. II, figs. 37–38.

SAN DOMINGO: AZUA: on cliffs, San Juan, between Palomino and Najaguitas, at Arroyo Limon, Cordillera Central, alt. 700 m., 1929, *Ekman H13624* (G).

Ekman 13624, which Harms has identified as *Tillandsia Tuerckheimii*, shows 2 scales at the base of each petal so that it must be transferred to *Vriesia*. I have not examined the type of the species but, except for a slight difference in the size and apex of the floral bracts, the Ekman material agrees closely with the type description.

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2. NOTES ON PLANTS OF NORTHERN BRAZIL COLLECTED BY DR. FRANCIS DROUET.

BY LYMAN B. SMITH.

(*Plate II.*)

IN 1935 in connection with his work in Brazil for the Commissão Technica de Piscicultura do Nordeste, Dr. Francis Drouet made a large collection of plants in the states of Pará and Ceará and sent the Pteridophytes and Phanerogams to the Gray Herbarium for study. He included with them plants of some other collectors, notably those of Dr. Stillman Wright from Pará and Paraiba.

These plants have yielded a number of novelties and critical notes which for the most part are recorded here. The great value of the collection, however, lies in the light which it sheds on little-known old species. This is particularly the case with the species from Ceará based on material of such collectors as Gardner and Huber. Later,

probably in some Brazilian periodical, it is planned to make a complete list of the collection. For a general account of the collecting and the region which it covered see: "Seis mezes de estudos botanicos no Nordeste" by Drouet in Bol. Inspect. Fed. Obras Contra Seccas, v. pt. 2, 37 (1936). The following are recommended as aids to a floristic study of Ceará and adjoining states: "Travels in the Interior of Brazil" by Gardner, London (1846); "Plantae Cearenses" by Huber in Bull. Herb. Boiss. ser. 2, i. 290 (1901); "Notas Botanicas (Ceará)" by Loefgren in Minist. Viação e Obras Publ. Inspect. de Obras Contra as Seccas, ser. 1, A, Publ. ii. 1 (1910) and ed. 2 (1923); and "Estudo botanico do Nordéste" (3 vols.) by Luetzelburg in Inspect. Fed. Obras Secc. Publ. n. 57, sér. I, A. (1922–3).

Sagittaria Sprucei Micheli in DC. Mon. Phan. iii. 80 (1881). Pl. II, figs. 39–40.

PARÁ: shallow water of fish pools, Museu Paraense, Belém, *Drouet 1958* (G).

The above specimen agrees closely with the original description of *Sagittaria Sprucei*, but reaches a height of 8 dm. and is correspondingly larger in all its vegetative parts as might be expected from its occurrence in a semicultivated state. So far as known this is the first record since the very imperfect type and the opportunity is taken to illustrate and clarify the species. It appears most nearly related to *S. montevidensis*, but differs from that species in its subsessile pistillate heads. Also in *S. Sprucei* the slender divergent beaks of the achenes make the heads appear bristly, while in *S. montevidensis* they are closely appressed.

Syngonanthus (§ **Dimorphocaulon**) **Drouetii**, spec. nov., radicibus simplicibus, crassiusculis, spongiosis, albis; caule perbrevi, dense albo-lanato; foliis rosulatis, divergentibus vel patentibus, linearibus, obtusis vel emarginatis, ad 4 cm. longis, paulo ultra 1 mm. latis, ad basin versus paulo ampliatis, glabris, supra planis laevibusque, subtus striatis; pedunculis per complures fasciculatis, strictis, leviter tortis, 15–22 cm. longis, 0.2 mm. diametro, tricostatis, dense albido-pilosis; vaginis folia subaequantibus, oblique fissis, glabris; capitulis applanatis, 1 cm. diametro (disco solo 1.5 mm.); bracteis involucrantibus spathulatis, obtusis, glabris, exterioribus pallide aureo-brunneis, interioribus albis, 4 mm. longis, flores multo superantibus; receptaculo villoso; floribus masculis pedicellatis: sepalis 3, spathulatis, obtusis, glabris; petalis 3, in tubum connatis; staminibus 3; floribus femineis sessilibus: sepalis liberis, late ellipticis, acutis, carinatis, 1.5 mm. longis, petala multo superantibus; petalis spathulatis, obtusis, supra medium margine connatis, longe pilosis; germine

3-cocco; appendicibus styli quam stigmata subduplo brevioribus. Pl. II, figs. 41–43.

PARÁ: sandy banks and flats 4 km. south of Vigia, *Drouet 2112* (G, TYPE).

The strikingly large inner bracts of its involucre distinguish *Syngonanthus Drouetii* from such near relatives as *S. simplex* and *S. gracilis*. In fact its habit much more closely resembles that of *S. niveus* in the Section *Eulepis* than it does that of any species in its own section.

Notylia sylvestris Smith & Harris, spec. nov., radicibus numerosis; pseudobulbis dense aggregatis, oblongis, 2 cm. longis, 1 cm. diametro; foliis ellipticis, acutis, 5–7 cm. longis, 15 mm. latis, basi contractis et breviter conduplicatis, superne plana; scapo brevissimo, pseudobulbos subaequantibus; scapi bracteis magnis, ovatis, acutis, dense imbricatis; racemo deflexo, fere 2 dm. longo, densifloro; bracteis florigeris anguste triangularibus, acuminatis, infimis ad 5 mm. longis, supremis quam pedicelli brevioribus; floribus patentibus, aureis, glabris; sepalis anguste oblongis, acutis, 5 mm. longis, lateralibus ad ⅓ connatis; petalis sepalis similibus; labello sepala subaequanti, unguiculo brevi, cum laminae basi valde carinato; lamina trulliformi, acuminata, basi rotundata, crassiuscula; columna gracili, tereti, 2 mm. longa. Figs. l–n.

CEARÁ: epiphytic, wooded bottoms of Rio Pacoty at Fortaleza-Recife Road, Municipio de Pacatuba, *Drouet 2717* (G, TYPE).

Of the species in the Flora Brasiliensis this comes closest to *N. laxa* but differs in its short-connate sepals and uniformly orange-yellow flowers.

Mimosa litigiosa Mart. Herb. Fl. Bras. 138 (1838); Benth. in Hook. Journ. Bot. iv. 361 (1842). Pl. II, figs. 44–45.

VENEZUELA: CARABOBO: Guaremales, road from Puerto Cabello to San Felipe, in forest, alt. 10–100 m., 1921, *H. Pittier 9116* (G, NY); BOLÍVAR: Cuidad Bolívar, alt. 35 m., 1929, *Holt & Gehriger 161* (G, US, NY). BRAZIL: PARÁ: near Belém (Pará), 1849, *Spruce s. n.* (NY); same, 1929, *Dahlgren & Sella 618* (NY); same, 1929, *Killip & Smith 30252* (NY); sandy coast, Ilha do Mosqueiro, near Pará, 1929, *Killip & Smith 30571* (NY); thickets west of Estrella do Norte, Municipio de Belém, *Drouet 2081* (G); CEARÁ: low sandy woods, Bairro do Tauápe, Fortaleza, *Drouet 2364* (G); PERNAMBUCO: Tapera, 1931, *Pickel 900* (G).

In his treatment of the *Mimosae* in the Flora Brasiliensis, Bentham reduced *Mimosa litigiosa* Mart. to the synonymy of *M. sensitiva* L.[1] The two are almost identical in habit, which doubtless explains his action. However, the series of specimens cited above exhibits complete constancy in the long pectinate floral bracts which completely

[1] Benth. in Mart. Fl. Bras. xv. pt. 2, 305 (1876).

conceal the buds and give the flowering heads the appearance of burs. On the other hand typical *M. sensitiva* (Pl. II, figs. 46–47) has floral bracts that are entire except for the terminal mucro and so short that the flowers usually have to be pried apart to disclose them. Compare Breyn. cent. 31, t. 16 cited by Linnaeus.

Martius failed to note the floral bracts of *M. litigiosa* but Bentham in describing the species in Hooker's Journal of Botany wrote: "bracteolis pectinato-ciliatis corollam aequantibus vel superantibus."

Helicteres heptandra, spec. nov., arbuscula, ad 3 m. alta; ramis adultis glabris, cortice atro-brunneo obtectis, apice supremo pallide stellato-tomentosis; foliis distichis, usque ad 8 mm. petiolatis, petiolo gracili, stipulis linearibus, 5 mm. longis, lamina 50–75 mm. longa, 35–45 mm. lata, late ovata vel elliptica, abrupte acuminata, basi late cordata, supra sparsissime stellato-tomentosa, subtus dense minuteque stellato-tomentosa, irregulariter vel dupliciter serrata; inflorescentia e dichasiis 1–3 bi- vel quadrifloris 2–8 mm. longe stipitatis; pedicellis 1–3 mm. longis; prophyllis linearibus, integris, 7 mm. longis; floribus erectis, androecio excepto actinomorphis; calyce subcylindrico, 18–21 mm. longo, 3.5–4.5 mm. diametro, pallide rubescenti, extus pilis stellatis et longe stipitatis vestito; lobis triangularibus, filiformi-acuminatis, 4.5 mm. longis; petalis inclusis, 14 mm. longis, limbis cuneato-spathulatis, 2.5 mm. latis; gynophoro recto, 35–40 mm. longo, gracili, minutissime pilosulo; staminibus fertilibus 7, alteris omnino abortivis; filamentis 2 mm. longis; antheris 1.5 mm. longis, staminodiis 2 mm. longis; fructo spirali, ad 24 mm. longo; folliculis dorso carinatis, longe rostratis. Pl. II, figs. 48–49.

CEARÁ: woods, Açude São Bento, Municipio de Maranguape, *H. W. Curran in herb. Drouet 2177* (G, TYPE); banks of creek, Mucuripe, Municipio de Fortaleza, *Drouet 2542* (G).

The species is distinguished at once by its seven stamens. It is unusual also in having the petals included but with well developed blades.

Clusia Drouetiana, spec. nov., arbor, 7 m. alta; ramulorum internodiis 25–30 mm. longis; foliis sessilibus, oblanceolatis, latissime acutis, basi cuneatis, 14 cm. longis, 6 cm. latis, opacis, nervis lateralibus patentibus, ex sicco utrinque cum nervo collectivo a margine 1 mm. remoto prominentibus, margine angustissime cartilagineo pallide vinaceo; panicula terminali, quam folia breviore, pauciflora; ramulis compressis; bracteolis late ovatis, 5 mm. longis, carinatis; floribus masculis solum cognitis, 55 mm. diametro; sepalis 8, late ovatis vel ellipticis, extimis 5 mm. intimis 11 mm. longis; petalis 8, obovatis,

latissime obtusis vel truncatis, 25 mm. longis, 15 mm. latis, membranaceis, aureis; receptaculo leviter convexo; synandrio carpellorum rudimentis destituto; staminibus liberis, numerosissimis, 2.5 mm. longis; thecis antherarum angustis, connectivo lato separatis, parte ¾ superiore rimula longitudinali dehiscente. Pl. II, fig. 50.

PARÁ: woods along creek, 3 km. north of São Antonio, Municipio de Vigia, *Drouet 2101* (G, TYPE).

According to the treatment in the second edition of Engler's Pflanzenfamilien[1] this species should belong to the Section *Clusiastrum*. It is unusual in a number of characters, notably the sessile vinaceous-margined leaves and the large number of sepals. The perianth looks much like the illustrations of *C. viscida* and *C. insignis* in Martius's Flora Brasiliensis[2] at first glance but the sepals are more numerous and the inner ones irregularly imbricate instead of decussate.

Jacquemontia asarifolia, spec. nov., suffruticosa, magna; ramis ad 6 dm. longis, leviter curvatis, dense fulvo-tomentosis; foliis late vel latissime ovatis, late obtusis, basi cordatis, 4 cm. longis, ad 38 mm. latis, concoloribus, utrinque dense fulvo-tomentosis, petiolo 2–4 cm. longo; pedunculis lateralibus et terminalibus, 50–65 mm. longis; cymis laxiuscule 7–13-floris; bracteolis minutissimis; pedicellis gracilibus, ad 2 mm. longis; sepalis ellipticis, valde inaequalibus, exterioribus acutis, 4 mm. longis, tomentosis, interioribus 2 truncatis, 2 mm. longis, glabris; corolla late infundibuliformi, 7 mm. longa, caerulea, lobis brevissimis, obtusis; stigma bilobo, lobis angustis; capsula ignota. Pl. II, figs. 51–52.

CEARÁ: dry rocky hillsides about Açude Cedro, Municipio de Quixada, *Drouet 2395* (G, TYPE).

Because of the welter of unorganized species in *Jacquemontia* it is impossible to assign any position in the genus to *J. asarifolia* or to the following species. Simply they do not fit any known species that an exhaustive check can bring to light.

Jacquemontia saxicola, spec. nov., verisimiliter suffruticosa; ramis volubilibus, dense fulvo-tomentosis; foliis ovatis, acutis vel acuminatis, basi cordatis, 7–10 cm. longis, 35–57 mm. latis, concoloribus, utrinque dense fulvo-tomentosis, petiolo 2–4 cm. longo; pedunculis ad 75 mm. longis; cymis densis, sine corollis 2 cm. diametro; bracteolis linearibus, quam sepala paulo brevioribus; pedicellis brevissimis; sepalis ovatis, acuminatis, tomentosis, valde inaequalibus, exterioribus ad 7 mm. longis, interioribus multo minoribus; corolla

[1] Pflanzenf. ed. 2, xxi. 200 (1925).
[2] Fl. Bras. xii. pt. 1, t. 89 (1888).

infundibuliformi, 12 mm. longa, ex sicco alba, lobis brevissimis, truncatis, apiculatis; stigma bilobo, lobis angustis; capsula ignota. Pl. II, fig. 53.

CEARÁ: dry rocky areas below Açude São Antonio das Russas, Municipio das Russas, *Drouet 2485* (G, TYPE).

Bacopa cochlearia, comb. nov. *Herpestes cochlearia* Huber in Bull. Herb. Boiss. ser. 2, i. 323 (1901). Pl. II, fig. 54.

CEARÁ: sandy flats about Lagoa do Tauápe, Bairro do Tauápe, Fortaleza, *Drouet 2285* (G).

The above specimen is practically a topotype, the type having come from: "Endroits sablonneux et humides entre Fortaleza et Bemfica."

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3. A NEW GENUS OF ERIOCAULACEAE.

By LYMAN B. SMITH.

(*Plate II.*)

Comanthera, gen. nov. Flores monoeci, trimorphi, actinomorphi. Flores steriles pedicellati: sepala petalaque libera. Flores masculi pedicellati: perigonia ad vaginam cylindricam brevissimam reducta; stamen unicum; anthera loculis 4 (thecis 2) instructa, longe comata. Flores femini sessiles: sepala petalaque libera.—Species unica.

Comanthera Linderi, spec. nov., caule perbrevi; foliis multis, dense rosulatis, patentibus vel recurvatis, linearibus, 2 cm. longis, 1–1.5 mm. latis, albido-hispidis; pedunculis compluribus, fasciculatis, gracillimis, ad 14 cm. longis, glabris; vaginis ad 15 mm. longis, oblique fissis, pilis brevibus anguste ellipsoideis refractis albis dense indutis; capitulis semiglobosis, 5 mm. diametro; bracteis involucrantibus ellipticis vel obovatis, obtusis, hyalinis vel pallide fuscis, glabris; receptaculo piloso; floribus masculis 2.5 mm. longis; florum feminorum sepalis anguste ellipticis, obtusis, hyalinis, glabris, quam petala bene longioribus; petalis linearibus, pilis longis hyalinis valde indutis; appendicibus styli simplicibus, ramos subduplo superantibus. Pl. II, figs. 55–60.

BRITISH GUIANA: in white sand, Rockstone, 1923, *D. H. Linder 40* (G, TYPE).

The sterile flowers of *Comanthera* closely resemble the flowers of *Rondonanthus*[1] in having pedicels and free petals. The staminate flowers with their single stamen and greatly reduced perianth are

[1] Herzog in Fedde, Rep. Spec. Nov. xxix. 210 (1931); Oliver in Trans. Linn. Soc. ser. 2, ii. 286, t. 49, figs. 7–14 (1884).

quite unlike anything else in the family. The pistillate flowers are sessile, unlike those of *Rondonanthus*, but closely resembling those of *Pacpalanthus*.

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4. NOTES ON SOUTH AMERICAN ORCHIDACEAE,—II.

By Lyman B. Smith,
Gray Herbarium of Harvard University
and Stuart K. Harris,
College of Liberal Arts of Boston University.

(*Figures a–k.*)

Neodryas latilabia, spec. nov., epiphytica, 22–27 cm. alta; rhizomate brevi; pseudobulbis ovatis, compressis, 25 mm. altis, 14 mm. latis, unifoliatis, vaginis foliaceis distichis obtectis; folio erecto, ligulato, apiculato, 12 cm. longo, 16 mm. lato; scapo erecto, gracili, ad 18 cm. alto, valde compresso; scapi vaginis parvis, valde remotis; panicula laxiflora, anguste ellipsoidea, 8 cm. longa; bracteis deltoideis, 1–2 mm. longis; floribus glabris; sepalis rubris, intermedio elliptico, apiculato, 5 mm. longo, carinato, lateralibus in laminam late ellipticam breviter excisam 5 mm. longam connatis; petalis orbicularibus, apiculatis, 6 mm. longis, rubris, late aurantiaco-marginatis; labello ambitu late obcordato, 6 mm. longo, 5.5 mm. lato, medio callo 5-fido ornato, unguiculo late cuneato sed basi truncato, limbo deflexo, reniformi; columna 2.5 mm. longa, subcylindrica, basi paulo attenuata et in pedem brevem producta; ovario cum pedicello ad 12 mm. longo. Figs. a–c.

BOLIVIA: Cochabamba: prov. Ayopaya, Sailapata, alt. 2700 m., *Cardenas 3296* (G, type; Ames).

This species is distinguished from others in the genus by its very broad lip borne on a distinct foot at the base of the column.

Neodryas reniformis, spec. nov., epiphytica et terrestris, 26–28 cm. alta; rhizomate ultra 4 cm. longo; pseudobulbis anguste ellipticis, 45 mm. altis, 13 mm. latis, vaginis foliaceis distichis obtectis; folio ligulato, subobtuso, 18 cm. longo, 17 mm. lato; scapo erecto, gracili, valde compresso; scapi vaginis parvis, valde remotis; panicula laxa, subsecundiflora, pauciramosa, 8–9 cm. longa; bracteis deltoideis, 2 mm. longis; floribus glabris; sepalis rubris, intermedio elliptico, apiculato, 6 mm. longo, carinato, lateralibus in laminam suborbicularem breviter excisam 6 mm. longam connatis; petalis orbicularibus, apiculatis, 5 mm. longis, aureis; labello 4.5 mm. longo, 5 mm. lato, e basi usque ad medium callo 4-fido ornato, unguiculo subquadrato,

latiori ac longo, limbo deflexo, subreniformi, retuso; columna 3 mm. longa, crasse claviformi; ovario cum pedicello ad 15 mm. longo. Figs. d–g.

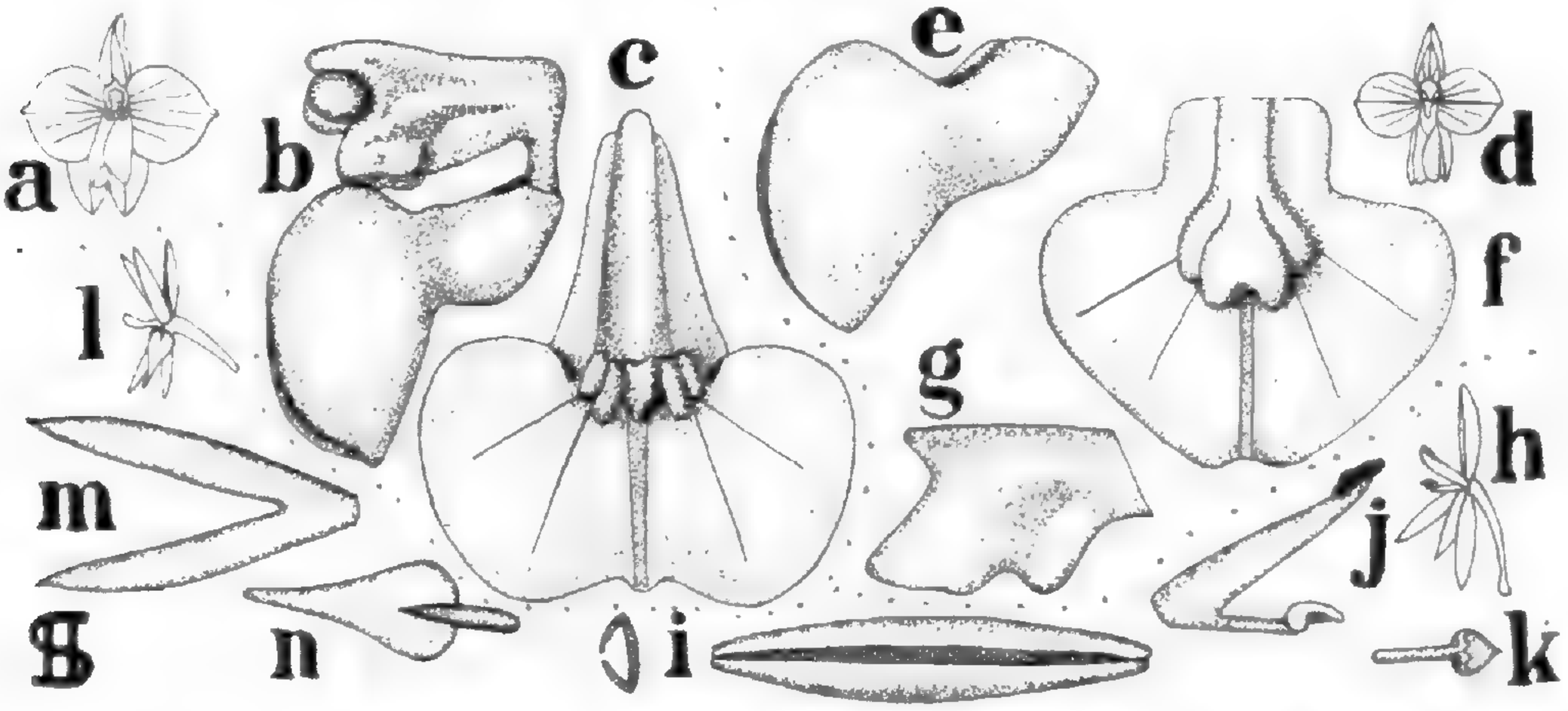
BOLIVIA: La Paz: Nor Yungas, Unduavi, alt. 3200 m., 1910, *Buchtien 159* (G, TYPE).

The outstanding characters of this species are the very broad claw of its lip and the short ventrally produced column.

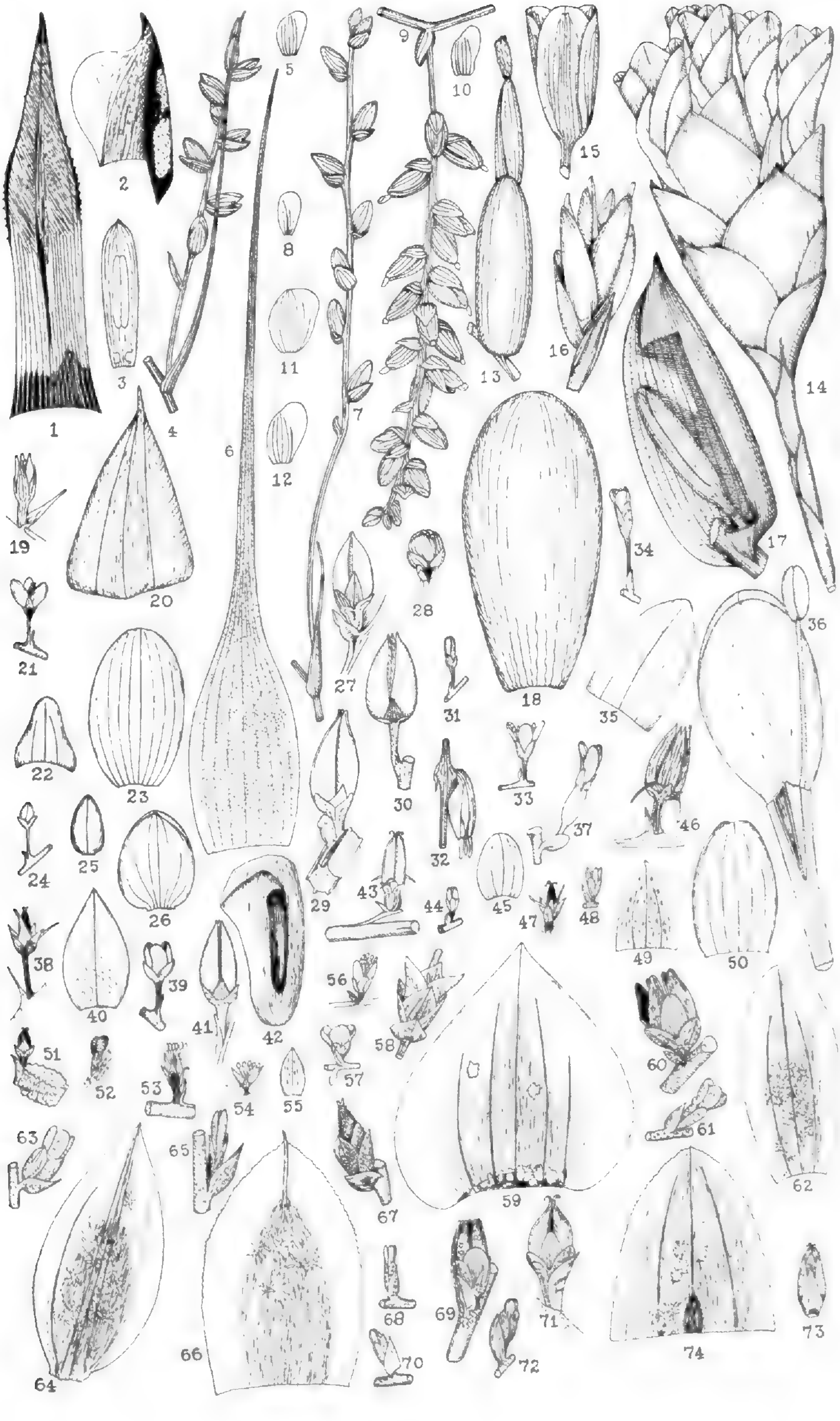
Notylia Amesii, spec. nov., epiphyta; folio ligulato, obtuso, 14 cm. longo, 35 mm. lato, plano; scapo gracili, 6 cm. longo; scapi vaginis parvis, ovatis, remotis; racemo recto, 3 dm. longo, dense multifloro; bracteis deltoideis, 1–4 mm. longis; floribus reflexis, glabris, viridibus et albis; sepalis patentibus, intermedio oblongo-elliptico, obtuso, curvato, obtuse carinato, 6 mm. longo, lateralibus in laminam ellipticam bicarinatam breve excisam 6 mm. longam connatis; petalis deflexis, anguste ellipticis, acutis, 5.5 mm. longis; labello supero, unguiculo graciliter subcylindrico, lateraliter compresso, 1.2 mm. longo, limbo late cordato, acuto, 0.8 mm. longo, lateris erectis, apice decurvato; columna cylindrica, gracili, 3 mm. longa; ovario cum pedicello 7 mm. longo. Figs. h–k.

BRITISH GUIANA: between the Demerara and Berbice Rivers, lat. about 5° 50′ N., 1922, *Cruz 1674* (G, TYPE; NY). PERU: Loreto: Mishuyacu, near Iquitos, alt. 100 m., 1930, *Klug 999* (Ames).

The elongate claw and small cordate blade of the lip readily distinguish this species from others of the genus.



NEODRYAS LATILABIA: FIG. a, flower × 1, FIG. b, lateral view of lip and column × 5, FIG. c, extended lip × 5.
NEODRYAS RENIFORMIS: FIG. d, flower × 1, FIG. e, lateral view of lip × 5, FIG. f, extended lip × 5, FIG. g, column × 5.
NOTYLIA AMESII: FIG. h, flower × 1, FIG. i, paired sepals × 5, FIG. j, lateral view of column and lip × 5, FIG. k, extended lip × 5.
NOTYLIA SYLVESTRIS: FIG. l, flower × 1, FIG. m, paired sepals × 5, FIG. n, lip × 5.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Explanation of Plates.

Plate I.

Fig. 1. Aechmea multiflora L. B. Smith (*Curran 297*), floral bract × 1.
2. Same, inside view of sepal × 1.
3. Same, petal and stamen × 1.
4. Catopsis delicatula L. B. Smith (*Rojas 445*), primary bract and spike × 1.
5. Same, expanded sepal × 1.
6. Catopsis Lundelliana L. B. Smith (*Lundell 6256*), inner leaf × 1.
7. Same, primary bract and spike × 1.
8. Same, sepal × 1.
9. Catopsis montana L. B. Smith (*Ekman 16555*), upper primary bract and branch × 1.
10. Same, sepal × 1.
11. Catopsis sessiliflora (R. & P.) Mez (*Shafer 8638*), sepal × 1.
12. Catopsis nitida (Hook.) Gris. (*Shafer 8098*), sepal × 1.
13. Guzmania guatemalensis L. B. Smith (*H. Johnson 391*), primary bract and flower × 1.
14. Guzmania Sneidernii L. B. Smith (*Sneidern 695*), inflorescence and upper scape × ½.
15. Guzmania stenostachya L. B. Smith (*Standley & Valerio 50174*), calyx × 1.
16. Guzmania subcorymbosa L. B. Smith (*Killip 5059*), spike from above × 1.
17. Guzmania Wrightii L. B. Smith (*Wright 1523 e. p.*), floral bract cut away on one side to show flower × ½.
18. Same, expanded sepal × 1.
19. Hechtia dichroantha J. D. Smith (*O. F. Cook*), floral bract and ♂ flower × 1.
20. Same, sepal × 5.
21. Hechtia Purpusii Brandegee (*Purpus 8420*), floral bract and ♀ flower × 1.
22. Same, sepal × 5.
23. Same, petal × 5.
24. Hechtia lindmanioides L. B. Smith (*Liebmann 7951*), floral bract and ♀ flower × 1.
25. Same, sepal × 5.
26. Same, petal × 5.
27. Hechtia podantha Mez (*Pringle 8578*), floral bract and mature ♀ flower × 1.
28. Same, floral bract and ♂ flower × 1.
29. Hechtia subalata L. B. Smith (*Rose 3467*), section of rhachis, floral bract and mature ♀ flower × 1.
30. Hechtia pedicellata Watson (*Pringle 2970*), floral bract and ♀ flower × 1.
31. Same (*Pringle 3934*), floral bract and ♂ flower × 1.
32. Hechtia guatemalensis Mez (*Deam 6274*), floral bract and capsule showing remnants of perianth near apex × 1.
33. Same (*H. Pittier 137*), floral bract and ♂ flower × 1.
34. Hechtia epigyna Harms (*Rozynski 741*), floral bract and ♂ flower × 1.
35. Same, sepal × 5.
36. Same, section of pedicel, petal and stamen × 5.
37. Same (*Viereck 81*), floral bract and ♀ flower × 1.
38. Hechtia montana Brandegee (*Brandegee*), floral bract and ♀ flower × 1.
39. Same, floral bract and ♂ flower × 1.

40. Same, ♂ sepal × 5.
41. HECHTIA ROSEANA L. B. Smith (*Rose, Painter & Rose 9970*), floral bract and ♀ flower × 1.
42. Same, seed × 5.
43. HECHTIA GLABRA Brandegee (*Purpus 8506*), floral bract and mature ♀ flower × 1.
44. Same (*Purpus 8522*), floral bract and ♂ flower × 1.
45. Same, ♂ sepal × 5.
46. HECHTIA RETICULATA L. B. Smith (*Palmer 1352 in 1891*), floral bract and mature ♀ flower × 1.
47. HECHTIA STENOPETALA Kl. (*Pringle 4637*), floral bract and ♀ flower × 1.
48. Same, floral bract and ♂ flower × 1.
49. Same, ♂ sepal × 5.
50. Same, ♂ petal × 5.
51. HECHTIA GALEOTTII Mez (*Pringle 6703*), section of rhachis, floral bract and ♀ flower × 1.
52. Same, floral bract and ♂ flower × 1.
53. HECHTIA SUAVEOLENS E. Morr. (*Hort. Bot. Lond.*), floral bract and ♂ flower × 1.
54. HECHTIA REFLEXA L. B. Smith (*Langlassé 238*), floral bract and ♂ flower × 1.
55. Same, sepal × 5.
56. HECHTIA CONZATTIANA L. B. Smith (*Conzatti & Gómez 3501*), floral bract and ♂ flower × 1.
57. HECHTIA SPHAEROBLASTA Robinson (*Nelson 2044*), floral bract and ♂ flower × 1.
58. HECHTIA TEXENSIS Watson (*Havard 85*), floral bract and ♀ flower × 1.
59. Same, sepal × 5.
60. HECHTIA MEXICANA L. B. Smith (*Maury 6593*), floral bract and ♀ flower × 1.
61. HECHTIA ELLIPTICA L. B. Smith (*Palmer 205 in 1898*), floral bract and ♂ flower × 1.
62. Same, sepal × 5.
63. HECHTIA SCARIOSA L. B. Smith (*Pringle 72*), floral bract and ♂ flower × 1.
64. Same, sepal × 5.
65. HECHTIA ZACATECAE L. B. Smith (*Kirkwood 5*), floral bract and ♂ flower × 1.
66. Same, sepal × 5.
67. HECHTIA CAPITULIGERA Mez (*Parry & Palmer 877*), floral bract and ♀ flower × 1.
68. Same, floral bract and ♂ flower × 1.
69. HECHTIA SCHOTTII Bak. (*Gaumer 23839*), floral bract and ♀ flower × 1.
70. Same, floral bract and ♂ flower × 1.
71. HECHTIA CONFUSA L. B. Smith (*Pringle 7479*), floral bract and ♀ flower × 1.
72. Same, floral bract and ♂ flower × 1.
73. HECHTIA PITCAIRNIAEFOLIA (Karw. & Zucc.) L. B. Smith (*Hort. Monac.*), floral bract and ♀ flower × 1.
74. Same, sepal × 5.

PLATE II.

Fig. 1. HECHTIA GAMOPETALA Mez (*Ehrenberg 1001 e. p.*), floral bract and ♂ flower × 1.
2. Same, sepal × 5.
3. Same, inner leaf × 1.

4. PITCAIRNIA AMBLYOSPERMA L. B. Smith (*Salazar*), floral bract and flower × 1.
5. Same, expanded sepal × 1.
6. Same, base of petal × 2.
7. Same, ovule much enlarged.
8. PITCAIRNIA CALATHEOIDES L. B. Smith (*Klug 4237*), leaf × 1/10.
9. Same, floral bract and flower × 1.
10. Same, sepal × 1.
11. Same, petal × 1.
12. PITCAIRNIA CUBENSIS (Mez) L. B. Smith (*Wright 689*), sepal × 1.
13. Same, seed × 5.
14. PITCAIRNIA CYLINDROSTACHYA L. B. Smith (*Pringle 3884*), floral bract and flower × 1.
15. Same, anterior sepal × 1.
16. PITCAIRNIA OAXACANA L. B. Smith (*Reko 3383*), floral bract and flower × 1.
17. Same, base of petal × 2.
18. PITCAIRNIA OBLANCEOLATA L. B. Smith (*Brenes 13512*), sepal × 1.
19. PITCAIRNIA PTEROPODA L. B. Smith (*Holway 3619*), floral bracts and flowers × 1.
20. PITCAIRNIA PURPUSII L. B. Smith (*Purpus 295*), upper floral bracts and flower × 1.
21. Same, sepal × 1.
22. PITCAIRNIA ROSEANA L. B. Smith (*Rose 2325*), floral bract and flower × 1.
23. Same, sepal × 1.
24. PITCAIRNIA SAMUELSSONII L. B. Smith (*Ekman H7125*), young sepal × 1.
25. Same, old sepal × 1.
26. Same, ovule much enlarged.
27. PITCAIRNIA SYLVESTRIS L. B. Smith (*Sneidern 939*), floral bract and flower × 1.
28. THECOPHYLLUM ACUMINATUM L. B. Smith (*Standley 38276*), floral bract and flower × 1.
29. Same, expanded sepal × 1.
30. THECOPHYLLUM STANDLEYI L. B. Smith (*Standley & Valerio 43573*), floral bract and small flower × 1.
31. Same, expanded sepal × 1.
32. TILLANDSIA MAURYANA L. B. Smith (*Maury 5747*), posterior sepals × 1.
33. Same, petal and stamen × 1.
34. TILLANDSIA MELANOCRATER L. B. Smith (*Cooper 261*), inflorescence × ½.
35. TILLANDSIA MEXIAE L. B. Smith (*Mexia 1838*), primary bract and spike × ½.
36. Same, posterior sepals × 1.
37. VRIESIA TUERCKHEIMII (Mez) L. B. Smith (*Ekman H13624*), floral bracts and flowers × 1.
38. Same, base of petal and stamen × 2.
39. SAGITTARIA SPRUCEI Micheli (*Drouet 1958*), fruiting heads × 1.
40. Same, achene × 5.
41. SYNGONANTHUS DROUETII L. B. Smith (*Drouet 2112*), head × 1.
42. Same, ♂ flower × 5.
43. Same, ♀ flower × 5.
44. MIMOSA LITIGIOSA Mart. (*Drouet 2364*), head × 1.
45. Same, floral bract and flower × 10.
46. MIMOSA SENSITIVA L. (*Herb. Martii 1079*), head × 1.
47. Same, floral bract and flower × 10.
48. HELICTERES HEPTANDRA L. B. Smith (*Drouet 2542*), petal × 1.

49. Same, summit of gynophore, stamens and pistil × 2.
50. Clusia Drouetiana L. B. Smith (*Drouet 2101*), flower × ½.
51. Jacquemontia asarifolia L. B. Smith (*Drouet 2395*), leaf × ½.
52. Same, calyx × 2.
53. Jacquemontia saxicola L. B. Smith (*Drouet 2485*), calyx × 2.
54. Bacopa cochlearia (Huber) L. B. Smith (*Drouet 2285*), flower × 1.
55. Comanthera Linderi L. B. Smith (*Linder 40*), head × 1.
56. Same, ♀ sepal × 10.
57. Same, ♀ petal × 10.
58. Same, pistil × 10.
59. Same, sterile floret × 10.
60. Same, ♂ flower × 10.

INDEX

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

CXVIII

Reprinted from Rhodora, Vol. 39, August, 1937.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

CXVIII

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.

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-

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.

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 470–473)

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).

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 as 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 south-western 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).

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.

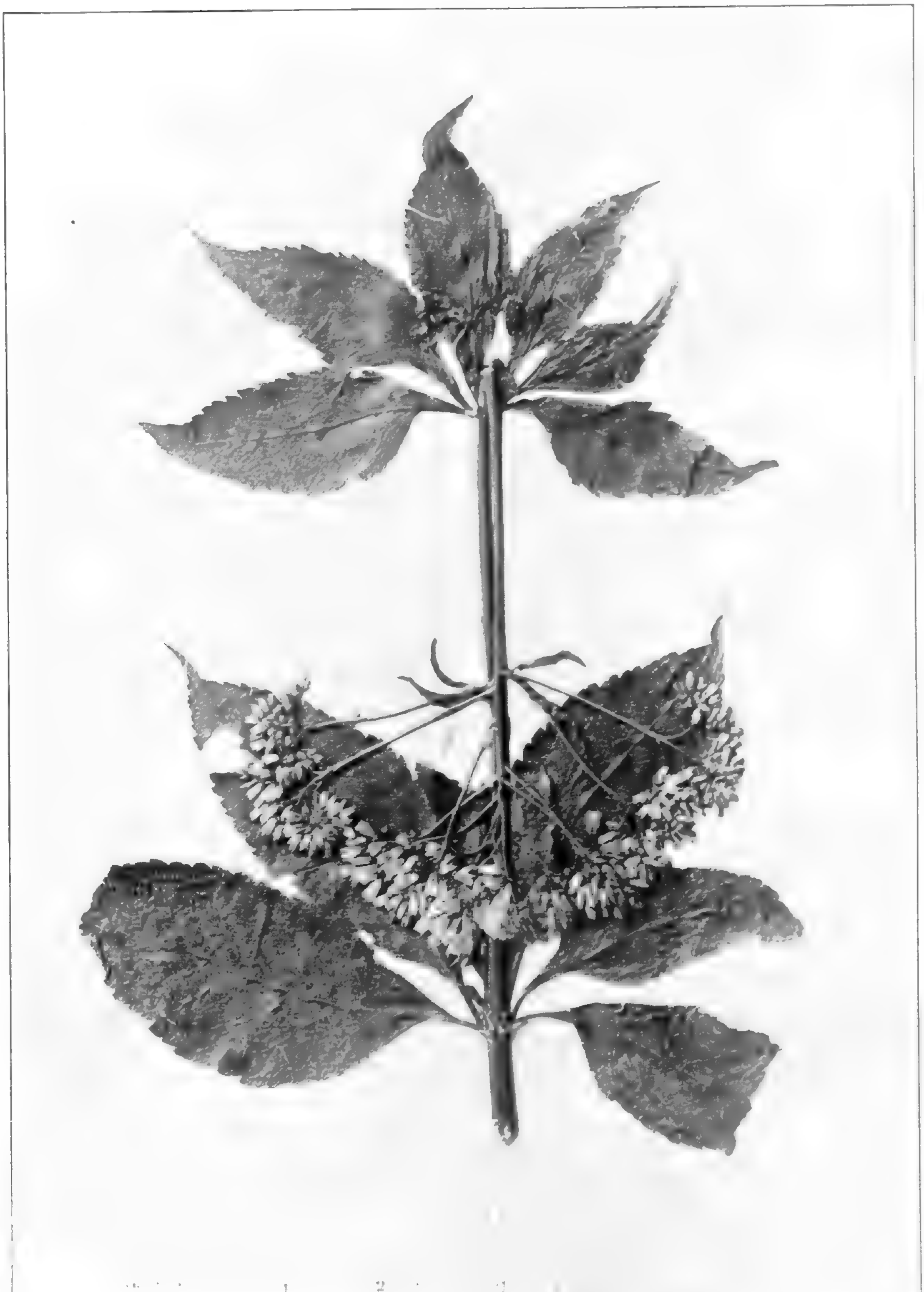
Volume 39, no. 463, including pages 233–276 and plates 460–465, was issued 14 July, 1937.

INDEX

New scientific names are printed in full-face type

TYPE OF EUPATORIUM PURPUREUM IN HERBARIUM OF LINNAEUS

STERILE SPECIMEN OF EUPATORIUM PURPUREUM IN HERBARIUM OF LINNAEUS



TYPE OF EUPATORIUM MACULATUM IN HERBARIUM OF LINNAEUS

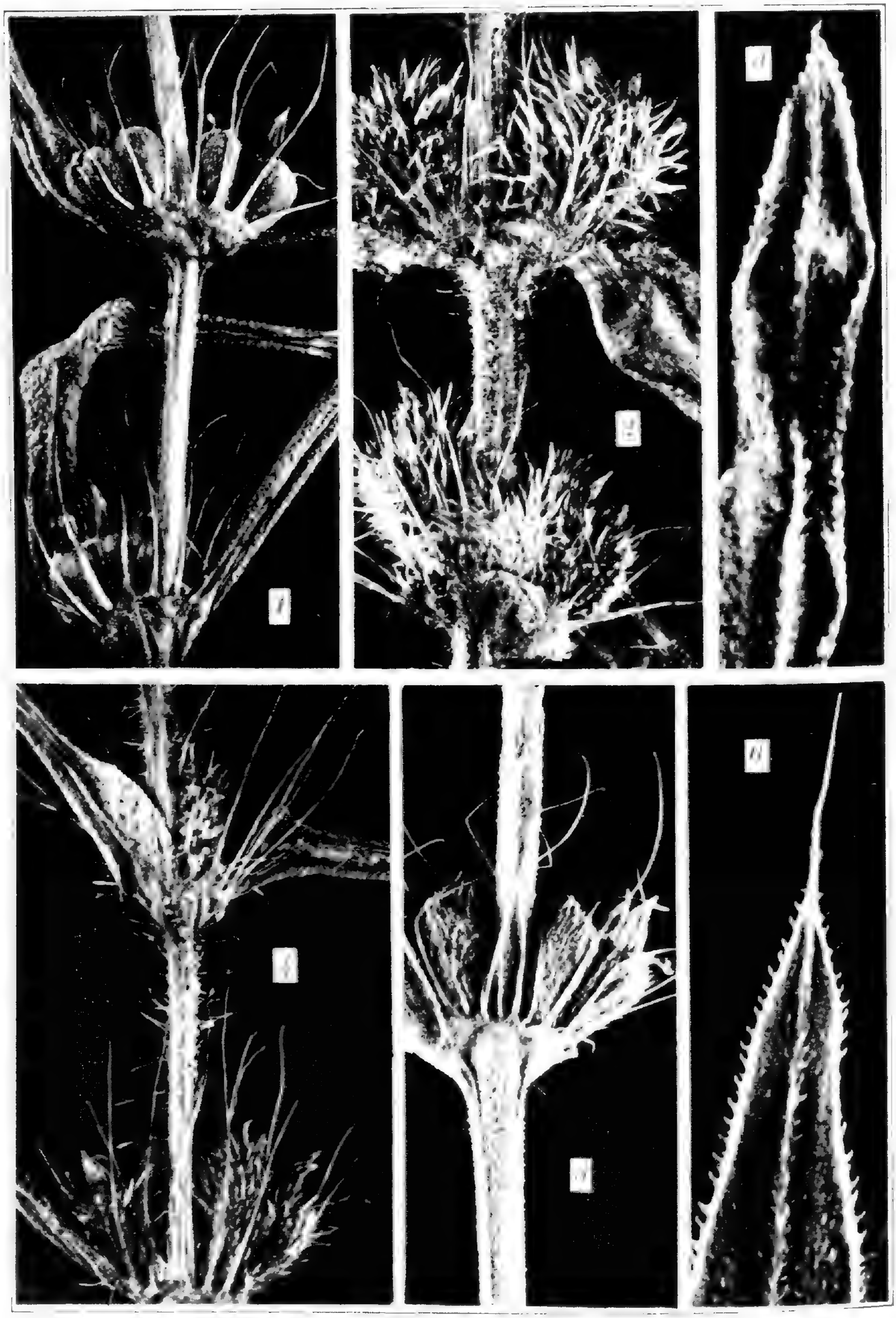


Photo E. C. Ogden

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.

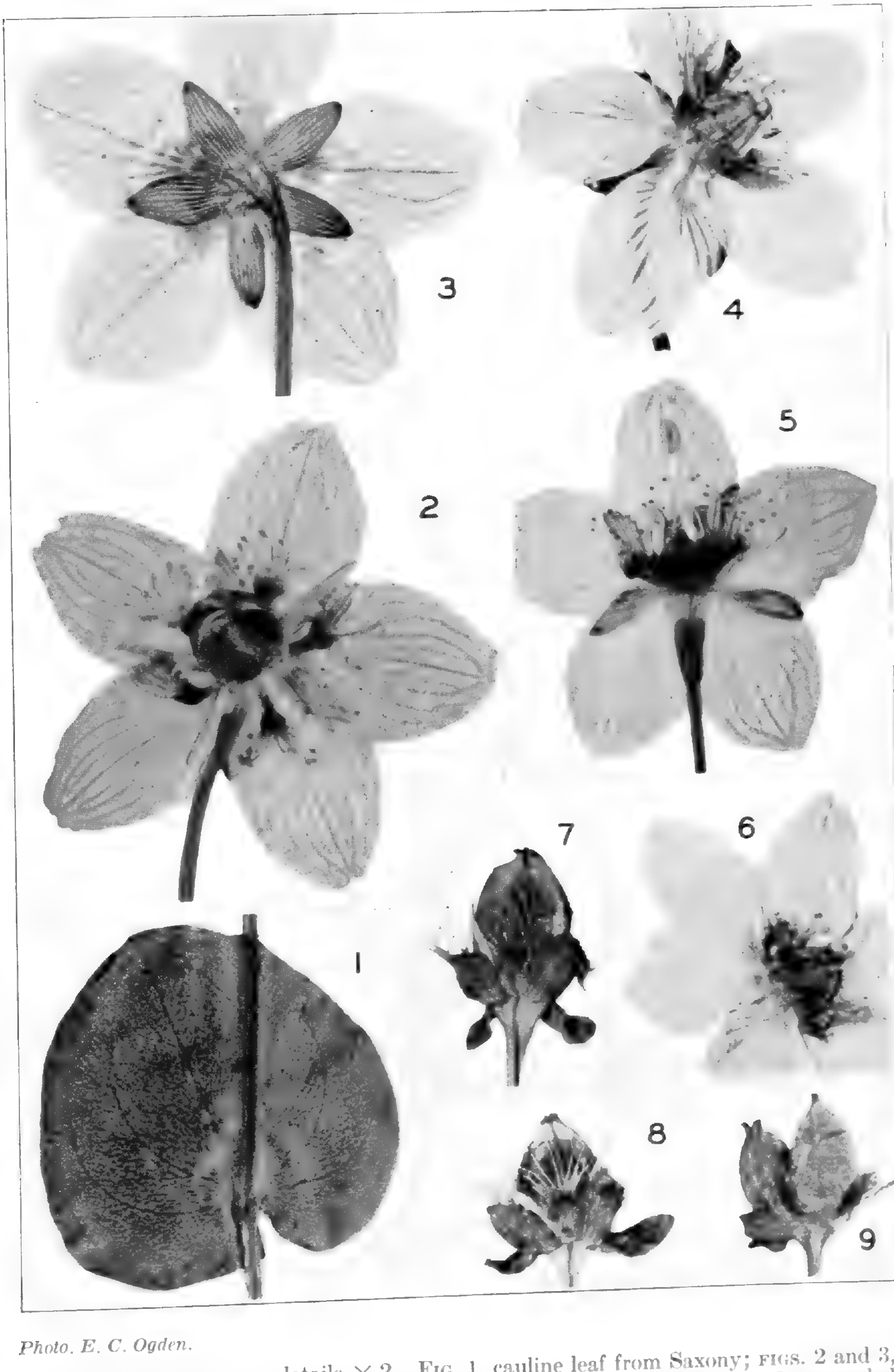


Photo. E. C. Ogden.

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.

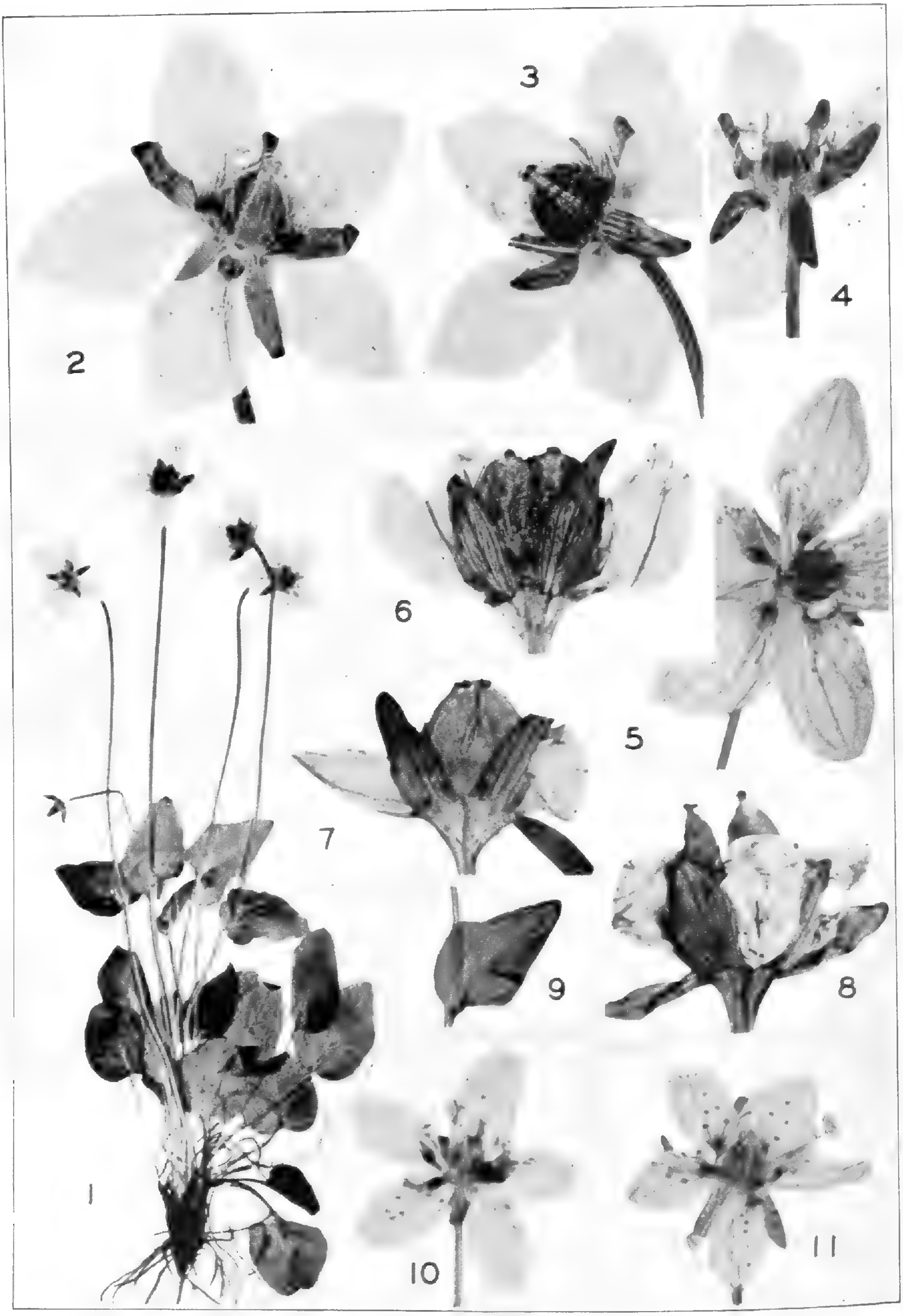


Photo. E. C. Ogden.

PARNASSIA PALUSTRIS, vars., habit × 1/2, 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.

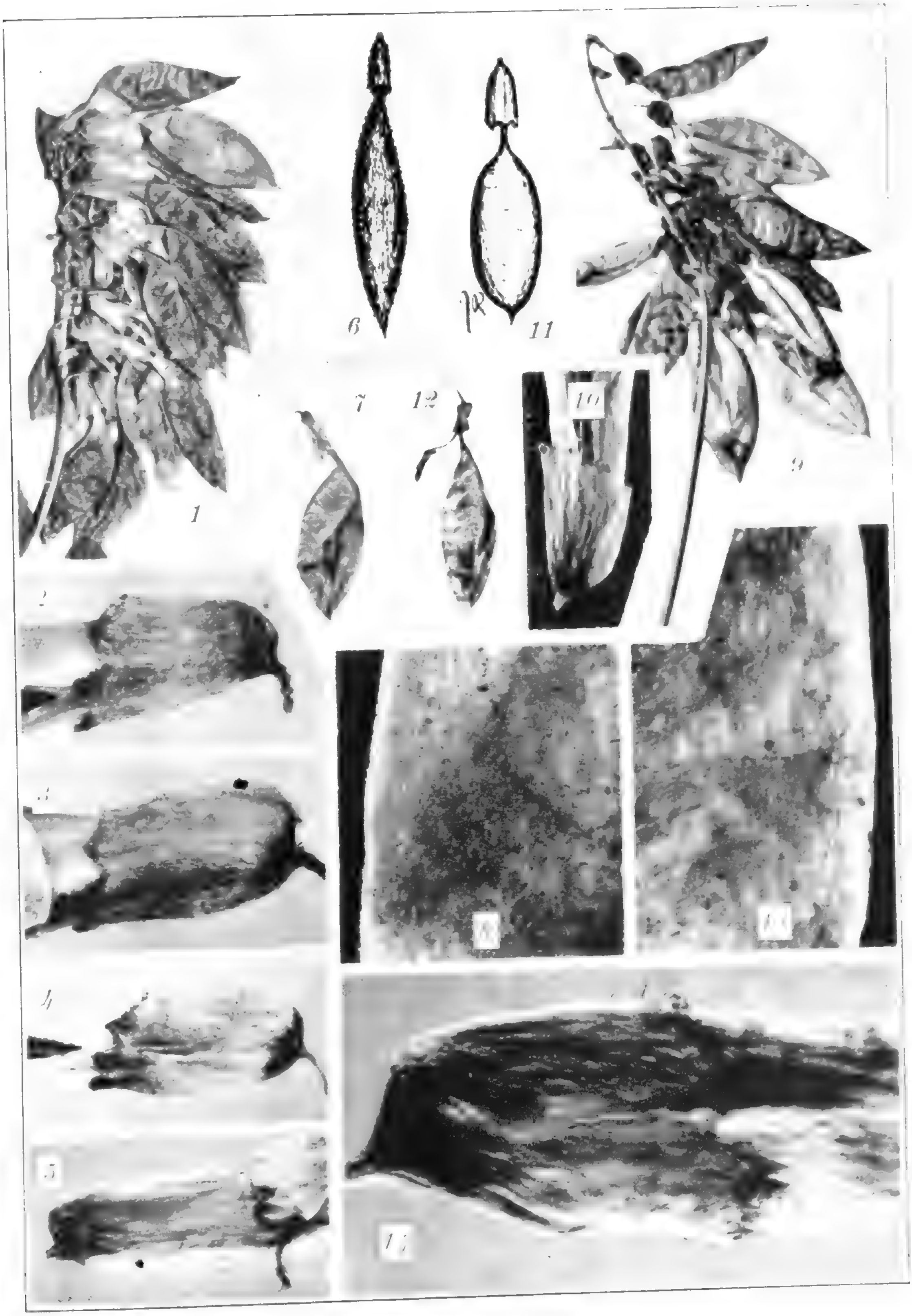


Photo E. C. Ogden.

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.

DODECATHEON MEADIA, forma STRICKLERAE.

CONTRIBUTIONS FROM THE GRAY HERBARIUM.
OF HARVARD UNIVERSITY.

No. CXIX.

A CYTO-TAXONOMIC SURVEY OF THE NORTH AMERICAN SPECIES OF IRIS.

By Robert C. Foster.

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Introduction.

In no sense is this study intended for a monographic treatment of the North American species of *Iris*. Beginning as a purely cytological study, it has developed, in addition, into an investigation of the taxonomy and distribution of these species. From the outset, it was clear that equal emphasis and, hence, equal treatment could not be given all the groups studied. Aside from the apparent proliferation of species in Louisiana and, to a lesser degree, in Florida, the chief taxonomic problems seemed to be those involving the two western subsections, the *Californicae* and the *Longipetalae*, groups confined to this continent. Available material of these latter groups was more plentiful, and better-preserved, than that of the southern and eastern species, with the result that the emphasis has been placed upon the western American representatives of the genus. Their treatment here is not final; it is a necessary survey, preliminary to a more extended monographic study to be built upon this foundation.

Since the remaining species of this continent have been included for completeness, without the intensive study given to their western relatives, there has been a tendency to accept the status quo with regard to them. In justice, it must be added that this laissez faire policy is in part due to the inadequate collections of these species. Nevertheless, even in these groups, certain changes have been made, involving nomenclature, but not status, in some cases, and status as well as nomenclature in others. Some of these changes in status are based on the conviction that in these instances specific lines have been drawn with unwarrantable narrowness, without involving fundamental structural differences. Others have been due to the fact that the cytological evidence, entirely independent of such distributional studies as those of Viosca,[1] independent, even, of taxonomic study, indicates a hybrid origin for most, if not all, of the "species" described from the Louisiana region in the last fifteen years.

[1] See Bull. Amer. Iris Soc. no. 57: 3–56 (1935).

What are the "fundamental structural differences" upon which species have been separated in the present study? Capsules, seeds, the nature of the stigmatic lip, the type and length of the perianth-tube, and the character of the spathes have been the principal structures studied. Stems, leaves, rhizomes, and color as a thing in itself have been regarded as of less value, although rhizome-differences can be of value in separating larger units than species. At the same time, no character which remains relatively constant in a group has been ignored. As a result, in certain cases, the nature of the style-crests, their length relative to the style-branches, the length of the anther relative to the filament, and the length of the pedicel at anthesis have all been found useful. The final test, particularly in the western species, where necessity has occasionally forced drawing the lines of separation rather finely, has been that of geography. In nearly every case examined, groups segregated on the basis of morphological characteristics were found to occupy rather definite, often compact, geographic zones. I should like, however, to emphasize the fact that the geographic test was never applied until after all determinations of specimens had been made, and that no determination was ever changed as a result of the geographic test.

In view of the fact that this is not a monographic study of all or part of the genus, it has not seemed necessary, or even desirable, to include an historical sketch. A succinct account, to 1913, can be found in Dykes's monograph, The Genus Iris, a work based almost as much on a study of living plants as on study of herbarium specimens. To place the American species in their proper perspective involves a brief survey of the genus as a whole. At certain places, disagreement with Dykes's treatment is suggested, but any detailed discussion of these points would be out of place here.

This large and cosmopolitan genus is found widespread throughout the northern hemisphere; no certain record is known of the natural occurrence of any species of Iris south of the equator. Conservatively speaking, it has at least one hundred and fifty members, although recent work on the Central European and Near Eastern species has resulted in a considerable increase in number. The genus can be divided into two major groups: those possessing rhizomatous rootstocks, and those possessing bulbous rootstocks. The latter group was for many years split off from *Iris* but was reunited by Baker[1] and Dykes.[2] I am inclined increasingly to believe the older view correct,

[1] See Baker, Handbook of the Irideae (1892).
[2] See Dykes, The Genus Iris (1913); Handbook of Garden Irises (1924).

not only on morphological but also on physiological grounds.[1] The bulbous species are grouped in three sections, which are found around the Mediterranean, in the Near East, and in the Middle East in Bokhara, Turkestan, and Afghanistan. None of the sections is large, and the ranges of the groups, or of the species within the groups, are somewhat discontinuous. The chromosome numbers are often low, and this, taken in conjunction with the fact that intersectional hybrids do not seem to be known and even intrasectional hybrids are difficult to obtain, argues for a considerable age for most of these groups. If they are truly Irises, the stock from which they have sprung must have been separated for a long time from the stock which ultimately produced the assemblage of rhizomatous Irises. In this consideration of the bulbous Irises I have not included *I. Sisyrinchium* L., which is neither an *Iris* nor a *Moraea*, belonging properly in *Gynandriris* Parl.

A group of two closely allied species from Yunnan, Siam, and Nepal is distinguished from the true rhizomatous series as section *Nepalenses*, because it possesses a tuberous rootstock, not unlike that of *Hemerocallis*.

The rhizomatous Irises, constituting more than half of the genus, are divided into seven sections, most of which are small and found in relatively small areas. Section *Pogoniris*, which contains most of the garden Irises, is fairly large and widely distributed in the Old World. From Portugal it extends eastward to Kashmir, northward into Austria and Hungary, and southward into Mediterranean Africa. Within it, certain subgroups are to be distinguished, whose morphological differences are accompanied by chromosomal differences.

Of the rhizomatous series, the largest and most widespread group is section *Apogon*, whose members lack the multicellular beard on the sepals, characteristic of section *Pogoniris*. So varied are the members of this section that no less than seventeen subsections can be distinguished, the distinctions being based upon vegetative, as well as on floral, characters. It is the only section with representatives in Europe, Asia, Africa, and North America. With the exception of two species, all our North American Irises belong to this section. The two exceptions are members of the small section *Evansia*, distinguished by the fimbriate crest on the sepals. Aside from these two species in eastern North America, the remainder of the Evansias are found in eastern Asia. Seven subsections of section *Apogon* are

[1] See Carles in Bull. Soc. Bot. France lxxxi. 761–765 (1934); Rev. Gen. Bot. xlvii. 5–22, 87–95, 144–159, 215–229, 294–307, 363–377 (1935).

found on this continent, and of these, only one, *Tripetalae*, is found elsewhere.

A detailed account of procedure is unnecessary. Sections of root-tips were prepared by the usual paraffin technique, utilizing various fixatives and stains. Benda's modification of Flemming's solution and crystal violet stain were found to be the best, in spite of an unfortunate tendency of the stain to fade. Drawings of chromosomes were made on two different Zeiss microscopes, at different magnifications.

In the case of large groups, the technical treatment of each species has usually been followed by some discussion, but the members of smaller groups have usually been treated in a general discussion of the subsection in question.

No review of cyto-taxonomy has been included here, although numerous papers were read for this purpose. Most of them contain routine determinations of chromosome numbers, with an attempt to arrange the counts in accordance with the prevailing classification of the group being investigated. Only seldom has any real taxonomic work been done by the cytologist. There are a few outstanding papers in cyto-taxonomy, such as the work of Bruun on *Primula*,[1] Clausen on *Viola*,[2] Manton on the *Cruciferae*,[3] and such cyto-genetic studies as those of Müntzing on *Galeopsis*,[4] and Babcock and Navashin on *Crepis*[5] have a marked taxonomic background. Simonet's work on *Iris*[6] is sometimes marked by less consideration of taxonomy than of cytology. For an excellent survey of cyto-taxonomy, reference may be made to Bruun's study of *Primula*.

ACKNOWLEDGMENTS.

Begun as a cytological study, this aspect of the work has been done under the supervision of Professor Karl Sax. The taxonomic aspect has been done under the guidance of Professor M. L. Fernald. To both, I should like to express my appreciation of their unfailing kindness and generous helpfulness. To Mr. C. A. Weatherby, Dr. L. B. Smith, Miss R. D. Sanderson, and Miss M. W. Stone, of the Gray Herbarium staff, I should like to indicate my gratitude for their unstinted assistance to a cytologist astray in taxonomic fields. For

[1] See Bruun in Symb. Bot. Upsal. i. 1–329 (1932).
[2] See Clausen in Ann. Bot. xli. 677–714 (1927); Ann. Bot. xliii. 741–764 (1929).
[3] See Manton in Ann. Bot. xlvi. 509–556 (1932).
[4] See Müntzing in Hereditas xiii. 185–341 (1930); Hereditas xiv. 153–172 (1930).
[5] See Babcock and Navashin in Bibliog. Genet. vi. 1–90 (1930).
[6] See Simonet in Bull. Biol. France et Belg. lxvi. 255–444 (1932); Ann. Sc. Nat., Bot. (ser. 10) xvi. 228–383 (1934).

numerous helpful suggestions, living plants, and permission to use unpublished material, I am under considerable obligations to Dr. Edgar Anderson, of the Missouri Botanical Garden.

Material of living plants was secured from various sources, but in particular I am indebted to Dr. John K. Small, of the New York Botanical Garden, who on two occasions made generous donations of the forms discovered by him in Louisiana. Thanks are due also to Mrs. Wheeler H. Peckham, through whom these gifts from Dr. Small were sent. Other material was secured from the *Iris* garden at Connecticut College, and to Dr. G. S. Avery, Jr. I am grateful for permission to make extensive collections of root-tips.

Herbarium material has been seen from the following sources: Gray Herbarium (G); New England Botanical Club (NE); New York Botanical Garden (NY); United States National Herbarium (US); Missouri Botanical Garden (MBG); Rocky Mountain Herbarium of the University of Wyoming (RM); California Academy of Sciences (CA); Willamette University (W); University of Oregon (O); Mr. J. W. Thompson, of Seattle, Washington (JWT). To all who have so generously lent material, I am much indebted.

The photographs for the plates have been made by Mr. E. C. Ogden.

Section Evansia.

A small group in eastern Asia, with two representatives in eastern North America, this section is distinguished by its broad succulent leaves, and, in particular, by the fimbriate or laciniate crest upon the sepal-blade.

Iris cristata Aiton. Rhizome very slender, with long torulose stolons bearing dark brown remnant sheaths at the nodes, and, along the stolons producing the living lateral shoots, a series of broadly lanceolate-ovate, over-lapping, scarious sheathing leaves with dark brown mid-ribs; true leaves 4–5 in a fan, light green, sometimes yellowish green, broadly ensiform, with a few subprominent nerves, 3–25 cm. long, 0.5–2.5 cm. wide at flowering time, later growing to 40 cm. long in some instances, with 4–5 nerves becoming more prominent; stems short, 2.5–4.5 cm. long, bearing 2–3 sheathing leaves, free for most of their length; spathes large, green, broadly lanceolate, acuminate, carinate, somewhat inflated, opposite, the outer shorter than the inner, to 7 cm. long by 1 cm. broad, 1–2-flowered; pedicel 0.7–1.8 cm. long, very slender; ovary 6–9 mm. long, oval; perianth-tube filiform, widening gradually near the top, 4.5–6.8 cm. long, longer than the sepals, and usually much exceeding the spathes in length; sepals obovate to spatulate, bluntly rounded at the apex, sometimes

emarginate or undulate, without marked constriction between blade and claw, to 4 cm. long, 1.5 cm. wide, lilac-purple on the blade, with a whitish "signal" patch at the end of the three-ridged, toothed, orange-white central crest ascending the claw, the white mark streaked and bordered with a darker purple than the rest of the blade; petals somewhat shorter, obovate-oblanceolate, possibly with a more definite claw than the sepals, lilac-purple; style-arms about 1.5 cm. long, pale lilac; style-crests about 7 mm. long, semi-ovate, crenate; stigma entire, rounded-oblong; filaments ± 6 mm. long; anthers ± 7 mm. long; capsule quite small, oval, triangular in cross-section, 1.2 cm. long, hidden in the spathes, said to dehisce completely while still green; seeds brown, oval, with a gelatinous aril coiled around them.—Hort. Kew. i. 70 (1789); Smith, Spicil. Bot. 12, t. 13 (1791–92); Curtis in Bot. Mag. xii. t. 412 (1798); Michaux, Flor. Bor.-Amer. i. 22 (1803); Persoon, Synops. Pl. i. 50 (1805); Redouté, Lil. vii. t. 376 (1813); Elliott, Sk. Bot. S. Car. & Ga. i. 44 (1816); Pursh, Flor. Amer. Sept. i. 29 (1816); Ker, Irid. Gen. 55 (1827); Baker in Journ. Linn. Soc., Bot. xvi. 143 (1877); Baker, Handbk. Irid. 23 (1892); Britton and Brown, Illust. Fl. (ed. 1) i. 451 (1896); Robinson and Fernald in Gray, Man. (ed. 7) 301 (1908); Dykes, Genus Iris 106 (1913); Small, Flor. Se. U. S. (ed. 2) 305 (1913); Dykes, Handbk. Gard. Ir. 84 (1924); Small in Addisonia ix. 63, pl. 320 (1924); Waller in Ohio Journ. Sci. xxxi. 34 (1931). *Iris odorata* Persoon, Synops. Pl. i. 53 (1805), fide Ker, l. c., and Baker (1892). *Neubeckia cristata* (Ait.) Alefeld in Bot. Zeitung xxi. 297 (1863); Small, Man. S. E. Fl. 331 (1933).—Rich woods, or well-drained, moist, and cool soils, in partial shade; southeastern and central U. S., west to eastern Oklahoma. Specimens seen: District of Columbia: Washington, May 9, 1898, *E. S. Steele* (G); near Washington, May 8, 1879, *L. F. Ward* (G). Virginia: Tobacco Row Mt., Apr. 30, 1903, *M. A. Coe* (G); Smyth Co., Marion, middle fork of the Holston River, May 22, 1892, *J. K. Small* (G); Goshen Pass, Apr. 30, 1915, *J. R. Churchill* (G). West Virginia: Huntington, May 18, 1928, *F. A. Gilbert*, no. 87 (G). Ohio: Trumbull Co., without locality, May, 1888, *R. H. Ingraham* (G); Rocky River, May, 1897, *G. B. Ashcroft* (25,795 in RM). Kentucky: Natural Bridge, May 23, 1931, *B. C. Stephenson* (124,431 & 124,432 in RM); Irvine-Estill Springs, May, 1926, *W. A. Anderson*, no. 290 (G); Robard, April, 1923, *W. A. Anderson*, no 21 (G). Tennessee: Joelton, July 16, 1922, *H. K. Svenson*, no. 83 (G); Knoxville, May 17, 1896, *A. Ruth*, no. 438 (G); Hollow Rock Junction, Aug. 27, 1922, *H. K. Svenson*, no. 375 (G); Jackson, April, 1893, *S. M. Bain*, no. 220 (G); Tullahoma, May 4, 1883, *A. Gattinger* (G); Lookout Mt., Apr. 25, 1906, *T. O. Fuller* (G). North Carolina: mountains, without locality, July, 1841, *Gray & Carey* (G); Winston-Salem, Apr. 20, 1921, *P. O. Schallert* (G); Asheville, May 11, 1924, *C. H. Knowlton* (G); Biltmore, Apr. 27, 1896, *Biltmore Hb.*, no. 1220 (RM); Hot Springs,

April, 1888, *C. E. Smith* (G); Swain Co., without locality, July, 1891, *Beardslee & Kofoid* (G); Highlands, April, 1902, *E. E. Magee* (G). ALABAMA: Berkley (?), 1841, *Gray & Carey* (G). MISSOURI: Grandin, May 5, 1901, *B. F. Bush*, no. 345 (G). ARKANSAS: between St. Paul and Durham, Apr. 25, 1935, *N. C. Fassett*, no. 17,349 (G). OKLAHOMA: near Page, May 1, 1914, *O. W. Blakley*, no. 1485 (G). Additional localities given by Transeau and Williams,[1] Waller,[2] Coulter,[3] Greenwell,[4] Millspaugh,[5] Dykes,[6] Peattie,[7] Mohr,[8] Lowe,[9] Palmer and Steyermark,[10] and Buchholz and Palmer.[11]

Longley[12] has reported $n = 12$ in this species, but Simonet[13] finds $2n = 32$ in plants from three different sources. My own count, made on still different material, confirms Simonet, both as to number and morphology. There are two large, eight medium-sized, and two small chromosomes with median attachment points, two with broadly subterminal constrictions, and the remainder are rod-shaped or slightly curved, without visible constrictions. There seem to be only two satellites (see Plate 1, fig. 2).

Perhaps motivated by the obvious differences between *I. cristata* and other irises of the rhizomatous group, Alefeld removed it to his genus *Neubeckia*, an example followed on one occasion by Small,[14] who, at the same time, placed *I. verna* L. in this same genus. There seems to be no especially good reason for this generic split. Granted that there are differences in size between the American and Asiatic members of the *Evansia* section, even differences in detail, as well as differences in karyotypes, these seem to be specific rather than generic in nature. It is possible to cross *I. cristata* with at least two members of the Asiatic species, *I. gracilipes* A. Gray and the albino form of *I. tectorum* Maxim.[15] Furthermore, several crosses between *I. tectorum* and members of the *Pogoniris* section have been recorded,[16] so that

[1] In Ohio Biol. Surv. iv. 181–217 (1929).
[2] In Ohio Journ. Sci. xxxi. 29–43 (1931).
[3] Cat. Flow. Pl. . . . Indig. to Indiana (1899).
[4] Flora of Nelson County, Kentucky (1935).
[5] Living Flora of West Virginia (1913).
[6] Genus Iris (1913).
[7] In Journ. Elisha Mitchell Sci. Soc. xliv. 141–229 (1929).
[8] Plant Life of Alabama (1901).
[9] Plants of Mississippi (1921).
[10] In Ann. Missouri Bot. Gard. xxii. 375–758 (1935).
[11] In Trans. Acad. Sci. St. Louis xxv. 91–155 (1926).
[12] In Bull. Amer. Iris Soc. no. 29: 43–55 (1925).
[13] In Ann. Sc. Nat., Bot. (ser. 10) xvi. 228–383 (1934).
[14] See Man. Se. Fl., p. 331 (1933).
[15] Cover, Swabey, and Stout in Bull. Amer. Iris Soc. no. 16: 2–38 (1925).
[16] Simonet in Bull. Biol. France et Belg. lxvi. 255–444 (1932), and in Ann. Sci. Nat., Bot. (ser. 10) xvi. 228–383 (1934).

this species seems to serve as a link coupling the American Evansias with the rest of the genus.

Throughout its range, *I. cristata* appears extremely variable as to size, and somewhat less variable as to color and markings. There is in my possession a plant collected by Dr. Edgar Anderson in one of the Carolinas, in which the leaves at flowering time are easily 25 cm. long, and much larger specimens have been seen in favorable locations in Tennessee (Anderson, private information). Flower-color, on the contrary, seems not to change greatly, although I have seen blossoms of dead-white and cream-white on plants blooming in commercial plantings, while similar forms have been reported in the wild state.[1] The orange-yellow of the crest varies in amount and intensity of color, and may even be altogether absent.

IRIS LACUSTRIS Nuttall. Rhizome similar to but more slender than that of *I. cristata;* leaves in the sterile fans more laxly spreading, not exceeding 16 cm. at flowering, usually much smaller, otherwise like *I. cristata;* stems very slender, 0.8–4 cm. long at flowering, with 1–3 reduced leaves; spathes smaller versions of those of *I. cristata,* to 4.5 cm. long, scarious at the edges, sub-equal, or the inner much longer; pedicel slender, 0.6–1.5 cm. long; ovary narrowly oval, 8–10 mm. long; perianth-tube 1.3–1.8 cm. long, seldom exceeding the spathes, equal to or shorter than the sepals, not linear but dilating upward from the very base; sepals cuneate, emarginate, about 2 cm. long and 8 mm. wide, not separable into blade and claw, crest as in *I. cristata,* but with a deeper purple edge to the "signal" patch, and the blade also deeper in color; petals shorter than the sepals, cuneate, emarginate, nearly the same color as the sepals; style-branches ± 1.2 cm. long; style-crests linear to semi-ovate, 4 mm. long, crenate; stigma entire, rounded-oblong; filaments longer than the anthers, which are about 4 mm. long; capsule rounded, oval, ± 1.2 cm. long; seeds like those of *I. cristata,* but smaller.—Gen. Amer. Pl. i. 23 (1818); Ker, Gen. Irid. 56 (1827); Rafinesque, New Fl. N. Amer. part 2: 94 (1837); Baker in Journ. Linn. Soc., Bot. xvi. 43 (1877); Baker, Handbk. Irid. 22 (1892); Britton and Brown, Illust. Fl. (ed. 1) i. 451 (1896); Robinson and Fernald in Gray, Man. (ed. 7) 301 (1908); Dykes, Handbk. Gard. Ir. 85 (1924); Small in Addisonia ix. 61, pl. 319 (1924); Waller in Ohio Journ. Sci. xxxi. 35 (1931). *Iris cristata* var. *lacustris* (Nutt.) Dykes, Genus Iris 106 (1913).—Closely confined to small sections in Wisconsin, Michigan, and Ohio, with a few stations in Ontario; sandy or mossy ridges, free from grass. Specimens seen: MICHIGAN: Thunder Bay, near Alpena, July 18, 1895, *C. F. Wheeler* (G); Cecil Bay, June 27, 1917, *Gates & Gates,* no. 10,434 (RM); Valley of Menominee River,

[1] Waller, l. c. (1931).

July 12, July 15, 1905, *C. A. Davis* (G). WISCONSIN: Milwaukee, 1844, *A. Gray* (G); Bailey's Harbor, June 13, 1933, *N. C. Fassett*, no. 16,060 (G); Whitefish Bay, May 31, 1866, *H. Gillman* (G); Egg Harbor, July 6, 1882, *J. F. Schuette* (G); Ephraim, June 16, 1921, *A. S. Pease*, no. 18,080 (G). ONTARIO: Bruce Peninsula, 1871, *Macoun* (G); Bruce Co., Tobermory, Big (=Dorcas) Bay, June 5, 1933, *P. V. Krotkov*, no. 7277 (G). Additional references given by Waller.[1]

It has been impossible for me to secure living material in good condition with actively growing roots. Simonet, however, reports $2n = 42$ for this species,[2] the count being made on plants secured from Kew. According to his figure (plate 7, fig. 44), there are no large chromosomes, medianly attached or otherwise. Of the ± 18 chromosomes with apparently median attachment-points, even the largest is not so large as the medium-sized V-chromosomes of *I. cristata* (the figures are apparently drawn on the same scale). There seem to be at least two chromosomes with broadly subterminal attachments, and the remainder are either rod-shaped or slightly curved without visible constrictions. Two satellites are shown.

The specific status of this plant has been questioned, Dykes, in 1913, regarding it as a variety of *I. cristata*. In 1924, however, he doubtingly gave it separate standing, a course followed by Small[3] and Waller,[4] who feel certain of its distinctness. That the two plants are closely related is beyond question, but morphologically there are differences between them. Dr. Anderson informs me that *I. cristata* is distinctly variable throughout its range, while *I. lacustris* is constant. Except for unusually small plants of *I. cristata*, its rhizome, leaves, and flower are nearly twice the size of average *I. lacustris*, a statement based in part on the herbarium specimens examined, and in part on Atwood's comparisons of living plants.[5] The perianth-tube of *I. cristata* is long, linear for at least half its length, markedly exceeding the spathes in most cases, and longer than the sepals. That of *I. lacustris* is much shorter, infundibuliform from the base, does not usually exceed the spathes, and is equal to or shorter than the sepals. There are distinct differences, too, in the shape of petals and sepals in the two plants. The sepals of *I. cristata* are obovate, bluntly rounded, while those of *I. lacustris* are cuneate. The petals of the former are obovate-oblanceolate, while those of the latter are cuneate.

[1] l. c.
[2] In Ann. Sci. Nat., Bot. (ser. 10) xvi. 228–383 (1934).
[3] In Addisonia ix. 61, pl. 319 (1924).
[4] l. c.
[5] See Bull. Amer. Iris Soc. no. 47: 78–79 (1933).

As Atwood[1] also has noted, the leaves of *I. lacustris* tend to be much more lax and spreading than those of *I. cristata*. The capsule of the former is more ovoid in cross-section than that of the latter, which is rather sharply triangular. *I. lacustris* is almost odorless, while *I. cristata* has the fragrance of wild crab-apples. The final point to be mentioned is the complete difference of chromosome-number and morphology in the two species, points which have already been sufficiently described.

Two other facts may be mentioned here because of their bearings on the geographic ranges of the two species. Wherry[2] finds that *I. cristata* will tolerate a pH range of 5.1–7.9, although it prefers the range 6.1–6.9. Its relative, *I. lacustris*, will tolerate a less wide range, pH 6.1–7.9, but prefers 7.1–7.9, thus showing a distinct preference for a more alkaline habitat. On the other hand, Atwood[3] has studied the effects of growing *I. lacustris* in various soils, reaching the conclusion that the type of soil is relatively immaterial, so long as it is kept free of grass. From this he argues that it is the inability to compete successfully with invading grass-roots that keeps this species so narrowly restricted to the sandy and mossy grass-free ridges of its present homes.

As can be seen from the accompanying citations, *I. cristata* is a plant of reasonably wide distribution in the eastern United States, south of the area of late Pleistocene glaciation. A study of the localities recorded on herbarium specimens, as well as the records of local floras, indicates that it is essentially a plant of the Appalachian and Ozark highlands, although, as Small points out,[4] it has spread down into the Piedmont and Coastal Plain. Even so, when it occurs in the glaciated area of Ohio, it is found in the hilly, eastern portion, where its presence, together with the restriction of *I. lacustris*, argues for the differentiation of the two species in pre-glacial times. The most western records of its occurrence seem all to be in the hilly regions of Oklahoma, Arkansas, and Missouri. In Cuyahoga County, Ohio, both *I. cristata* and *I. lacustris* are recorded by Waller,[5] the only overlap of their ranges known to me. Whether *I. lacustris* ever existed south of its present range is unknown; certainly it does not now grow south of the glaciated area, although it can be cultivated in regions much to the south of its present habitat. It is interesting to note that it has

[1] l. c.
[2] In Ecology viii. 197–206 (1927).
[3] In Nat. Hort. Mag. xiv. 182–183 (1935).
[4] In Addisonia ix. 61; pl. 319 (1924).
[5] l. c.

been recorded in several localities on or near the Bruce Peninsula, Ontario, that home of so many pre-Wisconsin relics.[1] Professor Fernald informs me that he has seen it growing there in some abundance on the upper levels of the sandy beaches. Quite probably, it is present there, not as a newcomer, but as a relic. Regardless of this, its existence in such restricted regions must be interpreted as in part a survival from pre-Wisconsin times. If it cannot now compete successfully with invading grasses, it seems hardly likely that it could have fought its way back through the glaciated area, only to die out later in all regions south of its present home. Or is it to be regarded as a post-glacial variant of *I. cristata*?

If this were true, one might expect to find it continuous along the lake shores from Ohio to Wisconsin, which does not seem to be the case, from the records available to me. One must assume, also, that *I. cristata* crept back through a narrow line in the glaciated area, changed its habitat as well as its morphological characters, added ten chromosomes to its chromosome complement by some means other than hybridization (since *I. cristata* apparently does not cross successfully with members of the *Apogon* section), and altered its chromosome morphology at the same time, after which the new variant jumped from northeast Ohio to northern Michigan without leaving intervening traces. The alternatives to the hypothesis of survival *in situ* for *I. lacustris*, at least in part, seem somewhat improbable. One should not overlook the possibility that *I. cristata's* presence in this narrow line in the hills of eastern Ohio may itself be due to survival in some small unglaciated patch, from which it spread southward and became reunited with survivors south of the moraines. Evidence for this is lacking, at present, and the suggestion is advanced only as being possible under certain circumstances.

In view of the differences in range, soil reaction preferences, size, shape of the floral parts, and the unlike karyotypes of the two plants, I am retaining specific status for *I. lacustris*.

Section Apogon: subsection Californicae.

This group of plants, sixteen species and varieties in the present treatment, is confined to California, Oregon, and Washington. So far as available records show, only one of these, *I. tenax* Herb., extends into the state of Washington and most of them are confined to California, where there has been a rather astonishing burgeoning of species, varieties and forms. The ease with which these plants can be

[1] See, e. g., Fernald in Rhodora xxxvii. 197–222, 238–262, 272–301, 324–341 (1935).

crossed has undoubtedly played an important part in producing this plentitude of variants, a wealth of variation which makes a conservative taxonomic treatment difficult or nearly impossible.

As a group, with few exceptions, it is characterized by fairly narrow, prominently nerved, tough leaves, which have a pink, red, or purple flush at the base, and which turn a deep red-brown as they mature and die. The rhizomes are slender, widely spreading, and possessed of few roots, which apparently are developed only in the spring and fall during the rains, a fact making transplantation of these species a difficult task. In most cases there is a well developed perianth-tube, and a stigma, which, with two exceptions, is entire and triangular to tongue-shaped.

A tentative key has been drawn up, as follows:

KEY TO THE CALIFORNICAE.

a. Stem usually branched....*b.*
  b. Spathes herbaceous....*c.*
    c. Spathes opposite, rather broad....*d.*
      d. Leaves about 6 mm. wide; perianth-tube ± 2.5 cm. long.....*I. Douglasiana.*
      d. Leaves about 1.5 cm. wide; perianth-tube ± 1.5 cm. long.....*I. Douglasiana* var. *oregonensis.*
    c. Spathes usually distant, narrow.....*I. Douglasiana* var. *bracteata.*
  b. Spathes scarious.....*I. tenuis.*
a. Stem simple....*e.*
  e. Stems almost completely covered with short inflated bracts....*f.*
    f. Stigma tongue-shaped.....*I. bracteata.*
    f. Stigma truncately flattened.....*I. Purdyi.*
  e. Stems with 1–4 narrow linear leaves, not covering it....*g.*
    g. Spathes distant; perianth-tube infundibuliform, 5–7 mm. long....*h.*
      h. Perianth purple or some lighter shade, seldom yellowish....*i.*
        i. Leaves narrow, much exceeding the stem; Oregon and Washington.....*I. tenax.*
        i. Leaves barely overtopping the stem; confined to southern California.....*I. tenax* var. *australis.*
      h. Perianth yellow or yellowish....*j.*
        j. Tall; sepals suborbicular; confined to northern Oregon.....*I. tenax* var. *Gormanii.*
        j. Short; sepals oblanceolate; central and southern California.....*I. Hartwegii.*
    g. Spathes opposite....*k.*
      k. Perianth-tube 5–8 cm. long....*l.*
        l. Style-crests short, not linear.....*I. macrosiphon.*
        l. Style-crests long, linear....*m.*
          m. Spathes linear-lanceolate.....*I. chrysophylla.*
          m. Spathes naviculate....*n.*
            n. Cauline leaves linear, free for most of their length.....*I. tenuissima.*
            n. Cauline leaves inflated bracts. *I. tenuissima* var. *purdyiformis.*

k. Perianth-tube 1.2–3 cm. long....*o.*
o. Spathes ovate; sepals oblanceolate.....*I. innominata.*
o. Spathes ovate-lanceolate; sepals oblanceolate-spatulate.....*I. Thompsonii*

This key is artificial and is in no sense regarded as final. Study of more extensive herbarium material and, above all, study of living plants will probably cause changes in several respects.

IRIS TENUIS S. Watson. Rhizome extremely slender, 2 mm. in diameter, widely and shallowly creeping; leaves ensiform, acute, pale green with scarious margins on the equitant bases, to 3.2 dm. long and 1.5 cm. wide, nerves subprominent, the leaf-fans clothed at the base with 2 scarious semi-sheathing leaves about 5 cm. long, with a dark brown mid-rib; stems equal to the leaves in length, slender, deeply 1–2-branched, bearing the 2–3 flowering heads at approximately the same level, the 1–2 cauline leaves semi-membranous, narrowly lanceolate, acute, free from the stem for half their length; spathes scarious, but apparently herbaceous at the base and along the keel, subequal, opposite, 2–3 cm. long and 5 mm. wide, lanceolate-acuminate, 1-flowered; pedicels very slender, 0.4–1 cm. long; ovary elliptical, 4–7 mm. long; perianth-tube extremely short, infundibuliform, 3 mm. long; sepals white, veined with pale purple, yellow at the throat, oblong-spatulate, 2.8 cm. long and 1 cm. wide; petals 2 cm. long and 6 mm. wide, oblanceolate-spatulate, emarginate, bluish-white; style-branches 1.8 cm. long, markedly exceeding the stamens; style-crests 7 mm. long, broadly obovate, erose; stigma triangular-acuminate; filaments 8 mm. long; anthers 6 mm. long; capsule ovate, obtuse, 9–15 mm. long; seeds D-shaped with a pitted surface, light brown with a whitish raphe and funicle. (Description based on the type).—Proc. Amer. Acad. xvii. 380 (1882); Baker, Handbk. Irid. 12 (1892); Howell, Fl. N. W. Amer. i. 634 (1902); Dykes, Genus Iris 38 (1913); Piper and Beattie, Fl. N. W. Coast 105 (1915); Abrams, Illust. Fl. Pacif. States i. 463 (1923); Dykes, Handbk. Gard. Ir. 117 (1924).—Narrowly endemic in pine forests of northern Oregon. Specimens seen: OREGON: Clackamas Co.: banks of Eagle Creek, June, 1881, *L. F. Henderson* (type, in G); Eagle Creek, May, 1884, *L. F. Henderson* (G); Eagle Creek, July 9, 1922, *L. R. Abrams*, no. 8801 (RM, W); 5 miles from Eagle Creek, June 11, 1927, *J. W. Thompson*, no. 2602 (JWT, W); banks of Eagle Creek, May 20, 1928, *J. W. Thompson*, no. 4247 (JWT, O); Clackamas River, 10 miles above Estacada, June 11, 1924, *Mrs. G. C. Ballinger* (W); Clackamas River, 15 miles above Estacada, Aug. 15, 1925, *M. E. Peck*, no. 14,513 (W); Washington Co., without precise locality, May, 1884, *L. F. Henderson* (G).

This very distinct endemic species is so unlike other members of the subsection that it is with some hesitation that I leave it in association

with them. The broad, pale green leaves are much like those of a giant *I. cristata.* The slender deeply-branched stems, with semi-scarious bracts and spathes, make this *Iris* recognizable at a glance. Its morphological differences are accompanied by a difference in chromosome number and morphology.

Usually occurring only in scattered patches, this plant has been found by Starker[1] in one locality in large groups of several thousand plants.

IRIS TENAX Douglas ex Lindley. Plant caespitose; rhizome slender; leaves light green, paling to pink or straw color basally, finely ribbed, somewhat lax, linear-acute to linear-ensiform, to 4.5 dm. long and 5 mm. wide, over-topping the stem; stem slender, simple, somewhat angular, 15–27 cm. long, with 1–3 narrow, reduced, linear-lanceolate leaves to 15 cm. long, free for half their length; spathe-valves distant, by 3 cm. in some cases, the outer longer than the inner, 5–7 cm. long and 2–4 mm. wide, herbaceous with scarious margins, carinate, linear-lanceolate to lanceolate-acuminate, 1–2-flowered; pedicel 1–5 cm. long, that of the second flower being longer than that of the first; ovary 1–2 cm. long, slightly wider above than below, tapering very gradually into the pedicel; perianth-tube short, infundibuliform, 7 mm. long; sepals obovate in the blade, narrowing gradually into the claw, to 6 cm. long and 2 cm. wide, color variable, ranging from pearly gray or white to a deep purple, the claw and basal part of the blade usually white veined with the color of the blade, the slight central ridge yellowish, the blade sometimes emarginate, or bluntly rounded; petals the same color as the sepal-blade, not prominently veined, slightly shorter than the sepals, 5 cm. long and 1 cm. wide, lanceolate to oblanceolate; style-branches ±3 cm. long; style-crests ±1 cm. long, subquadrate, crenate or incised, reflexed; stigma entire, triangular; filaments to 10–12 mm. long; anthers 16–18 mm. long; capsule oblong, to 3.5 cm. long, beaked, prominently ribbed; seeds thick, D-shaped, brown.—Bot. Reg. xv. t. 1218 (1829); Hooker in Bot. Mag. lxi. t. 3343 (1834); Baker, Handbk. Irid. 7 (1892); Howell, Fl. N. W. Amer. i. 634 (1902); Piper, Fl. State of Wash. 203 (1906); Dykes, Genus Iris 39 (1913); Piper and Beattie, Fl. N. W. Coast 105 (1915); Abrams, Illust. Fl. Pacif. States i. 463 (1923); Dykes, Handbk. Gard. Ir. 118 (1924); Haskin, Wild Fls. Pacif. Coast 55 (1934). *Ioniris tenax* (Dougl.) Klatt in Bot. Zeitung xxx. 502 (1872).—A plant of fairly dry soils, in fields or open woods in Washington, Oregon, and, according to the original description, northern California. Specimens seen: WASHINGTON: near Montesano, June 3, 1898, *A. A. & G. E. Heller,* no. 3876 (G, RM); Vancouver, June 8, 1904, *C. V. Piper,* no. 4943 (G); Battleground Lake, May, 1919, *R. G. Ebert* (G). OREGON: without

[1] See Bull. Amer. Iris Soc. no. 55: 90–91 (1935).

locality or date, *T. J. Tolmie* (G); without locality, 1871, *E. Hall*, no. 514 (G); Willamette Valley, May & June, 1878, *J. W. Marsh* (G); Columbia Co., upper Clatskanie Valley, May 15, 1927, *J. W. Thompson*, no. 2431 (JWT); Multnomah Co., 1877, *T. Howell* (G); mountain above Bridal Veil, June 25, 1911, *M. E. Peck* (W, no. 1980); Portland, May 7, 1905, *M. W. Lyon*, no. 18 (US); Eagle Creek, July 9, 1922, *L. R. Abrams*, no. 8804 (RM); Polk Co., without date, *Mrs. L. Reynolds* (W, nos. 9031, 9032); Salem, 1917, *J. C. Nelson*, no. 1127 (G); near Black Rock, July 18, 1930, *M. E. Peck*, no. 16,306 (W); Silver Creek Falls, June 8, 1912, *M. E. Peck*, no. 1422 (W); Newport, 1892, *A. I. Mulford* (G); fields and hillsides in Benton Co., April, 1920, *H. M. G.* (RM, no. 98,545); Cottage Grove, June 15, 1916, *M. E. Peck*, no. 5120 (W); 2 miles north of Gardiner, Aug. 3, 1924, *M. E. Peck*, no. 13, 582 (W); first crossing of the Umpqua River north of Canyonville, May 12, 1924, *Abrams & Benson*, no. 10,487 (RM); along West Fork-Marial Trail, 5 miles west of West Fork, June 27, 1917, *M. E. Peck*, no. 5017 (W); between Grants Pass and Corvallis, May 16, 1933, *Aven & R. A. Nelson*, no. 594 (RM); Deer Creek to Kerby, May 11, 1924, *Abrams & Benson*, no. 10,315 (RM). CALIFORNIA: northern California, without precise locality, July 29, 1925, *Mrs. N. P. Gale* (JWT).

This large and easily recognized species has an extensive range in the western parts of Oregon and Washington. It varies, like all of its relatives, in color and size. *Peck*, no. 5120, for instance, is small enough to be *I. Hartwegii* Baker, but its color is a deep red-purple. The magnificent dark purple of *Aven & R. A. Nelson*, no. 594 is much deeper than is usual in this species. The color variation possible has been well described by the Starkers[1] from a number of variants collected in the wild: "There were pure white forms, beautifully marked with gold down the center of the falls, there were cream colored and apricot forms; there were white blossoms edged with pink; there were pearl gray flowers; there were blossoms of orchid, lavender, blue, and deepest purple strikingly set off by a white blotch in the center of the falls, and there were other color variations almost without end."

Three of the specimens cited above present certain difficulties which can briefly be indicated here. In the first, collected by Mrs. Reynolds in Polk Co., Oregon, the shape of the flower parts closely resembles *I. Gormanii* Piper, but as it occurs well outside the range of that highly endemic plant, I have retained it with *I. tenax*. In the herbarium of Mr. J. W. Thompson, a specimen collected by Mrs. Gale in northern California is labelled *I. Hartwegii* Baker; in size of flower, certainly, it is more nearly *I. tenax*, while the color, now some-

[1] In Bull. Amer. Iris Soc. no. 53: 11–20 (1934).

what faded, might be that of either species. The third specimen, *Abrams & Benson*, no. 10,315, from Josephine Co., Oregon, is not *I. bracteata* Howell, as originally labelled. Its yellow flower color and general dimensions answer closely to the original description of *I. Hartwegii*, yet its locality is well outside the most northern limits generally assigned to that species. These three specimens may perhaps serve as connecting links between typical *I. tenax* and the other plants mentioned.

Reference to specimens of *I. tenax* collected in Newfoundland and New Brunswick was made by Hooker (in his Flora Boreali-Americana ii. 306). At the request of Professor Fernald some years ago, Dr. S. F. Blake examined these specimens, reporting that they are indeed *I. tenax*. Since no other trace of the species has been found in these regions, it is probable that there has been confusion of data, resulting in the mislabelling of these specimens.

✓ IRIS TENAX var. **Gormanii** (Piper) comb. nov. Like *I. tenax* in nearly all respects except in the color and shape of the perianth-segments; sepals pearly white to cream or even butter yellow, 4.5–5.3 cm. long, and 2.4 cm. wide, with the blade so broadly obovate as to be nearly orbicular; petals similar in color, 3.5–4.5 cm. long and 1.5 cm. wide, oblanceolate to spatulate; both sepals and petals usually entire, but occasionally emarginate.—*Iris Gormanii* Piper in Proc. Biol. Soc. Wash. xxxvii. 91 (1924).—Apparently endemic in northern Oregon. Specimens seen: OREGON: Washington Co.; Scoggin's Valley, June 9, 1923, *L. F. Henderson*, no. 6166 (O); Scoggin's Creek, May 19, and May 26, 1928, *J. W. Thompson*, no. 4289 (G, US, JWT); Scoggin's Creek, June 27, 1930, *M. E. Peck*, no. 16,194 (W); Forest Grove, without date, *J. W. Thompson*, no. 558 (JWT).

Although the type of this plant, preserved in the United States National Herbarium, has not been seen, seven sheets of material collected in the type region have been available.[1] After much consideration, it seems impossible to separate this plant from *I. tenax* as a species. In such specimens as *Peck*, no. 16,194, which conforms very closely to Piper's original description, there are differences which make it equally impossible to reduce it to a synonym of *I. tenax*. Aside from differences in flower-color, the sepals are more broadly obovate, giving a different ratio of sepal length to sepal width, although the petals are less markedly different from those of *I. tenax*.

[1] Since this was written, a sheet of the type collection has been seen from the herbarium of the State College of Washington. The plant is even more slender and delicate than is usual in *I. tenax*, but in many respects it can be matched very closely by small, purple-flowered specimens of *I. tenax*.

On the other hand, *Thompson*, no. 4289 has the yellow coloring but the shape-difference is less apparent. Another plant, *Thompson*, no. 558, comes from a short distance from the type region; it seems to be almost a duplicate of *Peck*, no. 16,194 in shape, but the coloring is more nearly that of *I. tenax*. Thompson's plants may have had their origin in a cross between the two forms, or they may be natural intergrades. Nevertheless, their appearance, coupled with the slight differences apparent between *I. tenax* and *I. Gormanii*, make it seem preferable, to me, to regard the latter as a variety of the former. It may be pointed out that there is less to distinguish them than there is to distinguish *I. setosa* Pall. from its variety *canadensis* M. Foster, yet the separate status of var. *canadensis* is not usually conceded, in spite of its geographic segregation from *I. setosa*.

✓ IRIS TENAX var. **australis** (Parish), comb. nov. Rhizome rather thick; leaves 20–30 cm. long, slightly exceeding the stems, 3–4 mm. wide; stems 15–25 cm. high, with 1–2 cauline leaves; spathes distant 2–4 cm., 6–9 cm. long and 6–7 mm. wide; pedicels 2–5 cm. long at flowering; ovary and perianth-tube as in *I. tenax*, but larger; sepals broadly oblanceolate, to 5.5–6 cm. long and 2 cm. wide, with a more pronounced distinction between blade and claw, blue-purple with darker veins; petals slightly shorter, linear-oblanceolate; style-branches 3.4 cm. long; style-crests broadly semi-ovate, 1.2 cm. long, somewhat crenate; filaments 1.5 cm. long; anthers 1.8 cm. long; stigma, capsule, and seeds as in *I. tenax*.—*I. Hartwegii* var. *australis* Parish in Erythaea vi. 86 (1898); Abrams, Illust. Fl. Pacif. States i. 463 (1923); Munz, Man. S. Calif. Bot. 98 (1935).—Southern California, in dry soil, especially in open pine woods, around 5000–6000 ft. altitude. Specimens seen: CALIFORNIA: Cucamonga Mts., 1880, *Parish, Bros.* no. 589 (G); Gray Back Peak, 1880, *Wright*, no. 43 (G); San Bernardino Mts., Bear Valley, 1889, *Parish Bros.*, no. 2089 (G); east base of San Bernardino Mts., 1894, *S. B. Parish*, no. 3084 (G); southern slope of San Bernardino Mts., 1895, *S. B. Parish*, no. 3760 (G); southern slope of the San Bernardino Mts. at 6000 ft. alt., June 14, 1906, *S. B. Parish*, no. 5807 (RM).

According to Dykes,[1] herbarium material of this variety cannot be distinguished from *I. tenax*. The resemblances are great, but the two can be separated. Specimens of this plant seem much coarser than *I. tenax;* the leaves barely exceed the stem; and the perianth-tube is much broader than in that species.[2]

[1] Handbk. Gard. Ir. 115 (1924); also, Genus Ir. 41 (1913).

[2] Dr. S. Stillman Berry, of Redlands, Calif., informs me that in its habit of growth in the garden var. *australis* is unlike *I. tenax*.

Munz[1] says that var. *australis* is common in the San Bernardino Mts., but rare in the San Gabriel and San Jacinto Mts.

In view of its resemblance to *I. tenax*, I am unable to see why this plant should any longer be regarded as a variety of *I. Hartwegii* Baker.

IRIS HARTWEGII Baker. Rhizome slender to moderately thick, covered with the fibrous remains of old leaf-bases; leaves relatively few in a clump, linear, acute, 20–35 cm. long at flowering time and 3–5 mm. wide, later becoming much longer, finely nerved, pale green, exceeding the stem; stem slender, simple, 5–20 cm. long, usually bearing one narrow lanceolate leaf which is free for over half its length, 1–2-flowered; spathes usually distant, narrowly linear-lanceolate, acute, divergent, the lower 6–9 cm. long and 2–4 mm. wide, the upper 5–6 cm. long and 2–3 mm. wide, or the two subequal when opposite, herbaceous, with scarious margins; pedicel 0.5–2.5 cm. long at flowering, lengthening to 3.5–7.5 cm. as the capsule develops; ovary narrow, ±1 cm. long; perianth-tube short, stout, infundibuliform, ±5 mm. long; sepals oblanceolate, to 4.5 cm. long and 1.6 cm. wide, sub-obtuse at the apex, pale yellow; petals narrowly oblong-oblanceolate, erect, to 3.5 cm. long, ±7 mm. wide; style-branches ±2 cm. long; style-crests semi-ovate, obtusely rounded, ±8 mm. long; stigma entire, acutely triangular; filaments 1 cm. long; anthers 1.2 cm. long, exserted nearly half their length beyond the stigma; capsule oblong-oval, 2–3 cm. long, tapering somewhat abruptly at the ends, three-angled; seeds irregularly D-shaped, brown.—Gard. Chron. (II) vi. 323 (1876); Baker in Journ. Linn. Soc., Bot. xvi. 138 (1877); Baker, Handbk. Irid. 6 (1892); Hall and Hall, Yosem. Fl. 60 (1912); Dykes, Genus Iris 40 (1913); Jepson, Flor. Calif. i. 325 (1921); Abrams, Illust. Fl. Pacif. States i. 463 (1923); Jepson, Man. Fl. Pl. Calif. 254 (1925). *I. tenax* sensu Bentham (non Dougl.), Pl. Hartw. 338 (1857). —Mountainous regions in California, from the Siskiyous south to Kern Co., in open pine woods. Specimens seen: CALIFORNIA: "in montibus Sacramento," *Hartweg*, no. 1978 (G, part of type collection); Sierra Valley, 1873, *J. G. Lemmon*, no. 110 (G); Indian Valley, 1873, *Mrs. M. E. P. Ames* (G); Mariposa, Clarke's, 1872, *A. Gray* (G); Sierra Nevada Range, Tioga Road, near Aspen Valley, August 24, 1916, *Smiley*, no. 904 (G); Plumas Co., 1876, *Mrs. R. M. Austin* (G); Nevada City, 1912, *A. Eastwood*, no. 530 (G); Nevada Co., head of south fork, Wolf Creek, on the western slope of the Sierra Nevada, June 7, 1916, *Hall & Essig*, no. 10,167 (RM); near Stirling, Butte Co., at 3525 ft. alt., June 7, 1913, *Heller*, no. 10,803 (G). Additional localities are given by Dykes[2] and Jepson.[3]

[1] Man. S. Calif. Bot. 98 (1935).
[2] Genus Iris 41 (1913).
[3] Flor. Calif. i. 325 (1921).

Dykes,[1] working on living plants as well as with herbarium specimens, was convinced that this species was separable from *I. tenax* only with difficulty, if indeed it could be separated. The resemblances to *I. tenax* are obvious, e. g., the short, stout perianth-tube and the narrow, distant, divergent spathes. Nevertheless, the usual difference in size of plant, as well as in size and shape of flower, the yellow flower-color, the exserted anthers, and the different range of *I. Hartwegii* serve to distinguish it rather clearly from *I. tenax*. To me, the differences between *I. tenax* and *I. Hartwegii* as shown in herbarium material seem more numerous and more pronounced than those between *I. tenax* and *I. Gormanii*. If the latter be correctly regarded as a variety, then *I. Hartwegii* seems entitled to specific status.

For the type, Jepson[2] cites *Hartweg*, no. 373, from Bear Creek, Nevada Co., California. Abrams,[3] on the other hand, regards the type locality as on the American River in the Sierra Nevada, thus possibly in Sacramento County, the locality cited in Dykes' monograph for the Hartweg specimens preserved in the British Museum and at Kew. Baker's original description cites only *Hartweg*, collected in 1848. The complete citation by Bentham (l. c.) is as follows: "1978 (373). Iris tenax, Dougl., var. floribus minoribus pallide flavis.—In montibus Sacramento." Earlier (p. 294), Bentham states that the collections were made in 1846 and 1847, "imprimis circa Monterey et Sacramento."

IRIS MACROSIPHON Torrey. Rhizome slender, ±8 mm. in diameter, somewhat torulose, with fibrous remains of old leaves at the nodes and with few roots; leaves narrowly linear, acute, rather light green, often glaucous, finely nerved, exceeding the stems, 30–35 cm. long and ±4 mm. wide; stems simple, short, sometimes nearly absent, to ±10 cm. long, with 1–2 cauline leaves about 10 cm. long; spathes opposite or nearly so, herbaceous, linear-lanceolate, acuminate, subequal or the outer longer, to ±8 cm. long, the outer narrower than the inner, 1–2-flowered; pedicel short, 1.5–2 cm. long; ovary ±1 cm. long, ovoid; perianth-tube narrow, linear, gradually dilating at the top, to 8 cm. long, or a trifle longer, but usually about 6 cm. long; sepals oblanceolate or obovate, to 5 cm. long, 1.8 cm. wide, usually purple in color with fine, dark venation on the blade, becoming coarser on the claw; petals nearly equal to the sepals in length, 1 cm. wide, oblanceolate; style-branches to 2.5 cm. long; style-crests ±1 cm. long, erose, subquadrate or semi-ovate, but not narrowly linear; stigma entire, tri-

[1] l. c.
[2] l. c.
[3] Illust. Fl. Pacif. States i. 463 (1923).

angular; filaments to 1.7 cm. long; anthers to 1.2 cm. long; capsule 2.5–3 cm. long, somewhat angular in cross-section, oblong to ovoid; seeds angular, dark brown. (Description based on the type.)—Pacif. Rail. Rep. iv. 144 (1857); Baker in Journ. Linn. Soc., Bot. xvi. 138 (1877); Baker, Handbk. Irid. 5 (1892); Greene, Man. Bot. San Fran. Bay Region 307 (1894); Jepson, Fl. West. Mid. Calif. 129 (1901); Dykes, Genus Iris 43 (1913); Jepson, Fl. Calif. i. 325 (1921); Abrams, Illust. Fl. Pacif. States i. 465 (1923); Dykes, Handbk. Gard. Ir. 120 (1924); Jepson, Man. Fl. Pl. Calif. 254 (1925). *I. californica* Leichtlin in The Garden lii. 126 (1897), nomen nudum; Purdy in The Garden liii. 1 (1898), nomen subnudum; Abrams, Illust. Fl. Pacif. States i. 465 (1923); Dykes, Genus Iris 43 (1913), as synonym of *I. macrosiphon*. *Iris amabilis* Eastwood in Bull. Torrey Bot. Club xxx. 484 (1903).—Central and north central California, the type having been collected near San Francisco Bay. Specimens seen: CALIFORNIA: without locality, 1869, *Kellogg & Harford*, no. 975 (G); Grass Valley, 1854, *J. M. Bigelow* (G); Siskiyou Co.: near Marble Mt., June, 1901, *Chandler*, no. 1570 (G, US); Metcalf's Ranch, northeast base of Mt. Eddy, at 3800 ft., June 20, 1920, *Heller*, no. 13,385 (US): Shasta Co.: Fern, May 18, 1911, *Jones*, no. 57 (G); Humboldt Co.: Redwood Highway, May 22, 1932, *Mrs. A. H. Rodda* (CA, no. 195,270); Dinsmore's Ranch, in valley of Van Duzen River, opp. Buck Mt., June 22, 1913, *J. P. Tracy*, no. 4263 (US): Mendocino Co.: Willits, May 21, 1921, *C. V. Piper* (CA, no 110,652); Ukiah, 186–, *Bolander*, no. 3842 (G); Ukiah, Apr. 18, 1886, *Bolander*, no. 4651 (G, US); Ukiah, June 13, 1913, *Eastwood*, no. 3310 (CA, G, US); Forest Reserve, Osborne's, June 6, 1928, *Eastwood*, no. 15,255 (CA); between Ukiah and Largo, Apr. 30, 1918, *L. R. Abrams*, no. 7014 (US); Long Valley, 1866, *Bolander*, no. 4682 (G, US); Round Valley, May–June, 1898, *V. K. Chesnut*, no. 5 (US); near Handley's, May & July, 1903, *J. MacMurphy*, no. 110 (US): Lake Co.: Mt. Sanhedrin, Dashiells, May 22, 1925, *Eastwood*, no. 12,810 (CA); south slope of Mt. Sanhedrin, above sawmill, July 19, 1902, *Heller*, no. 5915 (G, US, RM); Binkley Ranch, between Cobb Mt. and Adams Springs, June 27, 1933, *M. S. Jussel*, no. 264 (CA); southeast side of Snow Mt., above Bonnie View, June 7, 1917, *Heller*, no. 13,227 (G, CA, US); foot of Mt. Sanhedrin, June, 1917, *Mrs. L. R. Reynolds* (CA, no. 110,562); between Cobb Mt. and Adams Spring, on the Binkley Ranch, June 27, 1933, *M. S. Jussel*, no. 245 (CA); Jordan Park, near Mt. Konocti, May 1, 1932, *M. S. Jussel* (CA, no. 195,298); Mt. Konocti, Apr. 14, 1923, *J. W. Blankinship* (CA, no. 165,152); Kelseyville, Cole Creek, Apr. 1, 1931, *M. S. Jussel* (CA, no. 195,872); divide between Lakeport and Hopeland, 1903, *C. F. Baker*, no. 3095 (G); near Clear Lake, 1865, *J. Torrey*, no. 531 (NY, G): Glenn Co.: Houghton's Trail, near Bennet Spring, Newville-Covelo Road, June 3, 1915, *Heller*, no. 11,950 (G, US, CA): Butte Co.: Durham, May 8, 1932, *Mrs. J. H. Morrison* (CA, no.

193,173); Little Chico Canyon, April, 1896, *Mrs. R. M. Austin*, no. 13 (US); Berry Canyon (near Clear Creek), 1902, *Heller & Brown*, no. 5517a (G); 3 miles above Centerville, in the Sierra foothills, Apr. 20, 1915, *Heller*, no. 11,844 (G, CA): Sierra Co.: Downieville, Apr. 15, 1928, *W. Vortriede* (CA, no. 170,863): Nevada Co.: near Grass Valley, May, 24, 1919, *Heller*, no. 13,210 (G, CA); Nevada City, June 20-22, 1912, *Eastwood*, no. 601 (CA, G): Sonoma Co.: without locality, by 1888, *E. Samuels*, no. 203 (US); Skaggs Springs, June 3, 1915, *E. P. Hawver* (CA, no. 110,575); Marsh Hot Springs, near Santa Rosa, March, 1884, *S. S. Holman* (US, no. 294,956); near Windsor, Mar. 19, 1902, *Heller & Brown*, no. 5070 (US, G): west base of Mt. Hood, 1902, *Heller & Brown*, no. 5163 (G): Napa Co.: 5 miles south of Calistoga, Apr. 12, 1924, *Heller*, no. 13,841a (US); 5 miles southeast of Napa, Wooden Valley Grade, west side of Napa Range, 1931, *Keck*, no. 1026 (G); hills east of Napa, July 26, 1913, *W. N. Suksdorf*, no. 680 (G); Napa, 1899, *H. Smyth* (G); hills east of Napa, May 21, 1933, *J. T. Howell*, no. 11,313 (CA): Placer Co.: Auburn, May, 1878, *Mrs. R. M. Austin* (G); Auburn, Apr. 11, 186–, *Bolander*, no. 4529 (G, US): Eldorado Co.: Coloma, May 16, 1928, *W. Vortriede* (CA, no. 170,865): Marin Co.: Mt. Tamalpais, Apr. 10, 1906, *N. L. Gardner* (RM, no. 62,284); Kentfield, May 9, 1912, *M. E. Parsons* (CA, no. 110,645); Pipeline Trail, Apr. 5, 1925, *J. T. Howell*, no. 904 (CA); Mt. Tamalpais, Mar. 16, 1913, *Eastwood*, no. 2514 (CA); Kentfield, May 20, 1912, *Eastwood*, no. 64 (CA, US, G); Sausalito, without date, *Eastwood* (CA, no. 110,646); Sausalito Hills, Mar. 25, and May, 1869, *Kellogg & Harford*, no. 974 (US, G); Corte Madera, Apr. 28, 1904, *Heller*, no. 7370 (G, NY, US); Corte Madera, Apr. 10, 1854, *Bigelow* (type, in NY, fragment in G); San Rafael, 1885, *A. Gray* (G); Mt. Tamalpais, Apr. 13, 1913, *E. O. Wooton* (US, no. 663,698): Santa Clara Co.: trail to Pine Ridge, May 28, 1895, *Dudley*, 4061 (CA, US, G); Gilroy, May, 1903, *A. D. E. Elmer*, no. 4854 (CA, US); Saratoga, June 11, 1929, *G. L. Fischer*, no. 120 (US); Mt. Hamilton, May 11, 1895, *C. Rutter*, no. 2 (US); Mt. Hamilton, 1877, *Mrs. M. E. P. Ames* (G); hills west of Gilroy, Apr. 13, 1903, *C. F. Baker*, no. 1947 (G, US); foothills west of Los Gatos, Apr. 9, 1904, *Heller*, no. 7305 (G); Smith Creek at foot of Mt. Hamilton, 1907, *Heller*, no. 8535a (G).

I. macrosiphon is a highly variable species, from which varietal or specific segregates will undoubtedly be separated after study of living material. Temporarily, such entities as *I. californica* Leicht. and *I. amabilis* Eastw. have been included within *I. macrosiphon, sensu lato*. *I. amabilis* was treated by Dykes (Genus Ir. 30 (1913)) as a synonym of *I. Douglasiana* Herb., but the long perianth-tube suggests closer affinity with the *macrosiphon*-aggregate, especially with the members which have been called *I. californica*.

At present, the herbarium material available seems to fall into several groups, which, unfortunately, are neither geographically nor morphologically so distinct as could be desired. One group centers in the type locality of *I. macrosiphon*, Marin Co., but a group of specimens has also been seen from Santa Clara Co., south of San Francisco Bay, so like material from Marin Co. that separation is difficult or impossible. Differing from the short, purple, narrow-leaved, long-tubed material of the type region, a second group, ranging from Butte Co. west to the coast and south to Santa Cruz and Santa Clara Cos., possesses flowers with somewhat shorter tubes, variable in color, with broader leaves, longer stems, and variable spathes. It is this group which is usually treated as a whole and called *I. californica*, but plants from the northern and southern portions of the range seem separable.

From the north, many specimens of this group resemble *I. amabilis*, which raises a nomenclatural problem. *I. californica* Leicht. is a *nomen nudum; I. californica* Leicht. ex Purdy is at best a *nomen subnudum*. The name seems not to have been used with an adequate description until 1923, when Abrams so employed it. In the interval, however, Miss Eastwood, in 1903, validly published *I. amabilis*, which appears to me, at present, to be conspecific with many, if not most, of the northern specimens of "*I. californica*." Since this latter name apparently includes at least two entities and, from the first, has been loosely and indefinitely applied, it appears to me preferable to reject it as a *nomen dubium*, extending the original conception of *I. amabilis* somewhat to cover the northern forms, and possibly giving varietal status to the southern plants of this aggregate. For the present, however, this is to be regarded as a tentative suggestion, awaiting the test of field study before being accepted or rejected.

IRIS CHRYSOPHYLLA Howell. Rhizome slender, sparsely rooted; leaves exceeding the stem, linear-acute, to 50 cm. long, usually much shorter, 4 mm. wide, finely ribbed, glabrous, light green, with a yellowish tinge in many specimens, or glaucous, light green, flushed pink or purple-brown at the base; stems slender, simple, 2.5–20 cm. long, usually with 1 cauline leaf, occasionally 3 on tall stems, 1–3-flowered; spathes lanceolate to linear-lanceolate, acute, unequal, the outer being often much shorter and narrower than the inner, 5–10 cm. long, 3–7 mm. wide, herbaceous, often with white, scarious edges, in many plants flushed with pink or dull red-purple at the tips; pedicel absent or nearly so, occasionally to 1 cm. long; ovary to 1.5 cm. long and 7 mm. wide, tapering gradually into the perianth-tube and abruptly into the pedicel; perianth-tube slender, linear, 2.5–7.5 cm. long, usu-

ally about 5 cm. long; sepals ±5 cm. long and 1 cm. wide, oblanceolate, the blade tapering gradually into the claw, pale yellow, cream, or white, with bluish tinge and veins; petals shorter than the sepals, 4 cm. long, 5 mm. wide, of the same color as the sepals, oblanceolate-spatulate, emarginate; style-branches 2–3 cm. long, much exceeding the stamens; style-crests linear or very slightly lanceolate, very slender, slightly incised at the tip, 1.5–2.5 cm. long, sometimes longer than the style-branches; stigma entire, tongue-shaped; filaments shorter than the anthers which are ±1.8 cm. long; capsule oblong, 3 cm. long, beaked, sometimes on an elongated pedicel; seeds slightly compressed. —Fl. N. W. Amer. i. 633 (1902); Dykes in Gard. Chron. (III) xlviii. 57 (1910); Dykes, Genus Iris 43 (1913), as synon. of *I. macrosiphon;* Abrams, Illust. Fl. Pacif. States i. 465 (1923).—Southwest to central Oregon, possibly occurring in Siskiyou Co., California, in semi-shade or deep shade. Specimens seen: OREGON: Cascade Mts., July, 1893, *Mrs. R. M. Austin* (G); southern portion of the western Cascades, July 1, 1902, *Cusick,* no. 2853 (G); 2 miles above Finch's, up the Illinois River, Apr. 20, 1926, *L. F. Henderson,* no. 5969 (RM, CA); Josephine Co., upper Thompson Creek, May 10, 1924, *Abrams & Benson,* no. 10,301 (RM); near Selma, Apr. 28, 1928, *N. P. Gale,* no. 17 (JWT); Savage Creek, 7 miles from Grants Pass, Apr. 2, 1926 (RM, CA); Grants Pass, June 20, 1886, *L. F. Henderson* (G); Wolf Creek, 1884, *T. Howell* (G); Grants Pass, Apr. 23, 1910, *G. Prescott* (W, no. 1389); Grants Pass, May 25, 1912, *H. S. Prescott,* (G, W, no. 3070); Rogue River, May 16, 1924, *W. Sherwood,* no. 966 (W); Ashland Creek, 5 miles above Ashland, May 17, 1924, *W. Sherwood,* no. 536 (W); on Oak Hills, north side of Siskiyou Mts., 12 miles south of Ashland, at 4000 ft., May 20, 1898, *E. I. Applegate,* no. 2243 (US); along Mill Creek, Polk Co., July 1, 1930, *M. E. Peck,* no. 16,201 (W); Jackson Creek, ¾ mile from Jacksonville, May 10, 1924, *Abrams & Benson,* no. 10,250 (RM); west Cascade Mts., near Ashland, June 13, 1895, *E. I. Applegate,* no. 283 (G); high hills in the east of Jackson Co., May, 1927, *J. W. Heckner* (JWT); northeast slope of Mt. Ashland, July 19, 1913, *M. E. Peck,* no. 1423 (W); near Woodville, June 27, 1909, *M. E. Peck,* no. 1424 (W); Soda Springs, May 31, 1902, *F. A. Walpole,* no. 2194 (US); summit of Cascade Mts., along Ashland-Klamath Falls Road, July 3, 1920, *M. E. Peck,* no. 9321 (W, G, JWT); Rogue-Umpqua Divide, 20 miles east of Crater Lake, July 23, 1916, *M. E. Peck,* no. 7650 (W); Douglas Co., without locality, Apr. 17, 1881, *T. J. Howell* (JWT, US); Glendale, May 27, 1918, *J. F. Collins* (G); road northeast of Diamond Lake, July 9, 1930, *L. F. Henderson,* no. 13,027 (O); McKenzie River, 5 miles above McKenzie Bridge, July 9, 1914, *M. E. Peck,* no. 7649 (W); 6 miles southwest of Dothan, June 26, 1917, *J. C. Nelson,* no. 1546 (G).

This species is usually found in herbaria as either *I. macrosiphon* or

I. californica. From *I. macrosiphon* it is distinguished by flowers with narrower and more delicate perianth-segments, by its narrowly linear and usually very long style-crests, by the spathe-valves, of which the outer is often much shorter and narrower than the inner, and by filaments much shorter than the anthers, which are purple or violet instead of yellow. The leaves are usually a lighter green than is characteristic of *I. macrosiphon.*

Examination of a number of specimens which could reasonably be regarded as this species has shown the presence of three groups. The largest of these is characterized by rather narrow leaves which are light green and glaucous, instead of the yellow green from which the specific name was taken. It should be noted that this yellow-green character is not mentioned in the original description, and that no type specimens are cited there. Therefore, since this group is the largest and most widespread, I am regarding it as characteristic *I. chrysophylla.* A second group is rather tall, with more ovate spathes in some cases, and with several sheathing cauline bracts very similar to those of *I. bracteata* S. Watson, except that the uppermost have a greater portion free from the stem than is the case with that species. It is possible that these plants are of hybrid origin. The group includes the following specimens: OREGON: halfway between Waldo and bridge over east fork of the Illinois River, May 11, 1924, *Abrams & Benson*, no. 10,367 (RM); 19.6 miles west of Roseburg on the Marshfield Road, May 13, 1924, *Abrams & Benson*, 10,523 (RM); 5 miles west of Camas Valley, June 2, 1928, *J. W. Thompson*, no. 4447 (JWT, G, US); upper Row River, below the falls, May 1, 1926, *Lupher* (G). Of these four, however, only one occurs within the general range of *I. bracteata*, so that if they are hybrids, it seems doubtful if that species can have been one of their progenitors. The third group is florally like the other two, but the leaves are much broader and tend to be more prominently nerved; the spathes are ovate-acuminate and rather broad in comparison with characteristic specimens of *I. chrysophylla.* It seems distinct, possibly worthy of recognition as a form or variety, but the available material does not justify segregation at present.

IRIS TENUISSIMA Dykes. Rhizome slender; leaves linear, acute, 30–35 cm. long and 5 mm. wide, subglaucous, finely ribbed, relatively few in a clump; stem simple, to 30 cm. tall, but usually shorter, with 1–3 narrow, linear-lanceolate reduced cauline leaves, free for most of their length; spathes (on the type) averaging 4.8 cm. long and 5 mm. wide, subequal, or the inner somewhat longer than the outer, acuminate, apparently rigid, usually 2-flowered; pedicel 1.2 cm. long, or less; ovary 1–1.5 cm. long, tapering equally at the ends; perianth-

tube linear for half its length, then abruptly dilating into a wider throat, averaging (on the type) 2.7 cm. long; sepals 4–6.5 cm. long, narrowly oblanceolate with a long claw, yellow-white, veined brown; petals shorter, pointed, very narrow, yellow-white; style-branches averaging ±2.5 cm. (2 cm. on the type); style-crests linear, slightly undulate near the tip, from ½ the length of the style-arms to approximately equal in length (1 cm. on the type); stigma triangular, entire; filaments 4–5 mm. long; anthers 1.3–1.5 cm. long; capsule oblong, tapering abruptly into the short pedicel, gradually into the longish beak, to 3.5 cm. long; seeds pyriform to oval, 3 mm. long, flattened, grayish-brown, wrinkled. (Description based on the type.) —Gard. Chron. (III) li. 18 (1912); Dykes, Genus Iris 44 (1913); Jepson, Fl. Calif. i. 324 (1921), as synon. of *I. macrosiphon;* Abrams, Illust. Fl. Pacif. States i. 465 (1923); Dykes, Handbk. Gard. Ir. 121 (1924).—Apparently centered in Shasta Co., California, with occasional appearances to the north and south. Specimens seen: CALIFORNIA: Siskiyou Co.: McCloud, July 15, 1912, *Eastwood*, no. 1092 (CA, G); Cantara, July 23, 1912, *Eastwood*, no. 1353a (CA); Shasta Springs, May 18, 1923, *Eastwood*, no. 11,824 (CA): Shasta Co.: Montgomery Creek, May 24, 1923, *E. Bethel* (CA, no. 110,675); near Pitt River Ferry, 1897, *H. E. Brown*, no. 239 (type, in US); Baird, June, 1912, *Mrs. A. L. Coombe* (CA, no. 110,672); Baird, Apr. 21, 1934, *Eastwood & Howell*, no. 1821 (CA); Goose Valley, June 29, and July 11, 1912, *Eastwood*, no. 719 (CA, G, US); Delta, May 28, 1923, *Eastwood*, no. 11,965 (CA); Ydalpom, Apr. 29, 1918, *Mrs. D. B. McAllister*, no. 26 (CA); near Redding, May, 1931, *Mrs. C. F. Rose* (CA, no. 174,605); near Shasta, Apr. 25, 1931, *Mrs. C. F. Rose* (CA, no. 191,460); Pitt River, May 6, 1913, *L. E. Smith*, no. 180 (G, US, CA); Iron Mt., May 31, 1915, *L. E. Smith* (CA, no. 110,682): Butte Co.: Butte Meadows, June 20, 1925, *Mrs. G. E. Kelly* (CA, no. 128, 603); Chico Meadows in the Sierra Nevada, June 11, 1915, *Heller*, no. 11,961 (G, CA).

The description here given is based in large measure upon the type, *Brown*, no. 239. In his original description, Dykes stated that the style-crests are almost as long as the style-branches, and this distinctive feature is utilized in his key to the group.[1] In a later description,[2] he says that plants grown from seeds collected near the type locality by Miss Alice Eastwood corroborated the original description, even the guess as to the probable color of the flowers. In my opinion, the type sheet does not justify Dykes' assertion as to the length of the crests relative to the style-branches. On the five flowering stems, only one style is sufficiently preserved to warrant the assertion that

[1] Genus Iris 36 (1913).
[2] Handbk. Gard. Ir. 121 (1924).

the style-crests are linear, and the best measurements which I can make seem to show that the crests are little over half the length of the style-arm in this particular specimen. Of twenty-four measurements on specimens other than the type, in only one is the ratio of style to crest less than 1.25, and the average is 1.72.

Abrams[1] says of this species: "An imperfectly known relative of *I. macrosiphon*, differing, probably inconstantly, in the narrower, tapering perianth-segments; stigma-crests about as long as the stigmas." Nevertheless, since the crests are narrowly linear, the perianth-segments narrower, as well as slighter, the spathes more broadly "naviculate," and the perianth-tube usually much shorter, this plant is reasonably well differentiated from *I. macrosiphon*. Its slender floral parts are even more difficult to preserve than is the case with most of these plants, and a detailed field study is needed for this species, as for so many of its relatives, in order to clear up some of the doubtful points. Some of the specimens here assigned to this species are so placed with hesitation, particularly some of the stems on various sheets of *Eastwood*, no. 1092. In tube-length, shape of perianth-segments, and ratio of style to crest, these are almost indistinguishable from *Heller*, no. 11,961, of which a sheet in the Gray Herbarium has been marked *I. amabilis* Eastwood, by L. R. Abrams. The spathes and leaves of *Heller*, no. 11,961 are different from those of the other specimen, but otherwise there is a great similarity. Comparison with the type of *I. amabilis* indicates that neither specimen can be assigned to it. It is of course possible, even probable, that extensive hybridization is responsible for some of the difficulties presented by this species, a thing true of most of the *macrosiphon*-complex.[2]

✓ IRIS TENUISSIMA var. **purdyiformis**, var. nov. (Tab. 2, fig. 1). Folia pauca, ad 3–3.5 dm. longa, 3–5 mm. lata, caulem excedentia, unilateraliter glaucescentia ut in *I. Purdyo;* folia caulina pauciora quam in *I. tenuissima* (in caulibus aequilongis), breviora, appressa, apice modo libera breviterque acuminata; stigma subrotundum, nec acutum ut in *I. tenuissima* nec truncatum ut in *I. Purdyo;* ceterum ut in *I. tenuissima*.—Leaves linear, acute, to 3.5 dm. long, but occasionally reaching 5.5 dm., narrow, 3–5 mm. wide, rather light green, glaucous or subglaucous on one side, darker on the other; stems simple, 1.4–3.4 dm. long, exceeded by the leaves which are probably somewhat lax, with 2–4 somewhat inflated, herbaceous, rose-tipped, basally appressed, shortly acuminate cauline leaves, which are free only at

[1] Illust. Fl. Pacif. States i. 465 (1923).

[2] Further study indicates that it will probably be necessary to reinterpret and extend the concept of *I. tenuissima*.

the tip; spathes opposite, herbaceous, tipped and margined with rose, 3.5–5 cm. long and 6–10 mm. wide, the inner longer than the outer by 4–8 mm., 2-flowered; pedicel 5–8 mm. long; ovary narrowly oval, ±7 mm. long; perianth-tube linear, a trifle dilated near the top, 3–4.3 cm. long, averaging 3.29 cm. in 8 measurements; sepals narrow, to 4.2 cm. long, apparently pale yellow; petals narrow, to 3.7 cm. long; style-branches 2 cm. long; style-crests linear, 7–10 mm. long; stigma more rounded than in *I. tenuissima*, but not truncately so as in *I. Purdyi* Eastwood; filaments 5 mm. long; anthers ±1.2 cm. long; immature capsule somewhat oblong-ovate, 1.2 cm. long; seeds not seen.—Plumas and Sierra Counties, California, in pine woods. Specimens seen: CALIFORNIA: Plumas Co.: Feather River region, Camp Rodgers, Apr. 11, 1934, *E. P. Chace* (type, in CA, no. 212,531); Camp Rodgers, June 8, 1920, *Anna Head* (CA, no. 110,671): Sierra Co.: Cedar Glen, May 25, 1920, *V. Jones* (CA, no. 110,677).

This plant is known to me only from the three specimens cited, two of which were originally labelled *I. Purdyi* Eastwood. The varietal name was given because of this resemblance. According to the label on *Anna Head's* specimen, collected at the same place as the type, the plant is found under pines, and the flowers are never blue in color, but almost white. In the coloring and shape of the cauline leaves, the short stems, pink-tipped and margined spathes, and one-sidedly glaucous leaves, this plant does have a deceptive resemblance to *I. Purdyi*. Nevertheless, an examination of the rather poorly preserved flowers shows petals and sepals to be much smaller and more delicate than those of *I. Purdyi*, or, indeed, than in most specimens seen of *I. tenuissima*. As in that species, however, the style-crests are narrowly linear. On the whole, the floral parts are quite unlike those of *I. Purdyi*. That species has a truncately rounded or flattened stigma, while that of *I. tenuissima* is so acuminate as to be nearly tongue-shaped. In this new variety the stigma is not tongue-shaped, but is apparently more rounded than is the case with *I. Purdyi*, nor does it seem bilobed, as is sometimes true of that species.

To call this new variety a hybrid between *I. tenuissima* and *I. Purdyi* is tempting, but there are several reasons against doing so at the present time. First, the only real floral resemblance to *I. Purdyi* is in the stigma. An examination of living material may show that there is actually less resemblance in this respect than appears from dried material. In the second place, *I. Purdyi* is confined to the coast redwoods, and no records of its natural occurrence elsewhere are known to me. *I. tenuissima* is a plant of the interior, with a rather limited range well to the east of *I. Purdyi*, with no overlap between

the two ranges. Hybridization between the two species, producing a plant known only from southeast of the range of *I. tenuissima*, seems improbable.[1]

IRIS PINETORUM Eastwood. Rhizome slender, bearing the fibrous remains of old leaves; leaves pale green, finely striate, linear, acute, to 40 cm. long and 5 mm. wide; stems simple, very slender, 11–27 cm. long, shorter than the longest leaves, bearing 2–3 narrow cauline leaves, which are 5–8.5 cm. long, with the upper third free from the stem; spathe-valves distant from 8–12 mm., divergent, narrow, linear-lanceolate, herbaceous, with scarious edges, the outer one 5.6–6.2 cm. long and 2 mm. wide, the inner 4.7–5.3 cm. long and 3 mm. wide; perianth-tube linear, 1.2–1.7 cm. long; sepals ±6 cm. long, narowly oblanceolate, the blade about 1 cm. wide, tapering gradually into the long claw, pale yellow veined with violet; petals narrower and somewhat shorter; style-arms 3 cm. long; style-crests ±8 mm. long; stigma entire, triangular; filaments 8–10 mm. long; anthers about 1.3 cm. long; capsule 2 cm. long by 1 cm. wide, broadly oblong, abruptly tapering at base and apex; seeds not seen.—Proc. Calif. Acad. Sci. xx. 137 (1931).—In pine forests, apparently endemic in Plumas Co., California. Specimens seen: CALIFORNIA: Plumas Co.: Forest Lodge, near Greenville, June 11, 1927, *Eastwood*, no. 14,454 (type, in CA).

This species is known to me only from the type specimen. According to the original description, the plant is common in the type locality, growing under pines. In some respects, such as the narrow leaves and the flower parts, this species is distinctly like *I. tenuissima*. The perianth-tube, however, is shorter, possibly half the length of that of its relative, and the spathes are narrow and divergent, as well as distant, a point not mentioned in the original description. The spathe characters, indeed, are exactly those of *I. Hartwegii* and *I. tenax*. It is possible that *I. pinetorum* will prove to be a hybrid between *I. Hartwegii* and *I. tenuissima*, or a stabilized segregate from such a cross, a suggestion which the ranges of these two species make not impossible. Nevertheless, in the absence of living plants and more extensive herbarium material, it seems advisable to leave this plant in the status originally given it.

IRIS DOUGLASIANA Herbert in Hooker and Arnott. Rhizome moderately slender, ±8 mm. in diameter; leaves linear, acute, prominently ribbed, usually lightish green but occasionally darker, flushed pink or red at the base, 3–4.5 dm. long, ±6 mm. wide; stems exceeded by the leaves, usually 1–2-branched, but simple in weakly growing

[1] Material recently seen extends the range of *I. tenuissima* to the west.

plants, with 1–3 cauline leaves; spathes green, sometimes flushed purple at the base, lanceolate-acuminate, broad, subequal, or the inner longer, opposite, to 8.5 cm. long and 8 mm. wide, 2–3-flowered; pedicel to 4–5 cm. long, but usually shorter; ovary elliptic-oval, sharply trigonal, tapering equally at the ends, to 3–4 cm. long; perianth-tube linear, ±2.5 cm. long; sepals obovate-oblanceolate, obtusely rounded or subacute, to 5.5 cm. long, but usually less than 5 cm., ±2 cm. wide, color variable among shades of lavender-purple, veined deeply on the claw and at the base of the blade; petals shorter than the sepals, oblanceolate, 4.5 cm. long and 1 cm. wide; style-branches 2.7 cm. long; style-crests subquadrate, coarsely toothed, 1.6 cm. long; stigma entire, triangular; filaments ±8 mm. long; anthers ±1.2 cm. long; capsule very sharply trigonal, tapering equally at the ends, 3.5–5 cm. long; seeds almost spherical, with wrinkled coats.—Bot. Beech. Voy. 395 (1841); Hooker f. in Bot. Mag. c. t. 6083 (1874); Baker in Journ. Linn. Soc., Bot. xvi. 138 (1877); Baker, Handbk. Irid. 6 (1892); Greene, Man. Bot. San Fran. Bay 308 (1894); Jepson, Fl. West. Mid. Calif. 129 (1901); Howell, Fl. N. W. Amer. i. 634 (1902); Dykes, Genus Iris 37 (1913); Jepson, Fl. Calif. i. 324 (1921); Abrams, Illust. Fl. Pacif. States i. 464 (1923); Dykes, Handbk. Gard. Ir. 116 (1924); Jepson, Man. Fl. Pl. Calif. 253 (1925). *Iris Beecheyana* Herbert in Hooker and Arnott, Bot. Beech. Voy. 395 (1841), fide Dykes (1913). *Iris Douglasiana* var. *nuda* Herbert in Hooker and Arnott, Bot. Beech. Voy. 395 (1841). *Iris Douglasiana* var. *altissima* Purdy ex Jepson, Fl. Calif. i. 325 (1921); Jepson, Man. Fl. Pl. Calif. 253 (1925).—Open woods or sunny slopes and fields, southern Oregon to Monterey, California. Specimens seen: CALIFORNIA: without locality or date, *Coulter*, no. 746 (G); without locality, 1869, *Kellogg & Harford*, no. 973 (G); San Lorenzo Valley, 1869, *Kellogg & Harford*, no. 978 (G): Del Norte Co.: Smith River, June 12, 1884, *T. Howell* (G); Requa, Aug. 19, 1920, *C. D. Duncan*, no. 324 (RM): Mendocino Co.: without locality, 1876, *G. R. Vasey* (G): Humboldt Co.: Redwood belt, 1907, *Chandler*, no. 1262 (G); Carlotta, Aug. 16, 1923, *Eastwood*, no. 12,313 (CA); Yances, Camp 19, May 6, 1911, *H. H. Smith*, no. 3777 (US); Eureka, May 22, 1921, *C. V. Piper* (CA, no. 110,694) in part: Mendocino Co.: Albion River, May, 1902, *J. MacMurphy*, no. 111 (US) in part; Fort Bragg, Aug. 8–16, 1912, *Eastwood*, no. 1600 (CA); Fort Bragg, May 3, 1914, *G. Newell** (CA, no. 110,692); Mendocino City, May 24, 1921, *Anna Head* (CA, no. 110,695); Mendocino City, Aug. 8–16, 1912, *Eastwood*, no. 1710* (CA); Ukiah, May 11, 1869, *Kellogg & Harford*, no. 979 (G): Sonoma Co.: Bodega Point, 1891, *Eastwood* (RM, G); Bodega Bay, 1902, *Heller & Brown*, no. 5182 (G, RM): Marin Co.: without locality, June, 1880, *G. Brown* (US, no. 36,766); Corte Madera, 1854, *Bigelow* (G); Corte Madera, Apr. 28, 1904, *Heller*, no. 7371 (G); Sausalito, Mar. 8, 1913, *W. F. Schmitt* (US, no. 880,085); Kentfield, May 21, 1912, *Eastwood*, no. 44 (CA); Fairfax,

Apr. 27, 1891, *W. C. Blasdale* (RM, no. 40,625); Point Reyes, May 13, 1923, *Eastwood,* no. 11,805 (CA); Point Reyes, June 23, 1915, *Eastwood*, no. 4774 (CA); Mt. Tamalpais, July 29, 1912, *Eastwood,* no. 1506 (CA); Point Reyes, May 1, 1930, *B. R. Jackson* (CA, no. 174,149); Point Reyes, May, 1906, *Eastwood* (CA, no. 110,690); Mt. Tamalpais, Rock Spring Trail, Feb. 28, 1926, *J. T. Howell,* no. 1650 (CA): San Francisco Co.: San Francisco Peninsula, near Lake Merced, May, 1903, *N. L. Gardner,* no. 542 (RM); San Francisco, March–May, 1906, *H. A. Walker,* no. 27 (RM); San Francisco, Presidio, 1894, *Eastwood* (G); San Francisco, Mt. Davidson, May 8, 1933, *H. W. Clark* (CA, no. 204,573); near San Francisco, Mar. 20, 1913, *W. F. Schmitt* (US, no. 880,087): Santa Clara Co.: Los Gatos, Raymond's Ranch, June 18, 1914, *G. Newell* (CA, no. 110,572): Santa Cruz Co.: near Glenwood, Apr. 10, 1903, *Heller* (G); Santa Cruz, San Lorenzo Drive, June 11, 1929, *Mr. & Mrs. Dearing** (CA, no. 173,309): San Mateo Co.: above Woodside, in the Santa Cruz Mts., May 3, 1930, *L. Benson,* 2105 (JWT); Portola, May, 1903, *A. D. E. Elmer,* no. 4503 (CA); San Bruno Hills, 1907, *Heller,* no. 8461 (G); San Bruno Hills, April, 1918, *M. L. Campbell* (CA, no. 110,588); San Mateo, June, 1903, *A. D. E. Elmer,* no. 4806 (CA); Crystal Springs Lake, Mar. 22, 1902, *C. F. Baker,* no. 343 (G): Monterey Co.: Monterey, 17-mile Drive, Apr. 25, 1917, *I. McGuire* (CA, no. 110,589); Carmel, April, 1922, *F. S. Cantwell** (CA, no. 110,587); Monterey, Cypress Point, May 28, 1912, *Eastwood,* no. 24* (CA); Pacific Grove, 1903, *Heller,* no. 6468* (G, RM); Monterey, Mar. 9, 1913, *Eastwood,* no. 2483 (CA).

This essentially maritime plant is extremely variable. Jepson, taking up a manuscript name of Purdy's, mentions a var. *altissima,* which is 3–3½ feet tall, from Halfmoon Bay, San Mateo Co. The name has not been kept up here because only a single specimen was cited by Jepson, and in a matter so variable as height, more than this is necessary to warrant the retention of a varietal name. In color, *I. Douglasiana* is almost as variable as *I. tenax,* with flowers usually of some shade of purple, lavender, or white, veined rather deeply on the sepal claw.

Iris Douglasiana var. bracteata Herbert in Hooker and Arnott. Rhizome moderately thick, red-brown, sheathed in the dark red-brown bases of old leaves; leaves linear-ensiform, acute, to 80 cm. long and 1.5 cm. wide, pale green and nerved as in the northern plants of *I. Douglasiana;* stem usually branched, bearing numerous narrow cauline leaves, to 30 cm. tall, the terminal inflorescence 3-flowered; spathes usually distant by about 1.5 cm., but sometimes by much less, to 11 cm. long, 5 mm. wide, linear-lanceolate, divergent, herbaceous; pedicel 1–4 cm. long; ovary 2.5–5.5 cm. long, ±7 mm. wide,

trigonal, tapering equally at the ends; perianth-tube 1.5–2 cm. long, linear, dilating near the top; sepals to 5 cm. long (usually shorter) and 2 cm. wide, obovate-oblanceolate, without real distinction between blade and claw, variable in color but usually a darkish purple, veined more deeply, especially on the claw; petals a trifle shorter than the sepals, to 1.2 cm. wide, oblanceolate, more nearly acute than the sepals; style-branches 2.5 cm. long; style-crests 1 cm. long, large, subquadrate, less coarsely toothed than in *I. Douglasiana;* stigma entire, triangular; filaments ±1.2 cm. long; anthers ±1.4 cm. long; capsule less sharply angled than in *I. Douglasiana*, ovate-oblong; seeds not seen.—Bot. Beech. Voy. 395 (1841). *Iris Watsoniana* Purdy in Erythaea v. 128 (1897); Dykes in Gard. Chron. (III) lv. 391 (1914); Dykes, Genus Iris 37 (1913); Dykes, Handbk. Gard. Ir. 116 (1924), as synon. of *I. Douglasiana* in these last two references.—Coastal region in California around Humboldt Co., apparently occurring infrequently elsewhere. Specimens seen: CALIFORNIA: without locality or date, *Coulter* (G); Nova California, 1833, *Douglas* (G): Humboldt Co.: Big Lagoon near Orick, June 25–27, 1922, *Abrams & Bacigalupi*, no. 8273 (RM); Trinidad, Apr. 21, 1907, *Eastwood*, no. 23 (CA); Carlotta, June, 1915, *E. P. Hauver* (CA, no. 110,688); Carlotta, Apr. 24, 1924, *Mrs. H. E. Wilder* (CA, no. 110,686); Eureka, May 22, 1921, *C. V. Piper* (CA, no. 110,694) in part; Humboldt Bay, 1878, *V. Rattan* (G); Mendocino Co.: Mendocino City, June 28, 1922, *Eastwood*, no. 11,418 (CA): Monterey Co.: Pacific Grove, 1902, *Elmer*, no. 3565 (G); Santa Lucia Mts., April, 1898, *R. A. Plaskett*, no. 79 (RM).

Plants collected at Eureka in Humboldt Co., California, were described by Carl Purdy, in 1897, as *I. Watsoniana.* The dimensions given in the original description are of such a nature as to suggest that an unusually large specimen had been found, much larger than any specimen seen by me. The sepals, for example, are described as being "1¾ inches long and 6 inches wide" and the petals as being 3 inches wide. Nevertheless, from living material, Dykes[1] reached very nearly the same concept of *I. Watsoniana* that I have reached from a study of herbarium material. It is a plant of paler green, even yellowish-green, leaves which are consistently wider and less conspicuously ribbed than in the typical variety. Its spathes are narrower, more nearly linear-lanceolate, divergent, and usually distant rather than opposite, although in this respect there is some variation. Unlike Dykes, however, I can distinguish no real difference in the perianth-tubes of the two plants; that of *I. Watsoniana* falls within the range of variation shown by *I. Douglasiana.* The flower of this broad-

[1] In Gard. Chron. (III) lv. 391 (1914).

leaved plant is often, but not always, smaller than that of *I. Douglasiana*, and is more consistently uniform in color, usually a rather deep purple. Here again, however, it falls within the limits of variation in *I. Douglasiana*. With few exceptions, it appears to occupy a definite geographic range.

Since significant difference in floral structure is lacking, it appears to me impossible at present to separate *I. Watsoniana* as a species. Yet, to follow Dykes[1] in making it merely a synonym of *I. Douglasiana* is unwarrantably to ignore the facts as to its range and vegetative characters. It is clearly entitled to varietal status.

In the original description of *I. Douglasiana*, Herbert described a var. *bracteata* (appearing as *bacteata* through a misprint), which differed from the type by its "caule superne bracteato (ut in I. tenace) spatha 3-valvi, pedunculis brevioribus, limbo breviore (saturatiore?)." From the reference to *I. tenax* it is clear that this phrase must refer to the distant spathe valves, for when these are distant for any appreciable length, the effect of only three spathe valves is readily produced. In many, but not all, of the specimens of *I. Watsoniana* examined, the pedicels are shorter than in *I. Douglasiana*, while the perianth-segments are usually smaller (although the largest dimensions have been given in the description above). Nevertheless, in what seem essential points, *I. Watsoniana* so closely resembles the description of *I. Douglasiana* var. *bracteata* that I have ventured to regard them as identical. This decision has been confirmed by a photograph of the type specimen of *I. Douglasiana*, which is preserved in the Kew Herbarium. Through the kindness of Sir Arthur W. Hill this photograph has been presented to the Gray Herbarium. In the left-hand specimen, the type of var. *bracteata*, the outer spathe valve is inserted on the stem some distance below the second, about 2.7 cm., according to information contained in a letter from Sir Arthur Hill to Professor Fernald (Feb. 28, 1936). In appearance, this plant is so like numerous specimens of *I. Watsoniana* examined that the identity of the two seems unquestionable.

As Dykes[2] pointed out, this Iris bears striking resemblances to *I. tenax*, as well as to *I. Douglasiana*. It may have had its origin as a stabilized segregate from a cross of these two species, a suggestion which, from the present ranges of the two plants, is not impossible. The occurrence of var. *bracteata* on the southern edge of the limits of *I. tenax* and north of the principal locations of *I. Douglasiana* would

[1] Genus Iris 36 (1913).
[2] In Gard. Chron. (III) lv. 391 (1914).

favor such an hypothesis. Numerous specimens have been seen which appear to be transition-forms between *I. Douglasiana* and its var. *bractata*, but these have been classed with *I. Douglasiana* in the list of exsiccatae and marked with an asterisk. When the localities of these specimens were found on the map, it was seen that almost without exception the intermediate forms were found in regions where the species and variety were associated, as on the coast of Humboldt and Monterey Counties. A hybrid origin for these intermediates can thus be postulated with a fair degree of probability.

IRIS DOUGLASIANA var. **oregonensis**, var. nov. (Tab. 2, fig. 2). Folia breviora latioraque; spathae valvi latiores, ovato-lanceolati, fere 1-fl.; perianthii tubus brevior; sepala amplius obovata quam in *I. Douglasiana* typica. Rhizome moderately slender; leaves light yellowish-green, flushed pink at the base, prominently ribbed, to 5 dm. long and 1.5 cm. wide; stems simple or shortly branched, bearing 1–2 lanceolate, reduced leaves; spathes broadly lanceolate, acute, opposite, herbaceous, to 9.5 cm. long and 8 mm. wide, 1–2-flowered; pedicel to 3 cm. long; ovary ±3 cm. long, narrowly elliptic, trigonal; perianth-tube linear, 1.3–1.8 cm. long; sepals broadly oblanceolate or obovate, to 6.5 cm. long and 3 cm. wide, obtuse, lavender-grey, the broad claw lighter than the blade and veined more darkly than the blade; petals ±5 cm. long and 1.4 cm. wide, lavender-grey; style-branches ±2.6 cm. long, ±8 mm. wide at the stigma; style-crests ±1.3 cm. long, rounded-oblong, dentate; stigma entire, triangular; filaments ±9 mm. long; anthers 1.5 cm. long; capsule ±5 cm. long, oblong-ellipsoid, tapering equally at the ends; seeds not seen.—Coast of southern Oregon. Specimens seen: OREGON: Coos Co.: near Myrtle Point, May 13, 1924, *Abrams & Benson*, no. 10,545 (TYPE, in RM); cliffs at Bandon Beach, May 14, 1924, *Abrams & Benson*, no. 10,606 (RM), possibly a hybrid: Curry Co.: hills back of Gold Beach, May 16, 1924, *Abrams & Benson*, no. 10,660 (RM); moist to wet ground in town-limits of Gold Beach, June 24, 1926, *L. F. Henderson*, no. 7138 (O); Cape Blanco, May 15, 1924, *Abrams & Benson*, no. 10,633 (RM); moist slopes, Port Orford, June 20, 1919, *M. E. Peck*, no. 8452 (G).

This variety is known to me only from the six specimens cited above. It differs from typical *I. Douglasiana* in its broader, more nearly ovate spathes, shorter perianth-tube, in being usually 1-flowered, and in the shape and color of the sepals. The leaves also seem to be rather shorter, wider, and of a somewhat different color than in the more southern plants.

IRIS DOUGLASIANA forma **alpha** (Dykes) comb. nov. *Iris Douglasiana* var. *alpha* Dykes in Gard. Chron. (III) lv. 392 (1914).

This plant, of which no specimens have been available, is described as differing from the typical color-forms of the species in having creamy-white sepals, with a few deep crimson-purple veins on the blade, which is suffused with pale yellow between the veins. Accordingly, it is here reduced to the rank of a form. In a species which varies so markedly in color as does *I. Douglasiana*, it seems a questionable procedure to award color variants the status of forms, since this will inevitably result in a multiplicity of virtually useless names. However, forma *alpha* seems, *ex descr.*, to be sufficiently unlike the usual *I. Douglasiana* in color to warrant the retention of the name, especially since it is probably this color form to which Baker[1] refers as the "Santa Cruz variety," indicating that it has a certain geographic definiteness.

IRIS BRACTEATA S. Watson. Rhizome slender, ±8 mm. in diameter, sheathed in the unsplit bases of old leaves; leaves few, thick, rigid, linear-acute, strongly ribbed, glossy on one side, glaucous on the other, to 53 cm. long and 9 mm. wide; stems simple, usually exceeded by the leaves, 25 cm. long, closely sheathed in 3–6 linear-acuminate bracts, of which the lowest have no free portion, while the upper have one-third of their length free, all more or less strongly tinged with red; spathes 2-flowered, subequal in length, 7 cm. long and 6–7 mm. wide, lanceolate, acuminate, herbaceous, with scarious margins; pedicel to 6.5 cm. long; ovary 2 cm. long, tapering gradually into the pedicel and abruptly into the tube; perianth-tube short and infundibuliform, not over 1 cm. long; sepals yellow, veined brown, obovate-oblanceolate, 6.5 cm. long by ±1.5 cm. wide, the blade narrowing into a rather broad claw; petals 5 cm. long, 7 mm. wide, narrowly oblanceolate, yellow, unveined; style-branches 3 cm. long; style-crests broadly subquadrate, with toothed edges, 6 mm. long: stigma entire, triangular or tongue-shaped; filaments 7 mm. long; anthers 1.3 cm. long; capsule 2–2.5 cm. long, tapering equally and abruptly at the ends; seeds dark brown, angular, flattened. (Description based on the type).—Proc. Amer. Acad. xx. 375 (1885); Baker, Handbk. Irid. 7 (1892); Howell, Fl. N. W. Amer. i. 634 (1902); Dykes, Genus Iris 38 (1913); Stapf in Bot. Mag. clxi. t. 8640 (1915); Abrams, Illust. Fl. Pacif. States i. 464 (1923); Dykes, Handbk. Gard. Ir. 117–118 (1924).—Endemic in southern Oregon. Specimens seen: OREGON: Josephine Co.: Waldo, June, 1884, *T. Howell* (type, in G); Deer Creek Mts., Apr. 26, 1887, *T. Howell* (G); Waldo, Apr. 24, 1887, *T. Howell* (G); Waldo, May 20, 1928, *N. P. Gale*, no. 232 (JWT); Hogue Ranger Station, 3 miles above Takilma, on East Illinois River, Apr. 25, 1926, *L. F. Henderson*, no. 5968 (O, RM); Page Creek, 3 miles southeast of Takilma, July 8, 1918, *M. E. Peck*, no. 8174 (W).

[1] Handbk. Irid. 7 (1892).

This large and handsome species is apparently closely confined to a small region in southern Oregon. Less variable than other members of the *Californicae*, it does vary somewhat in size, as is to be expected. Its leaves and bracteate stem make it easily recognizable. Dykes[1] noted that in the wild state apparently no color is found other than yellow, a fact corroborated by Starker.[2]

IRIS PURDYI Eastwood. Rhizome slender, dark red-brown, covered with the fibrous remains of old leaves; leaves few in a clump, linear, acute, to 4.8 dm. long and 7 mm. wide, bright dark-green on one side, rather glaucous on the other, flushed pink at the base, the margins thickened, but the nerves only subprominent, exceeding the flowering stems but somewhat laxly spreading; stems simple, 15–25 cm. long, covered with imbricate, somewhat inflated, acuminate, sheathing bracts, free only at the tips, striate, flushed and edged with pink; spathes opposite, herbaceous, inflated, very broadly lanceolate-ovate, acuminate, the outer shorter than the inner, usually by 1 cm., 5.5–6.5 cm. long and 8–10 mm. wide, prominently margined with rose-color, 1–2-flowered; pedicel 1–2 cm. long; ovary narrow, 1–1.5 cm. long; perianth-tube linear, 1.5–4 cm. long (rather short on the type); sepals oblanceolate, widely spreading, ±6 cm. long and 2 cm. wide, cream or lavender, veined and dotted with deeper purple on the claw and blade; petals ±4.5 cm. long and 1 cm. wide, oblanceolate, the margins sinuate; style-branches 2.6 cm. long; style-crests 1.5 cm. long, narrowly semi-ovate or nearly linear, laciniate; stigma entire, rounded truncately, so distinctly undulate on the edge that in some instances the stigma appears almost bilobed; filaments 5 mm. long; anthers ±1.7 cm. long; capsule oblong-ovoid, trigonal, somewhat beaked, 2–3 cm. long; seeds D-shaped, thick, light brown. (Description based on the type.)—Proc. Calif. Acad. Sci. (ser. 3) i. 78 (1897); Dykes, Genus Iris 42 (1913); Abrams, Illust. Fl. Pacif. States i. 464 (1923); Dykes, Handbk. Gard. Ir. 119 (1924). *Iris macrosiphon* var. *Purdyi* (Eastw.) Jepson, Fl. Calif. i. 325 (1921); Jepson, Man. Fl. Pl. Calif. 254 (1925). *Iris Douglasiana* sensu Regel in Gartenflora, t. 1222 (1886).—Apparently common in the Redwood region, Mendocino and Humboldt Counties, California, in open woods. Specimens seen: CALIFORNIA: Mendocino Co., Ukiah, May, 1897, *C. Purdy* (type, in CA); Ukiah, June 13, 1913, *Eastwood*, no. 3292 (CA, US, G); between Westport and Branscombe, June 21–24, 1922, *L. R. Abrams*, no. 8199 (RM); Albion River, May, 1902, *J. McMurphy*, no. 111 (US) in part; Humboldt Co., Red Mountains, 1866, *Bolander*, no. 6587 (G, US); 20 miles north of Garbersville, May 2, 1931, *M. S. Jussel* (CA, no. 195,737); Redwood Forest, May 15, 1933, *Aven & R. A. Nelson*, no. 582 (RM).

[1] Handbk. Gard. Ir. 118 (1924).
[2] Bull. Amer. Iris Soc. no. 53: 14 (1934).

To a certain extent, as Miss Eastwood remarked in the original description, this species bears a resemblance to *I. Douglasiana* in leaves and flowers. Nevertheless, the flowers, on the whole, are larger, while the leaves differ in color and in being glaucous on one side. Above all, the shape of the stigmatic lip is enough to distinguish this species from any other known member of the *Californicae*. Where others have a triangular acute, or acuminate, or even tongue-shaped stigma, *I. Purdyi* has a flat, truncate stigma, which in one or two well-preserved flowers is so undulate in the middle that it appears slightly bilobed.[1] The plant is apparently endemic in northern California. Dykes[2] refers to it as coming from Sonoma and Mendocino Counties, but cites no herbarium specimens. The few specimens I have seen have come from Mendocino and Humboldt Counties, where it is said to be fairly common in the Redwood region.[3] The flower color is usually yellow, but *Aven & R. A. Nelson*, no. 582 appears to be a very delicate lavender; this specimen also has a perianth-tube which is somewhat longer than usual, both things being equally true of *M. S. Jussel* (CA, no. 195,737). This is possibly an indication of hybridization.

In the measurements given in the original description, the sepals are said to be 7 cm. long. An examination of the type shows that the perianth-tube has been split downward from the top, exposing the undivided portion of the style. Measurements from the base of the split give the length 7 cm., while measurements from the actual point of separation of the perianth-segments give approximately 6 cm., or a trifle less, for sepal length.

IRIS INNOMINATA Henderson. (Plate 3, fig. 1.) Rhizome slender, about 4 mm. in diameter; leaves to 35 cm. long and 4 mm. wide, exceeding the stems in dwarf forms, dark green on one side, paler and glaucous on the other, flushed brown-purple at the base, linear, acute, somewhat striate but not prominently nerved; stems slender, simple, to 25 cm. tall, with 3–4 cauline leaves which are 4–9 cm. long and free for the upper third of their length; spathes broadly lanceolate or ovate, herbaceous, with scarious margins, subequal, 4 cm. long and 6 mm. wide, 1–2-flowered; pedicels short, 5–11 mm. long; ovary 1.5–1.8 cm. long; perianth-tube linear, 2–3 cm. long; sepals broadly oblanceolate, 4.5 cm. long and 1.8 cm. wide, the blade tapering into the narrow claw, usually yellow with purple veins; petals about 4 cm.

[1] Specimens from the Dudley Herbarium of Stanford University, seen in 1937, indicate that the stigma-lip is often definitely bilobed.

[2] Genus Iris p. 42 (1913).

[3] Eastwood in Proc. Calif. Acad. Sci. (ser. 3) i. 78 (1897).

long and 7 mm. wide, narrowly oblanceolate, entire, yellow, apparently only slightly veined, if at all; style-branches averaging 1.7 cm. long; style-crests about 9 mm. long, subquadrate to semi-ovate, apparently not toothed in the type; stigma entire, triangular; filaments 8 mm. long; anthers 1.2 cm. long; capsule oblong-oval, 2.5 cm. long, 1.2 cm. wide; seeds rather dark brown, oval, 3 mm. long, pitted and wrinkled, sharply angled.—Rhodora xxxii. 23 (1930).—Dry sunny woods in southern Oregon. Specimens seen: OREGON: Douglas Co.: west fork of Cow Creek, May 1, 1930, *L. F. Henderson*, no. 12,307 (G); 6 miles southwest of Dothan P. O., June 20, 1917, *J. C. Nelson*, no. 1402 (G); along West Fork-Marial Trail, 5 miles west of West Fork, June 20, 1917, *M. E. Peck*, no. 5118 (W); 5 miles west of West Fork, June 27, 1917, *M. E. Peck*, no. 5116 (W): Curry Co.: on Rogue River, 8 miles above ferry at Wedderburn, May 23 and July 14, 1929, *L. F. Henderson*, no. 10,086 (TYPE, in O); South Fork of Euchre Creek, Port Orford-Gold Beach Road, May 16, 1924, *Abrams & Benson*, no. 10,644 (RM); 13 miles southeast of Port Orford, July 2, 1919, *M. E. Peck*, no. 8939 (W); Snow Camp, June 23, 1929, *L. Leach*, no. 2347 (W); Illahe, June 30, 1929, *L. Leach*, no. 2346 (W); 4 miles northeast of Brookings, Aug. 1, 1913, *M. E. Peck*, no. 7652 (W).

The description given here has been based to a large extent on a portion of the type presented to the Gray Herbarium by Professor Henderson. When the species was first described, it was thought to be confined to a relatively small area on the Rogue River in Oregon. Mrs. J. R. Leach[1] has found this species to be widespread in Curry County, Oregon, and the specimens here associated with the type extend the range into Douglas County.

In size and color, *I. innominata* is variable. *Peck*, nos. 8939 and 5116 are only 11 cm. from the base of the plant to the tip of the petals, while *Peck*, no. 8642 is about 30 cm. tall. The leaves, too, vary in length, the longest leaves, in apparently all cases, exceeding the stem. Flower-color varies, according to Starker,[2] from clear yellow through butter-yellow and apricot to orange, while Mrs. Leach (l. c.) mentions lavender and purple variants. Although most of the specimens have the flower-parts entire, *Leach*, no. 2347 has one flower with emarginate petals and sepals. Despite these variations, the species should be rather easily recognized, for its short perianth-tube and short, almost oval, spathes distinguish it clearly from *I. macrosiphon*, the name under which most of the specimens cited were masquerading.

Henderson[3] has noted that in regions along the Rogue River where

[1] Quoted by Mrs. Sherrard in Iris Soc. (of England) Yrbk.: 38–39 (1933).
[2] Bull. Amer. Iris Soc. no. 53: 18 (1934).
[3] In Rhodora xxxii. 23 (1930).

I. Douglasiana and *I. innominata* come in contact, the former tends to develop shades of yellow, as a result of hybridization with the latter. Mrs. Sherrard (l. c.) has found similar color-variations growing on the Oregon coast, apparently not near plants of *I. innominata*. Two sheets of *L. F. Henderson*, no. 5769, collected on "bluffs of the ocean" at Brookings, Curry Co., Oregon, have been seen by me. One (in CA) is like the variants found by Mrs. Sherrard. It is tall, with very long, appressed spathes, greatly exceeding the perianth-tube; the sepals somewhat resemble those of *I. innominata* in shape and are emarginate; in color, the perianth was probably apricot or some allied shade. This specimen is definitely not *I. Douglasiana*, as labelled, and a hybrid origin seems the most reasonable explanation for it. On the other hand, a second sheet of this number and locality (in RM) is entirely different. The plants are half as tall as the other specimen; the spathes are shorter and more nearly ovate, as in *I. innominata*, while the perianth-tube, in most of the flowers, exceeds the spathes to a certain degree; the large deep-purple flowers approach those of *I. Douglasiana* in color and shape. On both sheets the leaves are dark green and narrow, much more like leaves of *I. innominata* than of typical *I. Douglasiana*. Because of its leaves and spathes I consider this sheet of *Henderson*, no. 5769 to be of hybrid origin, like the (CA) specimen, but approaching closer to *I. Douglasiana* in this case.

Iris Thompsonii R. C. Foster. (Plate 3, fig. 2.) Plant caespitose; rhizome slender, ±1 cm. in diameter, apparently shallow-growing; leaves few in a clump, linear, acute, subglaucous, distinctly ribbed, exceeding the stems, to 30–35 cm. long and 3–5 mm. wide; stems slender, simple, 10–25 cm. long, with 2–3 narrow, linear-lanceolate cauline leaves which are free from the stem for one-half to two-thirds of their length; spathes 1–2-flowered, subequal, herbaceous, slightly keeled, not inflated, narrowly lanceolate, 3.5–5 cm. long and 6–9 mm. wide, with a slight pink flush in some instances; pedicel ±1.2 cm. long, that of the first flower being shorter than that of the second; ovary 1–2 cm. long, tapering equally at the ends, passing gradually into the perianth-tube; perianth-tube narrow, linear, ±1.3 cm. long; sepals narrowly oblanceolate-spatulate, tapering gradually from the blade to the claw, obtusely rounded at the apex, entire, 3.5–3.8 cm. long and 1–1.3 cm. wide, rather deep blue-purple; petals oblanceolate-spatulate, 2.8–3.2 cm. long and ±7 mm. wide, obtuse at the apex, entire, apparently the same color as the sepals; style-branches 2 cm. long; style-crests 7–10 mm. long, subquadrate or triangular, but not linear, with distinctly rounded-toothed edges; stigma entire, triangular-acute, but not tongue-shaped; filaments about 8 mm. long; equal to the anthers in length; immature capsule oval, about 2.5 cm.

long, fairly broad, tapering abruptly into a beak; seeds not seen.—Rhodora xxxviii. 199 (1936).—Northern California, in semi-open places. Specimens seen: CALIFORNIA: Del Norte Co.: Douglas Park, semi-open slopes ½ mile from the Smith River, about 500 ft. alt., June 5–7, 1928, *J. W. Thompson*, no. 4510 (TYPE, in G, with co-types in US, MBG, JWT).

Confusion of this species with others of the *Californicae* is not be to expected, save possibly with its closest relative, *I. innominata*, from which it differs in its shorter perianth-tube, more narrowly lanceolate spathes, perianth-segments smaller, more delicate, and more nearly spatulate, and cauline leaves free for a greater portion of their length, especially in the upper leaves. Its longer stems, shorter perianth-tube, shorter and broader spathe-valves, smaller and more delicate flowers, shorter styles and larger crests serve to distinguish it readily from *I. macrosiphon*.

CYTOLOGY OF THE CALIFORNICAE. With the exception of *I. tenuis*, in which Simonet[1] found $2n=28$, the species in this subsection have a uniform chromosome number, $2n=40$, and a similar uniformity of chromosome morphology. Several attempts to grow *I. tenuis* have failed, the plants dying before root-tips could be secured. As a result I can only refer to Simonet's figure (l. c., plate I, fig. 10), which shows about eight small or medium-sized chromosomes with median attachment points, and about twelve larger chromosomes with apparently subterminal ones, one pair of this group having satellites. The remainder of the complement cannot be distinguished with certainty.

The material of *I. bracteata* at my disposal was so poor that drawings were impossible to make; the diploid number is apparently 40. Seedlings and mature plants of *I. Douglasiana*, from different sources, show $2n=40$ (plate 1, fig. 14), the count given also by Simonet (l. c.). No authentic material of *I. Douglasiana* var. *bracteata* has been available, but Simonet (l. c.) reports $2n=40$ for *I. Watsoniana*, which, as I have shown, is identical with var. *bracteata*. No difference in idiogram is apparent. There are two large chromosomes with median attachments, two almost equally large with subterminal attachments, at least ten smaller medians, and about ten with submedian or subterminal attachments; there are two satellites. Counts made on seedlings of *I. Purdyi*, before the blooming period was reached, gave $2n=40$ (Plate 1, fig. 26). The count $2n=40$ for *I. tenax* was also found by Simonet (l. c.), who reported the same count for *I. Gormanii*, the two idiograms being apparently alike, except for four satellites in the latter as

[1] In Ann. Sc. Nat., Bot. (ser. 10) xvi. 228–383 (1934).

opposed to two in the former. As my material of *I. tenax* also showed four satellites on occasion, there seems to be no discrepancy here. From plants of *I. tenax* var. *Gormanii* secured from Mr. Carl Starker of Jennings Lodge, Oregon, I have verified the count on this plant. Seedlings supposed to be *I. macrosiphon*, *I. Hartwegii*, and *I. tenax* var. *australis* were found to have $2n=40$, but the uncertainty of the identification is so great that I am not including these counts as definitely established.

From the chromosome-counts given, it is clear that differences of karyotype can be of little use in the *Californicae* in distinguishing species. In one instance, that of *I. tenuis*, the morphological differences which cause that species to stand apart from the rest of the group are accompanied by chromosomal differences. For the rest, uniformity is the rule. Examination of numerous seedlings and mature plants has not disclosed any tetraploids, nor even tetraploid sectors in root-tips. At present, it would seem that speciation in this group has not been accompanied by any drastic chromatin rearrangements, at least of such a nature that they could become apparent in the mitotic complement.

General Discussion of the Californicae. Leaving *I. tenuis* aside for the moment, it is clear that in the remainder of this subsection there are several definite species-complexes. At least one of these is the result of drawing rather narrow specific lines, yet the alternative to such a course is to produce a single species-aggregate of such a diverse and polymorphic nature that no single, intelligible species-concept can be formed.

First to be considered is the *tenax*-complex. The dominant species here is the variable *I. tenax*, abundant in the central and western portions of Oregon and Washington. In the central part of its range it has produced, probably quite recently, a yellow-flowered segregate, *I. Gormanii*, here regarded as entitled only to varietal status. As the southern limits of *I. tenax* are reached in southern Oregon or northern California, there is evidence of a loss in height, and seeming intergrades occur between *I. tenax* and the small, yellow-flowered *I. Hartwegii*. This small plant, superficially only a miniature *I. tenax*, moves southward in the mountain ranges of California, until in the extreme southern limits another large, purple-flowered plant is found, *I. tenax* var. *australis*. This variety, so like *I. tenax* in appearance but usually treated as a variety of *I. Hartwegii*, is confined to the higher portions of the San Bernardino, San Gabriel, and San Jacinto mountain groups. It is possible that the two purple-flowered plants are offshoots of a

common stock, colonies of which became separated some time ago. It is possible, too, that cytological examination of authentic material of the large, coarse, southern plant will show that it is a tetraploid.

The second complex to be considered is that which includes *I. tenuissima*, its variety *purdyiformis*, *I. chrysophylla*, and the anomalous *I. pinetorum*. This group, closely allied to the *macrosiphon*-complex, is distinguished from it by its narrow, linear style-crests, and the narrowness and delicacy of the perianth-segments. It is a group of discontinuous ranges and probably represents only a series of parallel developments out of the *macrosiphon*-complex, on the borders of the latter's range. In the face of the inadequately preserved material of these two complexes, one can only sigh—and lump.

Of the remaining species, *I. bracteata* and *I. Purdyi* seem connected, and *I. innominata* and *I. Thompsonii* are plainly allied. Geographically, the members of the former pair are separated by some distance, while the latter two are found in contiguous regions. All four are alike in possessing a rather short perianth-tube, a feature which they tend to share with *I. Douglasiana*. It is possible that these five species might be grouped together in a complex, but there are certain distributional and morphological reasons against so doing at the present time.

The group showing closest relationship with the *Californicae* is not American but Eurasian, the *Sibiricae*. Morphologically the two groups are similar in many ways, although the *Californicae* usually possess a much longer perianth-tube, the leaves are different in color and texture, and the rootstocks are different. Cytologically, each group is subdivided into two groups, characterized by the diploid chromosome numbers 28 and 40. On the basis of this parallelism of chromosome numbers and superficial morphological resemblance, Simonet[1] has united *I. tenuis*, *I. sibirica* L., *I. orientalis* Thunb.[2], and *I. prismatica* Pursh (*2n*-42) as the *Sibiricae*, with a basic chromosome number of 7. He has likewise united *I. Douglasiana*, *I. tenax*, and their varieties, with the Chinese and Himalayan species, *I. Delavayi* Micheli, *I. Wilsonii* C. H. Wright, *I. Forrestii* Dykes, *I. chrysographes* Dykes, *I. Clarkei* Baker, and *I. Bulleyana* Dykes as the new subsection *Chrysographes*. Of the first proposal I can only say that if *I. tenuis* and *I. sibirica* are to be grouped together, external morphology is probably valueless for taxonomy. After careful comparison of herbarium specimens of these two species, and after examining living

[1] Ann. Sc. Nat., Bot. (ser. 10) xvi. 333 (1934).

[2] This name, a later homonym, cannot stand; the plant has been renamed *I. extremorientalis* Koidzumo in Bot. Mag. Tokyo lx. 330 (1926).

plants of *I. sibirica*, the only points of similarity, aside from the chromosome number, seem to be the triangular stigma, the short perianth-tube, and the rather short style-crests, characters which they share with half the genus. *I. virginica* L., likewise, has these same characters, as well as a chromosome count of *n*-35–36. Is it, then, to be regarded as a decaploid and grouped with the *Sibiricae*?

The second proposal seems equally questionable. The California species differ from the others in tube-length, spathe length and shape, leaf shape and color, and in the rootstock. Furthermore, as Dykes has shown in various places,[1] crosses between the American and Asiatic species have produced sterile hybrids. Taken by itself, sterility in a species-hybrid is not to be regarded as due to a lack of relationship between the parents,[2] but when such sterility accompanies morphological differences between the parents, it is probably of significance. Simonet's proposals, in this instance, seem based on chromosome counts rather than on consideration of the species or groups as entities. The attitude adopted in this study is that similarity or difference of karyotype is not in itself enough to warrant union or separation of species or groups of species. As Sir William Wright Smith has said in a broad-minded consideration of the cyto-taxonomic problem:[3] "Approximation cytologically is not necessarily decisive as to close affinity. Until the cytologist can . . . carry his analysis deeper, involving the *qualitative* content of the chromosomes and the different relationships between them, this divergence of opinion will persist." (p. 162)

Subsection Prismaticae

Its slender, wiry rhizome, narrow leaves, solid, wiry, twisted stem, trigonal winged capsule, and nearly cubical seeds serve to distinguish the single species of this subsection from the other irises of eastern North America, to which region it is confined.

Iris prismatica Pursh ex Ker-Gawler. Rhizome very slender, stoloniferous, sheathed in the fibrous bases of old leaves; leaves linear-ensiform, long-acuminate, glaucous, finely striate, 30–50 cm. long, 3–9 mm. wide, usually not surpassing the stem; stem slender, terete, flexuous in some cases, usually with 1–2 reduced linear, acuminate leaves, 30–50 cm. tall, simple or once-branched, the main branch 2–3-flowered, the lateral branch 1-flowered; spathe-valves

[1] See Genus Iris, p. 30 (1913); Handbk. Gard. Ir. pp. 91, 117, 119 (1924).

[2] For a general consideration of species-hybrids, see Sax, "The cytological analysis of species-hybrids," in Bot. Rev. i. 100–117 (1935).

[3] In Proc. Linn. Soc. Lond. session 1932–33: 151–181 (1933).

opposite, equal, or the outer a trifle longer, 2.5–5 cm. long, 3 mm. wide, lanceolate, partially membranous; pedicel slender, 3–5 cm. long, lengthening before the capsule matures; ovary trigonal, with very pronounced angles, 1–2 cm. long; perianth-tube extremely short, funnel-shaped, 3 mm. long; sepals to 5 cm. long, with an ovate blade to 1.5 cm. wide, narrowing rather abruptly into the long claw, the blade light blue-purple with darker veins, green-white at the base of the blade and on the claw which is veined with violet; petals to 4 cm. long, with a very short claw, lanceolate, occasionally emarginate, pale blue-purple; style-branches 2 cm. long; style-crests almost quadrate, serrate, 7 mm. long; stigma entire, triangular; filaments 1.2 cm. long; anthers 1 cm. long, blue-purple; capsule trigonal, with very prominent ridges at each angle, the wings becoming less conspicuous as the capsule matures; seeds light brown, smooth, almost cubical through crowding in the capsule.—Bot. Mag. xxxvii. t. 1504 (1812); Pursh, Fl. Amer. Sept. i. 30 (1814); Roem. & Schult., Syst. Veg. i. 476 (1817); Barton, Fl. N. Amer. iii. 39, pl. 58 (1823); Bigelow, Fl. Bost. (ed. 2) 16 (1824); Ker, Gen. Irid. 55 (1827); Baker in Journ. Linn. Soc., Bot. xvi. 138 (1877); Baker, Handbk. Irid. 8 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 450 (1896); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908); Dykes, Genus Ir. 31 (1913); Small, Fl. Se. U. S. (ed. 2) 305 (1913); House, Wild Fls. N. Y. i. 63, pl. 27 (1918); Dykes, Handbk. Gard. Ir. 101 (1924); Small in Addisonia xii. 15, pl. 392 (1927); Small, Man. Se. Fl. 355 (1933). *Iris gracilis* Bigelow, Fl. Bost. (ed. 1) 12 (1814). *Iris Boltoniana* Roem. & Schult., Syst. Veg. i. Suppl., 308 (1822). *Iris virginica* sensu Klatt in Linnaea xxxi. 534 (1861–62), not L.—Swampy regions on the Atlantic seacoast, occasionally occurring inland as far west as Tennessee. Representative material: Nova Scotia: Cape Breton, Louisburg, 1893, *J. Macoun* (G). Maine: Wells, Drake's Isl., July 8–11, 1901, *Kate Furbish* (NE). New Hampshire: Rye, 1903, *B. L. Robinson*, no. 688 (G); Mason, July 9, 1918, *C. F. Batchelder* (NE). Massachusetts: Revere, Oak Isl., 1896, *W. P. Rich* (G); North Reading, July 11, 1904, *A. S. Pease*, no. 4222 (NE); Needham, June 27, 1886, *T. O. Fuller* (NE); Georgetown, July 4, 1906, *E. F. Williams* (NE); Westport, June 24, 1923, *S. N. F. Sanford*, no. 10,285 (NE); Orleans, Namskaket Creek, 1919, *Fernald & Long*, no. 18,270 (G, NE); Martha's Vineyard, Oak Bluffs, Farm Pond, June 29, 1916, *F. C. Seymour*, no. 1159 (NE); Nantucket, Hummock Pond, June 3, 1916, *J. R. Churchill* (NE). Rhode Island: Warren, June 5, 1921, *S. N. F. Sanford*, no. 10,286 (NE); Block Isl., Wash Pond, 1913, *Fernald, Hunnewell & Long*, no. 9260 (G); Westerly, Aug. 21, 1913, *Bissell, Harger & Weatherby* (NE). Connecticut: Norwich, June 6, 1903, *E. M. Rogers* (NE); Chatham, June 9, 1918, *C. A. Weatherby*, no. 4268 (NE); Orange, June 29, 1899, *L. Andrews*, no. 822 (NE); Stratford, 1896–97, *Eames*, no. 1 (G, NE). New York: Long Island,

1887, *Steele* (G). PENNSYLVANIA: Sellersville, 1908, *W. M. Benner* (G); Hatfield, 1923, *W. M. Benner* (G). NEW JERSEY: New Lisbon, west of Rancocas Creek, 1899, *MacElwee*, no. 970 (G); Atco, 1903, *T. W. Edmondson*, no. 1025 (G). VIRGINIA: Richmond, 1894, *J. R. Churchill* (G). NORTH CAROLINA: near Hendersonville, 1898, *Biltmore Hb.*, no. 2596a (G). GEORGIA: Taylor county, without locality or collector, 1877 (G). TENNESSEE: Coffee Co.; Tullahoma, 1930, *H. K. Svenson*, no. 4269 (G).

This distinctive little species is usually considered a plant confined to the marshes and sandy beaches of the northern Atlantic coast, but this is incorrect. It has been found in the mountains of North Carolina, as well as in Georgia and Tennessee. In this last region, Dr. H. K. Svenson informs me (June, 1936) that he has found it in some abundance around Tullahoma and Sewanee; that is, it occurs in patches of considerable extent, in some cases several hundred square feet, rather than as scattered, individual plants. There are several of these colonies in each locality. Professor M. L. Fernald tells me that he has seen it growing in peaty swamps at Richmond, Virginia, well-removed from any tidal influence. Furthermore, its distribution in the northern portion of its range is somewhat anomalous. Occurring rather extensively on Connecticut, Rhode Island, and Massachusetts shores, it seems to extend only a short distance into Maine and then jumps to Cape Breton in Nova Scotia. The collections of the Gray Herbarium and the New England Botanical Club show no specimens from the region between York County, Maine, and Cape Breton. Is it to be regarded as a coastal plain plant which moved out of the coastal plain in the north before the submergence of this marginal area? Or is it, rather, to be considered a former inhabitant of the Appalachian core, which moved out of that region as it became increasingly elevated, and survived there only in a few favored localities? If the former hypothesis is true, *I. prismatica* should occur rather extensively in the southern coastal plain. Apparently, it does not.

Dykes[1] included this species with the *Sibiricae*, remarking, however, that several characters, such as the solid stem, serve to separate it from them. The actual separation from that group was made by Small[2] and I have followed him in this respect. Cytologically, too, although this species, like one group of the *Sibiricae*, has a base number of seven, it has a diploid number of 42, according to Simonet,[3] who

[1] Genus Iris 32 (1913).
[2] Man. Se. Fl. 332 (1933).
[3] In Ann. Sc. Nat., Bot. (ser. 10) xvi. 256, and Pl. I, fig. 4 (1934).

unites it with *I. tenuis* and *I. sibirica* as a distinct sub-group. As this union has been discussed previously, further comment seems unnecessary, except to repeat that the morphological characters seem to warrant its separation from the *Sibiricae*, using that term either in the sense of Dykes or of Simonet. The chromosome complement shown by Simonet, l. c., appears to have four relatively long chromosomes with subterminal attachments, 18 small or medium-sized chromosomes with median attachments, and two satellites. The remaining members of the complement appear to have either subterminal or submedian attachments.

Subsection Hexagonae

This subsection, consisting of 4–5 or nearly 100 species, depending on one's concept of species, is confined chiefly to the Mississippi Valley and southeastern United States, with certain extensions westward into Texas. The exact range of most of its members cannot yet be stated, because adequate field work has not been carried out. Stout, furcate, wide-spreading, greenish rhizomes, tall, linear-ensiform leaves, terminal and axillary flowers, long, foliaceous outer spathes, bilobed stigmas, strongly 6-ribbed capsules, and large seeds with thick, corky coverings characterize this group.

Iris fulva Ker-Gawler. Rhizome more slender than others in this group, 1.5 cm. in diameter, many-branched at each point of furcation, usually a greenish-brown; leaves linear-ensiform, 6–10 dm. long under favorable conditions, ±1.5 cm. wide, bright green, inconspicuously ribbed, reflexing in the upper portion; stems exceeding the leaves, simple or very shortly branched, sometimes very slightly flexuose or zigzag, with a terminal head of two flowers, and 1–2 lateral flowers borne in the axils of the reduced, linear-lanceolate cauline leaves; spathes markedly unequal in length, the outer green, lanceolate, to 10.5 cm. or more in length, the inner shorter and often partially scarious, as are the innermost; pedicel variable in length, ±2 cm. long, as a rule; ovary hexagonal, ±1.5 cm. long; perianth-tube 2–2.5 cm. long, broadly linear; sepals broadly obovate-oblanceolate, or oblong, with a very short claw, emarginate, to 5.5 cm. long and 3.8 cm. wide, reddish-copper or brick-red, veined somewhat more deeply along the center of the blade; petals oblanceolate-spatulate, emarginate, with a less distinct claw than the sepals, to 3.5 cm. long and 1.8 cm. wide, markedly drooping, nearly the same color as the sepals; style-branches 2 cm. long; style-crests very small, rounded, 3 mm. long; stigma bilobed, the lobes pointed; filaments 6–7 mm. long; anthers 1 cm. long, somewhat exserted beyond the stigma; capsule large, ovoid or ellipsoid, to 5 cm. long, 2.5 cm. wide, hexagonal; seeds

large, flattened, with a thick corky or spongy covering, causing them to float easily.—Bot. Mag. xxxvi. t. 1496 (1812); Geel, Sert. Bot. i. Cl. III (1826); Rafinesque, New Fl. N. Amer. part 2: 94 (1837); Baker in Journ. Linn. Soc., Bot. xvi. 142 (1877); Baker, Handbk. Irid. 14 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 450 (1896); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908); Dykes, Genus Ir. 84 (1913); Small, Fl. S. E. U. S. (ed. 2) 305 (1913); Dykes, Handbk. Gard. Ir. 128 (1924); Small in Addisonia xii. 7, pl. 388 (1927); Small, Man. Se. Fl. 337 (1933). *Iris cuprea* Pursh, Fl. Amer. Sept. i. 46 (1816); Roem. & Schult., Syst. Veg. i. 468 (1817); Sprengel, Syst. Veg. i. 160 (1825). *Iris rubescens* Raf., Flor. Lud. 20 (1817). *Neubeckia fulva* (Ker-Gawl.) Alefeld in Bot. Zeitung xxi. 297 (1863).—In damp localities from Louisiana northward along the Mississippi Valley, and slightly to the east and west. Representative material: KENTUCKY: Muhlenberg County, June 5, 1901, *S. F. Price* (NY). TENNESSEE: near Humboldt, June, 1884, *A. Gattinger* (US, no. 784,972); near Brownsville, June, 1884, *A. Gattinger* (US, no. 36,703). ALABAMA: near Gainesville, June, 1880, *C. Mohr* (US, no. 784,971). LOUISIANA: New Orleans, Audubon Park, Mar. 24, 1899, *J. H. Mellichamp* (NY, MBG). MISSISSIPPI: Rudyard, Apr. 17, 1927, *Woodson & Anderson*, no. 1537 (MBG). ARKANSAS: Grady, May 5, 1897, *J. B. Koonce*, no. 112/97 (MBG); near Little Rock, May 31, 1923, *E. J. Palmer*, no. 22,952, (MBG); Corning, May, 1884, *G. W. Letterman*, no. 497 (MBG); Varner, Apr. 28, 1898, *B. F. Bush*, no. 5 (MBG, NY). MISSOURI: Scott County, May 26, 1917, *J. A. Drushel*, no. 3198 (MBG); Allenton, June, 1900, *G. W. Letterman* (MBG, no. 771,142); Dunklin County, May 20, 1892, *B. F. Bush* (MBG, nos. 141,453 & 141,454). ILLINOIS: near Wetaug, June 18, 1926, *E. Anderson* (MBG, no. 932,221 & US, no. 1,365,961 in part); Mound City, May 7, 1919, *E. J. Palmer*, no. 15,075 (MBG).

This, the most striking and distinct of all the North American species, is by no means endemic around New Orleans, as was formerly supposed.[1] On the contrary, it has a rather wide range in the states bordering the Mississippi, and it is reported to have spread into Ohio in recent years.[2]

Its drooping petals and tiny, bluntly rounded style-crests, as well as the shape of petals and sepals, separate this plant, to a degree, from the remainder of the *Hexagonae*. Small, indeed, has segregated it[3] in a separate subsection, *Fulvae*, and it is possible that it does deserve this distinction. These morphological differences are strengthened by the chromosome count, $2n=42$, a count given by both Randolph[4]

[1] Dykes in Genus Iris, p. 84 (1913).
[2] Waller in Ohio Journ. Sci. xxi. 37 (1931).
[3] Man. S. E. Fl. 331 (1933).
[4] In Bull. Amer. Iris Soc. no. 52: 63 (1934).

and Simonet,[1] while the chromosome count for its relatives is $2n=44$.[2] In view of the importance of *I. fulva* as one of the putative progenitors of the large number of species described by Dr. Small, its cytology will be discussed with that of its relatives in a special section.

IRIS HEXAGONA Walter. Rhizome large, greenish with brown rings, stout, widely spreading, much branched; leaves ensiform, yellowish-green, glaucous or subglaucous, rather firm-textured, erect, 6–9 dm. long, or longer, 2.5 cm. or more in width; stem erect, or occasionally somewhat flexuose, usually simple, stout, terete, 3–9 dm. long, not flowering from near the base, with 3–4 large cauline leaves, solitary flowers in the axils of the upper ones and two flowers in the terminal cluster; spathes lanceolate, acute, subequal or unequal in length, the outer green, 15–20 cm. long, the inner shorter, herbaceous, with scarious margins, the innermost entirely scarious; pedicel 2.5–3.5 cm. long; ovary hexagonal, equal to or longer than the pedicel; perianth-tube grooved, infundibuliform, to 3 cm. long; sepals to 9–10 cm. long and 4 cm. broad, the claw greenish with prominent yellow midrib, pubescent, with a yellowish or whitish patch at the base of the obovate or oval blade, which is usually a dark violet-purple; petals erect, oblanceolate to spatulate, shorter and narrower than the sepals, the claw veined green, the blade violet-purple; style-branches nearly 5 cm. long, tapering towards the base; style-crests semi-ovate to triangular, 1.5 cm. long, coarsely toothed; stigma bilobed, the lobes triangular or rounded-deltoid; filaments much shorter than the anthers which are 2.5–3 cm. long; capsule markedly hexagonal, ovoid, 4–6 cm. long; seeds large, D-shaped or irregularly rounded, with a thick corky covering, light brown, pitted.—Fl. Carol. 66 (1788); Michaux, Fl. Bor.-Amer. i. 22 (1803); Elliott, Sk. Bot. S. Car. & Ga. i. 46 (1816); Chapman, Fl. South. U. S. (ed. 1) 472 (1860); Baker in Journ. Linn. Soc., Bot. xvi. 141 (1877); Baker in Bot. Mag. xl. t. 6787 (1884); Baker, Handbk. Irid. 13 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 448 (1896); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908); Dykes, Genus Ir. 82 (1913); Small, Fl. Se. U. S. (ed. 2) 306 (1913); Small in Addisonia ix. 51, pl. 314 (1924); Dykes, Handbk. Gard. Ir. 129 (1924); Small, Man. Se. Fl. 354 (1933).—Rich swamps, in southeastern United States. Representative material: FLORIDA: without locality, 1877, *Mary Treat* (G); Apalachicola, without date, *Curtiss*, no. 2852 (G); Magnolia, 1883, *J. D. Smith* (G); Manatee, 1878, *A. P. Garber* (G); Duval County, 1902, *Fredholm*, no. 5034 (G); near Jacksonville, without date, *Curtiss* (G). ALABAMA: Mobile, Apr. 26, 1898, *C. F. Baker*, no. 1491 (NY).

IRIS HEXAGONA var. **savannarum** (Small), comb. nov. Appears

[1] In Bull. Biol. France et Belg. lxvi. 289, figs. 25, 29 (1932).

[2] Simonet, l. c.; Randolph, l. c.; Anderson, unpublished.

to differ from *I. hexagona* principally in the shape of the perianth-segments; sepals oblanceolate, with the blade nearly elliptic, 9.5 cm. long, 3.2 cm. wide; petals oblanceolate, 7.5 cm. long, 1.5 cm. wide.—*Iris savannarum* Small in Addisonia ix. 57, pl. 317 (1925); Small, Man. Se. Fl. 351 (1933).—Apparently confined to Florida swamps, where colonies sometimes extend over several acres. Material seen: FLORIDA: swamp near Kissimmee, Dec., 1921, *J. K. Small*, no. 50,442 (NY, type?); cypress swamp near Seville, Apr. 9 and June 5, 1901, *Curtiss*, no. 6754 (G, NY); without exact locality, swamps near the coast, April, *Chapman* (4042 in Hb. Biltmore) (G, NY).

This plant is reported by various observers[1, 2] to be extremely plentiful in Florida, where it occurs, according to Hume[3], from the St. Johns River to the region south of Lake Okechobee and Fort Myers. It seems to be no more distinct from *I. hexagona* than is *I. giganticoerulea* Small, and therefore I am regarding it as only a variety. Of the five specimens seen, incidentally, not one has the narrowly linear-elliptic petals shown in the figure of the type-plate in Addisonia.

IRIS HEXAGONA var. **giganticoerulea** (Small), comb. nov. A robust variety of *I. hexagona*, differing principally in size; sepals with oval or suborbicular blade narrowing abruptly into the claw, 8.6 cm. long, 4 cm. wide; petals oblanceolate-spatulate, emarginate, 7.2 cm. long, 2 cm. wide; style-branches 4.5 cm. long; style-crests incised, 2 cm. long; filament 1.3 cm. long; anther 2.2 cm. long.—*Iris giganticoerulea* Small in Addisonia xiv. 56, pl. 451 (1929); Small, Man. Se. Fl. 352 (1933); Viosca in Bull. Amer. Iris Soc. no. 57: 18 (1935).—Rich swamps in the Louisiana delta. Material seen: LOUISIANA: Morgan City, Apr. 1, 1927, *J. K. Small*, no. 58,174 (NY, TYPE); New Orleans, April, 1846, *A. Fendler* (MBG, no. 141,445); New Orleans, Apr. 11, 1846, *A. Fendler* (MBG, no. 141,443); Gretna, opposite New Orleans, May 15, 1899, *C. R. Ball*, no. 360 (G, NY); without locality, *Fowler* (MBG, no. 141,446).

I am unable to separate this plant from *I. hexagona*, from which it seems to vary in general size, and slightly in the shape of the perianth-segments. The type consists of two sepals, two petals, two style-branches with their attached style-crests, one stamen, and the detached perianth-tube, these being the dissected parts of the flower from which the plate in Addisonia was drawn.

IRIS HEXAGONA var. **flexicaulis** (Small), comb. nov. Smaller than *I. hexagona* and apparently close to *I. brevicaulis* Raf., but with leaves

[1] Small in Addisonia ix. 57 (1925).
[2] Hume in Bull. Amer. Iris Soc. no. 47: 16 (1933).
[3] l. c.

shorter, narrower and erect; stems erect, shorter than the basal leaves, zigzag; flowers terminal and axillary, but not borne basally; spathes apparently not foliaceous; sepals spatulate, 5–6 cm. long, 2.5 cm. wide, bright violet; petals ±5 cm. long, ±1.5 cm. wide, oblanceolate-spatulate, emarginate; anthers shorter than the filaments.—*Iris flexicaulis* Small in Addisonia xii. 9, pl. 389 (1927); Viosca in Bull. Amer. Iris Soc. no. 57: 12 (1935), as synon. of *I. foliosa* Mack. & Bush.—Swamps from Louisiana westward into Texas. Material seen: LOUISIANA: marsh near New Orleans, April, 1927, *J. K. Small* (NY). TEXAS: open woods near the San Jacinto River, east of Houston, Apr. 11, 1925, *Small & Wherry*, no. 11,807 (NY); Beaumont, April & May 1, 1884, *G. C. Nealley* (G), in part; 1 mile southeast of Lynchburg, Apr. 14, 1934, *V. L. Cory*, no. 8076 (G); without locality, *Drummond*, no. 420 (G).

In certain essential points, mentioned in the description, this plant stands nearer *I. hexagona* than it does to *I. brevicaulis*. Nevertheless, in general appearance it seems quite close to the latter, so much so that it might almost be a transition between the two. Field study and more extensive herbarium material may show that it should be regarded as a variety or form of *I. brevicaulis*.

IRIS BREVICAULIS Rafinesque. Rhizome 1–2.5 cm. in diameter, furcate; leaves ensiform, usually deep green, but sometimes glaucous, prostrate or semi-prostrate, 3–6 dm. long, or occasionally longer, and 2.5 cm. wide; stem flexuose, prostrate or suberect, oval in cross-section, flowering from near the base, 15–25 cm. long, usually markedly zigzag, bearing 3–6 large cauline leaves, the uppermost considerably exceeding the stem, solitary flowers in the axils of the cauline leaves, and usually two in the terminal cluster; spathes lanceolate, acute, opposite, subequal, the outer to 5 cm. long or occasionally longer, the outer pair green, the inner pair partially scarious; pedicel short, usually about 1.3 cm. long; ovary about 1.3 cm. long, prominently 6-angled; perianth-tube 1–2 cm. long, somewhat funnel-shaped; sepals variable in shape, but usually 7.5–9.5 cm. long and 2.5–3 cm. wide, the blade ovate, the claw cuneate, slightly shorter than the blade, which is deep blue or blue-purple, the claw light greenish-yellow with darker veins, with a prominent yellow midrib and a yellow-white blotch at the union of claw and blade, somewhat pubescent; petals a trifle shorter than the sepals, oblanceolate, perhaps a trifle lighter in color; style-branches rather greenish, to 4 cm. long; style-crests large, semi-ovoid to subquadrate, to 1.5 cm. long, irregularly toothed or entire; stigma bilobed, each lobe rounded-deltoid; filaments usually shorter than the anthers which are about 1.7 cm. long; capsule ovoid to ellipsoid, 3–5 cm. long, markedly hexagonal in cross-section; seeds large, irregularly circular, with a very thick covering, light

brown in color.—Flor. Lud. 20 (1817); Rafinesque, New Fl. N. Amer. part 2: 93 (1837). *Iris foliosa* Mackenzie & Bush in Trans. Acad. St. Louis xii. 80 (1902); Dykes, Genus Ir. 83 (1913); Britton & Brown, Illust. Fl. (ed. 2) i. 538 (1913); Dykes, Handbk. Gard. Ir. 129 (1924); Small in Addisonia ix. 53, pl. 315 (1924); Small, Man. Se. Fl. 355 (1933); Viosca in Bull. Amer. Iris Soc. no. 57: 12–14 (1935); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908), as synon. of *I. hexagona*. —Rich, rather damp locations, semi-shaded, from Louisiana northward in central United States. Representative material: OHIO: Toledo, 1883, *H. A. Young* (G); Worthington, without date, *J. R. Paddock*, no. 125 (NY); Catawba Island, June 15, 1925, *E. Anderson* (NY). ILLINOIS: near Venice, May 31, 1879, *H. Eggert* (MBG, nos. 141,432 & 141,433); near Wetaug, June 18, 1926, *E. Anderson* (MBG, no. 129,968); Carlinville, 1891–1892, *W. E. Andrews* (G, MBG). TENNESSEE: Nashville, 1877, *A. Gattinger* (US, no. 150,092). LOUISIANA: St. Martinville, June 13, 1893, *A. B. Langlois* (MBG, no. 981,097). ARKANSAS: Stuttgart, May 12, 1910, *O. H. Howell*, no. 645 (US); Homan, June 10, 1898, *H. Eggert* (MBG, no. 141,439). MISSOURI: south of Charleston, Aug. 29, 1918, *A. F. Satterthwait* (MBG, no. 905,461); Jackson County, July 6, 1893, *B. F. Bush* (MBG, no. 141,434); Buckner, June 5, 1912, *B. F. Bush*, no. 6765 (MBG, G, NY, US); Glendale, June 12, 1898, *K. K. Mackenzie*, no. 153 (MBG); Adams, June 12, 1898, *K. K. Mackenzie*, no. 159 (MBG, G, US, NY, RM); Little Blue Tank, June 6, 1897, *K. K. Mackenzie* (co-type of *I. foliosa* in MBG, no. 141,435, US); ½ mile southeast of Devil's Elbow, south of Columbia, June 7, 1933, *F. Drouet*, no. 497 (G); near Allenton, June 10, 1901, *G. W. Letterman* (MBG, no. 776,981). KANSAS: 22 miles northwest of Fort Leavenworth, June 7, 1849, *A. Fendler* (G).

It has been necessary to change the name of this species, which has been known since 1902 as *I. foliosa*, since Rafinesque[1] in 1817 described an *Iris brevicaulis*, a description which he amplified in 1837,[2] the two together leaving no doubt as to the identity of this species and *I. foliosa*.

There has been much confusion in herbaria between this species and *I. hexagona*. At their most characteristic, there seems to me to be little doubt of their specific difference, but in many cases there are intergrades. The character of stem flexuosity, one of the distinguishing marks of *I. brevicaulis*, is almost impossible to determine in dried specimens, and this naturally adds to the difficulty of separating the two in herbarium material.

[1] Flor. Lud. 20 (1817).
[2] New Fl. N. Amer. part 2: 93 (1837).

IRIS BREVICAULIS forma **boonensis** (Daniels), comb. nov. This plant is described by Daniels as being pure white in color, the only point in which it differs from the typical species. Accordingly, I have reduced it to the status of a form. A similar albino is reported from Louisiana by Viosca.[1]—*Iris foliosa* var. *boonensis* Daniels in Univ. Missouri Studies, Sci. Series i. 117 (1907).

CYTOLOGY OF THE HEXAGONAE.

My cytological work on this group was begun in 1932, when Dr. J. K. Small generously presented me with a number of plants collected by him in Louisiana. This was supplemented by a second gift in the following year. Unfortunately, the drastic winters of 1932–33 and 1933–34 killed almost all of the plants, with the result that they have not been seen in bloom. Nearly all the counts made by me on this group were made before the appearance of Randolph's paper[2] which included some of these forms. As can be seen, in most cases my previously made counts agree with his, although they were made on plants from different sources. Table I summarizes the known counts in the *Hexagonae*. Unless otherwise stated, the counts are given here for the first time.

TABLE I.

Name	2*n*	Authority
I. fulva Ker-Gawl.	42	Simonet[3]; Randolph[4]
I. moricolor Small	42	
I. fulvaurea Small	42	pl. 1, f. 23
I. fourchiana Small (no. 65,619)	42	pl. 1, f. 16
I. Kimballiae Small	42	pl. 1, f. 22
I. mississippiensis Alexander	42	pl. 1, f. 24
I. hexagona var. *giganticoerulea* (Small) R. C. Foster	42	Randolph[4]
Small, no. 65,626	42	
Small, no. 65,671	42	pl. 1, f. 13
Nicholls, no. 105	42	Randolph[4]
August Flame, hort. var.	42	Randolph[4]
Autumn Fire, hort. var.	42	Randolph[4]
Chef Menteur, hort. var.	42	Randolph[4]
I. albilinea Alexander	43	pl. 1, f. 9
I. Thomasii Small (no. 65,691)	43	pl. 1, f. 1
I. fourchiana (no. 65,789)	43	pl. 1, f. 12
I. fourchiana	43	Randolph[4]

[1] In Bull. Amer. Iris Soc. no. 57: 13 (1935).
[2] In Bull. Amer. Iris Soc. no. 52: 61–66 (1935).
[3] Bul. Biol. France et Belg. lxxi. 289 (1932).
[4] l. c.

TABLE I—*Continued.*

Name	2*n*	Authority
Small, no. 65,955	43	
Small, no. 63,739	43	pl. 1, f. 15
I. chrysophoenicia Small	43	Randolph[1]
I. vinicolor Small	43	Randolph[1]
I. cerasina (*sic* =? cerasioides Alexander)	43	Randolph[1]
× Dorothea K. Williamson (fulva × brevicaulis)	43	Randolph[1]
Nicholls, no. 102	43	Randolph[1]
I. citriregalis (nomen nudum; label on plant)	44	pl. 1, f. 3
I. citricristata Small	44	pl. 1, f. 10
I. violipurpurea Small	44	pl. 1, f. 20
I. viridivinea Small	44	pl. 1, f. 11
I. salmonicolor Small	44	pl. 1, f. 25
I. Marplei Alexander	44	pl. 1, f. 8
I. chrysaeola Small	44	pl. 1, f. 21
Small, no. 65,677	44	pl. 1, f. 18
Small, no. 65,730	44	pl. 1, f. 5
I. regalis Small	44	Randolph[1]
I. hexagona var. *giganticoerulea*	44	Randolph[1] pl. 1, f. 4
I. elephantina Small	44	Randolph[1] pl. 1, f. 7
I. lancipetala Alexander	44	Randolph[1]
I. hexagona alba	44	Randolph[1]
I. brevicaulis Raf. (as *I. foliosa*)	44	Randolph[1] Simonet[2]

In *I. fulva*, Simonet found (l. c., fig. 25) two large and at least eight small chromosomes with median attachments, and 14 with subterminal attachments; there are two satellites shown. The remainder of the complement cannot be distinguished. *I. brevicaulis*, as figured by Simonet (l. c., Pl. 2, fig. 15), shows 16 rather large chromosomes with subterminal attachments; most of the remainder appear to have subterminal or submedian constrictions, while there are four with median attachments. Two satellites are shown. Simonet's figure for *I. brevicaulis* is not unlike that given here for *I. hexagona* var. *giganticoerulea* (see Pl. 1, fig. 4), in which most of the chromosomes have subterminal or submedian attachments. Making the necessary allowances for dissimilarities due to different techniques of preparation and drawing, it seems safe to say that these two plants have almost identical chromosome complements. In neither one, it is important

[1] l. c.

[2] Ann. Sc. Nat., Bot. (ser. 10) xvi. 265 (1934).

to note, is there a pair of long V-shaped chromosomes such as are found in *I. fulva.*

When plants like *I. vinicolor* were found with $2n=43$, the obvious assumption was that these were hybrids between the 42- and 44-chromosome groups. That is, it was assumed that hybridization had occurred between *I. fulva* and either *I. brevicaulis* or *I. hexagona* var. *giganticoerulea.* Since *I. brevicaulis* blooms later than *I. fulva* in Louisiana, it could be eliminated as a possible parent in most cases. Knowing the chromosome numbers of the parents, it could be predicted that the horticultural hybrid, Dorothea K. Williamson (*fulva* × *brevicaulis*), would have $2n=43$, as Randolph (l. c.) discovered. As Table I shows, however, only ten other forms with a count of 43 have been found. The majority of the plants investigated have either 42 or 44 somatic chromosomes.

Upon analyzing the chromosome complements further, it was found that one plant of *I. fourchiana* (no. 65,619) had 2n=42, including two large V's, like *I. fulva.* A second plant labelled *I. fourchiana* (no. 65,789) had $2n=43$, and only one large V. The higher number was found by Randolph (l. c.) in his plant with this label, but he gives no details as to chromosome morphology. In *I. fulvaurea,* reported to be very similar to *I. fulva,*[1] $2n=42$, with at least one large V present, possibly two; it may thus be either a variant of *I. fulva* or a hybrid descendant of that species. Viosca[2] regards it as a hybrid. Although $2n=42$ in *I. mississippiensis,* it has only one large V in its chromosome complement. The unnamed no. 65,671 has $2n=42$, with two large V's, and a complement generally like that of *I. fulva.* The only other with $2n=42$, which I have examined, is *I. Kimballiae,* and as this is from Florida, not from Louisiana, it will be dealt with separately.

Of the plants with $2n=43$, it is enough to say that all show at least one large V in their chromosome complements. This fact, in addition to the chromosome number, suffices to show their hybrid origin.

With few exceptions, all the plants examined with $2n=44$ showed at least one large V. *I. citricristata* has probably none of these chromosomes and another exception is *I. elephantina,* which not only has no large V's but also has a chromosome complement very much like that of var. *giganticoerulea* and *I. brevicaulis.* It should be noted that Viosca,[3] regarding these two plants as color variants of *I. hexagona* var. *giganticoerulea,* says they occur in the geographic range of that

[1] Viosca in Bull. Amer. Iris Soc. no. 57: 17 (1935).
[2] l. c., p. 27.
[3] l. c., pp. 20–21.

plant "in habitats where hybridization with *I. fulva* is not likely to occur." The cytological evidence thus supports Viosca's conclusion that these plants are color-forms, not hybrids. The unnamed no. 65,677, which has no large V's, appears to have a complement like that of var. *giganticoerulea*, but as I have no data as to the appearance of the plant, I am unable to say definitely that it is only a color-form of this variety. Most of the remainder of the 44-chromosome group show at least one large V-chromosome. No. 65,730 may have two of these chromosomes. The appearance of even a single V-chromosome in the complements of these 44-chromosome plants is thus clear evidence of previous hybridization involving *I. fulva*.

On cytological grounds, then, it is concluded that many, if not most, of the Louisiana forms examined are of hybrid origin, the probable ancestors being *I. fulva* and *I. hexagona* var. *giganticoerulea*. For this reason, no attempt has been made to study the taxonomy of the numerous "species" described by Small and Alexander[1]. In any event, such a study can only be made after field experience, since the differences between many of these forms are so slight that, especially in the matter of color, herbarium material would be quite inadequate.

A situation analogous to that in Louisiana is shown by the work of Reed[2] on the progeny of a self-fertilized plant of the hybrid, Dorothea K. Williamson. This plant is a known hybrid between *I. fulva* and *I. brevicaulis*, the latter of which is closely allied to *I. hexagona* var. *giganticoerulea*. The colored plate accompanying Reed's report shows graphically the segregation in the five F_2 seedlings of numerous color, size, and shape factors, not only in the flower but also in other parts of the plant. Presumably, if more numerous F_2 progeny were raised and back-crosses to the original species were made, coupled with crosses between the seedlings, the riot of color forms now existing in Louisiana could be duplicated in a controlled experiment.

For two reasons, however, it seems probable that *I. brevicaulis* is not involved, to any degree, in the production of the Louisiana forms. As has been mentioned already, it blooms at a later time than *I. fulva*, although, undoubtedly, overlaps do occur on occasion. Viosca (l. c.), in a long and careful study of the distribution of the possible parents and their hybrid offspring in the Louisiana delta, shows clearly that only in favorable portions of the overlap zone between *I. fulva* and *I. hexagona* var. *giganticoerulea* do hybrids occur. Outside that zone they do not occur naturally, thus eliminating the possibility that *I. brevicaulis* or *I. virginica* L. might be the blue-flowered parent.

[1] Especially in Bot. Interp. Irid. Pl. Gulf States (1931).
[2] In Brooklyn Bot. Gard. Record xx. 243–253 (1931).

That these numerous species might be of hybrid origin was suggested by Small[1] himself, who noted (l. c., p. 182) that "when *I. fulva* is growing somewhere nearby, irises other than 'blues' are likely to be found. This seemingly indicates that this peculiar 'red' iris may have had a large part in the production of such a really startling scale of colors as our recent explorations have brought to light." In the following year, Mrs. Wheeler H. Peckham, who had been collecting with Dr. Small, suggested[2] a hybrid origin for these plants, and named *I. fulva* and *I. hexagona* var. *giganticoerulea* as the probable parents. Some, such as *I. elephantina*, which are probably not hybrids, may deserve the status of forms, but since material is unavailable, I have not attempted to deal with them taxonomically.

The case of *I. Kimballiae* from Florida is somewhat different. It cannot be a hybrid with *I. fulva* as an ancestor, for *I. fulva* apparently does not occur in Florida. Furthermore, lacking large V-shaped chromosomes, its chromosome complement is like that of *I. brevicaulis* and *I. hexagona* var. *giganticoerulea*, but its number is apparently 42, not 44. Randolph (l. c.) has counted 44 in what he calls an albino form of *I. hexagona*. It is possible, of course, that my plant from which the root-tips were taken was mislabelled, or that chromosomes were eliminated in the actual cutting of the sections. The figure reproduced was the clearest and best metaphase plate in very scanty material. More material, whose place of origin is known, should be studied to clear the uncertainty.

Subsection Tripetalae.

Consisting of two species and several varieties, this subsection is found on two continents, Asia and North America. In rootstocks, leaves and spathes the two species differ somewhat, but in the floral parts the similarity is great. The outstanding characteristic is the minute, reduced petal, which alone would suffice to distinguish them from other members of Section *Apogon*.

Iris tridentata Pursh. Rhizome medium-sized, spreading by means of very long internodes; leaves 4–5 in a clump, linear-ensiform, acute, green, subglaucous, with a reddish-brown edge, not prominently nerved, 2.5–3.75 dm. long and 1 cm. wide; stem exceeding the leaves, 3.5 dm. tall, usually simple, but occasionally branched, bearing 2–3 reduced cauline leaves; spathes narrow, linear-lanceolate, 1–2-flowered, unequal, the outer ±3 cm. long, the inner ±6 cm. long,

[1] In Journ. New York Bot. Gard. xxxii. 175–184 (1931).
[2] In Bull. Amer. Iris Soc. no. 44: 29–37 (1932).

covering the ovary and perianth-tube and extending over part of the claw of the sepal, rigid, dull green, striate with brown; pedicel 2.5–3 cm. long; ovary narrow, trigonal, ±1.5 cm. long; perianth-tube less than 1.5 cm. long, infundibuliform; sepals 7–8 cm. long, the orbicular blade nearly 4 cm. wide, passing abruptly into the claw, the blade bluish-purple with inconspicuous deeper veins and a yellow-white patch at the base where the blade passes into the whitish claw, which has yellow-brown reticulations; petals short and inconspicuous, ±1.5 cm. long, erect, tridentate, with the middle tooth longer than the others; style-branches nearly 4 cm. long; style-crests to 2 cm. long, linear to subquadrate, sometimes with incised edges; stigma entire, semi-circular; filaments ±1.7 cm. long; anthers ±1.3 cm. long; capsule globose to oblong, with rounded sides scarcely grooved, 2.5–3 cm. long, narrowing abruptly at the top into a pronounced beak; seeds round or D-shaped, fairly thick, dark red-brown.—Fl. Amer. Sept. i. 30 (1816); Sweet, Brit. Flow. Gard. iii. t. 274 (1828); Klatt in Linnaea xxxiv. 610 (1865–66). *Iris tripetala* Walter, Fl. Carol. 66 (1788); Elliott, Sk. Bot. S. Car. & Ga. i. 45 (1816); Ker, Gen. Irid. 46 (1827); Rafinesque, New Fl. N. Amer. part 2: 94 (1837); Baker in Journ. Linn. Soc., Bot. xvi. 138 (1877); S. Watson in Bot. Gaz. xii. 99 (1887); Baker, Handbk. Irid. 10 (1892); Dykes, Genus Ir. 94 (1913); Small, Fl. S. E. U. S. (ed. 2) 305 (1913); Dykes, Handbk. Gard. Ir. 144 (1924); Small in Addisonia xii. 5, pl. 387 (1927); Small, Man. S. E. Fl. 356 (1933); not L. f. (1781). *Xiphion tripetalum* (Walt.) Alefeld in Bot. Zeitung xxi. 297 (1863). *Xyridion tridentatum* (Pursh) Klatt in Bot. Zeitung xxx. 500 (1872).—Rich, swampy, shaded places, in southeastern United States. Representative material: NORTH CAROLINA: eastern portion, without locality, July, 1885, *McCarthy*, no. 228 (G); 1 mile east of Delco, July 5, 1927, *Wiegand & Manning*, no. 883 (G); Nakima, July 12, 1933, *P. O. Schallert* (NY); between Pates and Red Banks, Nov 17, 1905, *R. M. Harper* (US, MBG, NY); Pembroke, June, 5, 1901 *Biltmore Hb.*, no. 4041b (US); Wilmington, July 18, 1858, *McCarthy*, no. 85 (US); Wilmington, June 28, 1890, *F. V. Coville*, no. 208 (US). SOUTH CAROLINA: Hartsville, Black Creek Pond, July 12, 1920, *J. B. Norton* (US); Hartsville, Aug. 21, 1908, *W. C. Coker* (NY). GEORGIA: without locality or date, *Le Conte* (NY). FLORIDA: Lynn Haven, May 17, 1923, *C. Billington*, no. 15 (US): near Apalachicola, bogs at Poorhouse Branch, March, 1891, *Chapman* (MBG); near Jacksonville, without date, *Curtiss*, no. 2851 (G).

It has been impossible for me to obtain seeds or plants of this rather rare species, with the result that no report can be made on its cytology. The herbarium material seen leaves no doubt of its relationship with *I. setosa* and its var. *canadensis* M. Foster.

It is unfortunate that this plant, so long known as *I. tripetala* Walt.,

must relinquish that name, which is a later homonym of *I. tripetala* Linn. f., now *Moraea tripetala* (Linn. f.) Ker, since the Linnaean species was named in 1781.

IRIS SETOSA Pallas ex Link. Rhizome thick, short; leaves 3–6 in a fan, ensiform, somewhat glaucous in the upper portions, veins prominent, green, tinged with purple near the base, 2–4.5 dm. long, 1–2 cm. wide; stem simple or branched, usually exceeding the leaves, bearing 1–2 cauline leaves, the lateral branch set 12.5–15 cm. below the terminal flower-cluster and bearing its flowers on nearly the same level; spathes green, sometimes flushed with purple, the outer usually shorter than the inner, ovate-lanceolate, 2.5–4.5 cm. long, 5–7 mm. wide, 2-flowered; pedicel to 4.5 cm. long, barely, if at all, exceeding the spathes; ovary narrow, trigonal, ±1.3 cm. long; perianth-tube ±7 mm. long; sepals to 5 cm. long and 4.5 cm. wide, the blade flattened, orbicular, emarginate, narrowing abruptly to the short cuneate claw, which is yellowish-white, veined purple, the white extending for a short distance on the blade, which is otherwise a rather uniform blue-purple or red-purple in color, with somewhat darker veins; petals short, not over 2 cm. long, variable in shape, but usually falling into two groups, one of which is lanceolate, with wings near the base, the other lanceolate, with a second enlargement near the tip; style-branches to 2.5 cm. long; style-crests ±7 mm. long, incised, subquadrate or semi-ovate; stigma entire, rounded-triangular or even semicircular; filaments and anthers equal, ±1.3 cm. long; capsule trigonal, with the sides grooved, about 2.5 cm. long; seeds very shiny, light brown.—Sprengel, Schrader & Link, Jahrb. i (3). 71 (1820); Lindley in Bot. Reg. xxxiii. t. 10 (1847); Ledebour, Fl. Ross. iv. 96 (1853); Regel in Gartenflora (1861): 117, t. 322; Klatt in Linnaea xxxiv. 611 (1865–66); Baker in Journ. Linn. Soc., Bot. xvi. 140 (1877); Baker, Handbk. Irid. 11 (1892); Dykes, Genus Ir. 92 (1913); Dykes, Handbk. Gard. Ir. 143 (1924). *Iris brachycuspis* Fischer ex Sims in Bot. Mag. xlix. t. 2326 (1822). *Xiphion brachycuspis* (Fisch.) Alefeld in Bot. Zeitung xxi. 297 (1863). *Xyridion setosum* (Pall.) Klatt in Bot. Zeitung xxx. 500 (1872). *Iris brevicuspis* Schult., Mant. i. 306 (1822); Lindley in Bot. Reg. xxxiii. t. 10 (1847) as synon. of *I. setosa*. *Iris cuspidata* Fischer ex Lindley in Bot Reg. xxxiii. to. 10 (1847) as synon. of *I. setosa*.—Fairly dry localities in eastern and northern Asia, spreading into Alaska. Material seen: ALEUTIAN ISLANDS: Kadiak Isl., Karluk, 1903, *Rutter*, no. 222 (G); Kyska Isl., Mt. Baker, July 21, 1873, *W. H. Dall* (G); Unga Isl., Coal Harbor, July 21, 1872, *Hall & Harrington* (G); Atka, Nazan Bay, in bogs, July 28, 1907, *E. C. Van Dyke*, no. 260 (G). ALASKA: Dyea, 1897, *Canby, Sargent & Muir*, no. 285 (G); north Alaska, Kowak River, 1884, *S. B. McInnigan* (G); Lake Iliamna region, 1902, *M. W. Gorman*, no. 274 (G); Skagway,

trail to lakes, 1914, *Eastwood*, no. 803 (G); Yakutat Bay, mouth of Ankow River, 1892, *Funston*, no. 53 (G).

IRIS SETOSA var. ined. Hulten. Differs from the typical form of the species in having more orbicular sepals, and the outer spathe very much longer than the inner, naviculate, acuminate; usually the stem is simple and 1-flowered; petals minute, lanceolate.—*Iris arctica* Eastwood in Bot. Gaz. xxxiii. 132 (1902). Specimens seen: ALEUTIAN ISLANDS: Unalaska Isl., July 6, 1906, *E. C. Van Dyke*, no. 4 (G); Unalaska Isl., Makushin Bay, July 15, 1907, *E. C. Van Dyke*, no. 179 (G). ALASKA: Baranoff Isl., Kelp Bay, July 9, 1915, *Mr. & Mrs. Walker*, no. 800 (G, RM); Cape Nome, 1900, *Blaisdell* (G); vicinity of Nome, 1908, *C. N. Powers*, no. 54 (G).

IRIS SETOSA var. CANADENSIS M. Foster. A more dwarf form differing in certain respects from the Asian and Alaskan forms: leaves shorter and narrower, fewer in number, the edges often undulate; stems simple, overtopping the leaves, bearing one cauline leaf which is reduced to a leaf-like bract; spathes usually as in the typical forms, but sometimes distinctly naviculate, and the outer longer than the inner, 1–2-flowered; pedicel stouter than in the type; ovary more deeply grooved on the sides, similar in size; sepals more orbiculate than in the Asian plants, a distinct flange at the base of the claw, the white patch at the base of blade more diffuse, color variable, as in the typical form; petals minute, oblanceolate; style-branches as in the typical form; style-crests less overlapping, very coarsely incised, often nearly linear-oblong; capsule and seeds as in the typical form.—Rhodora v. 158 (1903); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908); Dykes, Genus Ir. 93 (1913) in part; Dykes, Handbk. Gard. Ir. 144 (1924) in part. *Iris Hookeri* Penny ex G. Don in Loudon's Hort. Brit. Suppl. 1: 591 (1832); Steudel, Nomencl. Bot. (ed. 2) 822 (1840); S. Watson in Bot. Gaz. xii. 99 (1887); Macoun, Cat. Canad. Pl. iv. 24 (1888); Baker, Handbk. Irid. 10 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 449 (1896); Small in Journ. New York Bot. Gard. xxxi. 42 (1930); Small in Journ. New York Bot. Gard. xxxii. 52 (1931). *Iris canadensis* (M. Foster) Wherry, Wild Fls. Mt. Desert Is., Maine 37 & 120 (1928). *Iris canadensis* (M. Foster) Small ex Peckham, Alphabet. Check List Iris 71 (1929). *Iris setosa* subsp. *pygmaea* Lundstr. in Act. Hort. Berg. v. 22 (1914), *ex descr. Iris tridentata* sensu Hooker (non Pursh), Fl. Bor.-Amer. 206 (1839). *Iris tridentata* sensu Baker (non Pursh) in Journ. Linn. Soc., Bot. xvi. 140 (1877). *Iris tripetala* sensu Hooker (non Walter) in Bot. Mag. lvi. t. 2886 (1829).—A maritime plant of northeastern North America, from Labrador south to northern Maine. Representative material: LABRADOR: Indian Harbor, 1921, *R. H. Wetmore*, no. 102,912 (G); Bird Rock, near Gready Island, 1928, *Bishop*, no. 219 (G); Hamilton Inlet, Mallijak, 1892, *Sornborger*, no. 75 (G); Straits of Belle Isle, Forteau, 1910, *Fernald & Wiegand*, no. 3088 (G). NEWFOUNDLAND: Straits of

Belle Isle, Flower Cove, 1924, *Fernald, Long & Dunbar*, no. 26,524 (G); Avalon Peninsula, Argentia, 1924, *Fernald, Long & Dunbar*, no. 26,525 (G); south of St. Paul's Bay, Cow Head, 1910, *Fernald & Wiegand*, no. 3087 (G); Bay of St. George, Stephenville Crossing, 1914, *Fernald & St. John*, no. 10,810 (G); Trinity Bay, Random Sound, Clarenville, 1911, *Fernald & Wiegand*, no. 5193 (G); south shore of Notre Dame, Dildo Run, 1911, *Fernald & Wiegand*, no. 5192 (G). QUÉBEC PROVINCE: Bic, 1905, *J. R. Churchill* (G); Carleton, Tracadigash Point, 1904, *Collins & Pease*, no. 6508 (G); Boishébert, Tabatière, 1915, *St. John*, no. 90,326 (G); Anticosti Island, Pointe Sud-Ouest, 1926, *Marie-Victorin & Rolland-Germain*, no. 24,245 (G); Matamek River district, 1927, *Bowman*, no. 90 (G). NEW BRUNSWICK: Belledune Point, 1922, *Fernald & Pease*, no. 24,971 (G). PRINCE EDWARD ISLAND: Grand Tracadie, 1914, *Fernald & St. John*, no. 11,005 (G). NOVA SCOTIA: Cape Breton Island, Cape North, Money Point, 1916, *Nichols*, no. 1880 (G); Canso, 1901, *J. Fowler* (G); Central Port Mouton, 1920, *Graves, Long & Linder*, no. 20,791 (G); Bay of Fundy, near Margaretville, 1920, *Bissell, Bean, White & Linder*, no. 20,790 (G); St. Paul Island, Trinity Cove, 1929, *Perry & Roscoe*, no. 156 (G); Magdalen Islands, Grindstone Isl., Étang du Nord village, 1912, *Fernald, Long & St. John*, no. 7211 (G). MAINE: Cutler, 1901, *G. G. Kennedy* (G, NE).

IRIS SETOSA var. CANADENSIS forma PALLIDIFLORA Fernald. Much like a large-sized var. *canadensis* except in the flower-color; the floral parts are white, with a slight bluish tinge in the large sepals.—Rhodora xxviii. 168 (1926).—Specimens seen: NEWFOUNDLAND: turfy shore near Nameless Point, Flower Cove, Aug. 2, 1925, *Fernald & Long*, no. 27,843 (TYPE, in G); Straits of Belle Isle, Flower Cove, Capstan Point, 1924, *Fernald, Long & Dunbar*, no. 26,527 (G).

IRIS SETOSA var. CANADENSIS forma ZONALIS Eames. The leaves differ from typical var. *canadensis* in having transverse bands of white or yellowish-white, occasionally bordered with red.—Rhodora xi. 91 (1909).—Specimens seen: NEWFOUNDLAND: beach near Bay St. George Hotel and moist sand in its vicinity, head of Bay St. George, Aug. 12, 1908, *Eames & Godfrey*, no. 5999 (G, co-type); Bay St. George, Stephenville Crossing, 1914, *Fernald & St. John*, no. 18,811 (G). QUÉBEC PROVINCE: Magdalen Islands, Grindstone Isl., Hospital Point, 1912, *Fernald, Bartram, Long & St. John*, no. 7210 (G).

These two forms seem to call for no comment, since the brief indication of their differences from the typical var. *canadensis* is sufficient.

DISCUSSION OF THE TRIPETALAE. The Asiatic representative of this group, *I. setosa*, is widespread and variable, especially as to petal-shape, which seems to fall into two main groups. How far the process of distinguishing these varietal and formal groups should be

carried nomenclaturally is difficult to decide. Here, too, the study of living plants should supplement the study of dried specimens. Hultén has labelled a number of sheets of Aleutian Island material in the Gray Herbarium as a new variety (to avoid nomenclatural complications I shall not use his unpublished name). Among these are several which were originally named *I. arctica* Eastwood, the determinations having been made in several cases by Miss Eastwood herself. Apparently, Hulten has reduced this plant to varietal status, with which I agree, but it seems unfortunate that he has rejected the specific name and adopted a new one for the new status. *I. arctica* was originally described by Miss Eastwood as having simple stems and one-flowered spathes. There is in the Gray Herbarium a sheet collected by Blaisdell at Cape Nome, Alaska, in the summer of 1900, sent out by the California Academy of Sciences, and labelled "*I. arctica* Eastwood, n. sp." One specimen on this sheet has a branched stem, and four of the five flower-clusters are two-flowered instead of one-flowered. The outer spathe-valve of this plant is much longer than the inner, one of the important points of difference between it and typical *I. setosa.*

In one form or another, *I. setosa* spreads southward in Alaska, but has no considerable eastward extension. On the contrary, there is a tremendous hiatus between the eastern and western varieties. The eastern plant, known for seventy years as *I. Hookeri* Penny, was reduced to the status of *I. setosa* var. *canadensis* by Sir Michael Foster, in a note published in 1903. The change in name was not necessary, but there is no alternative to acceptance. Since 1903 varietal status has generally been accorded it. Small,[1] however, has not only revived it as *I. Hookeri,* but has also created for it a separate subsection, *Hookerianae.* To this there are two objections: (1) there is not sufficient difference between it and *I. tridentata* to warrant removing it from the subsection *Tripetalae;* (2) the choice of name for the proposed subsection is unfortunate since it suggests a non-existent relationship with the totally different *I. Hookeriana* M. Foster, of western Tibet and Kashmir. There has been, in recent years, a tendency on the part of horticulturists to restore specific rank to var. *canadensis,* with the specific name *canadensis.* Under the existing rules of nomenclature, this is, of course, impossible; specific status must be accompanied by the specific name *Hookeri.* On the restoration of specific status I am not prepared to judge, since I am not familiar with living plants of both *I. setosa* and var. *canadensis.* An

[1] In Journ. New York Bot. Gard. xxxii. 49–66 (1931).

extensive range of the variants of each should be studied before making the change, and material of *I. setosa* has not been available. It seems not impossible that careful study would result in specific status for var. *canadensis*. Whatever be the final systematic disposition of these plants, their disrupted range indicates a great age on this continent, the disruption being probably due in part to continental glaciation. It is possible, too, that connecting colonies may have been obliterated by shifts in the land-level in these northern regions, if *I. setosa* arrived sufficiently early. At present, var. *canadensis* is found naturally only in localities close to the sea, although it can easily be grown in inland regions and also far to the south of its present home.

Cytologically there seems nothing to distinguish *I. setosa* from var. *canadensis*. For the former, Simonet[1] reports $n=19$, $2n=38$, a number which I found in seedlings of this species, secured from a western source. In var. *canadensis* I have found $2n=38$, a number also reported by Randolph.[2] There are two long chromosomes and two shorter with median, about 14 with subterminal, and about 18 with submedian attachment-constrictions; two satellites are visible (plate 1, fig. 19).

Subsection Longipetalae

In the present treatment of this group, it is regarded as having two species and two varieties. As a whole, the group is confined to the western portion of the United States and Canada, with occasional appearances in northwest Mexico. It is found as far east as the Dakotas. The members possess stout rhizomes with fleshy roots, leaves rather narrow, linear, or somewhat ensiform, stocky stems, a short perianth-tube and a bilobed stigma. The capsule is nearly circular in section, with six ribs which are less prominent than is the case with the *Hexagonae*. In the stigma, the *Longipetalae* seem to show a certain relationship with the *Hexagonae*, but the capsule, stem, and spathes of *I. missouriensis* Nutt. show a definite resemblance to *I. setosa* var. *canadensis*, a resemblance further borne out by the chromosome numbers of the two plants.

Iris missouriensis Nuttall. Rhizome thick, 2–3 cm. in diameter, clothed with the dark remnants of old leaves; leaves rather light green, glaucous, usually not prominently ribbed, erect, to 4.5 dm. or slightly longer, and 1 cm. wide, but usually narrower, linear, acute; stems usually exceeding the leaves by 5–10 cm., branched, or sometimes simple,

[1] In Ann. Sci. Nat., Bot. (ser. 10) xvi. 228–383 (1934).
[2] In Bull. Amer. Iris Soc. no. 52: 61–66 (1934).

rather slender; spathes opposite, scarious, with herbaceous portions at the base and along the keel, lanceolate or ovate, acuminate, 4–7 cm. long; pedicel to 20 cm. long, slender; ovary narrow, trigonal, 1.5–3 cm. long; perianth-tube infundibuliform, constricted above the ovary, to 1 cm. long; sepals ±6 cm. long and ±2 cm. wide, the blade obovate, deeply veined lilac-purple on a paler ground, with a yellow-white blotch at the base, the claw yellowish-white, veined and dotted with purple; petals slightly shorter, 1 cm. wide, oblanceolate or spatulate, emarginate, not veined; style-branches to 2.5 cm. long; style-crests ±8 mm. long, subquadrate, incised; stigma bilobed, sometimes obscurely so; filaments and anthers approximately equal, ±1.5 cm. long; capsule 3–5 cm. long, oblong, trigonal, tapering about equally at the ends; seeds subglobular or pyriform, dark brown.—Journ. Acad. Philad. vii. 58 (1834); Baker in Bot. Mag. cvii. t. 6579 (1881); Baker, Handbk. Irid. 9 (1892); Howell, Fl. N. W. Amer. i. 634 (1902); Rydberg, Fl. Colorado 86 (1906); Dykes, Genus Ir. 90 (1913); Piper & Beattie, Fl. N. W. Coast 105 (1915); Wooton & Standley, Fl. New Mexico 148 (1915); Rydberg, Fl. Rocky Mts. (ed. 1) 176 (1917); Jepson, Fl. Calif. i. 324 (1922); Dykes, Handbk. Gard. Ir. 124 (1924); Tidestrom, Fl. Utah & Nevada 128 (1925); Rydberg, Fl. Prairies & Plains 232 (1932); Munz, Man. S. Calif. Bot. 98 (1935). *Iris Tolmieana* Herbert in Hooker & Arnott, Bot. Beech. Voy. 396 (1841). *Iris longipetala* var. *montana* Baker, Handbk. Irid. 10 (1892).—Widespread, especially at high altitudes, throughout the west, occurring to some extent east of the continental divide, but usually west of the divide; wet meadows. Representative material: MONTANA: Anaconda, July 12, 1906, *J. W. Blankinship* (RM); Bozeman, June 2, 1898, *J. W. Blankinship* (RM); 5 miles east of Norris, June 13, 1933, *D. B. Swingle* (RM). WYOMING: Rock River, May 24, 1914, *J. F. Macbride*, no. 2730 (RM); Sand Creek, 1900, *Aven Nelson*, no. 6960 (RM, G); Yellowstone National Park, Mammoth Falls, June 27, 1930, *Mrs. E. C. Van Dyke* (CA). SOUTH DAKOTA: Rapid City, June 8, 1924, *A. C. MacIntosh*, no. 212 (RM); Boulder Creek, near Deadwood, 1929, *E. J. Palmer*, no. 37,202 (G); Black Hills National Forest, Sylvan Lake Road, 1908, *J. Murdoch, Jr.*, no. 3026 (G). COLORADO: hills above Mancos, 1898, *Baker, Earle & Tracy*, no. 140 (G, RM); Mesa Verde National Park, Prater Canyon, June 9, 1925, *H. M. Schmoll*, no. 1712 (RM); Estes Park, July 15, 1904, *W. S. Cooper*, no. 122 (RM); Durango, May 21, 1916, *Eastwood*, no. 5329, in part (CA, G); Breckenridge, Aug., 1901, *K. K. Mackenzie*, no. 278 (RM); near Boulder, May 30, 1906, *Ramaley*, no. 1543 (RM); Alamosa, June 12, 1924, *H. M. Schmoll*, no. 1022 (RM); Norwood Hill, 1912, *E. P. Walker*, no. 495 (RM, G); Spainero, June 1, 1898, *H. N. Wheeler*, no. 624 (RM); South Park, 1873, *Wolf & Rothrock*, no. 967 (G). NEW MEXICO: Pecos River National Forest, Winsor's Ranch, 1928, *P. C. Standley*, no. 4045 (G); near Las Vegas, 4 miles north, Aug. 6, 1926,

G. Arsène, no. 18,235 (CA); near Sulphur Springs, Aug. 17, 1926, *Arsene & Benedict*, no. 16,549 (CA); Eagle Lake, near Taos, 1929, *M. E. Mathias*, no. 550 (G); Fort Wingate, 1882, *W. Matheus*, no. 56 (G); Sawyer's Peak, south end of the Black Range, 10,000 ft., 1904, *O. B. Metcalfe*, no. 1080 (G, CA); Catskill, intervales of the Canadian, 1895, *W. O. St. John*, no. 137 (G); Rio de las Casa, 5 miles above Mora, 1902, *W. C. Sturgis* (G); Chusca Mts., 1918, *A. Wetmore*, no. 531 (G); Mogollon Mts., Willow Creek, 18 miles east of Mogollon, July 14, 1928, *C. B. Wolf*, no. 2684 (G, CA); Mescalero Indian Reservation, Sierra Blanca Peak, July 20, 1928, *C. B. Wolf*, no. 2873 (G, CA). IDAHO: Twin Falls, May 26, 1912, *D. Bennitt*, no. 89 (RM); Salmon River country, 1926, *R. Donagh* (CA); Albion, May 24, 1909, *M. P. Henderson*, no. 39 (RM); Silver City, June 26, 1911, *J. F. Macbride*, no. 985 (RM, G); Sweet, May 8, 1911, *J. F. Macbride*, no. 810 (RM, G); Spencer, June 26, 1916, *H. J. Rust*, no. 530 in part (CA). UTAH: La Sal Mts., ridge north of Brumley Creek, July 14, 1911, *Rydberg & Garrett*, no. 8933 (RM); Soldier Summit, June 24, 1918, *Eastwood*, no. 7682 (CA); Bryce Canyon, June 19, 1933, *Eastwood & Howell*, no. 750 (CA); 6 miles below Coyote, May 29, 1894, *M. E. Jones*, no. 5315 (RM); Beaver Valley, 1877, *E. Palmer*, no. 455 (G); Glenwood, 1875, *Ward*, no. 120 (G). ARIZONA: Chiricahua Mts., Barfoot Park, Sept., 1906, *J. C. Blumer*, no. 1403 (G); near Flagstaff, May 31, 1898, *D. T. MacDougal*, no. 13 (G, RN); Cooley's Ranch, July 1, 1912, *L. N. Goodding*, no. 1111 (RM). BRITISH COLUMBIA: Lake Atlin, July 14, 1914, *Eastwood*, no. 648 (CA, G). WASHINGTON: Prosser, May 27, 1903, *J. S. Cotton*, no. 1085 (G); Waitsburg, 1897, *Horner*, no. R470 (G); Klickitat, 1879, *T. Howell* (G); between Cle Elum and Easton, 1931, *J. W. Thompson*, no. 6697 (G). OREGON: south fork of John Day River, at Prairie City, June 5, 1925, *L. F. Henderson*, no. 5363 (CA, G); west of Unity on the John Day Highway, May 25, 1927, *L. F. Henderson*, no. 8716 (CA); Antelope, May, 1885, *T. Howell* (JWT); near Rock Creek, 1894, *Leiberg*, no. 101 (G); Juniper Springs, 1896, *Leiberg*, no. 2258 (G); near Union, 1928, *J. W. Thompson*, no. 4865 (G); along Crooked River, 1921, *Whited*, no. 340 (G). NEVADA: about Washoe Falls, 1902, *C. F. Baker*, no. 1081 (G, RN); White Mts., Trail Canyon, June 12, 1920, *V. Duran*, no. 514 (CA, RM); near Deeth, on Victory Highway, June 11, 1933, *Eastwood & Howell*, no. 303 (CA). CALIFORNIA: Owens Valley, 1877, *W. Mathews* (G); Shasta River, June 11, 1876, *E. L. Greene*, no. 1047 (G); western side of Mt. Davidson, 1860–62, *J. G. Bloomer* (G); San Bernardino Mts., Bear Valley, I. S. Ranch, June 20, 1930, *J. A. Ewan*, no. 2037 (RM); Cuyamaca Lake, June 25, 1903, *L. R. Abrams*, no. 3892a (G); Mt. Pinos, over 8000 ft., June 13, 1927, *R. Hoffman* (CA); near Eagle Lake, 1879, *Mrs. R. W. Austin* (G); Levining Canyon, near the mouth, July 4, 1932, *M. S. Baker*, no. 5829 (CA); Monarch, Aug., 1912, *Mrs. A. L. Coombs* (CA); Carson Pass, Sept. 8, 1920, *M. S.*

Clemens (CA); Goose Lake Valley, June, 1895, *Mrs. R. M. Austin*, no. 498 (US); Surprise Valley, July, 1913, *P. Monnet*, no. 932 (CA); Siskiyou County, 1909, *G. D. Butler*, no. 883 (G).

IRIS MISSOURIENSIS var. **pelogonus** (Goodding), comb. nov. Rhizome stout, 1 cm. in diameter, sheathed in the dark-brown, unsplit bases of old leaves; leaves very pale green, glaucous, with subprominent or inconspicuous nerves, thick, rigid, seldom exceeding the stem, and often not over half its length, 1.2–2.5 dm. long, 2–6 mm. wide, linear, acute; stem simple, terete, stout, 1.2–2.8 dm. long, 1–3-flowered; spathes opposite and subequal, or distant and unequal, white-membranous, but slightly herbaceous at the base and along the midrib, ovate-lanceolate, acute, closely appressed to the ovary and pedicel, usually extending well beyond the base of the perianth-segments, 3.7–7 cm. long; pedicel 5–10 mm. long; ovary narrow, trigonal, 1–1.5 cm. long; perianth-tube constricted above the ovary, infundibuliform, 8–12 mm. long; sepals to 7 cm. long, 2 cm. wide, the claw long and narrow, the blade ovate to obovate, light blue-purple with deeper veins, the claw and basal patch on the blade yellowish; petals possibly paler in color, oblanceolate-spatulate, to 5.5 cm. long, 8–10 mm. wide, obtuse or emarginate; style-branches to 3 cm. long; style-crests 8 mm. long, subquadrate, serrate at the tip; stigma obscurely bilobed, crenate; filaments to 1.2 cm. long; anthers to 1.5 cm. long, the ends nearly reaching the stigma; capsule and seeds not seen on the type; in other specimens the capsule is oblong, tapering about equally at the ends, to 6 cm. long, the seeds dark brown, subglobular to pyriform.—*Iris pelogonus* Goodding in Bot. Gaz. xxxiii. 68 (1902); Dykes, Genus Ir. 91 (1913), as synon. of *I. montana* Nuttall ex Dykes; Dykes in Gard. Chron. (III) lxi. 45 (1917). *Iris montana* Nuttall ex Dykes, Genus Ir. 91 (1913); Dykes, Handbk. Gard. Ir. 125 (1924).—Hilly regions, in moist meadows or along streams, along the eastern side of the continental divide, occasionally occurring west of the divide. Representative material: MONTANA: Armstead, June 20, 1920, *E. B. & L. B. Payson*, no. 1731 (RM, G, CA); forks of the Madison, 1897, *Rydberg & Bessey*, no. 3883 (G, RM). WYOMING: Albany County, without precise locality, 1903, *P. L. Nelson* (RM); near Red Buttes, June 17, 1891, *B. C. Buffum*, no. 880 (RM); Laramie, June, 1908, *Aven Nelson*, no. 9131 (RM); Laramie, U. S. Pen. Reservation, June 18, 1899, *Aven Nelson*, no. 260 (RM); Centennial Valley, June 9, 1895, *Aven Nelson*, no. 1268 (RM); alkali spring, 35 miles north of Point of Rocks, June 21, 1901, *Merrill & Wilcox*, no. 518 (G, RM); Sweetwater County, Bush Ranch, June 10, 1909, *Aven Nelson*, no. 7102 (type, in RM). SOUTH DAKOTA: 1 mile from Hardy Station, June 25, 1927, *H. E. Hayward*, no. 1419 (RM); 12 miles west of Deerfield, July 22, 1927, *H. E. Hayward*, no. 2298 (RM). COLORADO: Crystal Park, June 20, 1901, *F. E. & E. S. Clements*, no. 170 (RM, G); Buena Vista, June 18, 1918, *Eastwood*, no. 7092 (CA); Arkansas Valley, foot

of Mount Massive, without date, *L. M. & N. T. Schedin*, no. 610 (RM); near Leadville, without date, *L. M. & N. T. Schedin*, no. 611 (RM); Fort Collins, May 12, 1896, *C. L. Crandall*, no. 2426 (RM); South Park, bluffs, 1892, *E. L. Hughes*, no. 56 (G); Rio Grande National Forest, Elliott Creek, wet meadows at 8600 ft., June 18, 1911, *J. Murdoch, Jr.*, no. 4621 (G, CA); near Florissant, Aug. 1–8, 1905, *Ramaley*, no. 1317 (RM); Colorado Springs, Bear Creek Canyon, 1910, *Mrs. T. C. Pease* (G); Veta Mt., June 4, 1900, *Rydberg & Vreeland*, no. 6419 (RM); Gunnison Watershed, Marshall Pass, 1901, *C. F. Baker*, no. 527 (G, RM); Durango, May 23, 1916, *Eastwood*, no. 5329 in part (CA, no. 110,634); Trinidad, June 15, 1917, *Johnston & Hedgcock*, no. 872 (RM); near Boulder, South Boulder Canyon, June 8, 1901, *Ramaley*, no. 730 (RM). ARIZONA: on the Springerville-Cooly Ranch Road, Apache National Forest, in the White Mts., July 4, 1918, *R. L. Ferris*, no. 1247 (CA).

✓ IRIS MISSOURIENSIS var. **arizonica** (Dykes), comb. nov. Rhizome stout; leaves rather yellowish-green, at most only subglaucescent, to 6–7.5 dm. long, 1.2 cm. wide, rather finely but conspicuously ribbed; stems equal to the leaves, usually with a short lateral branch or flower-cluster about 15 cm. below the terminal cluster, the latter 3–5-flowered, the former 2–3-flowered; spathes scarious, or semi-herbaceous on the keel and at the base, opposite or nearly so, subequal, or the inner longer, appressed to the pedicel and ovary; pedicel 4–10 cm. long; ovary trigonal, narrow, 1.5–2.5 cm. long; perianth-tube infundibuliform, to 1 cm. long; sepals to 5 cm. long and 2 cm. wide, oblanceolate-obovate, the claw whitish, veined with purple, the blade whitish, veined deeply with violet-purple, a yellowish blotch at the base of the blade; petals shorter than the sepals, narrowly oblanceolate, entire; style-branches ±3 cm. long; style-crests ±8 mm. long, rounded-triangular to subquadrate, finely incised; stigma bilobed, sometimes obscurely so; filaments 1 cm. long; anthers 1.5 cm. long; capsule and seeds as in other members of the group.—*Iris arizonica* Dykes in Gard. Chron. (III) lxi. 45 (1917); Dykes, Handbk. Gard. Ir. 125 (1924).—Apparently confined to Arizona, at fairly high altitudes. Specimens seen: ARIZONA: Chiricahua Mts., Barfoot Park, Sept., 1907, *J. C. Blumer*, no. 1556 (G); Chiricahua Mts., Coronada National Forest, Rustler's Park, June 18–19, 1930, *Goodman & Hitchcock*, no. 1194 (CA); Chiricahua Mts., Cave Creek Canyon, July–Aug., 1927, *J. A. Kusche* (CA); Huachuca Mts., 1886, *C. G. Pringle*, no. 79 (G); near Brome, on the road from Prescott, June 1929, *Mrs. C. W. McKelvey*, no. 1251 (CA).

✓ IRIS MISSOURIENSIS forma **angustispatha**, form. nov. Spathae valvi angusti, aliquantum divergentes. This form is separable from typical *I. missouriensis* by the fact that its spathes are usually narrower, and more or less divergent in numerous cases, occasionally distant.—Widely scattered throughout the western states. Material

seen: IDAHO: Coeur d'Alene, Brady Place, May, 1914, *H. J. Rust*, no. 530 (TYPE in CA); valley of Big Potlatch River, June 6, 1892, *J. H. Sandberg et al.*, no. 315 (CA). WASHINGTON: Pullman, June 23, 1925, *Eastwood* (CA); Pullman, 1920, *H. E. Phelps* (CA); near Pullman, 1892, *E. R. Lake*, no. 607 (G); Spokane County, camp no. 2, May 29, 1893, *Sandberg & Leiberg*, no. 100 (G, CA); Waikiki, May 28, 1913, *G. W. Turesson* (RM); Sequim, May 10, 1915, *J. M. Grant* (RM). OREGON: Cow Creek, Jordan Valley-Homedale Highway, May 24, 1927, *L. F. Henderson*, no. 8917 (CA); Swan Lake Valley, 1896, *Applegate*, no. 181 (G). CALIFORNIA: Klamath Lake, June, 1924, *Mrs. G. E. Kelly* (CA); Edgewood, May 18, 1913, *L. E. Smith* (CA); Mariposa, Snow Creek, May 23, 1897, *Condon* (CA); 9 miles south of Hopland, Apr. 10, 1934, *Eastwood & Howell*, no. 1302 (CA); Yosemite, Fern Creek near Bridal Veil Falls, June 14, 1922, *Mrs. J. C. Augsberg* (CA).

IRIS LONGIPETALA Herbert in Hooker & Arnott. Rhizome stout, 2–2.5 cm. in diameter, covered with the unsplit bases of old leaves, roots numerous, fleshy; leaves linear-ensiform, acute, usually exceeding the stem, to 7 dm. long and 1 cm. wide, dark green, glaucous or subglaucous, not prominently nerved; stems simple or occasionally branched, stout, to 6 dm. long, sometimes bearing 1–2 reduced cauline leaves, 3–6-flowered; spathes herbaceous or even foliaceous, sometimes scarious in the upper portion, narrowly linear-lanceolate, to 15 cm. long, the outermost usually distant from the second by 1–10 cm.; pedicels stout, unequal at blooming, 3–9 cm. long, becoming more nearly equal after flowering; ovary trigonal, to 2.5 cm. long, surface distinctly uneven, with a ridge in the middle of each of the three sides; perianth-tube short, infundibuliform, 5 mm. to 1.3 cm. long; sepals to 10 cm. long, 5 cm. wide, the claw narrow, the blade obovate, a prominent ridge passing up the claw, yellowish, dotted purple, ending in a white blotch at the base of the blade which is veined lilac-purple on a lighter ground; petals to 9 cm. long and 1.5–2 cm. wide, oblong, bluntly rounded at the apex, emarginate; style-branches cuneate, to 4 cm. long; style-crests subquadrate, irregularly incised, to 1.5 cm. long; stigma obscurely or prominently bilobed, the edges crenate; filaments to 1.5 cm. long; anthers to 2 cm. long, occasionally equalling or exserted beyond the stigma; capsule oblong-oval, 6-ribbed, tapering at either end, to 9 cm. long; seeds dark brown, subglobular to pyriform.—Bot. Beech. Voy. 395 (1841); Hooker f. in Bot. Mag. lxxxviii. t. 5298 (1862); Baker in Journ. Linn. Soc., Bot. xvi. 142 (1877); Baker, Handbk. Irid. 10 (1892); Greene, Bot. San Fran. Bay Region 308 (1894); Jepson, Fl. West. Mid. Calif. 129 (1901); Howell, Fl. N. W. Amer. i. 634 (1902); Dykes, Genus Ir. 89 (1913); Jepson, Fl. Calif. i. 324 (1922); Abrams, Illust. Fl. Pacif. States i. 462 (1923); Dykes, Handbk. Gard. Ir. 123 (1924); Jepson, Man. Fl. Pl. Calif. 253 (1925). —Moist regions along the coast of California, from Mendocino County

south to Monterey. Representative material: CALIFORNIA: San Francisco Bay, 186–, *H. N. Bolander*, no. 2756 (G); Mills Hills, 1903, *M. H. Hincks* (G); Potrera, Mar. 10, 1869, *Kellogg & Harford*, no. 976 (G, CA); South San Francisco, on San Francisco Bay, Mar. 21, 1929, *L. Benson*, no. 1021 (JWT); South San Francisco, San Bruno Hills, Mar. 12, 1914, *Eastwood*, no. 3751 (CA); South San Francisco, Visitation Valley, Mar. 27, 1929, *Ynes Mexia*, no. 2335 (RM); Contra Costa County, Point Isabel, 1897, *J. Burtt Davy* (G); near Cordelia, 1902, *Heller & Brown*, no. 5367 (G); Mendocino County, 1876, *G. R. Vasey* (G); Monterey, 1860–62, *W. H. Brewer*, no. 609.

CYTOLOGY OF THE LONGIPETALAE. *I. missouriensis* has been found to have a chromosome count of $2n=38$ (see pl. 1, fig. 17). There are two long and two medium-sized medians, two long and 22 smaller subterminals, at least four small rods without apparent constrictions, and four satellites. The rest of the complement cannot be distinguished with certainty. Although the count is identical with that of *I. setosa* var. *canadensis*, the idiogram is quite different.

Since the two varieties and form of *I. missouriensis* are known to me only from herbarium specimens, no account can be given of their cytology. Simonet[1] reports $2n=86$–88 for *I. montana*, but he gives no drawing of the chromosome complement, nor does he give any description of the plant. Consequently, the question of whether or not he had the plant here called *I. missouriensis* var. *pelogonus*, or *I. montana* as Dykes called it, must remain unanswered. It is, of course, quite possible that polyploidy will be found in *I. missouriensis* and its varieties when the necessary large-scale examination of wild material can be made.

Simonet[2] reports $2n=86$–88 for *I. longipetala*, noting that the small chromosomes are so numerous that an exact count was not possible. Examination of numerous sections of root-tips has failed to show any division figures which could be drawn or counted accurately. Rough counts of about 80 have been made, but exactness is impossible. Aceto-carmine smears of root-tips have likewise proved useless.

DISCUSSION OF THE LONGIPETALAE. Covering a tremendous area of the Rocky Mountain and Pacific Coast states, *I. missouriensis* presents another example of polymorphism of the sort shown by *I. versicolor* L. In that species, as Anderson[3] has shown from field collections, there seems to be an almost unlimited expression of variation, with none of the variants actually deserving distinction as a

[1] Ann. Sci. Nat., Bot. (ser. 10) xvi. 371 (1934).
[2] In Bull. Biol. France et Belg. lxvi. 291 (1932).
[3] In Ann. Missouri Bot. Gard. xv. 241–332 (1928).

variety or form. The specimens seen of *I. missouriensis* show variation in almost every conceivable respect, but only one of these has seemed, at present, sufficiently widespread or numerous to deserve recognition as a form. Among others, *Eastwood & Howell,* no. 303, from Nevada, might almost be separated; it has, in particular, anthers which are much exserted beyond the stigma, and in some size relationships differs from normal *I. missouriensis.* Nevertheless, on the basis of this single specimen, I should not feel justified in making a separation, especially since the differences are not outstanding. At best, it could be entitled only to varietal status.

This vigorous species occurs both east and west of the Continental Divide. Yet, though wide-spread, it tends to be restricted to favorable areas. In Idaho, for example, it has recently been reported to be found in the northern part of the state "primarily in the meadows of the Palouse Prairie, ... and in the valleys and tributaries of the Snake River, in southern Idaho."[1] Mrs. K. N. Marriage[2] reports that in Colorado individual plants or small groups are often found at the edges of aspen groves, but that whenever large fields occur there is always underflow of water until the blooming season is over. It is found even in such geologically ancient regions as the Black Hills. Is it there as a newcomer or as a relic? That question cannot be answered at present, but *I. missouriensis* is vigorous and aggressive, spreading over a vast area and maintaining itself with ease wherever the moisture conditions are satisfactory. Its behavior is that of a young, invading plant, which has spread over this region in recent geological times. The focal point, or points, from which it has spread cannot now be determined. Nevertheless, there are certain facts which should not be overlooked. In spathes, capsule, and stem, it is not unlike *I. setosa* and its varieties. The chromosome numbers of the two plants are apparently the same, and in certain ways there is some resemblance between the idiograms of the two plants; in other respects, however, the karyotypes are quite unlike. Moreover, in its northern extension into British Columbia, *I. missouriensis* tends to approach the southern extension of *I. setosa* in Alaska. These facts suggest that a more detailed study, supplemented by the study of species-crosses between the two, might be rewarding.

Known to me only from herbarium specimens, neither the cytology nor the exact distribution of *I. missouriensis* var. *pelogonus* can be

[1] J. H. Christ in Bull. Amer. Iris Soc. no. 61: 8 (1936); actually, it occurs in the Caldwell silt loam, not in the Palouse silt loam—see Bull. Amer. Iris Soc. no. 61: 6 (1936).

[2] In Bull. Amer. Iris Soc. no. 61: 17 (1936).

determined at present. An obvious relative of *I. missouriensis*, it seems to differ from that species in being much smaller in general, with the plant stockier in proportion to its size, in the shorter pedicel length, and in the relative lengths of the stamens and style-branches, although this may be a variable character. Dykes[1] makes *I. pelogonus* Goodding synonymous with *I. montana* Nutt. ex Dykes, and states that the living plant from which his plate (XXII) was made had been sent to him from Laramie, Wyoming, where it had been collected by Professor Aven Nelson. This plate shows the petals to be acutely pointed, and the description stresses this point of difference between *I. missouriensis* and *I. montana*. If *I. montana* and *I. pelogonus* are really identical, then Goodding's name must be retained, since it was published eleven years before Dykes took up Nuttall's manuscript name.

After careful study of specimens, in particular the type of *I. pelogonus* (*Aven Nelson*, no. 7102) and sheets of *Aven Nelson*, no. 1268 and *C. F. Baker*, no. 527, which Dykes (l. c.) cited as *I. montana*, two conclusions were reached: (1) *I. montana* and *I. pelogonus* are identical; (2) the sheets of the collections cited by Dykes as *I. montana* show obviously emarginate, spatulate petals. Accordingly, it seems to me, the rather narrow line between *I. missouriensis* and *I. pelogonus* fails. The two plants, in the material available to me, can be separated only by such variable characters as pedicel-length and leaf-length, and even here intergrades occur. In view of these fluctuating vegetative differences, there seems no alternative, at present, to reducing *I. pelogonus* to varietal status. Study of living plants collected over a considerable portion of its range, contrasting them with living plants of *I. missouriensis*, might result in establishing fundamental differences which would warrant specific status for *I. pelogonus*. The herbarium material seen does not justify this status.

Dykes originally described *I. arizonica* from seedlings raised from seed taken from an herbarium specimen in the United States National Herbarium. This specimen had been collected in Barfoot Park, in the Chiricahua Mts., Arizona, in September, 1907, and was probably, although Dykes did not mention the collector, *J. C. Blumer*, no. 1556, of which there is a sheet in the Gray Herbarium. Only five specimens have been seen which can be assigned here. As is the case with *I. pelogonus*, the principal differences from *I. missouriensis* seem almost entirely vegetative, and somewhat inconstant. For this reason, there seems to be no alternative but to reduce it to varietal status. In view of the fact that, of the five specimens seen, three came from the Chiricahua Mts. it is probably of quite restricted range.

[1] Genus Ir. 91 (1913).

Unlike *I. missouriensis*, *I. longipetala* has a very limited range. Its size, range, and high chromosome number indicate that it is a tetraploid, probably of fairly recent origin. Whether it is an autotetraploid or an amphidiploid produced from a species-cross cannot be stated until the chromosome number is definitely known. The distinction between it and *I. missouriensis* is, for the most part, one of size, although, unlike the latter, its foliage does not die away before new leaves are produced, and the leaves usually exceed the stem. Because of this similarity, Dykes[1,2] and others following him call *I. missouriensis* merely an upland variety of *I. longipetala*, and only doubtfully entitled to specific rank. Since the former was the first-described of the two species, it would be nomenclaturally impossible to reduce it to varietal status under the latter. The comparative ranges and chromosome numbers of the two plants furnish an additional argument against doing so.

It is possible that *I. longipetala* is an amphidiploid, resulting from a species-cross involving *I. missouriensis*. If the other parent was not a member of the *Longipetalae*, it might possibly be *I. Douglasiana*. I suggest this species because of its size, its leaf habit, and because there is at times enough similarity between it and *I. longipetala* to cause the two species to be confused in herbaria. It should be emphasized that this is only a tentative suggestion. The part played in speciation by chromosome-doubling after a specific or generic cross is as yet virtually unknown, although examples are multiplying in experimental work. In addition to the examples cited by Bleier,[3] I have found enough more to bring the number to about fifty. Several instances occurring in nature are known, such as *Aesculus carnea* Willd.,[4] *Spartina Townsendii* H. & J. Groves,[5] and *Penstemon neotericus* Keck.[6] It seems reasonable to believe that a wide field of investigation lies open in the continuation of this work upon species occurring in the wild.

At the same time, the possibility that *I. longipetala* is an autotetraploid must not be overlooked. Its size and vigor are wholly compatible with this suggestion, for Müntzing[7] has found from a survey of autopolyploidy that greater vigor and corresponding morphological changes in the organism often accompany such a chromosomal change.

[1] Genus Ir. 89 (1913).
[2] Handbk. Gard. Ir. 124 (1924).
[3] In Bibliog. Genet. xi. 393–489 (1934).
[4] Skovsted in Hereditas xii. 64–70 (1929).
[5] Huskins in Genetica xii. 531–538 (1930).
[6] Clausen in Hereditas xviii. 65–76 (1933).
[7] In Hereditas xxi. 263–378 (1936).

That this is not always the case with autotetraploids has been shown in *Tradescantia* by Anderson and Sax,[1] who find that autotetraploids in this genus are distinguishable only cytologically from the related diploids.

Subsection Virginicae

Consisting of two species usually grouped with the subsection *Laevigatae*, these have been segregated by Waller[2] as the *Virginica* subsection. Large, moisture-loving plants, they possess good-sized rhizomes, linear-ensiform leaves, trigonal ovaries and capsules, and entire stigmas. Florally they are similar, but the seeds differ markedly.

Iris virginica L. Rhizome stout, ±2.5 cm. in diameter; leaves linear-ensiform, acute, gray-green, or bright green, with several ribs prominent in mature leaves, 4–9 dm. long, 1–4 cm. wide; stems simple or sparingly branched from above the middle, the branches flowering at nearly the same level as the terminal cluster, 5–9 dm. tall, with several long, linear cauline leaves which sometimes exceed the terminal cluster; spathes unequal, the outer shorter than the inner, except when the outer is wholly or partially foliaceous, 3–14 cm. long, herbaceous, or partially membranous, striate with brown, rigid, not inflated; pedicel 3–8 cm. long, not exceeding the spathes at anthesis; ovary 1–3 cm. long, trigonal; perianth-tube constricted above the ovary, infundibuliform, 1–2 cm. long; sepals to 7–8 cm. long, 3–4 cm. wide, the blade obovate-ovate, the claw often very broad and 1.5 cm. long, yellow-green with deeper veins, the prominent yellow midrib pubescent, expanding into a bright yellow pubescent patch at the base of the blade, which is usually bright lavender-blue; petals obovate to obovate-spatulate, frequently emarginate, to 5.5–6 cm. long, 1–2.5 cm. wide, of the same color as the sepals, the claw yellow-green; style-branches to 3.5 cm. long; style-crests reflexed, finely or coarsely toothed, to 1.5 cm. long; stigma entire, triangular or rounded-triangular; filaments ±1.5 cm. long; anthers 1–2 cm. long; capsule trigonal in cross-section, ovoid or ellipsoid, the seeds often in two rows in each carpel, 4–7 cm. long; seeds round or irregularly D-shaped, with an irregularly pitted corky covering.—Sp. Pl. i. 39 (1753); Michaux, Fl. Bor. Amer. 22 (1803); Sims in Bot. Mag. xix. t. 703 (1804); Baker in Gard. Chron. (II) vi. 615 (1876); Anderson in Ann. Missouri Bot. Gard. xv. 254 ff. (1928); Small, Man. Se. Fl. 356 (1933); Viosca in Bull. Amer. Iris Soc. no. 57: 8 ff. (1935). *Iris carolina* Radius in Naturforsch. Ges. Leipzig Schrift. i. 158 (1822); Small in Addisonia ix. 49, pl. 313 (1924). *Iris versicolor* auctorum, non L. *Iris caroliniana*

[1] In Bot. Gaz. xcvii. 433–476 (1936).
[2] In Ohio Journ. Sci. xxxi. 29–43 (1931).

S. Watson in Gray, Man. (ed. 6) 514 (1890); Baker, Handbk. Irid. 12 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 449 (1896); S. Watson in Proc. Amer. Acad. xxv. 134 (1898); Small, Fl. Se. U. S. (ed. 1) 306 (1903); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908); Stapf in Bot. Mag. cxxxviii. t. 8465 (1912). *Iris georgiana* Britton in Britton & Brown, Illust. Fl. (ed. 2) i. 537 (1913). *Iris Shrevei* Small in Addisonia xii. 13, pl. 391 (1927); Small, Man. Se. Fl. 356 (1933).—Swamps and marshes in southeastern and central United States, north to Minnesota and Wisconsin, and the Bruce Peninsula in Canada. Representative material: ONTARIO: Bruce County, Stag Lake, June 18, 1933, *G. L. Stebbins*, no. 81 (G). OHIO: Oberlin, June 20, 1890, *C. A. Kofoid* (G). ILLINOIS: Starved Rock, June 1-7, 1909, *Greenman, Lansing & Dixon*, no. 157 (G); Urbana, May 27, 1899, *H. A. Gleason*, no. 558 (G); Cowford Bridge, June 12, 1918, *I. W. Clokey*, no. 2433 (G, RM). INDIANA: Roby, July 12, 1906, *O. E. Lansing*, no. 2540 (G). IOWA: Ames, June 21, 1897, *Ball & Meeker*, no. 524 (G); Missouri Valley, June 21, 1897, *L. H. Pammel*, no. 587 (G). MINNESOTA: west of Beaver River, near shore of Lake Superior, June 29, 1921, *Butters & Rosendahl*, no. 4463 (G); Kasson, June 23, 1928, *E. Anderson* (G). NORTH CAROLINA: Currituck Sound, Newbridge Creek, July 1, 1922, *L. F. & F. R. Randolph*, no. 603 (G); Wilmington, 1887, *Manda* (G, TYPE of *I. caroliniana*); Highlands, May, 1902, *T. G. Harbison* (G); Hendersonville, May 26, 1898, *Biltmore Hb.*, no. 542b (G). SOUTH CAROLINA: Conway, Apr. 8, 1932, *Weatherby & Griscom*, no. 16,495 (G); Socastee, Apr. 21, 1932, *Weatherby & Griscom*, no. 16,492 (G); Waccamaw River, Longwood Island, Apr. 22, 1932, *Weatherby & Griscom*, no. 16,493 (G). GEORGIA: brackish marshes of Savannah River at upper end of McQueen Island, Apr. 30, 1904, *R. M. Harper*, no. 2180 (G). FLORIDA: banks of St. Johns River, April, 1877, *Mary Treat* (G); near Sopchoppy, Apr. 1, 1934, *Griscom*, no. 21, 473 (G); Apalachicola, May, 1897, *Chapman* (G). ALABAMA: 4½ miles southwest of Tuscaloosa, May 1, 1932, *R. M. Harper* (G); swamps, Hollywood, May 15, 1902, *Biltmore Hb.*, no. 542g (RM). LOUISIANA: Covington, April, 1920, *L. Arsène*, no. 12,400 (G). MISSOURI: near Bismarck, May 21, 1927, *Kobuski & Larsen* (RM); Maple Lake, Dolbow Sta., June 2, 1934, *Drouet*, no. 1477 (G); Rocheport, May 30, 1933, *Drouet*, no. 424. KANSAS: moist places, Wyandotte County, Aug. 5, 1897, *G. L. Clothier*, no. 1067 (G). TEXAS: Orange County, 1885, *G. C. Nealley* (G); Troupe, May 9, 1902, *J. Reverchon*, no. 2793 (G, NY, apparently the type of *I. Shrevei*).

IRIS VERSICOLOR L. Rhizome thick, to 2.5 cm. in diameter; leaves linear-ensiform, from 1.5–9.5 dm. long and 0.5–3 cm. wide, the middle ribs prominent in mature leaves, gray-green; stems simple or branched, to 6 dm. tall, with 1–2 linear-lanceolate cauline leaves; spathes unequal, the outer shorter, 3–4.5 cm. long, ovate-lanceolate, semi-herbaceous, striate with brown, rigid; pedicel 2–8 cm. long at anthesis,

frequently exceeding the spathes; ovary narrow, trigonal, ±2 cm. long; perianth-tube constricted above the ovary, infundibuliform, ±1.2 cm. long; sepals 4–7 cm. long, 2–3.5 cm. wide, the claw yellow-green, veined, with a prominent midrib passing upward to the ovate or sub-orbicular blue-purple blade, with the basal patch absent, or greenish-yellow if present; petals 2–4.5 cm. long, 1 cm. wide. lanceolate-acute to lanceolate-oblong, occasionally obtuse, rarely emarginate, the same color as the sepals; style-branches to 3.5 cm. long; style-crests to 1.5 cm. long, toothed or entire; stigma entire, triangular or rounded-triangular; filaments exceeding the anthers, which are 0.8–1.5 cm. long; capsule ovoid to oblong-ellipsoid, to ±5 cm. long; seeds dark brown, shiny, D-shaped, with a thin, hard, but not corky, covering.—Sp. Pl. i. 39 (1753); Curtis in Bot. Mag. i. t. 21 (1790); Redouté, Lil. vi. t. 339 (1812); Baker in Gard. Chron. (II) vi. 614–615 (1876); Baker, Handbk. Irid. 12 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 448 (1896), in part; Small, Fl. Se. U. S. (ed. 1) 306 (1903), in part; Robinson & Fernald in Gray, Man. (ed. 7) 299 (1908), in part; Dykes, Genus Ir. 79 (1913), in part; Dykes, Handbk. Gard. Ir. 138 (1924), in part; Small in Addisonia ix. 55, pl. 316 (1924); Anderson in Ann. Missouri Bot. Gard. xv. 253 ff. (1928); Small, Man. Se. Fl. 356 (1933). *Iris virginica* sensu Jacquin, Ic. Pl. Rar. ii. t. 223 (1786–93).—Northern United States and Canada, in swampy places, west to Wisconsin and Minnesota. Representative material: CANADA: James Bay, East Coast, Rupert House, July 8, 1929, *D. Potter* no. 925 (G); north coast, Gulf of St. Lawrence, Pointe aux Esquimaux, July 12, 1924, *Marie-Victorin & Rolland-Germain*, no. 18,471 (G); Magdalen Islands, Grindstone Isl., Grindstone, July 11, 1912, *Fernald, Bartram, Long & St. John*, no. 7208 (G); Labrador, Straits of Belle Isle, Forteau, July 30, 1910, *Fernald & Wiegnad*, no. 3084 (G); Newfoundland, Bonne Bay, East (or Deer) Arm, Deer Brook, Aug. 26, 1929, *Fernald, Wiegand & Fogg*, no. 1528 (G); Nova Scotia, Sandy Cove, Lily Lake, Aug. 23, 1920. *Fernald & Long*, no. 20,789 (G); Prince Edward Island, Dundee, Aug. 26, 1912, *Fernald, Long & St. John*, no. 7209 (G); New Brunswick, Shediac Cape, July 3, 1914, *F. T. Hubbard* (G); Ontario Province, Kingston, Plevna, June 18, 1902, *J. Fowler* (G); Bruce County, Ontario, Stokes Bay, June 21, 1934, *P. V. Krotkov*, no. 8875 (G); Ontario, Timagami, Sandy Inlet, July 21, 1926, *E. & D. M. Anderson*, no. 26015B (G). MAINE: North Berwick, June, 1892, *J. C. Parlin* (G). NEW HAMPSHIRE: Richmond, July 19, 1922, *C. F. Batchelder* (NE). VERMONT: Manchester, July 19, 1898, *M. A. Day*, no. 309 (G, NE). MASSACHUSETTS: Andover, May 31, 1902, *A. S. Pease*, no. 329 (NE); Orleans, Arey's Pond, June 8, 1913, *J. Murdoch, Jr.* (NE). RHODE ISLAND: Cranston, near Pawtuxet, June 7, 1907, *T. Hope* (NE). CONNECTICUT: Southington, *C. H. Bissell*, no. 589 (G); Colchester, June 9, 1918, *C. A. Weatherby*, no. 4271 (G). NEW YORK: Canton, June 16, 1914, *O. P. Phelps*, no.

347 (G); Southampton, Long Island, Sweezy Pond, July 26, 1920, *H. St. John*, no. 2651 (G). NEW JERSEY: Atsion, June 2, 1934, *W. H. Witte* (RM). PENNSYLVANIA: Pequea, May 20, 1889, *A. A. Heller* (G). MICHIGAN: near Gulliver Lake, Aug. 26. 1929, *J. H. Ehlers* (G); Cheboygan County, Burt Lake, June 28, 1917, *J. H. Ehlers*, no. 382 (G). OHIO: Portage County, Muzzy Lake, June 5, 1903, *R. J. Webb*, no. 613 (G); Berea, June, 1897, *G. B. Ashcroft* (RM). ILLINOIS: Chicago, June 12, Aug. 13, 1892, *W. S. Moffatt*, no. 141 (RM). WISCONSIN: Mellen, Sept. 7, 1927, *Fassett & Wilson*, no. 10,138 (G). MINNESOTA: Pine City, June 24, 1927, *E. Anderson* (G); shore of Lake Itasca, June 21, 1930, *J. B. Moyer*, no. 59 (G).

IRIS VERSICOLOR forma MURRAYANA Fernald. This plant is described as being like typical *I. versicolor* except that it has pure white blossoms.—Rhodora xxxviii. 52 (1936).—NEWFOUNDLAND: bank of Salmonier River, near its mouth, July 4, 1935, *Andrew Murray* (type, in G).

CYTOLOGY OF THE VIRGINICAE. *Iris virginica* was reported by Simonet[1] to have $n=54$–56; Randolph[2] reports $2n=71$. The discrepancy is due to misidentification of Simonet's material. Dr. Edgar Anderson has very kindly allowed me to examine his unpublished counts and drawings, giving me permission to cite his findings. Although different plants appear to vary slightly in chromosome number, possibly as a result of irregularities in the reduction division due to the formation of multivalents, usually $2n=72$ and $n=36$, according to Dr. Anderson. Since Simonet (l. c.) made his *I. virginica* equivalent to the red form of *I. versicolor* known commercially as *kermesina* (spellings vary with dealers), it is certain that he did not have true *I. virginica*, and his count for this species can be disregarded. For *I. Shrevei* Small, here treated as synonymous with *I. virginica*, $2n=70$ was reported by Randolph (l. c.). In this same note, Randolph reported counts on several varieties of this group which have been introduced horticulturally, Autauga having $2n=72$, Charles Hardee, Frenier, and Oglethorpe, $2n=70$.

Numerous chromosome-counts have been given for *I. versicolor*, some of which are incorrect, for one reason or another. Longley[3] made counts on plants from several localities, finding $n=\pm 36$ in a plant from Alabama, $n=42$ in a plant from Wilmington, North Carolina, and $n=44_{II}$ and 17_{I} in a plant from Rosslyn, Virginia. To judge from the locality and the chromosome number, the plant from Alabama was undoubtedly *I. virginica*. That from North Carolina

[1] Bull. Biol. France et Belg. lxvi. 289 (1932).
[2] Bull. Amer. Iris Soc. no. 52: 63 (1934).
[3] In Bull. Amer. Iris Soc. no. 29: 43–55 (1925).

certainly was not *I. versicolor*, but there is no means of determining its identity; the count is much too high for *I. virginica*. The plant from Virginia, coming from almost opposite Washington, D. C., was probably the only one of the three which was truly *I. versicolor*. For this species, too, Kaufmann[1] reported $2n$=ca. 68, but as his material apparently came from Alabama, the number and the locality would indicate that here, again, the plant in question was *I. virginica*. Simonet (l. c.) reported n=54–56 for *I. versicolor*, a count corroborated by Randolph (l. c.), who found $2n$=108 for this species. Simonet's figure shows that reduction irregularities are present, a fact previously noted by Longley (l. c.). The Simonet-Randolph count seems correct for this species.

Discussion of the Virginicae. To differentiate between the two species comprising this subsection can be extremely difficult, if not impossible, in poorly preserved herbarium material. That there are actually two species, instead of one as assumed by Dykes,[2] has been clearly shown by Anderson.[3] By a lengthy series of diagrams showing the proportions of floral parts to each other, he established the fact that there are certain differences, the petals of *I. versicolor* being lanceolate, short, and narrow in proportion to the sepals, while those of *I. virginica* are longer, broader in proportion to the sepals, and oblanceolate to spatulate. Spathe, stem, and pedicel differences also are useful in separating the two. Nevertheless, despite Anderson's insistence (l. c., p. 249) that the outer spathe-valves of *I. versicolor* never become foliaceous, while those of *I. virginica* frequently do, one of the first specimens of the former seen by me in the Gray Herbarium, *J. C. Parlin* from North Berwick, Maine, has a foliaceous outer spathe. The frequency with which this occurs, however, is much less than is true of *I. virginica*. It is in the seeds of the two species that an almost infallible means of separation is found. *I. virginica* has seeds with a dull corky covering, like a smaller edition of seeds of the *Hexagonae*. *I. versicolor* has seeds with a thinner, shiny, hard covering, resembling those of *I. setosa* var. *canadensis*. The seeds and frequently foliaceous spathes of *I. virginica* strongly suggest a relationship with the *Hexagonae*. At the same time, when the spathes are not folicaeous, there is a marked similarity in size, shape, and even coloring to those of *I. tridentata*.

As Anderson showed, these two species within their extensive ranges, are highly variable, but he did not differentiate any varieties

[1] In Amer. Nat. lxv. 280–283 (1931).
[2] Genus Ir. 79 (1913).
[3] In Ann. Missouri Bot. Gard. xv. 241–332 (1928).

or forms. He treated *I. Shrevei* Small and *I. carolina* Radius as synonyms of *I. virginica*. It is difficult for me to see how the Carolina plants collected by Weatherby and Griscom can be associated with those collected by Mrs. Treat in Florida and those collected by Fernald *et al.* in Virginia, without varietal or formal distinction. Viosca[1] states that from his collections he believes there are definitely three complexes within *I. virginica* which probably deserve varietal or subspecific rank, although he has not given them this status. Moreover, since Dr. Anderson is continuing his study of *I. virginica*, I have not felt it desirable to make any change in the *status quo*.[2]

Subsection Vernae.

The slender rhizome and ensiform leaves bear a certain resemblance to members of the dwarf series of section *Pogoniris*, but the flower is characteristic of section *Apogon*. Only one species is contained in the subsection.

Iris verna L. Rhizome slender, torulose, widely-creeping by elongated internodes, roots occurring only at the nodes, which are sheathed in persistent leaf-bases; stem usually not present, so that the plant is almost always acaulescent; leaves 3–5 in a clump, 11–21 cm. long, 3–5 mm. wide, very light in color at the base, rapidly passing into a reddish-purple, with white striations, which is the color of the entire leaf in the outer members of a sterile clump, inner leaves light green, glaucous, ensiform; spathes a series of imbricated bracts, usually 5 in number, 1.3–5 cm. long, the innermost the longest, lanceolate, acute, the outermost short and almost obovate, occasionally green or greenish, more often like the outermost leaves of a sterile fan in color; pedicel present, but short, to 1.3 cm. long, elongating to 2.5 cm. as the capsule matures; ovary narrow, almost linear, 1.3 cm. long, or less; perianth-tube 2.5–6.5 cm. long, slender, filiform, expanding somewhat into the throat; sepals 3–4 cm. long, 1.2 cm. wide, reddish-violet, with the claw passing gradually into the obovate blade, whose central portion is yellowish-orange, minutely papillose, veined violet and white; petals 3–4.5 cm. long, 1 cm. wide, spatulate, with a more pronounced distinction between claw and blade than in the sepals, red-violet; style-branches 2 cm. long, pale violet; style-crests 7 mm. long, narrow, linear-acute, pale violet; stigma rounded, entire; filament 1.3 cm. long, very slender; anther 7 mm. long; capsule 1.3 cm. long, tapering into a beak consisting of the dried remnant of the perianth-tube, ovoid; seeds oval, dark brown, 3 mm. long.—Sp. Pl. i.

[1] In Bull. Amer. Iris Soc. no. 57: 10 (1935).

[2] Since this was written a segregate has been recognized: *I. virginica* var. *Shrevei* (Small) Anderson in Ann. Missouri Bot. Gard. xxiii (3). 469 (1936).

39 (1753); Aiton, Hort. Kew. (ed. 1) i. 73 (1789); Michaux, Fl. Bor. Amer. i. 22 (1803); Pursh, Fl. Amer. Sept. i. 30 (1816); Sweet, Brit. Flow. Gard. i. t. 68 (1824); Ker, Irid. Gen. 54 (1827); Loddiges, Bot. Cab. t. 1855 (1833); Klatt in Linnaea xxxi. 535 (1861–62); Klatt in Linnaea xxxiv. 596 (1866); Baker in Journ. Linn. Soc., Bot. xvi. 144 (1877); Baker, Handbk. Irid. 16 (1892); Britton & Brown, Illust. Fl. (ed. 1) i. 452 (1896); Robinson & Fernald in Gray, Man. (ed. 7) 300 (1908); Dykes, Genus Ir. 95 (1913); Small, Fl. Se. U. S. (ed. 2) 305 (1913); Dykes, Handbk. Gard. Ir. 147 (1924); Small in Addisonia xiv. 15, pl. 456 (1929); Small in Addisonia xvi. 15, t. 520 (1931). *Iris nana* Persoon, Syn. Pl. i. 53 (1805), as synon. of *I. verna*. *Neubeckia verna* (L.) Small, Man. Se. Fl. 330 (1933).—Acid, semi-shaded or open woodlands or thickets in southeastern United States. Representative material: DISTRICT OF COLUMBIA: vicinity of Washington, May 13, 1883, *L. F. Ward* (G). MARYLAND: Baltimore County, "Glenbirnie", May 18, 1910, *J. R. Churchill* (G). VIRGINIA: 1 mile northwest of Williamsburg, Apr. 9, 1921, *E. J. Grimes*, no. 3396 (G); Nansemond County, near Kilby, Sept. 11, 1925, *Fernald, Fogg & Long*, no. 4848 (G); Salt Pond Mt., May, 1869, *W. M. Canby* (G); Appomattox, dry woods, May 1, 1932, *C. A. Weatherby*, no. 6159 (G); Massanutten Mt., May 9, 1893, *Heller*, no. 782 (G). NORTH CAROLINA: Pinehurst, April, 1899, *H. F. Ayres* (G); Asheville, Apr. 28, 1932, *C. A. Weatherby*, no. 6154 (G); Biltmore, Apr. 27, 1896, *Biltmore Hb.*, no. 1219 (G, RM); Highlands, May, 1903, *T. G. Harbison* (G); 4 miles east of Bolivia, Apr. 16, 1933, *J. M. Fogg, Jr.*, no. 5499 (G); Wilmington, Apr. 17, 1923, *J. R. Churchill* (G); Hildebran, Apr. 18, 1933, *E. J. Palmer*, no. 39,939 (G); Bath, Apr. 15, 1932, *C. A. Weatherby*, no. 6084 (G). SOUTH CAROLINA: Hot Springs, April, 1888, *C. E. Smith* (G). GEORGIA: north slope of Pine Mts., Aug. 29, 1901, *R. M. Harper*, no. 1266 (G). ALABAMA: Troy, Mar. 17, 1891, *G. H. Leland* (G); Little Cohaba Creek, 20 miles east of Birmingham, Apr. 8, 1931 (G).

This small and very attractive plant has an extensive range in the central Atlantic and southeastern states, occurring most frequently in upland regions, but spreading downward from the mountains to the seacoast. As Small[1,2] has shown, there are two forms of this plant, but specimens of the mountain form are found on the coast, and intergrades of such a nature exist that at present I am not differentiating the two forms.

Dykes[3] speaks of this plant as having a strong resemblance to a small *Iris pumila* L., but lacking the multicellular beard of the *Pogoniris* section. This resemblance to a *Pogoniris* is fairly evident in the

[1] Addisonia xiv. 15 (1929).
[2] Addisonia xvi. 15 (1931).
[3] Genus Ir. 95 (1913).

case of plants with small leaves. Large-leaved plants would probably be regarded as belonging to section *Apogon*, without much hesitation. The flower in herbarium specimens might easily be confused with that of *I. cristata*, since the sepal-crest of the latter is difficult to preserve.

Cytologically, this species has been found by Simonet[1] to have $2n=42$, a count which seems correct, judging from the extremely poor material available to me. On this continent it shares that number with *I. fulva*, *I. prismatica*, and *I. lacustris*, an anomalous situation, for it is difficult to see any striking relationships with any of these species, and their karyotypes are quite unlike.

Description of Plate 1.

Chromosomes of Iris.

The original magnifications ranged from 2500 × to 4000 ×.

Fig. 1. I. Thomasii.
Fig. 2. I. cristata.
Fig. 3. I. citriregalis.
Fig. 4. I. hexagona var. giganticoerulea.
Fig. 5. Small, no. 65,730.
Fig. 6. I. regalis.
Fig. 7. I. elephantina.
Fig. 8. I. Marplei.
Fig. 9. I. albilinea.
Fig. 10. I. citricristata.
Fig. 11. I. viridivinea.
Fig. 12. I. fourchiana (no. 65,789).
Fig. 13. Small, no. 65,671.
Fig. 14. I. Douglasiana.
Fig. 15. Small, no. 63,739.
Fig. 16. I. fourchiana (no. 65,619)
Fig. 17. I. missouriensis.
Fig. 18. Small, no. 65,677.
Fig. 19. I. setosa var. canadensis.
Fig. 20. I. violipurpurea.
Fig. 21. I. chrysaeola.
Fig. 22. I. Kimballiae.
Fig. 23. I. fulvaurea.
Fig. 24. I. mississippiensis.
Fig. 25. I. salmonicolor.
Fig. 26. I. Purdyi.

Plate 2.

Fig. 1. Type of *I. tenuissima* var. *purdyiformis*.
Fig. 2. Type of *I. Douglasiana* var. *oregonensis*.

Plate 3.

Fig. 1. Isotype of *I. innominata*.
Fig. 2. Type of *I. Thompsonii*.

[1] In Ann. Sci. Nat., Bot. (ser. 10) xvi. 266 (1934).

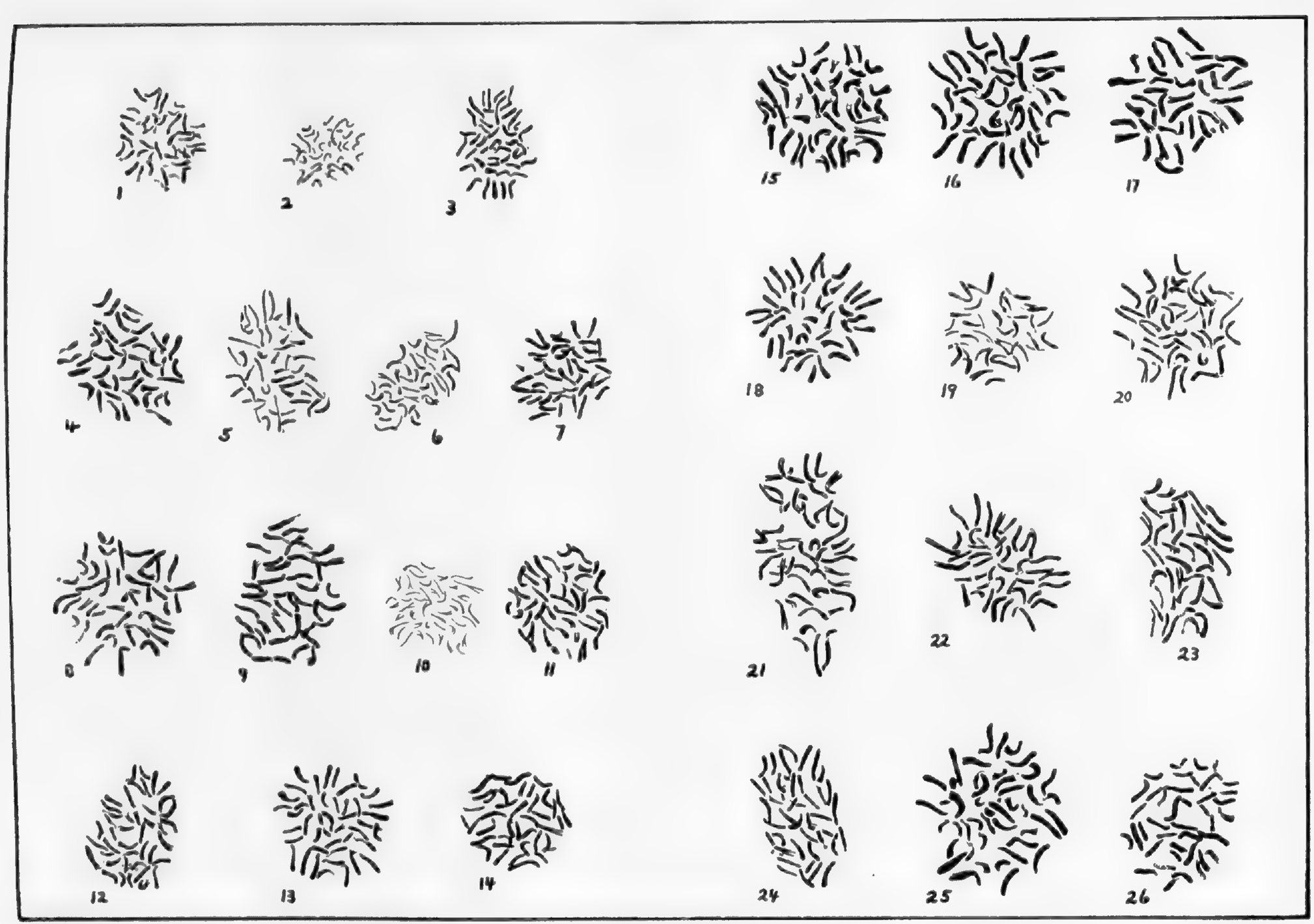

Plate 1. Chromosomes of Iris.

Plate 2. Fig. 1, type of IRIS TENUISSIMA var. PURDYIFORMIS; fig. 2, type of I. DOUGLASIANA var. OREGONENSIS.

Plate 3. Fig. 1, isotype of IRIS INNOMINATA; fig. 2, type of I. THOMPSONII.

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CXX

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By M. L. FERNALD

DATES OF ISSUE

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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 Katharine 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.

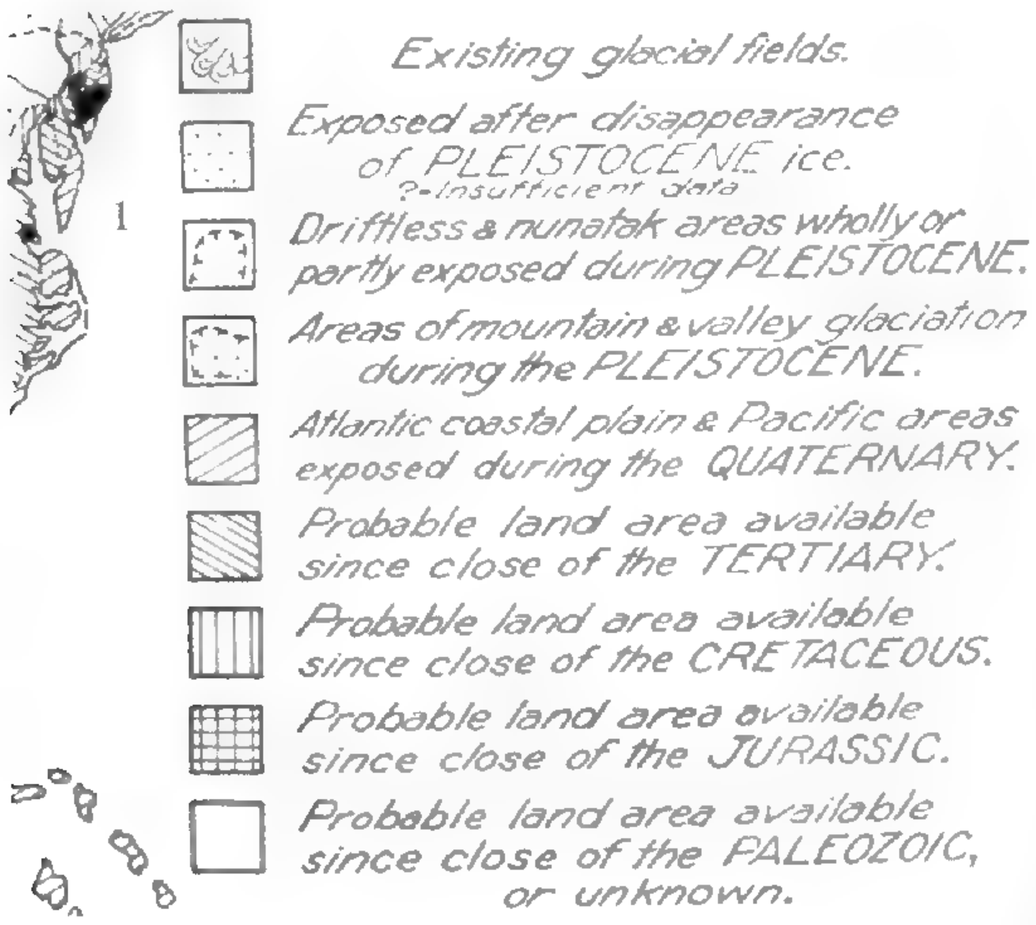
After we had breakfasted at his home, renewed the acquaintance of Mrs. Smart, changed into tramping clothes and heavily sprinkled ourselves with sulphur, for it was "chigger-time," Smart took us to a locality long known to local botanists, not far southeast of Petersburg but in Prince George County (Petersburg 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-

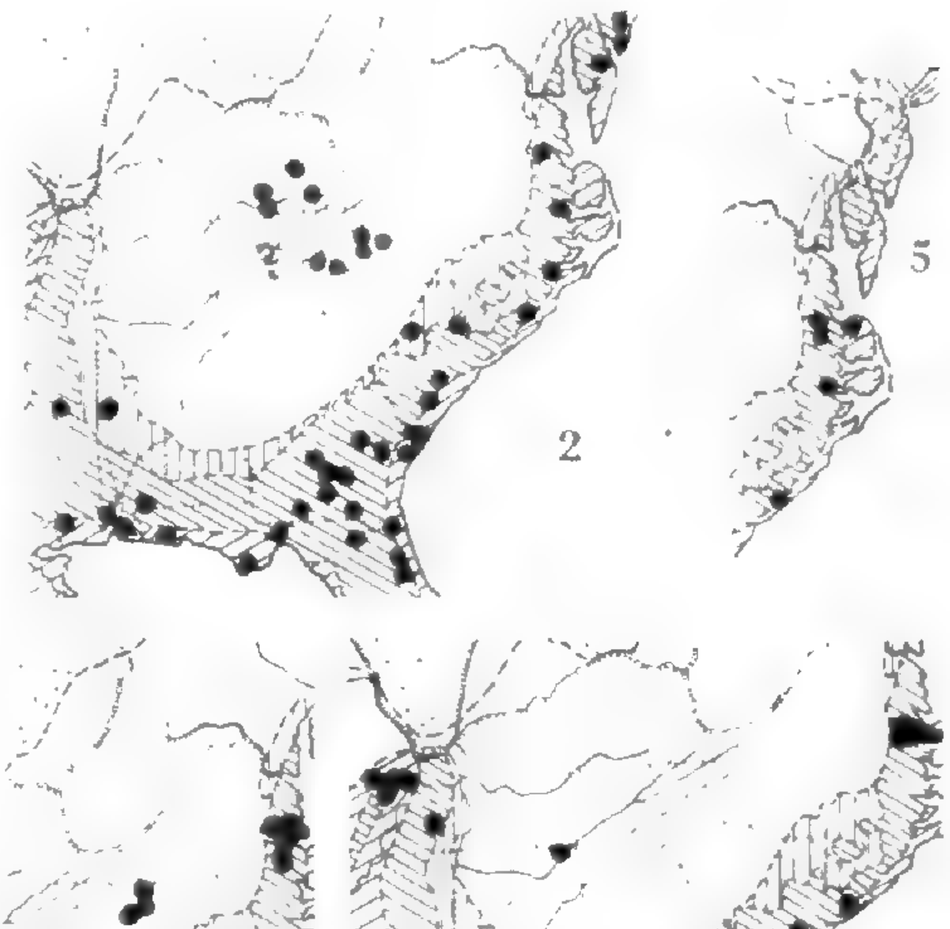
[1] *Drosera capillaris* Poir., readily mistaken for *D. brevifolia,* occurs in several peaty depressions, at least in Dinwiddie, Prince George and Sussex Counties. It may extend slightly northward from there. But the only evidence I know of *D. brevifolia* in Virginia is undoubted material in the Gray 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.

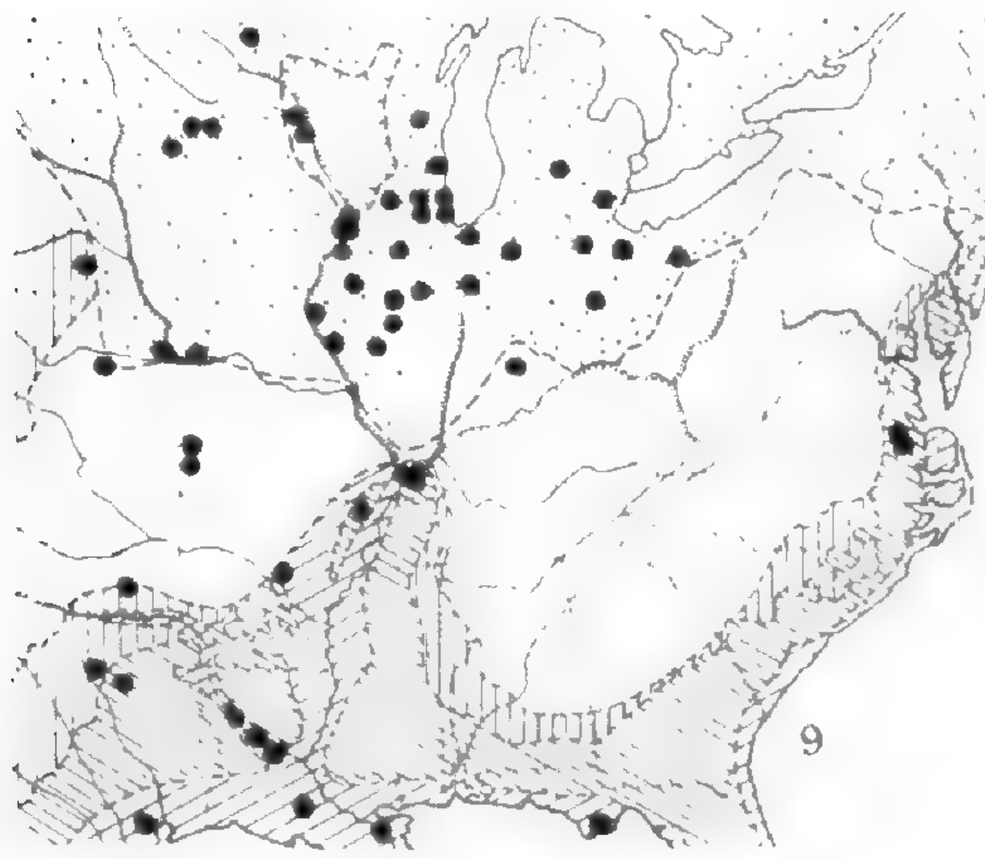
like area of many acres a few meters lower than the gently merging rim, where water accumulates over winter and in early spring, but now, in late June, bone-dry and with an almost impregnable substratum of clay underlying the thin peat.

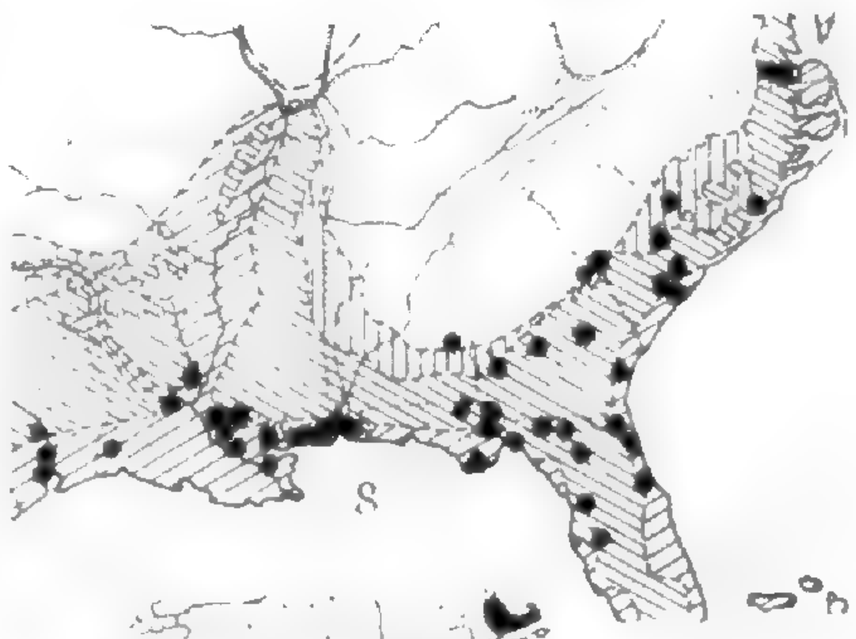
Sarracenia flava was, indeed, gratifyingly abundant and very handsome, with its stiffly erect slender yellow trumpets, but we were more interested in the carpet of the pink-flowered *Drosera capillaris* Poir. (unrecorded from north of South Carolina) upon which we walked. *Aletris aurea*, its occurrence 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. *Sclcria* 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-

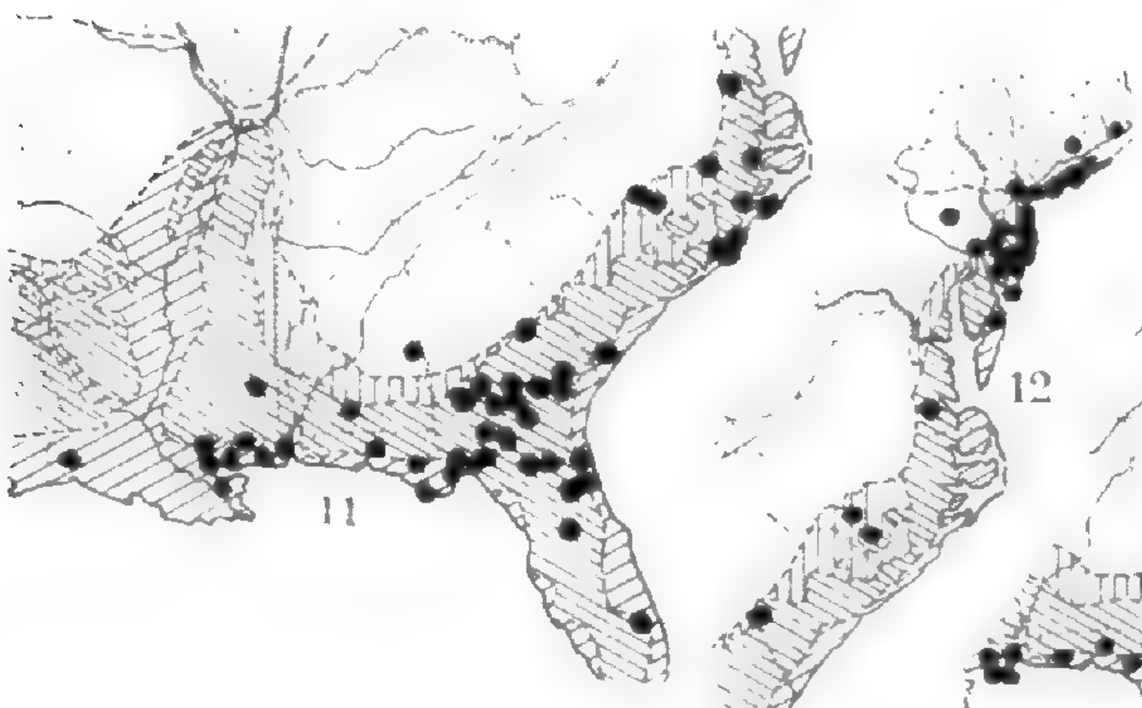
[1] See RHODORA, xxxviii. 397, 398, plate 444 (1936).

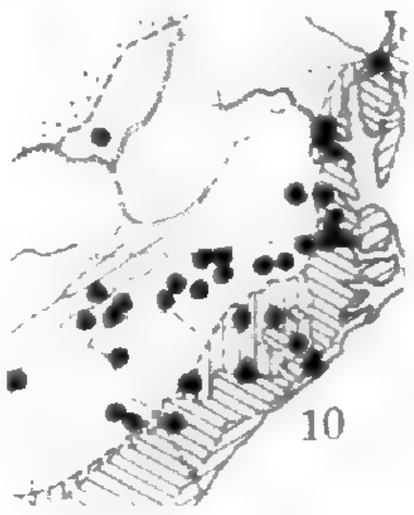












Map 1, range of Juncus caesariensis; 2, Cleistes divaricata; 3, Chelone Cuthbertii; 4, Scirpus divaricatus; 5, Sagittaria Weatherbiana; 6, Festuca paradoxa (F. Shortii); 7, Hypoxis leptocarpa; 8, Micranthemum umbrosum; 9, Carex crus-corvi, including var. virginiana (from Virginia); 10, Gratiola viscidula; 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 of 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*, *Breweria 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. arcnicola* 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.

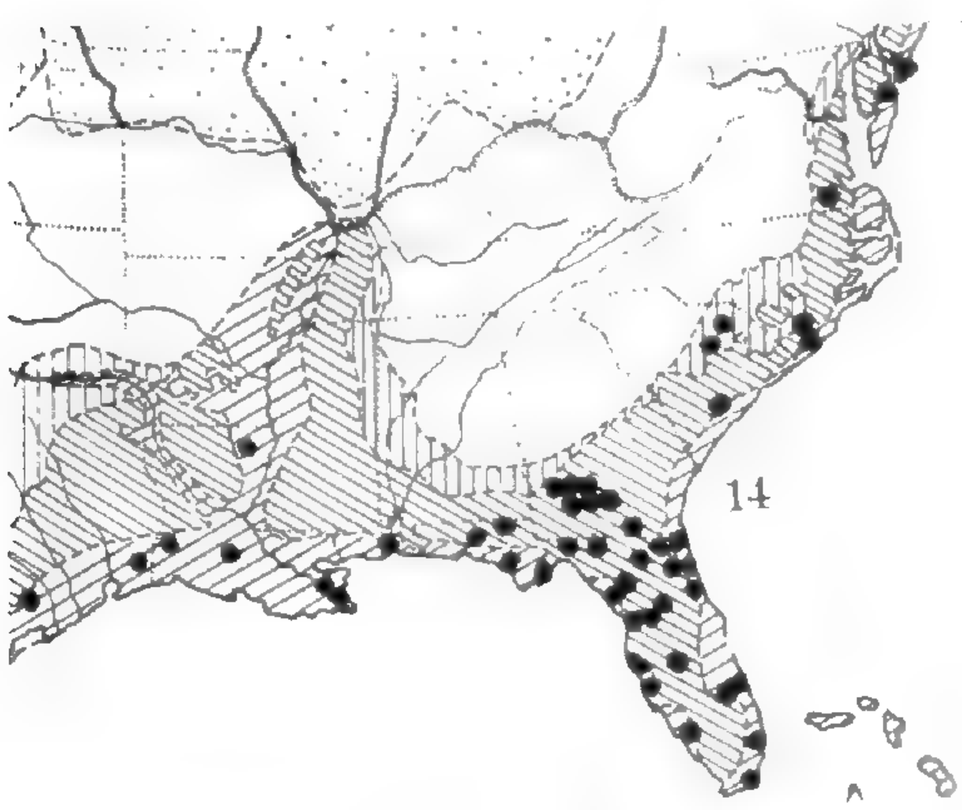
It was dark when we crossed the Bridge but we had to look upon one dryish, sandy alluvial bank. *Eragrostis hypnoïdes* was beautiful, with long repent flowering stems, and Long soon held up one solitary and dwarfed individual of *Paspalum dissectum*, not mapped by Hitchcock (*Man.*) from between Georgia, 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, of 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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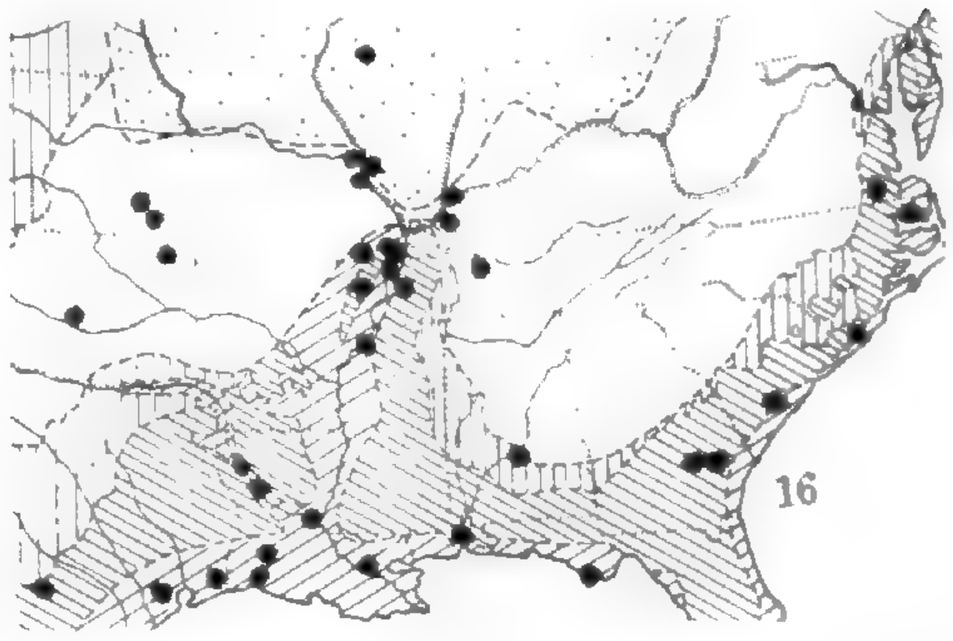
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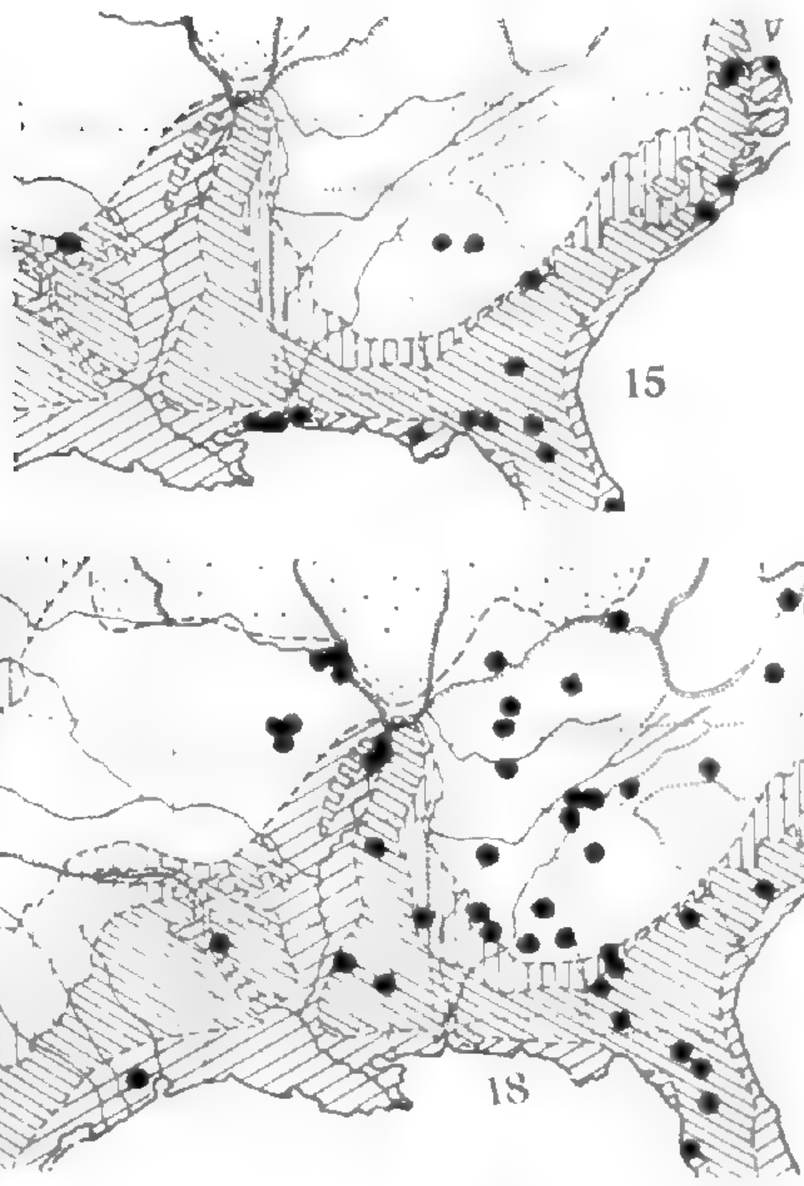
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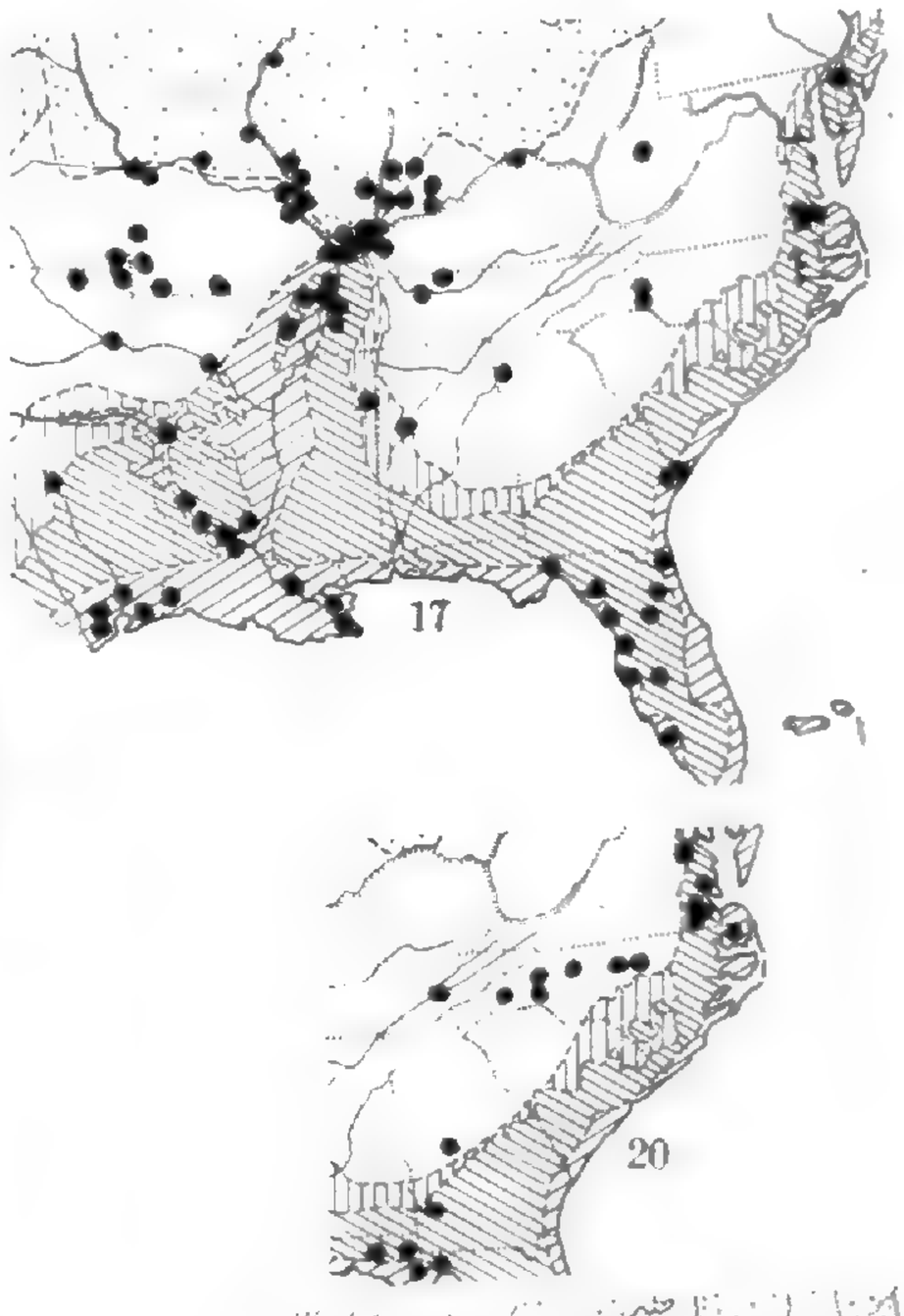
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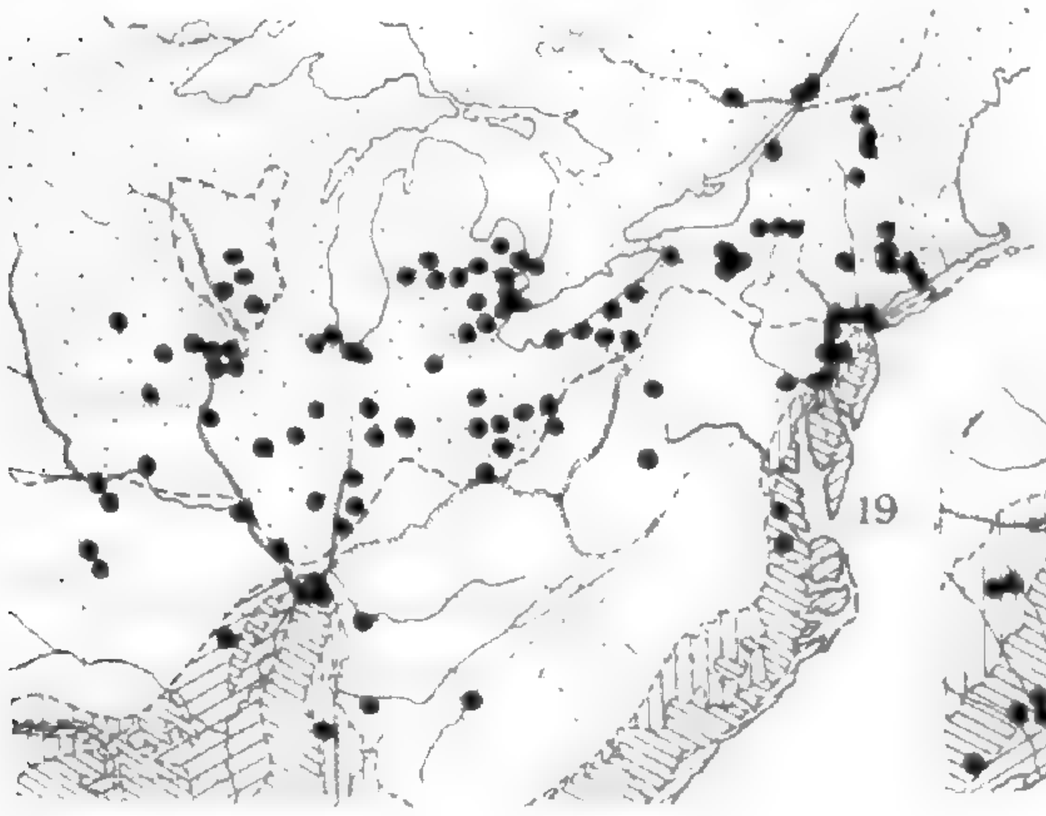
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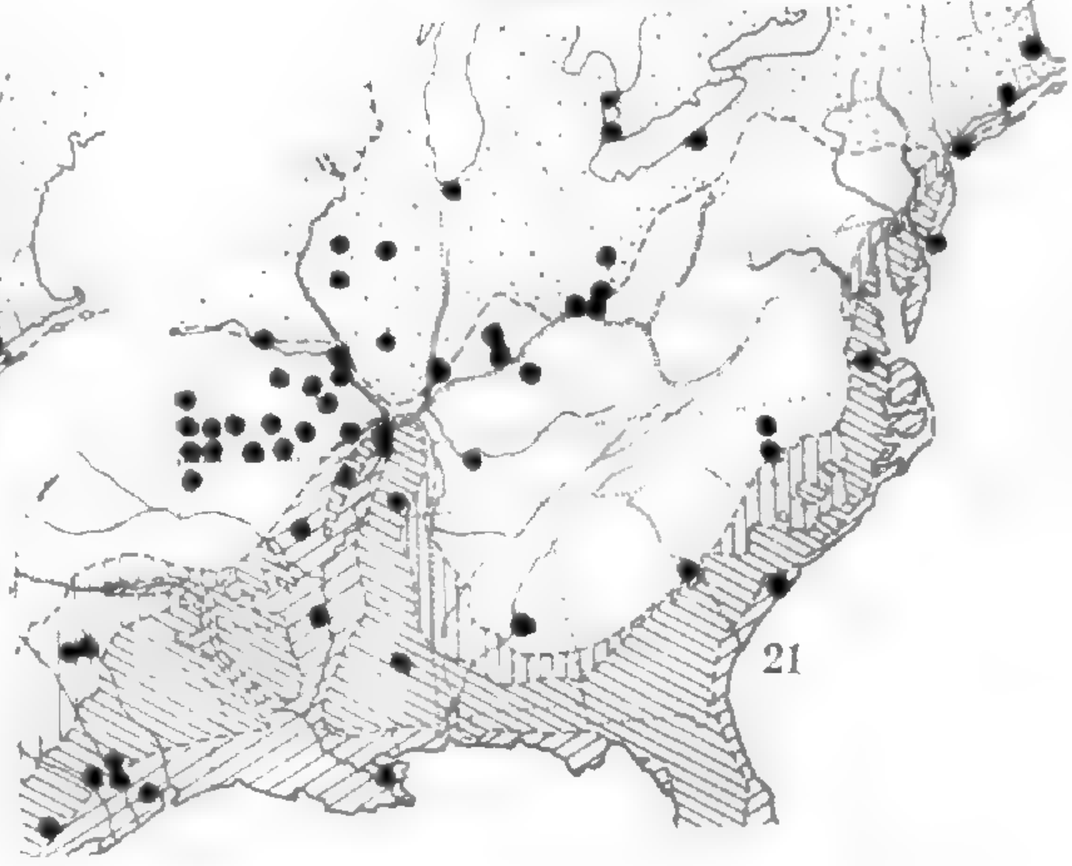
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MAP 14, range of PANICUM HEMITOMON (northern extension); 15, PANICUM MUTABILE; 16, ECHINODORUS RADICANS (northern half of range); 17, PASPALUM FLUITANS; 18, HEXALECTRIS SPICATA (northeastern area); 19, CAREX GRAYII; 20, LOBELIA GLANDULIFERA; 21, JUNCUS 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 *Corcopsis 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.

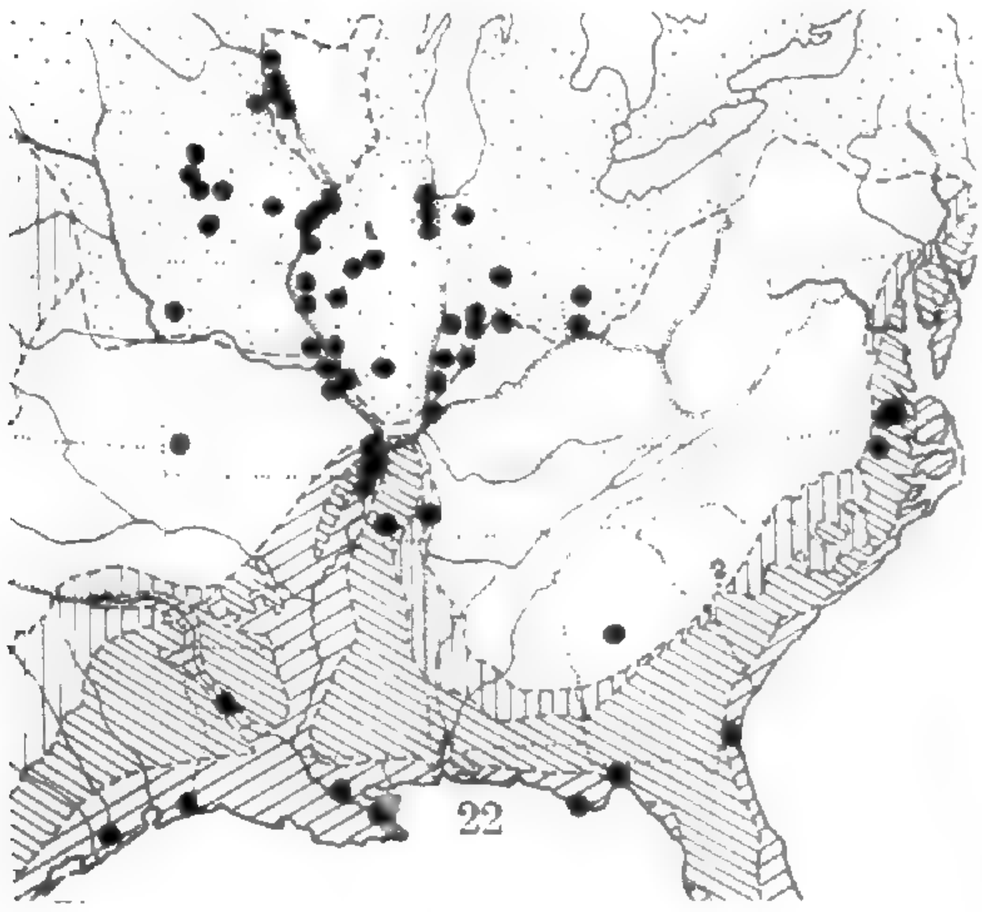
Furthermore, "Albino flowers occur in the various species." With 96 of the "Fully 100 species" allowed to the genus *Iris* thus accounted for, the problem remains as to which 4 or possibly more of all the old-line species (those of Aitcheson, Aiton, Ascherson & Sintenis, Baker, Barbey, Bertolini, Bieberstein, 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.

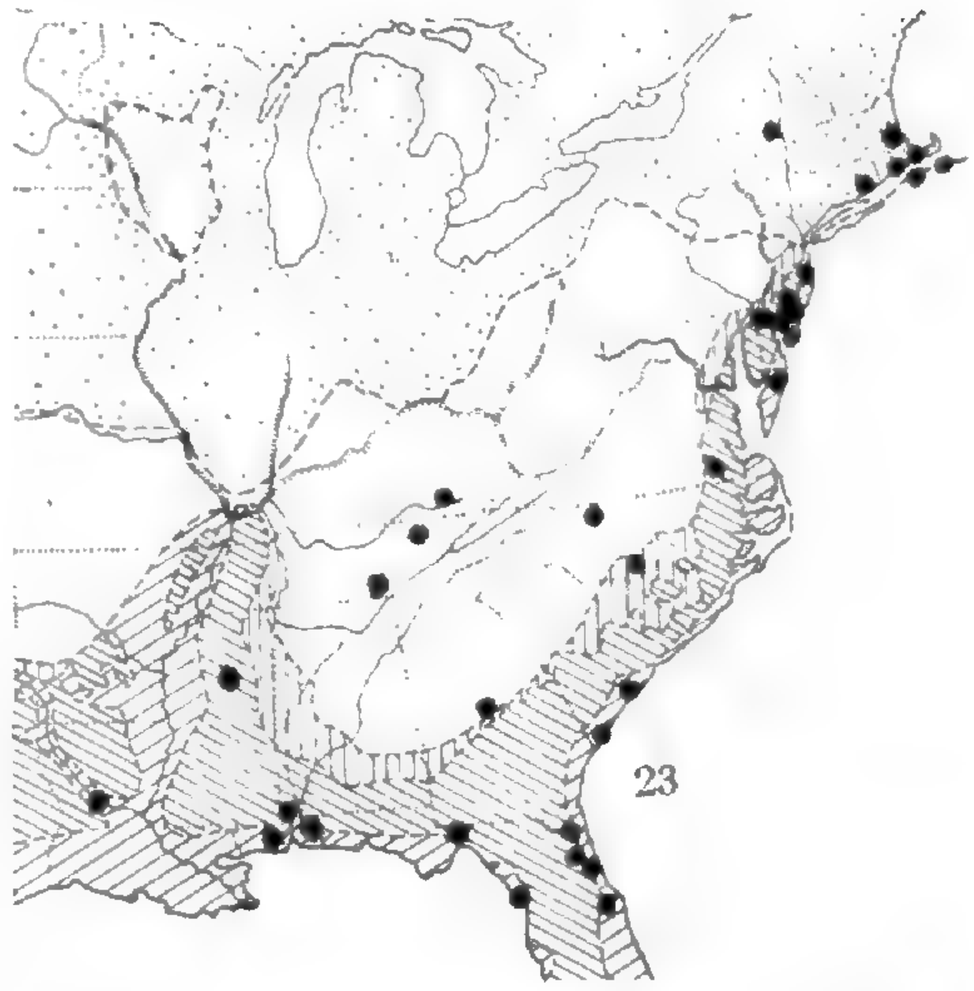
It is interesting to note that what at New York have been called "chloronyms" are less acceptable: "The native plant of the southern Appalachian mountains appears to be almost identical with the European one [*Convallaria majalis*]. . . . The native American plant usually has a shorter inflorescence, and has larger bracts and an oblate seed." The *native* American species is *C. majuscula* Greene.

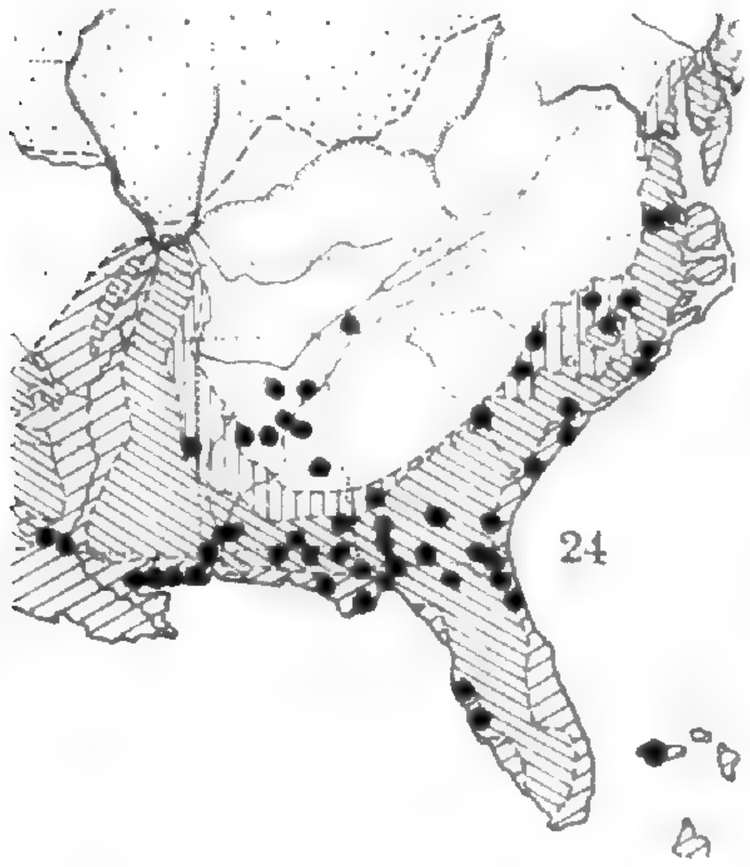
a mid-western species, not supposed to grow naturally east of the Mississippi Valley, here very striking on account of the pendulous, cylindric pods up to 4.5 dm. long. Presumably originally planted, the tree is now thoroughly naturalized.

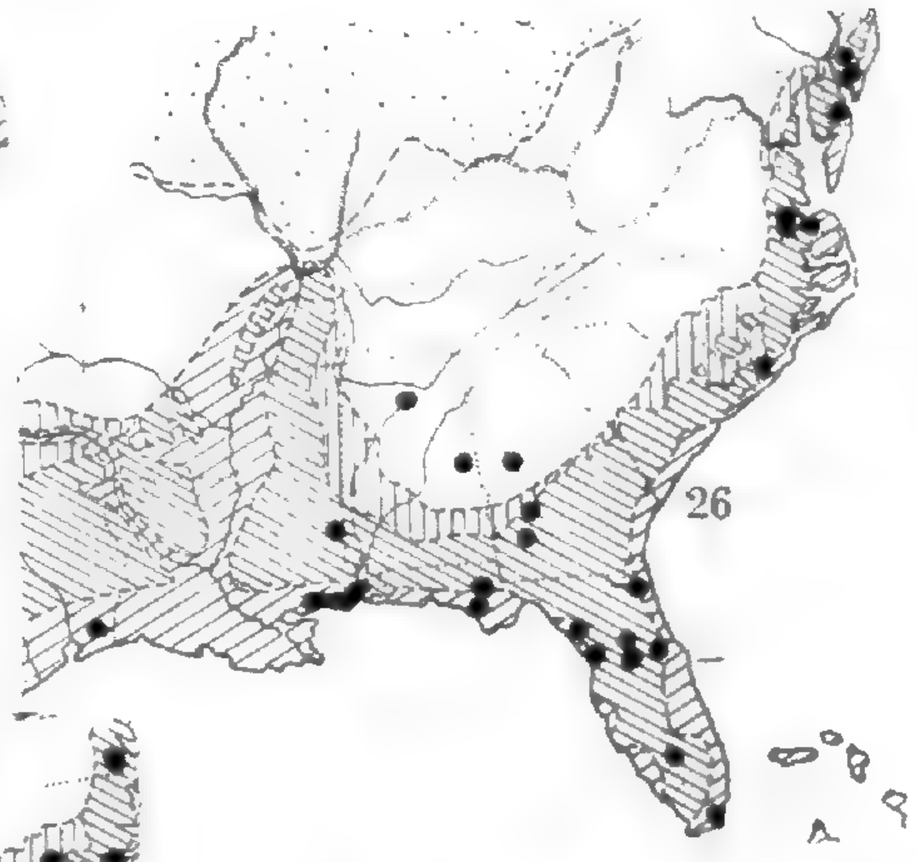
The wooded Warwick Swamp, where the Suffolk road crosses it, and the bottomland of the Blackwater, west of and at Zuni (the I pronounced like the personal pronoun), have many of the choice bottomland plants we had seen elsewhere, but here we made our first bow to *Leersia lenticularis* (MAP 22), handsome (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!

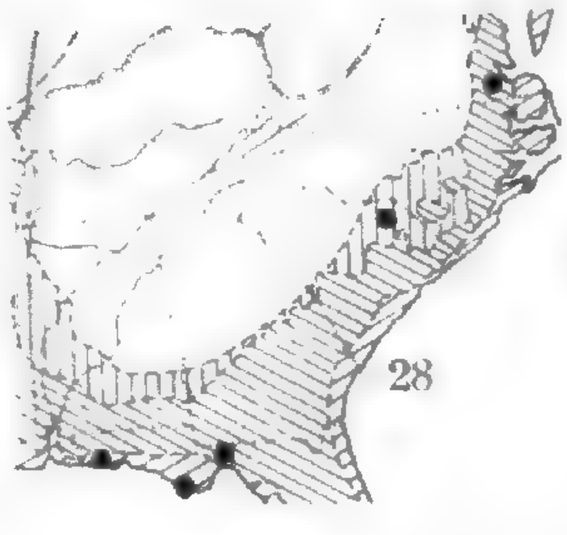
"In wet gravelly woods in Illinois and Virginia. 4. July. *v. v.* This singular and elegant grass I found on the islands of Roanoak river in North Carolina, and observed it catching flies in the same manner as *Dionaea muscipula:* the valves of the corolla are nearly of the same structure as the leaves 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,

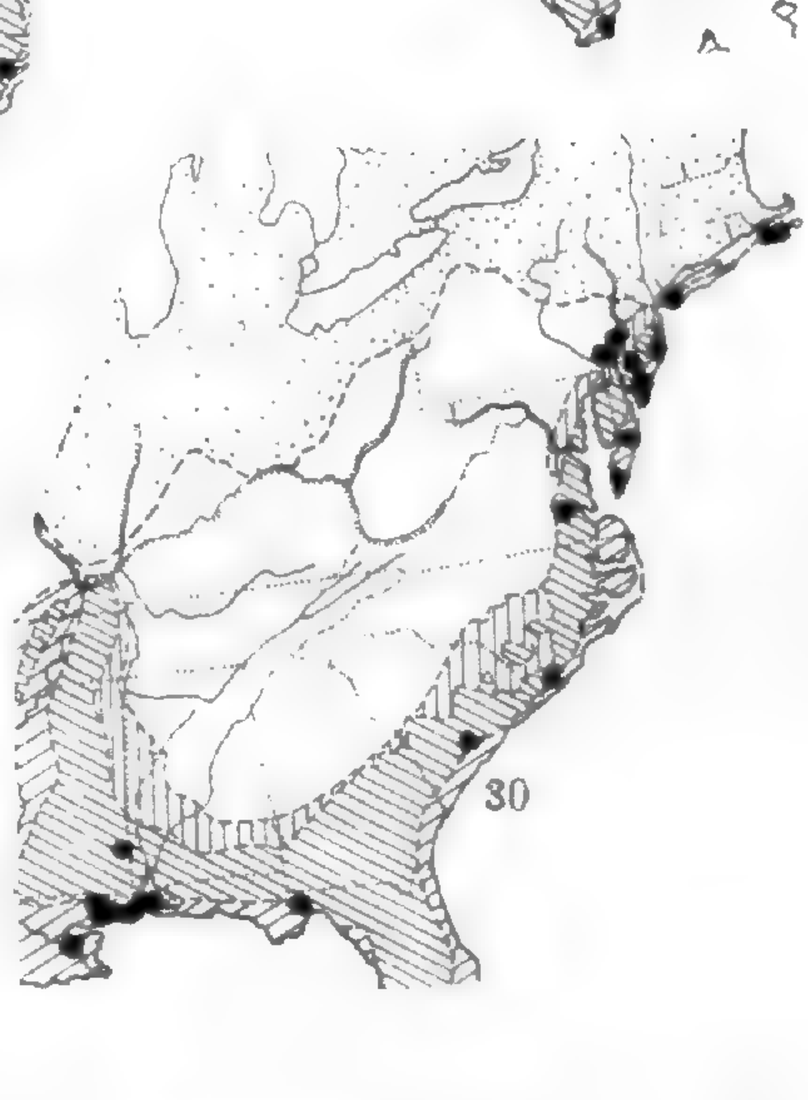












Map 22, range of Leersia lenticularis; 23, Schwalbea americana (including australis); 24, Seymeria cassioides; 25, Carex Barrattii; 26, Aristida virgata; 27, Habenaria blephariglottis var. conspicua; 28, Juncus abortivus; 29, Arenaria caroliniana; 30, Agrostis elata.

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 deciduа*, 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 lancearium* 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 lineare*, 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*)

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.

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).

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. LASIONEURON (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 to be 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 parvifolia*, 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

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."

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 lineari-bus 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).

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.

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. **caroliniana** (Small), comb. nov. *K. caroliniana* 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 out-right 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)

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 wan ing.
  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.

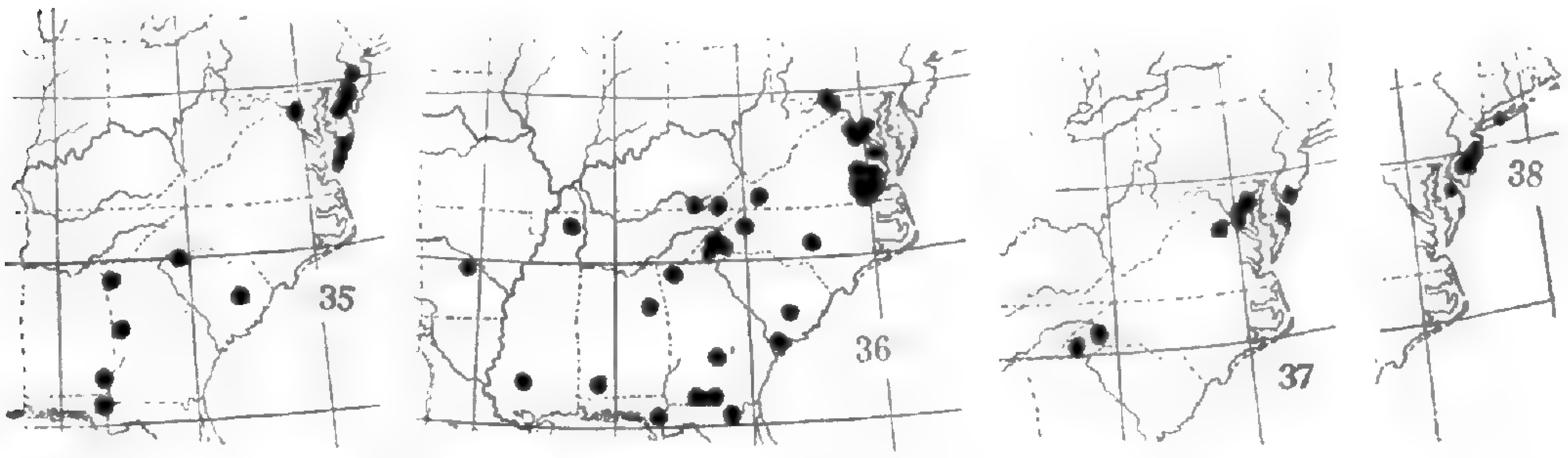
In our Virginia field-work we have seen var. typicum (with glandless or essentially glandless involucres) only on the Eastern Shore where it is abundant. We have never met it or any variety of the species in the two southeastern counties; but from Nansemond County to the Fall Line all the plants (very 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-

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. i². 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;* below Satulah Mt., 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)

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. *Nashii* (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.

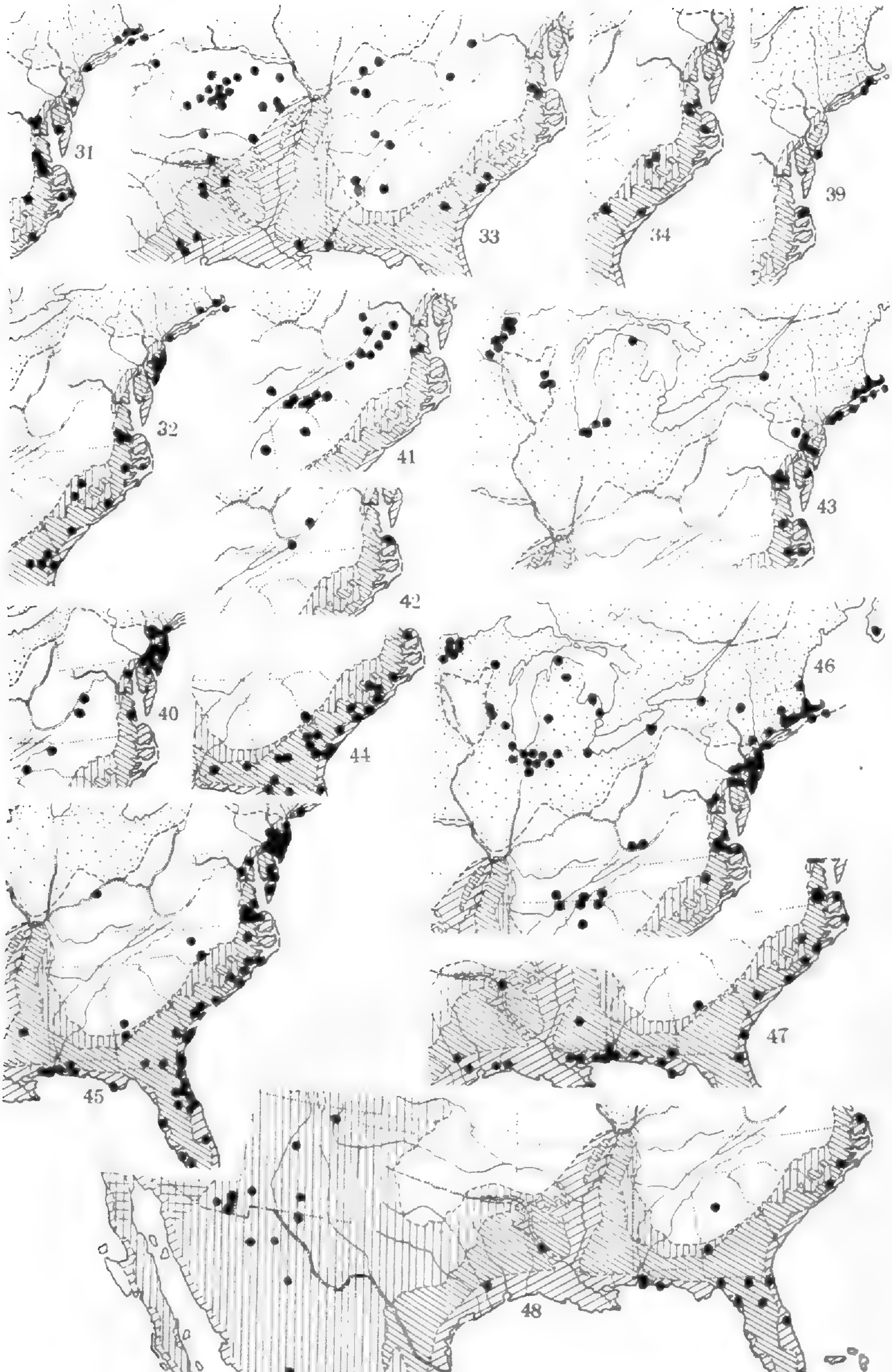
[2] On p. 437 the spelling *carolina*, which Small first used, was followed. However, on his p. 1336 he changed to caroliniana, the spelling which, since it accompanied the citation of the type, should prevail.

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.

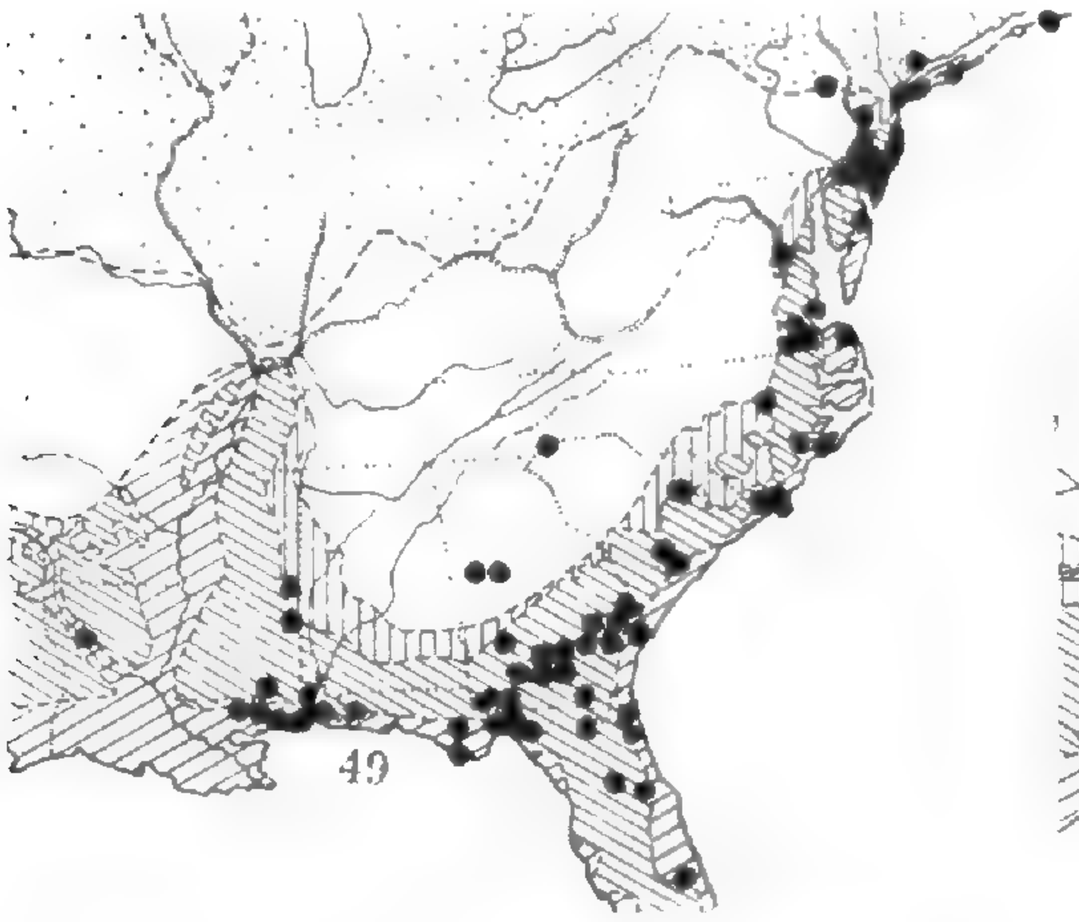
IIIA. LIKE III BUT WITH COLONIES ON THE APPALACHIAN OR THE OZARK UPLAND. *Orontium aquaticum*, **Habenaria blephariglottis* var. *conspicua* (MAP 27), **Cleistes divaricata* (L.) Ames (MAP 2), **Asarum arifolium*, *Sarracenia flava*, *Lechea Leggettii* (also IIIB), **Monotropsis odorata*, *Penstemon australis* Small, *Lobelia glandulifera* (Gray) Small (MAP 20), and *L. Nuttalli*, *Eupatorium album* (MAP 35), *Liatris graminifolia* and **Tetragonotheca helianthoides*.

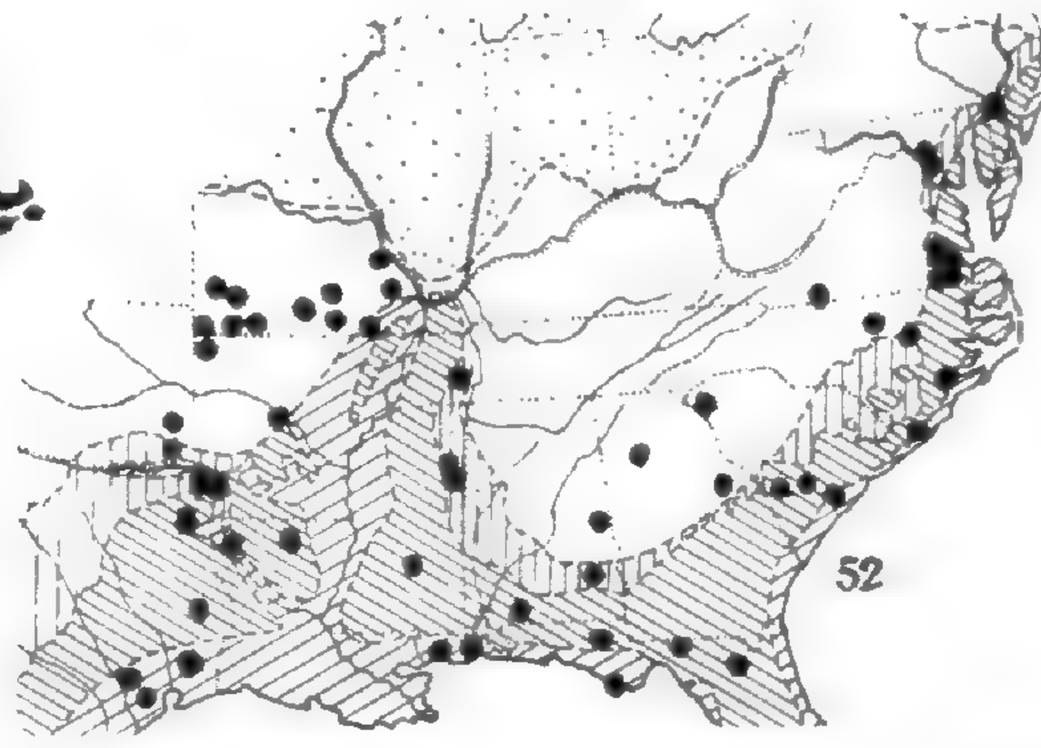
IIIB. LIKE III BUT WITH ISOLATED COLONIES NEAR OR ABOUT THE GREAT LAKES (CHIEFLY LAKE MICHIGAN). *Aristida tuberculosa*, *Panicum virgatum* var. *cubense* and *Lechea Leggettii* (also IIIA).

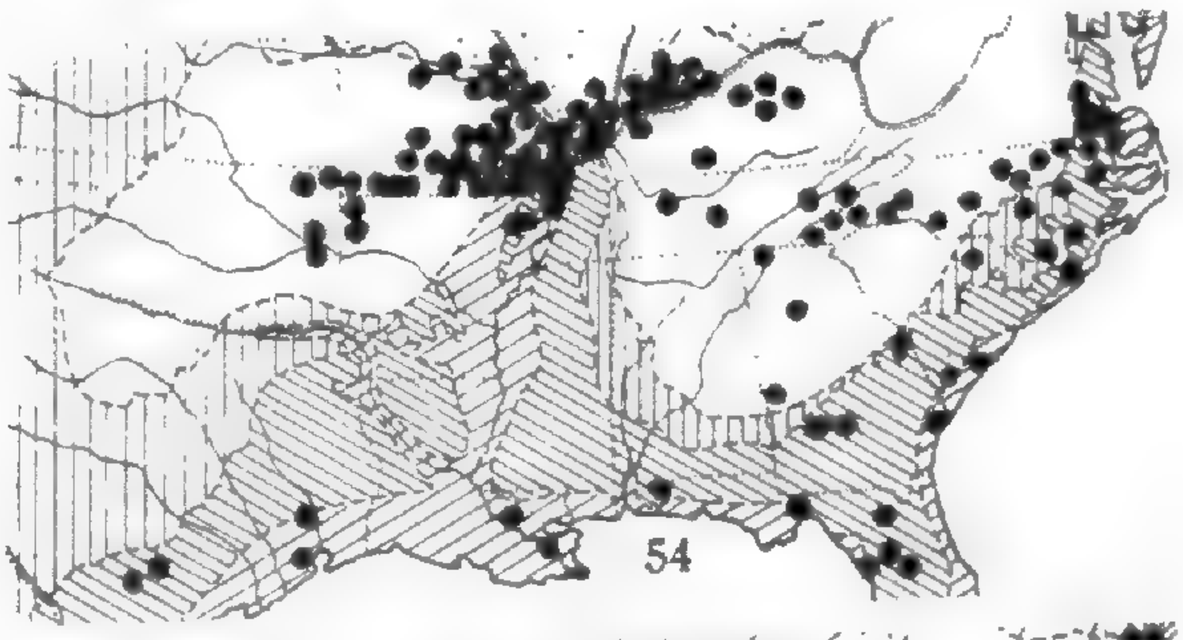
IV. ON THE GULF COASTAL PLAIN BOTH EAST AND WEST (TEXAS, ARKANSAS OR WESTERN LOUISIANA TO SOUTHWESTERN GEORGIA OR NORTHWESTERN FLORIDA) AND THE SEA-ISLAND HALF OF THE ATLANTIC COASTAL PLAIN, EXTENDING NORTH TO VIRGINIA OR BEYOND. The largest element in the flora, consisting in part of **Pinus palustris* 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. strigosum*, *P. aciculare*, *P. commutatum* (Hitchc. & Chase) Fern., **P. longiligulatum*, *P. albomarginatum*, *P. sanguineum* (MAP 47), *P. roanokense*, **P. mutabile* (MAP 15) and *P. trifolium*, **P. ensifolium*, *P. lancearium*, *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.*

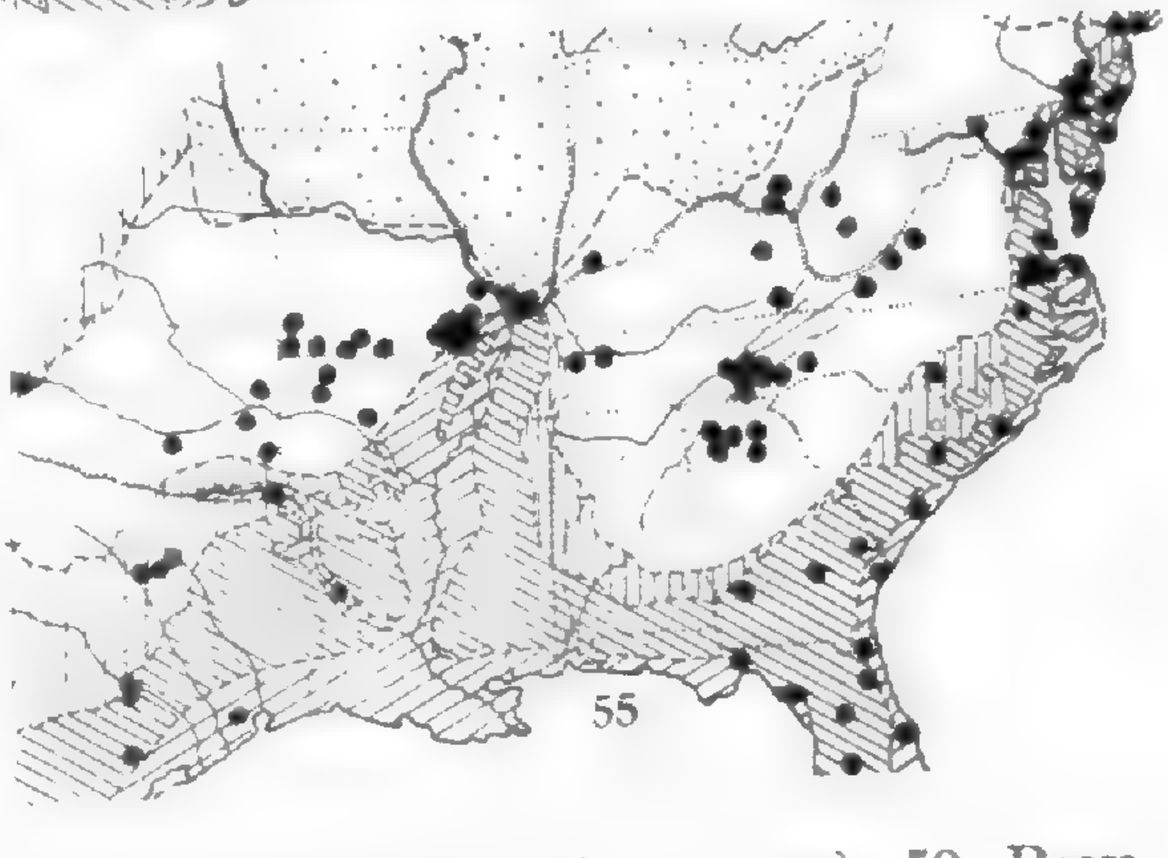


Map 31, range of Panicum mattamuskeetense; 32, Rynchospora Torreyana; 33, Juncus diffusissimus; 34, Dioscorea hirticaulis; (for maps 35–38 see Eupatorium in Part II); 39, Eleocharis ambigens; 40, Helonias bullata; 41, Parnassia asarifolia; 42, Silphium atropurpureum; 43, Panicum meridionale var. albemarlense; 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. variflora*, **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).

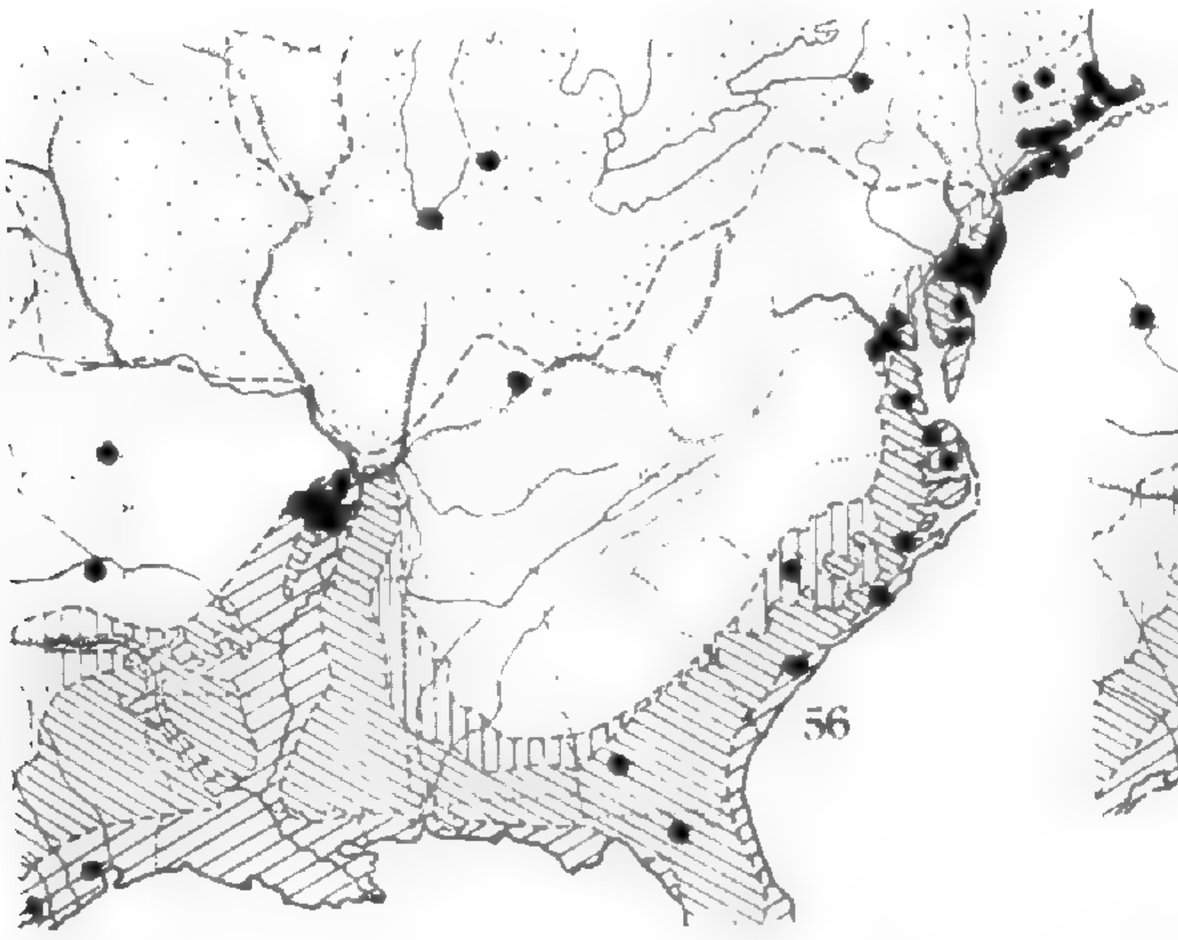
*wigia glandulosa, Myriophyllum pinnatum, Ptilimnium capillaceum, Nyssa aquatica, Cornus stricta, Lyonia mariana, *Fraxinus profunda, Trachylospermum difforme, Asclepias variegata* and **A. rubra, *Verbena canadensis, *Lippia nodiflora, Callicarpa americana, Scutellaria integrifolia, Physostegia denticulata, Salvia lyrata, *Pycnanthemum albescens, Oldenlandia uniflora, Diodia virginiana, Viburnum rufidulum, Melothria pendula, Elephantopus tomentosus, *Eupatorium incarnatum* and *Cirsium virginianum.*

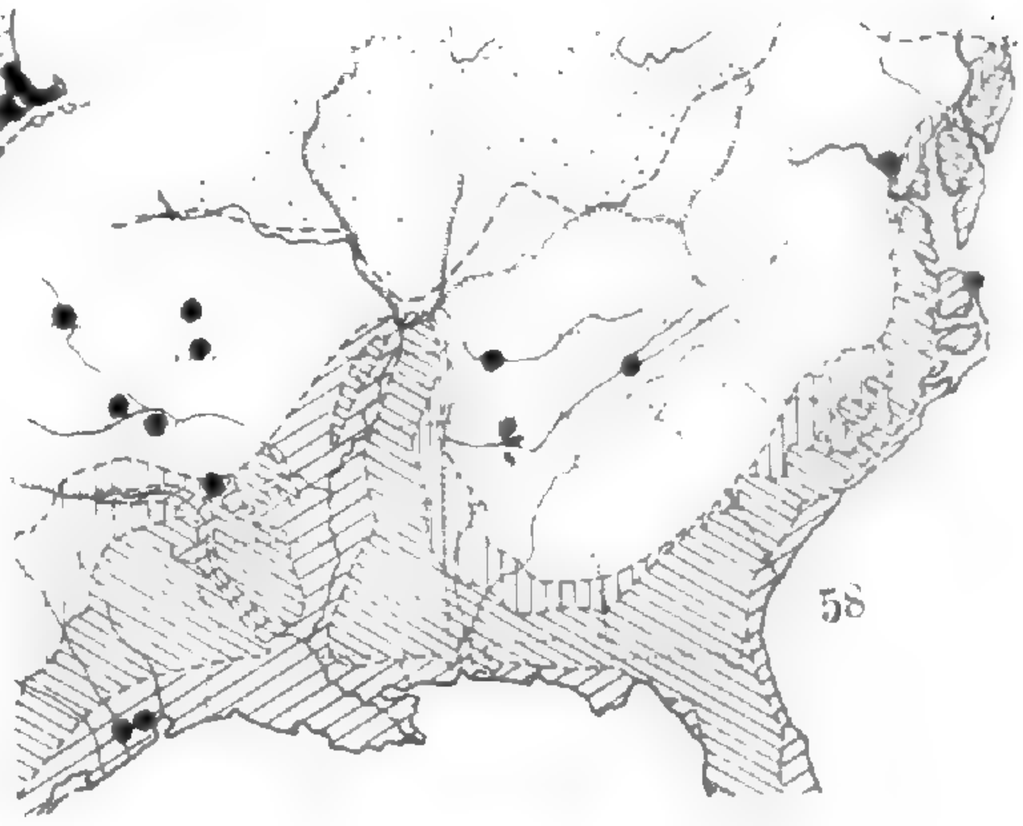
VA. Like V but with Colonies on the Appalachian or Ozark Upland. **Paspalum fluitans* (map 17), *Panicum Ravenelii* (map 52), *Scirpus divaricatus* (map 4), **Scleria oligantha* (map 53), *Xyris torta* J. E. Sm. (see also VB), **Juncus diffusissimus* (map 33), *Smilax glauca, *Hexalectris spicata* (map 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 carolinianus, 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.*

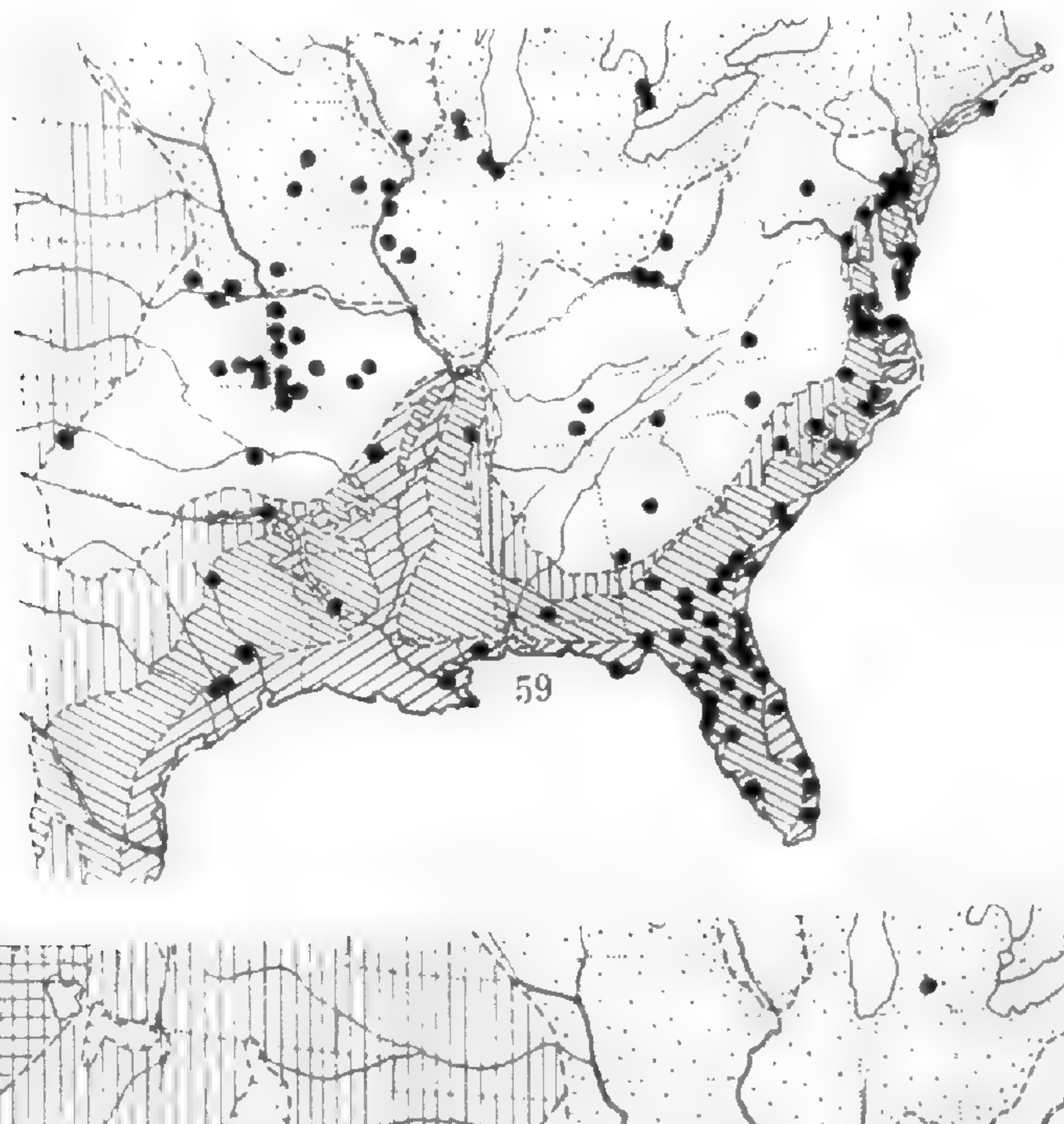
VB. Like V but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). **Panicum spretum, Fuirena hispida, *Rynchospora macrostachya* (map 56), **Scleria setacea* Poir., *Xyris torta* (see VA), *Juncus scirpoides, Polygonum setaceum, *Hottonia inflata.*

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 bottom-land 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, × ⅕, 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, × ⅕, 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, × ⅖, 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, × ⅖, 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, × ⅖, 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, × ⅖, 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, × ⅖, 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, × ⅖, 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.

INDEX

New scientific names are printed in full-face type

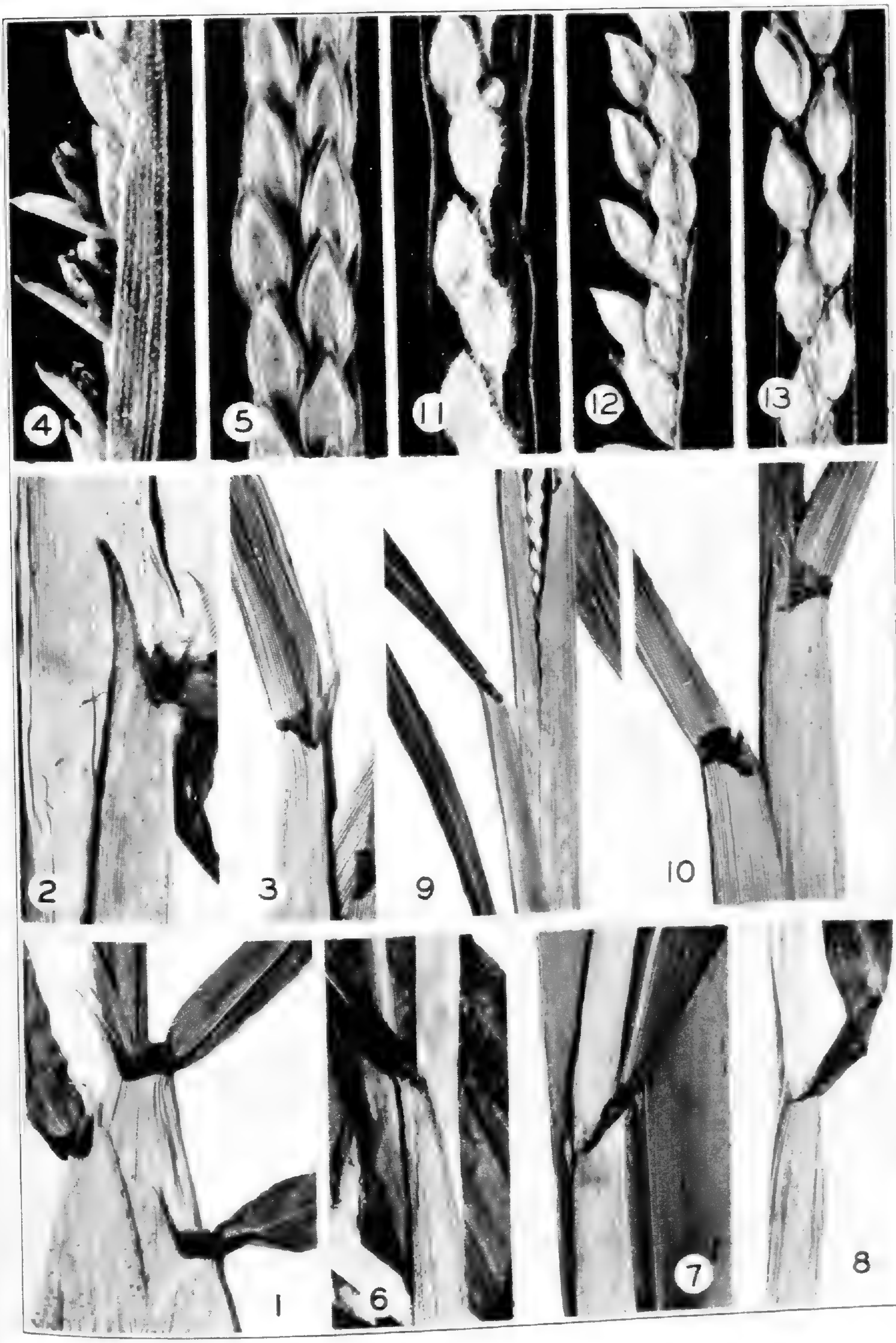


Photo. E. C. Ogden.

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, × 2/5; 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.

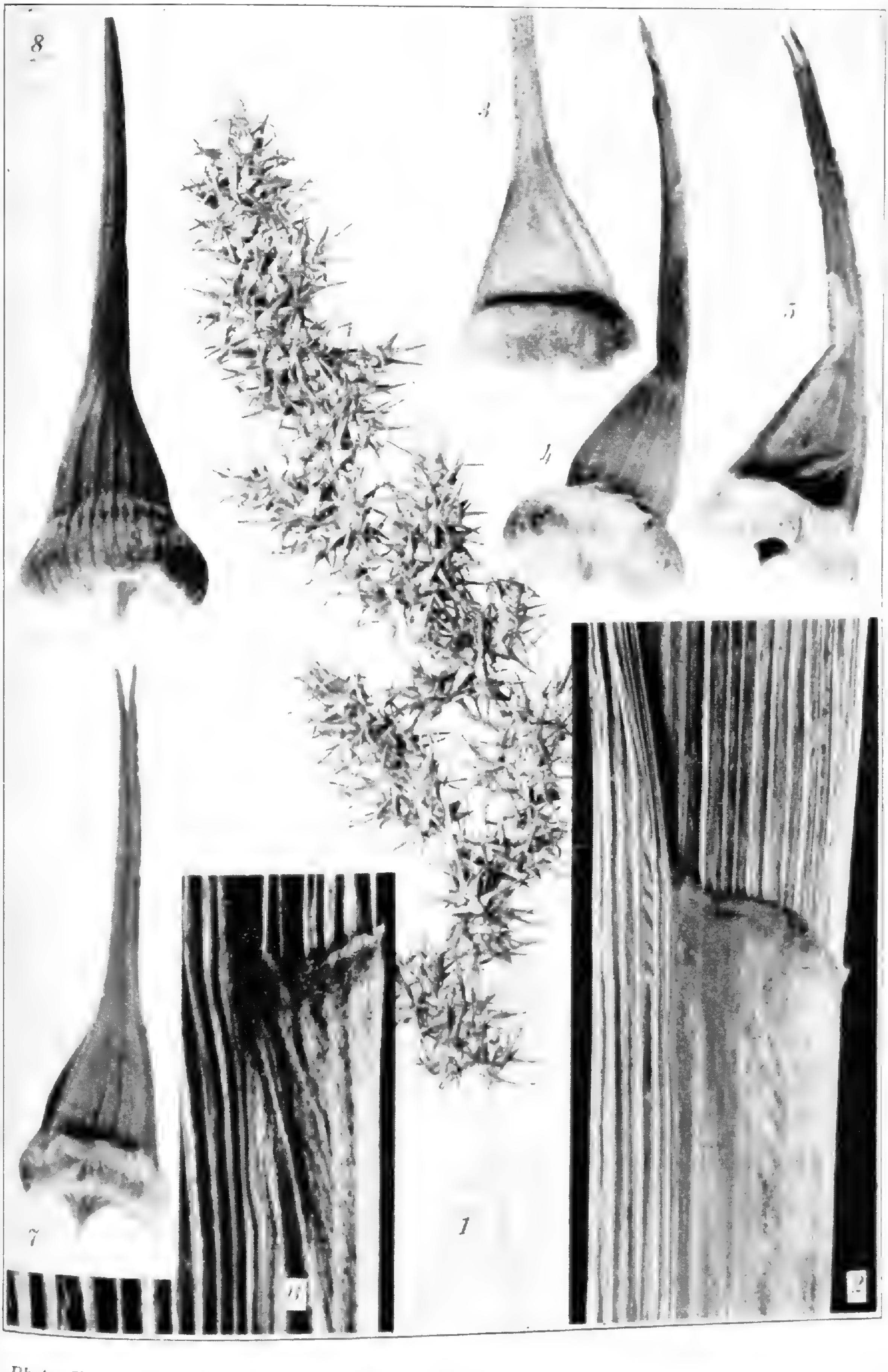


Photo. E. C. Ogden.

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.

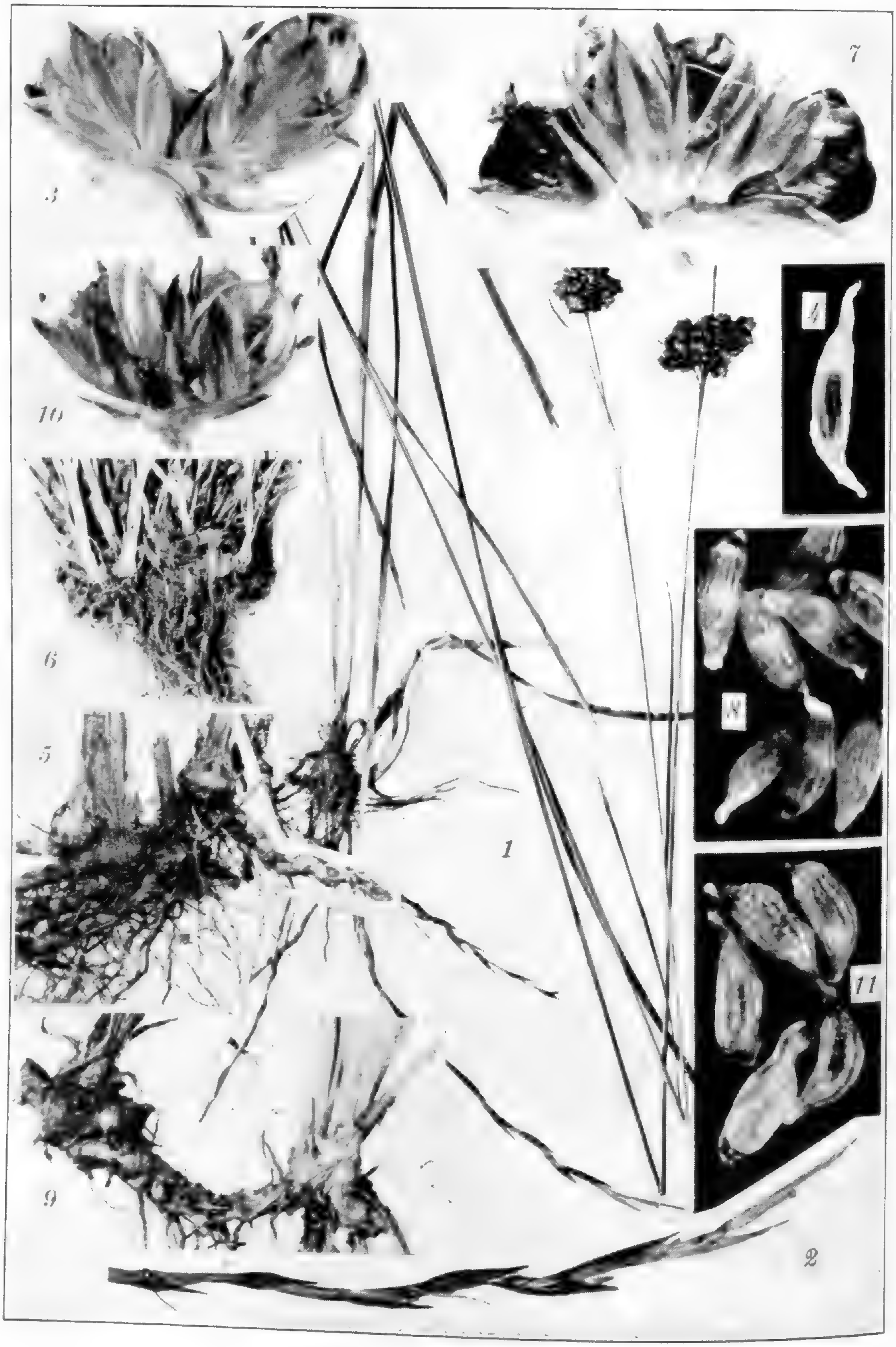


Photo. E. C. Ogden.

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.

Photo. E. C. Ogden.

POLYGONELLA POLYGAMA: FIG. 6, two plants, × 1/5, 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), × 1/5; FIG. 2, leaves, × 2; FIG. 3, old rachis, × 10.

Photo. E. C. Ogden.

GEUM CANADENSE, var. BREVIPES: FIG. 1, TYPE, × 2/5; FIG. 2, portion of fruiting head, showing style-tips, × 10; FIG. 3, mature achene, × 10.
Var. GRIMESII: portion of summit, × 2/5, of TYPE.

TYPE of CASSIA MARILANDICA in LINNEAN HERBARIUM, courtesy of Mr. SPENCER SAVAGE.

Photo. E. C. Ogden.

CASSIA HEBECARPA: FIG. 1, portion of TYPE, × $^2/_3$; FIG. 2, base of petiole, showing gland and stipule, × 4; FIG. 3, ovary, after anthesis, × 2; FIG. 4, legumes, × 1.

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.

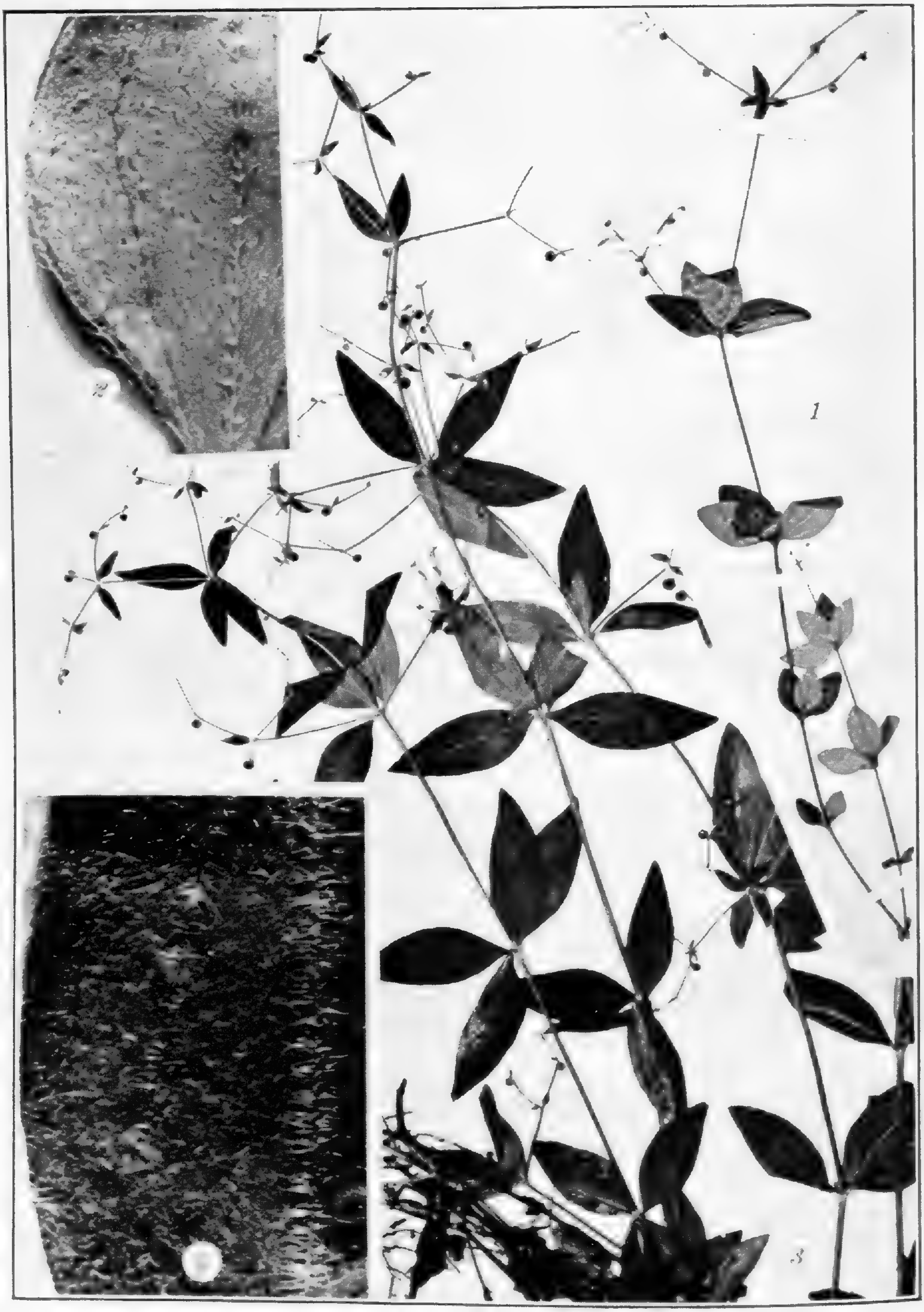


Photo. H. G. Fernald.

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.

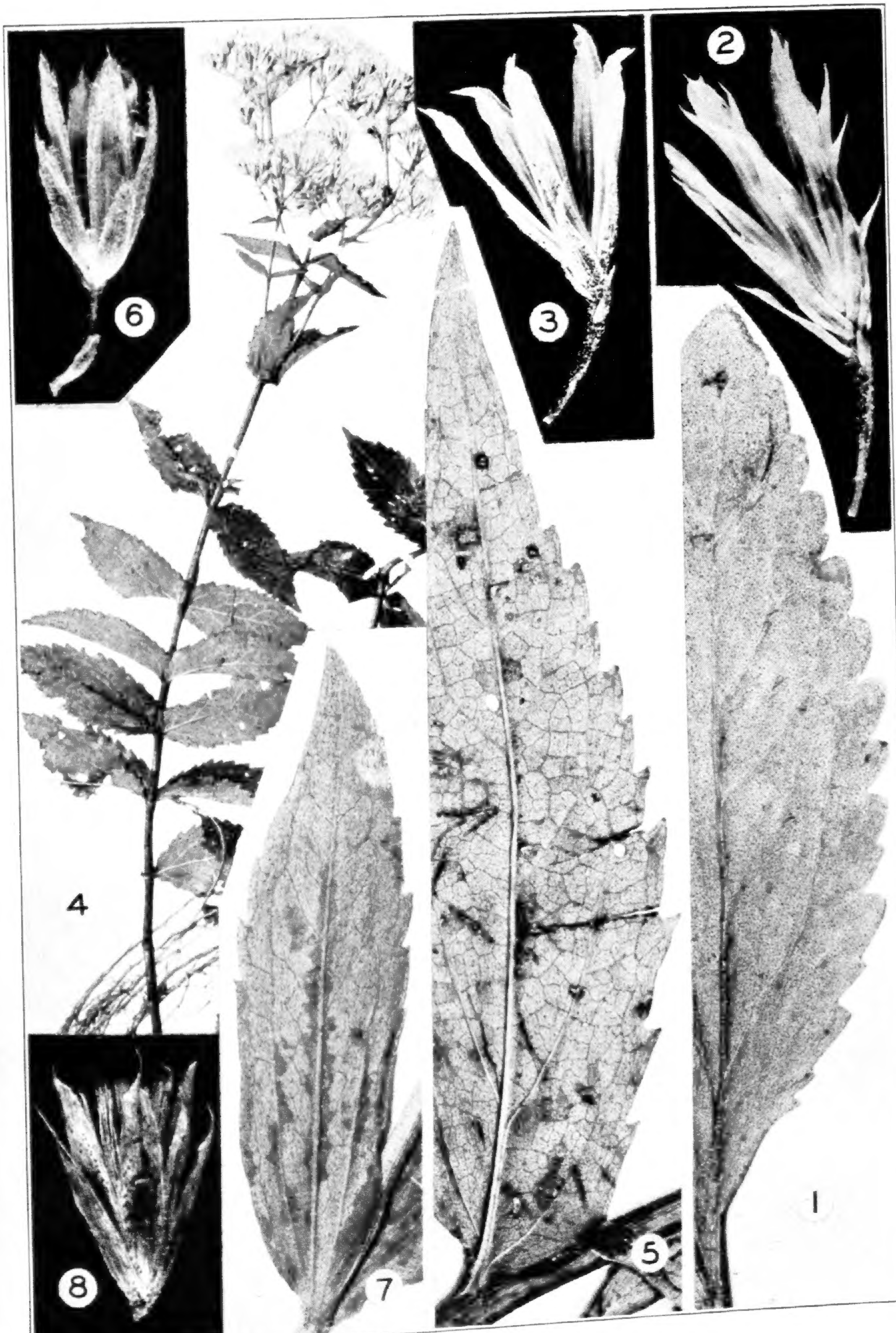


Photo. E. C. Ogden.

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, × 2/5; 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.

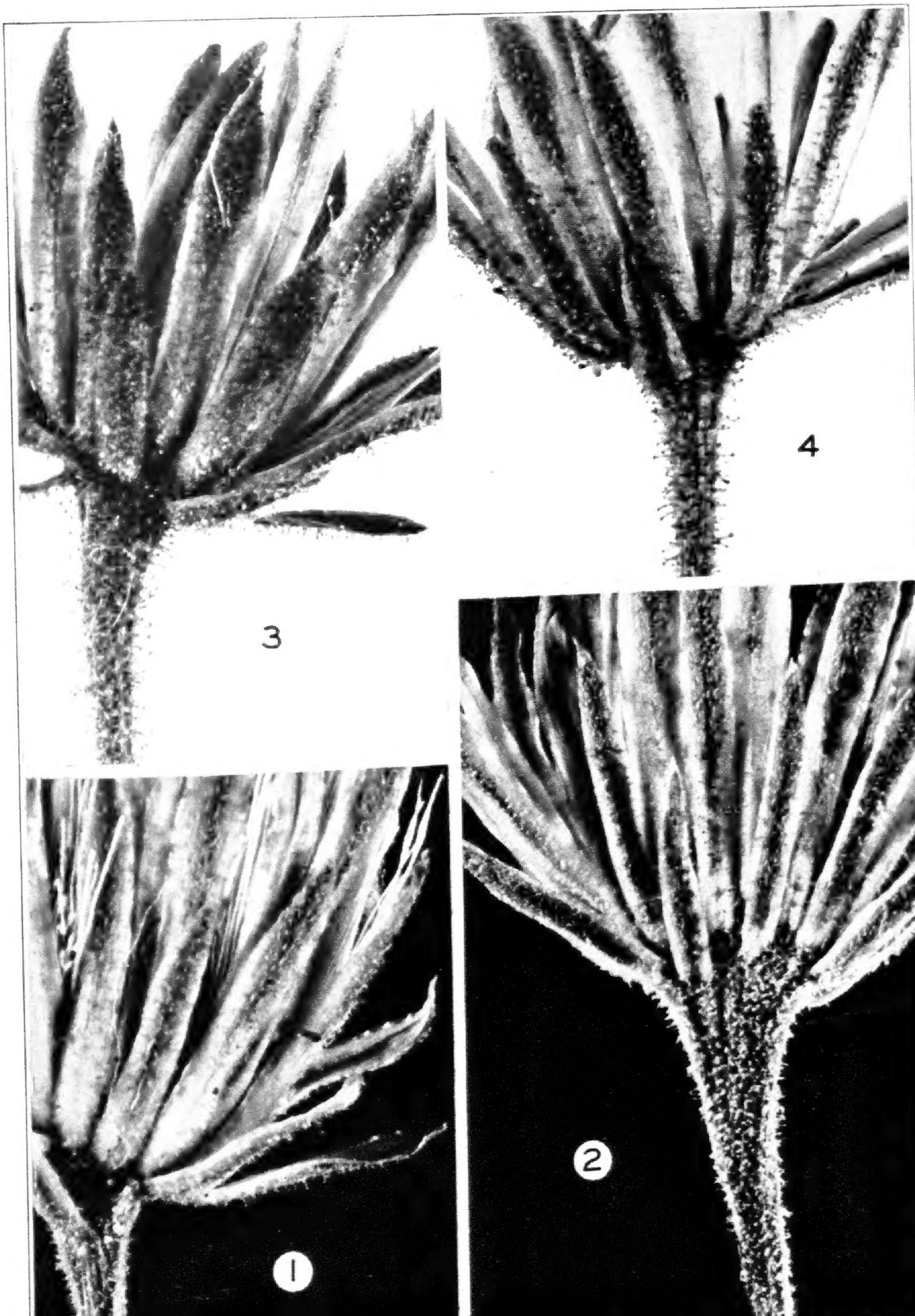


Photo. E. C. Ogden.

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.

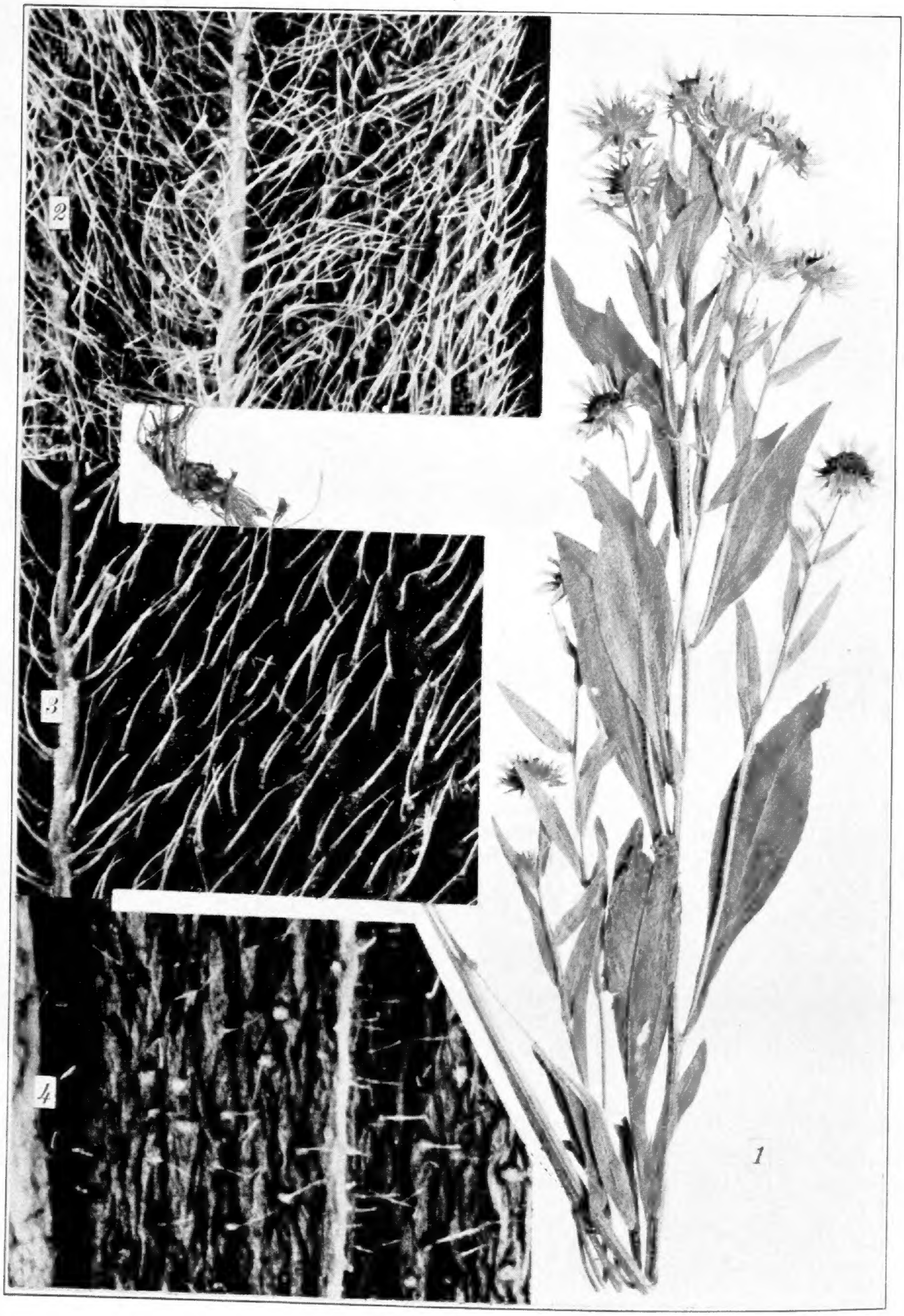


Photo. E. C. Ogden.

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.