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CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY

CXXXIX

139 – 146

ANOTHER CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

Dates of Issue

Pages 485–553 and Plates 670 and 671 .... 11 October, 1941
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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXXIX

ANOTHER CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA[1]

M. L. Fernald

(Plates 670–695)

Part I. Journal of Field-trips in 1940

Ambitious to get into the field and glad temporarily to escape being forced to witness the occupation of the lap of spring by the New England winter, I induced Dr. Arthur Stanley Pease to join Mr. Bayard Long and me at our Virginia headquarters at Century House, south of Petersburg, for our brief spring recess. Although spring had not emerged in eastern Massachusetts, we basked in sunshine in southeastern Virginia, from March 30 to April 4, and tramped through woodlands full of *Nemophila microcalyx*,[2] gigantic *Hepatica americana* (DC.)

[1] Exploration done with aid from the Penrose Fund of the American Philosophical Society.

[2] In this, as in preceding papers of this series, the authors of species are omitted in the narrative if they are in Gray's Manual. The preceding papers on the work in Virginia are as follows: Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189, 20 plates (1935)—Contrib. Gray Herb. CVII; Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413 and 423–554, 22 plates (1935)—Contrib. Gray Herb. no. CIX; Fernald, *Plants from the Outer Coastal Plain of Virginia*, Rhodora, xxxviii. 376–404 and 414–452, 13 plates (1936)—Contrib. Gray Herb. no. CXV; *Local Plants of the Inner Coastal Plain of Southeastern Virginia*, Rhodora, xxxix. 321–366, 379–415, 433–459 and 465–491, 14 plates (1937)—Contrib. Gray Herb. no. CXX; *Noteworthy Plants of Southeastern Virginia*, Rhodora, xl. 364–424, 434–459 and 467–485, 27 plates (1938)—Contrib. Gray Herb. no. CXXIII; *Last Survivors in the Flora of Tidewater Virginia*, Rhodora, xli. 465–502, 529–559 and 564–577, with 14 plates (1939)—Contrib. Gray Herb. no. CXXVIII; *A Century of Additions to the Flora of Virginia*, Rhodora, xlii. 355–416, 419–498 and 503–521, with 24 plates (1940)—Contrib. Gray Herb. no. CXXXIII.

Ker. in three color-forms, *Corydalis flavula,* which we had not previously seen on the Coastal Plain, *Dentaria laciniata* (sometimes 18 inches high), and more limited colonies of *Obolaria* or of *Aplectrum,* the latter with distinctively veined over-wintering leaves and last year's fruiting stems up to 20 inches high. Little of novelty was seen, though in one piece of new seeding the apetalous *Lamium amplexicaule,* forma *clandestinum* (Reichenb.) G. Beck, replaced the common plant with expanded purplish corollas; and one fallow field was given over to masses of *Viola arvensis* in perplexing color-variations and mingled with *Veronica hederaefolia,* which we had not previously noted in the state. A new station for *Galax aphylla* on the Coastal Plain was found and additional ones for *Symplocarpus foetidus* and for *Caltha palustris,* each of them indicating areas needing exploration (not yet made) later in the season. *Amelanchier* was flowering; and one species which we had collected in previous years seemed very marked by its broadly oblong to oblong-obovate leaves, corymbiform racemes and erect calyx-lobes. This proves to be *A. austro-montana* Ashe, described from the Carolina mountains and, I believe, not recorded from Virginia.

When we were forced to return to our regular duties at home spring in Virginia was rapidly advancing; but it was more than a month before Long and I could get back to Petersburg for another period of exploration (May 6–12). As on the April trip and for some years past we were happy in securing the assistance of Mr. Leonard Birdsall and his car—happy because we always enjoy Leonard's companionship, sane common sense, good humor and ready helpfulness, and the ability of the car, under his guidance, to go into the most improbable places.

The early species of *Carex* were maturing and we promptly took under consideration the perplexing plant which we had repeatedly collected, overripe, in June and July, on bottomlands of the Nottoway. Strongly resembling the wide-ranging *C. grisea* and *C. amphibola* Steud., this plant of the lower Nottoway has puzzled us since 1936 because its inflated perigynia have a puckered and crumpled summit. In the past we had wondered if it were wholly normal, but now it was superabundant on the rich calcareous bottoms wherever we visited the Nottoway (as Pease has aptly said, it is one of many species of southeastern

Virginia there found "not away from the Nottoway"), its healthy deep green foliage and the inflorescences all vigorous and normal but with the perigynia regularly with the crumpling so long noted in dead-ripe material. Examination shows that, whereas the two closely similar species, *C. grisea* and *C. amphibola,* have the prolonged achenes tapering at summit and essentially filling the perigynia, our puzzling plant has them only half as long and with truncate summits. This fundamental character of the achene, which accounts for the extreme puckering of the empty summit of the perigynium, was abundantly checked in much ripe material in June, also in the old collections in the herbarium, and again in June of the current year. The plant is a morphologically quite distinct and undescribed species, to be further considered and illustrated (PLATE 671) in Part II. That started the genus *Carex* with a high initial score; but on four of our trips of 1940 we added 10 other members of the genus (2 never before known from north of Georgia, others unknown from south of northern Maryland and 1 undescribed) to the known flora of Virginia!

While Pease was with us in early April we had, inevitably, taken him to the extensive sandy pine barrens which follow the eastern bank of the Blackwater from below South Quay Bridge into northwestern Gates County, North Carolina. Nothing but *Pyxidanthera* and *Carices* were yet flowering there but the splendid association of rare evergreen shrubs is always alluring and there is always the hope of a new discovery. In early April, finding that the bridge at South Quay was being replaced and, consequently, not open to travel, we sought a new and short route back to Franklin, rather than go far out of our way by following the surfaced roads. So we took a dirt road northward from Duck's Store and very soon found ourselves skirting the eastern margin of a fine new tract of white sand and pine barren (characterized by Long-leaf Pine and Catesby's Oak) in Isle of Wight County, south of Lee's Mill and midway between that south of Zuni and the similar but larger area in Nansemond County. In just this chance way we had discovered in 1936 the pine barren between Zuni and Walters; very similarly, we had unexpectedly happened upon the extensive pine barren of western Nansemond; and now we had a third such tract awaiting exploration—discovered at twilight on our last day of the April trip. Early May was too soon to expect much, but the preliminary canvass showed the typical carpets of *Pyxidanthera* and of *Vaccinium crassifolium* Andr., which meant that day after day until late autumn must be devoted to the new barrens.

In April we had found the rich slopes by the James near Indian Point a carpet of *Corydalis flavula* and other species of rich woods. So, returning there in May, we were promptly rewarded by a second station in the state for *Carex Jamesii* and a good colony of *C. Leavenworthii,* new to Virginia (afterward found along the Appomattox at Petersburg, and under the oaks at Benns Church in Isle of Wight). *Ranunculus micranthus* was here more than 1½ feet high; *Viola striata,* at our only Coastal Plain station, was in full bloom; and *Myosotis macrosperma* Engelm. was unusually tall (up to 2¾ feet high). The latter species (MAP 1)[1] has been very generally misunderstood. It is frequently confounded with merely overgrown *M. verna* Nutt. (*M. virginica* sensu recent authors, not as to type, which was a BLUE-flowered plant); but the two species have many significant characters, which will be fully presented in Part II. The bottomland swamp, back of the James, at Indian Point is carpeted with *Ranunculus carolinianus* DC. at its probable northern limit, and *Aneilema Keisak* Hassk. (discussed by me at length in the last Virginia report) closely mingles with it, while *Euphorbia obtusata* borders the low woods.

Farther down the James, in Surry County, the northern and upland *Carex prasina* occurs at two stations some miles apart; the range of *Chaerophyllum Tainturieri* was extended slightly northward; *Conopholis americana* was found in such quantity as we had never imagined; and we added *Orobanche uniflora* to our list of species on the Coastal Plain. In a churchyard at Surry Courthouse *Aira praecox,* certainly rare in Virginia, was growing; and we were told of yellow lady's-slippers, though we did not see them.

We visited the courthouse-grounds of Prince George Court-

[1] Unless otherwise noted the maps in this paper are based on the material in the Gray Herbarium and the Britton Herbarium (New York Botanical Garden), with trustworthy records (as those in Mohr's Plant Life of Alabama) added. Other herbaria would supply more stations, but the general ranges would probably not be materially altered.

house, Surry Courthouse and Isle of Wight Courthouse, all comparatively near the James River, because we hoped there to find *Alchemilla microcarpa* Boiss. & Reuter and *Draba brachycarpa.* One or both of these we had found in the lawns and open ground by the courthouses of Greensville and Southampton Counties and we had jumped to the alluring conclusion that they were being spread by the foot-wear of the officers of the circuit courts. When we explained our hope to court-officers at Isle of Wight Courthouse, they promptly said: "It's no use; we James River counties are on a different circuit". They were right; the *Draba* and *Alchemilla* are not there. We could establish no evidence that the court-officers of the more northern counties had been "bootlegging" weeds from the lawns of the more southern judicial circuit.

The region of Carey Bridge (over the Nottoway) and of Applewhite's Church, in Southampton County, had proved worth while in 1938 and 1939, with an abundance of highly localized and interesting species found there: *Tetragonotheca helianthoides, Sida inflexa* Fernald, *Polygala polygama,* etc. We, consequently, make a point of checking the area as often as possible for something previously overlooked. The brief visit there on May 7th gave us typical *Amsonia Tabernaemontana* (recorded by me a year ago) and a colony, on the wooded bank of Three Creek, of typical *Viola septemloba* LeConte, also not previously known from Virginia, although it will not be surprising if critical study reduces to it some of the more recently proposed northern species. Near by, on the wooded slope by Three Creek, north of Applewhite's Church, a rather definite new *Carex* was discovered, evidently allied to *C. digitalis* but with peculiarly inequilateral and arching fruits, an undescribed plant, although already represented in the Gray Herbarium from eastern Georgia and northwestern Florida.

At another area on Three Creek, just at the "fall-line" northwest of Emporia, the rich woods were more those of the Appalachian Upland than of the Coastal Plain. We already knew this transition-spot with its upland vegetation of *Scleria oligantha, Chamaelirium luteum, Stellaria pubera, Silene virginica, Clematis ochroleuca, Sanicula Smallii, Coreopsis auriculata* and other Alleghenian species; but we were not prepared to find close to the Coastal Plain *Ligusticum canadense, Thaspium trifoliatum* (L.) Gray, var. *flavum* Blake, the upland yellow-flowered representative of the smaller purplish-flowered Coastal Plain *T. trifoliatum,* and, closely simulating it, the upland and transcontinental *Zizia aptera* (Gray) Fernald (*Z. cordata* sensu most authors, not *Smyrnium cordatum* Walt., its basinym). Migration only a few rods down the valley would bring all three definitely into the Coastal Plain. In fact, one of them was found, in June, well to the east of this rock-ribbed boundary. Along a path in these woods, some miles from the nearest town and with only a small clearing (quite innocent of the plant) near-by, was a fine colony of the handsome *Vicia grandiflora* Scopoli, a European species with flowers up to 1½ inches long, the yellowish corolla suffused with lilac or black dots. Dr. Robert Tatnall had been getting it on the Eastern Shore; but how it got isolated in this remote spot is a problem, a problem the more complicated because in August two other equally isolated new arrivals were found in profusion at the border of these woods. At another point just above the "fall-line", this time on the Appomattox slightly above Petersburg, we got many species from the rich woods which we know definitely to creep over to the Coastal Plain; but there were two, *Amsonia Tabernaemontana,* var. *salicifolia* (Pursh) Woodson, and *Scutellaria nervosa,* which we still yearn to see native slightly farther east.

So much for the rich woods. A brief visit to the sandy pinelands near Cathole Landing, on Somerton Creek west of Factory Hill, gave us good returns. The plants most worth special record are two. *Sphenopholis filiformis* (Chapman) Scribner, the most delicate member of the genus, a species not recorded from north of the Carolinas and Tennessee, has a nice station on one sandy ridge south of Tom Hunter's. Along the branch which empties into Somerton Creek we were made very uncomfortable by a tall (up to 10 feet high) sprangling bramble. Since it differed from any we had previously encountered we painfully and dutifully took three sheets. It is fortunate that we thus salved our consciences, for the flowering material is a close match for the type of *Rubus floridus* Trattinick, a long-lost species, described in 1823 from material sent to Vienna by Enslen from somewhere in the South, and, according to Bailey, it has never been rediscovered. It is unfortunate that we did not know its full interest when we found the colony, for we should then have overlooked the pain and taken abundant material. Still more unfortunately, when we returned to the station in June of this year, the effects were everywhere evident (dried-out and dead leading shoots and blighted fruits) of a late spring frost which had hit the region and had caught practically all the floricanes of *R. floridus*. Again, three poor fruiting bits were all we got. The station is easily reached, however, and another year should yield plenty of good material. On the way there, if the searcher takes the proper sandy side-road[1] south-west of Marsh Hill School, he can see a considerable colony of *Rhododendron atlanticum* (Ashe) Rehder, with the corollas cleft to base into slenderly linear to filiform segments, a most bizarre form (PLATE 692) when in full bloom.

The inundated woods, swamps, thickets and clearings centering on Stony Creek in Sussex County always yield good things. The swamps (with back-flow from the Nottoway) are so extensive, from north and west of the town to some miles to the south and east, and their proper exploration physically so exhausting that we have never made a thorough examination of them; but whenever we stop in passing we are always repaid. Halting on this trip to look into a damp fallow field full of *Alopecurus carolinianus* Walt., *Agrostis Elliottiana, Poa Chapmaniana, Sibara virginica* (L.) Rollins, *Callitriche deflexa* var. *Austini,* and other vernal and quickly passing species, we chanced to wander across the road to the uncleared and deeply drowned margin of the woods. There, covering a good portion of an acre and only a few rods from a spot we had previously investigated, was a solid colony of the northern and transcontinental ("New Brunswick to British Columbia, and southward to Tennessee . . . New Mexico and southern California"—*Mackenzie*) *Carex lanuginosa,* new to the known flora of Virginia and surely not to have been expected among such austral associates. This addition to the flora must finish the records for May, except that, in wet woods along a small branch north-

[1] When we first encountered this particular road, with its water-holes, asymmetrical ruts and floating corduroys, Leonard sought out a farmer in a distant field, to ask about driving over it. Returning to the car he reported: "He says 'the road's not bad if you knows how to drive over it!' " Leonard knew how.

east of Sebrell in Southampton County, we came upon a few plants of very erect and wholly typical *Dryopteris cristata* (L.) Gray, another northern and transcontinental (even circumboreal) species, which seemed as much out of place on the Coastal Plain near the Carolina line as does *Carex lanuginosa*, or as do such other boreal species of the general region as *C. Buxbaumii* Wahlenb. ("Newfoundland to southern Alaska", etc.), *Caltha palustris* or *Drosera rotundifolia*. This localized station for *Dryopteris cristata* is on land which, at the opening of the 19th century, was part of the vast domain of Edwin Gray,[1] the host of Frederick Pursh, who in this region established northern limits for many extremely southern species: *Asimina parviflora* (Michx.) Dunal, *Quercus laevis* Walt., *Lobelia glandulifera* (Gray) Small, *Carphephorus bellidifolius* (Michx.) T. & G. and, best of all, *Litsea geniculata*, which is characterized by Small (under *Glabraria geniculata*) as "One of our rarer shrubs. . . . Its closest relatives . . . tropical".

In June (4–14) I was met at an early afternoon train by Long, with a bunch of *Bromus catharticus* in his hand, and Leonard; and, since it was not worth while to go far afield, we returned after lunch to the wooded banks of the Appomattox below the Norfolk and Western station in Petersburg. We knew from a visit the preceding autumn that there were rich alluvial woods in which travel was made difficult by tangles of *Clematis Viorna* and by shoulder-high thickets of *Laportea canadensis*. We were, therefore, not surprised by the abundance of *Staphylea* and other calcicoles. We were not prepared, however, to see in southeastern Virginia so distinct a species as *Carex conjuncta* ("New York . . . to the District of Columbia, and westward to South Dakota and eastern Kansas"—*Mackenzie*) making solid stands. Mackenzie says "4–8 dm. high" but on the Appomattox it vies with *Laportea* and reaches a height of 10.5 dm. (3 feet, 6½ inches). It is here very abundant and handsome and two days later we were collecting it on the north bank of the James. It is another indication of the lack of general interest in the more technical groups that so conspicuous a species should be "new to Virginia". On the upper banks of the river, partly in natural habitat, partly in railroad cinders, so that

[1] See Rhodora, xlii. 362 (1940).

their status as natives is questionable, *Carex Leavenworthii* was growing; and *Rubus trivialis,* at its northwestern outpost in the state, and *R. centralis* Bailey, extended south from Stafford County, entangled their creeping stems.

Farther out, definitely on cinders of the railroad yards (of the Atlantic Coast Line and the Norfolk and Western) there is no question that most of the plants are adventive, though some are evidently natives resisting invasion. *Bromus catharticus* abounds, *B. sterilis* has a foothold, and *Festuca octoflora* is bafflingly variable. Typical *Sphenopholis obtusata* (with glabrous sheaths) is there but probably adventive, since the common native of southeastern Virginia is var. *pubescens*. *Rumex altissimus* has crept south from the region of Washington and *Chaerophyllum Tainturieri*, var. *floridanum* northward from South Carolina; and *Anthriscus scandicina* (Web.) Mansfeld (*A. vulgaris* Fries), a new wanderer from Europe, has come to stay. Most of these plants, except the last, with the turpentine-like oil of which I unsuccessfully tried to make Long flavor his tea, would scarcely excite the enthusiasm of those whose "botany" begins and ends with showy flowers; but the beautiful colony of *Heliotropium europaeum*, with cymes of rich purple flowers, would win their applause, assuming that its great beauty compensates for its lack of the expected fragrance.

On the 5th we went south to the Nottoway, to secure ripe material of the two new *Carices* and to pick up any novelties occurring with them. When we parked the car on the soft shoulder by the river west of Homeville, where calcareous bottomland soil had been used for the shoulder, the effect of thus loosening it was at once apparent in the gigantism of the plants invading it. This stimulation to growth was well displayed by *Plantago virginica* with spikes nearly a foot long. Ordinarily spikes half that length are considered near the maximum size. The two new Carices were both in good ripe condition, settling their achene-characters; but our attention soon turned to another plant which, since we first saw it along the Blackwater in 1936, has been puzzling us. We, of course, were very familiar with *Justicia americana* (L.) Vahl (*Dianthera*), which carpets much of the lower James, and we had become familiar with the very different and exclusively southern *J. humilis* Michx.

(*Dianthera ovata*) in Southampton and Nansemond Counties. The plant which troubled us is midway between those two species in habit and inflorescence and it inhabits deeply shaded bottomlands and margins of quiet and shaded waters from south of the James to the Carolina line. We were still worried by it but, actually, it was in June of the current year before we brought together side-by-side fresh flowers of the three. Although this final study belongs more explicitly to a report on the work of 1941, it has so long been in progress that I am including in Part II an account of the new species with illustrations (PLATE 693) of the very different corollas, stamens and seeds of the three.

On the bottomland just east of Carey Bridge Long collected the prize specimens of *Mitchella repens*—with corollas three fourths of an inch long. In fact, much of the Mitchella in this quarter of Virginia has the flowers larger than we are used to farther north but I have been unable to find any definite morphological character to separate the two, although in March Pease had specially commented that the plant in Southampton "looked" unlike that of New England. The genus was named for John Mitchell, who lived near the mouth of the Rappahannock and in 1748 published a small tract on the plants of Virginia. It cannot now be settled (Mitchell's plants, presumably in England, being inaccessible until after the war) what form he had. In a small cypress swamp on the eastern bottomland of the Nottoway at Carey Bridge there is a beautiful *Carex* of § *Ovales.* It certainly "looked different" and its very large and cordate or round-based perigynia show it to be *C. reniformis* (Bailey) Small (MAP 2), a very rare species of the region from Florida to Texas, north, very locally, into eastern Georgia, northern Mississippi and eastern Oklahoma; and now in Southampton County, Virginia. Directly across the river, at a springhead in the wooded bank, we soon discovered the first definite station[1] known for the famously rare true *Sphenopholis pallens* (not *S. pallens* of most authors which is the transcontinental *S. intermedia* Rydb.), which was described 134 years ago from material of indefinite origin sent by Muhlenberg to Sprengel and has subsequently been known only from a second collection

[1] See Rhodora, xlii. 356, 357 (1940).

made somewhere in South Carolina. Since Elliott and Muhlenberg freely exchanged material and Elliott's herbarium contains much from Muhlenberg and Muhlenberg's much from Elliott, it is not improbable that the original material sent by Muhlenberg to Sprengel came, not from Pennsylvania as assumed, but was originally received by the sender through Elliott. At any rate, Carey Bridge and the Nottoway still retain their prestige!

The next day, June 6th, we swung northward. In early April we had found along the James, slightly west of Varina, a particularly rich slope and wooded bottomland, and northeast of there, at our old springy and boggy area west of Elko Station, there was an immature *Tradescantia* which we wished to check. On the way, in passing through the eastern border of Richmond, near the limit of tide on the James, we saw that *Zizaniopsis*, characteristic of tidal shores, had extended as far as possible up-river; and with it was a white-flowered *Convolvulus* which could be only *C. sepium*, var. *fraterniflorus*, of "The Prairie and Great Plain region", "Illinois to Montana, south to Arkansas and New Mexico"—Tryon in Rhodora, xli. 422 (1939). We are beginning to be hardened to such ranges!

The slopes and bottomlands west of Varina were as productive as we had anticipated, with lush growth of calcicolous species. Here, again, was *Carex conjuncta*, with the northern and inland *C. normalis* Mackenzie and *C. tenera* Dewey, the latter new to Virginia. *Xanthorhiza simplicissima* Marsh. (*X. apiifolia*) greatly surprised us, for we thought of it as an upland plant, though a few days later we were getting it in Southampton County and, still more surprising and to make a thorough job, finally in Nansemond County at the border of pine barren!

The greatest "jolt" at Varina, however, was when we found side-by-side two quite distinct members of the genus *Heuchera*, one of them a coarse plant with deeply cordate and heavy foliage which required two weeks in press properly to dry; the other smaller, with the thin leaves subtruncate at base and coming out of press in three days. The monographers of the genus, evidently without looking up all the specimens cited by Linnaeus, have selected to stand as typical *Heuchera americana* L. (the only Linnean species and, therefore, the type of the genus) a form which they surmise to be typical: "Since it is the only form of *Heuchera americana* that occurs in tidewater Virginia, whence apparently, came the plants seen by Linnaeus, it appears that this variety rather than the more widespread Northern and Western one next discussed must be taken as the type of his species. This conclusion is borne out by the fact that this is still the form cultivated in European botanical gardens under the name of *H. americana*".[1] But here, growing together, were two members of the group; while the plant treated by Rosendahl, Butters & Lakela as true *H. americana* is relatively frequent (at several stations) in tidewater as well as upland Virginia and at two points in tidewater Virginia we collected "the more widespread Northern and Western one" which the monographers felt could not be typical of the species because they had not seen it from tidewater Virginia. Further to complicate the matter, in June, 1941, we have been collecting from extensive colonies on the lower James (within the mail-delivery area of Smithfield) gigantic plants with panicles nearly a foot and a half long and up to 6 inches broad, leaves heavily soft-pilose, and scapes almost as shaggy as in the most extreme plant of the Ozarks. This and some of the others are in areas where they could scarcely have been missed by early collectors; and it is quite certain that no one of the five can be singled out as type of the genus *Heuchera* and of *H. americana* simply because "it is the only form . . . that occurs in tidewater Virginia". At the present rate of discovery we can hardly feel certain that we have reached the end; and until the specimens cited by Linnaeus are critically studied it cannot be determined just what is the type.

The genus *Heuchera* started in 1737 almost simultaneously in Linnaeus, Genera Plantarum, ed. 1: 68, where it was described without statement of source or of origin of name, but with a single reference to Boerhaave, and in Linnaeus's Hortus Cliffortianus, 82 (1737), where earlier references (to Hermann, Plukenet and Boerhaave) were cited and the plant said to "*Crescit in* America", the genus named for Johann Heucher of Wittenberg. To me the plant of Hortus Cliffortianus, of which a good photograph is before me, seems to be the type. It was the plant actually known to Linnaeus and clearly bears his inscription

[1] Rosendahl, Butters and Lakela, Mon. Gen. Heuchera, 56 (1936).

"americana"; while the evidence is that he had nothing in his personal herbarium in 1753 (starting point of specific nomenclature) so identified. But Linnaeus cited plants of Clayton and others. These (all in Europe) can not just now be identified. It is fairly clear, however, that Hermann's plant of *Cortusa americana*, a name still earlier cited by Boerhaave and later cited as a synonym by Linnaeus, and from which, it is possible to argue, Linnaeus might have borrowed his specific name, is characteristic *H. villosa* Michx. Hermann's plate is to me of unmistakable *H. villosa* and the old descriptions defined the "flore squalide purpureo villoso". As yet *H. villosa* is not known from east of the Appalachian Upland but that should not be disconcerting, for many plants (including some from Clayton[1]) very early reached Europe from the mountains of Virginia. Rosendahl, Butters & Lakela separate their § *Villosae* from their § *Americanae* by "Outside of the flower villous" in the former, contrasted with "Outside of the flower glandular-puberulent without any villous hairs" in the latter. With the earliest pre-Linnean accounts of *Cortusa americana*, or of *Mitella americana* of Boerhaave, calling for villous flowers, with Hermann's plate showing characteristic *H. villosa*, with Linnaeus's own material of Hortus Cliffortianus a quite different plant, with four or five different plants now known in tidewater Virginia and the likelihood of others being there found, it is certainly wiser (and easier) to defer the answer. This situation, however, vividly illustrates the complexity of the flora of southeastern Virginia and the errors which may result from an assumption that it is sufficiently known.

The *Tradescantia*, forming a large colony west of Elko Station, proved, appropriately enough, to be *T. virginiana*, although Anderson & Woodson in their monograph of the genus cite no material from the Coastal Plain of Virginia. Near it, while we were inspecting our small colony of *Helonias bullata*, we suddenly remembered that *Carex canescens* var. *disjuncta*, which was abundant in the bog, had not been seen by me, when I described

[1] "John Clayton (1693–1773) . . . collected plants extensively in eastern Virginia, and was also much interested in the plant life of the interior. He seems to have traveled into the interior to some extent. . . . He also encouraged travelers to bring plants from the western sections. We find in some of his letters mention of plants from as far west as Wythe County [in the Alleghenies]"—A. B. Massey, *Plant Hunters in Virginia*, The Commonwealth (Richmond, Va.) vi. no. 4: 14 (April, 1939).

the variety, from south of Maryland. It was, therefore, worth collecting, although over-ripe. We had heretofore regarded *Lapsana communis* as relatively rare; but the embankments of the Chesapeake and Ohio, west of Elko, are covered by a low thicket of it and since we had seen it near the same railroad in Richmond, 18 miles to the west, it has evidently got a real foothold. The only other plant worthy a note here is the infrequent *Galium parisiense,* which forms a thin carpet in the cinders near Elko station.

It is unnecessary that the remaining notes on the June work should be strictly chronological. The thought having gradually but very forcefully evolved, that in southeastern Virginia many of the most interesting plants are "not away from the Nottoway", we finally conceived a rapid capture of them all by what is now known as a *Blitzkrieg.* Study of the contour-sheets showed that, beginning with Double Bridge, where the Nottoway enters the Coastal Plain, thence swinging eastward, then northward, and finally southward, uniting with the Blackwater at the North Carolina line, there are at least 16 bridges across the river in the Coastal Plain. There are also various railroad-bridges and old ferry- and boat-landings, as well as other old but perhaps passable routes to the river. Our work was cut out but, as yet, we have "contacted" the river at only a few points; these have usually proved worth while. The Nottoway rarely "lets us down". Starting south of Littleton on a sandy sideroad, to reach the river at Peters Bridge, we were soon startled by the vivid show of orange-yellow which could not come from any of the endless color-forms of Butterfly-weed, *Asclepias tuberosa.* Leonard slowed down in the deep and slewy sand and we made a first-hand acquaintance with the splendid southern *Lithospermum carolinense* (Walt.) MacM., heretofore known from Florida to Texas and Mexico, north to Arkansas and Oklahoma, and in the East to sand-hills of South Carolina. All about Chub, for at least two miles north and south, the dry white sand of open woods and clearings is brilliant in June and early July with the gorgeous inflorescences. The usual "sand-hill" plants of the South are there and new northern limits for several of them, *Quercus cinerea, Stillingia sylvatica,* etc., were established. That was a good start and it was evident that our new plan of campaign was going to work.

The wooded bottomland between Chub and Peters Bridge is particularly rich and most species of such woodlands reach phenomenal development, while *Asclepias purpurascens*, which we once thought to be rare on the Coastal Plain, is very handsome and abundant. At the crest of the bank immediately above the river, however, we got our two prizes, two montane species new to the Coastal Plain: *Tradescantia canaliculata* Raf., which Anderson & Woodson in their monograph of the genus map for Virginia only from west of the Blue Ridge; and *Stenanthium gramineum*, another characteristic plant of the mountain region.

Another day we visited two other bridges over the Nottoway. One, Double Bridge, we well knew, but we thought that by approaching it from down-river, instead of from the Piedmont, we might pick up some novelties. Somewhat north of Orion (pronounced *ŏŕ-i-ŏn*) we were attracted by rich woods sloping to the river and there, among other good things, we found the characteristically broad-triangular and abruptly almost cuspidate-acuminate, glabrous foliage which very closely matches the type of *Viola latiuscula*, hitherto known only from calcareous western New England, eastern New York and northwestern New Jersey. It was accompanied by the beautifully distinct and rather ornamental southern *Carex oxylepis* and by the *Heuchera*, already referred to, which had been supposed not to occur in tidewater Virginia, the plant treated by Rosendahl, Butters and Lakela as *H. americana*, var. *brevipetala*. Here, also, was unmistakable *Zizia aptera*, the upland and nearly transcontinental species which had so surprised us when we found it at the "fall-line" northwest of Emporia. In the woods north of Orion it is well below that boundary-line. Best of all, along the little brook in these woods were carpets of young stalks of the weak-stemmed *Aconitum* which we already know at Carey Bridge. When we finally get it in flower and fruit, if we ever do, it will presumably prove to be the montane *A. uncinatum*. The colony at Carey Bridge was under 40 feet of water during the terrible freshet of the following August; that near Orion barely escaped, but in early September the trailing and leaning stems scarcely showed any indication of flowering. In October, if freshets or drouth do not spoil it, we are hoping for conclusive material of the plant. The flowering material in the Gray Herbarium of *A. uncinatum* was collected from August 9 to October 10.

North and northwest of Jarratt the boundary between Sussex and Greensville Counties follows the sinuosities of the Nottoway and the bridge next below Double Bridge is called, on the contour-sheets, Readjuster Bridge, although, when in Jarratt we asked how to reach it, our informant looked puzzled by the big word but admitted that by following dirt roads as sinuous as the river we should come to *a* bridge. The southern end of the bridge is at the northeastern sharp angle of Greensville County, about due north of Orion, the northern end in the re-entrant western angle of Sussex, just south of what seemed like an unromantic small village with an unromantic name, Peanut. The road from Jarratt finally straightens out and proceeds for a mile or two through swampy woods and argillaceous clearings, sometimes very wet but after drouth with an almost impervious baked-clay soil. In these clearings there is a rank growth of many species and we collected many of them to establish records for size (*Panicum polyanthes*, for instance, with leaves more than an inch and a quarter broad), others for county records (*Juncus diffusissimus*, for example, our first from Greensville County); but the most important plant, perhaps, was typical *Hypericum denticulatum* Walt. We already knew var. *ovalifolium* (Britton) Blake from three counties farther east, but the typical variety of the species seems to be new to Virginia.

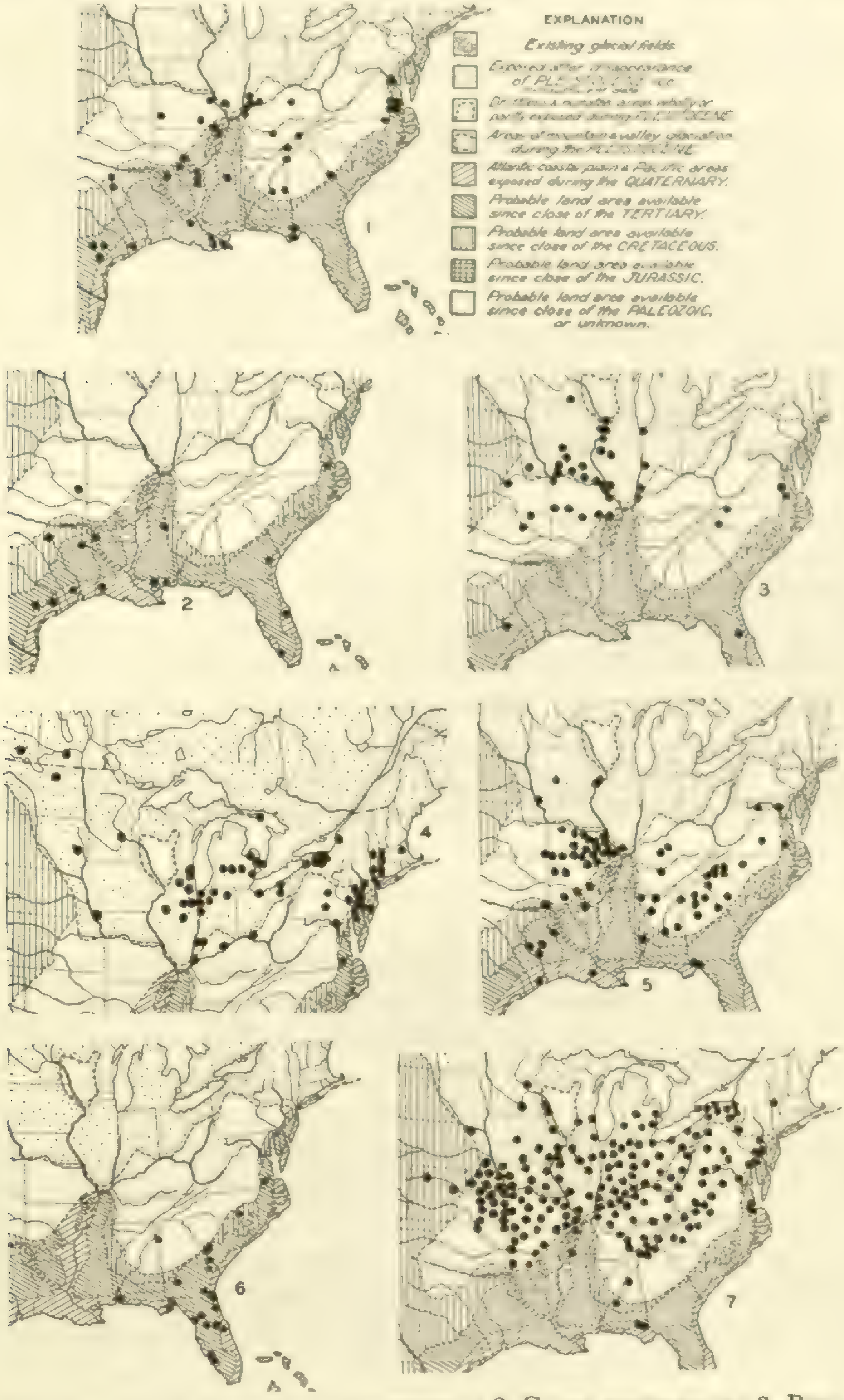
When we reached the Sussex end of the bridge (south of Peanut) I turned south on the wooded bottomland, Long north. My attention was promptly drawn to a perplexing swale of sedges, but before I could concentrate on it a call for help came from above the bridge. Hurrying to Long's aid I found that all he wanted was botanical, not physical, support. He was legitimately puzzled by the flowering and fruiting aquatic in a backwater pool by the river, which failed to register. I, too, was puzzled by it, until I remembered *Peplis diandra* Nutt., chiefly of the Mississippi drainage (MAP 3), the plant which has been unjustifiably separated from *Peplis* as *Didiplis diandra*. Our plant was certainly *Didiplis* or *Peplis,* but it is very rare in the East. The only stations I have located east of western Indiana and eastern Missouri are two in the upland of North Carolina, our new one, one at the "fall-line" in Chesterfield County, Virginia[1] and, far remote from the others, one in Florida. Just as remote is a Texan station. It is humiliating to record that Long and I, making an off-hand misidentification, had collected remarkably large terrestrial plants of the *Peplis* in Chesterfield County and that the many duplicates were distributed by me and recorded in RHODORA, xli. 477 and 570 (1939), as the habitally similar *Oldenlandia Boscii* (DC.) Chapm.[2] After we together took the necessary two dips to secure the best material of *Didiplis* we returned to my original problem. The dominant *Carex* which had astounded me was *C. tetanica* (MAP 4), a northern calcicolous species, occurring from New England to Saskatchewan, with its previous southeastern limit in the upland of Maryland. While we were absorbed with *C. tetanica* and an obvious hybrid of *C. lurida* and *C. squarrosa,* Leonard remarked "I never saw a clover like this". Neither had we. In openings in the thicket and in the border of the woods he had discovered a good colony of Buffalo Clover, *Trifolium reflexum* (MAP 5), the true southern and pilose *T. reflexum,* not the more northern and glabrous var. *glabrum* Lojacono in Nuov. Giorn. Bot. Ital. xv. 150 (1883). The latter extends north into central and western New York and southern Ontario. Only typical pubescent *T. reflexum* is included on the map. Torrey & Gray (1838) and others have given the northeastern limit of typical *T. reflexum* as in North Carolina; and Small, in his Manual, says: "northward only W of Blue Ridge, Fla. to Tex." etc. Professor Wherry, who intimately knows western Virginia, tells me that he has never met the plant there; and the only station in the state known to Professor Massey is one discovered in May, 1940, by Mr. E. W. Carson in Cumberland County. The old stations, where last collected in 1902, along the Potomac, kindly enumerated for me by Mr. E. H. Walker of the National Herbarium, seem to have been in Maryland. Mr. Walker states

[1] Too late for inclusion on the map other stations in eastern Virginia, as far north as the Chickahominy River.

[2] Those who received no. 9439 are asked to correct the identification to *Peplis diandra* Nutt.

that otherwise the National Herbarium shows nothing from north of North Carolina. Nevertheless, *T. reflexum* was originally published by Linnaeus (1753) with "*Habitat in* Virginia". He then cited an earlier description of a Virginian plant described by Plukenet (presumably received from Banister) and specimens collected by Clayton and described by Gronovius. Presumably the species, which naturally occurs in openings in loamy or otherwise rich thickets and woods, agriculturally promising habitats, was once more generally distributed in the state. At any rate, we now know a good station at the edge of the wooded bottomland of the Nottoway only a few rods from a still more isolated colony of *Peplis diandra.* In spite of a modern invidious connotation of the word peanut (as in "peanut politics"), no true botanist will jeer at Peanut, Sussex County, Virginia. That humble locality now has a dignified place on the botanical map of the state, and the Nottoway there maintains the interest we expect of it.

We had not wholly forgotten the pine barrens of western Nansemond and adjacent southwestern Isle of Wight. In the latter area we added *Amianthium Muscaetoxicum* and *Polygonella articulata* to the county list; and in the former we found a new station for *Calopogon pallidus* Chapm., some miles away from our first station, and with it young shoots of unmistakable *Gentiana Stoneana* Fernald. Our greatest delight, however, was in finding in full flower extensive thickets of the rare and distinguished *Zenobia pulverulenta* (Bartram) Pollard, discussed by me in detail in Rhodora, xlii. 471–473 (1940). All three forms (sometimes treated as species) grow together, very striking in their extremes, and the beautiful broad white bell-shaped flowers are deliciously fragrant. Most unhappily they lose their fragrance and become discouragingly blackened in drying. *Calopogon pulchellus,* in all color-shades from bluish-purple to pale pink, abounded and the white-flowered plant, forma *albiflorus* (Britton) Fernald, was positively abundant on one area—many scores of plants. Tom Hunter had invaded the springy sphagnous bog with his plow; and in his corn-field, heavily manured and fed with commercial fertilizer, the *Calopogon* lingered along the rows. It was a novel experience to collect this bog orchid as a "weed" in a cultivated field. It is supposed to be in-



MAP 1, range of MYOSOTIS MACROSPERMA; 2, CAREX RENIFORMIS; 3, PEPLIS DIANDRA; 4, CAREX TETANICA; 5, TRIFOLIUM REFLEXUM (typical); 6, PSORALEA CANESCENS; 7, CAMPANULA AMERICANA.

tolerant of lime; but the manure and the nitrates in the fertilizer seemed to have stimulated it and the calcium not to have injured it. From one hill of corn I extracted a plant three feet high, with leaf 7 inches long and 1¼ inches broad, flowers approaching 2 inches in breadth, 21 of them in a full raceme more than a foot long. *Calopogon* may yet become a garden plant!

The Peninsula of Virginia always yields good returns; so, on June 12th we made a brief circuit into York County. Near Grafton there is a swale bordering swampy woods which at once attracted us by its display of *Asclepias purpurascens.* Upon investigation the swale proved trebly interesting, for it is given over largely (for an acre or more) to the southern *Lythrum lanceolatum* Ell., a species we had known as far north as Virginia only from a little remnant of swale near Homeville (Florida to Texas, north to southeastern Virginia and Arkansas). With it was *Scirpus lineatus*, an inland and relatively northern type, which we had never seen in southeastern Virginia, although Grimes got it near Williamsburg. As we approached Yorktown, fields and clearings began to be showy with the dark purple globular umbels of a gigantic onion (more than a yard high, with very dense umbels more than 2½ inches in diameter); and some miles farther on, up-river from Yorktown, areas along the newly disturbed lands of the parkway are rapidly being invaded by it. It is superb to look at, but its deep-seated large bulbs, each producing a hundred or more small bulblets, make it a serious threat to hay-fields and pastures. It is far more vigorous and effective in rapid propagation than the pestiferous Field Garlic, *Allium vineale,* which, for two centuries, has occupied and tainted the fields of the Coastal Plain. Unless drastic steps are immediately taken to exterminate it (already a difficult task) before it goes any farther, eastern Virginia and adjacent states will be overrun by a new and highly flavored pest. It is a plant originating in the warmer parts of Europe and western Asia, *Allium Ampeloprasum* L., var. *atroviolaceum* (Boiss.) Regel. *A. Ampeloprasum* has a number of varieties, this one with a dense ring of essentially sessile bulblets borne about the base of the parent-bulb. For purely whimsical reasons we should have been glad to add to the Virginia list the oriental variety with the small bulblets borne on long stalks, like a loose crown, about the parent-bulb, var. *pater-familias.* The name alone makes it sound "interesting but tough".

Other weeds have become established above Yorktown, some of them likely to spread, as they have done farther north. *Silene Cucubalus* Wibel (*S. latifolia*), a ubiquitous weed of fields and roadsides in eastern Canada and the northeastern states, is rapidly increasing along the parkway. It is a relatively harmless weed, however, and from its young and tender new leafy shoots in early spring a good purée, suggestive of pea-soup, may be prepared. It would be well, however, that the plant have an English name different from the long established Bladder-Campion. In the thicket slightly above Yorktown *Verbascum Lychnitis* abounds, a European species not very generally established in America; and on the sands along the river and farther west along the parkway a small Old World *Medicago*, with burr-like fruits, *M. minima* L., var. *compacta* Neyraut, has taken a firm hold. I have emphasized the weeds of disturbed soils, but the native flora in undisturbed areas is always interesting along the lower York. *Acer floridanum* Pax, apparently not previously recorded from the county, thrives and is made conspicuous by its chalky-white trunks; and under it in early spring a rich vegetation of early-flowering herbs may be expected. *Arabis laevigata,* growing there, is a good indicator.

Only one more plant need here be recorded for the June trip. This is the very low and stoloniferous, colonial and small-leaved *Amelanchier* which abounds in pinelands and other acid soils. Strongly suggestive of the northern *A. stolonifera* Wiegand, it is markedly different from that species in its very thin and relatively narrow leaves, with uniformly small teeth and compact flowering racemes, with very short pedicels. It was now fruiting; the rather dry fruits are also short-pedicelled and with erect calyx-lobes. It is a strongly marked species of the southern Coastal Plain, not heretofore generally understood, although André Michaux, a century and a half ago, had a good knowledge of it. It will be further discussed and illustrated in Part II.

Late March and early April had been relatively unproductive of novelties, May had done better by us, and June had given splendid returns; but by July our restricted time prevented our reaching half the areas we wanted to examine, while in late August and early September novelties and new problems were so frequent that it was difficult to convince ourselves that, for seven seasons we had been working in the field at intervals on the flora of southeastern Virginia, five seasons with our routes radiating from the same center, Petersburg. When we reached Petersburg for our July work (July 9–19) we were grieved to learn that Leonard could no longer help us. He had, however, done the best thing possible for us, delegated his position to his brother, Frank Birdsall, a graduate of William and Mary and now at the head of the large Seaboard High School in northern North Carolina (over the line from Emporia). Frank promptly adapted himself to the new work, drove skillfully and with Leonard's ability and willingness to tackle difficult roads, and was a genial and always interesting and interested companion; we felt ourselves very fortunate. Our first venture, obviously, was to the dry sandy woods at Chub, where *Lithospermum carolinense* has its only known station north of the sand-hills of South Carolina. Here the southern *Bulbostylis ciliatifolius* (Ell.) Fernald was found at a new northern limit and other "sand-hill" types, rare so far north, were collected. For years we had been searching for *Baptisia villosa*, collected nearly a century and a half ago by Frederick Pursh in Southampton and much later by Canby in the same county. Consequently, when, at the border of the woods, I stumbled upon a strange erect leguminous plant passing out of flower, I thought that we had at last located it. But a little examination showed that I was wrong. The disappointment was more than cancelled, however, for we were collecting *Psoralea canescens* Michx., a yellowish-flowered species of sand-hill and sandy pinelands of Florida, Georgia and Alabama, heretofore unknown north of southern North Carolina (MAP 6). It is certainly an appropriate companion for *Lithospermum carolinense;* but another occupant of the same woods, in the largest colony I had ever seen (I cannot speak for Long), was a wholly inappropriate companion for those two—*Scrophularia lanceolata* Pursh, hundreds and hundreds of plants, a species occurring, according to Pennell, from "Cape Breton Island to British Columbia, south to [mountains of] Virginia", etc. Here at its southeastern limit of range, it is in sandy oak and hickory woods where in August we found typical *Sanicula marilandica* (northern Newfoundland to Hudson Bay and British Columbia, south to Nova Scotia, New England, Virginia, upland to northwestern Florida, Great Lakes states, northern Kansas and Colorado) growing with the largest colony we ever saw of *Hexalectris spicata* (Mexico to Florida, north to Maryland, Virginia, etc.) and with other species hitherto "unknown from north of South Carolina"; and close at hand, in more sterile areas, other such meetings of North and South were noted. Another such amazing juxtaposition was found when we went down the slope south of Chub to the sphagnum-carpeted spring-heads bordering the bottomland-woods of the Nottoway. We went for a drink of cold spring-water, but in getting at it we were forced to push back the fruiting branches of *Rhododendron serrulatum* (Small) Millais of "Ga. to Fla. and La." (Rehder, Man. Cult. Trees and Shrubs, ed. 2). We then crouched, to get our drinks, in a carpet of *Campanula aparinoides*, the first colony we had ever met in Virginia of this northern and upland flaccid plant (Maine to Wisconsin, Nebraska and Colorado, south to upland of Georgia, etc.). What would those who are "sold" on the exact working of life-zones in mesophytic lowland eastern America do with these plants? Their behavior is as reprehensible as the commingling in Newfoundland of *Schizaea pusilla* with *Sparganium hyperboreum*, or the interlocking in western Nova Scotia of *Ilex glabra* and *Ledum groenlandicum*, or the climbing of *Picea mariana* there by *Smilax rotundifolia!*

Across the Nottoway, south of Peters Bridge, there is such a domination of the sandy woods by *Quercus cinerea* and its almost endless variations and apparent hybrids that we got the impression that this is one of the most unstable of species. The hybrid, × *Q. subintegra* Trelease (*Q. cinerea* × *falcata*) is there in quantity. Just below the bridge, in the sandy loam of the woods above the Nottoway, the Coastal Plain *Thaspium trifoliatum* abounds and with it the northern and inland *Scutellaria parvula*, var. *ambigua*, a rare plant in Virginia. Still farther south of Peters Bridge and over the line in Southampton County, in the thickets and woods near Raccoon Creek, we came upon our second Coastal Plain colony of the upland *Xanthorhiza;* and not far away the upland *Pycnanthemum Torrei* abounded. North of Peters Bridge, near Lumberton, lies Chappell's Millpond (now known as Honey Pond). The margin of the pond is an aquatic garden, with *Echinodorus radicans, Brasenia Schreberi, Potamogeton capillaceus* Poir. and other species already familiar; but we were more interested in the southern extension of *Potamogeton Berchtoldi* Fieber, var. *tenuissimus* (Mert. & Koch) Fernald, new to Virginia, and, also in the same category, *Ceratophyllum echinatum* Gray. We strained our backs, legs and eyes, bending over and carefully fingering, under water, thousands of plumes of the *Ceratophyllum* in a vain search for fruit. Fortunately, as pointed out in Part II, fruit is not absolutely necessary for identification of it.

With *Potamogeton* in mind, we remembered a slow creek at the outlet of Lee's Millpond, a dammed cypress swamp, in Isle of Wight County. Proceeding there, we found the stream covered with pondweeds. Among them were *P. epihydrus*, var. *Nuttallii* (Cham. & Schlecht.) Fernald, which, when we got it in the Chickahominy, fifty miles to the north, was then the first from south of the Potomac. Another pondweed, not yet fruiting, puzzled us but we looked forward to securing good fruit in late August. Going on to the pine barrens south of Lee's Mill we found, as we had expected, most of the characteristic plants of such areas; these need not be here enumerated. A few (very few) plants of *Calopogon pallidus* Chapm. established a record for Isle of Wight; and over the county line, just within Nansemond County, there was a bank of *Xanthorhiza,* bringing that upland species pretty far out into the Coastal Plain. The plant which most interested us, however, was an undescribed *Diodia,* with oblong leaves. It is here abundant in loosened sand, as along the Camp Company's lumber-railroad. and it had been on our minds ever since we originally got it in a similar habitat in 1936. It will be described in Part II. Near the road which skirts this barren there is a fine tree which is obviously a hybrid of *Quercus cinerea* and *marylandica,* × *Q. carolinensis* Trelease, new to the state; and, to continue evidence of the difficulties caused by *Q. cinerea*, near Cathole Landing we found × *Q. caduca* Trelease (*Q. cinerea* × *nigra*).

Renewing the visits to the Nottoway, we first stopped at the bridge slightly southeast of Stony Creek; and there, instead of by the common pilose-leaved *Solidago gigantea*, the species is represented by the transcontinental and northern (Quebec to British Columbia, south to upland of North Carolina, etc.) glabrous-leaved var. *leiophylla* Fernald (*S. serotina* Ait., not Retz.). The other plant of special note, as not recorded in previous years from the Stony Creek region, is the leafy-stemmed yellow-flowered *Viola eriocarpa* Schweinitz, a relatively northern and inland plant which we were amazed to find on the Coastal Plain. As I shall show in Part II the name *V. eriocarpa* is antedated by 19 years by *V. pensylvanica* Michx., the name I am reviving. A little farther up-river, where the automobile-road crosses the Nottoway east of Huske, the bottom-land-woods are particularly fine. Here are the common species of such habitats, and some not so general, such as *Elymus riparius* Wiegand, rare in eastern Virginia, and *Eryngium yuccifolium*, sufficiently local to be worth here recording. All the *Corylus americana* here and wherever we have subsequently examined it in southeastern Virginia has glandless involucres. It is the shrub described by Alphonse DeCandolle as var. *missouriensis* on account of this lack of stalked glands on the involucre. The shrub with the involucre stipitate-glandular was assumed by him to be *C. americana* Walt.; but it is usually more northern in range than var. *missouriensis*. Walter made no mention of glands in describing his material from South Carolina and I have seen no material of the species from his region. His herbarium, preserved at the British Museum, is now inaccessible, but when it can be reached examination of the involucre will be in order. The most thrilling plant of this bottomland, however, is something apparently quite new. With prolonged and very pilose sheaths covering the nodes, the *Bromus* here has the folded lemmas with flat sides, the 2nd glume 5- or 7-nerved. It is quite unlike *B. purgans*, abundant along the James, a plant with exserted nodes, strongly inrolled lemmas and 3-nerved 2nd glumes. *B. purgans* in eastern Virginia flowers from late May into June and by late June the spikelets are disintegrating. Our Nottoway plant begins flowering when *B. purgans* stops and continues through July. In its included nodes and prolonged sheaths, as well as in its flat-sided lemmas, it suggests the appropriately named northern and western *B. latiglumis* (Shear) Hitchcock, but that species has unique sheaths, with broad, horizontal summit-flanges prolonged into tapering appendages, and it differs in other characters from the Nottoway plant; incidentally, at the southern extension of its range *B. latiglumis* flowers from mid-August through September. In Part II I shall describe the new plant and illustrate details of all three species (PLATE 670). We also found it along the Nottoway at Green Church Bridge, Readjuster Bridge and Double Bridge, but could not find it on the James, the Blackwater or the Meherrin. Like the new *Carex* it is, so far as we yet know, "not away from the Nottoway". At Readjuster Bridge splendid trees of *Acer floridanum* still held their fruit (near Yorktown a month earlier the fruit had all fallen). Here the prickly vine, with fiddle-shaped leaves suggestive of those of *Smilax Bona-nox,* is, Long assured me, *S. hispida.* I bow to his understanding of the genus; I completely lack it, nor can I get real comfort out of any treatment I have seen! *Acerates* here was quite as perplexing as *Smilax;* again I give up. But the beautiful tall *Phlox,* abundant at the borders of swampy woods (south of Peanut) was more comforting. With its mottled stem, long-attenuate leaves and very prolonged and cylindric inflorescence it is unmistakable *P. maculata,* although the first we have ever met on the Coastal Plain of the state.

One day, having only a remnant of time, we went to Richmond to look for weeds about freight-sidings and waste lots. The crop was good but only a few species are worth comment. *Potentilla millegrana* Engelm., native of the prairies in the interior of the country, has come east; it is accompanied by superabundant *Froelichia gracilis,* upon which I commented a year ago, and along the canal from the James and all over the adjacent woods in one area the yam, *Dioscorea Batatas* Dcne., has taken full possession, climbing high or trailing in solid mats on the ground, the stems high in the trees abundantly flowering, those on the ground bearing only axillary small tubers, like tiny potatoes. A similar weeding of Petersburg yielded the subtropical weed, *Gnaphalium spathulatum* Lam., the European *Sambucus nigra* L., probably thrown out from cultivation, and a second species of *Richardia*. In 1939 we were at first much excited when we found a solitary plant of the tropical American *R. scabra* L., but when, soon after, we found solid acres of it the thrill was lessened. In 1940 we did not happen to see *R. scabra*. Instead, we had a run on another tropical species, often in great abundance, *R. brasiliensis* (Moq.) Gomez. Small cites it only from peninsular Florida but in Dinwiddie and Henrico Counties, Virginia, it is well established. The distinctions, not too sharply brought out by Small, will be discussed in Part II.

We wished to get to Cedar Island in Back Bay where, in June, 1935, we had found, with Griscom, so many interesting plants. My friend of many years, Dr. Thomas Barbour, with characteristic generosity offered us the use of the old family place at Barbour Heights, on the outer side of Back Bay; but, since we learned of an available motor-boat which daily made the round trip from near Back Bay village to Cedar Island, it seemed simpler for us to cross in that way. On July 15th, therefore, we drove to Virginia Beach, thence to Back Bay, to consult Mr. Beals, who was in charge of renovations going on and some new construction for the club on Cedar Island. From Century House to "the Beach" was more than 100 miles. When we had ridden about three-fourths of the distance Frank meekly asked: "Are we going way through to the Beach without a stop? I'm dying for a smoke". We were speeding along the great trunk-road, without parking possibilities, which cuts directly across the northern edge of the Great Dismal Swamp. Hopeful tests in the past had invariably shown this stretch of clearing to be an almost uniform and uninspiring cane-brake, a dense jungle of *Arundinaria* higher than one's head. At the next cart-road, however, we turned in and parked. Frank was to have his smoke and we would get out and stretch. Almost immediately, however, the stretching was for a curious herbaceous *Smilax*, with leaves ending in almost tendril-like excurrent midribs. While we were puzzling over this (Long did not tell me just what it is) and collecting specimens, we wondered at the *Scleria* which here makes clumps, with arching culms and pendulous or drooping axillary inflorescences. It somewhat suggested *S. setacea* Poir. but we were too familiar with that slender plant to see more than a habital suggestion. The achenes were perfectly smooth as in *S. triglomerata, S. nitida* Willd. and *S. minor* (Britton) Stone; yet it was none of these. The obvious procedure was to "play trumps". So we took a series; and study shows it to be *S. flaccida* Steudel, described in 1855 from somewhere in South Carolina and not subsequently recognized. The only material in the Gray Herbarium, besides our plant from Norfolk County, is from Florida, Mississippi and Louisiana. Its technical characters and other details will be discussed in Part II. After that experience we encouraged Frank to stop for a smoke whenever he wished!

There was some time for botanizing before dark and, as most wild areas between Virginia Beach and Munden had been visited by us at this season, we hit upon Sand Beach for our quest. We knew it of old but, coming here at a slightly different season, we proceeded to collect a few species not previously noted; and we ate, inordinately perhaps, the luscious big fruits of *Rubus Longii* Fern. Of the numerous blackberries of southeastern Virginia two stand out in memory and are always sought for their superlative fruit, the stiffly branched and often upright *R. Longii* of relatively sterile and dry soils, and the prostrate *R. Grimesii* Bailey, also of sandy or dry and argillaceous openings. Both of them should have a place among cultivated fruits. *Juncus bufonius* was here, a seemingly inane observation, but in nine years of botanizing in southeastern Virginia we have only rarely met this reputedly ubiquitous and supposedly cosmopolitan annual! *Panicum caerulescens,* a regular inhabitant of damp flats back of the dunes, was also present and with it was the northern coastwise *Elymus virginicus,* var. *halophilus* (Bicknell) Bush, our first from south of New Jersey. We also found a new station (this on an inlet to Rainey's Pond) for the always surprising and usually very local *Limnobium Spongia;* while the small *Galactia* on the flat back of the dunes threw me into perplexity. I thought that I had settled *Galactia* for the manual-range, but here and at other stations later in the season I became very humble. The group (likewise *Stropho-*

styles) needs fuller collecting; after that it needs a friend who understands it!

Promptly on the morning of the 16th we crossed with Mr. Beals and his helper, a young carpenter, to Cedar Island. The island has not been too much cleared and we were delighted to get back to the flora seen here six years earlier and to that seen on Long Island a year before. Those species need not again be enumerated. The forest is largely of superb Live Oak, both the typical small-leaved tree and the larger-leaved *Quercus virginiana,* forma *macrophylla* (Sargent) Trelease; and we gazed with delight at the great masses of *Ampelopsis arborea* (L.) Koehne high in the trees and repeatedly remarked upon the subtropical aspect of the forest. *Smilax* again intruded problematic tangles in our path. We did not mind the tangles; the problems are what worry me! *Kosteletzkya virginica* was here represented by the coarsely and heavily rough-tomentose southern var. *altheaefolia* Chapm. (*K. altheaefolia* (Chapm.) Gray), which we had not previously known so far north; the pools were full of true *Potamogeton pusillus* (*P. panormitanus* Biv.), not recorded from south of the Potomac; and at the southern end of the Island we came upon an extraordinary exhibition of *Typha angustifolia,* with the pistillate spikes variously slit into partially united, partially separated strands or quite split to base into 2–5 spreading or drooping portions. Just such abnormalities were discussed by Dr. Harold St. John in Rhodora, xliii. 85–91 (1941).

When the day's work at carpentering was finished Mr. Beals offered to land us, if we had a permit, on Ragged Island, part of the government holdings. My permit from the Superintendant, Mr. Harry Bailey, took care of this question and in the few minutes available we snatched, near the wharf, *Erigeron bonariensis* L., *Pluchea purpurascens* (Sw.) DC., *Verbena scabra* Vahl and other specialties of Long Island reported a year ago. Three large oaks stand near the landing. One is characteristic *Quercus virginiana,* another seems like a hybrid of *Q. nigra* and *Q. Phellos,* and the third, so far as I can see, is the hybrid, × *Q. ludoviciana* Sargent (*Q. falcata* × *Phellos*). A visit to these islands and to False Cape, late in the season, when the marsh plants are mature, would well repay the acute botanist.

We had been inclined to be sentimental over the great festoons of the rather rare *Ampelopsis arborea,* covering the Live Oaks on Cedar Island. Consequently, when, two days later, we stopped to investigate the adventives along the railroad east of Franklin and the plants of a waste lot in Franklin, we felt rather cheap: *Ampelopsis arborea* was there as a weed! Other weedy plants, like *Euphorbia marginata,* obviously came from garden refuse, though now well naturalized; but the abundant *Croton monanthogynos,* its range extended north from North Carolina, surely came out of no garden.

This stop was made on our way to the region of Joyner's Bridge, to follow side-roads through the sands east of the Blackwater. We had already visited the Bridge at three different times, but it was still possible to extend into Isle of Wight County a good number of southern species, *Bulbostylis ciliatifolius* and *Paronychia riparia* Chapm. for instance. The new *Diodia,* already referred to, was here abundant; the recently described *Tephrosia spicata,* var. *semitonsa* Fern., here almost justified omission of the qualifying first syllables of its name; and *Galactia* again caused perplexity. On one tree of *Quercus Phellos* the very narrow leaves had their lower faces white with minute pubescence; ordinarily, no matter how broad or how narrow the leaf in eastern Virginia, it is green beneath. Something may eventually come out of study of this complex group. The last plant to be mentioned from the July collections is a tall variety of *Lyonia ligustrina,* with unusually large fruits, found along a woodland branch near Joyner's Bridge. It proves to be the shrub described by the British dendrologist, Watson, in 1825, from a specimen cultivated in England, as *L. capreaefolia.* From the mass of variations of *L. ligustrina* I am able to pick out a series representing the same extreme and found from Florida to Texas, north to southeastern Virginia, western North Carolina, Tennessee and Arkansas. It and the other varieties of the species will be discussed in detail in Part II.

Northern papers had had brief mention of unprecedented mid-August freshets in Virginia and the Carolinas, but it was not until we reached Richmond that the vastness of the calamity fully impressed us. All Virginia from the lower James River southward and much of the two Carolinas was under water. A week of torrential and unceasing rain, from the mountains to the Coastal Plain, had disrupted all normal traffic; much of Richmond, Petersburg, Franklin and other cities were drowned and it was impossible to guess when or where one could go and come. On our way to Century House long after midnight a guard stopped us, to say that we could not go far on U. S. Route 1; and next morning, when we started on two weeks of botanical exploration (August 19 to September 2), we were flagged at the start toward Courtland and Franklin and told that we could not even reach Homeville. Going on until we found the road completely submerged and were told of cars and families swept off the road by onrushing back-waters, we turned back some miles northwest of Homeville; instead of rare plants being "not away from the Nottoway" the river itself was miles away from the Nottoway and the plants within its reach were all ruined until the next spring. Since all roads leading to the Nottoway, the Blackwater and the Meherrin were thus deep under water, the stronger bridges drowned (sometimes, we were told, under 40 feet of rushing water), and all weaker bridges gone, our beautiful plan to devote our energies to the wooded bottomlands had also gone.

The only dry area we could think of was the freight-yards and waste land about Broad Street Station in Richmond; so we went there for the rest of the day. North of the station the waste ground and cinders were, at this season, a carpet of small adventives, the taller weeds having been destroyed. *Plantago indica* L. (*P. arenaria* W. & K.), now becoming rather general from Maine to Virginia, formed tiny thickets of bushy-branched plants and *Richardia brasiliensis,* here in flower and fruit, was abundant; but, having already had that, we were more interested in the mats of a somewhat arched-ascending *Euphorbia* which was new to us. It is very abundant and quickly distinguished at a glance from the prostrate *E. supina* Raf. (*E. maculata* of authors) and the nearly erect *E. maculata* L. (*E. Preslii*); and we found it next day some miles away, also on railroad cinders. It proves to be *E. humistrata* and adventive (like the equally abundant *Froelichia gracilis*) from west of the Alleghanies. Another plant new to our experience was a stiffly branched *Anthemis* with very short ligules, the Mediterranean

A. secundiramea Bivona, apparently a very recent arrival in America. At another freight-yard, where the clerk was much interested and helped us search for *Zornia bracteata,* which persists or has been slightly introduced there, we were delighted to find the southern *Erigeron quercifolius* Lam. We had collected it two years before in just such a place, the freight-yard at Charleston, South Carolina, but it has not been recorded from north of North Carolina.

This was only a small terminal but we were advised to go to a very extensive yard which was pointed out to us, for there we would surely find many additional species, brought in on freight-cars of one of the large transportation lines. Something in the proposition, which we took to be an invitation, miscarried or failed to coordinate; for next morning, when, driving up from Petersburg, we started into the extensive yard, we were promptly taken in charge by a plain-clothes detective and held for some hours, while questioned by one officer and another and by varying grades to higher officers, as "German spies" who had been "under observation for days" (we had driven to Richmond at noon the day before, returning to Petersburg for the night) and who were hiding their operations under the pretense of "looking for a weed". "Looking for a weed; get that? Yeah, looking for a weed!" The "false" white beard and the queer glasses (bifocals) of the old man were conclusive evidence and his botanizing pick was corroborative. Our friends in Richmond, deans and professors at the University, were all on summer vacation; the ticket-agent at Petersburg, through whom I had for years made reservations, could not be reached, the Norfolk and Western station in Petersburg being under water; Mrs. Bowman had gone shopping and all others who could identify us were away! It was a hot morning, so we had left our coats, containing letters, at home. There we were! When the Chief arrived, however, he graciously took us to Frank's waiting car where, fortunately, I dug out from among our contour-maps (government maps!) a letter two years old from our friend, Mr. John B. Lewis, then of Amelia, addressed to me at the Gray Herbarium. That was verification of our statement that I was Director of that institution, which had meant nothing to the Richmond police;[1] and after a friendly visit with the Chief and the Police Commissioner we went on our way, with the good advice: in these feverish times always have identifications on your persons! We now do so. Every field-naturalist should. We are, to the officers, "queer people".

During the inquisition one of the police-officers had amused himself making imaginary passes at everyone near with my botanizing pick and exclaiming over its wickedness as a weapon. This implement is a copy of a Mexican tool brought from there many years ago by the late C. G. Pringle. Consequently, when, next day, the front pages of the papers carried pictures of Trotsky, his Mexican murderer and the implement used (the prototype of my pick), we congratulated ourselves that the pictures had not come out twenty-four hours earlier.

We had started for Yorktown to get better material of the tropical American *Euphorbia ammannioides* HBK. which, when, almost in the dark some years before, we had collected it there, was at its first known station north of Florida. We were so unnerved by the morning's experiences, however, that we hesitated to leave the car; and when we reached the sand-beach above Yorktown we were at first disappointed to find nothing but *Euphorbia polygonifolia* along the lower and looser sand of the beach. Nearly ready to give up, we went to the upper border of the beach. There, in more firm and unshifting sand, was our plant, plenty of it and at once recognizable by the bluish- or dark-green color of the foliage, that of *E. polygonifolia* being a paler green. When we crossed the James River Bridge from near Newport News we saw that below the south end of the bridge there was a sand-beach, outside the salt marsh. There, again, was *E. ammannioides,* in the same relation to *E. polygonifolia* as at Yorktown; and in the following days we trailed the two, always in the same relative positions and always quickly distinguished by color, along the sand-beaches of the James up-river into Surry County. *Euphorbia ammannioides,* although tropical, is surely at home in Virginia.

[1] Some years ago a prominent German botanist, finding, upon reaching Harvard Square, almost no one who could help him, eventually discovered a taxi-driver who had taken me to the Gray Herbarium. "Why", he said upon reaching his destination, "everyone in Germany knows the Gray Herbarium".

One point was very clear. Whereas up-river all streams were at freshet-pitch, the broad estuary of the James, confluent with Chesapeake Bay, had quickly disposed of the surplus; the beaches and tidal reaches of the lower James were available for exploration and *Euphorbia ammannioides* indicated real discoveries to be made. Before concentrating on a programme so suddenly conceived we had to do what we could with some already known areas. The road to Emporia was open; so we could follow up problems in that direction, but we at once found that the Nottoway was still on the rampage. I have referred to the occurrence of the isolated colony of *Vicia grandiflora* by a woodland path northwest of Emporia. At the border of the same woods, on one side of Three Creek, the still pretty local Asiatic *Arthraxon hispidus* (Thunb.) Makino, var. *cryptatherus* (Hackel) Honda, abounds; across the Creek, the woods are bordered by the tropical Asiatic *Eulalia viminea* (Trin.) Kuntze, a decidedly local adventive. Below Double Bridge it was impossible to approach the Nottoway. A mile away from the river a dislodged wooden bridge was poised in the branches of forest-trees and plants beginning to be uncovered by receding waters were unrecognizable, crisp and black. The still unidentified *Aconitum* was intact, however, but, as already noted, with little promise of ever flowering.

At Chub, as soon as the river had somewhat receded, the whole area became a breeding haunt for mosquitoes. With heads as much veiled as possible we fought our way through their devouring hordes and soon found in the sand a sedge quite new to our field-experience, another southern plant not previously known in the state, *Bulbostylis coarctatus* (Ell.) Fernald. At first happy to collect midgets a few inches high, we soon became selective and would touch nothing which would fill less than the length of the herbarium-sheet; and a few days later we again found this fine species, this time east of Cypress Bridge in Southampton. *Lespedeza* here was perplexing; it always is. In Part II I shall discuss and illustrate some of the complexities of the genus, but there are others still unsolved. At the border of the hickory and oak woods already noted, where *Sanicula marilandica, Hexalectris, Psoralea canescens* and *Scrophularia lanceolata* occur, we found our first

Chenopodium Boscianaum. For a plant originally collected in the Southeast it is remarkably local in eastern Virginia; in New England it is far more common. In the sandy border of a thicket *Centrosema virginianum* was heavily flowering. Since we are inclined to pass this showy plant as not important to collect, I here relented a little and suggested taking just two plants, one apiece, to show complete root-systems. This we did, and upon labeling the material months later it became evident that we had unwittingly got the southern extreme which was described by DeCandolle as *Clitoria virginiana, β. elliptica.* This is its first collection from north of South Carolina. In fact "the first from north of South Carolina" is the key-note to botanizing in the region of Chub. Nevertheless, in dry sand only a little to the south the boreal *Lycopodium tristachyum* (Newfoundland to the Lake Superior region, south to the mountains of North Carolina) forms the largest and healthiest carpet either Long or I had ever seen!

Worried concerning the fate of the unidentified pondweed in the outlet of Lee's Millpond, we soon went there. Ordinarily it would be about 60 miles by road but, since we could nowhere cross the Blackwater and much of Franklin, on the west bank of the river, was still afloat, we were forced to go 100 miles around to get there. Nothing which could be identified by the most acute student of fossil peat remained; the outlet-stream, with its mat of floating aquatics, was a deep trough of bare mud. Proceeding toward the pine barrens to the south we soon found the road at the foot of one slope wholly submerged. The Blackwater was still chiefly a back-water. Eventually reaching portions of the pine-barren area, we found *Carphephorus tomentosus,* var. *Walteri* (Ell.) Fern. and *Andropogon virginicus,* var. *glaucus* (Muhl.) Hack. (*A. capillipes* Nash), both new to the county, in great abundance. *Symplocos tinctoria* was represented by a dwarf shrub, sometimes only a foot high, with very small yellowish leaves. The late Judge Churchill once got the same dwarf near Norfolk. It seems to be worth varietal recognition. *Juncus abortivus* Chapm. was everywhere abundant, while *Asimina parviflora* and *Cleistes divaricata* (L.) Ames, also new to the county, were scattered.

Having cleared off the problems held over from preceding trips, we now started for the lower James; and the farther east of the Piedmont we went the nearer to the Blue Ridge and the Shenandoah Valley we seemed to be, until at the farthest point eastward which we reached, the rapidly disintegrating Miocene bluffs below old Fort Boykin (north of Smithfield), we were getting our first Coastal Plain collection of the northern and inland *Celastrus scandens;* while here *Campanula americana* (MAP 7) and *Lobelia siphilitica,* wide-ranging upland and inland species, were as abundant as farther up the James or as in the mountains, and *Thaspium barbinode* here attained a height well over three feet. We visited the shores or woodlands near the James at seven stations in Surry and Isle of Wight Counties and everywhere the continental and montane species outnumbered those of the Coastal Plain. This, of course, is due to the highly calcareous Miocene fossil-beds here at the surface, where inland as well as coastwise calcicolous types have every encouragement to growth.

The westernmost area examined was slightly above Claremont, where deep ravines have been cut by small streams entering the James. We already knew, slightly east of our present ravines, fine colonies of such localized specialties as *Athyrium thelypterioides* (Michx.) Desv. (the largest we ever saw), *Carex Jamesii, Hybanthus concolor, Euonymus atropurpureus, Aralia racemosa, Stachys Nuttallii* and scores of other calcicoles of the uplands; but, starting upon a new ravine, we gave a real shout when we promptly walked into a carpet of *Athyrium pycnocarpon* (Spreng.) Tidestrom. That surely was one of the last ferns to be expected on the Coastal Plain. *Ponthieva racemosa* (Walt.) Mohr was, of course, here, as at other such places in the county, and *Pedicularis lanceolata* and *Aster infirmus* we had occasionally found before, farther west; but when we came upon colonies of the orange- to vermilion-lipped *Malaxis floridana* (Chapm.) Kuntze, almost at its northern limit, and, while following up its several scattered patches, came upon clumps of upland *Triphora trianthophora* (Sw.) Rydb., nearer the southeastern border of its range, we had difficulty in restraining our joy. For seven years we had sought in vain the southern *Eupatorium incarnatum,* long ago reported from Virginia. Here it was; and with it the northern and inland *Desmodium bracteosum*

(Michx.) DC., new to the Coastal Plain list. On a drier slope, with *Cunila origanoides,* which we had known on the Coastal Plain only at a point 35 miles to the southwest, in Southampton County, there was a colony of *Arabis canadensis* (Maine to Minnesota, south to the Blue Ridge and Alleghenies of Virginia, thence to the mountains of Georgia, etc.). We ought to have been satisfied; but, looking along the spring-fed bottom, where in May we had got the northern and montane *Carex prasina* and where the leaves of *Senecio aureus* reached a diameter of 9 inches (!), we had a new thrill. There was unmistakable *Senecio Crawfordii* Britton, the local species of southeastern Pennsylvania and adjacent region, with its previous authenticated southern limit in Prince George County, Maryland. It is useless to deny that Claremont is a rich botanical center. We always make discoveries there and only a few limited spots in the region have yet been touched.

Along the western end of Cobham Bay, as at Scotland for instance, the famous fossiliferous bluffs of the James are so indurated as to support only a tediously uninspiring living flora, although the paleontologists apparently give the Scotland bluffs superior rank. Consequently, when, desiring to get at sandy beaches on the James, we put the proposition to Frank, we were not over-enthusiastic as he told us of a sand-beach on Cobham Bay. When we got there, however, slightly to the west of Chippokes, one day would not suffice; we came again next day. The steep wooded bluffs have a fine forest, with Hop Hornbeam, Slippery Elm and other trees of rich upland prevailing, and at the bases of the slopes or in the thicket back of the beach the upland vegetation was highly developed, with *Equisetum arvense* here largely represented by the gigantic extreme with forking and reforking branches, forma *pseudosylvaticum* (Milde) Luerss., which, judging from the 2 sheets accumulated by Alvah Eaton, is a very unusual plant. Many upland species already known along the river, *Stachys Nuttallii* and others, would have thrilled us if we had first come to the lower James at this point. They need not be mentioned here; but typical *Eupatorium sessilifolium* was our first from the Coastal Plain, although we had now become somewhat hardened to *E. sessilifolium,* var. *Vaseyi* (Porter) Fern. & Griscom. And on the sands, at the farthest point up-river we have yet found it, was the long-sought *Euphorbia ammannioides,* from here down-river afterward pretty generally seen. Here, too, was the inland limit on the James for *Diplachne maritima* Bicknell, which we had previously seen only about Back Bay; and *Lythrum lineare* we know only slightly farther inland.

Cobham Bay is separated from Burwell's Bay, farther down-river, by a point, to the north of Bacon's Castle, which ends in a great flat of sands and marsh-land, Hog Island. It was here that the original proprietor kept his hogs early in the 17th century, and it was appropriate that, crossing the creek to Hog Island, we should immediately hear the unmistakable squealing of hogs. These and cattle have full control of the place but the genial owner gave us permission to share the vegetation with them. In some marshy spots, fenced off from invasion, as too soft and dangerous for heavy animals with sharp hoofs, we established new inland limits for maritime types: *Distichlis spicata, Spartina alterniflora* var. *glabra, Eleocharis parvula, Juncus Roemerianus* and *Sabatia stellaris* (with the white-flowered form abundant). This was all most interesting but we were still more pleased with shallow pools solidly filled with *Ammannia Koehnei,* var. *exauriculata* Fernald, for this variety of a relatively rare species had been known only as an endemic of the marshes of North Landing River in Norfolk County. Three to four centuries of occupation by cattle and swine of flat and steaming Hog Island, with almost tropical heat and plenty of open woods and thickets, had greatly encouraged ticks. We never imagined so many; and when we got back to the car and found poor Frank stripped and desparately extracting the hundreds of peppery little seed-ticks which had got him and had instantly burrowed in, we were ready to leave. Frank's clothes were safely concealed under a closed cover, to be fumigated on the return home, and he was forced to drive all the way back to Petersburg, girdled in a string and a loin-cloth devised from a small piece of balloon-silk which I used as a shoulder-cape during thunder-showers. Luckily we had no encounters with the police on the way. Hog Island has some obvious disadvantages.

The broad sweep of Burwell's Bay, from above old Mackimmie's Wharf to Day's Point below old Fort Boykin, has its chief village a little back from the western shore, Rushmere, called on the contour-sheets of 1907 Fergusson's Wharf (a name almost forgotten, while the settlement near old Mackimmie's Wharf is now Bailey's Beach). We tried the shore at three points: at Bailey's Beach (Mackimmie's Wharf), at Rushmere, and below Rushmere at a beach-resort which has now monopolized the name Burwell's Bay. If you ask for Burwell's Bay, the native, from Smithfield to Surry, thinks of this resort rather than of the 7-mile sweeping arc in the south shore of the James. Alternating bluffs and depressions are back of the sand-beach. The depressions are chiefly cypress- and gum-swamps, often with bayou-like forking pools of black water. The bluffs are steep, all fossiliferous and with broad hard bands, ragged with the solidified shells of giant Miocene mollusks, shark-skeletons and other sharp protuberances, alternating with other broad bands of soft and seeping or oozing white shell-bearing marls, with the shells soft and disintegrating, the springs bubbling out at all heights, from crests at 30 to 60 feet above the river or from the bases of steep slopes back of the beach. The forest was largely of the richest upland type, with a grand mixture of the commoner inland species interspersed with *Juglans cinerea*, *Quercus montana*, *Ostrya virginiana*, *Acer floridanum* Pax, and *Tilia heterophylla*. These are not Coastal Plain types; but the abundance of the fiercely armored Hercules'-club, *Zanthoxylum Clava-Herculis* (Florida to Texas, north to southeastern Virginia and Arkansas) back of the beach, there associated with *Bumelia lycioides*, var. *virginiana* Fernald (lower James to Cape Henry), the carpets on the sand of the coastal *Euphorbia ammannioides* again, with the coastal *Diodia teres*, var. *hystricina* Fernald & Griscom (Cape Charles and Cape Henry), and the abundance at the bases of the seeping bluffs of the coastwise (tropical America, north to eastern Virginia) *Verbena scabra* Vahl—these convinced us that we had not been set down in the Shenandoah Valley or on the slopes of the Alleghenies. Vegetation was rank: *Equisetum hyemale*, var. *affine* nearly 6½ feet high; the annual *Impatiens biflora* 8 feet high, with trunks 2–3 inches in diameter; *Hydrangea arborescens* with leaves sometimes nearly 6 inches broad and cymes more than

7 inches across. We took many species for record of extreme size and were occupied with this innocuous diversion when suddenly, in the deep crannies of a fallen and very ragged chunk of a sheer cliff we detected *Pellaea atropurpurea!* Long went back through the tangle of lianes (*Decumaria* and *Berchemia* tangled with *Menispermum, Rhus radicans* and *Smilax hispida,* made navigable by sprangling brambles 12 or 15 feet high) and found the sheer hard cliff closely covered with gigantic *Pellaea.* That, again, is not a Coastal Plain type.

Where the bluffs consist of soaking-wet slippery marl the northern and inland *Epilobium coloratum* was tall and of shrubby aspect (a fragment of a lateral branch fills a sheet) and the coastal *Polypogon monspeliensis,* lopping its old panicles into the seepage, where the grains had all germinated, was fantastic with its miniature terminal lawns of young seedlings! In such habitats an *Erigeron,* relatively small on drier ledges, was producing basal rosettes with crisply brittle and fleshy, smooth leaves up to a foot long and 4 inches broad; and its old and shrivelled stems, in late August, often lopped over into perpetually springy paste, were taking root at the upper nodes and there producing new rosettes with fresh flowering stems. This was a most novel plant, with abundant white rays; and when, in June of the current year, we found it everywhere characteristic of the springy and seeping bluffs from below Fort Boykin, in Isle of Wight, nearly to Sunken Meadow Beach in Surry, and in September on the marl-bluffs of Claremont, it became evident that these unique calcareous walls along the lower James support a unique and endemic species of *Erigeron.* This will be further discussed and illustrated (PLATE 695) in Part II.

Vitis was a hopeless tangle. All the regular species of eastern Virginia there abound, with *V. aestivalis* mostly represented by the northern and upland var. *argentifolia* (*V. bicolor* of most authors). Others are precariously close to *V. Baileyana* (western Virginia, westward and southwestward) and sprouts, where fire had run, were perplexing, with deeply cleft leaves, the middle lobe strongly constricted near the base, the veins of the lower surface copiously hirsute. This was a puzzle but Long insisted that it was ordinary *V. vulpina* (*V. cordifolia*), which has essentially unlobed long-pointed and glabrous foliage. As usual, he was right. In June of the present year I found these long sprouts with much dissected hirsute-veined leaves coming from the base of a large vine. Pulling it down from the trees above, there it was, with foliage of the flowering branches uncleft, rounded, long-acuminate and glabrous, typical *V. vulpina*. Ho, hum!

When, snatching a few minutes for lunch, we spread a cloth in the shade near the summer-cottages, we found that the broad carpet all around was a great mat of the Old World *Potentilla reptans*, a relatively rare species in America and not, I think, recorded from Virginia. At this station it makes a continuous carpet in the cleared and settled area, although, as we found last June, sharing the ground with other local adventives.

Below the bluffs there is a broad sand-beach (very weedy with ubiquitous *Saponaria*, *Melilotus*, etc.) and back of the beach a swamp of cypress, gum and other paludal trees. In the thicket between the beach and the swamp many fine species prevail; best of those, not already known from along the lower James, is *Eupatorium altissimum*, another montane species. In the edge of the wooded swamp I picked up a single specimen of *Malaxis floridana* which, the day before, we had seen in some quantity farther west. There must be more but we did not see it. *Sabatia calycina,* the first seen so far north as the James, and *Echinodorus radicans*, also new to our list of James River plants, were here; while the wonderful pink flowers of *Kosteletzkya virginica,* with a spread of 2½ inches, were so much larger than those of New Jersey and Long Island that in Part II I shall attempt a clarification of the group. The great excitement here, however, was caused by the big clumps of a tall and arching *Carex,* with flexuous panicles shattered but still handsome. We got it again in the cypress swamp back of Bailey's Beach, and in June of this year fresh and sumptuous material shows conclusively that it is one of the rarest of sedges, *Carex decomposita*. Singularly few sheets exist in the Gray Herbarium showing actual localities; they are mostly of specimens collected before 1870, the single or rare old vouchers with only the state indicated: duplicating sheets from Penn Yan or Junius or Ontario County, in western New York, all nearly a century old; more modern ones from near Great Falls on the Potomac in Maryland; old specimens marked simply "Florida. *Chapman*"; others, as vague, from "Ohio, *Sullivant*" and "Michigan Territory, June 1832, *Folwell*"; one, with modern data, from Edmonson County, Kentucky, *Svenson;* one from *F. L. Harvey* with no further information than "New to my collection of Ark[ansas] plants. Only this specimen seen"; one from Lawrence County, Alabama, June 26, 1867, *T. M. Peters;* and the usual indefinite sheets from "Louisiana, *Hale*". Two others from the Southeast have good data and are significant because Mackenzie (N. Am. Fl.) excluded both these states from the range: 1 mile southwest of Williamsburg, Virginia, *Grimes;* base of cypress-tree, Greenfield Lake at Wilmington, North Carolina, *Godfrey & Wells.* From such data it is impossible to make a satisfactory map, and state floras regularly indicate the great rarity or early extermination of the plant. In Isle of Wight County material for all herbaria can be easily secured!

I must here content myself with mention of only one more plant. Spanish Moss, *Tillandsia usneoides,* had been known to us in Virginia only in eastern Princess Anne County and near Eastville on the Eastern Shore. It was, consequently, a great surprise, looking up from caring for *Carex decomposita,* to see the familiar balls hanging from branches overhead. They were quite beyond reach, but by balancing on a slumpy knoll and reaching up with a long branch, Long, after many efforts, succeeded in twisting off a few fragments—enough to establish the record of *Tillandsia* up the James to Isle of Wight (nearly to Surry).

We needed fresh material of one of the tidal plants of the Mattaponi to complete a record published a year ago. We thought we had sufficiently explored these fresh tidal shores in the autumn of 1939, but, returning to the region of King William Courthouse, we found that one of the supposedly rare species of *Bacopa,* which, in 1939, we had found so extremely scattered that we spent back-breaking hours in assembling a few sheets of meagre specimens, now formed carpets here, farther up-river and across the Mattaponi in King and Queen County. It was a simple matter to lift mats which cover quarter of the area of a standard herbarium-sheet. I thought I knew what it was, but in August and September of the current year its abundance in equally extensive carpets along the Chickahominy, where it associates with other members of its affinity, raises new questions of identity, so that the solution must be held over until thorough study of the series can be undertaken. This should have satisfied us; but a tall *Echinochloa* with lax and open flexuous panicles up to a foot or more long, the spikelets nearly smooth, the long leaves membranous, was everywhere in the estuary, the culms floating at high tide or the panicles becoming submerged. This was something quite new to us. It seems to be the tropical American *E. crus-pavonis* (HBK.) Schultes, its northern recorded limit almost 800 miles away, in southern Alabama. As if that were not enough, for an estuary already "worked out", *Najas* at low tide began to upset our calculations. The material secured belongs to three species. Before they can be satisfactorily settled additional collections, especially at a later season, must be secured. They illustrate again the complexity of the flora of southeastern Virginia and emphasize, as I shall doubtless repeat until the end: there is plenty to do; there are few thoroughly prepared to do it.

Part II. Range-extensions, technical Notes and Revisions

In Part II I have assembled, mostly in briefer form for quick reference, the principal records of range-extensions found in the preceding diffuse narrative. With them are some not there noted. Several revisions of groups found in eastern Virginia are included, though the study of *Rhus aromatica*, not growing directly out of our field-work, is here published that it may be associated with the discussion of *R. Toxicodendron* and *R. radicans,* based largely upon Virginian experiences. A few records not our own are also added, since they pertain to the region, southeastern tidewater Virginia, primarily studied. As noted at the opening of the paper, we were helped through a grant to the author from the Penrose Fund of the American Philosophical Society. This grant, for which I am deeply grateful, covered the expenses of automobile and boats as well as the employment of an efficient helper through the season. The original photographs for illustration were made chiefly by Dr. Walter H. Hodge, while a teaching fellow in the Laboratory of

Systematic Botany at the Gray Herbarium. Their cost and that of the engraver's blocks has been defrayed through an appropriation for personal research from the Department of Biology of Harvard University. Their reproduction has, with his customary generosity, been made possible through aid from Mr. Long. In the citation of specimens (except in new descriptions or in revisions) the names of the collectors, *Fernald & Long,* are omitted. Plants thought to be unrecorded as members of the flora of the state are indicated by an asterisk (*).

Dryopteris cristata (L.) Gray. To the very few known stations in Tidewater Virginia add one in Southampton County: low sandy woods along Wakefield Road, northeast of Sebrell, no. 11,921, a small and highly localized colony. See p. 492.

Athyrium pycnocarpon (Spreng.) Tidestrom. Surry County: bottom of rich calcareous wooded ravine west of Claremont, no. 12,512, one extensive colony. See p. 520.

Our only Coastal Plain station.

Pellaea atropurpurea (L.) Link. Isle of Wight County: dry cliff and loosened boulders of calcareous conglomerate by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,513 and 12,514, an extensive colony. See p. 524.

Our only Coastal Plain station.

*Equisetum arvense L., forma pseudosylvaticum (Milde) Luerss. Surry County: wooded calcareous slopes by Cobham Bay, James River, northwest of Chippokes, no. 12,515, large plants, with branches spreading 2 dm. from the main axis.

The material in the Gray Herbarium shows none of this form from so far south as Virginia. See p. 521.

E. hyemale L., var. affine (Engelm.) A. A. Eaton. Isle of Wight County: rich calcareous wooded slopes by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,516, stems up to 1.95 m. high. See p. 523.

Potamogeton pusillus L. (*P. panormitanus* Biv.). New Kent County: fresh tidal marsh by Chickahominy River, at "Shady Rest", southeast of Windsor Shades (Boulevard Post-office), no. 12,527. Surry County: tidal pools, Hog Island, no. 12,525. Princess Anne County: sand-bottomed shallow ponds, Cedar Island, no. 12,232. See p. 513.

Extension south from the Potomac.

*P. Berchtoldi Fieber, var. tenuissimus (Mert. & Koch) Fernald (*P. pusillus,* var.). Sussex County: in water at margin of Chappell's Millpond (Honey Pond), west of Lumberton, no. 12,236. See p. 508.

Extension south from New Jersey and Pennsylvania.

P. Spirillus Tuckerm. To the station in New Kent County add one in King William County: fresh tidal margin of Mattaponi River, northwest of King William Courthouse, no. 12,526.

P. epihydrus Raf., var. Nuttallii (C. & S.) Fernald. To the station in New Kent County add one in Isle of Wight County: outlet of Lee's Millpond, no. 12,231. See p. 508.

Echinodorus radicans (Nutt.) Engelm. Local range extended north from Southampton County. Sussex County: in water at margin of Chappell's Millpond (Honey Pond), west of Lumberton, no. 12,237. Isle of Wight County: cypress and gum swamp back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,531. See pp. 508 and 525.

Limnobium Spongia (Bosc) Richard. An additional station in Princess Anne County: shallow water, inlet to Rainey Pond, back of Sand Bridge, no. 12,238. See p. 512.

Bromus catharticus Vahl. Henrico County: waste places and roadsides, Richmond, no. 11,931. Dinwiddie County: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,930. See pp. 492 and 493.

B. purgans L. York County: rich wooded ravine by York River, above Yorktown, no. 11,936. Prince George County to Isle of Wight County: common along the James (many nos.).

*B. japonicus Thunb., var. porrectus Hackel in Magyar Bot. Lapok, ii. 58 (1903). Common in waste ground (many nos.).

Bromus japonicus has been reported from Virginia, and Hitchcock (Man.) maps it as occurring in most states from New England to the Pacific, south to North Carolina, Tennessee, Arkansas and Texas. His illustration (fig. 43) and description, with "awn . . . somewhat twisted and strongly flexuous at maturity" do not agree, however, with the bulk of eastern specimens. They do agree with Thunberg's original diagnosis "aristis divaricatis" and with *B. japonicus*, var. *typicus* Hackel, l. c. In the small representation in the Gray Herbarium the only specimen of var. *typicus* (with divergent awn) from the Atlantic States is one *cultivated* at the Department of Agriculture in Washington in 1895, though the herbarium of the New England Botanical Club contains ballast-land specimens collected in Boston in 1879 and a sheet from mill-waste in Connecticut collected in 1912. The others are from Michigan, Iowa, Missouri, Nebraska, Alberta and Washington. All other material in the Gray Herbarium from the Atlantic States is of var. *porrectus,* with awns directed straight forward. It is surmised that the Virginia record (and those from many other states) was really based on var. *porrectus.*

*Bromus (§ Zerna) **nottowayanus,** sp. nov. (tab. 670, fig. 1–7), culmis 0.6–1.5 m. altis; foliis caulinis 6–8, vaginis nodos plerumque superantibus imis mediisque retrorso-villosis; laminis 0.6–1.3 cm. latis paginis superioribus pilosis, inferioribus glabris vel ad costam hirsutis, basi rotundatis ligula brevi; paniculis nutantibus 0.5–2 dm. longis ramis flexuosis pulvinis vix crassis; spiculis 1.8–4 cm. longis 3–11-floris; gluma inferiore 1–3-nervia, superiore 5–7-nervia; lemmatibus dorso strigoso-pilosis 8–13 mm. longis; aristis 5–8 mm. longis; palea dorso pilosa apice plana.—Valley of Nottoway River, Sussex and Greensville Counties, Virginia: Sussex County: border of dry sandy woods, 4 miles south of Stony Creek, August 19, 1936, *Fernald, Griscom & Long,* no. 6519 (distrib. as *B. purgans* L.); bottomland woods along Nottoway River, east of Huske, July 14, 1940, *Fernald & Long,* no. 12,239 (type in Herb. Gray; isotype in Herb. Phil. Acad.), also June 13, 1941 (young panicles beginning to show), no. 12,927; border of woods near Nottoway River, Green Church Bridge, northwest of Owen's Store, July 14, 1940, *Fernald & Long,* no. 12,240. Greensville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion (gigantic plants with unusual number of exposed nodes, growing in rich and recently burned land), July 14, 1940, *Fernald & Long,* no. 12,241; rich woods along brook entering Nottoway River below Double Bridge, north of Orion, August 21, 1940, no. 12,537; bottomland woods, Nottoway River, north of Orion, September 14, 1941, no. 13,520 (ripe fruit). See pp. 509 and 510.

As noted, our first collection was distributed as *Bromus purgans* L.; but *B. nottowayanus* is technically nearer the more northern and inland *B. latiglumis* (Shear) Hitchcock (*B. altissimus* Pursh, not Gilib.). In *B. purgans* the nodes more generally overtop the leaf-sheaths; the ligule is prolonged beyond the junction (fig. 8) of sheath and blade; the branches of the panicle have strongly thickened pulvini (fig. 9); the first glume is 1-nerved, the second 3-nerved; the lemmas are tightly inrolled (fig. 10) and more pilose at base than above, or quite glabrous in forma *glabriflorus* Wieg.; and the palea is pulverulent on the back or only occasionally pilose. In *B. nottowayanus,* on the other hand, the lower and middle and usually all but the uppermost nodes are overtopped by the sheaths; the ligule is very short or scarcely visible above the rounded summit of the sheath (FIG. 2); the 1st glume is 1–3 nerved, the 2nd 5 (rarely 7)-nerved (FIGS. 5 and 6); the lemmas (FIGS. 4 and 5) are evenly strigose-pilose over the back, their margins scarcely incurved; and the palea (FIG 7) is copiously pilose on the back.

In its prolonged sheaths and in its lemmas scarcely inrolled at margin *Bromus nottowayanus* is similar to *B. latiglumis;* but the two differ in many points. *B. latiglumis* has 10–20 cauline leaves; *B. nottowayanus* only 6–8. The base of the blade just above the junction with the sheath of *B. latiglumis* expands into a characteristic broad flange with a prolonged projection on each side (FIG. 11); *B. nottowayanus* has no such flange at the base of the blade (FIG. 2). The bases of the panicle-branches in *B. latiglumis* have very large pulvini (FIG. 12), those of *B. nottowayanus* (FIG. 3) being relatively slender. In *B. latiglumis* the 1st glume is 1-nerved, the 2nd 3-nerved; in *B. nottowayanus* 3-nerved and 5 (or 7)-nerved respectively. In *B. latiglumis* the lemmas are glabrous, or pubescent particularly at base; in *B. nottowayanus* evenly strigose-pilose all over. In *B. latiglumis* the palea is sometimes pilose but more often glabrous on the back; in *B. nottowayanus* apparently always pilose.

Bromus purgans is a relatively early-flowering species, *B. latiglumis* much later, *B. nottowayanus* intermediate between them in time of anthesis. The flowering material of the latter was collected in July, with belated culms flowering in August. In New England and New York *B. purgans* flowers from mid-June to mid-July, in Virginia from late May through June. In New England, New York, New Jersey and Pennsylvania *B. latiglumis* flowers from August 10 to mid-September; from Ohio and West Virginia westward, from mid-August to late September.

In PLATE 670, FIGS. 1–7 are of BROMUS NOTTOWAYANUS Fernald, all figures from the TYPE; FIG. 1, the TYPE, × ⅔; FIG. 2, summit of sheath, × 4; FIG. 3, bases of branches of panicle, × 4; FIG. 4, spikelet, × 2; FIG. 5, glumes and base of lowest lemma, × 4; FIG. 6, inner face of 2nd glume, × 4; FIG. 7, floret, with palea exposed, × 4. FIGS. 8–10, B. PURGANS L.: FIG. 8, summit of sheath (with ligule), × 4, from Milton, Massachusetts, July 31, 1899, *Kennedy;* FIG. 9, bases of panicle-branches, × 4, from Lansing, New York, *A. J. Eames,* no. 11,378; FIG. 10, portion of spikelet, showing inrolled lemmas, × 2, from no. 11,378. FIGS. 11–13, B. LATIGLUMIS (Scribn.) Hitchc.: FIG. 11, summit of sheath, × 4, from Beau Lac, St. Francis River, Maine, August 14, 1902, *Eggleston & Fernald;* FIG. 12, bases of panicle-branches, × 4, from Sheffield, Massachusetts, August 14, 1920, *Churchill;* FIG. 13, spikelet, × 2, from Ithaca, New York, *F. P. Metcalf,* no. 5828.

B. STERILIS L. DINWIDDIE COUNTY: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,935. See p. 493.

POA BULBOSA L. DINWIDDIE COUNTY: dry roadside and dooryard, Century House, northeast of Burgess, no. 11,743. Our only station.

DISTICHLIS SPICATA (L.) Greene. Extending up the James to SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. 12,538. See p. 522.

DIPLACHNE MARITIMA Bicknell. Extending up the James to SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. 12,541; tidal marsh by Cobham Bay, James River, northwest of Chippokes, no. 12,540. See p. 522.

*ELYMUS VIRGINICUS L., var. HALOPHILUS (Bicknell) Bush. PRINCESS ANNE COUNTY: marshes back of the dunes, Sand Bridge, no. 12,246.

Extension south from New Jersey. See p. 512.

*LOLIUM MULTIFLORUM Lam., forma SUBMUTICUM (Mut.) Hayek. HENRICO COUNTY: waste places and railroad ballast, Richmond, no. 12,251.

SPHENOPHOLIS OBTUSATA (Michx.) Scribn.

In eastern Virginia *Sphenopholis obtusata* occurs in three somewhat definite variations. These are clearly confluent but they have all been treated by competent students of grasses as three distinct species, by others (Hitchcock, Man.) as not worthy recognition even as forms. In sorting the material in the Gray Herbarium certain trends come to light, however, which indicate that each of the three has an area of geographic concentration and that in large areas of the United States one of them abounds to the exclusion or near exclusion of one or both of the others. I am, therefore, returning to Scribner's treatment of 1908[1] when he called them three varieties. I distinguish the three as follows.

[1] Scribner in Robinson in RHODORA, x. 65 (1908).

a. Panicle 0.7–2 dm. long, up to 3 cm. thick, its branches irregularly elongate and not strongly appressed and rounded at summit.
Leaves or their sheaths glabrous or merely scabrous *S. obtusata* (typical).
Leaves or their sheaths pilose........................Var. *pubescens*.
a. Panicle 0.3–1 (–1.3) dm. long, 0.5–1.5 cm. thick, its tightly appressed branches essentially uniform and strongly rounded; sheaths puberulent........................... Var. *lobata*.

Taking as a check the representation in the Gray Herbarium, where, with no specialization upon the grasses, the average run of collections has accumulated, I note the following trends. Typical *Sphenopholis obtusata* is irregularly dispersed over the eastern half of the United States, from Maine to southern Ontario, Minnesota and eastern Nebraska southward. There are no specimens from the Cordilleran region (Alberta to New Mexico and westward), while from Virginia to Georgia there are only 10 specimens as against 27 from New England to North Dakota, Nebraska and eastern Kansas. Var. *pubescens* is not at all represented from northern New England westward, but from southern New England southward to Florida, thence to Louisiana and Missouri, there are 38 sheets, this variety showing a concentration on the Coastal Plain and outer Piedmont. Var. *lobata* has the broadest range, but it is the only variety represented from Alberta to New Mexico, thence west to the Pacific (27 sheets), with marked development from North Dakota to Oklahoma and northeast to northern New England (31 sheets as against 0 of var. *pubescens*). From the Coastal Plain area, whence var. *pubescens* is represented by 38 sheets, var. *lobata* shows only 8. If other herbaria were studied these figures would be greatly increased, but it is doubtful if their trend would be greatly changed.

In southeastern Virginia all three varieties occur.

*Sphenopholis obtusata (Michx.) Scribn. (typical): Dinwiddie County: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,946. Presumably an adventive. See p. 493.

S. obtusata, var. pubescens (Scribn. & Merr.) Scribn. (*Eatonia pubescens* Scribn. & Merr.). Many nos. from Accomac, Henrico, Norfolk and Greensville Counties. Old specimens from Richmond and from Bedford County annotated by Scribner, with the comment that "This is the more common form of *Eatonia obtusata* in the South." See p. 493.

*S. obtusata, var. lobata (Trin.) Scribn. (*Trisetum lobatum* Trin.) Princess Anne County: swale by Nowney Creek, Back Bay, no. 4552. Isle of Wight County: thickets and open woods back of the beach of James River west of Fort Boykin, no. 12,933. Sussex County: clearings, borders of dry woods and roadsides east of Stony Creek, no. 8047.

*S. filiformis (Chapm.) Scribn. Nansemond County: white sand of pine and oak woods and clearings near Cathole Landing, west of Factory Hill, no. 11,747.

First from north of North Carolina. See p. 490.

*S. pallens (Spreng.) Scribn. Southampton County: rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, no. 11,945.

First except for an indefinite station in South Carolina and the unidentified station for the type. See p. 494; also Rhodora, xlii. 357 (1940).

Aira praecox L. Surry County: weed in lawn, Surry Courthouse, no. 11,749. Princess Anne County: sandy open ground near sea, Virginia Beach, *B. L. Robinson,* no. 424.

Certainly a local plant in Virginia. See p. 488.

A. caryophyllea L. Norfolk County: Norfolk, *Heller,* no. 857. Dinwiddie County: dry pastured field east of Burgess Station, no. 11,947.

Much less common than *A. capillaris* Host. Several collections of the latter have unfortunately been distributed as *A. caryophyllea,* this misidentification resulting, in part, from the statement by Hitchcock in Gray's Man. ed. 7, that the spikelets of *A. capillaris* are "2.5 mm. long". Measurements of spikelets and reference to European descriptions indicate that they are 1.5– rarely 2 mm. in length, while those of *A. caryophyllea* range from 2.5 to 3 mm.

Polypogon monspeliensis (L.) Desv. Range extended up the James to Isle of Wight County: seeping argillaceous and calcareous bluffs along Burwell Bay, below Rushmere (Fergusson's Wharf), no. 12,547. See p. 524.

*Agrostis stolonifera L. Isle of Wight County: open bushy margin of Lee's Millpond, no. 12,252. Nansemond County: roadside bank south of Nurney, no. 12,936. Seen in several other counties.

Not recorded by Hitchcock (Man.) from south of New Jersey.

*A. STOLONIFERA, var. COMPACTA Hartm. (*A. palustris* Huds., *A. maritima* Lam.). SURRY COUNTY: sandy tidal shore of Crouch Creek, east of Scotland, no. 8547.

First from south of Delaware and Maryland.

*A. TENUIS Sibth. PRINCESS ANNE COUNTY: swales back of the dunes, Sand Bridge, no. 4548.

Hitchcock (Man.) says "south to Maryland, West Virginia and Michigan", although his map shows a dot squarely in the center of Virginia and another in western North Carolina. The two southern dots were evidently based upon var. *aristata* (Parn.) Druce, which Hitchcock records as occurring south to North Carolina.

A. ELLIOTTIANA Schultes. Local range extended north to SUSSEX COUNTY: argillaceous fallow field south of Stony Creek, no. 11,750. See p. 491.

ARISTIDA LANOSA Muhl. Inland range extended north into SUSSEX COUNTY: dry white sand of woods and clearings near Chub, no. 12,548.

SPARTINA ALTERNIFLORA Loisel., var. GLABRA (Muhl.) Fern. Extending up the James to SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. 12,549. See p. 522.

ZIZANIOPSIS MILIACEA (Michx.) Döll. & Aschers. Extending to the head of tide on the James, in HENRICO COUNTY: margin of a canal, Richmond, no. 11,952. See p. 495.

Late in the season the culms may fork from the upper nodes, producing stout branches (our no. 12,550 from west of Claremont).

*ECHINOCHLOA CRUS-PAVONIS (HBK.) Schultes. Fresh tidal marshes of Mattaponi River, wholly or nearly immersed at high tide. KING AND QUEEN COUNTY: Walkerton, no. 12,557. KING WILLIAM COUNTY: northwest of King William Courthouse, no. 12,556; Horse Landing, near King William Courthouse, no. 12,555. Extension northward from Alabama. See p. 527.

Echinochloa crus-pavonis, an aquatic and very smooth species with flaccid leaves, elongate and loosely open panicle of relatively smoothish spikelets, has been known as a plant of tropical America (South America, West Indies and Mexico). In his *Manual* Hitchcock records it only from "marshes and wet places, often in water, Alabama, southern Texas, and through tropical America at low altitudes." Its abundance in the estuary of the Mattaponi is another instance of the tropical types persisting, far north of their more continuous areas, in estuaries, a situation discussed in some detail by me in Rhodora, xlii. 504 et seq. (1940). In the Mattaponi *E. crus-pavonis* is isolated by nearly 800 miles from its stations in southern Alabama.

E. Walteri (Pursh) Heller, forma breviseta Fern. & Griscom in Rhodora, xxxvii. 137 (1935). Originally described from North Landing River, Norfolk Co. Now known from Isle of Wight County: brackish marsh along Cypress Creek, Smithfield, no. 8949 (distrib. as *E. Walteri*); border of salt marsh, Ragged Island, northeast of Carrollton, no. 12,561.

With the dense inflorescence of typical *Echinochloa Walteri* but with awns only 3.5–4.5 mm. long (exceptionally with a few longer ones), the panicle green in all three colonies (instead of purple), the sheaths scabrous but scarcely strigose-hispid.

Eulalia viminea (Trin.) Kuntze. To the original Virginian station of Blake at City Point, Prince George County, reported in Rhodora, xxxvi. 420 (1934) add an extensive one in Greensville County: roadside bordering rich woods by Three Creek, northwest of Emporia, no. 12,564. See p. 518.

The City Point station persists but is likely to be exterminated. The new one shows every indication that the plant will spread. City Point is translated in Hitchcock's Manual into "near Richmond"; but Richmond and City Point are in different counties and farther apart than are Washington and Brandywine or the Patuxent River, Rockville, Fairfax or Accotink. We have no evidence that *Eulalia* is in Richmond, where, on account of the record, many hours have been spent in fruitless search for it.

Arthraxon hispidus (Thunb.) Makino, var. cryptatherus (Hackel) Honda. Rapidly spreading; new stations in southern Sussex and Greensville Counties. See p. 518.

Andropogon virginicus L., var. glaucus (Muhl.) Hackel. Range extended northward into Isle of Wight County: moist sandy and peaty pine barrens, south of Lee's Mill, no. 12,568. See p. 519.

*Cyperus refractus Engelm. Southampton County: bushy swales and borders of swampy woods near Blackwater River, Cobb's Wharf, no. 10,957.

An inland species, heretofore known in the upland of Pennsylvania, Maryland, District of Columbia and from western North Carolina and Georgia, and westward.

C. Grayii Torr. Occurring only near the coast (on dunes, in dune-hollows, etc., close to the sea) at the northern end of its range (in New England), *C. Grayii* in the South pushes back to the "fall-line sand hills". The inland stations in southeastern Virginia are the following. Isle of Wight County: dry sandy pine barrens south of Zuni, no. 6525; white sand of dry woods and clearings east of Joyner's Bridge, no. 12,265. Nansemond County: white sand of pine barrens, southwest of South Quay, no. 10,136; dry white sand of pine barrens, east of Cox Landing, south of South Quay, no. 10,536; white sand of pine barrens, east of Cherry Grove, south of South Quay, nos. 10,534 and 10,535. Southampton County: white sand of pine and oak woods southeast of Wiggins School, south of Franklin, no. 11,265; dry sand, pine barrens about 7 miles south of Franklin, nos. 7326 (large) and 7326^a (dwarf); dry white sand in oak and pine woods and clearings bordering Assamoosick Swamp, south of Sebrell, no. 10,135; dry white sand in woods, Terrapin Ridge, east of Drewryville, no. 8971.

Through my own stupidity many of these numbers were hastily identified as *Cyperus filiculmis* var. *oblitus* Fern. & Griscom. The two are very different. *C. filiculmis* Vahl has scabrous-margined flat (or folded) leaves and involucres; scales of the spikelets with broad hyaline margins, the terminal scales ending in involute or subulate tips, the rachilla wingless or only narrowly winged and the style 3-cleft nearly to base. *C. Grayii*, on the other hand, has smooth, filiform or filiform-conduplicate leaves and involucres; scales narrow-margined, the midrib not at all prolonged to form slender tips, the rachilla broadly winged, and the style 3-cleft to the middle. Only through my association of *C. Grayii* with coastal sands can I explain my inexcusable misidentifications of it.

*C. ovularis (Michx.) Torr., var. sphaericus Boeckl. Elizabeth City County: Hampton, July 15, 1891, *A. B. Seymour*, no. 8.

Although Britton in Bull. Torr. Bot. Cl. xiii. 215 (1886) cited var. *sphaericus* only from Arkansas, Indian Territory (Oklahoma) and Texas, and Kükenthal adds to the range only Louisiana (type-locality) and Georgia, the variety seems to be a fairly defined one, extending northward to Virginia and into southern Ohio (Vinton, Gallia Co., July 1901, *Kellerman*) southern Indiana (Daviess Co., *Deam*, no. 17,101) and Missouri (Sheffield, *Bush*, no. 41). The Seymour specimen is a close match for an isotype, from *Drummond's* Louisiana material. Typical *Cyperus ovularis* has the usually flat basal and involucral leaves 3–10 mm. long, the longest involucral leaf 1.2–4.5 dm. long; spikes globose-ellipsoid, definitely longer than thick, in maturity 1–2.3 cm. long and 0.8–1.8 cm. thick. Var. *sphaericus* is smaller and more slender, with firmer and more folded leaves only 1.5–5 mm. wide, the longest involucral leaf usually 0.5–1.5 dm. long; the exactly spherical heads few (1–5) and only 7–12 mm. in diameter.

*C. retrorsus Chapm. Accomac County: clearing in pine woods 3½ miles north of Accomac, no. 5231. Princess Anne County: wet depression in pine barrens, Cape Henry, *Fernald & Griscom*, no. 2791. Sussex County: sandy open woods, thickets and clearings by Nottoway River, below Peter's Bridge, southeast of Lumberton, no. 12,263. Southampton County: dry sand, pine barrens about 7 miles south of Franklin, no. 7323. Mostly distributed as var. *cylindricus* (Ell.) Fern. & Grisc.

When Griscom and I studied the variations of *Cyperus retrorsus*—see Rhodora, xxxvii. 152, 153 and plate 342 (1935)—we did not recognize typical *C. retrorsus*, with slenderly cylindric spikes bearing crowded small retrorse spikelets at base, these closely appressed to or parallel with the summit of the ray, from north of South Carolina. The typical form of the species reaches southern New Jersey.

Bulbostylis ciliatifolius (Ell.) Fernald. Range extended northward and northeastward. Sussex County: dry white sand of woods and clearings near Chub, no. 12,582. Isle of Wight County: white sand of dry pine barrens, south of Lee's Mill, no. 12,578; white sand of dry woods and clearings east of Joyner's Bridge, no. 12,267. See pp. 506 and 514.

*B. coarctatus (Ell.) Fern. Sussex County: dry white sand of woods and clearings near Chub, nos. 12,579 and 12,581; Southampton County: dry sandy woods and clearings northeast of Cypress Bridge, no. 12,580. See p. 518.

Extension north from North Carolina.

Scirpus lineatus Michx. York County: old-field swale north of Grafton, no. 11,982. See p. 504.

Collected by Grimes near Williamsburg. Very local on the Coastal Plain.

*RHYNCHOSPORA GRAYII Kunth. NORFOLK COUNTY: Norfolk, *Reed,* old specimen in Herb. Phil. Acad.

Extension north from southeastern North Carolina.

*SCLERIA FLACCIDA Steud. Syn. Pl. Cyp. 174 (1855). NORFOLK COUNTY: peaty clearing, Great Dismal Swamp, north of Yadkin, no. 12,274. First from north of South Carolina. See p. 512.

In RHODORA, xxxviii. 397, 398, pl. 444 (1936), I pointed out three species which had been confused by Core in his *American Species of Scleria,* Brittonia, ii. 63 (1936), as *S. triglomerata* Michx. These were there sufficiently discussed and illustrated by me, except that a character in the hypogynium or basal disk supporting the achene was not then emphasized. True *S. triglomerata* is a relatively coarse plant with depressed-globose achenes 2–2.5 mm. high and 2–2.7 mm. broad, nearly glabrous band on the ventral side of the leaf-sheath, and with a knotty, forking rhizome. It occurs in damp to slightly dry soils from eastern Massachusetts to southern Ohio, Wisconsin and Iowa, south to Florida, Alabama, Mississippi, Louisiana and Texas. *S. minor* (Britton) Stone is a very slender species, with achenes only 1–1.8 mm. high and 1–1.8 mm. broad, inhabiting peaty and boggy places from southern New Jersey to South Carolina. *S. nitida* Willd., with usually elongate and straightish rhizomes or branches of the rhizome, culms erect or strongly ascending and terminated by the inflorescence, without lateral branches, and membranous band of the leaf-sheath pubescent, has ovoid achenes longer than thick (2.8–3.3 mm. long, 2–2.8 mm. broad), *S. nitida* growing principally in dry sands of pinelands and barrens, from New Jersey to Georgia and southern Kentucky.

The plant (no. 12,274) found by us at the northern margin of the Great Dismal Swamp at once challenged attention: it is cespitose, making tussocks, with arching culms bearing capillary lateral branches much as in *Scleria setacea* Poir.; but its sheaths are much as in *S. nitida,* while its lustrous white to buff achenes are more slenderly ovoid. Study of the material shows a very striking difference in the hypogynium. In *S. nitida* of the pine barrens the latter is tuberculate with low rounded pebbling;

in the cespitose and more flexuous and branching plant the hypogynium has the tubercles prolonged into lance-acuminate scale-like blades. Study of all the material in the Gray Herbarium shows the Dismal Swamp plant with branching and flexuous culms and elongate achenes resting upon a hypogynium with lance-acuminate laminate tubercles to occur from Florida to Louisiana. Although the Virginia material is more slender and with narrower leaves than in the Florida plant, some of the Mississippi material and that from Louisiana is quite as slender as ours.

Since a species with so broad a range is unlikely to have been overlooked, although the plant of Florida and Mississippi, along with *S. nitida* and *S. minor,* was identified by Core with *S. triglomerata,* I have checked the original descriptions of the species thus merged by him and there seems no doubt that the cespitose plant with pubescent band on the leaf-sheath, axillary and finally prolonged and flexuous or nodding branches, slenderly ovoid achenes and laminate-tuberculate hypogynia is *S. flaccida* Steudel. Steudel clearly distinguished his new *S. flaccida* from the stiffer and unbranched *S. nitida* as follows (italics mine):

"76. S. NITIDA. *Willd.* (ex *Kunth.* l. c. [Enum. ii.] 350.) . . . achenio lapideo ovato-subgloboso umbonato laevi lacteo-candido nitido, *ad basin margine tumido trigono subtilissimo celluloso-papilloso cincto.*"

"77. S. FLACCIDA. *Steud.* Culmo tenui triquetro vix scabriusculo (2–3-pedali) flaccido, vaginis arctis simpliciter triquetris (angulis non membranaceis nec alatis); ligula brevi; spicis versus apicem caulis subcapitatis paucifloris parum remotis; spiculis androgynis masculis intermixtis; achenio ovato-suborbiculato fragili nitido lacteo laevissimo *basi margine inciso celluloso-papilloso cincto;* stipite brevissimo. A praecedente, cui quoad discum similis pluribus notis diversa. *M. Curtis* legit in Carolina austr."

As above stated, I have seen no material but ours of *Scleria flaccida* from north of Florida and the Gulf States; but since the plant is in the Great Dismal Swamp of Virginia (and, therefore, presumably in North Carolina) there seems every reason to believe that the species which Steudel had from South Carolina with "achenio . . . basi margine inciso celluloso-papilloso cincto" is our plant. As also noted, *S. flaccida* prefers wet, peaty soil, *S. nitida* dry sand, though the two are apparently not restricted to these habitats. When I showed the material from the Great Dismal Swamp to Dr. D. S. Correll he promptly went to his Louisiana material and brought me a sheet quite like our no. 12,274, with an apology for its lack of base. It grew in an inundated gum-swamp where the muck was so deep that he could reach only the culms by creeping out on a floating log. That is *not* the habit of *S. nitida* nor of *S. triglomerata*. It may be of service to others to have the material of these two species cited. I am, therefore, listing specimens seen from south and west of Virginia.

S. NITIDA. NORTH CAROLINA: dry sterile soil, southeast of Granite Falls, Caldwell Co., *L. F. & F. R. Randolph*, no. 1063; dry woods, Columbus, Polk Co., *Peattie*, no. 1086: pineland near Lilington, Harnett Co., *Godfrey*, no. 5648; savannah at Richlands, Onslow Co., *Godfrey*, no. 4471. SOUTH CAROLINA: sand-ridge west of Paxville, Clarendon Co., *Godfrey & Tryon*, no. 1017; open white-sandy oak-pine woods east of Eutawville, Orangeburg Co., *Godfrey & Tryon*, no. 822; pine barren west of Pineville, Berkeley Co., *Godfrey & Tryon*, no. 614. GEORGIA: dry woods, summit of Chattoogata Mts., Whitfield Co., *Harper*, no. 268; dry pine woods near Belair, Richmond Co., *Harper*, no. 1316; sandy soil, Sumter Co., June 17, 1897, *Harper*. KENTUCKY: dry bank, between New Concord and Tennessee State Line, Calloway Co., *Smith & Hodgon*, no. 4096.

S. FLACCIDA. FLORIDA: oak woods and thickets, Duval Co., *Curtiss*, no. 3179; hummock, Duval Co., *Fredholm*, no. 5167; sandy oak woods by salt water, Jacksonville, *Wiegand & Manning*, no. 649; Eustis, Lake Co., *Nash*, no. 316; sand-barrens, Hillsboro River, Tampa, April 9, 1893, *Churchill:* Clearwater, *Tracy*, no. 6965; Miami, *Tracy*, no. 9288; Everglades, Dade Co., *A. A. Eaton*, no. 341a; old field, Alva, Lee Co., *Hitchcock*, no. 431. MISSISSIPPI: Biloxi, *Tracy*, no. 4805; Avondale, March 31, 1898, *Tracy*. LOUISIANA: without stated locality, *Hale;* in tupelo swamp, 3 miles northeast of Franklinton, Washington Parish, *D. S. & H. B. Correll*, no. 9200.

*CAREX LEAVENWORTHII Dewey. PRINCE GEORGE COUNTY: disturbed soil of roadside, rich wooded slopes by James River, Indian Point, no. 11,761. DINWIDDIE COUNTY: border of woods in cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,994. SURRY COUNTY: weed in lawn, Surry Courthouse, no. 11,762. ISLE OF WIGHT COUNTY: in turf under trees by Benns Church, no. 11,995. See pp. 488 and 493.

Not cited from Virginia by Mackenzie in N. Am. Fl.

C. **virginiana** (Fernald), stat. nov. *C. crus-corvi,* var. *virginiana* Fernald in Rhodora, xxxix. 393, pl. 476, figs. 1–5 (1937).

To the several characters distinguishing the plant of bottomlands of the Meherrin and Nottoway systems in southeastern Virginia from *Carex crus-corvi* Shuttlew. of the Mississippi Basin and drainage area of the Gulf of Mexico should be added longer styles and shorter-cleft beaks of the perigynia. With so many characters and so complete isolation *C. virginiana* is better treated as a separate species, although obviously derived from the same ancestral stock as *C. crus-corvi.* On the bottomlands of the Meherrin, northeast of Gaskins, in Greensville County, the panicles reach a length of 2.1 dm. (our no. 12,953).[1]

*C. conjuncta Boott. Dinwiddie County: wooded bottomland of Appomattox River below Petersburg, nos. 11,996 and 11,997. Henrico County: bottomland woods and thickets along James River, west of Varina, no. 11,998.

First known in the Atlantic States from south of the District of Columbia. See pp. 492 and 495.

*C. decomposita Muhl. James City County: swamp along side of creek, 1 mile southwest of Williamsburg, *Grimes,* no. 3925. Isle of Wight County: cypress and gum swamp back of beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,597 and 12,951; similar habitat, Bailey's Beach (MacKimmie's Wharf), near Rushmere, nos. 12,598, 12,949 and 12,950. See p. 525.

The material, over-ripe and apparently not quite typical, collected in late August of 1940, seemed distinguishable from the

[1] *Carex virginiana* has been recorded only from Greensville and Southampton Counties, Virginia, where it abounds on rich bottomlands of rivers entering the sea in North Carolina. It is, therefore, significant that in the Gray Herbarium I find in the cover of *C. stipata* Muhl., var. *uberior* C. Mohr or *C. uberior* (C. Mohr) Mackenzie a very characteristic but wholly immature specimen of *C. virginiana* from river-swamp, Waccamaw River, below Longwood Landing, Horry County, South Carolina, April 22, 1932, *Weatherby & Griscom,* no. 16,441. In their report of it, as *C. stipata,* var. *uberior,* the collectors discriminatingly said: "In the last collection, kindly determined for us by Mr. Mackenzie, the leaves are deep bluish-green and the very young panicle almost as open and branched as in species of the section *Indocarex,* which superficially the specimens much resemble".—Weatherby & Griscom, Rhodora, xxxvi. 39 (1934). *Carex stipata,* var. *uberior* has yellowish-green, flaccid leaves, with the cross-puckered membranous band of the sheath friable, very thin and prolonged at summit, the spiciform panicle dense and, to quote Mackenzie, "4–10 cm. long". Weatherby & Griscom's no. 16,441 not only has the firm and heavily glaucous foliage and the firm veinless and unpuckered band of the leaf-sheath concave at summit, as in *C. virginiana;* its quite immature (not even flowering), lax panicle is more than 2 dm. long and in maturity would easily reach a length of 2.5 dm. It is most difficult to understand how it could originally have been identified by Mackenzie with his *C. uberior.*

chiefly continental *C. decomposita,* but fresh material secured in June, 1941, shows that the supposed differences do not hold. The species is primarily of the Mississippi drainage and of the Coastal Plain of the Gulf of Mexico, Mackenzie (N. Am. Fl.) citing it only from western New York, Maryland (near Great Falls of the Potomac), Ohio, Michigan, Indiana, Missouri, Arkansas, Louisiana, Alabama and Florida. Although Mackenzie did not know the species from North Carolina, it occurs in the region of Wilmington: base of cypress tree, Greenfield Lake at Wilmington, *Godfrey & Wells,* no. 4789. In the two cypress swamps of Isle of Wight County the species roots chiefly upon cypress-bases and -knees, its roots hanging down into the water.

*C. CANESCENS L., var. DISJUNCTA Fernald. PRINCESS ANNE COUNTY: swampy pools near Dam Neck, *Fernald & Griscom,* no. 4317. ISLE OF WIGHT COUNTY: cypress swamp back of sand-beach of Burwell's Bay, James River, at Bailey's Beach (MacKimmie's Wharf), near Rushmere (Fergusson's Wharf), no. 12,956. HENRICO COUNTY: sphagnous bog bordering White Oak Swamp, west of Elko Station, no. 11,991.

Extension south from Maryland. See p. 497.

*C. TENERA Dewey. HENRICO COUNTY: rich wooded slopes by James River, west of Varina, no. 11,985. SUSSEX COUNTY: bottomland woods by Nottoway River, east of Huske, no. 12,958.

Not seen by Mackenzie from Virginia. See p. 495.

C. NORMALIS Mackenzie. HENRICO COUNTY: bottomland woods and thickets along James River, west of Varina, no. 11,986. SUSSEX COUNTY: bottomland woods along Nottoway River, east of Huske, no. 12,961.

Our first stations on the Coastal Plain of Virginia. See p. 495.

*C. RENIFORMIS (Bailey) Small. SOUTHAMPTON COUNTY: small cypress swamp in sandy woods and clearings by Nottoway River, near Carey Bridge, nos. 11,989 and 12,277.

Extension north from South Carolina. See p. 494 and MAP 2.

C. JAMESII Schwein. To the single known Virginia station in Surry County add one in PRINCE GEORGE COUNTY: rich wooded slopes by James River, Indian Point, no. 11,768. See pp. 488 and 520.

*C. TETANICA Schkuhr. SUSSEX COUNTY: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,014.

First in Atlantic States from south of the region of Washington. See p. 501 and MAP 4.

C. DIGITALIS Willd. SURRY COUNTY: rich wooded ravines near James River, west of Ingersoll, no. 11,794; steep calcareous wooded bluffs along James River, above Chippokes, no. 12,976.

Our first stations on the Coastal Plain of Virginia where the species is largely represented by var. MACROPODA Fernald in RHODORA, xl. 400, t. 511, figs. 3 and 4 (1938).

*CAREX DIGITALIS Willd., var. **asymmetrica,** var. nov., perigyniis lanceolato-fusiformibus 3–4 mm. longis obsolete angulatis valde curvatis apice prolongatis.—VIRGINIA: steep wooded banks, ravines and clearings near Three Creek, northwest of Applewhite's Church, Southampton County, May 8, 1940, *Fernald & Long,* no. 11,791 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.), June 5, 1940, no. 12,013; about 3 miles from North Carolina line, Henry County, May 6, 1939, *J. T. Baldwin, jr.,* no. 232. GEORGIA: rich woods along Rocky Creek, 5 miles west of Waynesboro, Burke County, March 30, 1904, *Harper,* no. 2076. FLORIDA: moderately damp rich woods about two miles east-southeast of Tallahassee, Leon County, at 5:35 p. m., April 26, 1925, *Harper* no. 32. See p. 489.

Typical *Carex digitalis* has the rhombic-ovoid, definitely angled and flat-faced perigynia nearly symmetrical or only slightly oblique at the short and scarcely beaked summit and mostly 2.5–3 mm. long. In var. *asymmetrica* of the South the perigynia are lance-fusiform, obscurely angled, 3–4 mm. long and tapering on one side by a long curve to the tip, thus giving a long-beaked appearance. I have sought in vain for other characters; the plants are in other respects very close to typical *C. digitalis.*

C. CREBRIFLORA Wiegand. To the first recorded Virginia station, in Southampton County, add the following. GREENSVILLE COUNTY: bottomland woods, Meherrin River, northeast of Gaskins, no. 12,962. SOUTHAMPTON COUNTY: rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, no. 12,009; sandy woods and clearings near Carey Bridge, no. 12,010. NANSEMOND COUNTY: wooded bottomland of a branch near Cathole Landing, west of Factory Hill, no. 11,785. SUSSEX COUNTY: alluvial bottomland woods along Nottoway River, west of Homeville, no. 12,008. SURRY COUNTY: bottomland woods along Blackwater River, about 1 mile southwest of Dendron, no. 12,963.

C. OLIGOCARPA Schkuhr. SURRY COUNTY: low woods along Gray's Creek, near Old Courthouse Corners, no. 8624.

Our first station on the Coastal Plain of Virginia.

C. AMPHIBOLA Steud. To the original Virginia stations, recorded in 1939 for Surry and Dinwiddie Counties, add many others in these and in PRINCE GEORGE, SUSSEX, SOUTHAMPTON and GREENSVILLE COUNTIES.

*CAREX **rugata,** sp. nov. (TAB. 671, FIG. 1–4), *C. grisea* habitu simillima; foliis viridibus; perigyniis inflatis ellipsoideo-oblongis plus minusve transverse rugatis apice rotundatis vel rotundo-obliquis; achaeniis truncato-obovoideis 2–2.5 mm. longis, 1.8–2 mm. latis basi subcuneatis stipitatis.—Alluvial or bottomland woods of Nottoway River, southeastern VIRGINIA: Sussex County: west of Homeville, May 7, 1940, *Fernald & Long,* no. 11,787 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.), June 5, 1940, *Fernald & Long,* no. 12,004 (TOPOTYPE); southwest of Burt, July 25, 1936, *Fernald & Long,* no. 6110, April 3, 1938, *Fernald & Long,* no. 7783; by Nottoway River, May 20, 1939, *J. T. Baldwin, Jr.,* nos. 277, 279 and 281. Southampton County: near Courtland, June 23, 1936, *Fernald, Long & Smart,* no. 5679; above Cypress Bridge, July 23, 1936, *Fernald & Long,* no. 6109. See p. 486.

Carex rugata has troubled us in the field for five years. It is so close to *C. grisea* Wahlenb. that it would readily pass as that species, for *C. grisea* may be far from griseous in color and its perigynia (FIG. 5) are sometimes puckered. The plant along the lower Nottoway is almost ubiquitous, occupying extensive areas of wooded bottom, and every time we get into a good colony we feel that it can hardly be crowded into *C. grisea,* for the perigynia (FIGS. 2 and 3) are less definitely tipped and always with cross-wrinkling or puckering. The achenes are very different: in *C. grisea* (FIG. 6) somewhat ellipsoid-obovoid, with summit gradually rounded to the style-base, whereas the achenes (FIG. 4) of *C. rugata* are broadly cuneate-obovoid with truncate summit. The achenes of *C. grisea* are so closely invested by the perigynia that some effort and scraping are required to separate them; those of *C. rugata* are so free from the perigynia that a slight rolling of the latter promptly frees the achene. The perigynium is, obviously, readily puckered on account of this "fullness".

In outline the achene of *Carex rugata* somewhat approaches that of *C. amphibola* Steud. (fig. 8) but the latter is more rounded at summit and the perigynia (fig. 7) are prolonged into straight subrostrate tips. Furthermore, the basal sheaths of *C. amphibola* are purple, in *C. rugata* drab.

In plate 671 figs. 1–4 are of Carex rugata Fernald: fig. 1, habit, × ½, from type; fig. 2, inflorescences, × 3, from type; fig. 3, perigynia, × 5, from topotype; fig. 4, mature achenes, × 10, from topotype. Figs. 5 and 6, C. grisea Wahlenb.: fig. 5, pistillate spike, × 3, from Middlebury, Vermont, June 22, 1878, *Brainerd;* fig. 6, mature achene, × 10, from the latter collection. Figs. 7 and 8, *C.* amphibola Steud.: fig. 7, pistillate spike, × 3, from east of Burgess Station, Dinwiddie County, Virginia, *Fernald & Long*, no. 9873; fig. 8, ripe achene, × 10, from no. 9873.

C. gracillima Schwein. To the only Virginian Coastal Plain station recorded (in Dinwiddie County) add the following. Prince George County: swampy bottomland woods along James River, Indian Point, no. 11,766. Greensville County: alluvial bottom by Three Creek, northwest of Emporia, no. 11,767.

C. prasina Wahlenb. Surry County: spring-heads, rich wooded ravines west of Claremont, no. 11,771; spring-heads and brook-sides, rich wooded ravines near James River, west of Ingersoll, no. 11,772. See pp. 488 and 521.

A northern and montane species; our first recorded from the Coastal Plain.

C. debilis Michx., var. Rudgei Bailey (*C. flexuosa* Muhl.). Sussex County: brookside in pine woods by Nottoway River, west of Lamb's no. 12,965. Southampton County: wet swampy clearing at head of rich wooded ravine, Nottoway River, near Davis School, northwest of Courtland, no. 11,764. Greensville County: alluvial bottom by Three Creek slightly above the "fall-line", northwest of Emporia, no. 11,765.

An upland plant; our first stations on and near the Coastal Plain.

*C. lanuginosa Michx. Sussex County: swales and wet thickets south of Stony Creek, nos. 11,797 and 12,024.

First in the Atlantic States from south of the District of Columbia. See p. 491.

C. Emoryi Dewey. King and Queen County: fresh tidal marsh of Mattaponi River, Walkerton, no. 12,599.

Our first station in eastern Virginia.

C. Mitchelliana M. A. Curtis. York County: margin of rill in rich wooded ravine by York River, above Yorktown, no.

12,003. Isle of Wight County: cypress swamp back of sand-beach of Burwell's Bay, James River, at Bailey's Beach (Mackimmie's Wharf), near Rushmere (Fergusson's Wharf), no. 12,978; similar habitat, below Rushmere, no. 12,979; seen in other cypress swamps along the James.

*C. lurida × squarrosa. With *C. lurida* Wahlenb. and *C. squarrosa* L. and clearly combining their characters. Sussex County: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,028. See p. 501.

*Arisaema triphyllum (L.) Schott, var. acuminatum (Small) Engler (*A. acuminatum* (Small). Sussex County: swampy woods northeast of Homeville, no. 12,031.

Small (Man.) restricts his *Arisaema acuminatum* to northern Florida, but says "Forms with the spathe-blade moderately long-acuminate occur in the Coastal Plain as far up as SE Va., and may represent this species". Whether they are anything but extremely large developments of *A. triphyllum* is very doubtful.

A. Dracontium (L.) Schott. To the station already reported in Southampton County add others in Sussex County: open woods along Nottoway River at Peters Bridge, no. 12,032; bottomland of Nottoway River, southeast of Stony Creek, no. 12,280.

Symplocarpus foetidus (L.) Nutt. To the very few stations on the Coastal Plain add one in Charles City County: springhead in ravine, margin of Chickahominy River, Eagle Bottom, no. 11,656. See p. 486.

Wolffia punctata Griseb. To the few recorded stations add the following. Isle of Wight County: cypress swamp back of sand-beach of Burwell's Bay, James River, at Bailey's Beach (MacKimmie's Wharf), near Rushmere (Fergusson's Wharf), no. 12,601. King William County: pond confluent with fresh tidal marsh of Pamunkey River, Sweet Hall, no. 12,602.

Eriocaulon Parkeri Robinson. Local range extended to King and Queen County: fresh tidal marsh of Mattaponi River, Walkerton, no. 12,604.

Tradescantia virginiana L. Henrico County: embankments and cinders of Chesapeake and Ohio Railroad, west of Elko Station, no. 12,033. See p. 497.

Anderson & Woodson cite no material from the Coastal Plain.

T. canaliculata Raf. Sussex County: open woods along Nottoway River at Peters Bridge, no. 12,034. Identified by Dr. Edgar Anderson.

Anderson & Woodson cite and map no Coastal Plain station in Virginia, but many such from Florida to southeastern North Carolina. See p. 499.

Tillandsia usneoides L. Local range extended inland to northwestern Isle of Wight County: high in trees at border of cypress and gum swamp back of beach at Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,609. See p. 526.

Juncus bufonius L. To the very limited stations in southeastern Virginia add one in Princess Anne County: marshes back of the dunes, Sand Bridge, no. 12,286. See p. 512.

J. effusus L., var. costulatus Fernald. Local range extended inland. Norfolk County: wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 12,037. Nansemond County: sandy and sphagnous margins of thickets in pineland southwest of Marsh Hill School, south of South Quay, no. 12,290.

J. Roemerianus Scheele. Extending up the James to Surry County: fresh to brackish tidal marshes, Hog Island, no. 12,610. See p. 522.

J. abortivus Chapm. To the two areas already recorded add another in Isle of Wight County: very abundant in moist sandy and peaty pine barrens, south of Lee's Mill, no. 12,611. See p. 519.

J. diffusissimus Buckl. Local range extended into Greensville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, no. 12,039. See p. 500.

Tofieldia racemosa (Walt.) BSP. To the stations in adjacent counties add one in Isle of Wight County: moist sandy and peaty pine barrens, south of Lee's Mill, no. 12,294.

Amianthium Muscaetoxicum (Walt.) Gray. Local range extended into Isle of Wight County; swampy depressions in sandy pine barrens and open woods, south of Lee's Mill, no. 12,041. See p. 502.

Stenanthium gramineum (Ker.) Kunth. Sussex County: open woods along Nottoway River at Peters Bridge, nos. 12,043 and 12,295.

Far remote from its stations in Shenandoah and Highland Counties, recorded in Claytonia, i. no. 2: 13 (1934). See p. 499.

*Allium Ampeloprasum L., var. atroviolaceum (Boiss.) Regel. York County: becoming very abundant, open roadside and fields south of Yorktown, no. 12,046; abundant near mouth of Indian Fields Creek, above Yorktown, no. 12,047.

Very handsome on account of its large globular dark purple inflorescences but likely to become a worse pest than *A. vineale*, the deep-seated bulbs bearing very numerous small bulblets which rapidly spread the plant. See p. 504.

A. CANADENSE L. HENRICO COUNTY: sphagnous bog bordering White Oak Swamp, west of Elko Station, no. 12,044. SUSSEX COUNTY: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,045. GREENSVILLE COUNTY: similar situation to last, north of Orion, no. 12,212.

Our first stations on the Coastal Plain of Virginia.

ERYTHRONIUM AMERICANUM Ker.

In a piece of rich woodland northwest of Emporia where in favorable conditions the flowers, borne 3 dm. above the bulb, had perianths 3.3 cm. long, individuals growing in thin sterile soil were only 1–1.5 dm. high and with perianths down to 1.8 cm. long. This variation was clearly due to increase or decrease of nutrition.

SMILAX HISPIDA Muhl. To the few recorded stations on the Coastal Plain add the following. PRINCE GEORGE COUNTY: thickets at upper border of beach of James River, Windmill Point, Flowerdew Hundred, no. 12,990. SUSSEX COUNTY: rich woods by Nottoway River, southeast of Stony Creek, no. 12,229; alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,300. YORK COUNTY: rich wooded ravine by York River, above Yorktown, no. 12,048. See pp. 510 and 524.

DISCOREA BATATAS Dcne. HENRICO COUNTY: abundantly naturalized in border of rich woods near margin of a canal from James River, Richmond, no. 12,304. See p. 510.

IRIS PSEUDACORUS L. YORK COUNTY: swale by a small branch near York River, above Yorktown, no. 12,051.

CLEISTES DIVARICATA (L.) Ames. To the small and scattered stations in adjoining counties add an equally meagre one in ISLE OF WIGHT COUNTY: moist sandy and peaty pine barrens south of Lee's Mill, no. 12,616. See p. 519.

TRIPHORA TRIANTHOPHORA (Sw.) Rydb. SURRY COUNTY: rich calcareous wooded ravine west of Claremont, no. 12,617.

Our first station on the Coastal Plain of Virginia. See p. 520.

CALOPOGON PALLIDUS Chapm. Range extended north into ISLE OF WIGHT COUNTY: moist sandy and peaty pine barrens south of Lee's Mill, very scarce, no. 12,310. See pp. 502 and 508.

*C. PULCHELLUS (Sw.) R. Br., forma ALBIFLORUS (Britton) Fernald. NANSEMOND COUNTY: sandy and peaty pine barrens northeast and east of Cox Landing, south of South Quay, no. 12,059; sphagnous savannah-like swale east of Cherry Grove, south of South Quay, no. 12,060, very abundant.

Ordinarily the albino form is rare and casual, but at the station of no. 12,060 it abounds, many scores of plants with their milk-white flowers making a striking display. See p. 502.

Malaxis floridana (Chapm.) Kuntze. To the few recorded stations add the following. Surry County: rich calcareous wooded ravine west of Claremont, plants scattered, rather scarce, no. 17,618. Isle of Wight County: border of cypress and gum swamp back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), very scarce, no. 12,619. See pp. 520 and 525.

Hexalectris spicata (Walt.) Barnh. To the now several known stations add one of 20 or more plants in Sussex County. See pp. 507 and 518.

*Corylus americana Walt., var. missouriensis A. DC. Sussex County: rich woods along Nottoway River, east of Huske, nos. 12,330 and 12,331; rich woods by Nottoway River, above Readjuster Bridge, south of Peanut, no. 12,997. See p. 509.

*× Quercus caduca Trelease (*Q. cinerea* × *nigra*). Nansemond County: a small tree in white sand of pine and oak woods and clearings near Cathole Landing, west of Factory Hill, no. 12,326. See p. 509.

*× Q. carolinensis Trelease (*Q. cinerea* × *marylandica*). Isle of Wight County: tree 25 feet high, in dry sandy pine barrens, south of Lee's Mill, no. 12,627. See p. 508.

*× Q. ludoviciana Sargent (*Q. falcata* × *Phellos*). Princess Anne County: large tree in clearing near landing, Ragged Island, no. 12,323. See p. 513.

*Q. virginiana Mill., forma macrophylla (Sargent) Trelease. Princess Anne County: abundant in low woods along Back Bay, Cedar Island, no. 12,325.

Trees with large leaves (1 dm. long, 4 cm. broad) as abundant as typical small-leaved *Q. virginiana*. See p. 513.

Ulmus fulva Michx. Extending down the James to Isle of Wight County: (several nos.).

Aristolochia Serpentaria L., var. hastata (Nutt.) Duchartre (*A. hastata* Nutt.). Dinwiddie County: rich deciduous woods about old marl-pits east of Burgess Station, nos. 9914 and 10,248 (passing into typical *A. Serpentaria*). Southampton County: rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, no. 12,064; rich wooded ravines, slopes and clearings along Nottoway River, near Davis School, northwest of Courtland, no. 11,817.

In Gray's Man., ed. 7, and in Britton & Brown's Illustrated Flora, ed. 2, only tentatively included as extending north into Virginia.

*RUMEX ALTISSIMUS Wood. DINWIDDIE COUNTY: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 12,065.

No specimens in Gray Herbarium from south of Maryland; cited in Trelease's Monograph as south only to the District of Columbia. See p. 493.

CHENOPODIUM LEPTOPHYLLUM Nutt. To the station near Cape Henry add one (adventive) in SOUTHAMPTON COUNTY: by railroad, Courtland, no. 12,069.

C. BOSCIANUM Moq. ISLE OF WIGHT COUNTY: sandy beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,645. SUSSEX COUNTY: disturbed spot at border of dry sandy hickory and oak woods near Chub, no. 12,644.

Our first specimens on the Coastal Plain. See p. 519.

SALSOLA KALI L. Extending up the James to ISLE OF WIGHT COUNTY: sandy beach of Burwell's Bay, below Rushmere (Fergusson's Wharf), no. 12,647.

PARONYCHIA RIPARIA Chapm. Range extended northeastward into ISLE OF WIGHT COUNTY: white sand of dry woods and clearings east of Joyner's Bridge, no. 12,344.

CERASTIUM BRACHYPETALUM Desportes. To the first American station (south of Franklin), recorded in 1939, add another, also in SOUTHAMPTON COUNTY: roadside thicket, bordering dry sandy pine woods by Nottoway River, near Carey Bridge, no. 11,821.

*SILENE CUCUBALUS Wibel. YORK COUNTY: sandy beach of York River and fields above Yorktown, no. 12,073. HENRICO COUNTY: cinders of Chesapeake and Ohio Railroad, Elko Station, no. 12,072. See p. 505.

Extension south from Maryland and the District of Columbia.

*S. ANTIRRHINA L., forma DEANEANA Fernald. YORK COUNTY: open roadside banks south of Yorktown, no. 12,071.

*CERATOPHYLLUM ECHINATUM Gray. SUSSEX COUNTY: in water at margin of Chappell's Millpond (Honey Pond), west of Lumberton, no. 12,346. PRINCESS ANNE COUNTY: West Branch Creek, west of Pungo, no. 10,642. See p. 508.

The study by Dr. W. C. Muenscher in Am. Journ. Bot. xxvii. 231–233 (1940) brings out the apparently constant relation of the fruit-characters to the foliage of seedlings in *C. echinatum* and the commoner and amphigean *C. demersum.* Study of all fruiting material in the Gray Herbarium shows that, in addition to the fruit-characters (which are seen in only 1 collection in 10 or 20), the two can be separated by mature foliage. In

C. demersum the leaves have the capillary to linear and flattened divisions serrate; in *C. echinatum* they are all subcapillary (not linear) and entire. In the collections before me *C. demersum* exhibits a semicosmopolitan range, in North America found from Quebec to British Columbia and far to the south. *C. echinatum* seems to be strictly North American, from Florida to Texas and Mexico, north to southern Maine, southwestern Quebec, New York, Ohio, Michigan and Illinois. The collections assembled in the herbarium show 2 or 3 sheets of *C. demersum* to every 1 of *C. echinatum* over the same broad area.

Ranunculus carolinianus DC. A new northern outpost in Prince George County: swampy bottomland woods along James River, Jordan Point, no. 11,831. See p. 488.

*Hepatica americana (DC.) Ker., forma rhodantha Fernald. Southampton County: rich marly woods along Three Creek, northwest of Carey Bridge, no. 11,678.

*H. americana, forma candida Fernald. Surry County: rich wooded ravine northwest of Ingersoll, no. 11,680.

Caltha palustris L. To the very scattered Coastal Plain stations add one in Surry County: along brook at base of rich wooded ravine northwest of Ingersoll, no. 11,681. See p. 486.

Xanthorhiza simplicissima Marsh. Henrico County: rich wooded slopes by James River, west of Varina, no. 12,080. Southampton County: rich woods and thickets near Raccoon Creek, north of Mill Neck Church, no. 12,350. Nansemond County: dry wooded slope by a branch entering Blackwater River, northwest of Duck's Store, no. 12,351.

Our first Coastal Plain stations. See pp. 495 and 508.

Asimina parviflora (Michx.) Dunal. Local range extended into Isle of Wight County: white sand of dry pine barrens, south of Lee's Mill, no. 12,657. See pp. 492 and 519.

Corydalis flavula (Raf.) DC. Henrico County: rich wooded slope of ravine by James River, west of Varina, no. 11,686; railroad bank bordering White Oak Swamp, west of Elko Station, no. 11,687. Prince George County: rich wooded slopes by James River, Indian Point, nos. 11,685 and 11,838. Dinwiddie County: wooded bottomland of Appomattox River below Petersburg, no. 12,083.

Our first Coastal Plain stations; but previously reported from Virginia Beach. See pp. 486 and 488.

Draba brachycarpa Nutt. Sussex County: dry white sand of woods and clearings near Chub, no. 12,658. Southampton County: weed in lawn of courthouse, Courtland, no. 11,839.

Our first Coastal Plain stations. See p. 489.

ARABIS LAEVIGATA (Muhl.) Poir. Local range extended eastward into YORK COUNTY: rich wooded ravine by York River, above Yorktown, no. 12,086. See p. 505.

A. CANADENSIS L. Now added to the remarkable assemblage of inland and upland types in SURRY COUNTY: dry wooded upper slopes of ravines west of Claremont, no. 12,660. See p. 521.

SEDUM TERNATUM Michx. To the relatively few known stations on the Coastal Plain add one in SUSSEX COUNTY: on a steep slope, woods by Nottoway River, southwest of Lamb's, no. 12,357.

(*To be continued*)

ANOTHER CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(*Continued from page 553*)

Hydrangea arborescens L. In southeastern Virginia two strikingly different extremes of the species occur: typical *H. arborescens,* with the principal leaf-blades broadly ovate to suborbicular, cordate to broadly rounded at base, the better developed ones two-thirds as broad to as broad as long (8–15 cm. broad); and var. oblonga Torr. & Gray, with the principal leaf-blades gradually rounded to tapering at base, narrowly ovate to lance-elliptic or -oblong, the better developed ones one-third to two-thirds as broad as long (3–8 cm. broad). The original Clayton material was of the first variety. The specimens before me (besides a tracing of the Clayton type) show typical *H. arborescens* in southeastern Virginia only from the calcareous area of the James River bluffs and ravines; var. *oblonga* more widely dispersed.

H. arborescens L. (typical). Surry County: rich wooded gullies along James River, below Sunken Meadow Beach, nos. 8285 and 13,034. Isle of Wight County: seeping argillaceous and calcareous bluffs along Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,662 and 13,032; similar habitat, west of Fort Boykin, no. 13,033. Forma grandiflora Rehder, with all the flowers sterile and showy, is cultivated; collected on rubbish near Emporia, no. 6601. See p. 523.

H. arborescens L., var. oblonga Torr. and Gray. Surry County: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7863; rich calcareous woods at head of Sunken Meadow Creek, south of Claremont, no. 8284. Isle of Wight County: seeping calcareous bluffs along Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 13,035; similar habitat, west of Fort Boykin, no. 13,036. York County: rich wooded ravine by York River, above Yorktown, nos. 12,093 and 12,094. Southampton County: rich wooded ravine by Nottoway River, near Davis School, northwest of Courtland, no. 11,697. Middlesex County: wooded slope by Rappahannock River, Bay Port, no. 13,348.

Amelanchier in Southeastern Virginia (plate 672).—In late March and early April *Amelanchier* is fully flowering in southeastern Virginia; and the rather scanty or too often blasted fruits are mature in May or June. Three species are tall fastigiate shrubs from 1.5–5 m. high, one of these often becoming a fine tree up to 10 (or even 13) m. high; the fourth species is a low colonial shrub, spreading by stolons and forming loose colonies with flowering or fruiting stems only 0.2–1 m. high, suggesting but quite distinct from the northern *A. stolonifera* Wiegand. All four are readily matched with types or isotypes of species already described, but in at least two cases the types of Linnaeus and of Michaux have been so misinterpreted by recent students of the genus that it is necessary to start at the beginning!

Mespilus canadensis L. Sp. Pl. i. 478 (1753) was published with unusual lack of involving references, merely the plant of Linnaeus's herbarium described, with a single reference to a description of Gronovius. The original treatment follows:

> *canadensis.* 5. MESPILUS inermis, foliis ovato-oblongis glabris serratis, caule inermi.
> Mespilus inermis, foliis subtus glabris obverse-ovatis. *Gron. virg.* 54.
> *Habitat in* Virginia, Canada. ♄

The late Dr. B. Daydon Jackson has indicated that Linnaeus had material of this species in his herbarium during the preparation of the first edition of Species Plantarum. That, therefore, is the type material; and Mr. Savage sent me some years ago photographs of these 3 sheets of *M. canadensis* which Linnaeus had prior to 1753: two sheets not marked by Linnaeus but conspecific with sheet no. 19, clearly marked by Linnaeus "5 K *canadensis*", i. e. species no. 5, collected by Kalm. This, the TYPE (because bearing the specific name in Linnaeus's hand and, as shown in the photograph, "foliis ovato-oblongis"), is here reproduced as PLATE 672, FIG. 1. That it is very characteristic *Amelanchier oblongifolia* (T. & G.) Roemer, based on *A. canadensis*, var. *oblongifolia* T. & G., can hardly be doubted, a conclusion independently reached by Mr. C. A. Weatherby when he looked up the material in the Linnean Herbarium. It is, therefore, unfortunate that, when he so clearly differentiated our species of *Amelanchier* and thus gave study of the genus a new and stimulating interest, Wiegand[1] seems to have misunderstood the basis of *A. canadensis.* He had had a comparison made by a botanist not familiar with the eastern species and he then used the Linnean name for the largest member of the genus, the large shrub or tree with cordate, ovate or broadly ovate-oblong, sharply serrate leaves which, like those of true *A. canadensis* (*A. oblongifolia*), are pubescent beneath on unfolding, losing most of their pubescence with age. The latter tree has often been called *A. Botryapium* (L. f.) Borkh.; but this combination rests directly on *Pyrus Botryapium* L. f. Suppl. 255 (1781), which was based upon the *Mespilus canadensis* of Murray's ed. 13 of L. Syst. Veg. (1774). Murray altered the original Linnean account and omitted the Gronovian citation and, as in case of the other species, also the geographic source. Murray's alteration resulted in the following, under *Mespilus:*

> *canadensis.* 5 M. inermis, fol. ovato-oblongis glabris serratis acutiusculis. *Tenera lanata; adultior nuda. Racemi elongati.*

The diagnosis of Linnaeus filius of his *Pyrus Botryapium* was compounded from the description by his father and that of Murray of *Mespilus canadensis:*

> *Botryapium.* PYRUS inermis, foliis ovato-oblongis serratis acutis, racemis simplicibus elongatis.
> Mespilus canadensis. *Syst. veg. ed.* 13. *p.* 388.
> *Habitat* in Virginia, Canada. *Ehrhart.* ♄

Mr. Savage sent me photographs of all the specimens in the Linnean Herbarium which were placed by Linnaeus and his later editors under *Mespilus canadensis.* These all belong to *M. canadensis* as above typified. I can see, therefore, no probability that, when Murray redescribed *M. canadensis,* he was defining a different species nor that the younger Linnaeus, under the name *Pyrus Botryapium,* was defining a species different from that originally diagnosed by his father. Neither Murray nor Linnaeus filius otherwise disposed of the original *Mespilus canadensis* of 1753. The fact that in the Supplement the latter did not cite *M. canadensis* as starting with Species

[1] Wiegand, *The Genus Amelanchier in eastern North America,* Rhodora, xiv. 117–161, plates 95 and 96 (1912).

Plantarum (1753) is of no significance, for it was his regular practice to cite the species there as starting not from Sp. Pl. but from the latest treatments: *Mespilus Amelanchier* from Syst. Veg. ed. 13, not Sp. Pl. ed. 1; *M. arbutifolia* from Syst. Nat. ed. 13, not Sp. Pl. ed. 1; etc., etc. The younger Linnaeus gave in addition to the brief diagnosis a somewhat detailed description of *Pyrus Botryapium,* but this is wholly consistent with sheet no. 21 in the Linnean Herbarium, also Kalm material, this in flower, of true *Mespilus canadensis:* a branch with unfolding white-felted leaves, racemes with lanate hypanthium, ascending calyx-lobes and relatively short petals (perfectly characteristic *Amelanchier oblongifolia*).

Under "*A. canadensis*" of his treatment Wiegand cites numerous synonyms besides *Pyrus Botryapium* and its resultant combinations. The first two are cited with doubt, and this doubt must still continue. The first is *Crataegus racemosus* Lam. Encyc. i. 84 (1783). Lamarck's account was very sketchy and he thought that the shrub cultivated in the Jardin du Roi might be *Mespilus canadensis.* It was a branching shrub 6–10 feet high, with oval-oblong, acute, dentate leaves white-felted beneath when unfolding but becoming glabrate. This account is too like that of *Mespilus canadensis,* then cultivated in European gardens; furthermore, Professor Humbert and M. Metman have been unable to locate any specimen of it preserved by Lamarck. In fact, they have informed me that apparently no herbarium specimens were preserved of many species described from living plants in the Jardin du Roi. It is, therefore, wholly unsafe to identify the large shrub and tree with cordate-ovate leaves, which Wiegand treats as *A. canadensis,* with *Crataegus racemosus* Lam. Similarly, *Mespilus nivea* Marsh. Arbust. 90 (1785) is altogether too vague, unless an original specimen of it can eventually be discovered. Its transfer into *Amelanchier* would merely lead to the doubt which surrounds so many names unfortunately taken up from Marshall's inadequate and often merely impressionistic accounts. *Crataegus amoena* Salisb. was illegitimate, merely a substitute for *Mespilus canadensis* L.

The first clear account of the tree or large shrub called by Wiegand *Amelanchier canadensis* was that of *Mespilus canaden-*

sis, var. *β. cordata* Michx. Fl. Bor.-Am. i. 291 (1803). Michaux divided *M. canadensis* into four varieties: Var. *α. obovalis,* the dwarf stoloniferous shrub of the Coastal Plain from Georgia to southeastern Virginia; var. "*β. cordata:* arborea: foliis cordato-ovalibus, conspicue acuminatis . . . a Canada ad Virginiam et in montibus Carolinae"; var. *γ. rotundifolia:* arborescens, etc. "in Canada"; and var. *δ. oligocarpa:* "in America boreali". In 1810, the younger Michaux, evidently taking the name from his father's first word of diagnosis, elevated *M. canadensis,* var. *cordata* to specific rank as *M. arborea* Michx. f. Hist. Arb. Am. Sept. iii. 68, t. 11 (1810). The beautiful plate, with cordate-oval serrate and acuminate leaves, flowers with long petals, and fruits with short and tightly reflexed calyx-lobes, is conclusive; so are the diagnosis, emphasizing the characters, "*foliis subovalibus, acutissime serratis, subacuminatis; adultis glabris*", and the fuller account of its attaining in favorable situations "une élévation plus grande, mais qui cependant n'excède pas 35 à 40 pieds (11 à 13 mètres) sur 10 à 12 pouces (26 à 32 centim.) de diamètre" and "Les feuilles . . . dans le commencement de leur développement, couvertes d'une duvet argentin, très-épais, mais qui disparoît à mesure qu'elles deviennent plus grandes." Here, then, is the first perfectly clear name for *Amelanchier canadensis* sensu Wiegand. Most unfortunately the combination based upon the very appropriate name, *Mespilus arborea,* has to be here made.

Amelanchier **arborea** (Michx. f.), comb. nov. *Mespilus arborea* Michx. f. Hist. Arb. Am. Sept. iii. 68, t. 11 (1810). *Mespilus canadensis* L., var. *β. cordata* Michx. Fl. Bor.-Am. i. 291 (1803). *A. canadensis* sensu Wiegand in Rhodora, xiv. 150, pl. 96, fig. 6 (1912), not *Mespilus canadensis* L., basinym. A portion of the original plate of *M. arborea* is reproduced as our plate 672, fig. 2.

In southeastern Virginia the expanding flowers of *Amelanchier arborea* are commonly suffused with pink, especially on the lower faces of the petals; farther north the petals are more definitely white.[1] Except for this color I can find no other difference.

The third species in southeastern Virginia with fastigiate shrubby habit is near *Amelanchier canadensis* (*A. oblongifolia*),

[1] In Va. Journ. Sci. ii. 118 (1941), Dr. Allard records the pink-flowered form from Loudon County.

but with short, oval to obovate leaves coarsely toothed at summit but less so along the margin below, and with compact and short racemes, the calyx-lobes in fruit spreading-ascending or scarcely recurved. This closely matches an isotype of *A. austro-montana* Ashe in Journ. Elisha Mitchell Soc. xxxiv. 138 (1918), described from the valley of French Broad River in extreme southwestern North Carolina.

Another tall shrub awaits better material. This is a shrub of pine-barren swamps, with nearly entire oblong leaves. Its flowers and fruits are unknown.

The last species to be considered illustrates as vividly as do *Amelanchier canadensis* and *A. arborea* the difficulty of undertaking monographic or revisionary work on a genus without most carefully checking the types or good photographs of the types. The dwarf stoloniferous and colonial shrub of southeastern Virginia, probably unknown to Wiegand in 1912, is superficially somewhat like *A. stolonifera* Wiegand (1912) of the northeastern states. The shrub of the Coastal Plain of southern Virginia, however, has very short and compact flowering racemes only 1–2.5 cm. long, with very short pedicels, which in fruit lengthen to only 3–8 mm. The calyx is tomentose during anthesis, the short calyx-lobes divergent after anthesis. The leaves are at first more or less white-pubescent beneath but soon glabrate, elliptic-oblong or oblong-oval to oblong-obovate, in maturity ranging from 2 cm. long and 1 cm. wide to 5.5 cm. long and 3 cm. broad and with small teeth extending along the margin. It ranges from Georgia to southeastern Virginia and was described by Michaux in his Flora Boreali-Americana, i. 291 (1803) as *Mespilus canadensis*, "Var. *α. obovalis:* humilior; foliis oblongiuscule obovalibus . . . in Carolina inferiore." Specimens before me from both North and South Carolina ("Carolina inferiore") are clearly Michaux's plant. The photograph of it, which I took at Paris in 1903 and which has been in the organized material in the Gray Herbarium for 38 years, shows it to bear Michaux's original label "*Mespilus canadensis α. obovalis.* Arbriss[eau] de deux pieds de haut. Carolines." This photograph[1] of Michaux's type of a Carolina shrub "2 feet high" was

[1] Like so many of Michaux's collections, material of different things was mounted (by someone else) unintelligently with one label; but most of the material clearly belongs with the label and with Michaux's description.

labeled by Wiegand during his revision of the genus in 1912, "May be an extreme form of *Amelanchier oblongifolia* (T. & G.) Roem."; but by Small (*Man.*) the southern dwarf and colonial species is merged with the dwarf and colonial northern *A. stolonifera* Wiegand (1912). If Small's merging of the two should seem to some correct, then Wiegand's name of 1912 must be set aside. Michaux's original diagnosis of his *M. canadensis*, var. *obovalis*, "humilior; foliis oblongiuscule obovalibus" for a shrub "2 feet high" was quite satisfactory and in sharp contrast with that of the next variety "*β. cordata:* arborea; foliis cordato-ovalibus, conspicue acuminatis," which soon became *Mespilus arborea* Michx. f.

Nevertheless, in discussing his all-inclusive *A. canadensis* in the Silva of North America (all-inclusive because uniting as a single species true *A. canadensis, Mespilus arborea* Michx. f., the boreal *A. Bartramiana* (Tausch) Roem., and others) Sargent made the new combination *A. canadensis*, var. *obovalis* Sargent, Silva, iv. 128 (1892),[1] based upon Michaux's South Carolina *Mespilus canadensis*, var. *α. obovalis*, the stoloniferous "shrub 2 feet high," Sargent saying "The most distinct of these forms is *Amelanchier Canadensis*, var. *obovalis*. This is a tree sometimes twenty-five or thirty feet in height, with a single stem or often with a cluster of spreading stems. . . . This variety is found in Nova Scotia and New Brunswick . . . and is abundant in Quebec and Ontario, extending northward to the valley of the Mackenzie River . . .; ranging southward along the Allegheny Mountains to Virginia . . . and occasionally occurs, much reduced in size, in the southern coast region from Bluffton, South Carolina, to the shores of the Bay of Mobile." Only the extreme southern "much reduced" shrub secondarily mentioned by Sargent belongs to var. *obovalis* sensu stricto!

[1] Although in 1892 Sargent made the combination *Amelanchier canadensis*, var. *obovalis* (Michx.) Sargent in correct form, citing the basinym with full bibliographic reference, the same combination, inadequately supported by reference to the basinym and with the wrong synonym cited, was published in their always doubtfully adequate bibliography by Britton, Stern & Poggenberg in their Preliminary Catalogue of Anthophyta and Pteridophyta, 17 (1888), as follows:

> "**Amelanchier, Lindl.**
> Canadensis, (L.), Medikus (fide Steudel.)
> var. obovalis, (Michx.) (*var. oblongifolia, T. & G.*)"

Michaux's place of publication was not cited (that was left to others to hunt for), and "var. *oblongifolia*" was evidently meant to define the identity of var. *obovalis*.

Not until Ashe made the combination *Amelanchier obovalis* (Michx. f.) Ashe in Bot. Gaz. xxxv. 434 (1903), based upon *Mespilus canadensis*, var. *α. obovalis* Michx., did clarification of the species begin; but it merely began, for, although Ashe described a Coastal Plain "shrub 9–15 dm. high", he also included, somewhat like Sargent, "a small tree . . . attaining a maximum height of about 4.5 m." What the latter is I cannot say without access to Ashe's material. In southeastern Virginia such a tall shrub or small tree would be *A. austro-montana* Ashe (1915) which was originally described as up to 4 m. high. Whether the Clayton material described by Gronovius "foliis obverse-ovatis" and a secondary element of the Linnean species, belongs in *A. austro-montana* or in *A. obovalis* cannot just now be determined, the Gronovian plants being at present stored underground in England and practically inaccessible. Since no name was based on this material its identity is relatively unimportant, but the further account by Gronovius of it as "Frutex . . . humilis, . . . foliis subrotundis, eleganter serratis, & ad apicem rotundis", at least piques the imagination!

In southeastern Virginia the following species of *Amelanchier* are now recognized.

Amelanchier canadensis (L.) Medicus, as to type, *Mespilus canadensis* L., the type shown in our plate 672, fig. 1. *A. canadensis β. oblongifolia* Torr. & Gray. *A. oblongifolia* (Torr. & Gray) Roemer and later authors, including Wiegand in Rhodora, xiv. 147, pl. 96, fig. 5 (1912).—Common in eastern Virginia (many nos.).

*A. austro-montana Ashe. Surry County: peaty thicket east of Surry Courthouse, no. 9948; dry pine and oak woods about 3 miles northwest of Surry Courthouse, no. 13,039; at foot of wooded bluff by James River, above Scotland, no. 13,041. Southampton County: dry woods north of Sebrell, no. 7869; wooded swamp about 7 miles south of Franklin, no. 9949; low woods southeast of Little Texas, no. 11,700. Nansemond County: sandy woods and thickets south of Cleopus, no. 13,040. See p. 486.

A. arborea (Michx. f.) Fernald. Common (many nos.). A portion of the original plate of Michaux filius is shown in our plate 672, fig. 2.

*A. obovalis (Michx.) Ashe, as to type, *Mespilus canadensis*, var. *α. obovalis* Michx. Prince George County: dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, no. 5790; argillaceous and siliceous boggy depression southeast of Petersburg, at head of Poo Run, no. 9947. SUSSEX COUNTY: pinelands 3–4 miles northwest of Waverly, nos. 7072, 7870 and 13,042; dry sandy pine woods northwest of Homeville, no. 7073. SOUTHAMPTON COUNTY: moist peaty and sandy depressions in pine barrens, south of Franklin, no. 7448. GREENSVILLE COUNTY: argillaceous clearing near Readjuster Bridge over Nottoway River, north of Orion, no. 13,043; mossy pineland east of Slagle's Pond, north of Emporia, no. 11,847. ISLE OF WIGHT COUNTY: dry sandy pine barrens and open woods, south of Lee's Mill, no. 11,846. NANSEMOND COUNTY: low pineland east of Whaleyville, no. 7449; pine woods south of Suffolk, no. 7074. A flowering tip from no. 7072 and a fruiting branch from no. 9947, both × 1, are shown in PLATE 672, FIGS. 3 and 4; my photograph of Michaux's type (quite like our FIG. 4) being too poor for reproduction. See p. 505.

*POTENTILLA MILLEGRANA Engelm. HENRICO COUNTY: waste places and railroad ballast, Richmond, no. 12,363. See p. 510.

Native from the Prairie States westward; obviously adventive.

*P. REPTANS L. ISLE OF WIGHT COUNTY: forming extensive carpets back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,664. See p. 525.

Extension south from New Jersey and Pennsylvania.

*RUBUS PROCERUS P. J. Muell. HENRICO COUNTY: waste places and roadsides, Richmond, no. 12,111.

Spread abundantly from cultivation.

R. TRIVIALIS Michx. DINWIDDIE COUNTY: thicket bordering freight-yard of Atlantic Coast Line, Petersburg, no. 12,108.

Slight northwestern extension from easternmost counties. See p. 493.

R. BAILEYANUS Britton; See Bailey, Gent. Herb. ii. 324 (1932) and ibid, i. fig. 112 (1925). PRINCESS ANNE COUNTY: trailing in dry field, Virginia Beach, *Fernald & Griscom*, no. 4430.

Very similar to the Williamsburg material cited by Bailey.

*R. (§ PROCUMBENTES) **plexus,** sp. nov., procumbens ramosissimus ramibus prolongatis valde implicatis; primocannis adscendentibus angulatis glabris remote aculeatis aculeis vix retrorsis; floricannis prostratis subteretibus duris glabris divergenter aculeatis, aculeis 5 mm. longis rectis subremotis (20–30 per dm.); primocannae foliis (immaturis) 3–5-foliatis juvenilibus strigoso-pilosis glabratis, foliolis anguste ovatis acuminatis;

floricannae foliis ternatis, foliolis lanceolato-ovatis membranaceis serrato-dentatis acuminatis glabris vel glabratis; inflorescentiis corymbiformi-racemosis 3–5-floris rachi subglabra; pedicellis rectis filiformibus minute pilosis sparse setosis imis 3–4 cm. longis; calycis lobis reflexis ovatis minute pilosis 5 mm. longis; petalis roseis vel roseo-albidis obovatis 1.3 cm. longis 0.9 cm. latis.—Princess Anne County, Virginia: trailing in wooded swamp, east of Little Creek, May 4, 1935, *Fernald & Griscom*, no. 4432 (distrib. as *R. flagellaris* Willd.), type in Herb. Gray.

Rubus plexus, most absurdly distributed as *R. flagellaris* (for fear of describing a new species in the genus), has the very complicated branching suggestive of the northern *R. severus* Brainerd. Its true relationship is not clear and must await fuller material for elucidation. It abounds in the border of the wooded swamp south of the shore-road from Cape Henry westward, very near the large station of *Galax*. In early May it was attractive to look at (but not to collect) on account of its roseate petals; and subsequently Griscom and I saw it in a wooded swamp west of Pungo. It is not very closely related to any recognized species of § *Procumbentes*.

*R. invisus (Bailey) Britton. Sussex County: trailing on dry roadside bank at border of woods west of Homeville, no. 11,860. Southampton County: arching and tip-rooting, steep wooded banks, ravines and clearings near Three Creek, northwest of Applewhite's Church, no. 11,857. Greensville County: trailing and tip-rooting at border of rich deciduous wooded slope by Three Creek, slightly above the "fall-line", northwest of Emporia, no. 11,849.

Extension south from central-western New York. The specimens seem inseparable from an isotype in the Gray Herbarium and from the illustration in Bailey, Gent. Herb. iii. 263, fig. 139 (1934).

R. centralis Bailey. Dinwiddie County: thicket bordering waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 12,109.

Extension south from Stafford County and from the Eastern Shore of Maryland. See p. 493.

R. Grimesii Bailey. Local range extended into Southampton County: dry sandy roadside thicket south of Sunbeam, no. 12,103.

Fruit ripe in early June, of rich flavor and very juicy; worth cultivating. See p. 512.

R. Janssonii Bailey. To the single station in Sussex County, recorded in 1940, add one in Isle of Wight County: disturbed white sand of dry pine barrens, south of Lee's Mill, no. 12,370.

*Rubus (§ Hispidi) **ambigens,** sp. nov., valde arcuans deinde prostratus; primocannis laxe adscendentibus retrorse aculeato-setosis vix glandulosis, aculeis subsparsis (100–200 per dm.) setis parvis intermixtis; floricannis prostratis ramosissimis apicibus radicantibus sparse aculeatis; primocannae foliis firmis vix coriaceis subtus griseo-pilosis supra sparse pilosis quinatis, petiolo 3–7 cm. longo piloso aculeato, foliolis obovatis abrupte breviterquė acuminatis serrato-dentatis, foliolo terminali basi rotundo-subcuneato 5.5–8 cm. longo 3–4.5 cm. lato petiolulo piloso retrorse-aculeato eglanduloso 1–2 cm. longo; floricannae foliis ternatis, foliolis elliptico- vel rhomboideo-obovatis subacutis argute serratis utrinque pilosis; inflorescentiis corymbiformi-racemosis vel cymosis rhachi pedicellisque minute pilosis pedicellis plus minusve setosis; calycis lobis reflexis pilosis 3.5–5 mm. longis; fructibus vix 1 cm. diametro.—Norfolk County, Virginia: wet, peaty clearings in woods of *Pinus serotina,* south of Grassfield, June 11, 1940, *Fernald & Long,* no. 12,098 (type in Herb. Gray; isotype in Herb. Phil. Acad.).

Rubus ambigens, the fruiting canes of which form extensive prostrate carpets in the wet peat and clearing, is superficially so like *R. vigil* Bailey, Gent. Herb. i. 251, fig. 116 (1925) that, without examination, it would pass for that species. As originally described *R. vigil* is a plant with leaves glabrous except along the nerves beneath; "canes . . . so thickly beset with sharp stiff retrorse prickles . . . as to give them a shaggy look . . . bristles more or less gland-bearing". In Bailey's latest treatment, Gent. Herb. v. 71 (1941), the only way to reach *R. vigil* by his key is under the call "EE. Axis of primocanes conspicuously glandular-hairy", under which *R. vigil* is the first species. The detailed description of the species on p. 86, however, says "canes . . . glandless". It is very easy to understand Bailey's statement (p. 69) that "Species of the Hispidi are particularly difficult to place in a key of contrasts, for the easy aid of the student confronted with the problem of identification". However, the original description and the specimens cited show glabrous leaves, and all specimens which I have seen have glandular canes. *R. ambigens,* although habitally resembling *R. vigil,* is, so far as we know, quite glandless, but its expanding primocane-foliage is whitish with dense pubescence, the mature foliage of both primocane and floricane pilose on both surfaces, softly so beneath.

R. PERNAGAEUS Fernald. To the original station in Isle of Wight County (additional nos. 11,848 and 12,101) add one in SUSSEX COUNTY: border of dry woods near Assamoosick Swamp, about 2 miles northeast of Homeville, no. 11,852.

R. CUNEIFOLIUS Pursh.

Typical *R. cuneifolius,* with truly cuneate leaflets of the floricane-foliage and the primocane-leaves with 5 cuneate leaflets subtruncate but abruptly short-pointed at summit, is rare in southeastern Virginia. There the primocane-foliage is mostly 3-foliolate and the leaflets are more curved on the sides. These plants form a transition to the more extreme variation noted below. I am temporarily leaving them in *R. cuneifolius,* as follows:

JAMES CITY COUNTY: opening in flat oak woods west of Williamsburg, *Grimes,* no. 3056. SUSSEX COUNTY: border of dry woods northeast of Homeville, no. 12,106; sandy, mossy swale northeast of Belsches, *Wiegand & Manning,* no. 1405.

Similar material is in the Gray Herbarium from Wake and Durham Counties, North Carolina. The most extreme departure from typical *Rubus cuneifolius* is

*R. CUNEIFOLIUS Pursh, var. **subellipticus,** var. nov., primocannae foliis 3- vel 5-natis; floricannae foliolis elliptico-obovatis vix cuneatis.—Southeastern VIRGINIA: sandy pine woods along Wakefield Road, northeast of Sebrell, Southampton County, *Fernald & Long,* no. 10,675, distrib. as *R. cuneifolius* (TYPE in Herb. Gray).

R. LONGII Fernald. The common representative of *R. cuneifolius* in southeastern Virginia, the type-material with floricanes arched-ascending to trailing. New collections show it to vary from depressed or trailing shrubs to arching, and in dune-areas to be stiffly erect. All these nos. (from ELIZABETH CITY, YORK, JAMES CITY, PRINCESS ANNE, NORFOLK, SURRY, SUSSEX and SOUTHAMPTON COUNTIES) are consistent in the broadly ovate or obovate to suborbicular gradually acuminate leaflets of the primocane-foliage and the elliptic to ovate or rounded leaflets of the floricanes. See p. 512.

*R. PROBABILIS Bailey. SOUTHAMPTON COUNTY: sandy thicket southeast of Branchville, no. 10,284, shrubs freely branched, the tall canes arching and root-tipping.

Extension north from North Carolina.

*R. FLORIDUS Tratt. NANSEMOND COUNTY: wooded bottomland of a branch near Cathole Landing, west of Factory Hill, no. 11,854, erect to arching, very tall. SOUTHAMPTON COUNTY: dry sandy pine woods by Nottoway River, near Carey Bridge, no. 11,859. See p. 490.

Rubus floridus has been unknown except for the type described by Trattinnick from a collection made in the South by Enslen. According to Bailey, Gent. Herb. iii. 125, 126 (1933) it is otherwise unknown. Our collection of no. 11,854, from an extensive colony (within a mile of the North Carolina line), seems to be a very close match for the illustrations of Trattinnick's type published by Bailey in Gent. Herb. i. 194 and 195 as figs. 89 and 90. No. 11,859 has narrower floricane-leaflets and glandless pedicels; it is, perhaps, not properly placed with no. 11,854.

ALCHEMILLA MICROCARPA Boiss. & Reut. To the few stations noted by me in 1938 add the following. SUSSEX COUNTY: ledges by foot-path in rich woods at the "fall-line" along Nottoway River, above Double Bridge, about 6 miles northwest of Jarratt, nos. 11,701 and 12,112 (mature plants up to 1.5 dm. high). SOUTHAMPTON COUNTY: weed in lawn of courthouse; Courtland, no. 11,861. GREENSVILLE COUNTY: lawns and grassland, Emporia, no. 11,702. See p. 489.

*ROSA MULTIFLORA Thunb. and its hybrids. Spread from cultivation to thickets, borders of woods, etc., several nos.

*TRIFOLIUM PRATENSE L., forma LEUCOCHRACEUM Aschers. & Prantl. DINWIDDIE COUNTY: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 12,375.

T. REFLEXUM L. SUSSEX COUNTY: open thickets and clearings near Nottoway River at Readjuster Bridge, south of Peanut, nos. 12,117 and 12,118. See p. 501 and MAP 5.

*MEDICAGO MINIMA L., var. LONGISETA DC. ELIZABETH CITY COUNTY: Fortress Munroe, May 2, 1894, *J. R. Churchill* (distrib. as *M. maculata*).

*M. MINIMA L., var. COMPACTA Neyraut. YORK COUNTY: abundant at intervals for several miles, sandy beach and open fields above Yorktown, no. 12,119. See p. 505.

*PSORALEA CANESCENS Michx. SUSSEX COUNTY: dry white sand of woods and clearings near Chub, nos. 12,378 and 12,671.

Extension north from South Carolina; only a few plants. See p. 506 and MAP 6.

DESMODIUM GRANDIFLORUM (Walt.) DC. (*D. bracteosum* (Michx.) DC.). SURRY COUNTY: rich calcareous wooded ravines west of Claremont, no. 12,674. See p. 520.

Recorded by Merriman in his Flora of Richmond. Certainly very local in eastern Virginia. Although the name *D. grandiflorum* (Walt.) DC. has been taken up by Small and others on the basis of Blake's note in Bot. Gaz. lxxviii. 277 and 278 (1924), there is no material of this species in the Gray Herbarium from south of Virginia and the mountain-region of western North Carolina. It would be gratifying to see specimens from Walter's territory and to have the comparison with Walter's type made by some one familiar with the North American species. Blake's note was based upon a comparison made by the late E. G. Baker, who could hardly have known the intricacies of the genus.

SOME VARIETIES OF LESPEDEZA CAPITATA AND L. HIRTA (PLATES 673–682).—Although the purple-flowered series of American species of *Lespedeza* is perplexingly variable and often seems to cross indiscriminately, the whitish-flowered plants, especially *L. capitata* Michx. and *L. hirta* (L.) Hornem. are probably our most variable species. Each has a number of fairly recognizable varieties with pronounced geographic concentration; but the identifications in the herbarium show a large number of specimens with the characteristic racemes and fruits of *L. hirta* placed under *L. capitata* because of their relatively short peduncles. In attempting, rather unsatisfactorily, to clarify the group I have found it necessary to reassort the accumulated material in the Gray Herbarium and in the herbarium of the New England Botanical Club with regard for the rather definite characters of the raceme, calyx and legume, rather than by the names on the labels. True *L. capitata* (PLATE 673) has dense subcapitate spikes with the long calices closely overlapping and strongly ascending, so that the inner flowers of the head are quite hidden in maturity, and the legumes are greatly overtopped by the prolonged calyx-lobes; *L. hirta* (PLATE 678) has cylindric spiciform racemes, with the loosely ascending to divergent flowers not strongly imbricated, in fruit definitely separated, and with the legume nearly equaling to overtopping the calyx-lobes. Unfortunately, in defining varieties under the two species authors have often failed to go back to original diagnoses and to types or isotypes, with the result that a realignment of varietal names becomes necessary. *L. angustifolia* (Pursh) Ell., at least as usually interpreted, for the type is not just now available, is closely allied to and sometimes united with either *L. hirta*[1] or with *L. capitata.* Although hybridizing with them, it seems to me almost as well defined as a species as most members of the genus; for this is a group in which interspecific hybridization is exceptionally frequent, associated as it is with the two types of inflorescence, showy petaliferous flowers and cleistogamous apetalous ones, with the result that crosses due to insect-pollination of the earlier and showy flowers seem to be carried on through the cleistogamous fruits, just as they are in *Viola.*

I am defining the three species as follows.

a. Racemes capitate-spiciform, very dense; the strongly appressed calices 7–13 mm. long, closely overlapping, with the inner ones mostly hidden, greatly exceeding the legume; peduncles very short, usually much shorter than the subtending leaves .... *L. capitata.*

a. Racemes cylindric, the ascending to divergent lower flowers not hiding those above; mature calyx 4–10 mm. long, nearly equaling to only slightly exceeding legume; peduncles shorter than to usually much longer than subtending leaves.

  Principal leaves with petiolule of terminal leaflet 3–8 mm. long and conspicuously coarser and more pilose at summit; leaflets rounded-obovate to linear, 0.6–3.5 cm. broad; calyx 6–10 mm. long; bracteoles 2–4 mm. long ..... *L. hirta.*

  Principal leaves with petiolule of terminal leaflet 0.5–4 mm. long and not conspicuously modified at summit; leaflets linear, 2–6 mm. broad; mature calyx 4–6.5 mm. long; bracteoles 1–2 mm. long .... *L. angustifolia.*

Lespedeza capitata was first described by Michaux with an unequivocal diagnosis, as follows:

> CAPITATA. L. erecta: foliis subsessilibus; foliolis oblongis: capitulis sessiliter conglomerato-terminalibus: legumine intra calycem multo majorem recondito.
> *Hab.* in Virginia et Carolina.
> —Michx. Fl. Bor.-Am. ii. 71 (1803).

[1] *L. hirta,* var. *angustifolia* (Pursh) Maxim. in Act. Hort. Petrop. ii. 379 (1873).

It has been customary to treat as typical *Lespedeza capitata* the wide-ranging plant (PLATE 674) with round-tipped or obtuse oblong leaflets appressed-pubescent beneath with opaque or only slightly lustrous hairs, and green above, the capitate spikes often overtopped by their subtending leaves, the plant occurring from west-central Maine to Minnesota and Nebraska, entering the southern corners of Quebec and Ontario, thence south through the northeastern and central states and locally to the mountains of North Carolina[1] and into Missouri, the plant called by Torrey & Gray *L. capitata, β. vulgaris;* while a plant of similar habit, but with leaves brilliantly silvery beneath and grayish to silvery and lustrous above and with the densely crowded upper spikes mostly overtopping their subtending leaves, was described from Louisiana as *L. capitata, β. sericea* by Hooker & Arnott in Hooker's Comp. to Bot. Mag. i. 23 (1835).

Var. *sericea* (PLATE 673) abounds on the Coastal Plain of the Southern States, from Texas to Georgia, thence northward to Nebraska, Iowa, Wisconsin and Indiana, and on the Atlantic Coastal Plain and outer Piedmont locally to Massachusetts, our representation of it from eastern North Carolina being 10 numbers, from eastern Virginia 5. The common northern and inland plant with only sublustrous to opaque foliage and rather leafy inflorescences (var. *vulgaris*) shows 2 collections from eastern Virginia, none from eastern North Carolina. It is, therefore, not surprising to find on inspection of the photograph of Michaux's type (taken by me in 1903) that his species from "Virginia and Carolina" is the common plant of the eastern sections of those states, i. e. var. *sericea* Hook. & Arn. (our PLATE 673). This interpretation is supported by Poiret's full description of the Michaux type. Renaming it *Hedysarum conglomeratum* Poir. in Lam. Encycl. vi. 416 (1804), he described the "folioles . . . oblongues, luisantes, soyeuses. . . . Les fleurs sont réunies, à l'extrémité des tiges & des rameaux, en petits paquets agglomérés & en tête, pourvues de pédoncules partiels très-courts." Michaux's material in *Lespedeza,* like that in many other groups, was mounted by some one else without much, if any, regard to the diagnoses. The sheet containing the label "*Lespedeza capitata*" has five stems mounted upon it. That at the

[1] In September, 1941, found in southeastern Virginia.

right closely matches the original diagnosis and must stand as the TYPE. To the left (in the middle of the sheet) are two stems of the extreme of *L. hirta* which has been called by different authors *L. longifolia* DC., *L. capitata* var. *longifolia* (DC.) Torr. & Gray, *L. hirta* var. *oblongifolia* Britton and *L. oblongifolia* (Britton) Stone; while at the extreme left are two stems of *L. angustifolia* (Pursh) Ell. That the mixture was not made by Michaux himself is evident from his very clear diagnosis.

It has been customary to recognize one of the extremes of *Lespedeza capitata* with narrowest leaflets as var. *longifolia* (DC.) Torr. & Gray. When, however, the basinym, *L. longifolia* DC. Prodr. ii. 349 (1825), is studied it is evident that DeCandolle had a southern Coastal Plain extreme of *L. hirta*. He correctly described *L. capitata* "spicis capitatis brevè pedunculatis axillaribus et conglobato-terminalibus, calycibus villosis longitudine corollae legumine multò longioribus"; but his new *L. longifolia*, with oblong leaflets, differed: "racemis [nec spicis] fasciculato-corymbosis multifloris axillaribus et subterminalibus, legumine calycis lobis acuminatis breviore." Although I have not examined the type of *L. longifolia*, DeCandolle's description so strongly suggests a rare Coastal Plain extreme of *L. hirta*, which occurs in Louisiana, that I do not see how to separate it from *L. hirta* var. *oblongifolia* Britton, described from the Pine Barrens of New Jersey.

The restoring of *Lespedeza capitata* var. *longifolia* (DC.) Torr. & Gray, as to basinym at least, to varietal rank under *L. hirta* necessitates finding a name for the rather rare extreme of *L. capitata* with narrowly oblong to lance-linear leaflets commonly silky beneath and often above. Although *L. capitata* var. *stenophylla* Bissell & Fernald in RHODORA, xiv. 92 (1912) was thought, when published, to be well separable from the plant then passing as var. *longifolia*, it may be extended to cover that variable series (PLATE 676).

The varieties of *Lespedeza capitata*, as I now see them, are as follows.

a. Lower surfaces of leaves with closely appressed or sericeous pubescence . . . *b*.
 b. Leaflets oblong, elliptic, oval or obovate . . . *c*.
  c. Leaflets oblong to narrowly elliptic; heads crowded and very short-peduncled among the upper leaves.

Leaves brilliantly silvery beneath, grayish and lustrous above; upper heads closely aggregated and mostly hiding the subtending leaves .... *L. capitata* var. *typica.*

Leaves opaque or only slightly lustrous beneath, green above or soon becoming so; subtending leaves most often exceeding the heads; northern .... Var. *vulgaris.*

c. Leaflets broadly elliptic-oval to rounded-obovate; some or all peduncles scattered and equaling or exceeding the subtending leaves; southern .... Var. *calycina.*

b. Leaflets lance-oblong or lanceolate to lance-linear, usually sericeous, at least beneath .... Var. *stenophylla.*

a. Lower surfaces of oblong to narrowly obovate leaflets densely velvety-pilose with dull to sublustrous cinereous to fulvous pubescence; inflorescence leafy; northeastern. Var. *velutina.*

L. capitata Michx., var. **typica.** *L. capitata* Michx. Fl. Bor.-Am. ii. 71 (1803). Var. *sericea* Hook & Arn. in Hooker's Comp. to Bot. Mag. i. 23 (1835). *Hedysarum conglomeratum* Poir. in Lam. Encycl. vi. 416 (1804).—Eastern Texas to Georgia, north to Nebraska, Minnesota, Wisconsin, Tennessee and eastern Massachusetts. The following, selected from many numbers, are characteristic. Massachusetts: near Cottage Farm, Boston, August 7, 1879, *C. E. Perkins;* Dedham, August 22, 1903, *A. W. Cheever;* Blue Hill, Milton, September 1, 1887, *Faxon;* Darby Station, Plymouth, *Fernald, Hunnewell & Long*, no. 9746; Wareham, *Fernald & Long*, no. 9748; New Bedford, *E. W. Hervey;* Centerville, August 12, 1900, *Clara Imogene Cheney;* Yarmouth, *Fernald & Long*, no. 9747; Eastham, *F. S. Collins*, no. 528; Uncatena, Dukes Co., *Fogg*, no. 3129; Ludlow, September 9, 1922, *Hunnewell.* Rhode Island: Meshanticut Park, Cranston, August 23, 1908, *T. Hope;* Watchaug Pond, Charlestown, *Pease & Griscom*, no. 24,010. Connecticut: Vernon, September 23, 1888, *Chas. Wright.* New York: 2 miles northeast of Hicksville, Nassau Co., September 6, 1907, *R. M. Harper.* New Jersey: Lakewood, *Hunnewell*, no. 6926; Cape May, *Gershoy*, no. 383. Pennsylvania: mouth of Tucquan, Lancaster Co., *Heller & Halbach*, no. 528. Virginia: Little Neck, Princess Anne Co., *Fernald & Long*, no. 4907; north of Factory Hill, Nansemond Co., *Fernald & Long*, no. 9586; west of Wiggins School, south of Franklin, *Fernald & Long*, no. 11,360. Virginia or North Carolina: type of species, *Michaux* (photograph in Gray Herb.). North Carolina: near Gatesville, Gates Co., *Godfrey*, no. 7045; near Williamstown, Martin Co., *Godfrey*, no. 7023; Middlesex, Nash Co., *Godfrey & Kerr*, no. 6637; near Edward, Beaufort Co., *Godfrey & White*, no. 6881; near Grantsboro, Pamlico Co., *Godfrey & White*, no. 6810; near Ft. Barnwell, Craven Co., *Godfrey & White*, no. 6781. South Carolina: 5 miles south of Andrews, Georgetown Co., *Godfrey*, no. 8186. Georgia: Nacooche Valley, Habersham Co., September 17, 1883, *J. D. Smith.* TENNESSEE: Knoxville, *Ruth,* no. 312. ALABAMA: Perdido, *Blanton,* no. 7082; northeast of Autaugaville, Autauga Co., *Harper,* no. 3128. MISSISSIPPI: Ocean Springs, *Skehan,* no. 2422. WISCONSIN: Fountain City, Buffalo Co., *Fassett & Wilson,* no. 4392. ILLINOIS: Evanston, August 16, 1911, *Sherff;* Champaign, *Pease,* no. 12,413; north of Princeville, August 18, 1896, *V. H. Chase;* Sugar Creek Ravine, *Robert Ridgway,* no. 92. ARKANSAS: northwestern Arkansas, September, 1882, *F. L. Harvey.* LOUISIANA: without stated locality, *Hale.* MINNESOTA: west of Brainerd, Crow Wing Co., *Hotchkiss & Jones,* no. 472. IOWA: Ames, *Ball,* no. 16. NEBRASKA: Halsey, Thomas Co., *Rydberg,* no. 1746. KANSAS: Riley Co., *Norton,* no. 114 (transition to next var.). OKLAHOMA: Shattuck, Ellis Co., *G. W. Stevens,* no. 2929. TEXAS: west of Alvin, Brazoria Co., *Cory,* no. 11,390. **PLATE 673.**

*Var. VULGARIS Torr. & Gray, Fl. N. Am. i. 368 (1840), as to description and plant of "Canada and New England States!"—West-central Maine and southern Quebec to Minnesota and Nebraska, south to North Carolina and Missouri. The following from about ten times as many specimens examined are characteristic. QUEBEC: Ottawa River, Baie Sherley, *Rolland-Germain,* no. 19,282. MAINE: Moose Hill, Livermore, 1894, *Kate Furbish;* Topsham, August 28, 1913, *Furbish;* Limington, *Fernald, Long & Norton,* no. 13,964. NEW HAMPSHIRE: Lake Ossipee, Freedom, Carroll Co., *Pease,* no. 25,827; Dover, *Hodgdon,* no. 2374; Derry, Rockingham Co., August 30, 1916, *C. F. Batchelder;* Hollis, Hillsborough Co., August 21, 1932, *Batchelder;* Hinsdale, Cheshire Co., August 23, 1919, *Batchelder;* Hampton, August 31, 1902, *Williams.* VERMONT: Brattleboro, September 16, 1912, *L. A. Wheeler.* MASSACHUSETTS: Newbury, *Pease,* no. 25,761; Lexington, November 13, 1892, *W. Deane;* Carlisle, 1884, *C. W. Jenks;* Plymouth, *Fernald, Hunnewell & Long,* no. 9744; Edgartown, Martha's Vineyard, *Bicknell,* no. 5110; Sutton, *Anderson, Smith & Weatherby,* no. 2492; Grafton, September 22, 1921, *Knowlton;* Green Pond, Montague, *F. C. Seymour,* no. 3326; Southwick, *F. C. Seymour,* no. 226; Springfield, August 27, 1913, *Bissell & Weatherby.* RHODE ISLAND: Cumberland, September 13, 1903, *Williams;* Warwick, *Collins, Fernald & York,* no. 11,361; Great Salt Pond, Block Island, *Fernald, Hunnewell & Long,* no. 9742. CONNECTICUT: Franklin, September 29, 1906, *Woodward;* Waterbury, *Blewitt,* no. 1332; Milford, October 10, 1909, *H. S. Clark;* Stratford, *A. E. Carpenter,* no. 756. NEW YORK: Patten's Mills, between Washington and Warren Cos., August 9, 1896, *Burnham;* Narrows Island, Black Lake, St. Lawrence Co., *Fernald, Wiegand & Eames,* no. 14,362; east of Owego, Tioga Co., *Wiegand,* no.

12,337. New Jersey: Delaware Valley, Sussex Co., September 15, 1917, *E. B. Bartram;* Manahawkin, Ocean Co., *Long,* no. 13,495; Somerdale, Camden Co., September 23, 1921, *Meredith.* Pennsylvania: Keller's Church, Bucks Co., August 24, 1923, *Benner.* Delaware: south of New Castle, *Tidestrom,* no. 11,515; near Centreville, September 28, 1875, *A. Commons;* Rehoboth, September 6, 1908, *Churchill.* District of Columbia: Washington and vicinity, September 7, 1896, *Steele.* Virginia: southeast of Stony Creek, *Fernald & Long,* no. 13,650. North Carolina: near Biltmore, *Biltmore Herb.* no. 586a; Great Smoky Mts., alt. 3000 ft., Swain Co., August 25, 1891, *Beardslee & Kofoid.* Indiana: Miller's, September 4, 1897, *Umbach.* Wisconsin: Hertel, Burnett Co., *Fassett,* no. 16,486; south of Wautoma, Waushara Co., *Fassett,* no. 16,707; southeast of Mauston, Juneau Co., *Fassett,* no. 17,143. Illinois: Catlin, Vermilion Co., *Lansing,* no. 3512 (transition to var. *typica*); Peoria, September, 1904, *McDonald;* Decatur, *Gleason,* no. 749. Minnesota: Center City, August, 1892, *B. C. Taylor;* Morrison Lakes, Clearwater Co., *M. L. Grant,* no. 3082 (transition to var. *typica*). Iowa: Fayette, August, 1894, *Fink;* West Branch, *Pennell,* no. 713. Missouri: Green Co., Sept. 7, 1893, *Blankinship* (transition to var. *typica*); Newton Co., *Bush,* no. 66 (transition to var. *typica*). Plate 674.

Var. **calycina** (Schindler), comb. nov. *L. hirta* var. *β. calycina* Schindler in Engler, Bot. Jahrb. xlix. 624 (1913). *L. capitata* var. *hirtiformis* Fernald in Rhodora, xl. 437, t. 524 (1938).—Southeastern Virginia to Florida, west to eastern Texas. Virginia: northwest of Whaleyville, Nansemond Co., *Fernald & Long,* no. 7481 (type of var. *hirtiformis*). North Carolina: near Ft. Barnwell, Craven Co., *Godfrey & White,* no. 6826. South Carolina: cited without specified locality by Schindler, l. c. collected by *Cabinis.* Florida: Jacksonville, *Curtiss* (cited by Schindler). Louisiana: without stated locality, *Hale.* Texas: Dallas, *Reverchon,* no. 288 (type). Plate 675.

Schindler placed this extreme from the southern Coastal Plain under *Lespedeza hirta* because of the shape of the leaflets and the peduncled spikes; but he noted that it differed in the only sparsely pilose or subglabrous and elongate calyx overtopping the sparsely pilose legume and in the whole plant being less pubescent than in the villous-stemmed *L. hirta,* all characters of *L. capitata.* I placed it under *L. capitata,* as var. *hirtiformis,* because, with the technical characters of spike, calyx and short legume of that species, it has the peduncles and outline of leaflets of *L. hirta!* Since Schindler designated no type of his

L. hirta var. *calycina,* the varietal name earlier than mine, I am designating as its TYPE Reverchon's no. 288 (our PLATE 675, FIGS. 1–3), which seems to have been the plant he had before him.

*Var. STENOPHYLLA Bissell & Fernald in RHODORA, xiv. 92 (1912). Leaflets linear-oblong, lanceolate or lance-linear, mostly sericeous beneath, green and glabrous or promptly glabrate above, acute or blunt; heads mostly scattered. Var. *longifolia* sensu most authors, not *L. longifolia* DC., basinym.—Local, Massachusetts to Virginia; southern Wisconsin and northwestern Indiana to northern Missouri. The following are characteristic. MASSACHUSETTS: summit of Blue Hill, Milton, September 8, 1891, *Faxon,* September 22, 1895, *Kennedy.* RHODE ISLAND: north of Ashaway, Hopkinton, September 1, 1919, *Fernald, Woodward & Collins.* CONNECTICUT: Franklin, August 22, 1914, *Woodward;* Glastonbury, September 17, 1911, *Bissell;* near Trading Cove Bridge, Norwich, September 15, 1904, *Graves.* NEW JERSEY: Borderville, Passaic Co., *Mackenzie,* no. 3889 (transitional). VIRGINIA: southeast of Stony Creek, *Fernald & Long,* nos. 13,646 and 13,649. WISCONSIN: north of Ridgway, Iowa Co., *Fassett & Graeber,* no. 16,711. INDIANA: Dune Park, *Greenman,* no. 2671; south of Fair Oaks, Jasper Co., *Deam,* no. 51,267; White Co., *Heimlich,* no. 739. ILLINOIS: Peoria, September, 1904, *F. E. McDonald* (TYPE), leaflets long-attenuate; Havana, August 17, 1903, *Gleason;* Champaign, *Pease,* no. 12,413 (leaflets blunt); Beardston, August, 1842, *Geyer.* MISSOURI: south of Graysville, Putnam Co., *Drouet,* no. 1830. PLATE 676.

Var. STENOPHYLLA, forma **argentea,** forma nov. foliis utrinque sericeo-argenteis.—ILLINOIS: sand dunes, Havana, August, 1903, *Gleason* (TYPE in Herb. Gray).

In var. *stenophylla* the head is often more elongated and more inclined to become spicate-racemose than in the other varieties. It thus approaches *Lespedeza hirta* and in immature specimens it is often difficult to be quite certain whether the plants are *L. capitata* var. *stenophylla* or the northern extreme of *L. hirta* (described below), which has almost the identical habit. Fully developed inflorescences and, preferably, fruit are important in distinguishing these two plants.

Var. VELUTINA (Bickn.) Fern. in RHODORA, x. 51 (1908). *L. velutina* Bicknell in Torreya, i. 102 (Sept., 1901), not Dunn (Feb., 1901). *L. Bicknellii* House in Torreya, v. 167 (1905). *L. Schindleri* Lévl. Cat. Pl. Yun-Nan, 159 (1916).—Central

Maine to eastern New York and northern New Jersey. The following, selected from many specimens, are characteristic. Maine: Orono, September 14, 1897, *Fernald;* Rumford, September 7, 1889, *Parlin;* Brunswick, September, 1903, *Furbish;* Cumberland, *Chamberlain,* no. 277; Wells, September 17–21, 1898, *Furbish;* North Berwick, September 13, 1894, *Parlin.* New Hampshire: by Connecticut River, Bath, Grafton Co., *Fernald,* no. 15,548; Haverhill, *Fernald,* no. 15,547; Pemigewasset River, Plymouth, *Fernald,* no. 11,789; Hooksett, Merrimack Co., August 16, 1925, *C. F. Batchelder;* Pelham, Hillsboro Co., October 11, 1902, *Knowlton;* Hinsdale, Cheshire Co., August 22, 1931, *Weatherby & Griscom.* Vermont: Colchester, *Blake,* no. 2103; Connecticut River, Vernon, *Raup & Weatherby* in Pl. Exsicc. Gray, no. 561; Pownal, *Eggleston,* no. 1111. Massachusetts: Lynnfield, August 18, 1880, *H. A. Young;* Horn Pond Mt., Winchester, October 20, 1901, *E. F. Williams;* Westwood, October 6, 1901, *B. L. Robinson;* Pembroke, September 6, 1920, *Churchill;* Wood's Hole, Falmouth, *Fernald & Weatherby,* no. 16,992; West Tisbury, *Fernald & Fogg,* no. 935; Chilmark, *F. C. Seymour,* no. 1427; Worcester, September, 1878, *E. W. Sargent.* Rhode Island: Warwick, *Collins, Fernald & York,* no. 11,362. Connecticut: Beach Pond, Voluntown, September 22, 1902, *Harger* (transition to var. *vulgaris*); Groton, October 10, 1901, *Graves;* Milford, October 18, 1896, *Eames.* New York: Little Neck, Long Island, July 31, 1853, *Hexamer & Maier.* New Jersey: Ringwood Junction, Passaic Co., *Mackenzie,* no. 3902 (unusually narrow leaves). **Plate 677.**

Typical *Lespedeza hirta,* at least as usually interpreted, for I cannot now secure a photograph of the type which was collected by Clayton in Virginia, is very definite: a tall plant (plate 678) with spreading pubescence on the stem, long-petioled leaves with rounded-obovate to rounded-oval or broadly oblong large leaflets pubescent, at least on the veins, beneath with spreading or loosely ascending hairs, its long-peduncled cylindric racemes spiciform but with the mature flowers and fruits only loosely ascending or spreading, not crowded into closely imbricated heads, and the legume nearly equaling or even exceeding the calyx. In the Southeastern States, from Florida to eastern North Carolina, and less characteristically into southeastern Virginia, var. *appressipilis* Blake is habitally like typical *L. hirta* but with the consistently small and thick leaflets cinereous beneath (often silvery) with minute appressed puberulence.

Of wider but interrupted range on or near the Coastal Plain, from Louisiana to southern New Jersey, there occurs a plant habitally like *L. hirta* and with quite similar racemes and flowers but with narrowly oblong leaflets. This is, as noted on p. 575, *L. longifolia* DC., described from Louisiana, the Louisiana plant seeming scarcely separable from *L. hirta* var. *oblongifolia* Britton, described from southern New Jersey. Whether the plant is of hybrid origin, as Britton suggested in Ill. Fl. ed. 2, ii. 407 (1913), can be determined only by further observation, for I have seen no fruit. The late Dr. Witmer Stone thought it a good species.

In southeastern Virginia there is an extreme with the long-peduncled open racemes and flowers of *Lespedeza hirta* but with leaflets nearly as narrow as in *L. angustifolia.* Its large calyx and long bractlets are those of *L. hirta,* its minute sericeous pubescence is that of *L. hirta* var. *appressipilis,* its leaflets nearly those of *L. capitata* var. *stenophylla.* It is possible to think, as Britton suggested regarding his *L. hirta* var. *oblongifolia,* that it is a hybrid of *L. angustifolia;* but that little species (PLATE 681, FIGS. 5 and 6), if correctly identified, with much smaller flowers and shorter and more compact spikes, has not been found at most of our known stations for the coarser plant. The latter might, likewise, be looked upon as a connecting link between *L. angustifolia* and *L. hirta.* Even so, *L. hirta,* having priority of specific epithet, it will serve convenience to give the large plant of Virginia a varietal name under that species.

Not only does *Lespedeza hirta* in one extreme strongly simulate *L. angustifolia* and possibly grade into it in the South; north of or at the northern outposts of any known form of *L. capitata* it strongly simulates that species. In New England typical *L. capitata,* with erect densely imbricated long fruiting calices, glistening sericeous foliage and short legumes, reaches very locally northward only into eastern Massachusetts; var. *vulgaris* is on the most sterile and arid soils northward to Androscoggin County, Maine, the Ossipee region of east-central New Hampshire and the southeastern corner of Vermont; while the strictly northeastern var. *velutina* alone reaches central Maine, northern New Hampshire and northern Vermont, and var. *stenophylla* reaches its isolated northeastern limit on a weathered and leached sterile crest in Norfolk County, Massachusetts. In New England, furthermore, typical *L. hirta* is quite unknown northeast of the extreme southwestern corner of Maine and southernmost counties of New Hampshire. It is, consequently, noteworthy that along the richer river-valleys of northern and western New England there should be a velutinous and sericeous plant (PLATE 682) strongly suggestive of *L. capitata* var. *velutina* (PLATE 677) in its short-peduncled and compact spiciform racemes scattered in interrupted virgate and leafy inflorescences, but with the short calyx, less overlapping flowers and the nearly or quite exserted legume of *L. hirta.* In aspect it stands midway between *L. hirta* var. *longifolia* and *L. capitata* var. *velutina,* but it can hardly be a recent cross of these two, for the former doubtfully fertile plant reaches its northern limit in southern New Jersey. This singular plant of northern New England, standing somewhat between *L. hirta* var. *longifolia* and *L. capitata* var. *velutina,* is on the relatively rich terraces and banks of the Penobscot, Kennebec, Connecticut and Housatonic systems, and it apparently extends locally southward to Nantucket and Cape Cod. It seems also to occur in Wisconsin. On account of its flowers and fruit I am placing it tentatively under *L. hirta,* as an anomalous variety. It needs close attention in the field, for as yet we know only one fruiting collection.

The varieties of *Lespedeza hirta,* as I now interpret them, are as follows.

a. Peduncles mostly overtopping their subtending leaves; racemes relatively open, in fruit 1.5–4.5 cm. long . . . *b.*
- *b.* Leaflets rounded-obovate to oblong-ovate, the terminal one of the primary leaves 1–3.5 cm. broad.
  - Stem villous or copiously pilose; leaves pubescent beneath, at least on the veins, with spreading or spreading-ascending hairs; terminal leaflet of primary leaves 2–6 cm. long, 1.5–4 cm. broad. . . . . Var. *typica.*
  - Stem densely short-pubescent; leaves grayish, silvery beneath and sometimes above with minute sericeous puberulence; terminal leaflet of primary leaves 1–2.7 cm. long, 1–2 cm. broad; southeastern. . . . . Var. *appressipilis.*
- *b.* Leaflets narrowly oblong to linear, 6–10 mm. broad; southern.
  - Leaflets oblong, the larger 2–3 cm. long and 7–10 mm. broad; calyx 6–8 mm. long. . . . . Var. *longifolia.*
  - Leaflets narrowly linear, the larger 3–7 cm. long and 6–8 mm. broad; calyx 8–10 mm. long. . . . . Var. *intercursa.*

a. Peduncles mostly much shorter than their subtending leaves, producing a virgate leafy inflorescence; racemes relatively compact in fruit, only 1–2.5 cm. long; leaflets oblong, velutinous or sericeous, the larger ones 3–6 cm. long and 1–2 cm. broad; northern............Var. *dissimulans*.

L. HIRTA (L.) Horneman., var. TYPICA Schindler in Engler, Jahrb. xlix. 623 (1913). *Hedysarum hirtum* L. Sp. Pl. 748 (1753). *L. polystachya* Michx. Fl. Bor.-Am. ii. 71, t. 40 (1803). *L. hirta* (L.) Hornem. Hort. Reg. Bot. ii. 699 (1815). *L. hirta*, var. *sparsiflora* Torr. & Gray, Fl. N. Am. i. 368 (1840).—Dry soils, southwestern Maine to southern Ontario, south to Georgia (Florida?), Alabama, Arkansas and eastern Texas. The following, selected from ten times as many specimens, are characteristic. MAINE: Alfred, July 23, 1936, *Knowlton;* South Berwick, September 11, 1896, *Parlin.* NEW HAMPSHIRE: Lee, Strafford Co., *Hodgdon,* no. 660; Hooksett, Merrimack Co., July 26, 1921, *C. F. Batchelder;* Hollis, Hillsboro Co., July 30, 1896, *Grout.* VERMONT: Vernon, August, 1895, *Grout;* Castleton, September 12, 1897, *Eggleston.* MASSACHUSETTS: Andover, *Pease,* no. 1516; Ayer, *Pease,* no. 23,990; Winchester, September, 1884, *Mrs. P. D. Richards;* West Roxbury, August and September, 1911, *F. F. Forbes;* Plymouth, *Fernald, Hunnewell & Long,* no. 9735; Falmouth, *Fogg,* no. 2449; Yarmouth, *Fernald & Long,* no. 9741; West Tisbury, *F. C. Seymour,* no. 1426; Nantucket, August, 1901, *Dame;* Douglas, *Weatherby et al.,* no. 3009; Sunderland, *F. C. Seymour,* no. 3733; Deerfield, *Day,* no. 97; Great Barrington, August 3, 1911, *Hoffmann.* RHODE ISLAND: Cumberland, September 13, 1903, *Williams;* Tiverton, *E. A. Mearns,* no. 187; South Kingston, *Collins & Fernald,* no. 11,360. CONNECTICUT: Franklin, August 22, 1914, *Woodward;* Southington, *Bissell,* no. 166; Waterbury, *Blewitt,* no. 768; Lyme, *Graves,* no. 305; Washington, September 1, 1919, *A. W. Evans;* Huntington, August 12, 1902, *Eames.* NEW YORK: north of Patten's Mills, Washington Co., August 9, 1896, *Burnham;* Bethlehem, Albany Co., *House,* no. 10,799; Black Rock Forest, Orange Co., *Raup,* no. 7856; Southampton, Suffolk Co., *St. John,* no. 2771; Sandy Ridge, northeast of Phoenix, Oswego Co., *Fernald, Wiegand & Eames,* no. 14,361; Ithaca, *Eames,* no. 6741. NEW JERSEY: Manchester, 1854, *Hexamer & Maier;* Atsiom, August 10, 1926, *Benner, Long & Bassett;* Cold Spring, Cape May Co., *Gershoy,* no. 381. PENNSYLVANIA: Wayne, Delaware Co., *E. B. Bartram,* no. 1161; near Rohrerstown, Lancaster Co., September 19, 1901, *Heller;* Franklin, Green Co., August 3, 1922, *S. S. Dicky;* Treichler, Lehigh Co., August 25, 1923, *Churchill.* DELAWARE: near Wilmington, *R. R. Tatnall,* no. 3509. MARYLAND: College Park, *C. P. Smith,* nos. 2609 and 2767; Clinton, September, 1921, *Holm.* WEST VIRGINIA: Roland Park, Cabell Co., *Gilbert,* no.

795; White Sulphur Springs, *Hunnewell*, no. 7092. Virginia: below Aldie, Fauquier Co., *Allard*, no. 890; Elko Station, Henrico Co., *Fernald & Long*, no. 9352. North Carolina: Swain Co., August 16, 1891, *Beardslee & Kofoid;* near Biltmore, *Biltmore Herb.*, no. 587[a]; Middlesex, Nash Co., *Godfrey & Kerr*, no. 6615; south of Aberdeen, Scotland Co., *Godfrey*, no. 6906. South Carolina: Pendleton, Anderson Co., *Wiegand & Manning*, no. 1603. Ontario: Queenstown Heights, *J. Macoun*, no. 474; London, *Burgess;* Leamington, *J. Macoun*, no. 34,273. Ohio: Newell Ledge, Portage Co., September 6, 1905, *R. J. Webb;* Cleveland, *Greenman*, no. 956; Friendship, Scioto Co., *Demaree*, no. 10,825. Indiana: Bedford, *Kriebel* no. 2815; Mineral Springs, *Lansing*, no. 3356; Dune Park, *Greenman*, no. 2661. Kentucky: Kuttawa, Lyon Co., *Eggleston*, no. 5318; Pine Mt., Harlan Co., *Kearney*, no. 127. Tennessee: Cumberland Co., August 24, 1890, *Coffman;* east of Crossville, *Svenson*, no. 4195; southeast of Hollow Rock Junction, Carroll Co., *Svenson*, no. 454. Alabama: Auburn, September 8, 1897, *Earle & Tracy*. Illinois: Cobden, *Earle*, no. 1500. Missouri: Green Co., 1880, *E. M. Shepard;* Swan, *Bush*, no. 3423. Arkansas: Booneville, Logan Co., *Demaree*, no. 8118; Hot Springs, *Scully*, no. 68; Murfreesboro, *Demaree*, no. 9404. Oklahoma: Page, Leflore Co., *G. W. Stevens*, no. 3413. Texas: near Texarkana, Bowie Co., *Heller & Heller*, no. 4202. Plate 678.

Lespedeza hirta is usually stated to occur from New England to Minnesota, south to Florida, etc. In the representation which has accumulated in the Gray Herbarium I find no specimens which I can refer to var. *typica* from Michigan, Wisconsin and Minnesota. If it is in those states it must be local. Similarly, I find no material of var. *typica* from Florida, where var. *appressipilis* probably takes its place.

*Var. appressipilis Blake in Rhodora, xxvi. 32 (1924).— Florida to eastern North Carolina and, in less extreme development, to southeastern Virginia. Virginia: Cedarville, Norfolk Co., *Fernald & Griscom*, no. 2843; south of Sebrell, Southampton Co., *Fernald & Long*, no. 11,057; south of Skipper's, Greensville Co., *Fernald & Long*, no. 9587. North Carolina: near Rocky Mount, Nash Co., *Godfrey*, no. 6988; near Goldsboro, Wayne Co., *Godfrey*, no. 6573; near Sanford, Lee Co., *Godfrey*, no. 6935; near Ft. Barnwell, Craven Co., *Godfrey & White*, no. 6831; near Grantsboro, Pamlico Co., *Godfrey & White*, no. 6809. South Carolina: 5 miles south of Georgetown, *Godfrey*, no. 8126. Georgia: east of Eastman, Dodge Co., *Harper*, no. 1978. Florida: specimens cited by Blake, l. c. Plate 679.

*Var. **longifolia** (DC.), comb. nov. *L. longifolia* DC. Prodr. ii. 349 (1825). *L. capitata* var. *longifolia* (Michx.) Torr. & Gray, Fl. N. Am. i. 368 (1840). *L. hirta* var. *oblongifolia* Britton in Trans. N. Y. Acad. Sci. xii. 66 (1893). *L. oblongifolia* (Britton) Stone, Pl. So. N. J. 509 (1912).—Local, on Coastal Plain, southern New Jersey to Louisiana. New Jersey: besides the original material cited by Britton and another collection cited by Stone there is a Torrey & Gray sheet without stated locality. Virginia: open pineland near Mason's Siding, about 1 mile north of Henry, Sussex County, *Fernald & Long*, no. 13,654. North Carolina: pineland near Goldsboro, Wayne Co., *Godfrey*, no. 6565. Florida: dry barrens near Jacksonville, *A. H. Curtiss* (without no.). Louisiana: without locality, *Drummond*. Plate 680. See discussion on p. 575.

*Var. **intercursa,** var. nov. (tab. 681, fig. 1–4), caulibus ad 1.5 m. altis cinereo-velutinis; foliis breviter petiolatis; foliolis linearibus obtusis subtus albido-sericeis, supra viridibus, longioribus 3–7 cm. longis 6–8 mm. latis; racemis ad 3 cm. longis; calycibus 8–10 mm. longis.—Virginia: roadside, Pleasant Ridge, Princess Anne County, September 9, 1935, *Fernald, Long & Fogg*, no. 4908; clearing in wet woods near Great Bridge, Norfolk County, August 4 and 5, 1934, *Fernald & Long*, no. 3974; argillaceous and siliceous swales and swaley thickets south of Zuni, Isle of Wight County, August 20 and 22, 1936, *Fernald, Griscom & Long*, no. 6622 (type in Herb. Gray); swaley clearing north of Emporia, August 19, 1936, *Fernald, Griscom & Long*, no. 6617 (most slender extreme); sphagnous bog about 1 mile northwest of Dahlia, Greensville County, August 20, 1938, *Fernald & Long*, no. 9076 (as *L. angustifolia*); all, unless noted, distributed as *L. capitata* var. *longifolia*. See discussion on p. 581.

Var. **dissimulans,** var. nov. (tab. 682), caulibus ad 1.3 m. altis velutinis; foliolis oblongis velutinis vel velutino-sericeis, longioribus 3–6 cm. longis 1–2 cm. latis; inflorescentiis elongatis virgatis valde foliosis; pedunculis perbrevibus 0.5–1 (rarissime –3) cm. longis arcte adscendentibus; racemis compactis 1–2.5 cm. longis; calycibus 6–8 mm. longis; siliquis plus minusve exsertis.—Northern and western New England, south to southeastern Massachusetts; Wisconsin. The following are characteristic. Maine: sunny gravelly bank, Orono, August 19, 1897, *Fernald*; dry thickets on clay terraces of Penobscot River, Veazie, September 6, 1916, *Fernald & Long*, no. 13,966 (type in Herb. New England Bot. Club); roadside, Chesterville, August 16, 1902, *L. O. Eaton*. New Hampshire: dry open ground, Walpole, August 21, 1916, *C. F. Batchelder*. Massachusetts: Groveland, Essex County, *C. N. S. Horner*; moors, Nantucket, August 18, 1917, *Churchill*; Stockbridge, August 12, 1904, *Hoffmann*;

dry sandy ground, Sheffield, August 13, 1920, *Churchill*. Wisconsin: sand-bank, Shawano, August 24, 1934, *Wadmond & Fassett*, no. 17,199; Fayette, Lafayette Co., August 22, 1889, *L. S. Cheney*.

A very puzzling plant, discussed on p. 582. Other New England specimens, collected very young and others from Wisconsin may belong here. Fully mature material is needed before the plant can be finally evaluated. The TYPE is the only collection seen with good fruit.

Plate 673 shows details of Lespedeza capitata var. typica (var. *sericea* Hook. & Arn.): fig. 1, summit of fruiting stem, × 1, from Perdido, Alabama, *Blanton*, no. 7082; fig. 2, fruiting head, × 4, from no. 7082; fig. 3, legumes, × 4, from base of fruiting calyx of no. 7082; figs. 4 and 5, upper and lower surfaces of leaf, × 10, from no. 7082.

Plate 674 shows L. capitata var. vulgaris Torr. & Gray: fig. 1, summit of flowering stem, × 1, from Limington, Maine, *Fernald, Long & Norton*, no. 13,964; fig. 2, portion of flowering head, × 4, from no. 13,964; fig. 3, portion of fruiting head, × 4, from Lexington, Massachusetts, November 13, 1892, *Deane*; figs. 4 and 5, lower and upper leaf-surfaces, × 10, from no. 13,964; fig. 6, legumes, × 4, from bases of calyx of fig. 3.

Plate 675 is of L. capitata var. calycina (Schindler) Fernald: fig. 1, summit of isotype, × 1; fig. 2, portion of fruiting spike, × 4, from isotype; fig. 3, lower leaf-surface, × 10, from isotype; fig. 4, median cauline leaves, × 1, from Louisiana, *Hale*.

Plate 676 is of L. capitata var. stenophylla Bissell & Fernald: fig. 1, summit of type, × 1; fig. 2, lower leaf-surface, × 10, from type; fig. 3, portion of flowering head, × 4, from White County, Indiana, *Heimlich*, no. 739; fig. 4, fruiting head, × 4, from Jasper County, Indiana, *Deam*, no. 51,267; fig. 5, legumes, × 4, from bases of calices of fig. 4.

Plate 677 shows L. capitata var. velutina (Bickn.) Fernald: fig. 1, flowering summit, × 1, from Little Neck, Long Island, July 31, 1853, *Hexamer & Maier*; fig. 2, median cauline leaves from same specimen; fig. 3, lower leaf-surface, × 10, from Groton, Connecticut, October 10, 1901, *Graves*; fig. 4, flowering head, × 4, from West Tisbury, Massachusetts, *Fernald & Fogg*, no. 935; fig. 5, portion of fruiting head, × 4, from Winchester, Massachusetts, October 20, 1901, *E. F. Williams*; fig. 6, legumes, × 4, from bases of calices of fig. 5.

Plate 678 shows L. hirta (L.) Hornem. var. typica: fig. 1, flowering top, × 1, from Southington, Connecticut, September 2, 1901, *Bissell*; fig. 2, summit of petiolule of terminal leaflet, × 10, from Winchester, Massachusetts, September, 1884, *Mrs. P. D. Richards*; fig. 3, portion of flowering raceme, × 4, from Clinton, Maryland, September, 1921, *Holm*; fig. 4, portion of a lax fruiting raceme, × 4, from Hammond Pond, Brookline, Massachusetts, September 22, 1886, Faxon; fig. 5, portion of compact fruiting raceme, × 4, from Nottingham, New Hampshire, 1896. *A. A. Eaton*.

Plate 679 is of L. hirta var. appressipilis Blake: figs. 1 and 2, summit and median foliage, × 1, from isotype; fig. 3, portion of fruiting raceme, × 4, from isotype; fig. 4, lower leaf-surface, from isotype; fig. 5, summit of petiolule of terminal leaflet, × 10, from isotype.

Plate 680 shows L. hirta var. longifolia (DC.) Fernald: fig. 1, flowering top, × 1, from Louisiana, *Drummond*; fig. 2, flowering raceme, × 4, from Goldsboro, Wayne County, North Carolina, *Godfrey*, no. 6565; fig. 3, petiolule of terminal leaflet, × 10, from the *Hale* specimen.

PLATE 681, FIGS. 1–4, shows L. HIRTA var. INTERCURSA Fernald: FIGS. 1 and 2, portions of TYPE, × 1; FIG. 3, summit of petiolule of terminal leaflet, × 10, from TYPE; FIG. 4, portion of flowering raceme, × 4, from TYPE. FIGS. 5 and 6, details of L. ANGUSTIFOLIA (Pursh) Ell. (as here interpreted): FIG. 5, portion of fruiting raceme, × 4, from Plymouth, Massachusetts, *Fernald & Svenson* in Pl. Exsicc. Gray, no. 463; FIG. 6, summit of petiolule of terminal leaflet, × 10, from Egg Harbor, New Jersey, September 3, 1891, *J. B. Brinton.*

PLATE 682 is of L. HIRTA var. DISSIMULANS Fernald: FIG. 1, summit of TYPE, × 1; FIG. 2, flowering raceme, × 4, from Chesterville, Maine, August 16, 1902, *L. O. Eaton;* FIG. 3, fruiting raceme, × 4, from TYPE; FIGS. 4 and 5, upper and lower leaf-surfaces, × 10, from TYPE.

ZORNIA BRACTEATA (Walt.) Gmel. To the very few known stations in Virginia add one in HENRICO COUNTY: railroad ballast, Atlantic Coast Line Railroad freight-yard, Richmond, no. 12,381. See p. 516.

*VICIA GRANDIFLORA Scop. NORTHAMPTON COUNTY: side of road to Savage Neck, 1 mile east of Eastville, *R. R. Tatnall*, no. 3381. GREENSVILLE COUNTY: near foot-path on rich deciduous wooded slope by Three Creek, slightly above the "fall-line", northwest of Emporia, no. 11,863.

A handsome European species. See p. 490.

*CENTROSEMA VIRGINIANUM (L.) Benth., var. **ellipticum** (DC.) comb. nov. *Clitoria virginiana, β. elliptica* DC. Prodr. ii. 234 (1825), as to diagnosis. SUSSEX COUNTY: dry white sand of woods and clearings near Chub, nos. 12,690 and 13,368. JAMES CITY COUNTY: sandy border of field south of Norge, no. 13,369. First from north of South Carolina. See p. 519.

Centrosema virginianum consists, in the United States, of three varieties. The typical plant, described by Linnaeus from Virginia, has the principal well developed leaves with narrowly to broadly ovate leaflets tapering gradually to a subacuminate apex. This occurs from the West Indies and Florida to Texas and eastern Mexico, northward to southern New Jersey, Tennessee and Arkansas. It is the common plant of eastern Virginia. Var. *ellipticum* has most or all of the well developed leaves with elliptic-oblong to oblong-ovate and blunt or gradually round-tipped leaflets. DeCandolle's original diagnosis of *Clitoria virginiana,* var. *elliptica* was clear: "foliolis ovato-oblongis aut ellipticis", as contrasted with his γ. *ovata* (typical *C. virginiana*) "foliolis ovatis". Under his var. *elliptica* DeCandolle cited plate 76 of Dillenius. That, however, seems to me referable to typical *Centrosema virginianum* and not to agree with DeCandolle's diagnosis. Var. *ellipticum* is relatively rare. We have it from northern Florida to Louisiana, north to southeastern Virginia and Wayne Co., Kentucky (*Smith & Hodgdon*, no. 3878). Extremes with narrowest leaflets grade into the more southern *Centrosema virginianum*, var. *angustifolium* (DC.) Griseb. Fl. Brit. W. Ind. 193 (1860) = *Clitoria virginiana* α. *angustifolia* DC. l. c. (1825), with linear leaflets. Var. *angustifolium* occurs from the West Indies and Florida to eastern Texas and into Mexico. I have seen no material from north of Florida and Texas; and, whereas the common Virginian plant has leaflets mostly ovate, Small, thinking of the Florida plants, describes *Bradburya virginiana* (L.) Kuntze (*Centrosema virginianum*) with "Leaflets . . . linear, often narrowly so and elongate, to ovate", with primary emphasis on "linear". In the region where Clayton collected the type no plants with linear leaflets have been found.

Zanthoxylum Clava-Herculis L. Range extended inland from the outer coast to Isle of Wight County: thicket back of sand-beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,696, abundant. See p. 523.

*Croton monanthogynus Michx. Southampton County: waste ground, Franklin, no. 12,396.

Extension north from North Carolina. See p. 514.

Stillingia sylvatica L. Range extended northward. Sussex County: dry open sandy woods and thickets near Chub, nos. 12,125 and 12,397. See p. 498.

Euphorbia polygonifolia L. Range extended up the James to Surry County: sand-beach of Cobham Bay, James River, northwest of Chippokes, no. 12,702.

E. ammannioides HBK. To the first station north of Florida recorded in Rhodora, xli. 548 (1939) add the following. York County: sandy beach of York River above Yorktown, no. 12,703. Surry County: inner border of sand-beach of Cobham Bay, James River, northwest of Chippokes, no. 12,705. Isle of Wight County: inner border of sandy beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,706; similar habitat, Ragged Island, northeast of Carrollton, no. 12,704. See pp. 517, 518, 522 and 523, and Wheeler in Rhodora, xliii. 128, map 39 (1941).

*E. humistrata Engelm. Henrico County: railroad-ballast, Richmond, Fredericksburg and Potomac Railroad, Richmond, no. 12,708; similar habitat, South Richmond, no. 12,709. See p. 515 and Wheeler in Rhodora, ibid, 261 and map 40 (1941).

Adventive from west of the Appalachians.

*E. MARGINATA Pursh. SOUTHAMPTON COUNTY: waste ground, Franklin, no. 12,395. ISLE OF WIGHT COUNTY: waste ground, Lee's Mill, no. 12,394. See p. 514.

E. DENTATA Michx. To the few recorded stations add from HENRICO COUNTY: waste places and railroad ballast, Richmond, nos. 12,313, 12,712 and 12,713; leaves varying from narrowly lanceolate to elliptic-ovate.

CALLITRICHE DEFLEXA A. Br., var. AUSTINI (Engelm.) Hegelm. To the few recorded stations add one in SUSSEX COUNTY: argillaceous fallow field south of Stony Creek, no. 11,869. See p. 491.

Those who take up for this barely separable variety of the South American *Callitriche deflexa* the name *C. terrestris* Raf. have evidently overlooked the statements of Hegelmaier. In his Monographie der Gattung Callitriche, 55 (1864) Hegelmaier stated that *C. terrestris* Raf. was the terrestrial state of *C. verna.* Later, in his critical paper, *Zur Systematick von Callitriche* in Verhandl. d. Bot. Vereins f. Brand. ix. 16 (1867), Hegelmaier definitely said: "Was in den Herbarien unter dem Namen *C. terrestris* Raf. liegt, sind Landformen verschiedener Species, namentlich auch von *C. verna* und *heterophylla*"; and he went on to state that DeCandolle had material from Rafinesque. Rafinesque's account was as follows:

"1. Callitriche terrestre, terrestrial callitriche; stem procumbent spreading, leaves entire, thick, petiolated, oblong, obtuse flowers monoiceous; it is found in some moist grounds in New-Jersey and Pennsylvania".—Raf. in Med. Repos. hex. 2, v. 358 (1808).

It might easily be the terrestrial state of one of the amphibious species and in view of Hegelmaier's comments the name can hardly be maintained for *C. deflexa,* var. *Austini.*

SOME VARIETIES AND FORMS OF RHUS RADICANS AND R. TOXICODENDRON (PLATES 683–685).—It is now quite clear that the specimen in the Linnean Herbarium which was the primary basis of *Rhus Toxicodendron* is the low and simple to only sparsely branching, erect and slender plant, with obtuse and strongly pubescent leaflets, characteristic of the Coastal Plain from New Jersey to Texas and called by Michaux *R. Toxicodendron,* var. *quercifolia;* and that the often coarser species with usually more bushy to high-climbing habit and with acuminate leaflets and less pubescence is *R. radicans* L. Photographs of the two types in the Linnean Herbarium make this clear. Within these two major species Greene, Nieuwland and some others have proposed more than thirty of their species; though Barkley,[1] following them in treating *Rhus*, § *Toxicodendron* (Mill.) Gray as a genus *Toxicodendron*, recognizes only one departure from type in the two species in eastern North America. For many years, puzzled by the great variation of these species in eastern Virginia, Mr. Long and I have been accumulating material. This, with the large series already in the Gray Herbarium and in the herbarium of the New England Botanical Club, shows that each of the two primary species has well defined forms (some of them treated by others as species or varieties) and that in *R. radicans* we have within the Gray's Manual range three series which have sufficiently individual geographic ranges as to be apparently worthy recognition as geographic varieties. These eastern varieties and forms of *R. radicans* I distinguish as follows:

a. Stems strongly woody and prolonged, bushy and much-branched, erect, leaning, trailing or high-climbing and then forming aerial clinging roots; leaves alternately scattered along the branches; terminal leaflet narrowly to broadly ovate, scarcely rotund, gradually acuminate . . . *b*.
- *b*. Leaves firm to subcoriaceous, on petioles 2–10 (rarely –18) cm. long; leaflets mostly entire, the terminal one 3.5–10 (–14) cm. long; fruiting panicles dense, 1.5–5 (–7) cm. long; erect, leaning or climbing . . . *c*.
  - *c*. Fruit glabrous.
    - Leaves glabrous, or pilose or hispid only along the midrib and bases of veins ....*R. radicans* (typical).
    - Leaves pilose on the lower surface ....Forma *hypomalaca*.
  - *c*. Fruit pubescent; leaves as in typical form. Forma *malacotrichocarpa*.
- *b*. Leaves membranaceous, on petioles mostly 0.65–2 dm. long; leaflets coarsely dentate or lobate, undulate or entire, the terminal one 1.1–2 dm. long; fruiting panicle more open, 3.5–8 cm. long; high-climbing . . . *d*.
  - *d*. Lower leaf-surfaces and petioles glabrous ....Var. *vulgaris*.
  - *d*. Lower leaf-surfaces soft-pubescent.
    - Petioles glabrous ....Forma *intercursa*.
    - Petioles villous-tomentose ....Forma *Negundo*.

a. Stems woody for only 0.5–6 dm. above creeping subterranean stoloniferous bases, simple or very sparsely upright-branched, with no aerial roots; leaves approximate at summit of stem and branches, thus appearing falsely verticillate, on erect petioles 0.5–2.3 dm. long; leaflets membranaceous or subcoriaceous (in exposed habitats), dentate, undulate or entire, the terminal one broadly ovate to suborbicular (rarely narrower) and abruptly acuminate, 0.4–1.5 dm. long, the veins and veinlets of the lower surface often hirtellous ....Var. *Rydbergii*.

[1] Barkley in Ann. Mo. Bot. Gard. xxiv. 417–441 (1937).

R. RADICANS L. Sp. Pl. i. 266 (1753), photograph of TYPE in Gray Herb., our PLATE 683, FIG. 1. *R. Toxicodendron*, var. γ. *microcarpa* Michx. Fl. Bor.-Am. i. 163 (1803), photograph in Gray Herb.[1] *R. radicans*, var. *microcarpa* (Michx.) DC. Prodr. ii. 69 (1825). *Toxicodendron radicans* (L.) Ktze. Revis. Gen. i. 153 (1891). *R. Toxicodendron*, var. *radicans* (L.) Dippel, Handb. Laubholzk. ii. 376 (1892). *R. Blodgettii* Kearney in Bull. Torr. Bot. Cl. xxi. 486 (1894). *T. Blodgettii* (Kearney) Greene, Leafl. i. 126 (1905). *R. Toxicodendron*, forma *radicans* (L.) McNair in Field Mus. Bot. Ser. iv. 68 (1925). *T. radicans*, var. *microcarpum* (Michx.) Farwell in Am. Midl. Nat. xii. 125 (1930).—Thickets, open woods, sandy or rocky places and fencerows, southern Quebec to Minnesota, south to Nova Scotia, New England, Long Island, Florida, Kentucky and Illinois. Among many specimens examined, the following are characteristic. QUEBEC: Ste.-Geneviève, Ile de Montréal, *Adrien*, no. 1439. NOVA SCOTIA: East Jordan, Shelburne Co., *Fernald & Long*, no. 24,095; Yarmouth, *Pease & Long*, no. 21,785; Vaughan (Tusket) Lake, Gavelton, Yarmouth Co., *Fernald & Long*, no. 24,048. MAINE: Northfield, Aug. 15, 1931, *Knowlton;* Rockland, *Fernald*, no. 1994; Bowdoinham, *Fassett*, no. 352. NEW HAMPSHIRE: Gorham, *Pease*, no. 10,711; Plymouth, *Fernald*, no. 11,800. MASSACHUSETTS: Hyannis, Barnstable, *Fernald, Butters & St. John*, no. 15,269; Brewster, *Fernald & Long*, no. 17,053; Harwich, *Fernald & Long*, no. 17,055. RHODE ISLAND: Warren, *Sanford*, no. 10,121; Wickford, June 18, 1908, *E. F. Williams*. CONNECTICUT: Bethlehem, *Weatherby*, no. 4956; Oxford, June 8, 1889 and July 24, 1896, *Harger*. NEW YORK: Montezuma, Cayuga Co., *Eames, Wiegand & Randolph*, no. 12,399; Greenport, Long Island, August 22, 1858, *E. S. Hoar*. NEW JERSEY: New Brunswick, *F. L. Stevens* in Halsted's Am. Weeds, no. 119; east of Cedar Grove, Ocean Co., *Fogg*, no. 4832. PENNSYLVANIA: West Philadelphia, *J. W. Adams*, no. 619.

[1] I am purposely refraining from guesses as to the identities of the species of Miller in his Gardeners Dictionary, ed. 8 (1768). Many authors, including Barkley, have assumed, apparently without studying Miller's types (if they exist), that his *Toxicodendron vulgare, pubescens, glabrum* and *volubile* are all referable to typical *Rhus radicans* L. The latter, as shown by a photograph of the type (our PLATE 683, FIG. 1), is the shrub with relatively small, firm and entire ovate to ovate-lanceolate leaflets with rounded bases, the petioles rarely 1 dm. long. *T. vulgare*, as described by Miller, had "foliolis obcordatis, glabris, integerrimis . . . The foot-stalks of the leaves . . . near a foot long" and he cited as the only synonym of this shrub with glabrous and entire leaflets the *Toxicodendron triphyllum, folio sinuato pubescente* of Tournefort. Similarly, under his *T. pubescens*, "foliolis ovatis inciso-angulatis pubescentibus", Miller gave as the only synonym *T. triphyllum, glabrum* of Tournefort. In the modern slang, Miller's diagnoses and synonymy were a "mess." Without clarification of his names by means of accurate photographs they cannot safely be interpreted. For similar reasons I am omitting several additional names, listed by others without question. In so plastic a group their identity, merely from the vague descriptions, can only be assumed.

Delaware: south of New Castle, *Tidestrom*, no. 11,547; east of Leipsic, Kent Co., *E. L. Larsen*, no. 714. West Virginia: Hendricks, Tucker Co., *A. H. Moore*, no. 2115. Virginia: False Cape, *Fernald & Long*, no. 4016; Bedford Co., June and Sept., 1871, *A. H. Curtiss*. South Carolina: type of *R. Toxicodendron*, var. γ *microcarpa* Michx. (photo. in Gray Herb.). Florida: Alva, Lee Co., *Hitchcock*, no. 39; Sykes Hammock, Dade Co., *Small & Mosier*, no. 5482; Manatee, June, 1845, *Rugel;* Pine Key, *Blodgett* (tracing of type of *R. Blodgettii*). Wisconsin: Milwaukee Co., 1907, *Howland Russell*. Illinois: Ottawa, *J. W. Huett*. Minnesota: near Houston, Houston Co., *Butters & Rosendahl*, no. 3614.

When he published *Rhus Blodgettii* Kearney took as *R. radicans* the southern shrub with large, membranaceous and pubescent leaves which I am treating as a form under var. *vulgaris*. Kearney, with this interpretation of *R. radicans*, said that *R. Blodgettii* "may easily be distinguished by the smaller . . . thick and coriaceous leaflets, the upper surface shining and perfectly smooth, the lower surface pubescent only in the axils of the veins and at the base of the midrib", while his "*R. radicans* has the upper surface of the leaf almost always pubescent at least on the midrib, the lower surface pubescent all over."

*Forma **hypomalaca**, f. nov., foliorum paginis infernis pilosis. New York: along south wall, Vaughns, north of Hudson Falls, Washington Co., August 22, 1912, *S. H. Burnham;* on fence, 2 miles east of Vaughns, September 23, 1897, *Burnham*. West Virginia: dry upland woods, Berea, Ritchie Co., August 23, 1922, *L. F. & F. R. Randolph*, no. 1385 (type in Herb. Gray). Virginia: woods and thickets at base of calcareous bluffs along James River, above Chippokes, June 10, 1941, *Fernald & Long*, no. 13,064. Kentucky: Iroquois Park, May 16, 1932, *H. Bishop*, no. 56.

Forma **malacotrichocarpa** (A. H. Moore), comb. nov. *R. littoralis* Mearns in Proc. Biol. Soc. Wash. xv. 148 (1902), isotype in Gray Herb. *R. Toxicodendron*, forma *malacotrichocarpum* A. H. Moore in Rhodora, xi. 163 (1909), type in Gray Herb. *Toxicodendron radicans*, var. *littoralis* (Mearns) Barkley in Ann. Mo. Bot. Gard. xxiv. 434 (1937).—Scattered in the range of the glabrous-fruited plant, from Maine to Florida and Indiana.

Barkley, l. c., cites many specimens, to which many more might be added. He also includes in the synonymy *Toxicodendron aboriginum* Greene, Leafl. i. 125 (1905), from Oklahoma, which I have not seen. Greene's description calls for "thin" leaflets and "fruit . . . sparsely muriculate", whereas forma *malacotrichocarpa* has subcoriaceous leaves and distinctly pilose or villous fruit.

Var. VULGARIS (Michx.) DC. Prodr. ii. 69 (1825), at least as to basinym. *R. Toxicodendron*, var. α. *vulgare* Michx. Fl. Bor.-Am. i. 183 (1803), photograph of TYPE in Gray Herb.—Swampy woods and bottomlands, Florida to eastern Texas, north to southern Maine, Massachusetts, New York and Oklahoma. The following, selected from many specimens, are typical. MAINE: Fairfield, *Fernald & Long*, no. 14,017. MASSACHUSETTS: Andover, *Pease*, no. 836; Lexington, May 30, 1896, *Churchill;* New Marlboro, July 3, 1912, *Hoffmann.* RHODE ISLAND: Johnston, June 13, 1912, *Thos. Hope.* NEW YORK: Ithaca, *Wiegand*, no. 12,402. PENNSYLVANIA: Conewago, May 28, 1889, *Heller;* Northampton, August 21, 1923, *Churchill.* DELAWARE: west of Wilmington, *Tidestrom*, no. 11,500. MARYLAND: Horse Point, Tuckahoe River, *Tidestrom*, no. 11,977. SOUTH CAROLINA: northeast of Pineville, Berkeley Co., *Godfrey & Tryon*, no. 579; TYPE of variety, *Michaux* (photograph). FLORIDA: near Kissimmee, Osceola Co., *Hunnewell*, no. 8693. OKLAHOMA: Tishomingo, Johnston Co., *H. W. Houghton* in distrib. *G. W. Stevens*, no. 3559; Boss, McCurtain Co., *Houghton* in distrib. *Stevens*, no. 3718; Commerce, *Bush*, no. 10,142. TEXAS: Lake Como, Tarrant Co., *Ruth*, no. 941. PLATE 684.

It should be noted that in publishing *Rhus Toxicodendron*, var. *vulgaris* Michaux made no reference to the wholly dubious or confused *Toxicodendron vulgare* Mill. His var. *vulgaris* cannot, therefore, be held as a mere transfer of Miller's name. If it be urged that Michaux intended his var. *vulgaris* in the sense of typical *R. Toxicodendron*, it should be kept in mind that the specimen he described from South Carolina and Georgia is very different from the type of *R. Toxicodendron* L. I am, therefore, taking up Michaux's varietal name for the variation of *R. radicans* which he had.

*Forma **intercursa,** f. nov., var. vulgari similis, foliolis subtus velutino-pilosis, petiolis glabris.—PENNSYLVANIA: Neshaminy, Bucks Co., June 10, 1928, *Fred McDowell.* VIRGINIA: deciduous woods, Curles Neck Farm, Henrico Co., June 21, 1936, *Fernald, Long & Smart*, no. 5832 (TYPE in Herb. Gray); wooded bottomlands and swampy woods near Nottoway River, east of Stony Creek, Sussex Co., June 9, 1938, *Fernald & Long*, no. 8349.

*Forma **Negundo** (Greene), comb. nov. *Toxicodendron Negundo* Greene, Leafl. i. 117 (1905). *R. Toxicodendron Negundo* (Greene) F. C. Gates in Trans. Kans. Acad. Sci. xli. 106 (1938).—Distinguished by the large mostly membranaceous leaflets villous-tomentose beneath, the petioles also tomentose.—Wooded swamps and bottomlands, Florida to eastern Texas, north to Virginia, Ohio, Indiana, Illinois and Iowa. The following are characteristic. VIRGINIA: Matoaka Park, James City Co., *Baldwin*, no. 362; seeping calcareous wooded bluffs by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), Isle of Wight Co., *Fernald & Long*, no. 13,065; Claremont Wharf, Surry Co., *Fernald & Long*, no. 8350; Blacksburg, Montgomery Co., *Adams & Wherry*, no. 2230; Pembroke, Giles Co., *Fogg*, no. 14,773. NORTH CAROLINA: Tryon, Polk Co., May 18, 1899, *Churchill*. OHIO: Yellow Springs, Greene Co., *Demaree*, no. 11,455. INDIANA: Ingalls, Madison Co., *H. H. Smith*, no. 5619. TENNESSEE: Maryville, Blount Co., May 3, 1934, *R. K. Godfrey*. ILLINOIS: Starved Rock, La Salle Co., *Greenman, Lansing & Dixon*, no. 66. ARKANSAS: Lake City, Craighead Co., *Demaree*, no. 7218; West Memphis, Crittenden Co., *Demaree*, no. 11,118; Natural Steps, Pulaski Co., *Demaree*, no. 8569; Norman, Montgomery Co., *Demaree*, no. 9563; War Eagle, Benton Co., *Demaree*, no. 6784. LOUISIANA: near Alexandria, *Ball*, no. 429. KANSAS: Riley Co., *J. B. Norton*, no. 79, ISOTYPE of *Toxicodendron Negundo*. TEXAS: San Antonio, *Jermy*, no. 326.

*Var. RYDBERGII (Small) Rehder in Journ. Arn. Arb. xx. 416 (1939). *R. Rydbergii* Small ex Rydb. Mem. N. Y. Bot. Gard. i. 268 (1900). *Toxicodendron Rydbergii* (Small) Greene, Leafl. i. 117 (1905). *T. macrocarpum* Greene, l. c. (1905). *T. coriaceum* Greene, ibid. 120 (1905). *T. pumilum* Greene, ibid. 124 (1905). *T. punctatum* Greene, ibid. 125 (1905). *R. Toxicodendron*, var. *Rydbergii* (Small) Garrett, Spring Fl. Wasatch Reg. ed. 3: 69 (1917).—Woods, rocky slopes and wet peat, Gaspé County, Quebec, to southern British Columbia, south to Nova Scotia, northern, central and western New England, mountains of western Virginia, northern Indiana, northern Illinois, western Kansas, Texas, New Mexico and Arizona. The following, selected from abundant specimens, are characteristic. QUEBEC: Cape Rosier, Gaspé Co., July 14, 1932, *Pease*; Milnikek, Matapedia R., *Rousseau*, no. 32,417; Montmorency Falls, *J. Macoun*, no. 66,814. NEW BRUNSWICK: gorge of Aroostook River, Victoria Co., Aug. 17, 1901, *E. F. Williams*; Woodstock, *Fernald & Long*, no. 14,016. NOVA SCOTIA: Port Bevis, Victoria Co., *Fernald & Long*, no. 21,792; Five-mile River, Hants Co., *Pease & Long*, no. 31,789; Bridgewater, *Fernald & Long*, no. 24,093. MAINE: Fort Fairfield, *Fernald*, no. 1995; Winn, *Fernald & Long*, no. 14,014; Pembroke, *Fernald*, no. 1993; Camden, *Rossbach*, no. 532. New Hampshire: Stark, *Pease*, no. 17,465; Randolph, *Pease*, no. 16,705; Shelburne, *Pease*, no. 12,249. Vermont: Willoughby Lake, June 5, 1895, *Churchill;* Shelburne Point, June 25, 1913, *Knowlton;* Halifax, June 28, 1939, *Knowlton*. Massachusetts: Bradford, June 17, 1914, *Churchill;* Stony Brook Reservation, Suffolk Co., June 7, 1919, *Kidder*. New York: Trenton Falls, *Haberer*, no. 197; Selkirk, Oswego Co., *Fernald, Wiegand & Eames*, no. 14,374; Lansing, *Wiegand*, no. 12,401; Ithaca, *E. L. Palmer*, no. 768. Virginia: north of Hopewell Gap, Bull Run Mts., Fauquier Co., *Allard*, no. 462; at 3600 ft. alt., near Luray, *Steele & Steele*, no. 151. Ontario: Stokes Bay, Bruce Peninsula, *Krotkov*, no. 9192. Michigan: Charity Island, Saginaw Bay, Huron Co., September 25, 1911, *C. K. Dodge;* Agricultural College, June 9, 1894, *Skeels*. Wisconsin: Minong, Washburn Co., *Fassett*, no. 8528; Milwaukee Co., 1907, *Howland Russell*. Minnesota: Spring Grove, *Rosendahl*, no. 280; Schoolcraft Island, Itasca Park, *M. L. Grant*, no. 2976. Manitoba: Lake Winnipeg Valley, 1857, *Bourgeau*. North Dakota: Devil's Lake, July 17, 1902, *Lunell*. South Dakota: Deadwood, *Rydberg*, no. 83. Kansas: at 3500 ft. alt., Syracuse, Hamilton Co., *C. H. Thompson*, no. 102, isotype of *Toxicodendron macrocarpum* Greene. Oklahoma: Knowles, Beaver Co., *G. W. Stevens*, no. 516 (the specimen, showing the base broken off at ground-level, is less than 3 dm. high and characteristic var. *Rydbergii;* the memorandum on the label, "Climbing trees and shrubs", must have belonged to some other number). Saskatchewan: without definite locality, 1857–8, *Bourgeau*. Idaho: Lake Pend d'Oreille, *Sandberg, MacDougal & Heller*, no. 963. Wyoming: Hartville, *A. Nelson*, no. 557; Pole Creek, *A. Nelson*, no. 154; Sheridan, *Rollins*, no. 558. Colorado: at 5000 ft., Poudre R., Larimer Co., *J. H. Cowen*, no. 126; Norwood Hill, San Miguel Co., *E. P. Walker*, no. 498. Utah: Wahsatch Mts., *S. Watson*, no. 218; Farmington Cañon, alt. 4300–4500 ft., *Pammel & Blackwood*, no. 3630; Farmington, June 11, 1908, *Mrs. Joseph Clemens;* Jackson Draw, alt. 7000 ft., Uinta Basin, *E. H. Graham*, no. 8115. New Mexico: Kingston, alt. 6600 ft., *O. B. Metcalfe*, no. 1088, isotype of *Toxicodendron punctatum* Greene; Mogollon Mts., at 7500 ft., *O. B. Metcalfe*, no. 339; Winsor's Ranch, alt. 8400 ft., Pecos River National Park, *Standley*, no. 4011. Arizona: vicinity of Flagstaff, alt. 7000 ft., *MacDougal*, no. 28, isotype of *Toxicodendron pumilum* Greene; Navaho Reservation, *C. T. Vorhies*, no. 62; Chaperon Canyon, Chiricahua Mts., alt. 7500 ft., *Blumer*, no. 1325. Washington: Spokane, *Suksdorf*, no. 264 (*Toxicodendron coriaceum* Greene), *Kreager*, no. 538; Waitsburg, *Horner*, no. R 113 B 129; Coulee City, Grant

Co., *Thompson,* no. 9115. Oregon: The Dalles, *Thos. Howell;* Pendleton, June, 1886, *Henderson.* Plate 683, fig. 2.

Var. *Rydbergii* is more distinct from typical *Rhus radicans* than the other varieties and forms here considered, but altogether too many specimens are found which cannot be clearly identified. They seem to be quite transitional. There is no question that it was included by Linnaeus in his *R. radicans.* Although the sheet which Linnaeus had in his own herbarium at the time of preparing Species Plantarum is *R. radicans,* as here interpreted (plate 683, fig. 1), the specimen in the Clifford herbarium (plate 683, fig. 2) cited by him (Hort. Cliff. 110) is characteristic *R. radicans,* var. *Rydbergii.* The variety, I am told by some who have watched it in the field, rather rarely fruits as compared with the frequent and abundant fruiting of typical *R. radicans.* This scarcity of fruiting may, perhaps, be correlated with the highly perfected vegetative reproduction by subterranean stolons. There is no satisfaction in trying to separate the firm-leaved plants of open and more xerophitic habitats from the thinner-leaved plants of mesophytic areas. Greene indulged freely in an attempt to set up as species such responses to aridity and moisture, but the most extraordinary of his propositions is his *Toxicodendron pumilum,* based upon specimens collected on June 2, with the shattered fruit of the preceding year persisting and the new leaves not yet expanded.[1]

[1] In ordering up the material in the Gray Herbarium I find it necessary to have satisfactory names for the following:

Rhus radicans, var. **laetevirens** (Greene), stat. nov. *Toxicodendron laetevirens, phaseoloides* and *Arizonicum* Greene, Leafl. i. 123 (1905).

Isotypes of all three are in the Gray Herbarium, all from the same phytogeographic area, and show no difference which I can detect. They have very pale and narrow leaflets as compared with the other varieties of *R. radicans.*

R. radicans, var. **verrucosa** (Scheele), comb. nov. *R. verrucosum* Scheele in Linnaea, xxi. 592 (1848). *Toxicodendron verrucosum* (Scheele) Greene, Leafl. i. 124 (1905). *T. radicans,* var. *verrucosa* (Scheele) Barkley in Ann. Mo. Bot. Gard. xxiv. 435 (1937).

R. radicans, var. **divaricata** (Greene), comb. nov. *Toxicodendron divaricatum* Greene, Leafl. i. 122 (1905). *R. divaricata* (Greene) McNair in Field Mus. Publ. Bot. iv. 60 (1925), not Eckl. & Zeyh. (1834). *R. Greenei* McNair, ibid. as Correction (1925). *T. radicans,* var. *divaricata* (Greene) Barkley in Ann. Mo. Bot. Gard. xxiv. 433 (1937).

R. radicans, var. **pubens** (Engelm. ex Wats.), comb. nov. *R. Toxicodendron,* var. foliis ramulisque molliter pubentibus. Thickets, New Braunfels [Texas], Engelm. ex Gray in Bost. Journ. Nat. Hist. vi. 295.—Pl. Lindh. pt. ii. 159 (1850). *R. Toxicodendr.,* var. *pubens* Engelm. ex Wats. Bibl. Index. 185 (1878), interpretable through reference to descr.

The sheet of the type or isotype in the Gray Herbarium has Lindheimer's label with the data: "247. High in thickets, not climbing, fl. odorous. New Braunfels, Texas.

True *Rhus Toxicodendron* is a relatively constant species. Although the name was early tossed about, the specimen in the Linnean Herbarium (our PLATE 685, FIGS. 1 and 2) which Linnaeus had in preparing Species Plantarum is quite definite. It was properly interpreted by many of the earlier authors (Nuttall, DeCandolle and others) and recently by Britton and by Rehder as the small nonclimbing shrub of the southeastern Coastal Plain which was called by Michaux *R. Toxicodendron*, var. *quercifolia*. Barkley has given the synonymy under *Toxicodendron quercifolium* [as *quercifolia*] (Michx.) Greene in Ann. Mo. Bot. Gard. xxiv. 420 (1937) and it need not here be repeated, except to exclude as altogether doubtful the *T. pubescens* Mill. and the resultant combination *R. pubescens* (Mill.) Engler. As to the specific name, it is somewhat singular that most, if not all, monographers cite the original binomial, *Rhus Toxicodendron*, without qualification as published by Linnaeus in Species Plantarum, ed. 1 (1753), except when, as in DeCandolle's Prodromus (ii. 69) and in Engler's treatment in DeCandolle's Monographiae, iv. 393 (1883), they start it from p. 381, which was in ed. 3 (1766) of Species Plantarum, where, as in his ed. 2 (1762), Linnaeus definitely called it *R. Toxicodendr*UM. Barkley (p. 426), to be sure, says "*R. Toxicodendrum* L., Sp. Pl. **1:** 266. 1753, in part; Torr. & Gray, Fl. N. Am. **1:** 218. 1838, as *R. Toxicodendron*", thus implying that, first, the name was spelled *Toxicodendrum* by Linnaeus in 1753 and, second, that the change to *Toxicodendron* started with Torrey & Gray in 1838. Since there is no justification for either of these inferences and since the citation in *Index Kewensis* is inadequate, it seems important to attempt a clarification of the name. As I see the facts they are embodied in the following paragraph.

RHUS TOXICODENDR L. Sp. Pl. i. 266 (1753). *R. Toxicod.* L. Syst. Nat. ed. 10, ii. 964 (1759). *R. Toxicodendron* L. Syst. Nat. ed. 11, ii. 964 (1760). *R. Toxicodendrum* L. Sp. Pl. ed. 2, i, 382 (1762) and ed. 3, i. 381 (1766). *R. Toxicodendr.* L. Syst. Nat. ed. 12, ii. 218 (1767) and ed. 13, ii. 218 (1770).

F. L. Aug. '46" and in Engelmann's hand "*Rhus Toxicodendron* ? var. *pubens*". The larger and flowering specimen has very pale bark, the young growth cinerous-puberulent, the panicle very long and lax, the firm leaflets densely velvety-puberulent. This I take as TYPE OR ISOTYPE. With it is a small sterile sprig of var. *verrucosa*.

It is evident that Linnaeus and the space-regulations of his printers caused some doubt as to the ending of the name, a borrowing of the earlier generic name *Toxicodendron.* Fortunately, however, the first time the full spelling was used (unless, unhappily, I may have overlooked a case) for the species, in 1760, Linnaeus conformed to the long-established usage.

Typical *Rhus Toxicodendron* has lobulate or coarsely toothed leaves suggesting oak-leaves, whence the colloquial Poison Oak. They are crowded near the tip of the slender ascending stem and thus appear somewhat falsely verticillate. Their lower surfaces are velvety to the touch with dense pilosity, and the fruit is commonly very pubescent. The lobes or teeth vary from rounded to deltoid but there seems to be no clear character to separate such variations. In adding to the synonymy Greene published several names. One of his proposed species, *Toxicodendron compactum* Greene, Leafl. i. 126 (1905), of which an isotype is before me, had leaflets which "recall strongly those of some oaks of the black oak series; though the lobes are all obtuse." On the next page it was said of *T. quercifolium* (Michx.) Greene that "Its leaflets are patterned always after the black-oak type, i. e. are acutangular, while in . . . *T. compactum* they have sinuate and rounded lobes, imitating the white-oak type".

Scattered through the range there are colonies with more or less elliptic and almost entire to barely undulate leaflets. These are so definite that I am calling them

*R. Toxicodendron, forma **elobata,** f. nov. (tab. 685, fig. 3), foliolis ellipticis subintegris. New Jersey: 1½ miles southeast of Bridgeton, Cumberland County, July 20, 1909, *S. S. Van Pelt* (type in Herb. Gray.). Virginia: dry sandy woods south of Petersburg, June 8, 1938, *Fernald & Long,* no. 8346 (transitional); dry sandy pine and oak woods north of Orion, Greensville County, *Fernald & Long,* no. 13,675. Louisiana: without statement of locality, *Hale.*

Throughout its broad range, from New Jersey and Maryland to Texas, the fruit of *Rhus Toxicodendron* is usually quite pubescent. At one of our stations in Sussex County, Virginia, however, the fruit is essentially glabrous. This plant I am calling

*R. TOXICODENDRON, forma **leiocarpa,** f. nov., fructibus glabris vel glabratis.—VIRGINIA: dry open sandy pine and oak thickets near the County Line, south of Jarratt, June 8, 1938, *Fernald & Long,* no. 8347 (TYPE in Herb. Gray, ISOTYPE in Herb. Phil. Acad.).

In PLATE 683, FIG. 1 is from the TYPE of RHUS RADICANS L.; FIG. 2, the Hortus Cliffortianus specimen included by Linnaeus with the other and here interpreted as R. RADICANS, var. RYDBERGII (Small) Rehder.

PLATE 684 shows a characteristic terminal leaflet, × 1, of RHUS RADICANS, var. VULGARIS (Michx.) DC., from Tishomingo, Oklahoma, *H. W. Houghton* in distrib. *G. W. Stevens,* no. 3559 (quite like the TYPE of *R. Toxicodendron,* var. *vulgare* Michx.—photograph too weak for reproduction).

In PLATE 685, FIGS. 1 and 2 are from the TYPE of RHUS TOXICODENDRON L.; FIG. 3 from TYPE, × 1, of R. TOXICODENDRON, forma ELOBATA Fernald.

THE VARIATIONS OF RHUS AROMATICA IN THE GRAY'S MANUAL RANGE (PLATES 686 and 687).—

RHUS AROMATICA Ait., var. **arenaria** (Greene), comb. nov. *Schmaltzia arenaria* Greene, Leafl. i. 130 (1905). *R. trilobata,* var. *arenaria* (Greene) Barkley in Ann. Mo. Bot. Gard. xxiv. 408 (1937); *Schmaltzia trilobata,* var. *arenaria* (Greene) Barkley in Am. Midl. Nat. xxiv. 660 (1940).

The small-leaved extreme of *Rhus aromatica* which centers on the dunes at the head of Lake Michigan has the characteristic fruits and stones of *R. aromatica,* not those of *R. trilobata* Nutt. The latter, described from "the central chain of the Rocky Mountains" has, as originally described, "the nut flat". In his treatment of the group, originally in *Rhus,* when, under conservative influence, he followed the broad and mature judgment of DeCandolle, Torrey, Gray, Endlicher, Bentham & Hooker, Engler and many others (including even Rydberg and Small in their later years) in maintaining the subgenus within *Rhus,* and in his latest paper, preferring the procedure of Desvaux, Rafinesque and Greene in keeping it apart, Barkley places the small-leaved shrub of the dunes of Lake Michigan under *R. trilobata* or *Schmaltzia trilobata* because of its small leaves, with flabelliform terminal leaflet.

That the group is most complex every one knows; and Rafinesque, Greene and Rydberg proposed nearly half a hundred specific names for its variations in the United States alone. The shrub of "the central chain of the Rocky Mountains", from Alberta to New Mexico, described by Nuttall as *R. trilobata* (PLATE 686, figs. 1–5) has the fruit pruinose with waxy or glandular atoms and without or with only remote nonglandular villi. The stone (FIGS. 4 and 5) is 4.5–6 mm. long and strongly flattened, the sides almost plane.

The more eastern *Rhus aromatica* Ait. (*R. canadensis* Marsh., not Mill.) has larger leaves than in *R. trilobata* and the fruit is very densely long-villous, so densely that the surface of the fruit is almost hidden (PLATE 687, FIG. 9); and the relatively plump (though compressed) stones (FIGS. 10 and 11) have somewhat rounded to subumbonate sides and are 3.8–4.5 mm. long. It is, therefore, significant that the small-leaved shrub of the dunes of Lake Michigan described by Greene as a species, *Schmaltzia arenaria* (PLATE 686, FIGS. 6 and 8–10), and treated by Barkley as an isolated eastern variety of the western *Rhus* or *Schmaltzia trilobata*, should have the densely long-villous fruit (FIG. 8) and the relatively plump and small stone (FIGS. 9 and 10) of the eastern *R. aromatica*. Although in his recent Flora of Indiana Deam follows Barkley, it is quite reassuring that, in his detailed account of the small-leaved shrub of the Indiana dunes in his earlier Shrubs of Indiana (1924), he should have said: "It appears to be a dwarf form [of *Rhus canadensis*, i. e. *R. aromatica*] with puberulent branchlets. All specimens from the dune area belong to this form, and specimens from Porter County were referred to this species by Nieuwland. A study of the branchlets of specimens from thirteen counties shows that those from the dune area of Lake Michigan, and from Clark and Harrison Counties are puberulent. The remainder are smooth or nearly so. It is believed that the smoothness or pubescence of the branchlets is a character not sufficient to divide the species, on account of the intergrading forms."[1]

Consideration of the lines, if there are any, between *Rhus aromatica* and *R. trilobata*, as the latter is reputed to occur in the Gray's Manual range, leads one to *Schmaltzia serotina* and *S. lasiocarpa* Greene. Their treatment by different authors is as follows:

SCHMALTZIA SEROTINA Greene, Leafl. i. 131 (1905). *S. lasiocarpa* Greene, ibid. 141 (1905). *Rhus canadensis*, var. *serotina* (Greene) Palmer & Steyermark in Ann. Mo. Bot. Gard. xxii. 591 (1935). *R. trilobata*, var. *serotina* (Greene) Barkley in

[1] Deam, Shrubs of Indiana, 173 (1924).

Ann. Mo. Bot. Gard. xxiv. 406 (1937). *Rhus aromatica*, var. *serotina* (Greene) Rehder in Journ. Arn. Arb. xx. 415 (1939). *Schmaltzia trilobata*, var. *serotina* (Greene) Barkley in Am. Midl. Nat. xxiv. 661 (1940).

I have before me many of the numbers cited by Barkley, including nine sheets from the original collector of *Schmaltzia serotina* and an isotype of Greene's *S. lasiocarpa*, treated, correctly, by Barkley as inseparable from *S. serotina*. It is, then, important to note that these have heavily long-villous fruit (PLATE 687, FIGS. 2 and 5) as in *Rhus aromatica* and the relatively plump stone (FIG. 6) as in the eastern species. Their terminal leaflets were described by Barkley under *R. trilobata*, var. *serotina* as "4–9 cm. long, 5–8 cm. broad", and he considered them "a fairly uniform variety with fruit characters similar to the species, and with leaf characters between those of the species and *R. aromatica*." The variety, as it occurs from Iowa and eastern Nebraska to Arkansas and eastern Oklahoma, is nearly uniform, but in the many sheets before me the terminal leaflets are only 2.5–6 cm. long and 2–4 cm. broad. Greene's original description of his *Schmaltzia serotina*, from Missouri, said "terminal leaflet 2 inches [5.7 cm.] long or more, 1½ [3.8 cm.] wide; his account of his *S. lasiocarpa*, from Kansas, said "terminal leaflet 1¼ to 1¾ inches [3.18–4.45 cm.] long". I am unable to reconcile Greene's original measurements or my own with those given by Barkley in his monograph. Neither do I find the "uniform variety with fruit-characters similar to the species [*R. trilobata*]", at least as shown by the series from Nuttall's type-area of *R. trilobata*, "the central chain of the Rocky Mountains"; for typical *R. trilobata*, as already noted, has pruinose and only sparsely if at all villous fruit and flattened stones, *R. aromatica*, var. *serotina* densely long-villous fruit and smaller and plumper stones.

Two other characters seem to me wholly to justify Palmer & Steyermark and Rehder in treating *Schmaltzia serotina* as a variety of *Rhus aromatica*, rather than of *R. trilobata*. These are the bracts of the ament, and the relatively short pedicels. In typical *R. trilobata* the loosening bracts (PLATE 686, FIG. 2) of the ament are densely villous over the back; in *R. aromatica* they (PLATE 686, FIG. 7 and PLATE 687, FIG. 7) have a nearly or quite glabrous area within the densely ciliate margin. In *R. aromatica*, var. *serotina* the bracts (PLATE 687, FIG. 4) show the bare area as in true *R. aromatica*.

Barkley characterizes the eastern *Rhus aromatica*[1] as having "flowers almost sessile", while his description assigns *R. trilobata* "pedicels about 2.5 mm. long." PLATE 686, FIG. 7 and PLATE 687, FIG. 8 show portions of flowering aments, × 10, from Natural Bridge, Virginia, of typical *R. aromatica;* PLATE 687, FIG. 3, a similar portion, also × 10, of an ament from Greenwood, Missouri (cited by Barkley), of *R. aromatica,* var. *serotina.* That the flowers in PLATE 686, FIG. 7 and in PLATE 687, FIG. 8 are not "almost sessile" and that the pedicels in PLATE 687, FIG. 3 do not approach "2.5 mm." is sufficiently evident.

I am fortunate that all the variations of the *Schmaltzia*-series within the Gray's Manual range are so clearly referable to *Rhus aromatica,* for farther west the complex generally referred to *R. trilobata* or its varieties shows many unfortunate transitions. *R. canadensis,* var. *serotina,* with leaflets too large and fruit too densely villous for typical *R. trilobata,* passes insensibly, it would seem, into the very small-leaved but villous-fruited shrub of Kansas, Oklahoma and Texas which Greene called *Schmaltzia pulchella, S. quercifolia* and *S. tridophylloides,* all of which are unequivocally placed by Barkley under *R. trilobata* (typical) or one of its varieties. These seem to merge westward and northwestward into the shrub with sparsely villous to non-villous fruit; and the old-fashioned treatment of them all as geographic varieties of a single specific type may prove to be the sound one.

In PLATE 686 FIGS. 1–5 are of RHUS TRILOBATA Nutt.: FIG. 1, fruiting branch, × 1, from Leucite Hills, Wyoming, *Merrill & Wilcox,* no. 704; FIG. 2, portion of inflorescence showing pubescent backs of bracts, × 10, from Blue Grass Hills, Wyoming, *A. Nelson,* no. 322; FIG. 3, drupe, × 5, from Twin Falls and Shoshone Falls, Idaho, *Nelson & Macbride,* no. 1350; FIGS. 4 and 5, stone, × 5, from Howe's Gulch, Colorado, *Crandall,* no. 124. FIGS. 6, 8, 9 and 10, R. AROMATICA Ait., var. ARENARIA (Greene) Fernald:

[1] *Rhus aromatica* is cited by Barkley from but two stations in Canada: Ile Lemieux, which is in the lower Ottowa River, not far from Ottawa; and Shannonville, which is slightly north of the eastern end of Lake Ontario. Nevertheless, his map, with only two dots in Canada, indicates the species as growing from Nippissing District to Algoma, north of Lake Huron and 300–400 miles northwest of its cited Canadian stations. He also cites and maps it from the Arnold Arboretum in Boston, where, of course, it is cultivated. There is no evidence of it as a native of New England outside of western Vermont and southern Connecticut.

FIG. 6, flowering branch, × 1, from Pine, Indiana, *Lansing*, no. 2711; FIG. 8, drupe, × 5, from Port Chester, Indiana, July 19, 1920, *D. C. Peattie*; FIGS. 9 and 10, stone from same collection. FIG. 7, portion of inflorescence of R. AROMATICA Ait., to show glabrous-backed bracts and long pedicels, × 10, from Natural Bridge, Virginia, May 8, 1887, *Kennedy*.

In PLATE 687 FIGS. 1–6 are of RHUS AROMATICA Ait., var. SEROTINA (Greene) Rehder: FIG. 1, flowering branch, × 1, from Greenwood, Missouri, *Bush* no. 6676; FIG. 2, fruiting branch, × 1, from Louisa County, Iowa, June 26, 1909, *Shimek*; FIG. 3, portion of inflorescence, showing glabrate backs of bracts, × 10, from no. 6676; FIG. 4, young ament showing glabrous backs of bracts, × 10, from Vale, Missouri, *Bush* no. 4929; FIG. 5, portion of drupe, × 5, from *Shimek*; FIG. 6, stone, turned edge up, × 5, from *Shimek*. FIGS. 7–11, R. AROMATICA Ait.: FIG. 7, portion of expanding inflorescence, showing glabrous backs of bracts, × 10, from Guilford, Connecticut, May 1, 1905, *G. H. Bartlett*; FIG. 8, portion of expanded inflorescence, showing long pedicels, × 10, from Natural Bridge, Virginia, May 8, 1887, *Kennedy*; FIG. 9, portion of drupe, × 5, from Lansing, New York, *MacDaniels*, no. 4508; FIGS. 10 and 11, stone, × 5, from Middleburg, New York, *Svenson*, no. 7841.

CELASTRUS ORBICULATUS Thunb. To the station recorded in Caroline County add one in HENRICO COUNTY: thickets and borders of woods, Richmond, no. 12,717.

C. SCANDENS L. ISLE OF WIGHT COUNTY: thicket back of sand-beach of Burwell's Bay, James River, below Fort Boykin, no. 12,716. SURRY COUNTY: rich calcareous wooded ravines along James River, Claremont, no. 13,680 (plants weak and sterile). See p. 520.

Our first records from the Coastal Plain of Virginia.

STAPHYLEA TRIFOLIA L. To the few Coastal Plain stations recorded add one in DINWIDDIE COUNTY: wooded bottomland of Appomattox River below Petersburg, no. 12,127. See p. 492.

ACER FLORIDANUM (Chapm.) Pax. Local range extended northward and northeastward. YORK COUNTY: rich wooded ravine by York River, above Yorktown, no. 12,128. ISLE OF WIGHT COUNTY: rich calcareous wooded slopes by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,718; wooded bluffs along James River below Fort Boykin, no. 13,070; seen in great abundance west of Fort Boykin. SUSSEX COUNTY: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,399. See pp. 505, 510 and 523.

*A. RUBRUM L., var. DRUMMONDI (Hook & Arn.) Sargent. SUSSEX COUNTY: dry white sand of woods and clearings near Chub, no. 12,720; swampy woods near Nottoway River, above Readjuster Bridge, south of Peanut, no. 13,072. SOUTHAMPTON COUNTY: dry woods and clearings south of Berlin, no. 7526. NANSEMOND COUNTY: open wet pineland southwest of Marsh Hill School, south of South Quay, no. 12,721.

Range extended north from South Carolina.

*Impatiens biflora Walt., forma Peasei A. H. Moore. King William County: fresh tidal marsh of Pamunkey River, Sweet Hall, no. 12,724.

*I. biflora, forma immaculata Weatherby. King and Queen County: fresh tidal marsh of Mattaponi River, Walkerton, no. 12,723.

*Parthenocissus incerta (Kern.) K. Fritsch, forma macrophylla (Lauche) Rehder. Dinwiddie County: waste place, Petersburg, no. 12,408; spread from cultivation.

Ampelopsis arborea (L.) Koehne. To the few recorded stations add the following. Princess Anne County: climbing high in trees, Cedar Island, no. 12,406. Isle of Wight County: waste ground near Lee's Mill, no. 12,407. See pp. 513 and 514.

*Vitis labruscana Bailey. Henrico County: waste places and railroad ballast, Richmond, no. 12,405; obviously from seed thrown from car-window.

V. aestivalis Michx., var. argentifolia (Munson) Fernald. Surry County: thicket back of sand-beach of Cobham Bay, James River, northwest of Chippokes, nos. 12,728 and 12,729. Isle of Wight County: similar habitat, Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,730.

The common northern and upland extreme with petioles and new branchlets glabrous. See p. 524.

V. cinerea Engelm. Local range extended northward to the James River. Isle of Wight County: thickets and borders of cypress and gum swamps back of beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,731; Bailey's Beach (MacKimmie's Wharf), near Rushmere, no. 12,734.

V. Baileyana Munson. Isle of Wight County: thicket back of sand-beach of Burwell's Bay, James River, at Bailey's Beach (MacKimmie's Wharf), near Rushmere, no. 12,732; border of cypress and gum swamp back of beach of Burwell's Bay, below Rushmere (Fergusson's Wharf), no. 12,733. See p. 524.

First record east of the upland of western Virginia.

*Tilia floridana (V. Engler) Small. Surry County: rich woods on fossiliferous sandy slopes of gullies near Claremont Wharf, no. 7897 (as *T. Michauxii* Nutt.).

Extension north from North Carolina.

Tilia, as it occurs along the lower James, is as baffling as elsewhere. I find myself incapable of applying with satisfaction the keys and descriptions of Sargent's revision of the American species in Bot. Gaz. lxvi. 421–438, 494–511 (1918). But, judging by specimens so identified, our no. 7897 seems to be *T. flori-*

dana (V. Engler) Small, Fl. Se. U. S. 761 and 1335 (not "Ashe, Fl. Southern U. S.," as cited by Sargent).

Near the station for no. 7897 there are handsome trees with the leaves heavily white-felted beneath when mature, our no. 8365, which I have already reported as *T. heterophylla* Vent. It is a close match for many specimens from the Appalachian Upland but perhaps not for "*T. heterophylla*" as interpreted by Sargent, op. cit. 423. There, in his key, he assigns "*T. heterophylla*" "petioles not more than 4 cm. long; . . . flowers 3.5–5 mm. long", as contrasted with his proposed new *T. monticola*: "petioles up to 7 cm. in length; . . . flowers 10–12 mm. long". On p. 504, however, he describes his "*T. heterophylla*" with "Flowers 6–7 mm. long"; and under *T. heterophylla*, with "petioles not more than 4 cm. long", Sargent (p. 509) retains as var. *Michauxii* (Nutt.) Sarg. the cordate-leaved tree occurring from "southern and western New York . . . to Missouri and northwestern Arkansas, . . . Southward through Kentucky and Tennessee . . . , Georgia and . . . Alabama". If *T. heterophylla* has "petioles not more than 4 cm. long", it is most disconcerting that so many specimens from western New York, Pennsylvania, Ohio, Kentucky and Tennessee (Sargent's *T. heterophylla*, var. *Michauxii*) should have them often 5–8 cm. long: Ithaca, New York, *Palmer & Eames*, no. 792, up to 5 cm.; Alexandria, Huntingdon County, Pennsylvania, *Porter*, up to 6.5 cm.; New Bloomfield, Perry County, Pennsylvania, *Adams*, no. 1394, up to 5.3 cm., with flowers 8 mm. long; near Cincinnati, Ohio, *C. G. Lloyd*, up to 5 cm.; Garner Creek, Kentucky, *McCoy*, no. 136, up to 8.2 cm.; Anchorage, Kentucky, *Le Constant et al.*, no. 137, up to 5 cm.; etc. These, although in the range given by Sargent for his *T. heterophylla*, var. *Michauxii* and outside the range assigned by him to his *T. monticola*, can scarcely be separated from specimens cited by him under the latter. Until those who see different species in this group give us a statement of characters which really separate them it is quite unsatisfactory to attempt differentiation.

A word should be said regarding *Tilia americana* L. and *T. neglecta* Spach. Sargent (p. 424), stating that *T. americana* was based by Linnaeus upon a specimen from Kalm "not in the Linnaean Herbarium", rejected the name, since it had been used for the northern species (*T. glabra* Vent.) and because "both *T. neglecta* and *T. heterophylla Michauxii* are more common in the part of the country which he [Kalm] visited than the tree which recent authors have called *T. americana*." The latter occurs generally from western New Brunswick across Maine and Quebec to Manitoba, thence southward, Victorin, Fl. Laurent. 382, saying of its occurrence in Quebec "Général, sauf dans le nord-est", Dole and others, Fl. Vt. 187, citing it as "common" in Vermont, and House saying of it in New York "Common in most sections of the State". Stone (Pl. So. N. J. 548) said of it in New Jersey "Common in the northern counties, and occasional southward" but he knew of no other species there; and Porter (Fl. Penn. 208) cited it from most counties of eastern Pennsylvania and no other species there. *T. neglecta* is said by Sargent (p. 492) to reach its northern limit near Montreal, though Victorin (Fl. Laurent. 382) was doubtful of its occurrence anywhere in the province of Quebec. From the doubted station near Montreal *T. neglecta* was given a range "to the coast of Massachusetts and New York, to the valley of the Potomac River and along the Appalachian Mountains to those of North Carolina and to . . . Mississippi" etc. Now, reexamination of Kalm's routes shows that he spent much time in eastern Pennsylvania, New Jersey and northern Delaware and that he went up the Hudson, through Lake Champlain, thence to Montreal and eastward to Quebec and beyond, also to the Ontario Basin of New York State, always within the area of *T. americana* as generally understood and mostly outside the ranges of the other two species. The identity of Kalm's specimen can hardly be doubted. It is, furthermore, certainly not without significance that in September, 1748, in an enumeration of the trees of the Philadelphia region, Kalm listed as no. 52 "Die Linde, in guter Erde".[1] This could have been only *T. americana* as regularly interpreted.

As to *T. neglecta* Spach (*T. Michauxii* sensu Sargent, not Nutt.), it is a baffling series with little constancy. Theoretically it should have the leaves green or merely grayish beneath, with loosely scattered stellate hairs and simple pilosity. In fact, however, few different collections can be closely matched one

[1] Kalm, Reise, i. 221 (1757).

with another. It seems to be a series very close to glabrous *T. americana,* but with some stellate or mixed pubescence. As now interpreted it is surely not a satisfactory species. I have temporarily placed here our no. 8763 from Eastover, Surry County, and our no. 13,083 from banks of the James west of Fort Boykin, Isle of Wight County. These have permanent pubescence like that of the tree of "the coast of Massachusetts" (Harwich, *Fernald & Long,* nos. 17,083 and 18,742) which Sargent (p. 495) refers to *T. neglecta.* Since, however, his key (p. 423) calls for "tufts of axillary hairs not conspicuous" and his fuller description (p. 494) says "furnished with conspicuous tufts of axillary hairs", the would-be interpreter is left high and dry. Furthermore, at the station for no. 13,083 three trees side-by-side are referable to (1) the narrow-leaved extreme of *T. heterophylla,* (2) the broader-leaved extreme of *T. heterophylla* and (3) the green-leaved *T. neglecta.* It is most difficult to imagine seeds of three different species landing on the shore of the James at this point and then producing three large trees of different species side-by-side.

Sida rhombifolia L. To the single Virginian station recorded (in Southampton County) add one in Isle of Wight County: roadside, Lee's Mill, no. 12,738, a single healthy plant, obviously of recent introduction.

Kosteletzkya virginica (L.) Presl, var. **aquilonia,** var. nov. (tab. 688, fig. 3 et 4), var. *typicae* simillima; calycibus floriferis 6–10 mm. altis, bracteolis 2.5–6 mm. longis; petalis 1.8–3 cm. longis 1–1.6 cm. latis; columna 0.65–1.5 cm. longa; carpellis sparse hispido-setosis, setis 0.5–1.5 mm. longis.—Long Island, New York, to Virginia. Type: Hudson County, New Jersey, *D. C. Eaton* in Herb. Gray.

Kosteletzkya virginica is represented in Virginia by three varieties. Typical *K. virginica* (L.) Presl, for want of better knowledge of the Linnean type of *Hibiscus virginicus* L. (which must await the present war), I am taking in the sense of the Sprague drawings published when the specific combination was ascribed to Presl by Gray in his Gen. ii. 80, pl. 132 (1849). Sprague's published plate and the drawings which form its basis were of the southern extreme which occurs from the Gulf States and Florida north to southeastern Virginia. Whereas the northern var. *aquilonia* has the leaves mostly angulate-rotund to

-ovate, with only the upper and bracteal ones becoming narrowly ovate to lanceolate and hastate, var. *typica*[1] has the narrowly ovate to lanceolate and hastate blades extending farther down the stem. In var. *typica* (FIGS. 1 and 2) the flowering calyx (FIG. 1) is 8–13 mm. high, with linear-subulate bractlets 6–10 mm. long, the expanded flower (FIG. 1) with petals 3.2–4.5 cm. long and 2–3 cm. broad, with the column of stamens and the styles 1.5–2.5 cm. long. In var. *typica*, furthermore, the carpels (FIG. 2) are copiously villous-hirsute with hairs 1.5–2 mm. long. The smaller-flowered var. *aquilonia* has the flowering calyx 6–10 mm. high, the bractlets 2.5–6 mm. long, the expanded corolla (FIG. 3) with petals only 1.8– (rarely) 3 cm. long and 1–2 cm. broad, the column 0.65–1.5 cm. long, the carpels (FIG. 4) more sparsely hispid-setose with straight setae only 0.5–1.5 mm. long.

The third variety in Virginia is var. *altheaefolia* Chapm., coarser, with copius rough tomentum on stem and foliage giving a paler and plush-like appearance, the leaves often without divergent basal lobes, the thick pedicels rarely equaling their subtending leaves (in vars. *typica* and *aquilonia* the more slender pedicels frequently overtopping the subtending leaves), the flower much as in var. *typica* but with more hispid-tomentose calyx, the carpels (FIG. 5) very heavily villous-hirsute.

Characteristic Virginia specimens of the three varieties are cited below.

KOSTELETZKYA VIRGINICA (L.) Presl. JAMES CITY COUNTY: tidal marsh along Chickahominy River west of Toano, *R. W. Menzel*, no. 270. PRINCESS ANNE COUNTY: open clay at border of woods, east of Little Creek, no. 4029. ISLE OF WIGHT COUNTY: cypress and gum swamp back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,737. SURRY COUNTY: swale back of sand-beach of James River, Claremont, no. 13,691. See p. 525.

*Var. AQUILONIA Fern. PRINCESS ANNE COUNTY: border of salt marsh, arm of Lynnhaven Bay, at Third Street Bridge, Great Neck, no. 4937. NORFOLK COUNTY: brackish marsh near Kempsville, *Fernald & Griscom*, no. 2851. SURRY COUNTY: springy swale by Cobham Bay, James River, northeast of Chippokes, no. 12,736.

[1] KOSTELETZKYA VIRGINICA (L.) Presl, var. typica. *Hibiscus virginicus* L., Sp. Pl. ii. 697 (1753). *K. virginica* (L.) Presl ex Gray, Gen. ii. 80, pl. 132 (1849).

*Var. ALTHEAEFOLIA Chapm. PRINCESS ANNE COUNTY: brackish to fresh marsh along Back Bay, margin of Cedar Island, no. 12,409. See p. 513.

In PLATE 688 FIGS. 1 and 2 are of KOSTELETZKYA VIRGINICA (L.) Presl. var. TYPICA: FIG. 1, flowering branch, × 1, from below Rushmere (Fergusson's Wharf), Virginia, *Fernald & Long,* no. 12,737; FIG. 2, fruit, × 3, from east of Jacksonville, Onslow County, North Carolina, *Godfrey,* no. 6397. FIGS. 3 and 4, var. AQUILONIA Fernald: FIG. 3, flowers, × 1, from the TYPE; FIG. 4, fruit, × 3, from south of Hancock's Bridge, Salem County, New Jersey, *Fogg,* no. 9916. FIG. 5, var. ALTHEAEFOLIA Chapm.: fruit, × 3, from Lake Okeechobee, Florida, *Small,* no. 8218.

*HYPERICUM DENTICULATUM Walt. GREENSVILLE COUNTY: argillaceous clearing in swampy woods near Readjuster Bridge, northeast of Orion, no. 12,132. See p. 500.

H. MUTILUM L., var. LATISEPALUM Fernald. To the single recorded station add the following. KING WILLIAM COUNTY: fresh tidal marsh of Pamunkey River, Sweet Hall, no. 12,740; fresh muddy and sandy tidal shore of Mattaponi River, northwest of King William Courthouse, no. 12,739. KING AND QUEEN COUNTY: fresh tidal marsh of Mattaponi River, Walkerton, no. 12,741. NEW KENT COUNTY: fresh tidal marsh of Chickahominy River, Lanexa, no. 13,698; similar habitat, Lacey Creek, west of Walker, no. 13,697.

CROCANTHEMUM; HAS IT REALLY STABLE GENERIC CHARACTERS? (PLATES 689 and 690).—In Engler & Prantl, Die natürlichen Pflanzenfamilien, iii. Abt. 6: 304–306 (1895), Reiche followed the conservative and conventional course and held *Helianthemum* as a single genus, with several subgenera, throwing all American species, no matter what their habit, inflorescence and style-characters, into an all-inclusive subgenus *Lecheoides* (Dunal) Reiche (§ *Lecheoides* Dunal). In this course Reiche followed the best students of the past. Shortly thereafter, again in one of the Englerian series, *Halimium* (Dunal) Willk. and *Tuberaria* (Dunal) Spach were taken out of *Helianthemum*, this time by Grosser in Engler, Das Pflanzenreich, iv[193]. 9 and 10 (1903). Grosser defined the three genera recognized by him as follows.

"1. Stigma stylo brevi, recto, basi nunquam geniculato vel flexuoso suffultum. Sepala 5 vel 3. Flores aut omnes homomorphi, chasmogami, aut dimorphi, chasmogami petaliferi, multistaminei, cleistogami aut petalis minutis praedita, aut omnes apetali, oligandri. Embryo circinatus vel subcircinatus, non plicatus. Funiculi filiformes. Genus gerontogaeum et americanum............................1. *Halimium* (Dunal) Willk.

2. Stigma sessile vel stylo brevissimo suffultum. Sepala 5. Embryo periphaericus triangulariter flexus aut curvatus, non plicatus. Funiculi validi media parte inflati. Genus gerontogaeum.......2. *Tuberaria* (Dunal) Spach.
3. Stigma stylo elongato basi saepius geniculato vel sigmoideo-curvato suffultum. Embryo simpliciter vel biplicatus. Funiculi obconici, validi, non filiformes. Genus gerontogaeum..................3. *Helianthemum* Adans."

Although Grosser's statement of the characters differentiating *Halimium* clearly said "Stigma stylo brevi, recto . . . suffultum", his fuller description of *Halimium* (on his p. 33) allowed it to have "stigma subsessile", which is precariously close to his "Stigma sessile vel stylo brevissimo suffultum" for *Tuberaria*. Furthermore, although in his contrasting statements *Helianthemum* was described "Stigma stylo elongato basi saepius geniculato vel sigmoideo-curvato suffultum", Grosser allowed detailed drawings to be published, showing quite straight styles (in *Helianthemum Strickeri* Gross., in his fig. 15D; in *Helianthemum Schweinfurthii* Gross. (his fig. 16C) and in *Helianthemum aegyptiacum* (L.) Mill., his fig. 18I—our PLATE 690, FIG. 4).

All North and South American species were placed in two sections of *Halimium*, the third section being of the Old World. The first, *Halimium* § *Spartioides* Grosser, is Pacific American, plants with broom-like habit, no cleistogamous flowers, and seeds said to be numerous ("Capsula polysperma"), such species as *Helianthemum Greenei* Robinson (*H. occidentale* Greene, not Nym.), *Helianthemum scoparium* Nutt. (our PLATE 690, FIG. 5) and *Helianthemum spartioides* Presl. The second section recognized by Grosser was *Halimium*, § *Euhalimium* Grosser, Old World plants with isomorphic flowers and few or many seeds. The third of his sections was the polymorphic American *Halimium* § *Lecheoides* (Dunal) Grosser, with habit not broom-like, the flowers either uniform and showy or the later ones cleistogamous and with few ovules.

This section included such dissimilar plants as *Helianthemum carolinianum* (Walt.) Michx. (our PLATE 689, FIGS. 1–3), the type-species of *Crocanthemum* Spach, with broad rosulate leaves much as in *Tuberaria guttata* (L.) Grosser or *Helianthemum guttatum* (L.) Mill. (our PLATE 689, FIG. 4), with cleistogamous flowers so rare that, in revising *Helianthemum* for Small's Flora of the Southeastern States, ed. 2: 793 (1913), Barnhart separated it from the other eastern American species by "Flowers all alike and petaliferous", and with the broad stigma (FIG. 3) nearly or quite as sessile as in the most extreme members of Old World *Tuberaria* (as in *Tuberaria globularifolia* (Lam.) Willk.[1], our FIG. 5), in some of which the cauline leaves are opposite or the upper alternate (PLATE 690, FIG. 1) and the flowers are "nicht selten kleistogam und dann manchmal apetal" —*Janchen; Helianthemum brasiliense* (Lam.) Pers. (our PLATE 690, FIGS. 2 and 3) with lower leaves sometimes opposite; *Helianthemum glomeratum* Lag., clearly illustrated by Grosser, l. c. fig. 11A, with opposite (instead of alternate) leaves, the petaliferous flowers (our PLATE 690, FIGS. 6 and 8) with definite styles as defined for the group, the cleistogamous flowers abundant; *Helianthemum corymbosum* Michx., which has both showy petaliferous and apetalous and cleistogamous flowers in the same corymb; *H. canadense* (L.) Michx., with the cleistogamous flowers in separate inflorescences, the broad stigma (our FIG. 10) essentially sessile; *H. propinquum* Bicknell, with slender style (fig. 11); and *H. capitatum* Nutt. (FIG. 9) and *H. rosmarinifolium* (fig. 7) also with slender styles.

In a third of the Englerian series, Die Pflanzenfamilien, Aufl. 2, Bd. 21: 300 et seq. (1925), Janchen took his turn at revising the generic lines, here following his *Bemerkungen zu der Cistaceen-Gattung Crocanthemum.*[2] Janchen felt that all the American plants ought to be treated as a single genus, because they had long been segregated geographically from the Old World ones, a type of wishful thinking too frequently taking the place of detailed studies and careful taxonomy. *Halimium* of Grosser's treatment in Das Pflanzenreich was forthwith split, throwing out all species which occur in the Americas as a separate genus, *Crocanthemum* Spach. The chief differences between *Halimium, Tuberaria* and Old World *Helianthemum* were given much as they had been by Grosser; but strictly American *Crocanthemum* was contrasted with Old World *Halimium* as having spirally arranged (instead of opposite) leaves, cleisto-

[1] On his p. 53 Grosser cited the species as *Tuberaria "globulariifolia* (Lam.) Willk.", based upon *Cistus "globulariaefolius"* Lam.; but on his p. 55 it appeared as *T. "globulariifolia* (Spach) Willk." The specific name started with Lamarck, not with Spach, and as *Cistus globularifolius*, not *"globulariaefolius"*.

[2] Janchen in Osterr. Bot. Zeitschr. lxxi. 266–270 (1922).

gamous flowers in some of the species (instead of in none), sepals 5 (instead of 3 or 5) and in being native of the Americas (instead of the Old World). If development in the New World, as contrasted with the Old World, is alone a generic character, then several of our sections of *Viola* (either with or without cleistogamous flowers) are genera; so are scores of other American subgenera, sections and series in genera also represented in the Old World. In his paper in 1922 Janchen noted that *Crocanthemum* had been taken up by Britton and by Bicknell. In regard to Britton's subscribing to *Crocanthemum* as a genus I wrote in 1917: "It is noteworthy in this connection that even Dr. Britton, under *Crocanthemum* in the *Illustrated Flora*, inserts after *C. majus* a newly recorded species for the region, not as *Crocanthemum* but as *Helianthemum georgianum*, thus indicating that the change to *Crocanthemum* was made at the last moment and apparently without very careful study of the question".[1] If the segregation of amphigean genera is justified merely because Britton or his follower, Bicknell, segregated them, then the sections of *Polygonum* must be treated as genera and we must take up *Persicaria, Bistorta, Tracaulon, Tiniaria*, &c. It is doubtful if Britton and Bicknell (who was an intensive and keenly observant local amateur) gave the thorough world-wide study to *Polygonum* that it has received from Meisner and others who have viewed it in relation to all the genera in the family and have kept it intact. It is also evident, from the above quotation, that Britton did not go extensively into the generic constancy of *Crocanthemum*.

Rehder, following the latest German treatment, that of Janchen, gives in the second edition of his Manual of Cultivated Trees and Shrubs, 644–649 (1940) the conventional Germanic characterization of *Helianthemum*, with "Style elongated, curved or bent at base; sepals 5"; leaves "mostly opposite, or the upper ones alternate, rarely all alternate". No mention is made by him of cleistogamous flowers in his *Helianthemum*, though Grosser recognized 12 species of *Helianthemum* § *Eriocarpum* with "Flores saepissime cleistogami"; and, as already noted, the

[1] Fernald in Rhodora, xix. 59 (1917). At the same time I pointed out that when Spach published *Crocanthemum* as a genus, based on *Helianthemum carolinianum*, he explicitly said "Flores omnes 5-petali"; Spach at the same time setting up for the American series with apetalous cleistogamous flowers another genus which he called *Heteromeris*.

definition, "Style elongated, curved or bent at base," for *Helianthemum*, finds exception in numerous admitted Old World species of that genus with straight and sometimes very short styles. *Halimium* is defined by Rehder with "lvs. exstipulate, the lower opposite, the upper alternate or all alternate; . . . sepals 3 or 5; . . . style short, straight, with capitate or 3-lobed stigma"; and he separates "**Crocanthemum** Spach, differing from *Halimium* chiefly in alternate lvs., the presence of small cleistogamous fls. and 5 sepals". In view of the "lvs. . . . upper alternate or all alternate; . . . sepals 3 or 5" of *Halimium* we are left only with production of cleistogamous flowers as the differentiating point in the strictly American genus *Crocanthemum;* and since the type of *Crocanthemum, Helianthemum carolinianum,* was collected for more than 150 years before it was recorded as ever producing rare and exceptional cleistogamous flowers and since several other species treated unequivocally as *Crocanthemum* (*Helianthemum Greenei, scoparium, spartioides* and others) never produce them, while the short- and straight-styled species of Old World *Helianthemum* have them, the production of cleistogamous flowers in some but not all of the species of *Crocanthemum* does not seem to me final proof that it is, therefore, a distinct genus.

As to the characters of the embryo, I have not had a sufficient series of modern Old World material to go with confidence into these somewhat erudite points; but the more obvious distinctions recently cited give us the following results (see p. 614):

In his statement in 1922 that *Crocanthemum* should be recognized as a distinct genus primarily because it is in America, not in the Old World, Janchen wrote: "It may be disputed whether such characters are sufficiently significant for one to base a separation of genera on them, and the determination of that would be to a certain degree a matter of taste, so long as it can be considered certain that both the groups under consideration have a common origin and are more closely related to each other than either of them to a third group. (Es liesse sich wohl streiten, ob solche Merkmale bedeutend genug sind, um darauf eine Gattungstrennung zu begründen, und die Entscheidung darüber wäre bis zu einem gewissen Grade Geschmackssache, so lang es als sicher gelten kann, dass die beiden in Betracht

	Duration	*Leaves*	*Flowers*	*Sepals*	*Style*
HELIANTHEMUM in the restricted sense	Herbaceous to fruticose	Opposite or alternate	Isomorphic, with expanded petals, or cleistogamous, with reduced or no petals.	5	Often geniculate or curved and elongate; or straight and sometimes short.
HALIMIUM	Fruticose to suffruticose	Opposite (or alternate, acc. to *Rehder*)	Isomorphic, with expanded petals	3 or 5	Straight and short
CROCANTHEMUM	Herbaceous to suffruticose	Alternate, the lower sometimes opposite, the basal sometimes rosulate.	Isomorphic, with expanded petals, or cleistogamous, with reduced or no petals.	5	Straight and short, with small or large stigma; or wanting and with broad sessile stigma
TUBERARIA	Herbaceous or fruticose	Opposite or partly alternate, the basal rosulate.	Isomorphic, with expanded petals, or cleistogamous, with reduced or no petals.	5	Straight and short; or wanting and with broad sessile stigma.

kommenden Gruppen gemeinsamen Ursprung haben und untereinander näher verwandt sind, als jede von ihnen mit irgendeiner dritten Gruppe)." It seems to me much less a matter of taste than of sound morphology. So long as the American series contains species which, sometimes in one, sometimes in another, exhibit differences in habit, arrangement of leaves, isomorphy or dimorphy of flowers, and development of style and of stigma, which are duplicated in the proposed generic segregates in the Old World I must await a more convincing statement before I abandon the use of *Helianthemum* for the entire group.

In PLATE 689, FIG. 1 is a plant, × 1, of HELIANTHEMUM CAROLINIANUM (Walt.) Michx. (type-species of the genus *Crocanthemum*) from south of Myrtle Beach, South Carolina, *Weatherby & Griscom*, no. 16,585; FIG. 2, a mature inflorescence, × 1, from Charleston, South Carolina, *B. L. Robinson*, no. 132; FIG. 3, ovary and sessile stigma, × 10, from Murrell's Inlet, South Carolina, *Weatherby & Griscom*, no. 16,586. FIG. 4, plant of H. GUTTATUM (L.) Mill. or TUBERARIA GUTTATA (L.) Grosser, × ½, after *Reiche* and *Janchen*. FIG. 5, ovary and stamens of HELIANTHEMUM

GLOBULARIFOLIUM (Lam.) Pers. or TUBERARIA GLOBULARIFOLIA (Lam.) Willk., × 5, after *Grosser*.

PLATE 690, FIG. 1, shows three fruiting stems of HELIANTHEMUM (TUBERARIA) GUTTATUM (L.) Mill. with upper leaves alternate, × 1, from near Placencia, Spain, *Bourgeau*, no. 2405. FIGS. 2 and 3: HELIANTHEMUM BRASILIENSE (Lam.) Pers. (*Crocanthemum brasiliense* (Lam.) Spach): FIG. 2, base of stem, showing *opposite* leaves, × 1, Rio Grande do Sul, *Bornmüller*, no. 297; FIG. 3, ovary and sessile stigma, × 10, from Dept. Maldonada Solis, Uruguay, *Osten*, no. 21,649. FIG. 4, section of flower of HELIANTHEMUM AEGYPTIACUM (L.) Mill., × 3, after *Janchen*. FIG. 5, ovary and stamens, × 8, of HELIANTHEMUM SCOPARIUM Nutt. or *Crocanthemum scoparium* (Nutt.) Millsp., after *Grosser*. FIGS. 6 and 8, HELIANTHEMUM GLOMERATUM Lag. or *Crocanthemum glomeratum* (Lag.) Janchen: FIG. 6, ovary and style, × 10, from Santiago Papasquiaro, Durango, *Palmer*, no. 56 (of 1896); FIG. 8, vertical section of flower, × 3, after *Janchen*. FIG. 7, vertical section of flower, × 10, of HELIANTHEMUM ROSMARINIFOLIUM Pursh or *Crocanthemum rosmarinifolium* (Pursh) Janchen, after *Grosser*. FIG. 9, ovary and style, × 10, of HELIANTHEMUM CAPITATUM Nutt., from Oliver, Georgia, *Curtiss*, no. 6838. FIG. 10, ovary and stigma, × 10, of HELIANTHEMUM CANADENSE (L.) Michx or *Crocanthemum canadense* (L.) Britton, from Francis Mills, New Jersey, *Long*, no. 52,124. FIG. 11, ovary, style and stigma, × 10, of HELIANTHEMUM PROPINQUUM Bicknell or *Crocanthemum propinquum* Bicknell, from Harwich, Massachusetts, *Fernald*, no. 17,161.

*HELIANTHEMUM CANADENSE (L.) Michx., var. **sabulonum,** var. nov. (TAB. 691, FIG. 1 et 2), caulibus paucis decumbentibus vel laxe adscendentibus; foliis oblongo-ellipticis plerumque supra canescentibus; floribus cleistogamicis in corymbis laxis plerumque terminalibus pedicellatis, maturis 4–5 mm. diametro.—Dunes and open sand, local, Cape Cod, Massachusetts, and Oneida Lake, New York, to southeastern Virginia. MASSACHUSETTS: dry sands along Lower County Road, Dennis, Barnstable County, September 2, 1918, *Fernald & Long*, no. 17,135.[1] NEW YORK: sandy fields at head of Oneida Lake, Verona, Oneida County, September 3, 1901, *J. V. Haberer*, no. 95.[2] VIRGINIA: dry pine barrens, Cape Henry, September 24, 1933, *Fernald & Griscom*, no. 2853 (transitional); sprawling on sand dunes south of False Cape, Princess Anne County, August 2, 1934, *Fernald & Long*, no. 4044 (TYPE in Herb. Gray.).

Typical *Helianthemum canadense* (FIG. 3) has the numerous stems erect or nearly so, the lance-oblong to oblanceolate leaves green above, the nearly sessile cleistogamous flowers few in small glomerules terminating the branches and usually scattered in spiciform series in the axils below the glomerules, in maturity

[1] Although on the original label note was made that the peculiar branching was induced by injury to the main axis, several of the specimens show no injury, and they have the oblong-elliptic leaves of the variety.

[2] One of several miscellaneous collections distributed by Haberer under the identical number.

or in fruit commonly unequal in size, the terminal ones 3–4 mm. in diameter, the lower ones smaller. In its relatively open terminal corymbs of cleistogamous fruits var. *sabulonum* somewhat suggests *H. corymbosum* Michx. It is probable that collections of the former have given rise to reports of the latter in the Gray's Manual range.

In PLATE 691, FIG. 1 is from the TYPE of HELIANTHEMUM CANADENSE (L.) Michx., var. SABULONUM Fernald; FIG. 2, from Dennis, Massachusetts, *Fernald & Long*, no. 17,135. FIG. 3 is of characteristic fruiting H. CANADENSE from Norwood, Massachusetts, August 14, 1908, *Kennedy*.

*VIOLA LATIUSCULA Greene. DINWIDDIE COUNTY: rich, deciduous woods about old marl-pits east of Burgess Station, no. 9982. SUSSEX COUNTY: rich woods and bushy clearings just east of the "fall-line" along Nottoway River, Double Bridge, about 6 miles northwest of Jarratt, no. 11,085. GREENSVILLE COUNTY: rich woods along brook entering Nottoway River below Double Bridge, north of Orion, no. 12,134.

Extension south from northwestern New Jersey and Pennsylvania. Nos. 11,085 and 12,134 closely match Greene's type. See p. 499.

*V. SEPTEMLOBA LeConte. SOUTHAMPTON COUNTY: rich sandy and loamy woods along Three Creek, northwest of Carey Bridge, no. 11,871.

Extension north from North Carolina. See p. 489.

V. PENSYLVANICA Michx. Fl. Bor.-Am. ii. 149 (1803) in part. *V. eriocarpa* Schwein. in Am. Journ. Sci. v. 75 (1822). SUSSEX COUNTY: rich woods by Nottoway River, southeast of Stony Creek, no. 12,414; our first collection on the Coastal Plain of Virginia. See p. 509.

Michaux's *Viola pensylvanica*, as shown by a photograph of the original material, was a mixture of *V. pubescens* Ait. (1789) and of *V. eriocarpa* Schwein. (1822). The former is represented by very immature plants scarcely in bloom, the latter by a plant with well-grown foliage and an old flower. Excluding the element already described (*V. pubescens*), we have material of *V. eriocarpa* remaining. By the "doctrine of residues" the latter stands as type of the Michaux name. *V. pensylvanica* grew "in umbrosis, juxta rivulos Pensylvaniae, praesertim ad *Skullkill*". It is impossible to determine whether it represented the common southern plant with white-woolly capsules or the common northern variety with them glabrous. Since the two varieties meet in eastern Pennsylvania I am treating *V. pensylvanica* as identical with *V. eriocarpa*.[1]

*PEPLIS DIANDRA Nutt. (*Didiplis diandra* (Nutt.) Wood.). CHESTERFIELD COUNTY: margin of exsiccated old mill-pond in Swift Creek, Lakeview, no. **9439**, the terrestrial forma TERRESTRIS Koehne (erroneously distributed to many herbaria and reported in RHODORA, xli. 477 and 570 (1939) as *Oldenlandia Boscii* (DC.) Chapm., which is known in Virginia only from Southampton County). SUSSEX COUNTY: back-water pool by Nottoway River at Readjuster Bridge, south of Peanut, no. **12,137**, forma AQUATICA Koehne; shallow water of pond, Moore's Mill, no. **13,400**. CHARLES CITY COUNTY: fresh tidal margin of Chickahominy River near Cypress Bank Landing, no. **13,399**.

Extension north from North Carolina. See p. 500 and MAP 3.

AMMANNIA KOEHNEI Britton. To the few recorded stations add one in NORFOLK COUNTY: tidal marshes of North Landing River, below North Landing Bridge, no. **12,744**.

A. KOEHNEI, var. EXAURICULATA Fernald. To the single known station (on North Landing River) add one in SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. **12,745**, very abundant. See p. 522.

LYTHRUM LINEARE L. Extending up the James to SURRY COUNTY: tidal marsh by Cobham Bay, northwest of Chippokes, no. **12,747**.

L. LANCEOLATUM Ell. To the nearly (possibly wholly) extinct small station in Sussex County reported in RHODORA, xxxix. 342 and 436 (1937) add a very extensive one in YORK COUNTY: old-field swale north of Grafton, nos. **12,136** and **12,748**. See p. 504.

EPILOBIUM COLORATUM Muhl. Local range extended down the James to ISLE OF WIGHT COUNTY: seeping argillaceous and calcareous bluffs along Burwell's Bay, below Rushmere (Fergusson's Wharf), no. **12,750**. See p. 524.

SANICULA MARILANDICA L. SUSSEX COUNTY: dry sandy hickory and oak woods near Chub, no. **12,756**.

Our first station for typical *S. marilandica* on the Coastal Plain. See p. 507.

ERYNGIUM YUCCIFOLIUM Michx. To the few recorded stations add two others in SUSSEX COUNTY: rich woods along Not-

[1] The plant common in eastern Canada and New England and less so southward is V. PENSYLVANICA, var. **leiocarpa** (Fernald & Wiegand), comb. nov. *V. eriocarpa*, var. *leiocarpa* Fernald & Wiegand in RHODORA, xxiii. 275 (1921).

toway River, east of Huske, no. 12,424; border of swampy woods, abundant, near Nottoway River, above Readjuster Bridge, south of Peanut, no. 13,091. See p. 509.

*Anthriscus scandicina (Web.) Mansf. (*A. vulgaris* Pers.) Dinwiddie County: waste ground and cinders of freight-yard of Norfolk and Western Railroad, Petersburg, no. 12,142, in some abundance.

Our first collection from North America; adventive from Europe. See p. 493.

Chaerophyllum Tainturieri Hook. Range extended northeastward to Surry County: clearings and borders of cultivated fields west of Ingersoll, no. 11,876; thicket back of sand-beach of James River, above Chippokes, no. 13,092. See p. 488.

*C. Tainturieri, var. floridanum Coult. & Rose. Dinwiddie County: waste ground and cinders of freight-yard of Norfolk and Western Railroad, Petersburg, no. 12,141.

Extension north from South Carolina. See p. 493.

Zizia aptera (Gray) Fernald. Sussex County: about ledges in rich woods at the "fall-line" along Nottoway River, above Double Bridge, about 6 miles northwest of Jarratt, no. 12,145. Greensville County: rich wooded slope slightly above "fall-line" by Three Creek, northwest of Emporia, nos. 11,877 and 12,760; rich woods along brook entering Nottoway River below Double Bridge, north of Orion, no. 12,144.

Our first collections of this upland plant at and below the "fall-line." See pp. 490 and 499.

Ligusticum canadense (L.) Britton. Greensville County: rich wooded slope slightly above the "fall-line" by Three Creek, northwest of Emporia, nos. 11,878, 12,143 and 12,765.

A typical plant of the Appalachian Upland here within a few rods of the inner margin of the Coastal Plain. See p. 490.

Thaspium trifoliatum (L.) Gray. Local range extended inland to Sussex County: dry woods and thickets bordering Jones Hole Swamp, west of Coddyshore, no. 10,350; sandy open woods, thickets and clearings by Nottoway River, below Peters Bridge, southeast of Lumberton, no. 12,425. See p. 507.

T. trifoliatum, var. flavum Blake. Greensville County: rich wooded slope by Three Creek, slightly above the "fall-line", northwest of Emporia, no. 11,879.

The plant of the Appalachian Upland here close to the inner margin of the Coastal Plain. See p. 490.

T. BARBINODE (Michx.) Nutt. Range extended down the James to ISLE OF WIGHT COUNTY (several nos.); plants unusually vigorous, up to 1.2 m. high.

SOME FORMS OF RHODODENDRON ATLANTICUM.—In spring, from late March into June, the sandy barrens and oak- and pine-lands of the Coastal Plain from South Carolina to New Jersey are deliciously fragrant and beautifully colored by the broad colonies of *Rhododendron atlanticum*, a low species, usually only 2–6 dm. high but sometimes up to 1 m., with shallowly buried subterranean slender stolons and erect stems usually unbranched below, the strongly ascending branches with spreading stipitate glands on the young growth. Its one competitor at that season is *R. nudiflorum* (L.) Torr., taller, up to 3 m. high, with more spreading branches, the branchlets strigose-setose and glandless. In *R. nudiflorum* the corolla is essentially odorless, in *R. atlanticum* with a strong fragrance as of carnations; in *R. nudiflorum* the corolla is pilose and glandless outside (or in forma *glandiferum* (Porter) Fernald[1] with scattered glands); in *R. atlanticum* the corolla (especially the tube and throat) bears slender lines of gland-tipped spreading hairs; in *R. nudiflorum* the ovary and capsule are setose and nonglandular; in *R. atlanticum* glandular-hirsute. As a species *R. atlanticum* is very definite,[2] but in its variations in color of corolla it is most perplexing. Some of the variations have received names; others doubtless will. Unfortunately there has been a complete misunderstanding, created by the original author of the species, as to what constitutes true *R. atlanticum*. In an effort to clarify his contradiction and the confusion arising from it, I have made the following brief key to the different forms of the species already recognized. The specimens cited are in the Gray Herbarium.

[1] RHODODENDRON NUDIFLORUM (L.) Torr., forma **glandiferum** (Porter), stat. nov. *Azalea nudiflora glandifera* Porter in Bull. Torr. Bot. Cl. xxvii. 508 (1900) and Fl. Penn. 228 (1903). *R. nudiflorum*, var. *glandiferum* (Porter) Rehder in Wilson & Rehd. Mon. Azaleas, 138 (1921).

[2] Although the species received its first binomial in 1917, it was evidently known to John Clayton, whose plant was described by Gronovius in 1739:

AZALEA pusilla floribus albis in corymbos tenues dispositis: foliis oblongis glabris integris alternis: caule duro non ramoso lignoso. *Clayt.* n. 533.—Gron. Fl. Virg. 140 (1739).

a. Corolla purple or reddish to deep pink throughout.
Corolla glabrous outside except for the scattered rows of straight stipitate glands; pedicels spreading-glandular *R. atlanticum* (typical).
Corolla minutely pilose outside, the glands mixed with long villi; pedicels villous and more sparsely glandular..Forma *neglectum*.
a. Corolla white to pale pink or merely pink to purple outside toward base, or with yellowish tones toward base . . . *b*.
b. Corolla white, suffused outside or on tube with pink or purple; corolla-tube and pedicels merely glandular-hispid; buds white or pink.
Corolla-lobes uncleft..............................Forma *confusum*.
Corolla-lobes deeply cleft into linear-spatulate or linear segments or changed to stamens.............Forma *tomolobum*.
b. Corolla white, suffused with yellow and salmon tints, commonly pilose on the surface as well as glandular; buds yellowish..................................Forma *luteo-album*.

*R. ATLANTICUM (Ashe) Rehder in Wilson & Rehder, Mon. Azaleas, 147 (1921) as to basinym. *Azalea atlantica* Ashe in Bull. Charlest. Mus. xiii. 26 (1917), not Ashe in Bull. Torr. Bot. Cl. xlvii. 581, 582 (1920) nor Coker in Journ. Elisha Mitchell Soc. xxxvi. 97 (1920).—Eastern South Carolina to southeastern Virginia. SOUTH CAROLINA: Society Hill, Chesterfield Co., "very common here in dry woods, very fragrant", *M. A. Curtis;* dry pinelands, 5 miles south of Conway, Horry Co., *Weatherby & Griscom*, no. 16,604; sandy woods, 5 miles south of Myrtle Beach, *Weatherby & Griscom*, no. 16,605; moist pine woods, Kinlock, near Georgetown, Georgetown Co., May 1, 1916, *W. W. Ashe* (ISOTYPE); sandy openings in pine woods, Charleston, *B. L. Robinson*, no. 247 (as *R. viscosum*). NORTH CAROLINA: mixed dry woods, Bath, Beaufort Co., *Weatherby* no. 6083; pine barren, Wilmington, April 17, 1923, *Churchill*. VIRGINIA: pine barrens, south of Lee's Mill, Isle of Wight Co., *Fernald & Long*, no. 11,880; wooded slope northeast of Statesville, Southampton Co., *Fernald & Long*, no. 7925.

In the original description of *Azalea atlantica* (1917) Ashe explicitly said "The fragrant flowers . . . are rose-purple, or reddish". It came from about Georgetown, South Carolina, and was collected "in May and June, 1916". Three years later (1920), however, he changed his mind and misquoted himself in a manner not inspiring complete confidence in his precision, saying:

"In 1916 I collected near Georgetown, South Carolina, specimens and growing plants of an Azalea which was published under the name *A. atlantica* Ashe. The flowers of this were described as pale rose-purple [his original description, however, was "rose-purple, or reddish"!] but they are really white or nearly so, becoming purplish as they wilt, the description having been drawn from wilted specimens. A careful study of additional material and of cultivated plants seems to show that there are two closely related species, the one, *A. atlantica*, with white flowers which change to pale rose as they wilt, the other with rose-purple flowers".

There is no assurance that Ashe, collecting at different times and places, had a uniform series. If he had collected in eastern Virginia there would be every probability that the series would be quite diverse. In northeastern South Carolina the conspicuous form of the species apparently does not have white corollas; they are of an essentially uniform pink or purplish color. This is the statement of Messrs. Weatherby and Griscom, who spent much of the month of April, 1932, in Horry County and the adjacent region. Their published note was "attractive because of its large pink flowers which exhale a strong, carnation-like fragrance"—RHODORA, xxxvi. 49 (1934). Mr. Weatherby informs me that, until I showed him, he did not know that the flowers are ever white!

Although others have followed Ashe's second description, instead of the original, this course is scarcely justified. Otherwise, the shrub of eastern South Carolina with pink or roseate corollas, such as Ashe originally described, would be nameless; and, in view of Ashe's misquotation of himself and the obviously mixed elements he later studied, I am holding as typical *Rhododendron atlanticum* the form he originally described.

*Forma NEGLECTUM (Ashe) Rehder in Wilson & Rehder, Mon. Azaleas, 149 (1921). *Azalea neglecta* Ashe in Bull. Torr. Bot. Cl. xlvii. 581 (1920).—Eastern South Carolina to southern New Jersey. SOUTH CAROLINA: moist pine woods, Kinlock, near Georgetown, May 1, 1916, *W. W. Ashe* (ISOTYPE). VIRGINIA: dry open thicket, Virginia Beach, Princess Anne Co., *Fernald & Griscom*, no. 4477, *Fernald & Long*, no. 4109 (fruit from same colony as no. 4477). NEW JERSEY: moist woods near foot of Chestnut Branch, along Mantua Creek, southeast of Mantua, Gloucester Co., *Long*, no. 26,871.

Although the ISOTYPE of his *Azalea neglecta*, sent by Ashe to the Gray Herbarium, is not so extreme as the material from Virginia Beach, I am leaving them together. In the latter the villosity of pedicels and corolla is pronounced, the glands of the pedicels being almost hidden, and the corolla has a fine pilosity over its surface. The fruit (no. 4109) is much less glandular than in other forms of the species.

Forma **confusum,** f. nov., corollis albidis vel extus roseo vel pallido purpureo suffusis.—South Carolina to eastern Maryland. TYPE: dry oak thicket, Virginia Beach, Virginia, May 4, 1935. *Fernald & Griscom,* no. 4479 (in Herb. Gray).

This is the most widespread form, mistakenly taken up, in spite of his original account of the roseate-flowered shrub of eastern South Carolina, by Ashe in 1920 as true *R. atlanticum.* It is very common on the Coastal Plain of North Carolina and Virginia, thence northward to eastern Maryland. It is *Azalea atlantica* sensu Ashe in Bull. Torr. Bot. Cl. xlvii. 581 (1920) and sensu Coker in Journ. Elisha Mitchell Sci. Soc. xxxvi. 97 (1920), not Ashe in Bull. Charlest. Mus. xiii. 26 (1917); also *R. atlanticum* Rehder in Wilson & Rehder, Mon. Azaleas, 147 (1921) as to plant described, not as to basinym.

*Forma **tomolobum,** f. nov. (TAB. 692), corollis albidis lobis laceratis, segmentis lineari-spathulatis vel in stamina commutatis.—VIRGINIA: a considerable colony, 6–9 dm. high, in dry white sand of pineland, southwest of Marsh Hill School, south of South Quay, Nansemond County, May 10, 1940, *Fernald & Long,* no. 11,881 (TYPE in Herb. Gray, ISOTYPE in Herb. Phil. Acad.). See p. 491.

*Forma **luteo-album** (Coker), stat. nov. *Azalea atlantica,* var. *luteo-alba* Coker in Journ. Elisha Mitchell Sci. Soc. xxxvi. 98, pl. 1 (1920). *R. atlanticum,* var. *luteo-album* (Coker) Rehder in Wilson & Rehder, Mon. Azaleas, 150 (1901).—South Carolina to Delaware and northeastern Maryland. Rehder cites several collections from South Carolina. The following are more northern. VIRGINIA: near Walters, Isle of Wight Co., *Fernald & Long,* no. 7626; southwest of Franklin, Southampton County, *Fernald & Long,* no. 7924. MARYLAND: near Elk Neck, Cecil Co., May 16, 1937, *Mary C. Henry.* DELAWARE: near Coopers Corners, Kent Co., May 22, 1922, *J. P. Otis.*

The distinctive marks of forma *luteo-album* are the yellowish buds and the suffusion of yellow or salmon-orange through the outside of the tube and throat, as well as a greater tendency to villosity on the tubes and the pedicels.

*R. SERRULATUM (Small) Millais. PRINCE GEORGE COUNTY: wet woods south of Templeton, at head of Jones Hole Swamp, nos. 5870 and 13,100. Sussex County: wooded bottomland, Jones Hole Swamp, west of Coddyshore, no. 10,359 (distrib. as *R. viscosum,* var. *glaucum*); wooded springhead by Nottoway River, south of Chub, no. 12,426 (distrib. as *R. arborescens*). Surry County: border of damp woods northeast of Elberon, no. 13,101. Isle of Wight County: swampy woods bordering pine barrens, south of Zuni, no. 8803 (as *R. arborescens*). Southampton County: wet woods, Assamoosick Swamp, south of Sebrell, nos. 10,001 and 10,301 (as *R. arborescens*); sphagnous swampy woods southwest of Applewhite's Church, no. 10,362 (as *R. arborescens*). Nansemond County: swampy depressions in pine barrens east of Cox Landing, south of South Quay, no. 10,762 (as *R. arborescens*); along Big Branch, east of Cherry Grove, south of South Quay, no. 11,098 (as *R. arborescens*). See p. 507.

Previously unreported from north of South Carolina, although Godfrey and others have distributed it, as *R. viscosum,* from North Carolina, as I had also done with the Virginia material. My published records of *R. arborescens* from southeastern Virginia all belong here. In the upland *R. arborescens* the young branchlets are glabrous, the leaves glabrous, calyx-lobes 3–6 mm. long, the style 6–9 cm. long, the ovary glandular-villous. In *R. viscosum* and *R. serrulatum* young branchlets are bristly or strigose, the leaves bristly or hirsute along the midrib beneath, the calyx-lobes only 1–2 mm. long, the style 4.5–6 cm. long, the ovary appressed- or ascending-pilose, only rarely glandular. *R. serrulatum* differs from *R. viscosum* in usually greater stature (up to 7 m. high), more strigose reddish or brown branchlets, floral winter-buds with 15–20 mucronate to aristate dark-bordered scales (as against 8–12 round-tipped or merely short-mucronate ones), leaves elliptic to obovate or oblanceolate, green both sides, those of the fertile branches 2.5–8 cm. long and 1.5–3.8 cm. broad, serrulate-ciliate (as against narrowly ovate or elliptic-obovate to oblong-oblanceolate ones, those of fertile branches 1.5–6 cm. long and 0.7–2.5 cm. broad, bristly-ciliate, mostly pale or glaucous[1] beneath), pedicels 1–2.3 cm. long (as against 0.5–1, rarely 1.5 cm.), corolla-tube slenderly cylindric nearly to summit, 2.5–3.5 cm. long, about the length

[1] The extreme form with leaves glaucous on both sides is
Rhododendron viscosum (L.) Torr., forma **glaucum** (Ait.), stat. nov. *Azalea viscosa* ε. *glauca* Ait. Hort. Kew. i. 203 (1789).

of the lobes, glabrous within (as against tube gradually dilated upward, 1.5–2.5 cm. long, about equaling to once and a half as long as lobes, pubescent inside above middle of tube), style glabrous or minutely pubescent only at base (as against style pubescent up to middle) and capsule slenderly ovoid (instead of lance-cylindric). Its flowers have less of the clove-fragrance than those of *R. viscosum*.

The Varieties of Lyonia ligustrina.—*Lyonia ligustrina*, ranging from New England to Florida and Texas, is one of our polymorphous species. Michaux, knowing it from New England to Florida, described it "Magnitudine et figura admodum variant" as *Andromeda paniculata*, with two primary varieties, each of them with two subvarieties: the first "Var. 1. *nudiflora:* racemis nudis . . . in frigidioribus, per *États-Unis*", the second, "Var. 2. *foliosiflora:* racemis foliosis", with two unnamed subvarieties, "A. floribus glabellis . . . in sylvis Carolinae inferioris" and "B.—[floribus] subtomentosis . . . in stagnosis."[1] Michaux, in this early subdivision of the species indicated the complexity of the group. It is certainly a far cry from shrubs 4 dm. high, with slender quill-like stems, densely puberulent branches and cinereous-tomentulose oblong or narrowly obovate round-tipped leaves to tree-like shrubs 3 or 4 m. high, with trunks 1 dm. in diameter, glabrous branchlets and lance-acuminate glabrous leaves. Early authors saw in the extremes of the series several species, while later authors have recognized 2 species or 2 or 3 varieties; but an attempt to organize the assembled material in the Gray Herbarium leads me to the recognition of at least 5 varieties, each with a somewhat distinctive geographic range. These are outlined below.

a. Leaves of fertile branches 2.5–9 cm. long, 1–5 cm. broad, lanceolate or oblanceolate to ovate or broadly elliptic, acuminate.
 Flowers 2.5–3.5 (–4) mm. long; fruits 2.5–3 mm. long.
  Leaves thickish, rugulose, opaque, oblanceolate, obovate, elliptic or oval, abruptly short-acuminate, more or less setulose or pilose beneath or glabrate; branchlets pilose to glabrous; panicles without leafy bracts along the branches.......................... Var. *typica*.
  Leaves membranaceous, lustrous above, plane, lance- to narrowly ovate-elliptic, long-acuminate, mostly glabrous; branchlets glabrous or nearly so; panicles loose, their branches with several leafy bracts..... Var. *salicifolia*.

[1] Michx. Fl. Bor.-Am. i. 255 (1803).

Flowers 4–5 mm. long; fruits 3.5–5 mm. long; leaves subcoriaceous, broadly elliptic to ovate or obovate, short-acuminate.................................Var. *capreaefolia.*

a. Leaves of fertile branches 1.3–4.5 cm. long, 0.8–2.5 cm. broad, oblong to narrowly obovate, round-tipped, blunt or merely subacute or mucronate; branches of panicle more or less leafy-bracted; flowers 2.5–3.5 mm. long; fruits 2.5–3 mm. long.

Branchlets and lower surfaces of leaves glabrous or only sparingly setulose-pilose; flowers and fruits glabrescent to appressed-pilose.................................Var. *foliosiflora.*

Branchlets cinereous-puberulent; leaves cinereous-tomentulose beneath; flowers and fruits hispid-tomentulose...Var. *pubescens.*

L. LIGUSTRINA, var. **typica.** *Vaccinium ligustrinum* L. Sp. Pl. i. 351 (1753). *Andromeda paniculata* Ait. Hort. Kew. ii. 69 (1789), non L. Sp. Pl. i. 394 (1753). *A. paniculata,* var. *nudiflora* Michx. Fl. Bor.-Am. i. 255 (1803). *A. ligustrina* (L.) Muhl. Cat. 43 (1813). *Lyonia paniculata* (Ait.) Nutt. Gen. i. 226 (1818); Wats. Dendr. Brit. i. t. 37 (1825). *L. ligustrina* (L.) DC. Prodr. vii. 599 (1839). *Xolisma ligustrina* (L.) Britton in Mem. Torr. Bot. Cl. iv. 135 (1894). *Arsenococcus ligustrinus* (L.) Small, Fl. Lancaster Co. 218, 319 (1913).—Shrub 0.5–3 m. high.—Wet to dry thickets, South Carolina and northern Georgia to New England, New York, West Virginia and Kentucky.

*Var. SALICIFOLIA (Wats.) DC. Prodr. vii. 600 (1839). *L. salicifolia* Wats. Dendr. Brit. i. t. 38 (1825). *L. multiflora* Wats. l. c. ii. t. 128 (1825). *L. ligustrina,* var. *foliosiflora* sensu many auth., probably not *Andromeda paniculata,* var. *foliosiflora* Michx. (1803).—Tall shrub up to 4 m. high, with elongate membranous plane lustrous and usually glabrous acuminate leaves, and small flowers and fruits in persistently leafy-bracted loose panicles.—Damp thickets, swampy woods and low pinelands, Florida to Louisiana, north to Virginia, Kentucky, Arkansas and Oklahoma. The following, selected from many specimens, are typical: VIRGINIA: swampy or inundated woods, north of Blackwater River, Princess Anne Co., *Fernald & Long,* no. 4118 (as var. *foliosiflora*); swampy depressions in pine barrens, east of Cox Landing, south of South Quay, Nansemond Co., *Fernald & Long,* no. 10,765 (as var. *foliosiflora*); low woods, Riddick's Swamp, west of Cypress Chapel, Nansemond Co., *Fernald & Long,* no. 7567 (as var. *foliosiflora*); wooded swamp, about 7 miles south of Franklin, Southampton Co., *Fernald & Long,* no. 10,006 (as var. *foliosiflora*). NORTH CAROLINA: swamp, 1 mile southwest of South Mills, Camden Co., *Wiegand & Manning,* no. 2398 (as var. *foliosiflora*); swamp bordering Mill Creek, north of Perquimans River, Parkville, Perquimans County, *Wiegand & Manning*, no. 637; shrub bog, 2 miles south of Columbia, Tyrell County, *Godfrey & Kerr*, no. 3927 (close match for original plate of *L. multiflora* Wats.). Georgia: sandy swamp of Ochlocknee Creek, near Moultrue, Colquitt Co., *Harper*, no. 1673 (leaves unusually broad, pilose beneath). Kentucky: Pine Mountain, Bell Co., *Kearney*, nos. 417 and 550 (the latter as *Gaylussacia ursina*). Tennessee: side of Gregory's Bald, Blount Co., June 29, 1930, *Jennison;* thicket along stream between Altamont and Palmer, Grundy Co., *Svenson*, no. 7138. Alabama: Tallapoosa Co., August 21, 1897, *F. S. Earle;* 8 miles north of Headland, Henry Co., *Wiegand & Manning*, no. 2396. Arkansas: along Cove Creek near Martinville, Faulkner Co., *E. J. Palmer*, no. 26,521; flat woods, Malvern, Hot Springs Co., *Demaree*, no. 11,042; near entrance to Ouchita National Forest, Pike Co., *Demaree*, no. 9792; Salt Gum Ford, Murfreesboro, Pike Co., *Demaree*, no. 9361; Camden, May 14, 1850, *Fendler*. Louisiana: tupelo swamp, 3 miles northeast of Franklinton, Washington Parish, *Correll & Correll*, no. 9198; swampy woods, 4 miles west of Minden, Webster Parish, *Correll & Correll*, no. 10,270. Oklahoma: thicket, Page, Laflore Co., *O. W. Blakeley* (*G. W. Stevens*, no. 1427); thicket, valley of mountain creek, Page, Laflore Co., *G. W. Stevens*, no. 2654.

Although var. *salicifolia* has usually been called var. *foliosiflora*, there is such doubt of its identity with *Andromeda paniculata*, var. *foliosiflora* Michx. as to support taking up var. *salicifolia*, about which there can be no question. Watson's plate of *Lyonia salicifolia* was wholly characteristic and his detailed description was equally so: branches glabrous; leaves long-lanceolate, acuminate, shining, with the special note, "closely allied to *paniculata*, but its lanceolate, shining, less pubescent leaves and other particulars sufficiently distinguish it." DeCandolle's brief diagnosis of var. *salicifolia* was "foliis lanceolatis glabriusculis sublucidis." Michaux's *Andromeda paniculata*, var. *foliosiflora* was very briefly described and with two subvarieties, one with glabrate, the other with subtomentose flowers [leaves?] and it came from South Carolina. In all the accumulation of material in the Gray Herbarium no specimen from South Carolina has come to hand of the long- and acuminate-leaved var. *salicifolia*. North of Georgia it is shown in our collection only by 15 numbers from southeastern Virginia and adjacent northeastern North Carolina (mostly north of Albermarle Sound). From South Carolina, on the other hand, we have copious material of two small shrubs with small blunt leaves, one of them glabrous, the other subtomentose. (It is surmised that Michaux's "floribus glabellis" and "floribus subtomentosis" had *floribus* inadvertently substituted for the more significant *foliis*). The glabrous dwarf shrub with blunt leaves is represented in the Gray Herbarium by 24 numbers from "mixed woods", "thickets", "clearings", "pinelands", "shrub-bogs" and "savannahs" of South Carolina and southeastern North Carolina. Habitally it is quite like var. *pubescens,* which has cinereous-tomentulose leaves and which we have only from shrub-bogs and pinelands of South Carolina and Georgia. Until photographs are available to disprove my interpretation I am taking up as Michaux's *Andromeda paniculata,* var. *foliosiflora,* "A floribus [foliis?] glabellis . . . in sylvis Carolinae inferioris", the glabrous or glabrate blunt-leaved shrub which is so well represented from South Carolina, while the similar var. *foliosiflora* "B. floribus [foliis?] subtomentosis . . . in stagnosis" seems to be the tomentose *L. ligustrina,* var. *pubescens* of "shrub bogs" of South Carolina.

*Var. CAPREAEFOLIA (Wats.) DC. Prodr. vii. 600 (1829). *L. capreaefolia* Wats. Dendr. Brit. ii. t. 127 (1825).—Panicle naked or more or less leafy-bracted; flowers 4–5 mm. long; fruits 3.5–5 mm. long.—Local, Florida to eastern Texas, north to southeastern Virginia, western North Carolina, Tennessee and Arkansas. VIRGINIA: swampy woods east of Joyner's Bridge, Isle of Wight Co., *Fernald & Long,* no. 12,340. NORTH CAROLINA: Blowing Rock, Watauga Co., June 18, 1899, *Churchill;* Linville, Avery Co., *Hunnewell,* no. 9277; woods, Hot Springs, Madison Co., June 1, 1899, *Churchill.* FLORIDA: New Smyrna, 1874, *Edw. Palmer,* no. 322. TENNESSEE: White Cliff Springs, July 16, 1894, *Kearney;* near Roan Mountain Station, June 20, 1900, *Rehder* (Arnold Arb.). ARKANSAS: creek-beds, Pulaski Heights, Pulaski Co., *Demaree,* no. 8227; small stream, Langley, Pike Co., *Demaree,* no. 9517. LOUISIANA: wet soil, edge of pocosin, 4 miles west of Winnfield, Winn Parish, *Correll & Correll,* no. 10,039. TEXAS: near Texarkana, Bowie Co., *Heller & Heller,* no. 4098.

Although neither Watson nor DeCandolle noted the large flowers and fruits of var. *capreaefolia,* Hart, Watson's artist, caught them, showing practically all the flowers 5 mm. long, whereas Watson's other plates, of *Lyonia multiflora, paniculata* and *salicifolia,* showed smaller flowers.

Var. FOLIOSIFLORA (Michx.) Fernald in RHODORA, x. 53 (1908) as to basinym. *Andromeda paniculata,* var. *foliosiflora,* A. Michx. Fl. Bor.-Am. i. 254 (1803). *Xolisma foliosiflora* (Michx.) Small, Fl. Se. U. S. 889, 1336 (1903), at least as to basinym.—Low (0.4–2 m. high), with glabrous or glabrescent branchlets and leaves; the latter firm, oblong to oblong-obovate, 1.3–4.5 (–5.5) cm. long, glabrous; inflorescences lax, leafy-bracted, small-flowered.—Thickets, pinelands, shrub-bogs and savannahs. Florida to eastern North Carolina. The following, selected from many numbers, are characteristic. NORTH CAROLINA: pineland near Roper, Washington Co., *Godfrey,* no. 4299; shrub-savannah, 7 miles south of Washington, *Godfrey,* no. 4408; peaty thicket, 4 miles east of Grimesland, Pitt Co., *Wiegand & Manning,* no. 2392; dry or peaty thicket near Saratoga, Wilson Co., *Wiegand & Manning,* no. 2399; 12 miles northwest of Chapel Hill, Orange Co., *Wiegand & Manning,* no. 2393; moist grassy clearing near Erwin, Hartnett Co., *Godfrey,* no. 4226; boggy place, west of Laurel Hill, Scotland Co., *Wiegand & Manning,* no. 2401; savannah near Havelock, Craven Co., *Godfrey,* no. 4415; savannah near Richlands, Onslow Co., *Godfrey,* no. 4476; savannah near Old Dock, Columbus Co., *Godfrey & Shunk,* no. 4188. SOUTH CAROLINA: shrub-bog, 3 miles southwest of Manning, Clarendon Co., *Godfrey & Tryon,* no. 905; swampy oak-tupelo woods, 4 miles south of Bonneau, Berkeley Co., *Wiegand & Manning,* no. 2402; swampy, shrubby, peaty woods, 8 miles southwest of Moncks Corners, *Godfrey & Tryon,* no. 1405; low, sandy, mixed woods, Summerville, *Robinson,* no. 150; shrub-bog, 6 miles northwest of McClellanville, Charleston Co., *Godfrey & Tryon,* no. 1139; clearing, near Beaufort, May 5, 1917, *Churchill.* GEORGIA: border of swamp, Augusta, *A. Cuthbert,* no. 1101; wet pine barrens, Bulloch Co., *Harper,* no. 888. FLORIDA: South Jacksonville, April 14, 1897, *Churchill;* swamps, vicinity of Eustis, Lake Co., *Nash,* no. 528.

See discussion under var. *salicifolia.*

Var. PUBESCENS (Gray) Rehder in Bailey, Stand. Cycl. Hort. iv. 1935 (1916). *A. paniculata,* var. *foliosiflora,* B., Michx. Fl. Bor.-Am. i. 255 (1803). *A. tomentosa* Dum.-Cours. Bot. Cult. ed. 2, iii. 495 (1811). *A. frondosa* Pursh, Fl. Am. Sept. i. 295 (1814). *L. frondosa* (Pursh) Nutt. Gen. i. 267 (1818). *L. ligustrina,* var. *pubescens* Gray, Syn. Fl. ii. 33 (1878). *L. ligustrina pubescens* Rehder in Bailey, Cycl. Am. Hort. i. 62 (1900) without citation of basinym nor (as a trinomial) designation of rank; also Rehder, Man. Cult. Trees and Shrubs, ed. 2: 733 (1940), trinomial wrongly ascribed to Gray. *Xolisma ligustrina,* var. *pubescens* (Gray) Millsp. Living Fl. W. Va.

324 (1913), as to basinym only. *Arsenococcus frondosus* (Pursh) Small, Shrubs of Fla. 97, 133 (1913), as to basinym.—Dwarf; branchlets cinereous-puberulent; small coriaceous blunt leaves cinereous-tomentulose; flowers and fruits cinereous.—Bogs and pinelands, South Carolina and Georgia. SOUTH CAROLINA; pineland, 2 miles west of Salters, Williamsburg Co., *Godfrey & Tryon*, no. 528; shrub-bog, 3 miles southwest of Manning, Clarendon Co., *Godfrey & Tryon*, no. 906; shrub-bog, 6 miles northwest of McClellanville, Charleston Co., *Godfrey & Tryon*, no. 1106. GEORGIA: Savannah, *Nuttall* (TYPE of *L. frondosa* Nutt., who thought his species perhaps not *Andromeda frondosa* Pursh; also TYPE of *A. ligustrina*, var. *pubescens* Gray).

I am indebted to Professor Rehder for the use of a sheet of *Andromeda tomentosa* Dum.-Cours.

GALAX APHYLLA L. To the relatively few recorded Coastal Plain stations add one in SURRY COUNTY: rich wooded ravine west of Eastover, no. 11,717. See p. 486.

BUMELIA LYCIOIDES (L.) Pers., var. VIRGINIANA Fern. Add a station in ISLE OF WIGHT COUNTY: border of cypress swamp back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,769. Also one in PRINCE GEORGE COUNTY: thickets and woods back of beach of James River, Windmill Point, Flowerdew Hundred, no. 13,106. See p. 523.

SABATIA STELLARIS Pursh (*S. amoena* (Raf.) G. Don). Extending up the James to SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. 12,773. See p. 522.

When, in 1932, I took up the name *Sabatia amoena* (Raf.) G. Don (1837), based on *Chironia amoena* Raf. (1808), to displace *Sabatia stellaris* Pursh (1814), I did so because Pursh's specific name was later than that of Rafinesque. There is an illegitimate *Chironia amoena* Salisb. Parad. 137 (1796) which, as a mere substitute for the earlier *C. linoides* L., cannot be used. In 1932 I did not grasp the full absurdity of the provision of the International Rules, that, even though such names are wholly illegitimate, they have enough spurious validity to prevent the use of the same name properly published for another species. Since, when Don made the combination *Sabatia amoena* (Raf.) G. Don, the specific name of Pursh (1814) was available, under the rules adopted a century later he ought to have taken up Pursh's name. If Pursh's specific name had not been available, then Don's combination would be quite valid! In this instance (though not always) the working of the tricky rule is fortunate and *Sabatia stellaris* stands.

*S. STELLARIS, forma ALBIFLORA Britton. SURRY COUNTY: with and more abundant than the last, no. **12,774**. See p. 522.

S. CALYCINA (Lam.) Heller. Range extended north to James River. ISLE OF WIGHT COUNTY: cypress and gum swamp back of the beach, below Rushmere (Fergusson's Wharf), no. 12,775. See p. 525.

(To be continued)

ANOTHER CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(*Continued from page 630*)

*Symplocos tinctoria (L.) L'Hér., var. **pygmaea,** var. nov., frutex nanus 0.3–1.3 m. altus; foliis maturis elliptico-ovatis utrinque acutis 2–5.5 cm. longis 1–2.5 cm latis.—Southeastern Virginia: white sand of dry pine barrens, south of Lee's Mill, Isle of Wight County, August 23 and September 2, 1940, *Fernald & Long*, no. 12,770 (type in Herb. Gray; isotype in Herb. Phil. Acad.); open ground near Norfolk, May 17, 1877, *Thos. Morong*. See p. 519.

Typical *Symplocos tinctoria* is a large shrub or small tree (up to 6 m. high), with mature leaves 0.7–1.5 dm. long and 3–6 cm. broad. The small shrub of the pine barrens may prove, when we can secure flowering and fruiting material, to have other points of departure. Var. *Ashei* Harbison, described from the mountains of North and South Carolina, Georgia and Tennessee, is a tree or large shrub, with leaves much larger than in var. *pygmaea*.

Apocynum sibiricum Jacq. Range extended south to Isle of Wight County: sandy beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,777. Also Prince George County: woods and thickets back of beach of James River, Windmill Point, Flowerdew Hundred, no. 13,110.

Asclepias purpurascens L. To the very few recorded stations add others in York, Sussex and Greensville Counties (several nos.). See pp. 499 and 504.

Convolvulus sepium L., var. americanus Sims. To the single Virginian station (Buckroe, Elizabeth City County) cited by Tryon in Rhodora, xli. 420 (1939) add one in Princess Anne County: moist sandy depressions back of the dunes, Sand Bridge, no. 12,440.

*C. sepium, var. fraterniflorus Mackenz. & Bush. Henrico County: margin of canal from James River, Richmond, no. 12,171.

The range given by Tryon, op. cit. 422 is "Illinois to Montana, south to Arkansas and New Mexico". See p. 495.

*Jacquemontia tamnifolia (L.) Griseb. James City County: weed in abandoned corn-field about 5 miles west of Toano, *R. W. Menzel*, no. 349.

Pantropical weed, not previously recorded from north of South Carolina.

Phlox maculata L. Sussex County: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,444.

Our first station on the Coastal Plain of Virginia. See p. 510.

Heliotropium europaeum L. To the few recorded stations add one in Dinwiddie County: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 12,172. See p. 493.

Myosotis verna Nutt. To the very few stations in southeastern Virginia add one in Henrico County: border of woods, east of Fulton Hall, no. 12,175.

I am taking up the unequivocal name *Myosotis verna* Nutt. Gen. ii. Addenda (1818) instead of the wholly equivocal *M. virginica* (L.) BSP. (1888) which has recently replaced it. The combination of Britton, Stern & Poggenberg, published without bibliographic reference to its basinym, was said in Britton's later works to rest upon *Lycopsis virginica* L. Sp. Pl. 139 (1753). That, in turn, rested wholly upon the *Lycopsis foliis lineari-lanceolatis*, etc. of Gronovius, Fl. Virg. pars 2: 140 (1743), based upon a *blue-flowered* weed of a roadside, collected by Clayton: "flore minimo coeruleo . . . Crescit juxta vias publicas loco sterili"—Clayton's account quoted by Gronovius. A blue-flowered roadside weed can hardly be taken as identical with the white-flowered indigenous American plant. Just what Clayton had as the basis of *Lycopsis virginica* L. can be determined only when the Clayton specimen (at the British Museum) can be critically studied. Whether it was one of the several blue-flowered Old World species of *Myosotis* adventive in America or perhaps a species of *Lappula* can only be surmised. It is not improbable that *Lycopsis virginica* L. (1753) may be the basinym for some European species!

M. MACROSPERMA Engelm. Local range extended into rich or alluvial woods of HENRICO, DINWIDDIE, SUSSEX and GREENSVILLE COUNTIES (many nos.). See p. 488 and MAP 1.

Myosotis macrosperma has been stretched to include large states of *M. verna* and its specific characters have, consequently, been quite obscured and its range made nearly coincident with that of the latter species. Restudy of the two shows that, whereas *M. verna,* a plant of thin or sterile soils, has three areas of development (New England to Minnesota, south to northern Florida, Tennessee, Oklahoma and Texas; Idaho to southern British Columbia, south to Wyoming and California; southern South America), *M. macrosperma* is a plant of rich, mostly calcareous woodlands and bottoms, with a broad austro-riparian range (Florida to eastern Texas, north to Maryland, the District of Columbia, Kentucky, southern Indiana, southern Illinois and Missouri). I distinguish the two as follows:

M. VERNA. Simple or with stiff upright branches, 1–4 dm. high; principal leaves 2–10 mm. broad; racemes in maturity elongating to 0.3–1.8 dm. long; fruiting pedicels 1–5(–6) mm. long, erect and nearly parallel with rachis, the lowest 0.5–2 cm. apart; fruiting calyx 4–6 mm. long, persistent on the pedicel, the tube with few straight or slightly hooked short bristles, the base with mostly reflexed and appressed strigae; nutlets 1–1.3 mm. broad, the strophiole 0.4–0.5 mm. broad.

M. MACROSPERMA. Lax or loosely branching stem 1.5–8 dm. long or high; principal leaves 0.5–1.7 cm. broad; central raceme in maturity elongating to 1.2–4.7 dm. long; fruiting pedicels 3–10 mm. long, loosely spreading-ascending from base, the lowest 2–5 cm. apart; fruiting calyx 5.5–9 mm. long, promptly disarticulating from tip of pedicel, the tube covered to base with hundreds of strongly hooked upcurving long bristles (enabling fruiting calices to adhere to passing animals); nutlets about 2 mm. broad, the strophiole 0.5–0.8 mm. broad.

*LITHOSPERMUM CAROLINENSE (Walt.) MacM. SUSSEX COUNTY: dry sandy woods and clearings near and south of Chub, nos. 12,173, 12,449 (narrow-leaved) and 12,450 (broad-leaved).

First from north of South Carolina. See pp. 498 and 506.

Scutellaria parvula Michx., var. ambigua (Nutt.) Fernald. Sussex County: sandy open woods, thickets and clearings by Nottoway River, below Peters Bridge, southeast of Lumberton, no. 12,458.

Our first Coastal Plain station for a characteristically inland plant. See p. 507.

S. nervosa Pursh. Dinwiddie County: rich sandy and loamy wooded slopes and clearings along Appomattox River, just above the "fall-line," about 2 miles west of Petersburg, no. 11,905.

An upland species here closely approaching the Coastal Plain. See p. 490.

*Lamium amplexicaule L., forma clandestinum (Reichenb.) G. Beck. Greensville County: lawns and grassland, Emporia, no. 11,725.

Flowers minute and cleistogamous; our other collections from southeastern Virginia have showy and expanded corollas. See p. 486.

Stachys Nuttallii Shuttlew. To the extraordinarily isolated station already reported add another, also in Surry County: thicket back of sand-beach of Cobham Bay, James River, northwest of Chippokes, no. 12,788; stems up to 1.5 m. high, with moniliform inflorescences up to 3 dm. long. See pp. 520 and 521.

Monarda mollis L. Southampton County: waste ground, Franklin, no. 12,460.

Our first Coastal Plain station; probably from garden-refuse.

Pycnanthemum Torrei Benth. Southampton County: rich woods and thickets near Raccoon Creek, north of Mill Neck Church, no. 12,462.

Our first Coastal Plain station for an upland species; identification confirmed by Miss Elizabeth Boomhour. See p. 508.

Cunila origanoides (L.) Britton. Local range extended to Surry County: dry wooded slopes of ravines west of Claremont, no. 12,789. See p. 521.

Lycopus europaeus L. To the few recorded stations add the following. Surry County: springy swale by Cobham Bay, James River, northwest of Chippokes, no. 12,790. Isle of Wight County: along path in cypress and gum swamp back of beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,791.

Mentha longifolia (L.) Huds. To the few recorded stations add one in King William County: border of fresh tidal marsh of Pamunkey River, Sweet Hall, no. 12,792.

Verbascum Lychnitis L. York County: open thicket by York River above Yorktown, no. 12,181. See p. 505.

Veronica hederaefolia L. Henrico County: abundant in an open field, Fulton Hall, no. 11,726. See p. 486.

Pedicularis lanceolata Michx. To the few known Coastal Plain stations add one in Surry County: wooded swamp west of Claremont, no. 12,809. See p. 520.

*Justicia **umbratilis,** sp. nov. (tab. 693, fig. 1–3), *J. humili* simillima; rhizomatibus valde elongatis ramosis 3–7 mm. crassis; caulibus 2–6 dm. altis; foliis oblongo-lanceolatis vel anguste elliptico-oblongis primariis 5–9 cm. longis 1.5–3.5 cm. latis apice basique subacuminatis petiolatis; pedunculis 3.5–10 cm. longis; spicis compactis subcapitatis floribus valde imbricatis 1.5–3 cm. longis; corollis pallide violaceis vel lilacinis 1.5–2 cm. longis, labio superiore recurvato, labii inferioris lobis planis divergentibus oblongis vel ellipticis integris; seminibus brunneis quadrato-rotundatis 2.8–3 mm. longis minute subacuteque rugulosis.—Low dark woods, bottomlands and shaded margins of slow streams and pools, southeastern Virginia: Southampton Co.: bottomland woods along Nottoway River, Monroe Bridge, June 22, 1941, *Fernald & Long*, no. 13,162 (type in Herb. Gray; isotype in Herb. Phil. Acad.); margin of Nottoway River at Round Gut, south of Franklin, June 12, 1941, *Fernald & Long*, no. 13,162; margin of Nottoway River below Point Beach, south of Franklin, July 20, 1939, *Fernald & Long*, no. 10,820. Nansemond County: muddy tidal margin of Blackwater River, Cox Landing, south of South Quay, September 22, 1939, *Fernald & Long*, no. 11,441. Prince George Co.: "Cat-tail Swamp", river-swamp of Blackwater River, north of Disputanta, June 21, 1936, *Fernald, Long & Smart*, no. 5921. Surry Co.: bottomland woods, Blackwater River, about 1 mile southwest of Dendron, July 14, 1941, *Fernald & Long*, no. 13,159; margin of sluggish stream, Cypress Swamp, near Sexton, June 17, 1941, *Fernald & Long*, no. 13,161. See p. 494.

For six years we have been puzzled by *Justicia umbratilis.* During 1939 and 1940 we became convinced of its distinctness but not until June, 1941, did we have the opportunity to compare side-by-side fresh flowers of *J. umbratilis* and those of *J. americana* (L.) Vahl and of *J. humilis* Michx. (*J. ovata* (Walt.) Lindau, not Dietr.). In its relatively coarse and extensively creeping rhizomes, in its capitate spikes, and in its pebbled seeds without conspicuously differentiated rims *J. umbratilis* is as near to *J. americana* as to *J. humilis,* with which it grows. Its flowers (fig. 2), however, are, both corolla and anthers, more like those of *J. humilis* (FIG. 7); for the arched-recurving lower lip of the corolla of *J. americana* (FIGS. 4 and 5) has the central lobe somewhat constricted above the base and the margins are strongly reflexed, the lobes white or whitish-lilac above, the narrow basal shield with brownish-purple and white markings, and the terminal anther is horizontally transverse (FIG. 4), the lower ascending one muticous at both ends. The corollas of *J. umbratilis* and of *J. humilis* are violet to lilac throughout, except that the deltoid shield has a white background, with deep violet margins and spots. Their lower lips (FIGS. 2 and 7) are flat, the margins of the median lobe not reflexed; and the terminal anther is oblique, the lower erect one pointed at base (FIGS. 2 and 7). In texture (firm and opaque) the corolla of *J. umbratilis* (FIG. 2) is like that of *J. americana* (FIGS. 4 and 5), the corolla of *J. humilis* (FIG. 7) being very thin and translucent. In its very prolonged and branching rhizomes *J. umbratilis* suggests the narrower-leaved *J. americana* but these are deep in the mud in *J. umbratilis*, superficial and somewhat coarser in *J. americana*. The seeds of the two are similar but those of *J. americana* (FIG. 6) are drab or pale brown, round-reniform and covered with low and broad flattish pebbling, resembling the pattern of dried and crackled clay. The seeds (FIG. 3) of *J. umbratilis* are deep brown or fulvous, quadrate-orbicular, and covered with very small acutish pebbling.

In its flowers *Justicia umbratilis* is very similar to *J. humilis*, but the corolla is of thicker texture, the lateral lobes of its lower lip wide apart, while the thin-textured corollas of *J. humilis* have the porrect lobes of the lower lip approximate. The latter species (FIGS. 7 and 8), furthermore, has the slender rhizomes less extensively creeping and only 2–4 mm. thick; the stems only 1–3 (rarely –5) dm. high; the leaves more rhombic in outline; the peduncles mostly 1–5 (rarely –8.5) cm. long; the spikes more open, with the flowers becoming scattered or subdistant, the well developed spikes in full anthesis 1.5–5 cm. long; and the more orbicular seeds (FIG. 8) smooth or only faintly and minutely pebbled, with a conspicuous broad and thick entire or merely undulate-dentate rim. *J. umbratilis* has more elongate, more branching and thicker (3–7 mm. thick) rhizomes; usually taller stems (mostly 3–6 dm. high); narrower and scarcely rhombic leaves; mostly longer peduncles, 3.5–10 cm. long; dense and subcapitate spikes, the crowded flowers closely imbricated, the spikes in full anthesis only 1.5–3 cm. long; seeds quadrate, without distinctly differentiated rim, and the surfaces smooth or with obscure minute pebbling.[1]

In Virginia *Justicia umbratilis* is known only from the southeastern counties, chiefly in dense shade. At the southern margin of its range in the state it associates with *J. humilis*. Since the latter species is highly localized in the state and since its nomenclature is involved, the following paragraphs may be helpful.

J. HUMILIS Michx. Fl. Bor.-Am. i. 8 (1803), photographs of type-sheets in Gray Herb. *Dianthera ovata* Walt. Fl. Carol. 63 (1788). *D. humilis* (Michx.) Gray, Syn. Fl. N. Am. ii[1]. 329 (1878), by Gray and by *Index Kewensis* cited as starting in Engelm. & Gray in Bost. Journ. Nat. Hist. v. 234, repr. as Pl. Lindh. i. 22 (1845), where the mere name was published, without description, bibliographic reference or citation of basinym. *J. ovata* (Walt.) Lindau in Urban, Symbol. Ant. ii. 237 (1900), not Dietr. in Steud. Nom. ed. 2, i. 838 (1840).

The following Virginian specimens of *Justicia humilis* are before me. SOUTHAMPTON COUNTY: wet woods, Assamoosick Swamp, south of Sebrell, no. 10,425; alluvial wooded bottomland of Nottoway River, Cypress Bridge, no. 8466; alluvial woods, bottomland of Mill Creek, Hart's Bridge, no. 8467; about Franklin, *Heller*, no. 987; bottomland woods, Nottoway River,

[1] In studying *Justicia* it has been found desirable to set off a southwestern variety of *J. americana* as

J. AMERICANA (L.) Vahl, var. **subcoriacea**, var. nov., caulibus firmis 2–8 dm. altis pallidis; foliis subcoriaceis pallidis imbricatis oblongis vel lanceolatis vel elliptico-ovatis obtusis vel subacutis, primariis 4.5–15 cm. longis 1–3 cm. latis sessilibus; pedunculis erectis capitulis elevatis.—TEXAS: South Concho River, at Christoval, Tom Green County, June 5, 1934, *Cory*, no. 8860, as *Dianthera ovata* (TYPE in Herb. Gray); Nueces River, 11½ miles south of Uvalde, Zavalla County, October 24, 1934, *Cory*, no. 11,959, as *Dianthera ovata;* bed of small stream, 5 miles south of Fort Worth, June 5, 1912, *A. Ruth*, no. 267, as *D. ovata;* Tarrant County, June 5, 1923, *Ruth*, no. 267; 4 miles northwest of Medina, Bandera County, May 25, 1937, *Cory*, no. 23,530, as *D. ovata;* Cibolo Creek, east of Bulverde, Bexar County, May 2, 1933, *Cory*, no. 6079, as *D. ovata*. OKLAHOMA: edge of creek, Cache, Comache County, June 25, 1913, *G. W. Stevens*, no. 1339, as *D. ovata;* Fort Sill, Comanche County, June, 1916, *Mrs. J. Clemens*, no. 11,781; wet clay, meadow west of Claremore, Rogers County, July 2, 1939, *U. T. Waterfall*, no. 1465. KANSAS: Severy, June, 1905, *S. F. Poole*, no. 133. MISSOURI: Meramec River, *N. M. Glatfelder*.

In typical *Justicia americana* the elongate-lanceolate or -oblanceolate to lance-linear leaves are 0.8–2 dm. long and 0.5–2.5 (rarely –3) cm. broad. After flowering the leafy tip prolongs so that the erect or strongly ascending inflorescences are well overtopped by the leafy tip. In var. *subcoriacea* the firmer and pale leaves are more crowded, broader, shorter and blunter, and the peduncles elevate the flowering heads well above the foliage.

Monroe Bridge, nos. 13,163 and 13,164; wooded bottomland of Blackwater River, southeast of Ivor, no. 13,763. Isle of Wight County: bottomland woods along Blackwater River above Broadwater Bridge, north of Zuni, no. 13,456. Nansemond County: wooded bottomland of Somerton Creek, near Factory Hill, nos. 8468 and 8855. See p. 493.

In plate 693, figs. 1–3 are of Justicia umbratilis: fig. 1, the type, × 2/5; fig. 2, portion of spike, × 3, from *Fernald & Long,* no. 13,159; fig. 3, seed, × 8, from the type. Figs. 4–6, J. americana (L.) Vahl: fig. 4, corolla, × 3, from James River, east of Scotland, Virginia, *Fernald & Long,* no. 13,155; fig. 5, to show shield on middle lobe of lower lip, × 3, from no. 13,155; fig. 6, seed, × 8, from Oneida Lake, New York, *Muenscher,* no. 195. Figs. 7 and 8: J. humilis Michx.: fig. 7, portion of corolla (recurving tip of upper lip covering anthers), × 4½, from Monroe Bridge, Southampton Co., Virginia, *Fernald & Long,* no. 13,164; fig. 8, seed, × 8, from Hart's Bridge, Southampton Co., Virginia, *Fernald & Long,* no. 8467.

Utricularia inflata Walt., var. minor Chapm. (*U. radiata* Small). Southampton County: floating at border of Predler's Pond, Nottoway Swamp, southwest of Sedley, no. 8463.

In Rhodora, xli. 122 (1939) Rossbach stated that the "range of var. *minor* is disrupted, it having been collected from . . . Maine, south near the coast commonly to New Jersey, then becoming very local, if not lacking southward, reappearing in pine barrens of . . . Florida". We have seen it in Virginia only in Predler's Pond, but Mr. Lloyd C. Carr reported it in Claytonia, iv. 24 (1937) from Augusta County; and recent collections from South Carolina and from Delaware, in addition to the Virginian specimens, materially close the implied gap in the known range.

U. vulgaris L. *U. vulgaris,* var. *americana* Gray, Man. ed. 5: 318 (1867); *U. macrorhiza* Le Conte in Ann. Lyc. N. Y. i. 73 (1824). King William County: fresh tidal shore of Mattaponi River, at Horse Landing, near King William Courthouse, no. 11,619. Norfolk County: rills and pools, Great Dismal Swamp, west of Yadkin, no. 11,146.

Utricularia vulgaris, as *U. macrorhiza,* was assigned a range by Barnhart in Britton & Brown, Ill. Fl. ed. 2, iii. 229 (1913): "south to Maryland, Missouri", etc., but in Small, Man. 1236 (1933) Barnhart admitted it as a Virginian but only doubtfully from North Carolina. The Great Dismal Swamp is partly in North Carolina and the plant is presumably in that state. In the former work he assigned the stems a length of 1–3 feet ("Stems 1°–3° long") and explained his segregation of the

American *U. macrorhiza* from the Eurasian *U. vulgaris* as follows. "Very variable, but appears to differ constantly from the related and equally variable European species, *Utricularia vulgaris* L., by the longer stems, the shape and direction of the spur, and the minuteness of the appendages (rudimentary stolons) at the base of the scape".

There is no question that the species is variable, but I match very closely variations of the Eurasian and North American specimens. As to our plant differing, as Barnhart thinks, "by the longer stems", it is significant that in Britton & Brown, l. c., he says of the American "Stems 1°–3° long" and in Small, l. c. "Stems . . . 3–10 dm. long" but that Hegi, Ill. Fl. Mittel-Eu. vi[1]. 168 (1914) should describe the European plant "Sprosse . . . bis 2 m. . . . lang" and that Hugo Glück, who devoted his life to study of hydrophytes, should describe the European plant as "30–200 cm. lang". 200 cm. is the same as 2 m., twice the extreme length given by Barnhart for the American plant with reputedly "longer stems". Glück's longest specimens were collected "bei Viernheim in Hessen",[1] not in North America. As a matter of fact, the maximum length of 3 feet or of 10 dm. given for the American plant could safely have been increased. Our no. 11,146 from the Great Dismal Swamp shows stems 1.2 m. long; so does *Victorin, Rolland & Jacques,* no. 33,854 from New Richmond, Quebec, while a sheet in the herbarium of the New England Botanical Club, collected by Walter Deane from a creek at Gilead, Maine, shows a length of 1.4 m. Even these specimens from North America do not equal the 2 m. recorded by Hegi and by Glück for the European plant, though it is probable that devotion to the task might yield an American specimen as long as the longest European.

The difference in "the shape and direction of the spur" was not defined by Barnhart. From dried material alone the exact form of the corolla is difficult to make out; but the pressed flowers show parallel variations in both Eurasian and North American series. Some of these are shown in PLATE 694, FIGS. 1–15: FIGS. 1 and 3–5 from Eurasian specimens, FIGS. 2 and 6–15 from North American. FIG. 2 shows the flowers (× ¾) of the American plant, as illustrated in Britton & Brown, ed.

[1] Glück, Biol. Morph. Untersuch. Wasser- und Sumpfgew. ii. 30 (1906).

2, iii. fig. 3867, where Barnhart felt that our plant "appears to differ constantly from . . . *U. vulgaris* L. by the . . . shape and direction of the spur"; FIG. 7 is from a painting of the fresh flowers, × ¾, of the American plant (from eastern Massachusetts) by the late Elsie Louise Shaw, whose remarkable series of paintings of native American plants has just been presented to the Gray Herbarium in her name by Julia Howe Shaw; FIG. 1 is copied from the plate of the European plant in Reichenbach's Icones. I am puzzled to see the difference in the spur. So with the other figures, some from Eurasian, some from American specimens, they show great variation on both continents, but the differentiation of even var. *americana* Gray (to say nothing of a purely American species) by a more slender and acutish spur becomes wholly artificial.

As to the occasional production in the Old World series of "rudimentary stolons at the base of the scape", they are sufficiently unusual there as to result in special note of them. The illustration in Britton & Brown to show their "minuteness" in America is indeed minute; but, as Rossbach points out in RHODORA, xli. 118 (1939), they are frequently elongate in North America. In the American specimens before me they are present in 43 numbers and often as long as in the European plants. Some of the American specimens with such prolonged rudimentary stolons at the base of the scape are shown in FIGS. 16–19. As a character distinguishing the American *U. macrorhiza* from the Eurasian *U. vulgaris* the "minuteness" of these structures is no more constant that the other points which have seemed to some botanists besides Barnhart sufficient for specific differentiation of the two. Until those who see two species bring forward a series of stable characters it seems better to treat the variable Eurasian and the equally variable North American plants as a single circumboreal species, *U. vulgaris* L., comparable in its distribution with the circumboreal *U. minor* L. and *U. intermedia* Hayne. Incidentally, the inappropriate name, *U. macrorhiza,* for a free-floating plant will thus sink into synonymy.

In PLATE 694, of details of UTRICULARIA VULGARIS, all figures are × ¾–× 1. FIGS. 1–15, flowers: FIG. 1, from Germany, after *Reichenbach;* FIG. 2, North American, after *Britton & Brown;* FIG. 3, European, after *Hegi;* FIG. 4, from Jalatum, Manchuria, *Dorsett & Dorsett,* no. 3496; FIG. 5, from Irkutsk, Siberia, *Stubendorff;* FIG. 6, from Woodstock, New Hampshire, *Fernald,* no. 15,570; FIG. 7, from Lexington, Massachusetts, *E. L. Shaw;* FIG. 8, from Norwood, Massachusetts, June 23, 1895, *E. F. Williams;* FIG. 9, from Concord River, Bedford, Massachusetts, August 23, 1884, *C. W. Jenks;* FIG. 10, from Fort Saskatchewan, Alberta, *G. H. Turner,* no. 25; FIG. 11, from Lake Athabasca, Saskatchewan, *Raup,* no. 6624; FIG. 12, from Ann Arbor, Michigan, *F. J. Hermann,* no. 6896; FIG. 13, from Phalanx, Ohio, *A. N. Rood,* no. 64; FIG. 14, from Worcester, Massachusetts, 1890, *G. E. Stone;* FIG. 15, from vicinity of Rosedale, Alberta, *Moodie,* no. 1133. FIGS. 16–19, rudimentary stolons, × 1: FIG. 16, from Round Lake, Wood Buffalo Park, Mackenzie Basin, *Raup,* no. 3142; FIG. 17, from Lake-of-the-Woods, Klamath County, Oregon, *J. W. Thompson,* no. 13,109; FIG. 18, from Lake Athabasca, Saskatchewan, *Raup,* no. 6624; FIG. 19, from Lake James, Steuben County, Indiana, *Deam,* no. 20,241.

U. GEMINISCAPA Benj. To the few recorded stations add one in SUSSEX COUNTY: shallow pond in woods northeast of Homeville, no. 12,187.

OROBANCHE UNIFLORA L. SURRY COUNTY: rich wooded ravines near James River, west of Ingersoll, no. 11,907. See p. 488.

GALIUM PARISIENSE L. To the few recorded stations add one in HENRICO COUNTY: cinders of Chesapeake and Ohio Railroad, west of Elko Station, no. 12,190. See p. 498.

G. CIRCAEZANS Michx., var. HYPOMALACUM Fern. HENRICO COUNTY: rich wooded slopes by James River, west of Varina, no. 12,191.

The upland and inland extreme.

*RICHARDIA BRASILIENSIS (Moq.) Gomez. HENRICO COUNTY: waste places and railroad ballast, Richmond, nos. 12,816–12,818. DINWIDDIE COUNTY: similar habitat, Petersburg, no. 12,481. See pp. 511 and 515.

A South American species becoming naturalized in temperate and tropical North America. Small (Man.) records it only from peninsular Florida, but in southeastern Virginia it has come to stay. Small's differentiation of the two species, *R. brasiliensis* and *R. scabra,* the former as perennial, the latter as annual, is unsatisfactory, for *R. brasiliensis,* though becoming perennial with a deep and thickened root, may fruit the first year. In *R. scabra* the calyx-lobes are united only at base and 3–4 times as long as the ovary, the corolla hypercrateriform, with the lobes much exceeding the stamens, and the cocci of the fruits ventrally sulcate; in *R. brasiliensis* the calyx-lobes are more united and little exceeding the ovary, the corolla infundibuliform, its lobes little exceeding the stamens, and the cocci of the fruits are keeled on the ventral side (these characters derived from Schumann's treatment in Flora Brasiliensis).

Besides the Virginian material the following specimens of *Richardia brasiliensis* are in the Gray Herbarium from north of Florida.

North Carolina: sandy roadside bank 1 mile east of Delco, Columbus Co., July 5, 1927, *Wiegand & Manning*, no. 3015; dry sandy soil, waste ground, 2 miles south of Wilmington, July 25, 1922, *L. F. & F. R. Randolph*, no. 1007; roadside near Wilmington, *Godfrey & Shunk*, no. 4221. South Carolina: sandy roadside bank, 1 mile west of Marion, Marion Co., *Wiegand & Manning*, no. 3013; roadside gravel, 10 miles northwest of Charleston, *Godfrey & Tryon*, no. 702; damp sandy roadside, 3 miles southeast of Waterboro, Colleton Co., *Wiegand & Manning*, no. 3016.

There are also specimens from Alabama and Texas.

*Diodia teres Walt., var. **oblongifolia**, var. nov., a var. *typica* differt caulibus valde depressis; foliis oblongis vel oblongo-ellipticis 1–2.5 cm. longis 5–8 mm. latis; stipulis vix fructibus aequantibus; fructibus 3–3.5 mm. longis valde hispidis, pilis divergentibus.—Southeastern Virginia: disturbed white sand of dry woods and clearings east of Joyner's Bridge, Isle of Wight County, July 17, 1940, *Fernald & Long*, no. 12,480; dry sandy roadside at crossing of Southern Railroad, Lee's Mill, Isle of Wight County, August 24, 1936, *Fernald & Long*, no. 6698; disturbed white sand of dry pine barrens, south of Lee's Mill, July 11, 1940, *Fernald & Long*, no. 12,479; same locality, August 23 and September 2, 1940, *Fernald & Long*, no. 12,820 (type in Herb. Gray, isotype in Herb. Phil. Acad.); waste ground, Franklin, September 11, 1941, *Fernald & Long*, no. 13,767; railroad ballast, Richmond, Fredericksburg and Potomac Railroad, Richmond, August 19, 1940, *Fernald & Long*, no. 12,819. See pp. 508 and 514.

Var. *oblongifolia* is at once recognized by its oblong and broad-based leaves, by its relatively short stipules and by the spreading-hispid fruit. In the latter and in its foliage it approaches var. *hystricina* Fernald & Griscom in Rhodora, xxxix. 307, t. 469. figs. 2 and 3 (1937), but var. *hystricina* has strongly hispid or hirsute stems, narrower and more elongate leaves (when well developed 1.5–4.5 cm. long), the more densely hispid fruit 3.8–5 mm. long. Var. *oblongifolia* has puberulent stems, short and broad leaves only 1–2.5 cm. long, and short-hispid fruits only 3–3.5 mm. long. Typical *D. teres* is usually not depressed and it has linear to linear-lanceolate and elongate leaves and the bristles of the stipules greatly overtop the fruits.

VIBURNUM **recognitum,** nom. nov. *V. dentatum* L., *α. lucidum* Ait. Hort. Kew. i. 372 (1789), not *V. lucidum* Mill. Gard. Dict. ed. 8, no. 5 (1768). *V. dentatum* sensu most authors, not L. Sp. Pl. 268 (1753) nor Svenson in RHODORA, xlii. 5, pl. 586 (1940).

Viburnum dentatum L. and *V. pubescens* (Ait.) Pursh have been much discussed in recent years, first by Blake,[1] later by Svenson.[2] It is, therefore, tedious at least to continue the discussion. I fully concur in Blake's decision that the type of *V. pubescens* (Ait.) Pursh belongs in the more southern series with usually pubescent branchlets, including *V. venosum* Britton; I also agree, from Svenson's notes upon and photograph of the type of *V. dentatum* L., that it has long been misinterpreted (or not examined) and that it is inseparable from *V. venosum*, var. *Canbyi* Rehder.

I am not prepared, however, to follow Svenson in reducing to the variable and usually pubescent *V. dentatum* (= *V. venosum*) merely as a glabrous-twigged variety the usually more northern shrub which has regularly passed as *V. dentatum*, i. e. *V. dentatum α. lucidum* Ait. The two species, true *V. dentatum* L. (including *V. pubescens* (Ait.) Pursh, *V. scabrellum* (T. & G.) Chapm., *V. venosum* Britton, *V. longifolium* Loddiges ex Zabel and *V. semitomentosum* (Michx.) Rehder) and *V. recognitum* (*V. dentatum, α. lucidum* Ait.), are both hopelessly variable in leaf-outline and toothing of leaves, each of them with blades varying from lance-ovate or ovate-oblong to orbicular, with veins prominent beneath or obscure, with length from 2.5 to 10 cm. and breadth from 2 to 8 cm. In the series with usually pubescent new branchlets and more or less pubescent leaf-surfaces and inflorescences these different leaf-outlines have formed the bases for several so-called species and varieties; in *V. recognitum* exactly parallel leaf-variations have been quite as consistently ignored. The type of *V. dentatum* can be easily matched in shape, size and toothing of leaf by many sheets of unquestioned *V. recognitum*. The type of Michaux's *V. dentatum β. semitomentosum* from South Carolina, basis of *V. semitomentosum* (Michx.) Rehder, is closely matched in leaf-outline by some extreme (elongate-leaved) specimens of *V. venosum*

[1] S. F. Blake, *On the Names of some Species of Viburnum*, RHODORA, xx. 11–15 (1918).
[2] H. K. Svenson, *Plants of Southern United States, I. Viburnum dentatum*, RHODORA, xlii. 1–6 (1940).

from southeastern Massachusetts, by authentic material of *V. dentatum β. scabrellum* T. & G. or *V. scabrellum* (T. & G.) Chapm., by some of Canby's material of *V. pubescens* var. *Canbyi* (Rehder) Blake, as well as by authentic sheets of *V. pubescens* var. *indianense* Rehder. In other words, most of these reputed varieties, dependant for their recognition upon evasive degrees of pubescence and leaf-outline, are scarcely to be accorded true varietal rank; at best they are rather trivial forms. And even the most extreme of these variations in leaf-outline can be fairly matched in the more glabrous *V. recognitum*, in which, as noted, no varieties have been thought worthy recognition by our students of trees and shrubs.

The strongest departure from the regular run of leaf-variation in *Viburnum dentatum* which I see is in the type of *V. dentatum β. pubescens* Ait., therefore of *V. pubescens* (Ait.) Pursh. This type was traced by Blake in 1915 and his tracing (see p. 650) is preserved in the Gray Herbarium. It is, therefore, somewhat perplexing to find him, in 1918, writing that "The type of *β. pubescens,* marked 'Hort. Dr. Lee,' and labeled in Solander's own hand, is a characteristic specimen of the plant now passing as *V. venosum* Britton"; and then recognizing, in his summary, not only "Viburnum pubescens (Ait.) Pursh.—*V. venosum* Britton" but, likewise, "V. pubescens (Ait.) Pursh var. **longifolium** (Dippel).—*V. dentatum* var. *longifolium* Dippel . . . *V. venosum* var. *longifolium* (Dippel) Rehder". The perplexity arises through the fact that *V. dentatum β. pubescens* Ait. was originally accurately described "foliis ovato-oblongis acuminatis subtus villosis, petiolis elongatis", while *V. venosum* Britton was originally and correctly described with "blades broadly ovate to orbicular"; and Britton correctly so illustrated the most typical leaf-outline of his own *V. venosum* in Ill. Fl. iii. 272 (1913). I have counted the commonly broad and deltoid (though sometimes prolonged) teeth on the leaf-margins of all the plastic forms of *V. dentatum* and *V. recognitum*. They range from 4–18 (very rarely to 22) on each side of the midrib. The tracing of Aiton's type of *V. dentatum* var. *pubescens* made by Blake shows ovate-oblong leaves with 16–22 *lance-falcate* teeth. It is closely matched by authentic material of *V. dentatum* var. *longifolium* Dippel or *V. venosum* var. *longifolium* (Dippel) Rehder or *V.*

pubescens var. *longifolium* (Dippel) Blake, this variety being a shrub long cultivated in Europe, whence it was received at the Arnold Arboretum. Rehder, Man. Cult. Trees and Shrubs, ed. 2: 841 (1940) correctly describes it with "Lvs. narrower and longer, usually ovate-oblong." The type of *V. pubescens* (*V. dentatum* β. *pubescens* Ait.) was also correctly described "foliis ovato-oblongis", and Blake's tracing of it is closely matched by material from the Arnold Arboretum of *V. dentatum* var. *longifolium* Dippel, not only in leaf-outline but in the very numerous, slender and falcate teeth. That var. *longifolium* is the same as typical var. *pubescens* Ait., also described from material in European gardens, I am satisfied.

Besides *Viburnum dentatum,* var. *pubescens* Ait. (known primarily in cultivation) the only variation within the species which seems to me worthy recognition as a geographic variety is the inland extreme with glabrous or nearly glabrous branchlets, the petioles often with subpersistent basal stipules, whereas the highly variable but confluent series with pubescent branchlets very rarely shows stipules. This extreme is

V. DENTATUM L., var. **Deamii** (Rehder), comb. nov. *V. pubescens,* var. *Deamii* Rehder in Journ. Arn. Arb. v. 58 (1924) and var. *indianense* Rehder, l. c. 59 (1924).

These varieties proposed by Rehder, *V. pubescens,* vars. *Deamii* and *indianense,* show less difference than do *V. venosum* Britton and *V. venosum,* var. *Canbyi* Rehder, which, as I have seen them in the field, are edaphic phases of a single shrub, the extreme in more exposed habitats having thick, sulcate-ribbed and strongly pubescent leaves, the extreme in more protected spots having thinner, flatter and less pubescent blades. The keen observer, C. C. Deam, who had collected the original material of both of Rehder's proposed varieties, wrote, in 1924, of var. *indianense:* "This shrub very much resembles the preceding [var. *Deamii*], from which it is sometimes very doubtfully separated. For this reason, the writer believes that a further study of the two shrubs will show that this is only a form of the preceding"—Deam, Shrubs of Indiana, 321 (1924). After "further study", in 1932, Deam, in his 2nd edition (p. 350), seems not to have altered his opinion.

(Type of V. dentatum L.
var pubescens Ait.!
Br. Mus. 30·8·15)

Viburnum dentatum β. pubesc
Viburnum pubescens, Pursh

That *Viburnum recognitum* is *V. dentatum* α. *lucidum* Ait. there is no doubt but, since there is already a *V. lucidum,* Aiton's name can not be taken up. It is not improbable that it is also *V. dentatum* α. *glabellum* Michx. Fl. Bor.-Am. i. 179 (1803). My photograph of the latter, taken in 1903, looks like it but, because there is already an American *V. glabratum* HBK. (*V. glabrum* Willd. ex Schultes) it is wiser not to make confusion by taking up Michaux's varietal name for a species.

As pointed out by Mr. Bayard Long in Stone's Plants of Southern New Jersey, 709, the flowering and fruiting periods in the same region of *V. dentatum* true (*V. scabrellum,* etc.) and of *V. recognitum* ("*V. dentatum*" of authors, not L.) are very different. The shrub with pubescent branchlets, foliage and cyme flowers in southern New Jersey from "Mid-June to early July" and its fruits are mature from "Early September to early October". In the same region *V. recognitum,* with glabrous branchlets and cyme and glabrous or glabrate foliage, flowers from "Late May to mid-June", the fruit maturing from "Early August to early September". On Nantucket Island, the type region of *V. venosum* Britton, Bicknell recorded[1] the glabrous *V. recognitum* (*V. dentatum* of Bicknell) as "just in flower June 22, . . . no flowers remaining July 12", but the pubescent *V. dentatum* (*V. venosum*) with "forward bushes just in flower June 30 . . . , everywhere in showy bloom July 4 to 13". Similarly on Cape Cod and Martha's Vineyard, the very large representation of the two in the herbarium of the New England Botanical Club gives the following: V. DENTATUM (*venosum*), flowers June 28–August 14, ripe fruit August 26–November 1; V. RECOGNITUM, flowers June 16–July 5, ripe fruit August 6–September 19. Throughout their coincident ranges, then, *V. dentatum* (*venosum*) is in prime of flowering 10 days to 3 weeks later than *V. recognitum;* while the former matures its fruit 3 to 4 weeks later. The ripe drupes of *V. dentatum* range from 5–8 mm. long; those of *V. recognitum* are slightly but not strikingly smaller (5–7 mm.). Ordinarily the stones of *V. dentatum* are ellipsoid-ovoid, those of *V. recognitum* more globose-ovoid; and the ventral groove of the stone in the former is narrow, deep and furrow-like, in the latter broader, shallow and trough-like.

[1] E. P. Bicknell, Bull. Torr. Bot. Cl. xlii. 347, 348 (1915).

V. dentatum is a southern species, occurring from Florida to Texas, north to southeastern Massachusetts, Block Island (Rhode Island), Long Island, New Jersey, Pennsylvania, West Virginia, southern Ohio, central Indiana and Missouri. *V. recognitum* is more northern: New Brunswick to southern Ontario, south to South Carolina (or Georgia), northern Ohio and Michigan.

*V. nudum L., var. angustifolium Torr. & Gray. York County: wooded swamp along Carter's Creek, about 8 miles north of Williamsburg, *Grimes*, no. 3589. Southampton County: depression in sandy pine woods north of Point Beach, south of Franklin, no. 13,166; rich woods in ravine of small brook south of Applewhite's Church, no. 13,167.

Viburnum nudum, in its typical development, is a coarse, often tree-like shrub with the mature leaves of the fertile branches elliptic to narrowly ovate or obovate and 6–15 cm. long, by 2.5–7.5 cm. broad, the cymes 7–10 cm. broad. It extends northward to southern Connecticut, Kentucky and Arkansas. Var. *angustifolium* is lower, the mature leaves of the fertile branches lanceolate to narrowly oblong and 3.5–10 cm. long, by 1.7–3 cm. broad, its cymes only 2.5–7 cm. broad. It occurs in bogs, savannahs and wet woods from Florida and Alabama to southeastern Virginia. The Grimes material belongs in the variety but not in its more extreme development. Our no. 13,166 is more characteristic.

*Sambucus nigra L. Dinwiddie County: waste ground, Petersburg, no. 12,486. See p. 511.

The European species, here probably spread from cultivation.

Campanula aparinoides Pursh. Sussex County: wooded springhead by Nottoway River, south of Chub, no. 12,484.

Our first Coastal Plain station in the state. See p. 507.

C. americana L. Range extended down the James to Isle of Wight County (several nos.). See p. 520 and map 7.

Lobelia siphilitica L. Range extended down the James to Isle of Wight County (several nos.). See p. 520.

*Vernonia glauca (L.) Willd., forma **longiaristata,** f. nov., phyllaribus longe aristatis, aristis 4–6 mm. longis.—Occasional in range of typical *V. glauca*. New Jersey: loamy, wooded slope, west of Chestnut Branch of Mantua Creek, Sewell, Gloucester County, September 22, 1920, *Long*, no. 23,399. Virginia:

rich calcareous wooded ravine west of Claremont, Surry County, August 28, 1940, *Fernald & Long*, no. 12,836 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.); rich wooded slope just above the "fall-line" by Three Creek, northwest of Emporia, Surry County, August 17, 1940, *Fernald & Long*, no. 12,835. NORTH CAROLINA: rocky woodland, Oxford, Granville County, July 28, 1938, *Godfrey*, no. 5521; thicket near Siler City, Chatham County, October 14, 1938, *Godfrey*, no. 6975.

Typical *V. glauca*, as shown by heads of the Clayton plant given to Asa Gray in 1839, the only material cited by Linnaeus under his *Serratula glauca* which he had actually studied, has the broad phyllaries barely tipped by short awns. It is from characteristic material of the plant now generally known as *V. glauca*, in which the awns vary from none on some phyllaries up to 4 mm. long. Forma *longiaristata*, growing in rich woodlands with typical *V. glauca* or in colonies by itself, simulates *V. noveboracensis* of more peaty habitats in its involucre but in its foliage and pale brownish pappus is good *V. glauca*.

EUPATORIUM ALTISSIMUM L. ISLE OF WIGHT COUNTY: rich calcareous wooded slopes by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,848; seeping argillaceous and calcareous bluffs near Rushmere, no. 12,849.

Our first evidence of this inland and upland species on the Coastal Plain. See p. 525.

E. SESSILIFOLIUM L. SURRY COUNTY: thicket back of sand-beach of Cobham Bay, James River, northwest of Chippokes, no. 12,851.

As in the preceding, our first Coastal Plain station. See p. 521.

E. SESSILIFOLIUM, var. VASEYI (Porter) Fernald & Griscom. Local range extended northward. CHESTERFIELD COUNTY: thicket south of Dutch Gap, no. 12,852. HENRICO COUNTY: open thickets, South Richmond, no. 12,853.

E. INCARNATUM Walt. SURRY COUNTY: rich calcareous wooded ravine west of Claremont, no. 12,856. PRINCESS ANNE COUNTY: rare, Munden, September, 1905, *Mackenzie*, no. 1773. See p. 520.

Although long ago reported from Virginia, the two nos. above cited are all that have come to the Gray Herbarium. The corollas are a pale lilac, not of the deeper color we had expected.

SOLIDAGO GIGANTEA Ait., var. LEIOPHYLLA Fernald. SUSSEX COUNTY: rich woods by Nottoway River, southeast of Stony Creek, no. 12,488.

Our first Coastal Plain station. See p. 509.

*Aster laevis L., forma **amplifolius** (Porter), stat. nov. *A. laevis*, var. *latifolia* Porter in Bull. Torr. Bot. Cl. xxi. 121 (1894), not *A. latifolius* Desf. (1829). *A. laevis amplifolius* Porter in Mem. Torr. Bot. Cl. v. 324 (1894).

Our Virginian material is from Isle of Wight County: seeping argillaceous and calcareous bluffs along Burwell's Bay, James River, near Rushmere (Fergusson's Wharf), no. 12,865, some of the obtuse and oblong-elliptical rosette-leaves abruptly contracted at base, the blades up to 6 cm. broad.

A. infirmus Michx. Local range extended into Surry County: rich calcareous wooded ravines west of Claremont, no. 12,868. See p. 520.

A. tenuifolius L. Extending up the James to Surry County: fresh to brackish tidal marshes, Hog Island, no. 12,866.

*Erigeron quercifolius Lam. Henrico County: freight-yard of Atlantic Coast Line Railroad, Richmond, no. 12,869.

Extension north from North Carolina. See p. 516.

*Erigeron **scaturicola,** sp. nov. (tab. 695, fig. 1 et 2), perennis caudice plus minusve multicipito; foliis basilaribus rosulatis carnosis obovatis subintegris vel undulato-dentatis late petiolatis 0.5–3 dm. longis 2–12 cm. latis; caulis laxe adscendentibus vel suberectis mollibus (1–)3–8 dm. altis basi villosis supra glabrescentibus laxe corymboso-ramosis; foliis caulinis carnosis obovatis vel late oblongis vel ovatis integris vel parce dentatis glabris vel glabratis imis basi plerumque contractis, mediis superioribusque basi late rotundatis vel subamplexicaulibus 1.5–6 cm. latis; corymbis laxe ramosis, capitulis junioribus erectis longe pedunculatis; involucris hemisphericis, phyllaribus lineari-oblongis acutis viridibus albido-marginatis 5–8 mm. longis glabris vel dorso sparse setosis; ligulis numerosissimis albidis phyllaribus duplo longioribus; acheniis lineari-columnaribus vel lineari-oblanceolatis olivaceis 1 mm. longis glabris vel strigosis glabratisque; receptaculi denudati foveis quam jugis latioribus.—Seeping and springy calcareous marl-bluffs and adjacent beaches of the James River, Isle of Wight and Surry Counties, Virginia: Isle of Wight County: seeping argillaceous and calcareous bluffs along Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), August 27 and 29, 1940, *Fernald & Long*, nos. 12,870 and 12,871; under crest of seeping calcareous bluff of James River, below Fort Boykin, June 14, 1941, no. 13,179; thickets and open woods back of beach of James River, west of Fort Boykin, June 14, 1941, no. 13,180; steep bushy calcareous bluff below Fort Boykin, June 14, 1941, no. 13,178; seeping calcareous wooded bluff west of Fort Boykin, June 14 and 16, 1941, no.

13,181 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.) and no. 13,182. Surry County: base of seeping calcareous wooded slope by James River, below Sunken Meadow Beach, June 16, 1941, no. 13,183; seeping calcareous and argillaceous bluffs along James River, Claremont, September 7, 1941, *Fernald & Long*, no. 13,822.

Erigeron scaturicola (from *scaturex*, a gushing spring) is apparently a local ally of the wide-ranging *E. philadelphicus* L. of meadows, damp shores and thickets across the continent, a species represented in tidewater Virginia in only a few meadows and damp woodlands of Surry and Princess Anne Counties. *E. philadelphicus* is a short-lived perennial or biennial without strongly developed caudices; *E. scaturicola* a deep-rooted perennial with stout branching rhizome and elongate caudices. The leaves of *E. philadelphicus* are relatively narrow, scarcely or rarely amplexicaul, villous and of submembranaceous texture; the glabrous or glabrate leaves of *E. scaturicola* are fleshy and brittle, those of the basal rosettes much larger than in *E. philadelphicus*, the middle and upper cauline ones subamplexicaul and large, the bracteal ones much broader than in *E. philadelphicus*. In *E. philadelphicus* the usually single erect stems terminate in regular corymbs with the young and unexpanded heads nodding. In *E. scaturicola* the loosely ascending, arching or sometimes erect stems fork down to or below the middle into a loose inflorescence, with the young peduncles ascending, not nodding. The involucre of *E. philadelphicus* is commonly villous, that of *E. scaturicola* glabrous or nearly so. The ligules of *E. philadelphicus* are flesh-pink to deep-lilac (white in rare forms) and 2–3 times the length of the phyllaries. The achenes of the two species are similar but usually glabrous or more promptly glabrate in *E. scaturicola*. The denuded receptacles, after the falling of the achenes are somewhat different. In *E. philadelphicus* the pits of the receptacle (FIG. 3) are minute, with a subulate projection (the stipe of the disarticulated flower), and the separating ridges are broader than the pits; in *E. scaturicola* the broad and shallow pits (FIG. 2) show no subulate projections and are broader than the separating ridges.

So far as we yet know *Erigeron scaturicola* is confined to the dripping or seeping spring-fed bluffs (and adjacent thickets and beaches below the bluffs) of soft and pasty Miocene fossiliferous marls along the lower James River in Isle of Wight and Surry Counties. Where the Miocene beds are solidified (as at Scotland Ferry, for instance) there is no trace of it. In the region of its best development, from Burwell's Bay (Fergusson's Wharf) near Rushmere to the rapidly collapsing bluffs below Old Fort Boykin, it is associated with a considerable flora of localized species with disrupted ranges. Late in the season the old flowering stems may lop over into the dripping marl and clay and there form new rosettes and flowering stems from the axils of the fallen leaves (our no. 12,871). See p. 524.

In PLATE 695, FIG. 1 is two small plants, × 2/5, of ERIGERON SCATURICOLA from the TYPE-number; FIG. 2, portion of denuded receptacle, × 9, from TYPE. FIG. 3 is a denuded receptacle of E. PHILADELPHICUS L., × 9, from Hanover, New Hampshire, July 6, 1910, *E. F. Williams*.

GNAPHALIUM SPATHULATUM Lam. To the single recorded station (in Henrico County) add one in DINWIDDIE COUNTY: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 12,491. See p. 511.

SILPHIUM COMPOSITUM Michx. Local range extended eastward into NANSEMOND COUNTY: dry sandy pineland southwest of Marsh Hill School, south of South Quay, nos. 12,878 and 12,879.

No. 12,878 is quite like a photograph of Michaux's type of *S. compositum,* which was clearly described "foliis radicalibus trifoliatis; foliolis petiolatis, inaequaliter sinuato-multipartitis". This is one of the extremes of the species and it was separated by Small as *S. lapsuum* Small.

*RUDBECKIA SPATHULATA Michx. GREENSVILLE COUNTY: margin of low woods southeast of Emporia, no. 11,195 (distrib. as *R. fulgida*).

The first from north of North Carolina, unless a specimen so identified (but inadequate for study), from Augusta County, *Carr,* no. 808, belongs here. The Virginia plant called by Gray *R. spathulata,* in preparing his treatment for the Synoptical Flora, belongs to *R. umbrosa,* occurring from the Blue Ridge and the Alleghenies to the Ozark region. This specimen is

*R. UMBROSA Boynton & Beadle. BEDFORD COUNTY: October 1, 1871, *A. H. Curtis* (as *R. fulgida*).

The three species here involved are separated by the following characters.

Basal and lower cauline leaves ovate, broadly rounded to subcordate at base, 3.5–5 cm. broad; ligules 1.5–3 cm. long. *R. umbrosa.*

Basal and lower cauline leaves lanceolate or oblanceolate to narrowly obovate or narrowly elliptic, gradually tapering at base, 0.5–4.5 cm. broad; ligules 1–2 cm. long.

Middle and upper internodes and bases of leaves spreading-hirsute; basal and petioled cauline leaves 2–4.5 cm. broad; involucre 1–2.2 cm. long, its larger phyllaries 2.5–7 mm. broad .... *R. fulgida.*

Middle and upper internodes glabrous to strigose-hispid; bases of leaves appressed-short-strigose; basal and petioled cauline leaves 0.5–2 cm. broad; involucre 5–9 mm. long, its larger phyllaries 1–2 mm. broad .... *R. spathulata.*

R. triloba L. Range extended down the James to Isle of Wight County: thicket back of sand-beach of Burwell's Bay, below Rushmere (Fergusson's Wharf), no. 12,883.

Helianthus mollis Lam. To the few recorded stations add one in Henrico County: thickets and borders of woods, Richmond, no. 12,884.

H. decapetalus L. Range extended down the James to Isle of Wight County: (several nos.).

*Cosmos sulphureus Cav. Isle of Wight County: roadsides and waste places, Rushmere (Fergusson's Wharf), no. 12,889. Dinwiddie County: roadsides and waste places, Petersburg, no. 13,831.

A garden plant, likely to become more common as an escape.

*Anthemis secundiramea Bivona. Henrico County: waste places and railroad ballast, Richmond, no. 12,500.

A short-rayed species from the Mediterranean. See p. 516.

*Senecio Crawfordii Britton. Surry County: bottoms of rich calcareous wooded ravines west of Claremont, no. 12,892, very local. See p. 521.

First from south of Prince George County, Maryland.

*Lactuca hirsuta Muhl., var. sanguinea (Bigel.) Fernald, forma **indivisa,** f. nov., foliis caulinis oblongis vel subrotundatis remote dentatis nec lobatis. Virginia: low woods and thickets near Hunting Quarter Creek, southwest of Lumberton, Sussex County, July 10, 1940, *Fernald & Long* (type in Herb. Gray).

Photo. W. H. Hodge.

Bromus nottowayanus: fig. 1, habit, × ⅔; fig. 2, summit of sheath, × 4; fig. 3, bases of panicle-branches, × 4; fig. 4, spikelet, × 2; fig. 5, glumes and base of lemma, × 4; fig. 6, inner face of 2d glume, × 4; fig. 7, lemma and palea, × 4.

B. purgans: fig. 8, summit of sheath, × 4; fig. 9, bases of panicle-branches, × 4; fig. 10, inrolled lemmas, × 4.

B. latiglumis: fig. 11, summit of sheath, × 4; fig. 12, bases of panicle-branches, × 4; fig. 13, spikelet, × 2.

Photo. W. H. Hodge.

CAREX RUGATA: FIG. 1, habit, × ½; FIG. 2, inflorescence, × 3; FIG. 3, perigyn[ia] × 5; FIG. 4, achenes, × 10.
C. GRISEA: FIG. 5, pistillate spike, × 3; FIG. 6, achene, × 10.
C. AMPHIBOLA: FIG. 7, pistillate spike, × 3; FIG. 8, achene, × 10.

Photo. W. H. Hodge.

AMELANCHIER CANADENSIS: FIG. 1, TYPE, from Linnean Herbarium, × 1.
A. ARBOREA: FIG. 2, portion of original plate of F. A. Michaux.
A. OBOVALIS: FIG. 3, flowering branch, showing the short racemes; FIG. 4, fruiting branch; both × 1.

Photo. W. H. Hodge.

LESPEDEZA CAPITATA, var. TYPICA: FIG. 1, summit of fruiting stem, × 1; FIG. 2 fruiting head, × 4; FIG. 3, legumes, × 4, from base of fruiting calyx; FIGS 4 and 5, upper and lower surfaces of leaf, × 10.

Photo. W. H. Hodge.

Lespedeza capitata, var. vulgaris: fig. 1, summit of flowering stem, × 1; fig. 2, portion of flowering head, × 4; fig. 3, portion of fruiting head, × 4; figs. 4 and 5, lower and upper surface of leaf, × 10; fig. 6, legumes, × 4, from base of fruiting calyx.

Photo. W. H. Hodge.

Lespedeza capitata, var. calycina: fig. 1, summit of isotype, × 1; fig. 2, portion of fruiting spike, × 4; fig. 3, lower surface of leaf, × 10; fig. 4, median cauline leaves, × 1.

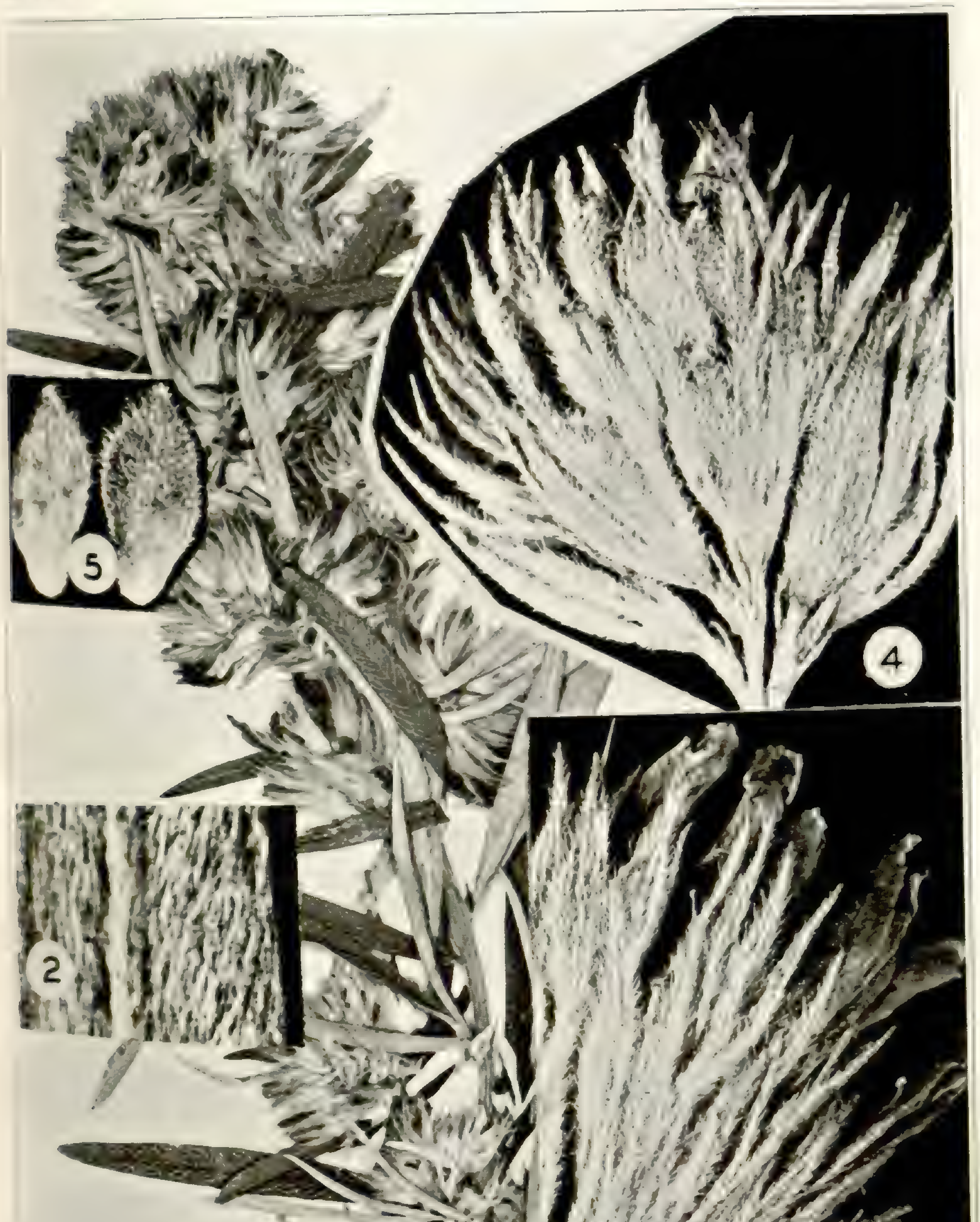


Photo. W. H. Hodge.

LESPEDEZA CAPITATA, var. STENOPHYLLA: FIG. 1, summit of TYPE, × 1; FIG. 2, lower surface of leaf, × 10; FIG. 3, portion of flowering head, × 4; FIG. 4, fruiting head, × 4; FIG. 5, legumes from bases of fruiting calices, × 4.

Photo. W. H. Hodge.

LESPEDEZA CAPITATA, var. VELUTINA: FIG. 1, flowering summit, × 1; FIG. 2, median cauline leaves, × 1; FIG. 3, lower surface of leaf, × 10; FIG. 4, flowering head, × 4; FIG. 5, portion of fruiting head, × 4; FIG. 6, legumes from bases of fruiting calyx × 4.

Photo. W. H. Hodge.

LESPEDEZA HIRTA, var. TYPICA: FIG. 1, summit of flowering stem, × 1; FIG. 2, summit of petiolule of terminal leaflet, × 10; FIG. 3, portion of flowering raceme, × 4; FIGS. 4 and 5, portions of fruiting racemes, × 4.

Photo. W. H. Hodge.

Lespedeza hirta, var. appressipilis: fig. 1, summit of fruiting plant (isotype) × 1; fig. 2, median cauline leaves and (at right) flowering raceme, × 1; fig. 3, portion of fruiting raceme, × 4; fig. 4, lower surface of leaf, × 10; fig. 5, summit of petiolule of terminal leaflet, × 10.

Photo. W. H. Hodge.

LESPEDEZA HIRTA, var. LONGIFOLIA: FIG. 1, summit of flowering plant, × 1; FIG. 2. small flowering raceme, × 4; FIG. 3, summit of petiolule of terminal leaflet, × 10.

Photo. W. H. Hodge.

LESPEDEZA HIRTA, var. INTERCURSA: FIGS. 1 and 2, portions of TYPE, × 1; FIG. 3, summit of petiolule of terminal leaflet, × 10; FIG. 4, portion of flowering raceme × 4.

L. ANGUSTIFOLIA: FIG. 5, portion of fruiting raceme, × 4; FIG. 6, summit of petiolule of terminal leaflet, × 10.

Photo. W. H. Hodge.

Lespedeza hirta, var. dissimulans: fig. 1, summit of type, × 1; fig. 2, flowering raceme, × 4; fig. 3, fruiting raceme, × 4; figs. 4 and 5, upper and lower surfaces of leaf, × 10.

Photo. W. H. Hodge.

RHUS RADICANS: FIG. 1, portion of TYPE. × 1, from Linnean Herbarium.
R. RADICANS, var. RYDBERGII: specimen of Hortus Cliffortianus, referred by Linnaeus to *R. radicans*.

Photo W. H. Hodge.

RHUS RADICANS, var. VULGARIS: characteristic terminal leaflet, × 1.

Photo. W. H. Hodge.

RHUS TOXICODENDRON: FIGS. 1 and 2, TYPE, × 1, from Linnean Herbarium
R. TOXICODENDRON, forma ELOBATA: FIG. 3, TYPE (including fruit), × 1.

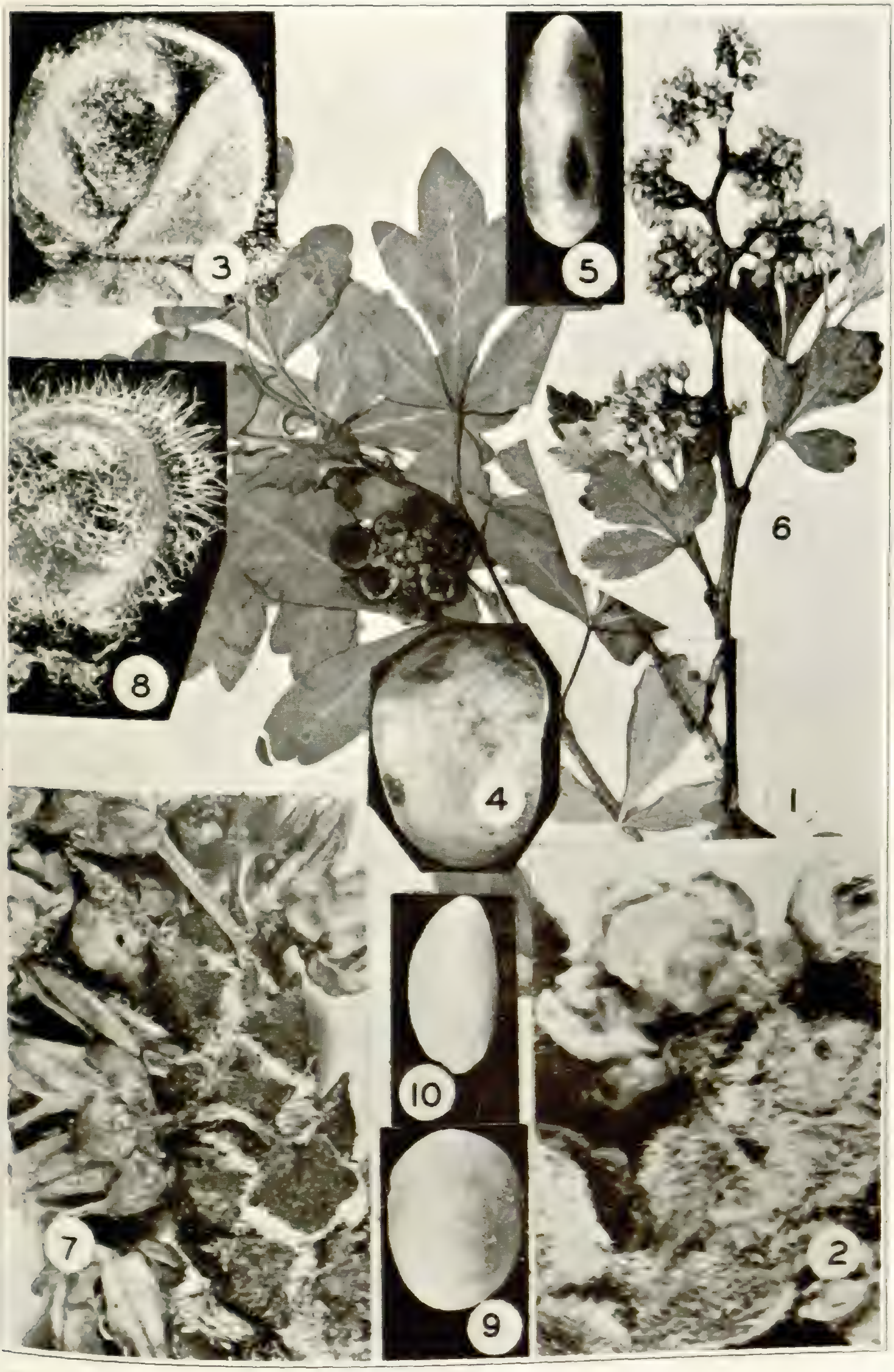


Photo. W. H. Hodge.

Rhus trilobata: fig. 1, fruiting branch, × 1; fig. 2, portion of inflorescence, showing pubescent bracts, × 10; fig. 3, drupe, × 5; figs. 4 and 5, stone, × 5.
R. aromatica: fig. 7, portion of inflorescence, showing glabrous backs of bracts, × 10.
R. aromatica, var. arenaria: fig. 6, flowering branch, × 1; fig. 8, drupe, × 5; figs. 9 and 10, stone, × 5.

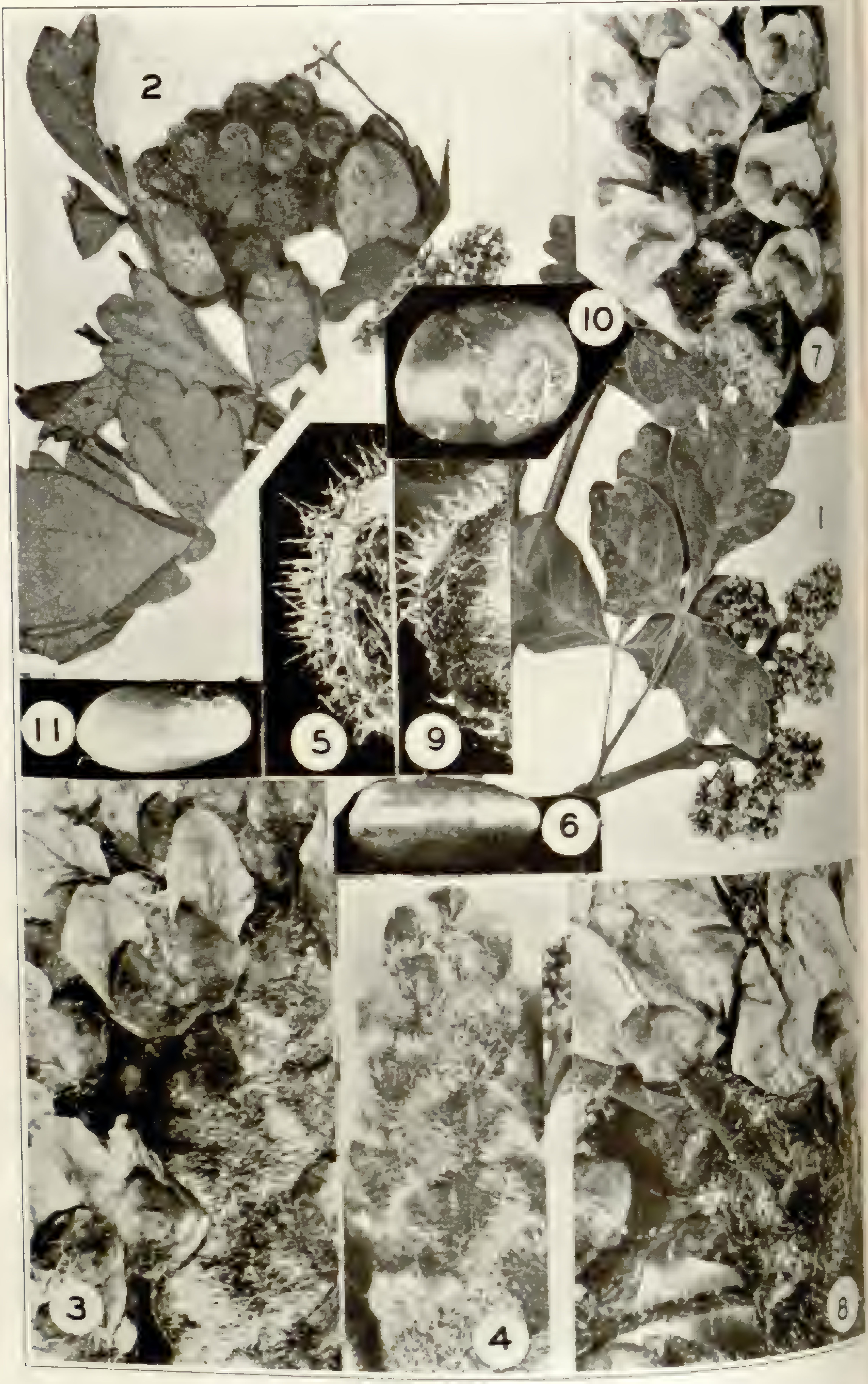


Photo. W. H. Hodge.

RHUS AROMATICA: FIGS. 7 and 8. portions of inflorescences, × 10; FIG. 9, port[illegible] of drupe, × 5; FIGS. 10 and 11, stone, × 5.

R. AROMATICA, var. SEROTINA: FIG. 1. flowering branch, × 1; FIG. 2, fru[illegible] branch, × 1; FIG. 3. portion of inflorescence, × 10; FIG. 4, young ament, × [illegible] FIG. 5, portion of drupe, × 5; FIG. 6, stone, × 5.

Photo. W. H. Hodge.

KOSTELETZKYA VIRGINICA, var. TYPICA: FIG. 1, flowering branch, × 1; FIG. 2, fruit, × 3.
Var. AQUILONIA: FIG. 3, flowers, × 1, from TYPE; FIG. 4, fruit, × 3.
Var. ALTHEAEFOLIA: FIG. 5, fruit, × 3.

Photo. W. H. Hodge.

HELIANTHEMUM CAROLINIANUM (type-species of *Crocanthemum*): FIG. 1, flowering plant, × 1; FIG. 2, mature inflorescence, × 1; FIG. 3, ovary and SESSILE stigma × 10.

H. GUTTATUM (*Tuberaria guttata*): FIG. 4, plant, × ½, after *Reiche* and *Janchen*.

H. GLOBULARIFOLIUM (*Tuberaria*): FIG. 5, ovary and stamens, × 5, after *Grosser*.

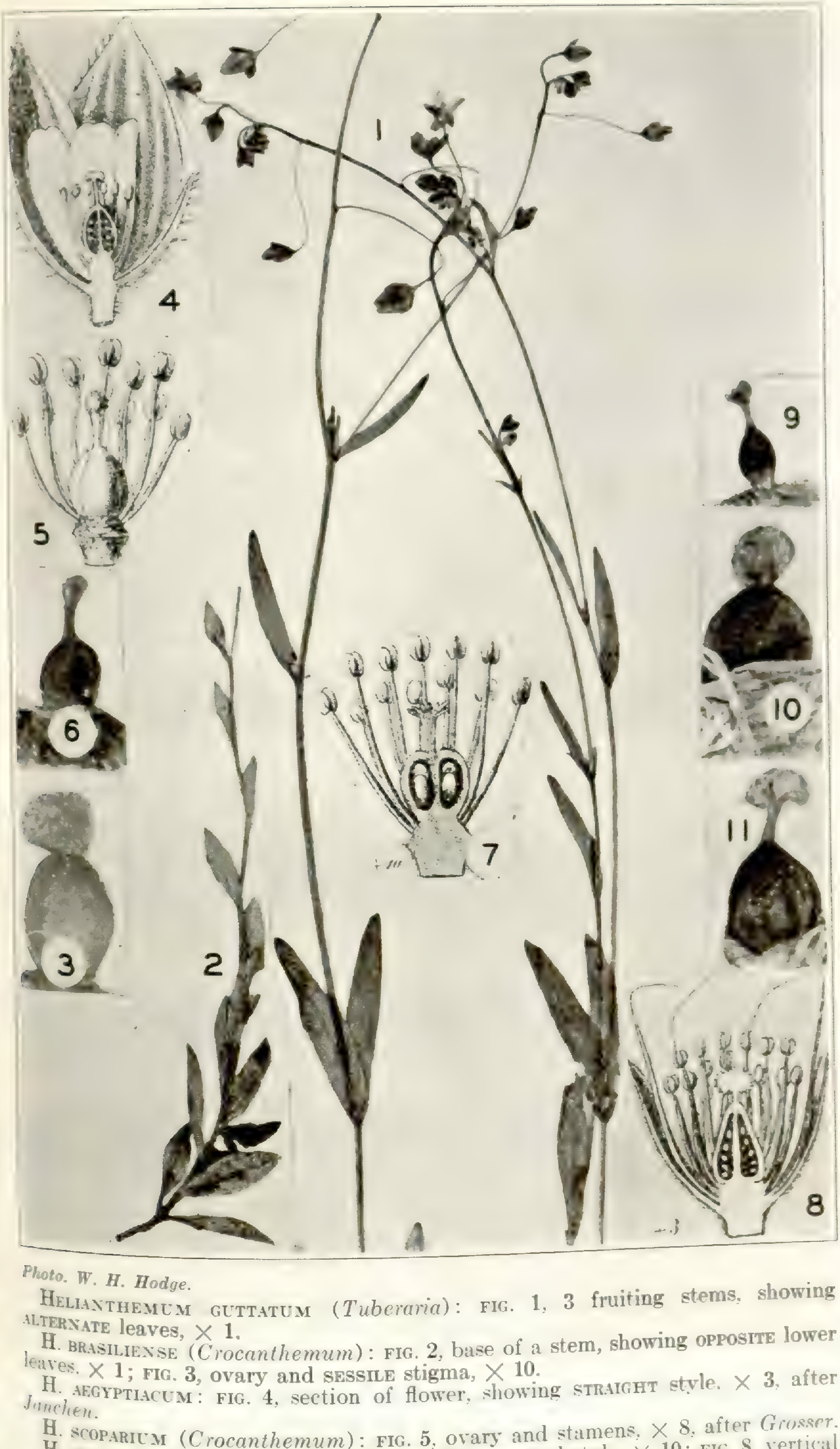


Photo. W. H. Hodge.

HELIANTHEMUM GUTTATUM (*Tuberaria*): FIG. 1, 3 fruiting stems, showing ALTERNATE leaves, × 1.

H. BRASILIENSE (*Crocanthemum*): FIG. 2, base of a stem, showing OPPOSITE lower leaves, × 1; FIG. 3, ovary and SESSILE stigma, × 10.

H. AEGYPTIACUM: FIG. 4, section of flower, showing STRAIGHT style, × 3, after *Janchen*.

H. SCOPARIUM (*Crocanthemum*): FIG. 5, ovary and stamens, × 8, after *Grosser*.

H. GLOMERATUM (*Crocanthemum*): FIG. 6, ovary and style, × 10; FIG. 8, vertical section of flower, × 3, after *Janchen*.

H. ROSMARINIFOLIUM (*Crocanthemum*): FIG. 7, vertical section of flower, × 10, after *Grosser*.

H. CAPITATUM (*Crocanthemum*): FIG. 9, ovary and style, × 10.

H. CANADENSE (*Crocanthemum*): FIG. 10, ovary and subsessile stigma, × 10.

H. PROPINQUUM (*Crocanthemum*): ovary, style and stigma, × 10.

Photo. W. H. Hodge.

HELIANTHEMUM CANADENSE: FIG. 3, fruiting stems, × 1.
Var. SABULONUM: FIG. 1, portion of TYPE; FIG. 2, portion of plant from Massachusetts.

Photo. W. H. Hodge.

RHODODENDRON ATLANTICUM, forma TOMOLOBUM, × 1.

Photo. B. G. Schubert.

JUSTICIA UMBRATILIS: FIG. 1, TYPE, × 2/5; FIG. 2, flowering spike, × 3; FIG. 3 seed, × 8.
J. AMERICANA: FIG. 4, corolla (dense and opaque), × 3; FIG. 5, shield on lower l and horizontal terminal anther, × 3; FIG. 6, seed, × 8.
J. HUMILIS: FIG. 7, corolla (translucent), × 3; FIG. 8, seed, × 8.

Photo. W. H. Hodge.

UTRICULARIA VULGARIS

Flowers, × ¾–× 1: FIGS. 1 and 2–5 Eurasian; FIGS. 2 and 6–15 North American. Rudimentary stolons, × 1, all (FIGS. 16–19) North American.

Photo. B. G. Schubert.

ERIGERON SCATURICOLA: FIG. 1, two small plants, × 2/5, showing characteristic elongate caudex; FIG. 2, portion of denuded receptacle, × 9.
E. PHILADELPHICUS: FIG. 3, denuded receptacle, × 9.

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New scientific names are printed in full-face type

Reprinted from RHODORA, Vol. 44, April, 1942

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY

CXL

INCIDENTS OF FIELD-WORK WITH J. FRANKLIN COLLINS

M. L. FERNALD

Photograph by Bachrach

Very truly
J. Franklin Collins

Reprinted from Rhodora, Vol. 44, April, 1942

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M. L. Fernald

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

INCIDENTS OF FIELD-WORK WITH J. FRANKLIN COLLINS

M. L. Fernald

(Plates 696–707)

Fifty years ago, in late July and early August of 1892, I made my first field-trip with Frank Collins or, as he always signed himself, J. Franklin Collins[1]. He then invited me to join him and a group of his cousins and friends at the old Collins home in North Anson, Maine, whence we started for several days of camping, trouting and botanizing, making two chief sojourns, one on the shores of the Kennebec at Carratunk, the other above The Forks, in Carrying Place Plantation, at the mouth of Dead River. The very names, long seen on maps, Carrying Place and Old Military Road, survivals from the time of Arnold's futile and costly expedition up the Kennebec, thence via the Dead River to Quebec in the American Revolution, thrilled my boyish imagination. My earlier botanizing had always been within walking-distance of home and, having a keen interest in plants which I had been forced to follow alone, it was a wonderful new experience to be with an older and kindly companion to whom I dared speak in the peculiar language which I had previously been able to share with few others. While the various cousins and friends enjoyed the out-of-doors activities of a camp in the woods, Collins and I made the acquaintance of many plants which I had never seen near Orono, and I quickly recognized that I was with a friend of unusual sincerity, modesty and skill. Quiet, undemonstrative, of few words, sensitively sympathetic, always with a quiet, dry humor, a master of woodcraft, mechanical technique and specimen-making, he gave me the companionship and help I had yearned for; and for 32 years it was a very exceptional summer which did not find us exploring or camping and botanizing somewhere in New England or the Gaspé Peninsula, our last trip together being with the party which went to the Mt. Logan region of Gaspé in 1923.

[1] James Franklin Collins, b. North Anson, Maine, December 29, 1863; d. Providence, Rhode Island, November 14, 1940. For biographical appreciation see Walter H. Snell in Rhodora, xliv. 93–97 (1942).

Our first considerable expedition was in August, 1896, when, accompanied by the late Professor William C. Strong of Bates College and my young brother, the late George Bancroft Fernald, we hired the old-fashioned stage-coach of the North Anson-New Portland route, as a commodious vehicle for camp-equipment, presses, paper and foodstuffs, and drove across to Dead River Plantation, there to get at Mt. Bigelow, then on to Flagstaff and back under the western slope of Bigelow. That trip gave us our first sight in Maine of *Prenanthes Boottii* and some other montane species previously known in the state only on Katahdin, and it strongly cemented a friendship.

Collins was a conscientious keeper of records. Several of his diaries, always literally kept up by an entry, no matter how adverse the conditions, at the end of each day, were designated by him shortly before his death to come to me, along with his invaluable volumes of photographs taken on our many trips together. These have been supplemented by many botanical notes received either by me or by the Gray Herbarium from his sister, Mrs. Edith Jenckes. The diaries are explicit and they followed an almost unvarying pattern. There are no frills; all sentiment and emotion are omitted. The simple framework is there, upon which, as he afterward reviewed them in his late years of enforced inactivity, he greatly enjoyed mentally filling in the abundant unrecorded but vividly remembered details. With characteristic caution he refrained from setting down off-hand identifications of plants seen or collected each day; until they had been studied that would have been unwise. I am, therefore, in the following notes, using Collins's framework and, whenever they might be of interest to other botanists, supplying some of the identifications he withheld. The first few excerpts are quite typical of the whole series, beginning with the Mt. Bigelow trip of 1896 and closing with the Mt. Logan expedition of 1923.

"August 13, 1896, . . . Fair and not quite so warm. Slept well last night and got up about 5.00 A. M. . . . The Fernalds went collecting along the river and a little later Professor Strong followed them. I stayed about camp and fixed it up. Had pickerel, fried sweet potatoes, oatmeal, cocoa, etc. for breakfast . . . About 5 P. M. a very heavy shower accompanied by much wind passed over. We all had to take hold of the tent to prevent its blowing away—three of us outside and one inside. It came up so suddenly that we had no time to pick up a pile of driers, and the last we saw of them they were sailing through the air one or two hundred feet above the ground in the direction of Dead River. We did not bother to chase them up. Rain fell most of the evening. All of us were very wet below our rubber coats, and the tent was badly ripped in two or three places." Characteristically, there is no statement that only through his personal skill and forethought in meeting the emergency did we have any shelter through the remainder of the trip, for it was he who had brought first aid for an injured tent.

Still briefer the following, ten years later, while ascending Rivière Ste. Anne des Monts in Gaspé, on the way to Mt. Albert.

"August 6, 1905, Sunday. Cloudy and hazy. Spent all day on the river, going from Marten River Camp to Main Camp, a short distance below the Forks. Hard poling". (Plate 701, fig. 1).

"August 7, 1905, Monday. Rain last night and most of the day. Toasted driers before fire and fixed up camp to protect against rain. Coté caught some trout [the large sea-trout, running up the river] and shot two ducks. Breakfast of potatoes, coffee, etc. Dinner of trout, duck, tomatoes, etc."

A little more detailed the entry for

"August 8, 1905, Tuesday. Clearing somewhat last evening and cooler. Broke camp about 9:00 A. M. and got ready to go up the mountain. Left camp near the Forks of the Ste. Anne River about 9:40 A. M. Fernald and I carried small packs, camera and collecting boxes. We went up over a near-by ridge and then down through a ravine, then up the mountain, stopping every ten minutes for a rest. Coté, the two Gagnon boys, and Joe Fortin carried heavy packs. We reached an altitude of 3250 feet about 1:30 P. M. and decided to camp there. Coté, Fernald and I stayed up the mountain; the rest of the men went down to the river-camp. About 3 P. M. Fernald and I went higher up the mountain, botanizing, and left Coté to fix camp. He came up the mountain later". The remarkable discoveries on this trip will be later considered.

In the summer of 1900 Collins was a member of the Mt. Katahdin Expedition, described in some detail in Rhodora for

June, 1901 (iii. no. 30). The other members of the party, besides Collins and me, were much older and, consequently, somewhat less active amateurs, the late Judge Joseph R. Churchill,[1] Dr. George Golding Kennedy[2] and Emile Francis Williams.[3] It naturally fell to the lot of Collins and me to work together over the more precipitous and less accessible areas. Returning to camp we put up the better material, throwing the remnants outside the cabin. This refuse-pile accounts for some of the labels of Emile Williams, now preserved in the Gray Herbarium or in the herbarium of the New England Botanical Club: "Collected by J. F. Collins and M. L. Fernald, recollected by E. F. W." Judge Churchill, who prided himself on never putting into his personal herbarium any specimen which he had not himself collected, could not be induced to share our *Saxifraga stellaris*, var. *comosa*, *Epilobium alpinum* L. (*E. anagallidifolium* Lam.) and other specialties. He looked longingly at the abundant material we brought in but it never went into his herbarium.[4]

As a result of the Katahdin trip Kennedy and Collins recorded 23 bryophytes new to Maine, one of them the first known except in Eurasia; and 18 vascular plants were recorded as new to the

[1] See C. H. Knowlton in Rhodora, xxxvi. 1–7, with portraits (1934).

[2] See Emile F. Williams in Rhodora, xxi. 25–35, with portrait (1919).

[3] See B. L. Robinson in Rhodora, xxxiii. 1–18, with portrait (1931).

[4] Only once in my experiences in the field with Judge Churchill did he partly yield to temptation. Then, when he, Williams, Collins and I were in the gorge of the Aroostook River, he sought without success for any *Woodsia alpina* within his reach. Finally, in despair, he consented to lean over and allow me to stand on his shoulders (supported by the cliff) to get some of the plants which, collected with his aid, he felt justified in preserving! Another incident indicating the uncompromising loyalty to principle of Judge Churchill may be noted. When he was asked to join the Katahdin party, to be gone beyond the reach of the outside world, he had grave doubts. Through many years of married life he had never been away from Mrs. Churchill; she had always accompanied him on his trips. Finally Mrs. Churchill persuaded him to go with us, since he could write her a daily letter. This he consented to do, often to the extent of a long evening by candle-light or by staying in camp while we were away botanizing. The Judge specially paid one of the guides daily to take his letters fifteen miles toward the railroad to a "depot-camp," whence they might be picked up and delivered at a post-office. When, finally breaking camp and starting home, we reached the "depot-camp", there were all twenty fat letters on the window-sill. The Judge delivered them in person. Still another non-botanical incident of this trip, which was not recorded in the "Katahdin number" of Rhodora, concerned Dr. Kennedy. Always a Scotchman, he feared that the guides might forget to stock up with oatmeal. He, therefore, went to S. S. Pierce in Boston and ordered a five-pound box sent in care of the head-guide. When, after reaching Camp Kennedy, by Chimney Pond on Mt. Katahdin, Dr. Kennedy hopefully unwrapped the box from S. S. Pierce, he found five pounds of confectionary with a gentleman's card. Imagine the feelings of the lady with five pounds of uncooked oatmeal and a memorandum in a strange man's writing!

state, one of them, *Carex katahdinensis*,[1] new to science and subsequently found only twice, once in east-central Newfoundland, once on Lake St. John at the head of the Saguenay in Quebec.

In subsequent years Collins and I were much in Aroostook County, Maine; and in the summer of 1904 we had our first trip together to the Gaspé Peninsula. I had been on the Grande Rivière in southeastern Gaspé with the late George H. Richards and the late Lewis Cabot, who was then owner of the seigneurie, lured there by the discovery by Mr. Richards of a new *Comandra*, *C. Richardsiana*, and a wonderful series of *Anemone*, *A. multifida*, forma *polysepala* and var. *Richardsiana* and *A. riparia*, forma *rhodantha*, and other plants I had never encountered. The brief trip there in late June had yielded my first *Cystopteris montana* (Lam.) Bernh.; *Carex concinna*, *Sisyrinchium montanum*, *Osmorhiza obtusa* and *Valeriana septentrionalis* Rydb., all of the Rocky Mountains; and three undescribed species, *Antennaria appendiculata*, *Arnica chionopappa* and *Taraxacum Longii*, the two latter subsequently found in western Newfoundland. Such discoveries, made in limited spots (when and where there was good salmon-fishing) whetted my appetite and, hurrying back to a meeting of the Josselyn Botanical Society at Fort Kent, in northern Maine, I looked forward with restlessness to returning with Collins to the region. From the train, on the trip to northern Maine, I was thrilled by the precipitous headlands and cliffs which suddenly came into view, centering on Bic in Rimouski County, Quebec; the return to Grande Rivière was, consequently, delayed.

Collins's diary for the summer of 1904 records a very diversified season of discovery.

"July 6, 1904, Wednesday (Bangor—Fort Kent, Maine). Breakfast at 6 A. M. at the Bangor House. Went to Fort Kent on the 7:10 A. M. train, arriving there at 3:40 P. M. On the train were some twenty people going to the meeting of the Josselyn Botanical Society, including the Misses Hunter [now Mrs. Clarence H. Knowlton], Louise H. Coburn, Mary Clark, Sarah Brooks, Elsie L. Shaw, Nellie F. Mansfield, Dora H. Moulton and some I did not know, and the Messrs. W. L. Powers, Clarence

[1] The authors of species in Gray's Manual are omitted. When species and varieties not in the manual are mentioned their authors are noted, except those published by the writer; these may be assumed.

H. Knowlton, W. F. Stubbs, Dana W. Fellows, Ora W. Knight and a few more." . . . .

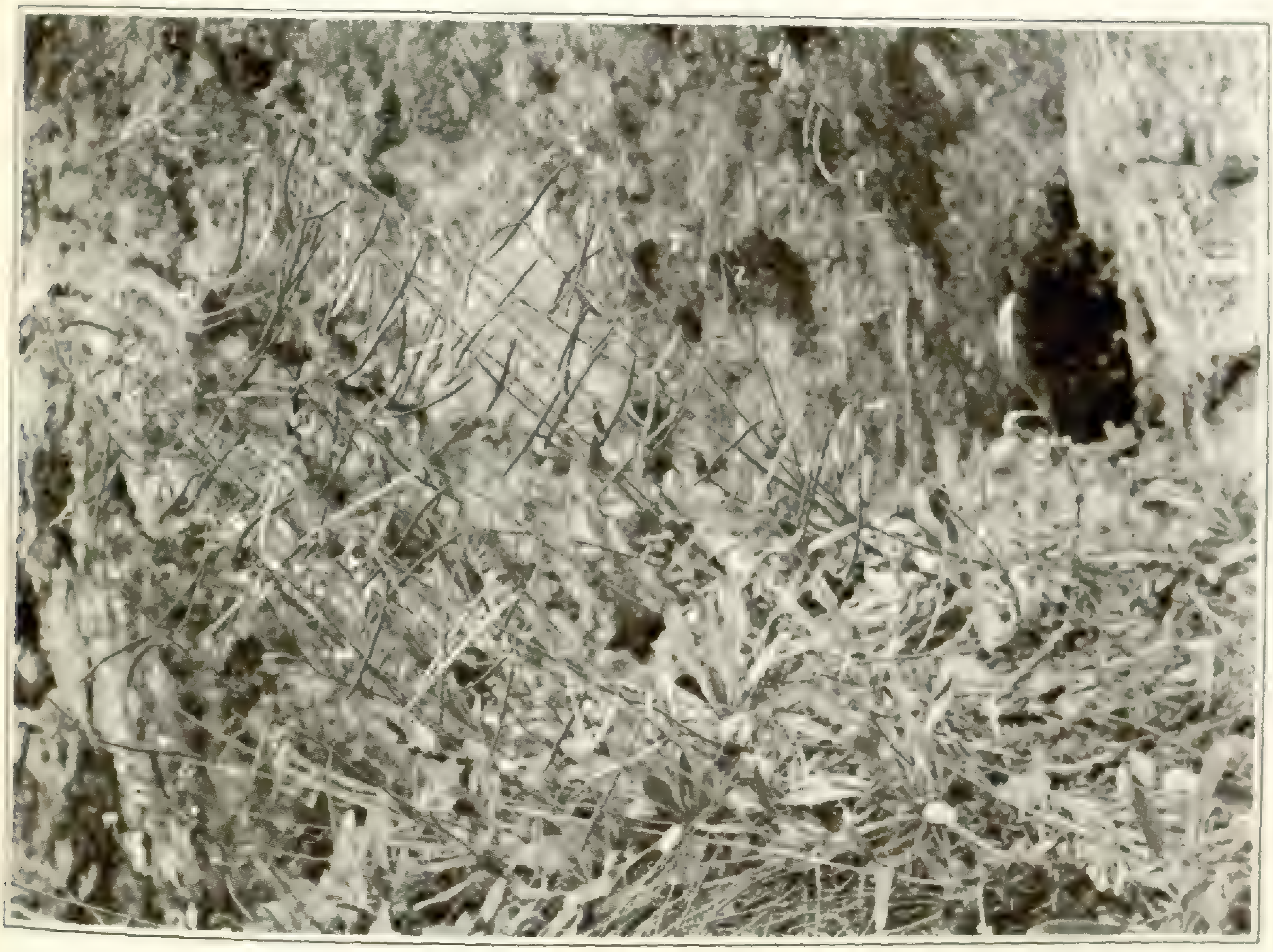
"July 7, 1904, Thursday (Fort Kent). Clear; got up at 5 A. M. and worked on mosses and helped Fernald [with his large collection from Grande Rivière, spreading and picking up driers and otherwise making himself unselfishly helpful, whereupon he was nicknamed by the ladies 'the faithful Collins']. After breakfast a party of twenty-three or -four started on a trip to St. Francis. We rode up the south side of the river, stopping occasionally to botanize." Along the St. John a *Viola*, then new to science, *V. novae-angliae*, was flowering and Miss Shaw made one of her wonderfully accurate water-color drawings of it, now in the Gray Herbarium.

"July 8, 1904, Friday. Clear. . . . In the P. M. Fernald, Dr. [George Upham] Hay, the Misses Brooks and Shaw and I walked down the bank of the St. John River botanizing", among many striking species getting the newly discovered and thus far quite endemic *Carex Josselynii* (Fern.) Mackenz., just as, a few years earlier, almost the same party, with the addition of the already venerable John Macoun, had collected at Fort Fairfield the equally local (endemic) *C. elachycarpa*.

"July 11, 1904, Monday. Cloudy, rainy in the P. M. Had breakfast at 6 A. M. at Dicky House. About 7:30 A. M. Miss Brooks, Miss Shaw, Dr. Hay, Fernald and I crossed over to Clairs, New Brunswick, and went on the 8:30 Temiscouata train to Rivière-du-Loup. The scenery is very fine, the railroad following down the St. John to Edmundston, then up the Madawaska to beautiful Lake Temiscouata [by the English-speaking people called 'Tommysquatty']. Had dinner at Notre Dame du Lac. [Collins omitted to state that the ride was so jerky and heaving that everyone was miserable or worse, so much so that, as we slowed down on approaching Notre Dame du Lac, a sufferer, looking out at the signs, caused a refreshing ripple of laughter as he disconsolately said 'Notre damn de luck']. Reached Fraserville (Rivière-du-Loup station) about 4:30 P. M. and went to Hotel Bellevue at R.-du-L. Point". The next days were spent in botanizing on the always fascinating shores of the St. Lawrence from the Point to Cacouna, always with the wonderful view across the broad river (there about 13 miles wide) of the

Laurentides. Miss Shaw, working until dark and again from dawn to breakfast-time, was kept over-busy drawing the many plants new to her, *Zigadenus glaucus* Nutt., *Cornus suecica*, *Pedicularis palustris* and many others—her paintings now a prized possession of the Gray Herbarium; while Collins and I were discovering the then undescribed *Puccinellia lucida* Fern. & Weath. and other choice species.

"July 15, 1904. Friday. Fair. . . . At 12:30 P. M. Fernald and I rode to the Intercolonial Railway station and came to Bic (Ste. Cécile du Bic). Walked to the Canada Hotel (proprietor Michel Pineau) and got rooms." Our days at Bic were very full; there seemed to be no limit to the novelties. *Woodsia oregana* at our first eastern station; *Cystopteris fragilis*, var. *laurentiana* Weath., then a novelty; *Ruppia maritima*, var. *intermedia* (Thed.) Aschers. & Graebn., at the first North American station east of the Pacific states; *Puccinellia laurentiana* Fern. & Weath., then an undescribed species; *Calamagrostis purpurascens* R. Br., at the first station known in eastern North America; *Cerastium beeringianum* Cham. & Schlecht., a characteristic and very distinct species of northwestern America; *Draba minganensis* (Victorin) Fern., then an undescribed species; *Arabis Holboellii* Hornem., typical (Plate 696, fig. 1), at our first station in the East; *A. Holboellii*, var. *Collinsii* (Fern.) Rollins (Plate 696, fig. 2), then quite new but subsequently found in the Rockies; *Saxifraga cespitosa* L., a "typus polymorphus" of the Arctic; *Potentilla nivea*, also arctic; the new × *Geum pulchrum* a strikingly handsome hybrid of *G. macrophyllum* and *G. rivale*; *Antennaria subviscosa*, representative of localized species of Greenland, Newfoundland, the Rocky Mountains and Patagonia; and numerous others quite new to us and very thrilling. Recent burns, too, were brilliant with masses of the strawberry-like fruits of *Chenopodium capitatum*, the drooping large white and yellow petunia-like corollas of *Leucophysalis grandiflora* (Hook.) Rydb. (Plate 699, fig. 1), or with *Corydalis aurea*, *Dracocephalum parviflorum* or the western *Senecio indecorus* Greene; while ferns, such as *Woodsia alpina* and *Dryopteris fragrans*, var. *remotiuscula* Komarov (Plate 697, fig. 1), and orchids, such as the Cordilleran *Goodyera decipiens* (Hook.) F. T. Hubbard, were so very abundant that we almost tired of them. To us



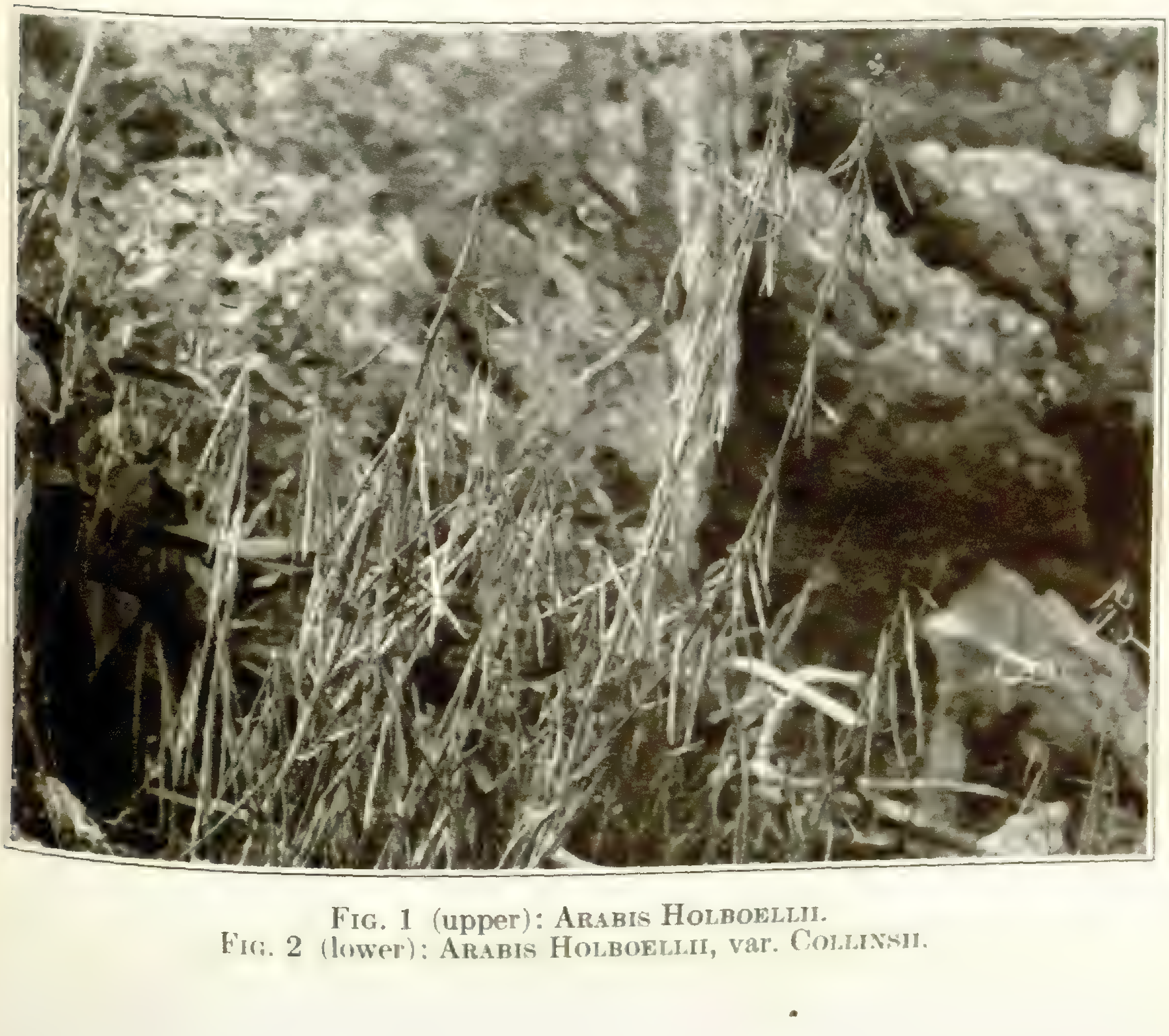


FIG. 1 (upper): ARABIS HOLBOELLII.
FIG. 2 (lower): ARABIS HOLBOELLII, var. COLLINSII.

Fig. 1 (upper): Dryopteris fragrans, var. remotiuscula.
Fig. 2 (lower): Polystichum mohrioides, var. scopulinum.

New Englanders this was a new world (a bit of Cordilleran America transplanted into the East); and the botanical fascination of the region, added to the scenic rarity which has so long attracted colonies of artists there, made it difficult to leave. We could not forget, however, that we were really on the way to Gaspé and that we had an appointment to meet Arthur Stanley Pease at Carleton on the Baie des Chaleurs.

"July 24, 1904, Sunday. Warm. Had breakfast at 7 A. M. and at 8:15 A. M. started for Tracadigash Mountain. . . . We ascended to a point about one half mile west of the main peak and thence along slowly [because stopping to collect *Collomia linearis* Nutt. of western North America; *Carex praticola* Rydb., at its second station in eastern North America; the always fascinating *C. Backii; Clematis verticillaris* in solid tangles; and *Poa Canbyi* (Scribn.) Piper, at its first (but not the last) known eastern station] to the summit, which is surmounted by a large wooden cross. . . . The aneroid showed 1930 feet above sea-level. Pease and Fernald worked along the base of the cliff, finding several interesting plants [*Polystichum Lonchitis, Hackelia americana* (Gray) Fern., at its first known station in the East, etc.]. I worked along the top of the cliff, going down occasionally on the alpine rope to collect."

As I have said, Collins was reticent and undemonstrative; incidentally, in a French-speaking country he was inclined to let others do the talking. It was, consequently, a complete surprise, at breakfast one morning at Carleton, to hear his bilingual pun. He suffered from dyspepsia and regularly had his cup of hot water at the beginning of breakfast. His conventional greeting to the waitress every morning included "de l'eau chaude, s'il vous plait." On the morning I refer to the porridge had been eaten, then there arrived the fish and toast and my cup of coffee, with glasses of milk for Collins and Pease. Without cracking a smile Collins quietly remarked: "There seems to be a great deal of de lait about de l'eau. In Providence it is often the other way 'round". One expected such things from Pease, but never from Collins!

For this day the diary proceeds: "Worked until 10:30 A. M. on plants and then Fernald, Pease and I started for the cedar-swamp on the road to Tracadigash Mountain. After we had botanized there an hour or more a heavy thunderstorm passed over. I happened to have an oil-coat with me but Fernald and Pease did not have any; so they removed their clothes and put them in their waterproof rücksacks during the half-hour shower. They said the big drops felt like hail-stones and they were numb with cold, but after the shower they had dry clothes to put on."

After Carleton came the Little Cascapedia River, one of the most fascinating of Gaspé streams, with gravel-flats carpeted with miles of the trailing shrub, with great plume-like heads of fruit, *Dryas Drummondii* Richardson of the Canadian Northwest; with thickets bordered by *Astragalus frigidus* (Richardson) Gray, var. *gaspensis* (Rousseau) Fernald, closely related to a Cordilleran variety, or with the Cordilleran *Lonicera involucrata*. On the gravels we also got the Rocky Mountain *Sisyrinchium montanum* and the then new *Solidago graminifolia*, var. *septentrionalis*. The calcareous cliffs crowded closely down to the small river, and we were delighted to get characteristic *Parnassia Kotzebuei* Cham.[1] (PLATE 698, FIG. 1), another northwestern plant, and other species quite new to us.

Compared with the Little Cascapedia, the Bonaventure, which we next ascended, is a large river, with extensive tidal marshes at its mouth. Here we got the very distinct *Juncus balticus*, var. *stenocarpus* Buchenau & Fernald, a new variety, not yet known away from the Gulf of St. Lawrence; *Stellaria crassifolia*, a species which in the East is concentrated about the Gulf; and the new halophytic *Bidens hyperborea* Greene, var. *gaspensis*. Up-river, slightly below the carpets of *Dryas Drummondii*, there were great areas of *Epilobium latifolium* L., PLATE 698, FIG. 2, a depressed arctic-alpine perennial with thick, gray foliage, and flowers two or three times the size of those of *E. angustifolium*. In springy spots *Carex media* R. Br. (*C. angarae* Steud.) of Asia and northwestern America was new to the East; the then undescribed *C. Garberi*, var. *bifaria* (Gaspé

[1] *Parnassia Kotzbuei* was wholly new to me. When I reached Cambridge with our collections the late Dr. Rydberg was visiting the Gray Herbarium. I showed him the *Parnassia* and he promptly replied: "That's a new species. I have just finished the genus for the North American Flora. Why can't you and I publish this new one there?" I forthwith studied the genus and found that our plant was the well known Alaskan species of Chamisso. In this study, however, I found a very distinct novelty, collected in Montana by Rydberg. This, the only species I share with him, was published as *P. montanensis* Fern. & Rydb. in the North American Flora, the only time I was ever invited to contribute to that variegated work.

Fig. 1 (upper): Parnassia Kotzebuei.
Fig. 2 (lower): Epilobium latifolium.

Fig. 1 (upper): Leucophysalis grandiflora.
Fig. 2 (lower): Salix vestita.

to northern Maine; southern Alberta and British Columbia), and the new *C. flava*, var. *gaspensis*, were abundant, while dripping ledges were yellow with *Saxifraga aizoides*, with *Anemone parviflora* frequent. On calcareous slopes *Dryopteris Robertiana* (Hoffm.) C. Chr. abounded. Our very brief visit to the Bonaventure gave good evidence that detailed exploration would yield fine results.

Travel on the Baie des Chaleurs by steamer is a special art. Witness the record.

"August 10, 1904, Wednesday. Clear. Had breakfast at Bonaventure about 7:30 A. M. At about 8 A. M. or a little later our baggage was carried up the beach a short distance and left at a store for transportation to the steamer 'Admiral' when she or he came. When the 'Admiral' appeared in the distance the tide was so low that the regular lumber-boat which carried passengers and baggage out to the steamer could not be floated; so two whale-boats were hauled by horsepower out to deep water, luggage was hauled out to one, and the passengers, some eight in number, were hauled to the other. Both boats were then rowed out to the path of the 'Admiral'. . . . At Newport, l'Anse au Gascon, and Grand Pabos lumber-boats came out to meet the steamer—at the last place there was a heavy sea and the transfer of freight and passengers was exciting . . . arrived at Grande Rivière at 7:00 P. M."

We landed at Grande Rivière because it was important to get up-river in late summer to explore in more detail the shores which, in June, had yielded so many novelties. The owner, Mr. Cabot in Boston, had given me authority to employ one of his officials, since it would now be close time on salmon-fishing and the man would be at our command. Unfortunately, Mr. Cabot, then far from Grand River, did not realize what we soon discovered; his faithful employe was up-river in the employ of various county officials enjoying forbidden fruits! Repeated calls at the official residence proved futile and our only botanizing on the river was near its mouth. There, however, we got the then undescribed and very local and endemic *Salix paraleuca*. Lingering for a few days, always hopeful that we might yet ascend the river, we utilized the time to some advantage. Near our temporary home there was a marl-bog, full of such characteristic plants, already familiar to us, as *Carex chordorrhiza*, *C. livida*, var. *Grayana* (Dewey) Fernald, *Juncus stygius*, var. *americanus* and *Orchis rotundifolia;* but the Rocky Mountain *Salix myrtillifolia* Anders. was a novelty, as were *Drosera linearis* and *D. anglica*, the beautiful little red-flowered *Rubus acaulis* Michx. and its relative, the then undescribed *R. peracaulis* Bailey (of northwestern America). At another boggy spot, the margin of Marl Pond, we discovered the then quite new little *Galium brevipes* Fern. & Wieg., a species subsequently found by Dr. Porsild in Greenland; and the limy pockets yielded the type-collection of *Drosera rotundifolia*, var. *comosa*, plants with the flowers altered to clusters of leaves, these dropping off and rooting. The exposed bluffs along the outer Bay had a dense tangle of *Aster*. From this assemblage we extracted the original collections of *A. foliaceus* Lindl., vars. *crenifolius* and *subpetiolatus*, plants endemic on the Gaspé Peninsula. Finally, realizing that our canoeman had no intention to come for us, we moved on. Later, at Gaspé Basin, we met some of the poachers who took evident delight in having thwarted us Yankees.

"August 16, 1904, Tuesday. Mostly clear. In the early A. M. we worked on the plants and then packed trunks. Started from Grande Rivière about 9:30 A. M., our baggage on one wagon, and Rupert driving the other with us. About noon we stopped at Cape Cove for dinner. Later we started for Percé where we arrived about 4:00 P. M. We tried four different places before we found a single room, at Mme. Traché's." [This room, heavily musked and liberally hung with Mme. Traché's clothes and the inevitable sacred pictures and ornaments, with one feather-bed, screened by very thick curtains, the window tightly nailed against possible opening, was the home and workshop for three men. At night we matched pennies to decide which of us would have the good luck to sleep on the floor, which would accommodate only one.] "After supper [of parboiled beans] and unpacking a bit we walked up on one of the headlands [Cap Barré] near the house, doing some botanizing": *Cerastium beeringianum*, var. *grandiflorum* (Fenzl) Hultén of Alaska and northeastern Asia; *Draba incana* L. and its var. *confusa* (Ehrh.) Poir., the first from so far south; the new *D. pycnosperma* Fern. & Knowlton, a beautiful little species endemic on outer Gaspé and in western

Newfoundland, the plant Emile Williams, when he collected it a year later, suggested as the appropriate emblem, on account of its name, for the Society for the Protection of Native Plants; the arctic *Saxifraga oppositifolia* and *Arenaria rubella* (Wahlenb.) Sm.; and the types of the nearly endemic *Solidago lepida* DC., var. *molina* and of *Senecio pauperculus* Michx., var. *firmifolius* Greenm. That was a brilliant start and we tried to overlook the deficiencies of hotel-accommodations, complete lack of modern sanitary and toilet facilities, and improper food. These could not be wholly ignored, however, for we all suffered from pretty acute indigestion and, when we had had parboiled beans for three successive days and I asked our hostess for something more digestible, we came in to a supper of heavy French pancakes. Mme. Traché's father, a fisherman who spoke English, sat at table with us, and noticing that our physiological adjustments were not like his own, encouraged us by frequently urging: "Eat hearty, fellers. Men can't work the way you do without eating hearty." Our own supply of educator-crackers, raisins and chocolate kept us going and when, after getting back to Cambridge to recuperate, I was promptly sent to the Stillman Infirmary to have my inflamed appendix out, I was thankful that the operation had not been done by the fishermen at Percé!

"August 17, 1904, Wednesday. Foggy and rainy all day. After breakfast we worked a while on the presses, then put on our waterproof clothes and botanized on the crags northwest of the house and about the waterfall in the ravine (La Coulée) until noon. After dinner . . . collected along shore to and around the lighthouse at White Cape. Here Fernald had the alpine rope looped around his shoulders and walked along the treacherous and crumbling edge of the cliff while Pease and I held the other end of the rope some distance away from the cliff. Got home at 6:30 very wet." The day had been so foggy and rainy that many flowers were beautifully expanded, others as conspicuously closed. We specialized upon *Euphrasia*, bringing back *E. arctica* Lange, *E. rigidula* Jordan, *E. tatarica* Fisch. and *E. americana* Wettst., and some not easily settled. Small boys followed us wherever we went, always anxious to help the "doctors" gather their herbs. They were specially fond of bringing us bulbs of *Zigadenus glaucus*, with the explanation that "it's a horrible thing for the guts"; in view of the toxic properties of the genus, reflected in its western name "Death-Camass", we did not try it.

"August 18, 1904, Thursday. Fair a little while in the A. M. during which we partially dried driers, etc.; later alternately rainy and fair . . . at 12:30 P. M. we all went up Mt. Ste. Anne to the shrine, botanizing both going up and coming down. Used the rope considerably about the summit [collecting the type-material of *Antennaria gaspensis* and many other fine species]. Took some pictures (Plate 700, fig. 1) from the summit when the clouds and rain would permit." The last modest statement was tyical of Collins's almost puritanic dread of expressing emotion. He was keenly appreciative of the unique beauty and grandeur of the Percé landscape, verbally became very enthusiastic, and throughout this and all other trips with me spent as much time on photography as on botany. His negatives from Gaspé ran into the thousands. The tops of the balsam firs, *Abies balsamea,* here presented a strong contrast with firs as we knew them generally. Upon material from Mt. Ste. Anne I based my var. *phanerolepis.* An incident on the trail well illustrated the mental subservience of these people. Looking out to the northeast, we saw a long and low land, obviously Anticosti. When we met the priest with a workman, who was repairing the trail to the shrine, by way of conversation we pointed to the distant island and asked, "Is that Anticosti?" The workman promptly replied, "Oui, oui, Anticosti", but his master said, "No, you can't see Anticosti from here", whereupon the man corrected himself: "Non, non, ce n'est pas Anticosti."

The diary continues until our reaching Boston on September 2nd. From Douglastown we went a very short distance up the Douglastown and from Gaspé Basin an equally short distance up the Dartmouth River. We could get no canoes and had to be content with heavy lumbermen's bateaux, solid and very slow. Our discoveries were, therefore, relatively unimportant.

In the summer of 1905, Emile and Mrs. (Blanche) Williams and Mrs. Williams's friend, Miss Mary Waring, joined us for a trip over the same route, through Williams's July vacation, and Mr. and Mrs. Oakes Ames were with us for a brief trip up the Grand Cascapedia. Since the specialties have been so thoroughly

Fig. 1 (upper): Percé from Slope of Mt. Ste. Anne (Rocher Percé near middle; Bonaventure Island in distance, at right).
Fig. 2 (lower): Gannets nesting on Ledges of Bonaventure Island.

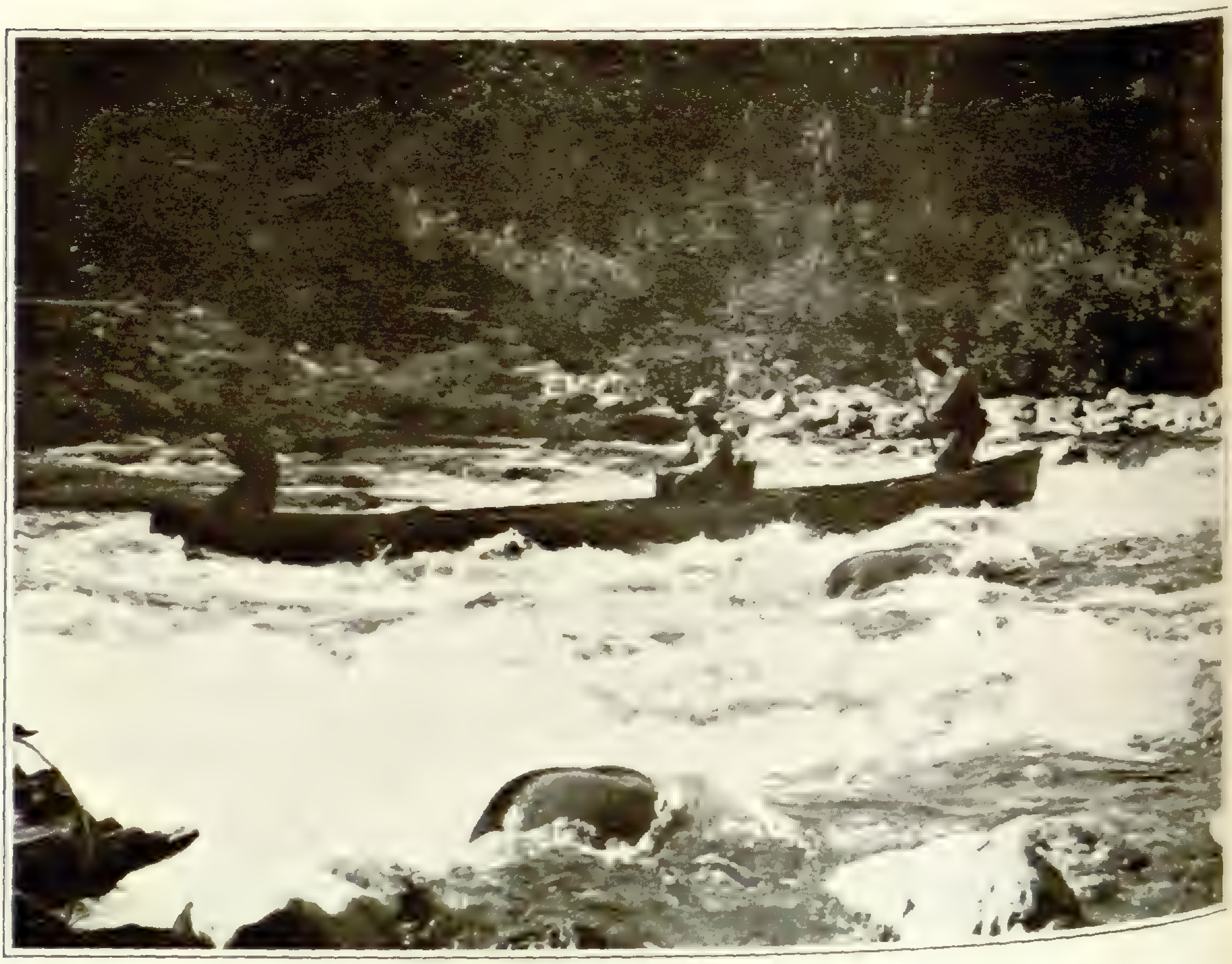


FIG. 1 (upper): HARD POLING.
FIG. 2 (lower): COLLINS (center) ENJOYING LIFE.

covered in the notes for 1904 only a few items for July need here be noted.

Botanically the Grand Cascapedia is relatively uninteresting. The plants which make the Little Cascapedia a joy are largely wanting. At Percé we had superior quarters at the fine old house of M. Le Boutillier, the elderly head of large fisheries and of large stores. One of Collins's entries records a notable new station near Percé.

"July 25, 1905, Tuesday. Cloudy, foggy and rainy. We all spent the A. M. in taking care of plants collected yesterday. In the early P. M. we went by team to Grande Coupe. Mr. and Mrs. Williams botanized along the bases of ridges and Miss Waring, Fernald and I went up the cliffs and around to the next 'coupe' to the westward. We got some nice things, *e. g. Dryas integrifolia* Vahl, *Salix vestita* Pursh (Plate 699, fig 2) *Polystichum Lonchitis*, *Corallorrhiza striata*, etc. [including the arctic-alpine *Carex rupestris* All., the new *Salix Bebbiana*, var. *capreifolia* and the tiny *Thalictrum alpinum* L.]. Got back about 7:00 P. M. very wet. Had a fine supper."

That "very wet" day on the dripping ice-cold cliffs of Grande Coupe laid Collins and me off with intestinal disturbances and hard colds, which did not soon vanish. Consequently, after the Williams party had sailed for home, we took the steamer "Gaspésien" from Gaspé Basin to Mont Louis on the north coast of the Peninsula, picking that village out as likely to have proper food and as being the center of precipitous limy walls, which fascinated us. Collins's brief entry only partly tells the story.

"July 31, 1905, Monday. Clear. Got up on str. 'Gaspésien' at about 4:30 and went on deck. Stopped there most of the A. M. enjoying the scenery [and taking many photographs]. Reached Mont Louis and went to the bargeman's house [one Bouchier, a piratical giant with ragged black beard and great projecting tusks, who, when we asked for the hotel, replied, 'I have the hotel', not divulging the spick-and-span house, with fine food, run by Fred Au Clair, which, of course, we knew nothing about. Dinner consisted of bread and butter, tea and chunks of salt pork, floating in grease, not the best food for our condition; our room was a bit of unfinished loft, without window, and reached by a ladder from the kitchen and living-room. We were not enthusiastic to remain there]. In the P. M. and again in the evening we walked out and examined the cliffs, etc., for plants. Did not seem to find a single characteristic plant and we were much disappointed. [Showing how completely mental and physical discouragement control the outlook. In 1923, when, under better conditions, a party botanized about Mont Louis, and in 1931, when, with Mr. and Mrs. Charles A. Weatherby and my daughter and son, I spent some days there, it was difficult to break away from the fascinating cliffs and slopes, which support such treasures as *Carex misandroides*, endemic representative here and in western Newfoundland of the rare Canadian Rocky Mountain *C. Franklinii* Boott; *Draba lanceolata* Royle, of Asia and western North America; the endemic *Astragalus scrupulicola* Fern. & Weath., eastern representative of the western *A. aboriginum* Richardson; and *Oxytropis gaspensis* Fern. & Kelsey, endemic eastern representative of the Rocky Mountain *O. viscida* Nutt.; *Erigeron compositus* Pursh, var. *trifidus* (Hook.) Gray, at its first known station south of the Arctic and east of the Rockies, and scores of non-endemic specialties. On July 31, 1905, Collins and I were glad to think Mont Louis a poor spot.] Talked of driving to Ste. Anne des Monts but no one would undertake to haul our trunks there over the rough and hilly roads. Later decided to go in a barge [lobster-boat with decayed fish smearing the whole inside]."

"August 1, 1905. Tuesday. Cloudy, windy and cold . . . Started about 8 A. M. in a barge with M. Bouchier and another man [fare 'dix piastres'] for Ste. Anne des Monts. We were practically becalmed for an hour near Pt. de Chasse. Reached Ste. Anne des Monts about 4:30 P. M. nearly frozen. Went into LeMontagne's store and talked with him about boarding places, eating, etc. He recommended Ed. Lefrancois' place." Supper consisted of "bifstek", carrots, baked potatoes, lettuce, graham bread, a choice of 23 kinds of relish and condiments, massed at the center of the table, pickled beets, cake and cherries! We immediately forgot that we were desperately ill and when, after supper, Lefrancois asked "Are you going in to Mt. Albert?" we woke up, "just like that" and said, "Why, this is where you start for Mt. Albert, isn't it?" In half an hour the famous guide and hunter, Sam Coté, was with us, planning the trip, to start as soon as possible. That shows what proper food will do!

"August 3, 1905, Thursday. Cloudy and foggy in the A. M. Clearing in the P. M. Clear with aurora borealis in the evening. In the A. M. spent most of the time in getting ready to go up river. Had Lefrancois haul our baggage down to the river after dinner and about 1:30 P. M. we started up-river, with Fernald and part of the luggage in one canoe, I and the rest of the baggage in another. The river is a rather rough one and we went up about one hundred feet in the first nine miles. Here we stopped for the night at Col. Starkey's lower camp. Our canoemen (Coté, Joe Fortin and Hector and Edouard Gagnon) pitched tent and Fernald and I dined with Col. Starkey (owner of the salmon-fishing rights on the river). Nice dinner and pleasant chat afterward. Fernald and I in tent; the canoemen in the guides' house at the camp. From here we got our first fine view of the foothills of the Shickshock Range."

"August 4, 1905, Friday. Fair, partly clear; very warm in middle of day. We left 'Nine-mile Camp' about 8 A. M. and stopped for lunch at 11:05 A. M. While we were lunching, two men came down the river with the skin of a bear they had killed at the next Starkey camp. We camped near the head of a long and hard rapid known as 'Three-mile Rapid'; and then passed through a wild and beautiful rocky gorge (Grand Rapid), where it was very difficult to get the canoes through. Fernald and I in our lean-to tent under canopies; canoemen in another tent".

"August 5, 1905, Saturday. Cloudy and somewhat showery. Warm in middle of the day. Collected a considerable number of specimens [*Festuca prolifera* (Piper) Fern.; the new *Poa gaspensis* (subsequently found in Alaska); *Sagina saginoides* (L.) Dalla Torre, the first from east of the Rockies and south of the Arctic, *Arabis alpina*, etc.] and I got quite a number of mosses. [One of the very rare memoranda regarding the group upon which Collins was a recognized authority.] In the late P. M. we reached Rivière à la Martre (Marten River) and camped about one mile above there on a gravel-beach. Got some fine views of Tabletop Mountain. A few rods above our camp the top of Mt. Albert was seen (our first view of it) over the top of a great ridge". . . The entries for the next three days, including the ascent of Mt. Albert, were earlier copied. That for August 8, continues

"We found the nearest peak (East Peak) about 3650 feet high, with a still higher peak to the west-northwest. To the south of these there is an immense tableland sloping gently to the southward. The eastern end of this tableland is a great serpentine rock-barren, and the western a bog or meadow. To the south of this is a deep gorge with three large snow-banks in view. Beyond this is the main (highest) part of the mountain—a still larger desolate-looking rock-barren plateau sloping gently to the main dome. We found extremely interesting plants—many of them unknown to Fernald" [*Adiantum pedatum*, var. *aleuticum* Rupr., the first from east of British Columbia; *Festuca scabrella* Torr., a characteristic plant of the arid Cordilleran region; *Danthonia intermedia* of the Rocky Mountains; the beautiful copper-colored *Eriophorum Chamissonis*, in rippling carpets; true *Carex paupercula* Michx., much smaller than the lowland varieties; a host of strange willows in prostrate mats almost solidly enmeshed in rock, the arctic *Salix anglorum* Cham. in three varieties, *S. brachycarpa* Nutt., the first from east of the Rockies, and an amazing little species for a willow, with glabrous capsules and glabrous green scales, the endemic *S. chlorolepis;* very strange species of *Arenaria*, dense masses of wiry marcescent foliage and large pink or white flowers, the new *A. marcescens*, subsequently found only on the serpentines of Newfoundland, a delicate creeping species with fine linear leaves, *A. sajanensis* Willd., elsewhere unknown in America from south of northern Labrador, and a little species with thick oblong leaves, which I described as *A. cylindrocarpa*, a species then recognized only in the Canadian Rockies and in northern Labrador, subsequently found in western Newfoundland and now united with the famous relict of northern Europe, *A. humifusa* Wahlenb.; *Lychnis alpina* L., var. *americana*, of Greenland, Labrador and western Newfoundland; *Statice labradorica* (Wallr.) Hubbard and Blake, var. *submutica* Blake, extending down from the Arctic; the only arctic goldenrod, *Solidago multiradiata* Ait., and another species, a local endemic, with vividly green involucres, the new *S. chlorolepis;* the wide-ranging *Artemisia borealis* Pallas; and the new *Cirsium muticum*, var. *monticola*. We were thrilled, pestered by black flies (to the point of repeating the guides' most frequent expression, "les sacrés mouches") and so confused by novelties on all sides that, as soon as we started to collect one, several

Fig. 1 (upper): Northern Amphibolite Slope of Mt. Albert, with Margin of Serpentine Tableland at right.
Fig. 2 (lower): Serpentine Tableland of Mt. Albert; wooded Amphibolite Area in Background.

Fig. 1 (upper): Head of Ruisseau à la Neige, Mt. Albert.
Fig. 2 (lower): Treeless Serpentine Wall north of Ruisseau au Dia[illegible] Mt. Albert.

others would divert us. The mosscarpet, too, kept Collins absorbed; and singularly enough, sharing the wet depressions in this alpine and wind-swept serpentine barren were such commonplace lowland plants as *Sarracenia purpurea, Geum rivale, Vaccinium Oxycoccus, Kalmia angustifolia* and *polifolia* and *Andromeda glaucophylla*. Yet, where we were making an amazing harvest of novelties and of common boreal herbs and low shrubs, the region was once described by one of the most famous of Canadian geologists as "absolutely destitute of vegetation". Along the western margin of the serpentine tableland a nearly straight line (PLATE 702, FIG. 2) divides it from a Hudsonian scrub-forest or "puckerbrush", the latter occurring on the amphibolite rock. So sharp is this boundary, that, given the cue, one could predict the vegetation. On the serpentine occurred the above-mentioned specialties and some more familiar plants: *Carex Bigelowii* Tuckerm. (*C. rigida* of the manuals), *Juncus trifidus, Betula glandulosa* var. *rotundifolia, Empetrum nigrum, Rhododendron lapponicum, Phyllodoce caerulea* and *Arctostaphylos Uva-ursi;* while the amphibolite or hornblendic area was as definitely marked by the abundance of *Hierochloë alpina, Carex capillaris, Luzula spicata, Salix planifolia* Pursh and *S. herbacea, Sibbaldia procumbens, Vaccinium cespitosum* and *Arnica mollis,* never or only rarely seen on the serpentine. On the north-facing slope, just below the tableland (PLATE 702, FIG. 1), the wet amphibolite below a mass of packed snow and ice was a carpet of species not once seen on the serpentine: *Lycopodium alpinum* L. of the Arctic; *Poa alpina* L. and *Carex bipartita* All., also arctic; *Luzula confusa;* the newly discovered *Streptopus amplexifolius,* var. *oreopolus* (Fernald) Fassett; *Salix cordifolia* Pursh and the new *S. hebecarpa;* the western North American and Siberian *Betula microphylla* Bunge; the arctic *Ranunculus pygmaeus* Wahlenb. and the type of *R. Allenii* Robinson, of the Shickshock Mts. and northern Labrador; *Viola palustris; Epilobium lactiflorum* and *E. alpinum* (*anagallidifolium*); *Cassiope hypnoides;* the Rocky Mountain *Vaccinium ovalifolium* and a beautiful new species, *V. nubigenum; Veronica alpina,* var. *unalaschcensis,* and *V. humifusa; Gnaphalium norvegicum* Gunn. and *Taraxacum lapponicum* Kihlm. In this typically alpine and subalpine vegetation it was amazing to find carpets of the lowland *Chrysosplenium americanum* and to be able to supplement our limited vegetable-diet with cooked stalks of the common lowland *Heracleum lanatum*, with *Oxyria digyna* and *Arabis alpina* as salad. The contrast between the floras of the amphibolite and the serpentine was so vivid that I was stimulated to a new line of research.] Picking up the journal again: "The black flies on the mountain, especially at the summit, were something fearful and we were obliged to wear improvised head-nets (Plate 704, fig. 1) and even then there was little comfort. . . . I have never seen anything like them." . . .

"August 9, 1905, Wednesday. Spent all A. M. putting up plants collected yesterday. Were obliged to do this inside cheesecloth canopies [in a 6-foot lean-to] to keep away from 'brûlots' (midges), black flies and mosquitoes." . . .

"August 12, 1905, Saturday. . . . At about ten o'clock we all started for Snow Brook Ravine (Ruisseau à la Neige) collecting. . . . Before reaching the great snow-arch we were caught in a shower or two. These showers continued most of the P. M. At one time we got under the snow-arch to get out of the rain. The arch (Plate 703, fig. 1) was formed by the brook flowing underneath the great snow-bank and was some twenty-five feet high." Besides more willows, the great prize of the day was *Polystichum mohrioides*, var. *scopulinum* (D. C. Eaton) Fernald (Plate 697, fig. 2), the serpentine of Mt. Albert the only region for it east of Idaho.

"August 14, 1905, Monday. Snowing and hailing most of the early A. M. The temperature was below freezing in the morning and in the late afternoon 37 degrees. Slept cold last night. Tabletop Mountain, ten miles away, was covered with snow. . . . Fernald and Joe went off to the ravine to the eastward about 2:30 P. M. . . . I got back about 7:00 P. M. Temperature 42 degrees".

"August 15, 1905. Clear and cold. Got up about 3:30 A. M. on account of cold. [I well remember the greeting from Coté, in characteristic Canadian French, as I crawled out of the tent: 'Fer fret cum job' ('Il fait froid comme le Diable')]. Fernald and I worked on the plants until 10:30 A. M., when Edouard and Hector started down the mountain with large packs. About noon Fernald, Joe, Coté and I started down (Plate 704, fig. 2) . . . Flies bad."

Out on the coast, away from the freezing alpine conditions of mid-August, we explored along shore, fascinated by the giant *Senecio Pseudo-Arnica* (shared with the Bering Sea region), *Plantago eriopoda* Torr., a species primarily of the alkaline Canadian Plains, and other maritime or halophytic types. We were delighted, too, with the great areas, at the mouth of the river, of the very fleshy *Hippuris vulgaris*, var. *maritima* Hartm., a rare plant as shown by herbaria. Driving down river to Pointe Tourelle, Cap Tourelle, Rivière Patate and Ruisseau Castor, we called in to see that the type-colony of *Arnica gaspensis* was intact and spent much of the time exploring and botanizing about the remarkable natural bridges and fantastically weathered sea-stacks and tower-rocks which gave the name Tourelle. The Rocky Mountain *Woodsia scopulina*, new to the flora of the East, abounded in some of the crevices. *Draba glabella* Pursh, with the endemic lower St. Lawrence var. *orthocarpa* and the very definite var. *megasperma*, more or less alternated on the cliffs, and *Festuca* was a complicated group, with *F. rubra* often represented by the arctic vars. *mutica* Hartm. and *arenaria* (Osbeck) Fries, and the *ovina*-series by *F. saximontana* Rydb.

In 1906, vividly conscious of the sharp contrasts in the floras of the acid areas, the serpentine and the calcareous rocks, we undertook a thorough collection of typical plants and the rocks upon which they grew, Harley H. Bartlett, then a student with me, being ready to undertake the chemical analyses. Equipped with a steel frying-pan and abundant cloth bags we started in at Bic, placing the thoroughly washed plants on the hot pan and allowing them to ignite over a bed of hot coals without the use of matches. Collins entered whole-heartedly into this collecting and, already knowing much of the country to be visited, we planned to secure the samples of plant-ash, rock and soils without making many new discoveries. At Bic, of course, we got to some new territory, the ragged and castellated white cliffs toward St. Fabien (Plate 706, fig. 2), as well as Cap Orignal (Moose Cape) and some others and, inevitably, new discoveries were in order. The greatest shocks, however, were when we got back and Bartlett proceeded with the analyses. *Saxifraga Aizoon* is famous for having the large stomata along the leaf-margins heavily incrusted with insoluble calcic carbonate, waste thrown off through the stomata; it obviously should occur on calcareous rocks. On one big cliff near Bic it was very handsome, growing on what seemed like quartzite. We accordingly got a large sample of the plant-ash and good samples of soil and rock. When Bartlett got hold of them repeated analyses showed the ash of the plant to contain a large amount of calcium, the soil and the rock to be pure silica! Rock-samples were referred to the petrographer, the late John Eliot Wolff, and he, too, said "quartzite." That was that! On the base of Cap Orignal, a headland wholly unlike those around, both in its rock and its weathering, *Iris setosa*, var. *canadensis* abounded. We consequently got good samples. When the analyses were made the ash of the *Iris* showed abundant manganese, the rock-sample only a trace. Again, there we were! Bartlett went through hundreds of samples, sometimes finding what was expected, sometimes just the opposite, and in the end, realizing that the analyses were not repeating the operations of the plants, he declined to publish the inconclusive results. In the analyses it was not possible to repeat the activities of the roots in attacking the hygroscopic film about each soil-particle nor the ability of the plant to draw alkaline salts from the fogs and mists along shore. Although *Saxifraga Aizoon* was on pure silica, the heavy fogs, apparently, supplied it with the calcium it required. All this was unknown to Collins and me at the beginning of the season and we spent many hours daily in conscientiously assembling the ash.

We had arranged in advance with Sam Coté to have the provisions all bought and packed into the Gaspé canoes (dugouts), so that we could start immediately up the River Ste. Anne des Monts. With the aid of my French dictionary we had drawn up two pages of required provisions, but on reaching Ste. Anne des Monts we found Coté and the storekeepers in perplexity. Everything was clearly understood and the supplies had been properly stowed except two: "*pommes de terre*" and "*jambon.*" Proceeding to the market we pointed out what we meant, *patates* and *becking*. *Pomme de terre* in Gaspé is the mountain cranberry, *Vaccinium Vitis-Idaea*, var. *minus*, which carpets the mountains; *patate*, the early French name, was the word brought from France by the original settlers of Gaspé. Later, after the guides

Fig. 1 (upper): Flys bad, on Mt. Albert (Collins, Sam Coté, Fernald and Joe Fortin, from left to right).

Fig. 2 (lower): Breaking Camp, Mt. Albert (Sam Coté and Joe Fortin).

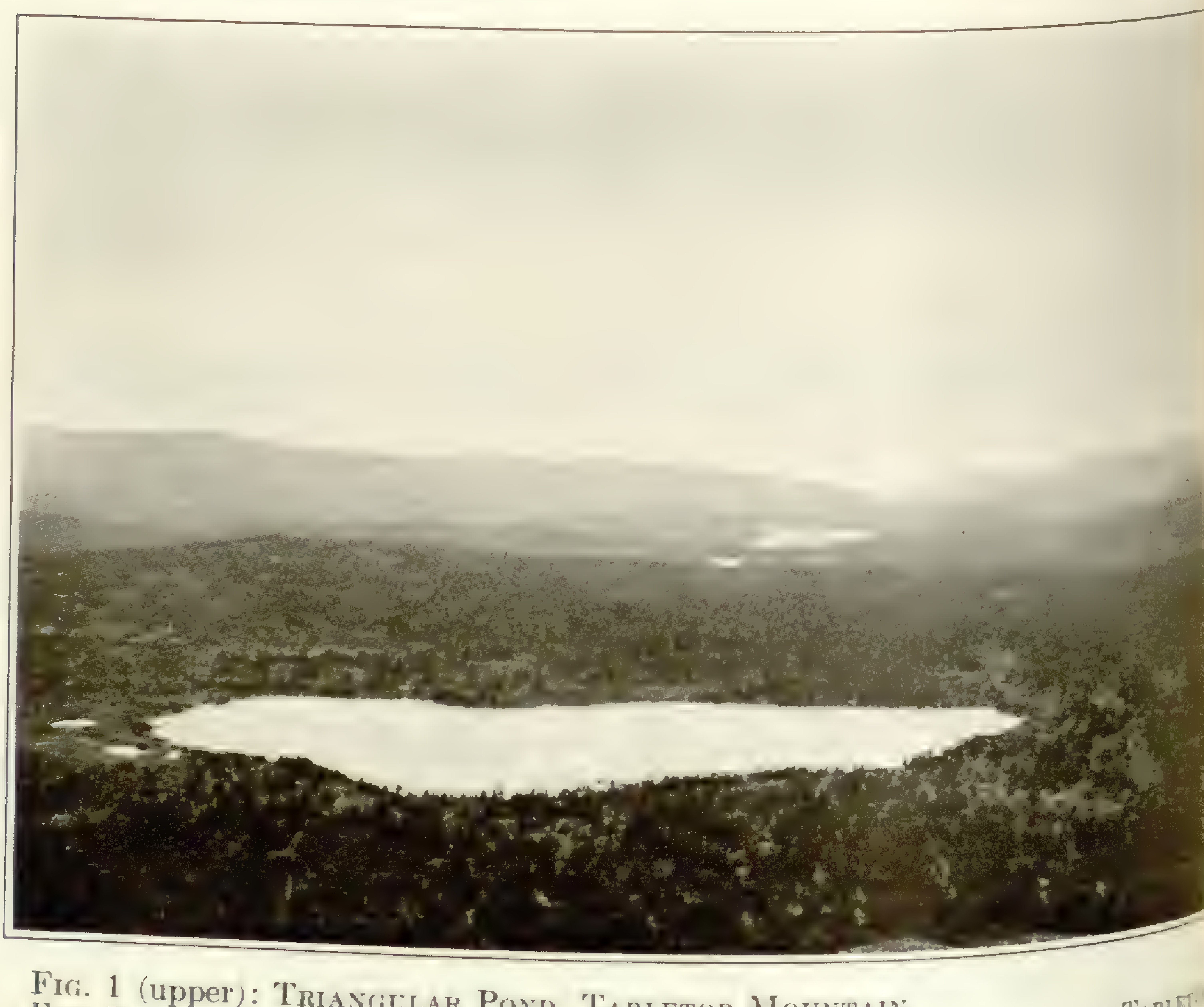


Fig. 1 (upper): Triangular Pond, Tabletop Mountain.
Fig. 2 (lower): Across northern End of platter-like Tableland of Tabletop Mountain (Gorge of Rivière Madeleine at right in distance).

had packed more than ten miles through the woods, thence up the steep walls of Tabletop, when we suggested attacking the 20 pounds of "prunes", they got out a quart can of Green Gage Plums, mostly water; we went without the less costly and more desired *prunes sèches*.

Going this time to Ste. Anne des Monts,

"July 11, 1906, Wednesday. Started from Little Métis with Paul Marmon as driver at 7:30 A. M. Arrived at Matane (33 miles) at noon and had dinner . . . Started on again at 2:15 P. M. and reached Les Méchins at about 8:30 P. M. (45 miles), making about 78 miles from Little Métis with one horse." . . .

"July 12, 1906, Friday. Left Les Méchins about 7:30 A. M. and drove leisurely [because stopping for a good deal of botanizing, on this drive becoming much impressed with a small tree with the largest fruiting aments and the largest leaves we had ever seen on a willow, the new *Salix laurentiana*, endemic on the shores and bluffs of the Gulf of St. Lawrence and closest related to *S. Hookeriana* Barratt, of the Pacific coast from southern British Columbia to California] to . . . Ste. Anne des Monts. Found Coté and Joe Fortin there. In the late P. M. we reorganized baggage", and at 10 next morning started up-river. A disgruntled and very boastful rough-neck, whom we will call Zéphirin Violette, was at the starting-point, wildly gesticulating and assuring us that we had a miserable crew, that Coté knew nothing about the woods—in short, that we ought to have employed him. Consequently, when we stopped at noon to "boil the kettle" and found the axe gone, we knew who had removed it. One canoe was sent back to get another axe and Collins and I took off time to botanize. The next time we were organizing an expedition, the Mt. Logan trip of 1923, we received a letter, written in flowing English and a fine bookkeeping hand, from one of our former guides, urging us to take Zéphirin into the party; he was a splendid fellow and heartily ashamed of the way he had acted. Fortunately, before we could answer, the following self-explanatory message arrived:

"Wen i rot you las nite i had Mr. —— at the store in Cap Chat rite for me i axe you to hire Zéphirin Violette i had to he stood there an' made me he is a liar please rite me and say you don want nothink to do of Zéphirin Violette." We so wrote.

While waiting for the axe and during a leisurely ascent of the river for some days we watched the plants, as we had not done in the hurried trip of the year before. *Listera auriculata*, *Primula mistassinica* and *Pinguicula vulgaris* carpeted the damp slopes, usually overhung by *Lonicera involucrata;* and wherever there were spring-rills and small brooks coming in *Arnica mollis* and *Arabis alpina* L. made great displays, with the gravels bearing the usual solid carpets of *Dryas Drummondii* and *Epilobium latifolium* (PLATE 698, FIG. 2). All these were now quite familiar, but the goldenrod of the gravel-flats seemed strange, the Rocky Mountain *S. lepida*, var. *elongata* (Nutt.) Fern. On one wet slope the *Erigeron* puzzled us, *E. elatus* Greene of the Canadian Rockies; and, topping off breakfast one morning by picking some wild strawberries, we found ourselves instinctively neglecting the tiny ones—until it dawned upon us that they were on many-crowned and nonstoloniferous half-shrubs with tiny leaves, the unique and strictly endemic *Fragaria multicipita*. At another point, when we left the canoes in order to decrease their loads, we walked into a carpet of a strange little round-leaved willow, *Salix obtusata*, so strange that its relationship in the genus has not been made out.

This trip up-river was full of thrilling incidents.

"July 16, 1906, Monday. Cooler, 66 at 6:00 A. M. Very hazy and smoky. Not many flies to bother us last night. Used a joss stick in the canopy before going to sleep. Got up about 5:30 A. M. and had a bath in the river. Took Coté's trout-rod and caught a salmon. Coté and Joe helped me land him. [Collins omitted to state that the entire camp was roused by his shout, 'Help, help!' He had stepped into the stern of one of the emptied canoes, drawn part-way out of the water, and the fighting salmon was towing the canoe (without poles or paddles) swiftly down the Grand Rapid, when Coté and Joe, paddling with all their might, caught the speeding canoe and brought back the two heroes of the episode.] Warm in middle of the day —82 about noon. . . . Saw a large Canada lynx trying to catch some ducks. Portaged past Little Sault", our station for *Salix obtusata*.

The journal of much of the Mt. Albert trip may be omitted, except to note that we had great difficulty making many of the plants from the serpentine barrens ignite. They had grown on silicate of magnesium and had some of the properties of asbestos or of soapstone. On the steep and treeless north wall of Devil's Gulch (Ruisseau au Diable) we got *Pellaea densa* (Brack.) Hook., a characteristic species from southern British Columbia to southern California, here growing with the still rarer *Polystichum mohrioides*, var. *scopulinum*, PLATE 697, FIG. 2, already referred to; and in collecting them we found ourselves kneeling in a carpet of *Epigaea repens!*

From the eastern border of Mt. Albert we figured out a route from the Forks of the Ste. Anne des Monts across to Tabletop; and on the 26th Coté and Roy went down to the river-camp and started to blaze a trail to that vast tableland. In the evening of the 28th, just after we had come down to the river, the two trail-makers came in, haggard, pale and unnerved. They had been "through Hell", nearly died of thirst and were bleeding from fly-bites. "Nothing" would induce them ever to go again "through Hell". Discussion of the matter was not then in order; embracing, soothing, hot supper and bed were the best cure; and when, after a quiet Sunday, they realized that everyone at Cap Chat and at Ste. Anne des Monts knew that Coté was guiding an expedition to little-known Montagne de la Table, they decided to take us in, that we might see for ourselves. Upon leaving the river they had found old blaze-marks on trees. These they had followed, taking exactly the course we had figured out from Mt. Albert, for they had hit upon the old route of A. P. Low, who, when exploring for the Geological Survey of Canada, had also started from the Forks.

"July 31, 1906, Tuesday. Clear all day. After breakfast at the Forks we packed up our things and started at 9:00 over Low's Trail for Tabletop. It was a long, hard tramp—ten miles by pedometer. Arrived at a small lake, at the foot of Tabletop, called by Coté 'Lac des Américains', at 6:15 P. M."

"August 1, 1906, Wednesday. Had a headache in the A. M., so stayed about camp most of time. In the P. M. Fernald and I made a circuit of the lake and got some interesting plants [carpets of *Isoëtes macrospora* and of *Subularia aquatica*, etc.] Coté been up the mountain cutting trail most of the day. Joe, John and Wilfred gone down to the Forks for second load of things. Trout abundant in the lake. In less than one hour I caught 35 trout with the ravellings from my khaki trousers as bait for the first fish, then used a trout-fin for the rest. Fernald came in to camp a little later and as a result of his hour's fishing had 36 trout, the largest being 7½ inches long. He caught all from a rock, with the fin of one fish as bait for all but the first".

"August 2, 1906, Thursday. Hazy from smoke. Spent the early A. M. taking care of plants. About 9:30 A. M. Coté, Fernald and I started up the mountain via Low's Trail, going from camp to that trail via one cut by Coté. Reached top of first spur, very dry (2970 feet) . . . From here we worked east and then north to the top of a high peak which was 3760 feet altitude. We then went north to the edge of the next ravine, east along its upper edge and then down to a rectangular-shaped pond—one of six seen in the gorge". When, coming over the crisply dry ridges, we suddenly saw these (PLATE 705, FIG. 1) and, a little later, a hundred other ponds occupying the broad platter-like top of Tabletop, Coté's gloom suddenly passed: this was a promising moose-country and he would return in the autumn. He had "gone through Hell" unscathed and was reaping his reward. Returning to Lac des Américains we caught 75 more trout. These we cleaned, and when, next morning, we formally moved to a camp-site near the rectangular pond of the day before, these were put into a rubber blanket and carried up the mountain, to piece out the dry foods coming in from the Forks. As it subsequently proved, all the larger lakes and ponds of the Madeleine River system were paved with very hungry trout waiting to be eaten; incidentally *les savons* (partridges, especially the spruce partridges or fool-hens) were very abundant and tame. By throwing a stone or a botanizing-pick we could easily stun them, and in ten minutes they were over the fire. We did not soon hear the end of those stale trout!

Collins's entry for August 4 contains these items: "I tried to make a map of the ponds (large and small) up as far as the first large one above camp. Mapped 45—numbered them in a sketch I made. Got *Polytrichum* eighteen inches long." Later on our ingenuity gave out; we could think of no more names for ponds. There must be many hundreds of them.

"August 7, 1906, Tuesday. Clear in the A. M. Cloudy in the

P. M. Rainy in the evening. Had breakfast of trout, partridge, etc., and about 8.30 Coté, Joe, Fernald and I started down to Triangular Pond (PLATE 705, FIG. 1) and across to Granite-block Pond, up to Second Peak where I took a panorama. Coté and I then went across the Third Peak while Fernald and Joe worked around Pond no. 101 (southeast of Third Peak). Took panorama from Third Peak. . . On the way from Second to Third Peak I went along edge of barrens above Pond no. 201 and found *Dryas integrifolia* and several other interesting things. [The peaty meadows, bogs and pond-margins in the platter-bottom were semi-temperate, partly arctic-alpine, with a grand mixture of such plants as *Eriophorum tenellum*, temperate American; *E. Chamissonis*, boreal; *Carex rariflora*, arctic-alpine; *C. lenticularis*, var. *albi-montana* Dewey, mostly alpine; *C. limosa*, north-temperate; *C. oligosperma*, temperate North American; *C. saxatilis* var. *miliaris*, boreal American; *Salix argyrocarpa*, alpine; *S. arctophila* Cockerell, the first from south of northern Labrador; *Rubus Chamaemorus*, subarctic; and *Petasites vitifolia* Greene, west-American. The ponds had an equally north-temperate aspect: *Potamogeton epihydrus*, var. *Nuttallii*, temperate North American; *Nuphar variegatum* Engelm., temperate American; carpets of *Subularia aquatica*, circumboreal, and of *Isoëtes macrospora* (boreal American); the newly discovered *Callitriche anceps* (subsequently found in Greenland, Labrador, Newfoundland, and on Mt. Mansfield, Vermont); and *Myriophyllum Farwellii* of the northern states and southeastern Canada. Joe became very keen at detecting specific differences and, although he had never heard of such erudite subjects as grammar, syntax and rhetoric, he promptly got hold of the Latin names. He and I worked much together, each of us taking one side of a pond. I well remember calling across, 'Is there anything new over there, Joe?' and receiving the immediate reply, 'No, there's nothing here but *Subularia aquatica* and *Isoëtes macrospora*.' The region of Tabletop where we camped was of highly feldspathic pink granite, and the dry slopes and crests supported the usual alpine and subalpine plants of granitic mountains, rather notable through the absence of *Arenaria groenlandica*, which we found only once (on one of the eastern-most crests). Toward the northwest and north, in the area we visited, the outer walls were of calcareous rocks, as if the granitic mass, as it rose, had carried with it a northwestern fringe of limy rock from below. It was this edge which Collins reached when he noted *Dryas integrifolia*.] After lunch we all went back to this place and worked the barrens above Pond no. 201 and also to some extent the upper slope of the next ravine north of no. 201. Found a good many interesting plants", including the following calcicolous species: *Juncus castaneus* Sm., the first from south of Labrador; *Tofieldia palustris*, a wide-ranging boreal species; a remarkable willow with large persistent stipules, *Salix calcicola* Fern. & Wieg.; the then undescribed and essentially endemic *Draba Allenii;* a little rosulate *Saxifraga*, resembling the arctic *S. nivalis* L., but with minute cuneate petals, the new *S. gaspensis*, subsequently found in northern Labrador and abundant with *Draba Allenii* on the calcareous schists of the Mt. Logan area; *Epilobium Drummondii* Hausskn. of the Rocky Mountains; *Pyrola grandiflora* Radius, the tiny-leaved and large-flowered arctic ally of *P. rotundifolia; Pedicularis flammea* L., another arctic species at the first station known south of northern Labrador; *Campanula uniflora* L. ditto; a brand new goldenrod, the endemic *Solidago mensalis;* and the beautiful discoid *Senecio* with purple involucres and deep orange disks, the Cordilleran *S. pauciflorus* Pursh. In spring-rills of this area *Cerastium cerastioides* (L.) Britton, an anomalous arctic plant, almost as well placed in *Stellaria*, abounded. Another afternoon, while Collins was working over his mosses, I returned with Joe, further to explore the walls of this "Marble Ridge". A leaf somewhat suggesting a *Taraxacum* but mottled and surely not belonging to *Taraxacum* because the young scape was solid and the young phyllaries ciliate, greatly puzzled me, and better material was secured of some of the other specialties. Unfortunately, Joe was in an insubordinate mood and I soon told him to go back to camp. He had forgotten that we were not out merely for his personal gratification. Very soon, however, I regretted that I was alone, for on the treacherous scree I twisted my ankle and immediately one of my expensive high boots chafed the injury, and I was forced alternately to hobble and crawl four miles back to camp, arriving there quite exhausted and having lost the strange Composite. (In 1923 this proved to be the new *Agoseris gas-*

pensis, a species subsequently found elsewhere only on mountains of northern British Columbia). Evidently Joe did not tell Collins why he went back to camp alone, for the record simply reads: "Joe came back in late P. M. to get some firewood. Fernald went on alone from Pond no. 201 to Marble Ridge. He came in long after dark, having had a hard, slow trip home on account of one of his boots skinning an injured ankle. He gave the boots to Joe when he got back"; the gift intended to heap coals of fire on the head of the rebel, who promptly put on the boots and wore them the rest of the trip!

At the northeastern border of the platter-bottom of Tabletop some of the high domes are of a whitish syenite, consequently slightly calcareous. We got to this region, draining into the Madeleine River, only for a short side-trip in August, 1906, just enough to show how different it is from the granite area where we had chiefly camped.

"August 9, 1906, Thursday. Very cold last night. Fernald and Joe got up about 4:30 A. M. After breakfast Joe, Coté, Fernald and I started for the eastern edge of the mountain at 8:45 . . . went up the 'South Dome' [Botanists' Dome of Coleman's report] and built a cairn for marking spot—altitude 4100 feet. Fernald, Coté and Joe started southeast to a lake we called 'Lac Coté' to make camp, while I went up on the big main dome alone and built a cairn [Mt. Jacques Cartier of recent Canadian maps]. Big dome 4250 feet. . . On the way down found Fernald collecting *Phegopteris alpestris*, new to eastern America"—not only new to eastern America, but new to science, for it is the endemic *Athyrium alpestre*, var. *gaspense*.[1]

"August 14, 1906 . . . Left our camp in the ravine of the East Fork of the Ste. Anne River at 7:45 A. M. in a dense fog. Came down over the regular Low's Trail. . . . Reached our old camp at the Forks at 6:15 P. M. Pedometer 12 miles. Altitude 675 feet, which means that 30 to 50 feet should be added to all altitudes taken on Tabletop Mountain."

[1] In the 1923 trip to the northeastern region of Tabletop after Collins had returned home, the smaller half of our large Mt. Logan party, Carroll W. Dodge, Lyman B. Smith and I, found in this syenitic area a great many additional species: *Carex capitata*; the famously localized *C. macloviana* D'Urv. (of the Falkland Islands and Patagonia and scattered spots in arctic and subarctic regions); the arctic *Saxifraga cernua* L. and *Gnaphalium supinum;* the almost endemic *Agoseris gaspensis*, finally in flower and young fruit, and many other rare things.

"August 16, 1906. Very cold in the tent towards morning. Clear now. Temperature 40 degrees."

In 1907 Mrs. Fernald and I took a delayed honeymoon to Bic and to Percé, with Collins as the third member of the party. These regions having been already covered by the preceding narrative, only a few items need mention. At Bic we regularly left the hotel after breakfast and arranged for a hearty evening meal, taking with us for lunch only bread, butter, tea and some sweets. When M. Pineau expressed surprise that we needed so little we explained to his horror, that we regularly cooked clams, mussels or mushrooms and wild vegetables; that was terrible, clams and mussels were deadly poisonous (as were mushrooms) and used only for fish-bait, and only cattle ate wild plants! With a recruit in the party we explored many new spots, roped precipitous cliffs (PLATE 706, FIG. 1) to get at herring-gulls' nests, and otherwise shocked the staid people of Bic who had never seen a woman scale vertical walls. Where the herring-gulls had their nests, *Draba minganensis, arabisans* and *glabella* and *Primula laurentiana* were stripped of flowers, fruit and new foliage. Elsewhere they were intact; only one inference was obvious.

Then we went on to Percé, again revelling in the work with the alpine rope. We had all been very seasick during a stormy trip on the "Lady Eileen", from Dalhousie to Percé, arriving at about 3 A. M. I shall never forget the breakfast at 3:30 A. M. at M. Le Boutillier's, such a contrast to our meals the first summer at Percé—heaping platters of lobster and of "Gaspé oysters" (cod-tongues and sounds), our introduction to the latter delectable dish. The cliffs of Grande Coupe (PLATE 707, FIG. 2) were reclimbed (with difficulty on account of "overhang") and those of Mt. Ste. Anne again raked for specialties; but the great new trip was to Bonaventure Island, a long red calcareous-conglomerate island, famous as one of the great breeding haunts of gannets, puffins and other sea-birds. The people at Percé, on the mainland, are derived from French-speaking ancestors, originally from Jersey. Their distant cousins on Bonaventure Island often can not talk to them for, although also from Jersey, they came much later and speak only English. "Willie" Duval, long familiar to tourists (who, in 1907, were unknown) took us over in his sailboat and we spent two wonderful days on

Fig. 1 (upper): Cliff-climbing at Bic (Margaret H. and Merritt L. Fernald descending to Herring-Gulls' Nests).
Fig. 2 (lower): Castellated Cliff west of Bic.

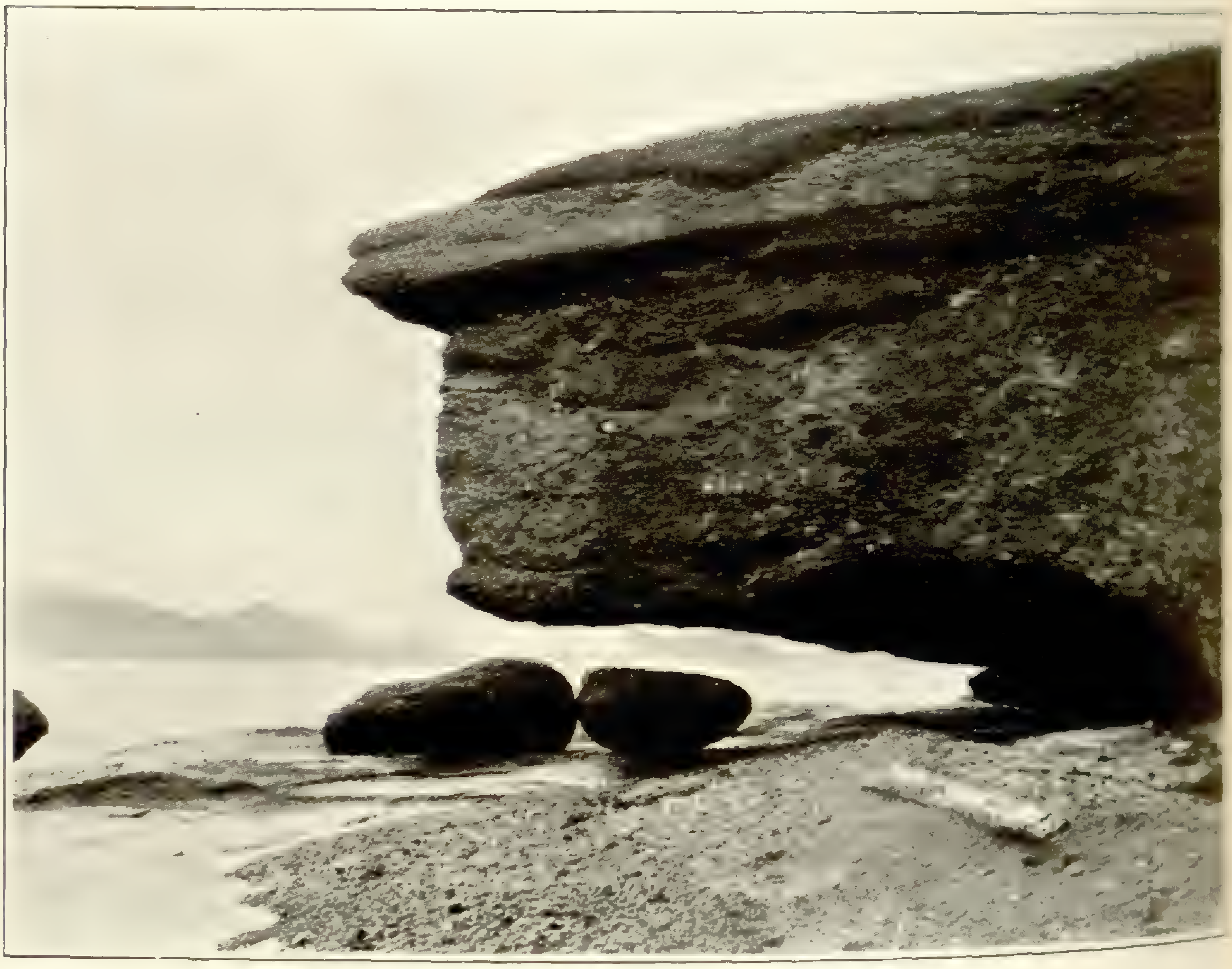


FIG. 1 (upper): OUR LANDING-PLACE, BONAVENTURE ISLAND, TYPE-STATION PUCCINELLIA MACRA.
FIG. 2 (lower): OVERHANGING WALL OF GRANDE COUPE, PERCÉ.

the Island. On the overhanging shelf of rock (PLATE 707, FIG. 1) where we landed there was a strange grass, the new and endemic *Puccinellia macra* Fern. & Weath.; and all the way from the landing to the Duval house we walked on Drabas, Euphrasias and other choice plants which form much of the turf. There was, naturally, a great temptation to spend our time on the rope, down among the tens of thousands of nesting gannets, razor-billed auks, sea-pigeons and other inhabitants of the cliffs. The old gannets, with wing-stretch of 6 feet or more would leave the young on the shelves of rock and, flying in great circles about us, shout "go-rock! go-rock! go-rock!" No plants grew down among the crowded nests, however, and we, consequently, returned to the turfy crests (PLATE 700, FIG. 2) collecting most of the Percé specialties and getting particularly fine material of *Draba pycnosperma* (often eaten off); *Epilobium glandulosum* Hausskn. of the North Pacific region; *Oxytropis johannensis*, described from the upper St. John in Maine; the tiny *Sagina procumbens*, var. *compacta* Lange, the arctic extreme of the species, not previously recorded from south of Greenland; *Euphrasia purpurea* Reeks, described from Newfoundland; and *Descurainia Richardsonii* (Sweet) O. E. Schulz, of the Rocky Mountains.

That trip closed for many years my long expeditions with Collins. His duties in government work kept him from joining the parties which spent succeeding summers in Nova Scotia and Newfoundland, so that our work together consisted then of occasional week-end exploration of pond-shores and swamps of Rhode Island. On these brief trips in his adopted state we were able to add to the known flora of the state some nice things (*Rhynchospora Torreyana*, *Eupatorium leucolepis*, var. *novae-angliae*, etc.), but these are insignificant in comparison with his own discoveries in the state. In 1923, however, Collins got off long enough to spend much of July in the party which went to the Mt. Logan region of Gaspé. The preceding summer Pease and I had tapped the region, one of calcareous schists, whereas Mt. Albert to the east is serpentine and amphibolite and, still farther east, the small part of Tabletop we knew is granite or syenite, with marble and other calcareous rock at the northwestern edge; and from our very brief visit Pease and I knew that another alpine flora was on Logan. Whereas our first trip into the Shickshock Mountains had been by Gaspé canoes up-river, we now left Cap Chat in automobiles[1] and drove to the farm farthest up Rivière Cap Chat, Émond's. There the party, Pease, the late Kenneth K. Mackenzie, Ludlow Griscom, Carroll W. Dodge, Lyman B. Smith, Collins and I, with the guides, transferred the collecting- and camp-equipment and the foodstuffs to lumber-wagons and proceeded by lumber-road to up-river headquarters in a log-cabin about west of the Mt. Logan range. Thence we packed across to the high basin which lies under a steep escarpment below the summit-levels of the Mt. Logan system and after much preliminary botanizing moved our camp to a higher level and continued work there. The physiographic details of this mountain-area have already been discussed and illustrated elsewhere.[2] I need not go into them here. This trip and the one preceding it yielded, as we had thought, a great many important additions to the Shickshock flora. Of course the more or less ubiquitous alpines are there but there are many specialties. The cool slopes are most frequently carpeted with the beautiful *Salix vestita* (PLATE 699, FIG. 2), with an abundance of *Draba Allenii*, otherwise known only on Tabletop, or of the new and endemic *D. clivicola*, with *Barbarea orthoceras* Ledeb. of Siberia and northwestern America abundant. *Saxifraga cernua*, *S. rivularis* and the local *S. gaspensis* are frequent. In some of the chimneys *Arnica louiseana* Farr, of Lake Louise in the Canadian Rockies, abounds; in others there are endless variations of *Senecio resedifolius* Lessing, of the Bering Sea region and the Altai of Siberia. On some of the alpine meadows *Epilobium boreale* Hausskn. of Alaska, *Galium Brandegeei* Gray, of the

[1] Many incidents, some merely amusing, some almost tragic (like the overturning of one of the automobiles or the dropping of a horse through a weak corduroy) occurred. These can hardly be enumerated here. One, however, was so amusing that it must be told. Mackenzie, always dogmatic, promply resented the British government's allowing the French Canadians to speak anything but English. He refused to recognize any other language and would not concede the "*si'l vous plait*" and "*merci*" necessary for a smooth passage through the country. Griscom, early educated in France, spoke better than the natives and at Lefrancois', when dinner was nearly finished, he would quietly explain to the waitress that M. Mackenzie was terribly hungry (in fact a gourmand); and when large new helpings were set, to his amazement, at Mackenzie's place, the joker would calmly reach over and draw them to his own place.

[2] Collins and Fernald, *The Region of Mt. Logan, Gaspé Peninsula*. Geogr. Rev. xv. 84–91, with map and illustr. (1925).

Rocky Mountains, and *Luzula sudetica* (Willd.) DC., of arctic-alpine Europe occur. The pass between Mts. Fortin and Mattaouisse is distinguished by the arctic *Potentilla emarginata* Pursh and *Draba nivalis* Liljebl., at their first known stations south of northern Labrador, and the arctic *Carex norvegica* Retz. (*C. alpina* Swartz), also at its first station so far south. One ridge gave us the high-arctic *C. nardina* Fries, while the slope beneath bore the Rocky Mountain *Arenaria macrophylla;* bare crests had the Mt. Washington *Euphrasia Oakesii*, and on the tablelands two new species of *Antennaria* are noteworthy, the strictly endemic *A. Peasei*, and another, *A. vexillifera*, shared with the lime-barrens of western Newfoundland.

The Mt. Logan trip was as worth-while as Collins's and my introductory trip to Gaspé twenty years earlier. It was a fitting climax to our work together in that fascinating country. Our first season, at Bic, Carleton, on the Little Cascapedia and at Percé, yielded scores of species never before known south of the St. Lawrence or east of the Rocky Mountains or even the Pacific slope, with a good share new to science; the last trip was almost as productive. Although the Gaspé flora had been earlier explored by John Macoun, John A. Allen and some others, they left plenty to be discovered.[1] There is much more to be found; but with the self-sacrificing, financially unsupported and unremunerated but always skillful and cheerful coöperation of Collins a real start was made; without it little would have been accomplished. In 1903 Gaspé meant nothing to botanists[2]; by 1907 it had become famous as one of the botanically unique regions.

Throughout his active period of collecting Collins was primarily interested in Bryophytes. His collections and memoranda

[1] One Canadian botanist, prominent on account of his official position but given to "plain thinking and high drinking," repeatedly wondered at our finding so much about Percé. He went there every summer and "never could find anything of interest." One doesn't if he sits about the front porch or in the bar.

[2] Collins and I, with no grants in aid of our work, tried, without much success, to get back a small part of the expenses of our trips by selling uniform sets of the Gaspé material. A letter from St. Petersburg (now Leningrad) stated that their herbarium was already rich in Alaskan plants and that they needed no more! "Gaspé Peninsula, Quebec," meant nothing to their geographic sense. Specific and varietal names like *aleuticum*, *sitchense*, *alaskana*, *unalaschcensis*, *Menziesii*, *oregana*, *Douglasii*, *dawsonensis*, *Bongardiana*, *beeringiana*, *Romanzoffiana*, *Fischeriana*, *Chamissonis*, *mandjuricum*, *sajanensis*, *davuricum*, *sibiricum*, *kamtschaticum*, *Langsdorfii*, *Kotzebuei*, *Gmelini* and *atarica* sufficiently indicated the region.

on the mosses are invaluable. Of these, his chief interest for years, I am unable to write; but I constantly recognized the care with which he collected and the endless pains he took to have his data accurate. His own collections, presented to the Gray Herbarium, the Farlow Herbarium and the New England Botanical Club, will always be a reminder of his thoroughness. When, gradually dropping his activities through an increasing paralysis, he asked C. A. Weatherby and me to come to his apartments, to move his herbarium and library while he could yet oversee the transfer, he said with his accustomed cheerfulness: "I've had more than forty years of satisfactory exploration and botanizing. What more could one ask?", not mentioning the fact, that for four decades he had looked forward to his years of retirement, when he would concentrate upon his mosses. The paralysis of his hands, while his brain and eyes were still acute, prevented the delicate manipulation necessary for that work. And as we packed the books and papers, preliminary to his moving to a sanitarium, he retained his diaries because, with them before him, he could live over again his long period of active field-work.

The many photographs taken by Collins naturally include few of himself and those are in groups, taken when he had joined the party after setting his camera.[1] He did, however, delight in photographing plants in their natural habitats. It seems fitting, therefore, to add to this account of our field-work together a few of his photographs, some of scenes or incidents in our work together, some of plants rarely pictured. These I offer as a slight recognition of the genius of a sincere and wholly unselfish friend.

Appendix I.

Those who follow us may be glad to have a brief summary of the regions in eastern Quebec and the seasons of collecting by Collins and me. They are as follows, with the addition of other trips to eastern Quebec by myself or those exploring with me or influenced by Collins or me to visit the region.

[1] A characteristic picture of Collins on the alpine rope is in Fernald, *Botanizing on the Gaspé Sea-cliffs*, Harvard Alumni Bull. xxxiv. 419–425—repr. 1–7 (1932).

1902

E. F. Williams and M. L. Fernald, late July and early August: Matapedia, Bonaventure County; mouth of Bonaventure River and region of New Carlisle and Paspebiac to Port Daniel, Bonaventure County; Rivière du Loup, Temiscouata County; St. Alphonse, Saguenay River, Chicoutimi County.

1904

G. H. Richards and M. L. Fernald, late June: valley of Grande Rivière, Gaspé County.

M. L. Fernald, late June: Escuminac, Bonaventure County.

J. F. Collins and M. L. Fernald, July 11–13: Rivière du Loup and Cacouna, Temiscouata County. July 14: St. Alphonse, Saguenay River, Chicoutimi County, and Tadousac, Saguenay County. July 15–18: Bic and vicinity, Rimouski County. July 19: Matapedia, Bonaventure County. July 19 and 20: lower Nouvelle River and region of St. Jean l'Evangéliste, Bonaventure County. July 21 and 22: Carleton and Tracadigash Point, Bonaventure County.

J. F. Collins, M. L. Fernald and A. S. Pease, July 23–27: Carleton and vicinity, and Tracadigash Mountain, Bonaventure County. July 28 and 31 and August 1: New Richmond, Bonaventure County. July 29 and 30: Little Cascapedia River to slightly above the Forks. August 2 and 3: about mouth and lower islands of Bonaventure River. August 5, 6 and 8: Bonaventure River as far up as Mt. Baldé. August 11–15: region about Grande Rivière, Gaspé County. August 16: Grande Rivière to Percé. August 16–19: region of Percé, Gaspé County. August 20: Percé to Douglastown, Gaspé County, collecting slightly on southwest slopes of Percé Mountain and at Barachois. August 21 and 22: region of Douglastown and Seal Cove River. August 23: lower Douglastown River. August 24: Douglastown to Gaspé Basin. August 24–27: region of Gaspé, York, and lower Dartmouth River.

Fayette F. Forbes, July, August: Rivière du Loup to Ste. Anne des Monts.

1905

E. F. Williams, J. F. Collins, M. L. Fernald and others, July 5 and 6: Rivière du Loup and Cacouna, Temiscouata County. July 6–10: region of Bic, Rimouski County. July 12–15 (with Oakes and Blanche Ames) and July 17: valley of Grand Cascapedia River, Bonaventure County. July 16: region of New Richmond, Bonaventure County. July 18–21: region of Carleton and Tracadigash Point, Bonaventure County. July 23–26: region of Percé, Gaspé County, July 27: Percé to Gaspé Basin. July 28: region of Gaspé Basin. July 29: lower York River, Gaspé County.

J. F. Collins and M. L. Fernald, July 31: Mont Louis, Gaspé County. August 3–7: valley of Rivière Ste. Anne des Monts, up to the Forks, Gaspé County. August 8–15: Mt. Albert, Gaspé County. August 19–21: mouth of Rivière Ste. Anne des Monts to Ruisseau Castor, Gaspé County. August 24: Father Point, Rimouski County. August 24: Rivière du Loup.

1906

J. F. Collins and M. L. Fernald, July 3–8: region of Bic. July 10: Little Métis, Matane County. July 11 and 12: Little Métis to Ste.

Anne des Monts. July 13–17 and 30 and August 15–17: Rivière Ste. Anne des Monts, up to the Forks. July 18–28: Mt. Albert. July 31: Forks of Rivière Ste. Anne des Monts to Lac des Américains. August 1: Lac des Américains. August 2–13: northern end of Tabletop Mountain (Montagne de la Table), Gaspé County. August 14: Tabletop to Forks of Ste. Anne des Monts (Low's Trail).

1907

J. F. Collins, M. L. Fernald and Margaret H. Fernald, July and August: regions of Bic and of Percé.

1910

K. M. Wiegand and M. L. Fernald, late July and early August: Blanc Sablon, Straits of Belle Isle, eastern Saguenay County.

1912

M. L. Fernald, E. B. Bartram, Bayard Long and Harold St. John, July: Magdalen Islands.

M. L. Fernald, Bayard Long and Harold St. John, August: Magdalen Islands.

1914

Harold St. John, August: Brion Island and Bird Rock, Magdalen Islands.

1915

Harold St. John, June–September: Côte Nord eastward to Straits of Belle Isle.

1922

M. L. Fernald and A. S. Pease, July and early August: Lévis to Marsouin River, Gaspé County; Rivière Cap Chat and western section of Mt. Logan region, Matane County; Mt. Nicolasbert, Matane County.

1923

J. F. Collins, M. L. Fernald, A. S. Pease, K. K. Mackenzie, Ludlow Griscom, C. W. Dodge and L. B. Smith, July: Rivière Cap Chat and Mt. Logan region, Matane County; Rivière Ste. Anne des Monts and Mt. Albert, Gaspé County.

M. L. Fernald, C. W. Dodge and L. B. Smith, August: Rivière à Pierre to Lac Pleureuse, and northwestern region of Tabletop Mt., Gaspé County.

N. C. Fassett and H. K. Svenson, August: lower St. Lawrence and Baie des Chaleurs.

1925

K. M. Wiegand, M. L. Fernald, Bayard Long, F. A. Gilbert and Neil Hotchkiss, early September: Blanc Sablon and Blanc Sablon River to Bradore, and Mutton Bay, Saguenay County.

1927

S. L. Kelsey and P. H. Jordan, late July: north coast of Gaspé County.

1928

A. S. Pease, mid-July: Cap Rosier and vicinity, Gaspé County.

Arthur F. Allen, July and August: valley of Rivière Cap Chat and Mt. Logan region, Matane County.

1931

M. L. Fernald, C. A. Weatherby (and others), late June and early July: Levis to Cap Rosier, Gaspé County, thence to Matapedia, Bonaventure County, collecting at numerous stations, especially east of Marsouin River.

M. L. Fernald, C. A. Weatherby and G. Ledyard Stebbins, Jr., July 5: Mt. St. Pierre, Gaspé County.

M. L. Fernald (with daughter and son), September: River St. Lawrence from above Quebec to Ste. Anne de Beaupré and to Bellechasse County (especially Anse St. Vallier).

G. Ledyard Stebbins, Jr., July: Lower St. Lawrence and coast of Gaspé Peninsula.

1934

Walter H. Hodge and John H. Pierce, June and July: Shickshock Mountains of western Matane County (Mt. Blanc, Mt. Bayfield, etc.); Matane River.

Appendix II. Bibliography

The following papers resulted wholly or in large part from the work of Collins and me or of those influenced by us to explore in eastern Quebec. The majority of them would not have been written without Collins's constant aid in securing the material.

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A new Arabis from Rimouski County, Quebec. RHODORA, vii. 31, 32 (February, 1905).

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Appendix III. Types and Paratypes

Nearly 200 types or paratypes of new species, varieties or forms (mostly in the Gray Herbarium) were collected on the trips in Quebec by Collins and me or by those working with us or visiting the region through our direct influence, two-thirds of them collected by Collins or with his personal assistance. When his extensive collections of Gaspé mosses are properly studied the number will be greatly extended. In this enumeration the discoveries made in the same region by the energetic workers of the University of Montreal and their collaborators (Brother Marie-Victorin and others), the Institut Agricole d'Oka (Father Louis-Marie and others), and the Canadian government (Dr. Harrison F. Lewis and others) are omitted, as not directly inspired through Collins or those collaborating with him. Their inclusion would greatly extend the list of types, altogether a very remarkable series to come in the 20th century out of one restricted area of temperate and early-settled eastern North America.

Cladonia invisa C. A. Robbins in A. F. Allen in Rhodora, xxxii. 93 (1930). Type from Cap Chat River, Matane County.

Cystopteris fragilis, var. laurentiana Weatherby in Rhodora, xxviii. 129 (1926). Type from Bic, Rimouski County.

Thelypteris fragrans, var. Hookeriana Fernald in Rhodora, xxv 3 (1923); basis of *Dryopteris fragrans*, var. *Hookeriana* (Fernald) A. R. Prince ex Weatherby in Am. Fern. Journ. xxvi. 62 (1936). Type from River Ste. Anne des Monts, Gaspé County. Apparently identical with *Nephrodium fragrans*, var. *remotiusculum* Komarov in Fedde, Rep. Spec. Nov. ix. 394 (1911); basis of Dryopteris fragrans, var. remotiuscula Komarov, Fl. U. R. S. S. i. 38 (1934).

Athyrium alpestre, var. gaspense Fernald in Rhodora, xxx. 48, pl. 168. Type from Mt. Dunraven, Tabletop Mountain, Gaspé County.

Athyrium angustum, var. laurentianum Butters in Rhodora, xix. 194 (1917). Type from Tabletop Mountain, Gaspé County.

Athyrium angustum, forma confertum Butters in Rhodora, xix. 195 (1917). Type from Tabletop Mountain, Gaspé County.

Botrychium virginianum, var. laurentianum Butters in Rhodora, xix. 209 (1917). Type from Bic, Rimouski County.

Lycopodium annotinum, var. acrifolium Fernald in Rhodora, xvii. 124 (1915). Paratype from Magdalen Islands.

Equisetum palustre, var. nigridens St. John, Victoria Memorial Mus. Mem. cxxiv. 42 (1922). Type from Romaine, Saguenay County.

Abies balsamea, var. phanerolepis Fernald in Rhodora, xi. 203 (1909). Type from Percé, Gaspé County.

Juniperus communis, var. megistocarpa Fernald & St. John in Proc. Bost. Soc. Nat. Hist. xxxvi. 58 (1921). Paratypes from Magdalen Islands.

Potamogeton moniliformis St. John in Rhodora, xviii. 130 (1916). Type from Blanc Sablon River, Saguenay County. Later identified by St. John with P. vaginatus Turcz. in Bull. Soc. Nat. Moscou, xi. 102 (1838), xxvii. 65 (1854) and Fl. Baical-Dahur. ii. 162 (1856).

Potamogeton pusillus, var. colpophilus Fernald in Mem. Amer. Acad. xv. 90, pl. 20, figs. *d* and *10*, and pl. 35, fig. 5 (1932); basis of P. Berchtoldi, var. colpophilus Fernald in Rhodora, xlii. 246 (1940). Type from mouth of Dartmouth River, Gaspé County.

Potamogeton microstachys, var. subellipticus Fernald in Rhodora, xxxii. 82 (1930); basis of P. tenuifolius, var. subellipticus Fernald in Rhodora, xxxiii. 211 (1931). Type from Magdalen Islands.

Scheuchzeria palustris, var. americana Fernald in Rhodora, xxiii. 178 (1923). Paratype from Tabletop Mountain, Gaspé County.

Sagittaria cuneata, forma hemicycla Fernald in Rhodora, xxxviii. 74 (1936). Type from St. Augustin, Portneuf County.

Bromus Dudleyi Fernald in Rhodora, xxxii. 63, pl. 196, figs. 1–3 (1930). Paratypes from Gaspé and Bonaventure Counties, etc.

Puccinellia coarctata Fernald & Weatherby in Rhodora, xviii. 13, pl. 115, figs. 28–32 (1916). Paratypes from Brest and Romaine, Saguenay County.

Puccinellia laurentiana Fernald & Weatherby in Rhodora, xviii. 14, pl. 115, figs. 33–38 (1916). Type from Carleton, Bonaventure County.

Puccinellia macra Fernald & Weatherby in Rhodora, xviii. 15, pl. 115, figs. 39–43 (1916). Type from Bonaventure Island, Gaspé County.

PUCCINELLIA LUCIDA Fernald & Weatherby in RHODORA, xviii. 16, pl. 116, figs. 54–58 (1916). TYPE from Cacouna, Temiscouata County.

POA FERNALDIANA Nannfeld in Symb. Bot. Upsal. v. 50, figs. (1935). PARATYPE from Tabletop Mountain, Gaspé County.

POA GASPENSIS Fernald in RHODORA, xxxi. 46 (1929). TYPE from River Ste. Anne des Monts, Gaspé County.

POA SALTUENSIS Fernald & Wiegand in RHODORA, xx. 122 (1918). TYPE from River Ste. Anne des Monts, Gaspé County.

POA SALTUENSIS, var. MICROLEPIS Fernald & Wiegand in RHODORA, xx. 124 (1918). PARATYPES from Gaspé and Bonaventure Counties.

CATABROSA AQUATICA, var. LAURENTIANA Fernald in RHODORA, xxxv. 137, pl. 242, figs. 3 and 4 (1933). TYPE from Capuchins, Matane County.

AVENA STRIATA, forma ALBICANS Fernald in RHODORA, vii. 244 (1905); basis of *Melica striata*, forma *albicans* Fernald in RHODORA, x. 47 (1908), and of SCHIZACHNE PURPURASCENS (Torr.) Swallen, forma **albicans** (Fernald), comb. nov. TYPE from Mt. Albert, Gaspé County.

AGROPYRON CANINUM, var. TENERUM, forma FERNALDII Pease & Moore in RHODORA, xii. 73 (1910); basis of A. TRACHYCAULUM, var. FERNALDII (Pease & Moore) Malte in Ann. Rep., 1930, Nat. Mus. Can. 46 (1932). PARATYPE from Percé, Gaspé County.

AGROSTIS GEMINATA, forma EXARISTATA Fernald in RHODORA, xxxv. 211 (1933). TYPE from North Fork of Madeleine River, Gaspé County.

CALAMAGROSTIS LAPPONICA, var. BREVIPILIS Stebbins in RHODORA, xxxii. 56 (1930). TYPE from Blanc Sablon, Saguenay County.

TRISETUM SPICATUM, var. PILOSIGLUME Fernald in RHODORA, xviii. 195 (1916). PARATYPES from Saguenay, Gaspé and Rimouski Counties.

ZIZANIA AQUATICA, var. BREVIS Fassett in RHODORA, xxvi. 157 (1924). TYPE from Levis, Levis County.

ELEOCHARIS UNIGLUMIS, var. HALOPHILA Fernald & Brackett in RHODORA, xxxi. 72, pl. 183 (1929); basis of E. HALOPHILA Fernald & Brackett in RHODORA, xxxvii. 395, pl. 387, figs. 12–14 (1935). TYPE from mouth of Bonaventure River, Bonaventure County.

ERIOPHORUM SPISSUM Fernald in RHODORA, xxvii. 209 (1925). PARATYPES from Saguenay and Gaspé Counties.

ERIOPHORUM TENELLUM, var. MONTICOLA Fernald in RHODORA, x. 47 (1908). TYPE from Tabletop Mt., Gaspé County.

CAREX GLAREOSA, var. AMPHIGENA Fernald in RHODORA, viii. 47 (1906); basis of C. BIPARTITA, var. AMPHIGENA (Fernald) Polunin, Bot. Can. E. Arctic. pt. i. 115 (1940). TYPE from Escuminac, Bonaventure County.

CAREX DEWEYANA, var. COLLECTANEA Fernald in RHODORA, xv. 93 (1913). TYPE from Grand Cascapedia River, Bonaventure County.

CAREX GARBERI, var. BIFARIA Fernald in RHODORA, xxxvii. 255, pl. 360, figs. 11 and 12 (1935). TYPE from River Ste. Anne des Monts, Gaspé County.

CAREX CLIVICOLA Fernald & Weatherby in RHODORA, xxxiii. 233 (1931). TYPE from Mt. St. Pierre, Gaspé County.

CAREX LAXIFLORA, var. LEPTONERVIA Fernald in RHODORA, viii. 184 (1906); basis of C. LEPTONERVIA Fernald in RHODORA, xvi. 214 (1914). PARATYPE from Mt. Albert, Gaspé County.

CAREX ORMOSTACHYA Wiegand in RHODORA, xxiv. 196 (1922). PARATYPE from Bic, Rimouski County.

CAREX FLAVA, var. GASPENSIS Fernald in RHODORA, viii. 200 (1906). TYPE from Bonaventure River, Bonaventure County.

Carex vesicaria, var. laurentiana Fernald in Rhodora, xxxv. 232 (1933). Paratypes from Saguenay County and Magdalen Islands.

Carex rostrata × saxatilis, var. miliaris, n. hybr., Fernald in Rhodora, x. 48 (1908). Type from Tabletop Mt., Gaspé County.

Juncus bufonius, var. halophilus Buchenau & Fernald in Rhodora, vi. 39 (1904). Type from Rivière du Loup, Temiscouata County.

Juncus balticus, var. stenocarpus Buchenau & Fernald in Buchenau in Engler, Pflanzenr. iv[36]. 141 (1906). Type from mouth of Bonaventure River, Bonaventure County.

Juncus balticus, var. melanogenus Fernald & Wiegand in Rhodora, xiv. 35 (1912). Type from Bradore, Saguenay County.

Allium Schoenoprasum, var. laurentianum Fernald in Rhodora, xxviii. 167 (1926). Paratype from Matapedia, Bonaventure County.

Streptopus oreopolus Fernald in Rhodora, viii. 70 (1906); basis of S. amplexifolius, var. oreopolus (Fernald) Fassett in Rhodora, xxxvii. 99 (1935). Type from Mt. Albert, Gaspé County.

Habenaria obtusata, var. collectanea Fernald in Rhodora, xxviii. 175 (1926). Paratypes from Blanc Sablon, Goynish and Mingan, Saguenay County.

Salix vestita, var. psilophylla Fernald & St. John in St. John, Victoria Memorial Mus. Mem. cxxiv. 44 (1922). Type from Eskimo Island, Mingan, Saguenay County.

Salix anglorum, var. kophophylla Schneider in Bot. Gaz. lxvi. 130 (1918). Paratypes from Mt. Albert, Gaspé County.

Salix anglorum, var. araioclada Schneider in Bot. Gaz. lxvi. 133 (1918). Type from Mt. Albert, Gaspé County.

Salix anglorum, var. antiplasta Schneider in Bot. Gaz. lxvi. 134 (1918). Type from Mt. Albert, Gaspé County.

Salix chlorolepis Fernald in Rhodora, vii. 186 (1905). Type from Mt. Albert, Gaspé County.

Salix chlorolepis, var. antimima Schneider in Bot. Gaz. lxvi. 339 (1918); basis of S. brachycarpa, var. antimima (Schneider) Raup in Rhodora, xxxiii. 243 (1931). Type from Mt. Albert, Gaspé County.

Salix cordifolia, var. intonsa Fernald in Rhodora, xxviii. 185 (1926). Paratypes from Blanc Sablon, Saguenay County and from Tabletop Mountain, Gaspé County.

Salix cordifolia, var. eucycla Fernald in Rhodora, xxviii. 187 (1926). Paratypes from Archipel Ouapitagone, Saguenay County.

Salix cordifolia, var. tonsa Fernald in Rhodora, xxviii. 187 (1926). Paratype from Mt. Mattaouisse, Matane County.

Salix fuscescens, var. hebecarpa Fernald in Rhodora, ix. 224 (1907); basis of S. hebecarpa Fernald in Rhodora, xxvi. 123 (1924). Type from Mt. Albert, Gaspé County.

Salix rostrata, var. capreifolia Fernald in Rhodora, xvi. 177 (1914); basis of S. Bebbiana, var. capreifolia Fernald in Rhodora, xxvi. 123 (1924). Type from Tourelle, Gaspé County.

Salix rostrata, var. luxurians Fernald in Rhodora, ix. 223 (1907); basis of S. Bebbiana, var. luxurians Fernald in Rhodora, xxvi. 122 (1924). Type from Bic, Rimouski County.

Salix laurentiana Fernald in Rhodora, ix. 221 (1907). Type from Les Méchins, Matane County (formerly Gaspé County).

Salix paraleuca Fernald in Rhodora, xvi. 175 (1914). Type from Grand River, Gaspé County.

Salix stenocarpa Fernald in Rhodora, xvi. 176 (1914). Type from Matapedia, Bonaventure County.

Salix obtusata Fernald in Rhodora, ix. 223 (1907). Type from River Ste. Anne des Monts, Gaspé County.

Salix glaucophylloides Fernald in Rhodora, xvi. 173 (1914). Paratypes from Gaspé and Bonaventure Counties.

Betula alba, var. elobata Fernald in Rhodora, xv. 169 (1913); basis of B. papyrifera, var. elobata (Fernald) Sargent in Journ. Arn. Arb. i. 63 (1919). Type from Mt. Albert, Gaspé County.

Betula pumila, var. renifolia Fernald in Rhodora, xxviii. 190 (1926). Type from Mutton Bay, Saguenay County.

Comandra Richardsiana Fernald in Rhodora, vii. 48 (1905). Type from Grand River, Gaspé County.

Polygonum achoreum Blake in Rhodora, xix. 232 (1917). Paratype from York, Gaspé County.

Polygonum Hydropiper L., var. projectum Stanford in Rhodora, xxix. 86 (1927). Paratypes from Magdalen Islands, etc.

Arenaria cylindrocarpa Fernald in Rhodora, xvi. 43 (1914). Type from Mt. Albert, Gaspé County. Better referred to A. humifusa Wahlenb. Fl. Lapp. 129 (1812).

Arenaria verna, var. propinqua, forma epilis Fernald in Rhodora, viii. 32 (1906); basis of *A. verna*, var. *pubescens*, forma *epilis* Fernald in Rhodora, xxi. 22 (1919) and of A. rubella, forma epilis (Fernald) Polunin in Rhodora, xli. 39 (1939). Type from Percé, Gaspé County.

Arenaria litorea Fernald in Rhodora, viii. 33 (1906). Type from Carleton, Bonaventure County. Apparently identical with A. dawsonensis Britton in Bull. N. Y. Bot. Gard. ii. 169 (1901).

Arenaria marcescens Fernald in Rhodora, xxi. 15 (1919). Type from Mt. Albert, Gaspé County.

Stellaria calycantha, var. laurentiana Fernald in Rhodora, xlii. 254 (1940). Type from Christie, Gaspé County.

Ranunculus subrigidus W. B. Drew in Rhodora, xxxviii. 39, pl. 406, figs. 1, 4 and 10 (1936). Type from York River, Gaspé County.

Ranunculus Purshii, var. prolificus Fernald in Rhodora, xix. 135 (1917); basis of R. Gmelini, var. prolificus (Fernald) Hara in Rhodora, xli. 386 (1939). Type from Magdalen Islands.

Ranunculus pygmaeus, var. petiolulatus Fernald in Rhodora, xix. 137 (1917). Type from Mt. Albert, Gaspé County. According to Dr. M. P. Porsild in Arbejder fra Danske Arkt. Sta. Disko, no. 13: 42–44 (1930), this is the rare plant of Greenland, R. pygmaeus, var. Langeana Nathorst in Öfv. K. Vet. Akad. Förh., 1884, no. 1: 46 (1884).

Ranunculus Allenii Robinson in Rhodora, vii. 220 (1905). Type from Mt. Albert, Gaspé County.

Ranunculus abortivus, var. acrolasius Fernald in Rhodora, xl. 418, pl. 519, figs. 1 and 2 (1938). Paratypes from Saguenay, Gaspé and Matane Counties.

Anemone multifida, forma polysepala Fernald in Rhodora, xix. 141 (1917). Type from Grand River, Gaspé County.

Anemone multifida, var. Richardsiana Fernald in Rhodora, xix. 141 (1917). Type from Grand River, Gaspé County.

Anemone multifida, var. Richardsiana, forma leucantha Fernald in Rhodora, xix. 141 (1917). Type from Grand River, Gaspé County.

Anemone riparia, forma rhodantha Fernald in Rhodora, xix. 139 (1917). Type from Grand River, Gaspé County.

Anemone riparia, forma inconspicua Fernald in Rhodora, xix. 140 (1917). Type from Percé, Gaspé County.

Thalictrum polygamum, var. hebecarpum Fernald in Rhodora, x. 49 (1908). Type from Rivière du Loup, Temiscouata County.

Draba Peasei Fernald in Rhodora, xxxvi. 298, pl. 295, figs. 4–7 (1934). Type from Cape Rosier, Gaspé County.

Draba Allenii Fernald in Rhodora, xxxvi. 289, pl. 292 (1934). Type from Fernald Pass, Mt. Mattaouisse, Matane County.

Draba norvegica, var. pleiophylla Fernald in Rhodora, xxxvi. 324, pl. 302 (1934). Paratypes from Blanc Sablon, Saguenay County.

Draba clivicola Fernald in Rhodora, xxxvi. 326, pl. 303 (1934). Type from Big Chimney, Mt. Mattaouisse, Matane County.

Draba incana, var. conica O. E. Schulz in Engler, Pflanzenr. iv[105]. 285 (1927). Type from Percé, Gaspé County.

Draba arabisans, var. orthocarpa Fernald & Knowlton in Rhodora, vii. 66, pl. 60, figs. 10 and 11 (1905); basis of D. glabella, var. orthocarpa (Fernald & Knowlton) Fernald in Rhodora, xxxvi. 336, pl. 310 (1934). Type from Bic, Rimouski County.

Draba megasperma Fernald & Knowlton in Rhodora, vii. 65, pl. 60, figs. 6–8 (1905); basis of D. glabella, var. megasperma (Fernald & Knowlton) Fernald in Rhodora, xxxvi. pl. 311 and 312 (1934). Type from Paspebiac, Bonaventure County.

Draba pycnosperma Fernald & Knowlton in Rhodora, vii. 67, pl. 60, figs. 13–15 (1905). Type from Percé, Gaspé County.

Arabis pycnocarpa Hopkins in Rhodora, xxxix. 113, pl. 458, figs. 1 and 2 (1937); basis of A. hirsuta, var. pycnocarpa (Hopkins) Rollins in Rhodora, xliii. 318 (1941). Type from Nouvelle, Bonaventure County.

Arabis pycnocarpa, var. reducta Hopkins in Rhodora, xxxix. 117 (1937). Type from Carleton, Bonaventure County.

Arabis divaricarpa, var. stenocarpa Hopkins in Rhodora, xxxix. 133 (1937). Type from Bic, Rimouski County.

Arabis Collinsii Fernald in Rhodora, vii. 32 (1905); basis of A. Holboellii, var. Collinsii (Fernald) Rollins in Rhodora, xliii. 445 (1941). Type from Bic, Rimouski County.

Drosera rotundifolia, var. comosa Fernald in Rhodora, vii. 9 (1925). Type from Grand River, Gaspé County.

Saxifraga cernua, var. latibracteata Fernald & Weatherby in Rhodora, xxxiii. 234 (1931). Type from Tabletop Mountain, Gaspé County.

Saxifraga gaspensis Fernald in Rhodora, xix. 141 (1917). Type from Tabletop Mountain, Gaspé County.

Ribes oxyacanthoides, var. calcicola Fernald in Rhodora, vii. 155 (1905); basis of R. hirtellum, var. calcicola Fernald in Rhodora, xiii. 76 (1911). Type from mouth of Bonaventure River, Bonaventure County.

Amelanchier sanguinea, var. gaspensis Wiegand in Rhodora, xiv. 139 (1912); basis of A. gaspensis (Wieg.) Fernald & Weatherby in Rhodora, xxxiii. 235 (1931). Type from Bonaventure River, Bonaventure County.

Amelanchier Fernaldii Wiegand in Rhodora, xxii. 149 (1920). Type from Magdalen Islands.

Rubus idaeus, var. strigosus, forma tonsus Fernald, in Rhodora, xxi. 96 (1919). Type from Mt. Albert, Gaspé County.

Rubus idaeus, var. eucyclus Fernald & Weatherby in Rhodora xxxiii. 237 (1931). Type from Ruisseau a Rebour, Gaspé County.

Fragaria multicipita Fernald in Rhodora, x. 49 (1908). Type from River Ste. Anne des Monts, Gaspé County.

Geum pulchrum Fernald in Rhodora, viii. 11 (1906). Type from Bic, Rimouski County.

Rosa Williamsii Fernald in Rhodora, xx. 95 (1918). Type from Bic, Rimouski County.

Astragalus scrupulicola Fernald & Weatherby in Rhodora, xxxiii. 238, fig. 1 (1931). Type from Mt. St. Pierre, Gaspé County.

Atelophragma Fernaldi Rydberg in Bull. Torr. Bot. Cl. lv. 126 (1928); basis of Astragalus Fernaldi (Rydb.) H. F. Lewis in Can. Field Nat. xlvi. 36 (1932). Type from Blanc Sablon, Saguenay County.

Astragalus gaspensis Rousseau in Contrib. Lab. Bot. Univ. Montréal, no. 24: 51, figs. 15 and 16 (1933); basis of A. frigidus, var. gaspensis (Rousseau) Fernald in Rhodora, xxxix. 313, pl. 472, figs. 9–13 (1937). Topotype from Little Cascapedia River, Bonaventure County.

Oxytropis gaspensis Fernald & Kelsey in Rhodora, xxx. 123 (1928). Type from Mt. St. Pierre, Gaspé County.

Callitriche anceps Fernald in Rhodora, x. 51 (1908). Type from Lac des Americaines, Tabletop Mountain, Gaspé County.

Empetrum atropurpureum Fernald & Wiegand in Rhodora, xv. 214 (1913). Paratype from Magdalen Islands.

Empetrum Eamesii Fernald & Wiegand in Rhodora, xv. 215 (1913). Paratype from Blanc Sablon, Saguenay County.

Viola cucullata, var. microtitis Brainerd in Rhodora, xv. 112 (1913). Paratype from Magdalen Islands.

Viola adunca, var. glabra Brainerd in Rhodora, xv. 109 (1913). Type from Carleton, Bonaventure County.

Epilobium palustre, var. longirameum Fernald & Wiegand in Rhodora, xiii. 188 (1911). Type from Blanc Sablon, Saguenay County.

Epilobium densum, var. nesophilum Fernald in Rhodora, xx. 29 (1918); basis of E. nesophilum Fernald in Rhodora, xxvii. 32 (1925). Type from Magdalen Islands.

Epilobium glandulosum, var. cardiophyllum Fernald in Rhodora, xx. 35 (1918). Type from Low's Trail, Gaspé County.

Epilobium glandulosum, var. brionense Fernald in Rhodora, xx. 35 (1918). Type from Magdalen Islands.

Epilobium glandulosum, var. ecomosum Fassett in Rhodora, xxvi. 48 (1924); basis of E. ecomosum (Fassett) Fernald in Rhodora, xxxiv. 39 (1932). Type from St. Vallier, Bellechasse County.

Myriophyllum exalbescens Fernald in Rhodora, xxi. 120 (1919). Type from York River, Gaspé County.

Myriophyllum magdalenense Fernald in Rhodora, xxi. 123 (1919) and xxvi. 198 (1924). Type from Magdalen Islands.

Sanicula marilandica, var. borealis Fernald in Rhodora, xxviii. 220 (1926). Paratypes from Gaspé and Bonaventure Counties.

Angelica laurentiana Fernald in Rhodora, xxviii. 222 (1926). Paratype from Boishébert, Saguenay County.

Cornus canadensis, forma rosea Fernald in Rhodora, xliii. 156 (1941). Type from Mt. Mattaouisse, Matane County. Apparently inseparable from *Chamaepericlymenum canadense*, forma *purpurascens* Miyabe & Tatewaki in Trans. Sapporo Nat. Hist. Soc. xv. 43 (1937); basis of Cornus canadensis, forma purpurascens (Miyabe & Tatewaki) Hara in Rhodora, xliv. 20 (1942).

Arctostaphylos Uva-ursi, var. coactilis Fernald & Macbride in Rhodora, xvi. 212 (1914). Paratype from Magdalen Islands.

Vaccinium nubigenum Fernald in Rhodora, x. 53 (1908). Type from Mt. Albert, Gaspé County.

Primula farinosa, var. macropoda Fernald in Rhodora, ix. 16 (1907); basis of P. laurentiana Fernald in Rhodora, xxx. 68, pl. 169 (1928). Type from Bic, Rimouski County.

Androsace septentrionalis, var. robusta St. John, Victoria Memorial Mus. Mem. cxxiv. 48 (1922). Type from Ile Ste. Geneviève, Mingan, Saguenay County.

Statice labradorica, var. submutica Blake in Rhodora, xix. 7 (1917). Type from Mt. Albert, Gaspé County.

Lomatogonium rotatum, forma ovalifolium Fernald in Rhodora, xxi. 197 (1919). Type from Magdalen Islands.

Cynoglossum boreale Fernald in Rhodora, vii. 250 (1905). Type from Little Cascapedia River, Bonaventure County.

Scutellaria lateriflora forma rhodantha Fernald in Rhodora, xxiii. 86 (1921). Type from Dartmouth River, Gaspé County.

Prunella vulgaris, var. lanceolata, forma candida Fernald in Rhodora, xv. 184 (1913). Paratype from River Ste. Anne des Monts, Gaspé County.

Mimulus ringens, var. colpophilus Fernald in Rhodora, xxxiv. 119 (1932). Type from mouth of Chaudière River, Levis County.

Gratiola lutea, var. glaberrima Fernald in Rhodora, xxxiv. 149 (1932). Type from Anse St. Vallier, Bellechasse County.

Euphrasia Oakesii, forma lilacina Fernald & Wiegand in Rhodora, xvii. 185 (1915). Type from Blanc Sablon, Saguenay County.

Euphrasia purpurea, forma candida Fernald & Wiegand in Rhodora, xvii. 187 (1915). Type from Magdalen Island.

Euphrasia purpurea, var. Randii, forma albiflora Fernald & Wiegand in Rhodora, xvii. 188 (1915). Paratype from Magdalen Islands.

Euphrasia disjuncta Fernald & Wiegand in Rhodora, xvii. 190 (1915). Paratypes from eastern Saguenay County.

Rhinanthus oblongifolius Fernald in Rhodora, ix. 24 (1907). Type from Tabletop Mt., Gaspé County.

Plantago juncoides, var. laurentiana Fernald in Rhodora, xxvii. 102, pl. 150, fig. 5 (1925). Paratype from Magdalen Islands.

Plantago oliganthos, var. fallax Fernald in Rhodora, xxvii. 103, pl. 150, fig. 7 (1925). Paratypes from Carleton, Bonaventure County, etc.

Galium brevipes Fernald & Wiegand in Rhodora, xii. 78 (1910). Type from Grand River, Gaspé County.

Galium trifidum, var. halophilum Fernald & Wiegand in Rhodora, xii. 78 (1910). Type from mouth of Bonaventure River, Bonaventure County.

SAMBUCUS PUBENS, forma CALVA Fernald in RHODORA, xxxv. 310 (1933). TYPE from Fernald Pass, between Mts. Mattaouisse, Fortin and Logan, Matane County.

EUPATORIUM PERFOLIATUM, var. COLPOPHILUM Fernald & Griscom in RHODORA, xxxvii. 182 (1935). TYPE from Berthier, Montmagny County.

SOLIDAGO HISPIDA, var. DISJUNCTA Fernald in RHODORA, xvii. 2 (1915). PARATYPE from Tabletop Mountain, Gaspé County.

SOLIDAGO CHLOROLEPIS Fernald in RHODORA, xvii. 3 (1915). TYPE from Mt. Albert, Gaspé County.

SOLIDAGO MULTIRADIATA, var. PARVICEPS Fernald in RHODORA, xxxviii. 202, pl. 417, fig. 2 (1936). TYPE from near Cape Rosier, Gaspé County.

SOLIDAGO MENSALIS Fernald in RHODORA, xvii. 4 (1915). TYPE from Tabletop Mountain, Gaspé County.

SOLIDAGO CHRYSOLEPIS Fernald in Ottawa Nat. xix. 168 (1905). TYPE from River Ste. Anne des Monts, Gaspé County.

SOLIDAGO LEPIDA, var. MOLINA Fernald in RHODORA, xvii. 9 (1915). TYPE from Percé, Gaspé County.

SOLIDAGO LEPIDA, var. FALLAX Fernald in RHODORA, xvii. 9 (1915). PARATYPES from Gaspé and Bonaventure Counties.

SOLIDAGO GRAMINIFOLIA, var. SEPTENTRIONALIS Fernald in RHODORA, xvii. 12 (1915). PARATYPE from St. John (Douglastown) River, Gaspé County.

ASTER FOLIACEUS, var. ARCUANS Fernald in RHODORA, xvii. 14 (1915). TYPE from St. John (Douglastown) River, Gaspé County.

ASTER FOLIACEUS, var. CRENIFOLIUS Fernald in RHODORA, xvii. 15 (1915). TYPE from Grand River, Gaspé County.

ASTER FOLIACEUS, var. SUBPETIOLATUS Fernald in RHODORA, xvii. 15 (1915). TYPE from Grand River, Gaspé County.

ASTER PUNICEUS, var. PERLONGUS Fernald in RHODORA, xvii. 17 (1915). TYPE from Tabletop Mountain, Gaspé County.

ASTER PUNICEUS, var. FIRMUS, forma RUFESCENS Fassett in RHODORA, xxvii. 187 (1925). TYPE from Cap-Rouge, Quebec County.

ASTER LAURENTIANUS Fernald in RHODORA, xvi. 59, pl. 109, figs. 1–3 (1914). PARATYPE from Magdalen Islands.

ASTER LAURENTIANUS, var. MAGDALENENSIS Fernald in RHODORA, xvi. 59, pl. 119, fig. 4 (1914). TYPE from Magdalen Islands.

ERIGERON RAMOSUS, var. SEPTENTRIONALIS Fernald & Wiegand in RHODORA, xv. 61 (1913). PARATYPE from Douglastown, Gaspé County.

ERIGERON ACRIS, var. OLIGOCEPHALUS Fernald & Wiegand in RHODORA, xii. 226 (1910); basis of E. ELATUS, var. OLIGOCEPHALUS (Fernald & Wiegand) Fernald in RHODORA, xl. 344, pl. 505, figs. 1 and 2 (1938). TYPE from Blanc Sablon, Saguenay County.

ANTENNARIA VEXILLIFERA Fernald in RHODORA, xxvi. 99, pl. 142, fig. 4 (1924). TYPE from Tableland between Mts. Mattaouisse and Collins, Matane County.

ANTENNARIA PEASEI Fernald in RHODORA, xxvi. 101, pl. 142, fig. 11 (1924). TYPE from Mt. Logan, Matane County.

ANTENNARIA SUBVISCOSA Fernald in RHODORA, xvi. 131 (1914). TYPE from Bic, Rimouski County.

ANTENNARIA SPATHULATA, var. CONTINENTIS Fernald & St. John in St. John, Victoria Memorial Mus. Mem. cxxiv. 55 (1922). TYPE from Natishkwan, Saguenay County.

Antennaria appendiculata Fernald in Rhodora, xxiii. 295 (1922). Type from the Grand River, Gaspé County.

Antennaria glabrifolia Fernald in St. John, Victoria Memorial Mus. Mem. cxxiv. 55 (1922). Type from Natishkwan, Saguenay County.

Antennaria neodioica, var. gaspensis Fernald in Ottawa Nat. xix. 156 (1905); basis of A. gaspensis Fernald in Rhodora, xxxv. 341, pl. 268, figs. at right (1933). Type from Percé, Gaspé County.

Antennaria neodioica, var. interjecta Fernald in Rhodora, xxxv. 342 (1933). Type from Bic, Rimouski County.

Bidens cernua, var. oligodonta Fernald & St. John in Rhodora xvii. 25 (1915). Type from Magdalen Islands.

Bidens hyperborea, var. gaspensis Fernald in Rhodora, xx. 150 (1918). Type from mouth of Dartmouth River, Gaspé County.

Bidens hyperborea, var. Svensoni Fassett in Rhodora, xxvii. 170 (1925). Type from Rimouski, Rimouski County.

Bidens hyperborea, var. laurentiana Fassett in Rhodora, xxvii. 169 (1925). Type from Cap-Rouge, Quebec County.

Bidens heterodoxa, var. orthodoxa Fernald & St. John in Rhodora, xvii. 24 (1915). Type from Magdalen Islands.

Bidens heterodoxa, var. atheistica Fernald in Rhodora, xxxiv. 116 (1932); basis of B. infirma Fernald in Rhodora, xl. 351, pl. 507, figs. 1–3 (1938). Type from Anse St. Vallier, Bellechasse County.

Bidens frondosa, var. stenodonta Fernald & St. John in Rhodora, xvii. 22 (1915). Paratype from Magdalen Islands.

Senecio pseudaureus, forma ecoronatus Fernald in Rhodora, xxx. 225 (1928). Type from North Fork of Madeleine River, Gaspé County.

Senecio aureus × Balsamitae, n. hybr. Greenman in Rhodora, x. 69 (1908). Type from Bonaventure River, Bonaventure County.

Senecio gaspensis Greenm. in Ann. Mo. Bot. Gard. iii. 138 (1916). Type from Percé, Gaspé County.

Senecio Balsamitae, var. firmifolius Greenm. in Rhodora, vii. 244 (1905); basis of S. pauperculus, var. firmifolius Greenm. in Ann. Mo. Bot. Gard. iii. 166 (1916). Type from Percé, Gaspé County.

Arnica chionopappa Fernald in Rhodora, vii. 148 (1905). Type from Grand River, Gaspé County.

Arnica gaspensis Fernald in Rhodora, vii. 149 (1905). Type from Cap Tourelle, Gaspé County.

Arnica Griscomi Fernald in Rhodora, xxvi. 105, pl. 143, fig. 7 (1924). Type from Mt. Mattaouisse, Gaspé County. Seems specifically inseparable from A. louiseana Farr in Ottawa Nat. xx. 109 (1906).

Cnicus muticus, var. monticola Fernald in Ottawa Nat. xix. 166 (1905); basis of Cirsium muticum, var. monticola Fernald in Rhodora, ix. 28 (1907). Type from Mt. Albert, Gaspé County.

Agoseris gaspensis Fernald in Rhodora, xxvi. 125 (1924). Type from Tabletop Mountain, Gaspé County.

Taraxacum Longii Fernald in Rhodora, xxxv. 379, pl. 273, figs. 1–4 (1933). Paratype from Grand River, Gaspé County.

Taraxacum ambigens Fernald in Rhodora, xxxv. 376, pl. 271, figs. 5–8 (1933). Paratypes from Blanc Sablon, Ste. Anne des Monts River and Grand Cascapedia River.

Taraxacum ambigens, var. fultior Fernald in Rhodora, xxxv. 376, pl. 271, fig. 9 (1933). Paratypes from Fernald Basin, Matane County.

Hieracium canadense, var. hirtirameum Fernald in Rhodora, xvii. 19 (1915). Paratypes from Bonaventure County.

Hieracium scabrum, var. tonsum Fernald & St. John in Rhodora, xvi. 182 (1914). Type from Magdalen Islands.

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New scientific names are printed in full-face type

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CONTRIBUTIONS FROM THE GRAY HERBARIUM
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I. STUDIES OF THE ICACINACEAE IV.[1]

(Plates 1–3)

CONSIDERATIONS OF THE NEW WORLD GENERA

RICHARD A. HOWARD

The *Icacinaceae* is a poorly understood family of general tropical distribution. Since Miers separated the *Icacinaceae* from the *Olacaceae* in 1851 the family has had few general studies. Very little attention has been given to the New World genera and the existing treatments of these genera are unsatisfactory. When a general morphological study of this family was begun it was found that the taxonomic treatments then available were not to be trusted. For that reason a systematic revision of the family was started but had to be limited to the New World genera, for the present, because of the unavailability of much of the critical material and many of the type specimens.

There are twelve recognized genera in the Western Hemisphere, all falling into the *Icacineae* as established by Engler in the Natürlichen Pflanzenfamilien (1893). These genera do not constitute a coherent or natural division of the family. It is recognized that the group is an artificial one and it is considered in this study only as a matter of convenience for students of the New World floras.

During the course of this study I have seen material from the following herbaria: Arnold Arboretum (A); Brisbane Botanical Gardens, Brisbane, Australia (B); Field Museum (FM); Gray Herbarium (G); New York Botanical Gardens (NY); Singapore Botanical Gardens (S); Instituto Lillo, Univ. Nacional de Tucuman, Argentina (T); University of California (UC);

[1] The preceding papers of the series are: 1. *Preliminary Taxonomic Notes*, Journ. Arnold Arb. **21**: 461–89. 1940; 2. *Humirianthera, Leretia, Mappia* and *Nothapodytes, Valid Genera of the Icacineae*, l. c. **23**: 55–78. 1942, and 3. *A Revision of the Genus Emmotum*, to be published in the current volume of Journ. Arnold Arb.

United States National Herbarium (US). I am grateful for the use of this material.

I should like to express my appreciation to Dr. I. M. Johnston, under whose guidance this work progressed, and to Dr. E. D. Merrill and Dr. M. L. Fernald for assistance on many special occasions, as well as for the use of facilities of the Arnold Arboretum and the Gray Herbarium.

History of the Family

The *Icacinaceae* receives its name from the genus *Icacina*, which was selected as a type by Bentham (Trans. Linn. Soc. London **18:** (4): 679. 1841). *Icacina* had been described by A. Jussieu (Mem. Soc. Nat. Hist. Paris **1:** 174. 1823) and was related by him to the order *Olacineae* of Mirbel. Several other genera were referred to this complex by Lindley (Nat. Sys. Bot. 1836) before Bentham (l. c.) made the first comprehensive study of the *Olacineae*. Bentham divided the order into three tribes, the *Olacineae*, the *Opileae* and the *Icacineae*, recognizing that it might be necessary sometime to consider them all as distinct orders. Bentham placed *Leretia* and *Pogopetalum* in the *Icacineae* as the first New World genera of that order.

Miers (Ann. Mag. Nat. Hist. II. **8:** 174, 1851, II. **9:** 221, 1852, Contrib. Bot. **1:** 34. 1851–61) raised Bentham's tribes to family status in 1851 and recognized for the first time the actual differences between the *Icacinaceae* and the *Olacaceae*, as well as their true affinities. This is perhaps the most outstanding bit of work on the family. In 1862 Baillon (Adansonia **3:** 89, 367–70) produced further evidence supporting Miers separation of these two families. However, Baillon believed that *Icacina*, *Leretia* and *Mappia* were identical genera and since *Mappia*, not *Icacina*, was the oldest name he proposed that the family be called the *Mappiae*.

In the same year Bentham and Hooker's Genera Plantarum appeared and did not recognize the groups as families but, instead, followed Bentham's previous classification of them as tribes. This prompted Miers (Seem. Jour. Bot. **2:** 257–66. 1864) to restate rather bitterly his distinctions between the *Icacinaceae* and the *Olacaceae*. In Flora Brasiliensis (**12:** (2): 41–62. 1872)

Engler recognized the *Olacaceae* and *Icacinaceae* as families but he considered them together. Beccari (Malesia **1**: 105–134. 1877), Valeton (Crit. Overz. Olac. 1886) and Engler (Nat. Pflanzenfam. **3** (5): 233–257. 1893) followed Miers consideration of the *Icacinaceae* as related to the *Celastrales*. Van Tieghem (Bull. Soc. Bot. Fr. **44**: 115. 1897) further subdivided the family, recognizing *Emmotum* and *Pleurisanthes*, New World genera, as the type genera of independent families. More recent authors have not recognized Van Tieghem's divisions, as there seems to be no substantial ground for doing so.

The revision of the family for the second edition of Natürlichen Pflanzenfamilien has been prepared by Sleumer (see also Notizbl. **15**: 228–57. 1940) but it is not available in this country at the present time.

Thus, since Miers established the family in 1854, its independence has been unchallenged.

Systematic Position of the Family

Engler and Diels (Syllabus der Pflanzenfamilien, 11th. Auflage. 1936) place the family in the order *Sapindales* and the suborder *Icacinineae*, on equal status with the *Sapindineae*, *Celastrineae*, *Anacardiineae* and eight others. It is the only member of the *Icacinineae*. The order *Sapindales* is established, in contrast with the *Geraniales*, in the position of the micropyle under the ventral raphe. The *Icacinineae* is quite distinct in this order in having the following characters as listed by Engler and Diels: flowers heterochlamydeous, always actinomorphic, haplostemonous; stamens opposite the calyx-lobes; pistil mostly with one fertile locule; ovules with a single integument; fruit one-seeded.

While the distinctions for orders expressed above may be open to criticism, the most valuable point offered is the equality of the *Icacinineae* with the other suborders. Other workers have not considered it so. Wettstein (Handbuch Systematischen Botanik, 1924) considers the *Icacinaceae* as another family of the *Celastrales*. Hutchinson (Families of Flowering Plants. **1**. Dicotyledons. 1926) does the same, placing it in equal rank with the *Aquifoliaceae*, *Celastraceae* etc. Hallier (Arch. Neerl. Sci. Exact. et Natur. ser. 3b: 147–234. 1912) considers the *Icacinaceae* in the *Santalales* and of close relationship with the *Olacaceae.* In a phylogenetic tree Hallier derives the *Icacineae* from the *Olacaceae.*

Considering only the wood-structure of the *Icacinaceae,* one could find all stages of phylogenetic specialization. These may be from the most primitive woody form to the highly specialized lianas. Several of the genera of the *Icacinaceae* have a wood-structure far more primitive than the groups from which various authors would derive them. Florally and on the fruit-characters the *Icacinaceae* must be considered as an advanced group. The highly specialized aestivation of the corolla, with its abutting or inrolled edges and inflexed apex, the single row of stamens and the advanced pistil, with but a single locule containing two pendant anatropous uni-integumented ovules, and the fruit with but a single seed, are the characters upon which the previous workers have decided the position of the family. All of these floral characters seem to be specializations of such a nature that it is doubtful if the family could be considered the ancestor of any other group or of any tendency expressed in another group. The *Icacinaceae* seems to represent an end-line when the floral characters are considered. In the anatomical characters, however, one finds that part of the group is basically primitive. Therefore, the most satisfactory treatment of the *Icacinaceae,* phylogenetically or systematically, is to consider it in part a primitive group, with evidences of specializations and modifications and forming an end-line of development. The treatment proposed by Engler and Diels, considering the *Icacinaceae* and *Icacinineae* as a separate monotypic line of equal status with such groups as the *Sapindineae, Celastrineae* and the *Anacardiineae,* has the most support from this study and is to be recommended. Whether these are called orders or tribes is not significant but I do believe the *Icacinaceae* should not be considered a family in the *Celastrales.*

Geographical Distribution

The *Icacinaceae* is a pantropical family, with only a few representatives reaching the Southern Temperate zone. In the New World and on the American continent no genus has been found north of Mexico. The distribution in the Caribbean area is limited to the Greater Antilles. No collections have been reported from El Salvador or Nicaragua, although several genera probably occur there. Representatives have been found in all countries of South America.

The center of distribution in the New World is in the upper Amazon basin of Brazil. *Citronella* and *Emmotum* have the broadest distributions of the various genera. Generic distributions are summarized in the accompanying table.

	MEXICO	CUBA	HAITI	SANTO DOMINGO	JAMAICA	PORTO RICO	COSTA RICA	GUATEMALA	PANAMA	BRIT. HONDURAS	COLOMBIA	VENEZUELA	ECUADOR	BRIT. GUIANA	DUTCH GUIANA	FRENCH GUIANA	BRAZIL	URUGUAY	PARAGUAY	BOLIVIA	ARGENTINA	CHILE	PERU	TOTAL No. SPECIES
Calatola	✓						✓		✓	✓	✓	✓	✓										✓	7
Citronella							✓										✓	✓	✓	✓	✓	✓	✓	10
Dendrobangia																✓	✓							1
Discophora									✓		✓			✓			✓						✓	3
Emmotum												✓		✓		✓	✓						✓	12
Humiriantherr											✓	✓					✓							3
Leretia														✓			✓						✓	1
Mappia	✓	✓	✓		✓	✓			✓															3
Oecopetalum	✓							✓																3
Ottoschulzia		✓	✓	✓		✓																		3
Pleurisanthes														✓		✓	✓							6
Poraqueiba															✓	✓	✓							3
Total	3	2	2	1	1	2	2	1	3	1	3	3	1	4	1	4	8	1	1	1	1	1	5	

The plants occur in a variety of habitats. They are most commonly found on the edges of clearings in primary forests or on land liable to inundation. The genera *Poraqueiba* and *Humirianthera* are cultivated by the indians of Brazil and may be found in plantations. *Mappia* frequents dry, rocky outcrops in Havana province of Cuba but occurs in dense forests at higher elevations in the province of Santa Clara. *Ottoschulzia cubensis* is a shrub of salt marshes, while *O. domingensis* is limited to limestone outcrops. Species of *Citronella* have been collected on dry, barren soil as well as dense, moist forests. *Calatola* and *Dendrobangia* are commonly found in rain-forests. Altitudinal ranges of genera may vary from sea-level for *Ottoschulzia* to 6,000 feet for *Emmotum* and *Calatola*.

Economic Uses

Three genera of the New World *Icacinaceae* are cultivated as sources of food and members of one are also used as ornamental plants. *Poraqueiba* is cultivated in Brazil, near Pará, for the oil that may be extracted from the sarcocarp and for the copious starchy endosperm of the seed. Fresh fruits are sold in local markets, although their use is not general and a taste must be developed for them. *Humirianthera* has large fleshy tubers which contain a large amount of starch. This genus is cultivated for the tubers or rootstocks and for the starchy seeds (Ducke, Arch. Jard. Bot. Rio **3:** 206. 1922). *Citronella* is also found under cultivation in southern South America. The leaves of *C. Gongonha* are used as a substitute for those of *Ilex paraguayensis* in the preparation of maté. This usage was traced by Lambert (Genus Pinus **2:** app. 7** t. 6. 1824) to the period when Dr. Francis was dictator of Paraguay and declared an embargo on the leaves of *Ilex*. *Citronella Gongonha* was tried as a substitute, probably because of the close similarity in appearance of the two plants. Other species of *Citronella* lack the essential oils necessary for maté and cannot be used. *C. Gongonha* and *C. mucronata* frequently have spinose-margined leaves and for this reason are often used as ornamentals or for hedging. Both are planted as park shade-trees as well as being used as greenhouse or hot-house plants.

The fruits of several species of *Calatola* are edible either raw or roasted and serve as local food-products. No record was found of this plant being under cultivation. The bark, leaves and fruits of *Calatola* all contain a pigment which is used as a blue dye.

Only two genera are reported as toxic to humans. The fruits of *Calatola mollis,* if eaten, cause extreme nausea and often violent stomachic and intestinal pains. The other species of this genus are apparently harmless. The starchy material in the rootstocks and fruits of *Humirianthera* is toxic and must be washed thoroughly before it can be used.

Basis of the present Treatment

Engler divided the *Icacinaceae* into four tribes based primarily on anatomical characters. Bailey and Howard (Journ. Arnold Arb. **22:** 125–32. 1941) have discussed the merits of this division on the basis of anatomical characters, and have shown that two of these tribes cannot be distinguished in all cases by the anatomical criteria Engler suggested. Certain of the *Icacineae* appear transitional in form and structure between the *Icacineae* and the *Iodeae, Sarcostigmateae* and *Phytocreneae.* The New World genera have all been placed in the *Icacineae.* Several of the New World genera show either transitions in form and structure to the Old World forms or show closer similarities to the Old World genera than to other New World genera. It is apparent that the New World genera do not comprise a homogeneous or even related unit of the family. Among the genera found in the New World several must be considered as anomalous. Thus the present study is not designed to represent a treatment of a natural unit but is only a consideration of a geographic division of the family for use of students of New World floras.

A total of 12 genera and 70 species are recognized in the New World. One genus is pantropical. Two are monotypic. Three have no New World affinities and are either related to the Old World genera or are considered as anomalous.

Generic and specific characters are found in all parts of the plant and in many organs. Although differences are recognized in the wood-structure, or hair-structure and are used in some keys, no genera are based on these differences alone. The most reliable characters are found in the fruits and the form of the stamens. Excellent floral characters exist in most genera.

Although the generic limits are probably as well marked and readily observable as those of any other family, the limits of the species are difficult to draw. For this reason, as well as the insufficiency of material and the fact that I have not seen the collections in European herbaria, I have recognized few subspecific entities. That more than are here accepted do exist is not doubted but, until more material can be examined to determine better the limits of the species themselves, it does not seem wise to propose numerous trinomials for minute variations which may prove to be only in the individual specimen.

ICACINACEAE Miers

Trees, shrubs or lianas; leaves alternate, petiolate, exstipulate, coriaceous or rarely membranaceous, entire or rarely sinuate-dentate, the veins arcuate-anastomosing; inflorescence cymose or paniculate with cymose branches, terminal, axillary, extra-axillary or supra-axillary, bracteate; flowers articulated below the calyx, perfect or polygamous or unisexual by abortion, hypogynous; calyx small, fleshy, the lobes or teeth 5, imbricate; petals 5, rarely 4–6, free or rarely united at the base, valvate, fleshy, the apex inflexed; stamens 5, alternate with the petals, erect, the filaments fleshy, often hairy below the anther, anthers attached basally or dorsally near the base, the anthers with 4, rarely 2, locules, often deeply lobed, the dehiscence introrse or lateral, longitudinal; ovary 1–, rarely 2–3-celled, the ovarian appendage present or absent, the ovules 2, anatropous, pendent from near the apex, collateral or rarely superposed, functional style one, rudiments often present, the stigma capitate; fruit drupaceous, symmetrical or flattened, 1-celled (3- in *Emmotum*), the funicle in a special tubular canal of the putamen or free in the sarcocarp, the seed one, the embryo minute or large, the endosperm copious.

Type genus: *Icacina* Juss. (Africa).

Distribution in the Western Hemisphere: Antilles, Mexico, Central America, South America.

An Analysis of the New World Genera Referred to the Icacinaceae

Asterolepidion Ducke	equals Dendrobangia Rusby
Barreria Juss.	equals Poraqueiba Aubl.
Briquetina Macbride	equals Citronella Don
Calatola Standley	
Casimirella Hassler	
Citronella Don	
Clavapetalum Pulle	equals Dendrobangia Rusby
Dendrobangia Rusby	
Discophora Miers	
Emmotum Desv. ex Hamilton	
Humirianthera Huber	probably the same as Casimirella
Kummeria Mart.	equals Discophora Miers
Lasianthera Barb. Rod. not P. Beauv.	equals Discophora Miers
Leretia Vellozo	

MAPPIA Jacq.	a conserved name
MARTIA Valeton	equals PLEURISANTHES Baill.
MEISTERIA Gmel.	equals PORAQUEIBA Aublet
METTENIUSSA Karsten	genus excluded from family
OECOPETALUM Greenman & Thompson	
OTTOSCHULZIA Urban	
PARAQUEIBA Scopoli	equals PORAQUEIBA Aublet
PATAGUA Baill.	equals CITRONELLA Don
PLEURISANTHES Baillon	
POGOPETALUM Bentham	equals EMMOTUM Desv.
PORAQUEIBA Aublet	
PORARESIA Gleason	equals POGONOPHORA, *Euphorbiaceae*
VALETONIA Durand	equals PLEURISANTHES Baill.
VILLARESIA Ruiz & Pavon (in part)	equals CITRONELLA Don.
VILLARESIOPSIS Sleumer	equals CITRONELLA Don.

KEY TO THE GENERA BASED ON FLOWERS

Flowers unisexual.
- Staminate inflorescence spicate; flowers 4-parted; pistillate rudiment absent; pistillate inflorescence cymose, few-flowered, the pistil pubescent, without a basal pulvinus........ *Calatola*
- Both inflorescences cymose; flowers 5-parted; pistillate rudiment present in staminate flowers; the pistil glabrous, with a basal fleshy pulvinus........ *Discophora*

Flowers perfect.
- Ovary 2–3-loculed........ *Emmotum*
- Ovary 1-loculed (rarely 2 locules in *Citronella*).
  - Ovules superposed.
    - Locule pubescent inside, inflorescence few-flowered or consisting of a single flower........ *Ottoschulzia*
    - Locule glabrous inside, inflorescence many-flowered.... *Oecopetalum*
  - Ovules collateral.
    - Petals glabrous inside.
      - Corolla gamopetalous, petals with clavate appendages; plant stellate-lepidote-pubescent........ *Dendrobangia*
      - Corolla polypetalous, inflexed petal-apices not clavate.
        - Lianas; inflorescence-axes frequently flattened; flowers not articulated........ *Pleurisanthes*
        - Trees or shrubs; inflorescence-axes terete; flowers articulated........ *Citronella*
    - Petals pubescent inside.
      - Ovarian disk present........ *Mappia*
      - Ovarian disk absent.
        - Ovary glabrous; locule glabrous inside; trees........ *Poraqueiba*
        - Ovary pubescent; locule pubescent inside; shrubs or lianas.
          - Inflorescence axillary; connective linear........ *Leretia*
          - Inflorescence terminal; connective broadly triangular........ *Humirianthera*

Key to the Genera based on Characters in the Fruits

Fruit 2–3-loculed . . . . *Emmotum*
Fruit 1-loculed.
  Fruit compressed laterally and bearing a fleshy lateral pulvinus . . *Discophora*
  Fruit without an appendage.
    Locule subdivided with a radial partition, seed hippocrepiform . . . . *Citronella*
    Locule without partial partition.
      Fruiting calyx about equal to diameter of fruit . . . . *Oecopetalum*
      Fruiting calyx minute.
        Locule pubescent inside.
          Funicle in tubular canal in the putamen; sarcocarp thick . . . . *Humirianthera*
          Funicle in groove of putamen and surrounded by sarcocarp-tissue.
            Fruit ovoid; putamen woody . . . . *Ottoschulzia*
            Fruit elongate or ellipsoid, slightly flattened; putamen often papery . . . . *Leretia*
        Locule glabrous inside.
          Embryo minute, less than 1/10 the length of the seed.
            Putamen strongly reticulate-crested outside, glabrous, or pubescent with simple hairs . . . . *Calatola*
            Putamen essentially smooth, at most slightly rugose outside, stellate-pubescent . . . . *Dendrobangia*
          Embryo large, ½–¾ the length of the seed.
            Fruit seldom 2 cm. long; sarcocarp dry . . . . *Mappia*
            Fruit large, 3–7 cm. long; sarcocarp oily . . . . . . *Poraqueiba*

Fruit of *Pleurisanthes* not known.

Key to the Genera based on Sterile Material

Node trilacunar.
  Hairs disarticulating from a papilla-like base.
    Leaves with helically thickened mesophyll-fibers . . . . *Emmotum*
    Leaves without fibers in the mesophyll . . . . *Poraqueiba*
  Hairs not disarticulating.
    Hairs in stellate-lepidote clusters . . . . *Dendrobangia*
    Hairs single, not stellate.
      Mesophyll with large pockets of crystal-sand . . . . . . *Discophora*
      Mesophyll with druses or rhombic crystals but no crystal sand.
        Leaves with domatia in axils of primary veins and the midrib or in the bifurcations of the veins . . . . *Citronella*
        Leaves without domatia.
          Mesophyll porous, of stellate cells . . . . *Oecopetalum*
          Mesophyll of rectangular or globular cells.
            Leaves 2–8 cm. long . . . . *Ottoschulzia*
            Leaves 13–30 cm. long . . . . *Calatola*
Node unilacunar.
  Flowers disarticulating at the base of the calyx; stems and petioles without lysigenous canals.
    Trees or shrubs; leaves with pores in axils of veins and midrib . . . . . *Mappia*
    Lianas; leaves without axillary pores.
      Hairs in stellate clusters . . . . *Humirianthera*
      Hairs simple, malpighiaceous type . . . . *Leretia*
  Flowers not disarticulating at the base of the calyx; stems and petioles with lysigenous canals; stems strap-shaped . . . . . *Pleurisanthes*

CALATOLA Standley

Calatola Standley, Contrib. U. S. Nat. Herb. **23:** 688. 1923, Journ. Wash. Acad. Sci. **16:** 413. 1926, Field Mus. Pub. Bot. **22:** 39. 1940; Record, Tropical Woods **53:** 24. 1938; Sleumer, Notizbl. **15:** 248. 1940.

Trees; the leaves papery to coriaceous, turning black on drying, margin entire, revolute, the oblique-arcuate veins slender; flowers minute, dioecious, the staminate arranged in axillary dense pseudo-spikes; calyx of staminate flowers small, 4-lobed; corolla gamopetalous 4-parted, midrib evident inside, villous on the midrib; stamens alternate with the lobes, erect, the filaments short, adnate to the corolla tube, the anthers oblong, basifixed, longitudinally dehiscent; pistillate flowers solitary or in few-flowered axillary racemes; calyx 4-lobed; petals inconspicuous; pistil cylindric, strigose- or hirsute-pubescent, the style not evident; fruit drupaceous, the pericarp fleshy, thick, the putamen bicrestate and irregularly reticulate-dentate-crested or essentially smooth; seed one, large, the embryo minute, the cotyledons ovate, the radicle cylindrical or flattened and rhomboidal in section, the endosperm copious.

Type species: *Calatola mollis* Standley.

Distribution: Mexico, Central America, Venezuela, Colombia, Ecuador and Peru.

More material is needed for study before the treatment of the genus *Calatola* will be satisfactory. To the present time six species have been described and another is suggested in this paper.

Standley established the genus with some hesitation, both as to its relationships and as to the possibility of an earlier name, since some specimens had been collected by Liebmann in 1841 and by Gollmer in 1854. The genus has such striking fruits that it seemed likely that someone else had described it but, as yet, no earlier name has been found.

In most of its characters the genus fits into the limits of the *Icacinaceae;* however, the inflorescence is strikingly different from anything else in the family. In addition, the flowers are dioecious and the staminate flowers are subsessile, usually in clusters of three, and in spikes which are very dense when young but are looser at maturity. A bract subtends each flower and the entire inflorescence is pubescent. The flowers are articulated below the calyx, as is typical of the family. The female flowers are few, in more open racemes or cymes.

The flowers are 4-parted, with both the calyx and corolla valvate, at least in the male flowers. No petals have been described for the pistillate flowers but I was able to find several in flowers of *C. costaricensis*. These were lance-oblong, round at the apex, fleshy, essentially glabrous, and alternate with the calyx-lobes. In the staminate flowers the corolla is gamopetalous, short-pubescent outside and it bears long pilose hairs on the midrib. The lobes are about three times the length of the corolla-tube and do not have well developed inflexed apices. No pistillate rudiments were found in the staminate flowers examined.

The pistil is cylindric, without a noticeable style, and with a capitate discoid papillate or pilose stigma. The single locule is eccentrically placed in the ovary, with an abundance of sterile tissue on one side and a normal thin ovarian wall on the other.

The fruits are typical of the family, although they are larger than in most. The size of the fruit is comparable to that of *Poraqueiba* or *Humirianthera*. Only one fruit is developed to the infrutescence and the fruiting pedicel is stout. The drupe has a fleshy non-oily sarcocarp and a woody putamen. The outer surface of the two-ridged putamen is smooth or sharply crested and toothed. The inner surface is smooth or slightly rugose. In one of the ridges there is a canal which, for at least part of its length, houses the funicle. The canal makes an abrupt bend near the apex of the fruit and the funicle enters the locule parallel to the stylar canal. Only one of the two pendulous ovules matures. The raphe descends the seed, approximately 90° from the path of the funicle, in the endocarp and terminates in a circular chalaza. Pittier described the fruit of *C. venezuelana* as dehiscent and the isotype I have seen appears to have opened naturally for most of its length before it was broken. In the other species I have found no examples of dehiscence and all the fruits are tightly closed. The seed, differing from previous descriptions, is nearly as large as the locule but is convoluted and shrunken. The embryo is minute, not large, essentially straight, and is apical in position. The cotyledons, in those specimens examined, are ovate, slightly fleshy, prominently one-ribbed, with superposed margins, and are about one-third the total length of the embryo. The radicle is either cylindric or flattened and rhomboidal in section. This type of embryo is common in the Old World genera but only *Citronella* and *Dendrobangia* possess it in the New World forms. The remainder of the seed is undifferentiated endosperm, which is dark-colored, due to an abundance of pigment present. This pigment can be removed by boiling and is a brilliant blue or purple in dilute solution.

The key to the species as given by Sleumer is essentially satisfactory, although the basic separation of *C. laevigata* and *C. pastazana* from the other species on the size of the leaves must be used with caution. The numerous collections of Schipp from British Honduras which I have cited under *C. laevigata* have much larger leaves than does the type specimen, as the leaves approach 25 cm. in many cases. The characters of ornamentation of the putamen seem more reliable, judging from the fruits available for each species, and I have presented a key based on these. Many more fruits should be studied to determine variability of both shape and ornamentation.

The leaves themselves lack characters to isolate the genus. They turn black on drying, a character which is common in the Old World genera but unusual among the New World forms, although pigmented cells are present in several genera. Apparently this blackening in *Calatola* is due to a dye present in the tissues of the leaves. The dye is also present in the petioles, stem and fruit, and in the endosperm of the seed as well.

The wood is white and hard and used for general construction purposes, frequently for interior work, since it appears to be immune to insect-attacks. The trees are large but usually are rare and scattered in any one locality. The seeds of *C. mollis* and *C. costaricensis* are purgative and vomitive in action, while those of *C. laevigata* are eaten both raw and roasted for food. Their flavor is reported to be that of coconut or grated cheese. The seeds are also a source of a dye.

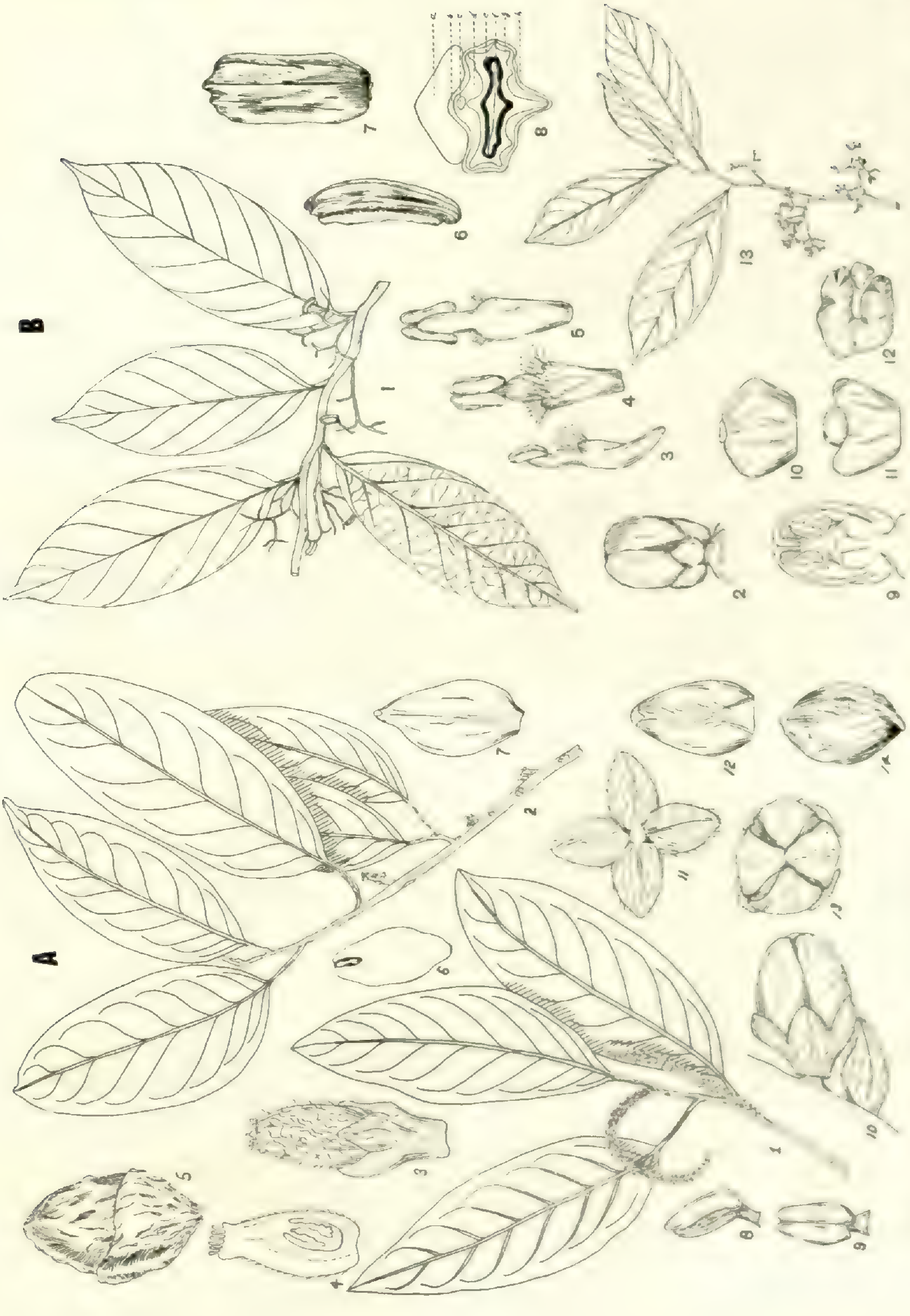
The relationships of the genus *Calatola* in the *Icacinaceae* are not clear. In flower, fruit and wood-structure it belongs in the family; however, it is an isolated genus and not closely related to other genera of the New World. In the floral structure the genus is to be considered advanced but in the wood-structure it is unquestionably primitive (Bailey and Howard, Journ. Arnold Arb. **22:** 129, 172–8, 434, 557–8. 1941). Its broad distribution in the New World is surpassed only by that of *Citronella*. *Calatola* is a truly anomalous genus of the *Icacinaceae*.

Key to the Species

Fruit densely tomentose, with apex and base rounded, 5–5.5 cm. long, 4–4.5 cm. in diameter; leaves densely ferruginous-tomentose below. (Mexico) . . . . *C. mollis*
Fruit glabrous, base rounded or rostrate; leaves glabrous below or nearly so.
 Fruits manifestly constricted or conical at the base.
  Fruits ellipsoid-oblong, 6 cm. long, 3.5–4 cm. in diameter, apex obtuse. (Western Colombia) . . . . *C. columbiana* √
  Fruits almost globose, 4 cm. long, 3 cm. in diameter, apex obtuse. (Eastern Ecuador) . . . . *C. pastazana*
 Fruits obtuse to rounded at the base.
  Putamen deeply reticulate-lacunose, strongly bicrestate, globose to elliptic, rarely subovoid-elliptic, 4.5–6 cm. long, 3.5–4 cm. in diameter. (Venezuela, Peru, Colombia) . . . . *C. venezuelana* √
  Putamen not deeply reticulate-lacunose, moderately bicrestate.
   Putamen ellipsoidal, with longitudinal ribs numerous and nearly equalling the prominent lateral crests; leaves barbate in the axils of the veins. (Costa Rica, Panama, Colombia) . . . . *C. costaricensis* √
   Putamen elongate-ellipsoid, slightly flattened, only the two lateral ridges prominently developed, the others inconspicuous, or essentially smooth; leaves strictly glabrous. (Mexico, British Honduras) . . . . *C. laevigata*

Calatola mollis Standley, Contrib. U. S. Nat. Herb. **23:** 689. 1923, Journ. Wash. Acad. Sci. **16:** 414. 1926; Sleumer, Notizbl. **15:** 249. 1940.

Trees; the branches terete, densely yellow-gray-pilose; petioles 3–4.5 cm. long, stout, pilose, the lamina oval-elliptic to oblong-obovate, 21–30 cm. long, 8–14 cm. wide, glabrate except along the nerves, acute to abruptly short-acuminate, the base obtuse or round, the oblique-arcuate and laxly anastomosing veins 7–9 pairs; staminate spike 8–21 cm. long, 6 mm. in diameter, densely flowered, the rhachis short-pilose, the ovate-acuminate bracts small; calyx white-pilose outside, glabrous within, the obtuse lobes oblong-oval, 1.6 mm. long and 1.4 mm. wide; corolla 2–2.4 mm. long, the lobes 1.5–1.7 mm. long; filaments 0.3 mm. long; pistillate flowers solitary, the fruiting pedicel 1.5 cm. long, stout; drupe 5–5.5 cm. long, 4–4.5 cm. in diameter, densely tomentose, the putamen with numerous thin, sharp, irregular crests, the seed 3 cm. long.



A, figs. 1–13, CALATOLA LAEVIGATA; fig. 14, C. sp. B, figs. 1–11, DISCOPHORA MONTANA; figs. 12 and 13, D. PANAMENSIS.

A, OTTOSCHULZIA CUBENSIS.

B, PLEURISANTHES FLAVA.

Type Specimen: *F. Salazar* s. n. (U. S. 43089) collected at Zacatlán, Puebla, Mexico.

Illustration: Journ. Wash. Acad. Sci. **16:** 414, fig. 1. 1926.

Distribution: Mexico. Reported from Puebla, Tabasco, Chiapas, Vera Cruz, Oaxaca, San Luis Potosi.

Specimens seen: Puebla, District of Tepeji, Tlatlanquitepec, collector unknown (US). Huitamalco, *Liebmann* 14923 (FM).

Vernacular Names: Calatola, Calatolazno, Nueces de Calatola, zapote de mono, Colas de ratas. This last name is applied to the staminate inflorescences.

This species is reported from altitudes of 650–900 m. It flowers in March and April. The seeds are vomitive or purgative in action when eaten. Their chief use is in dyeing. I have not seen fruiting material of this species.

Calatola columbiana Sleumer, Notizbl. **15:** 249. 1940.

Tree 15–20 m. tall, the trunk-diameter 60 cm., the bark rough and brown; petioles 2–3 cm. long, thick, yellow-brown-tomentose; lamina oblong, 16–25 cm. long, 8–13 cm. wide, yellow-tomentose, becoming glabrate except along the nerves, broadly acuminate to subobtuse, the base broadly attenuate, the 8–9 pairs of veins more or less horizontal, the secondary veins obscure; staminate spikes 7–8 cm. long, the abbreviated cymules with numerous subuliform bracts; sepals ovate-oblong, to 0.7 mm. long, obtuse, yellow-pubescent; petals ovate, acuminate, to 1 mm. long; pistillate flowers not known; drupe oblong-elliptic, 6 cm. long, 3.5–4 cm. in diameter, manifestly rostrate at the base, the apex obtuse, the tenuous pericarp black when dry, the endocarp woody, irregularly but not deeply lacunose to obtusely crested.

Type Specimen: *Duque* s. n. (Herb. Berlin, not seen) collected at Rio Cali, Dept. Valle, Colombia.

Illustration: Notizbl. **15:** 249, figs. 1–2. 1940.

I have not seen any material of this species, which is known only from one collection. It grows at an altitude of 18–2000 m. and flowers and fruits in November. The seeds are reported to taste like coconut but leave an aftertaste.

Calatola pastazana Sleumer, Notizbl. **15:** 248. 1940.

Tree to 20 m., the bark gray, the branches subterete; petioles 1–1.5 cm. long, laxly pubescent to glabrous; lamina oblong to broadly oblong, 13–17 cm. long, 5–7.6 cm. broad, glabrous, broadly acuminate to subobtuse, broadly cuneate at base, the subarcuate veins in 6 pairs, the secondary veins obscure; flowers not known; fruiting peduncle 1.2 cm. long, 2 mm. in diameter, solitary; drupe subglobose, 4 cm. long, 3 cm. in diameter, vertically bicrestate, the endocarp-face indistinctly reticulate, the apex obtuse, the base rostrate.

TYPE SPECIMEN: *Heinrichs* 860 (Herb. Berlin, not seen) collected in Ecuador in the highlands of Ambato, on the right bank of the Pastaza.

ILLUSTRATION: Notizbl. **15:** 249, fig. 5. 1940.

I have not seen this material, which was collected at 1800 m. and in fruit in April.

CALATOLA VENEZUELANA Pittier, Bol. Soc. Venez. Cienc. Nat. **4:** 360. 1938; L. Williams, Tropical Woods, **56:** 6. 1938; Sleumer, l. c. 249; Standley, Field Mus. Pub. Bot. **22:** 39. 1940.

Trees to 17 m. tall, trunk-diameter 40 cm., the branches terete and minutely appressed-puberulous; petioles 1.5 cm. long, terete, almost winged; lamina broadly oval to oblong, 17–20 cm. long, 8–12 cm. broad, glabrous above, sparsely villous below, becoming glabrate except on the 10–12 pairs of veins, abruptly acuminate to rounded, the base acute and commonly unequal; flowers not known; drupe ovoid to subglobose, 4.5–6.5 cm. long, 3.5–4.5 cm. in diameter, the putamen bivalved, the sutures prominent, the valves rugose, the crests prominent and more or less dentate-reticulate.

TYPE COLLECTION: *Williams* 10118, made in the National Park of the State of Aragua in Venezuela.

ILLUSTRATION: Notizbl. **15:** 249, fig. 4 a & b. 1940.

SPECIMENS SEEN: Venezuela. State of Aragua, National Park, *Williams* 10118 (FM isotype). Peru. Huanuco, Shapajilla, *Woythowski* 19 (FM). / Colombia. Cincinnati region, *Espina & Giacometto* A-146 (FM).

VERNACULAR NAMES: Orosul, Venenito.

Standley (l. c.) questions if this species is distinct from *C. costaricensis*. From a study of the fruits available for each species there appear to be reliable differences in the ornamentation of the putamen. The fruits cause nausea when eaten raw. They mature in May and September through October. Plants have been collected at altitudes of 950–1500 m. Williams (l. c.) reports that the wood is white when fresh but soon turns blue, although this color may be bleached out. It is suitable for carpentry because it is immune to insect-attack but it is not used locally because of its scarcity.

CALATOLA COSTARICENSIS Standley, Journ. Wash. Acad. Sci. **16:** 416. 1926 (Flora Costa Rica), Field Mus. Pub. Bot. **18:** 636. 1937; Sleumer, Notizbl. **15:** 249. 1940.

Tree 6–15 m. tall, the branches minutely pubescent to glabrate; petioles 2–5 cm. long; lamina oblong to elliptic-oblong, 10–25 cm. long, 4.5–10.5 cm. wide, appressed-pubescent, becoming glabrate except in the axils of the veins, short-acuminate to obtuse, the base acute, the oblique to arcuate veins in 6–8 pairs; staminate spikes 13 cm. long, laxly flowered, the rhachis and calyx hirsute; pistillate flowers not seen; drupe ellipsoid to subglobose, 4–6.5 cm. long, 3.5–4 cm. in diameter, rounded or obtuse at both ends, bicrestate with several sharp longitudinal crests, with less prominent transverse reticulate ridges.

TYPE SPECIMEN: *Standley & Valerio* 50000 (US 1251510) collected at Yerba Buena northeast of San Isidro, Province Heredia, Costa Rica.

ILLUSTRATION: Notizbl. **15:** 249, fig. 4. 1940.

SPECIMENS SEEN: Costa Rica. San José, Quebradillas, north of Santa Maria de Dota, *Standley* 42865 (US). Alajuela, Viento Fresco, *Standley & Torres* 47895 (A, US). Province undetermined, El Copey, *Tonduz* 11896 (G, NY, US), Zarcero, *Austin Smith* 4223 (FM). Panama. Bocas del Toro, region of Almirante, *Cooper* 371 (FM, G, NY, US).

VERNACULAR NAMES: Duraznillo, Erepe, palo de papa, papa de palo, palo azul, haguey.

This species is reported from altitudes of 17–2000 m. The trees have wood of good quality, which is used for general construction, and seeds which are roasted and eaten but which cause nausea and produce violent intestinal pains if eaten raw.

Many more complete collections of this species are desired. At present a large amount of variation is admitted in the form and ornamentation of the fruits and eventually it may be necessary to divide this species and establish some of these variations as new entities.

CALATOLA LAEVIGATA Standley, Contrib. U. S. Nat. Herb. **23:** 689. 1923 (Forest and Flora of British Honduras), Field Mus. Pub. Bot. **12:** 230. 1936.

Tree, the branches sparsely appressed-pilose, becoming glabrate; petioles 1.5–2 cm. long; lamina elliptic-lanceolate to narrowly elliptic-oblong, 12–24 cm. long, 4–8 cm. wide, puberulous, becoming glabrate, acute or rarely obtuse, the base acute or rarely obtuse, the slightly arcuate veins in 10 pairs; staminate spikes 4–10 cm. long, the sericeous bracts ovate-acuminate; calyx minutely sericeous, its lobes obtuse; pistillate spikes short, yellow-crispose-pubescent; drupe ellipsoid, 6 cm. long, 3.5–4 cm. in diameter, sparsely short-sericeous, very early becoming glabrate, acutely rounded at both ends, not rostrate, strongly bicrestate, the seed 4–5 cm. long, the embryo minute and 5 mm. long, the ovate cotyledons 2 mm. long and 1 mm. wide.

TYPE SPECIMEN: *Reko* 3440 (US) collected at Cerro Espino, Cafetal San Carlos, Oaxaca, Mexico.

ILLUSTRATION: PLATE 1-A, FIGS. 1–13.

SPECIMENS SEEN: Mexico. Oaxaxa, Cafetal San Carlos, Cerro Espino, *Reko* 3440 (US, TYPE), Calvario, Cerro Espino, *Reko* 3728 (US). British Honduras. Temash river on the Guatemala boundary, *Schipp* 366 (FM), 446 (A, FM, G, NY), 708 (FM, NY), 1366 (A, G, NY).

VERNACULAR NAME: palo tinta.

This species was found on river-banks in dense forests at altitudes of 600–900 m. It flowers in September and has been found fruiting in October. The leaf-blade is asymmetrical. The midrib is arched and the blade is commonly folded when pressed. Schipp states that the large green fruits are used in dyeing.

A collection consisting of three old fruits gathered by *M. Pacheco* (FM 926621) in Guatemala in 1938 seems to represent an additional species. The fruits are subglobose (PLATE 1B, FIG. 14), 4 cm. long and 2.5–3 cm. in diameter. One ridge, housing the funicle, is strongly developed but its counterpart is not more prominently developed than the ridges of the endocarp-faces. These faces have moderate crests, with the reticulated lesser ridges essentially smooth. Both ends of the putamen are rounded and no prominent rostrum is developed. The seed is 3 cm. long, with copious endosperm containing an abundant blue-purple dye which is easily extracted in boiling water. The dye is not stable in aqueous solution. The embryo is minute, about 4 mm. long, with two ovate cotyledons 1.4 mm. long and 1 mm. broad. The radicle is somewhat flattened and angled and appears rhomboidal in cross section. These fruits are similar in size and ornamentation to those described and figured by Sleumer for *C. pastazana* from Ecuador. However, they lack the prominent rostrate base characteristic of *C. pastazana*. Vegetative parts and the flowers are desired before this species is described.

DISCOPHORA Miers

The long controversy over the correct name for this genus has been entirely unnecessary. *Kummeria* of Martius was the first name proposed for it. Unfortunately the original publication contains absolutely no description of the plant but merely a dedication to Dr. Kummer; *Kummeria* is a *nomen nudum*. In 1852 Miers described, under the name *Discophora*, the species Martius had mentioned and Miers' name has been recognized as valid by Bentham and Hooker, Valeton, and Standley. Engler, in both Flora Brasiliensis and Natürlichen Pflanzenfamilien, and Baillon use the invalid designation *Kummeria*.

Engler mentions two species in Natürlichen Pflanzenfamilien, one Brasilian and one Guianan, apparently considering the Miers and Martius specimens distinct. I have examined an isotype of Martius' material, and from the description and plate of Miers' material conclude that they are conspecific. This conclusion is in agreement with that reached by Baillon and Valeton.

Lasianthera amazonica Barbosa Rodrigues must join *Kummeria brasiliensis* in the synonymy of *Discophora guianensis*. Rodrigues apparently had fresh material at his disposal and did not recognize the characters of *Discophora* from dried specimens.

A second valid species of *Discophora* was described by Standley in 1929 on material from Panama. A third species is described in this treatment, based on material from Colombia.

Discophora Miers, Ann. Mag. Nat. Hist. II. **9:** 223. 1852, II. **10:** 118. 1852.

Kummeria Martius ex Engl. Fl. Bras. **12:** (2): 52. 1872, Martius Herb. 1276. 1837, *nomen*.

Trees or shrubs, the branches short-strigose-pubescent or essentially glabrous, the bark smooth; leaves alternate, entire, petiolate; inflorescence axillary, paniculate, with strong branches at the base, the panicle diffuse, rarely strict, elongate and divaricate in fruit, the strigose-pubescent pedicels short, bracteate, the subsessile flowers articulated to the pedicel above the bract; flowers small, polygamous or possibly unisexual, the perianth moderately fleshy; calyx short-campanulate, broadly and frequently unevenly 5-lobed, the lobes deltoid or reduced to mere teeth; petals free, essentially glabrous, the apices inflexed, with short mucros, the midrib prominent adaxially; stamens with fleshy flattened filaments bearing an adaxial swelling or appendage midway its length, the appendage more or less densely pubescent with clavate hairs, the filament abruptly narrowed below the versatile anthers, the ovate anther-sacs diverging at the base and introrsely longitudinally dehiscent, the pollen abundant in the anthers of male flowers, scantily if at all developed in the anthers of functional female flowers; pistil in male flowers abortive, cylindrical or slightly conical, either immersed in a fleshy avascular disk or eccentrically placed in the orifice of a hippocrepiform disk, in functionally female flowers the one-celled ovary cylindrical or angled and slightly compressed and bearing a lateral basal fleshy pulviniform avascular appendage, the style not evident, the fleshy and rugose stigma capitate, and occasionally broader than the ovary; the two anatropous ovules nearly collateral and pendent from the apex of the locule; fruit drupaceous, flattened, slightly arcuate, bearing a large oblong fleshy appendage of a light color on the concave side, the pericarp dark-pigmented, fleshy, the putamen with two pairs of equal primary ribs on the lateral edges of the fruit and one median ridge developed on both the concave and convex sides, intermediate ridges more or less completely and prominently developed on the convex side; seed one, pendent from the apex of the contorted locule, the endosperm copious and conformant with the locule, the embryo minute, the radicle terete.

TYPE SPECIES: *Discophora guianensis* Miers.

DISTRIBUTION: Panama, Colombia, British Guiana, Brazil, Peru.

Valeton described the flowers of *Discophora* as polygamous. Most of those I have examined have been unisexual. Rarely in the flowers with functional pistils I have found anthers containing a few pollen-grains. It is impossible to tell from herbarium specimens if this pollen was viable. The scarcity of the grains and the complete absence of pollen in most flowers indicates that the plants are definitely tending towards a unisexual condition. In the flowers which are functionally staminate the anther-sacs are turgid and well packed with smaller and regular-sized grains. The form of the stamen also distinguishes the two types of flowers. After anthesis the stamens are longer in the male than in the female flowers. The pubescence of the filament is borne adaxially on a swelling or appendage midway the length of the filament and is usually denser in the male flowers. This pubescence, as seen in herbarium specimens, consists of thin-walled hairs which are either clavate or lanceolate. Elongation of the filament after anthesis occurs primarily in the region between the pubescence and the anther. The filaments are abruptly narrowed immediately below the anthers, which are versatile in both floral types. The anther-sacs are usually ovate-oblong and diverge at the base.

The pistil is very different in each type of flower. This condition has caused the very diverse views, expressed in the literature of this group, as to the nature of the pistil. In the staminate flowers the pistil is reduced. Usually it appears as a small cylindrical mass of undifferentiated tissue; frequently, however, I have found it reduced to a minute globular mass. In all cases this rudiment is associated with another undifferentiated mass of tissue, usually described as a "disk." This "disk" is a large fleshy, glabrous pulviniform mass. In the majority of cases the pistillate rudiment is located in the center of the tissue. Many flowers were observed, however, in which the pulviniform mass was not a complete circle but was hippocrepiform in shape. In these the pistillate rudiment was located in the orifice of the broken "disk." The pistil in functionally female flowers is strikingly different and greatly resembles the condition found in several Old World genera of the family. Here the ovary is cylindrical or angled and slightly compressed. It is unilocular with the locule containing two pendent collateral anatropous ovules. Sections through the ovary reveal two zones of differentiation, a denser tough outer layer, frequently pigmented, and an inner layer of soft tissue. The style is not evident and the sessile capitate stigma may be broader than the body of the ovary. At the base of the ovary is a larger pulviniform mass, which has also been called a "disk." This mass in the functional female flowers, as Valeton points out, never surrounds the ovary but is laterally placed. The glabrous pulvinus is very fleshy and usually approximates the diameter of the ovary. It it confluent with the inner layer of the ovarian wall at its base. The outer layer of the ovarian wall is not represented in the pulvinus. The pulvinus is partially free at the apex and resembles that found in *Lasianthera* and *Gastrolepis* and is unlike that found in *Medusanthera* (Howard, Journ. Arnold Arb. **21:** plates 1–2. 1940).

The fruit is somewhat unusual, yet has a striking resemblance to the fruits of the Old World genera *Lasianthera, Gastrolepis,* and *Medusanthera.* Several authors have cited the resemblance of these fruits to the mericarp of the *Umbelliferae.* It should be noted, however, that this resemblance is in shape only. A mericarp is only a portion of a fruit, *i. e.* a carpel, while in *Discophora* it is the entire fruit that is arcuate. On the concave side of the fruit there is a large cushion or pad of fleshy tissue. This appears to be undifferentiated and contains no vascular strands, although it is abundantly filled with oil-cells. Pressed and dried herbarium specimens contain much oil, and frequently even the mounting paper is saturated. Rodrigues points out the porcelain-white color of this appendage when fresh. Lawrance also indicates that it is of a glossy white color. In fresh condition this pad is described as broader than the body of the putamen, but in dried specimens it has shrivelled. The putamen is woody and strongly curved. Medianly on both the concave and convex surfaces it has one prominent ridge. On the lateral edges of the flattened fruit the putamen usually has two approximate, equally developed ribs. Between these lateral ridges and the median ridge on the convex surface are one or more less prominent ridges, which may be developed the complete length of the fruit or to varying degrees of completeness. Thus the convex surface of the drupe may appear to bear three or five or even more ribs. The pericarp of the drupe is fleshy, thin, of uniform thickness. Rodrigues mentions the pigmentation of the pericarp, commenting that it is soluble in alcohol. Reports of fresh fruit-color indicate that the pericarp is black or a rich dark brown. When dry all of the fruits are dark. When the pericarp is boiled in alcohol or caustic soda, or after long treatment in hot water, the pigment can be extracted. The resulting solution may be a deep wine-color or brown. The pericarp is unpigmented but readily distinguishable on the concave surface of the fruit where it is covered by the oily pulvinus. Only towards the base is the differentiation slight, indicating that the porcelain-colored pulvinus may have developed from the basal pulvinus of the functional ovary.

The single locule of the putamen conforms in shape to the exterior sculpturing since the wall of the putamen is nearly of uniform thickness. The albumen of the seed conforms with the irregular shape of the locule and the cotyledons in all specimens examined are minute.

The path of the funicle through the ovarian wall and in the fruit has received considerable attention in other genera of the family. Here the funicle is sturdy and not definitely flattened. Its path is outside the putamen and it usually lies on top of the median rib on the concave side of the fruit. After entering the locule at the stylar end it becomes flattened and descends the side of the seed 90° from its course on the outside. The funicle in its course on the concave side of the fruit is covered by unpigmented pericarp-tissue which is, in turn, covered by the fleshy oily paid previously described.

The genus *Discophora* cannot be closely related to any of the present known New World genera of the *Icacinaceae.* In all the characters of its fruit, flowers or wood it stands distinct. Comparison of these same characters with those of several genera of the Asiatic region show close relationships. The similarities and differences in wood structures of *Discophora, Lasianthera, Gastrolepis, Medusanthera* and *Grisollea* have been pointed out by Bailey and Howard (Journ. Arnold Arb. **22:** 178–180. 1941). Similarity in the flowers and particularly in the fruits of these genera is striking (Howard l. c.).

Key to the Species

Leaves obovate-oblong; acumen short, 7–10 mm. long . . . . *D. panamensis*
Leaves oblong-lanceolate to elliptic; acumen 1.5–4 cm. long.
  Drupe 2 cm. long, 1 cm. wide, 0.9 cm. thick; leaves oblong-lanceolate to elliptic-oblong, acumen 1–4 cm. long . . . . . . *D. guianensis*
  Drupe small, 1 cm. long, 0.4 cm. wide, 0.3 cm. thick; leaves elliptic, acumen to 2 cm. long . . . . *D. montana*

DISCOPHORA PANAMENSIS Standley, Field Mus. Pub. Bot. **4:** 222. 1929.

Trees to 10 m. tall; the trunk 10 cm. in diameter, the branchlets terete, minutely puberulous; petioles 1–1.5 cm. long, narrowly and deeply canaliculate, densely and minutely puberulous; lamina obovate-oblong, 13–17 cm. long, 4–5.5 cm. wide, flat or minutely revolute, membranaceous, light green above, glabrous, abruptly short-acuminate, the obtuse to acute acumen 7–10 mm. long, the base acute to rarely obtuse, the midrib and veins slightly impressed, sparsely short-puberulous below, the ascending and only slightly arcuate veins 7–8 pairs, conspicuous, the veinlets inconspicuous; cymes many-flowered, 2–3 cm. long and broad, the branchlets puberulous; staminate flowers with calyx subentire, 0.7 mm. high, glabrous except for small clusters of hairs at the tips of the teeth; petals ovate-oblong 1.5–3.0 mm. long, subglabrous or papillate on the inflexed apex, stamens as long as the petals, after anthesis slightly exserted, densely white-barbate, the anthers ovate, 0.6 mm. long; pistil abortive and undifferentiated, centric or eccentric to a large fleshy pulviniform disk; female flowers and fruits not known.

TYPE SPECIMEN: *Cooper* 613 (FM), collected in the region of Almirante, province of Bocas del Toro in Panama.

ILLUSTRATION: PLATE 1B, FIGS. 12–13.

SPECIMENS SEEN: Panama, Bocas del Toro, region of Almirante, *Cooper* 613 (FM TYPE, G, US).

This species is represented only by staminate material. As Standley has indicated, it differs from *D. guianensis* in having smaller, less coriaceous leaves and more slender branches to the inflorescence. The secondary venation of the leaves is not so conspicuous nor so highly reticulate as in *D. guianensis.* The specimens known are all tips of young shoots. Nevertheless the smaller size of the mature leaves is forecast by the small buds and leaf-primordia on these shoots. In comparison with those of *D. guianensis* the size is about one-third to one-half. The leaves of the present species are obovate-oblong, several times longer than wide, and broader near the apex than at the base, and the acumen is tapering to an acute apex. In contrast the leaves of *D. guianensis* of a comparable size are oblong-ovate and broader at the base, while the acumen is of uniform width for a good proportion of its length before it reaches an obtuse apex.

In the original description little mention was made of the unisexuality of the flowers of this plant. The anthers are fertile and the pistil is abortive, small and cylindrical or even further reduced to a globular mass. Sections of several of these rudiments revealed no structure other than a few weakly developed vascular strands very near the base. This rudiment is found either in the middle of a circular fleshy disk or at the orifice of a hippocrepiform fleshy mass. Female flowers and fruits are much desired.

DISCOPHORA GUIANENSIS Miers, Ann. Mag. Nat. Hist. II. **10:** 118. 1852, Contrib. Bot. **1:** 105. 1851–61; Bentham and Hooker, Gen. Pl. **1:** 352. 1862; Valeton, Crit. Overz. Olac. 241. 1886.

Kummeria brasiliensis Martius Herb. 1276. 1837, *nomen:* Martius ex Engler, Fl. Bras. **12:** (2): 52. 1872; Baillon, Adansonia **11:** 194. 1873 and Hist. Pl. **5:** 330. 1874; Engler, Nat. Pflanzenfam. **3** (5): 249. 1893.

Lasianthera amazonica Barbosa Rodrigues, Vellosia **1:** 12. 1891, second edition.

Trees or shrubs to 13 m. tall, the trunk to 10 cm. diameter, the branches lightly golden-strigose; petioles 10–25 mm. long, stout, canaliculate, strigose to glabrate; lamina oblong-lanceolate to elliptic-oblong, 15–30 cm. long, 7–13 cm. wide, coriaceous, olive-brown, silvery- or golden-sericeous or pilose when young, glabrate, acute or acuminate, the acumen to 4 cm. long but usually 2 cm. long, with the ultimate apex rounded, the base acute, rarely rounded, the margin revolute, the midrib prominent and strigose below, sulcate below, the arcuate or ascending veins 7–10 pairs, the veinlets conspicuously reticulated and sharply prominent on both surfaces; inflorescence paniculate, strongly branched from the base, rarely strict, densely golden-strigose, becoming glabrate and stout in fruit, the pedicels short, the densely pubescent bracts lance-ovate or ovate; calyx campanulate, glabrous except for the tips of the teeth; petals obovate to elliptic, 2–3 mm. long, glabrous except for minute pubescence on inside of inflexed acumen; stamens of male flowers 3.5–4 mm. long, the broadly ovate anther 0.7 mm. high, stamens of the female flowers shorter; functional pistil cylindrical or slightly angular and arcuate, 3 mm. high, basal lateral fleshy pulvinus to 1 mm. high and surrounding about one-half of the ovary, the capitate stigma strongly rugose; the pistil of the male flowers abortive, club-shaped or cylindrical, minute, rarely to 1 mm. high, completely surrounded by a fleshy disk, less frequently eccentrically placed; drupe 2 cm. long, 1 cm. wide, 0.9 cm. thick, the putamen strongly five-ribbed on the convex surface.

TYPE SPECIMEN: *Parker* in the Hooker herbarium (not seen), collected on the Demerare river in British Guiana.

ILLUSTRATIONS: *Miers,* Contrib. Bot. **1:** pl. 20. 1851–61; Engler, Fl. Bras. **12** (2): pl. 12. 1872; Valeton, Crit. Overz. Olac. pl. 5, fig. 24 a-d. 1886; Barbosa Rodrigues, Vellosia 3: pl. 7, 1891, second edition, as *Lasianthera amazonica;* Engler, Nat. Pflanzenfam. **3** (5): fig. 139. a-c. 1893.

SPECIMENS SEEN: Brazil. Amazonas: Para, *Huber* 93 (FM); Humayta, near Livramento on Rio Livramento, *Krukoff* 6789 (A, FM, NY, US); Humayta between Rio Livramento and Rio

Ipixuna, Cipoal, *Krukoff* 7227 (A, FM, NY, US); São Paulo de Olivença, *Krukoff* 8699 (A, FM, NY); Amazon region, *Ducke* 317 (NY). Bahia: Ilheos, *Martius* 1276 (NY isotype of *Kummeria brasiliensis,* TYPE photo FM); Esperance, *Riedel* 793 (NY). Peru: Loreto: Balsopuerto, *Klug* 3017 (A, FM, G, NY, US); Mishayacu near Iquitos, *Klug 478* (FM, NY, US), 986 (FM, NY, US), 452 (FM, NY, US), 942 (FM, NY, US). British Guiana. Barima River, *La Cruz* 3419 (FM, G, NY, US); Kamakusa upper Mazaruni river, *La Cruz* 4233 (FM, G, NY, US); Coverden, *Persaud* 135 (FM, NY). Without locality: *Melinon* 242 (FM) this specimen was originally from the Herb. Mus. Paris.

In spite of a wide separation geographically I believe the specimens upon which Martius and Miers established *Kummeria* and *Discophora* are conspecific. Martius' plant was from Bahia, that seen by Miers from British Guiana. I have not seen the specimen cited by Miers but more recent collections from the same region are indistinguishable from Martius' plant, which also is in agreement with the description and plate published by Miers.

Only slight variation appears in the specimens from Peru. In these the entire plant, calyx, inflorescence, leaves and branches are more pubescent, with the hairs longer and more persistent. No other differences worthy of distinction were to be found. The range of the present species, therefore, is from British Guiana through Brazil, from Para to Bahia, and up the Amazon river to Loreto, Peru.

Rodrigues mentions a lack of a fleshy pad on one side of the fruit in *Kummeria* and through this he distinguished the plant he described. Obviously he was in error for, although this fleshy mass is not indicated in Engler's diagnosis of the species, it is clearly visible in a photograph of the type specimen.

Illustrations of this species are variable in their accuracy. Those of Rodrigues are especially good and show well the habit, fruits and flowers. The sections of fruit as illustrated are also good. The stamens which Rodrigues illustrates are all from functionally female flowers. The adaxial appendage midway the length of the filament is accurate and the pubescence is correctly placed. The elongation of the filament after anthesis is primarily above the appendage and, as illustrated, its pubescence, and thereby quite different from the condition found in either *Lasianthera* or *Gastrolepis*. Engler's drawings in Fl. Bras. and Nat. Pflanzenfam. are inaccurate and should not be considered beyond the habit-sketch.

DISCOPHORA **montana** sp. nov.

Arbor 6-metralis; ramulis teretibus, minute puberulis, internodiis 3–5 cm. longis; petiolis 13–18 mm. longis minute puberulis, anguste et profunde sulcatis; laminis foliorum ellipticis 16–24 cm. longis 6–9 cm. latis coriaceis supra olivaceis et glabris apice acuto vel acuminato (acumine ad 2 cm. longo obtuso) basi acuto, cum costa et nervis impressis notatis, subtus pallidioribus sparse strigosis puberulis; nervis foliorum lateralibus utroque 7–9 adscendentibus, ad apicem arcuatis et juxta marginem conjunctis; cymis divaricatis laxe multifloris 3–4 cm. longis et 3–6 cm. latis ramulis sericeis puberulis bracteis ovatis 0.5–1.5 mm. longis; calycis florum masculorum 0.5 mm. longis lobis ad 0.2 mm. longis; petalis ovato-oblongis 1.5–2.0 mm. longis, obtusis; staminibus quam petalis laeviter longioribus filamentis crassis ad mediam dense albo-barbatis antheris ovatis 0.3–0.4 mm. longis; pistillo florum masculorum abortivo rudimento pistilli glabro in discum carnosum annularem inserto; floribus femineis ignotis; fructu maturo drupaceo leviter arcuato 9–11 mm. longo 3–4 mm. lato 3 mm. crasso in latere concavo pulvinum subcarnosum gerente; putamine longitudinaliter sulcato costis lateralibus costaque dorsali caeteris crassiore.

ILLUSTRATION: PLATE 1B, FIGS. 1–11.

SPECIMENS SEEN: Colombia. El Umbo region of Mt. Chapon, extreme western part of Dept. Boyaca, 130 miles N. of Bogota, *Lawrance* 522 (A TYPE, FM, G, NY isotypes), 535 (A, FM, G, NY).

VERNACULAR NAME: Senceso.

This species is represented by two collections of *A. E. Lawrance* from Colombia. One collection in full flower is entirely staminate, with abundant pollen in the anthers and a rudimentary pistil completely immersed in the center of a fleshy cushion or disk. This collection was made at an altitude of 3200 feet. The flowers are reported as tiny, creamy-white and odorous. The second collection consists of older material with a few fruits remaining attached to the cymose inflorescence. Diligent search failed to reveal any old flowers or floral parts, so a description of the functional pistil is lacking. The drupe is typical of the genus, slightly arcuate, with a long fleshy cushion attached to the concave side. It is conspicuously smaller than the fruits known for *D. guianensis.* This collection was made at an altitude of 4000 feet, in a high thick forest. In attached field-notes the fruits are described as bean-shaped, half black and half white. The altitudinal range of this species is much higher than those of the others. The specimens of *D. panamensis* were collected at less than 1250 feet and those of *D. guianensis* from coastal forests at altitudes up to 500 feet.

Several morphological features of this species are worthy of further mention. The strict silvery strigose pubescence of the inflorescence is continuous to the articulation of the flower at the base of the calyx. The fleshy calyx is minutely papillate and the tissue contains numerous large crystal-bearing cells. The calyx-teeth are better developed than in the other species of the genus. The inflexed apex of the corolla is papillate above and the inner surface of this apex bears numerous moderately long lanceolate hairs. The midrib of the petal is fleshy and prominent and broadens at the base. Auriculate lobes are well developed laterally in the middle of the filament on most of the stamens examined. The pubescence on these lobes is dense, with lanceolate rather than clavate hairs.

Discophora montana is distinct from the other species of this genus on its smaller fruits, elliptic leaves and delicate, much branched cymose inflorescences.

EMMOTUM Desv. ex Hamilt.

A complete revision of this genus will be published in one of the later numbers of the current volume of the Journal of the Arnold Arboretum.

OTTOSCHULZIA Urban

Ottoschulzia Urban Symb. Antill. **7:** 272. 1912.

Trees or shrubs, the terete branches strigose or glabrate; leaves coriaceous, entire, pinnately veined, the veins not arcuate; flowers small, in few-flowered racemes, or solitary in the axils of the leaves, articulated at the base of the elongated calyx, perfect; sepals ovate, obtuse or rounded; petals fleshy, with a prominent midrib, glabrous inside; stamens glabrous, the broad fleshy filaments slightly concave internally, the basifixed ovate anthers erect, connective extended to a slightly incurved apex, the anther-sacs laterally dehiscent along the connective; disk absent; ovary globose, glabrous, the short style terminal, the locule solitary, the two ovules superposed; drupe ovoid, mesocarp slightly fleshy and with a fibrous layer, the thin putamen smooth outside and pilose inside, the seed solitary, the embryo straight, the oblong cotyledons foliaceous, the radicle terete and shorter than the cotyledons, the endosperm copious.

Type Species: *Ottoschulzia cubensis* (Wright) Urban.

Distribution: Cuba, Porto Rico, Santo Domingo, Haiti.

Urban established *Ottoschulzia* by splitting the genus *Poraqueiba*. The genus is named in honor of Otto E. Schulz, a monographer of the Antillean flora.

The plants are either trees or shrubs. On a specimen of *O. cubensis* (*Wright* 2639) there is a pencilled label reporting the plant to be a large bush of saline thickets ("salt marsh") and another label on the same collection described it as a small tree 25 feet. The other two species are trees.

The leaves of *Ottoschulzia* are much smaller than in most of the New World genera. They bear a malpighiaceous pubescence on the lower surface when young. The arms of the hairs may be equal or quite unequal and they break off early. Frequently in *O. cubensis* and regularly in *O. rhodoxylon* and *O. domingensis* the leaves and older twigs are grey in color, due to a free layer of empty cells on each surface. The veins are not arcuate as in most genera of the family but are strictly pinnate and parallel. They branch near the margin, with the divisions curving and weakly anastomosing close to the edge of the lamina. This is somewhat similar to the condition found in *Emmotum*.

The inflorescence of *O. cubensis* is commonly racemose and scarcely equals the length of the petiole. The number of flowers may be reduced to two; or frequently only a single flower is to be found in the axil of a leaf. The bracteate calyx may be articulated either to the main axis in the case of the true inflorescence or to a very short axillary stalk when only one or two flowers are present. The calyx is densely strigose-pubescent with thick-walled chestnut-brown hairs. Urban described the corolla as gamopetalous but, although I have carefully studied flowers of *O. cubensis,* I can find no examples of this. The petals and filaments are fleshy and are usually agglutinized in drying, but boiling and careful dissection reveals that all parts are free. In fact, the petal-bases are rounded and actually quite separated. The petals are densely strigose outside except at the base, where the tight investment of the calyx prevents the development of hairs. The petals are glabrous inside and bear two longitudinal furrows and a prominent midrib, which is not sulcate as in *Poraqueiba.*

The glabrous stamens are similar in form to those found in *Poraqueiba* but differ in the presence of pigmented cells throughout the tissue. When viewed from the side the anthers are ovate in contrast to the triangular shape in *Poraqueiba,* and at the ends the anther-sacs are approximate. The apex of the connective is inflexed and the dehiscence of the anther is along the junction with the connective.

Urban described the ovary as having three locules, two of which aborted. I have been unable to find any indication of two extra locules at any stage of development. The single locule has two superposed ovules, the lower one usually shrunken and abortive.

Fruits are known only for *O. cubensis.* The drupe is ovoid, with a thin pericarp in which there are no oil cells such as were found in *Poraqueiba.* The thin woody putamen is pubescent on the inner surface, also different from *Poraqueiba.* These hairs are longer than those found elsewhere on the plant. They are usually thin-walled and have a restricted lumen and slightly enlarged base.

A dark pigment is found in the tissues of this plant which is comparable to that found in the tissues of *Emmotum* and *Poraqueiba.* The leaves have pigmented cells in the mesophyll and the pigment is also found in the bark, the ray-parenchyma and the pith. The pigment is present in the calyx but is masked by a thick-walled epidermis. It is also present in the connective tissues, the filaments and the ovarian wall.

Habitat-notes for this genus are few. Wright's material bears pencilled notes referring to a salt marsh, which may account for the reduced characters of leaf-size and inflorescence. *O. rho-*

doxylon is reported from woods, and Ekman gives limestone rocks as its habitat in Haiti.

The closest affinities of the genus are with *Poraqueiba.* Similar fleshy petals, filaments and broad connectives are also found in *Oecopetalum, Poraqueiba* and *Emmotum.* The position of the ovules is similar to that in *Oecopetalum.* Further agreement of these genera is found in the wood-structure.

The genus is readily distinguished from *Poraqueiba* by the much smaller leaves, reduced inflorescence, lack of subtending bracts to the flowers, elongate calyx-bases, glabrous inner surface of the petals, superposed ovules, and the pubescent inner surface of the putamen.

I have seen isotypes of *O. cubensis* and leaf-fragments of the other two species. *O. rhodoxylon* is known only in sterile condition but, according to Urban, Prof. Volkens reports it has a wood-structure comparable to that of *O. cubensis. O. domingensis* is known in flowering condition but I have not seen material of it.

Key to the Species

Young stems ferrugineous tomentose; leaves ovate 2.5–5 cm. long, 1.5–3 cm. wide, the base rounded, brown strigose pubescent. . . . . *O. cubensis*

Youngest stems glabrous.

  Leaves ovate to broadly elliptic, 6.5–8 cm. long, 4.5–6 cm. wide, the base rounded to truncate. . . . . *O. rhodoxylon*

  Leaves obovate, 3–3.5 cm. long, 1.3–3 cm. wide, the base narrowed or cuneate. . . . . *O. domingensis*

Ottoschulzia cubensis (Wright) Urban, Symb. Antill. **7**: 273. 1912.

Poraqueiba cubensis Wr. ex. Griseb. Cat. 119. 1866; Wr. et Sauv. Flor. Cub. 21: 1863 *nomen;* Urban Symb. Antill. **5**: 405. 1908.

Large bush or small tree to 25 feet, the branches terete, the youngest branchlets red-brown and strigose or tomentose to glabrate; petiole 5–8 mm. long, canaliculate, densely ferruginous-tomentose; lamina ovate or rarely oblong, 2.5–5 cm. long, 1.5–3 cm. wide, coriaceous, pubescent when young with malpighiaceous hairs, usually glabrous above, short-acuminate or rounded, the base rounded, the strigose-pubescent midrib prominent below, the veins inconspicuous; inflorescence axillary, racemose or reduced to 1–2 flowers, scarcely as long as the petiole, rhachis sparsely strigose; calyx-lobes ovate, rounded or acute, 0.5 mm high; petals ovate, 2.5–2.9 mm. long, 1 mm. wide; stamens 2.2 mm. long, the filaments 0.5 mm. wide, the connective-apex 0.2 mm. long, the anther-sacs 0.9–1.1 mm. long; pistil 1 mm. long; drupe 2–2.5 cm. long, 1.6 cm. in diameter, the putamen 0.5 mm thick.

Type Collection: *Wright* 2639, from the Oriente province of Cuba.

Illustration: Plate 2A.

Specimens seen: Cuba. Oriente: Manglaus, Toscano, *Wright* 2639 (G, NY, US isotypes); Sierra Maestra, *Leon* 10799 (NY). Isle of Pines: Hato Nuevo, Punta del Este, *Roig & Cremata* 1793 (NY).

Ottoschulzia rhodoxylon (Urban) Urban Symb. Antill. **7:** 274. 1912.

Poraqueiba rhodoxylon Urban, l. c. **5:** 405. 1908.

Stems angular, striate, glabrous; petioles 6–8 mm. long; lamina orbicular-ovate to oval, 6.5–8 cm. long, 4.5–6 cm. wide, coriaceous, olive, shining above, pale brown below, the apex rounded to obtuse, the base round to almost truncate, the prominently reticulate-anastomosing veins 6–7 pairs, lightly impressed above and oblique; flowers and fruits unknown.

Type Collection: *Krug* 1442, from Mayaguez, Porto Rico.

Specimens seen: Porto Rico. Near Mayaguez, *Krug* 1442 (NY leaf fragment of type). Haiti. Inseln Grande-Caimite near Les Abricots, *Ekman* 8933 (US), Massif du Nord, Port Margot, Bayeux, *Ekman* 2586 (US). Both of Ekman's collections are sterile.

Vernacular name: Palo de rosa.

Ottoschulzia domingensis Urban, Symb. Antill. **7:** 274. 1912.

Stems brown or gray; petioles 4–7 mm. long, 0.6–1 mm. thick, deeply sulcate, appressed-brown-pilose; lamina obovate to elliptic, 3–5.5 cm. long, 1.3–5 cm. wide, shining above, glabrous, short-brown-pilose below, the apex round or obtuse to short-acuminate, the base narrowed, the 5–7 pairs of veins slightly prominent on both surfaces; flowers solitary in the leaf-axils, the pedicels 1 mm. long and thick; calyx-lobes suborbicular, 1 mm. long, pilose outside, the apex round or obtuse; petals narrowly ovate, 3 mm. long, 1.3 mm. wide, acute, appressed-pubescent with brown malpighiaceous hairs; filaments 1.5 mm. long, 0.4 wide, the anthers not known; ovary ovate, 0.7 mm. long, 0.6 mm. in diameter, the style cylindric; fruit unknown.

Type Collection: *Fuertes* s. n., collected in Barahona province of Santo Domingo.

I have seen a fragment of a leaf from the type specimen (NY). Only one flower is known for this species.

In Urban's descriptions the only characters distinguishing between *O. domingensis* and *O. rhodoxylon* are leaf-size and, especially, the shape of the base of the lamina. Ekman (Arkiv. Bot. **17** (7): 40. 1921) includes in his description of a Haitian plant the characters of both these species. He suggests that they are conspecific. Using Urban's descriptions I have changed the identification of Ekman's material from *O. domingensis* to *O. rhodoxylon.* I cannot decide the question of conspecificity of these plants without seeing more material and, therefore, I accept the three species as defined by Urban. If *O. domingensis* and *O. rhodoxylon* should prove to be conspecific, as Ekman suggests, the name *rhodoxylon,* not *domingensis,* will have to be retained.

OECOPETALUM Greenman & Thompson

Oecopetalum Greenman & Thompson, Ann. Miss. Bot. Gard. **1**: 408. 1914.

Trees; leaves alternate, subcoriaceous, the veins arcuate and anastomosing, the margin entire; inflorescence axillary, pedunculate, much branched, the cymes densely flowered; flowers perfect; calyx fleshy, sericeous, accrescent in fruit; petals fleshy, the midrib prominent, the margins incurved; stamens with elongate anthers, erect, dehiscence lateral along junction with the connective, connective fleshy; disk none; ovary globose, glabrous or sparingly pilose, the ovules superposed, the style stout or filiform, the stigma obtuse and bilobed; fruit drupaceous, globose, 2-ridged, dehiscent with the calyx, the rugose and glabrous putamen woody, the single seed with a curved embryo, the ovate cotyledons not superposed, the radicle terete and equal in length to the cotyledons, the endosperm copious.

Type Species: *Oecopetalum mexicanum* Greenm. & Thomps.

Distribution: Mexico and Guatemala.

In the original description and in several subsequent reports of the genus the ovary has been described as unilocular and uniovulate. In fact, however, there are two pendant anatropous ovules present. Unlike most of the genera of the family, *Oecopetalum* has the two ovules superposed. One ovule has a short funicle and is situated directly above the second ovule with a longer funicle. Both ovules are turgid and tightly compressed against each other and against the locular walls. For this reason they could easily be mistaken as one, but careful dissection shows that two are present.

Baehni (Candollea **7:** 171. 1936) suggests that *Oecopetalum* is synonymous with *Poraqueiba* but this is not the case. *Oecopetalum* cannot be confused with any other genus of the New World. The much-branched inflorescence, accrescent calyx, fleshy, essentially glabrous petals, elongate anthers with very thick connectives, and the superposed ovules allow ready identification of the genus.

Greenman and Thompson suggested the characters which *Oecopetalum* has in common with *Mappia, Discophora* and *Poraqueiba;* however, the relationships of these genera are vague except that with *Poraqueiba.* The closest relationship of *Oecopetalum* is with *Ottoschulzia,* on the basis of floral structure, and with *Platea* through certain similarities in the wood.

The three species recognized in this genus are very similar. Study of more material may not allow all to be retained.

Key to the Species

Veins of the leaves 8–10 pairs; stamens only 5 mm. long, filaments 0.5–1.2 mm. long; ovary sparsely pilose at the base of the style . . . . *O. Greenmanii*

Veins of the leaves 4–6 pairs; stamens 6–8 mm. long, the filaments 2–2.5 mm. long; ovary glabrous.

- Leaves broadest below the middle, the base narrowed or rounded; anthers oblong, not narrowed at the base; petals pubescent outside . . . . *O. guatemalense*
- Leaves broadest above the middle, the base cuneate; anthers narrowed and the anther-sacs approximate at the apex; petals glabrate or very sparsely pubescent outside . . . . *O. mexicanum*

Oecopetalum Greenmanii Standley & Steyermark, Field Mus. Pub. Bot. **22:** 154. 1940.

Tree, the green and glabrous branches terete; petioles 0.8–1.5 cm. long, canaliculate, glabrate or sparsely sericeous; lamina oblong or elliptic-oblong to lance-oblong, 14–20 cm. long, 3.5–8 cm. broad, glabrous, shining above, acute to subacuminate, the base obtuse, the midrib slightly prominent, the arcuate veins 8–10 pairs, the veinlets reticulate; cyme 5 cm. wide, 6 cm. long, repeatedly branched, densely flowered, to 9 cm. long in fruit, the rhachis sparsely to densely sericeous; flowers aggregated, the minute bracts subulate or lanceolate; calyx 1.5–2 mm. long, the ovate, acute and sericeous lobes persistent and accrescent in fruit, the lobes then 5.5–6.5 mm. long and 3 mm. wide; petals

5–5.5 mm. long, 1.5–1.6 mm. wide, minutely sericeous outside, slightly pilose on the keel inside; anthers 4 mm. long, 1 mm. wide, the filaments 0.5–1.2 mm. long and 0.5 mm. wide; ovary 1 mm. long, 0.75 mm. wide, sparsely pilose at the base of the style, the glabrous style 3.5 mm. long; drupe depressed-ovoid or globose, obliquely 2-ridged, 1.5 cm. in diameter, the apex broadly rounded and short-rostrate, the rostrum 1.5 mm. long.

TYPE SPECIMEN: *Steyermark* 39516 (FM), collected in Guatemala, Dept. Izabal, Rio Dulce, west of Livingston.

SPECIMENS SEEN: *Steyermark* 39516 (FM, TYPE).

After examining the type specimen I find it necessary to emend the original description with the following details. The ovary is sparsely pilose at the base of the style and is uniloculate, with two superposed pendant, anatropous ovules.

OECOPETALUM GUATEMALENSE Howard, Journ. Arnold Arb. **21**: 483. 1940.

Tree to 20 m. tall, the trunk-diameter 30 cm., the branches sparsely sericeous to glabrate; petioles 0.7–1 cm. long, canaliculate, glabrate; lamina elliptic to elliptic-oblong, 10–14 cm. long, 3.5–6 cm. wide, broadest below the middle, glabrous above, green, paler below and sparsely appressed-pubescent with malpighiaceous hairs, acute, the base rounded, the midrib and veins prominent, the arcuate veins 4–6 pairs; cymes with peduncles to 2.5 cm. long, the rhachis appressed pubescent; calyx campanulate, 2.1 mm. in diameter, enlarging in fruit to 1.5 cm. in diameter, the lobes 6–7 mm. high; petals oblong-lanceolate, 8 mm. long, 1.7–2 mm. wide, sparsely sericeous-pubescent outside, glabrous inside; stamens 5–7 mm. long, the oblong anthers 5–5.3 mm. long and 1.3–1.5 mm. wide, the connective red-brown; ovary and style glabrous; drupe globose, 1.8–2 cm. in diameter.

TYPE SPECIMEN: *Skutch* 2080 (A), collected in Guatemala, Finca Moca, Dept. Suchitepequez.

ILLUSTRATION: Journ. Arnold Arb. **21**: pl. 3. 1940.

SPECIMENS SEEN: Guatemala. *Skutch* 2080 (A, TYPE); Volcan Zunil, Dept. Quezaltenango, *Skutch* 954 (A, NY). Mexico. Finca Irlanda, Chiapas, *Purpus* 7609 (A, G, NY, US).

OECOPETALUM MEXICANUM Greenm & Thomps. Ann. Miss. Bot. Gard. **1**: 408. 1914.

Trees, the branches sericeous to glabrate; petioles 0.7–1.5 cm. long, canaliculate; lamina elliptic to lanceolate, 10–25 cm. long, 3.5–10 cm. wide, glabrous, the apex short-acuminate to obtuse, the base cuneate or narrowly acute, the midrib and veins slightly sulcate above, prominent and sparsely appressed-pubescent below, the arcuate veins 5–7 pairs; cymes densely flowered, the rhachis densely appressed-puberulous; calyx 2 mm. in diameter, the obtuse and densely sericeous lobes ovate and 1 mm. long; petals oblong-lanceolate, 8–8.3 mm. long, 2 mm. wide, sparsely sericeous outside or glabrate, glabrous inside; stamens 7 mm. long, the anthers ovate-lanceolate, the anther-sacs approximate at the apex; ovary glabrous, the two ovules superposed, the style glabrous; fruit unknown.

TYPE SPECIMEN: *Purpus* 6159 (Mo. Bot. Gard. Herb. not seen), collected in Mexico, Vera Cruz, Sierra Madre near Miscantla.

ILLUSTRATIONS: Ann. Miss. Bot. Gard. **1:** pl. 25. 1914.

SPECIMENS SEEN: Mexico. Vera Cruz: Sierra Madre near Miscantla, *Purpus* 6159 (FM, G, US isotypes). Chiapas: Mt. Tacana, *Matuda* 2437 (FM, G, NY).

DENDROBANGIA Rusby

Dendrobangia Rusby, Mem. Torrey Bot. Club **6:** 19. 1896, Bull. Torrey Bot. Club **24:** 79. 1897; Smith, Lloydia **2:** 193. 1939.

Clavapetalum Pulle, Rec. Trav. Bot. Neerl. **9:** 148. 1912.

Asterolepidion Ducke, Arch. Jard. Bot. Rio **3:** 207. 1922.

Tree, the lepidote-strigose to glabrate branches terete; leaves alternate, entire; inflorescence axillary, paniculate, diffuse, densely pubescent, bracteate; flowers sessile in glomerules of 3–5, articulated below the calyx, perfect; calyx 5-parted, fleshy, the stellate-pubescent segments coherent at the base and imbricated; corolla gamopetalous, 5-lobed, valvate, glabrous or rarely papillate, the inflexed apices with long clavate appendages; stamens 5, the glabrous filaments dilated at the base and adnate to the corolla-tube at the sinuses, the long anther-sacs diverging at the base, longitudinally dehiscent and introrse; disk none; ovary dorso-ventrally compressed, uniloculate, collateral ovules two; style stout, capitate stigma minute; fruit drupaceous, oblong, mesocarp thin and fleshy, endocarp thin and woody, the seed solitary, the embryo minute, the endosperm copious.

TYPE SPECIES: *Dendrobangia boliviana* Rusby.

DISTRIBUTION: French Guiana, Brazil.

DENDROBANGIA BOLIVIANA Rusby, Mem. Torrey Bot. Club **6:** 19. 1896, Bull. Torrey Bot. Club **24:** 79. 1897.

Clavapetalum surinamense Pulle, Rec. Trav. Bot. Neerl. **9:** 148. 1912.

Asterolepidion elatum Ducke, Arch. Jard. Bot. Rio **3:** 207. 1922.

Clavapetalum elatum Ducke, Arch. Jard. Bot. Rio **4:** 116. 1925.

Tree to 40 m. tall, the brownish-gray bark smooth, the stout branches ferruginous-tomentose or stellate-pubescent, becoming glabrate; petioles 1–1.5 cm. long, narrowly canaliculate, stellate-pubescent; lamina lance-oblong to obovate, 8–14 cm. long, 3–5 cm. wide, coriaceous, dark green when fresh, turning black on drying, glabrate above, persistently ferruginous-stellate-pubescent below, the apex obtusely acuminate with curved acumen or acutish, the base acute to rounded, the midrib sulcate above but prominent below, the irregularly falcate-ascending and inconspicuous veins 6–8 pairs, slightly anastomosing near the margin; inflorescence axillary, much branched, the panicle 3–4 cm. long, with branches scurfy with stellate pubescence, the lance-ovate and fleshy bracts densely pubescent and ciliate; sepals 1–2 mm. long, stellate-pubescent, ciliate; corolla white, 3 mm. long, the broadly triangular lobes inflexed in bud and bearing clavate or oblanceolate appendages, the lobes reflexed on maturity; anthers 0.4 mm. long; ovary 0.4 mm. high and 0.6 mm. in diameter, bearing large stellate hair-clusters, the style minute but evident, the capitate stigma minute; drupe compressed, triangular in section, 1.5–2 cm. long, 1 cm. wide, 0.5 cm. thick, sparsely stellate-pubescent, the putamen thin and essentially smooth on both surfaces, the seed one, the endosperm copious, the embryo minute, the cotyledons minute and triangular.

TYPE SPECIMEN: *Rusby* 1694 (NY), collected in ~~British Guiana~~ between Tipuani and Guanai.

ILLUSTRATIONS: Bull. Torr. Bot. Club **24:** pl. 294. 1897; Rec. Trav. Bot. Neerl. **19:** pl. 2. 1912 as *Clavapetalum surinamense.*

SPECIMENS SEEN: British Guiana. *Rusby* 1694 (NY type, A. FM, G, US isotypes); Malali, Demerara river, *La Cruz* 2717 (G, NY, US); Kamakusa, upper Mazaruni river, *La Cruz* 2856 (G, NY, US); Wismar, *Persaud* 113 (NY); basin of the Essequibo river near the mouth of the Onoro creek, *Smith* 2726 (FM, G, NY). Brazil. Amazonas: Borba, *Ducke* 10153 (US); Belem de Pará, *Ducke* 17855 (US), 15534 (NY, US).

VERNACULAR NAMES: Piritjalopo, Apiritjalopo.

A. C. Smith recognized the identity of the three monotypic genera here cited and combined them under the oldest name, *Dendrobangia.* Only slight variation in the leaf-shape exists among the specimens and Ducke's claim of two species seems best disregarded.

Collectors report the trees in deep forests on high lands and 30–40 m. tall, making them among the tallest of the New World *Icacinaceae.* Only *Poraqueiba* is reported to comparable heights. Ducke says the bark is smooth and, when fresh, has an odor of "cubiu," a Solanaceous genus cultivated in the Amazon basin. The wood is hard and durable and is exported from the region of Breves under the name "pau de cubiu."

The leaves are somewhat variable in shape but examination of sufficient material of single collections shows the variations reported in each of the previous descriptions. The under side of the lamina and the midrib and veins bear ferruginous stellate hair-clusters. These clusters have frequently been described as lepidote, since the basal regions of the hairs are often fused and flattened. The outer extremities of the hair are crispose and free. The occurrence of stellate hairs in this genus is significant, since this type of indument is somewhat rare in the family. Among the other New World genera only the species of *Humirianthera* regularly have stellate clusters of hairs. Several Old World genera of the other subfamilies have clustered hairs but of different types. *Platea* has hairs which approach closely those of *Dendrobangia,* since the lower portions of the individual hairs are also fused.

The axillary inflorescence of *Dendrobangia* consists of one or two strongly branched panicles, which generally have the basal branches as well developed as the principal axis. The inflorescence usually is about the length of the leaf, or 2–3 cm. long. Pulle reports and figures the inflorescence of his material to be 4–8 cm. long, which is the only noteworthy character in his new genus. Both bracts and bracteoles of the inflorescence are fleshy and usually have a ciliate margin. The rest of the inflorescence and the calyx is stellate-pubescent. Terminating the branches are glomerules of 3–5 flowers which lack distinct pedicels and are articulated immediately below the calyx to the main axis. The valvate corolla is glabrous but there may be papillae developed on the margin of the lobe but no well developed indument, as described by Rusby, was seen. Upon anthesis the lobes recurve and frequently elongate. The genus *Dendrobangia* is the sole member of the New World *Icacinaceae to* possess a gamopetalous corolla and to have the stamens attached to the corolla-tube.

A complete description of the fruit has been lacking. It is a drupe, oblong in side-view and triangular in section, but laterally compressed, so that the shorter side is concave. The pericarp is thin, fleshy, and bears stellate hair-clusters. Ducke reports the fresh fruit to be yellow at maturity, with a sweet, slightly biting taste. The putamen is thin, uniform in thickness, and essentially smooth. The one locule bears a single anatropous seed pendent from the apex. The funicle which travels up the fruit in the pericarp-tissue is located in the concave groove or the narrower side of the fruit. Near the apex it makes an abrupt bend to enter the putamen below the stylar point. The raphe is strap-shaped and travels down the edge of the triangular-shaped albumen to the base, where it flattens out to form a circular chalaza. The change in the course of the funicle and raphe after entering the locule is not as great as in other genera, since it is less than 90° in all specimens examined. The seed itself fills the locule. The embryo is minute, apically placed, and varies from 1–1.6 mm. long, while the seed itself is 12–20 mm. long. Most of the cylindrical embryo consists of the radicle, the two minute ovate or triangular fleshy cotyledons being only 0.3 mm. long in the largest specimen.

Rusby considered in some detail the possible relationships of *Dendrobangia.* It is unique among the New World genera and has only a superficial resemblance to the others. Considering all characters, it is most similar to *Platea,* a Malaysian genus, in the structure of the wood, the type of inflorescence, the possession of stellate hairs and the gamopetalous corolla.

PLEURISANTHES Baillon

Pleurisanthes Baillon, Adansonia **11:** 201. 1874; Valeton, Crit. Overz. Olac. 258. 1886; Engler, Nat. Pflanzenfam. **3** (5): 252. 1893; Van Tieghem, Bull. Soc. Bot. France **44:** 117. 1897; Sleumer, Notizbl. **15:** 256. 1940.

Martia Valeton, Crit. Overz. Olac. 259. 1886, not Bentham.

Valetonia Durand, Index Gen. Phanerogam. 64. 1888; Engler, l. c. 460. 1896.

Vines or scandent shrubs; youngest stems terete, the older branches strap-shaped; leaves alternate, petiolate, pinnately arcuately veined, the secondary veins prominent and reticulate; inflorescence axillary, supra-axillary or terminal, paniculate or spiciform-racemose, the rachis commonly flattened, the glomerate and nonarticulated few flowers sessile or pedicelled in bracteate clusters, the glomerules usually arranged on only one face of the flattened rhachis, the flowers perfect; calyx campanulate, 5-lobed, the lobes triangular and acute; corolla polypetalous, the fleshy petals strigose outside and glabrous inside, the midrib frequently prominently developed; stamens 5, free, the glabrous filaments filiform, the longitudinally dehiscent introrse anthers oblong; ovary conical, hirsute, unilocular, the two ovules collateral, the style minute or well developed, the capitate stigma frequently papillate; fruit unknown.

TYPE SPECIES: *Pleurisanthes Artocarpi* Baillon.

DISTRIBUTION: French and British Guiana, Brazil.

The genus *Pleurisanthes,* described by Baillon, was based on a plant collected in French Guiana. Later Valeton studied Baillon's description of *Pleurisanthes* and described a genus very similar to it, which he dedicated to Martius and called *Martia.* However, this name proved invalid since Bentham had previously used it for a genus of the *Leguminosae.* Durand renamed the genus for Valeton, calling it *Valetonia.* When Van Tieghem examined the type material of *Pleurisanthes* he found that Baillon's description of *Martia* was simply a correct diagnosis of *Pleurisanthes.*

Van Tieghem made a thorough study of the group, since he believed that it should be the type genus of a distinct family. The original description of the plants as trees having polygamous flowers, with the male flowers in a separated inflorescence, was rejected by Van Tieghem, who also studied the wood and reported that the species are lianas having perfect flowers. Further study also indicated a polypetalous or agglutinated corolla, rather than a gamopetalous one, and an ovary without the basal disk which Baillon had claimed for it. I have not seen the original material on which these two diverse opinions were based, but, judging from the species later described, I believe Van Tieghem's corrections to be valid.

Thus the plants of this genus are lianas or scandent shrubs. The young stems and branches are terete, tendril-like in appearance and have a normal wood-structure. The older branches are strap-shaped, with the secondary xylem laid down principally on opposite sides of the stem between the orthostiches. The leaf-scars are elevated, as is frequent in vines, and are circular. On the stems and on petioles there may be two kinds of hairs developed, strict thick-walled rugose hairs and relatively thin-walled arching hairs. The lower leaf-surface of *P. Arto-*

carpi is reported as glabrous but those of other species all bear a pubescence. *P. parviflora* is most distinct, having a dense stellate-tomentose pubescence on the under side of the leaf. The primary veins are arcuate and anastomosing near the margin. The secondary veins are frequently parallel and the veinlets are strongly reticulate. Near the margin the vascular strands of the leaf often protrude, forming irregular spines or teeth. If the margin is recurved these teeth are not noticeable, but, when flat, the leaf-margin has been described as spinose-dentate.

The inflorescence is anomalous in the family, even among the lianoid tribes. It may be terminal, axillary, or in extreme cases supraaxillary midway between the nodes. The inflorescence may be a sparsely branched panicle, as reported in *P. brasiliensis* and *P. parviflora,* or, more commonly, it consists of a single raceme or a cluster of spiciform racemes with flattened axes. Baillon referred to these axes as cladode-like. These may be branched near the base but are, more commonly, strict and single. The flowers are only on one face of this axis. Van Tieghem and Sandwith point out that the axis may be strongly flattened when young but that it does round off slightly in maturity.

The flowers are sessile, pedicelled, or sessile when young and later developing short pedicels. Rarely are they found singly but more often in groups of 3–5 flowers, each group being subtended by a series of bracts. The glomerules may be placed close together on the axis or they may be widely spaced and alternate or zig-zag on the axis. The flowers are not articulated immediately below the calyx. The importance of this will be indicated later. Van Tieghem has mentioned that the valvate corolla is not gamopetalous, as Baillon described it, but consists of separate petals. These may be agglutinated near the base and dehisce as a unit or they may be entirely free and fall independently.

The pistil has been described either as lacking a style or having a style as long as the ovary. I have examined several sheets of *P. parviflora* and find, in that species, that the style elongates rapidly with the expansion of the bud. The stigma is capitate, rugose, or with papillae developed. Baillon reports a pubescence on the stigma of *P. Artocarpi.* The one locule has two nearly collateral anatropous ovules pendent from near the apex. Usually one, the upper one, is smaller and more shrunken than the lower. Probably only one developed. No fruits are known for this genus.

Recently Sleumer has proposed two sections, *Eupleurisanthes,* with the flowers sessile, arranged in interrupted spikes and having the axis of the inflorescence more or less flattened, and *Haplobotrys,* having the flowers shortly pedicellate and arranged in simple racemes on a terete axis. The first section was to contain all the species except *P. simpliciflora,* which was the sole member of the second section. Actually none of the characters of the sections seem constant. The flowers are short-pedicelled in *P. emarginata, P. brasiliensis* and *P. flava,* as well as *P. simpliciflora.* As mentioned earlier, the flattened nature of the inflorescence-rhachis seems to be a developmental feature. Thus, I do not believe a division of the genus as proposed is possible or necessary.

Van Tieghem removed the genus *Pleurisanthes* from the *Icacinaceae* and proposed that it become the type of a new family. His *Pleurisanthaceae* was separated from the *Icacinaceae* by the following characters: the presences of secretive canals in the primary tissues of the plant body; the progressive inclusion of the secondary wood; the hermaphroditic flowers, and the dialypetalous corolla. The canals mentioned by Van Tieghem run in the primary tissues through the petioles of the leaves and into the lamina. Unfortunately, these cannot be properly studied from dried material, so their exact nature must await better material for further study. On this character *Pleurisanthes* is anomalous in the family. Van Tieghem's additional criteria for separating the families are less distinctive and may be found in many genera of the *Icacinaceae* as well as in his *Pleurisanthaceae.*

Another anomalous character found in *Pleurisanthes,* which is not found in the *Icacinaceae* as a whole, is the absence of any kind of floral articulation either immediately below the calyx, as is the common expression, or at the base of the pedicel. Since this is present in the other genera of the *Icacineae* its absence in *Pleurisanthes* might suggest affinities with some other groups of the *Icacinaceae.*

Engler divided the *Icacinaceae* into four tribes, principally on anatomical characters. The *Sarcostigmateae* and the *Phytocreneae* are quite distinct but the *Iodeae* and *Icacineae* are more difficult to separate. Engler separated these last two essentially as follows: ICACINEAE: trees or shrubs, seldom climbing, mostly with perfect flowers; embryo small, seldom as long as the endosperm; vessels with scalariform perforations, interxylary phloem absent. IODEAE: climbing plants, with dioecious flowers; embryo as long as the endosperm; vessels with simple perforations, xylem more prominently developed between the orthostiches of the stem. Bailey and Howard (Journ. Arnold Arb. **22:** 125–30, 171–84. 1941) have discussed the merits of the anatomical characters used by Engler in dividing the family. They have shown that the *Iodeae* and the *Icacineae* could not be distinguished, in all cases, on the characters given by Engler. Such genera of the *Icacineae* as *Mappia* and *Leretia* have porous perforations to the vessel-segments, not the scalariform perforations prescribed. *Leretia* may have the xylem more prominently developed on two sides of the stem. Howard (Journ. Arnold Arb. **21:** 461–86. 1940) has pointed out that some genera of the *Icacineae* likewise may be dioecious and that several genera of this tribe have embryos approaching the length of the endosperm. *Pleurisanthes* is a liana with simple perforation-plates to the vessel-segments, unequal development of the stem, and perfect flowers, thereby tending to bridge the two tribes as established by Engler. However, in most of its characters *Pleurisanthes* is similar to the genera of the *Icacineae.* For this reason I consider the genus in the *Icacineae,* as Engler did, and reserve final decision as to its precise relationships until the fruits are known and have been studied. Among the New World genera *Pleurisanthes* is distinct and lacks close relationship with any of the known genera. Its similarities are strongest with the Old World genera.

KEY TO THE SPECIES

Inflorescence terminal or its lowermost branches axillary, profusely branched from the base, rhachis dorso-ventrally flattened.

Leaves ovate, broadest at the base, the apex rounded but apiculate, glabrous; flowers sessile or very short-pedicelled, 5-parted . . . . *P. Artocarpi*

Leaves elliptic to obovate-elliptic, broadest above the middle, the apex emarginate, densely pubescent; flowers glomerate, short-pedicelled, 4-parted . . . . *P. emarginata*
Inflorescence axillary or supra-axillary (rarely terminal in *P. brasiliensis*), sparingly if at all branched at the base.
Inflorescence paniculate.
Leaves elliptic, 7 cm. long, 2.5 cm. wide, glabrous, the margins spinose-denticulate, flat, the apex acute; inflorescence to 12 cm. long . . . . *P. brasiliensis*
Leaves lance-oblong to elliptic-oblong, 9–13 cm. long, 4–6 cm. wide, pilose above, densely stellate-tomentose below, the margins revolute, the apex acuminate, the acumen to 1.2 cm. long; inflorescence sparingly branched, shorter than the leaves . . . . *P. parviflora*
Inflorescence racemose, single, rarely of 2-spiciform racemes.
Leaves broadly elliptic-oblong, the apex rounded or obtuse . *P. simpliciflora*
Leaves lance-oblong to elliptic-oblong, the apex acute, ultimately cuspidate . . . . *P. flava*

PLEURISANTHES ARTOCARPI Baillon, Adansonia **11:** 201. 1874.

Vines or climbing shrubs; the stems compressed or subterete, the bark gray and striated; petioles 1.5 cm. long; lamina ovate, 12 cm. long, 7 cm. wide when young, becoming much larger, thinly coriaceous, glossy below, crenulate to denticulate, short-acuminate, the base rounded, the veins 7–9 pairs; inflorescence terminal or the basal portions axillary, the spikes to 7 cm. long, the flowers sessile in two rows, arranged in small glomerules; calyx cupular, puberulous outside; petals 5; stamens shorter than the petals, the filaments subulate; pistil short-conical, hirsute, the apex papillate- or pilose-stigmatic; fruit unknown.

TYPE SPECIMEN: Collected by *Melinon* in French Guiana in 1863. Specimen in the Herb. Mus. Paris, not seen. I have seen a photograph of the type (FM).

Van Tieghem reexamined the type specimen and concluded that the original description was inaccurate. No complete diagnosis of this species is known to me and the description above has been compiled from Van Tieghem's correction of Baillon's work.

PLEURISANTHES EMARGINATA Van Tieghem, Bull. Soc. Bot. France **44:** 117. 1897.

Vine; petioles to 1 cm. long; lamina elliptic to obovate-elliptic, broadest above the middle, 8–12 cm. long, 4–7 cm. broad, tomentose below, the base narrowed and round or cordate, the apex truncate or emarginate, the margin revolute, the veins 6–7 pairs; inflorescence terminal, composed of numerous branched spiciform racemes to 3 cm. long, the axes flattened, the flowers short-pedicelled and clustered, tetramerous; fruits unknown.

TYPE SPECIMEN: *Le Prieur* 275, collected in Guyane. I have seen a photograph of the type (FM) which is in the Herb. Mus. Paris.

PLEURISANTHES BRASILIENSIS (Valeton) Van Tieghem, Bull. Soc. Bot. France **44:** 117. 1897.

Martia brasiliensis Valeton, Crit. Overz. Olac. 261. 1886.

Valetonia brasiliensis Durand, Index Gen. Phanerogam. 64. 1888; Engler, Nat. Pflanzenfam. **3** (5): 460. 1896.

Climbing shrub; petioles to 1.5 cm. long; lamina elliptic, 7 cm. long, 2.5 cm. wide, glabrous, the base rounded, the apex acute to mucronate, the margin irregularly obtusely spinose-denticulate, the veins 7–9 pairs; inflorescence terminal, a panicle to 12 cm. long, or if axillary longer than the leaves, the flowers glomerate, 3–5 to a cluster, the pedicels 2–4 mm. long, the buds subglobose; calyx deeply five-parted; petals appressed-pubescent outside; fruit unknown.

TYPE SPECIMEN: *Neuwied* s. n., collected in Brazil. Valeton reports seeing this specimen in the Herb. of the Museum of Brussels.

ILLUSTRATION: Valeton, Crit. Overz. Olac. pl. 6, fig. 45. 1886.

I have not seen this material. Van Tieghem reports that the species is clearly distinct on the size of its leaves.

PLEURISANTHES PARVIFLORA (Ducke) Howard, Journ. Arnold Arb. **21:** 482. 1940.

Leretia parviflora Ducke, Arch. Jard. Bot. Rio. **4:** 119. 1925.

Mappia parviflora Baehni, Candollea **7:** 174. 1936.

Leretia glabrata Sleumer, Notizbl. **15:** 245. 1940. (?)

Climbing shrub; the stems angular to subterete, canous-tomentose or glabrate; petioles to 1 cm. long, densely subvillous or tomentose; lamina elliptic-lanceolate to lance-oblong, 10–16 cm. long, 5–6 cm. wide, thinly coriaceous, glabrous, shining above, stellate-tomentose below, the base slightly cordate, the apex short-acute to acuminate, the margin entire or slightly revolute, the veins 8–9 pairs; panicle axillary, 3–9 cm. long, the branches few, appressed-gray-pubescent, the bracts small, the pedicels 2–3 mm. long; calyx-teeth triangular-acute, 1 mm. wide; petals 2.5 mm. long, 0.6–1 mm. broad, linear-oblong to oblanceolate, sericeous-pubescent outside and on the margins; anthers oblong, 1 mm. long; pistil to 1.5 mm. high at anthesis, the ovary yellow-hirsute, the style glabrous, as long as the ovary; fruit unknown.

TYPE COLLECTION: *Ducke* Herb. Jard. Bot. Rio. 17856, collected at Mosqueiro near Para river in Para, Brazil.

ILLUSTRATION: PLATE 3A.

SPECIMENS SEEN: *Brazil.* Amazonas: Municipality Humayta, near Livramento on the Rio Livramento, *Krukoff* 6954 (A, FM, NY, US).

I have indicated in a previous paper (Howard, Journ. Arnold Arb. **23:** 60. 1942) that I am unable to distinguish between *P. parviflora* and *Leretia glabrata* Sleumer from the description of the later. Until I can examine the type-material I tentatively refer *L. glabrata* to the synonymy of *P. parviflora.* Sleumer's points of distinction do not allow separation of these two species without direct comparison of the specimens.

Through the paniculate inflorescence and the dense stellate-tomentose pubescence of the leaves one can readily identify this species. As in *P. flava,* the style is well developed but here it is glabrous. Also in common with *P. flava* is the pronounced development of the lower portion of the prominent midrib of the petal. Frequently this protuberance is gland-like in appearance.

Pleurisanthes simpliciflora Sleumer, Notizbl. **15:** 256. 1940.

Scandent shrub; the stems terete; petioles 1–1.5 cm. long, 2 mm. thick, densely tomentose; lamina broadly elliptic-oblong, 8–14 cm. long, 5–9 cm. broad, widest at the middle, membranaceous, lightly pilose above, ferruginous-tomentose below, the base cordate, the apex round or obtuse to subacuminate, the margins undulate, the veins protruding beyond the margin; inflorescence axillary, consisting of a single spiciform raceme 3–4 cm. long, yellow-ferruginous-pubescent, the minute bracts subulate, the short-pedicelled flowers in fascicles of 2–3; sepals deltoid, to 1 mm. long; petals narrowly oblong, 2.5 mm. long after anthesis; filaments subulate, 2 mm. long, the minute anthers elliptic; ovary ovoid, the glabrous stigma subcapitate; fruit unknown.

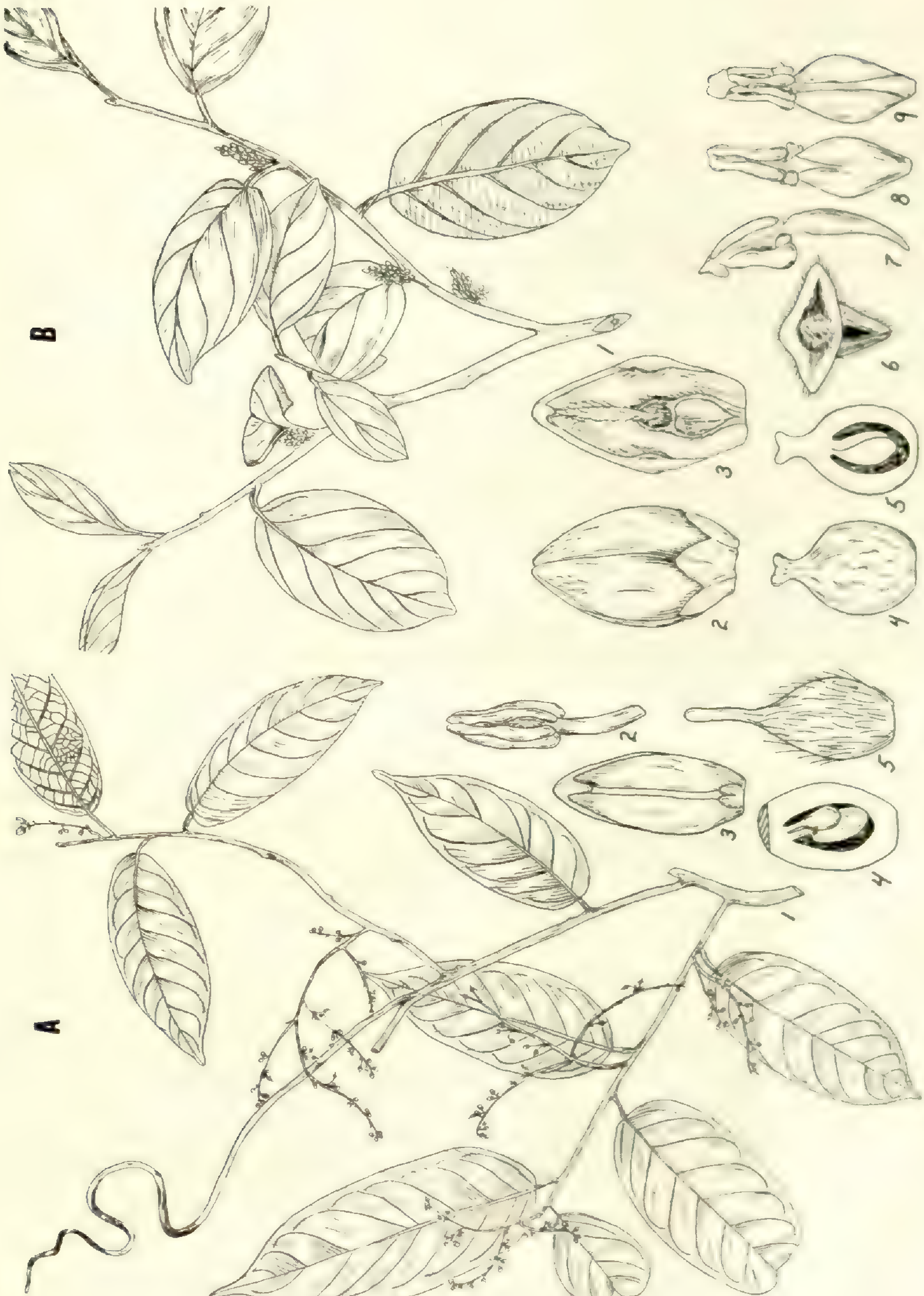
Type Specimen: *Ducke* ex Herb. Jard. Bot. Rio 37637 in the herbarium at Berlin. Collected at Camanaos on the Rio Negro, Brazil.

Specimen seen: Brazil. Amazonas: São Paulo de Olivença, *Krukoff* 8773 (NY).

I have not seen authentic material of this recently described species; however, it seems distinct on the single supra-axillary bracteate inflorescence and the elliptic-oblong leaves with rounded apices. The specimen cited is very immature.

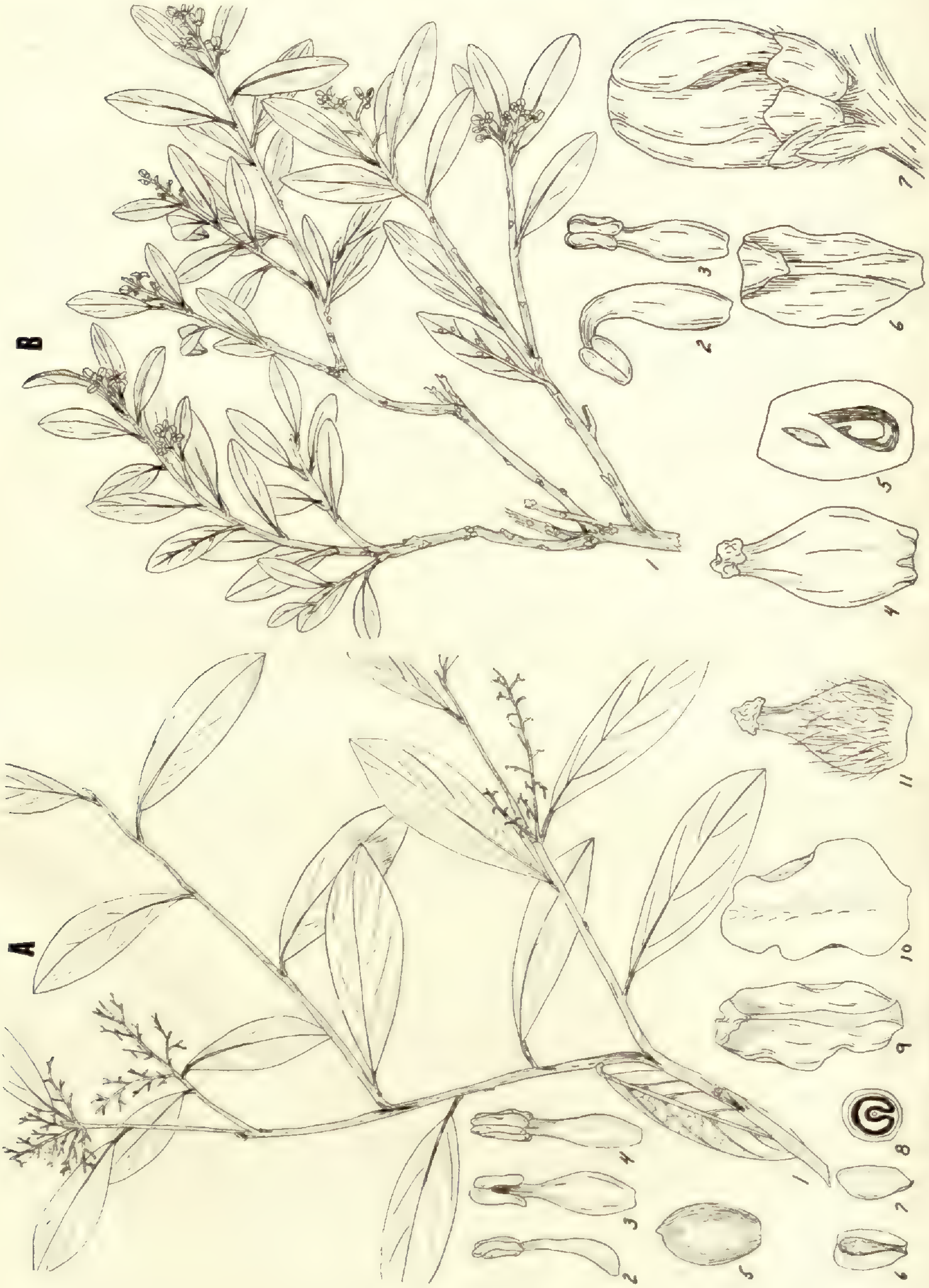
Pleurisanthes flava Sandwith, Kew Bull. 467. 1931.

Scandent shrub; the young stems terete, yellow-gray-pilose or appressed-tomentose; petioles flexuous, densely yellow-gray-tomentose, to 1.8 cm. long; lamina ovate to elliptic-oblong, 6–14 cm. long, 3–7 cm. wide, membranaceous, shining above, sparsely pubescent and paler below, tomentose on the veins, the base



A, PLEURISANTHES PARVIFLORA.

B, PORAQUEIBA PARAENSIS.



A, CITRONELLA PANICULATA.

B, CITRONELLA ENGLERIANA.

rounded to slightly cordate, the apex acute-acuminate to subcuspidate, the acumen broadly obtuse to abruptly mucronate, the margin entire, the veins 7–9 pairs; inflorescence axillary, simple racemes to 5.5 cm. long, the flowers two ranked, the tomentose and flattened branches bracteate, the glomerate to umbellate flowers in clusters of 3–5 flowers, short-pedicelled to sessile, the buds ovoid-ellipsoid; calyx cupular, 1.75 mm. in diameter, 0.8 mm. high, pubescent outside, the acute teeth deltoid, 0.4 mm. long and 0.7 mm. wide, with sinuses obtuse; petals elliptic, 2.5 mm. long, 0.8–1.1 mm. wide, cinereous-tomentose outside; stamens 1.8–2.2 mm. long, the filaments 1.5 mm. long, the oblong anthers 0.8 mm. long; ovary ovoid, densely pilose, 1 mm. long, 0.7 mm. diameter, the style 0.5 mm. long, the glabrous stigma discoid; fruit unknown.

TYPE COLLECTION: Sandwith 590, made in British Guiana.

ILLUSTRATION: PLATE 2B.

SPECIMENS SEEN: British Guiana. Moraballi Creek, on the Essequibo river, *Sandwith* 590 (isotype NY). Brazil. Amazonas, São Paulo de Olivença, *Krukoff* 8683 (NY).

Older stems on the Krukoff specimen reveal a strap-shaped stem 12 mm. wide and 5 mm. thick. The plant is described as a vine of the high forest. Sandwith reported the type collection as a "bush-rope," since the terminal shoot was tendril-like and terete. A section of this tendril-like portion showed that a tendency to subsequent unilateral growth was already initiated in a one-year-old stem.

CITRONELLA D. Don

A revision of this genus is presented as a separate paper (Studies, V) following this, since the Old World species of it are also treated.

MAPPIA Jacquin

The genus *Mappia* was treated in a study of the "*Mappia* Complex," published in the Journal Arnold Arboretum **23:** 56–78. 1942.

PORAQUEIBA Aublet

Poraqueiba Aublet, Fl. Guian. **1:** 123, t. 47. 1775; Poiret in Lamarck, Encycl. Meth. **5:** 569, pl. 134. 1804; Tulasne, Ann. Sc. Nat. III. **11:** 169. 1849; Walpers, Ann. Bot. **2:** 179. 1851; Miers, Ann. Mag. Nat. Hist. II. **9:** 481. 1852, Contrib. Bot. **1:** 69.

1851–61; Bentham and Hooker, Gen. Pl. **1:** 352. 1862; Engler, Fl. Bras. **12** (2)**:** 47, pl. 10. 1872, Nat. Pflanzenfam. **3** (5)**:** 252. 1893; Huber, Bol. Mus. Goeldi **4:** 396. 1904; Le Cointe, Arvores e Plantes Uteis. 1934.

Paraqueiba Scop., Introd. 182, No. 767. 1777.

Barreria Scop., Introd. 182, No. 767. 1777, not *Barreria* L.

Bareria Juss., Dict. Sc. Nat. **4:** 61. 1816.

Meisteria Gmel., Sys. Veg. **1:** 391. 1796, ex Steudel, Nom. Bot. 1821, not Scop., Introd. 124. 1777.

Trees; leaves alternate, petiolate, coriaceous, entire, the veins arcuate and weakly if at all anastomosing near the margin; inflorescence axillary, paniculate, strongly branched from the base, the flowers subtended by three imbricated pubescent bracts and articulated at the base of the calyx, the buds globose; calyx-lobes 5, fleshy, lightly imbricated; petals valvate, fleshy, the edges incurved, the midrib prominent, longitudinally furrowed inside, more or less white-silky pubescent on the lateral and median ridges, the apices inflexed; stamens with fleshy and flattened filaments usually concave at the base, glabrous, the basifixed anthers erect, the connective broadened and extended to an attenuate inflexed apex, in side-view the anthers appearing triangular, the anther-sacs lateral on the lobes of the connective, dehiscence lateral at the junction with the connective; disk none; ovary globose, glabrous, unilocular, the style terminal and shorter than the ovary, the minute stigma capitate; drupe ovoid to oblong, more or less oblique, the mesocarp fleshy, the woody and smooth endocarp with a longitudinal ridge around the fruit, the embryo curved or nearly straight, the cotyledons foliaceous, the radicle short cylindrical.

Type Species: *Poraqueiba guianensis* Aublet.

Distribution: Dutch Guiana, Brazil, Peru.

The trees of this genus are among the tallest of the American *Icacinaceae.* Aublet described *P. guianensis* as 50 feet tall and recent collections of *P. sericea* by Ducke and Krukoff are reported to 90 feet, with a trunk-diameter of 2.5 feet.

The leaves possess a short, white sericeous pubescence but soon become glabrate. The hair-bases persist as conspicuous projections (under a microscope) and are usually lighter in color than the rest of the leaf. Several authors have mistaken them for glands. The hair-bases are extremely abundant on leaves of *P. sericea* and rather sparse in *P. paraensis.*

There is a dark-colored material throughout the tissues of these plants. Ducke likens the color to that of *Emmotum*. It is readily removed in caustic soda or even by continued boiling in water. In aqueous solution it is a rich chestnut or brown to a wine-color. The tissues of the leaf have this pigment in the cells and the dark color of the petiole is due to its abundance there. It is likewise present in the cortex, bark, and frequently in the wood, particularly in the wood-parenchyma and in the ray-cells. It is also present in the fleshy connectives, and the variegated pigmentation of the ovarian wall results from the irregular masking of the cells containing this material by thick-walled cells of the outer tissues of the wall. In *P. guianensis* this colorless layer ends a short distance from the base of the ovary and the pigmented cells of the inner layer form a basal dark-colored ring.

The inflorescence is an axillary panicle, scarcely as long as the petiole in *P. paraensis*, but frequently twice as long as the petiole in both *P. sericea* and *P. guianensis*. It is much branched from the base, with the branches approaching the length of the main axis. The flowers are sessile on the branches in *P. sericea* and *P. paraensis* but are slightly stalked in *P. guianensis*. This last condition is frequently described as racemose and was illustrated as such by Miers. The flowers are all subtended by three imbricated bracts, the bract directed downward on the axis being lowermost, the lateral ones opposing each other. These are densely white-sericeous in all species.

The petals develop two internal longitudinal furrows separated by a usually well developed median ridge. The lateral margins of the petals are incurved. The form of the median ridge of the petal varies within the genus but appears to be relatively constant within the species. The value of this as a specific character must be tested by examination of more material. The median ridge is usually sulcate or canaliculate, with its lateral margins variously developed. In *P. sericea* the median ridge is divided at the middle. The lower portion is expanded into ovate, rounded lateral lobes and the upper portion is oblong-lanceolate and broadest at the middle. These flanges are densely white-sericeous with moderately long hairs. The lateral rims of the petals are also white-sericeous but the hairs are shorter.

The stamen is intimately associated with these flaps, both in bud-condition and until the petals fall away. The ear-like lobes of the lower portion of the median ridge-flaps of adjacent petals completely obscure the filament, with the anthers alone visible. In *P. guianensis* the median ridge is scarcely developed and only slightly sulcate above, but shallowly and very broadly sulcate below the middle. This results in two furrows in the upper half of the petal and essentially three in the lower portion. The upper and lower regions are separated by a definite transverse ridge of tissue which is lacking in the other two species of the genus. The pubescence of the petals of *P. guianensis* is greatly reduced. A few hairs occur on the lateral rim at the point of junction with the transverse ridge. Longer and more abundant hairs forming a fringe are found on the margins of the broadly sulcate median ridge in the lower half of the petal. The flaps of this lower portion do not cover the filaments in the younger stages of floral development. The internal form of the petals of *P. paraensis* is quite similar to that just described for *P. guianensis* but differs noticeably in the absence of a transverse ridge at the middle of the petal. Thus the two longitudinal furrows extend the full length of the petals. Both the lateral and median ridges are densely sericeous. The hairs resemble chains of beads when dry, due to the regular constriction along their length. The hairs may not collapse in others.

Externally the petals of *P. sericea* and *P. guianensis* are densely white-sericeous. In *P. paraensis,* however, the petals are only minutely and sparsely pubescent in the upper third when young and usually become completely glabrate at the time of aestivation.

The stamens of *Poraqueiba* are distinctive. The filaments are broad, frequently oblong-ovate in bud but expanding after anthesis. They are thick and slightly concave internally and lack the dark pigment so contrastingly present in the connective-tissue. The anthers are flattened laterally and are triangular in side-view, with the connective tapering to an apical mucro which is tightly inflexed against the adaxial margin of the anther. The four sides of the anther are sulcate; thus in transverse section the anther has a form of a flattened cross. The anther-sacs on the adaxial margin are usually shorter than those on the abaxial margin. In *P. sericea* the adaxial sacs commonly extend along the lower side of the anther. Their dehiscence is by means of a longitudinal slit along the junction with the connective. The white or yellow anther-sacs form a color-contrast with the chestnut-brown connective tissue.

Contrary to Miers report there is no disk in *Poraqueiba*. The ovary in *P. guianensis* commonly has a dark colored ring at its base. The ovarian wall in *P. paraensis* has only patches of dark colored tissue on the surface and in *P. sericea* no pigmented tissue is visible. Engler (Fl. Bras. **12** (2): 48. 1872) reports a specimen of Martius (No. 2689) as having three locules, two of which early abort. I have never seen such a condition in the material available to me.

Poraqueiba sericea has one of the largest fruits yet described in the family. One specimen is 8 cm. long and 5.5 cm. in diameter. The drupe is described as yellow-green or black. Dried specimens are either black or dark brown. The outer layers of the pericarp are completely permeated by pigmented cells. In the major portion the pigmented cells form a network with the colorless cells comprising the bulk of the tissue. Le Cointe reports that this pulp contains 12% of its weight in chestnut-yellow oil. The endocarp is smooth inside and out. There is a longitudinal ridge running around the putamen. A portion of this is hollow and contains the funicle. At the apex of the putamen is a slightly flattened conical stylar canal.

The fruits of *P. guianensis* are small, green and inedible. Those of *P. sericea* and *P. paraensis* are larger and the mesocarp and seeds are quite edible. Huber discusses at length their usefulness as food. He points out that the taste is not agreeable to all palates and, although they are sold on the market, their use is not widespread. *P. paraensis* and *P. sericea* have both been cultivated by the Indians on the lower Amazon. In the wild state *P. sericea* is known only from the upper Amazon and Peru, with *P. paraensis* only in the region around Belem de Pará. The wood of *P. guianensis* and of *P. sericea* is dark, hard, compact, and is used by the natives for general carpentry and fuel.

The vernacular name of "mary" has been applied to all species of this genus. "Umary" and "Mary Gordo" have been applied to *P. paraensis* (Le Cointe). "Mary negro," "umari roco," "umari negro," "Umari amarillo," "Mari preto," "Umari" and "Umary" apply to *P. sericea*. Common names for *P. guianensis* include "Umari bravo" and "Umari sauvage." For a discussion of further applications of the name "Mari" see the footnote by Ducke in Arch. Jard. Bot. Rio **4:** 117. 1925.

The genus *Poraqueiba* was described by Aublet in 1775. The generic name is an adaptation of the vernacular Carib name and, presumably for this reason, was not accepted by later botanists. Scopoli replaced it with *Barreria* but this name cannot be accepted since Linneaus had previously used it for a different plant. Dalla Torre and Harms consider *Barreria* L. in their list of *Genera incertae sediis* (No. 9645). *Barreria* Scopoli, however, refers to the Icacinaceous plant. In an attempt to save this name Jussieu changed the spelling to *Bareria*.

Scopoli, in placing *Poraqueiba* in the synonymy of *Barreria*, misspelled it and his spelling, *Paraqueiba*, has been carried in the literature by several authors.

According to Steudel (Nom. Bot. 515. 1821) the name *Meisteria* also belongs in the synonymy of *Poraqueiba* Aublet. *Meisteria* was a name substituted by Scopoli for *Pacourina* Aubl., a genus of the *Compositae*. Gmelin in 1796 (Veg. Sys. 1: 391) used *Meisteria* for an entirely different plant and attributes the name to Scopoli, Introd. No. 868. 1777. This reference is erroneous and cannot be checked. Steudel (l. c.) placed *Meisteria* Gmelin in the synonymy of *Barreria*, a genus which Willdenow states to be synonymous with *Poraqueiba* Aubl. Thus the name *Meisteria* is invalid in any sense. It is an invalid substitution for a valid name of a genus of the *Compositae* and its second use is, at best, a doubtful later synonym of *Poraqueiba* Aublet.

On the basis of the broad connective, the petal-form and the type of fruit and seed it appears that *Poraqueiba, Ottoschulzia, Emmotum,* and probably *Oecopetalum,* are closely related. There are similarities of wood which also support this relationship.

KEY TO THE SPECIES

Corolla glabrous outside; calyx glabrous or ciliate on the margins; inflorescence scarcely as long as the petiole; leaves elliptic to orbicular, 10–17 cm. long; petioles slender . . . . *P. paraensis*
Corolla and calyx densely short-white-sericeous outside; inflorescence twice as long as the petiole.
  Leaves narrowly oblong, 15–25 cm. long, 6–8 cm. wide, the base acute or rarely obtuse; petals with a transverse ridge across the middle, glabrate above the middle, sparsely pubescent below the middle inside; fruit small, 2.5 cm. long and 1.3–1.5 cm. in diameter, green . . . . *P. guianensis*
  Leaves broadly elliptic-ovate, 17–25 cm. long, 8–15 cm. wide, the base rounded to subcordate; petals densely villous on the ridges inside, transverse ridge absent; fruit large, 6–8 cm. long, 4.5–6 cm. in diameter, yellow-brown to dark brown or black . . . . *P. sericea*

PORAQUEIBA PARAENSIS Ducke, Arch. Jard. Bot. Rio **4:** 116. 1925, **5:** 90. 1930.

Tree 60–75 feet tall; the branches terete, brown-puberulent to glabrate; petiole 1.5–2.5 cm. long, sericeous-pubescent, becoming glabrate, deeply canaliculate above; lamina elliptic to orbicular, rarely ovate, 10–18 cm. long, 6–10 cm. broad, glabrous above except on the sulcate midrib, short-sericeous below, short acuminate, the acumen to 1 cm. long, the base obtuse to rounded, the midrib and veins prominent, the 4–6 pairs of arcuate veins free at the ends or slightly anastomosing; inflorescence scarcely equaling the petiole, sparsely white-sericeous, becoming glabrate; calyx 2 mm. in diameter, the oblong to ovate ciliate lobes 0.6 mm. long and 1.0 mm. broad; petals ovate to oblong, 3–3.5 mm. long, 1–1.4 mm. broad, sericeous outside, the margins inrolled, weakly sericeous, the fleshy sericeous midrib prominent and broadly but shallowly sulcate below the middle, the furrows glabrous; stamens 2.5 mm. long, the anthers 1.1–1.2 mm. long, the theca not extending adaxially on the basal portion of the strongly developed connective; ovary globose, the style short; drupe ovate-oblong, oblique or compressed, 7 cm. long, 3.5–4.5 cm. in diameter (ex Ducke), glabrous, shining at maturity, yellow or red, the mesocarp strongly odorous and containing a yellow oil.

TYPE COLLECTION: *Ducke,* Herb. Jard. Bot. Rio 11368, collected near Pará, Brazil (not seen).

ILLUSTRATION: PLATE 3B.

SPECIMENS SEEN: Brazil. Pará: Bélem de Pará, Quinta Carmita, *Ducke* 17850 (NY); vicinity of Pará, *Burchell* 9590 (G, NY).

According to Ducke this tree is cultivated for the edible oily mesocarp and the starchy endosperm of the seed. It is also subspontaneous in the estuaries of the Amazon-Tocantino. It is usually found in secondary humid and rich forests. The flowers are white.

Poraqueiba guianensis Aublet, Fl. Guian. **1:** 123, Ic. 47. 1775.
Poraqueiba surinamensis Miers, Ann. Mag. Nat. Hist. II. **9:** 483. 1852, Contrib. Bot. **1:** 72. 1851–61.
Barreria theobromaefolia Willd., Sp. Pl. **1:** 1145. 1798.
Meisteria anonyma Scopoli ex Gmel. Veg. Syst. **1:** 391. 1796.
Trees to 60 feet; the bark ash-gray; petioles 1.2–1.5 cm. long, canaliculate, commonly twisted; lamina oblong, 15–25 cm. long, 6–8 cm. broad, thinly coriaceous, lightly sericeous, becoming glabrate, long attenuate or frequently acuminate, the base acute or rarely obtuse, the midrib sulcate above and prominent below, sparsely crispose pubescent at maturity, the 7–8 pairs of veins prominent below; calyx pilose outside, the obtuse ovate lobes 1 mm. long and 1 mm. broad; petals ovate, becoming lance-ovate, 3.1–3.4 mm. long, 1.1–1.2 mm. broad, fleshy, pilose outside bearing two grooves in the upper half and three below, which are separated by a strigose or pilose transverse ridge; stamens 2.7–2.8 mm. long, the anther-sacs limited to the margins and not confluent; ovary globose, 1.2–1.5 mm. in diameter, the short style 0.2–0.5 mm. long; drupe 2.5 cm. long, 1.3–1.6 cm. in diameter, the outer fleshy layer of the pericarp with oil-bearing cells.
Type Collection was made in French Guiana.
Illustrations: Aubl. Hist. Pl. Guiane Franc. **3:** t. 47. 1775; Lamarck, Ill. **1:** t. 134. 1797; Engler, Fl. Bras. **12** (2): t. 10. 1872, Nat. Pflanzenfam. **3** (5): fig. 139, P-T. 1893; Miers, Contrib. Bot. **1:** t. 10, as *P. surinamensis* 1851–61.
Specimens seen: Brazil. Belem de Pará, *Huber* 1288 (US). Dutch Guiana: Batava, *Hostman* 1209 (FM).

The mature fruit is small, green and not edible. The figure given by Engler shows the fruit to be warty. There is no mention of this in the literature and I have not seen such a condition. The calyx as figured under No. 12 of the same plate is typical of *P. paraensis*, not *P. guianensis*, if it is correctly drawn. The figure labelled *P. sericea* in Nat. Pflanzenfam. **3** (5): fig. 139, P-T should be *P. guianensis*. Miers gives a good plate and accurate diagnosis of this species under the name *P. surinamensis*.

Poraqueiba sericea Tulasne, Ann. Sc. Nat. III. **11:** 172. 1849; Williams (Woods of Northeastern Peru) Field Mus. Pub. Bot. **15:** 291. 1936.

Poraqueiba acuminata Miers, Ann. Mag. Nat. Hist. III. **4:** 365. 1859, Contrib. Bot. **1:** 229. 1851–61.

Trees 45–65 feet tall, the crown spreading, the trunk straight and 10–20 inches in diameter; bark purplish or dark brown, the terete and frequently striate branches densely sericeous to glabrate; petiole stout, 2–4 cm. long, strongly canaliculate above, rarely twisted, subterete to frequently manifestly four-angled; lamina broadly elliptical-ovate, 17–25 cm. long, 8–15 cm. broad, membranaceous when young, becoming strongly coriaceous, glabrous above, frequently shining when dry, densely sericeous when young, becoming glabrate below, acuminate, the acumen 10–22 mm. long, 2–4 mm. wide, with the apex obtuse, rounded, emarginate or bifid (due to injury), the base rounded, the midrib strongly sulcate above, the veins 7–9 pairs; inflorescence 5–10 cm. long, sericeous; calyx densely sericeous, 2.3 mm. in diameter, 1.7 mm. high, the acute or obtuse ovate lobes 1 mm. long and 1 mm. wide; petals ovate-lanceolate, 3–4 mm. long, 1.8–2 mm. wide, densely sericeous outside, tapering to the inflexed papillate apex, the base rounded, the lateral rims strongly inrolled, the deeply sulcate midrib with its edges cleft to the base at the middle of the petal, the lower portions strongly developed into rounded triangular lobes, the midrib with long white pilose hairs, their inrolled margins with shorter hairs, the furrows glabrous; stamens 2.5–3.2 mm. long, the anthers 1.5 mm. long, the theca small and marginal, the adaxial sacs extended at the base of the anther, the abaxial sacs reduced in length, the filament 1 mm. broad; pistil 2 mm. high, the style stout, the stigma capitate; drupe ovate-oblong, slightly compressed, 6.5–7.6 cm. long, 3.5–4.5 cm. in diameter, the fleshy mesocarp bearing oil cells, shiny, the putamen 3–4 mm. thick.

TYPE COLLECTION: *Poeppig* 2597, from Amazonas, Brazil.

SPECIMENS SEEN: *Brazil.* Amazonas: *Poeppig* 2597 (FM, isotype); Manaos, *Ducke* 25 (A, FM, NY, US), 109 (FM); Municipality of Humayta, Basin Rio Madiera on plateau between Rio Livramento and Rio Ipixuna, fruit yellow, *Krukoff* 7064 (A, FM, NY, US), fruit black, *Krukoff* 7281 (A, FM, NY, US); Muncipality São Paulo de Olivença, near Palmeres planted by Indians, *Krukoff* 8569 (A, FM, NY); Rio Negro, *Riedel* 1462 (NY); Panure near Rio Uaupes, *Spruce* 1748 (FM, G). Peru. Loreto; Iquitos, *Killip & Smith* 29837 (FM, NY, US); Iquitos, *Williams* 8078 (FM), 8080 (FM, US); Caballo cocha on the Amazon, *Williams* 2099 (A, FM, G, NY, US).

The color of the fruit is apparently variable in this species. It is commonly reported as black but also is said to be brown or yellow. Krukoff indicates on his collection-labels that some trees bear yellow fruits and others black. Careful examination of these collections has failed to reveal any characters to allow specific segregation. Huber early recognized this discrepancy and left its solution to later workers. It seems advisable to consider all the color-variations of these fruits as being within one species.

Williams reports this to be a common tree in dry loamy soils among shrubs and small trees of secondary growth or on margins of forests.

The figure given by Engler (Nat. Pflanzenfam. **3** (5): fig. 139, P-T), cited as *P. sericea,* is actually of *P. guianensis.*

Species to be excluded

Poraqueiba cubensis Wright ex Griseb. Cat. Pl. Cub. 119. 1866, equals *Ottoschulzia cubensis* (Wr. ex Griseb.) Urban.

Poraqueiba rhodoxylon Urb. Sym. Antill. **5:** 405. 1908, equals *Ottoschulzia rhodoxylon* (Urb.) Urb.

LERETIA Vellozo

This genus was considered in a separate paper published in the Journal of the Arnold Arboretum **23:** 55–78. 1942.

HUMIRIANTHERA Huber

Humirianthera was also treated as part of the "Mappia Complex" in the Journal of the Arnold Arboretum **23:** 55–78. 1942.

CASIMIRELLA Hassler

The genus *Casimirella* (Fedde Repert Nov. Sp. **12:** 249. 1913) has escaped notice as a member of the "*Mappia* Complex." It is probably identical with *Humirianthera* Huber and will replace the latter name since it antedates Huber's name by one year. Besides a break in geographic distribution there are several technical points which remain vague, in spite of a fairly good generic diagnosis. For this reason I do not make the transfer at this time but will wait, and hope sometime to examine the type material.

The type species, *Casimirella guaranitica,* is found in Paraguay, while those known of *Humirianthera* are found in the Brazilian Amazon. The rhizome of *C. guaranitica* is smaller than that of the species of *Humirianthera,* being only 4–5 cm.

in diameter. It bears several short shoots, which are probably first-year shoots and will probably become vine-like in habit in subsequent growth. The plant is described as being densely pubescent, with the hairs presumably simple, not in stellate clusters. The fruit, described by Hassler, was immature, yet the thick pericarp and the tomentose inner surface of the putamen were recognized. The genus is probably similar to *Leretia* as well as to *Humirianthera*.

Explanation of the Plates

PLATE 1A. FIGS. 1–13 CALATOLA LAEVIGATA Standley. FIG. 14 CALATOLA SP. FIG. 1, habit of the staminate plant of C. LAEVIGATA (*Reko* 3440, US 989705 TYPE) × ⅓; FIG. 2, habit of the pistillate plant of C. LAEVIGATA (*Reko* 3728); FIG. 3, pistillate flower showing the papillate stigmatic disk and the calyx-articulation, × 6; FIG. 4, diagrammatic section of a pistil, showing the eccentric locule; FIG. 5, drupe, with a portion of the sarcocarp removed (*Schipp* 446), × ⅓; FIG. 6, longitudinal section of the seed, showing the minute embryo, × ⅓; FIG. 7, petal from a female flower, × 8; FIGS. 8–9, lateral and adaxial views of a stamen, × 7; FIG. 10, bud from a staminate spike, showing position of bract and floral-articulation, × 12; FIG. 11, basal view of the expanded calyx, × 6; FIG. 12, adaxial surface of a single petal, × 7; FIG. 13, top-view of a staminate flower, × 14; FIG. 14, fruit of CALATOLA SP., × ⅓.

PLATE 1B. FIGS. 1–11 DISCOPHORA MONTANA, sp. nov. (*Lawrence* 522, TYPE). FIGS. 12 and 13 DISCOPHORA PANAMENSIS Standley (*Cooper* 613). FIG. 1, habit of D. MONTANA, × ⅓; FIG. 2, bud of staminate flower, showing the floral articulation; FIGS. 3–5, fertile stamens in lateral, abaxial and adaxial views, × 11; FIG. 6, lateral view of the mature fruit, × 2; FIG. 7, view of concave surface of the drupe, × 2; FIG. 8, diagrammatic cross-section of the fruit, *a.* fleshy pad on the concave surface, *b.* uncolored exocarp, *c.* vascular trace, *d.* uncolored mesocarp, *e.* locule, *f.* seed, showing the bipartite albumen, *g.* endocarp or putamen, *h.* partly pigmented region of the exocarp; FIG. 9, diagrammatic longitudinal section of a staminate flower, showing the pubescent incurved apex of the petals, the pubescent abaxial swelling of the filament, the fleshy undifferentiated pulvinus, the sterile pistillate rudiment and the articulation of the calyx to the pedicel; FIGS. 10–11, types of disks and pistillate rudiments commonly found in the male flowers; FIG. 12, hippocrepiform disk and the eccentric rudiment of the pistil found in D. PANAMENSIS, × 7; FIG. 13, habit of D. PANAMENSIS, × ⅙.

PLATE 2A. OTTOSCHULZIA CUBENSIS (Wright) Urban (*Wright* 2639, ISOTYPE). FIG. 1, habit, × ⅓; FIG. 2, bud, × 6; FIG. 3, pistil, × 14; FIGS. 4–6, lateral, adaxial and abaxial views of a petal, × 9; FIG. 7, fruit, × ⅓; FIG. 8, diagrammatic cross-section of the ovary; FIG. 9, diagrammatic parasagittal section of the ovary; FIGS. 10–12, lateral, adaxial and abaxial views of a stamen, × 10.

PLATE 2B. PLEURISANTHES FLAVA Sandwith (*Sandwith* 590). FIG. 1, habit, × ⅓; FIG. 2, flattened branch, × ⅓; FIG. 3, calyx, × 3; FIGS. 4–6, lateral, adaxial and abaxial views of a petal, × 8; FIG. 7, parasagittal section of the pistil; FIG. 8, pistil, × 8; FIGS. 9–11, lateral, adaxial and abaxial views of a stamen, × 9.

PLATE 3A. PLEURISANTHES PARVIFLORA (Ducke) Howard (*Krukoff* 6954). FIG. 1, habit, × ⅓; FIG. 2, adaxial view of a stamen, × 12; FIG. 3, abaxial view of a petal, × 9; FIG. 4, diagrammatic parasagittal section of the ovary; FIG. 5, pistil, × 15.

PLATE 3B. PORAQUEIBA PARAENSIS Ducke (*Burchell* 9590). FIG. 1, habit, × ⅓; FIG. 2, bud, × 8; FIG. 3, adaxial surface of a petal, × 9; FIG. 4, pistil, × 10; FIG. 5, diagrammatic section of the pistil; FIG. 6, dorsal view of the three bracts subtending the flowers, showing the point of articulation, × 6; FIGS. 7–9, lateral, abaxial and adaxial views of the stamens, × 10.

II. STUDIES OF THE ICACINACEAE V.

A REVISION OF THE GENUS CITRONELLA D. DON

(Plates 4–6)

RICHARD A. HOWARD

Ruiz and Pavon presented two very different concepts in their successive treatments of the genus *Villaresia*. The plant they described in the Prodromus Flora Peru and Chile (1793) is a member of the *Celastraceae*. That described in the third volume of the same work (1803) is the *Icacinaceous* genus considered here. This discrepancy was mentioned by Jussieu in 1825 and by Don in 1832, yet all subsequent workers have persisted in accepting for the genus of the *Icacinaceae* their second and invalid epithet *Villaresia*. Since *Villaresia* was a later homonym Don substituted the name *Citronella* for the second genus which Ruiz and Pavon had described.

In 1850 Blume described a plant from Java under the name *Pleuropetalon*. Asa Gray described a second species in 1854 and mentioned the affinities of this genus with *Villaresia*. However, *Pleuropetalon* is also an invalid name, being antedated by *Pleuropetalum* Hook f. of the *Portulacaceae*, established in 1845, and for this reason Miquel (1855) substituted *Chariessa* as the generic name. Bentham and Mueller combined *Villaresia* and *Chariessa* and this treatment has been followed by Valeton, Merrill, Domin, and Howard. Beccari, Engler, and Sleumer maintain them as distinct genera.

Macbride proposed the genus *Briquetina* in 1926 and compared it with several New World genera but not with *Villaresia*. I cannot distinguish between *Briquetina* and *Villaresia* and have combined them. Likewise, it is not possible satisfactorily to distinguish between *Villaresia* and Baillon's genus *Sarcanthidion*, which was apparently separated because of its climbing habit.

In 1940 Sleumer described the genus *Villaresiopsis*, separating it from the *Citronella-Briquetina* complex through its broader staminal filaments. However, broadening of the filament does occur in other species of *Citronella*, and I see no reason why *Villaresiopsis* cannot be accommodated in the same genus.

CITRONELLA D. Don, Edinb. New Phil. Journ. **13:** 243. 1832; Howard, Journ. Arnold Arb. **21:** 471. 1940.

Villaresia Ruiz & Pavon, Fl. Peruv. Chil. **3:** 9, t. 231. 1803; A. Jussieu, Ann. Sc. Nat. **25:** 14, t. 3, 1832; Miers, Ann. Mag. Nat. Hist. III. **9:** 110. 1862, Contrib. Bot. **2:** 111. 1860–1869; Seem. Journ. Bot. **2:** 257. 1864; Bentham & Hooker, Gen. Pl. **1:** 353. 1862; Valeton, Crit. Overz. Olac. 194. 1886; Engler Fl. Bras. **12** (2): 53. 1872, Nat. Pflanzenfam. **3** (5): 244. 1893; not Ruiz & Pavon, Fl. Peruv. Chil. Prod. 35. 1793.

Pleuropetalon Blume, Mus. Bot. Lugd.-Bat. **1:** 248. 1850, not *Pleuropetalum* Hook. f.

Chariessa Miquel, Fl. Ind. Bat. **1**^{1}**:** 794. 1856; Sleumer, Notizbl. **15:** 229. 1940.

Sarcanthidion Baillon, Adansonia **11:** 199. 1874; Valeton, l. c. 200.

Briquetina Macbride, Field Mus. Pub. Bot. **11:** 26. 1931; Sleumer l. c.

Villaresiopsis Sleumer, l. c. 232. 1940.

Trees or shrubs; the branches terete, longitudinally striated, occasionally scandent; leaves petiolate, alternate, coriaceous or submembranaceous, entire or spinose-dentate, the veins oblique-arcuate and anastomosing; inflorescence terminal, axillary, extra-axillary or supra-axillary, paniculate or thyrsoid; flowers perfect or polygamous, 5-parted, articulated below the calyx; calyx fleshy, persistent, lobes imbricated; petals free, valvate or subimbricated, fleshy, their apices inflexed, the midrib prominently developed; stamens free, shorter than the petals, the glabrous and fleshy filaments usually thick and subulate and more or less flattened, the basifixed introrse anthers longitudinally dehiscent; disk none; ovary subgibbous, commonly 1- (rarely 2-) loculed, the locule containing a prominent parietal ridge, the two ovules pendent from near the apex, the glabrous style 1 (rarely 2), rudiments frequently present, the capitate stigma rugose; drupe scarcely fleshy, putamen woody, the locule incompletely septate, the solitary seed longitudinally plicate around the vertical woody dissepiment, hippocrepiform, the embryo small, the endosperm copious, the radicle terete or compressed, the minute cotyledons ovate-orbicular, their margins rarely superposed.

TYPE SPECIES: *Villaresia mucronata* Ruiz & Pavon.

DISTRIBUTION: Costa Rica to Chile, Australia, the East Indies, the Philippine Islands, Oceania.

Several of the distinctive morphological characters of this genus are worthy of mention. The plants are trees or shrubs, varying from *C. Moorei* of Australia, which is one of the largest trees of the high rain-forests, to *C. Engleriana,* which is a shrub only one meter high. Climbing habits have been reported for *C. sarmentosum* of New Caledonia and *C. affinis* of Peru, but in both of these the climbing habit is not reflected in the form of the shoots nor in their structure. Apparently the true condition is more a scrambling growth of the branches, comparable to that which occurs in *Mappia.* The leaves are generally thick-coriaceous and rigid, except for *C. Smythii* of Australia and *C. megaphylla* of Brazil, in which they are submembranaceous. The leaf-blades are glabrous in most, but in *C. Smythii* they are persistently wooly-tomentose. In the Old World species they are entire and the midrib is commonly slightly elevated on the upper surface. The blade, petiole and bark in these species turns dark on drying. This latter character, among the New World forms, is found only in *C. megaphylla.* Many of the New World species possess a cartilaginous margin from which spinose teeth may be developed. The teeth are very prominently developed in *C. ilicifolia* and *C. mucronata.* The youngest leaves are entire-margined and the spinose teeth develop later. Since many shoots have strictly entire leaves, it was assumed those having spinose-margined leaves were on sucker shoots; however, Reiche (Flora Chile **2:** 4. **1898**) pointed out that in *C. mucronata* the leaves of the younger plants and their shoots have entire margins and the older plants and shoots from the trunk are extremely spinose-leafed. Miers distinguished between *V. cuspidata* and *V. congonha* on the presence or absence of marginal teeth; however, examination of many specimens shows that the distinctions break down through all stages of intermediates.

An additional peculiarity of the leaves of the New World species is a pore-cavity. Pores are present in the axils of the veins and the midrib and also in the first bifurcation of the lateral veins in most of the New World species. In *C. incarum* and *C. ilicifolia* pores are absent from the axils of the main veins but minute pores are found in many reticulations along the arcuate veins. Sleumer has regarded the presence or absence of pores as significant in limiting species and, judging from the entire genus, it seems to be a valid conclusion. The pores occur primarily in the mesophyll-tissue and are usually separated from the meristeles by a single layer of cells. Occasionally a plate of tissue will be formed, with the cavity dorsal to it. The orifices and cavities of these pores vary considerably in size and apparently increase in size with the leaf. In small terminal leaves the pores are minute and frequently are revealed only through a hand-lens or by sections. In some material I have examined the pore-cavities were already formed in the leaves before there was any indication of an orifice developing. Hairs are present in many of these pores and frequently the hairs are of two types, short-strigose thick-walled hairs with small lumina and long crisp and frequently thin-walled collapsed hairs which reveal a large lumen when re-expanded. These pores have been reported as glandular or as glands in the earlier literature but Spegazzini (Ann. Soc. Cien. Arg. **49:** 124. 1900) examined fresh material and concluded they were not. He called them cecidiodomatia. In the large pores there are frequently small insects. The exoskeletons were in poor condition in the material I have examined but they were tentatively identified as acarina or mites, probably of the *Eriophyidae*.

The inflorescence may be terminal, axillary, or extra-axillary, being either supra-axillary or opposing the leaf. It is a modified panicle in most species. True panicles may be found in the South American species but in the others the main axis is indeterminate and the secondary branches cymose. In *C. latifolia* and *C. Brassii* the basal branches are as long as the main axis but in most of the others all secondary branches are subequal and rarely over 1 cm. long. The flowers are sessile, articulated below the calyx and subtended by bracts. The flowers are conglomerate at the ends of the branches when young but as the axis develops they become secund in a scorpioid cyme. In *C. latifolia* and *C. Brassii* these scorpioid cymose branches are bifurcated. All of the other species have unbranched cymes.

The floral articulation of this genus varies slightly from that found throughout the family. The calyx is extremely fleshy and the portions below the calyx-lobes are gibbous. The vascular strands from the peduncle extend up into the calyx, so that the actual point of articulation is sunken in the base of the calyx. A well developed socket-articulation of the calyx is characteristic of the genus.

Considerable discussion has appeared concerning the type of floral aestivation existing in this genus. The broad usually ovate-obtuse calyx-lobes are imbricate. The corolla, however, has been considered valvate by some workers and imbricate by others. The petals are usually oblong and quite thick. They have a more or less prominently protruding midrib and an inflexed apex. The apices may be broad or may be attenuate, and the ends frequently twist or become agglutinated, hindering the opening of the flower. The bud-apex is sunken, with the back of all five petals exposed. This could not occur if the aestivation was truly imbricate. The arrangement of petals in *Citronella* is either strictly valvate or a modified valvate condition due to the extreme thickness and fleshiness of the parts.

Either perfect or polygamous flowers may be found in *Citronella*. Five species have been reported in monoecious, *C. Moorei*, *C. suaveolens*, with some examples in *C. Gongonha*, *C. apogon*, and *C. costaricensis*. I have seen no authentic material of the first two species but the reduction of one sex is apparently complete, judging from the description. In the latter examples the flowers are functionally unisexual through the depauperization of one organ. Usually it is the stamens that are sterile and much smaller than normal. An occasional flower may be found in which the ovary had failed to develop a locule. In many of these abnormal cases the floral parts may be reduced to four in number.

The filaments are usually thick, broad, and subulate. The width may be uniform from the base upwards to shortly below the anther, where it tapers rapidly, or the filament may be broadest at the base and taper uniformly. In the Old World forms the anthers are usually oblong, with an obtuse or flattened apex and a cordate base. In the New World species the anthers are elliptic-oblong and not cordate at the base.

The characters of stylar length and obliqueness of the stigma, which Engler used to distinguish three genera among this complex, do not hold true if sufficient material is examined. The ovary is essentially gibbous, since the style is slightly eccentrically situated. There is commonly but one locule developed, with two anatropous ovules pendent from near the apex. Two locules may appear in some flowers, each with two ovules and the ovary with two styles.

The fruit of the genus *Citronella* is unique in the family. The drupe has a thin sarcocarp, only moderately fleshy, and a thin putamen. The putamen may be smooth, irregularly rugose, or strongly prismatic and angled. Characteristic of this fruit is the development of a dissepiment or partial partition along a radius of the locule, extending from the apex to the base. This dissepiment is present in the ovary as a small ridge and contains the vascular supply to the ovules. One ovule is pendant on each side of the ridge. In the ovary the ridge is curved with the ovary-wall, but as the drupe develops the thickened portion, containing the vascular supply, remains straight and at maturity is vertical in the center of the locule. A thin wall is formed between this thickened central column and the ovarian wall. Only one of the two pendant ovules develops and this seed has a minute embryo and a copious amount of endosperm. The endosperm conforms with the shape of the locule and is folded around the dissepiment, being hippocrepiform. The funicle is enclosed in the central column and enters the locule at the apex. The raphe is short and the vascular strands fimbriate promptly, so that no definite chalaza is found. The pattern of the raphe just described for *Citronella* is slightly variant from that found in other genera. It is possible that the endocarp-canal found in the other genera or the groove of the endocarp, which houses the funicle in some, may be comparable to the central column in *Citronella*. The fimbriation of the raphe has no counterpart in the other New World genera examined; however, there is a strong median vascular strand running down the seed at 90° from the dissepiment.

The frequent occurrence of two locules and two styles in *Citronella* raises the question, what was the primitive condition in this genus. In a normal one-celled ovary of *Citronella* there is evidence of one or two rudimentary styles and locules. At the base of the style may be found small protuberances which have been interpreted as stylar rudiments. They contain no vasculation. In the ovary also there will be a cavity or a mass of differentiated tissue between the vascular strands of the dissepiment and the ovarian wall. As many as two definite cavities without any indication of ovules have been found, although, commonly, only one such cavity is present. In many ovaries no evidence of this nature has been found.

Since the vasculation of the dissepiment is eccentric in the two-loculed ovary it is possible to presume, as Miers has done, that the primitive condition was a three-loculate ovary. It is evident in this genus that the uniloculate ovary was derived from the biloculate by abortion of one locule. On this basis the closest affinities of the genus are with *Emmotum* which has a regularly pluri-locular ovary. *Citronella* has a more primitive wood-structure than does *Emmotum* and compares more favorably with *Dendrobangia* on this basis.

More economic uses have been reported for *Citronella* than for any other genus of the Icacinaceae. *Citronella Gongonha* has an extensive use in South America as an inferior substitute for *Ilex paraguayensis* in making maté. The two plants have a remarkably similar appearance and it is possible that this use arose through a confusion of the plants. The essential oil necessary for maté is in much smaller quantities in the foliage of *C. Gongonha.* It is possible to distinguish between these plants on anatomical characters of the leaves. In addition to this use *C. Gongonha* is frequently cultivated as a shade-tree, a pot-plant or as a greenhouse shrub. Along with *C. mucronata* it is reported to be an excellent hedge-plant, probably because of its rigid, frequently spinose-margined leaves. *C. Moorei* is one of the largest trees of the Australian rain-forests and its use as a lumber tree is well known. It is frequently used for a veneer in cabinet work. Other Old World species are used locally by the natives for axe-handles and general construction, because of the hardness of the wood.

Specimens cited in this paper are from the following herbaria.

Arnold Arboretum (A), Brisbane Botanical Gardens, Brisbane, Australia (B), Field Museum of Natural History (FM), Gray Herbarium (G), Herbarium, Bureau of Science, Manila, Philippine Islands (M), New York Botanical Gardens (NY), Herbarium, Instituto Lillo, Univ. Nacional de Tucuman, Argentina (T), United States National Museum (US). The author is grateful to the directors of these institutions for the use of the materials.

Key to the Sections

Inflorescence axillary, terminal or rarely extra-axillary; buds globose; filaments short, stout; anthers ovate-oblong, apex and base rounded; leaves commonly with axillary pores, rarely darkening on drying, margin cartilaginous, entire or spinose-dentate. Species of the New World .... *Eucitronella*

Inflorescence extra-axillary or terminal; buds obovate; filaments broadly awl-shaped, attenuate at the apex; anthers oblong, cordate at the base; leaves without axillary pores, turning black on drying, margin entire, not cartilaginous. Species of the Old World .... *Euchariessa*

Section: **Eucitronella** sect. nov.

Plantae americanae, inflorescentiis axillaribus, gemmis globosis, antheris ovato-oblongis apice et basi rotundatis, axillis nervorum foliorum cavositatem porosam gerentibus, margine foliorum cartilagineo integro vel spinoso-dentato.

Key to the Species

Ovary densely to sparsely pilose.
- Inflorescence opposing the leaves or terminal; flowers polygamous .... *C. costaricensis*
- Inflorescence axillary or terminal, flowers perfect.
  - Ovary densely pilose; leaves membranaceous; petals glabrous .... *C. megaphylla*
  - Ovary sparsely pilose; leaves coriaceous, rigid; petals pubescent outside .... *C. paniculata*

Ovary glabrous.
- Leaves cuspidate, margin cartilaginous.
  - Inflorescence terminal; leaves oblong-lanceolate to ovate, 4–6.5 cm. long, midrib and veins only slightly prominent, petioles short .... *C. mucronata*
  - Inflorescence axillary or terminal; leaves ovate to elliptic, 7–14 cm. long, midrib and veins prominent, petioles long .... *C. Gongonha*
- Leaves not cuspidate, margin slightly cartilaginous.
  - Inflorescence terminal or axillary.
    - Leaves oblong to obovate, 7–10 cm. long, flat, veins distinct; calyx pubescent; flowers polygamous .... *C. apogon*
    - Leaves obovate, 4–6 cm. long, margin revolute, veins masked in fleshy lamina; calyx glabrous or only ciliate; flowers perfect .... *C. Engleriana*

Inflorescence extra-axillary.
Leaves with pores in axils of primary veins, entire, sweet-smelling . . . . *C. melliodora*
Leaves without large axillary pores in axils of primary veins but with numerous small pores in the bifurcations of these veins.
Leaves entire . . . . *C. incarum*
Leaves spinose-dentate . . . . *C. ilicifolia*

CITRONELLA COSTARICENSIS (Donn. Sm.) Howard, Journ. Arnold Arb. **21:** 471. 1940.

Villaresia costaricensis Donn. Sm., Bot. Gaz. **31:** 110. 1901; Standley, Field Mus. Pub. Bot. **18:** 636. 1937.

Trees to 20 m. tall, the trunk-diameter 40 cm., the bark light brown, the crown dense; branches light brown, sparsely strigose, becoming glabrate; petioles 4–8 mm. long, sulcate above, puberulous, soon glabrate; lamina oblong-elliptic, 9–12 cm. long, 4–5 cm. wide, coriaceous, rigid, green, shining above, gray and dull when dry, light brown below, very sparsely strigose, becoming glabrate, acuminate or acute, the base acute or rounded, the midrib sulcate above, prominent below, bearing large pores in the axils of the 5–6 pairs of primary veins, the entire margin slightly revolute; inflorescence extra-axillary, commonly opposing the leaf, the panicle 5–9 cm. long, its cymose branches 1 cm. long, the rhachis sparingly strigose, the bracts ovate; flowers sessile, glomerate, slightly secund, polygamous; calyx fleshy, 2 mm. in diameter, 1.3 mm. high, hirsute, the broadly triangular obtuse lobes 0.6–0.8 mm. high and 1 mm. wide; petals oblong-elliptic, 3.5 mm. long, 1.5–2 mm. wide, glabrous, apex attentuate; fertile stamens 2.6–3 mm. high, the filaments broadest below the middle, the oblong anthers 0.9–1 mm. long; the sterile stamens shorter than the ovary; fertile pistil 2.5 mm. long, the hirsute ovary globose, the short style glabrous, the stylar rudiments present, the capitate stigma rugose, sterile pistil 1–1.2 mm. high, the hirsute ovary globose, undifferentiated, the glabrous stylar rudiments 2–3 and equal; drupe elliptic-obloid, 2–3.5 cm. long, 1.6–1.8 cm. in diameter, the putamen longitudinally ridged, the minute embryo to 2 mm. long.

TYPE SPECIMEN: *Tonduz* 11664 (US 1394149), collected at Copey, Costa Rica.

ILLUSTRATION: PLATE 5A.

SPECIMENS SEEN: Costa Rica. Cartago: Copey, *Tonduz* 11664 (US type, FM, G, NY isotypes), 7351 (G, NY, US), 7388b (US), 11695 (G, US), 11791 (US); El Rosario de Orosi, *Pittier* 16625 (US); La Brisa de Zarcero, *Austin Smith* H-440 (FM), H-1357 (FM), 4112 (FM); San José, Santa Maria de Dota, *Standley* 42841 (FM); La Ventoleñ, S. slope of Volcán de Poas, *Standley* 34575 (US).

Occasionally completely unisexual flowers are found in *C. costaricensis*. Examples of flowers with sterile stamens are known for other species but this is the only instance where completely sterile pistils have been reported among the New World species. Among the staminate specimens there were no fertile pistils in any of the flowers of an inflorescence. In an inflorescence with fertile pistils some perfect flowers were found. In the flowers with functional pistils the ovary is one-celled, with one other smaller cavity eccentric to the fertile one. Two stylar rudiments are usually present at the base of the functional style. The sterile stamens are usually perfectly formed but much smaller than normal and their anthers develop no pollen.

The inflorescence is commonly opposite the leaf in this species. Its secondary branches are cymose, with the flowers glomerate at first, becoming slightly secund-scorpioid. The leaves have exceedingly large pores in the axils of the veins and the midrib. The drupe is larger than those of the other New World species. In all of these characters, except the pores, this species shows a closer relationship with species of the Old World than with those of the New World.

Plants have been collected from the high altitudes of Costa Rica between 1800 and 2500 meters. The trees are large and in deep forests. The fruit looks like a plum but is inedible.

Citronella megaphylla (Miers) Howard, Journ. Arnold Arb. **21:** 472. 1940.

Villaresia megaphylla Miers, Ann. Mag. Nat. Hist. III. **9:** 114. 1862, Contrib. Bot. **2:** 119. 1860–69.

Villaresia citrifolia Borzi, Boll. Ort. Bot. Palermo **1:** 44. 1897.

Villaresia grandiflora Fisch. ex Regel, Gartenfl. **5:** 61. 1856, **6:** 1, t. 180. 1857, *V. grandifolia* on plate.

Villaresia grandifolia Fisch. ex. Engler, Fl. Bras. **12** (2): 54. 1872, as synonym of *V. megaphylla*.

Villaresia megaphylla var. *acuminata* Miers, Ann. Mag. Nat. Hist. III. **9:** 115. 1862, Contrib. Bot. **2:** 120. 1860–69.

Tree, the branches glabrous; petioles slender, 2 cm. long, canaliculate above, glabrous; lamina oblong to narrowly elliptic, 16–19 cm. long, 5–8 cm. broad, subcoriaceous, glabrous, dull gray-green above when dry, lighter below, acute, the base acute, axillary pores rare, the midrib sulcate above and prominent below, the slightly prominent to inconspicuous veins 5–9 pairs;

margin entire; inflorescence axillary, paniculate, the lower branches as long as the main axis, slightly hirsute, the bracts ovate, the ultimate branches 3–5 flowered; the oblong calyx-lobes 1.5 mm. long, 0.7–0.9 mm. broad, sparsely hirsute; petals oblong or obovate, 4–4.5 mm. long, 1.5–2 mm. wide, glabrous; stamens 3–3.2 mm. long, the ovate anthers 0.8–1 mm. long; ovary globose, 2 mm. diameter, densely hirsute, the glabrous style short, the capitate stigma rugose; fruit not seen.

TYPE COLLECTION: *Miers* s. n. from Freichal, at the foot of the Organ mountains, Rio de Janeiro, Brazil (not seen).

ILLUSTRATION: *Miers*, Contrib. Bot. **2:** pl. 71. 1860–69, as *V. macrophylla.*

SPECIMENS SEEN: Brazil. Rio de Janeiro: Chacara do Fonsica, *Occhioni*, Herb. Jard. Bot. Rio 3456 (US). São Paulo: cultivated in the Botanic Garden, *Hoehne* 29752 (FM, NY).

VERNACULAR NAMES: Congonheira, Mborebi-caa, Palo de anta, Yerba de anta, Mborevi-Kaá.

This tree is frequently used as a source of paper-pulp and, more commonly, as firewood, according to Spegazzini.

CITRONELLA PANICULATA (Mart.) Howard, Journ. Arnold Arb. **21:** 473. 1940.

Leonia paniculata Mart. Flora **24** (2): Beibl. 26. 1840; DC. Prod. **8:** 669. 1844.

Leretia paniculata Miquel in Mart. Fl. Bras. **7:** 17. 1856.

Villaresia paniculata Miers, Ann. Mag. Nat. Hist. III. **9:** 116. 1862, Contrib. Bot. **2:** 121. 1860–69.

Villaresia paniculata var. *intermedia* Hassler, Fedde Repert. **14:** 164. 1915.

Trees to 10 m. tall; the branches stout, glabrous; petioles stout, to 1 cm. long, broadly canaliculate above, glabrous; lamina lance-oblong to oblanceolate, 9–11 cm. long, 3–5 cm. wide, coriaceous, glabrous, dull yellow-green above, lighter below, acute, slightly mucronate, the base cuneate or acute, the midrib sulcate above and prominent below, the 5 pairs of veins inconspicuous, the pores present in the axils of the veins, the margins entire, frequently cartilaginous; inflorescence axillary, paniculate, the basal branches as long as the main axis and densely sericeous-hirsute, the densely pubescent ovate bracts 3 mm. long and 1.5 mm. wide; flowers in clusters of 3–5, perfect; calyx-lobes broadly ovate, 1 mm. long, 0.7–0.9 mm. wide, densely hirsute; petals oblong, 3–3.5 mm. long, 1.2–1.6 mm. wide, sparsely short-strigose along the median line outside, glabrous inside; stamens 2–2.3 mm. long, the filaments broadest below the middle, the oblong anthers 0.5 mm. long; ovary globose, 1.2–2 mm. in diameter, densely hirsute, the short style glabrous, the capitate stigma rugose; drupe obovate, the apex cuspidate, the base acute or rounded, 1–1.5 cm. long, 1–1.2 cm. in diameter, glabrous, purple when ripe.

TYPE COLLECTION: *Martius* Herb. 460, made in Brazil, Capocapanae, prov. Sebastiano-politanae.

ILLUSTRATION: PLATE 4A.

SPECIMENS SEEN: Brazil. Minas Geraës: Fazenda do Paraiso, *Mexia* 5128 (FM, G, NY, US); Caldas, *Regnell* III-381 (US); *Widgren* s. n. (G). Rio de Janeiro: Macahé, *Riedel & Luschnaff* 1195 (NY); *Glaziou* 88288 (FM). No state given: *Mart.* Herb. 460 (type photo FM); *Warming* s. n. (photo type of var. obtusifolia FM, G). Paraguay. Cordillera de Altos, *Fiebrig* 135 (A, FM, G, US); Paraguay centralis, Sapucay, *Hassler* 11872 (A, G, US). Argentina. Missiones: Gobon, Puerto León, *Venturi* 111 (T).

VERNACULAR NAME: Perobossu.

I tentatively place *C. ramiflora* Miers (Ann. Mag. Nat. Hist. III. **9:** 116. 1862, Contrib. Bot. **2:** 120. 1860–69), *C. paraguaiensis* Hassler (Fedde Rep. **14:** 164. 1915), and *C. virescens* Miers (Ann. Mag. Nat. Hist. III. **9:** 115. 1862, Contrib. Bot. **2:** 120. 1860–69) in synonymy with *C. paniculata*. I have not seen authentic material of these species. When Miers described *C. ramiflora* and *C. virescens* he did not know *C. paniculata* and he recognized the possibility that either of the two species might be identical with *C. paniculata*. Miers established these species on slight differences in the pubescence of the ovary, a variable character in *C. paniculata*, where the ovary may be slightly pubescent or may have only a few hairs on the sulca. Since all stages of variation are found it is not possible to draw satisfactory lines between the extremes, as Miers has done. For this reason I consider *C. paniculata* a variable species and include *C. ramiflora* and *C. virescens* in it. Hassler's distinctions for *C. paraguaiensis* are unsatisfactory and that species, too, must be included here.

More material may also prove that the differences between *C. paniculata* and *C. megaphylla* are not substantial. At the present time the pubescence on the outside of the corolla and the larger submembranaceous leaves are the characters which seem to distinguish the present species from its relatives.

Both Engler and Miers have cited the wrong type specimen in their discussion of this species. The type specimen is *Leonia paniculata* Martius Herbarium, number 460 not 420. I have seen a photograph of it.

The collection by Warming, on which Engler based *Villaresia megaphylla* var. *obtusifolia,* is referable to *Villaresia paniculata.* I have seen a photograph of the type.

Citronella mucronata (Ruiz & Pavon) D. Don. Edinb. Phil. Journ. **13:** 243. 1832; Howard, Journ. Arnold Arb. **21:** 473. 1940.

Villaresia mucronata Ruiz & Pavon, Fl. Peruv. Chil. **3:** 9, t. 231. 1803; A. Juss. Ann. Sci. Nat. **25:** 14, t. 3, fig. 2. 1832; Reiss., Fl. Bras. **11** (1): 75. 1861.

Villaresia chilensis Stuntz, U. S. Dept. Agr. Bur. Pl. Ind. Invent. Seeds Pl. Imp. **32:** 39. 1914, not *Citrus chilensis* Molina.

Villaresia pungens Miers, Ann. Mag. Nat. Hist. III. **9:** 112. 1862, Contrib. Bot. **2:** 116. 1860–69.

Villaresia Congonha var. *pungens* Engler, Fl. Bras. **12** (2): 57. 1873.

Villaresia mucronata var. *laeta* Miers, Ann. Mag. Nat. Hist. III. **9:** 111. 1862, Contrib. Bot. **2:** 116. 1860–69.

Patagua chilensis Poepp. ex Neger, Bot. Centralbl. **84:** 307. 1900.

Small tree, to 8 m. tall; the branches yellow-puberulous, frequently fasciated; petioles 0.5 cm. long, sulcate above, puberulous to glabrate, stout; lamina broadly ovate to ovate-oblong, 4–6.5 cm. long, 2–4 cm. wide, coriaceous, rigid or membranaceous when young, dull gray-green above, yellow below, acute or mucronate, the base acute to obtuse or truncate, the sulcate midrib pubescent and prominent above but glabrous below with large pores in axils of primary veins, the 5–6 pairs of veins slightly prominent on both surfaces, the cartilaginous margin entire or spinose-dentate, the cartilaginous teeth to 2 mm. long; inflorescence terminal, the panicles 4–10 cm. long, rhachis yellow-brown-tomentose, the ovate bracts 2 mm. long and pubescent, flowers in clusters of 3–5 at the ends of the branches; calyx-lobes broadly ovate, 1–1.5 mm. long, 1–1.3 mm. wide, pubescent along the median line, ciliate; petals oblong, 3.5–4.5 mm. long, 1.5–2 mm. wide, glabrous; stamens 2.8–3.4 mm. long, the filament dilated below and broadest at the base, the oblong to ovate anthers 0.8–1.1 mm. long; pistil glabrous, conical, the style frequently grooved, the small capitate stigma rugose; drupe 9–12 mm. long, 6–7 mm. in diameter.

Type Collection: *Ruiz & Pavon,* s. n. made at Concepcion, Chile.

ILLUSTRATIONS: Miers, Contrib. Bot. **2:** 67. 1860–69 as *V. mucronata* Ruiz & Pavon, Fl. Peruv. Chil. **3:** pl. 231 b. 1803; Fl. Bras. **11** (1) **:** t. 22. 1861.

SPECIMENS SEEN: Chile: Coquimbo, Dept. Ovalle, Bosque de Fray Jorge, *Muños & Coronel* 1394 (G); Quillota, *Bertero* 1394 (FM, G); Rancagua, La Leona, *Bertero* 749 (FM, G); Temuco, *Sargent* s. n. (G); Bureo, *Joseph* 3445 (G); Temuco *Joseph* 4681 (G); Antuco, *Poeppig* 703 (photo FM, G). No locality given. *Dombey* 595 (FM); *Cuming* s. n. (FM, G); *Ruiz & Pavon* (FM, ex Herb. Horti. Bot. Matritensis, photo FM).

VERNACULAR NAMES: Naranjillo, Patagua, Guilli-patagua, Citronnier, Congonha do sertão, Herva de anta com espinho.

Citronella mucronata is frequently cultivated as a shade or park tree. The wood is used for fuel and for paper-pulp. The leaves lack the aromatic oil necessary for maté. Gay reports a superstition that hernias may be cured by lying under the tree or by the use of the plant.

Engler incorrectly attributed the specimen collected by Cuming to Concepcion, Paraguay, instead of Chile. This is the specimen upon which Miers based *V. pungens.* An isotype of the species is definitely identical with *C. mucronata,* so that I have referred *V. pungens* and *V. congonha* var. *pungens* to synonymy under *C. mucronata.*

Spinose-margined leaves are reported both for older plants and for sucker-shoots. The normal leaves are entire and cartilaginous-margined. *V. mucronata* var. *laeta,* established by Miers for plants with leaves truncate at the base, is not a substantial entity. Such leaf-forms are common and frequently may be found on the same branch with leaves having acute bases.

Stuntz made the new combination, *Villaresia chilensis,* for this plant, as Miers has referred *Citrus chilensis* Molina to the synonymy here. I have pointed out in an earlier paper (Howard, l. c. 473) that *Citrus chilensis* cannot belong here and probably represents a true *Citrus.* The new combination made by Stuntz is not applicable to this Chilean plant.

Occasional female flowers may be found with depauperate stamens having sterile anthers.

CITRONELLA GONGONHA (Mart.) Howard, Journ. Arnold Arb. **21:** 471. 1940.

Cassine Gongonha Mart. Reise Bras. **1:** 285. 1823; Travels Braz. **2:** 100. 1824.

Ilex Gongonha D. Don, Lambert, Gen. Pinus, **2:** app. 7** t. 6. 1824.

Villaresia Congonha Miers, Ann. Mag. Nat. Hist. III. **9:** 112. 1862, Contrib. Bot. **2:** 117. 1860–69.

Myginda Gongonha DC., Prod. **2:** 12. 1825.

Villaresia cuspidata Miers, Ann. Mag. Nat. Hist. III. **9:** 113. 1862, Contrib. Bot. **2:** 118. 1860–69.

Villaresia Gongonha C. Muell. Walp. Ann. **7:** 569. 1868.

Villaresia mucronata sensu Reiss. in Mart. Fl. Bras. **12** (2): 75, t. 22. 1872, not Ruiz & Pavon.

Villaresia mucronata sensu Sprague, Bot. Mag. **137:** t. 8376. 1911, not Ruiz & Pavon.

Tree to 8 m. tall; branches yellow, glabrous, frequently fasciated; petioles short, 0.5–1 cm. long, stout, deeply canaliculate above, glabrous, yellow; lamina oblong-lanceolate, ovate, elliptic or obovate, 7–12 cm. long, 3.5–6 cm. wide, coriaceous, rigid, glabrous, yellow-green and frequently shining above, yellow below, the apex rounded, cuspidate, the cartilaginous cusp to 3 mm. long, the base acute or rounded, the midrib sulcate above and prominent below, bearing pores in the axils of veins, the 5–8 pairs of veins slightly raised and sulcate above and slightly prominent below, the entire margin cartilaginous, slightly revolute or sinuate-dentate or denticulate, the cartilaginous teeth to 2 mm. long; inflorescence axillary, paniculate, to 4 cm. long, densely hirsute, the hirsute ovate bracts to 1 mm. long; flowers clustered; sepals ovate 1–1.5 mm. high, 0.7–1.3 mm. wide, fleshy, hirsute, ciliate; petals oblong, 3–4 mm. long, 1.5–3 mm. wide, glabrous; stamens 2–3 mm. long, the ovate-oblong anthers 0.3–0.6 mm. long; pistil glabrous, the ovary globose-conical, the stout style slightly eccentric, the capitate stigma rugose; fruit not seen.

Illustration: Miers, Contrib. Bot. **2:** pl. 69, pl. 70 as *V. cuspidata*. 1860–69; Bot. Mag. **137:** t. 8376. 1911; Rev. Chil. Hist. Nat. **21:** 129. 1917; Lambert, Genus Pinus **2:** t. 6. 1824.

Distribution: Brazil, Paraguay, Uruguay, Argentina.

Specimens seen: Brazil. São Paulo: Butantan, *Hoehne* 385 (A, FM, NY), 802 (FM), 2352 (G, NY). Paraná: Curityba, *Dusén* 17165 (G). Miñas Geraes: Caldas, *Regnell* 1404 (US); Uberana, *Riedel & Luschnatt* 2836 (NY). Rio Grande de Sul; Neu Württenburg, Estancia Luiz, *Bornmüller* 749 (A, G); Palmeira, *Bornmüller* 734 (A, G). Prov. not stated; *Sellow* 2857 (G). Argentina. Missiones: Santa Ana, *Rodriquez* 535 (T); Formosa: Colonia Clorinda, *Venturi* 9111 (US). Uruguay. Treinta-y-tres: Tacuari, *Herter* 1624 (FM, G); San Bernardino between Pirayó and Tacural, *Osten* 9121 (T). Paraguay. Carapegua, *Rojas* 3343 (NY, US); Ygatimí, Yerbales & Sierra de Maracayù, *Hassler* 5495 (A); Villa Rica, *Jorgensen* 4492 (US), 4498 (A, FM, NY, T, US); Yuguiri, Lugue, *Rojas* 1736 (T); Asuncion, Areguá, *Malme* 856 (G).

VERNACULAR NAMES: Yapon, Maté, Yerba de palos los paraguayos, Gongonha, Congonha, Congoña, Caá-guazú, Caá-rá, Caona, Tarumá del pantano, Palo de pantano, Congonha de bugre, Congonha falsa, Falsomaté, herva de anta.

The branches of this species are often either clustered at a node or actually fasciated and flattened. A rare flower may possess a few scattered hairs on the ovary. The cartilaginous margin and the cuspidate tip of the leaf readily distinguish this species.

The collection by Bornmüller (749) is the host for the type-specimen of fungus, *Pyenoderma Villaresiae* Sydow.

Engler reduced *Villaresia pungens* of Miers to the status of a variety and referred it here. The type specimen was collected by Cuming at "Concepcion," which Engler mistook to be the Concepcion in Paraguay. I have referred *V. pungens* and *V. Congonha* var. *pungens* to synonymy with *C. mucronata*. Most of Cuming's work was done in Chile and the plant is obviously a spiny shoot of *C. mucronata*.

CITRONELLA **apogon** (Griseb.), comb. nov.

Emmotum apogon Griseb. Göttung. Abhandl. **24:** 149. 1879.

Small tree; the branches strigose or hirsute when young, becoming glabrate, yellow, often fasciated; petioles 1 cm. long, sulcate above, hirsute or glabrate, yellow; lamina elliptic to oblanceolate, 7–10 cm. long, 3–4 cm. wide, rigid-coriaceous, glabrous, olive-green above, yellow-brown below, obtuse, the base acute or cuneate, the midrib sulcate above and prominent below, the 3–5 pairs of veins slightly prominent and bearing pores in the axils of the primary veins, the margin entire, slightly revolute, cartilaginous; inflorescence axillary, fascicled, the panicles to 2 cm. long, rhachis hirsute, bracteate, the hirsute ovate bracts 1.5 mm. long; flowers 3–5, clustered at the ends of the branches; calyx-lobes ovate, 1 mm. long, 0.8–0.9 mm. wide, obtuse or acute, fleshy, sparsely hirsute; petals oblong, 2.7–3.5 mm. long, 0.9–1.7 mm. wide, the apex extended to a narrow spatulate appendage, midrib prominent; stamens 1–1.2 mm. long, partially sterile, the oblong anthers slightly diverging at the base; pistil glabrous, the globose ovary 1 mm. in diameter, the eccentric style strongly sulcate and 1 mm. long, the capitate stigma rugose; fruit immature.

TYPE COLLECTION: *Lorentz* and *Hieronymus* 438, from Oran near San Andres, Argentina.

ILLUSTRATION: PLATE 5B.

SPECIMENS SEEN: *Argentina.* Oran near San Andres, *Lorentz & Hieronymus* 438 (NY, photo FM, ISOTYPE). Bolivia. Santa Cruz: Samaipata, *Steinbach* 8245 (FM, NY).

VERNACULAR NAME: Laurel.

Steinbach's plant was collected at 1400 meters altitude and was in flower in October. The flowers are functionally unisexual. In the specimens cited above, the flowers were mostly pistillate, although a few flowers with fertile pistils had stamens with a small number of pollen grains. Usually the pistil was well developed but the stamens were minute, well formed, but completely sterile. The ovary, which Grisebach described as three-loculate, is commonly one-celled, as in other species of *Citronella.* In *C. apogon* the vascular mass of the dissepiment protrudes into the locule of the ovary but at the junction of this partition and the ovarian wall are remnants of other locules. These are two more or less distinct regions of soft punky tissue which may represent the two other locules mentioned by Grisebach. No indication of ovules could be found in this tissue and only one small cavity was present. The fruits are not known. Older flowers, with enlarged pistils or young fruits, show only one locule and two ovules, one of which is clearly shrunken.

C. apogon is clearly distinct from the other species by the flat oblanceolate or elliptic leaves and the polygamous flowers.

CITRONELLA ENGLERIANA (Loesn.) Howard, Journ. Arnold Arb. **21:** 471. 1940.

Villaresia Engleriana Loesner, Notizbl. **3:** 20. 1900.

Small tree or shrub; the branches clustered at the nodes, dark brown, strigose or hirsute to glabrate; petioles 0.5–1 cm. long, sulcate above, hirsute; lamina oblanceolate to lance-oblong, 4–6 cm. long, 1–1.5 cm. wide, rigid-coriaceous, sparsely strigose or hirsute above, becoming glabrate, olive-brown, concolorous, acute, the base cuneate, the midrib sulcate above and slightly prominent below, the inconspicuous veins 3–4 pairs, the pores present, the margin revolute entire and not cartilaginous or only slightly so; inflorescence terminal, paniculate, to 2 cm. long, the rhachis yellow-hirsute, ovate hirsute bracts 1.6 mm. long; flowers clustered at the ends of the branches; calyx 2.1 mm. in diameter, fleshy, the broadly ovate glabrous or slightly ciliate lobes 1–1.2 mm. long and 1–1.2 mm. wide with apex rounded; petals lance-oblong, 2.5–2.7 mm. long, 1.3–1.6 mm. wide, glabrous; stamens 3.1–3.3 mm. long, the filaments oblong to broadly subulate, the oblong anthers 0.8–1 mm. long; pistil conical, glabrous, the ovary subglobose, 1.1 mm. in diameter, the style short, the capitate stigma rugose; fruit unknown.

TYPE COLLECTION: *Glaziou* 17575, from Serra des Orgas, Rio de Janeiro, Brazil.

ILLUSTRATION: PLATE 4B.

SPECIMENS SEEN: *Glaziou* 17575 (FM isotype, photo. of TYPE FM, G).

The size and shape of the leaves allow this species to be readily recognized.

CITRONELLA **melliodora** (Sleumer), comb. nov.

Briquetina melliodora Sleumer, Notizbl. **15:** 230. 1940.

Tree 12–15 m. high, trunk-diameter 20–30 cm.; the branches glabrous; petioles 1.2–1.7 cm. long; lamina oblong, rarely ovate-oblong, 18–25 cm. long, 7–19 cm. wide, subcoriaceous, glabrous, shining both sides, entire, short-acuminate with a subacute curved acumen 1.3–2 cm. long, the broadly cuneate or rarely round base almost equal, the veins 4–5 pairs, axils of primary veins bearing pores; inflorescence 6–10 (20) cm. long, rhachis laxly pilose, the cymes manifestly peduncled; flowers subsessile, sweet-smelling, the scarious bracts ciliate; pubescent ovate sepals 1 mm. long; petals oblong, glabrous, 1.5 mm. long, yellow; stamens one half the corolla-length, the filaments subulate, the anthers ovate-oblong; ovary ovoid, glabrous, the style short, the stigma subcapitate; fruit unknown.

TYPE SPECIMEN: *Tessmann* 4474 (Herb. Berlin, not seen), collected in Peru, Upper Maranon, Mundung des Santiago.

Further study may show that this species is not distinct from *C. incarum* for, according to the description, it differs only in the possession of pores in the axils of the primary veins and the midrib and has a sweet odor. I have not seen material of it.

CITRONELLA INCARUM (Macb.) Howard, Journ. Arnold Arb. **21:** 472. 1940.

Briquetina incarum Macbride, Field Mus. Pub. Bot. **11:** 26. 1926.

Briquetina mollis Sleumer, Notizbl. **15:** 231. 1940.

Briquetina affinis Standley ex Sleumer, Notizbl. **15:** 232. 1940, *nomen.*

Tree or shrub with scrambling branches; the terete branches chestnut brown and ferrugineous-tomentose or sparsely hirsute and becoming glabrate, the old branches ash-gray, the bark fissured; petioles stout, 0.7–1.5 cm. long, broadly canaliculate above, tomentose when young, becoming glabrate; lamina elliptic to oblong or ovate, 10–18 cm. long, 6–8 cm. wide, hirsute-tomentose above, becoming glabrate, shining, crispose-tomentose below, becoming sparsely pubescent or glabrate, thick-coriaceous, acute, the base acute to rounded, unequal, the midrib sulcate above and prominent below, the 5 pairs of veins sulcate above. the reticulate veinlets with pores in the axils of the secondary bifurcations, the pores absent from the axils of the primary veins, the entire margin crenulate on drying; inflorescence extra-axillary, commonly opposing the leaf, the panicle 8–15 cm. long, the subequal branches to 2 cm. long, rhachis hirsute or tomentose; flowers sessile, subtended by ovate yellow-hirsute bracts, secund-scorpioid; calyx 1.2 mm. high, the broadly ovate and obtuse lobes densely hirsute; petals oblong, 1.5–2 mm. long when immature; stamens immature, to 1.7 mm. long, the oblong anthers 0.7 mm. long; pistil conical, 2 mm. long, glabrous, the style subulate, two rudiments present, the capitate stigma rugose; drupe ovoid or ellipsoid, 1 cm. long, 0.8 cm. in diameter, dark brown when dry.

Type Specimen: *Macbride* 4050 (FM 535116).

Specimens seen: Peru. Huanuco: Muña, *Macbride* 4050 (FM type). Yanano: *Macbride* 3748 (FM, US). San Martin: Juan Jui, upper Rio Hullaga, *Klug* 3807 (FM, G, NY). Libertad: prov. Patáz, valley of Mishiollo below Ongón, *Weberbauer* 7056 (FM, G, US).

Sleumer published the name *Briquetina affinis* and attributed it to Standley. Such a plant has never been described. Although Sleumer referred a collection cited above to such a species and gives a key to distinguish them I find the key-differences very unsatisfactory. While there is a large difference in the altitudinal ranges of these two plants and a slight difference in the general appearance, I can find no substantial differences in the flowering specimens available. It seems best to refer all the collections to *C. incarum.*

I cannot distinguish between *B. mollis,* as described by Sleumer, and the type specimen of *C. incarum.* The latter is often persistently crispose-tomentose on the lower surface of the leaves and it is upon this character that *B. mollis* was established.

Unique in this plant is the absence of large pores in the axils of the primary veins and the midrib. Instead, many small pores are found in the bifurcations of the secondary veinlets or along the primary arcuate veins, especially where they parallel the margin of the leaf.

CITRONELLA **ilicifolia** (Sleumer), comb. nov.
Villaresiopsis ilicifolia Sleumer, Notizbl. **15:** 232. August, 1940.
Citronella peruviana Howard, Journ. Arnold Arb. **21:** 474. October, 1940.

Trees 5 m. high; branches yellow-hirsute, becoming glabrate; petioles 6 mm. long, canaliculate above; lamina lance-elliptic to oblong, 12–18 cm. long, 5–8 cm. wide, coriaceous, rigid, olive-brown when dry, acuminate, the base rounded, the midrib sulcate above and prominent below, the 5 pairs of veins slightly immersed above but prominent below and bearing pores in the axils of the primary veins, the margin entire when young but becoming sinuate-dentate, the rigid and cartilaginous teeth 2–3 mm. long and 4–7 mm. apart; panicle extra-axillary, 8 cm. long when immature, the cymes 0.5–1.5 cm. long, rhachis densely yellow-hirsute or -pilose, the ovate bracts minute; flowers sessile, agglomerate when young becoming secund-scorpioid; sepals ovate-oblong, 1.7–2 mm. long, obtuse, loosely pilose outside; petals oblong to 5 mm. long, 2 mm. wide, the apex inflexed, appendage ⅓–¼ the petal-length; stamens 2.2–2.8 mm. long, the subulate filaments 1.3–2 mm. long and broadest below the middle, the ovate-oblong anthers 0.5–0.8 mm. long and diverging at the base; pistil glabrous, to 2.5 mm. long, the ovary ovoid, the style 0.8 mm. long, the capitate stigma oblique and rugose; fruit unknown.

TYPE SPECIMEN: *Weberbauer* 6617 (Herb. Berlin, not seen), collected in Peru, Junin, prov. Jauja, along the Rio Comas.

ILLUSTRATION: Howard, Journ. Arnold Arb. **21:** pl. 4. 1940, as *Citronella peruviana.*

SPECIMENS SEEN: *Weberbauer* 6617 (FM, G, US isotypes).

Sleumer and I each described a new species of *Citronella* based on a collection by Weberbauer. I have pointed out (l. c.) that this specimen is intermediate in position between the South American species of *Villaresia* and *Briquetina* and that it forms a link rather than a new genus, as Sleumer proposed for it.

Section: **Euchariessa** sect. nov.

Plantae gerontogeae, inflorescentiis extra-axillaribus vel terminalibus, gemmis obovatis, antheris oblongis apice rotundatis basi cordatis, laminis foliorum non poros gerentibus margine non cartilagineis integerrimis.

Key to the Species

Inflorescence paniculate, basal branches elongate; cymes bifid.
  Fruit ovoid, 1.5 cm. in diameter; putamen 1–2 mm. thick, rugose. Philippine Islands . . . . *C. latifolia*
  Fruit ellipsoid, 1–1.5 cm. long, 0.6–0.9 mm. in diameter; putamen 0.5 mm. thick, smooth. New Guinea . . . . *C. Brassii*
Inflorescence thrysoid, cymes simple, subequal.
  Flowers monoecious.
    Ovary densely hirsute, stylar rudiments present. Australia . . *C. Moorei*
    Ovary glabrous, stylar rudiments absent. Java, Celebes . . *C. suaveolens*
  Flowers perfect.
    Semiscandent shrub; leaves obovate to oblong. New Caledonia . . . . *C. sarmentosum*
    Erect trees.
      Fruit prismatic, base rounded, apex attenuate; putamen rugose, strongly angled. Fiji Islands . . . . *C. vitiensis*
      Fruit globose; putamen slightly rugose, not angled.
        Leaves submembranaceous, persistently pubescent; inflorescence opposing the leaves or terminal. Australia . . . . *C. Smythii*
        Leaves coriaceous, glabrous; inflorescence supra-axillary or terminal.
          Petals prominently keeled, keel protruding equal to half the width of the petal; petioles 2–3 cm. long. Philippine Islands . . . . *C. philippinensis*
          Petals not prominently keeled, petioles 1–1.5 cm. long.
            Leaves ovate, 9–14 cm. long, 6–11 cm. wide, the apex acute, the base subtruncate. Samoa . . . . . . *C. samoensis*
            Leaves elliptic, 6–10 cm. long, 5–6.5 cm. wide, the apex rounded, the base cuneate or rounded . . . . . . *C. lucidula*

Citronella latifolia (Merr.) Howard, Journ. Arnold Arb. **21**: 472. 1940.

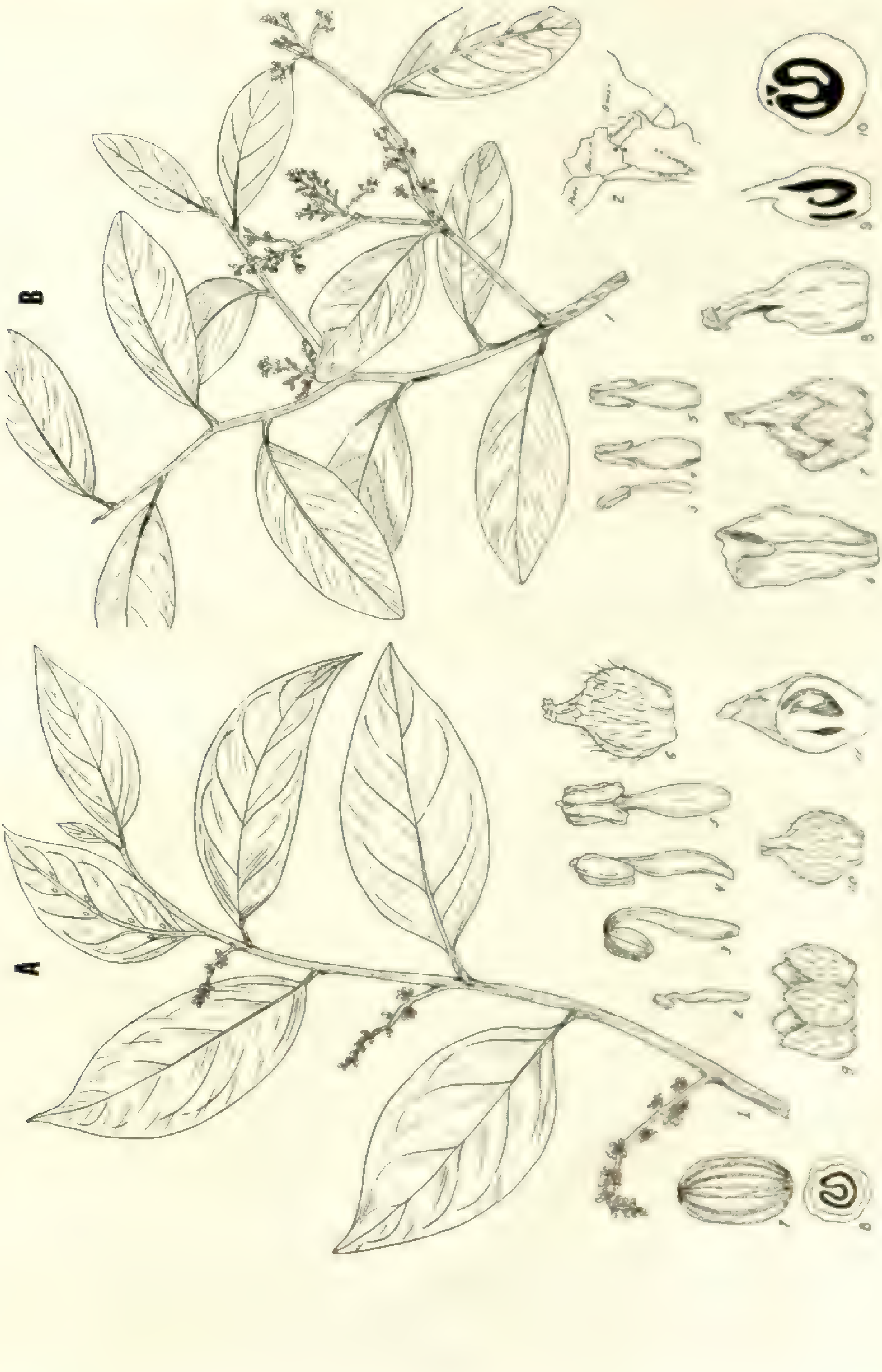
Villaresia latifolia Merr., Phil. Journ. Sci. Bot. **14**: 415. 1919.

Tree; the branches dark brown, glabrous; petioles stout, 1.5–2 cm. long, broadly sulcate above, glabrous; lamina elliptic-oblong to obovate, 14–18 cm. long, 8–10 cm. wide, coriaceous, rigid, glabrous, shining above, obtuse, slightly mucronate, plicated, the base rounded to broadly cuneate, the sulcate midrib slightly arched at least at the tip, the veins 5-paired, the margin entire and slightly revolute; inflorescence terminal, the panicle to 15 cm. long, the branches 2 cm. long, bifurcated; flowers not known; fruits ovoid, 2 cm. long, 1.5 cm. in diameter.

Type Collection: *Ramos* Herb. Phil. Bur. Sci. 24557, collected at Pinipisakan, on the Catubig river, Samar, Philippine Islands.

Illustration: Plate 6, figs. 9–12.

Specimens seen: *Ramos* 24557 (A, NY isotypes).



A, CITRONELLA COSTARICENSIS.

B. CITRONELLA APOGON.

Figs 1–8, Citronella philippinensis; figs. 9–12, C. latifolia.

CITRONELLA **Brassii,** sp. nov.

Arbor 20–30 m. alta; ramulis teretibus adpresse fulvo-hirsutis vel glabratis, petiolis crassis 1–1.5 cm. longis canaliculatis, laminis foliorum ovatis vel ellipticis 12–17 cm. longis 5.5–9 cm. latis coriaceis glabris utrinque lucidulis margine integris, apice acutis vel subrotundatis base rotundis costa supra valida elevata subtus prominente nervis 4 obliquis vel subarcuatis laxe anastomosantibus venulis subdense reticulatis, infrutescentibus paniculatis supra axillaribus vel terminalibus 10–16 cm. longis, ramis inferioribus usque ad 3 cm. longis, cymis bifidis subaequalis ad 1 cm. longis rhachi sparse adpresse pubescentibus fructu secundo-scorpioideis utrinque rotundatis putamine 0.3 mm. crasse leve.

SPECIMENS SEEN: *Brass & Versteegh* 13173 (A TYPE), 13591 (A), collected at the Bernhard camp on the Idenburg river, New Guinea.

Trees of primary forests on ridges and higher slopes at altitudes of 350–850 meters. The bark is thin (4 mm.) and brown and scaly. The type specimen was collected in fruit in April. This species is similar to *C. latifolia* in the inflorescence, which has several long branches at the base; however, it is different from all other species in the small ellipsoid drupes, which possess extremely thin walls and essentially smooth putamens. The leaves are unique in being thick-coriaceous and shining on both surfaces. They turn black on drying.

CITRONELLA MOOREI (F. Muell.) Howard, Journ. Arnold Arb. **21:** 472. 1940.

Villaresia Moorei F. v. Muell. in Bentham & Mueller, Fl. Austral. **1:** 396. 1863; Journ. Austr. For. Leag. **1:** 12. 1938.

Chariessa Moorei Engl. Nat. Pflanzenfam. **3** (5)**:** 245. 1893.

Tree to 40 m. tall; branches hirsute, becoming glabrous, turning black on drying; petioles tenuous, 1–1.5 cm. long, sparsely hirsute or glabrate, sulcate above; lamina ovate-lanceolate to oblong, 9–12 cm. long, 3–5 cm. wide, glabrate or sparsely hirsute, thin, coriaceous, turning black on drying, acuminate or acute, the base acute or tapering, the midrib slightly sulcate above but prominent below, the veins 5-paired, the margins entire; inflorescence extra-axillary or terminal, the panicle 6–16 cm. long, the rhachis hirsute, the branches subequal and up to 1 cm. long; flowers sessile, secund-scorpioid, subtended by minute ovate bracts, unisexual or polygamous; pistillate flowers with ovate obtuse ciliate calyx lobes 1 mm. long and 0.9 mm. wide; petals obovate to oblong, 4.5–5 mm. long, 1.3–1.7 mm. wide, thick-fleshy, the midrib stout and glabrous; stamens 4 mm. long, the flattened filaments narrowed at the apex, the oblong anthers 0.9–1.1 mm. long and divaricate at the base, sterile; pistil 3.4 mm. long, the globose ovary hirsute, the stout and fleshy style sulcate, stylar rudiments present, the capitate stigma rugose; drupe globose, 1–1.3 cm. in diameter.

TYPE COLLECTION: *Charles Moore* in F. Muell. herbarium (not seen), collected on the Clarence river, New South Wales, Australia.

ILLUSTRATIONS: Proc. Linn. Soc. N. S. Wales **25:** 4, t. 38. 1901; Proc. Roy. Soc. Queensland **38:** pl. 12, 13, fig. 12. 1926.

SPECIMENS SEEN: Australia. Queensland: Bunya Mts. *Tryon* s. n. (B); Roberts Plateau, Lamington Nat. Park, *Tryon* and *White* s. n. (B); Atherton Tableland, Gadgarra reserve, *Kajewski* 1125 (A, NY), 1015 (A, NY).

VERNACULAR NAMES: Churnwood, Soap Box, Corduroy beech, Australian beech, White Maple, Corduroy, Scrub Silky Oak.

Mueller based this species on a specimen in Mueller's herbarium collected by Dr. Charles Moore, Director of the Sydney Botanic Garden. This specimen was described as male and it apparently had no female parts, since none were described. Functional unisexuality of flowers in this genus has been reported from some of the South American species; however, in all of these examples the males are represented by well developed organs. Among the specimens which I have referred to this species are some completely sterile specimens and some with fertile pistils but completely sterile anthers to the stamens. I have not seen the type specimen and, while my material compares favorably in leaf-characters with the original description, I cannot be sure of their identity. The pubescent ovary is the first reported among the Old World species of this genus and easily separates *C. Moorei* from *C. suaveolens*.

Plants of this species are among the largest trees of the family and are found at higher altitudes in dense tropical rain forests. The wood is light grey in color, close-grained and used in cabinet making as a veneer.

CITRONELLA SUAVEOLENS (Blume) Howard, Journ. Arnold Arb. **21:** 475. 1940.

Pleuropetalon suaveolens Blume, Mus. Bot. Lugd.-Bat. **1:** 248. 1850.

Chariessa suaveolens Miq. Fl. Ind. Bat. **1**^{1}**:** 794. 1856; Sleumer, Notizbl. **15:** 229. 1940.

Villaresia suaveolens Valeton, Crit. Overz. Olac. 199. 1886.

Trees; petioles short; lamina ovate to elliptic-oblong, lanceolate, 6–17 cm. long, 3–7 cm. wide, coriaceous, shining, with 4–5 pairs of veins, reticulate, the margins entire; inflorescence terminal, paniculate, the branches short, densely flowered, rhachis yellow-tomentose; flowers monoecious by abortion; calyx-lobes ovate, ciliate; petals with prominent midribs; filaments subulate or filiform, fleshy, the anthers cordate and obtuse; ovary glabrous, globose, the style filiform, rudiments absent, the stigma minute and capitate; fruit elongate-globose, 15–20 mm. long, the putamen thin.

TYPE COLLECTION: Jerukie, from the Sundaice Mts. of Java occidentale.

ILLUSTRATION: Valeton, Crit. Overz. Olac. pl. 5, fig. 32. 1886.

DISTRIBUTION: Specimens have been reported from Java, Celebes, and British North Borneo.

SPECIMEN SEEN: Celebes, Gowa, Lembaja, *Beroe* ex Herb. Bot. Bog. 20434 (A, NY).

I have not seen any of the material previously cited for this species. The specimen here cited agrees with the very general descriptions now in the literature. A re-examination of the type material and a complete description of this species is much desired. Bentham thought that *V. suaveolens* might be the same as *V. Moorei* but the pubescent ovary in the female flowers of the latter species is easily separated from the glabrous ovary described for *V. suaveolens.*

CITRONELLA SARMENTOSA (Baill.) Howard, Journ. Arnold Arb. **21**: 475. 1940.

Sarcanthidion sarmentosum Baill., Adansonia **11**: 199. 1874.

Woody climber, 3–4 m. tall; stems terete, hirsute to glabrate; petioles 1–2 cm. long, canaliculate; lamina oblong-obovate, 8–10 cm. long, 3–5 cm. wide, coriaceous, glabrous, entire, obtuse to abruptly acuminate, the base attenuate and slightly decurrent on the petiole; inflorescence terminal, the panicle 10–15 cm. long, with secund-scorpioid branches to 1 cm. long; flowers perfect, sessile, subtended by minute bracts; calyx-lobes broadly ovate, obtuse, ciliate; petals obovate-oblong, 3.8–4.5 mm. long, 1.2–1.6 mm. wide, fleshy, with midrib prominent; stamens 3–4 mm. long, the oblong anthers 0.8–1 mm. long; pistil glabrous, 3–4 mm. long, the ovary globose, 1–2-celled, the styles 1–2, the subcapitate, oblique stigma grooved and rugose; drupe grooved on one side.

TYPE COLLECTION: *Deplanche* 547, from Pum, Yate and Pic de Pueblo, New Caledonia.
ILLUSTRATION: Engler Bot. Jahrb. **39:** 175. 1906.
SPECIMEN SEEN: New Caledonia, *Prony* 1576-A (A).

There is no adequate basis for maintaining *Sarcanthidion* as a distinct genus. Baillon describes the plant as a climbing shrub; however, judging from the wood-structure, it is not a vine or liana and the structure is that of a normal erect shrub and is scarcely distinguishable from that of the other species of *Citronella*. This is the only member of the genus reported from New Caledonia.

CITRONELLA VITIENSIS, Howard, Sargentia **1:** 53. 1942.
Arbor parva; ramulis teretibus glabris; foliis 1–1.5 cm. longe petiolatis, lamina late ovata vel elliptica 10–16 cm. longa 6–12 cm. lata subcoriacea glaberrima integra, apice acuminata ad 1 cm. longa, basi rotundata vel subcordata costa supra vix subtus valde prominente nervis lateralibus utroque latere 4–5 arcuatis anastomosantibus; paniculis terminalibus 8–19 cm. longis, cymulis ad 1 cm. longis apice flores plures subcapitato-congestos vel secundo-scorpioides gerentibus, rhachi adpresse flavido-pubescente; calycis lobis ovatis 1 mm. longis, 1.5 mm. latis ciliatis; petalis oblongis 5 mm. longis 1.4 mm. latis glabris costa prominula ornatis; staminibus ad 4.5 mm. longis, filamentis crassiusculis, antheris oblongis 1.2 mm. longis basi cordatis; ovariis ovoideis glabris in stylum attenuatis; stigmate capitato rugoso; fructibus oblongo-ovoideis ad 3 cm. longis 1.5 cm. latis complanatis basi truncatis vel subcordatis apicem versus angustatis; putamine lignoso conspicue angulare prominenter costato.
TYPE SPECIMEN: *Degener* and *Ordonez* 14007 (A), collected in the Fiji Islands, Vanua Levu, Thakaundrove, Savu Savu bay region of Vatunivuamonde Mt.
SPECIMENS SEEN: Fiji Islands. Viti Levu; Naitasiri, Suva pumping station, *Degener & Ordonez* 13773 (A); Nasinu, *Gillespie* 3590 (G, NY, US). Ovalu: Levuka reservoir, *Gillespie* 4527 (G, NY), 4511 (G, US).

This is the first report of the genus from the Fiji Islands. *C. vitiensis* is a clearly distinct species with angular prismatic drupes.

CITRONELLA SMYTHII (F. v. Muell.) Howard, Journ. Arnold Arb. **21:** 475. 1940.
Villaresia Smythii F. v. Muell. Frag. **5:** 156. 1866.
Chariessa Smythii Becc. Mal. **1:** 118. 1877.

Villaresia adenophylla Domin, Bibliot. Bot. **89:** 50. 1921.

Tree to 20 m. tall; branches ferrugineous-tomentose; petioles slender, 1.2–1.7 cm. long, canaliculate above, puberulous; lamina ovate-oblong, 9–14 cm. long, 4–7 cm. wide, sparsely hirsute above, densely so below, membranaceous, green, concolorous, acuminate or acute, the base rounded, the sulcate midrib densely pubescent below, the 3–4 pairs of veins slightly prominent, the margin entire; inflorescence terminal or opposing the leaf, the panicle 5–7 cm. long, with branches scorpioid; flowers sessile, glomerate, subtended by ovate bracts; calyx hirsute, deeply lobed, the ovate lobes 0.7–0.8 mm. long and 0.5–0.7 mm. wide; petals obovate to oblong, 3.8–4.5 mm. long, 1–1.3 mm. wide, attenuate, the inflexed glabrous apex 1–1.6 mm. long, the midrib well developed; stamens 4–4.3 mm. long, the oblong anthers 0.8–1 mm. long and slightly diverging at the base; pistil glabrous, the ovoid to conical ovary 1.5 mm. long, the terete style 1.5 mm. long, rudiments present, the capitate stigma minute; drupe elliptic-oblong, 1.2–1.4 cm. long, 1 cm. in diameter, pointed, the base rounded, the putamen thin and smooth.

TYPE COLLECTION: *Dallachy* s. n., from Rockingham bay, North Queensland, Australia.

SPECIMENS SEEN: Australia. North Queensland: Atherton Tableland, Boonjie, *Doggrell* s. n. (A); *C. T. White* s. n. (B); *Tardent* 136 (A); Taizali, *White* s. n. (B); Daintree river, *White* 1408 (NY), Gadgarra, *White* 1568 (A); Innisfall, *Michael* 203 (B, G); Mt. Spec, near Bambaroo, NW of Townsville, *Francis* (A); Rockingham Bay, *Mueller* s. n. (G, US); Johnstone river, *Michael* s. n. (B); Ravenshoe, *Manuell* s. n. (B).

This is the only species in the Old World to have persistently pubescent leaves.

CITRONELLA PHILIPPINENSIS (Merr.) Howard, Journ. Arnold Arb. **21:** 474. 1940.

Villaresia philippinensis Merr. Phil. Journ. Sc. Bot. **14:** 414. 1919.

Chariessa philippinensis Sleumer, Notizbl. **15:** 229. 1940.

Tree 4–5 m. tall; the branches smooth and glabrous; petioles 2–3 cm. long, slender, terete, narrowly sulcate; lamina elliptic-oblong, 6–12 cm. long, 4–6 cm. wide, coriaceous, rigid, glabrous, shining on both surfaces, acuminate, the base acute or rounded and slightly decurrent on the petioles, the midrib sulcate above but prominent below, the 4–5 pairs of arcuate veins slightly prominent, the margin entire; inflorescence terminal, the panicle to 10 cm. long, the lateral branches sub-equal and up to 1 cm. long, the rhachis appressed-hirsute; flowers sessile, secund, subtended by minute lanceolate bracts; calyx 1.5 mm. in diameter, 1.5 mm. high, sparsely hirsute, the ciliate ovate lobes rounded; petals obovate-oblong, 2.5–3 mm. long, 1–1.2 mm. wide, the prominent midrib keel-shaped and extending the lower half of the petal; filament to 4.5 mm. long, the broadly oblong anthers 0.8–1 mm. long, cordate and slightly diverging at the base; pistil glabrous, 5 mm. long, the globose ovary 1.5 mm. in diameter and 1–2 loculed, the 1–2 glabrous and equal styles 3–4 mm. long, the minute and grooved stigma capitate; drupe ovoid, 2–3 cm. long, 2 cm. in diameter, the putamen rugose.

Type Collection: *Ramos*, Herb. Bur. Sci. 33267, collected on Mt. Palimlin, Ilocos, Luzon, Philippine Islands.

Illustration: Plate 6, figs. 1–8.

Specimens seen: Philippine Islands. *Ramos*, Herb. Phil. Bur. Sci. 33267 (A, US isotypes), 33308 (A, US).

Pistils with two styles and two-locular ovaries are very common in the collections cited above. The styles of these are equally developed and strongly grooved on the adjoining surfaces. There are two locules in each ovary. The pistil noticeably elongates after anthesis of the flower. *Citronella philippinensis* is readily distinguished by the large prominent keel on the lower portion of the petals. The keel may protrude a distance equal to one-half the width of the petal. The petioles are longer than those of any other species.

Specimens here cited were collected in flower and fruit during August at an altitude of 1000 meters.

The combination *Chariessa philippinensis,* which I have attributed to Sleumer, was incorrectly made in Notizbl. **15:** 229. 1940, where Sleumer cites "*Chariessa philippinensis* (Merr.) Sleumer" but cited the name-bearing synonym as "*Chariessa latifolia* Merr." Sleumer's intentions are obvious and the mistake was evidently a slip of the pen.

Citronella samoensis (A. Gray) Howard, Journ. Arnold Arb. **21:** 475. 1940.

Pleuropetalon Samoense A. Gray, U. S. Explor. Exped. Bot. Phan. **1:** 299, pl. 27. 1854.

Chariessa samoensis Engler, Nat. Pflanzenfam. **3** (5): 245. 1893.

Villaresia Samoense Valeton, Crit. Overz. Olac. 199. 1886.

Shrub or small tree, 4 m. tall; branches glabrous, smooth; petioles 1–1.5 cm. long, sulcate above, glabrous; lamina broadly ovate, 9–14 cm. long, 6–9 (11) cm. wide, coriaceous, frequently shining above, glabrous, acute, the base rounded, truncate or subcordate, the slightly immersed midrib prominent below, the veins 3–4-paired; inflorescence terminal or extra-axillary, the panicle to 19 cm. long, the subequal branches 1–1.8 cm. long, the rhachis puberulous; flowers perfect, sessile, glomerate, becoming secund-scorpioid, subtended by minute bracts; calyx-lobes broadly ovate, obtuse, ciliate; petals obovate-oblong, 4.3–4.8 mm. long, 1.3–1.8 mm. wide, thick, fleshy; stamens 4 mm. long, the thick and flattened filaments lingulate, the oblong anthers cordate at the base; pistil glabrous, 4 mm. long, the ovary globose, the sytle filiform or subulate, the rugose or grooved stigma capitate; drupe oblong-elliptic, 2.5–3 cm. long, 1.5–2 cm. in diameter, the apex acute, the base rounded to subcordate, the putamen obscurely longitudinally ridged.

Type Specimen: U. S. 10543, collected by the U. S. Exploring Expedition, Samoa.

Illustration: U. S. Exploring Exped. Bot. Atlas 1: t. 27. 1857.

Specimens seen: Samoa. Savaii, Papa'afu, *Christophersen* 2721 (A, NY, US); Safotu, *Christophersen* & *Humes* 2362 (NY, US), Aopo, *Christophersen* 3459 (NY); Aopo-Gagamalae, *Christophersen* 3433 (NY, US); Tutuila: Tago-tago, *Setchell* 261 (G); Hua Pass, Stofoura, *Setchell* 217 (US); *Wilder* 36 (NY); *U. S. Explor. Exped.* (US 10543 type). Tonga. Eua Island: Powell Place, *Parks* 16205-a (G, NY); 16014 (US); Liku Cliffs, *Parks* 16205 (US). Solomon Islands, San Cristoval, Hinuahaoro, *Brass* 2911 (A).

Vernacular Names: Alo alovao, filifiloa, alaa.

Christophersen reports a great variation in the shape of the leaves found on a single plant. The plants occur at altitudes of 100–1500 meters. The wood is used by the natives for "digging up the ground." It is also used for general construction.

Citronella **lucidula** (Sleumer), comb. nov.

Chariessa lucidula Sleumer, Notizbl. **15:** 229. 1940.

Small tree; branches gray, glabrous; petioles 0.6–1 cm. long; lamina broadly elliptic, 6–10 cm. long, 5–6.5 cm. wide, round at apex broadly cuneate to almost round at base, coriaceous, glabrous, olive-shining above, the slightly prominent veins 5–6-paired, the margin entire and slightly revolute; inflorescence terminal or supra-axillary, the panicles to 10 cm. long, the rhachis appressed-yellow-pubescent, the thick branches to 1 cm. long; flowers sessile, bracteate, congested in capitate clusters becoming secund-scorpioid; calyx-lobes ovate-oblong, 1 mm. long and wide, obtuse, ciliate; petals oblong, 4.3–4.6 mm. long, 1–1.6 mm.

wide, glabrous; filaments 2–3 mm. long, the elliptic anthers 0.8–1.1 mm. long; ovary ovoid, glabrous, the style as long or twice as long, the stigma sub-capitate; fruit immature.

Type Specimen: *Franc* 1282 (Herb. Berlin, not seen), collected on Ile Mare, near Tadina, Loyalty Islands.

Specimen seen: Solomon Islands, Guadalcanal Island, Uulolo, Tutuve Mt., *Kajewski* 2562 (A).

Vernacular Name: Goring.

This species is very similar to *C. samoensis* but it differs in the smaller elliptic leaves which have cuneate bases and rounded apices. Dimensions of floral parts supplied in the original description were probably taken from very immature flowers.

Kajewski reports that the wood is very tough and is used for house-frames and axe-handles. Kajewski's specimen was collected at an altitude of 1200 meters.

I have seen a specimen in the herbarium of the Arnold Arboretum bearing the label "Plants of New Caledonia." It was collected by Franc and is numbered 1282. It fits the description published by Sleumer for *C. lucidula,* based on a collection by Franc also number 1282, but from the Loyalty Islands. The two localities are close together and it is possible that the specimen I have has only a general label and may actually be an isotype.

Species Excluded

Villaresia dichotoma Miers, Seem. Journ. Bot. **2:** 266, t. 21. 1864.

At the time Miers described this Brazilian species he was maintaining that the genus *Villaresia* belonged in the *Aquifoliaceae* and this species constituted part of his proof. I have not seen any material of it but from the excellent plate and the description conclude that the species does belong in the *Aquifoliaceae* and not in the genus *Citronella.* There are numerous characters which exclude it from the *Icacinaceae,* such as the imbricated ciliate petals which lack the inflexed tip, the ovarian disk and the strictly cymose inflorescence.

Villaresia emarginata Ruiz & Pavon, Fl. Peruv. Chil. Prod. 35. 1793.

This is the type species of the genus *Villaresia* which does not belong in the *Icacinaceae.* The fruits are bivalved dehiscent capsules with two tetragonal arillate seeds. The genus and species probably belong in the *Celastraceae.*

Villaresia macrocarpa Scheff. Ann. Jard. Buitenz. **1:** 13. 1876 equals *Gonocaryum pyriforme* Scheff. l. c. 100.

Villaresia scandens Hassk. equals *Chailletia timoriensis* DC.

Chariessa cauliflora Pulle, Nouva Guinea **8:** 657. 1912 equals *Pseudobotrys cauliflora* (Pulle) Sleumer, Notizbl. **15:** 235. 1940.

Explanation of Plates

Plate 4A. Citronella paniculata (Mart.) Howard (*Mexia* 5128). Fig. 1, habit × ⅓; figs. 2–4, three views of a fertile stamen, × 7; fig. 5, mature fruit, × ⅓; figs 6–7, face- and side-views of the hippocrepiform seed, × ⅓; fig. 8, diagrammatic cross-section of the fruit; fig. 9, abaxial view of a petal, × 7; fig. 10, adaxial view of the outer surface of a petal, showing the sparse pubescence, × 7; fig. 11, a fertile pistil, showing the sparse pubescence, × 8.

Plate 4B. Citronella Engleriana (Loesner) Howard (*Glaziou* 17575). Fig. 1, habit, × ⅓; fig. 2, mature stamen, × 8; fig. 3, an erect stamen taken from a bud, × 7; fig. 4, fertile pistil, × 10; fig. 5, a parasagittal diagrammatic section of the fertile pistil; fig. 6, an abaxial view of a petal, × 8; fig. 7, a bud, × 10.

Plate 5A. Citronella costaricensis (Donn. Sm.) Howard (*Tonduz* 11664). Fig. 1, habit, showing the extra-axillary position of the inflorescence, × ⅓; fig. 2, pauperized stamen from a functional female flower, × 7; figs. 3–5, three views of a fertile stamen, showing the connective-tip extending beyond the anther sacs, × 7; fig. 6, fertile pistil, × 7; fig. 7, fruit, × ⅖; fig. 8, diagrammatic cross-section of the fruit; fig. 9, calyx, × 7; fig. 10, sterile pistil, showing the three evenly developed styles, × 8; fig. 11, diagrammatic parasagittal section of a fertile pistil, showing the stylar rudiments.

Plate 5B. Citronella apogon (Griseb.) Howard (*Steinbach* 8245). Fig. 1, habit, × ⅓; fig. 2, map, showing the distribution of the two known specimens; figs. 3–5, lateral, abaxial and adaxial views of the sterile stamens, × 12; fig. 6, abaxial view of a petal, showing the narrowed inflexed apex, × 7; fig. 7, functional female flower with the petals removed to show the pauperized stamens, × 6; fig. 8, functional pistil, × 7; fig. 9, diagrammatic longitudinal section of the pistil to show extent of one extra cavity; fig. 10, diagrammatic cross-section of a fertile pistil to show the two extra cavities.

Plate 6. Figs. 1–8 Citronella philippinensis (Merr.) Howard (*Ramos*, Herb. Phil. Bur. Sc. 33267). Figs. 9–12 Citronella latifolia (Merr.) Howard (*Ramos*, Herb. Phil. Bur. Sc. 24557). Fig. 1, habit of C. philippinensis, × ⅓; fig. 2, side view of the pistil, × 12; fig. 3, face view of the pistil, × 12; figs. 4–5, side and abaxial views of the petal, showing the prominent keel, × 10; fig. 6, abaxial view of a fertile stamen, × 6; fig. 7, fruit, × ⅔; fig. 8, diagrammatic cross-section of the fruit; fig. 9, habit of C. latifolia, × ⅓; figs. 10–11, two views of the fruit, × ⅔; fig. 12, diagrammatic cross-section of the fruit, showing the relatively smooth putamen.

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New scientific names are printed in full-face type

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY

CXLIII

A REVISION OF THE GENUS DORYOPTERIS

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A REVISION OF THE GENUS DORYOPTERIS

R. M. Tryon, Jr.

Introduction

Doryopteris is one of the smaller genera of the tribe *Cheilanthinae* of the *Polypodiaceae*. As defined in this treatment, it includes 26 species. These are terrestrial, usually growing in rather dry, rocky places. Some are extremely xeromorphic.

Taxonomy

It has been difficult to establish reasonable generic lines. The characters of usual generic importance in the ferns behave very badly, as is customary in the *Cheilanthinae*. It has been possible definitely to exclude many species on the basis of the receptacular condition and other characters, and most of the species retained are obviously congeneric, but there are a few species that can neither be retained with full confidence nor definitely excluded. These species have been treated under *Doryopteris* traditionally, or in current treatments, and they are retained in the genus on the basis of convenience and because of our present inadequate knowledge of generic lines in the tribe. They are treated in section III—"Miscellaneous Species".

D. concolor shows a transition to the genus *Cheilanthes* (Pl. 7B, fig. 7). The fact that *Pellaea angulosa* (Pl. 3E, fig. 10) has a vascular commissure, although in other characters a true *Pellaea*, may indicate a close relation between that genus and certain species of *Doryopteris*.

The species treated in sections *Lytoneuron* and *Eudoryopteris* are clearly congeneric, even though a few species depart from the generic lines in one or two characters.

Most of the species are quite distinctive and offer no problem of interpretation. Other entities, however, of very local distribution, are distinct in only a few critical characters. These are, when definable, treated as species. On the basis of the clear-cut, although relatively slight, differences a specific rather than a varietal interpretation is adopted.

Phylogeny

Phyletically, the genus represents the highest state of soral development in the tribe. A reasonable sequence can be traced from *Eunotholaena*, with short-stalked sporangia borne on the terminal half or fourth of the little-modified veins and lacking a modified margin-indusium, through *Cheilanthes*, with short-stalked sporangia borne on clavate or flabellate vein-ends and covered by a reflexed, either broken or continuous, hyaline margin, to *Doryopteris* with long-stalked sporangia borne on a continuous commissure connecting the vein-ends and covered by a continuous reflexed margin-indusium. The receptacle can be thought of as having moved toward the vein-ends, which were then correspondingly expanded, and finally to have spread laterally, the adjacent vein-ends connecting. The long-stalked sporangia of *Doryopteris* are probably a result of crowding in the sorus; they are rarely found in *Notholaena* when the sorus is more crowded than usual.

Although presumably derived from a Cheilanthoid stock, there is a possibility of a Pellaeoid source. *Pellaea angulosa*, as previously mentioned, has a vascular commissure. The evidence for parallel and convergent evolution of characters in the tribe is too great to allow any definite statements of relationships. They must be based on sums of characters rather than any individual character, no matter how important it may be in other groups. There is no certainty that sections *Lytoneuron* and *Eudoryopteris* are closely related nor that the species in section III are related to them.

Thus *Doryopteris*, as here treated, is not necessarily a natural genus. However, it is a convenient one and since the genera in the tribe have not yet been reasonably defined I believe it is best to put convenience first and the attempt at naturalness second. A natural classification can hardly be presented until the actual characters of all the species of the tribe are known. When the species have been placed in convenient, definable groups, it may then be possible to revise them and present a natural classification.

PHYTOGEOGRAPHY

Of the 26 species of *Dryopteris*, a single species is pantropical, 21 additional species grow in the New World, 2 (possibly 4, see Doubtful Species) in Madagascar, 1 in Malaysia and 1 in the Hawaiian Islands. All of the 22 New World species grow in Brazil and 12 of them are endemic to it. MAP 10 shows the distribution of the New World species (*D. concolor* is omitted because of definite doubt of its relationship) and the concentration of the number of species.[1]

The combined map of the species possibly indicates the general route of migration of species with disrupted ranges, such as, *D. sagittifolia*, MAP 3, *D. varians*, MAP 4, *D. lomariacea*, MAP 7 and *D. nobilis*, MAP 8. The high concentration of species in the state of Rio de Janeiro suggests that the center of evolution and dispersal was in or near that region.

HISTORICAL ACCOUNT

In 1841 John Smith, Journ. Bot. **4**, proposed the genus *Doryopteris*, including in it *Pteris sagittifolia*, *P. varians*, *P. collina* and *P. hastata* of Raddi, *Pteris palmata* Willd. and *D. Wallichii* J. Sm. The important characters of the genus were the reticulate venation, marginal, continuous, linear sorus, black stipe and general pedate habit.

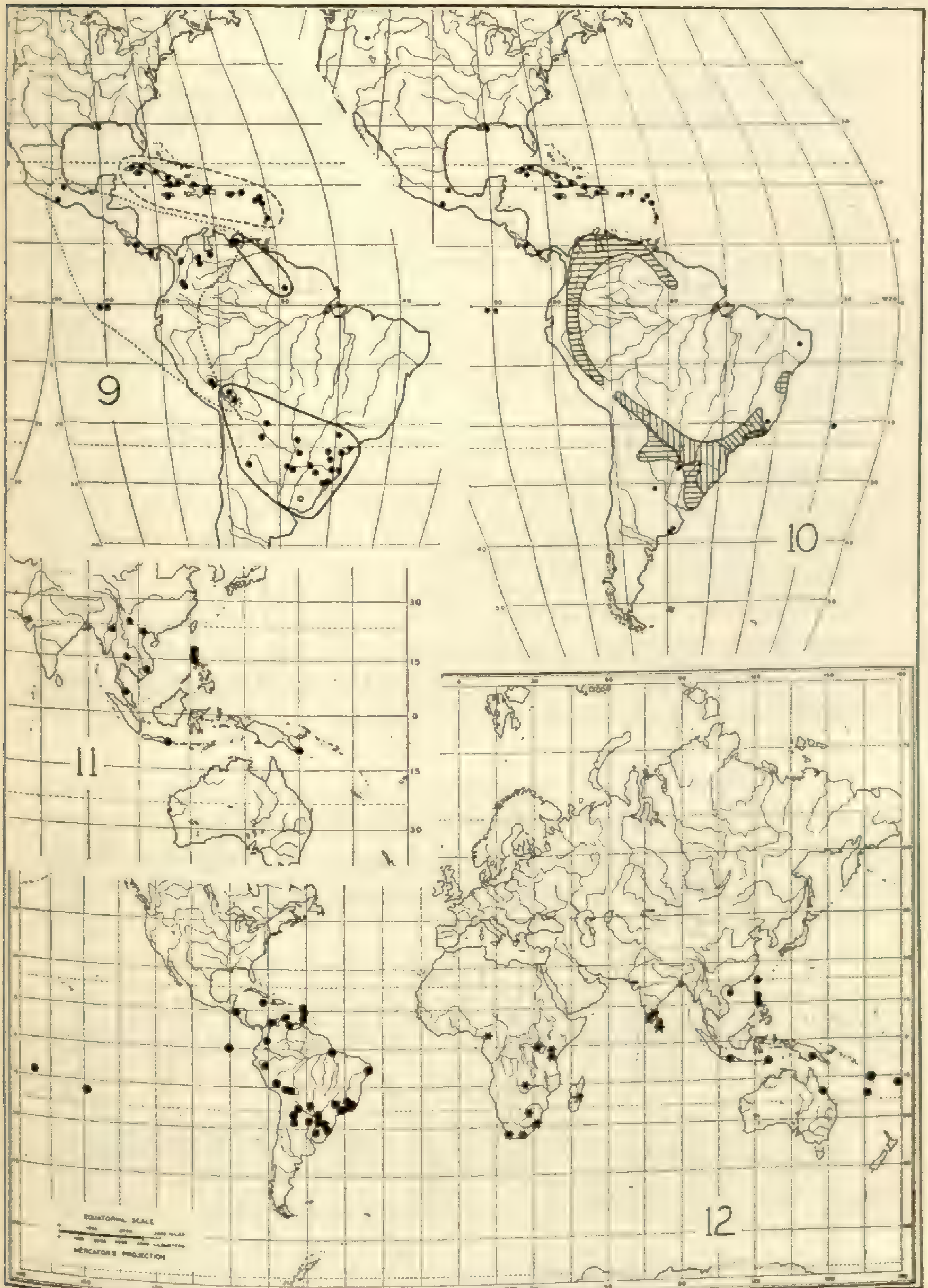
On the basis of concepts of their time, Willdenow, Sp. Pl. **5** (1810) and Raddi, Opusc. Sci. Bologna **3** (1819), had described these species under *Pteris* L., keeping them with true *Pteris* species on the basis of the continuous marginal sorus.

Presl, Tent. Pterid. (1836), included these species in his new genus *Litobrochia*, separated from *Pteris* L. primarily by the reticulate venation.

The only species described by Linnaeus now included in *Doryopteris*, *Pteris pedata*, was not included in *Doryopteris* by John Smith in 1841, but placed in *Cassebeera* Kaulf. However, Smith's specimen was from the Philippine Islands and was *D. concolor*, not *Pteris pedata* L. In his Historia Filicum (1875) he

[1] Shading shows number of species and varieties in each country, or, in Argentina and Brazil, each state. Dots, one species; horizontal lines, 2–4; vertical lines, 5–7; diagonal lines, 8–9; cross-hatched lines, 10–12.

Range of DORYOPTERIS TRIPHYLLA, MAP 1; D. COLLINA, MAP 2; D. SAGITTIFOLIA, MAP 3; D. VARIANS, MAP 4; D. LORENTZII, MAP 5; D. CRENULANS, MAP 6; D. LOMARIACEA, MAP 7; D. NOBILIS, MAP 8.



Ranges of varieties of Doryopteris pedata, map 9 (broken line, var. typica; dotted line, var. palmata; solid line, var. multipartita). Range and concentration of species of the genus in America, map 10 (see p. 5 for explanation). Range of D. ludens, map 11. Varieties of D. concolor, map 12 (dots, var. typica; asterisks, var. Kirkii).

transferred *Pteris pedata* to *Doryopteris* and designated it as the type species.

Kaulfuss, Enum. Fil. (1824), described the genus *Cassebeera* and included in it *C. triphylla* (Lam.) Kaulf. and *C. pinnata* Kaulf. The genus was distinguished by the free venation, oblong, marginal sorus and the submarginal indusium. This was maintained by many later authors. Otto Kuntze, Rev. Gen. **2** (1891), recognizing that *Cassebeeria* Dennst. (1818) invalidated *Cassebeera* Kaulf., proposed the new name *Bakeropteris* for the genus. In the present treatment, the species referred to *Cassebeera* are placed in *Doryopteris* or excluded and placed in *Pellaea*.

Although John Smith restricted *Doryopteris* to reticulate-veined species, the concept was extended to include free-veined ones as well by Klotzsch, Linnaea **20** (1847). He set the reticulate-veined species apart in section *Eudoryopteris* and the free-veined ones in section *Lytoneuron*.

Hooker, Sp. Fil. **2** (1858), placed *Doryopteris* sensu J. Sm. in *Pteris* section *Litobrochia*, and the free-veined species, with the exception of *Cassebeera*, which he maintained, in *Pellaea* Link.

Fée, Crypt. Vasc. Brésil (1869–72), described several free-veined species under *Pellaea* Link, placing only the reticulate-veined ones in *Doryopteris*.

Prantl, Engl. Bot. Jahrb. **3** (1882), placing little value on the soral characters, greatly expanded Link's definition of *Pellaea* and treated all *Doryopteris* species under it, in the sections *Cassebeera* (Kaulf.) Prantl, *Doryopteridastrum* Fée ex Prantl and *Doryopteris* (J. Sm.) Prantl.

Diels in Engl. & Prantl, Nat. Pfl. 1^4 (1899), followed Klotzsch in adopting a broad definition for *Doryopteris* and he has been followed by recent authors.

Characters

In the past there has been little recognition of the critical characters in the genus. Most of the species have been described and maintained on the basis of general leaf-cutting, sometimes supported by the more obvious characters of size, venation and presence of proliferous buds.

Most of the species are quite variable in leaf-cutting and it does not seem advisable to recognize these phases, even as varieties or forms, unless supported by additional characters.

Some of the best specific characters within the genus reside in the stipe: pubescent, glabrous or scaly; channeled, sulcate, wing-angled or plane on the upper side, or terete; smooth or verrucose; castaneous, atropurpureous or black: and in the number and shape of the vascular bundles. The margin of the sterile blade, entire or variously toothed, with or without hydathodes on the upper surface, and the characters of the vein-ends are also important. Venation, the sterile tips of the fertile segments, presence or absence of proliferous buds, the type of division of the blade and the type of scales on the frond-buds all afford good characters. The leaf-cutting naturally cannot be ignored but it is of secondary importance.

The character of the vascular bundles is taken from stipes of fronds of moderate size. The shape varies somewhat with the size of the frond; very small ones may have a terete bundle while larger ones have a U- or V-shaped bundle. In the species with two vascular bundles, very small fronds may have only a single bundle.

The term *soral line* is used to designate a continuous line of sporangia. This may represent a single sorus, if the vascular commissure is completely continuous, or it may represent two or more sori if the commissure is broken.

The outer wall of the spore is here called the *exospore;* the loose, outer covering, derived from tapetal tissue, is called the *perispore.*

Maps

The maps have been compiled from the specimens examined. With a single exception, literature-records have not been included. A solid dot represents a specimen from that locality and a circle represents a specimen from the general region. This is used when only the country, state or department is given on the label. The maps used have been selected from Goode's Series of Base Maps, Henry M. Leppard, Editor, copyright by the University of Chicago, published by the University of Chicago Press.

Illustrations

The drawings of blades have been made by tracing the outline from the specimens. The drawings of sterile and fertile segments, showing venation and the receptacle, were traced from photomicrographs of cleared segments. The other drawings are freehand. The three-dimensional drawings of part of the margin of a fertile segment are semi-diagrammatic. The receptacle is stippled and also indicated by a few sporangial stalks. The drawings are taken from fronds of middle age. In old fronds the pseudomargin and indusium are bent outward so that the indusium is nearly in the same plane as the blade.

Materials

The study is based on about 1000 sheets of *Doryopteris* in the herbarium of the Brooklyn Botanic Garden (abbreviated B in the specimen-citations), the Copeland Herbarium (Copel.), the herbarium of the Field Museum of Natural History (F), the Gray Herbarium (G), the herbarium of the New York Botanical Garden (NY) and the United States National Herbarium (US). Also notes taken by Mr. C. A. Weatherby on type-specimens and authentic material at Kew, Paris and Geneva, and the excellent photographs by Mrs. C. A. Weatherby have been available. These have naturally proved invaluable in placing many names.

In order to study the receptacular condition in the genus, slides of cleared material of each species were prepared. The fertile segment is boiled in water or dilute KOH (or NaOH) a few minutes and then placed in a vial of dilute KOH. In one or a few days the material is sufficiently cleared and it is then washed and transferred to alcohol. In a few hours it is ready to be washed in absolute alcohol and then xylol. Any desirable dissection is then performed and the material mounted in clarite. Using a mica slide it can be placed in a packet on the herbarium sheet, available for easy consultation.

This valuable method of studying the material has yielded significant results. The individual xylem cells can be seen easily and thus the exact extent and development of the receptacle can be determined. This often is very different from the condition that would be deduced from an external examination.

Acknowledgments

I wish to thank the curators of the above-mentioned herbaria for the generous loan of material and Mr. C. A. Weatherby for his unfailing help and encouragement during the course of this study.

Systematic Treatment

Dorypteris J. Sm. Journ. Bot. **3:** 404. 1841, nomen nudum; **4:** 162. 1841; emend Kl. Linnaea **20:** 342. 1847. Map 10.

Pteris L. Sp. Pl. **2:** 1075. 1753, in part. *Cassebeera* Kaulf. Enum. Fil. 216. 1824, in part, not *Cassebeeria* Dennst. Schlüss. Hort. malab. 35. 1818, a genus of the *Melastomaceae.* (Reference from Dalla Torre & Harms). *Litobrochia* Presl, Tent. Pterid. 148. 1836, in part. *Pteris* section *Litobrochia* (Presl) Hook. Sp. Fil. **2:** 207. 1858, in part. *Pellaea* Link emend. Prantl, Engl. Bot. Jahrb. **3:** 415. 1882, in part. *Allosorus* Bernh. emend O. Ktze. Rev. Gen. **2:** 804. 1891, in part. *Bakeropteris* O. Ktze. Rev. Gen. **2:** 807. 1891, in part, based on *Cassebeera* Kaulf. Type species: *Pteris pedata* L., chosen by J. Sm. Hist. Fil. 288. 1875.

Rhizome erect, suberect or decumbent: *stipe* with a *sclerotic* cortical layer, *usually black or atropurpureous: blades characteristically divided in a pedate manner* (as in Pl. 5B, fig. 6), entire or trilobate in some species and in small fronds of some species, large blades with the basal pinnae or primary segments larger than the second pair and lobed on the lower side with the inner lobe the longest, often also lobed on the upper side with the basal lobes much shorter than those on the lower side, palmately divided in *D. ornithopus* and *D. rediviva,* tending to be pinnate in *D. Kitchingii* and a phase of *D. decora* var. *typica;* venation areolate or free: *indusium formed by the greatly modified margin of the segments, continuous with the soral lines* and reflexed over the sporangia: *sori* (illustrated in each species) *marginal, or intramarginal* by reason of a pseudomargin, *continuous or contiguous* at maturity *to form a more or less continuous soral line: sporangia usually long-stalked* (with a stalk the length of the head or in *D. ornithopus* two to three times the length of the head), short-stalked in *D. paradoxa* and phases of *D. concolor* and *D. crenulans* (stalk half the length of the head or less): *receptacle a vascular commissure connecting all of the fertile vein-ends,* or in *D. paradoxa* and *D. concolor,* with transitions to discrete, fan-shaped receptacles terminating each fertile vein: spores tetrahedral-globose, yellow or brown, with a smooth (Pl. 5A, fig. 6) or slightly roughened, in *D. cordifolia* definitely sculptured, exospore and without a perispore, or rarely with a whitish, rugulose (Pl. 6B, fig. 5) or brown, rugose perispore (Pl. 8B, fig. 2). .

The important characters of the genus are the dark, sclerotic stipe, pedate blades, continuous margin-indusium, continuous marginal soral lines, long-stalked sporangia and continuous vascular commissure. Certain species lack one or two of these characters but, with the possible exception of *D. concolor*, are naturally placed in *Doryopteris* by their other characters.

Key to the Species and Varieties

a. Venation free, single areolae present by rare exception (Pl. 2A, fig. 2)....b.
  b. Stipe channeled, sulcate or wing-angled on the upper side, at least toward the top (Pl. 7A, fig. 9; Pl. 7B, fig. 2)....c.
    c. Blade deeply pinnatifid, or if pinnate, the bases of the pinnae decurrent and forming wings along the rachis (Pl. 7B, fig. 6)....d.
      d. Sori contiguous at maturity, covered by a more or less continuous indusium...........22a. *D. concolor* var. *typica*, p. 54
      d. Sori discrete at maturity, covered by an indusial flap at the sinus (Pl. 7B, fig. 7)........22b. *D. concolor* var. *Kirkii*, p. 56
    c. Blade pinnate, at least the lower pinnae not decurrent and not forming wings along the rachis (Pl. 7A, fig. 2) 24. *D. Kitchingii*, p. 59
  b. Stipe terete or subterete....e.
    e. Fertile blade usually with numerous ultimate segments, the pinnae and primary segments surcurrent and, except the basal pair, also decurrent, the bases forming wings along the rachis that are broad at the top and bottom and narrowed in the middle (Pl. 1B, fig. 4; Pl. 1D, fig. 2)....f.
      f. Fertile blade highly divided with very numerous, small, deltoid to oblong ultimate segments, the inner lower segments on the basal pinnae or primary segments very deeply lobed (Pl. 1D, fig. 2)..2. *D. itatiaiensis*, p. 17
      f. Fertile blade less divided, with several to numerous, mostly narrowly oblong to linear ultimate segments, the inner lower segments on the basal pinnae or primary segments often entire, or only pinnatifid (Pl. 1B, fig. 4)........................3. *D. crenulans*, p. 18
    e. Fertile blade entire or with 3–5 to several ultimate segments, the primary segments, if present, adnate, or slightly surcurrent and, except the basal pair, also decurrent, the bases forming wings along the rachis that are broad at the top and narrowed at the base or have nearly parallel sides (Pl. 2A, fig. 7; Pl. 2C, fig. 4)....g.
      g. Ultimate segments coarsely and remotely crenate (Pl. 1C, figs. 9, 10).........................1. *D. triphylla*, p. 16
      g. Ultimate segments entire or very shallowly crenate....h.
        h. Fertile blade entire, oblong, not more than three times as long as broad, deeply cordate, or 3-lobed, the basal lobes reflexed (Pl. 3A)...........12. *D. rufa*, p. 32
        h. Fertile blade usually 5- to several-lobed, if entire, narrowly oblong, eight or more times as long as broad, shallowly cordate, if 3-lobed, the basal lobes strongly ascending (Pl. 2C, fig. 1)....i.

i. Stipe with one terete, U- or V-shaped vascular bundle at the base....j.

j. Sporangia short-stalked; sori usually broken by the sinuses; fertile blade 1–5 cm. long..4. *D. paradoxa*, p. 21

j. Sporangia long-stalked; sori continuous around the sinuses; fertile blade 5–10 cm. long 11. *D. quinquelobata*, p. 30

i. Stipe with two oval vascular bundles at the base....k.[1]

k. Stipe densely verrucose, rarely sparsely so....l.

l. Stipe verrucose; sterile blades, excepting extremely small ones, with 5 or more lobes or ultimate segments, the basal primary segments not strongly ascending.....5. *D. tijucana*, p. 23

l. Stipe usually verrucose with acute processes; sterile blades entire, or deeply 3-lobed and the lateral lobes strongly ascending (Pl. 2C, figs. 6, 7)................6. *D. subsimplex*, p. 24

k. Stipe smooth or slightly and irregularly roughened....m.

m. Sporangia short-stalked; sori usually broken by the sinuses; fertile blade 1–5, rarely 7 cm. long.......................4. *D. paradoxa*, p. 21

m. Sporangia long-stalked; sori continuous around the sinuses; fertile blade rarely 5, usually 10–21 cm. long....n.

n. Sterile blade coriaceous, the ultimate segments usually shallowly and remotely crenate or crenate, broadly rounded (Pl. 2A, figs. 1, 5)...........7. *D. lomariacea*, p. 26

n. Sterile blade thin, the ultimate segments entire, acute or acuminate (Pl. 2D, figs. 3, 5)...................8. *D. acutiloba*, p. 27

a. Venation completely areolate, or rarely with areolae only along the midnerves of the segments (Pl. 3B, fig. 7; Pl. 6C, figs. 3, 5; Pl. 7C, fig. 12)....o.

o. Hydathodes present on the upper surface of the margin of the sterile blade....p.

p. Margin of the sterile blade with a broad red-brown or black sclerotic border...................26. *D. cordifolia*, p. 62

p. Margin of the sterile blade with a whitish or brown cartilaginous border....q.

q. Stipe wing-angled (Pl. 7C, fig. 8); base of rachis wing-angled or channeled on the upper side....r.

r. Fertile blade pinnate-pinnatifid to bipinnate-pinnatifid, the basal pinnae usually equally lobed on the upper and lower sides, the ultimate segments usually linear (Pl. 7C, fig. 1)...23a. *D. decora* var. *typica*, p. 57

r. Fertile blade deeply bi- to quadripinnatifid, not pinnate, the basal primary segments much more strongly lobed on the lower side than on the upper, the ultimate segments deltoid to oblong-lanceolate (Pl. 7C, fig. 10)........23b. *D. decora* var. *decipiens*, p. 58

q. Stipe terete to rarely wing-angled on the upper side; base of rachis flat or rounded on the upper side....s.

[1] 9. *D. Rosenstockii*, Pl. 3D, p. 28, belongs under this heading but having seen no specimens, I cannot key it out further.

s. Vein-ends in the sterile blade mostly joined or about half free . . . . 21. *D. rediviva*, p. 51
s. Vein-ends in the sterile blade all, or nearly all, free (Pl. 6C, fig. 3) . . . . t.
t. Sterile blade entire, oblong-lanceolate to broadly lanceolate, sagittate or cordate, the basal lobes quite short (Pl. 4A, fig. 2; Pl. 8B, fig. 1) . . . . u.
u. Rhizome relatively short, compact; fertile blade usually the same as the sterile, rarely 5-lobed (Pl. 4A, figs. 5, 6) . . . . 18. *D. sagittifolia*, p. 47
u. Rhizome long, extensively creeping; fertile blade with 5 or more lobes (Pl. 8B, figs. 5, 7, 11) . . . . 25. *D. ludens*, p. 60
t. Sterile blade usually with three or more lobes, very rarely entire, orbicular and cordate or ovate-lanceolate and sagittate, the basal lobes long (Pl. 6C, fig. 8) . . . . v.
v. Sterile tips of the fertile segments and tips of the sterile segments crenate or crenulate with ascending teeth . . . . w.
w. Fertile blade with 5 lobes, the lateral ones at right angles to the terminal lobe and shorter than it, the basal ones reflexed and shorter than the lateral lobes (Pl. 6A, fig. 4) 17. × *D. hybrida*, p. 46
w. Fertile blade usually with several lobes, rarely with 5 lobes, the lateral ones ascending and each with a lobe on the lower side, all of the lobes nearly of the same length (Pl. 6C, figs. 4, 6, 7) . . . . 16. *D. nobilis*, p. 43
v. Sterile tips of the fertile segments and tips of the sterile segments entire, or crenate or crenulate with spreading teeth . . . . x.
x. Fertile and sterile blades with partially areolate venation, areolae few to many, mostly along the midnerves (Pl. 4C, figs. 4, 7; Pl. 4D, fig. 2) . . . . y.
y. Ultimate segments rounded or acute; blade pentagonal; free veins not especially long nor crowded (Pl. 4C, fig. 6) 13. *D. Lorentzii*, p. 34
y. Ultimate segments apiculate; blade diamond-shaped; free veins long and crowded (Pl. 4D, figs. 1, 3) . . 14. *D. Juergensii*, p. 35
x. Fertile and sterile blades with completely areolate venation . . . . z.
z. Proliferous buds present at the base of the blade (Pl. 6B, figs. 3, 6) 15c. *D. pedata* var. *palmata*, p. 41
z. Proliferous buds not present at the base of the blade . . . . aa.
aa. Stipe usually wing-angled, sometimes sulcate on the upper side (Pl. 5A, fig. 9) . . . . 15a. *D. pedata* var. *typica*, p. 37
aa. Stipe terete, subterete or plane on the upper side (Pl. 5B, fig. 3) . . . . bb.

bb. Rhizome relatively short, compact.
15b. *D. pedata* var. *multipartita*, p. 38
bb. Rhizome long, extensively creeping
25. *D. ludens*, p. 60
c. Hydathodes not present on the upper surface of the margin of the sterile blade. . . .cc.
cc. Margin of the sterile blade with a black sclerotic border (PL. 3B, FIG. 7). . . . . .10. *D. ornithopus*, p. 29
cc. Margin of the sterile blade with a whitish or brown cartilaginous border. . . .dd.
dd. Stipe black, terete. . . . . .20. *D. varians*, p. 50
dd. Stipe castaneous or dark brown on the lower half, wing-angled on the upper side, at least on the upper fourth (PL. 4B, FIG. 3). . . . . .19. *D. collina*, p. 48

SECTION I.

2150 21568 LYTONEURON Kl. Linnaea **20:** 343. 1847.

Pellaea section *Doryopteridastrum* Fée, Crypt. Vasc. Brésil **1:** 42. 1869, nomen nudum; ex Prantl, Engl. Bot. Jahrb. **3:** 418, 1882. - 21571

Scales of the frond-buds usually *very long and narrow* (PL. 3B, FIG. 2) (long-lanceolate and attenuate in *D. itatiaiensis* and phases of *D. subsimplex* and *D. paradoxa*), entirely hyaline or often *with* a red-brown to blackish sclerotic central band and *narrow*, usually tawny, *hyaline margins*, occasionally entirely sclerotic or hyaline, entire or rather coarsely and remotely toothed; *the cells of the hyaline parts relatively long* (PL. 3B, FIG. 3) *mostly three or more times*, at least twice, *as long as broad* (*D. triphylla* is intermediate in scale-characters with this section and *Eudoryopteris*); *stipe naked or sometimes with scales* at the base *and* sometimes with *fibrils*, especially at the top and base, *not pubescent* (except in *D. Rosenstockii* and a phase of *D. subsimplex*), terete or subterete *with two nearly oval vascular bundles* at the base, excepting very small plants, or with one terete, U- or V-shaped vascular bundle at the base in *D. triphylla*, *D. quinquelobata* and a phase of *D. paradoxa; fertile and sterile blades* without proliferous buds, *with free venation*, or in *D. ornithopus*, with areolate venation; vein-ends nearly all free at the margin of the sterile blade, except in *D. ornithopus;* hydathodes present on the upper surface of the margin of the sterile blade, except in *D. ornithopus* and a phase of *D. triphylla;* spores usually without a perispore, the exospore smooth or minutely roughened, in *D. acutiloba* with a whitish rugulose perispore (as in PL. 6B, FIG. 5).

The species of this section form a natural group, with the exception of *D. triphylla* and possibly *D. ornithopus*. *D. triphylla* is intermediate in characters of the scales between sections *Lytoneuron* and *Eudoryopteris*. *D. ornithopus*, a very distinct species, is placed here because of the two vascular bundles and the scales. The areolate venation is probably a derived character rather than indicating a relation to species of section *Eudoryopteris*. The section contrasts with *Eudoryopteris* in having many of the species based on fewer and less important characters. That is, in general the specific lines are closer.

1. DORYOPTERIS TRIPHYLLA (Lam.) Christ, Bull. Boiss. s. 2, **2:** 546. 1902. PLATE 1C; MAP 1.

Adiantum triphyllum Lam. Encycl. **1:** 41. 1783. TYPE: Buenos Aires, Argentina, *Commerson*, Paris, not seen, photo G, seen. *Cassebeera triphylla* (Lam.) Kaulf. Enum. Fil. 216. 1824. *Pteris triphylla* (Lam.) Mett. Fil. Hort. Bot. Lips. 55. 1856, not Baker 1870. *Pellaea triphylla* (Lam.) Prantl, Engl. Bot. Jahrb. **3:** 418. 1882. *Bakeropteris triphylla* (Lam.) O. Ktze. Rev. Gen. **2:** 808. 1891. *Cassebeera pedatifida* Christ in Schwacke, Pl. Nov. Mineiras **2:** 25. 1900, ex char.; reference taken from C. Chr. Ind. Fil., description from Christ, Bull. Boiss. s. 2, **2:** 546. 1902. TYPE and PARATYPE: Capivare, Brazil, *Ule* 2335, not seen; Ferromecco, Brazil, *Kunert* 29, not seen. *Doryopteris pedatifida* (Christ) Christ, Bull. Boiss. s. 2, **2:** 546. 1902. *Doryopteris triphylla* var. *genuina* Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 54. 1928. *Doryopteris triphylla* var. *pedatifida* (Christ) Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 54. 1928.

Rhizome short, slender to moderately stout, compact to long and creeping: *scales* of the frond-buds and stipe *ovate-lanceolate to long-lanceolate, acuminate or attenuate, with usually narrow, sometimes broad*, light brown, *hyaline margins*, entire; *the cells of the hyaline parts usually not much longer than broad, sometimes relatively long, at least twice as long as broad: stipe* dark castaneous to dark red-brown, rarely atropurpureous, glabrous, *smooth or sometimes slightly and irregularly roughened, with one* terete, U- or V-shaped *vascular bundle* at the base: fertile and sterile blades similar to slightly dimorphic, without proliferous buds, coriaceous: *sterile* frond 2.5–8 cm. long; *blade* 0.5–3.5 cm. long, deeply pinnatifid to once pinnate, *deltoid, hastate, with 3 ultimate segments, all of about the same length, the basal segments usually at right angles to the terminal one*, or rarely pentagonal, with 5 ultimate segments, the lateral ones lobed on the lower side: *ultimate segments* ovate to ovate-lanceolate, acute or sometimes subapiculate, *moderately deeply and remotely crenate or bicrenate*: margin with a narrow whitish or brownish cartilaginous border; *sinuses black and sclerotic;* hydathodes present or absent on the upper surface: *fertile* frond 4–27 cm. long; *blade* 1–9 cm. long, deeply pinnatifid to tripinnatifid or pinnate-pinnatifid, deltoid to pentagonal, with 3–9 ultimate segments: ultimate *segments* ovate to linear, rounded, acute or sometimes subapiculate, *moderately deeply and remotely crenate or bicrenate; sinuses black and sclerotic;* sterile tips short to moderately long, entire or crenate, with a whitish or brown cartilaginous border: *soral lines broken by the sinuses.*

Southern Brazil to Buenos Aires and Tucumán, Argentina.

Representative specimens: BRAZIL.—SANTA CATHARINA: Lages, 1921, *Spannagel* (NY); Lages, July, 1905, *Spannagel* (US); Lages, February, 1905, *Spannagel* 56 (NY). RIO GRANDE DO SUL: Santa Cruz, 1906, *Juergens* 122 (NY); Santa Cruz, 1906, *Juergens* (NY, US); Rio Alegre near Neu-Wurttemberg, August 12, 1904, *Bornmüller* 127 (G). URUGUAY: Colón-La Paz, Dept. Montevideo, May 25, 1925, *Herter* 15a (G, NY); Flores, April, 1937, *Rosengurtt* B 1527 (G, US); Maldonado, Cerro Pan de Azucar, May 18, 1937, *Rosengurtt* B 1844 (G, US); Conchillas, December 20, 1921, *Castellanos* 671 (G); Pan de Azucar, February 25, 1907, *Herter* 2077 (NY); Montevideo, April, 1836, *Gaudichaud* (NY); Montevideo, June, 1859, *Gilbert* 609 (US). PARAGUAY: Serra Pelada, July, 1931, *Jorgensen* 4609 (NY, US); Cerros de Paraguay, Cordillera Centralis, December, 1900, *Hassler* 6570 (G); 1885–1895, *Hassler* 1007 (NY). ARGENTINA.—BUENOS AIRES: Cerro la Peregrina, 20 km. north of Mar del Plata on road to Balcarce, December 11, 1938, *Eyerdam, Beetle & Grondona* 23649 (G); Tandil, November, 1892, *Kuntze* (NY); Loberia, February, 1918, *Alboff & Scala* 1 (G); Tandil, November, 1928, *Burkart* 2803 (G); Sierra Baja, Cerro Redondo, November 11, 1924, *Castellanos* (G); Sierras Balcarce, Cino Cerros, April, 1925, *Castellanos* (G). TUCUMÁN: Barrancas Coloradas, Dept. Capital, May, 1920, *Venturi* 807 (G, US).

This species is readily distinguished from the others of the section by the typically trifoliate blade with the segments rather deeply and remotely crenate and the black sclerotic sinuses. Also the scales are distinctive, being of a type intermediate between sections *Lytoneuron* and *Eudoryopteris*.

2. DORYOPTERIS ITATIAIENSIS (Fée) Christ, Bull. Boiss. s. 2, **2:** 549. 1902. PLATE 1D.

Pellaea itatiaiensis Fée, Crypt. Vasc. Brésil **2:** 26, t. 88, fig. 1. 1872–73. TYPE: Itatiaia, Rio de Janeiro, Brazil, *Glaziou* 5348, probably at Rio de Janeiro, not seen, fragment "ex Fée" NY, seen. ISOTYPE: Paris, not seen, photo G, seen. *Pellaea lomariacea* (Kl.) Hook. var. *itatiaiensis* (Fée) Prantl, Engl. Bot. Jahrb. **3:** 425. 1882. *Pteris itatiaiensis* (Fée) Syzsz. in Beck, Itin. Princ. Coburgi **2:** 119. 1888. *Doryopteris lomariacea* Kl. var. *itatiaiensis* (Fée) Luetzelb. Est. Bot. Nordéste **3:** 248. 1923.

Rhizome moderately long, slender to moderately stout, creeping: *scales* of the frond-buds and stipe *long-lanceolate, attenuate: stipe* red-brown to atropurpureous, usually *densely and minutely verrucose,* sometimes only sparsely so, rarely smooth: *fertile and sterile blades slightly dimorphic,* moderately coriaceous: *sterile* frond 3.5–23 cm. long; *blade* 1–6.5 cm. long, deeply bi- or usually tripinnatifid, or sometimes pinnate-bipinnatifid, pentagonal, *with numerous ultimate segments:* ultimate segments oval to oblong, broadly rounded, usually entire, sometimes remotely crenate, the crenations rounded; margin with a whitish or brown cartilaginous border: *fertile* frond 10–32 cm. long; *blade* 3–6.5 cm. long, deeply tripinnatifid or sometimes pinnate-bipinnatifid, *with numerous ultimate segments: pinnae and primary segments surcurrent and,* except the basal pair, *also decurrent, the bases* of the primary segments *forming wings along the rachis that are broad at the top and bottom and narrowed in the middle:* ultimate segments deltoid to oblong, usually rounded, sometimes subacute, entire, or often some remotely crenate with rounded crenations, and often crenulate: *soral lines broken by the sinuses.*

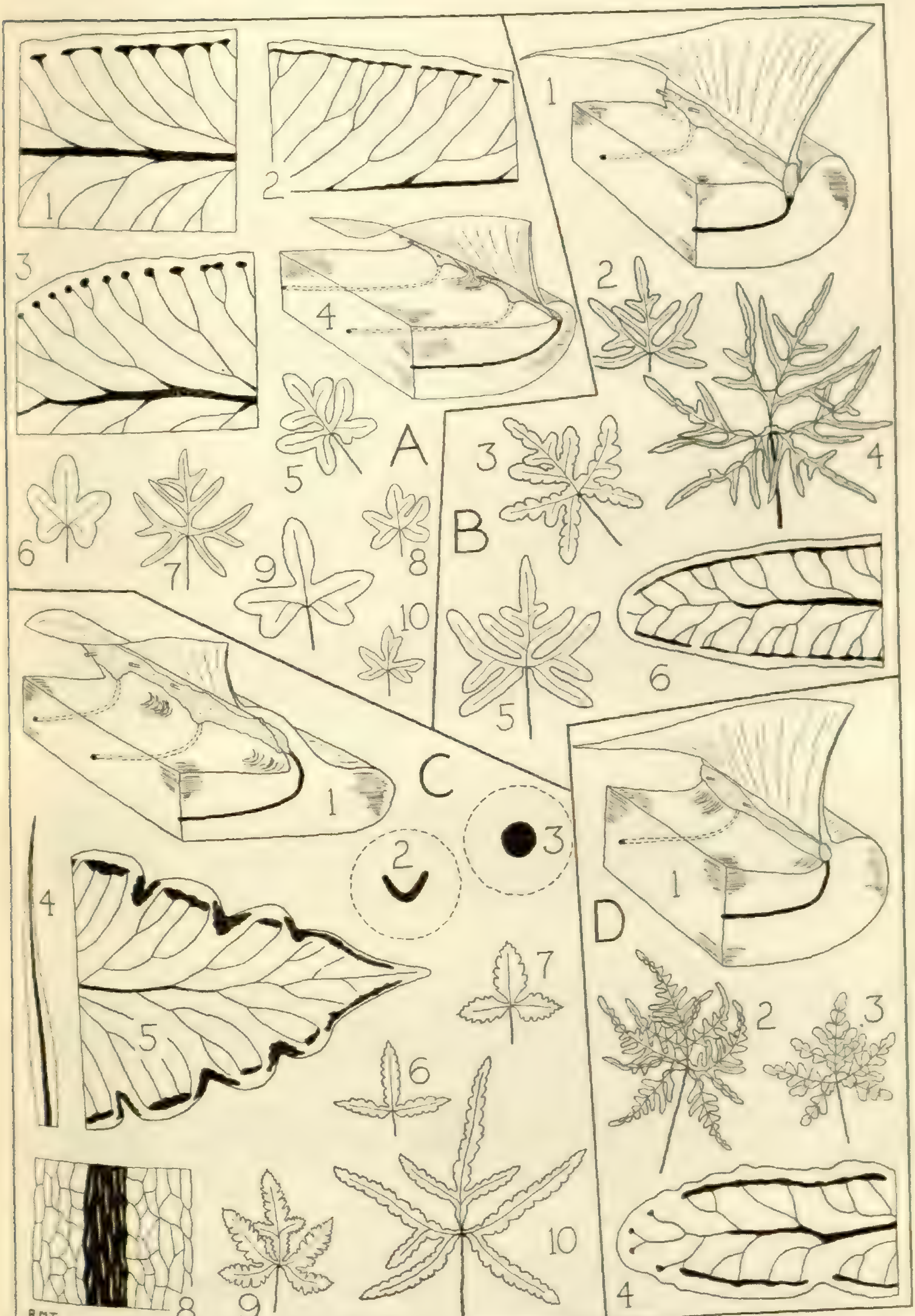
Mt. Itatiaya, Rio de Janeiro, Brazil.

Specimens examined: Brazil, Rio de Janeiro: *Glaziou* "5345" (NY); Mt. Itatiaya, January 8, 1929, *L. B. Smith* 1758 (G, NY, US); Serra do Itatiaya, May 5, 1902, *Dusén* 1135 (US); Itatiaya, June, 1903, *Brade* 10124 (NY); Vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20503 (US).

This species differs from *D. crenulans* in the slightly, rather than quite, dimorphic fertile and sterile blades and the more highly divided fertile blade with deltoid to oblong, rather than mostly narrowly oblong to linear ultimate segments. Also the scales are long-lanceolate and attenuate rather than very long and narrow. The two species differ from the others of the section by the highly divided blades with numerous ultimate segments and the peculiar wings on the rachis formed by the surcurrent and decurrent bases of the primary segments.

3. Doryopteris crenulans (Fée) Christ in Schwacke, Pl. Nov. Mineiras **2:** 26. 1900; reference taken from C. Chr. Ind. Fil.; also in Bull. Boiss. s. 2, **2:** 549. 1902. Plate 1B; map 6.

Pteris lomariacea (Kl.) Hook. & Baker var. *actinophylla* Baker in Martius, Fl. Brasil. **1**²**:** 406, t. 60. 1870. Type and paratype: "Prov. S. Paul", Brazil, *Burchell* 4731–5, Kew, not seen, G, seen; "Caldas prov. Minarum", Brazil, *Lindberg* 600, Kew, not seen, photo G, seen. *Pteris actinophylla* Kze. ex Baker in Martius, Fl. Brasil. **1**²**:** 406. 1870, in synon. *Pellaea crenulans* Fée, Crypt. Vasc.



I. A, DORYOPTERIS PARADOXA. B, D. CRENULANS. C, D. TRIPHYLLA. D, D. ITATIAIENSIS.

Brésil **2:** 27, t. 87, fig. 3. 1872–73. TYPE: Tijuca, Brazil, *Glaziou* 5345, probably at Rio de Janeiro, not seen, fragment "ex Fée" NY, seen. ISOTYPE: Paris, not seen, photo G, seen. Fée also cites *Glaziou* 5343, but a photo, G, of a duplicate at Paris shows that this is different (= *D. tijucana*) and that Glaziou labeled it with an unpublished name of Fée's, indicating that Fée later distinguished it from *D. crenulans*. *Doryopteris actinophylla* (Baker) Rosenst. Hedwigia **46:** 85. 1906. *Doryopteris lomariacea* Kl. var. *actinophylla* (Baker) Luetzelb. Est. Bot. Nordéste **3:** 248. 1923.

Rhizome short to moderately long, slender, compact: *stipe* usually dark red-brown or atropurpureous, rarely red-brown or blackish, usually *densely and minutely verrucose*, sometimes only sparsely so, rarely smooth: *fertile and sterile blades* usually *quite dimorphic*, coriaceous: *sterile* frond 3–35 cm. long; *blade* 2–8 cm. long, deeply bi- or tripinnatifid, pentagonal, rarely with few, usually *with numerous ultimate segments:* ultimate segments hemispherical to usually oblong-ovate or narrowly oblong, broadly rounded, usually rather deeply and remotely crenate, sometimes entire; crenations rounded; margin with a whitish or brown cartilaginous border, sometimes black at the sinuses: *fertile* frond 9–50 cm. long; *blade* 2–13 cm. long, usually deeply tripinnatifid or pinnate-bipinnatifid, rarely bipinnatifid, pentagonal or rarely suborbicular, rarely with few, usually *with numerous ultimate segments: pinnae and primary segments surcurrent and,* except the basal pair, *decurrent, the bases forming wings along the rachis that are broad at the top and bottom and narrowed in the middle:* ultimate segments oblong-ovate to narrowly oblong or linear, rounded or subacute, at least some, often many, remotely crenate with the crenations rounded and also crenulate, rarely not remotely crenate, very rarely not crenulate: *soral lines broken by all, or nearly all, of the sinuses:* sporangia rarely short-stalked.

Southern Brazil and Bolivia.

Specimens examined: BRAZIL.—MINAS GERAES: Caldas, 1868, *Henschen* 329 (US); Ouro Preto, April 7, 1925, *Chase* 9369½ (US); Ouro Preto, May 28, 1923, *Godoy* 8419 (NY). (RIO DE JANEIRO): Tijuca, *Glaziou* 5345 (NY). S˜O PAULO: *Burchell* 4731–5 (G); Campos do Jordão, July 23, 1927, *Harshberger* 928 (NY, US), February 12, 1924, *Bailey & Bailey* 810 (US). PARANÁ: Villa Nova, 1905, *Annies* (Copel., NY, US); Tibagy, May 10, 1934, *Reiss* 23 (G); Jaguariahyva, June 6, 1914, *Dusén* 15099 (G, NY, US). BOLIVIA: Samaipata, March, 1911, *Herzog* 1872 (US); Cortey, February 12, 1902, *R. S. Williams* 1176 (NY, US); Tipuani, December 2, 1922, *Buchtien* 7038 (NY, US); Prov. Chapare, Dept. Cochabamba, June 18, 1929, *Steinbach* 9856 (G); Nor-Yungas, December, 1917, *Buchtien* 799 (Copel., US).

This species is closely related to the preceding, *D. itatiaiensis*, and the differences are discussed in its treatment. It is also closely related to the next species, *D. paradoxa.* It differs from the latter in being larger; the fertile blade is usually considerably taller than the sterile and more divided, with relatively numerous ultimate segments rather than similar in size and division to the sterile and with relatively few segments; the wings along the rachis are broad at the top and bottom and narrowed in the middle rather than broad at the top and narrowed at the base; the stipe is usually densely and minutely verrucose rather than smooth; and the sporangia are long-stalked rather than short-stalked.

However, some specimens of *D. crenulans* show some transitions to *D. paradoxa. Annies,* Paraná, Brazil, has many of the sporangia with short stalks. *Annies* (Pl. 1B, fig. 5), *Steinbach* 9856, Bolivia, and *Williams* 1176, Bolivia, all have relatively small fertile blades that are similar to the sterile and have relatively few segments. Also a single fertile blade in *Williams* 1176 (NY), does not have the segments surcurrent. However, I am not considering these variations as critical because they are very rare and especially because all of them, with the exception of *Annies,* occur in Bolivia, far from the range of *D. paradoxa* and certainly do not represent true intermediates.

4. Doryopteris paradoxa (Fée) Christ, Bull. Boiss. s. 2, **2:** 546. 1902. Plate 1A.

Cassebeera paradoxa Fée, Mém. Fam. Foug. **7:** 30, t. 20, fig. 2. 1857, as *Cassebeeria.* Type: Organ Mountains, Brazil, *Gardner* 5930, probably at Rio de Janeiro, not seen. Isotype: NY, seen; Kew, not seen, photo G, seen. *Pellaea lomariacea* (Kl.) Hook. var. *columbina* Hook. Sp. Fil. **2:** 133, t. 112 A. 1858. Type: Organ Mountains, Brazil, *Gardner* 5930, Kew, not seen, photo G, seen. *Pellaea columbina* (Hook.) Hook. & Baker, Syn. Fil. 146. 1867. *Pellaea columbina* var. *vestita* Hook. & Baker, Syn. Fil. 146. 1867. *Pellaea microphylla* Fée, Crypt. Vasc. Brésil **1:** 43, t. 4, fig. 2. 1869, not Mett. ex Kuhn. Type and paratype: Rio de Janeiro, Brazil, *Glaziou* 3158, 3159, probably at Rio de Janeiro, not seen. Isotype: *Glaziou* 3158, Kew, not seen, photo G, seen. *Pellaea paradoxa* (Fée) Fée, Crypt. Vasc. Brésil **1:** 43. 1869, not (R. Br.) Hook. Sp. Fil. **2:** 135. 1858. *Pellaea Glaziovii* Baker var. *minor* Baker in Martius, Fl. Brasil. **1**[2]: 595. 1870. Type and paratype: Rio de Janeiro, Brazil, *Glaziou* 3158, 3159, Kew, not seen, photo *Glaziou* 3158, G, seen. *Cheilanthes monticola* Mart. ex Prantl, Engl. Bot. Jahrb. **3:** 422. 1882, in synon., not Gardn. ex Hook. 1842, acc. to Prantl. *Pellaea vestita* (Hook. & Baker) Prantl, Engl. Bot. Jahrb. **3:** 418. 1882. *Allosorus microphyllus* (Fée) O. Ktze. Rev. Gen. **2:** 806. 1891. *Pteris paradoxa* (Fée) Kuhn ex Schenck, Hedwigia **35:** 160. 1896. *Doryopteris columbina* (Hook.) Diels in Engl. & Prantl, Nat. Pfl. **1**^{4}**:** 269. 1899. *Doryopteris vestita* (Hook. & Baker) Diels in Engl. & Prantl, Nat. Pfl. **1**^{4}**:** 269. 1899. *Cassebeera microphylla* (Fée) Christ in Schwacke, Pl. Nov. Mineiras **2:** 25. 1900, reference from C. Chr. Ind. Fil. *Doryopteris microphylla* (Fée) Christ, Bull. Boiss. s. 2, **2:** 546. 1902. *Doryopteris Feei* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **1:** 226, fig. 4 & t. 5. 1935. TYPE and PARATYPE: Serra do Itatiaia, Brazil, *Toledo & Brade* 6496; *Kuhlman* s. n., Rio de Janeiro, not seen. *Doryopteris Feei* f. *maior* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **1:** 226. 1935. TYPE: Serra do Itatiaia, Brazil, *Campos-Porto* 184, Rio de Janeiro, not seen.

Rhizome short to moderately long, small, compact: *scales occasionally long-lanceolate, attenuate: stipe* red-brown to atropurpureous, *smooth,* with two oval, or one terete, U- or V-shaped vascular bundle at the base: *fertile and sterile blades usually similar,* sometimes moderately dimorphic, thin to moderately coriaceous: *sterile* frond 2–14 cm. long; *blade* 0.5–4 cm. long, obscurely 3-lobed and suborbicular to bipinnatifid, pentagonal, *with usually 5–7,* rarely numerous *ultimate segments:* ultimate segments suborbicular to oblong, rounded, entire or finely crenulate; margin with a broad and crisped or narrow, whitish or brown cartilaginous border: *fertile* frond 3–32 cm. long; *blade* 1–7 cm. long, deeply bipinnatifid or tripinnatifid, rarely pinnate-bipinnatifid, pentagonal to suborbicular, *with 5 to several,* rarely numerous *ultimate segments: pinnae and primary segments adnate or very slightly surcurrent and,* except the basal pair, *decurrent, the bases forming wings along the rachis that are broad at the top and narrowed at the base:* ultimate segments deltoid to narrowly oblong, rounded, entire or usually finely crenulate: *soral lines usually broken by the sinuses: sporangia short-stalked:* receptacle a continuous vascular commissure connecting the fertile vein-ends or with transitions to discrete, fan-shaped receptacles terminating the vein-ends.

Minas Geraes and Rio de Janeiro, Brazil.

Specimens examined: BRAZIL.—*Glaziou* 4392 (NY); *Glaziou,* "Pellaea microphylla Fée" (NY). MINAS GERAES: Serra do Caparaó, April 30–May 4, 1925, *Chase* 9705 (US); Ouro Preto, 1907, *Damazio* (NY, US). RIO DE JANEIRO: Theresopolis, 1929, *Brade* 9935 (NY); November, 1910, *Luetzelburg* 18916 (NY); Rio de Janeiro, *Gardner* 5930 (as to small plant) (NY); Serra dos

Orgãos, November, 1910, *Luetzelburg* 6643 (Copel.); Itatiaya, March, 1937, *Brade* 15513 (G); Itatiaya, June, 1930, *Brade* 10093 (NY); Vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20532 (G, US).

This species is closely related to *D. crenulans* and the differences are discussed under that species. The smooth stipe, small and similar fertile and sterile blades, soral lines broken by the sinuses and short-stalked sporangia separate it from the other species in the section. The receptacle is a nearly continuous vascular commissure (*Chase* 9705) or transitional (*Brade* 10093) to separate receptacles terminating the vein-ends (*Brade* 15513).

5. Doryopteris tijucana Brade & Rosenst. Bol. Mus. Nac. Rio Janeiro **7**: 144, t. 9. 1931. Lectotype: Rio de Janeiro, Brazil, *Brade* 8598, at Rio de Janeiro, not seen; isolectotype: NY, seen. Paratypes: Rio de Janeiro, Brazil, *Brade* 8537, 8563, at Rio de Janeiro, not seen; isoparatype: *Brade* 8563, NY, seen. Plate 2B.

Rhizome short, slender to moderately stout, compact: *stipe* atropurpureous to black, *densely and minutely verrucose:* fertile and sterile blades moderately dimorphic, coriaceous: *sterile* frond 2–28 cm. long; *blade* 1–15 cm. long, entire, orbicular and cordate, or deltoid and 3-lobed in small blades to deeply pinnatifid or usually bi- or tripinnatifid, pentagonal, with 5 to numerous ultimate segments, the *basal primary segments nearly at right angles to the rachis:* ultimate segments broadly ovate to oblong or oblong-lanceolate, rounded or rarely acute, sometimes entire, usually shallowly and remotely crenate or crenate; the crenations usually flat; margin with a whitish or brown cartilaginous border: *fertile* frond 9–66 cm. long; *blade* 3.5–17 cm. long, deeply bi- or usually tripinnatifid, pentagonal to suborbicular, with several to usually numerous ultimate segments: *primary segments only slightly surcurrent and,* except the basal pair, *decurrent, the bases forming wings along the rachis that are usually narrowed at the base or* sometimes that *have nearly parallel sides:* ultimate segments oblong-ovate to long-lanceolate, rarely linear, rounded or acute, entire: *soral lines continuous around the sinuses*, or broken by the sinuses of the primary segments.

Mts. Tijuca and Corcovado, Rio de Janeiro, Brazil.

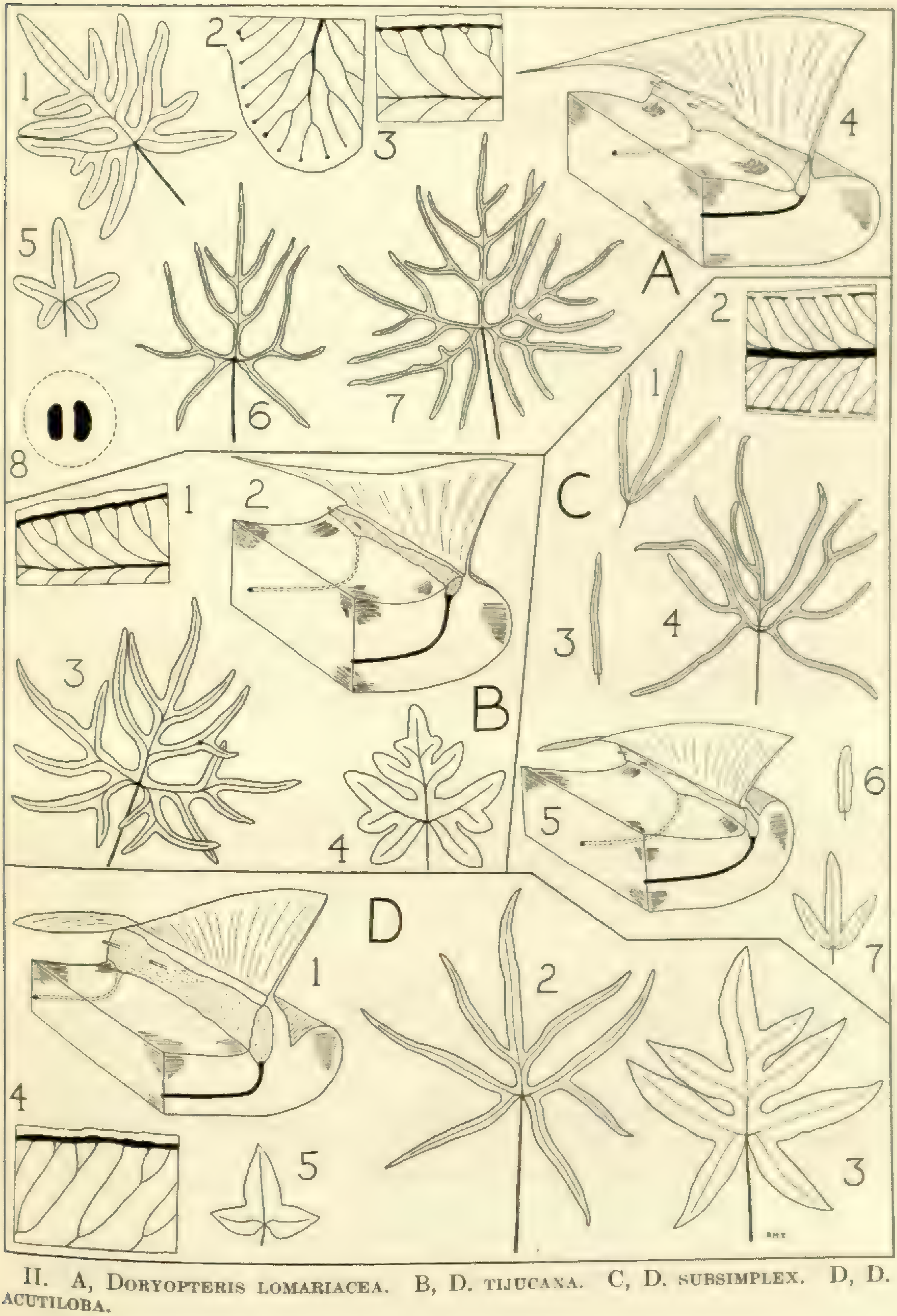
Specimens examined: Brazil, Rio de Janeiro: Tijuca, October, 1928, *Brade* 8598 (NY), June 14, 1933, *Brade* 12550 (G), November, 1928, *Brade* 8563 (NY); Corcovado, December, 1910, *Luetzelburg* 18927 (Copel., NY), November 17, 1928, *L. B. Smith* 1251 (G), March 6, 1924, *Bailey & Bailey* 752 (US), August 1887, *Ule* 257 (US), July 18, 1927, *Harshberger* 891 (US), July, 1915, *Rose & Russell* 21250 (US).

This species and *D. subsimplex* are apparently closely related and the densely and minutely verrucose stipe sets them apart from *D. lomariacea* and *D. acutiloba*. It differs from *D. subsimplex* in the construction of the sterile blade—this is more highly divided in *D. tijucana* and the basal primary segments are nearly at right angles to the rachis rather than strongly ascending. Also the stipe is truly verrucose rather than verrucose with acute processes.

6. Doryopteris subsimplex (Fée) Diels in Engl. & Prantl, Nat. Pfl. 1[4]: 269. 1899. Plate 2C.

Pellaea subsimplex Fée, Crypt. Vasc. Brésil **1:** 44, t. 4, fig. 3. 1869. Type: Rio de Janeiro, Brazil, *Glaziou* 3160, probably at Rio de Janeiro, not seen. Isotype: Paris, not seen, photo G, seen. *Pteris longula* Mett. ex Kuhn, Linnaea **36:** 88. 1869. Organ Mountains, Brazil, no specimen cited. *Pteris triphylla* Baker in Martius, Fl. Brasil. 1[2]: 596. 1870, not (Lam.) Mett. 1856. Type: Rio de Janeiro, Brazil, *Glaziou* 3160, probably at Kew, not seen. Isotype: Paris, not seen, photo G, seen. *Doryopteris subsimplex* var. *magdalenensis* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **2:** 3. 1935. Type: Magdalena, Rio de Janeiro, Brazil, *Lima & Brade* 13130, at Rio de Janeiro, not seen. Isotype: G, seen.

Rhizome short, slender to moderately stout, compact: scales occasionally long-lanceolate, attenuate: *stipe* dark red-brown to black, usually *densely and minutely verrucose with acute processes*, occasionally sparsely so, rarely spinulose or pubescent with short brown hairs: *fertile and sterile blades similar to moderately dimorphic*, coriaceous: *sterile* frond 3–27 cm. long; *blade* 1–7 cm. long, entire, *strap-shaped or rarely linear and subcordate, or deeply 3-lobed*, deltoid and hastate in small blades, *usually diamond-shaped, the lateral lobes strongly ascending*, a little more than half as long as the central lobe: ultimate segments broadly ovate to usually strap-shaped, rounded or usually rather abruptly acute, entire or shallowly and remotely crenate; margin with a whitish or brown cartilaginous border: fertile frond 15–38 cm. long; blade 5–11 cm. long, entire, linear and subcordate, or deeply (2–) 3–5-lobed, obovate or ovate, the lateral segments ascending, or deeply bipinnatifid, suborbicular, with numerous ultimate segments, the basal primary segments ascending: *primary segments of the highly divided blades slightly surcurrent and*, except the basal pair, *decurrent, the bases forming wings along the rachis that are narrowed at the base:* ultimate segments narrowly oblong to usually linear, subacute, entire: *soral lines continuous around the sinuses, if present*, or broken by the sinuses of the lower primary segments.



II. A, Doryopteris lomariacea. B, D. tijucana. C, D. subsimplex. D, D. acutiloba.

Rio de Janeiro, Brazil.

Specimens examined: BRAZIL, RIO DE JANEIRO: Pedra Dubois, Magdalena, February 28, 1924, *Lima & Brade* 13130 (G); Pedra dos Flores, Magdalena, March 4, 1934, *Lima & Brade* (G); Pedra dos Flores, Magdalena, March 4, 1934, *Lima & Brade* 13131 (G).

D. subsimplex differs from *D. lomariacea* and *D. acutiloba* in its verrucose stipe. It is closely related to *D. tijucana* and the differences are discussed under that species. The vascular commissure is not always completely continuous. The fertile blade of this species is extremely variable, ranging from entire to deeply bipinnatifid; the sterile blade is somewhat less variable. However, judging by ample series in other variable species, these are probably only normal variations, perhaps related to the age of the plants.

7. DORYOPTERIS LOMARIACEA Kl. Linnaea **20:** 343. 1847. TYPE: British Guiana, *Schomburgk* 1197, probably at Berlin, not seen. PLATE 2A; MAP 7.

Pteris septemloba Kl. Linnaea **20:** 343. 1847, in synon. *Pteris lomariacea* Kze. ex Kl. Linnaea **20:** 343. 1847, in synon; ex Hook. & Baker, Syn. Fil. 164. 1867. *Pellaea lomariacea* (Kl.) Hook. Sp. Fil. **2:** 133. 1858. *Pellaea lomariacea* var. *septemloba* Hook. Sp. Fil. **2:** 133. 1858. *Allosorus lomariaceus* (Kl.) O. Ktze. Rev. Gen. **2:** 806. 1891. *Doryopteris Bradei* Rosenst. Hedwigia **56:** 360. 1915. TYPE: São Paulo, Brazil, *Brade* 5820, probably at Stockholm, not seen. ISOTYPE: NY, seen.

Rhizome long, slender to moderately stout, creeping: *stipe* usually dark red-brown or atropurpureous, sometimes castaneous or blackish, usually *smooth* or *slightly and irregularly roughened,* rarely slightly and sparsely verrucose: *fertile and sterile blades strongly dimorphic, coriaceous: sterile* frond 4–49 cm. long; *blade* 3–19 cm. long, deltoid, hastate and deeply 3-lobed, or deeply lobed to usually bi- or tripinnatifid, pentagonal or suborbicular, with 5 to several, sometimes numerous ultimate segments: *ultimate segments* oblong-ovate to narrowly oblong, *broadly rounded,* sometimes entire, *usually shallowly and remotely crenate or crenate;* crenations usually flat; margin with a whitish or brown cartilaginous border: *fertile* frond 18–118 cm. long; *blade* 5–18 cm. long, deeply bi- or tripinnatifid, rarely only deeply lobed, deltoid, ovate, pentagonal or suborbicular, rarely with 5, usually with several to numerous ultimate segments: *primary segments adnate or only slightly decurrent, the bases forming wings along the rachis with nearly parallel sides: ultimate segments usually* *linear*, rarely narrowly oblong, rounded or rarely acute, usually entire, sometimes a few crenulate: *soral lines continuous around the sinuses.*

Southern Brazil and Paraguay; also Peru and Mt. Roraima, British Guiana.

Specimens examined: BRITISH GUIANA: Mt. Roraima, October–January, 1884–5 (U. S. Nat. Herb. no. 61614), *Schomburgk* 6 (US); "Basement" of Roraima, 1895, *Jenman* (NY); BRAZIL.—MINAS GERAES: Diamantina, December 27–30, 1929, *Chase* 10376 (G), April 28, 1931, *Mexia* 5705 (Copel., G, NY, US); Caldas, *Regnell* 329 (US). SÃO PAULO: Alto da Serra, March 16, 1913, *Brade* 5820 (NY), February 12, 1929, *L. B. Smith* 1856 (G, US); Ypiranga, June, 1906, *Luederwaldt* 21315 (NY). PARANÁ: Villa Nova, February, 1904, *Annies* (US); Incena, April, 1904, *Wialewski* 76 (NY); Jaruariahyva, May 14, 1914, *Dusén* 15016 (G). SANTA CATHARINA: Lages, 1921, *Spannagel* 6c (NY); Joinville, March, 1904, *Schmalz* 76 (NY). RIO GRANDE DO SUL: Ferromecco, 1889, *Kunert* 26 (US). PARAGUAY: Sierra de Maracayú, *Hassler* 5191 (G); Fluminis Y-acá (Cordillera centralis), 1900, *Hassler* 6846 (G); Caaguazú, February, 1905, *Hassler* 9035 (G). PERU: Eneñas, Dept. Junín, July 1, 1929, *Killip & Smith* 25709 (NY, US).

D. lomariacea and *D. acutiloba* are set off in the section by the smooth or only slightly roughened stipe and the soral lines which are continuous around the sinuses. The differences from *D. acutiloba* are discussed under that species.

8. DORYOPTERIS ACUTILOBA (Prantl) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 269. 1899. PLATE 2D.

Pellaea acutiloba Prantl, Engl. Bot. Jahrb. **3:** 425. 1882. TYPE and PARATYPE: Rio de Janeiro, Brazil, *Glaziou* 2471, 7262, probably at Berlin, not seen. Having seen no material of either collection I am not choosing a type. The description agrees with the specimens distributed by Rosenstock as *Pellaea acutiloba* and *Doryopteris acutiloba.*

Rhizome short to moderately long, moderately stout, compact: *stipe* dark red-brown to atropurpureous, *smooth: fertile and sterile blades moderately dimorphic, relatively thin: sterile* frond 2–50 cm. long; *blade* 1–22 cm. long, entire, orbicular and cordate in very small blades, or rather deeply 3-lobed, deltoid and hastate, or deeply lobed to bipinnatifid, pentagonal, with 5 to numerous ultimate segments: *ultimate segments* deltoid to long-lanceolate, *usually acute*, sometimes acuminate, *entire;* margin with a whitish or brown cartilaginous border: *fertile* frond 40–60 cm. long; *blade* 11–21 cm. long, deeply bi- to tripinnatifid, pentagonal to suborbicular, with 7 to numerous ultimate segments: *primary segments adnate or*, except the basal pair, *slightly decurrent, the bases forming wings along the rachis that are slightly narrowed at the base or have nearly parallel sides: ultimate segments lanceolate to linear*, rounded to acute, entire: *soral lines continuous around the sinuses:* spores with a whitish rugulose perispore.

Southern Brazil.

Specimens examined: BRAZIL: Alto Macahé, Rio de Janeiro, *Glaziou* 7263 (NY); Villa Nova, Paraná, February, 1905, *Annies* (Copel., NY, US); Palhoya Tagnara, Santa Catharina, September, 1909, *Spannagel* (NY).

D. acutiloba differs from *D. lomariacea* in its relatively thin sterile blade, entire ultimate segments and the much broader segments of the fertile blade. The spores with perispore are unique in the section.

9. DORYOPTERIS ROSENSTOCKII Brade, Bol. Mus. Nac. Rio Janeiro **7:** 143, t. 8. 1931. TYPE: Rio de Janeiro, Brazil, *Brade* 9257, at Rio de Janeiro, not seen. PLATE 3D.

"Rhizoma breve, suberectum, vestitum paleis mollibus, lineariter lanceolatis, subdenticulatis, in apicem crispum piliformem excurrentibus, ad 8 mm. longis, 0.2 mm. latis. Petioli erecti, teretes, rufuli, pilis articulatis, mollibus ferrugineis canescentibus lanosi, denique glabrescentes, duobus fasciculis ovalibus praediti, in foliis sterilibus ad 40 cm., in fertilibus ad 75 cm. longi, 3–4 mm. crassi. Laminae basi cordatae, hastato-lanceolatae, tri- vel quinque-lobatae, subcoriaceae vel chartaceae, supra virides vel olivae, subtus pallidiores, glaberrimae, 20–40 cm. longae, 10–20 cm. latae. Segmenta unijuga, lateralibus sinu plus minus lato cum terminali connexis, e basi posteriore lobos singulos auricularios deorsum emittentia, in foliis sterilibus (et semifertilibus) horizontaliter patentia vel subincurvata, lanceolata, longe acuminata, margine leviter crenulata vel subintegra, ad 12 cm. longa, supra basim 2.5–3 cm. lata; in foliis sat fertilibus longiora et angustiora quam in sterilibus (ad 20 cm. longa, 2 cm. lata). Lobi basales foliorum sterilium ad 6 cm. longi, 2 cm. lati, imbricati et petiolum comitantes, fertilium longiores et angustiores, ad 15 cm. longi, 1.5 cm. lati, sinu lato interstincti. Segmentum terminale lateralibus conforme, sed integrum et paulo majus. Costae utrinque immersae, parenchymate ochraceo subtus obtectae. Nervi immersi vix conspicui, plerique furcati, apicibus superficialibus. Sori continui.

"Habitat in Brasiliae Statu Rio de Janeiro prope Teresopolim (Sete Quedas), 1500 m. supra mare, 19—IX—1929, leg. *A. C. Brade*, No. 9257. Herb. Mus. Nat., No. 21009."

I have not seen any material of this species. It is apparently a good species and distinguished by the pubescent stipe, the cutting of the blades and the large size of the fronds.

10. DORYOPTERIS ORNITHOPUS (Mett. ex Hook. & Baker) J. Sm. Hist. Fil. 289. 1875. PLATE 3B.

Pellaea lomariacea (Kl.) Hook. var. *digitato-palmata* Hook. Sp. Fil. **2:** 133. 1858. TYPE: Diamond District, Brazil, *Gardner* 5298, Kew, not seen, photo G, seen. *Pteris ornithopus* Mett. ex Hook. & Baker, Syn. Fil. 166. 1867. LECTOTYPE: Diamond District, Brazil, *Gardner*, 5298, Kew, not seen, photo G, seen. PARATYPES: "*Burchell*, south of Brazil", Kew, not seen; Caldas, Minas Geraes, Brazil, *Lindberg* 600, Kew, not seen, photo G, seen. *Pteris cheirophylla* Kze. ex Baker in Martius, Fl. Brasil. **1**[2]**:** 406. 1870, in synon. *Pteris alcicornu* Kze. ex Baker in Martius, Fl. Brasil. **1**[2]**:** 406. 1870, in synon. *Pellaea alcicornis* Prantl, Engl. Bot. Jahrb. **3:** 429. 1882. Based on *Pteris ornithopus* Mett. ex Hook. & Baker, epithet taken from *Pteris alcicornu* Kze. ex Baker. *Doryopteris alcicornis* (Prantl) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 270. 1899. *Doryopteris ornithopus* var. *pygmaea* Brade, Bol. Mus. Nac. Rio Janeiro **5:** 95, t. 2, fig. 1. 1929. TYPE: Serra Dourada, Goyaz, Brazil, *Ule* 798 ex parte, Herb. Mus. Nac. Rio Janeiro, no. 18286, not seen.

Rhizome short to moderately long, moderately stout, compact: *scales* of the frond-buds and stipe *entire: stipe* usually atropurpureous or black, sometimes red-brown toward the base, *usually scaly with fibrils*, especially at the base, occasionally nearly naked, *smooth or slightly roughened by small longitudinal grooves: fertile and sterile blades palmately divided, quite dimorphic, very coriaceous, with areolate venation: sterile* frond 4–28 cm. long; *blade* 1.7–8 cm. long, pentagonal to suborbicular, shallowly to rather deeply 5–7-lobed, the central segments a little longer than the others: *segments* broadly ovate or deltoid to ovate-lanceolate, *rounded, entire; margin with a black, sclerotic border;* vein-ends mostly joined; *hydathodes not present on the upper surface: fertile* frond 7-45 cm. long; *blade* 3–17 cm. long, *usually orbicular or suborbicular*, sometimes pentagonal, deeply 5–9-lobed: *segments oblong to linear*, rounded or subacute, *entire: soral lines continuous around the sinuses:* stalks of the sporangia very long, usually two to three times the length of the head.

Goyaz, Minas Geraes and São Paulo, Brazil.

Specimens examined: BRAZIL.—MINAS GERAES: 1846, *Regnell* 1459 (US); Bello Horizonte, July 10, 1940, *Foster & Foster* 590 (US); São João d'El Rei, August 31, 1892, *Lindman* A137 (US). S˜o PAULO: March 21, 1915, *Brade* (NY); Serra do Mar, *Edwak* (NY).

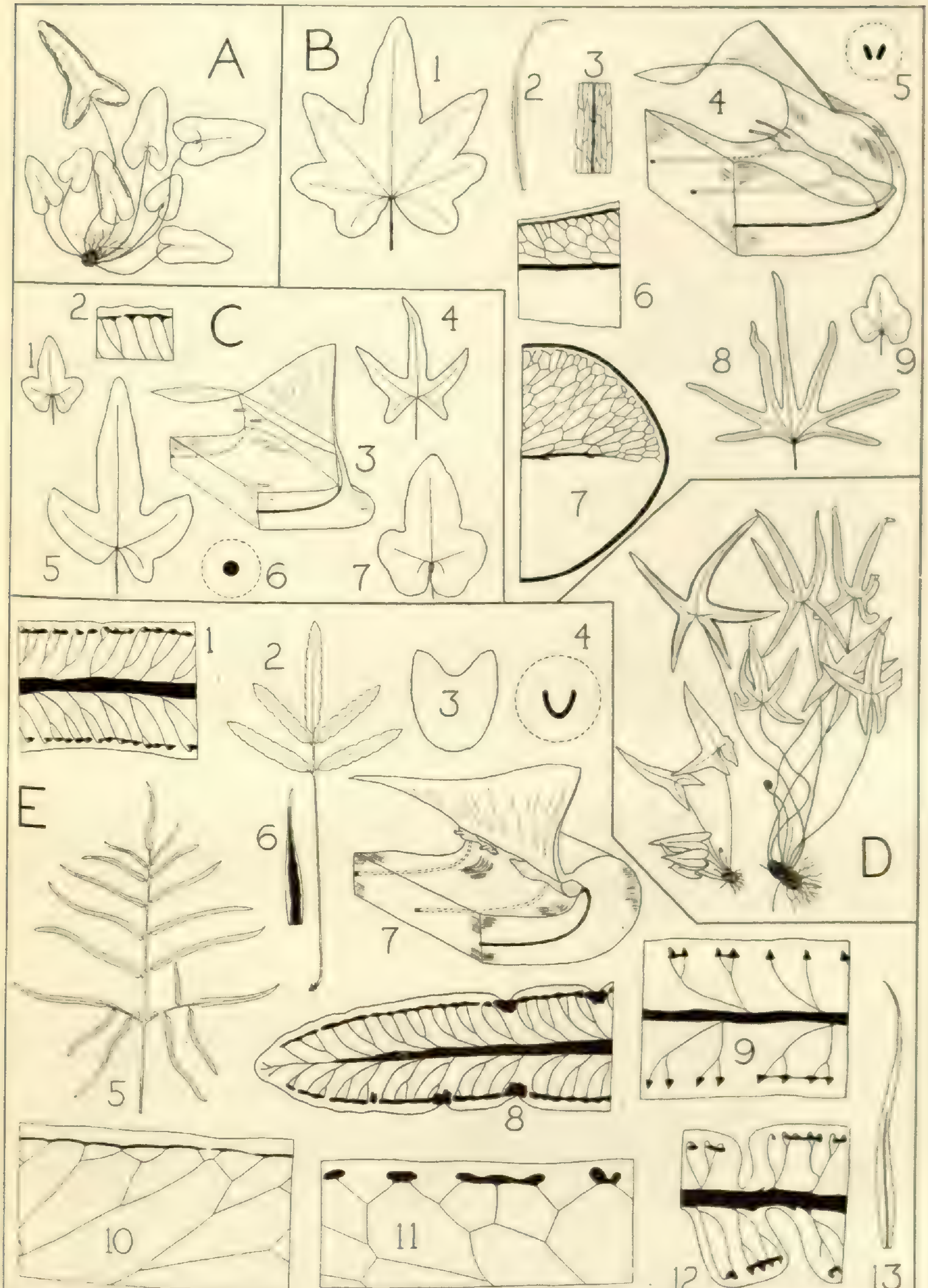
D. ornithopus is a very distinct species. The palmately divided, very coriaceous, areolate-veined blades, the black sclerotic border of the sterile blade and absence of hydathodes are distinctive characters. Although it has areolate venation, the two vascular bundles and the typical scales place it naturally in section *Lytoneuron.*

11. Doryopteris quinquelobata (Fée) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 269. 1899. Plate 3C.

Pellaea quinquelobata Fée, Crypt. Vasc. Brésil **1:** 42, t. 10, fig. 1. 1869. Type: Rio de Janeiro, Brazil, *Glaziou* 2055, probably at Rio de Janeiro, not seen. Isotype: Paris, not seen, photo G, seen. *Pellaea Glaziovii* Baker in Martius, Fl. Brasil. **1**[2]**:** 595. 1870. Type: Rio de Janeiro, Brazil, *Glaziou* 2055, Kew, not seen. Isotype: Paris, not seen, photo G, seen. *Pteris quinquelobata* (Fée) Baker, Ann. Bot. **5:** 215. 1891. *Doryopteris Glaziovii* (Baker) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 269. 1899. *Doryopteris quinquelobata* var. *septemlobata* Brade, Bol. Mus. Nac. Rio Janeiro **5:** 93, t. 1. 1929, ex char. Type: Tijuca, Rio de Janeiro, Brazil, *Brade* 8567, Rio de Janeiro, not seen. "Varietas statura multo majore insignis, ad 37 cm. alta. Laminae steriles 3–7 loborum, diametri 8–14 cm.; lobi, maxime terminalis et basales, acutiores quam in specie typica. Laminae fertiles pinnatifidae, bijugatae, lobis basalibus uno alterove lobo basiscopo instructis, lobis omnibus lanceolatis, acutis, 12–18 mm. latis. O exemplar unico distingue-se da especie typica principalmente pelo tamanho e a divisão mais complicada da lamina. Os outros caracteres indicam sem difficuldade Doryopteris quinquelobata." I am unable to place this variety. It may possibly be a distinct species. If it is *D. quinquelobata,* it is undoubtedly only a well developed phase and should not be formerly recognized. The following description does not include it.

Rhizome short, slender, compact: *stipe* atropurpureous or black, minutely verrucose or smooth, *with one* terete or U-shaped *vascular bundle* at the base: *fertile and sterile blades slightly dimorphic, relatively thin: sterile* frond 2–21 cm. long; *blade* 1–8 cm. long, *entire, orbicular and cordate to deltoid or long-pentagonal, shallowly 5-lobed,* the lateral lobes shorter than the central lobe: *lobes* broadly ovate to ovate-lanceolate, rounded, *entire;* margin with a whitish or brown cartilaginous border: *fertile* frond 7.5–25 cm. long; *blade* 5–10 cm. long, pentagonal to long-pentagonal, *moderately deeply 5-lobed,* the lateral lobes shorter than the central lobe: *lobes* broadly ovate to linear-lanceolate, rounded to acute, *entire: soral lines continuous around the sinuses.*

Rio de Janeiro, Brazil.



111. A, Doryopteris rufa. B, D. ornithopus. C, D. quinquelobata. D, D. Rosenstockii. E, figs. 1–7, Pellaea crenata; 8, P. pinnata; 9, P. Riedelii; 10, P. angulosa; 11, P. crispatula; 12, 13, P. gleichenioides.

Specimens examined: BRAZIL, RIO DE JANEIRO: *Glaziou* 7011 (NY); Tijuca, June 25, 1904, *Dusén* 2530 (G), October, 1929. *Brade* 8634 (NY).

This species is characterized by the single vascular bundle, the entire lobes and the soral lines continuous around the sinuses. The blades are typically 5-lobed.

12. DORYOPTERIS RUFA Brade, Bol. Mus. Nac. Rio Janeiro **5:** 94, t. 2, fig. 2. 1929. PLATE 3A.

"Rhizoma breve, suberectum, paleis mollibus linearibus rufis vestitum. Stipites fasciculati. Petiolus teres, tenuis (diametri ca. 0.7 mm.) ebeneus, in juventute atrofuscus, nitidus, glaberrimus, ad 8 cm. longus. Laminae steriles ambitu rotundae vel obtuse ovatae, basi profunde cordata, margine membranaceo, integerrimo. Laminae fertiles sagittiformes vel hastiformes; lobi omnes obtusi, lobus terminalis versus basim plus minus attenuatus, 3 cm. longus, 14 mm. latus; lobi basales obovati, obtusi, aliquantulum divergentes, 2 cm. longi, 10–12 mm. lati. Sori anastomosantes ad marginem, apicibus segmentorum exceptis; margo revolutus, abrupte attenuatus, scariosus, integerrimus. Laminae coriaceae, glaberrimae, pallide virides, costis immersis, nervis liberis, obscure immersis, nervorum apicibus distincte superficialibus. Laminae steriles 2–3½ cm. longae, 1½ cm. latae. Laminae fertiles 5½ cm. longae, 3 cm. latae.

In Brasiliae statu Minas Geraes (Ouro Preto). Coll. *Bruno de Godoy* 28. V. 1923. In Herbario Sectionis Botanicae et Agronomiae Instituti Biologici de 'Defesa Agricola e Animal', São Paulo, No. 8425."

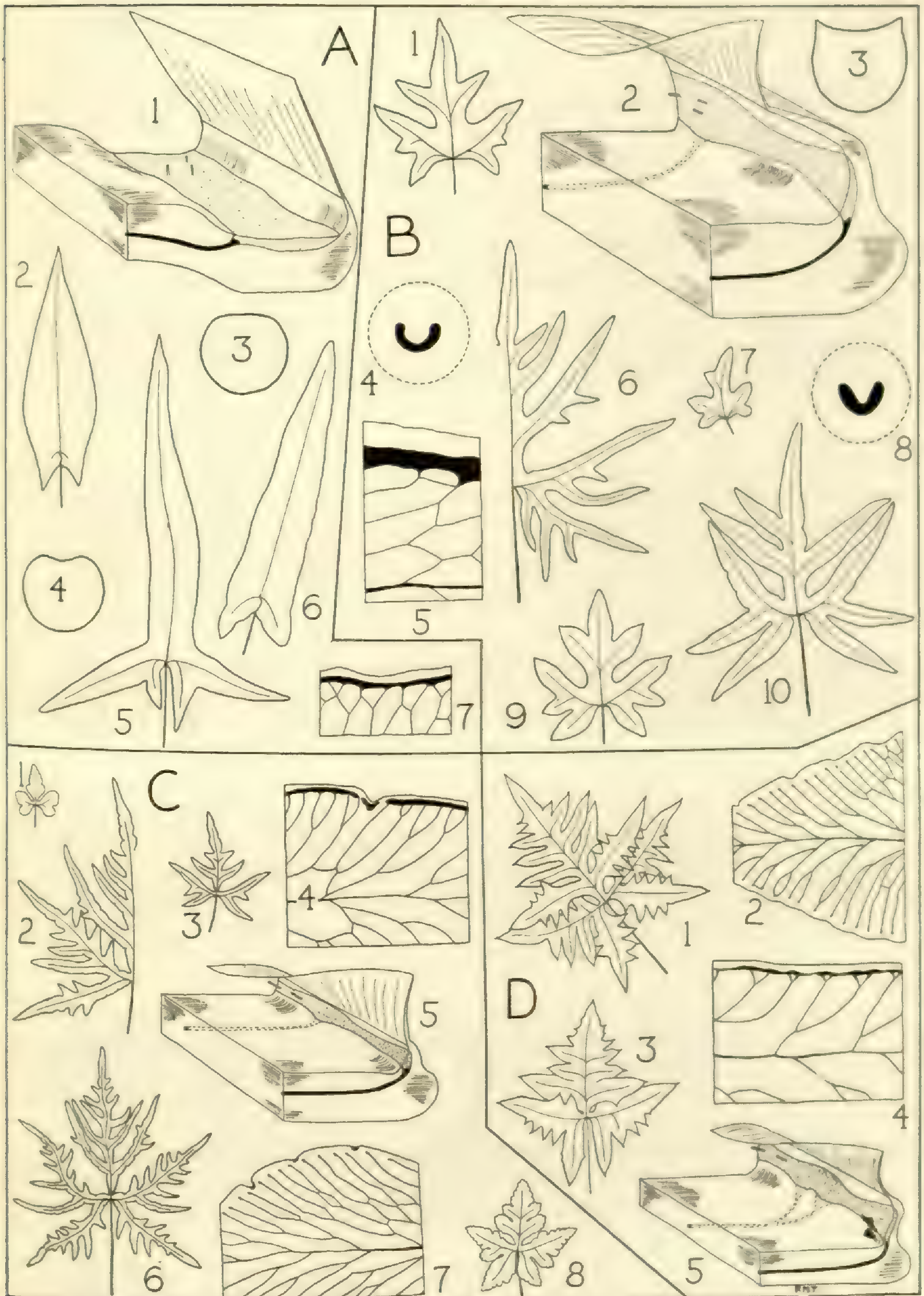
I have not seen any material of this species. The obvious characters of the blades apparently sufficiently distinguish it from the other free veined species.

SECTION II.

EUDORYOPTERIS Kl. Linnaea **20:** 342. 1847.

Litobrochia Presl section *Doryopteris* (J. Sm.) Moore, Ind. Fil. xliv. 1857. *Pteris* L. section *Doryopteris* (J. Sm.) Hook. & Baker, Syn. Fil. 166. 1867. *Pellaea* Link section *Doryopteris* (J. Sm.) Prantl, Engl. Bot. Jahrb. **3:** 419. 1882.

Rhizome short, small to stout, compact: *scales* of the frond-buds *usually ovate-lanceolate* (PL. 5C, FIG. 7), sometimes long-lanceolate, attenuate, *with* a dark red-brown to blackish, sclerotic central band and *relatively broad*, light brown to brown, hyaline *margins*, rarely entirely hyaline, entire or rather finely toothed; *the cells of the hyaline parts relatively short* (PL. 5C, FIG. 1), *mostly*



IV. A, Doryopteris sagittifolia. B, D. collina. C, D. Lorentzii. D, D. Juergensii.

about as long as broad to sometimes one and a half times as long as broad; stipe often pubescent with short brown hairs, not scaly with fibrils, *with one U- or V-shaped vascular bundle* at the base: *fertile and sterile blades with areolate, or* in *D. Lorentzii* and *D. Juergensii* with *partially areolate, venation;* margin of the sterile blade with a whitish or brown cartilaginous border: spores usually without a perispore, the exospore smooth or minutely roughened, or in *D. nobilis, D. rediviva* and *D. pedata* var. *palmata* with a whitish rugulose perispore (PL. 6B, FIG. 5).

The species of this section are not as clearly related as a unit as are those of section *Lytoneuron* and the specific lines, in general, are more distinct.

13. DORYOPTERIS LORENTZII (Hieron.) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 270. 1899. PLATE 4C; MAP 5.

Pellaea Lorentzii Hieron. Engl. Bot. Jahrb. **22:** 392. 1896. TYPE and PARATYPE: Córdoba, Argentina, *Lorentz* 19, not seen; Tucumán, Argentina, *Lorentz & Hieronymus*, not seen. Having seen neither collection, I am not choosing a type. The description clearly places them. *Doryopteris Lorentzii* f. *interrupta* Rosenst. Hedwigia **46:** 86. 1906. TYPE: Fazenda Soledad, Rio Pardo, Rio Grande do Sul, Brazil, *Juergens & Stier* 128, probably at Stockholm, not seen. *Doryopteris pedata* (L.) Fée var. *Lorentzii* (Hieron.) Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 54. 1928.

Rhizome short, slender to moderately stout, compact: *stipe* usually atropurpureous or blackish, rarely dark red-brown, naked, or scaly at the base, slightly pubescent, especially near the top, to nearly glabrous, usually smooth, occasionally irregularly roughened, *terete* or rarely sulcate on the upper side toward the base: *fertile and sterile blades* moderately dimorphic, without proliferous buds, moderately coriaceous, *with partially areolate venation,* that is, with few to many areolae, mostly along the mid-nerves, *the free veins not especially long nor crowded: sterile* frond 4–18 cm. long; *blade* 1.5–9 cm. long, deltoid, 3-lobed and hastate in small blades to deeply bipinnatifid, *pentagonal, with* numerous, *more or less ascending ultimate segments: ultimate segments* broadly ovate to ovate-lanceolate, *usually acute,* occasionally rounded or subapiculate, *remotely crenate, or crenate* with usually spreading, occasionally ascending teeth; *sinuses usually black and semi-sclerotic;* vein-ends nearly all free; hydathodes present on the upper surface: *fertile* frond 5–35 cm. long; *blade* 2–17 cm. long, deeply bi- or tripinnatifid, *pentagonal, with* numerous, *more or less ascending ultimate segments: ultimate segments* deltoid to long-lanceolate, *usually acute,* rarely subapiculate, *remotely crenate,* at least on the terminal segments of the blade and basal primary segments; *sinuses usually black and semi-sclerotic;* sterile tips short to moderately long, entire or crenate: *soral lines broken by the sinuses.*

Southern Brazil to Córdoba, Argentina, and north to Bolivia and Peru.

Specimens examined: BRAZIL.—SANTA CATHARINA: Blumenau, August, 1911, *Luederwaldt* 1838 (US). RIO GRANDE DO SUL: Rio Pardo, 1906, *Juergens* (Copel., US), May 11, 1906, Juergens "128", certainly not as to type of *D. Juergensii* (NY); São Leopoldo, 1940, *Eugenio* 25 (NY), 1941, *Eugenio* 24 (NY); Ferromecco, 1889, *Kunert* 6 (US). URUGUAY: (U. S. Nat. Herb. no. 690844). PARAGUAY: Pilcomayo river, 1888–1890, *Morong* 170 (NY). ARGENTINA.—MISIONES: San Ignacio, March 3, 1914, *Vattuone & Bianchi* 165 (US); Loreto, July, 1927, *Burkart* 1365 (G). (CORRIENTES): Corrientes, 1854, *E. Palmer* (US). FORMOSA: Monte Guayenlec, 1919, *Jorgensen* 3276 (G). CHACO: Colonia Benítez, October, 1934, *Schulz* 720 (G). (CÓRDOBA): Córdoba, December, 1891, *Kuntze* (NY). SALTA: Salta, July 26, 1940, *Maldonado* 402 (G). TUCUMÁN: Naranjal, Dept. Tafí, July 23, 1923, *Schreiter* 27/2229 (G); Dept. Tafí, February 28, 1921, *Venturi* 182 (US); Dept. Chicligasta, February 16, 1925, *Venturi* 6477 (US). BOLIVIA.—LA PAZ: Yungas, 1885, *Rusby* 112 (NY, US). NOR YUNGAS: December, 1917, *Buchtien* 797 (Copel.); Coroico to Rio Yolasa, December 5, 1935, *Mexia* 7799 (G, US); Polo-Polo, near Coroico, October–November, 1912, *Buchtien* 3397 (G, NY, US). SUR YUNGAS: November 17, 1906, *Buchtien* 473 (US); July, 1933, *Carder* 820 (G); Yrupana, August 18, 1921, *Cárdenas* 2108 (B, NY). PERU: Dist. Santa Ana, January, 1926, *Herrera* 871a (US); Santa Ana, June 25, 1915, *Cook & Gilbert* 1479 (US); Valle de Lares, February, 1928, *Herrera* 1635 (US).

D. Lorentzii differs from *D. Juergensii* in having the segments rounded or acute rather than apiculate, the free veins not especially long and crowded rather than long and crowded, the blade pentagonal rather than diamond-shaped and the segments ascending rather than mostly at right angles to the midnerve. The partially areolate venation separates both of these species from the others in the section.

14. DORYOPTERIS JUERGENSII Rosenst. Festschr. Alb. v. Bamberg, 58. 1905. TYPE and PARATYPE: Rio Grande do Sul, Brazil, *Juergens* 128, 169, probably at Stockholm, not seen. Rosenst. Fil. Brasil. exsicc., *Juergens* 126, labeled "*D. Juergensii* Ros. n. sp. Original", NY, seen. Not having seen the original collections, I have not chosen a type. PLATE 4D.

Rhizome short, slender, compact: *stipe* atropurpureous or blackish, sometimes brown toward the base, naked, or scaly at the base, glabrous, or very slightly pubescent, smooth, *terete or subterete: fertile and sterile blades similar,* without proliferous buds, *relatively thin, with partially areolate venation,* that is, few to many areolae, mostly along the midnerves, the free veins relatively long and crowded: *sterile* frond 11–20 cm. long; *blade* 6–8 cm. long, deeply bi- or tripinnatifid, *diamond-shaped,* rarely pentagonal, with numerous ultimate segments; most of the *segments at right angles to their midvein* and many overlapping: *ultimate segments* deltoid to ovate-lanceolate, *apiculate,* rarely acute, crenate or crenulate with usually spreading, occasionally ascending teeth, sometimes only slightly toothed; *sinuses often black and cartilaginous;* vein-ends nearly all free; hydathodes present on the upper surface: *fertile* frond 15–30 cm. long; *blade* 6–11 cm. long, deeply tripinnatifid, otherwise similar to the sterile: *ultimate segments* deltoid to lanceolate, *usually apiculate,* sometimes acute, entire or slightly crenulate; sterile tips moderately long, entire or shallowly crenate: *soral lines broken by all, or nearly all, of the sinuses.*

Rio Grande do Sul, Brazil.

Specimens examined: Brazil, Rio Grande do Sul: Santa Amaro, 1904, *Juergens* 126 (NY); Serra da Coria, *Juergens* (US).

This species is closely related to *D. Lorentzii* and the differences are discussed under that species.

15. Doryopteris pedata (L.) Fée, Mém. Fam. Foug. **5:** 133. 1850–52. Plate 5A, B; Plate 6B; map 9.

Rhizome short, slender to stout, compact: stipe naked or scaly on the lower part, usually pubescent, especially at the top and on the upper side, rarely glabrate, usually smooth, occasionally irregularly roughened: *fertile and sterile blades moderately dimorphic,* moderately coriaceous: *ultimate segments of the sterile blade crenate or crenulate with spreading teeth,* rarely subentire; the tips similar, except in var. *palmata,* rarely with slightly ascending teeth; vein-ends nearly all free; hydathodes present on the upper surface; the sinuses occasionally rather obscurely black and cartilaginous: *ultimate segments of the fertile blade usually acute,* sometimes rounded or acuminate, usually entire, sometimes crenulate, very rarely remotely crenate toward the tips; *sterile tips usually short,* sometimes moderately long, *usually entire,* rarely crenate or crenulate with erect teeth: *soral lines usually broken by the sinuses,* occasionally continuous around some.

D. pedata is characterized by the completely areolate venation, the sterile blade with spreading teeth on the margin, the hydathodes on the upper surface of the margin of the sterile blade, the free vein-ends in the sterile blade and the rather highly divided fertile blade.

This species contains three elements that have usually been considered to be of specific rank, but due to the fact that intermediates occur and that each can be separated by only a single critical character, although supported by strong tendencies of less important characters, it seems best to treat them as varieties. Each occupies a natural geographic area.

15a. Doryopteris pedata var. **typica.** Plate 5A.

Pteris pedata L. Sp. Pl. **2:** 1075. 1753. Type: Sheet labeled "*Pt. pedata*" in Linnaeus' hand, Herb. Linn., not seen, photo G, US, seen. In 1753 Linnaeus included mention of a Siberian specimen (Hooker, Sp. Fil. **2:** 77. 1858 refers this record to *Cheilanthes argentea*) but all of his references apply to the West Indian plant and his specimen, in the herbarium in 1753, is also the West Indian plant. *Litobrochia pedata* (L.) Presl, Tent. Pterid. 149. 1836. *Cassebeera pedata* (L.) J. Sm. Journ. Bot. **3:** 404. 1841, not as to plant! *Pellaea pedata* (L.) Fée, Mém. Fam. Foug. **5:** 130. 1850–52.

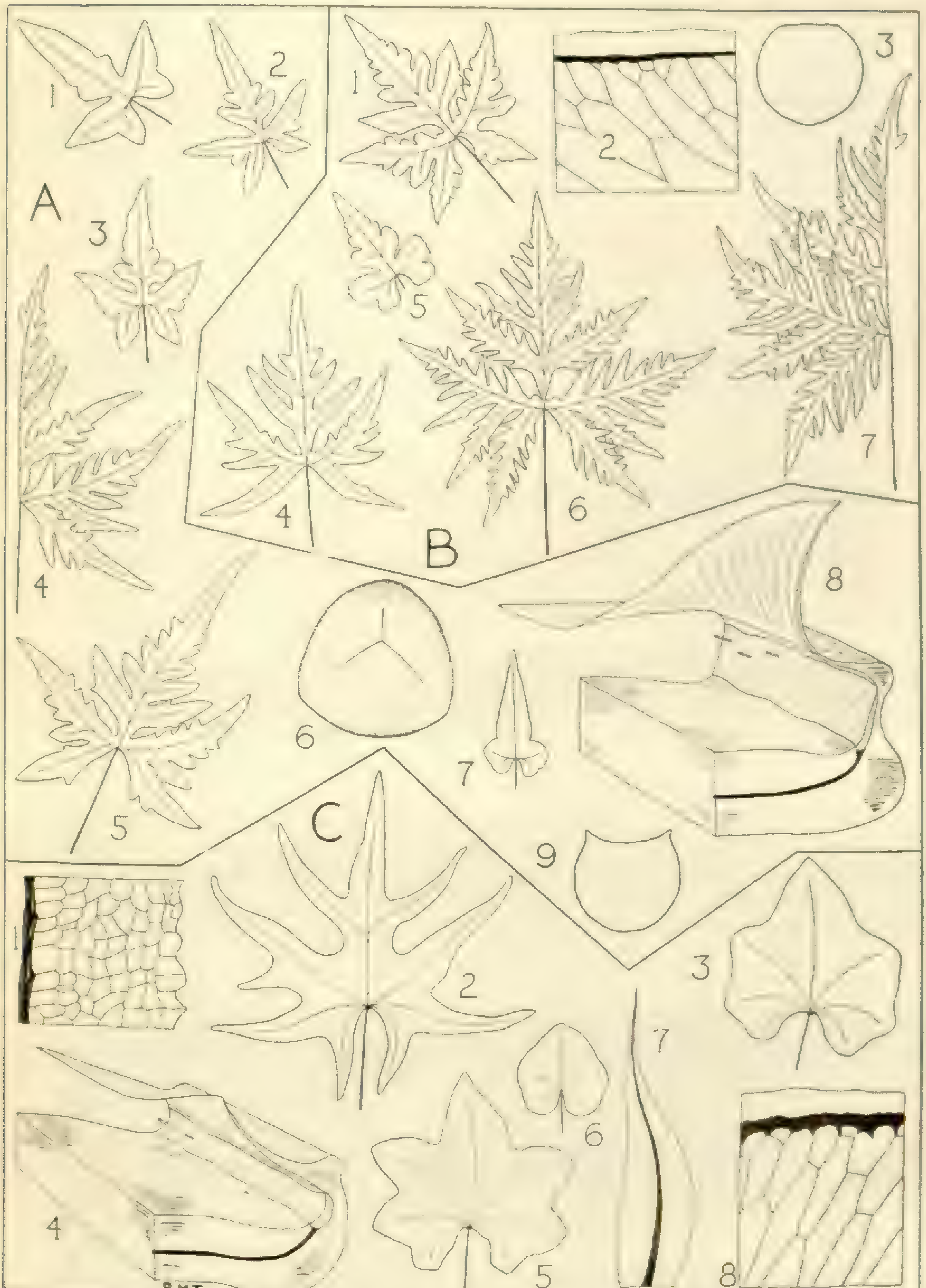
Stipe dark red-brown, atropurpureous or blackish, *usually wing-angled, sometimes sulcate,* at least on part of the upper side: *fertile and sterile blades without proliferous buds: sterile* frond 2–27 cm. long; *blade* 1–10 cm. long, entire, orbicular and cordate in very small blades, or long-deltoid, sagittate or cordate, *3-lobed, the central lobe long, or* moderately deeply lobed to deeply bipinnatifid, long-pentagonal, *with 7 to several ultimate segments, the basal primary segments often much longer than the second pair, the central shank often much longer than the basal primary segments:* ultimate segments broadly ovate to long-deltoid, rounded or acute: *fertile* frond 8–50 cm. long; *blade* 5–21 cm. long, long-pentagonal or pentagonal, rarely deeply 5-lobed, the lateral segments much shorter than the central one and each with a shorter lobe on the lower side, usually deeply bi- or tripinnatifid, *with 7 to numerous ultimate segments, the basal primary segments often much longer than the second pair, the central shank often much longer than the basal primary segments:* ultimate segments deltoid to long-lanceolate or linear-lanceolate.

West Indies, Cuba to Martinique.

Representative specimens: Cuba.—Pinar del Rio: San Diego de los Baños, April 10, 1900, *Palmer & Riley* 507 (G, NY, US), August 31–September 3, 1910, *Britton, Earle & Gager* 6794 (NY, US); Sierra Caliente, August 15, 18, 1912, *Shafer* 13762 (NY, US). Havana: Loma de la Crampa, December 30, 1918, *León* 8534 (NY). Isle of Pines: San Juan, March 15, 17, 1916, *Britton, Britton & Wilson* 15451 (G, NY, US). Santa Clara: Trinidad Mountains, June, 1941, *Howard* 5310 (G); Las Lagunas, Buenos Aires, December 5, 1928, *Jack* 6868 (NY, US); Pitajones, February 28, 1912, *Shafer* 12208 (Copel., NY, US). Camaguey: Sierra Cubitas, February 19–21, 1909, *Shafer* 470 (G, NY, US). Oriente: La Perla, February 6–18, 1911, *Shafer* 8480 (NY, US); above Daiquiri, June 28–29, 1914, *Ekman* 1583 (G, NY); Yateras, May 5, 1907, *Maxon* 4467 (G, NY, US). Jamaica: Gordontown, September, 1906, *A. Moore* (Copel., NY), March 12, 1900, *Clute* 301 (printed 182 and corrected) (G, NY, US); Chestervale, February 7, 1903, *Underwood* 1179 (NY, US); Portland, March 6, 1920, *Maxon & Killip* 797 (G, US). Hispaniola.—Haiti: Vicinity of Furcy, May 26–June 15, 1920, *Leonard* 4780 (G, NY, US); Tortue Island, December 28, 1928 to January 8, 1929, *Leonard & Leonard* 11516 (G, NY, US); Tortue, May 23, 1925, *Ekman* H4103 (NY, US). Dominican Republic: District of Moncion, October 4, 1929, *Valeur* 222 (NY, US); Cotuy, January 28–February 7, 1922, *Abbott* 770 (G, NY, US); Polo, February 26–March 12, 1922, *Abbott* 1868 (G, US). Porto Rico: Cayey, October 16, 1885, *Sintenis* 2193 (G, US); Vieques Island, February 18, 1914, *Shafer* 2949 (NY, US), February 26, 1914, *Shafer* 3041 (NY, US); near Utuado, March 19, 1906, *Britton & Marble* 1086 (NY, US). Saint Thomas: July 18, 1915, *Shoemaker* (NY, US); February 11–22, 1913, *Britton & Marble* 1237 (NY, US); November, 1880, *Eggers* (G); March 1–5, 1913, *Rose* 3190 (NY, US). Antigua: Sugar Loaf Mountains, January 17, 1932, *Box* 226 (US); *Breutel*, "Underwood Herb." (NY). Montserrat: February 6, 1907, *Shafer* 396 (NY, US); *Turner* (U. S. Nat. Herb. no. 428396). Guadeloupe: 1897, *Duss* 4188 (US); 1895, *Duss* 4130 (NY); April 22, 1939, *Questel* 1076 (US); *L'Herminier* (G, US). Martinique: November, 1871, *Hahn* 1299 (G, US); 1884, *Duss* 1552 (NY, US); 1900, *Duss* 4584 (NY, US).

The typical variety differs from var. *palmata* in the lack of proliferous buds and the usually wing-angled stipe. The differences from var. *multipartita* are discussed under that variety.

15b. Doryopteris pedata var. **multipartita** (Fée) n. comb. Plate 5B. *Pteris pedata* γ Raddi, Opusc. Sci. Bologna **3:** 293. 1819; Pl. Brasil. **1:** t. 65, fig. 3. 1825. *Litobrochia Raddiana* Presl, Tent. Pterid. 149. 1836. Based on *Pteris pedata* γ Raddi. *Doryopteris Raddiana* (Presl) Fée, Mém. Fam. Foug. **5:** 133. 1850–52. *Doryopteris Raddiana* var. *multipartita* Fée, Crypt. Vasc. Brésil **1:** 45. 1869. Type: Rio de Janeiro, Brazil, *Glaziou* 1741, probably at Rio de Janeiro, not seen. Isotype: Paris, not seen, photo G, seen. *Pellaea Raddiana* (Presl) Prantl, Engl. Bot.



V. A, Doryopteris pedata var. typica. B, Var. multipartita. C, D. rediviva.

Jahrb. **3:** 419. 1882. *Doryopteris Stierii* Rosenst. Hedwigia **46:** 86. 1906. TYPE: Rio Grande do Sul, Brazil, *Juergens & Stier* 124, probably at Stockholm, not seen. ISOTYPE: NY, seen. *Doryopteris pedata* f. *glaberrima* Rosenst. Hedwigia **46:** 86. 1906. TYPE and PARATYPE: Rio Grande do Sul, Brazil, *Matschinske* 29b, *Juergens & Stier* 26, probably at Stockholm, not seen. *Doryopteris pedata* f. *tomentosa* Rosenst. Hedwigia **46:** 86. 1906; as var. *tomentella* in Luetzelb. Est. Bot. Nordéste **3:** 248. 1923. São Paulo to Rio Grande do Sul, Brazil, seven collections cited, probably at Stockholm, not seen.

Stipe usually atropurpureous or blackish, occasionally dark red-brown, *terete, subterete, or plane* on part of the upper side: *fertile and sterile blades without proliferous buds: sterile* frond 11–28 cm. long; *blade* 4–13 cm. long, pentagonal or long-pentagonal, hastate, deeply lobed, *with 5 ultimate segments, the lateral ones rather short* and each with a lobe on the lower side, *or usually* bi- or tripinnatifid, *with numerous ultimate segments, the basal primary segments usually not much longer than the second pair, the central shank usually not much longer than the basal primary segments:* ultimate segments ovate or deltoid to oblong-lanceolate, rounded or acute: *fertile* frond 14–40 cm. long; *blade* 5–23 cm. long, bi- or usually tripinnatifid, rarely quadripinnatifid, pentagonal or occasionally long-pentagonal, *with numerous ultimate segments, the basal primary segments usually not much longer than the second pair, the central shank not much longer than the basal primary segments:* ultimate segments deltoid to long-lanceolate.

Southern Brazil to Argentina and Bolivia; also in British Guiana and Venezuela.

Representative specimens: VENEZUELA: La Guayra and Caracas, *Kuntze* (NY). BRITISH GUIANA: Takutu river, Kanuku Mountains, March 4–22, 1938, *A. C. Smith* 3295 (NY). BRAZIL.—SÃO PAULO: Iguape, 1923, *Brade* (US); Rio Grande, 1906, *Wacket* (NY); São Vincente, March 8, 1929, *L. B. Smith* 2085 (G, US). PARANÁ: Rio Grande, March, 1905, *Wacket* (Copel., US); Tibagy, May 15, 1934, *Reiss* 21 (G). SANTA CATHARINA: Blumenau, *Handhen* 26 (NY); Lages, August, 1906, *Spannagel* (NY); May, 1902, *W. Riegel* (Copel.). RIO GRANDE DO SUL: Rio Pardo, 1906, *Stier* (Copel., US); São Leopoldo, *Rick* 25 (G); Porto Alegre, September 22, 1892, *Lindman* A281 (G, NY). URUGUAY: (U. S. Nat. Herb. no. 690844). PARAGUAY: *Hassler* 494 (NY); Sud-Paraguay, September, 1892, *Kuntze* (NY); between Rio Apa and Rio Aquidaban, 1908–1909, *Fiebrig* 5226 (G); Caballero, January 20, 1899, *Morong* 170 (NY, US). ARGENTINA.—MISIONES: Loreto, July, 1927, *Burkart* 1539 (G); San Ignacio, February 22, 1914, *Vattuone & Bianchi* 107, 119 (US). FORMOSA: Monte Guayenlec, 1919, *Jorgensen* 3277 (G, US). CHACO: Colonia Benítez, July, 1934, *Schulz* 721 (G). SALTA: Tartagal, February 23, 1937, *West* 8410 (G). TUCUMÁN: Dept. Monteros, September 23, 1929, *Venturi* 9587 (G, US); San Pablo, July, 1913, *Hauman* 213 (G); Monte de Alpachiri, September 12, 1916, *Jorgensen* 1920 (G, US). BOLIVIA: Espia, August 8, 1921, *Rusby* 135 (US); Apolo, February 23, 1902, *R. S. Williams* 1175 (NY); San Juan, March 20, 1902, *R. S. Williams* 1174 (NY, US); Charagua, Oriente, April, 1934, *Cárdenas* 2658 (US).

The stipe, terete or plane on part of the front, separates this variety from var. *typica*, which has the stipe wing-angled or rarely sulcate on the front. Also the blade is usually pentagonal, that is the central shank is not much longer than the basal primary segments, while in var. *typica* the blade is usually long-pentagonal, the central shank being conspicuously long. Var. *multipartita* has the basal primary segments not much longer than the second pair, while in var. *typica* they are conspicuously longer. These distinctions tend to break down in Martinique and Guadeloupe. The differences from var. *palmata* are discussed under that variety.

15c. DORYOPTERIS PEDATA var. PALMATA (Willd.) [incorrectly attributed to J. Sm. by] Hicken, Rev. Mus. de la Plata **15:** 253. 1908. PLATE 6B.

Pteris palmata Willd. Sp. Pl. **5:** 357. 1810. TYPE: Caracas, Venezuela, *Bredemeyer*, Berlin, not seen, photo US, seen, rephoto G, NY, seen. *Doryopteris palmata* (Willd.) J. Sm. Journ. Bot. **4:** 163. 1841. *Litobrochia palmata* (Willd.) Moore, Ind. Fil. 342. 1862. *Pteris pedata* L. var. *palmata* (Willd.) Baker in Martius, Fl. Brasil. **1**^{2}**:** 408. 1870. *Pteris pedata* β *gemmipara* Sodiro, Anal. Univ. Quito **8:** 68. 1893; also Crypt. Vasc. Quiten. 99. 1893. "Rio Guallabamba cerca de 'los Realés'", Ecuador. *Doryopteris pedata* (L.) Fée ssp. *palmata* (Willd.) Hassl. Trab. Mus. Farm. Fac. Cienc. Med. Buenos Aires **21:** 20. 1909, as *Dryopteris*. *Doryopteris Mayoris* Rosenst. Mém. Soc. neuchateloise **5:** 51, t. 2, fig. 2. 1912. TYPE: Medellin, Columbia, *Mayor* 180, probably at Stockholm, not seen. ISOTYPE: US, seen, photo G, NY, seen. "*Doryopteris palmata* var. *argenteo-striata*" Hort. Ind. London. **2:** 524. 1930; Rev. Hort. Belge **31:** 12. 1905.

Stipe castaneous to blackish, *usually plane* on the upper side, at least on the lower half, rarely sulcate or subterete: *fertile and sterile blades with proliferous buds* at the base, very rarely absent on some blades of a plant, the scales similar to those of the frond-buds and stipe: sterile frond 2.5–37 cm. long; blade 1.5–14 cm.

long, deltoid, hastate and shallowly 3-lobed in small blades, or long-pentagonal, rather deeply 5-lobed, the lateral lobes shorter than the central one, or deeply bi- or tripinnatifid, pentagonal, with several ultimate segments: ultimate segments deltoid to ovate-lanceolate, rounded or acute, sometimes rather abruptly so: fertile frond 11–40 cm. long; blade 4–15 cm. long, usually pentagonal, sometimes orbicular or suborbicular, rarely deeply 5-lobed, all of the lobes about the same length, usually deeply bi- or tripinnatifid, with numerous ultimate segments: ultimate segments deltoid to linear: *spores with a whitish rugulose perispore.*

Mexico to Bolivia, Galapagos Islands and Venezuela.

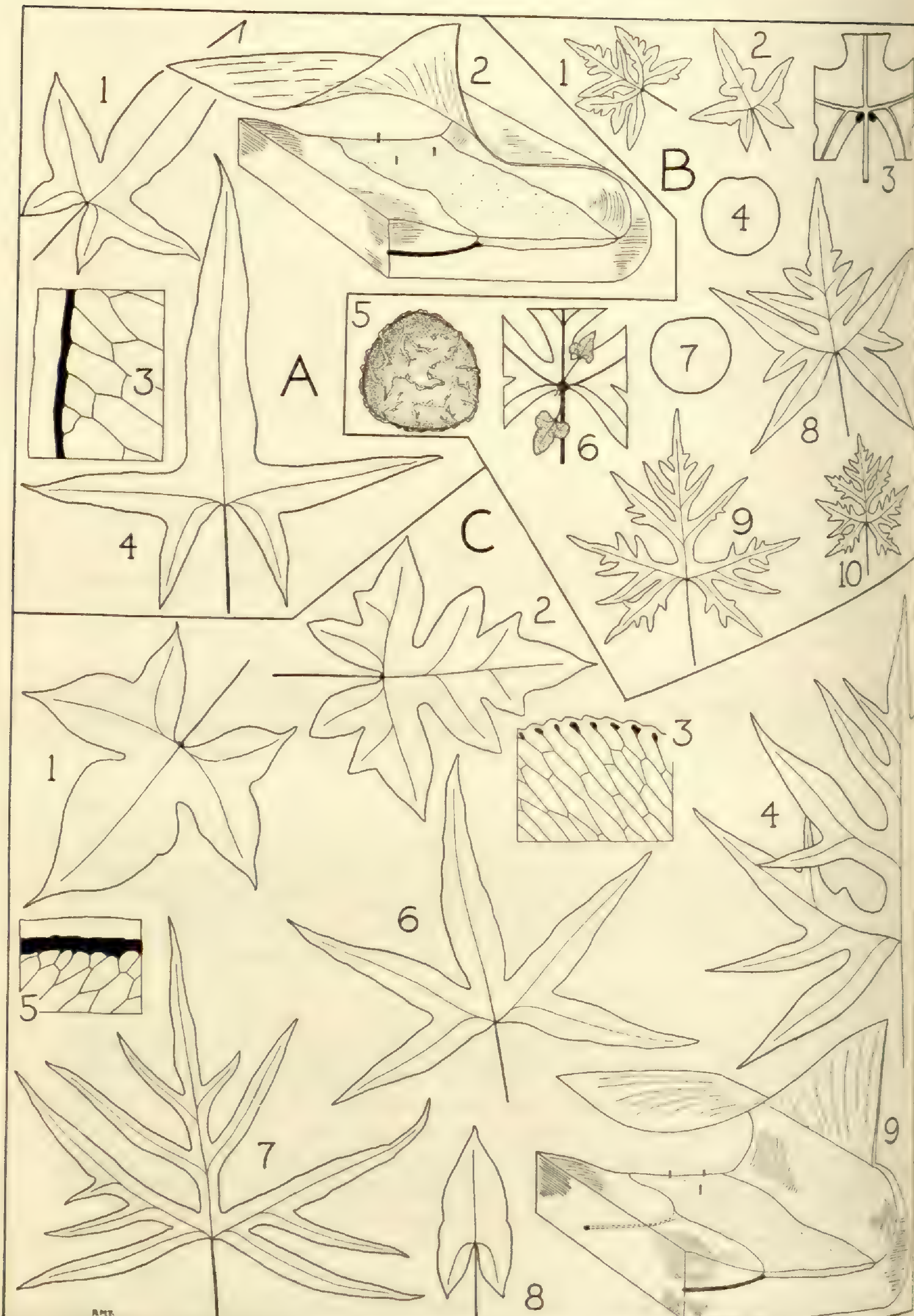
Representative specimens: MEXICO: Cordoba, Vera Cruz, July 26, 1935, *Fisher* 35361 (NY), 1908, *Spence* 24 (G); Potrero Viejo, Vera Cruz, February 27, 1938, *Copeland* (Copel.); Galeana, Guerrero, October 25, 1939, *Hinton* 14723 (G); *Kerber* "Pl. Mexicanae Exsicc. 98" (NY). COSTA RICA: El General, Prov. San José, July, 1936, *Skutch* 2746 (US); *Cooper* (U. S. Nat. Herb. no. 154209); Vicinity of Santiago, east of Cartago, April 20, 1906, *Maxon* 77 (NY, US); Reventazón, Prov. Cartago, April, 1901, *Alfaro* 8066 (G, US); Finca las Cóncavas, Prov. Cartago, December 7–8, 1925, *Standley* 41475 (US). PANAMÁ: Río Cañazas, Prov. Veraguas, February 8, 1937, *Allen* 193 (G, US). COLOMBIA.—NORTE DE SANTANDER: Vicinity of Chinácota, March 18, 1927, *Killip & Smith* 20788 (G, NY, US). SANTANDER: Rio Suratá valley, January 2, 1927. *Killip & Smith* 16357 (G, NY, US); Vicinity of Suratá, January 4–10, 1927, *Killip & Smith* 16808 (G, NY, US). ANTIOQUIA: Bélen, December 24, 1930, *Archer* 1046 (US). VENEZUELA: Near Caracas, December 11, 1921, *Pittier* 9937 (G, NY, US), April 24, 1921, *Pittier* 9473 (NY, US), October, 1924, *Allart* 49 (NY, US); Tovar, 1854–5, *Fendler* 91 (G, US). ECUADOR, GALAPAGOS ISLANDS.—ALBEMARLE: Iguana Cove, March 17, 1905–1906, *Stewart* 1003 (G, US). JAMES: James Bay, January 3, 1905–1906, *Stewart* 1009, 1010 (G, US). INDEFATIGABLE: Academy Bay, April 1, 1930, *Svenson* 69 (B, US). CHARLES: October 9, 1905–1906, *Stewart* 1006 (US). CHATHAM: Wreck Bay, January 27, 1905–1906, *Stewart* 1004 (US). PERU: Torontoy, 1927, *Herrera* 1304 (US); Colpani, Urubamba valley, June 1, 1915, *Cook & Gilbert* 1062 (G, NY, US); Santa Rosa, Urubamba valley, July 9, 1915, *Cook & Gilbert* 1723 (US); Prov. Convención, Dist. Cuzco, January 10, 1940, *Vargas* 1705 (G). BOLIVIA: Espia, August 8, 1921, *Rusby* 135 (NY); Nor Yungas, December, 1917, *Buchtien* 797 (Copel., NY, US); Polo-Polo, near Coroica, Nor Yungas, October–November, 1912, *Buchtien* 3397 (US).

The spores with perispore differ from those of vars. *typica* and *multipartita* which lack a perispore. This variety is also separated from var. *multipartita* by the proliferous buds at the base of the blade. It is usually a smaller plant and has the blade less divided. Two collections of var. *multipartita* from Bolivia, *Cárdenas* 2658 and *Rusby* 135 (US), are very close to var. *palmata* in general aspect. *Rusby* 135 is a mixture, the sheet at NY being var. *palmata*.

The specimens from the Galapagos Islands differ from most of those on the continent in having a usually lighter stipe, a more orbicular, smaller and highly divided blade (PL. 6B, FIG. 10) with the ultimate segments usually crenate. However, this phase also occurs in Mexico, Costa Rica and Peru and the differences are so slight and indefinite that I am not giving it recognition.

16. DORYOPTERIS NOBILIS (Moore) C. Chr. Ind. Fil. 244. 1905; "Hort." ex Regel, Ind. Sem. Hort. Bot. Petrop. **1866**: 77. 1867, in synon.; "J. Sm." Baker, Syn. Fil. Ed. 2, 167. 1874, in synon. PLATE 6C; MAP 8.

Pteris elegans Vell. Fl. Flum. **11**: t. 81. 1827; Arch. Mus. Nac. Rio Janeiro **5**: 451. 1881, not Jacq. 1809 nor Sw. 1817. *Litobrochia grandis* Moore, Proc. Roy. Hort. Soc. **2**: 451. 1862, not Fée, 1857. *Litobrochia nobilis* Moore, Gard. Chron. Oct. **1862**: 932. A renaming and enlarged description of *L. grandis*. AUTHENTIC SPECIMEN: labeled by Moore "*L. nobilis*", G, seen. "**D**[oryopteris] **collina** *J. Sm.; Lowe's Ferns*, 3, *t.* 38. Pteris collina, *Radd. Fil. Bras. t.* 65,—*var.* nobilis, *Moore.*—Tropical America." —Ferns Brit. & Foreign, 195. 1866. A transfer of *L. nobilis* Moore to varietal status under *Doryopteris* or *Pteris collina*, apparently in synonomy. *Pteris nobilis* "h. Veitch" ex Regel, Ind. Sem. Hort. Bot. Petrop. **1866**: 77. 1867, without reference or basinym. *Doryopteris Raddiana* Fée var. *patula* Fée, Crypt. Vasc. Brésil **1**: 45. 1869; **2**: t. 89. 1872–73. TYPE: Rio de Janeiro, Brazil, *Glaziou* 1740, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Pteris pedata* L. var. *palmata* (Willd.) Baker subvar. *elegans* (Vell.) Baker in Martius, Fl. Brasil. **1**^{2}: 408. 1870. *Doryopteris patula* (Fée) Fée, Crypt. Vasc. Brésil **2**: 30. 1872–73. *Pellaea patula* (Fée) Prantl, Engl. Bot. Jahrb. **3**: 419. 1882. *Pteris pedata* var. *Huberi* Christ, Bull. Boiss. **6**: 993. 1898, ex char. TYPE: Serra Baturité, Ceará, Brazil, *Huber*, not seen. *Doryopteris arifolia* Christ in Schwacke, Pl. Nov. Mineiras **2**: 25. 1900. Reference from C. Chr. Ind. Fil., description from Christ, Bull. Boiss. s. 2, **2**: 548. 1902. TYPE: Ferromecco, Rio Grande do Sul, Brazil, *Kunert*, not seen. Prob-



VI. A, DORYOPTERIS HYBRIDA. B, D. PEDATA var. PALMATA. C, D. NOBILIS.

able ISOTYPE: same data, *Kunert* 6, US, seen, photo G, NY, seen. This is a mixed sheet. *Doryopteris elegans* (Vell.) Christ, Bull. Boiss. s. 2, **1:** 429. 1901. *Doryopteris Huberi* Christ, Geogr. Farne, 312. 1912, without reference or basinym. *Pteris patula* (Fée) Lindm. Ark. f. Bot. **1:** 210. 1903. *Doryopteris palmata* (Willd.) J. Sm. var. *elegans* (Vell.) Luetzelb. Est. Bot. Nordéste **3:** 248. 1923. *Doryopteris patula* var. *latesinuata* Rosenst. Fedde Rep. Spec. Nov. **21:** 346. 1925. TYPE: São Paulo, Brazil, *Brade* 7698, probably at Stockholm, not seen. ISOTYPE: G, NY, seen. *Doryopteris palmata* var. *patula* (Fée) [incorrectly attributed to C. Chr. by] Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 53. 1928. *Doryopteris pedata* var. *Huberi* (Christ) Brade, Rodriguesia **4:** 297. 1940.

Rhizome short to moderately long, usually stout, compact: *stipe usually castaneous or red-brown*, rarely atropurpureous or blackish, naked, or rarely scaly at the base, usually nearly glabrous, sometimes pubescent, especially at the top and on the upper side, usually smooth, occasionally irregularly roughened, *plane or sulcate*, at least on part of the upper side, elsewhere terete or subterete: *fertile and sterile blades moderately to quite dimorphic, moderately coriaceous, usually with proliferous buds at the base*, the scales similar to those of the frond-buds but with a lighter central band: *sterile* frond 4–65 cm. long; *blade* 2–27 cm. long, entire, lanceolate or ovate-lanceolate and sagittate, or 3-lobed, deltoid and sagitto-hastate or hastate, the basal lobes rather long, sometimes nearly as long as the central lobe, or deeply lobed to moderately deeply bipinnatifid, pentagonal, with 5 to numerous ultimate segments: *ultimate segments* deltoid-ovate to ovate-lanceolate, *acute or acuminate, usually rather abruptly so*, crenate or crenulate, *usually with ascending*, rarely with spreading *teeth*, very rarely subentire; *tips crenate or crenulate with ascending teeth;* vein-ends nearly all free; hydathodes present on the upper surface: *fertile* frond 15–80 cm. long; *blade* 8–30 cm. long, pentagonal to suborbicular, rather deeply 5-lobed, the lateral lobes ascending and all about the same length or deeply bi- or tripinnatifid, with numerous ultimate segments: *ultimate segments* deltoid to long-lanceolate, acute or acuminate, *entire; sterile tips usually long*, rarely short, usually crenate or crenulate *with ascending teeth*, very rarely entire: *soral lines continuous around the sinuses: spores with a whitish, rugulose perispore.*

Brazil to northern Argentina and Bolivia; also in Colombia.

Representative specimens: COLOMBIA: Masinga Vieja, Santa Marta, August 1898–99, *H. H. Smith* 1085 (G, NY, US); Rio Pedras, Donama, Santa Marta, July, 1936, *Bennett* 61 (US); Armenia, vicinity of Medellin, November 1, 1927, *Toro* 762 (NY).

BRAZIL.—BAHIA: Rio Grongogy Basin, October 1–November 30, 1915, *Curran* 266 (G, US). MINAS GERAES: Caldas, January 22, 1864, *Henschen* 329x (US); May 6, 1845, *Regnell* 329 (US). (RIO DE JANEIRO): 1867–1868, *Webb* 56 (NY); Corcovado, 1891, *Rathburn* (US). SÃO PAULO: Morro das Pedras, 1926, *Brade* 7698 (G, NY); Pilar, October 4, 1902, *Gerdes* 74 (US); Cantareira, May, 1912, *Luederwaldt* (NY). PARANÁ: Ypiranga, March 9, 1935, *Reiss* 129 (G). SANTA CATHARINA: Lages, 1908, *Spannagel* (NY); Joinville, July 9, 1901, *Schmalz* 4 (NY). RIO GRANDE DO SUL: Santa Cruz, March, 1904, *Juergens* (Copel., US); Santo Angelo, January 19, 1893, *Lindman* A1019 (US); Trombudo, 1904, *Matschinske* (NY, US). PARAGUAY: El Chaco, September 13, 1893, *Lindman* A2077 (G, NY); Mbuveno, April 3, 1929, *Jorgensen* 4062 (G, NY, US); Sierra de Maracayú, *Hassler* 4372, 5701 (G); Rio Paraná, 1909–10, *Fiebrig* 5796 (G, US). ARGENTINA.—MISIONES: Loreto, July, 1927, *Burkart* 1355, 1422 (G); San Ignacio, February 22, 1914, *Vattuone & Bianchi* 115 (US); Santa Ana, December, 1912, *Rodriguez* 130 (G). CHACO: General Vedia, January, 1935, *Schulz* 722 (G), September, 1937, *Meyer* 2352 (G). TUCUMÁN: Dept. Monteros, October 17, 1922, *Venturi* 9645 (G, US). BOLIVIA: May, 1911, *Herzog* 2143 (US).

D. nobilis is characterized by the long sterile tips of the fertile segments toothed with ascending teeth and the usual presence of proliferous buds at the base of the blade. It is the largest species of the section, the segments of the sterile blade are usually rather abruptly acute or acuminate and the stipe is usually rather light.

17. × DORYOPTERIS HYBRIDA Brade & Rosenst. Fedde Rep. Spec. Nov. **21:** 346. 1925. TYPE: São Paulo, Brazil, *Brade* 7697, probably at Stockholm, not seen. ISOTYPE: G, NY, seen. PLATE 6A.

Rhizome not seen: *stipe* atropurpureous, naked, glabrous or slightly pubescent, smooth, *terete: fertile and sterile blades slightly dimorphic, without proliferous buds,* moderately coriaceous: sterile frond and blade nearly as large as the fertile; *sterile blade rather deeply lobed, with 5 ultimate segments, the lateral ones long, but shorter than the central lobe, the basal ones reflexed and shorter than the laterals:* ultimate segments deltoid-ovate or ovate-lanceolate, acute or acuminate, sometimes rather abruptly so, usually crenate or crenulate with spreading or ascending teeth, sometimes subentire; *tips crenulate with ascending teeth;* vein-ends mostly free; hydathodes present on the upper surface: *fertile* frond up to 65 cm. long; *blade* 12–35 cm. long, *deeply lobed,* deltoid or pentagonal, hastate, *with 5 ultimate segments, the* *lateral ones long, but shorter than the central lobe, the basal reflexed and shorter than the laterals:* ultimate segments deltoid-ovate to lanceolate, acute or acuminate, entire; *sterile tips long, usually* crenulate *with ascending teeth*, rarely subentire: *soral lines continuous around the sinuses.*

Known definitely only from the type locality, São Paulo, Brazil.

Specimens examined: Sheet labeled "*Pteris Alcyonis* Lindl., Hort. Bot. Lips. 1882" (NY). BRAZIL, SÃO PAULO: Morro das Pedras, September, 1917, *Brade* 7697 (G, NY).

Apparently a hybrid between *D. nobilis* and *D. sagittifolia.* Rosenstock says that Brade found it growing in the neighborhood of the two parent species and immediately considered it to be a hybrid of them.

The cutting of the fertile blade is intermediate between the two presumed parent species. The lateral segments are shorter than the central shank and the basal segments are shorter than the lateral ones. In *D. nobilis* 5-lobed blades have all of the lobes of nearly the same length (PL. 6C, FIG. 6) and in *D. sagittifolia* the rare 5-lobed phase has the lateral segments much shorter than the central shank and the basal lobes much shorter than the lateral ones (PL. 4A, FIG. 5).

18. DORYOPTERIS SAGITTIFOLIA (Raddi) J. Sm. Journ. Bot. **4:** 163. 1841. PLATE 4A; MAP 3.

Pteris sagittifolia Raddi, Opusc. Sci. Bologna **3:** 292. 1841; Pl. Brasil. **1:** t. 63, fig. 1. 1825. Mandioca, Brazil. The plate is taken as the TYPE, though there may be an actual type specimen at Bologna. *Pteris hastata* Raddi, Pl. Brasil. **1:** 43, t. 63, fig. 2. 1825. *Litobrochia sagittifolia* (Raddi) Presl, Tent. Pterid. 148. 1836. *Litobrochia hastata* (Raddi) Presl, Tent. Pterid. 148. 1836. *Doryopteris hastata* (Raddi) J. Sm. Journ. Bot. **4:** 163. 1841. "*Pteris hastifolia* Rddi. var." Kze. Linnaea **23:** 289. 1850, in synon., apparently an error for "*hastata*". *Pteris sagittifolia* var. *sagittata* Hook. Sp. Fil. **2:** 207. 1858. *Pteris sagittifolia* var. *hastata* (Raddi) Hook. Sp. Fil. **2:** 208. 1858. *Pellaea sagittifolia* (Raddi) Prantl, Engl. Bot. Jahrb. **3:** 419. 1882.

Rhizome short, slender to moderately stout, compact: *stipe usually atropurpureous or blackish,* rarely red-brown, naked, or with a few scales at the base, glabrous, or rarely very slightly pubescent, usually smooth, occasionally irregularly roughened, *usually terete or subterete,* occasionally plane or broadly sulcate on the upper side: *fertile and sterile blades similar or slightly dimorphic, without proliferous buds,* moderately coriaceous: *sterile* frond 8–28 cm. long; *blade* 3.5–10 cm. long, *entire, oblong-lanceolate to broadly lanceolate, sagittate or cordate, the basal lobes quite short:* basal lobes rounded, acute or acuminate, sometimes abruptly so; margin of the blade usually entire, occasionally crenate with spreading or ascending teeth, or remotely crenate; vein-ends mostly free; hydathodes present on the upper surface: *fertile* frond 8–43 cm. long; *blade* 4.5–22 cm. long, *usually entire, oblong-lanceolate to long-lanceolate, sagittate, cordate* or occasionally sagitto-hastate, the basal lobes much shorter than the central lobe, or rarely deeply 5-lobed, long-deltoid, hastate, the lateral lobes considerably shorter than the central lobe, the basal lobes much shorter than the laterals: lobes or ultimate segments broadly ovate to long-lanceolate, rounded to acuminate, occasionally abruptly so, entire; sterile tips usually long, entire, or sometimes crenate or crenulate with spreading or ascending teeth: *soral lines continuous along the sides of the blade and around the sinuses, if present.*

Southern Brazil; isolated in Venezuela.

Representative specimens: VENEZUELA: Near Tovar, 1854–5, *Fendler* 366 (G). BRAZIL.—ESPIRITO SANTO: Serra da Caparaó: November 30, 1929, *Mexia* 4054 (G, US). RIO DE JANEIRO: Vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20590 (NY, US); Meio da Serra, April 7, 1929, *Smith & Brade* 2285 (G, US); Corcovado, November 28, 1928, *Smith & Vieira* 1375 (G, NY, US). SÃO PAULO: Toledo, 1904, *Ubricht* (US); Alto da Serra, 1906, *Wacket* (Copel., NY, US); Serra da Cantareira, June, 1913, *Brade* 6517 (NY). PARANÁ: Serra do Mar, Porto de Cima, July 11, 1914, *Dusén* 667a (G); Votha Grande, December 1, 1909, *Dusén* 8629 (G, NY, US). SANTA CATHARINA: Blumenau, April, 1888, *Ule* 138 (US); Joinville, November 29, 1901, *Schmalz* 130 (NY).

D. sagittifolia is easily recognized by the entire, lanceolate and sagittate fertile and sterile blades. The rare 5-lobed phase may be separated from × *D. hybrida* and *D. nobilis* as discussed under the former species. In technical characters it is apparently rather closely related to *D. nobilis*.

19. DORYOPTERIS COLLINA (Raddi) J. Sm. Journ. Bot. **4:** 163. 1841. PLATE 4B; MAP 2.

Pteris collina Raddi, Opusc. Sci. Bologna **3:** 292. 1819. TYPE: Rio de Janeiro, Brazil, *Raddi*, not seen. ISOTYPE: Geneva, not seen, photo G, seen. *Doryopteris euchlora* Kl. Linnaea **20:** 342. 1847, ex char. TYPE: British Guiana, *Schomburgk* 798, not seen. *Pteris euchlora* Kze. ex Kl. Linnaea **20:** 342. 1847, in synon. *Pteris pedata* L. var. *collina* (Raddi) Baker in Martius, Fl. Brasil.

1[2]**:** 407. 1870. *Pellaea collina* (Raddi) Prantl, Engl. Bot. Jahrb. **3:** 419. 1882. *Doryopteris alcicornis* (Prantl) Diels var. *major* Christ, Bull. Boiss. s. 2, **3:** 614. 1903, nomen subnudum. TYPE: Paraguay, *Hassler* 6129, not seen. ISOTYPE: G, seen. *Doryopteris collina* f. *minor* [apparently incorrectly attributed to Rosenst. by] Luetzelb. Est. Bot. Nordéste **3:** 248. 1923, nomen nudum. *Doryopteris collina* f. *pygmaea* Brade, Bol. Mus. Nac. Rio Janeiro **5:** 95. 1929. TYPE: Herb. Mus. Nac. Rio Janeiro, no. 18643, not seen. *Doryopteris Campos-Portoi* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **3:** 3, t. 5, figs. 2–5, t. 6, fig. 6. 1936. TYPE: Ilha Trinidade, Brazil, *Campos Porto* 574, Rio de Janeiro, not seen.

Rhizome short to moderately long, moderately stout, compact: *stipe usually castaneous*, occasionally dark brown, sometimes the upper fourth atropurpureous or blackish, naked, or scaly on the lower part, pubescent, especially on the upper side, to nearly glabrous, usually smooth, occasionally slightly roughened by small longitudinal grooves, *wing-angled on the upper side, at least on the upper half or fourth: fertile and sterile blades moderately dimorphic*, without proliferous buds, coriaceous: *sterile* frond 3–23 cm. long; *blade* 0.7–6.5 cm. long, pentagonal or long-pentagonal, deeply 5-lobed, usually hastate, the lateral lobes shorter than the central one, or deeply bipinnatifid, with several ultimate segments: *ultimate segments* oblong-ovate to oblong-lanceolate, rounded or subacute, *entire; vein-ends mostly joined to mostly free; hydathodes not present on the upper surface:* fertile frond 6–45 cm. long; blade 2–15 cm. long, deeply bi- or tripinnatifid, usually pentagonal, sometimes suborbicular, rarely orbicular, with several to numerous ultimate segments: ultimate segments oblong-ovate to oblong-lanceolate, rarely linear, entire; sterile tips short, entire: *soral lines continuous around the sinuses.*

Brazil to Paraguay; also British Guiana and Ilha Trinidade (20 S. Lat., 29 W. Long.).

Representative specimens: BRITISH GUIANA: Mount Iramaikpang, Kanuku Mountains, April 22, 1938, *A. C. Smith* 3655 (G, US). BRAZIL.—PARAHYBA: Serra do Patos, *Luetzelburg* 18926 (NY). BAHIA: Monte Cruzeiro, June 24, 25, 1915, *Rose & Russell* 20045 (US). MINAS GERAES: Bello Horizonte, July 10, 1940, *Foster & Foster* 593 (US); Paraisopolis, April 21, 1927 *Hoehne* (NY). RIO DE JANEIRO: Nitheroy, December 25, 1901, *Dusén* 152 (G, NY, US); Maricá, August 7, 1915, *Rose & Russell* 20740 (NY, US); Corcovado, July, 1915, *Rose & Russell* 21258 (NY, US); Mt. Itatiaya, December 31, 1928, *L. B. Smith* 1589 (G, NY, US), July 26–30, 1915, *Rose & Russell* 21491 (US); Itatiaya, June 4, 1913, *Brade* 6494 (NY); Vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20431 (NY, US). SÃO PAULO: Ilha das Alcatrazes, October, 1920, *Luederwaldt* (NY). PARA-

GUAY: Cerros de Tobaty, Cordillera centralis, September, 1900, *Hassler* 6129 (G); Armenia, January 16, 1900, *Anisits* 1938 (US).

D. collina is a distinctive species characterized by the wing-angled, castaneous or dark brown stipe and the absence of hydathodes on the upper surface of the sterile blade.

20. DORYOPTERIS VARIANS (Raddi) J. Sm. Journ. Bot. **4:** 163. 1841. PLATE 8A; MAP 4.

Pteris varians Raddi, Opusc. Sci. Bologna **3:** 292. 1819; Pl. Brasil. **1:** t. 64. 1825. Corcovado, Rio de Janeiro, Brazil. The plate is taken as the TYPE. *Pteris hederacea* Presl, Delic. Prag. **1:** 181. 1822. TYPE: Rio de Janeiro, Brazil, probably at Prague, not seen, probable fragment, "*Pteris hederacea* Presl, Rio Janeiro, *Pohl*, ex Presl", NY, seen. *Litobrochia varians* (Raddi) Presl, Tent. Pterid. 149. 1836. *Litobrochia hederacea* (Presl) Presl, Tent. Pterid. 149. 1836. *Pteris pedata* L. var. *hederacea* (Presl) Baker in Martius, Fl. Brasil. **1**[2]**:** 408. 1870. *Pellaea hederacea* (Presl) Prantl, Engl. Bot. Jahrb. **3:** 419. 1882. *Doryopteris hederacea* (Presl) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 270. 1899. *Doryopteris varians* f. *pluriloba* [apparently incorrectly attributed to Rosenst. by] Luetzelb. Est. Bot. Nordéste **3:** 248. 1923, nomen nudum. *Doryopteris Branneri* Copel. Phil. Journ. Sci. **38:** 148, t. 4. 1929. TYPE: Brazil, 1874, *Branner*, Herb. Copeland, seen. Sheet with same data, presumably an ISOTYPE, US, seen, photo G, NY, seen.

Rhizome short, moderately stout, compact: *stipe black*, naked, or scaly on the lower part, pubescent, especially at the top, to glabrous, usually slightly roughened by small longitudinal grooves, occasionally nearly smooth, *terete: fertile and sterile blades moderately to quite dimorphic*, without proliferous buds, coriaceous: *sterile* frond 3.5–14 cm. long; *blade* 1–4.5 cm. long, entire, orbicular and cordate in small blades to usually shallowly or moderately deeply lobed, pentagonal or long-pentagonal, with 5 to rarely 7 ultimate segments, usually hastate, the lateral segments slightly shorter than the terminal one: *ultimate segments* broadly deltoid to oblong-ovate, usually rounded, sometimes subacute, *entire; vein-ends nearly all joined; hydathodes not present on the upper surface:* fertile frond 10–40 cm. long; blade 4–16 cm. long, shallowly lobed to deeply tripinnatifid, pentagonal, with 5 to numerous ultimate segments: ultimate segments usually deltoid, sometimes lanceolate, rarely linear, rounded or subacute, entire; sterile tips short or nearly absent, entire: *soral lines continuous around the sinuses.*

Southern Brazil and British Guiana.

Specimens examined: BRITISH GUIANA: Kanuku Mountains, March 4–22, 1938, *A. C. Smith* 3296 (G, US). BRAZIL.—1874, *Branner* (Copel. Herb. no. 230; U. S. Nat. Herb. no. 517444). MINAS GERAES: Ouro Preto, 1907, *Damazio* 1816 (NY). RIO DE JANEIRO: Near Rio de Janeiro, 1876, *James* (G); Tijuca, November, 1928, *Brade* 8564 (NY); Corcovado, July, 1915, *Rose & Russell* 21252 (NY, US), July, 1915, *Rose & Russell* 21258 (NY); Nova Cintra, July, 1887, *Ule* 254 (US), 1891, *Rathburn* (US); Federal District, March 23, 1929, *L. B. Smith* 2135 (G); Petropolis, 1928, *Brade* (NY); vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20431, 20606 (NY, US); Itamaraty, Organ Mountains, 1911, *Luetzelburg* 267 (NY, US); *Pohl* (NY).

The black, terete stipe separates this species from *D. collina*. The absence of hydathodes on the upper surface of the sterile blade distinguishes it from the other species of the section.

21. DORYOPTERIS REDIVIVA Fée, Crypt. Vasc. Brésil **2:** 30, t. 89, fig. 1. 1872–73. Chosen over *D. angularis* Fée because of the better plate. TYPE: Tijuca, Rio de Janeiro, Brazil, *Glaziou* 5341, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. PLATE 5C.

Pteris palmata Willd. var. *lata* Hook. Gard. Ferns, t. 22 and text. 1862. *Pteris pedata* L. var. *palmata* (Willd.) Baker subvar. *lata* (Hook.) Baker in Martius, Fl. Brasil. **1**[2]**:** 408. 1870. *Doryopteris angularis* Fée, Crypt. Vasc. Brésil **2:** 29, t. 88, fig. 2. 1872–73. TYPE: Rio de Janeiro, Brazil, *Glaziou* 5340, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Doryopteris varians* (Raddi) J. Sm. var. *rediviva* (Fée) Luetzelb. Est. Bot. Nordéste **3:** 249. 1923. *Doryopteris varians* var. *angularis* (Fée) Luetzelb. Est. Bot. Nordéste **3:** 249. 1923.

Rhizome short, moderately stout, compact: *stipe black*, naked, or scaly at the base, glabrous or rarely very slightly pubescent, slightly roughened by small longitudinal grooves, *terete: fertile and sterile blades palmately divided*, or large fertile blades divided in a pedate manner, *usually quite dimorphic, with proliferous buds at the base*, the scales similar to those of the frond-buds and stipe, rarely without buds, coriaceous: *sterile* frond 3–17 cm. long; *blade* 0.5–6 cm. long, *entire*, orbicular and cordate *to shallowly 5–7 lobed: lobes* broadly deltoid, rounded, *entire; vein-ends mostly joined to about half free; hydathodes present on the upper surface:* fertile frond 9–40 cm. long; blade 4–15 cm. long, moderately deeply lobed to rarely deeply bipinnatifid, pentagonal to suborbicular, with 5 to several ultimate segments: ultimate segments deltoid to long-lanceolate, rounded or subacute, entire; sterile tips short and entire, or absent: *soral lines continuous around the sinuses: spores with a whitish rugulose perispore.*

Southern Brazil.

Specimens examined: BRAZIL.—*Riedel* (G); (U. S. Nat. Herb. no. 61624). RIO DE JANEIRO: Vicinity of Rio de Janeiro, 1864–70, *Monroe* (G); Tijuca, *Brade* 8597 (NY); Therezopolis, September, 1929, *Brade* 9484 (NY); Serra da Estrella, April 5, 1910, *Luetzelburg* 18924 (Copel., NY); Organ Mountains, 1910, *Luetzelburg* 12916 (Copel.). SÃO PAULO: Alto da Serra, 1902, *Wacket* (NY); Serra do Mar, 1909, *Wacket* 45 (NY), June, 1914, *Brade* 7583 (NY), 1908, *Wacket* (US).

D. rediviva is characterized by the black, terete stipe, the palmately veined blades (except in very large fertile ones) with hydathodes on the upper surface of the sterile, the proliferous buds and the spores with perispore.

III. MISCELLANEOUS SPECIES

The scales of *D. Kitchingii*, *D. ludens* and *D. cordifolia* have a semi-sclerotic, not sclerotic, central band and this character excludes them from sections *Lytoneuron* and *Eudoryopteris*. All three are apparently rather highly derived and their relationships are not clear. They do not form a natural group by themselves.

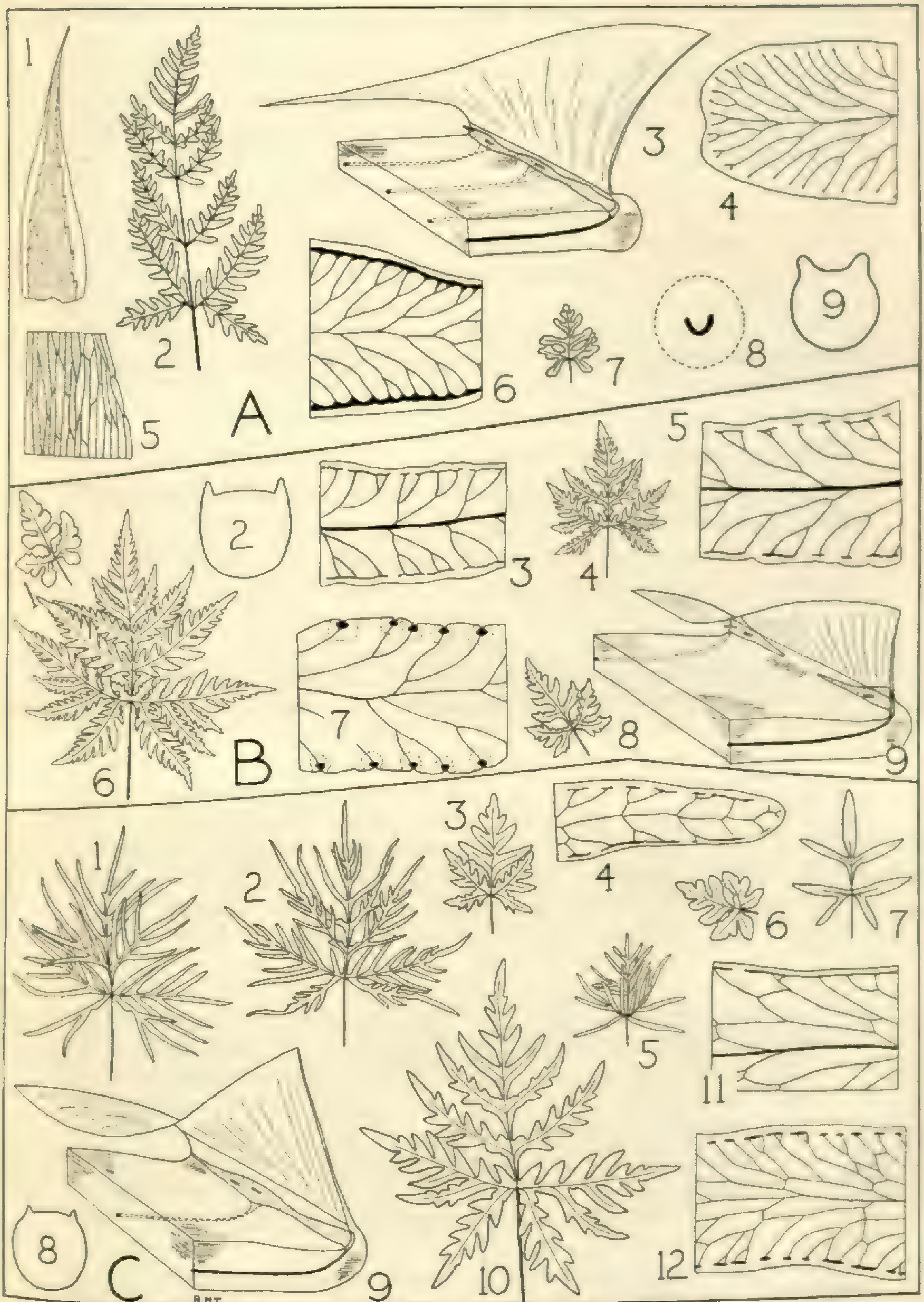
D. concolor has the scales of *Eudoryopteris* but it is free-veined. Also in var. *typica* the vascular commissure is only moderately developed and in var. *Kirkii* the soral condition is that of *Cheilanthes.*

D. decora would fit the characters of *Eudoryopteris* but it is placed here with *D. concolor* because it is undoubtedly closely related to that species and because it likewise has only a moderately developed vascular commissure.

Further study in related genera may clear up the relations of these five species and may indicate that one or more should be placed in another genus.

22. DORYOPTERIS CONCOLOR (Langsd. & Fisch.) Kuhn in v. d. Decken, Reisen in Ost-Afrika **3**^{3}**:** 19. 1879. PLATE 7B; MAP 12.

Rhizome moderately short, small to stout, compact: *scales of the frond-buds and stipe as in section Eudoryopteris: stipe reddish brown to black*, sometimes scaly, especially toward the base, glabrous or with a few short brown hairs, especially on the upper side, smooth or slightly irregularly roughened, *usually wing-angled, sometimes sulcate*, on the upper side, becoming plane or terete toward the base, with one U-shaped vascular bundle at the base: *fertile and sterile blades similar*, without proliferous buds, relatively thin to moderately coriaceous, *with free venation:*



VII. A, Doryopteris Kitchingii. B, D. concolor; figs. 1–6, 8–9, var. typica; fig. 7, var. Kirkii. C, D. decora; figs. 1, 4, 5, 7, 9, 11, 12, var. typica; figs. 3, 6, 8, 10, var. decipiens.

sterile frond 4–15 cm. long; *blade* 2–5 cm. long, pentagonal or long-pentagonal, bi- to tripinnatifid, with numerous ultimate segments: ultimate segments deltoid, oblong or oblong-ovate, acute to broadly rounded, entire or shallowly crenate; *margin with* a whitish or brown cartilaginous border; *vein-ends all free; hydathodes present on the upper surface:* fertile frond 5–34 cm. long; blade 3–15 cm. long, bi- to usually tripinnatifid, or rarely pinnate-bipinnatifid, pentagonal to suborbicular, with numerous ultimate segments: ultimate segments deltoid to long-lanceolate, usually acute or acuminate, occasionally rounded, usually entire, occasionally crenulate; sterile tips usually short, entire or slightly crenulate, with a whitish or brown cartilaginous border: *soral lines usually broken by the sinuses:* sporangia very rarely short-stalked: spores yellow, exospore smooth, with a very poorly to moderately well developed, whitish, rugulose perispore.

This species is distinguished by the free venation, the wing-angled or sulcate stipe, the pedate blades and the hydathodes on the upper surface of the margin of the sterile blade.

22a. Doryopteris concolor var. **typica.** *Pteris concolor* Langsd. & Fisch. Ic. Fil. 19, t. 21. 1810. Type: "Archipelagi Marquesas; insula Nucahiva", not seen. Isotype: in herb. Brit. Mus. acc. to Baker, Fl. Brasil. **1**^{2}**:** 396. 1870, not seen. *Pteris geraniifolia* Raddi, Opusc. Sci. Bologna **3:** 293. 1819; Pl. Brasil. t. 67. 1825. *Pteris Pohliana* Presl, Delic. Prag. **1:** 181. 1822. = *P. geraniifolia* acc. to Presl, Tent. Pterid. 145. 1836. *Pteris laciniata* Vell. Fl. Flum. **11:** t. 89. 1827, not Sw. *Pteris mysurensis* Heyne ex Wall. List no. 87. 1828, nomen nudum. Type: India, Herb. Heyne, Brit. Mus., not seen. Isotype: US, seen, photo, G, NY, seen. *Doryopteris geraniifolia* (Raddi) Kl. Linnaea **20:** 343. 1847. *Pellaea geraniifolia* (Raddi) Fée, Mém. Fam. Foug. **5:** 130. 1850–52. *Platyloma geraniifolia* (Raddi) Lowe, Ferns **3:** t. 27. 1857. *Pellaea concolor* (Langsd. & Fisch.) Baker in Martius, Fl. Brasil. **1**^{2}**:** 396. 1870. *Cheilanthes Pohliana* (Presl) Keys. Polypod. Cyath. Hb. Bung. 25. 1873. *Allosorus concolor* (Langsd. & Fisch.) O. Ktze. Rev. Gen. **2:** 806. 1891. *Doryopteris cuspidata* Copel. Phil. Journ. Sci. **38:** 148. 1929. Type: Mindanao, Philippine Islands, *Reillo*, Herb. Phil. Bur. Sci. no. 16515 in Herb. Copel., seen. *Doryopteris baturitensis* Brade, Rodriguesia **4:** 297, t. 1. 1940. Type: Serra de Baturité, Ceará, Brazil, *Eugenio* 40, Rio de Janeiro, not seen.

Sporangia contiguous at maturity, covered by a more or less continuous indusium; receptacle expanded laterally, often connecting several vein-ends.

Central America, West Indies, South America, Africa, India, China, Malaysia, Australia and Oceania.

Representative specimens:

CENTRAL AMERICA, EL SALVADOR: Izalco, July, 1923, *Calderón* 1713, 1714 (US).

WEST INDIES.—JAMAICA: Old Hope Copper Mine, *Hart* 94 (US); Gordontown, September, 1906, *A. Moore* (NY). GUADELOUPE: *Duss* (U. S. Nat. Herb. no. 524215). MARTINIQUE: *Duss* 1544 (NY). GRENADA: (NY).

SOUTH AMERICA.—COLOMBIA: Santa Marta, September, 1898–1901, *H. H. Smith* 1086 (G, NY, US); Tolima, *Lehmann* 6055 (US). BONAIRE (D. W. I.): *Boldingh* 7321 (NY). VENEZUELA: Between Caracas and La Guaira, October, 1916, *Rose* 21726 (G, NY, US); Curucutí (Federal District), February 20, 1920, *Pittier* 10220 (US). BRAZIL.—PARÁ: Pará (NY). PERNAMBUCO: Tápera, July 7, 1932, *Pickel* 39 (US). MINAS GERAES: Viçosa, November 3, 1930, *Mexia* 5246 (G, NY, US); Corinto, April 1, 1931, *Mexia* 5511 (G, US). RIO DE JANEIRO: Near Rio de Janeiro, October, 1887, *Ule* 358 (US); Monte de Cochrane, November 25, 1928, *L. B. Smith* 1334 (G). SÃO PAULO: Rio Grande, February, 1905, *Wacket* (Copel., NY, US); Loreno, June, 1926, *Sampaio* 16058 (NY). RIO GRANDE DO SUL: Rio Pardo, 1906, *Juergens* 10 (NY); Neu-Wurttemburg, March 20, 1904, *Bornmüller* 119 (G). URUGUAY: *Arechavaleta* 46 (US); Artigas, July 28, 1934, *Herter* 94701 (G). PARAGUAY: Cordillera do Altos, July 8, 1902, *Fiebrig* 12 (G, US); 1931, *Jorgensen* 4058 (NY, US). ARGENTINA.—MISIONES: Posadas, November 18, 1907, *Ekman* 25 (NY); Loreto, July 26, 1931, *Moreau* (G). FORMOSA: Monte Guayenlec, *Jorgensen* 3276 (US). CHACO: Colonia Benítez, 1935, *Schulz* 720a (G); Napalpi, December, 1934, *Donat* 11 (G). SALTA: Dept. Orán, October 28, 1938, *Eyerdam & Beetle* 22711 (G); Cerro del Bemate, February 22, 1928, *Venturi* 5870 (US). TUCUMÁN: Rio Sali, Capital, February 7, 1921, *Venturi* 229 (US); Dept. Tafí, April 14, 1928, *Venturi* 6115 (US). BOLIVIA: Buena Vista, Santa Cruz, February 13, 1921, *Steinbach* 5288 (G, NY); near Asela, April 7, 1902, *R. S. Williams* 1173 (NY, US). PERU: Santa Ana, June 27, 1915, *Cook & Gilbert* 1553 (US); Prov. La Convención, Dept. Cuzco, May 12, 1936, *Mexia* 8053 (Copel., G, US). ECUADOR: James Island, Galapagos Islands, April 18, 1941, *Schmitt* 19 (G, US).

AFRICA: Natal, *Wood* (U. S. Nat. Herb. no. 1095675).

ASIA. INDIA: Pulney Hills, Madras, *Sauliere* 787 (US). CEYLON: *Hancock* 28 (US); *Ferguson* 41 (G). CHINA, HAINAN: December, 1878, *Hancock* 23 (G, US); Fan Yah, 1932–33, *Chun & Tsao* 44084 (G, NY). FORMOSA: September, 1906, *Nakahara* (US).

MALAYSIA. PHILIPPINE ISLANDS: Twin Peaks, Benguet, Northern Luzon, September 8, 1904, *R. S. Williams* 1503 (NY, US); Luzon, *Cuming* 260 (G); Lutab, Benguet, Luzon, May, 1909, Copel. Pterid. Phil. Exsicc. 115 (Copel., NY, US). JAVA: 1898, *Raciborski* (US). TIMOR: 1882–3, *Forbes* 3837 (G). PAPUA (BRITISH NEW GUINEA): Rouna, May 26, 1935, *Carr* 12340 (NY); Rona, Laloki river, Central Division, April, 1933, *Brass* 3669 (NY).

AUSTRALIA: Mowbray river, North Queensland, January 22, 1932, *Brass* 1998 (US); Mount Julian, North Queensland, *Michael* 886 (G).

OCEANIA.—NEW CALEDONIA: *Franc* 357 (B, Copel., NY, US). NEW HEBRIDES: Wala, March, 1929, *Herre* 2 (NY). FIJI ISLANDS: Viti Levu, 1927, *Parks* 20487 (Copel., G, US); Levuka, Fiji, 1898, *Prince* (G, US). SAMOA: *Whitmee* 57 (G); Upolu, July 30, 1926, *Parks* 16425 (US). SOCIETY ISLANDS: Tevaitapu, Borabora, January 3, 1931, *Grant* 4926 (NY, US); Tahiti, May 21, 1922, *Setchell & Parks* 27 (G, US); Papeete, Tahiti, October, 1909, *Leland, Chase & Tilden* 68 (G, NY, US).

22b. DORYOPTERIS CONCOLOR var. KIRKII (Hook.) Fries, Wiss. Ergebn. Schwed. Rhodesia-Kongo Exp. **1**[1]: 4. 1914.

Cheilanthes Kirkii Hook. Second Cent. Ferns, t. 81. 1861. TYPE: Zambesi, Africa, *Kirk*, Kew, not seen, photo G, seen.

Sporangia discrete at maturity, sori discrete, covered by an indusial flap; receptacle fan-shaped.

Africa to India and Ceylon.

Representative specimens: AFRICA.—CAMEROON: 1897, *Zenker* 1459 (NY). UNION OF SOUTH AFRICA.—CAPE OF GOOD HOPE: King Williamstown, March, 1892, *Sim* 1578 (G); Cape Town (U. S. Nat. Herb. no. 61611). NATAL: Mapumulo, *Abraham* 4 (G, NY, US); Howick, February 18, 1895, *Schlechter* 6785 (NY, US). TRANSVAAL: Barberton, January, 1911, *Thorncroft* 115 (US); Pelindaba, Pretoria District, *Bottomley* 2071 (US). RHODESIA: Kafui, December 1, 1919, *Shantz* 451 (US). TANGANYIKA (GERMAN EAST AFRICA): Kilimanjaro, May, 1906, *Daubenberger* (Copel., US). UGANDA: Albert Nyanza, December 26, 1909, *Mearns* 2512 (US); Entebbe Road, October, 1931, *Hansford* 2295 (US). KENYA (BRITISH EAST AFRICA): Southeast of Narak, July 12, 1923, *Curtis* 737 (G); Loita Plains, July 12, 1923, *Curtis* 744a (G).

MADAGASCAR: Sambuano, 1925 (U. S. Nat. Herb. no. 1507508).

INDIA: Southern Hindustan, *Noyes* (U. S. Nat. Herb. no. 299616); Shevaroy Mountains, 1897–8, *Furrell* (US); Palni Hills, *Noyes* (G). CEYLON: *Beckett* 184 (G); *Thwaites* (G).

This is a remarkable variety differing from the typical in characters that would ordinarily be of generic importance. However, the two varieties are similar in all other characters and intermediate conditions occur. In soral characters var. *Kirkii* is a *Cheilanthes*.

23. DORYOPTERIS DECORA Brack. U. S. Expl. Exp. **16:** 103, t. 13, fig. 1. 1854. TYPE: Hawaii, *Brackenridge*, U. S. Nat. Herb. no. 61616, seen, photo G, seen. ISOTYPE: NY, seen. PLATE 7C.

Rhizome short, usually stout, compact, or very compact and the stipes tufted: *scales of the frond-buds and stipe as in section Eudoryopteris: stipe dark castaneous to blackish*, usually naked, sometimes slightly scaly at the base, usually glabrous, occasionally very slightly pubescent, *smooth, wing-angled* on the upper side, with one U- or V-shaped vascular bundle at the base: *fertile and sterile blades* slightly to moderately dimorphic, without proliferous buds, relatively thin to moderately coriaceous, usually *with areolate venation*, sometimes with partially areolate venation, that is, with areolae only along the midnerves, sometimes the venation free toward the tips of the segments: *sterile* frond 3–16 cm. long; *blade* 1–7.5 cm. long, deeply lobed to bipinnatifid, deltoid to suborbicular, with 3 to several ultimate segments: ultimate segments oblong-ovate to strap-shaped, rounded or subacute, remotely crenate, or crenate with spreading or ascending teeth, sometimes subentire; *margin* with a whitish or brown cartilaginous border; *vein-ends nearly all free; hydathodes present on the upper surface;* fertile frond 3–45 cm. long; blade 2–16 cm. long, deeply bi- or quadripinnatifid to bipinnate-pinnatifid, ovate-lanceolate to orbicular, with several to numerous ultimate segments: ultimate segments deltoid to linear, rounded to acute, usually crenulate, sometimes entire: *soral lines broken by the sinuses:* spores yellow, exospore smooth, with a poorly developed whitish, rugulose perispore.

The important characters of this species are the wing-angled stipe and the highly divided, usually rather thin, fertile blade. The venation is often only partially areolate and the vascular commissure is often discontinuous.

23a. DORYOPTERIS DECORA var. **typica.** *Pteris decora* (Brack.) Hook. Sp. Fil. **2:** 210. 1858. *Litobrochia decora* (Brack.) Moore, Ind. Fil. 342. 1862.

Sterile blade pentagonal to suborbicular, the basal primary segments not lobed on the upper side: ultimate segments oblong-ovate to strap-shaped: fertile blade pedately divided, rarely tending to be pinnately divided, pinnate-pinnatifid to usually bipinnate-pinnatifid, ovate-lanceolate to orbicular, the basal pinnae larger than the second pair, sometimes only slightly so, lobed on the upper side with the basal lobes usually as long as those on the lower side, sometimes considerably shorter: ultimate segments narrowly oblong to usually linear.

Hawaiian Islands.

Representative specimens: HAWAIIAN ISLANDS.—KAUAI: August 6, 1895, *Heller* 2654 (G, NY, US); Kaholuamanoa, September 2–9, 1895, *Heller* 1990 (G, NY); October 18, 1916, *Hitchcock* 15227 (US); Olokele canyon, August 10, 1924, *Topping* 2807 (NY). MOLOKAI: Kamalo gulch, June 29, 1928, *Degener* 9196 (NY). LANAI: *Hillebrand* (U. S. Nat. Herb. no. 816897). MAUI: Lahaina, December, 1887, *Safford* 882 (US); *E. Bailey* (B, NY). HAWAII: Hoopuloa, September, 1929, *Degener* 9197 (G, NY, US); August 2, 1911, *Forbes* 390H (NY); *Mann & Brigham* 253 (G, US).

The typical variety differs from var. *decipiens* in the pinnate rather than deeply pinnatifid fertile blade with the basal pinnae usually equally lobed on the upper and lower sides rather than strongly unequally lobed and the usually linear rather than oblong or deltoid ultimate segments.

23b. DORYOPTERIS DECORA var. **decipiens** (Hook.) n. comb.

Pteris decipiens Hook. Sp. Fil. **2:** 209. 1858. TYPE: Oahu, Sandwich Islands, *Seemann*, Kew, not seen, photo *Seemann* 2240, G, seen. *Pteris Beecheyana* Hook. Sp. Fil. **2:** 209. 1858, in synon. *Litobrochia decipiens* (Hook.) Moore, Ind. Fil. 342. 1862. Reference and basinym not given but they can be traced through "*Doryopteris pedata*, Brack." *Doryopteris decipiens* (Hook.) J. Sm. Hist. Fil. 289. 1875.

Sterile blade deltoid to pentagonal, the basal primary segments sometimes lobed on the upper side: ultimate segments broadly ovate to narrowly oblong: fertile blade pedately divided, usually deeply tripinnatifid, occasionally bi- or quadripinnatifid, long-pentagonal to suborbicular, the basal primary segments larger than the second pair, usually lobed on the upper side with the basal lobes much shorter than those on the lower side: ultimate segments deltoid to narrowly oblong or oblong-lanceolate.

Hawaiian Islands.

Representative specimens: HAWAIIAN ISLANDS.—KAUAI: Nawiliwili, January 8, 1940, *Degener* 12673 (NY, US). OAHU: Honolulu, October 28, 1922, *Degener* 4159 (NY); Nuuanu, March 23, 1895, *Heller* 1990 (B, G, NY, US); Niu valley, June 4, 1932, *Topping* 3529 (NY, US); *Mann & Brigham* 136 (G, US); Kuliouau valley, June 23, 1935, *Degener, Park & Topping* 9928 (G, NY, US). MOLOKAI: Pohakunui gulch, May 6, 1928, *Degener* 9194 (G, NY, US); Waiahewahewa gulch, April 18, 1928, *Degener & Wiebke* 3587 (NY). LANAI: September 22, 1916, *Hitchcock* 14698 (US). MAUI: *Remy* 38 (G); *E. Bailey* (NY); Near Haiku, August 5, 1927, *Wiebke & Topping* 3589 (NY, US).

This variety differs from *D. concolor* essentially only by the areolate venation and it seems undoubtedly to represent a development from that species.

Although conventionally maintained as a species, var. *decipiens* differs from var. *typica* only in characters of leaf-cutting and the two extremes are connected by frequent intermediates. Such intermediate specimens are: KAUAI: June 13, 1926, *Degener* 9198 (NY). OAHU: Kolekole Pass, May 1, 1932, *Degener* 9193 (NY, US); Waianae Range, April 12, 1932, *Yuncker* 3479 (US); Holpo Crater, February 15, 1910, *Forbes* 1452.0 (NY); Nuuanu valley, December, 1887, *Safford* 863 (US). MOLOKAI: Wawaia, June 27, 1928, *Degener* 9195 (NY).

24. DORYOPTERIS KITCHINGII (Baker) Bonap. ex C. Chr. Ind. Fil. Suppl. Prél. 13. 1917. PLATE 7A.

Pellaea Kitchingii Baker, Journ. Bot. **1880:** 327. TYPE: Madagascar, *Kitching*, Kew, not seen, photo G, seen. *Allosorus Kitchingii* (Baker) O. Ktze. Rev. Gen. **2:** 806. 1891.

Rhizome relatively long, moderately stout, *creeping: scales* of the frond-buds and stipe *ovate-lanceolate, attenuate, entirely tawny and hyaline, or* usually *with a* red-brown or *dark* red-brown, *semi-sclerotic central band and relatively broad, tawny, hyaline margins,* usually entire, sometimes obscurely toothed; *the cells of the hyaline parts relatively long, mostly three or more times as long as broad: stipe castaneous to dark castaneous,* usually naked, sometimes slightly scaly at the base and with a few fibrils at the top and base, glabrous, smooth, *channeled or deeply sulcate* on the upper side, with one U-shaped vascular bundle at the base: *fertile and sterile blades elongate-pedately divided,* tending to be pinnate, basal pinnae larger than the second pair, with the inner lobe on the lower side the longest, the basal lobes on the upper side much shorter than those on the lower side, *slightly dimorphic,* without proliferous buds, *coriaceous, with free venations: sterile* frond 14–18 cm. long; *blade* 3–5 cm. long, pinnate-pinnatifid to pinnate-bipinnatifid, deltoid to long-deltoid, with numerous ultimate segments: ultimate segments oblong-ovate to narrowly oblong, rounded, usually shallowly and remotely crenate, sometimes entire; *margin with* a whitish or brown cartilaginous border; *vein-ends free; hydathodes not present on the upper surface:* fertile frond 21–45 cm. long; blade 4–12 cm. long, pinnate-bipinnatifid to bipinnate-pinnatifid, deltoid to ovate-lanceolate: ultimate segments oblong-ovate to narrowly oblong, rounded, entire; sterile tips very short or absent: *soral lines broken by the sinuses:* spores yellow, exospore smooth or minutely roughened, without a perispore.

Endemic to Madagascar.

Specimens examined: MADAGASCAR: April, 1881, *Hildebrandt* 4163 (F, US); November 25, 1912, *Viguier & Humbert* 1598 (F).

This species is quite distinct by reason of the channeled stipe, free venation, elongate-pedate blade and absence of hydathodes on the upper surface of the sterile blade.

25. DORYOPTERIS LUDENS (Wall. ex Hook.) J. Sm. Hist. Fil. 289. 1875. PLATE 8B; MAP 11.

Pteris ludens Wall. List no. 88. 1828, nomen nudum; ex Hook. Sp. Fil. **2:** 210. 1858. TYPE: India, *Wallich* 88, Kew, not seen, photo G, seen. *Doryopteris Wallichii* J. Sm. Journ. Bot. **3:** 404; **4:** 163. 1841, nomen nudum. TYPE: Philippine Islands, *Cuming* 238, Kew, not seen. ISOTYPE: G, seen. *Litobrochia Smithii* Moore, Ind. Fil. 342. 1862, nomen nudum. Based on *D. Wallichii* J. Sm. *Litobrochia ludens* (Wall. ex Hook.) Bedd. Ferns Brit. India, t. 27. 1865. *Pellaea ludens* (Wall. ex Hook.) Prantl, Engl. Bot. Jahrb. **3:** 419. 1882. *Doryopteris papuana* Copel. Phil. Journ. Sci. Bot. **6:** 86. 1911. TYPE: Goodenough Bay, Papua, *King* 208, Herb. Copeland, seen.

Rhizome slender, elongate, *extensively creeping: scales* of the frond-buds and stipe *ovate-lanceolate to long-lanceolate, acuminate or attenuate, entirely red-brown or blackish and semi-sclerotic, or usually with a red-brown to blackish, semi-sclerotic central band and narrow to moderately broad, brown or light brown, hyaline margins, usually remotely and rather coarsely toothed; the cells of the hyaline parts relatively long, mostly three or more times as long as broad: stipe usually atropurpureous or black*, rarely dark brown, *usually scaly with fibrils*, rarely nearly naked, pubescent with moderately long, brown hairs, occasionally nearly glabrous, usually slightly roughened with small longitudinal grooves, sometimes smooth, *terete*, with one V-shaped vascular bundle at the base that is often flat or square on the bottom: *fertile and sterile blades typically divided in a pedate manner, usually quite dimorphic*, relatively thin to moderately coriaceous, *with areolate venation: sterile* frond 4–45 cm. long; *blade* 2–15 cm. long, quite variable, entire, ovate-lanceolate and sagittate, the basal lobes quite short, or shallowly to moderately deeply lobed, ovate-lanceolate to long-pentagonal, with 5 ultimate segments, often hastate, the lateral segments much shorter than the terminal one, or bipinnatifid, pentagonal, with several ultimate segments: ultimate segments broadly ovate to lanceolate, usually acuminate, often abruptly so, occasionally acute or rounded, usually entire, occasionally rather irregularly crenate or crenulate; *margin with* a whitish or brown cartilaginous border; *vein-ends nearly all free; hydathodes present on the upper surface:* fertile frond 20–65 cm. long; blade 9–20 cm. long, long-pentagonal, pentagonal or suborbicular, deeply lobed, with 5 ultimate segments, the lateral segments much shorter than the terminal one, or deeply bi- or tripinnatifid, with numerous ultimate segments: ultimate segments deltoid-ovate to long-lanceolate, rounded, acute or acuminate, crenulate or entire; sterile tips usually long, entire or slightly crenate, with a whitish or brown cartilaginous border: *soral lines usually continuous around all of the sinuses*, rarely broken by the sinuses of some of the primary segments: *spores brown, exospore smooth, with a brown, rather coarsely rugose perispore.*

Burma, India and Yunnan, China to Java, Philippine Islands and Papua.

Representative specimens:

ASIA.—INDIA: Maymyo, Burma, October, 1915, *J. F. Smith* 89 (G). CHINA: Yuan-Ching, Yunnan, December 28, *Henry* 13325 (NY, US). FRENCH INDO-CHINA: Prov. Lang-Son, January, 1926, *Colani* 3450 (NY, US); Cochinchina, 186–, *Pierre* 5790 (Copel.). SIAM: Lad Bua Kao, near Korat, November 22, 1920, *Rock* 503 (US). FEDERATED MALAY STATES: Bukit Lagi, Perlis, November 16, 1929, *Corner & Henderson* 22815 (US).

MALAYSIA.—JAVA: Tenggor Mountains, Pogal, 1906, *Maupet* (US), 1909, *Maupet* (Copel., G); Pogal, February, 1910, *Moussel* 188 (G), July, 1909, *Mousset* 188 (US). PHILIPPINE ISLANDS, LUZON.—ILOCOS NORTE: Mount Nagapatan, August, 1918, *Ramos* 33245 (US). BENGUET: Twin Peaks, March 12, 1908, *Bartsch* 219 (US), September 8, 1904, *R. S. Williams* 1501 (NY, US), May, 1904, *Elmer* 6349 (NY, US). PANGASINAN: Mount San Isidro, Labrador, November, 1917, *Fénix* 30032 (NY, US); Umingan, April–June, 1914, *Otanes* 17677 (US). NUEVA ECIJA: Mount Umingan, August–September, 1916, *Ramos & Edano* 26293 (US). RIZAL: Montalban, December 1, 1907, *Topping* 857 (G, US); Wawa, August 13, 1908, *Topping* 1014 (G, US); Bosoboso, July, 1906, *Ramos* 1078 (Copel., NY, US). PAPUA (BRITISH NEW GUINEA): Near Rouna Falls, May 27, 1935, *Carr* 12372 (NY); Goodenough Bay, 1908, *King* 208 (Copel.); *King* 388 (Copel.).

As the name implies, this species is extremely variable in leaf-form. The slender, elongate rhizome separates it from all other areolate-veined species. The spores are characteristic. Its local distribution is apparently well correlated with calcareous rocks.

26. Doryopteris cordifolia (Baker) Diels in Engl. & Prantl, Nat. Pfl. 1^4: 270. 1899. Plate 8C.

Pteris cordifolia Baker, Journ. Bot. **1891:** 4. Type: Bé Kilus Mountains, Madagascar, *J. T. Last*, Kew, not seen, photo G, seen.

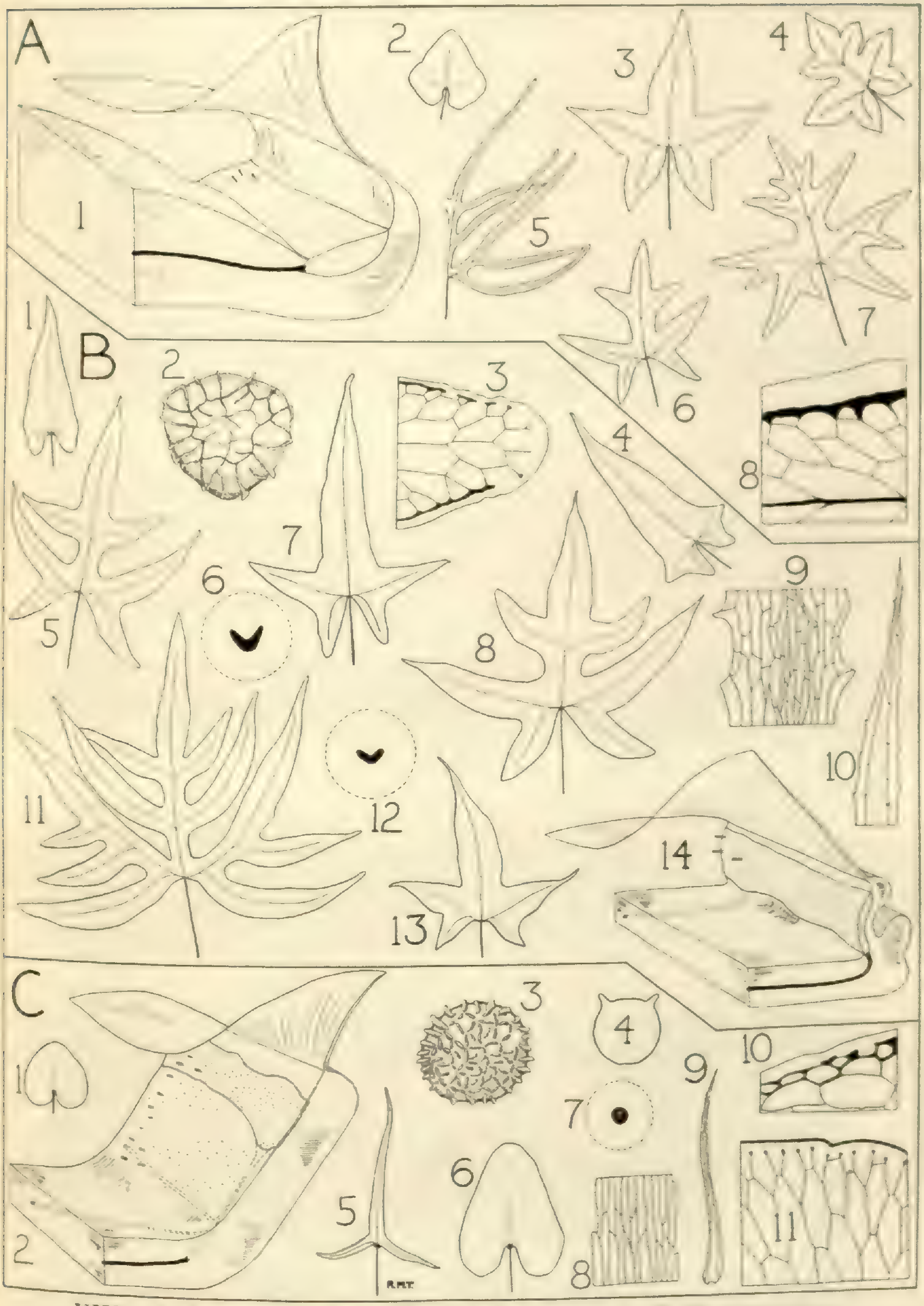
Rhizome short, slender, compact: *scales* of the frond-buds and stipe *lanceolate to long-lanceolate, subattenuate, entirely red-brown and semi-sclerotic, or usually with a* red-brown to blackish, *semi-sclerotic central band and very narrow, light brown, hyaline margins; the cells of the hyaline parts relatively long, three or more times as long as broad: stipe* castaneous to atropurpureous, naked, or with scales and fibrils, especially on the lower part, *pubescent* with short to moderately long, brown hairs (especially toward the top and on the upper side) to nearly glabrous, smooth, *deeply sulcate* on the upper side, *with one terete vascular bundle* at the base: *fertile and sterile blades completely dimorphic, usually with proliferous buds at the base,* the scales similar to those of the frond-buds and stipe, *relatively thin, with areolate venation: sterile* frond 2.5–25 cm. long; *blade* 1.2–13 cm. long, entire, orbicular to oblong-ovate, cordate; tip broadly rounded or acute; basal lobes rounded; *margin* entire, *with a red-brown to black, sclerotic border; vein-ends nearly all free; hydathodes present on the upper surface:* fertile frond 18–37 cm. long; blade 4–12 cm. long, deltoid, deeply 3-lobed, hastate, or the lateral lobes slightly reflexed: ultimate segments long-lanceolate to linear, acute or acuminate, entire; sterile tips moderately long, entire, with a whitish or brown cartilaginous border: *soral lines continuous around the sinuses: spores yellow, exospore with small but definite short ridges, without a perispore.*

Endemic to Madagascar.

Specimens examined: Madagascar: Massif du Beampingaratra (Sud-Est), Vallée de la Maloto, October 31–November 1, 1928, *Humbert* 6258 (G, US).

The deeply sulcate stipe with a single terete vascular bundle, the thin, entire sterile blade with proliferous buds and a dark, sclerotic border, the 3-lobed fertile blade and the characteristic spores set this species off as unique. It is apparently a very highly derived type. The soral condition is subacrostichoid. Receptacular xylem is distributed, somewhat irregularly, along the outer areolae and the sporangia are borne throughout the soriferous band thus formed, both in relation to the xylem and on the leaf-tissue. This condition, incidentally, is almost identical with that of *Acrostichum praestantissimum* as figured by Bower.[1]

[1] Bower, The Ferns **3**: 58, figs. 621, 622. 1928.



VIII. A, Doryopteris varians. B, D. ludens. C, D. cordifolia.

Doubtful Species

The following may be good *Doryopteris* species but having seen no material I cannot properly place them in the genus. The original diagnosis is quoted for each species.

× Doryopteris Duvalii Bellair, Rev. Hort. **1897:** 563, fig. 168.

"Bien qu'il existe un nombre assez important d'hybrides dans le genre *Pteris*, nous n'en connaissions encore aucun se rapportant à la section des *Doryopteris*.

La plante dont nous donnons une photographie comble cette lacune; elle a pris naissance chez M. Duval, l'horticulteur versaillais, et, dans son faciès, on reconnait facilement ses deux parents: le *Doryopteris* ou *Pteris sagittifolia* et le *Doryopteris* ou *Pteris palmata*.

Le *Doryopteris Duvalii* est une Fougère élégante et touffue, haute de 25 à 30 centimètres, dont les feuilles initiales, au nombre de 5 à 8, sont toutes sagittées à la facon de celles du premier parent (*D. sagittifolia*). Les feuilles adultes, chez lesquelles la longueur (15 à 20 centimètres) excède toujours la largeur (12 à 15 centimètres) sont multilobées, avec des sinus un peu moins profondes, des lobes moins nombreux, plus larges et un tissu d'une contexture plus épaisse que chez les frondes du *D. palmata*."

This is a horticultural form, proposed as a hybrid between *D. palmata* and *D. sagittifolia*, but the description and figure are not sufficiently diagnostic to place it with certainty.

Doryopteris latiloba C. Chr. Arch. Bot. (Caen) 2 Bull. mens. 213. 1928. Type: Madagascar, *Humbert* 3195, Herb. C. Christensen, not seen.

"Rhizomate repente, circa 2 mm. crasso, paleis brunneis lanceolatis dense vestito. Stipitibus 8–10 cm. longis, atropurpureis, nitidis, glabris, versus basin squamis nonnullis anguste lanceolatis, deciduis praeditis. Lamina cordata, trilobata, 3–6 cm. longa et lata vel minori, chartacea, glaberrima, infra pallida. Segmentis basalibus 1.5–3 cm. longis 1–1.5 cm. latis apice rotundatis, margine anteriore fere recto, inferiore lobo basali (raro binis) rotundato praedito; segmento terminali interdum libero sed saepe cum basalibus confluentibus profunde tri- vel quinque-lobato, lobis apice rotundatis. Costis medianis laminae et loborum atropurpureis, supra immersis. Venis immersis vix visibilibus, libris curvatim ascendentibus, 3–4-dichotomis, intra marginem desinentibus. Marginibus foliorum sterilium leviter crenatis tenuibus, fertilium ubique soriferis, soris angustissimis, indusiis membranaceis, pallidis, integris."

The long, creeping rhizome, the pinnate large blades and the winged rachis indicate that this may be, as Christensen suggests,[1] a dwarf form of *D. Kitchingii*.

DORYOPTERIS PEDATOIDES (Desv.) Kuhn in v. d. Decken, Reisen in Ost-Afrika **3**[3]**:** 63. 1879.

Pteris pedatoides Desv. Mém. Soc. Linn. Paris **6**[2]**:** 293, t. 7, fig. 2. 1827. TYPE: Isle Bourbon, Paris, not seen, photo G, seen.

"Frondibus trilobatis: lobis sinuato-lobatis; nervibus in lobos evanescentibus; frond. fertilibus in lobos pinnatifidis: laciniis lanceolatis, sinubus acutis; stipite tereti, nitido, discolore (atrato) apici subpulverulento."

C. E. Bewsher (U. S. Nat. Herb. no. 816949), without locality, is probably this species.

DUBIOUS AND REJECTED NAMES

I am unable to place the following names. They are either improperly published, or based on a mixture of material, or are insufficiently described.

Doryopteris cordifolia J. Sm. Journ. Bot. **4:** 163. 1841, nomen nudum.

Pteris polytoma Kze. Linnaea **23:** 289, 322. 1850. Hort. no specimen cited; description not sufficiently detailed to place it. Hook. Sp. Fil. **2:** 208, places it under *Pteris pedata*.

Doryopteris praealta Fée, Mém. Fam. Foug. **5:** 133. 1850–52, nomen nudum.

Doryopteris trifoliata Bory ex Fée, Mém. Fam. Foug. **5:** 133. 1850–52, nomen nudum.

Pteris palmata Willd. var. *angustiloba* Hook. Gard. Ferns, text for t. 22. 1862. No type cited; this is a mixture.

Doryopteris Alcyonis Linden "ex Regel," Ind. Sem. Hort. Bot. Petrop. Suppl. **1864:** 10. 1865, nomen nudum. *Pteris Alcyonis* Linden "ex Regel", Ind. Sem. Hort. Bot. Petrop. **1865:** 30. 1866, nomen nudum. "*Pteris Alcyonis* Lind. p. c. (Lind. cat.—Pt. sagittifolia Raddi β. hastata Hook. Sp. Fil. II. p. 208.—Doryopteris Hort." Regel, Ind. Sem. Hort. Bot. Petrop. **1866:** 20. 1867, nomen nudum. "**D**[oryopteris] **sagittifolia,** *J. Sm.;* . . . Pteris sagittifolia, *Radd.* . . . Litobrochia sagittifolia,—*var.* alcyonis, *Gard. Chron.* 1863.—Brazil" J. Sm. Ferns Brit. & Foreign, 195. 1866, nomen nudum. *Litobrochia Alcyonis* (Linden "ex Regel") [incorrectly attributed to Presl by] Salom. Nom. Gefässkr. 217. 1883, as *Lithobrochia*, nomen nudum. As

[1] Christensen. The Pteridophyta of Madagascar. Dansk Bot. Ark. 7: 118. 1932.

far as I have been able to determine, the epithet *Alcyonis* has never been validly published. Linden might have done so but I have been unable to consult any of his catalogues of the proper years. A sheet of × *D. hybrida* labeled "*Pteris Alcyonis* Lindl. Hort. Bot. Lips. 1882" suggests that it may represent that species.

Pellaea hederacea (Presl) Prantl var. *anisoloba* Kze. ex Prantl, Engl. Bot. Jahrb. **3:** 429. 1882. No type cited; differs from Prantl's *P. hederacea* in the pubescent stipe but his species is such a mixture that the variety cannot be identified.

"*Pteris decipiens* Hook. β P. Var. *intermedia*" E. Bailey, Haw. Ferns 27. 1883.

Doryopteris Borbonica Christ, Denkschr. Ak. Wien **79:** 34. 1907, nomen nudum.

Excluded Species

The following species have been referred to *Doryopteris* or *Cassebeera* (an illegitimate name) and I am excluding them from *Doryopteris*. The species described under *Cassebeera* are included because that genus has often been considered to be closely related to the free-veined species of *Doryopteris*. In connection with *Cassebeera* I also discuss some closely related species.

Several species here referred to *Pellaea* may not belong there but until that genus is worked out it seems the best place to put them.

The species are arranged alphabetically under the name to be excluded. The basinym, if any, is given, the accepted name, if different from the basinym, and in some cases the name under another genus that might possibly be revived for the species. The accepted name is indicated by small capitals. The basis upon which I exclude the species is given, except in such a well-known case as *Cheilanthes argentea*.

The quotations are from Mr. C. A. Weatherby's notes on the type specimens.

I. Species referred to Cassebeera and some closely related Species.

The following species are apparently closely related and approach *Doryopteris* in having a fairly well developed vascular commissure. In *Pellaea pinnata* it is nearly always continuous.

However, they are alike in four characters which, I think, naturally exclude them from *Doryopteris* and indicate that at the present time they can best be referred to *Pellaea*. These are: the deeply channeled stipe, rachis and costae of the pinnae, at least the stalk; the imparipinnate blade; the pinnate type of division of the blade with equilaterally, if at all, divided lower pinnae, or with subinequilaterally divided lower pinnae, but *not* approaching a pedate condition; and the brown, shallowly pitted spores with a whitish, rugulose perispore.

Cassebeera Kaulf. is illegitimate (see synonymy under *Doryopteris*) and the correct name for the genus, if maintained, is *Bakeropteris* O. Ktze.

1. *Cassebeera gleichenioides* Gardn. ex Hook. Ic. Pl. t. 507. 1843. TYPE: Diamond District, Brazil, *Gardner* 5295, Kew, not seen, photo G, seen. *Ormopteris gleichenioides* (Gardn. ex Hook.) J. Sm. Hist. Fil. 281. 1875. *Bakeropteris gleichenioides* (Gardn. ex Hook.) O. Ktze. Rev. Gen. **2:** 808. 1891. PELLAEA GLEICHENIOIDES (Gardn. ex Hook.) Christ, Bull. Boiss. s. 2, **2:** 545. 1902. PLATE 3E, FIGS. 12, 13.

Scales very long and narrow, usually entirely tawny, sometimes with a sclerotic, atropurpureous or blackish central band. Stipe, rachis and costae of pinnae channeled. Blade imparipinnate. Pinnae deeply pinnatifid, or once pinnate, the lower ones sometimes equilaterally bipinnate. Receptacle formed by the fan-shaped vein-ends that are usually expanded laterally to form a commissure between two to all of the vein-ends in a lobe. Sporangia short-stalked. Spores brown, slightly pitted, with a whitish, rugulose perispore.

2. *Cassebeera pinnata* Kaulf. Enum. Fil. 217, t. 1, fig. 11. 1824. *Cassebeera petiolata* Fée, Mém. Fam. Foug. **7:** 30, t. 12, fig. 4. 1857, as *Cassebeeria*. On the basis of *Gardner* 3556 (US), one frond of which matches Fée's plate, I follow Baker, Fl. Brasil. 1^2: 394. 1870, in reducing this to *C. pinnata*. PELLAEA PINNATA (Kaulf.) Prantl, Engl. Bot. Jahrb. **3:** 418, 1882. PLATE 3E, FIG. 8. *Bakeropteris pinnata* (Kaulf.) O. Ktze. Rev. Gen. **2:** 808. 1891. *Bakeropteris petiolata* (Fée) O. Ktze. Rev. Gen. **2:** 808. 1891.

Scales very long and narrow, usually entirely reddish-tawny, rarely with a sclerotic, atropurpureous central band. Stipe, rachis and stalks of pinnae channeled. Blade imparipinnate. Pinnae pinnatifid, the lower ones sometimes equilaterally pinnate-pinnatifid. Receptacle a vascular commissure that unites all, or nearly all, of the vein-ends in a lobe. Sporangia long-stalked. Spores brown, shallowly pitted, with a whitish, rugulose perispore.

3. Pellaea Riedelii Baker, Ann. Bot. **5:** 213. 1891. Type: Central Brazil, *Riedel*, Kew, not seen. Plate 3E, fig. 9.

Riedel, G, apparently is an isotype and the following description is drawn from it.

Scales very long and narrow, entirely reddish-tawny. Stipe, rachis and costae of pinnae channeled. Blade imparipinnate. Pinnae entire or usually equilaterally pinnate. Receptacle fan-shaped, narrow, or expanded laterally, sometimes so that a commissure is formed connecting two to several vein-ends. Sporangia medium to long-stalked. Spores brown, slightly pitted, with a whitish, rugulose perispore.

Note: *Pellaea Bongardiana* Baker in Martius, Fl. Brasil. 1^2: 397, t. 55, fig. 2. 1870.

Pellaea brasiliensis Baker, Engl. Bot. Jahrb. **17:** 522. 1893. Type: *Glaziou* 20158, not seen. Isotype: Copenhagen, not seen, photo G, seen.

These two species are apparently very closely related to, if not synonymous with, *P. Riedelii.* They differ from the other species discussed, as does *P. Riedelii*, in the fully bipinnate blade and narrowly oblong to shortly linear, entire segments.

4. Pellaea **crenata** n. sp. Plate 3E, figs. 1–7.

Rhizomate brevi, crasso: paleis lanceolato-ovatis vel longe lanceolatis, attenuatis, atro-ferrugineo-brunneis vel nigris, duris, margine membranaceo, fulvo: stipitibus rhachibusque valde castaneis, glabris, profunde canaliculatis: lamina imparipinnata, glabra, coriacea; venis libris; pinnis pinnulisque non-articulatis: fronde sterili 4–15 cm. longa; lamina 2–6 cm. longa, pinnata, ovata; pinnis anguste oblongibus vel linearibus, leviter remoteque crenatis: fronde fertili 15–32 cm. longa; lamina 7–11 cm. longa, pinnata vel basi bipinnata, ovata vel deltoideo-ovata; segmentis anguste oblongibus vel linearibus, leviter remoteque crenatis vel plerumque integris: soris submarginalibus, maturitate contiguis: indusio aliquando lato, membranaceo, continuo vel regulariter ad crenationes majores interruptis, margine integro: sporangio longe pedicellato.

Rhizome short, moderately stout, compact: scales of the frond-buds lanceolate-ovate to long-lanceolate, attenuate, with a dark red-brown to blackish, sclerotic central band and tawny, hyaline margins, entire or sparingly toothed; cells of the hyaline margins mostly two or more times as long as broad: stipe and rachis dark castaneous, naked, or the stipe with a few scales at the base, glabrous, deeply channeled on the upper side, the stipe with one U- or V-shaped vascular bundle at the base: fertile and sterile blade pinnately divided, imparipinnate, similar, glabrous, coriaceous, with free venation; stalks of the pinnae deeply channeled on the upper side; pinnae and pinnules nonarticulate; basal pinnae subinequilaterally divided in well developed blades: sterile frond 4–15 cm. long; blade 2–6 cm. long, once pinnate, ovate, with 2–5 pinnae; pinnae narrowly oblong to linear, subacute, shallowly and remotely crenate; hydathodes not present at the margin on the upper surface: fertile frond 15–32 cm. long; blade 7–11 cm. long, once pinnate or usually bipinnate at the base, ovate to deltoid-ovate, with up to 12 pinnae; basal pinnae undivided or usually once pinnate, with 1–3 pinnules on the lower side only, or in larger fronds, with 1–2 slightly shorter pinnules on the upper side: segments narrowly oblong to linear, acute, shallowly and remotely crenate or mostly entire; margin, strongly revolute: sori contiguous at maturity, the sporangia forming a more or less continuous submarginal line, sometimes regularly broken by the crenations: indusium moderately broad, continuous with the soral lines, membranous, entire: receptacle fan-shaped or roundish, often expanded laterally, sometimes connecting two vein-ends, occasionally several: sporangia long-stalked: spores tetrahedral-globose, brown, slightly pitted, with a whitish, rugulose perispore.

TYPE: Cerro do Cipo, 1400 m., Vaccaria north of Bello Horizonte, Minas Geraes, Brazil, July 12, 13, 1940, *Foster & Foster* 624 (US). ISOTYPE: (G).

Pellaea crenata is apparently most closely related to the species listed above, especially to *P. pinnata* and *P. Riedelii*. It differs from *P. gleichenioides*, *P. pinnata* and *P. Riedelii* in its relatively short and broad scales with a well developed, dark, sclerotic central band; and from *P. gleichenioides* also in its long-stalked sporangia. The cutting of the blade is also different and the species are compared in this character as follows.

In *P. Riedelii*, *P. Bongardiana* and *P. brasilensis* the blade is fully bipinnate with the pinnules narrowly oblong to shortly linear and entire. In *P. crenata*, *P. pinnata* and *P. gleichenioides* the blade is once pinnate, or bipinnate at the base. The pinnules and undivided pinnae of *P. crenata* are narrowly oblong to linear and shallowly and remotely crenate or mostly entire; those of *P. pinnata* are similar but more deeply lobed, that is, deeply and remotely crenate; and those of *P. gleichenioides* are narrower and very deeply lobed, usually cut to the midnerve or costa so that the blade is technically bipinnate or tripinnate.

II. Species referred to Doryopteris

5. *Doryopteris argentea* (Gmel.) Christ, Bull. Boiss. s. 2, **2:** 831. 1902. *Pteris argentea* Gmel. Nova Comm. Acad. Petr. **12:** 519, t. 12, fig. 2. 1768. Cheilanthes argentea (Gmel.) Kze. Linnaea **23:** 242. 1850.

6. *Doryopteris articulata* (Kaulf. ex Spreng.) Fée, Mém. Fam. Foug. **5:** 133. 1850–52. *Pteris articulata* Kaulf. ex Spreng. Syst. **4:** 76. 1827. Pellaea angulosa (Bory ex Willd.) Baker, Syn. Fil. Ed. 2, 153. 1874. Plate 3E, fig. 10. *Pteris angulosa* Bory ex Willd. Sp. Pl. **5:** 377. 1810. Synonymy according to C. Chr. Dansk Bot. Ark. **7:** 115. 1932.

Blade pinnate, with typical *Pellaea* type of division. Venation areolate. Sporangia long-stalked, borne on an almost perfectly continuous vascular commissure. Spores yellow, essentially smooth. (*Webb* 4, G).

7. *Doryopteris australiae* Bonap. Notes Ptérid. **4:** 100. 1916. Type: Port Darwin, Australia, 1882, *Tate*, Paris, not seen, photo G, seen. Pellaea or Notholaena.

"Sori elongate on the outer portion of the veins, reaching abcut half-way to the costa, but not half the length of the very oblique veins. Sporangia short-stalked."—C. A. W.

8. *Doryopteris crispatula* (Baker) C. Chr. Ind. Fil. 243. 1905. *Pellaea crispatula* Baker, Ann. Bot. **5:** 215. 1891. Type: Rio de Janeiro, Brazil, *Glaziou* 14405, Kew, not seen, photo G, seen. Isotype: US, seen. Plate 3E, fig. 11. The only material I have seen is the isotype and photograph of the type.

Blade simple, auricled at the base, thin. Venation areolate. Sori oblong, parallel to the margin, or roundish. Receptacles terminating free vein-ends (roundish) or on the outer walls of areolae (oblong). Sporangia short-stalked. Spores yellow-brown, with a whitish, rugulose perispore. See *D. lonchophora*.

9. *Doryopteris deltoidea* (Kze.) Diels in Engl. & Prantl, Nat. Pfl. **1**[4]**:** 269. 1899. Cheilanthes deltoidea Kze. Linnaea **10:** 535. 1836.

Burchell 2033, G, which has cheilanthoid sori and short-stalked sporangia.

10. *Doryopteris Duclouxii* Christ, Bull. Acad. Géogr. Bot. Mans **1902:** 231. Cheilanthes Duclouxii (Christ) Ching, Ic. Fil. Sinicarum **3:** t. 133. 1935.

Ching is undoubtedly correct in referring this to *Cheilanthes*. He cites *Cavalerie* 1212 and *Wilson* 5297; these are *Cheilanthes*, see *D. muralis* and *D. Veitchii*. It belongs to the *Cheilanthes argentea* complex.

11. *Doryopteris Fournieri* (Baker) C. Chr. Ind. Fil. 244. 1905. Pellaea Fournieri Baker, Syn. Fil. Ed. 2, 476. 1874, based on *Pellaea flavescens* Fourn. Mex. Pl. **1:** 119. 1872, not Fée, 1869. *Pellaea* according to C. Chr. Ind. Fil. Suppl. **3:** 78. 1934.

12. *Doryopteris Harrisonae* (Jenm.) C. Chr. Ind. Fil. 244. 1905. *Pteris Harrisonae* Jenm. Gard. Chron. **1898:** 414. Type: Kaieteur Falls, British Guiana, *Jenman*, NY, seen.

The only material I have seen is the type. This is a single plant and in such poor and fragmentary condition I cannot place it. There are no completely fertile fronds.

13. *Doryopteris lonchophora* (Römer ex Mett.) J. Sm. Hist. Fil. 289. 1875. *Pteris lonchophora* Römer ex Mett. Cheil. 4, t. 3, figs. 1–3. 1859. *Heteropteris Doryopteris* Fée, Crypt. Vasc. Brésil **1:** 123, t. 10, fig. 2. 1869. Type: Serra da Estrella, Rio de Janeiro, Brazil, *Glaziou* 939, probably at Rio de Janeiro, not seen, fragment "ex Fée", NY, seen. Isotype: Paris, not seen, photo G, seen. Mettenius' description and figures apparently represent the same species described later by Fée.

Blade simple, auricled at the base, or hastate, the lateral lobes each with a lobe on the lower side, thin. Venation areolate. Sori oblong, parallel to the margin, or roundish. Receptacles terminating free vein-ends (roundish) or on the outer walls of areolae (oblong). Sporangia long-stalked. Spores yellow, with a whitish, rugulose perispore. (*Glaziou* 939).

This species and *D. crispatula* are certainly closely related. I think they should be excluded from *Doryopteris* on the basis of the receptacular condition. Also the thin blades and whitish, rugose spores, although included within the range of *Doryopteris*, are not at all typical of it. As noted, *D. crispatula* has short-stalked sporangia.

At the present time they cannot reasonably be included in any genus and perhaps a genus should be proposed for them. I hesitate to do this because I have only seen a single collection of each species and because a new name would be necessary since *Heteropteris* Fée cannot be revived. (*Heteropteris* Fée, Crypt. Vasc. Brésil **1:** 123. 1869, not Fée, Dix. Congr. Sci. France **1:** 178. 1843, nor HBK. Nov. Gen. Spec. Pl. **5:** 163. 1822.)

14. *Doryopteris Mairei* Brause, Hedwigia **54:** 206, t. 4, fig. J. 1914. Type: Yunnan, China, *R. P. Maire* 6502, Berlin, not seen. Isotype: Herb. Copel., seen. Ceraceous indument beneath. Cheilanthoid sori. Sporangia short-stalked. A Cheilanthes, probably of the *C. argentea* complex.

15. *Doryopteris Michelii* Christ, Bull. Acad. Géogr. Bot. Mans **1910:** 14. Type: China, *Michel* 1018, Paris, not seen, photo G, seen.

White-farinose beneath. Sori "discrete on the somewhat transversely thickened vein-ends. Sporangia short-stalked."—C. A. W. Spores yellow, with a slightly roughened, whitish perispore. A Cheilanthes, probably of the *C. argentea* complex.

16. *Doryopteris muralis* Christ, Bull. Acad. Géogr. Bot. Mans **1904:** 111. Type: China, *Cavalerie* 1212, Paris, not seen, photo G, seen.

"Lower surface rather densely glandular, the glands of the type which secrete ceraceous indument, of which, however I find no trace. Sori on the suborbicular vein-ends. Sporangia short-stalked."—C. A. W. Spores yellow, with a slightly roughened, whitish perispore. A Cheilanthes, probably of the *C. argentea* complex.

17. *Doryopteris phanerophlebia* (Baker) Diels in Engl. & Prantl, Nat. Pfl. **1^4:** 269. 1899. *Pteris phanerophlebia* Baker, Journ. Bot. **1881:** 367. Adiantum phanerophlebium (Baker) C. Chr. Dansk Bot. Ark. **7:** 123, t. 49. 1932.

18. *Doryopteris pilosa* (Poir.) Kuhn in v. d. Decken, Reisen in Ost-Afrika **3^3:** 63. 1879. *Pteris pilosa* Poir. in Lam. Encycl. **5:** 717. 1804. Type: Bourbon, *Commerson*, Paris, not seen, photo G, seen. Cheilanthes ? *C. heterophylla* Willd. ex Kaulf. Enum. Fil. 210. 1824.

Blade hairy and scaly. Spores rugose. "Sporangia long-stalked."—C. A. W. The type is sterile, data on the sporangia and spores were taken from *de l'Isle* 431, Paris.

19. *Doryopteris rigida* (Sw.) Diels in Engl. & Prantl, Nat. Pfl. **1^4:** 269. 1899. *Pteris rigida* Sw. Syn. Fil. 104, 299. 1806. *Cheiloplecton rigidum* (Sw.) Fée, Mém. Fam. Foug. **7:** 34. 1857, as *Cheilopecton*. Pellaea rigida (Sw.) Hook. Sp. Fil. **2:** 144. 1858.

Pellaeoid receptacle but sorus with only a few sporangia. Spores yellow, smooth.

20. *Doryopteris robusta* (Kze.) Diels in Engl. & Prantl, Nat. Pfl. **1^4:** 269. 1899. *Allosorus robustus* Kze. Linnaea **10:** 502. 1836. Type: Namaqua Land, South Africa, *Drège*, Herb. Kunze, not seen. Isotype: NY, seen. Cheilanthes **robusta** (Kze.), n. comb.

Sporangia short-stalked, 2–4 to a sorus. Receptacle fan-shaped or roundish. Stipe reddish brown. Spores yellow-brown, smooth. (*Drège*).

21. *Doryopteris Skinneri* (Hook.) C. Chr. Ind. Fil. 245. 1905. Pellaea Skinneri Hook. Sp. Fil. **2:** 141, t. 118 B. 1858. Type: Guatemala, *Skinner*, Kew, not seen, photo G, seen.

Sori on the separate vein-ends. Receptacle fan-shaped and often somewhat laterally extended, rarely those of two adjacent vein-ends joining. Sporangia short-stalked. Spores yellowish, somewhat rugose with a whitish and brown perispore. (*Pringle* 2586.)

22. *Doryopteris squamosa* (Hope & Wright) C. Chr. Ind. Fil. 245. 1905. *Pellaea squamosa* Hope & Wright, Journ. Linn. Soc. **35:** 518. 1903. Type: Yunnan, China, *Henry* 13209, Kew, not seen, photo G, seen. Cheilanthes Hopeana C. Chr. Ind. Fil. Suppl. 18. 1913.

Blade described as scaly and white-farinose beneath. "Vein-ends not strongly dilated. Sporangia short-stalked."—C. A. W. Spores yellow with a whitish, rugulose perispore.

23. *Doryopteris tamburii* (Hook.) C. Chr. Acta Hort. Goth. **1:** 86. 1924. *Pellaea tamburii* Hook. Sp. Fil. **2:** 134, t. 129 A. 1858. Type: Tambur River, Nepal, India, *Hooker*, Kew, not seen, photo G, seen. Cheilanthes tamburii (Hook.) Moore, Ind. Fil. 254. 1861.

Cheilanthoid sori. Sporangia short-stalked. Spores brown, minutely pitted. The type was identified by Christensen and Ching in 1930 as *Cheilanthes tamburii.*

24. *Doryopteris Veitchii* Christ, Bull. Acad. Géogr. Bot. Mans **1906:** 134. Type: China, *Wilson* "5396", not seen, 5297 (not 5397), Paris, not seen, photo G, 5297, seen. Cheilanthes Veitchii (Christ) Ching ex C. Chr. Ind. Fil. Suppl. 3, 55. 1934.

White-farinose beneath. "Sori discrete on thickened vein-ends. Sporangia short-stalked."—C. A. W. Spores yellow, with a whitish, rugulose perispore. Belongs to the *Cheilanthes argentea* complex.

EXPLANATION OF PLATES

Plate I. A. Doryopteris paradoxa: Fig. 1, fertile segment, × 6, Rio de Janeiro, Brazil, *Brade* 10093; Fig. 2, fertile segment, × 6, Minas Geraes, Brazil, *Chase* 9705; Fig. 3, fertile segment, × 5.5, Rio de Janeiro, Brazil, *Brade* 15513; Fig. 4, part of fertile segment, × 24, Minas Geraes, Brazil, *Chase* 9705; Fig. 5, sterile blade, × 0.35, Minas Geraes, Brazil, *Damazio* (NY); Fig. 6, sterile blade, × 0.85, Minas Geraes, Brazil, *Damazio* (US); Fig. 7, fertile blade, × 0.35, Minas Geraes, Brazil, *Damazio* (US); Fig. 8, sterile blade, × 0.35, Minas Geraes, Brazil, *Chase* 9705; Fig. 9, sterile blade, × 1.4, Rio de Janeiro, Brazil, *Rose & Russell* 20532 (US); Fig. 10, fertile blade, × 0.35, Minas Geraes, Brazil, *Chase* 9705.

B. D. crenulans: Fig. 1, part of fertile segment, × 24, Paraná, Brazil, *Dusén* 15099 (G); Fig. 2, fertile blade, × 0.35, Paraná, Brazil, *Annies* (NY); Fig. 3, sterile blade, × 0.35, Paraná, Brazil, *Reiss* 23; Fig. 4, fertile blade, × 0.35, Bolivia, *Buchtien* 7038 (US); Fig. 5, sterile blade, × 0.35, Paraná, Brazil, *Annies* (NY); Fig. 6, fertile segment, × 4.5, Paraná, Brazil, *Dusén* 15099 (G).

C. D. triphylla: Fig. 1, part of fertile segment, × 28, Paraguay, *Hassler* 6570; Fig. 2, vascular bundle near base of stipe, × 14, Paraguay, *Hassler* 6570; Fig. 3, vascular bundle near base of stipe, × 26, Uruguay, *Rosengurtt* B 1844 (G); Fig. 4, scale, × 12, Paraguay, *Hassler* 6570; Fig. 5, fertile segment (sclerotic tissue at sinuses), × 5, Paraguay, *Hassler* 6570; Fig. 6, fertile blade,

× 0.35, Uruguay, *Rosengurtt* B 1844 (G); Fig. 7, sterile blade, × 0.7, *Uruguay, Gilbert* 609; Fig. 8, part of scale near middle, × 70, Paraguay, *Hassler* 6570; Fig. 9, sterile blade, × 0.35, Paraguay, *Hassler* 6570; Fig. 10, fertile blade, × 0.35, Paraguay, *Hassler* 6570.

D. D. ITATIAIENSIS: Fig. 1, part of fertile segment, × 24, Rio de Janeiro, Brazil, *L. B. Smith* 1758 (G); Fig. 2, fertile blade, × 0.35, Rio de Janeiro, Brazil, *L. B. Smith* 1758 (G); Fig. 3, sterile blade, × 0.35, Rio de Janeiro, Brazil, *Dusén* 1135; Fig. 4, fertile segment, × 5.5, Rio de Janeiro, Brazil, *L. B. Smith* 1758 (G).

PLATE II. A. DORYOPTERIS LOMARIACEA: Fig. 1, sterile blade, × 0.25, Rio Grande do Sul, Brazil, *Kunert* 26; Fig. 2, sterile segment, × 4.5, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 3, fertile segment, × 4, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 4, part of fertile segment, × 25, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 5, sterile blade, × 0.25, Rio Grande do Sul, *Kunert* 26; Fig. 6, fertile blade, × 0.25, Minas Geraes, Brazil, *Mexia* 5705 (US); Fig. 7, fertile blade, × 0.25, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 8, vascular bundles near base of stipe, × 12, São Paulo, Brazil, *L. B. Smith* 1856 (G).

B. D. TIJUCANA: Fig. 1, fertile segment, × 3.5, Rio de Janeiro, Brazil, *L. B. Smith* 1251 (G); Fig. 2, part of fertile segment, × 23, Rio de Janeiro, Brazil, *L. B. Smith* 1251 (G); Fig. 3, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Ule* 257; Fig. 4, sterile blade, × 0.25, Rio de Janeiro, *Ule* 257.

C. D. SUBSIMPLEX: Fig. 1, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Lima & Brade* s. n.; Fig. 2, fertile segment, × 3.5, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 3, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 4, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Lima & Brade* 13130; Fig. 5, part of fertile segment, × 23, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 6, sterile blade, × 0.25, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 7, sterile blade, × 0.25, Rio de Janeiro, Brazil, *Lima & Brade* 13130.

D. D. ACUTILOBA: Fig. 1, part of fertile segment, × 25, Paraná, Brazil, *Annies* (NY); Fig. 2, fertile blade, × 0.25, Paraná, Brazil, *Annies* (US); Fig. 3, sterile blade, × 0.25, Paraná, Brazil, *Annies* (US); Fig. 4, fertile segment, × 5, Paraná, Brazil, *Annies* (NY); Fig. 5, sterile blade, × 0.25, Paraná, Brazil, *Annies* (US).

PLATE III. A. DORYOPTERIS RUFA: Plant, reduced, Minas Geraes, Brazil, *Godoy* 28 (Herb. Sect. Bot. Agron. Inst. Biol. Defesa Agric. Animal São Paulo), drawn from Brade, Filices novae Brasilianae I, Bol. Mus. Nac. Rio Janeiro **5**: t. 2, fig. 2. 1929.

B. D. ORNITHOPUS: Fig. 1, sterile blade, × 0.3, Minas Geraes, Brazil, *Lindman* A137; Fig. 2, scale, × 4, São Paulo, Brazil, *Edwak;* Fig. 3, part of scale near middle, × 16, São Paulo, Brazil, *Edwak;* Fig. 4, part of fertile segment, × 16, Minas Geraes, Brazil, *Lindman* A137; Fig. 5, vascular bundles near base of stipe, × 7, Minas Geraes, Brazil, *Lindman* A137; Fig. 6, fertile segment, × 3, São Paulo, Brazil, *Edwak;* Fig. 7, sterile segment, × 2, Minas Geraes, Brazil, *Lindman* A137; Fig. 8, fertile blade, × 0.3, São Paulo, Brazil, *Brade;* Fig. 9, sterile blade, × 0.3, Minas Geraes, Brazil, *Lindman* A137.

C. D. QUINQUELOBATA: Fig. 1, sterile blade, × 0.3, Rio de Janeiro, Brazil, *Brade* 8634; Fig. 2, fertile segment, × 2, Rio de Janeiro, Brazil, *Dusén* 2530; Fig. 3, part of fertile segment, × 16, Rio de Janeiro, Brazil, *Dusén* 2530 and *Glaziou* 7011; Fig. 4, fertile blade, × 0.3, Rio de Janeiro, Brazil, *Brade* 8634; Fig. 5, fertile blade, × 0.3, Rio de Janeiro, Brazil, *Glaziou* 7011; Fig. 6, vascular bundle near base of stipe, × 11, Rio de Janeiro, Brazil, *Dusén* 2530; Fig. 7, sterile blade, × 0.3, Rio de Janeiro, Brazil, *Glaziou* 7011.

D. D. ROSENSTOCKII: Fertile and sterile plants, reduced, Rio de Janeiro, *Brade* 5297 (Herb. Mus. Nac. Rio Janeiro), drawn from Brade & Rosenstock, Filices novae Brasilianae II, Bol. Mus. Nac. Rio Janeiro **7**: t. 8. 1931.

E. PELLAEA CRENATA: All from Minas Geraes, Brazil, *Foster & Foster* 624. Fig. 1, fertile segment, × 4 (G); Fig. 2, sterile frond, × 0.3 (US); Fig. 3, cross section of stipe half way to blade, × 8 (US); Fig. 4, vascular bundle near base of stipe, × 8 (US); Fig. 5, fertile blade, × 0.3 (US); Fig. 6, scale, × 5.5 (US); Fig. 7, part of fertile segment, × 20 (G).

P. PINNATA: Fig. 8, fertile segment, × 5, Minas Geraes, Brazil, *Chase* 9149 (US).

P. RIEDELII: Fig. 9, fertile segment (receptacle curves above the vein and back toward the midnerve), × 11, Brazil, *Riedel* (G).

P. ANGULOSA: Fig. 10, fertile segment, × 7, Madagascar, *Webb* 4 (G).

P. CRISPATULA: Fig. 11, fertile segment, × 7.5, Rio de Janeiro, Brazil, *Glaziou* 14405 (US).

P. GLEICHENIOIDES: Fig. 12, fertile segment (receptacle curves above the vein and back toward the midnerve), × 6, Minas Geraes, Brazil, *Mexia* 5814 (G); Fig. 13, scale, × 5.5, Minas Geraes, Brazil, *Mexia* 5814 (G).

PLATE IV. A. DORYOPTERIS SAGITTIFOLIA: Fig. 1, part of fertile segment, × 24, Paraná, Brazil, *Dusén* 8629 (NY); Fig. 2, sterile blade, × 0.25, Paraná, Brazil, *Dusén* 667a; Fig. 3, cross section of stipe half way to blade, × 10, Rio de Janeiro, Brazil, *Smith & Vieira* 1375 (G); Fig. 4, cross section of stipe half way to blade, × 13, Paraná, Brazil, *Dusén* 667a; Fig. 5, fertile blade, × 0.25, São Paulo, Brazil, *Brade* 6517; Fig. 6, fertile blade, × 0.25, Paraná, Brazil, *Dusén* 8629 (NY); Fig. 7, fertile segment, × 2, Rio de Janeiro, Brazil, *Smith & Vieira* 1375 (G).

B. D. COLLINA: Fig. 1, sterile blade, × 0.25, Rio de Janeiro, Brazil, *Rose & Russell* 20740 (NY); Fig. 2, part of fertile segment, × 28, British Guiana, *A. C. Smith* 3655 (G); Fig. 3, cross section of stipe three-fourths way to blade, × 12, Rio de Janeiro, Brazil, *Dusén* 152 (US); Fig. 4, vascular bundle near base of stipe, × 12, British Guiana, *A. C. Smith* 3655 (G); Fig. 5, fertile segment, × 4.5, Paraguay, *Hassler* 6129; Fig. 6, fertile blade, × 0.25, Rio de Janeiro, Brazil, *L. B. Smith* 1589 (G); Fig. 7, sterile blade, × 0.25, Rio de Janeiro, Brazil, *Rose & Russell* 20740 (NY); Fig. 8, vascular bundle near base of stipe, × 8, Paraguay, *Hassler* 6129; Fig. 9, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Dusén* 152 (US); Fig. 10, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Dusén* 152 (US).

C. D. LORENTZII: Fig. 1, sterile blade, × 0.25, Peru, *Cook & Gilbert* 1479; Fig. 2, fertile blade, × 0.25, Bolivia, *Buchtien* 3397 (US); Fig. 3, fertile blade, × 0.25, Rio Grande do Sul, Brazil, *Eugenio* 24; Fig. 4, fertile segment (semi-sclerotic tissue at sinus), × 4.5, Chaco, Argentina, *Schulz* 720; Fig. 5, part of fertile segment, × 21, Chaco, Argentina, *Schulz* 720; Fig. 6, fertile blade, × 0.25, Bolivia, *Buchtien* 473; Fig. 7, sterile segment, × 2.5, Missiones, Argentina, *Vattuone & Bianchi* 165; Fig. 8, sterile blade, × 0.25, Salta, Argentina, *Maldonado* 402.

D. D. JUERGENSII: Fig. 1, fertile blade, × 0.25, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 2, sterile segment, × 3.5, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 3, sterile blade, × 0.25, Rio Grande do Sul, Brazil, *Juergens* 126; Fig. 4, fertile segment, × 4.5, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 5, part of fertile segment, × 21, Rio Grande do Sul, Brazil, *Juergens* s. n.

PLATE V. A. DORYOPTERIS PEDATA var. TYPICA: Fig. 1, sterile blade, × 0.25, Cuba, *Maxon* 4467 (NY); Fig. 2, fertile blade, × 0.25, Jamaica, *Clute* 301 (NY); Fig. 3, sterile blade, × 0.25, Jamaica, *Sherring* (US); Fig. 4, fertile blade, × 0.25, Porto Rico, *Shafer* 3041 (US); Fig. 5, fertile blade, × 0.25, Cuba, *Palmer & Riley* 507 (US); Fig. 6, spore, × 650, Cuba, *Wright* 867 (G); Fig. 7, sterile blade, × 0.25, Cuba, *Palmer & Riley* 507 (US); Fig. 8, part of fertile segment, × 30, Porto Rico, *Shafer* 3041 (US); Fig. 9, cross section of stipe half way to blade, × 13, Cuba, *Palmer & Riley* 507 (G).

B. D. PEDATA var. MULTIPARTITA: Fig. 1, sterile blade, × 0.25, Rio Grande do Sul, Brazil, *Eugenio* 22 (NY); Fig. 2, fertile segment, × 5.5, Tucumán, Argentina, *Venturi* 9587 (G); Fig. 3, cross section of stipe half way to blade, × 10, Chaco, Argentina, *Schulz* 721; Fig. 4, fertile blade, × 0.25, Bolivia, *R. S. Williams* 1175; Fig. 5, sterile blade, × 0.25, British Guiana, *A. C. Smith* 3295 (NY); Fig. 6, fertile blade, × 0.25, Rio Grande do Sul, Brazil, *Lindman* A281 (NY); Fig. 7, fertile blade, × 0.25, Paraná, Brazil, *Gonslyn* 39 (NY).

C. D. REDIVIVA: Fig. 1, part of scale near middle, × 50, São Paulo, Brazil, *Wacket* (US); Fig. 2, fertile blade, × 0.25, Brazil (U. S. Nat. Herb. 61624); Fig. 3, sterile blade, × 0.25, Brazil (U. S. Nat. Herb. 61624); Fig. 4, part of fertile segment, × 26, Rio de Janeiro, Brazil, *Brade* 8597; Fig. 5, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Brade* 8597; Fig. 6, sterile blade, × 0.25, Rio de Janeiro, Brazil, *Brade* 8597; Fig. 7, scale, × 9, São Paulo, Brazil, *Wacket* (US); Fig. 8, fertile segment, × 4.5, Rio de Janeiro, Brazil, *Brade* 9484.

PLATE VI. A. × DORYOPTERIS HYBRIDA: Fig. 1, sterile blade, × 0.2, "Ex. hort. bot. Lips. 1882"; Fig. 2, part of fertile segment, × 27, São Paulo, Brazil, *Brade* 7697 (G); Fig. 3, fertile segment, × 3.5, São Paulo, Brazil, *Brade* 7697 (G); Fig. 4, fertile blade, × 0.2, São Paulo, Brazil, *Brade* 7697 (NY).

B. D. PEDATA var. PALMATA: Fig. 1, sterile blade, × 0.2, Peru, *Herrera* (US); Fig. 2, sterile blade, × 0.2, Costa Rica, *Skutch* 2746; Fig. 3, proliferous buds at base of blade, × 0.8, Colombia, *Killip & Smith* 16357 (G); Fig. 4, cross section of stipe half way to blade, × 11, Costa Rica, *Skutch* 2746; Fig. 5, spore, × 430, Colombia, *Killip & Smith* 16357 (G); Fig. 6, young plant from proliferous bud, × 0.3, U. S. Bot. Gard. 1884 (U. S. Nat. Herb. 154812); Fig. 7, cross section of stipe half way to blade, × 8, Bolivia, *Rusby* 135 (NY); Fig. 8, fertile blade, × 0.2, Peru, *Vargas* 1705; Fig. 9, fertile blade, × 0.2, Bolivia, *Rusby* 135 (NY); Fig. 10, fertile blade, × 0.2, James Island, Galapagos Islands, Ecuador, *Stewart* 1010 (US).

C. D. NOBILIS: Fig. 1, sterile blade, × 0.2, Paraguay, *Jorgensen* 4062 (G); Fig. 2, sterile blade, × 0.2, Rio Grande do Sul, Brazil, *Eugenio* 26 (NY); Fig. 3, sterile segment, × 2, Rio Grande do Sul, Brazil, *Eugenio* 26 (NY); Fig. 4, fertile blade, × 0.2, Tucumán, Argentina, *Venturi* 9645 (G); Fig. 5, fertile segment, × 3, Chaco, Argentina, *Schulz* 722; Fig. 6, fertile blade, × 0.2, Rio Grande do Sul, Brazil, *Juergens* (U. S. Nat. Herb. 530675); Fig. 7, fertile blade, × 0.2, Rio Grande do Sul, Brazil, *Juergens* (U. S. Nat. Herb. 530674); Fig. 8, sterile blade, × 0.2, Rio Grande do Sul, Brazil, *Lindman* A1019; Fig. 9, part of fertile segment, × 27, Chaco, Argentina, *Schulz* 722.

PLATE VII. A. DORYOPTERIS KITCHINGII: All from Madagascar, *Hildebrandt* 4163 (US). Fig. 1, scale, × 9; Fig. 2, fertile blade, × 0.3; Fig. 3, part of fertile segment, × 24; Fig. 4, sterile segment, × 5; Fig. 5, part of scale near middle, × 60; Fig. 6, fertile segment, × 4.7; Fig. 7, sterile blade, × 0.3; Fig. 8, vascular bundle near base of stipe, × 7.5; Fig. 9, cross section of stipe half way to blade, × 7.5.

B. D. CONCOLOR var. TYPICA: Fig. 1, sterile blade, × 0.3, Australia, *Michael* 886; Fig. 2, cross section of stipe half way to blade, × 20, Peru, *Cook & Gilbert* 1512 (US); Fig. 3, fertile segment, × 4.7, Pernambuco, Brazil, *Pickel* 2620 (US); Fig. 4, sterile blade, × 0.3, Peru, *Vargas* 1709 (G); Fig. 5, fertile segment, × 6, El Salvador, *Calderón* 1714; Fig. 6, fertile blade, × 0.3, São Paulo, Brazil, *Wacket* (US); Fig. 8, fertile blade, × 0.3, Australia, *Michael* 886; Fig. 9, part of fertile segment, × 25, Bolivia, *Buchtien* s. n. (G).

D. CONCOLOR var. KIRKII: Fig. 7, fertile segment, indusia outlined in broken lines, receptacles curve over the veins and back toward the midnerve, × 4.5, Kenya, Africa, *Curtis* 744a.

C. D. DECORA var. TYPICA: Fig. 1, fertile blade, × 0.3, Hawaiian Islands, *Baldwin* 22 (U. S. Nat. Herb. 816929); Fig. 4, fertile segment, × 5, Hawaii, *Mann & Brigham* 253 (G); Fig. 5, fertile blade, × 0.3, Molokai, *Degener* 9196; Fig. 7, sterile blade, × 0.6, Kauai, *Heller* 2654 (NY); Fig. 9, part of fertile segment, × 24, Hawaii, *Mann & Brigham* 253 (G); Fig. 11, fertile segment, × 5, Kauai, *Heller* 1990 (G); Fig. 12, fertile segment, × 5, Hawaii, *Degener* 9197 (US).

D. DECORA var. DECIPIENS: Fig. 3, fertile blade, × 0.3, Oahu, *Degener* 4159; Fig. 6, sterile blade, × 0.3, Kauai, *Heller* 1990 (NY); Fig. 8, cross section of stipe half way to blade, × 12, Oahu, *Degener* 4159; Fig. 10, fertile blade, × 0.3, Oahu, *Degener* 4159.

Intermediate between var. *typica* and var. *decipiens*: Fig. 2, fertile blade, × 0.3, Kauai, *Degener* 9198.

PLATE VIII. A. DORYOPTERIS VARIANS: Fig. 1, part of fertile segment, × 24, British Guiana, *A. C. Smith* 3296 (G); Fig. 2, sterile blade, × 0.25, Rio de Janeiro, Brazil, *James;* Fig. 3, fertile blade, × 0.25, Minas Geraes, Brazil, *Damazio* 1861; Fig. 4, sterile blade, × 0.25, Rio de Janeiro, Brazil, *Brade* 8564; Fig. 5, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Brade* 8564; Fig. 6, fertile blade, × 0.25, British Guiana, *A. C. Smith* 3296 (G); Fig. 7, fertile blade, × 0.25, Rio de Janeiro, Brazil, *Brade* s. n.; Fig. 8, fertile segment, × 4, British Guiana, *A. C. Smith* 3296 (G).

B. D. LUDENS: Fig. 1, sterile blade, × 0.25, Philippine Islands, *R. S. Williams* 1501 (NY); Fig. 2, spore, × 490, Philippine Islands, Copeland exsicc. 95 (G); Fig. 3, fertile segment, × 4, Philippine Islands, *Topping* 1014 (G); Fig. 4, sterile blade, × 0.25, Philippine Islands, *Topping* 1247 (US); Fig. 5, fertile blade, × 0.25, Philippine Islands, Copeland exsicc. 95 (G); Fig. 6, vascular bundle near base of stipe, × 4.5, Federated Malay States, *Corner & Henderson* 22815; Fig. 7, fertile blade, × 0.25, Philippine Islands, Copeland exsicc. 95 (G); Fig. 8, sterile blade, × 0.25, Java, *Mousset* 188; Fig. 9, part of scale near middle, × 60, Yunnan, China, *Henry* 13325 (US); Fig. 10, scale, × 10, Yunnan, China, *Henry* 13325 (US); Fig. 11, fertile blade, × 0.25, Java, *Maupet* (G); Fig. 12, vascular bundle near base of stipe, × 6, Java, *Mousset* 188; Fig. 13, sterile blade, × 0.25, French Indo-China, *Colani* 3450 (US); Fig. 14, part of fertile segment, × 24, Philippine Islands, *Topping* 1247 (US).

C. D. CORDIFOLIA: All from Madagascar, *Humbert* 6258. Fig. 1, sterile blade, × 0.25 (U. S. Nat. Herb. 1718175); Fig. 2, part of fertile segment, × 16 (U. S. Nat. Herb. 1718176); Fig. 3, spore, × 410 (U. S. Nat. Herb. 1718175); Fig. 4, cross section of stipe half way to blade, × 9 (G); Fig. 5, fertile blade, × 0.25 (U. S. Nat. Herb. 1718175); Fig. 6, sterile blade, × 0.25 (U. S. Nat. Herb. 1718176); Fig. 7, vascular bundle near base of stipe, × 8 (G); Fig. 8, part of scale near middle, × 50 (G); Fig. 9, scale, × 7 (G); Fig. 10, fertile segment, × 2 (U. S. Nat. Herb. 1718176); Fig. 11, sterile segment, × 2 (U. S. Nat. Herb. 1718175).

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New scientific names are printed in full-face type

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CRITICAL NOTES ON CAREX

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CRITICAL NOTES ON CAREX

M. L. Fernald

(Plates 710–716)

While rewriting the treatment of *Carex* for a new edition of Gray's *Manual* so many points have arisen which need clarification that I am attempting their elucidation in the accompanying notes. Several more species need critical study, especially in the section *Vesicariae;* for instance, *C. vesicaria* itself. No one who has seen a good series of typical *C. vesicaria* of Europe can be at all satisfied with the reduction to it of all the diverse North American plants by Mackenzie in the North American Flora. These problems, temporarily interrupted, await further study. It seems desirable, however, to publish the notes on the genus already assembled.

It is to be regretted that it is not possible always to subscribe to the decisions and the splittings and reductions of Mackenzie. Suffering for many years from abnormal vision, he thought he saw, as I personally know from having shared a tent in Gaspé with him, what some others can not detect; and in his work upon the later groups in the North American Flora he had apparently lost his acuteness and "lumped" quite dissimilar plants. This failure in his latest work sharply to discriminate is well shown in his reduction of all variations of *C. inflata* (as *C. rostrata*) to one undivided maze (see PLATES 715 and 716). It is, obviously, unsafe to rely, without careful checking, upon all of the specific treatments in *Carex*, as presented in the North American Flora.

Carex disticha in North America (Plate 710, figs. 1–15). —*Carex disticha* Huds. Fl. Angl. 403 (1762) or *C. intermedia* Gooden. in Trans. Linn. Soc. ii. 154 (1794) is a variable species of Eurasia, so closely related to the North American *C. Sartwellii* Dew. in Am. Journ. Sci. xliii. 90 (1842) that difficulty has been encountered in separating the two. The common American plant has repeatedly been placed with it, sometimes as *C. disticha*, sometimes as *C. intermedia*, or as *C. disticha*, var. *Sartwellii* Dewey (1866). On the whole, however, the two can be rather readily recognized. *C. disticha* has the leaf-sheaths covering the nodes; in *C. Sartwellii* the upper nodes are exserted. In *C. disticha* the spikes are very unequal in size, oblong or narrowly ovoid, much longer than broad, the summit of the inflorescence continuous and more slender than the base and 2 or 3 cm. long; in *C. Sartwellii* the spikes are usually more uniform, small and globose to ovoid. The scales of *C. disticha* are castaneous, with pale hyaline margins, and acuminate; those of *C. Sartwellii* pale brown and blunter. The differences in the perigynia are not so pronounced as often stated but the prolonged beak in *C. disticha* is more sharply and deeply bidentate than in *C. Sartwellii*.

As to the name *C. disticha* Huds. (1762), Kükenthal, although so calling the plant in his introductory discussion in Das Pflanzenreich, Heft 38, iv[20]. 5 and 9 (1909), rejected the name in his fuller treatment on p. 135, in favor of the later *C. intermedia* Good. (1794), citing in synonymy the *C. disticha* of Lamarck and others, "vix Huds." In view, however, of the unanimous retention of *C. disticha* Huds., with *C. intermedia* as a synonym, by the British botanists (Britten & Rendle in 1907; Druce in 1908; Wilmott in 1922), who should understand Hudson's species, I am returning to that long-used name.

My first object in the present note is to point out the occurrence in Ontario of *Carex disticha*. Its occurrence, possibly as an adventive from Europe, on the shores of the St. Lawrence at the Iles de Boucherville in Quebec, where discovered in 1927, has already been reported by Victorin in his Flore Laurentienne, 706 (1935). In the Gray Herbarium there is an additional Canadian specimen, correctly identified by the late William Boott, collected by John Macoun on June 23, 1866, in a "peat bog near Belleville", Ontario. This material it seems to me is quite characteristic *C. disticha*. One of the inflorescences, × 1, is shown in PLATE 710, FIG. 10, with a perigynium, × 5, as FIG. 11. An inflorescence of the Boucherville plant, also × 1, is shown as FIG. 12; while FIG. 13 is from the Vosges, France, *Raine*, and FIGS. 14 and 15 from Stockholm, *Ostman*. Although it is possible that the plant of the St. Lawrence at Boucherville, like some others which have recently established themselves near Montreal, may be a recent adventive, derived from straw and litter thrown out at the latter port, the fact, that in 1866 John Macoun collected the species in a natural bog near Belleville, suggests the desirability of watching carefully for it in that region, where it is probably indigenous.

In his treatment of *Carex Sartwellii* in the North American Flora, xviii[1]. 37 (1931), Mackenzie, correctly citing Dewey's type as Sartwell material from Junius, Seneca County, New York, describes the perigynia as "ovate-orbicular, 2.5–3 mm. long, 1.5–1.75 mm. wide, . . . the body . . . abruptly contracted into a serrulate beak"; and Dr. F. J. Hermann, accepting without evident question Mackenzie's definition of the perigynium, described in 1938 a plant of Indiana as *C. Sartwellii*, var. *stenorrhyncha* F. J. Hermann in RHODORA, xl. 78 (1938) with gradually beaked elliptic perigynia 4–4.5 mm. long and 1–1.3 mm. broad, stating that the perigynia suggest those of *C. intermedia* (*C. disticha*) in length but not breadth, and in being "sessile to very short-stipitate," etc. I do not know how Mackenzie arrived at his statement of size (2.5–3 mm. long and 1.5–1.75 mm. wide) and the orbicular tendency in the perigynia of *C. Sartwellii*. Of the Sartwell collections which Dewey had there are 6 lots; in addition there are other collections from Junius, coll. *Sartwell*, in the Gray Herbarium, as well as others from Montezuma and from Buffalo. These are to me inseparable from the TYPE of var. *stenorrhyncha* and from many other collections of *C. Sartwellii* from farther west. FIG. 1 is an inflorescence, × 1, of the Junius plant, coll. *Sartwell* and originally named by Dewey *C. Sartwellii*, later changed by him to *C. disticha*. FIG. 2 is an inflorescence, × 1, from the TYPE of var. *stenorrhyncha*. The two look alike. FIG. 3 is a perigynium, × 5, 3.5 mm. long and 1.4 mm. broad, from the Dewey (*Sartwell*) material; FIG. 4, another × 5, 4.5 mm. long, also from Dewey (*Sartwell*) material; FIGS. 5 and 6 are two perigynia, × 5, each 3–3.5 + mm. long, one 1.5 mm. broad, the other 1 mm. broad, from Montezuma, New York (*Eames, Randolph & Wiegand*, no. 11,575); FIG. 7 is a perigynium, × 5, 4 mm. long and 1.5 mm. broad, from Port Huron, Michigan, *Dodge*, no. 52; FIG. 8, one, × 5, 4.8 mm. long, from Grass Lake, Michigan, July 1, 1858, *Wm. Boott;* and FIG. 9 a perigynium, × 5, from the TYPE of var. *stenorrhyncha*. I see no fundamental difference by which the latter can be set off; neither do I see the orbicular tendency in the perigynia nor that they are "abruptly contracted into a . . . beak".[1]

C. INTERIOR Bailey, forma **keweenawensis** (F. J. Hermann), stat. nov. Var. *keweenawensis* F. J. Hermann in Am. Midl. Nat. xxv. 19 (1941).

Although Hermann surmised that his var. *keweenawensis* is a highly localized variety, endemic on the Keweenaw Peninsula, I am incapable of separating from his type scattered collections from throughout much of the range of the species (southern Labrador Peninsula, Newfoundland, Quebec, New York, Minnesota, Nebraska, British Columbia and California). The plant with inner face of the perigynium nerved, not otherwise different from the commoner plant with nerveless inner faces, seems to me a minor form, rather than a true geographic variety.

C. SCOPARIA Schkuhr, forma **subturbinata** (Fernald & Wiegand), stat. nov. Var. *subturbinata* Fernald & Wiegand in RHODORA, xiv. 116 (1912).

C. CRISTATELLA Britton, forma **catelliformis** (Farwell), stat. nov. Var. *catelliformis* Farwell in Papers Mich. Acad. ii. 17 (1923).

[1] Most unfortunately, quite similar inaccuracies in measurements pervade Mackenzie's work in the North American Flora. Those who rely upon them are bound to be seriously misled. In the species almost immediately following *C. Sartwellii* we find *C. gravida* defined with "head . . . 1–2.5 cm. long . . . ; perigynia 4 mm. long, 2 mm. wide", although specimens clearly marked by Mackenzie as *C. gravida* in the Gray Herbarium show heads more than 5 cm. long, and perigynia 5.5 mm. long and 3 mm. wide; while material identified by Mackenzie as his own *C. aggregata*, described as having "perigynia . . . 3.25–4.5 mm. long, about 2 mm. wide", shows plenty of them 5.5 mm. long and more than 3 mm. wide. Mackenzie, who essentially lost his eyesight in his later years, used to take pride in not needing a lens, for he had "microscopic vision". Possibly he overestimated the precision of his abnormal eyes. At least, one who has hoped to lean with assurance upon his measurements finds it unsafe to do so. It is necessary to start anew!

C. NORMALIS Mackenz., forma **perlonga** (Fernald), comb. nov. *C. mirabilis* Dewey, var. *perlonga* Fernald in Proc. Am. Acad. xxxvii. 473, t. 2, fig. 27 (1902). *C. straminea* Willd., var. *mirabilis* Tuckerm., forma *perlonga* (Fernald) Kükenthal in Engler, Pflanzenr. iv[20]. 207 (1909). *C. normalis*, var. *perlonga* (Fernald) Burnham in Torreya, xix. 131 (1919).

Carex normalis, forma *perlonga*, occurring more or less throughout the range of typical *C. normalis*, is merely a form, but it is helpful to have a designation for it. In the typical form of the species the head is compact, 1.5–4 cm. long, made up of crowded to subapproximate spikes. In forma *perlonga* the spikes are all (or all but the terminal) remote in a flexuous, moniliform inflorescence 3–7 cm. long. Treated by Mackenzie (N. Am. Fl.) as of no consequence, plants of it with arching moniliform inflorescences 5–7 cm. long are bound to perplex those who attempt to reconcile it with his "erect head 2.5–5 cm. long."

C. CUMULATA (Bailey) Mackenz., forma **soluta**, f. nov., inflorescentiis moniliformibus ad 1 dm. longis, spicis 0.7–2 cm. distantibus.—NOVA SCOTIA: sphagnous pool back of barrier beach near mouth of Broad River, Queens County, August 16, 1920, *Fernald & Bissell*, no. 20,311 (TYPE, in Herb. Gray.).

Typical *Carex cumulata* has the spikes approximate or densely crowded in a head 1–4.5 cm. long; but, while some heads of no. 20,311 are typical of the species, most of them are as prolonged and lax as in the most extreme specimens of *C. silicea* Olney. Although Mackenzie marked no. 20,311 as his *C. cumulata*, its moniliform heads up to 1 dm. long could not be identified by his key (N. Am. Fl.), "spikes . . . densely aggregated", nor by his further definition of the species with "head 2–4 cm. long". Forma *soluta*, however, has the characteristic loose sheaths, broad and stiff leaf-blades, conic-ovoid and truncate-based spikes which place it in *C. cumulata;* and the presence in the clumps of some typical condensed heads clearly show its specific identity.

C. HORMATHODES Fern., forma **invisa** (W. Boott), stat. nov. *C. straminea*, var. *invisa* W. Boott. in Bot. Gaz. ix. 86 (1884). *C. tenera*, var. *invisa* (W. Boott) Britton in Britt. & Brown, Ill. Fl. i. 358 (1896); Fernald in Proc. Am. Acad. xxxvii. 475, t. II, fig. 35 (1902). *C. hormathodes*, var. *invisa* (W. Boott) Fern. in RHODORA, viii. 166 (1906). *C. straminea*, var. *tenera*, forma *invisa* (W. Boott) Kükenth. in Engler, Pflanzenr. iv[20]. 206 (1909).

Typical *C. hormathodes* is the larger extreme of the species, 0.2–9.5 dm. high, with spikes 8–15 mm. long and 5–9 mm. thick, the perigynia 4.8–6 mm. long. Forma *invisa* is the small extreme, mostly 1.5–3 dm. (sometimes –6 dm.) high, the spikes only 5–8 mm. long and 3–6 mm. thick, the perigynia only 4–5 mm. long. In both forms the head varies from moniliform and arching or flexuous to somewhat crowded and erect, and on late culms (second flowering), the spikes are often densely aggregated and increased in number, up to 15, instead of 3–9, as in the first inflorescences.

C. caryophyllea a Valid Name.—In recent years some continental Old World botanists have thrown aside the name *Carex caryophyllea* Latourrette, Chlor. Lugd. 27 (1785) in favor of *C. verna* Chaix in Villars, Hist. Pl. Dauph. i. 312 (1786) and ii. 204 (1787). Their argument was stated by Schinz & Thellung in their paragraphs in Vierteljahrss. Naturforsch. Gesellsch. Zurich, liii. Heft 4: 524 (1908):

> **Carex verna** [Chaix in Vill. Hist. pl. Dauph. I (1786), 312 ("Hall. 1381"), nomen nudum] Vill. l. c. II. (1787), 204.
> *Carex caryophyllea* Latourette [Chlor. Lugd. (1785), 27, nomen solum teste Hayek Sched. fl. stir. exs. 11/12 (1907), 5] ex A. et G. Syn. d. mitteleur. Fl. II, 2 p 123 (1902).

Schinz & Thellung quote Janchen to the effect that Latourrette cited as standing for his *Carex caryophyllea* "Haller nr. 1381," exactly the same number which was first cited (in 1786) by Chaix in Villars in publishing *C. verna*, a publication which, in case of *C. verna*, they characterized as a *nomen nudum*, while of *C. caryophyllea*, published with the same citation, they said "nomen solum". The International Rules of Botanical Nomenclature are as definite as rules can be which are stated as negations, that (Art. 37) "A name of a taxonomic group is not validly published unless it is . . . accompanied by a description of the group or *by a reference to a previously and effectively published description of it*" (italics mine); and, again (Art. 44) "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."

Both Latourrette in 1785, in publishing *Carex caryophyllea*, and Chaix in 1786, in his first publication of *C. verna*, met the requirement by citing Haller's beautifully described no. 1381. Latourrette's very brief item, under *Carex*, was

Caryophyllea, *N. Haller*, 1381. Lugd. & Delph. [localities].

The almost as brief publication of *Carex verna* by Chaix in Villars (1786) was as follows, under *Carex*.

verna (mihi): Hall. 1381: passim in collibus apricis (4).

When the account of Haller in his Hist. Stirp. Helv. ii. 192 (1768) is looked up we find, as we have learned to expect from that great student, an account almost unequaled for clarity. Omitting his enumeration of specimens and a comment which does not bear on the immediate question, we have as diagnoses and citations the following:

1381. CAREX foliis cespitosis, brevibus, spicis confertis, petiolis erectis brevibus; capsulis ovato triquetris.†
Gramen caryophyllatae foliis, spica divulsa. C. B[auhin]. *Theatr.* p. 46.
Cyperoides alpinum, Caryophyllatae foliis, spicis tenuibus, e fusco rufescentibus. SCHEUCHZER. p. 433.
Habitus caryophylleus. Folia cespitosa, brevia: firma, ad duas lineas lata, linea exarata, eminente nervo, retrorsum ducto digito aspera. Culmi trientales. Spicae in summa planta congestae. Mascula crassior, obesa, rufa, glumis cinnamomeis, nervo virescente divisis, ovatis. Feminae duae, tres, graciliores breviores, per maturitatem latescentes, capsulis hirsutis, ovato triquetris, absque rostro. Petiolus in ima spica aliquot linearum, suprema sessilis, marem contingit. Insident glumis aristatis.

What could better define *Carex caryophyllea*, a plant with short and firm, scabrous, spreading leaves (suggesting those of *Dianthus*), thick-clavate staminate spike with rufescent scales, and two or three pistillate spikes with hirsute trigonous-ovoid perigynia subtended by awn-tipped scales? These characters distinguish the species as usually defined. It is rarely that phytographers, from Linnaeus to our modern authors, give so lucid accounts of their species. Th re seems to be no ground for treating *C. caryophyllea* Latourrette as a "nomen" only, nor *C. verna* Chaix in Villars as a "nomen nudum".

Schinz & Thellung, von Hayek and others who have abandoned *Carex caryophyllea* presumably have done so because Haller's descriptions were in a non-binomial work. The diagnoses and often the illustrations of Haller, like those of Scheuchzer, are superior. There seems to be no sufficient reason for not taking up binomials based upon Haller's descriptions, when those based upon Scheuchzer's are admitted, nor when so many of the Linnean genera and species rest wholly on earlier non-binomial accounts.

The Type of Carex umbellata (Plate 710, figs. 16–25).—*Carex umbellata* Schkuhr ex Willd. Sp. Pl. iv. 290 (1805) and Riedgr. Nacht. 75, t. W w w, fig. 171 (1806) was clearly described with *ovate-lanceolate* pistillate *scales* about equaling the *ovoid,* beaked *perigynium:* "fructibus ovatis pubescentibus rostratis ore integris, squamam ovato-lanceolatam aequantibus" and again "Squamae *ovato-lanceolatae membranaceae albae.*" Schkuhr's plate (our figs. 16, 17 and 25) clearly showed the ovoid and long-beaked perigynium and the acuminate-cuspidate ovate-lanceolate scale. Francis Boott correctly understood the plant when, in his Ill. Carex, ii. 99, t. 292 (1860), he illustrated the "squamae ovatae . . . vel lanceolatae, acuminato-cuspidatae" and the long-beaked perigynia (our fig. 18). At the same time he described *C. umbellata*, var. *brevirostris* Boott, l. c. t. 294, with shorter-beaked and shorter obovoid perigynia and obtuse to merely acute broadly ovate scales: "perigyniis minoribus . . . obovatis . . . , rostro 2/10 lin. longo, . . . ; squama late ovata obtusa vel acuta . . . brevioribus." Boott's plate of var. *brevirostris* was clear. From it I have taken scales (reduced from the original) and perigynia (our figs. 19 and 20). Bailey and, later, I accepted Boott's decision and in 1913 in Bull. Torr. Bot. Cl. xl. 551 (1913) Mackenzie also did so; and in 1902 I described as *C. umbellata*, var. *tonsa* the glabrous-fruited plant which Boott had shown in his t. 293.

That the three are reasonably distinct species now seems apparent. The *narrow* (1.5–3 mm. broad)- and relatively *soft-leaved plant*, true *C. umbellata* Schkuhr, with *pistillate scales lance-ovate and gradually tapering to long or acuminate tips,* has the finely *pubescent perigynia* 3.2–4.7 *mm. long, with ellipsoid-ovoid or -obovoid body* 1.25–2.2 *mm. thick, the beak* 0.9–1.7 *mm. long.* The narrow- and softer-leaved plant with *scales ovate or ovate-oblong and short-tipped,* the *perigynia* 2.2–3.3 *mm. long,* *with globose-obovoid bodies* 1–1.3 *mm. thick, the beak only* 0.5–1 *mm. long*, is *C. abdita* Bicknell in Bull. Torr. Bot. Cl. xxxv. 492 (1908) = *C. umbellata*, var. *brevirostris* Boott. The coarser plant, with *hard and firm erect leaves becoming* 2.5–5 *mm. broad, the large and long-beaked perigynia* essentially *glabrous*, is *C. tonsa* (Fern.) Bicknell, l. c. = *C. umbellata*, var. *tonsa* Fern.

This interpretation of *C. umbellata* was the unanimous one until, in Bull. Torr. Bot. Cl. xlii. 621 (1915), Mackenzie wrote: "A careful study of Schkuhr's plate of *Carex umbellata* has thoroughly convinced me that what he had was a plant with short-beaked perigynia, named *C. abdita* by Bicknell." Consequently Mackenzie gave to his correct *C. umbellata* of his treatment of 1913, the plant with "scales lance-ovate, short-cuspidate to acuminate, . . . perigynia 3.25–4.25 mm. long, the body short-oval", etc., the new name *C. rugosperma;* and those botanists who undiscriminatingly think that the "last word" is necessarily the best have forthwith taken up *C. rugosperma*.

In the North American Flora, xviii[4]. 204, 205 (1935), therefore, Mackenzie treats as *C. umbellata* the smaller and softer plant, *C. abdita* Bicknell, with "scales ovate, abruptly acute, acuminate or cuspidate, . . . perigynia 2.25–3.25 mm. long, the body subglobose, . . . 1–1.25 mm. wide, . . . abruptly contracted into a short (0.5–1 mm. long) beak"; and at the same time he maintained his *C. rugosperma* for the plant with lance-ovate and acuminate scales and with larger and longer-beaked perigynia with the body "short-oval."

If one compares the illustrations of perigynia and pistillate scales in Mackenzie's North American Cariceae, i. pl. 234, of *Carex* "*umbellata*" sensu Mackenzie or *C. abdita* Bicknell (our FIGS. 21 and 22) and those of his *C. rugosperma*, the *C. umbellata* of Boott, Bailey, Fernald and in 1913 of Mackenzie (our FIGS. 23 and 24) and then takes into account the fact that the very long beak in Mackenzie's plate of the latter (his pl. 235) is very extreme (the beak commonly much shorter than there shown), it will be apparent that the shape of the scale and of the perigynium-body of true (Schkuhr's) *C. umbellata* (our FIGS. 16 and 17) are much closer to those of *C. rugosperma* (our FIG. 18) than to those of *C.* "*umbellata*" sensu Mackenzie, not Schkuhr (our FIGS. 19–22). The original description of Schkuhr ex Willdenow clearly defined the perigynia as ovate, the scales as ovate-lanceolate; for his *C.* "*umbellata*" Mackenzie as definitely says, body of perigynium "subglobose", the "scales ovate". In view of these facts I find myself reducing *C. rugosperma* to *C. umbellata* Schkuhr. When one considers the interchangeable character of the scale, in Schkuhr's original *C. umbellata* "ovate-lanceolate", in Mackenzie's *C. rugosperma* "lance-ovate", he is reminded (if he ever reads such nonsense) of one of the scaly characters of Stephen Leacock, who imagined that he had altered his identity by reversing his name from Vere de Lancy to Lancy de Vere and so far succeeded that his original name was unknown on shipboard except by "the captain, the purser, the steward, and the passengers".

A life-size photograph of Schkuhr's type, secured by Dr. Svenson, who kindly presented the Gray Herbarium with a copy, shows the prolonged-acuminate scales of *C. rugosperma* and should dispose of the doubts of those who take Mackenzie's verdicts as law. Unfortunately, the prints, sent from Halle without the negative, are too black for reproduction.

As to *Carex umbellata*, var. *vicina* Dewey, which in the North American Flora Mackenzie places in the synonymy of his *C.* "*umbellata*" (i. e. *C. abdita*), it should be noted that Dewey's type belongs in true *C. umbellata* Schkuhr (*C. rugosperma* Mackenzie).

C. Richardsonii R. Br., forma **exserta,** f. nov., spicis foemineis valde exsertis pedunculis imis 1.8–3.3 cm. longis. Illinois: Augusta, *S. B. Mead*, in Herb. Gray.

Typical and widespread *Carex Richardsonii* has the bases of the pistillate spikes included in or barely exserted from the colored sheaths. In restudying the species I had marked fig. 475 in Gray, Man. ed. 7, 240 as "impossible"; but search of the material in the Gray Herbarium reveals the wholly unusual sheet of the formerly unrecognized forma *exserta* as having been used as the basis for fig. 475 in the Manual. Fig. 475, then, is a good illustration of forma *exserta*, not of typical *C. Richardsonii*.

Carex **terrae-novae,** sp. nov. (tab. 711, fig. 1, 3, 4, 7, 8), *C. glaciali* habitu simillima; vaginis inferioribus plerumque pallide brunneis; culmis 1–12 cm. altis; bracteis spathiformibus; spicis foemineis sessilibus vel subsessilibus densifloris, rhachi recti glabro; squamis caducis; perigyniis anguste ovoideo-ellipsoideis fusiformibus 2–2.5 mm. longis, basi angustatis substipitatis, rostro 0.3–0.5 mm. longo.—Calcareous barrens of northern and western NEWFOUNDLAND: turfy slopes of slaty hills, Little Quirpon, August 6, 1925, *Fernald & Long*, no. 27,658; dry limestone barrens, northern half of Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald et al.*, no. 27,655; sandy and clayey spots in limestone gravel-barrens, Boat Harbor, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 27,656; gravelly and peaty limestone barrens back of Big Brook, Straits of Belle Isle, July 15, 1925, *Fernald & Long*, no. 27,652; limestone barrens west of Big Brook, July 16, 1925, *Long & Gilbert*, no. 27,653; limestone barrens on the Highlands northeast of Big Brook, *Fernald, Wiegand & Hotchkiss*, no. 27,654; dry gravelly limestone barrens, Savage Point, Straits of Belle Isle, July 13, 1925, *Fernald et al.*, no. 27,650; dry horizontal limestone, Rock Marsh, Flower Cove, Straits of Belle Isle, July 30, 1924, *Fernald, Long & Dunbar*, no. 26,428; limestone barrens near Ice Point, St. Barbe Bay, July 14, 1925, *Wiegand, Gilbert & Hotchkiss*, no. 27,651; damp clay pockets in limestone gravel, Brig Bay, August 6, 1924, *Fernald, Long & Dunbar*, no. 26,429; forming close turf in peaty pockets in limestone ledges, Plum Point, Brig Bay, August 8, 1924, *Fernald, Long & Dunbar*, no. 26,430; dry gravelly limestone barrens, St. John Island, St. John Bay, July 31, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,657 (TYPE in Herb. Gray.); gravelly crests of limestone sea-cliffs at base of Pointe Riche, July 22, 1929, *Fernald, Long & Fogg*, no. 1411; dry gravelly limestone barrens, Pointe Riche, July 24, 1929, *Fernald, Long & Fogg*, no. 1412; dry limestone barrens, upper slopes and tablelands, altitude 200–300 m., Table Mountain, Port au Port Bay, August 16, 1910, *Fernald, Wiegand & Kittredge*, no. 2894; dry exposed ledges and shingle on the limestone tableland, alt. 200–300 m., Table Mountain, July 16 and 17, 1914, *Fernald & St. John*, no. 10,796; summit of 1st dome, Table Mountain, July 24, 1921, *Mackenzie & Griscom*, no. 10,147; dry limestone barrens, Green Gardens, Cape St. George, July 18, 1922, *Mackenzie & Griscom*, no. 11,022.

The earliest collections were distributed as *Carex pedata* Wahlenb., all the others as *C. glacialis* Mackenzie; the latter name published by Mackenzie in Bull. Torr. Bot. Cl. xxxvii. 244 (1910) for *C. pedata* Wahlenb. (1812), not L. (1763), with reference only to the European plant. In the North American Flora, xviii[4]. 221, Mackenzie treats the Newfoundland plant, along with that of Greenland, Ellesmereland, Mackenzie and Yukon, as identical with the arctic-alpine European species; but the plant of Newfoundland differs in so many characters that I find it very difficult to consider it as belonging to *C. glacialis* (*C. pedata* Wahlenb.). The plant of Greenland, and Ellesmereland, thence west across Arctic America and south to Baffin Island (*Malte, Polunin*), Cape Mugford, Labrador (*Potter & Brierly*, nos. 2389 and 2390) and Lake Athabasca, Saskatchewan (*Raup*, no. 6521), seems to be very characteristic *C. glacialis;* the Newfoundland plant as clearly not.

Carex glacialis (*C. pedata* Wahlenb.) usually (but not always) has the bases purplish ("vaginae inferiores purpureae"—Kükenthal); *C. terrae-novae* very rarely so, the lowest sheaths being drab or pale brown in most cases, only 4 out of the 18 collections at hand showing a slight purplish tone. The lower bract of *C. glacialis* is subtruncate and usually ends in a slender but short hirtellous blade (FIG. 2), ("Bracteae ad vaginas breves truncatas coloratas reductae, ima plerumque lamina brevi setacea munita"—Kükenthal); in *C. terrrae-novae* the lower bract (FIGS. 3 and 4) is obliquely sheathing, much more scarious than in *C. glacialis*, and its very exceptional minute blade is smoother. In well developed *C. glacialis* the lower spike is clearly peduncled (FIG. 2), standing definitely out of the truncate bract, but in the most dwarfed extremes it may be subsessile; in *C. terrae-novae* (FIGS. 1 and 3) it is sessile or barely short-peduncled. The pistillate spikes of *C. glacialis* are lax and open, with a flexuous and hirtellous rachis ("spicis subpedunculatis sparsifloris"—Wahlenberg; "laxe 2–5-florae . . . rhachis flexuosa"—Kükenthal); in *C. terrae-novae* the pistillate spikes (FIGS. 3 and 4) are densely few-flowered, the straight and smooth rachis usually hidden by the imbricated perigynia. In *C. glacialis* the perigynia promptly fall, leaving the flexuous rachis clothed with the persistent and distant scales; in *C. terrae-novae* the pistillate scales are caducous, leaving the rachis covered by sub-persistent imbricated perigynia. In *C. glacialis* the perigynia (FIGS. 5 and 6) are broadly obovoid and only slightly narrowed at base, 2 mm. long, with a relatively short beak with oblique orifice, and slightly persistent style-base ("capsulis subglobosis apiculatis"—Wahlenberg; "Utriculi . . . orbiculato-ovati . . . 2 mm. longi . . . , basi contracti, apice in rostrum breve . . . saepe obliquum ore hyalino . . . abrupte abeuntes"—Kükenthal); in *C. terrae-novae* the more slender perigynia (FIGS. 7 and 8) are 2–2.5 mm.

long, tapering to a substipitate slender base and to a longer beak with subtruncate orifice. In *C. terrae-novae*, furthermore, the styles (FIG. 8) are apparently longer and their indurated bases more regularly persistent in the fruit.

Whether the staminate scales and the anthers of *Carex terrae-novae* differ materially from those of *C. glacialis* I cannot yet determine. The material is all past flowering.

C. PALEACEA Wahlenb., forma **erectiuscula** (Fernald), comb. nov. *C. maritima*, var. *erectiuscula* Fernald in RHODORA, ii. 170 (1900).

Since the familiar name, *Carex maritima* O. F. Muell. (1777), is antedated by *C. maritima* Gunner (1772) we have to take up for the maritime member of *Carex*, § *Cryptocarpae*, the name *C. paleacea* Wahlenb. in Svensk. Vet.-Akad. Nya Handl. xxiv. 164 (1803). In RHODORA, xxxv. 397 (1933) I most stupidly assumed (and consequently reaped the almost certain reward for so doing) that Wahlenberg's plant was the Scandinavian form of the species, there with tendencies to smaller parts (stature, leaf-breadth, size of spikes, length of beak, etc.) than the American plant (eastern Labrador to the lower St. Lawrence, south to Massachusetts; and shores of James Bay). I, consequently, too hurriedly named our American plant *C. paleacea*, var. *transatlantica*. Sad to confess, the type of *C. paleacea* Wahlenberg was the American plant. Wahlenberg took it to be a distinct species from the Scandinavian *C. maritima* of O. F. Mueller, describing the two, one after the other on the same page. Wahlenberg supposed his *C. paleacea* to be "*C. paleacea* SCHREB. in *Mühlenb.* Act. Amer?" and its habitat was given as simply: "*Hab.* in America boreali; secundum herbarium Cl. *Torneri*". A beautiful photograph of the TYPE, most generously sent me by Professor Alm in December, 1934, when he graciously pointed out my inexcusable blunder, shows the smallest northern extreme of our coastwise plant, such as occurs chiefly at the northern limit of the specific range with us. It presumably came from the Labrador Peninsula.

Mackenzie explicitly says in N. Am. Fl. xviii.[7] 414, "Type from Greenland". In view of the Scandinavian authorship of the species this was a plausible assumption but there is nothing in Wahlenberg's "*Hab.* in America boreali" to support it. The species was not included by Lange in his compendious works on the Greenland flora; neither is it in Ostenfeld's Flora Arctica, nor in his detailed enumeration of all known plants of Greenland; nor did Polunin find any evidence of it in the Canadian Eastern Arctic. In the Gray Herbarium there is an old specimen labeled in the hand of someone else: "legit Vahl. e Groenlandia", but it can hardly be taken, in view of the failure of the closest students of the Greenland flora to find it, as evidence that the type of *C. paleacea*, communicated by Torner as from North America, came from Greenland.

As to "*C. paleacea* Schreb. in *Mühlenb.* Act. Amer?", Wahlenberg doubtless meant *C. paleacea* Schreber ex Muhl. in Trans. Amer. Phil. Soc. iii. 179 (1793). This, merely a *nomen*, did not get recorded in *Index Kewensis*. It was in Muhlenberg's (Muhlenberg then and thereafter used the unmodified u, not ü, in his name) *Index Florae Lancastriensis*. It was an undescribed species of Schreber, with whom Muhlenberg was in regular correspondence, but, published simply as "*Carex*, Seg [Sedge] *paleacea*, Schreberi, N. S.", it can be treated only as a *nomen nudum*. Dewey and others took up Wahlenberg's *C. paleacea* as based upon the Lancaster (Pennsylvania) plant and Dewey made a varietal combination, *C. crinita*, β. *paleacea* (Wahlenb.) Dew. in Am. Journ. Sci. x. 270 (1826); but, as above indicated, the Wahlenberg type is conspecific with *C. maritima* O. F. Muell.

Forma *erectiuscula* was thought by me in 1933 to be a possible hybrid of *Carex paleacea* and *C. salina*, var. *kattegatensis*. There is such a hybrid but the type and several other collections (from Anticosti and the coast of Maine) show no traces of the latter plant. They seem to be an extreme of *C. paleacea* with very short and short-peduncled erect pistillate spikes. In this character they break down the statements in familiar keys. For example, Mackenzie's key says of *C. paleacea* "lower spikes normally pendulous"; "commonly" would have been better.

As to the keys in Kükenthal's treatment of § *Cryptocarpae*, they throw one into the hopeless despair suffered so frequently in trying to follow *Das Pflanzenreich*. Stoloniferous and halophytic *C. maritima* (*C. paleacea*) is there separated from its halophytic and stoloniferous allies (*C. salina*, *C. Lyngbyei*, etc.), with which it hybridizes, and is put with *C. crinita*, to which it has no close relationship. *C. salina* is distinguished in his key by "Culmus 10–30 cm altus . . . Spiculae ♀ 3–4 mm late erectae. Squamae . . . aristatae vel mucronatae". Nevertheless, under the fuller treatment of *C. salina* and its varieties and forms we get "Culmus validus 60–90 cm. altus"; "Spiculae ♀ . . . longe capillari-pedunculatae pendulae"; "Spiculae ad . . . 1 cm latae"; and "Squamae ♀ obtuse". It is not remarkable that students become confused in trying to use the treatments!

Carex aquatilis Wahlenb., var. **altior** (Rydb.), comb. nov. *C. variabilis* Bailey, var. *altior* Rydb. in Mem. N. Y. Bot. Gard. i. 76 (1900). *C. variabilis*, var. *elatior* Bailey in Mem. Torr. Bot. Cl. i. 19 (1889), not *C. aquatilis*, var. *elatior* Bab. Man. 341 (1843). *C. aquatilis*, var. *substricta* Kükenthal in Engler, Pflanzenr. iv[20]. 309 (1909). *C. substricta* (Kükenth.) Mackenz. in Rydb. Fl. Rocky Mts. 139 (1918), in N. Am. Fl. xviii.[7] 398 (1935) and N. Am. Cariceae, ii. pl. 458 (1940). Plate 712, figs. 1–3 and 5–7.

Typical *Carex aquatilis* of Scandinavia (perigynium, × 10, in fig. 4) and other parts of northern Eurasia has the culms, to quote Kükenthal, obtusely angled and smooth (Culmus . . . obtusangulus laevis). Examination of some scores of Old World sheets shows this to be the case. In its dwarf northernmost extreme this character holds, as does the elliptic to elliptic-obovate nerveless perigynium, the more northern and low plants sometimes separated as var. *stans* (Drejer) Boott, or even as a species, *C. stans* Drejer. The latter seems to be only a dwarfed state and hardly worth varietal or even formal recognition. *C. aquatilis* in North America is common from the Arctic southward to exposed areas of Newfoundland, the tablelands of Cape Breton, the Gaspé Peninsula, shores of James Bay, and along the Cordillera to New Mexico and California. In the southern part of its range, from Newfoundland to British Columbia, south to Nova Scotia, northern and western New England, northern New Jersey, New York, Ohio, Indiana, Wisconsin, Missouri, Nebraska, Colorado and Oregon, it is gradually replaced by a coarser extreme (sometimes up to 1.5 m. high), with broader leaves, longer spikes (up to 10 cm. long and 3–7 mm. thick), the perigynia more broadly ovate to obovate, with rounded summits and usually obscurely nerved. The upper 1–3 decimeters of the relatively slender and firm culm of this southern extreme are acutely angled and either smooth or scabrous. This is *C. substricta* (Kükenthal) Mackenzie. Upon the not too constant shape of the perigynium *C. aquatilis* and *C. substricta* are separated thus in the North American Flora:

"Perigynium narrowly to very broadly elliptic, broadest below apex, less than 3 mm. long, 1–1.5 mm. wide.....457. *C. aquatilis.*
Perigynia strongly obovate, broadest at the apex, 3 mm. long, 1.75 mm. wide..............................458. *C. substricta.*"

Mackenzie cites *C. aquatilis* as extending south in the East only to Quebec (the Gaspé Peninsula), while the only material of the group recognized by him from Maine is his *C. substricta.* It is, therefore, unfortunate that, in an attempt to display the "specific" difference in the perigynia, he should have selected for illustration of the boreal *C. aquatilis* a specimen from central Maine at an altitude of about 100 feet (Orono, *Fernald,* July 9, 1900), for the Orono plant, 1.5 m. high and with thick pistillate spikes 3–7 cm. long (for *C. aquatilis* Mackenzie says 1–4 cm.) is the best kind of *C. substricta!* The result is that Mackenzie's illustration of the perigynium, made from a large specimen of *C. substricta,* shows an obovate perigynium, not an elliptic one as demanded by his key for *C. aquatilis.*

It is unfortunate also that Kükenthal's *C. aquatilis,* var. *substricta,* the basis of Mackenzie's specific name, should be cited by Mackenzie in the North American Flora (pp. 397 and 398) in the synonymy of both *C. substricta* and *C. aquatilis.* Cited as a pure synonym of *C. aquatilis* it had its "Type from eastern North America"; cited as the basis of *C. substricta* it was designated as having its "Type probably from Junius, Seneca County, New York". Kükenthal had given the range, without designated type "Atlantisches Nordamerika: Newfundland; Canada bis Assiniboia (J. Macoun n. 16687!); Vereinigte Staaten nur im Nordosten, von Maine and Vermont (Pringle!) bis New York (Sartwell n. 56!), Pennsylvanien, Ohio and Minnesota". Since Mackenzie has chosen as type *Sartwell's* no. 56, that may stand as the type; but his "probably from Junius" suggests that Mackenzie did not take the trouble to look up no. 56. This was, of course, in the usually well known 2-volume *Carices Americae Septentrionalis Exsiccatae,* edidit H. P. Sartwell, M.D. Penn Yan, Nov. Ebor. Pars I, 1848, Pars II, 1850. No. 56, with the regular printed label, says "*Junius, New York*";

there is no "probably"; and of course Sartwell knew his own country.

It is natural that Mackenzie should have been confused in separating as species his *C. substricta* and the more boreal *C. aquatilis*. Everyone who faces a stack (in my case a stack 2 feet high) of specimens is bound to become confused in attempting to sort them. So long as one deals only with the plant of the Arctic and Subarctic, extending down to Newfoundland and Gaspé and along the mountains in the West, as contrasted with those from New England to southern Manitoba and Missouri, he is on fairly clear ground. When he tackles the transition areas, however, the characters become hopelessly confused. The material from northern Alberta to Colorado is particularly difficult to sort into two exclusive piles. In that area Mackenzie's policy of placing Kükenthal's *Carex aquatilis*, var. *substricta* under two species was partly justified.

On the whole, however, the large temperate American series with the culms acute-angled above, with broader leaves, longer spikes and more obovate and often nerved perigynia, stands off as a good geographic variety—that is all. It was clearly described in 1889 as *C. variabilis* Bailey, var. *elatior* Bailey in Mem. Torr. Bot. Cl. i. 19 (1889). At that time Bailey proposed for the Rocky Mountain representatives of *C. aquatilis* a species which he called *C. variabilis*, ibid. 18, differing from *C. aquatilis* in having "culm sharply angled, roughish on the angles", etc.; and for the taller extreme, "much taller", with "spikes often 3 to 4 inches [7.6–10.1 cm.] long", he proposed *C. variabilis*, var. *elatior*. Under the latter he cited three specimens: "Canon City, Colorado, *Brandegee;* open thickets, Morley 'Foot-hills of Rocky Mts', and Donald, Columbia Valley, B. C. *Macoun*". In the North American Flora, where his *C. substricta*, with "sharply triangular" culms "smooth or roughened above" with spikes "usually 3–6 cm. long", is distinguished from his *C. aquatilis*, with culms "obtusely triangular below . . . smooth throughout or somewhat roughened above", and with spikes only "1–4 cm. long", Mackenzie places without question *C. variabilis*, var. *elatior* in the synonymy of true *C. aquatilis*. He there designates as type of Bailey's var. *elatior* the Brandegee specimen from Canon City. This, clearly marked by Bailey, is in the Gray Herbarium. With its firm and slender culms acutely angled and scabrous and its spikes (FIG. 1) up to 7 cm. long it is to me inseparable from much slender-spiked *C. substricta*, for instance an isotype (*Sartwell*, no. 56 our FIG. 2) in the Gray Herbarium and a topotype (*Wiegand*, no. 1842, our FIG. 3), the former with the lowest spike 6 cm. long, the latter with it 7.5 cm. long. Strikingly enough the perigynium (FIG. 5, × 10) of the Canon City TYPE of *C. variabilis*, var. *elatior* is fully as rounded-ovate (Mackenzie says obovate) as in *Sartwell*, no. 56 (FIG. 6, × 10), isotype, and in *Wiegand*, no. 1842 (FIG. 7, × 10), topotype of *C. substricta*. There seems to me no question that *C. aquatilis*, var. *substricta* (1909) and *C. variabilis*, var. *elatior* (1889) belong together. Since, however, there is a *C. aquatilis* var. *elatior* Bab. (1843), a European variety with culms and perigynia of true *C. aquatilis*, it is necessary to take up the name *C. aquatilis*, var. *altior*, based on *C. variabilis*, var. *altior* Rydb. (1900), a substitute for Bailey's var. *elatior* and resting, for typification, upon it.

C. Bigelowii Torr., forma **anguillata** (Drejer), comb. nov. *C. anguillata* Drejer, Nat. Tidskr. iii. 454 (1841). *C. rigida*, var. *concolor*, f. *anguillata* (Drejer) Kükenth. in Engler, Pflanzenr. iv[20]. 302 (1909).

I quite agree with Polunin, Bot. Can. East. Arct. pt. i. 130 (1940), that there is no clear line to separate *Carex anguillata* from *C. Bigelowii*, and since it is scattered through the range of the latter it is best treated as a forma. Polunin, after studying the type of *C. concolor* R. Br. Chlor. Melv. 25 (1823), preserved at the British Museum, states, with the concurrence of both Wilmott and Dandy, that it is *C. aquatilis* Wahlenb., var. *stans* (Drej.) Boott. He also notes that Simmons had already suspected as much. Phytogeographically this is as it should be. *C. Bigelowii* (*C. concolor* sensu Mackenzie) is a pronounced oxylophyte; *C. aquatilis* is often decidedly calcicolous. *C. concolor* R. Br. came from one of the limestone islands, Melville Island, of the Arctic Archipelago. In his then exhaustive Phytogeography of the Arctic American Archipelago[1], Simmons was unable to cite *C. Bigelowii* (*C. rigida* of Am. auth. perhaps not Good., and not Schrank; *C. concolor* sensu Mackenzie, not R.

[1] Lunds Univ. Årsskr. n. f. Afd. 2. ix[19] (1913).

Br.) on the Archipelago from west of granitic eastern Baffin Island, making special note of its absence from the calcareous western islands; but the frequently calcicolous *C. aquatilis*, var *stans* was cited by him from many parts of the Archipelago, including three collections from Melville Island. Although Mackenzie, in N. Am. Fl. xviii[6]. 380 (1935), gives his *C. concolor* (i. e. *C. Bigelowii*) the broad range, "Greenland to Alaska, and southward to the mountains of New Hampshire and northern New York", he had seen material only from Greenland, Ungava and Labrador to northern New England and northern New York and "Mackenzie, Alaska"; nothing from the Arctic Archipelago.

Typical *Carex Bigelowii* has linear-cylindric and elongate pistillate spikes, in its type-area (the White Mountains of New Hampshire) mostly 2–5 cm. long and 3–5 mm. thick, with the perigynia and scales rather loosely disposed, the usually long-peduncled staminate spike 1–2.5 cm. long and commonly well overtopping the pistillate. The common plant of northern Europe has the densely flowered thick-cylindric spikes mostly 1–2 cm. long and 3–7 mm. thick, the usually short staminate spike overtopped at base by the pistillate ones. It is very different from typical *C. Bigelowii*, though probably passing into it northward. It is, therefore, surprising to find in the treatment of Mackenzie, who saw species in *C. anguillata* and many other minor forms or varieties, thirty or more names of European forms placed in the synonymy of the chiefly eastern North American *C. Bigelowii* (Mackenzie's *C. concolor*). It is impossible to keep one's tongue out of his cheek as he reads Mackenzie's characterization of these European "names . . . proposed of no systematic value." It is certain that Mackenzie had never seen authentic material nor types of most of these and their citation by him does not reflect actual understanding of them. In view of the complexity of the species, I refrain from selecting the proper name for *C. rigida* Goodenow. That is a problem for the European.

C. NIGRA (L.) Reichard, var. **strictiformis** (Bailey) comb. nov. *C. vulgaris* Fries, var. *strictiformis* Bailey in Mem. Torr. Bot. Cl. i. 74 (1889). *C. rigida* Good., var. *strictiformis* (Bailey) Bailey in Journ. Bot. xxviii. 172 (1890). *C. Goodenoughii* Aschers., var. *strictiformis* (Bailey) Kükenthal in Engler, Pflanzenr. iv[20]. 316 (1909).

The name *Carex nigra* (L.) Reichard, Fl. Moeno-Francofurtana, ii. 96 (1778) was based directly on *C. acuta* α. *nigra* L. Sp. Pl. ed. 2, ii. 1385 [1388], no. 35 (1763), where the treatment of *C. acuta* L. was identical with that of L. Sp. Pl. ed. 1, ii. 978, no. 28 (1753). *C. acuta* L. consisted of two varieties: α. *nigra*, which was *Carex nigra verna vulgaris* of Flora Lapponica, no. 330 (1737), growing "*in siccioribus*"; and β. *ruffa*, which was a tall aquatic ("*in aquosis*"). *C. nigra* (L.) Reichard antedates by seven years *C. nigra* All. Fl. Pedem. ii. 267 (1785), the name generally used for an alpine species of § *Atratae*, occurring in Europe and western Asia. *C. nigra* All., a later homonym, must be replaced either by *C. parviflora* Host (1801) or by *C. bina* Schkuhr (1801). That is for Europeans to settle; and *C. parviflora* C. A. Meyer (1831), maintained by Kükenthal, cannot be used because of *C. parviflora* Host (1801) and of *C. parviflora* Gaudin (1804). Meyer's species apparently becomes *C. melanocephala* Turcz. (1856).

Carex nigra (L.) Reichard was revived by G. Beck (Beck von Mannagetta) in his Flora von Nieder-Österreich, i. 136 (1890). It is the same as *C. Goodenowii* J. Gay in Ann. Sci. Nat. sér. 2, xi. 191 (1839), as *C. vulgaris* Fries, Mant. 153 (1842), as *C. Goodenoughii* Asch. Fl. Brand. i. 776 (1864) and as *C. acuta* sensu Mackenzie in Bull. Torr. Bot. Cl. l. 345 (1923) and in N. Am. Fl. xviii[6]. 388 (1935). In L. Sp. Pl. ed. 2, ii. 1388 (1763) and in later editions of the Linnean works, including Fl. Lapp. ed. 2: 265 (1792), edited and emended by Sir James Edward Smith who had the Linnean Herbarium, the identity of *C. acuta* α. *nigra* and *C. nigra verna vulgaris* was reaffirmed. Reichard drew his binomial, *C. nigra*, directly from *C. acuta* α. *nigra*; Gay, in publishing *C. Goodenowii*, cited as the first synonym *C. nigra verna vulgaris*, followed by *C. acuta* α. *nigra*; Fries, describing his *C. vulgaris*, also cited "Carex *vulgaris* nigra [changing the emphasis to '*vulgaris*']. *Linn. Lapp. n. 330*"; and Beck von Mannagetta, reviving *C. nigra*, gave only the synonyms "L. (als Var. α. der *C. acuta*) . . . —*C. Goodennouwii* Gay . . . (richtiger *C. Goodenoughii* [neither of Beck's spellings agreeing with Gay's original *Goodenowii*]—*C. vulgaris* Fries". It is difficult to find any doubt concerning the identity of *C. nigra* (L.) Reichard.

Carex acuta L. (1753), having consisted of two varieties, α. *nigra* and β. *ruffa*, which soon proved to be not closely related, the first author who satisfactorily distinguished one of them as a separate species automatically determined which element should retain the name *C. acuta*. In taking out *C. nigra*, based upon *C. acuta* α. *nigra*, Reichard solved the question; there was nothing left of *C. acuta* but β. *ruffa*. When, furthermore, in Trans. Linn. Soc. ii. 203 (1794), Goodenough definitely identified *C. acuta* as the *C. gracilis* of Curtis, Flora Londinensis, and described it as a relatively large plant reaching a height of 2 feet or more, with harsh culms, with 2 or 3 staminate spikes each 1–3 inches long, with foliaceous bracts overtopping the inflorescence, and with pistillate flowering spikes pendulous, he was restricting *C. acuta* to *C. gracilis* Curtis.

Goodenough erred in citing as a synonym of *Carex acuta*, as interpreted by him, *C. acuta* β. of Flora Suecica, ed. 2, no. 857 (1755) instead of *C. acuta* α. of that work, for the two varieties, α. and β. of Species Plantarum (1753) were reversed in Flora Suecica; but Goodenow's detailed description shows all who can read his excellent Latin that he was not describing *C. nigra verna vulgaris*. However, in arguing against the good usage of European botanists for one and a half centuries, in keeping *C. acuta* L. in the sense of *C. gracilis*, the late K. K. Mackenzie, in Bull. Torr. Bot. Cl. l. 343–345 (1923), laid his stress on the confusion prior to 1753 and upon his private dictum, that the "alpha variety" must be taken as type of a species. There is no justification for the latter argument and surely our nomenclature begins with 1753, not with 1737 or other earlier dates. The interpretation of Linnean species of 1753 should stop there, unless they depend primarily on descriptions of earlier date. If, seeking back of that for pre-Linnean (prior to 1753) meanings of names, we should insist on the ancient interpretations as more important than those of 1753 we should get into a hopeless maze. Careful and scholarly botanists have wisely decided to stop at 1753. Of course, if new light is discovered, showing that there has been serious error in identification, reconsideration is necessary. In case of the two components of *C. acuta* of 1753 there is no new information. In 1753 both elements were *C. acuta*. The withdrawal from the pair of *C. nigra* in 1778 left as

C. acuta the other member of the pair. This was clearly described in 1794 by Goodenough as true *C. acuta.* That should settle the matter. Nothing but confusion results from an attempt to disturb typifications so adequately made by those who understood what they were doing.

Carex nigra (*C. Goodenowii*) has several European varieties which are not known in America, while var. *strictiformis*, closely cespitose and tall (up to 7.5 dm.), with scattered and relatively loose pistillate spikes, is apparently confined to eastern North America. Beck von Mannagetta and Kükenthal have defined those of Europe, some of them considered endemic European species by good students of the genus. It certainly seems as if the 3½-page bibliography under the misidentified *C. acuta* in the North American Flora might well have been reduced by the omission of many scores of names of plants which are not known to occur anywhere in North America.

Carex stylosa C. A. Meyer, var. **nigritella** (Drejer), stat. nov. *C. nigritella* Drejer in Nat. Tidssk. iii. 450 (1841).

Although it has been the custom, ever since Kunze's uniting of the two, to treat *Carex nigritella* of Greenland, Labrador, Newfoundland and eastern Saguenay County, Quebec, as identical with *C. stylosa* of southern Alaska, there seems to be good ground for treating the plant of the North Atlantic area as varietally distinct. When he described *C. stylosa* from Unalaska, Meyer, in Mém. Acad. St. Pétersb. Sav. Étr. i. 222, t. 12 (1831), accompanied his very full description by a beautiful plate, showing the slenderly ellipsoid and subacute perigynia long-attenuate and "quasi" stipitate, the ellipsoid-obovoid achene gradually rounded at summit and with attenuate base; and the leaves were described as subrigid. Unfortunately, our old collections of *C. stylosa*, presumably containing an isotype, are all interned in Sweden so that I am now unable to examine them; but a few Alaskan sheets, most kindly sent me for study from the New York Botanical Garden, and some recent collections from there by Miss Scamman and by Mr. Erling Porsild well agree with Meyer's description and plate. They show the well developed perigynium to be slenderly ellipsoid and 3–3.5 mm. long, and mostly equaled or exceeded by the scales; whereas the more broadly obovoid perigynia of var. *nigritella* are 2–2.5 mm. long and much longer than the scales. The achene of *C. stylosa* is as shown by Meyer; that of var. *nigritella* shorter and more rounded-oblong, shorter-stipitate, and with broadly rounded to subtruncate summit. In *C. stylosa* the foliage is harshly scabrous, in var. *nigritella* less so or nearly smooth. The inner band of the leaf-sheath in *C. stylosa* is most often friable, in herbarium-specimens usually fractured; whereas, the inner band of var. *nigritella* is more durable and usually unbroken in the old dried material.

When Drejer described his *C. nigritella* he specially contrasted it with *C. stylosa*, emphasizing the more durable inner band of the leaf-sheath and other characters not so good. Kunze, Suppl. Riedgr. 115. t. xxix, promptly reduced *C. nigritella* and practically all botanists for a century have followed his interpretation. Kunze's plate, however, showed only the Alaskan plant, with the characteristic perigynium and achene, from Sitka, and he did not illustrate *C. nigritella*. Francis Boott, following Kunze, illustrated as the southern Alaskan *C. stylosa* a plant from Greenland (*C. nigritella*), showing the short-oblong achene subtruncate at summit, with the style either erect or depressed (the latter tendency frequent in var. *nigritella*); but, as a concession to the type-region of *C. stylosa*, he added details of the Alaskan plant, with longer and ellipsoid more gradually tapering achene, as in Meyer's original plate and as in the Alaskan specimens. *C. nigritella* was beautifully shown in Fl. Danica, xiv. fasc. xl. t. mmccclxix (1843), here again with the characteristic achenes of the eastern plant, one of them shown with depressed style-base.

C. MEDIA R. Br., var. **Stevenii** (Holm), comb. nov. *C. alpina*, var. *Stevenii* Holm in Am. Journ. Sci. ser. 4, xvi. 21, 27 (1903); Fernald in RHODORA, xxxv. 223, t. 248, figs. 5 and 10 (1933). *C. Vahlii*, var. *Stevenii* (Holm) Fernald in RHODORA, xxxv. 398 (1933). *C. angarae*, var. *Stevenii* (Holm) A. E. Porsild in RHODORA, xli. 204 (1939).

I fully agree with Porsild that the woodland and relatively southern *Carex angarae* Steud. (1855) is specifically distinct from the arctic-alpine plant of northern Eurasia and from Greenland to northern Newfoundland, the Shickshock Mts. of Gaspé and the northern shores of Hudson Bay. The distinctive characters were stated by me in RHODORA, l. c. 222 and 224, and then illustrated. In taking up for the woodland plant of Asia and North America the name *C. angarae* (1855) Mr. Porsild overlooked *C. media* R. Br. in Richardson in Frankl. Journ. 750 (reprint, 22) and ed. 2: 763 (reprint, 35) (1823). Brown's species, under the synoptic heading "4. *Spicis androgynis pedunculatis*" was clear:

356. C. media: spicis androgynis ternis brevissime pedunculatis sessilibusve approximatis basi masculis, stigmatibus tribus, capsulis ovato rostellatis glaberrimis squama ovata obtusiuscula longioribus. *Brown, MS.* (W) [W, "wooded country from latitude 54° to 64° north"].
Prope C. bicolorem. *Br.*

As to the name *C. Vahlii* Schkuhr (1801) for the arctic-alpine plant with strongly granular-papillose short- and straight-beaked trigonous-obovoid perigynia only 2–2.5 mm. long, Dr. V. Kreczetowicz, Fl. U. S. S. R. iii. 183 (1935) points out that *C. norvegica* Retz. Fl. Scand. Prodr. 179 (1779) antedates *C. norvegica* Willd. (1801) and is identical with *C. Vahlii* Schk. (1801). Retzius in his ed. 2: 219 (1795)—I have not seen ed. 1—gave a sufficiently clear characterization of the plant which has passed as *C. alpina* Lilj. (1798), not Schrank (1787), as *C. Halleri* Gunn. (1772) in small part only, not as to type) and as *C. Vahlii* Schkuhr (1801). The description of Retzius and his citation of Flora Danica, t. 403, which is a crude figure of the arctic-alpine plant (Retzius said "Pl[anta] alp."), cited by Mackenzie under *C. Vahlii*, and the further citation by Retzius of the Norwegian element of *C. Halleri* (not the Haller plant which must be taken as type of *C. Halleri*[1]), leave no question that for the much named *C. Halleri* Gunn. (1772), exclusive of type, *C. alpina* Lilj. (1798), and *C. Vahlii* Schkuhr (1801) we must, unfortunately, take up the name *C. norvegica* Retz. (1779). The maritime *C. norvegica* Willd. becomes *C. Mackenziei* V. Kreczetowicz, l. c. (1935).

C. lasiocarpa Ehrh., var. **americana,** var. nov. (tab. 712, fig. 10 et 11), a var. *typica* europaea recedit bracteis vix vaginatis, squamis foemineis plerumque aristatis vel cuspidatis; perigyniis ovoideo-ellipsoideis 3–4.5 mm. longis, 1.7–2 mm. latis, rostro perbrevi dentibus 0.2–0.5 mm. longis; achenio ellipsoideo.—Peaty meadows, swales, pond-margins, bogs, etc., Newfoundland to British Columbia, south to northern New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Manitoba, Saskatchewan, Idaho and Washington. Type: open sphagnous bog, Argyle, Yarmouth County, Nova Scotia, July 9, 1920, *Pease & Long*, no. 20,519 (in Herb. Gray.).

[1] For discussion see Fernald in Rhodora, xxxv. 220, 221 (1933).

Carex lasiocarpa, var. *americana* is the transcontinental and usually very familiar plant with involute-filiform or canaliculate slender leaves which has regularly passed either as *C. filiformis*, sensu authors, not L., or as *C. lasiocarpa* Ehrh. It is beautifully illustrated in Boott, Ill. Carex, i. t. 132 (1858) as *C. filiformis*, Boott's plate made, not from the type-area (Sweden) of *C. filiformis* of authors, but from Rhode Island material (our FIGS. 10 and 11). It is also well illustrated in Mackenzie, N. Am. Cariceae, ii. pl. 385 (1940). In both these plates the prevailingly cuspidate to aristate scale, the shape of the perigynium and its very short teeth, the outline of the achene, and the sheathless or barely sheathed lower bract are all brought out, Boott's figures of perigynia and scales here partly reproduced as FIGS. 10 and 11.

Typical *Carex lasiocarpa* of Europe and western Asia has the lowest bract either sheathless or with a tubular sheath up to 1.5 cm. long. In var. *americana* it is difficult to find more than a suggestion of a sheath. In typical Eurasian *C. lasiocarpa* the pistillate scales are much less often aristate than in the American plant. The perigynium of the Eurasian type (FIGS. 8 and 9) is more slender and longer (4–6 mm. long) and with longer teeth (0.7–1 mm. long); and its achene is more obovoid than in the American. The perigynia of typical Eurasian *C. lasiocarpa* are accurately shown in Host, Gram. i. t. 86 (1801) as *C. filiformis*—here reproduced as FIG. 9, and in Lindman, Svensk Fanerogampl. fig. 108^2 (1918)—here reproduced as FIG. 8.

Were true *Carex lasiocarpa*, of Europe and of Asia eastward from the Ural to Lake Baikal, and var. *americana* alone to be considered, the latter would have some claim to specific segregation. In eastern Asia, however, in Manchuria, China, Japan, etc., *C. lasiocarpa*, var. *occultans* (Franchet) Kükenthal has the perigynia (FIG. 12) as short and as short-toothed as in var. *americana*, but they are less pubescent and often longer-beaked, and the pistillate scales are more like the average run on the Eurasian plant. Var. *occultans* seems to be a variety about midway between typical *C. lasiocarpa* and var. *americana*, its perigynium (our FIG. 12) well shown in Akiyama's Consp. Caricum Jap. fig. 170 (1932); while some plants of Kamtchatka are scarcely separable from the American plant.

Carex pallescens L., var. **neogaea,** var. nov. (tab. 712, fig. 13–18) perigyniis apice late rotundatis erostratis ore depresso.—Meadows, grasslands, thickets and glades, Newfoundland to Ontario, south to Nova Scotia, New England, New Jersey, Pennsylvania, Ohio and Michigan. Type from wet clearing in spruce woods along Gander River, Glenwood, Newfoundland, July 12 and 13, 1911, *Fernald, Wiegand and Darlington,* no. 4918, in Herb. Gray.

Carex pallescens, var. *neogaea* is the common plant of eastern North America which regularly passes with us as *C. pallescens.* True *C. pallescens* L. Sp. Pl. ii. 977 (1753), with "*Habitat in* Europae *paludibus*", occurs over much of temperate Europe and western Asia (lacking, according to Kükenthal, in most of Arctic Europe, the Iberian Peninsula and the southernmost Mediterranean region). Its range does not connect with the North American area by way of Iceland and southern Greenland, and it is essentially unknown in eastern Asia. Realizing that long isolation without connecting colonies might have resulted in some constant differences I have tried every character. In habit, foliage and general characters of bracts, spikes, scales, perigynia and achenes the two series are similar. The better developed European material has the perigynia sometimes longer than in the American, but some of the smaller European forms show no difference from ours in their size. One apparently constant difference, one of real significance, comes out. In the Eurasian plant the perigynium (figs. 13–15 and 19) is gradually rounded or tapering to a definite, though extremely short, beak; in the American plant (figs. 16–18) there is no beak, the orifice occupying a slight depression in the broadly rounded summit. The very short but definite beak in true *C. pallescens* is shown in Host, Gram. Austr. i. t. 74, fig. 5 (1801)—our fig. 13; and in Boott's Illlustrations of the Genus Carex, iv. t. 450 (1867), figs. *a* and *b*, at right (our fig. 14), Boott's description on p. 139 saying "perigyniis . . . saepe brevissimo abrupte rostellatis", although on the next page (presumably through inclusion of the American plant) he reversed himself and said "*Perigynium* . . . saepe erostellatum". The beak is also displayed in Reichenbach, Ic. Fl. Germ. Helv. viii. t. ccli. fig. 617; and in numerous other Old World illustrations. The perigynium of the American var. *neogaea* has had no good illustration, except for the tiny one of the late Schuyler Mathews in Gray, Man. ed. 7, fig. 238 (1908). It has been many times accurately described: "Very obtuse . . . ; the orifice minute and entire"—Torr. Fl. N. Y. ii. 403 (1843); "wholly beakless"—Bailey in Gray, Man. ed. 6: 606 (1889); "well marked by the . . . pointless perigynia"—E. C. Howe in 48th Rep. N. Y. State Mus. 102—Repr. 64 (1896); "abruptly rounded and beakless at apex"—Mackenzie in N. Am. Fl. xviii[6]. 320 (1935). These authors had the American, not the European, plant before them; although Mackenzie cited in the synonymy of the American plant 28 names and combinations, 27 of them belonging exclusively to Old World variations not known in America, the 28th an American misapplication of the European *C. undulata* Kunze.

As to *Carex undulata* Kunze, Suppl. Riedgr. 23, t. 4, fig. 2 (1840), which became *C. pallescens*, var. *undulata* (Kunze) Reichenb. Ic. Fl. Germ. viii. 22, t. 251, fig. 618 (1846) and which was separately taken up as var. *undulata* (Kunze) Carey in Gray, Man. 552 (1848), although Reichenbach's characterization of it as "a praecedente fructu obtusiore" suggests var. *neogaea*, the original illustration of the inflorescence and the perigynium by Kunze (our FIG. 19) shows by the tapering summit that it is not ours.

In PLATE 712, FIGS. 13–16 are of CAREX PALLESCENS L. of Europe; FIG. 13, a perigynium, × 10, from Moravia, *Domin & Krajina*, Fl. Čechos. Exsicc., no. 354; FIG. 14, perigynium, after Host; FIG. 15, perigynia after Boott. FIG. 19 is the inflorescence and a perigynium (*g*) from the original plate of *C. undulata* Kunze. FIGS. 16–18 are perigynia, × 10, of var. *neogaea:* FIG. 16, from the TYPE; FIG. 17, from Grand Manan, New Brunswick, *Weatherby*, no. 5635, with persistent style projecting from orifice; FIG. 18, from Newcomb, New York, *House*, no. 7426.

CAREX DEBILIS Michx., var. **intercursa,** var. nov. (TAB. 713, FIG. 6), a var. *typica* differt perigyniis puberulis opacis, a var. *pubera* differt squamae foemineae carina non exserta. Southeastern Virginia and eastern North Carolina. VIRGINIA: Richmond, May 9, 1894, *J. R. Churchill;* argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, Greensville County, June 13, 1940, *Fernald & Long*, no. 12,016 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). NORTH CAROLINA: moist open woodland, Lake Raleigh, 3 miles south of Raleigh, April 23, 1938, *Godfrey*, no. 3706; creek-bank, Delgado, near Wilmington, April 21, 1923, *J. R. Churchill.*

Carex debilis, var. *intercursa* is exactly intermediate between typical *C. debilis*, with glabrous and lustrous perigynia, and var. *pubera* Gray, Man. ed. 5: 593 (1867). It has the puberulent and opaque perigynia of the latter, the pistillate scales of the former. In typical *C. debilis* the obtuse to acute scales (FIG. 1) usually (but not always) have the midrib evanescent toward the tip, so that the tip of the scale is commonly veinless; in var. *pubera* the midrib reaches the tip of the scale (FIG. 5) or projects as a short cusp or awn. Otherwise the only difference I am able to detect is the puberulent perigynium of var. *pubera*, a character quite variable in its intensity. Both of Judge Churchill's collections of var. *intercursa* (from Richmond and from Wilmington) and Godfrey's from Lake Raleigh were, quite naturally, distributed as var. *pubera*, while, at the time of collecting our no. 12,016, Mr. Long questioned if it might be var. *pubera*. All these plants of the Coastal Plain and the outer Piedmont have, however, the most extreme scale of *C. debilis* and they seem to be another of the numerous geographic varieties of that highly variable species.

It is most probable that var. *intercursa* is the *Carex venusta*, var. β. of Boott, Ill. Carex, i. 51 (1858), which Mackenzie includes in the synonymy of his *C. allegheniensis* (based, as to type, on *C. debilis*, var. *pubera* Gray). Boott gave no locality for his *C. venusta*, var. β. except "New [North] Carolina, *Mr. Curtis*". It differed from the coarser *C. venusta* (which has puberulent perigynia) in its more slender spikes with more slender perigynia and "squama lanceolata obtusa vel acuta, infima acuminata albida". That could have been either var. *pubera* or var. *intercursa;* without examining Boott's material we can only guess. Curtis collected extensively about Wilmington, where var. *intercursa* occurs, and published a list of the plants of the region; but he lived at Hillsboro in Orange County, where var. *pubera* possibly occurs.

It is somewhat disconcerting to one who has many times collected typical *Carex debilis* to read in Mackenzie's treatment in the North American Flora that it grows in "Dry woods and copses", while var. *pubera* (*C. allegheniensis*) occurs in "Dry woodlands, mostly in the mountains, Pennsylvania to North Carolina". There are only a few sheets in the Gray Herbarium on which the habitat of var. *pubera* is indicated. These, however, suggest anything but dry woods and none are from the Alleghenies. The type was collected by Porter at Bear Meadows, Center County, Pennsylvania. Bear Meadows, Professor Herbert A. Wahl informs me, is a peat bog in southern Center County, so near the northwestern corner of Huntingdon County that old specimens may have come from either county. Professor Wahl also informs me that he has thus far been unable to locate Porter's type-station. Bear Meadows is considerably to the east of the true Allegheny Mountains. The labels in the Gray Herbarium showing the habitat of var. *pubera* (*C. allegheniensis*) are as follows: "In swamp", Takoma Park, D. C., *Painter*, no. 105 (at inner edge of Coastal Plain); "boggy meadow", Augusta Co., Virginia, *Carr*, no. 423 (separated from the Alleghenies by the Shenandoah Range); "moist ground and copses", Biltmore, North Carolina, *Biltm. Herb.* no. 205b (no part of the Alleghenies in North Carolina!); "wet slope" Tallulah Falls, Georgia, *Perry & Strahan*, no. 784 (Blue Ridge). The latter and two other collections from Georgia (Savannah, herb. Dewey; Warm Springs, *Tracy*, no. 8976) indicate that var. *pubera* extends considerably south of Mackenzie's southern limit, North Carolina. Other specimens in the Gray Herbarium, although without indication of habitat, are from well to the east of the Alleghenies: Bedford County, Virginia (eastern edge of Blue Ridge) and Raleigh, North Carolina (outer Piedmont, merging to Coastal Plain).

As to the occurrence of typical *Carex debilis* in "Dry woods", all labels in the Gray Herbarium giving habitats have been checked. The result follows: alluvial bottomland, 3; bed of dried-up stream, 2; border of pond or creek, 8; edge of woods, 1; low woods (including collection by *Mackenzie*), 4; swamps, 1; swampy woods or thicket, 8; wet roadside, 1; wet woods, 3.

Since the varieties of *Carex debilis* are not too well understood I am showing in Plate 713 characteristic portions of pistillate spikes ($\times$ 5) of the varieties I recognize.

My understanding of this complex species is summarized below.

a. Perigynia glabrous and lustrous; scales rarely cuspidate . . . . b.
b. Perigynia mostly overlapping, obscurely angled; pistillate spikes 1.5–6 cm. long; midribs of pistillate scales usually evanescent at tip.
Scales whitish; perigynia 6–9(–10) mm. long . . . . Var. *typica*.
Scales stramineous to pale brown; perigynia 4.5–7 mm. long.
Basal leaves 2–4 mm. broad, relatively thin; spikes loosely spreading to pendulous; perigynia stramineous to rusty, twice as long as scales . . . . Var. *Rudgei*.
Basal leaves 4–7 mm. broad, subcoriaceous; spikes stiffer, simply spreading to erect; perigynia greener, barely one third longer than scales . . . . Var. *strictior*.
b. Perigynia mostly remotely alternate and not overlapping, firmer and more definitely trigonous; spikes 4–8 cm. long; midribs of pistillate scales sometimes excurrent; basal leaves subcoriaceous, 4–7 mm. broad . . . . Var. *interjecta*.
a. Perigynia minutely puberulent, often more nerved, 5–9 mm. long.
Midrib of pistillate scales extending to tip or excurrent . . . . . Var. *pubera*.
Midrib evanescent below tip of scale . . . . Var. *intercursa*.

C. debilis Michx., var. **typica.** *C. debilis* Michx. Fl. Bor. Am. ii. 172 (1803). *C. debilis*, var. *prolixa* Bailey in Proc. Am. Acad. xxii. 105 (1886).—Low woods, thickets, swamps and clearings, Florida to Texas, north to southeastern Massachusetts, Long Island, New Jersey, Pennsylvania, Kentucky, southern Indiana and Arkansas. Plate 713, fig. 1.

Var. Rudgei Bailey in Mem. Torr. Bot. Cl. i. 34 (1889). *C. tenuis* Rudge in Trans. Linn. Soc. vii. 97, pl. 9, fig. 2 (1804). *C. flexuosa* Muhl. ex Willd. Sp. Pl. iv. 297 (1805).—Open woods, thickets and meadows, Newfoundland to Ontario and Wisconsin, south to Nova Scotia, New England, Long Island, North Carolina, Tennessee and Missouri. Fig. 2.

Var. strictior Bailey in Mem. Torr. Bot. Cl. i. 34 (1889). *C. tenuis*, var. *erectior* Britton in Britt. & Brown, Ill. Fl. i. 321 (1896).—Upland woods, mostly at high altitudes (up to 1600 m.), central Maine to Vermont and Massachusetts. Fig. 3.

Var. interjecta Bailey in Bull. Torr. Bot. Cl. xx. 418 (1893). *C. tenuis*, var. *interjecta* (Bailey) Britton in Britt. & Brown, Ill. Fl. i. 320 (1896).—Mostly in upland woods and clearings, mts. of N. H. to southern Michigan, south to western Connecticut, northern New Jersey, Pennsylvania and mts. of Tennessee. Fig. 4.

Var. pubera Gray, Man. ed. 5: 593 (1867). *C. alleghaniensis* Mackenzie in N. Am. Fl. xviii⁵. 291 (1935).—Low woods and meadows, central and eastern Pennsylvania, south to Georgia, mostly east of the Alleghenies. Fig. 5.

Var. intercursa Fernald, supra.—Low woods, thickets, clearings and shores, southeastern Virginia and eastern North Carolina. Fig. 6.

In PLATE 713 the photographs of portions of pistillate spikes are mostly × 5. FIG. 1 is of CAREX DEBILIS Michx., var. TYPICA from east of Surry Courthouse, Virginia, *Fernald & Long*, no. 9883; FIG. 2, var. RUDGEI Bailey, from Yarmouth, Nova Scotia, *Bissell & Long*, no. 20,513; FIG. 3, var. STRICTIOR Bailey, × 1 from Mt. Lafayette, New Hampshire, July 29, 1863, *Wm. Boott;* FIG. 4, var. INTERJECTA Bailey, from Lincoln, New Hampshire, *Fernald*, no. 11,623; FIG. 5, var. PUBERA Gray, from Augusta Co., Virginia, *Carr*, no. 423; FIG. 6, var. INTERCURSA, from the TYPE.

CAREX AMPHIBOLA Steud., var. **rigida** (Bailey), comb. nov. *C. grisea*, var. (?) *rigida* Bailey in Mem. Torr. Bot. Cl. i. 56 (1889).

C. AMPHIBOLA, var. **turgida,** var. nov., perigyniis oblongo-subcylindricis turgidis 4–5.5 mm. longis 1.7–2.5 mm. latis apice subrotundatis basi rotundatis; foliis (3–) 4.5–10 mm. latis.—*C. grisea* sensu Boott, Ill. Carex, i. 34, t. 86 (1858).—Rich woods, bottomlands and swales, chiefly calcareous, western New Brunswick to southern Ontario and Minnesota, south to Massachusetts, Connecticut, Georgia, Alabama, Louisiana and eastern Texas. TYPE: open alluvial and marshy flats between Fall Creek, East Hill and Cayuga Lake, Ithaca, New York, June 15, 1914, *Wiegand & Thomas*, no. 1915 (in Herb. Gray.).

After several days of detailed study and checking of characters I am forced to consider *Carex amphibola* Steud., *C. grisea* sensu Boott and all later authors and *C. bulbostylis* Mackenzie (*C. amphibola*, var. *globosa* (Bailey) Bailey in Contrib. U. S. Nat. Herb. ii. 480 (1894), based on *C. grisea*, var. *globosa* Bailey in Gray, Man. ed. 6: 605 (1890)), one intergrading series of varieties.

There is even a grave doubt as to the exact identity of *C. amphibola*, for Steudel had mixed material. When he examined Steudel's plants, L. H. Bailey recorded "*C. amphibola* [p.] 234: *C. grisea*, var. *angustifolia*, Boott."—Bailey in Mem. Torr. Bot. Cl. i. 69 (1889). Boott's var. *angustifolia* is the southern plant with narrow leaves (mostly 1.5–4 mm. wide), relatively tight and slightly beaked, brown perigynia somewhat tapering at base and 4–4.7 mm. long by 1.4–2 mm. broad, the basal sheaths reddish-purple ("vaginis infimis foliorum purpureis"). Steudel's description was certainly of a mixture. His "culmo . . . compresso-triquetro" suggests some member of § *Laxiflorae*, that section being characterized by the easily compressed or even wing-angled soft and soon wilting culms, whereas the plant passing as *C. amphibola* has firm or almost wiry persistent culms not compressed. Steudel's "foliis . . . vix scabriusculis" is, likewise, not good for a plant (*C. amphibola*, sensu authors) with leaves scabrous on the margins and nerves. Mackenzie notes in North American Flora, xviii[5]. 269 (1935) that "*Drummond* 437 [basis of *C. amphibola*] in the New York Botanical Garden is *Carex blanda* Dewey, and C. B. Clarke in his copy of Steudel has so marked *C. amphibola*". In deference to Bailey's identification of Steudel's own material I am temporarily retaining the name *C. amphibola*, with the hope that I may yet have an opportunity personally to see Steudel's material.

When we consider the name *Carex grisea* Wahlenberg in Svensk. Vet.-Akad. Nya Handl. xxiv. 154 (1803) there seems to be little question that he had some member of the § *Laxiflorae*. The very name *grisea* is inappropriate for the plant to which it has been generally applied. Bailey included *C. grisea* among "Wahlenberg's originals [which] do not appear to be in existence" —Mem. Torr. Bot. Cl. i. 60, 61 (1889); but it is not clear what Bailey was referring to when he went on, "The figures in Schkuhr with which Wahlenberg compares his *C. grisea* . . . are unmistakable", for Bailey did not state where Wahlenberg made such a comparison and Wahlenberg, in publishing his *C. grisea* in 1803, made no mention of Schkuhr and no comparison with any species. Furthermore, the only figures of Schkuhr's which belong with *C. grisea* sensu Bailey were published in 1806 in Schkuhr. Riedgr. Nachtrag. 69, t. K k k, fig. 141 (1806), and were said (erroneously) to be of *C. laxiflora* Lam. In fact, when Francis Boott took up the name *C. grisea* in the sense of *C. amphibola*, var. *turgida* his discussion of it was chiefly a demonstration that it could not be *C. laxiflora* Lam. Here is Wahlenberg's whole account:

> 85. *C. grisea:* spicis exserte pedunculatis sexfloris sparsifloris, bracteis vaginantibus longissime foliatis remotissimis squamis cuspidatis, capsulis oblongo-ovalibus triquetris acutiusculis ore integerrimo. Patria ignota est, an America borealis? In herbario *Swartzii* asservatur.

Just how Boott, Ill. Carex, i. 34, t. 86 (1858), came to the conclusion that Wahlenberg's *Carex grisea* was the plant described and illustrated by himself is not clear. Wahlenberg said "spikes on exserted peduncles, remotely 6-flowered"; Boott said (correctly) "spicis . . . foemineis . . . sub-9-vel 4-13-floris remotis vel superioribus 2 contiguis sessilibus vel inserte vaginatis" and again "Spicae . . . subdensiflorae". Boott's correct description of a plant with dense mostly sessile or short-peduncled spikes up to 13-flowered and his plate showing 14 strongly imbricated perigynia on one half of a spike is not very suggestive of Wahlenberg's "spicis exsertis pedunculatis sexfloris sparsifloris". Neither does Boott's accurate account of the perigynium of *C. "grisea"* sensu Boott, "perigyniis oblongis utrinque obtusis subturgidis obtuse trigonis" or Mackenzie's "perigynia oblong-obovoid, suborbicular and slightly triangular in cross-section . . . rounded at base and apex, beakless" seem well satisfied by Wahlenberg's "capsulis oblongo-ovalibus triquetris acutiusculis". As already stated, Wahlenberg's account suggests some member of the § *Laxiflorae*, several of which are griseous and have long-exserted peduncles, 6-flowered spikes, with remote trigonous and pointed perigynia. Incidentally, the source of *C. grisea* was unknown. Until the actual type of *C. grisea* is found the name should be dropped as too doubtful.

As for the intergradation of the varieties of *Carex amphibola*, Mackenzie emphasizes the "Culms strongly purple-tinged at base" as absolute and forthwith includes in the synonymy *C. grisea*, var. (?) *rigida* Bailey. Var. *rigida*, said by its author to be "A singular plant, which I do not understand", was not understood by Mackenzie. As originally defined it was based on material from Sellersville, Pennsylvania, Faulkland, Delaware, and "Florida, *Chapman*", the Chapman plant "least characteristic of the three". The Sellersville specimen, originally called *C. oligocarpa*, bears the annotation by Bailey "This specimen appears to be intermediate bet. *oligocarpa* and *grisea*. It may be a stiff and broad-leaved *grisea* var. *angustifolia*". It is coarser and with broader and firmer leaves than in true *C. amphibola* and the purple in the base is pretty brown. The Faulkland material is similar to it and with brown lower sheaths, with the merest suggestion of purple at the very base (if properly turned to catch the light). The Chapman material is very similar, with too coarse and too brown-based tufts and too stiff and broad (up to 6 mm. wide) leaves for true *C. amphibola*.

C. amphibola has very slender and definitely purple bases, with relatively thin leaves only 1.5–4 mm. wide. Its close brownish perigynia taper to either end and are more definitely obtuse-angled than in the broader-ranging var. *turgida*, 4–4.7 mm. long by 1.4–2 mm. broad. It is represented in the Gray Herbarium by the following numbered specimens.

Virginia: Claremont Wharf, Surry County, *Fernald & Long*, no. 9874; Carey Bridge, Southampton County, *Fernald & Long*, nos. 11,783, 11,789, 11,790 and 12,005; Courtland, Southampton County, *Fernald & Long*, no. 11,792; Emporia, Greensville County, *Fernald & Long*, no. 11,795. Florida: St. Marks River, Wakulla County, *Harper*, no. 60; Hampton Springs, Taylor County, *Harper*, no. 63; Tallahassee, Leon County, *Harper*, no. 65; River Junction, *A. H. Curtiss*, no. 6401. Tennessee: Clarksville, Montgomery County, *E. J. Palmer*, no. 17,586 (as *C. digitalis*). Arkansas: Fulton, *Bush*, no. 1351. Louisiana: *Hale*. Texas: Houston, *E. Hall*, no. 742.

Var. *rigida* is coarser than true *C. amphibola*, with brown bases, rarely tinged with purple, the stiffer leaves 3–6 mm. broad, the perigynia nearly as in true *C. amphibola* or slightly larger and verging on the less inflated ones of var. *turgida*. It is commoner southeastward than true *C. amphibola* and intrudes much more upon the area of var. *turgida*. To me it is a transitional series between the two extremes. Its somewhat nondescript nature is shown by Mackenzie's marking many sheets of it "*C. amphibola*", many quite similar sheets "*C. grisea*", the latter, presumably, because he noted the "Culms brownish-tinged at base". The following, from among many sheets of specimens, I refer to var. *rigida*.

Massachusetts: Sheffield, Berkshire County, July 5, 1920, *Churchill*. Connecticut: Southington, *L. Andrews*, no. 656, *Bissell*, no. 25; New Haven, 1859, *D. C. Eaton*. New York: College Point, Queens County, June 9, 1908, *Harper;* Cayuga Heights, Ithaca, *Wiegand*, no. 6072. New Jersey: Harbourton, Mercer County, *Benner*, no. 5633; Garden Lake, *Long*, no. 16,162. Pennsylvania: Easton, June 4, 1887, *Porter;* Milford Square, Bucks County, May 27, 1922, *Fretz;* Lanape, Chester County, *Painter & Hodson*, no. 624; Sellersville, 1884, *Fretz*, (type or isotype). Delaware: Wilmington, *E. Tatnall;* Faulkland, June 7, 1884, *Commons* (paratype). Maryland: Patuxent, Anne Arundel County, *Painter*, no. 1402; Cropley, Montgomery County, *Blake*, no. 10,839. District of Columbia: Glen Echo, *C. F. Wheeler*, no. 827. Virginia: Bull Run Mountains, Fauquier County, *Allard*, nos. 4713 and 4786; Big Cobbler Mountain, *Allard*, no. 7771; Indian Point, Prince George County, *Fernald & Long*, nos. 11,786 (slightly purple tone in base, but leaves up to 6 mm. wide); Claremont, *Fernald & Long*, no. 11,793; Haley's Bridge, Southampton County, *Fernald & Long*, no. 7782; north of Orion, Greensville County, *Fernald & Long*, no. 12,007. North Carolina: Biltmore, *Biltmore Herb.* no. 5754a; south of

Durham, *Godfrey*, no. 3832; Raleigh, May, 1897, *Ashe;* Wilmington, April 21, 1923, *Churchill.* South Carolina: west of Myrtle Beach, *Weatherby & Griscom*, no. 16,426, Florida: without stated locality, *Chapman* (paratype); Jacksonville, *A. H. Curtiss*, no. 6356; Hampton Springs, Taylor County, *Harper*, no. 62. Indiana: Henryville, Clark County, *Hermann*, no. 6747: New Middletown, Harrison County, *Deam*, no. 27,655. Tennessee: Jackson, *Bain*, no. 253; Nashville, *Gattinger*. Mississippi: Starkville, May 29, 1891, *Tracy*. Illinois: Bird Haven, Richland County, *Ridgway*, no. 872. Missouri: Ironton, May 24, 1918, *Churchill*, Butler County, *Bush*, no. 2660. Texas: southwest of Lufkin, Angelina County, *Cory*, no. 7922. Some originally called *C. grisea*, others *C. amphibola*, the identifications variously altered, mostly to *C. amphibola*, by Mackenzie.

Many specimens quite intermediate between *C. amphibola* vars. *rigida* and *turgida* are in the collections from Kentucky and Tennessee.

The Identity of Carex laxiflora (Plate 714).—So far as I can find the material upon which Lamarck based his *Carex laxiflora* has not been adequately discussed. The name has been hopelessly misapplied—to several different plants of § *Laxiflorae* as well as to members of other sections; and in two recent studies it has been used in quite dissimilar senses. Wiegand, Rhodora, xxvi. 195 (1922), took it up for *C. gracilescens* Steud. with "pistillate spikes . . . 7–25 mm. long . . . perigynia usually crowded . . . apex tapering but scarcely beaked, usually strongly bent or recurved". He seems not to have studied Lamarck's original material; if he had he would have found it closely agreeing with that author's diagnosis and fuller account of his specimens. Lamarck quite appropriately called his species *C. laxiflora*, from the very slender and remotely flowered pistillate spikes of the more mature individuals before him. His account was as follows:

50. Laiche à fleurs lâches, *Carex laxiflora*, *Carex spicis foemineis filiformibus axillaribus erectis, flosculis distantibus, foliis planis.* N[obis].

Ses tiges viennent en touffe, sont feuillées, & s'élèvent à la hauteur de sept à neuf pouces. Ses feuilles sont alternes, droites, graminées, planes comme celles du *Juncus pilosus*, glabres, larges de deux lignes & demie à trois lignes; les inférieures ou radicales sont plus courtes que les autres. L'épi mâle est terminal, droit, pâle ou jaunâtre, à peine long d'un pouce; il est embriqué d'écailles ovales-lancéolées, membraneuses. Les épis femelles, au nombre de trois, sont alternes, axillaires, droits, filiformes, pédonculés, longs d'un pouce; ils sont garnis de fleurs alternes, distantes, blanchâtres, à écailles mucronées & membraneuses.

> Ces épis sont moins longs que les feuilles qui les accompagnent. Cette espèce bien distincte croît dans le New-York, la Pensylvanie & la Virginie. (*v. s.*)—Lam. Encycl. iii. 392 (1789).

Although Lamarck optimistically spoke of "this very distinct species", his material, preserved at the Muséum Nationale d'Histoire Naturelle at Paris and scarcely or barely in flower, really represents two species. In the autumn of 1934 Mr. Ludlow Griscom most kindly brought me, after his visit to Paris, photographs of the two sheets now extant of Lamarck's original specimens. One (FIGS. 1–4) is from New York, the other (FIGS. 5–7) from Virginia. They are mere culms broken off from the crown: the New York plant (FIG. 1) with a tuft of two culms, both far enough developed to show the loosened pistillate spikes; and a separate flowering culm quite like the other two. The Virginia plant (FIG. 5) is represented by a single culm barely in flower. The small ticket (FIG. 2) bearing in Lamarck's hand the name "*Carex laxiflora* Lam. dict." beside a similar one in his hand "de Virginie" has been pasted, somewhat recently, on the sheet with the latter specimen—somewhat recently, since the normal position for these labels, as shown by many photographs of Lamarck's types, is occupied by a larger label in the hand of L. H. Bailey: "*C. laxiflora* var. *intermedia* of Boott! L. H. Bailey Nov. 22, 1888". Lamarck's little labels were apparently originally loose and not attached by Lamarck himself. It was presumably by mere chance that the label marked "*C. laxiflora* Lam. dict." was attached to one sheet rather than to the other. Both the New York and Virginia plants were to Lamarck *C. laxiflora*, as they were to Bailey in 1888. Reporting on the latter, Bailey identified *C. laxiflora* with *C. heterosperma* Wahlenb. (1803) and *C. anceps* Muhl. (1805), saying "Lamarck's specimens, both from Virginia and New York, although young, are unmistakably the plant which Boott made var. *intermedia*, and I therefore revise the species that this form may appear as the type. . . . The type of *C. laxiflora* embraces slender plants, characterized by narrow leaves (usually less than ¼ in. in width), a peduncled or at least very conspicuous staminate spike, scattered pistillate spikes which are very loosely flowered and narrow (½ to 1½ in. long), and very blunt perigynia".—Bailey in Mem. Torr. Bot. Cl. i. 32 (1889).

The New York material of Lamarck's is certainly the same as *C. anceps* Muhl., but I see nothing in Boott's plate (Ill. i. t. 91. fig. 1) of his var. *intermedia* in it. The latter is correctly cited by Wiegand under *C. ormostachya* Wieg. in RHODORA, xxiv. 196 (1922). And, by present-day interpretations of typification, it may seem difficult to reconcile Bailey's further discussion of *C. striatula* Michx. or *C. laxiflora*, var. *striatula*, based nomenclaturally upon it. "Var. *striatula* is marked by broad leaves, a very short and inconspicuous sessile staminate spike, very short and thick pistillate spikes (rarely over ½ in. long), the upper ones being sessile about the staminate spike", followed by his description of *C. striatula* Michx. (basis of *C. laxiflora* var. *Michauxii* Bailey, l. c.), "leaves narrow . . . ; staminate spike commonly long-peduncled; pistillate spikes scattered, . . . loosely flowered". *C. striatula* to Bailey was one plant, *C. laxiflora*, var. *striatula*, resting nomenclaturally upon it, another. This interpretation arose from a former practice of divorcing plants described from the names erroneously borrowed from earlier authors for them. When Carey described his *C. laxiflora*, var. *striatula* he described *C. blanda* Dewey, although his varietal name was based on *C. striatula* Michx., which he did not understand.

When the material which Lamarck had before him is studied it is evident that the New York specimens (FIGS. 1–4), with pistillate spikes 3, about an inch (up to 3 cm.) long, filiform, with distant flowers and mucronate scales, the staminate spike pale to yellowish, with oval-lanceolate membranous scales, and the leaves 2½–3 lines (5.2–6.3 mm.) broad, most closely match his description. The Virginia fragment (FIGS. 5–7) has bracteal leaves only 3–3.5 mm. (1.4–1.7 lines) broad, pistillate spikes with imbricated scales, and the scales of the staminate spike white, round-tipped and with the conspicuous green midribs not excurrent as points. The very narrow bracteal leaves, the imbricated pistillate scales and relatively short spike, and the white (chartaceous) staminate scales with rounded tips and with the vivid green midrib not excurrent, are diagnostic characters of *Carex striatula* Michx. (a photograph of Michaux's TYPE before me). The latter southern species was beautifully illustrated, as *C. laxiflora*, by Boott, l. c. t. 89. Although the bracts of

Lamarck's Virginian element of his *C. laxiflora* greatly overtop the staminate spike, whereas in well developed *C. striatula* they are commonly shorter, young flowering culms of the latter have them prolonged, such Virginia material as *Allard*, nos. 325 and 1468, *Baldwin*, no. 194 and *Fernald & Griscom*, no. 4339 (misidentified as *C. anceps*). In several years of intensive exploration in southeastern Virginia Mr. Long and I have only rarely found true *C. laxiflora* (*C. anceps*) there; in woodlands of New York it is abundant. In eastern Virginia *C. striatula* abounds. I, therefore, am forced to the conclusion that Lamarck's New York specimens, more closely matching his characterization, are the TYPE of his *C. laxiflora*, the Virginia material included by him with it being very young *C. striatula* Michx. I wholly concur in Bailey's decision in 1889 that the type of *C. laxiflora* is to be identified with *C. anceps* Muhl., although Bailey confused the decision by including *C. gracilescens* Steud. and some other elements. I thus quite agree with Mackenzie in the North American Flora, in taking up *C. laxiflora* in the sense of *C. anceps*. I cannot follow Wiegand in using the name in the sense of *C. gracilescens*.

In PLATE 714, figs. 1–4 are from the New York (TYPE) specimens of Lamarck's CAREX LAXIFLORA: FIG. 1, summit of larger tuft, × 1; FIG. 2, pistillate spikes, × 3; FIG. 3, staminate spike, × 3; FIG. 4, the label, × 1. Figs. 5–7 are from the young Virginia material included by Lamarck under his *C. laxiflora* (now identified as *C. striatula* Michx.): FIG. 5, summit of the specimen, × 1; FIG. 6, spikes, × 3; FIG. 7, labels, with portion of annotation by L. H. Bailey, × 1.

C. HOSTIANA IN NORTH AMERICA.—In RHODORA xiii. 130 (1911) the late Dr. Wiegand and I pointed out that the plant of Newfoundland and Anticosti, which had passed as *C. fulva* Good. or as *C. Hornschuchiana* Hoppe, differed from the European plant in greater size of its parts. We consequently called it *C. Hornschuchiana*, var. *laurentiana*. Subsequently, finding that the latter specific name was antedated by another, we called it *C. Hostiana* DC., var. *laurentiana* Fern. & Wieg. in RHODORA xxvi. 122 (1924). Mackenzie, however, arguing that, as a strictly North American plant, *C. Hostiana*, var. *laurentiana* should be considered a species, described it as *C. fulvescens* Mackenzie in Bull. Torr. Bot. Cl. xxxvii. 239 (1916). The two differ only in size of parts; they have the same habit and are unique in § *Extensae* in having the upper and ascending bracts long-sheathing, the other species having the divergent upper bracts sheathless.

Most of the collections made of *C. Hostiana*, var. *laurentiana* are represented in the Gray Herbarium: Newfoundland collections of Fernald & Wiegand or of Fernald, Long and others and of Arsène, Mackenzie & Griscom, and Pease (8 nos.); Anticosti collections of John Macoun and of Victorin et al. (7 nos.). Although Mackenzie makes the perigynia of his *C. fulvescens* "5–6 mm. long", I have carefully studied the 15 numbers of it before me (one of Mackenzie & Griscom's misidentified as *C. lepidocarpa* Tausch, which has the upper bracts sheathless and divergent, instead of long-sheathed and ascending) and can find no perigynia 6 mm. long; they range from 3.5–5 mm. in length, mostly less than 5 mm., while the quite similar but usually smaller European *C. Hostiana* has them about 3 mm. long.

My reason for this note is to record typical *C. Hostiana*, with more slender habit, more slender pistillate spikes and perigynia only 3 mm. long, from Miquelon, collected in June, 1937, by *M. L. Hors* and sent me by Brother Louis-Arsène. The argument that *C. Hostiana* is wholly Eurasian, consequently that the Newfoundland plant, although differing from it only by an easily bridged gap in measurement of the perigynia, must be treated as a distinct species, loses its force. Both typical *C. Hostiana* and var. *laurentiana* occur along the streams and in the meadows of St. Pierre et Miquelon.

C. LACUSTRIS WEST OF THE ROCKY MOUNTAINS.—In the North American Flora, xviii[4]. 437 (1935) Mackenzie rejected from consideration the old collection of *Carex lacustris* Willd. (*C. riparia* sensu Am. auth., not W. Curtis) from Pend d'Oreille River, made by *Dr. David Lyall* on the Oregon Boundary Survey in 1861, with the following note:

"NOTE 2: An Idaho record for this species is based on an old specimen (*Lyall* in 1861, Fort Coville to Rocky Mountains) labeled as collected at Pend d'Oreille River, Idaho. This specimen was distributed from Kew and is preserved in the Gray Herbarium. This is so far out of the present known range of this species that the record is being treated as a matter of mislabeling."

Had Mackenzie taken pains to look up Dr. Lyall's report[1] he

[1] *Account of the Botanical Collections made by* DAVID LYALL, M.D., R.N., F.L.S., *Surgeon and Naturalist to the North American Boundary Commission.* Journ. Linn. Soc., vii. 124–144 (1864).

would have found no justification for "the record being treated as a matter of mislabeling." Here are Lyall's words: "my later and more extensive collections [the whole series collected from 1858–1861, the plants of 1861 certainly being "later collections"] . . . were retained intact . . . The necessary arrangements having been made which enabled me to repair to Kew, I immediately commenced the sorting and ticketing of the specimens in all the collections . . . The collections having been accurately . . . named, and a complete set laid into the Hookerian Herbarium, I distributed the duplicates to various public museums and botanists in Europe and North America . . .—those having been selected in which . . . they would be most beneficial to science. In doing this, I attached to every specimen a ticket, bearing the same name, locality, &c., as that attached to the specimens retained in the Herbarium at Kew". The first set of duplicates, personally labelled by Lyall, went to "Dr. Asa Gray, Cambridge University, Massachusetts", this the only set sent to America. There seems to be no reason to doubt Lyall's own label, with the name and locality in his own hand, "*Carex riparia* (*lacustris*) Pend Oreille River". The sheet bears the validation by Francis Boott of its identity, and an annotation of the same identification by Mackenzie. One of Lyall's sets was also sent to Berlin. This enabled Kükenthal, treating *Carex* in Engler's Pflanzenreich, to cite *C. lacustris* (as *C. riparia*, var. *lacustris*) as growing in "Idaho". Surely, if the set sent to Berlin also has *C. lacustris* from Pend d'Oreille River, just as do the sheets at Kew and at the Gray Herbarium, the possibility of mislabeling vanishes.

The occurrence west of the Rocky Mountains of species otherwise known only in the eastern States and eastern Canada is one of the most familiar phenomena of geographic distribution in temperate North America; while the occurrence in eastern North America of limited colonies of species predominantly of the Pacific Slope has been so much discussed that to those who see outside the limits of single genera the phenomenon should by this time be quite familiar. The number of species with such bicentric ranges runs into hundreds. In fact, Mackenzie himself admits such bicentric ranges in *Carex*: *C. tincta* Fernald, "Specimens examined from New Brunswick, Quebec, Maine, New Hampshire, Vermont, western Massachusetts, western Connecticut, Alberta", with a continuous range unjustifiably implied in "New Brunswick and Maine to Alberta", to which Washington may be added; *C. projecta* Mackenz. with an unsupported continuous range implied in "Newfoundland to British Columbia" but the most western specimens seen only from "Manitoba, Minnesota, Iowa, British Columbia"; *C. abdita* Bickn. (*C. umbellata* sensu Mackenzie, not Schkuhr), with the stated continuous range "Newfoundland to British Columbia" unjustified by the cited western material: "Minnesota, Keewatin, Saskatchewan, British Columbia (Vancouver Island)"; and *C. comosa* Boott, with the bicentric range definitely recognized in "Quebec to Minnesota, and southward . . ; . . . San Francisco Bay to Washington, and eastward . . . to Idaho".

It would be unwise for one who knows the Pend d'Oreille River only from maps to suggest where Lyall collected *Carex lacustris*. Perusal, with Dr. Hugh M. Raup, of Lyall's account indicates that he crossed the river in 1861 near Albany Falls in Bonner County, Idaho, perhaps slightly farther west, in Stevens County, Washington. Search along the river should reveal it, probably in both Idaho and Washington.

Incidentally, although Mackenzie's key and description call for perigynia of *Carex lacustris* with "Teeth of . . . beak short, 0.5 mm. long", as contrasted with other species having the teeth "0.5–3 mm. long", great care should be exercised in following his measurements. Specimens of *C. lacustris* show the teeth to range from 0.3 to 1 mm. in length!

C. INTUMESCENS Rudge, var. FERNALDII Bailey, forma **ventriosa,** f. nov. (PL. 713, FIG. 19–21), perigyniis ovoideis ventriosis 5–8 mm. diametro; achenio trigono-obovoideo apice rotundato.—Newfoundland to Minnesota, south to Nova Scotia, Maine, Massachusetts, Connecticut, New York, West Virginia and mts. of North Carolina. TYPE: Ripton, Vermont, July 19, 1898, *Ezra Brainerd* (in Herb. Gray.).

Carex intumescens at the northern limit of its range has the achene (FIGS. 13–21) obovoid, broadest near the summit and gradually to broadly rounded to the beak, whereas all material from the southern two thirds of the broad specific range has achenes more narrowly ellipsoid, broadest near the middle and gradually tapering to the beak. The latter is true *C. intumescens*.

described by Rudge from Carolina with "semina ovata, triquetra, glabra, acuminata." Examination of achenes of all specimens in the Gray Herbarium gives the following geographic contrast. True *C. intumescens*, with ellipsoid, acuminate achenes (FIGS. 7–12) is the only one there represented from Florida, Alabama, Mississippi, Louisiana, Texas, Georgia, South Carolina, eastern and Piedmont North Carolina, Virginia, Maryland, Delaware and New Jersey. On the other hand, the plants with obovoid achenes more gradually rounded at summit (var. *Fernaldii*, including forma *ventriosa*) are the only ones represented from Newfoundland, Saguenay County and the Gaspé Peninsula, Quebec, New Brunswick, Prince Edward Island, northern Maine, northern New Hampshire, high mountains of North Carolina, Minnesota and Manitoba. In the intermediate belt both types of achenes are found: in southwestern Quebec, 1 of true *C. intumescens*, 14 of var. *Fernaldii;* Nova Scotia, 5 against 12; southern Maine, 2 to 12; southern New Hampshire 1 to 10; Vermont, 2 to 4; Massachusetts, 10 to 6; Connecticut, 6 to 3; New York 13 to 11; Pennsylvania, 8 to 1; southern Ontario, 3 to 4; Michigan, 5 to 5; Wisconsin, 2 to 4.

That the two forms of achenes belong to geographically largely segregated varieties is clear. Typical var. *Fernaldii* has the perigynia lanceolate and barely inflated, 3–4 (–5) mm. thick (FIGS. 13, 14 and 17). Forma *ventriosa* in its distended ovoid perigynia closely resembles typical *C. intumescens* but its achenes (FIG. 21) are those of the northern var. *Fernaldii*.

In PLATE 713, FIGS. 7–12 are of typical CAREX INTUMESCENS Rudge: FIG. 7, a pistillate spike, × 1, from west of Fairfield, Hyde County, North Carolina, *Godfrey & Kerr*, no. 3855; FIG. 8, achene, × 2, from no. 3855; FIG. 9, perigynium, × 2, from north of Hoffman, Richmond County, North Carolina, *Wiegand & Manning*, no. 422; FIG. 10, achene, × 2, from no. 422; FIG. 11, perigynium, × 2, from Auburn, Lee County, Alabama, June 29, 1897, *Earle & Baker*; FIG. 12, achene, × 2, from Auburn.

FIGS. 13–18, var. FERNALDII Bailey: FIG. 13, pistillate spike, × 1, from the TYPE; FIG. 14, perigynium, × 2, from TYPE; FIG. 15, achene, × 2, from TYPE; FIG. 16, achene, × 2, from Grand Cascapedia River, Quebec, July 12–15, 1905, *Williams, Collins & Fernald;* FIG. 17, perigynium, × 2, from summit of Roan Mountain, North Carolina, 1878, *G. R. Vasey;* FIG. 18, achene, × 2, from Roan Mountain.

FIGS. 19–21, var. FERNALDII, forma VENTRIOSA, all from TYPE: FIG. 19, pistillate spikes, × 1; FIGS. 20 and 21, perigynium and achene, × 2.

C. GRAYII, VAR. HISPIDULA.—Typical *Carex Grayii* Carey has the perigynium quite glabrous; var. *hispidula* Gray more or less hispidulous, at least at base, and through half of its broad range it alone has been found, to the exclusion of the glabrous-fruited plant. In the North American Flora, xviii[7]. 464 (1935) Mackenzie reduced it outright, and in Deam, Fl. Ind. 270 (1940) Her-

Range of CAREX GRAYII (left); of var. HISPIDULA (right).

mann says: "The form known as var. *hispidula* shows no geographic segregation and doubtless does not merit even formal recognition", and he quotes another observer as stating that the same plants in different years change their perigynia from "hispidulous" . . . to "perfectly glabrous".

Familiar with glabrous-fruited *C. Grayii* in certain regions of the Northeastern States or Canada, Mr. Bayard Long and I have been impressed by its replacement on the bottomlands of southeastern Virginia by a plant which, when examined, always shows some hispidity on the fruit. At the northeastern limit of range, in the Ottawa, St. Lawrence and Chaudiere Valleys in Quebec, along Lake Champlain in Vermont, and along the Housatonic Valley in westernmost Massachusetts and adjacent Connecticut only typical *C. Grayii* has been collected. In the warm Connecticut Valley of central Connecticut, where many southern plants extend their northeastern limits, both are found. In view of this obvious difference of range in New England and southwestern Quebec and the failure of the more northern (glabrous-fruited) extreme to appear in the extensive region of calcareous bottoms in southeastern Virginia, I have borrowed all the material in the United States National Herbarium and the New York Botanical Garden, through the great kindness of Drs. Maxon, Gleason and Wittrock; and Mr. Long has checked the specimens at the Philadelphia Academy. These, with the material in the Gray

Herbarium and the herbarium of the New England Botanical Club, have all been entered on two maps (MAP 1, typical *C. Grayii;* MAP 2, var. *hispidula*). Although from the lower Connecticut and the Delaware westward to Wisconsin, Iowa and Missouri both occur, it will be noted that, in the four herbaria thus examined the glabrous-fruited plant predominates at the northern border of the specific range: 36 specimens seen from the western border of New England across New York, northwestern Pennsylvania, southern Ontario, Michigan and Wisconsin, against only 9 of var. *hispidula.* Conversely, var. *hispidula* alone is represented in these herbaria from Maryland, Virginia, North Carolina, Georgia and Alabama and from the Mississippi Embayment and confluent valleys in Mississippi, Arkansas, Missouri, Tennessee, Kentucky, southern Illinois and southernmost Indiana. In fact, the dominance of var. *hispidula* over the glabrous-fruited plant in the southern quarter of Indiana and the greater abundance in the northern third of that state of typical *C. Grayii* is displayed by the Indiana representation in the four large herbaria examined. The species or the variety is there represented from 27 counties: these collections which have been sent out, largely by Dr. Deam, should be fairly representative of the trend in the state. Enumerating the counties represented, beginning at the north and ending at the south, along the lower Ohio and Wabash Rivers, we get the following score, *g* standing for the typical glabrous-fruited plant, *h* for var. *hispidula:* Marshall *g*, Kosciusko *g*, Noble *g*, DeKalb *h*, Allen *h*, White *g*, Miami *g*, Huntington *g*, Wells *g* and *h*, Adams *h*, Jay *h*, Howard *g*, Hamilton *h*, Delaware *g*, Henry *h*, Marion *g* and *h*, Clay *h*, Union *g*, Knox *h*, Daviess *h*, Jackson *h*, Ripley *g*, Washington *h*, Gibson *h*, Posey *h*, Warrick *h*, Floyd *h*. That var. *hispidula* is, in its broad range, more southern than typical *C. Grayii* and that the latter extends farther to the northeast should be apparent. I am, therefore, forced to look upon it as meriting much more that "not . . . even formal recognition". While nomenclaturally *C. Grayii* is the type of the species, phylogenetically var. *hispidula*, less concentrated in the area invaded by Pleistocene ice, is apparently the older of the two.

THE NORTH AMERICAN VARIATIONS OF CAREX INFLATA (PLATES 715 and 716).—As shown by Rendle & Britten in Journ. Bot.

xlv. 444 (1907), *Carex rostrata* Stokes (1787) is antedated by *C. inflata* Hudson, Fl. Angl. 354 (1762) in part, emended in ed. 2: 412 (1778). Although the original (1762) account by Hudson included references to plants of Morison and of Ray which are not conspecific with Hudson's described plant, he emended the account in his second edition (1778), excluding the extraneous references and citing Welsh material which is positively identified with *C. rostrata* (1787). Since the elimination of the extraneous references was effected by Hudson himself and his own description was repeated in the 2nd edition and is supported by a cited specimen which is extant and authoritatively identified, there is no course open but to take up for *C. rostrata* Stokes (1787) the clearly typified *C. inflata* Hudson. This is inconvenient for those who have become familiar with the name *C. rostrata*. It was equally inconvenient when the long-used names *C. utriculata* Boott (1839) and var. *minor* Boott (1839) for the commonest American plant of the group were erroneously replaced by the earlier and chiefly Eurasian *C. rostrata*, or when our commonest American series was misidentified with typical *C. ampullacea* Gooden. (1794).

Very little North American material is satisfactorily identified with true *Carex inflata* (*C. rostrata* Stokes, *C. ampullacea* Gooden.), the 30 fat covers of North American material (fully 750 sheets) in the Gray Herbarium yielding only 29 numbers which can be forced into the typical European form of the species, these all from high-northern, alpine, subalpine or bleak habitats: in Labrador, Newfoundland, eastern Quebec, northern Nova Scotia, northern New Brunswick, northern Vermont, northern Michigan, Lake Athabasca, Mackenzie and Alaska, with a slightly thicker-spiked series, often with broader leaves, at high altitudes to Colorado and California. Otherwise, the great bulk of material from Labrador and Newfoundland to British Columbia, thence south to Delaware, District of Columbia, West Virginia, Ohio, Indiana, Wisconsin, Minnesota, South Dakota, New Mexico and California, differs in essential details from typical *C. inflata*. To be sure, the late K. K. Mackenzie, in a mood of almost unprecedented conservatism, placed all the North American material in undifferentiated "*C. rostrata*", giving as his excuse for so doing: "This is one of the most widely distributed and most frequently collected of our sedges. Variations in vegetative characters in individual specimens are often marked, but are of no systematic value".—Mackenzie in N. Am. Fl. xviii[17]. 457 (1935).

Typical *Carex inflata* (pl. 715, figs. 1 and 2) is 3–6 dm. high, with canaliculate leaves 2–4 mm. broad, pistillate spikes rather lax and 6–8 (rarely –10) mm. thick, with short and blunt or merely acutish scales, the perigynia 3–5 mm. long. The bulk of North American plants are coarser, 0.4–1.2 m. high, with flat leaves 4–12 mm. broad, pistillate spikes denser and 1–2 cm. thick, the prolonged acuminate to aristate scales merely equaling to exceeding the perigynia, the latter 4–10 mm. long. Such plants, to the exclusion of others, occurring over two to three million square miles of temperate North America are not satisfactorily disposed of as "individual specimens". Mackenzie, thus calling everything of the kind (with spongy and obtuse-angled smooth culms and septate-nodulose leaves) simply *C. rostrata*, thus characterizes it: "culms 3–12 dm. high . . . , leaves 2–12 mm. wide, flat . . . ; pistillate spikes 1–1.5 [misprint for 1–15] cm. long, 6–20 mm. wide . . . ; scales long-acuminate, varying to rough-awned or acute . . . ; perigynia . . . 3.5–8 mm. long"—these dimensions apparently taken over, with little change, from Kükenthal's account of *C. rostrata*, var. *utriculata* (the common American plant).

How much more inclusive than the description of true *C. rostrata* of Kükenthal's treatment in Engler, Pflanzen. iv[20]. 720 (1909), a plant recognized by him only from "Nord und Mittel-Europa . . . In Südeuropa selten und mehr in den Gebirgen . . . Asien: Turkisch Armenien . . . ; Lazistan . . . ; Sibirien, bis zur Lena . . . und Baikalien. Westhimalaya . . . Sudwestgröenland": "Culmus 10–60 cm altus . . . Folia . . . 2–3 mm lata canaliculata . . . Spiculae . . . ♀ cylindricae 3–5 cm. longae 6–8 mm latae . . . Squamae . . . subacutae . . . Utriculi . . . 4–5 mm longi".

By Kükenthal all American material (except from southern Greenland) was put into the inclusive *Carex rostrata*, var. *utriculata* (Boott) Bailey, with "Culms 90–100 cm altus . . . Folia 4–9 mm lata plana. Spiculis . . . ♀ crassiores 1–1½ cm latae. Squamae ♀ magis acuminatae saepe hispido-aristatae. Utriculi 5–8 mm longi"; Kükenthal correctly admitting this dominantly American variety as European and eastern Asiatic as well. His treatment reflects clearer understanding than Mackenzie's. In North America, however, we have two other varieties which seem worth recognition: a plant somewhat resembling the northern European *C. rostrata*, var. *borealis* (Hartm.) Kükenthal in its obsolescent teeth, but coarser, with longer perigynia, known only from Anticosti (PL. 715, FIGS. 5 and 6), and another, as slender as the slenderest *C. vesicaria*, with very short and loose pistillate spikes and slender-tipped or awned and prolonged scales, *C. rostrata*, var. *ambigens* Fernald (PL. 715, FIGS. 7–9).

It is significant, in view of the scarcity with us of true *Carex inflata* (*C. rostrata*, *C. ampullacea*), that Francis Boott, ultra-conservative and remarkably accurate, should have seen in the common American plant a distinct species. In Hooker's Fl. Bor.-Am. ii. 221 (1839), recognizing true *C. inflata* or *C. rostrata* (as *C. ampullacea*), Boott cited material only from extreme northwestern Canada. Immediately following it he described as strictly North American his *C. utriculata* (our PL. 716): 6–9 dm. (bitripedales) high; leaves 9.5 mm. (4½ lines) wide; pistillate spikes 6.35–10.15 cm. (2¼ ad 4 pollices) long and 14.75–16.9 mm. (7–8 lin.) thick; pistillate scales very acute, the lower often produced into a long scabrous awn, often scarcely shorter than the perigynia; perigynia 8.5 mm. (4½ lin.) long, . . . oblong-elliptic, acuminate. This is the large extreme of the American plant, the culms often up to 1.2 m. high, the leaves to 1.2 cm. broad, the pistillate spikes to 2 cm. thick, the perigynia to 1 cm. long. It passes insensibly into smaller plants with gradually smaller and less tapering or quite as tapering perigynia down to 4 mm. long, *C. utriculata*, var. *minor* Boott, l. c., originally described "Perigyniis spicisque brevioribus densifloris". Repeated attempts to find any line of cleavage between the largest extremes (PL. 716, FIG. 9) and the smallest and in shape of perigynia have thus far failed. In fact, whereas the perigynia of small or medium size are fertile, the extremely large ones (FIG. 9) are usually empty, without well developed achenes or blasted, as if lack of fertility might have resulted in overgrowth of the empty perigynium, perhaps somewhat comparable with the well known late-autumnal vegetative enlargement or prolongation of unfertilized ovaries in *Polygonum*, § *Avicularia*.

My interpretation of North American *Carex inflata* is as follows.

a. Pistillate scales oblong to ovate, blunt to merely acute, not prolonged at tip, shorter than perigynia.
Beak of perigynium prominently toothed, the teeth 0.3–0.7 mm. long; leaves canaliculate to flat, 2–8 mm. broad; pistillate spikes 2–4, 1.5–7 cm. long; perigynia prominently inflated, 3–5 (–6) mm. long. . . . . *C. inflata* (typical).
Beak of perigynium emarginate, the teeth 0.1–0.2 mm. long; leaves canaliculate to involute, 4 mm. broad; pistillate spike 1, 2.7 cm. long; perigynia barely inflated, 5.5–6 mm. long. . . . . Var. *anticostensis*.
a. Pistillate scales narrowly ovate to linear-lanceolate, tapering to acuminate tip or awned, often nearly equaling or the lower often exceeding the perigynia (4–10 mm. long).
Culms coarse, 0.2–1 cm. thick above upper sheath, 0.3–1.2 m. high; leaves 0.4–1.2 cm. broad; pistillate spikes cylindric, 2–15 cm. long, 0.9–2 cm. thick; perigynia crowded, 4–10 mm. long. . . . . Var. *utriculata*.
Culms very slender, barely 1 mm. in diameter, 3–5 dm. high; leaves 2–5 mm. broad; pistillate spikes ovoid to short-oblong, 1–2.5 mm. long; perigynia few, 4–6 mm. long. . . . . Var. *ambigens*.

Carex inflata Hudson, Fl. Angl. 354 (1762), in part, emend. ed. 2: 412 (1778); Rendle & Britten in Journ. Bot. xlv. 444 (1907); Schinz & Thellung in Vierteljahrss. Naturf. Gesells. Zurich, liii. 524 (1908); Mansfeld in Fedde, Repert. Sp. Nov. xlv. 221 (1938). *C. rostrata* Stokes in Withering, Brit. Pl. ed. 2, ii. 1059 (1787); Kükenthal in Engler, Pflanzenr. iv^{20}. 720 (1909) and many other European auth. *C. ampullacea* Gooden. in Trans. Linn. Soc. ii. 207 (1794), and many later authors. For fuller synonymy see Kükenthal.—Culms 3–8.25 dm. high, smooth or scabrous at summit; leaves strongly canaliculate or flat, 2–8 mm. broad; pistillate spikes 2–4, cylindric, 1.5–7 cm. long, 6–10 (–15) mm. thick, lax to closely flowered; pistillate scales oblong to ovate, blunt or merely acutish, shorter than perigynia; perigynia inflated-ovoid, membranaceous, 3–5 (–6) mm. long, mostly abruptly beaked.—Europe and western Asia; North America from southern Greenland (fide Kükenthal) and Labrador to Alaska, south to Newfoundland, northern Nova Scotia, northern New Brunswick, northern Vermont, northern Michigan, Saskatchewan, and on high mountains to Colorado and southern California; the more northern nearly typical, the Cordilleran from Alberta southward often with somewhat thicker pistillate spikes. Labrador: Anatolak, *C. S. Sewell*, no. 418; Fox Harbor, August 14, 1882, *J. A. Allen* (called *C. utriculata* and sent to

William Boott with the pertinent query: "Is it a form approaching *C. ampullacea?*") NEWFOUNDLAND: Tilt Cove, Notre Dame Bay, *Fernald & Wiegand*, nos. 5064 and 5066; Rushy Pond, Exploits River, *Fernald & Wiegand*, no. 5063; Quarry, *Fernald & Wiegand*, no. 5055; St. Johns, *Robinson & Schrenk*, no. 182. ST. PIERRE ET MIQUELON: Belle-Rivière, Langlede, *Arsène*, no. 139. QUEBEC: Blanc Sablon River, *Fernald & Wiegand*, no. 2967; Lac au Petit Rat, Anticosti, *Victorin*, no. 4036 (broad-leaved); Tabletop Mts., Gaspé County, "alt. ca. 3600 ped.", August 11, 1881, *J. A. Allen*, August, 1906, *Fernald & Collins*, nos. 189 and 441, August, 1923, *Fernald & Smith*, no. 25,599; Roberval, Lake St. John, July 16, 1892, *G. G. Kennedy*. NOVA SCOTIA: St. Paul Island, *Perry & Roscoe*, nos. 125 and 126. NEW BRUNSWICK: Serpentine River, July 21, 1900, *G. U. Hay*. MICHIGAN: Portage River, August 3, 1865, *Porter;* Keweenaw County, *Farwell*, no. 715; Isle Royale, *Cooper*, nos. 224, 233 and 271. MACKENZIE DISTRICT?: "Mackenzie River", *Richardson*, identified by Boott as *C. ampullacea*. SASKATCHEWAN: Lake Athabasca, *Raup*, nos. 6866, 6966 and 7001. ALBERTA: Lake Beauvert, alt. 3470 ft., Jasper National Park, *Edith Scamman*, no. 2325; Lake Louise, *Olson*, August 15, 1909. COLORADO: Evergreen Lake, alt. 9800 ft., Lake County, *Clokey*, no. 3326; 6 miles north of Wolcott, *Shear & Bessey*, no. 5352; near Mt. Harvard, *Shear*, no. 5497. CALIFORNIA: Tallac, alt. 6200 ft., El Dorado County, *Brainerd*, no. 6; Strawberry Creek, alt. 5900 ft., El Dorado County, *Brainerd*, no. 10; Truckee River, alt. ca. 7000 ft., June 25–30, 1897, *Davy;* Kaweah Meadows, alt. 9300 ft., *Purpus*, no. 5137. OREGON: Bear Valley, Blue Mts., *Griffiths & Hunter*, no. 177. ALASKA: Buckland River, Seward Peninsula, *A. E. & R. T. Porsild*, no. 1544; doubtless elsewhere in Alaska (Gray Herbarium material from there interned in Sweden). PL. 715, FIGS. 1–4).

Var. **anticostensis,** var. nov. (TAB. 715, FIG. 5 et 6), culmo 6 dm. alto crasso; foliis margine valde involutis 4 mm. latis; spica foeminea solitaria crasso-oblonga 2.7 cm. longa; squamis oblongo-ovatis obtusis vel subacutis atropurpureis; pergyniis oblongo-conicis, vix (?) inflatis in rostrum emarginatum vel breviter bidentatum attenuatis, dentibus 0.1–0.2 mm. longis. QUEBEC: eau peu profondes sur le calcaire, Petites-Rivières, Anticosti, 20 juillet 1926, *Victorin & Rolland*, no. 25,767 (TYPE in Herb. Gray.).

A very doubtful plant. Until more mature specimens are available better placed with *C. inflata* than elsewhere on account of its fleshy culms and septate-nodulose obviously glaucous foliage.

Var. UTRICULATA (Boott) Druce in Bot. Soc. & Exchange

Club Brit. Isl. ix. 141 (1930). *C. utriculata* Boott in Hook. Fl. Bor.-Am. ii. 221 (1839) and many later auth. *C. utriculata*, var. *minor* Boott, l. c. (1839) and many later auth. *C. ampullacea*, var. *utriculata* (Boott) Carey in Gray, Man. 566 (1848). *C. ampullacea*, var. *maxima* Anderss. in Bot. Notis. för 1849: 29 (1849). *C. ampullacea*, α. *altissima* Anderss. Cyp. Scan. 20 (1849). *C. ampullacea*, var. *robusta* Sonder, Fl. Hamb. 505 (1851). *C. rostrata*, var. *latifolia* Aschers. Fl. Brandenb. i. 792 (1864). *C. rostrata*, var. *utriculata* (Boott) Bailey in Proc. Am. Acad. xxii. 67 (1886). *C. rostrata*, var. *Cliftonii* Farwell in Rep. Mich. Acad. Sci. vi. 204 (1904). *C. rostrata*, var. *utriculata*. forma *minor* (Boott) Kükenthal in Engler, Pflanzenr. iv[20]. 722 (1909), at least as to source of name.—Southern Greenland and Labrador to British Columbia, south to Newfoundland, Nova Scotia, New England, Long Island, Delaware, District of Columbia, West Virginia, Ohio, Indiana, Wisconsin, Minnesota, South Dakota, New Mexico and California; northern Europe and northeastern Asia. Citation of specimens seems unnecessary. Pl. 716, showing variations.

I am retaining for the polymorphous and commonest plant of North America the varietal name *utriculata*. This name was given by Boott to the American plant as a species, with *C. utriculata*, var. *minor* as a small variety of it. Extreme literalists might argue that, since the latter is the earliest varietal name within this series as I conceive it, it should be taken up for the whole concept. The Guiding Principles of the International Rules of Botanical Nomenclature prescribe in Art. 4 that we should "avoid or . . . reject . . . names which may cause error or ambiguity". If anything might cause error or ambiguity it would be the forcing upon a plant, which differs from the type of the species in much greater stature, much larger spikes, longer perigynia and prolonged scales, the varietal name *minor*. I am not of the purely legalistic group who would exclude reason and common sense from their work and who believe that scientific procedure should be governed by purely mechanical rules.

Var. **ambigens** (Fernald), comb. nov. *C. rostrata*, var. *ambigens* Fernald in Rhodora, iii. 51 (1901).—For description see key.—The following are placed here. Quebec: Lac des Americains, alt. 670 m., western base of Table-topped Mountain, Gaspé County, *Fernald & Collins*, no. 443; by alpine ponds, alt. 1100–1250 m., Table-topped Mountain, *Fernald & Collins*, no. 445; in marly arbor-vitae swamp, New Carlisle, Bonaventure

County, July 28, 1902, *Williams & Fernald*. NEW BRUNSWICK: South Tobique Lakes, July, 1900, *G. U. Hay*, nos. 7, 9, 41 and 51. MAINE: wet sandy shore, St. Francis, Aroostook County, Fernald, no. 2076. PL. 715, FIGS. 7–9.

IN PLATE 715, FIGS. 1–4 are of CAREX INFLATA: FIG. 1, typical spikes, × 1, from Seine-et-Marne, *Camus*, no. 363²; FIG. 2, portion of fruiting spike, × 4, from no. 363²; FIG. 3, portion of coarser American form, × 1, from Bear Valley, Blue Mountains, Oregon, *Griffith & Hunter*, no. 177; FIG. 4, portion of fruiting spike, × 4, from no. 177. FIGS. 5 and 6, var. ANTICOSTENSIS: FIG. 5, inflorescence, × 1, FIG. 6, portion of pistillate spike, × 4; both from TYPE. FIGS. 7–9, var. AMBIGENS: FIG. 7, inflorescence, × 1, from St. Francis, Maine, TYPE; FIG. 8, riper inflorescence, × 1, from South Tobique Lake, New Brunswick, *Hay*, no. 41; FIG. 9, portion of pistillate spike, × 4, from no. 41.

PLATE 716, variations of CAREX INFLATA, var. UTRICULATA: spikes × 1; enlargements, × 4: FIGS. 1 and 2, from Mystic Pond, Middlesex County, Massachusetts, July 4, 1861, *Wm. Boott;* FIGS. 3 and 4, from Tadousac, Saguenay County, Quebec, August 12, 1892, *G. G. Kennedy;* FIGS. 5 and 6, exceptionally attenuated spikes with exaggerated long scales, from Birchy Cove (Curling), Newfoundland, *Fernald & Wiegand*, no. 2965; FIGS. 7 and 8, unusually short spikes, from Whitefield, New Hampshire, July 7, 1896, *Walter Deane;* FIG. 9, from Isle Royale, Michigan, *Cooper*, No. 237.

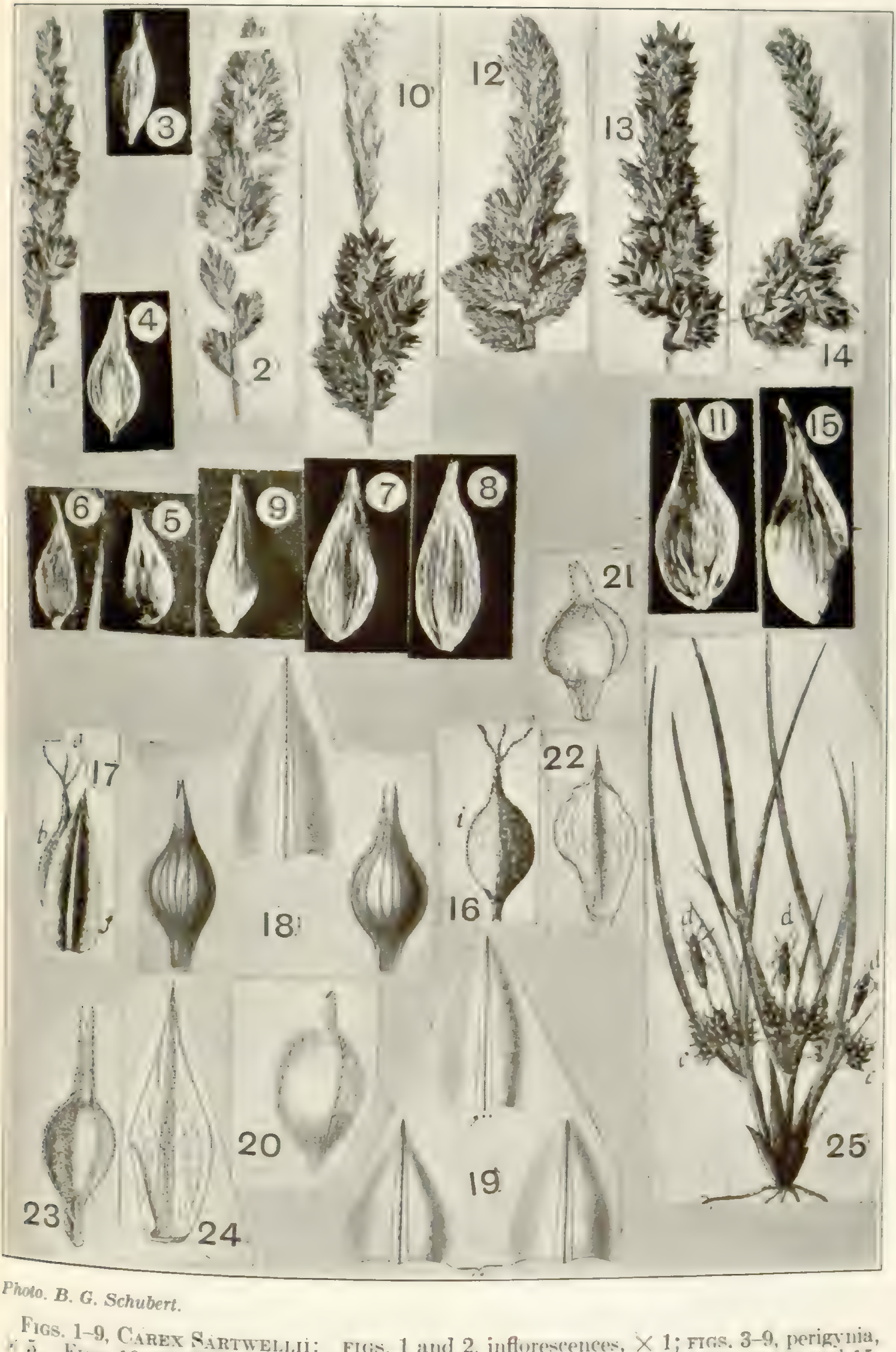

Photo. B. G. Schubert.

FIGS. 1–9, CAREX SARTWELLII: FIGS. 1 and 2, inflorescences, × 1; FIGS. 3–9, perigynia, × 5. FIGS. 10–15, C. DISTICHA: FIGS. 10 and 12–14, inflorescences, × 1; FIGS. 11 and 15, perigynia, × 5. FIGS. 16–18 and 23–25, C. UMBELLATA: FIGS 16 and 17, perigynia and scale from Schkuhr's original plate; FIG. 18, details after Boott; FIGS. 23 and 24, details of *C. rugosperma*, after Mackenzie; FIG. 25, habit, from Schkuhr's original plate. FIGS. 19–22, C. ABDITA: FIGS. 19 and 20, details after Boott; FIGS. 21 and 22, details of *C. umbellata* sensu Mackenzie, after Mackenzie.

Photo. B. G. Schubert.

Figs. 1 and 3, 4, 7 and 8, Carex terrae-novae: fig. 1, type, × 1; fig. inflorescence, × 3; fig. 4, inflorescence, × 10; figs. 7 and 8, perigynia, × Figs. 2, 5 and 6: C. glacialis: fig. 2, inflorescence, × 10; figs. 5 and 6, perigynia, × 10.

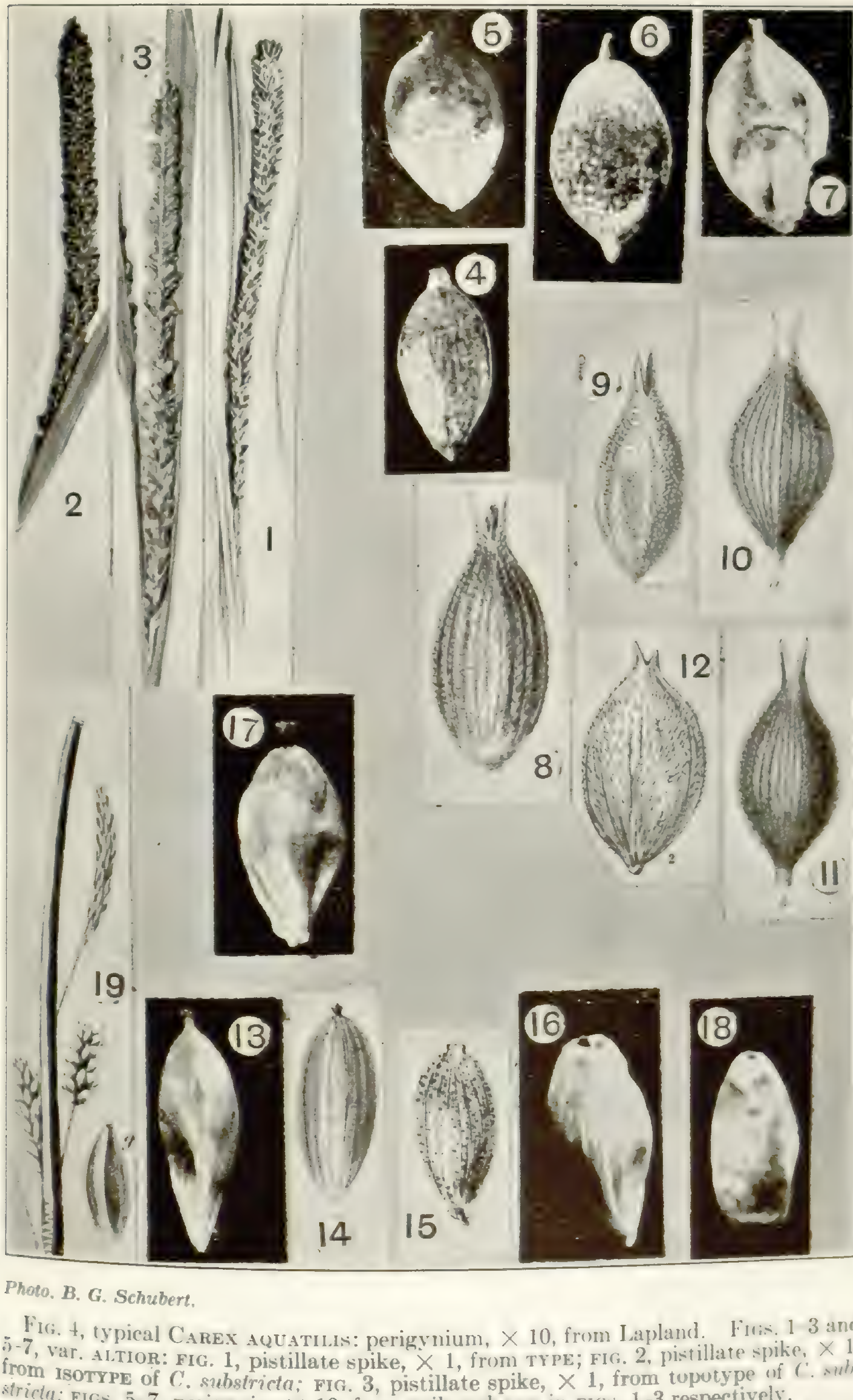

Photo. B. G. Schubert.

FIG. 4, typical CAREX AQUATILIS: perigynium, × 10, from Lapland. FIGS. 1–3 and 5–7, var. ALTIOR: FIG. 1, pistillate spike, × 1, from TYPE; FIG. 2, pistillate spike, × 1, from ISOTYPE of *C. substricta;* FIG. 3, pistillate spike, × 1, from topotype of *C. substricta:* FIGS. 5–7, perigynia, × 10, from spikes shown in FIGS. 1–3 respectively.

FIGS. 8–12, C. LASIOCARPA: FIG. 8, perigynium of European type, after Lindman; FIG. 9, perigynium of European type, after Host; FIGS. 10 and 11, perigynia of var AMERICANA, after Boott; FIG. 12, perigynium of var. OCCULTANS, after Akigama.

FIGS. 13–19, C. PALLESCENS: FIGS. 13–15 and 19, typical European plant: FIG. 19, inflorescence and perigynium of *C. undulata* Kunze, after Kunze; FIG. 13, perigynium, × 10; FIG. 14, perigynium, after Host, FIG. 15, after Boott. FIGS. 16–18, perigynia, × 10 of var. NEOGAEA.

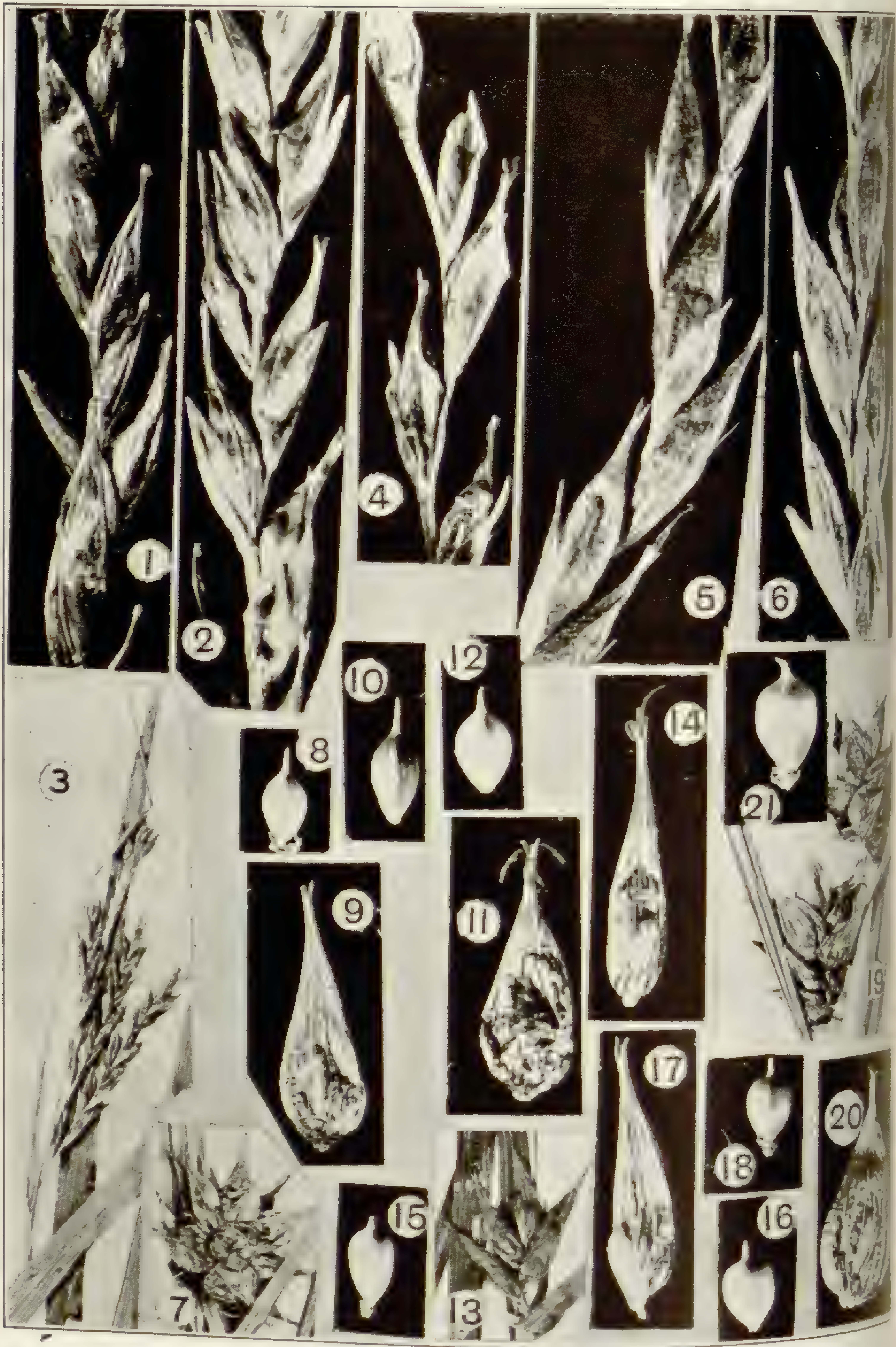

Photo. B. G. Schubert.

FIGS. 1–6, pistillate spikes of varieties of CAREX DEBILIS, × 5 (FIG. 3, × 1): FIG. var. TYPICA; FIG. 2, var. RUDGEI; FIG. 3, var. STRICTIOR; FIG. 4, var. INTERJECTA; FIG. var. PUBERA; FIG. 6, var. INTERCURSA.

FIGS. 7–21, C. INTUMESCENS: FIGS. 7–12, typical C. INTUMESCENS: FIG. 7, pistillate spi × 1; FIGS. 8, 10 and 12, achenes, × 2; FIGS. 9 and 11, perigynia, × 2. FIGS. 13–18, FERNALDII: FIG. 13, pistillate spike, × 1, from TYPE; FIGS. 14 and 17, perigynia, FIGS. 15, 16 and 18, achenes, × 2. FIGS. 19–21, var. FERNALDII, forma VENTRIOSA from TYPE: FIG. 19, pistillate spikes, × 1; FIG. 20, perigynium, × 2; FIG. 21, achene, × 2

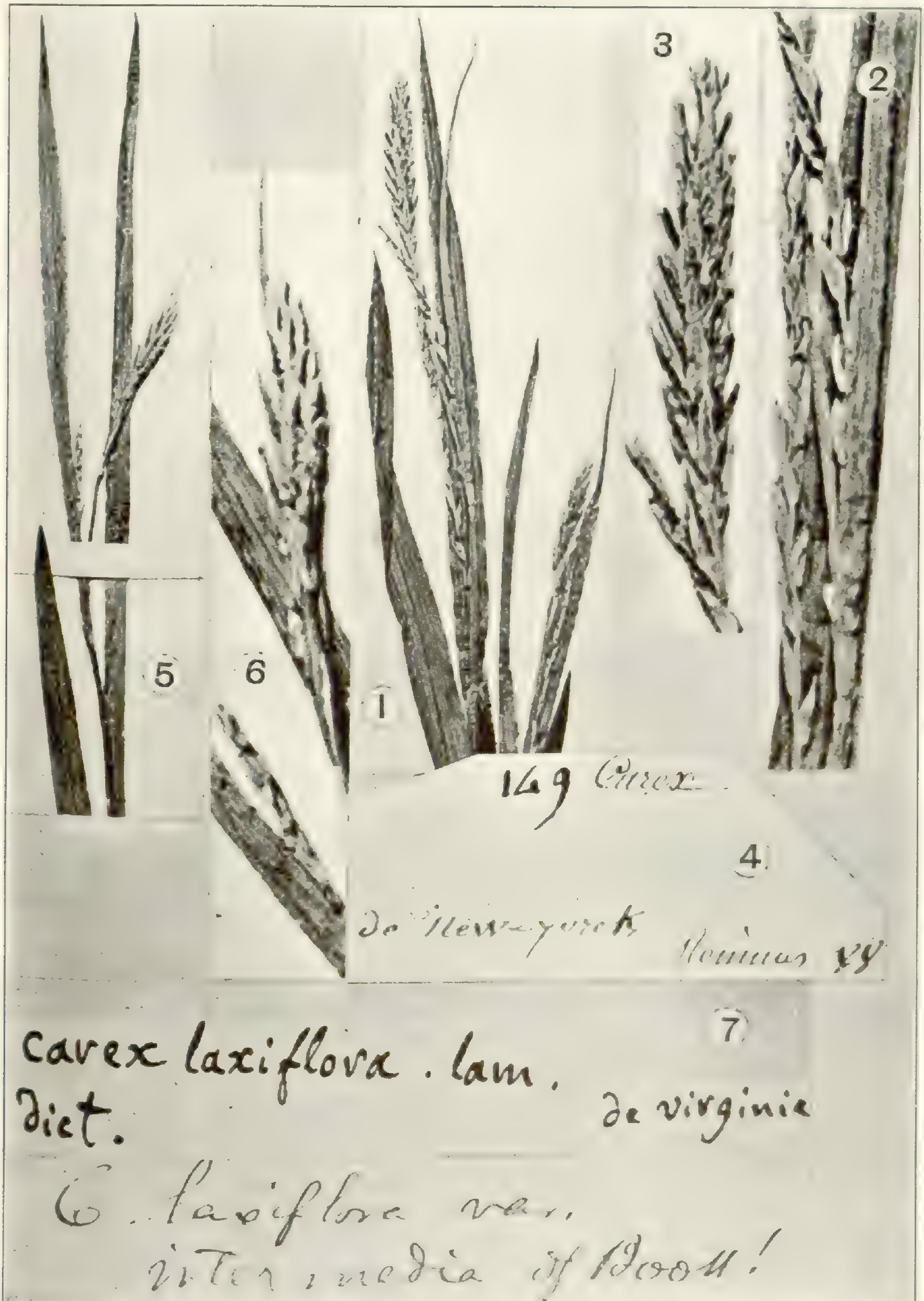

Photo. B. G. Schubert, after Cintract.

Details of Lamarck's sheet of CAREX LAXIFLORA (see text).

Photo. B. G. Schubert.

FIGS. 1–4, CAREX INFLATA: FIGS. 1 and 3, spikes × 1; FIGS. 2 and 4, portions of pistillate spikes to show scales, × 4. FIGS. 5 and 6, var. ANTICOSTENSIS: FIG. 5, portion of inflorescence, × 1; FIG. 6, portion of pistillate spike, × 4. FIGS. 7–9, var. AMBIGENS: FIGS. 7 and 8, inflorescences, × 1; FIG. 9, portion of pistillate spike × 4.

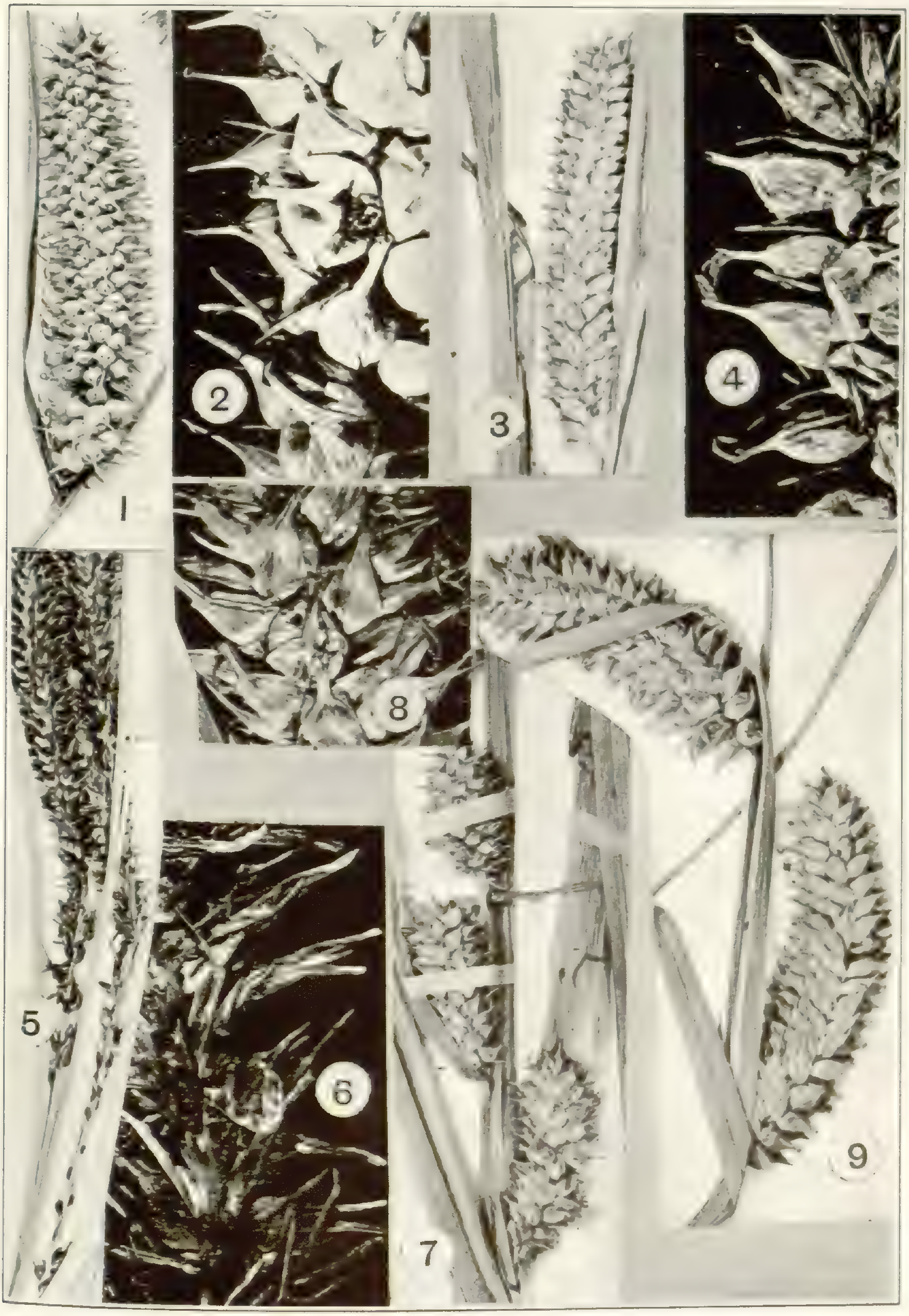

Photo. B. G. Schubert.

Variations of Carex inflata, var. utriculata: pistillate spikes, × 1; enlargements, × 4.

INDEX

New scientific names are printed in full-face type

Reprinted from RHODORA, Vol. 44, October–December, 1942

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY

CXLV

THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. FERNALD

DATES OF ISSUE

Pages 341–405 and Plates 717–724 .... 17 October, 1942
Pages 416–452 and Plates 725–736 .... 7 November, 1942
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THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(Plates 717–744)

Part I. High Lights of Field-trips in 1941

My records show that from September, 1933, to August, 1940, my companions and I, in 30 trips of three days to two weeks each in tidewater Virginia, had collected approximately 650 flowering plants and vascular cryptogams not previously recorded as definitely growing in the state. In addition, of course, there are many species, like *Burmannia biflora*, which had long been supposed to be extinct in the state but for which living stations are now known. The results of our four trips in 1941, supplemented by old collections not previously worked out, brought the returns to 751. This brief statement is here made to clarify the title of the present paper. It should not be inferred that there are six preceding reports with essentially similar titles.[1] Unfortunately the present title is misleading, in that

[1] The preceding papers on the work in Virginia are as follows: Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, Rhodora, xxxvii. 129–157 and 167–189, 20 plates (1935)—Contrib. Gray Herb. CVII; Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, Rhodora, xxxvii. 378–413 and 423–554, 22 plates (1935)—Contrib. Gray Herb. no. CIX; Fernald, *Plants from the Outer Coastal Plain of Virginia*, Rhodora, xxxviii. 376–404 and 414–452, 13 plates (1936)—Contrib. Gray Herb. no CXV; *Local Plants of the Inner Coastal Plain of Southeastern Virginia*, Rhodora, xxxix. 321–366, 379–415, 433–459 and 465–491, 14 plates (1937)—Contrib. Gray Herb. no. CXX; *Noteworthy Plants of Southeastern Virginia*, Rhodora, xl.

364–424, 434–459 and 467–485, 27 plates (1938).—Contrib. Gray Herb. no. CXXIII. *Last Survivors in the Flora of Tidewater Virginia*, Rhodora, xli. 465–502, 529–559 and 564–577, with 14 plates (1939).—Contrib. Gray Herb. no. CXXVIII: *A Century of Additions to the Flora of Virginia*, Rhodora, xlii. 355–416, 419–498 and 503–521, with 24 plates (1940).—Contrib. Gray Herb. no. CXXXIII: *Another Century of Additions to the Flora of Virginia*, Rhodora, xliii. 485–553, 559–630 and 635–657, with 26 plates (1941).—Contrib. Gray Herb. no. CXXXIX.

Since the publication of the previously enumerated reports on our work in southeastern Virginia a paper by another "furriner" has appeared: the *Check List of the Ferns and Flowering Plants of the Seashore State Park, Cape Henry*, by Frank E. Egler, published by the New York State College of Forestry (February 1, 1942). The almost pioneer work on the region by Kearney in 1898 is mentioned; but no records are taken from Kearney's enumeration of species nor is his well known cautious scientific method followed. Clearly cited by Kearney were many species of Cape Henry which will not be new discoveries when others find them there: *Andropogon virginicus* var. *tetrastachyus* (*A. tetrastachyus*), *Panicum oligosanthes* (*P. pauciflorum*), *Cyperus diandrus* and *C. Grayii*, *Eleocharis flavescens* (*E. ochreata*), *E. microcarpa* (*E. "prolifera"*), *Rhynchospora cymosa*, *Myrica cerifera* (difficult not to see), *Drosera intermedia*, *Physalis maritima* (*P. "viscosa"*), *Solanum nigrum*, and others. Kearney's work was done in 1898 and his report was so familiar as to be specially noted by the author of the *Check List*. He did not have for it the sophisticated excuse for neglecting the species enumerated in it which he assumed for the later and somewhat intensive collecting at Cape Henry done in 1933 by Griscom and me, in 1934 by Long and me and in 1935 by Griscom, Long, Fogg and me. This work is easily dismissed by the following sentence: "The results of the intensive investigations of R. F. Fernald [whoever he may be] on the Flora of southeastern Virginia are continuing to come from the press, and it is believed that until tidewater Virginia again becomes quiescent, a paper of this type should adhere to the status quo" (Egler, p. 15). Just what is the "status quo" is not explained. The author might have stopped with Gronovius or, at least, with Kearney, instead of disturbing the "quiescent" state of knowledge by including in a list of Virginian plants names like *Carex Kobomugi*, *Juncus effusus* var. *costulatus*, *Euphorbia supina* and *Vaccinium marianum*, which are not in any of the manuals listed as establishing the aforementioned status.

And why desecrate very violently this sacred status by intruding into the *Check List* species which are really not known from Virginia? *Cyperus dentatus* is listed (p. 5) as an ecological ingredient of "The Panicum-Ammophila Community". This very definite species, inhabiting pond- and river-margins from Quebec to Delaware and Maryland, would not be expected by those who know it to associate with *Ammophila breviligulata*, *Panicum amarum*, *Uniola paniculata* and *Iva imbricata*, and especially south of Chesapeake Bay. The specimen so identified (preserved at the New York Botanical Garden) is of the semicosmopolitan and aggressive weed, *C. esculentus*. "The Quercus cinerea Community" (p. 7) is made to include the Century-plant, *Agave americana* (on p. 8), although in the *Check List* (p. 28) it appears as the wholly different *A. virginica*. *Agave americana*, it seems almost superfluous to say, is a Mexican species, though now somewhat naturalized in southern Texas and in Florida; while in Virginia *A. virginica* is quite unknown from the tidewater counties. Incidentally, though most important, *Agave* has the characteristic inferior ovary of the *Amaryllidaceae*. The specimen collected by Egler is in fruit; it has the superior capsule subtended by the persistent perianth and came from a plant of the common *Yucca* of sands of southeastern Virginia. It was properly listed by Kearney. "The Juncus Community" (p. 8) contains "*Rumex persicaria*", changed on p. 32 to *R. Patientia*. There is no described species called *R. Persicaria*, though *R. persicarioides* is a rare plant of the coast from the lower St. Lawrence to New England and on the Pacific slope, and *R. Patientia* is, in America, common only in Newfoundland, Canada and the northern states, not generally south of the District of Columbia. Egler's material belongs to the almost cosmopolitan weed of disturbed soils, *R. crispus*. "The more common species of the pine-oak-hickory forest" include "*Carex gravida*" and "*Agave americana*", and others which are undoubtedly present. The fact, however, that *Carex gravida* is a characteristic species of low prairie and bottomlands the actual record is here brought above the middle of the eighth century.

In 1941 Mr. Bayard Long and I could not get back to our headquarters south of Petersburg until June, our field-work then covering the period of June 11–21. Our former drivers all being unavailable, we drew for this trip a lively and temperamental young man, keen on fast but very skillful driving but far keener on stunt-flying. It was most difficult for him to understand how anyone could be interested in things terrestrial and to believe that we had not made the journey to Virginia primarily to let him scare the lives out of us by taking us up and exhibiting his stunts; and he disliked to keep his car within the ordinary speed expected on Virginia roads. We consequently covered intermediate territory quickly and got promptly to remote points needing exploration. Our driver, like the proverbial

as yet not authoritatively recorded from east of southern Ontario, Ohio and Missouri, might have led to caution. not to disturb the status quo. Many such plants are on the calcareous bottoms of tidewater Virginia but not on the dune-sands of Cape Henry. The plant collected by Egler is the common and usually abundant *C. Muhlenbergii* of dry and sterile soils from southern Maine to Florida and westward. "*Sabatia brachiata*" (p. 13) of "*The Tidal Marsh Zone*" is presumably *S. stellaris*, an annual with pink or white flowers on scattered and elongate alternate peduncles, a species which really grows on tidal marshes, already so noted by Kearney. *S. brachiata* is a very different plant of dry pinelands, a square-stemmed biennial with opposite branching and crowded flowers in dense corymbiform panicles.

Had the author embraced the opportunity, freely offered him when he was there, to check over the collection from Cape Henry in the Gray Herbarium, he might have eliminated some misidentifications; at least he could have added many conspicuous and still more rather inconspicuous species to his list: *Lycopodium inundatum* var. *Bigelovii*, *Triodia Chapmani*, *Aristida lanosa*, *Paspalum supinum*, *Panicum rhizomatum* and many others, *Cyperus densicaespitosus*, *Psilocarya scirpoides* var. *Grimesii*, *Rhynchospora fascicularis*, *Carex Walteri* var. *brevis*, some species of *Xyris*, *Spiranthes gracilis*, *Cassia nictitans*, the very handsome *Centrosema virginianum*, *Desmodium Dillenii* and *strictum*, *Lespedeza Stuevei* and *stipulacea*, *Ludwigia brevipes*, *Polypremum procumbens*, *Linaria canadensis*, *Utricularia subulata*, *Oldenlandia uniflora*, *Eupatorium serotinum*, *Solidago erecta*, *Aster undulatus*, *Gnaphalium calviceps* (type from Cape Henry), *Bidens discoidea*, *Hieracium venosum*, and many more.

In fact, study of a single well known work on a single genus, Hitchcock and Chase's *North American Species of Panicum* (1910), would have considerably extended the *Check List*. Egler includes a total of only 8 species of this large genus. Hitchcock and Chase definitely cite from Cape Henry 10 others. The collectors noted by them of only one species at Cape Henry (*P. aciculare*) are enumerated as Chase, Hitchcock, Kearney, Mackenzie and Williams; while under another (*P. scoparium*) Coville and Noyes are also cited as having collected at Cape Henry. In short, the number of botanists who preceded the author of the *Check List* in making collections at Cape Henry is considerable. Unless the intellectual curiosity of those who visit this unique area is to be completely satisfied by a mere quiescent status quo, it is evident that, without disturbing that comfortable and unprogressive condition of *laissez faire*, a much more complete check list could be prepared simply by consulting the many collections and records made by those who visited Cape Henry before it became a State Park.

sailor, had or formerly had girl-friends at many points about the southeastern counties and he introduced us to new areas and to homes in the country, where, without his introduction, we should not have ventured. We also, of course, returned to many familiar areas for special plants.

The marly bluffs and the beaches and marshes of the lower James in Surry and Isle of Wight Counties had, in 1940, yielded such a concentrated upland calcicolous flora, that we promptly returned there. Going back to Bailey's Beach, near Rushmere, for good material of *Carex decomposita*, discussed in the last paper, we found that here, as at other points along the lower James, *Carex Mitchelliana* M. A. Curtis was a regular inhabitant of the cypress swamps and that *C. hyalinolepis* Steud. was a dominant species of swales, these two species previously not often noted. In the slightly brackish swale near the settlement the northern (Newfoundland and lower St. Lawrence southward) *C. hormathodes* abounded, here at its probable southern limit. At the resort, Burwell's Bay, *Bromus racemosus* (new to Virginia) was among the weeds; the relatively rare *Torilis japonica*, previously found on the shore in Prince George County, was well established; and a colony of Timothy interested us, because of its very slender spikes and smoothish spikelets. It proves to be *Phleum pratense*, var. *nodosum* (L.) Richter, a well known European plant not previously recorded, I think, as established in America.

Aiming to reach the James at a new point, we discovered that by following an old cart-road along the border of a cultivated field we could get to a remarkably undisturbed stretch of shore, with steep wooded slopes, dripping marl-bluffs up to some scores of feet in height, and a broad sandy beach. At the border of the field and along the boundary-fence a purple-tinged weedy *Bromus* was new to us, the infrequent *B. arvensis*, cited by Hitchcock (*Man.*) only from Maryland, there rare. Near-by the woods were monopolized for a good portion of an acre by a continuous mass of *Leucojum aestivum* L., obviously derived from ancient plantings about the now extinct old mansion; and the lady occupying the modern residence told us that in early spring neighboring woods are carpeted with extensive colonies of *Narcissus*. Descending the steep wooded slope, we proceeded to the dripping, white limy bluffs toward Fort Boykin. In RHODORA, xliii. 654, pl. 695 (1941), I described and illustrated from these and neighboring marl-bluffs the puzzling and very characteristic *Erigeron scaturicola*, the type collected at this station in June, 1941. In fact, the whole slope, wherever there was sufficient stability for vegetation to get a foothold, was a marvel when one thought of it as on the Coastal Plain midway between the Piedmont and the Atlantic shores. The upland continental calcicoles of the region have been sufficiently emphasized in past accounts, but we were still tempted by the largest specimens we had ever encountered of many species: *Elymus virginicus* between three and four feet high, *Solidago arguta* with basal leaves more than a foot long, and *Senecio obovatus* nearly 2 feet high, with rosette-leaves 6 inches long. With these overgrown plants of fertile soils *Zizia aurea*, the first we have found on the lower James, abounded; and there was a meagre representation of the strange variation of it with few rounded leaflets, forma *obtusifolia* (Bissell) Fernald. The *Oxalis europaea*, ordinarily with orange-yellow petals, here had them of a pale lemon-color; and here we found a small representation of *Osmunda Claytoniana*, the common northern and upland Interrupted Fern, the first we have encountered in the tidewater counties. The two great novelties in June, however, besides the *Erigeron*, which we had first noted near Burwell's Bay in late summer of 1940, were very exciting. Typical *Heuchera americana*, as currently understood, is a nearly glabrous plant, with smooth or only remotely hispid petioles and scapes. It and some closely similar variations abound in the richer woodlands of southeastern Virginia. But here, on these dripping bluffs of concentrated lime, the *Heuchera* was gigantic, with panicles up to 1½ feet long, and the petioles and scapes were heavily invested in masses of gland-tipped hairs of varying length. It is a novel plant, to be described and illustrated (PLATE 721, FIGS. 2 and 3) in Part II, somewhat simulating the two varieties of the Interior, in Arkansas, Missouri and southern Illinois, southern Indiana and Tennessee. While collecting this strange new *Heuchera* I came upon a single individual of an even stranger *Rubus*, in appearance like a blend of a dewberry and a stiffly upright blackberry, covered with cat's-claw prickles and with very prolonged and stiffly erect solitary axillary pedicels. It was quite unlike any *Rubus* recognized in the Northern States and we spent some time vainly searching for another plant. We obviously were not in its true home, a nearly vertical, wet bluff of lime-marl perhaps 75 feet high, but another season's search in the dry woods and pastures back of the bluffs may reveal it. This doubly unique plant proves to be a new member (PLATE 723) of the remarkable subsection *Anormi* of *Rubus* § *Arguti*, the described species of the subsection being two in Florida, one in Oklahoma. The bluffs of the lower James were maintaining their individuality!

Other points along the James gave us new stations for *Cimicifuga racemosa*, *Euonymus atropurpureus*, *Tilia heterophylla* and other nice things, but our greatest surprise was when our driver took us out to Flowerdew Hundred, near Windmill Point, in Prince George County. Being a friend of the present owners, the Moody family, he did not hesitate, as we should have done, at the closed gates and the "posted" signs along the roads; and the maze of forking country-roads was to him without intricacies. Mrs. Moody kindly allowed us to drive along a planted field to the river. Among the farm-weeds one deserves special note, the tiniest-fruited *Capsella* we had ever seen, a plant which proves to be the European *C. gracilis* Grenier, evidently new to North America. In June of 1941 we were completing the comparisons of freshly flowering *Justicia*, reported on in the last of these Virginia papers. After passing through phenomenally abundant *Ptelea trifoliata* and a new and inland extension of *Bumelia lycioides*, var. *virginiana*, we came to the tidal shore, where *Justicia americana* makes dense carpets. Kneeling to examine its fresh flowers, I suddenly changed my objective. There, amidst the *Justicia* rhizomes, was the little simple-leaved and apetalous, subulate-fruited *Cardamine Longii* Fernald, supposed to be an endemic of tidal shores of Cathance River in Sagadahoc County, Maine. The James River and tiny Cathance River in Maine are 600 miles apart; and here was certainly the reputedly most local member of the genus in eastern America. Chuckling over our new discovery, for here was another of the isolated and ecologically very exclusive estuarine species sharing unglaciated southern Virginia with glaciated southern Maine, another link in the long chain of evidence of relict endemism within the latter region, we selected nice specimens until nearly dark. Then the obvious thing to do was to try another tidal shore, this time at Jordan Point, up-river, where repeatedly we had combed the vegetation at the river-margin. The previous comb had apparently been too coarse or its manipulation too superficial, for in three minutes we had *Cardamine Longii* there, fine plants in great abundance. Since a specialty of Philadelphia botanists from Conrad and Nuttall to the present generation has been the tidal flora of the Delaware and since Long has particularly devoted his attention to these oozy and slimy flats, it was difficult not to accuse him of negligence in having there overlooked so remarkable a member of the estuarine flora and, especially, his own namesake.

Our duty was clear. The range in Virginia of *Cardamine Longii* must be worked out. So, very promptly, we journeyed to the head of tide on the Chickahominy. There it was, bigger and better than on the James. Then back to our old tidal-flat stations on the Mattaponi, near Horse Landing and King William Courthouse in King William County. *C. Longii* abounded, some plants 1½ feet high, where in August, September and October of preceding years we had crept on hands and knees among the vegetation; and when Mr. Walker gave us permission to explore the flat above his landing at Walkerton, we found it in delightful profusion on the north side of the Mattaponi, in King and Queen. In June we were unable to trail it farther north but later in the year we got it on the Rappahannock. Returning to Philadelphia, Long conscientiously reexplored the proper spots along the Delaware and finally wrote me that it was no use; *C. Longii* is not on the flats of the Delaware. When, however, on our next trip to Virginia, he joined me on the train, one of the first tricks he pulled from his pocket was a long envelope containing the evasive plant from the head of Chesapeake Bay, near the mouth of the Susquehanna.

Desiring, if possible, to find where the lush calcicolous and upland vegetation stops as one goes down the lower James and more definitely reaches Chesapeake Bay, we picked out the bluffs north of Eclipse in Nansemond County, between the mouths of Chuckatuck Creek and Nansemond River. We there were surely beyond the calcicolous flora; and, it being a hot and breathless day, we struggled through tall and rather ordinary shore-vegetation until we found a good place for siestas. On a cool day the region may prove interesting. At least, at the base of the wooded bluff and back of the beach there is an extensive thicket of a slender and arching but rather wiry blackberry, with remarkably small leaves and glandular pedicels, clearly related to *R. pauxillus* Bailey, a little known Virginia endemic, but much taller, more widely branched and with quite different leaflets (see PLATE 722).

Other localities, mostly already familiar, were visited. These need only brief mention. Rich or bottomland woods along the Nottoway near Huske contained very definite upland *Vitis Baileyana*, now in flower; and near it the *Cornus Amomum* was perplexing because it lacked the usual reddish hairs of the foliage. *Carices* were mostly too old to collect but one colony of plants was an evident hybrid of *C. abscondita* and *C. laxiculmis*, a hybrid we had once before collected, near Hotwater (an appropriate place for such puzzles). Other colonies were as clearly a cross of *C. digitalis* and *C. laxiculmis*, the plant treated by Mackenzie as a good species, *C. copulata* (Bailey) Mackenz. In the argillaceous clearing north of Orion in Greenville County, not far from Readjuster Bridge, there is a big sprangling and long-arching blackberry with jagged-margined leaflets. I have tried to make it something different but it seems to be inseparable from *Rubus recurvans*, one of the common species of Nova Scotia and northern New England, only doubtfully recorded from so far south as Virginia. Carpets of *Panicum* in fine anthesis were very striking on account of their color, one area with the plants blue-green, another with them yellowish. The difference is, apparently, due to different nutrient salts, for morphologically they are both *P. meridionale*, var. *albemarlense*. In this same clearing, which has yielded several notable plants, we had previously collected an extreme of *Carex debilis*, a new variety which I have recently (RHODORA, xliv. 307) described as var. *intercursa*, a plant as yet known only from southeastern Virginia and from eastern North Carolina.

A short visit to bottomlands of the Meherrin, near Gaskins, extended the range of the handsome *Carex Bayardi* Fernald in RHODORA, xliv. 71 (1942) into Greensville County; and here we also extended southward the range of *Quercus palustris* and got into deeper perplexities than heretofore in *Stachys;* while throughout the trip *Ruellia* proved quite as baffling. The species of the latter genus are not at all satisfactorily worked out. Conscientious collecting in flower and in fruit is necessary before its complexities will be solved.

Furthermore, when we returned to Varina for additional specimens of the *Heuchera* with thin and glabrous leaves subtruncate at base, discussed a year ago and described and illustrated (PLATE 721, FIG. 1) in Part II, we found it accompanied by the characteristic inland variety of *Scutellaria ovalifolia* Pers., the plant described by Short from Kentucky as *S. hirsuta.* Typical *S. ovalifolia,* common in eastern Virginia, is closely pilose with mostly incurved short hairs. Our plant, with long and straight pubescence, is the first from east of West Virginia and Kentucky, except for an old and misidentified specimen from Wytheville, which lies beyond the Blue Ridge. The wooded slope near Varina justifies our original evaluation of it.

If botanical science is the rational subject it is sometimes supposed to be it is obvious that progress should be made along rational lines. In the past some of our best localities in Virginia, the four areas of pine barren, one in Nansemond County, two in Isle of Wight and one in Southampton, and our little sphagnous bog near Dahlia in Greensville County, where *Burmannia biflora* forms a carpet and where *Oxypolis ternata* (Nutt.) Heller and *Zigadenus densus* (Desr.) Fernald have their only Virginian colonies and *Calamovilfa brevipilis* var. *calvipes* Fernald its only known station in the world,—these had all been discovered by sheer good luck or happy chance. The best of the four pine barrens is the extensive one, stretching from slightly below George's Bend on the Blackwater into Gates County, North Carolina. Here, associated with the dominant Catesby's Oak, *Quercus laevis* Walt., Turkey-Oak, *Q. cinerea* Michx., and remnants of the old forest of Long-leaf Pine, there are more specialties than in any of the others, although some are shared with at least one of them: *Sphenopholis filiformis* (Michx.) Vahl, *Rhynchospora pallida* and *R. distans* (Michx.) Vahl, *Tradescantia rosea* var. *graminea* (Small) Anderson & Woodson, *Juncus abortivus* Chapm., *Lilium Catesbaei* var. *Longii* Fernald, *Calo-*

pogon pallidus Chapm., *Zenobia pulverulenta* (Bartr.) Pollard, *Vaccinium crassifolium* Andr., *Pyxidanthera barbulata*, *Eupatorium tortifolium* Chapm., and several others not recognized as Virginians ten years ago. When, in early 1941, the Bureau of Plant Industry in Washington issued the report on the *Soil Survey of Isle of Wight County, Virginia*, following earlier reports on Nansemond and Southampton Counties, our course seemed very clear. The great pine barren of southwestern Nansemond County was definitely designated as "Norfolk sand" and the assumedly authoritative and up-to-date text (dated February, 1941) stated, without a word of qualification, that all the areas of "Norfolk sand" were in primitive and uncultivated condition: "**Norfolk sand.**—Norfolk sand . . . is inherently poor in mineral plant nutrients and organic matter, and none of it is cultivated . . . At present it supports a good stand of second-growth forest" (Soil Surv. Isle of Wight Co., Va. 26, 27). But, as we quickly discovered, dogmatic assertion without the facts is very different from simple demonstration through the actual facts!

Since the Soil Survey maps of Nansemond and Isle of Wight Counties showed approximately 15 areas of "Norfolk sand" which we had never known of, besides the famous one in southwestern Nansemond, our concentrated programme for July, August and September seemed ready made for us. We would use the proper scientific method and consistently visit them all at different seasons, there making the rich harvest of "Norfolk sand" (or pine-barren) specialties which, by the simplest of reasoning, must await us. So, when we started our next period (July 24–August 3), happy once again to be driven by Frank Birdsall, we promptly proceeded southeastward to Isle of Wight and Nansemond Counties. All the distinctive pine barrens known to us being adjacent to the Blackwater River and south of Zuni, the obvious course was to drive north from Zuni toward Raynor and other points near which "Norfolk sand" was indicated in several patches. But, alas, our faith in the Soil Survey, which in the past had received many jolts, was again to be blasted: every area, carefully located by means of the back roads and other features on the map, was now a prospering peanut-field, with no evidence that it had become so only since the

February preceding. Day after day we visited "Norfolk sand," always finding peanut-fields. The prosperous owners of these most productive fields did not realize that in Washington they are officially pronounced to be all "of second-growth forest" and "none . . . cultivated." And when Professor Massey joined us for a couple of days we gave him a vivid demonstration of the type of precision used in preparing the Soil Survey reports for these counties. Northwest of Holland (where there is a branch of the State Experiment Station) the map indicates an elongate patch of "Norfolk sand" with a farm-road bisecting it. Professor Massey was able to verify the farm-road, there running through the middle of a closely cultivated and productive field. Ho-hum! It was really not our fault that our perfectly logical programme had to be abandoned.[1]

[1] We had been perplexed by the very simple mechanical methods indicated in the Soil Survey reports, by which the so-called different soils are often determined, a system based primarily on size and texture of soil-particles. We had also been puzzled to discover no indication of very acute knowledge of the native vegetation, beyond the ubiquitous species which characterize different soils. Such platitudinous phrases as "The vegetation bears a marked relationship to the soils" or "The undergrowth . . . consists of small holly and cedar trees, briers, and native grasses," with no indication of what grasses nor any indication of the occurrence in the acid pine barrens of the three trees (Catesby's Oak, Turkey-Oak and Long-leaf Pine) above noted; with "Juniper", *Chamaecyparis*, in the depressions. There is, furthermore, no recognition of the splendid calcicolous forests on the concentrated lime of the James River escarpment in northern Isle of Wight: Cottonwood, *Populus deltoides*, Hop-Hornbeam, *Ostrya*, northern Red Oak, *Quercus borealis* var. *maxima*, Chestnut Oak, *Q. montana*, Slippery Elm, *Ulmus fulva*, Florida Maple, *Acer floridanum*, various Basswoods, *Tilia heterophylla*, etc., with conspicuous undergrowth of *Hydrangea arborescens*, Moonseed, *Menispermum*, and Climbing Hydrangea, *Decumaria*.

To some extent the pregnant words of the great soil-chemist, Hilgard (whose most helpful understanding of relations of soils and crops as well as native vegetation was started in Mississippi and Louisiana) in 1908 are still important to remember. At that time, writing of a study which demonstrated the marked differences of vegetation on acid, calcareous and magnesian soils, Hilgard said:

"It is refreshing to find . . . a distinct departure from the hackneyed gathering-up of superficial observations on 'plant associations', without any mention of the probable, in many cases abundantly obvious, causes of the geographical grouping of plants. Ecological studies, as often made, savor strongly of the 'gedankenlose Heusammler' habit animadverted upon by Schleiden over half a century ago, and were apparently only temporarily stopped by Darwin's great work. The soil-conditions accompanying the occurrence of certain plant groupings are usually so superficially set forth that nothing but the old classification into hydrophytes, mesophytes and xerophytes is attempted; in conformity with a hypothesis based upon the arbitrary assumption that moisture is the only controlling factor of plant growth. Adding to this hypothesis the factor of soil-texture, and basing thereon the entire work of soil classification, Whitney and the Bureau of Soils of the United States have built up a one-sided theory, which is in flagrant contradiction to facts observable by any one not under the official afflatus of that head center."—E. W. Hilgard in Science, n. s. xxvii. no. 682: 140, 141 (Jan. 21, 1908).

Incidentally, the Bureau of Chemistry and Soils of the United States Department

After, with the collaboration of the federal government, we had wasted precious days and also precious money we had learned our expensive lesson. Disregarding the misleading but official guides to the natural soils, we returned to the old method of exploration, seeking and finding worth-while areas. During the futile search for those 15 patches of "Norfolk sand" which "At present support . . . second-growth forest," we had, naturally, picked up some interesting plants. Somewhat east of Cahoon Pond and north of Suffolk there is an extensive area of peanuts, exactly fitting the pattern and size of a patch of "Norfolk sand" and surrounded by forest, stretching down to Nansemond River. Here the border of the woods is heavily draped by a coarse, subligneous twining legume, in early August showing no flowers but in September loaded with great racemes of royal-purple flowers which scent the atmosphere for some distance away with a concentrated fragrance of Concord grapes. We first collected young branches, in September got flowering material, and in October the absurdly small and thin pilose legumes. The plant is Kudzu-vine, *Pueraria Thunbergiana* (Sieb. & Zucc.) Benth., an eastern Asiatic species often cultivated but here monopolizing the forest-border as a relic of its cultivation long ago, even before the Soil Survey was made. At another "Norfolk sand" station, where, Frank knowing the owner, we were granted permission to search where we would, we spent a most enjoyable hour at the margin of Western Branch (south of Reid's Ferry). To our delight the rare *Ammannia Koehnei*, var. *exauriculata* Fernald here abounded and here was the *Sabatia* of tidal shores, *S. dodecandra*, which we only rarely meet.

Reasoning that the shores of the Rappahannock toward the head of tide might yield some of the tidal-shore species which we knew farther south, we went toward Tappahannock. About noon, stopping to eat lunch in King and Queen County, somewhat north of St. Stephen's Church, we turned up a cart-road at the border of woods. While Long still lingered over tid-bits specially

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of Agriculture, which put out the report on the *Soil Survey of Nansemond County, Virginia* (though "In cooperation with the Virginia Agricultural Experiment Station") would have done well to check on its geography. On the map accompanying the report most of Lake Drummond and a large portion of the Great Dismal Swamp, which on Virginia maps regularly appear in Norfolk County, are transferred to Nansemond County. An error of 2 miles of longitude is small, however, beside the other errors of fact above noted.

provided by his devoted housekeeper at home, I poked up the road until I was forced to decide whether to take the left or the right fork. I made a fortunate choice, for I promptly discovered a spring-fed sphagnous pocket in the woods and, after a cold drink, proceeded to untangle the mass of species, always of spring-fed sphagnous woods and always pretty local, including *Eleocharis tortilis* and *Carex Collinsii*. These were mingled with the most gigantic *Juncus subcaudatus* I had ever imagined, with inflorescences 10 inches long. I shouted to Long to come and help, and we soon found that, whenever we took hold of the abundant *Osmunda cinnamomea*, it stuck to our fingers. Search for ordinary *O. cinnamomea* failed to reveal it. The whole sphagnous wood was given over to the somewhat local var. *glandulosa*. We had never before met it in Virginia, nor have we seen it since. This was on one of the tiny rills flowing into Garnett Creek. At the crossing of another such rill near-by we tried our luck again. Here *Scirpus polyphyllus* abounded, the first we had ever seen in the tidewater counties. These sphagnous pockets between the low ridges which separate them will stand further work; but we had started for the Rappahannock and had to leave them for the future.

Aiming to try the shore of the Rappahannock at Ware's Wharf, we turned down-river toward Dunnsville. As we passed the big tidal marshes along Piscataway Creek we stopped to investigate. It was a sweltering day, especially in early afternoon, the marsh vegetation was rank and dense, as well as full of mosquitoes, and, although the spirit was not wholly unwilling the flesh was pretty weak. We decided to leave the Piscataway marshes until a cool day; not, however, before we had collected a good series of the *Polygonum sagittatum* there. It didn't look familiar and, later, when we found it also in the marshes of the Chickahominy, it became clear that these fresh tidal marshes support a tear-thumb which has much narrower leaves, the upper reduced to tiny bracts, and much longer and smoother upper internodes and peduncles than the usual plant. If we can only induce it wholly to abandon its scratchy character botanizing will become more pleasant! On the shore at Ware's Wharf, where, on account of the excessive heat, it was a temptation to lie in the shade of the Wharf, maritime species reach inland limits on the Rappahannock, *Diplachne maritima, Eleocharis albida, Fimbristylis castanea* and *F. caroliniana* (Lam.) Fernald and *Sabatia stellaris* all abounding. And on the sand there were a few plants of *Portulaca grandiflora*, the first time we had ever met it growing wild.

Hearing in Suffolk that the water of Lake Drummond, in the center of the Great Dismal Swamp, was unusually low, so that patches of shore were exposed, we arranged by telephone with Capt. W. G. Crockett at Wallaceton to take us there in his motor-boat. The trip up the Feeder Ditch from Wallaceton to the federal dam which controls the level of Washington Canal, by letting in water from Lake Drummond when needed, is wonderfully picturesque, especially toward twilight when the dense bordering forest is vividly reflected in the quiet black water; and, once introduced to it and to Capt. Crockett's kindly good nature, rare knowledge of the plants and animals, and wonderful fund of unbelievable but plausible tales, the trip to Lake Drummond promptly became one of the pleasures regularly to anticipate. After being duly introduced to and registered by the engineers, especially Mr. Cherry, at the dam, Long and I walked up the path to the outlet, there to be met by Capt. Crockett. It was obviously too early for most lake-shore vegetation, but in the rich and dark woods, where it would be most simple to get turned around and lost, *Dryopteris celsa*, at its type locality, abounded; and the variations of *D. spinulosa* and its var. *intermedia* were super-abundant and hopelessly perplexing. Anyone, if he still exists, who imagines that these are distinct species should study the confluent series about Lake Drummond. It can be sorted only by counting the glands under a microscope and then the sorting is quite artificial. At the entrance to the Feeder and again near Portsmouth Ditch *Lachnanthes tinctoria* abounds, this being the only surely indigenous station for it in Virginia. The plants are larger than we were used to farther north, nearly three feet high and with corymbs up to six inches broad; and we imagined that the perianth was yellower, but study of a large series fails to reveal any significant differences. The recently described *Rhynchospora chalarocephala* Fernald & Gale in Rhodora, xlii. 426 (1940), for which only one station was definitely known in Virginia, abounds on the shores of Lake Drummond, there particularly large and handsome; and we were here impressed by the very bristly sheaths of the *Sacciolepis*. Ordinarily *S. striata* is glabrous. The Lake Drummond plant proves to be *S. gibba* (Ell.) Nash, based upon *Panicum gibbum* of Elliott. It will be considered in Part II.

More than a century ago the erratic and too often irresponsible Rafinesque published as *Macuillamia obovata* a mixture of plants from Louisiana and from shores of the Potomac. His name, obviously based on a mixture and not identifiable by any specimens known to exist, had properly gone into the discard. But in 1935 Pennell, "leaning over backward" to do no possible injustice to the dubious memory of the author and to retrieve his name, took up *Macuillamia obovata* for a unique plant found by the late Earl J. Grimes on the shore of the Chickahominy (not on the Potomac) and, considering the species to belong in the not too inclusive *Bacopa*, I later stupidly (for I had not seen it) made the formal transfer of it, as *Bacopa obovata* (Raf.) Fernald. The only known material which had been referred to the Potomac half of Rafinesque's mixed *Macuillamia obovata* was a rather meagre series of 3 somewhat broken plants said by Pennell to have been collected by Grimes at Lanexa. Since, however, the label accompanying the specimens bears the name *Echinodorus tenellus*, belonging to a tiny acaulescent linear-leaved plant of the *Alismaceae* with umbels terminating naked scapes, a plant not known in Virginia, and since the Grimes specimens are clearly of a *Bacopa* (*Scrophulariaceae*), with rounded-obovate opposite leaves with axillary flowers borne along the ascending stems, there was obviously as much confusion about it as in Rafinesque's original publication. Repeatedly we had driven to Lanexa and there had crept along the tidal shores at every probable spot for a mile or more up- and down-river. The only *Bacopa* there is the smaller-leaved species forming prostrate mats, an undescribed and very characteristic inhabitant of the tidal shores of the Chickahominy and the Mattaponi, equally interesting as a new and localized species (PLATE 728) but surely not the Grimes plant. In view of the great abundance of the matted plant at Lanexa and generally along the Chickahominy for many miles, it is astounding that Grimes did not collect it. Still dissatisfied because of our failure to locate the rare species which he presumably *had* collected somewhere and which had so obviously been associated with the wrong label, we decided to cruise in motor-boat along the Chickahominy from the head of tide, below Providence Forge, to the big curve of the river below Lanexa, a distance, as the river meanders, of more than 12 miles along each shore, making approximately 25 miles, besides the inlets, of tidal shore to be investigated. That was some proposition, for every bit of open shore exposed at low tide, at the entrances of seepage-rills or near landings, where the ubiquitous thicket of erect and dominating *Nuphar advena*, with its associates of the extensive marshes, had not obliterated everything else, must be investigated.

Returning to our friend, Mr. W. T. Walls, on the shore of the Chickahominy near Windsor Shades, we secured a boat with out-board motor. While Mr. Walls was getting everything ready for our start, we browsed along the marshy shore near his landing, promptly finding a mixed and not too quickly distinguished colony of *Lindernia dubia*, var. *inundata* Pennell and *Gratiola virginiana*, var. *aestuariorum* Pennell, the latter cited by its author only from Salisbury, Maryland, and from the Delaware in New Jersey. Circling about the islands in the river, we skirted the southern shore (in Charles City County) only a short distance, only to Cypress Bank Landing, for the collecting was very absorbing. The prostrate small-leaved and undescribed *Bacopa* made almost continuous carpets, more and more exposed as the tide went out; and from amongst these mats we quickly extracted *Peplis diandra* of the Mississippi Basin, discussed in the last paper on our Virginia work, *Potamogeton Spirillus*, its range extended into a new county, *Sagittaria Eatoni*, the problematic plant of tidal mud from the lower Merrimac to the Delaware, new to Virginia, *Cardamine Longii* of course, and *Micranthemum micranthemoides*, the first from south of the Potomac at Alexandria, and, inevitably, the very baffling series of tidal-flat *Najas*. The careful collecting of these muddy and silt- and alga-covered plants in a habitat where the water promptly became dark and opaque after each grab from the bottom, is time-consuming and back-breaking and, as stated, we barely reached Cypress Bank Landing on the first day.

It was necessary to return for low tide on two succeeding days, not only for better material of some of these species but in order to reach Lanexa. The unusually dry cypress swamp at Cypress Bank Landing has some nice undergrowth but only two species there need detain us from the greatest prizes in late July along the Chickahominy. Here was *Styrax americana*, one of the rarest and most beautiful shrubs or small trees of Virginia, and the *Elymus virginicus* here was obviously var. *jejunus* (Ramaley) Bush, a distinct little extreme, not previously known in the Atlantic states from south of New Jersey. The greatest necessity to return to the Chickahominy, however, was the suddenly discovered problem in *Nuphar*. The broad and nearly impenetrable marginal marshes of the Chickahominy are an almost solid thicket of *Nuphar advena*, standing erect, and interspersed, where there is a root-hold, with *Zizania aquatica, Aeschynomene virginia, Kosteletzkia virginica, Boltonia asteroides* var. *glastifolia* (Hill) Fernald, either white or pink, and other tall species which can stand the crowding. When we left the immediate tidal shore of the Chickahominy we found ourselves in a maze of *Nuphar*, with floating leaves much narrower than the erect ones of *N. advena*, the plants bearing beautiful masses of filmy submersed foliage. In mid-current the narrow and elongate leaves were obviously those of the famously localized *N. sagittifolium* (PLATE 718), reputed to grow only in the Lower Cape Fear river and adjacent tidal rivers of southeastern North Carolina and northeastern South Carolina. That much was clear; the familiar "first known from north of southeastern North Carolina" applied even to the mid-current *Nuphar* of the Chickahominy. Our difficulty was with the floating-leaved plant (PLATE 719) which everywhere formed a broad belt between the mid-stream *N. sagittifolium* and the open-marsh *N. advena*. This plant, with floating and submersed leaves broader than in the former, with the "floaters" much narrower than in the latter, which is supposed not to have filmy submersed blades, abounded for many miles down-stream as well as up some of the entering creeks. Repeated study of it in the field and subsequent study in the herbarium indicate that it is a well defined hybrid-species, comparable with the northern *N. rubrodiscum*, which is often associated with its very distinct parents, *N. microphyllum* and *N. variegatum*. Even though we had not yet found Grimes's problematic *Bacopa*, the Chickahominy had more than justified our visits to it.

Grimes had reported *Sarracenia purpurea* from "Swampy woods, at Chisel's Run, near Williamsburg-Centerville Road"; and since *Sarracenia* is an index-species to a habitat where interesting associates may occur, we sought out Chisel's Run. Where it crosses the road it was, at this season, dried out and we could not locate the *Sarracenia*. The plant which immediately challenged our attention was, instead, a rather small *Nuphar*, with roundish, erect leaves and with the fruiting peduncles arched into the mud. This plant somewhat baffled us and, starting early next day, we crossed and recrossed Chisel's Run at several places, locating new colonies of the *Nuphar*, always small-leaved and erect, until finally, just east of Centerville, a small and very muddy pondhole proved to be its real home. At the margin of the pond the leaves were erect and rather large, inseparable from those of *N. advena* of the tidal marshes; but farther out, in deeper water, the firm blades were floating. Best of all, young plants in deep water had filmy basal foliage, in shape like the emersed leaves. The flowers and fruits are those of *N. advena* and it was evident that, in this quiet and hardly fluctuating water, we were getting the submersed foliage of that species (PLATE 717), which in estuaries does not produce them.

Having a few hours left, we decided to investigate flat Mulberry Island, a great and almost contourless expanse on the north side of the James, with many tidal creeks. Passing Lee Hall and approaching the "Old Earthwords" of the map, we found ourselves at Fort Eustis, a very much alive military post. It proved that Mulberry Island was in use throughout the week for bombing-practice and would be a most unhealthy place for botanists. Incidentally, we could visit it only on a Sunday and then by special permit. In view of the intensified activity since December of 1941 Mulberry Island will remain a botanical *terra* (if not *terror*) *incognita* for some time to come. Attracted by the crowded contours and steep slopes to the James west of Carter's Grove and southeast of Grove Station, we started for Grove Landing and adjacent Martin's Beach. Very soon we were in the richest of hardwood forest, growing on the Miocene fossil beds of calcareous marl and shells. Collecting as rapidly as possible, for it was becoming late, we were promptly impressed by the *Hypericum punctatum,* for here, instead of oblong and round-based leaves, it had them narrowly oblanceolate or spatulate. We had noticed it before but here it abounded, the extreme form which Bicknell had separated as *H. subpetiolatum.* In the woods *Taenidia integerrima* abounded, an inland and upland calcicolous species not seen by Grimes and never before found by us on the Coastal Plain. Similarly, *Triosteum perfoliatum* was new to our Coastal Plain experience. The forest from well back in the ravines to the bases of the bluffs was very striking with the whitish-gray trunks of *Acer floridanum* (Chapm.) Pax (PLATE 725).

It was evident that another half-day was needed for such a rich locality. So, returning next day, we at once became involved with *Acer.* Three series of trees abounded, some past fruiting, others in full fruit, and the late-fruiting trees differed from the others in many characters. We collected from a dozen different trees and when, in April of this year, we returned with my two former students, Dr. Ernst C. Abbe of the University of Minnesota and Dr. Albert L. Delisle of William and Mary, we got a fine series of flowering specimens, these later supplemented by fruiting material kindly gathered for me by Delisle. In brief, there are three quite distinct series of *Acer* and some evident transitions between them on the calcareous slopes near Grove Landing. One is a relatively small tree with smooth but finally furrowed whitish bark, the trunks up to 2½ feet in diameter. This tree has slender and glabrous or usually glabrous new branchlets; tiny flowers, the pistillate or perfect ones with the short style included; the small leaves, in size and form suggesting those of *A. campestre*, pale and minutely tomentulose-pilose on the veins beneath or glabrate; the small fruits promptly falling (often all dropped in June). This is an exact match for *A. floridanum* (Chapm.) Pax, a species (PLATE 725, FIGS. 1 and 2) already well known to extend into southeastern Virginia. The others in good development are very different: magnificent trees (PLATES 726 and 727, FIGS. 1 and 2) with whitish trunks up to 4 feet or more in diameter, the old bark exfoliating in long shingles, so that old trunks suggest shag-bark hickory; the flowers larger than those of *A. floridanum*, the styles long-exserted; the leaves as large as in the northern and upland *A. saccharum,* of two quite distinct forms, both deeply lobed and, like the young branchlets and petioles, heavily covered beneath with a dense whitish to brown felt or velvet; the fruits larger than in *A. floridanum.* Although a few trees are evident transitions between the two extremes, the shag-barked maples are certainly not typical *A. floridanum.* Neither are they the shrubby or barely arborescent and more southern *A. leucoderme* Small, the only other eastern white-barked species. They seem to stand to *A. floridanum* in much the relation of var. *nigrum* to *A. saccharum;* they will be further discussed and illustrated (PLATE 726 and 727, FIGS. 1 and 2) in Part II, where I shall take great satisfaction in permanently associating with them the name of my companion, Long, who has done so much to discover the rarer plants of southeastern Virginia.

A couple of remarkable and herefore undescribed "Sugartrees" would have been a fitting climax to a trip which began as an absolute "flop"; but we had to get back to the Meherrin, near Gaskins in Greensville County, for mature material of the puzzling *Stachys* which abounds on the wooded bottomland there. Consequently, we devoted out last day, before returning home, to the Meherrin. Starting on the farm-road toward the river, we soon got out and walked, for many interesting species demanded attention. The beautiful pink-flowered *Sabatia* was real *S. companulata* var. *gracilis*, the first satisfactory material we had seen in the state, earlier collections being too transitional to *S. campanulata.* A single plant of a *Crotalaria* excited us, for it was like oblong-leaved material we had once got on the Eastern Shore, about the identity of which we had never been happy. It proves to be *C. sagittalis* var. *oblonga*, described by Michaux in 1803 and not subsequently recognized, a plant represented in the Gray Herbarium by no other material from north of Florida. The border of a cultivated field gave us one fine species which we had never before seen in the state, the handsome *Cassia Tora*, a splendid tropical plant. Thus, our last day out was far more productive than the wasted first days and, having got into real stride, we regretted having to quit while discoveries, some of them of tremendous interest, were the daily reward for our effort.

When we returned in September (5–15) Frank's school was beginning, our other fine drivers and companions of the past were all away or in military service and, except for those happy days when Orion Birdsall could take a day off to go with us, we were at the mercy of as poor a substitute as could be imagined. Our regular or, rather, irregular driver was so irresponsible and unreliable that we never knew, until he arrived, whether we should get away for a full day's trip. Thus handicapped, the inevitable result of having all high-grade young men in the government service or at other important employments, we actually made a good score of discoveries, because we were in a region of seemingly endless possibilities, even under adverse conditions. Returning to the James River escarpment in northern Isle of Wight County, we found below Fort Boykin a patch of very large plants of *Physalis barbadensis* Jacq., a tropical American species we had not before encountered; but the strangest plant for its habitat here was about the hydraulic ram which pumped water for a hotel. The overflow from the pump made a perpetually replenished pool in the woods and in this pool, under heavy splashing of cold, fresh (probably calcareous) water, *Zannichellia palustris* var. *major* abounded, a plant more generally found in quiet, brackish to saline waters.

Returning to the steep marly bluffs above old Fort Boykin, we found the cultivated field, by which we passed in approaching the river, with one conspicuous weed, a villous-hirsute Malvaceous plant with somewhat angulate-lobed leaves, flowers with blue-violet petals shorter than the calyx-lobes, and radiating, long-awned carpels. It was wholly strange to us and not in Small's *Manual*. Search shows it to be a puzzling member of the tropical and subtropical genus *Anoda*. I can not exactly match the plant, which belongs to the polymorphic series of Texas, Mexico and South America and all called, until the genus is properly monographed, *A. cristata* (L.) Schlecht. In fields along the James it is pretty far from home, assuming that it can be matched and has a home. Then, in following the path down the wooded slope to the river-beach, we got the large-leaved *Satureja Calamintha* (L.) Scheele, var. *nepetoides* (Jordan) Briquet, a well marked variation of the common *S. Calamintha* (*S. Nepeta*) and not heretofore recorded from America. How these two weeds, the first apparently from South America, the second European, got into this corner, remote from railroads and much outside intercourse, is a problem, one which suggests the question of the local origin of the commonest representative of *Chenopodium ambrosioides* in southeastern Virginia, a villous, instead of glabrous, plant abounding in waste land, which proves to be the South American var. *chilense* (Schrad.) Spegaz., to be discussed in Part II. To this group of South American weeds, naturalized in southeastern Virginia (in this case also in eastern North Carolina), belongs "Muster John Henry", *Tagetes minuta* L., noted in Rhodora, xxxix. 459 (1937). That, however, is raised in many yards of the colored population as an aromatic herb.

The native plants of the marly bluffs have already been sufficiently noted, but on the beach of the James *Gaura biennis* reaches its probable eastern limit in the state, and here we found a single individual of *Cuphea petiolata*, obviously a waif from some station we do not yet know. One plant of the bluffs, however, should be specially noted, *Campanula americana* with the flowers all tubular and cleistogamous. Typically *C. americana* has the coralla rotate and deeply cleft into prolonged lobes; and upon these characters has been set up the *micro* (Small)-genus *Campanulastrum* Small. The aberrant plant with the corolla more tubular than in most true *Campanula* seriously shakes one's faith, if he has any, in the generic stability of *Campanulastrum*.

Earlier in the year we had seen a strange prostrate *Desmodium* in rich calcareous hard woods west of Chippokes. It now seemed the right season for it to be fruiting; and it surely was fruiting, the loments quite strange to us. Only two or three lingering flowers could be secured, these milk-white; but these belong, Dr. Schubert assures me, to the very rare *D. ochroleucum*. In Rhodora, xli. 546 (1939) I recorded the latter species from a wholly different habitat, dry and hopelessly sterile siliceous and acid woodland of *Pinus virginiana* in Caroline County, where Long and I could have collected many thousands of sheets. That plant had the petals cream-colored, quickly changing to yellow, and, although we then called it *D. ochroleucum*, Dr. Schubert shows me that in stipules and other characters it surely is not that species.

The calcareous woods and ravines sloping to the James below Claremont Wharf and, some miles away, above Claremont have yielded so many choice or rare species that we decided to try the shores and slopes immediately above the Wharf. We had looked there earlier in the season and when we went there in September we were happy to have Massey with us. The great series of calcicolous woodland species already recorded from the Clarement region need not be again enumerated, but some now found were new to us. Turning into an old station in order to show Massey our colonies there of *Hybanthus concolor*, *Athyrium thelypterioides*, *Dryopteris celsa*, etc., we walked into a fine colony of *Scrophularia marilandica*, new to the Surry County list. On the beach a clump of *Aster pilosus* Willd., var. *demotus* Blake held its old involucres of the preceding year and its new flowering branches arose from the axils of the preceding autumn. The herbaceous genus *Aster* is difficult enough; if it is to enter the group of shrubs we may be able to turn it over to those who somehow still think that trees and shrubs are taxonomically the property of specialists who never look at herbs. In the woods and thickets back of the beach and in wooded ravines *Eupatorium rugosum* Houtt. (*E. urticaefolium*) did not look right. Its leaves were rather small, harshly scabrous and often cordate and the involucres of the few flowering heads did not seem typical. It was promptly noted for observation a month later.

While Massey was with us we had no difficulty in inducing him to make the trip to Lake Drummond. We had already been to the Lake a week or so earlier but there were many strips of shore still awaiting attention. The two visits, chronologically so near together, may be treated as one. To us it was very sad to see much of the eastern half of the Great Dismal Swamp still smouldering and smoking. Whenever we had been there fire was working unchecked and, it seemed to us, so taken for granted that the destruction of forest and originally deep humus goes on as a matter of course. When, in April of this year, Capt. Crockett took us, with Dr. Abbe, in to Lake Drummond fire still burned, without evident protest, close to the government Feeder Ditch. Nearly 70 years ago the late J. W. Chickering wrote of the region of the Great Dismal Swamp reached from Norfolk, "Most of the large trees . . . have fallen victim to the frequent fires, several of which were raging during our visit, and lighted up the horizon at night; often by these fires the peaty soil for miles is burned to the depth of four or five feet; the hollow thus formed soon fills with water, and ever after retains a truly 'dismal' appearance."[1] That was 69 years ago. We gather from the newspapers and journals that we have advanced in our appreciation of our natural resources; it makes pleasant reading but if anyone, civilian or official, makes any serious effort to save from complete and wasteful ruin some remnant of the great forest and the deep soil of the eastern half of this unique, sentimentally significant, and economically once important area, we have not noticed it. The Feeder Ditch, tributary to the federal Washington Canal, is under government management. While the great feeder-dam is scrupulously maintained, guarded by military police, and its water conserved, the forest near-by is being wasted and laid bare. For that no one seems to "give a dam[n]". Yet we sometimes hear of so-called "conservation," which in this country often means killing out the rare native plants and then planting foreign crops to attract game-birds, in order that "conserving" man may destroy them. What a farce! When all the old trees and all the humus are burned out and the resultant ash has become covered with a rank growth of weeds, the Great Dismal Swamp will be a candidate for "preservation" as a National Forest.

But the living remnant of the original flora still has some interesting species. It was good to collect fine material of *Psilocarya scirpoides* var. *Grimesii* Fernald & Griscom at its type-station, where Grimes had got it 20 years before, and to verify the reported occurrence of *Eriophorum virginicum* in the Dismal Swamp. Grimes and, before him, the late J. Arthur Harris had got *Xyris fimbriata*, not recorded from the state, in some abundance; the best Long and I could do on our first trip of the month was to find a solitary individual among the super-abundant *X. caroliniana* and *X. difformis*. Typical *Rhynchospora macrostachya*, at its only known locality in the state,

[1] J. W. Chickering, *The Flora of the Dismal Swamp*, Am. Nat. vii. 521–524 (1873). Unfortunately it is not possible for those who know the region to accept some of Prof. Chickering's identifications. His statement that "The great laurel (*Rhododendron maximum*), and perhaps loblolly bay (*Gordonia Lasianthus*), are very abundant" should have had all the emphasis on "perhaps" or rather *probably not*; and surely there was serious error in recording *Myrica Gale*.

mingled with *Lachnanthes* and *R. chalarocephala;* and on one stretch of shore, near Jericho Ditch, *Sagittaria Engelmanniana* (the broad-leaved forma *dilatata*) abounded. Although not definitely reported from south of Delaware it is, on Lake Drummond, really at an intermediate station, for, as noted in Part II, it has been collected as far south as South Carolina.

Lake Drummond was so phenomenally low that it had been difficult to navigate, on account of drowned cypress-knees, and it was, consequently, necessary to anchor hundreds of yards from the thicket and to wade, often slipping on submerged logs, to shore. At one point on the southeastern side, where we saw a vivid green carpet of low vegetation, Long and I struggled ashore, guiding ourselves by means of oars as sounding-rods and sinking each step well above our knees into the plastic clay of the bottom. Even after we got to the green carpet the clay, above low-water level, was so pasty and deep that we wallowed and tumbled with great ease but kept enough poise and breath to collect only with extreme difficulty. Pulling and grabbing as best we could we brought back to the boat a miscellany of specimens and, after it was too late, we discovered that the *Sagittaria* of this deep mud had peculiar bracts and strongly compressed pedicels; furthermore it evidently has prolonged subterranean rhizomes. The material is rather inadequate and we needed more conclusive specimens. Unfortunately, however, when, in October, we tried to get to Lake Drummond for it, the Feeder was closed to navigation on account of repairs going on. The *Sagittaria* is one of many problems left for the future.

On seeping shores near Jericho Ditch and in the Ditch itself *Limnobium Spongia* abounds, sterile and very large in the Ditch, fertile, freely flowering and fruiting on the shore. We always turn in at Jericho Ditch for a drink of cold water. Fed by subterranean springs, Lake Drummond supplies potable water the color of strong tea ("Juniper water"), though after a hot summer pretty warm, but Jericho Ditch has delightfully cold water. We were glad, as we had never been before, to drink freely from a "ditch." Near here the woods yielded *Ilex coriacea*, known to Capt. Crockett as Sweet Gallberry, the fruits, becoming soft and pulpy in autumn, said by him to be palatable, as contrasted with the hard and persistent ones of Bitter Gallberry, *Ilex glabra*.

And at the western side of the Lake, in Nansemond County, we wandered in an extensive forest of large trees of *Persea palustris*, loaded with such masses of bluish-black fruit as we had never imagined, some trees with the prescribed pubescent foliage, others but sterile ones with the leaves glabrous. We already knew the glabrous-leaved form from other areas in the county. It seems not to have been described, for botanists of the past have evidently mistaken it for the quite different glabrous-leaved *P. Borbonia*. *Persea* is primarily tropical, formerly extending northward on the Coastal Plain only locally to southern Delaware. It was, therefore, a bit disconcerting to walk under its shade through abundant *Dryopteris spinulosa*, inseparable, so far as we could see, from the fern of Canadian and European forests. What sort of ecological "association" is this?

Eupatorium was developing, far enough along for recognition. One species, however, was not recognized in the field by us. We had already got it in thickets near Wallaceton, and on the shore of Lake Drummond it abounded. It proves to be *E. recurvans* Small, the first from north of Georgia. Another, a plant we had often collected, had jagged-toothed leaves. It belongs in the polymorphic series typified by *E. hyssopifolium*. We had been perplexedly collecting these plants since we first went to Virginia. In Part II I shall try to elucidate them, including two varieties (PLATE 737) not previously recognized from Virginia and a new species (PLATE 738), apparently endemic. Lake Drummond had well repaid our two visits. Outside, north of Wallaceton, we stopped on our second visit for more mature material of a *Bidens*, unlike any we had recognized in the state, but still needing mature fruit for its identification.

Returning from Norfolk County, we noticed that the broad bottomlands of the Blackwater, usually drowned, were dry enough for easy traveling. So we spent a very exceptional hour on the bottoms southeast of Ivor. The great prize was an extensive colony of *Cynoctonum Mitreola*, in aspect very like a Borage with white flowers, but promptly distinguished by its opposite and stipulate leaves and by the fruit. Other bottomlands, too, gave us some nice things. Returning to the Nottoway east of Huske we found our tangle of *Vitis Baileyana* in ripe fruit, the grapes blue with a bloom and pleasantly sweet.

V. vulpina (*V. cordifolia*), which it slightly resembles, would not be ripe for some weeks yet and no one would eat its black fruit for sweetness or for pleasure. On the bottomland of the Nottoway near Green Church Bridge we were delighted to find an extensive area of *Erianthus brevibarbis*, a rare species for which we had only one previous station, that in constant danger of extinction. Similarly, on the bottomland of Three Creek at Drewryville, where we always find something worth while, *Micranthemum umbrosum* (Walt.) Blake, which we had found there as immature plants in 1936, was now finely flowering, the broad, creeping mats suggesting tiny *Lysimachia Nummularia;* and with it were fine colonies of *Paspalum fluitans* (Ell.) Kunth, a species for which our stations are few. In the depressions where water stood the *Diodia* puzzled us. It proves to be an undescribed and quite characteristic extreme of *D. virginiana* with distinctive characters in both leaves and fruit.

While collecting beautifully flowering and very tall plants at the border of dry woods near Orion of the recently described *Sida inflexa* Fernald, new to Greensville County, we were impressed by the firm and strongly scabrous foliage of *Phaseolus polystachios*, growing with it. It had more than once so impressed us in past seasons, the leaflets relatively stiff, harsh and withstanding heat, whereas the plant of Pennsylvania, New Jersey, New York and southern New England wilts upon being picked and its thin leaflets are smooth above. In October, when we got it in fine fruit, it was clear that the beans differed in shape, size and color from those of the more northern plant.

Earlier in the summer we had seen at the border of woods in Adams Swamp, south of Baines Hill School in Nansemond County, an exceedingly villous and leafy *Elephantopus* which puzzled us. It was now time to go for mature material. The plant proves to be a marked extreme of *E. carolinianus*, one we have seen nowhere else.[1] In wet woods in the swamp there

[1] We thus added another to the Virginian series of Elephants and their feet. We already had the Bare-footed Elephant (*Elephantopus nudatus*), the Hairy-toed Elephant (*E. tomentosus*), the Stub-toed Hairy-toed Elephant (*E. tomentosus*, forma *rotundatus*), the Carolina Elephant's-foot (*E. carolinianus*). We were adding the Wooly-socked Carolina Elephant's-foot! These names, like "Foul-scented Lovegrass" and others in Britton and Brown and many of the crudely formed absurdities in the new "Standardized" Plant Names, are not colloquially used. Ours are intended as jokes; the others, unfortunately, were not. It is often said, however, that the greatest jokes are unintentional.

were extensive areas given over to the long-arching and often tip-rooting, very soft-hairy *Ludwigia pilosa* Walt., which we had known only once before in Virginia, in mossy pineland south of Grassfield in Norfolk County. There the plants are low and rather small. Here they were tremendous, and their creeping basal offshoots were prolonged. On the way back to Suffolk from Adams Swamp we suddenly saw in the roadside ditch bordering low woods a *Coreopsis* with much broader basal leaves and much shorter ligules than in the frequent *C. oniscicarpa* Fernald. Its involucre also showed marked differences and it was evident that we were adding another *Coreopsis* to the flora of the state. It would be necessary to return in October for fruit.

September visits to the tidal shores of the Chickahominy yielded more adequate material of *Micranthemum micranthemoides*, *Sagittaria Eatoni*, the carpet-forming *Bacopa* and, of course *Nuphar*. *Hypericum mutilum* var. *latisepalum* Fernald, which we had known north of Florida only on tidal shores of the Mattaponi and the Pamunkey, was abundant; and a slender *Strophostyles*, somewhat like *S. umbellata* but quite glabrous, abounded in the wettest of tidal marsh. Fruit secured in October showed it to be an estuarine variety of that species of dry soils. Best of all, we finally got the mysterious *Bacopa* (PLATE 729) about which Grimes's reputed label is so contradictory. Only three poor pieces of it have previously been known, their true source wholly vague, and their identity evidently misinterpreted. We now have a good series which forms the type of a second species of the genus to be described and illustrated (PLATE 729) in Part II.

No trip to southeastern Virginia could be made under happier circumstances than our next brief visit (October 10–17), for we had delightful weather, the red-bugs were gone, frosts had been delayed, except in the Dismal Swamp and other extensive low areas, and, best of all, Dr. Donovan Correll, at home in North Carolina for his vacation, readily accepted our invitation to drive us to old and to several new stations. Our only regret was that Mrs. Correll, whose acuteness as a field-botanist we well knew, could not be with us. Time was short and we wanted to get at many areas, the Rappahannock at the north, the Carolina border at the south. I had written from Cambridge arranging with Capt. Crockett to take us back to the pasty-clay shore of Lake Drummond for the perplexing *Sagittaria*. Unfortunately, however, when we reached Wallaceton the Feeder Ditch had been temporarily closed to navigation. We, consequently, started for Northwest River to the eastward. Coming to a wooded swamp near Gertie, which seemed attractive, we stopped to look it over. The only real novelty, however, was an abundant small oak in the dry woods above the swamp, with the lower leaves of the branches like those of *Quercus Phellos*, the terminal ones broadened from prolonged wedge-shaped bases to deeply 3-lobed obovate summits. This proves to be the very rare *Q. nigra*, var. *tridentifera* Sargent. We incline to the interpretation that its rarity is due to its probably being a hybrid of *Q. nigra* and *Q. Phellos*.

Aiming to cross the upper Northwest River by the bridges shown on the old map, we succeeded in finding our way to one bridge and on the broad bottomland southeast of Cornland found *Panicum hemitomon*, a local species in Virginia, very luxuriant. Then we got lost but eventually brought up at Northwest. One plant, detected on the way, is well worth a note. On the second day in this region, after passing Cedarville and driving toward Land of Promise, we saw a tall and loosely ascending *Aster* with very long and slender spiciform racemes of tiny lavender-rayed heads, somewhat suggesting *A. vimineus* but too stiff and scabrous and with the phyllaries inclined to be subulate-tipped. It proves to be the rare *A. racemosus* Ell., heretofore known only from Florida to eastern Texas, north into extreme southeastern South Carolina. We always expected something from the neighborhood of Land of Promise; now we were getting it.

The first afternoon at Northwest we spent chiefly on the reed-marsh near the bridge, where the tide is sufficient regularly to change the water-level. This was an old locality of Heller and of Kearney. We consequently got little which they have not recorded. These marshes are the type-locality of the superb *Lobelia elongata* Small, with large azure-blue flowers in racemes up to a foot long, and we were glad to secure good specimens, some of them strongly forking. *Cladium mariscoides*, apparently not recorded from the state, abounds, as does *Rhynchospora macrostachya* var. *colpophila* Fernald & Gale, the estuarine extreme which we had not seen from south of the James. The blunt- and small-leaved *Lyonia ligustrina* var. *foliosiflora* also abounded, the true southern shrub of such habitats, new to Virginia, the acute-leaved and usually taller Virginian shrub which has erroneously passed for it being var. *salicifolia* (Wats.) DC., as pointed out by me in Rhodora, xliii. 625 (1941). A sphagnous pocket gave us *Eriocaulon decangulare*, *Sabatia dodecandra* and some other species which, with them, were recorded by Kearney or by Heller. Seeing a corduroy road through the woods of the bottomland, we followed that. We vainly looked for fancy southern shrubs but everything at this season seemed familiar, although it is a promising habitat for something new to us. The most striking plants, perhaps, were two: *Limnobium Spongia* in solid carpets and the now quite familiar *Rhynchospora caduca* Ell., here just coming into flower in mid-October, doubtless because the woods had only recently emerged from continuous flooding.

Moving on to Blackwater River (tributary to the North Landing River), Long and I were fighting our way through *Typha truxillensis* HBK. and other towering plants of the reed-marsh there with our hands full of very tall *Ludwigia alata*, from its second station in the state, when Correll called, "What is this *Aster*?" We had seen no *Aster* but very soon we were in a large colony of a coarse and rather handsome species strange to us, with subcylindric, broad inflorescences of large flesh-pink heads. It proves to be the rare southeastern *A. Elliottii* Torr. & Gray, new to Virginia—so rare that, until our material was inserted, there were scarcely six sheets in the Gray Herbarium of this species, described more than a century ago.

During our earlier seasons, when we had our base at Virginia Beach, Long and I had several times followed the overgrown and greatly obstructed Pungo Causeway, an old highway leading from below Land of Promise to the likewise forsaken Pungo Ferry. At that period we were able to get only to the drowned border of the reed-marshes of North Landing River, just where the tropical Saw Grass, *Cladium jamaicense*, appears and where the northern Cranberry, *Vaccinium macrocarpon*, forms a carpet under this coarse and unpleasant sedge. Now things have changed. Pungo Ferry, originally crossing the North Landing

River, part of the federal Albemarle and Chesapeake Canal, but long abandoned, has been revived, and Pungo Causeway is now a surfaced road. When we drove in past the masses of *Smilax Walteri* and *S. laurifolia* which festoon the roadside and were now in full fruit, we suddenly saw many acres of *Eriophorum virginicum*. This and Cranberry indicated northern sphagnous conditions, but, alas, progress is most difficult in this area, every step a struggle through a mesh of tough and fierce *Smilax laurifolia*, like an unending chain of caltrops, and every misstep landing one either in its embrace or amongst the sharp and crowded, hard teeth of Saw Grass. Long and Correll braved these impediments to get grasshoppers and mosses, but I was content to dig out from the sphagnous knolls over-ripe material of *Rhynchospora alba*, another northern (circumboreal) species here at a remote southern limit.

While in this corner of the state we called in, at twilight, to get fruit of the *Bidens* north of Wallaceton. Its achenes were ripe (in fact the plants were heavily frosted). It proves, as we had expected, to be the characteristic Cape Cod *B. coronata* var. *brachyodonta* Fernald. The mingling of northern and extreme southern plants in the swamps of this region was again emphasized. We also drove toward Baines Hill School for fruit of the new *Coreopsis*. This, fortunately, was now quite ripe and it quickly settled the relationship of the new plant. Slightly to the east of Suffolk, perhaps nearer Magnolia, we saw a strange inflorescence. It proved to be a tall virgate panicle of a *Chrysopsis*, such as we had never before found; and since the members of the *graminifolia*-series of that genus had perpetually given us puzzles, I have taken this new one as a starting-point for a study of the series in Virginia and the Carolinas. This, including two new species and two new varieties, with four plates (741–744) will be found in Part II.

Returning to Claremont for the strange variety of *Eupatorium rugosum*, we got a full series in lingering flower and in fruit; and the character of the involucre which we had noted in September (the oblong phyllaries green and herbaceous, instead of linear and scarious), accompanying the small and scabrous leaves, indicated a local variety (PLATE 739) of that wide-ranging species. Farther down the James, along Burwell's Bay, below

Rushmere, we had formerly collected a gigantic extreme of *Strophostyles helvola*, with the leaflets broadly ovate and obtuse, not inclined to be fiddle-shaped and short-acuminate as in typical *S. helvola*, and twice as large as in the latter. Its flowers were also larger. Now, in mid-October, the fruit was ripe, the long legumes bearing beans up to 12 mm. long. It proves to be var. *missouriensis*, not recorded from Virginia.

Wishing to try the Rappahannock again, we proceeded to Port Royal, but, the shore there being not very available in limited time, we contented ourselves with *Rhynchospora macrostachya* var. *colpophila* and then drove farther down-river in Caroline County, finally taking a farm-road from near Return to the river-margin. The old place on the river, now owned by Mr. and Mrs. Snowden, is very interesting. Mr. Snowden, a retired teacher, and his alert wife fully value the traditions of the old plantation and we were inclined, as they showed us portions of the buildings and many Indian relics dug up on the grounds, to forget that we had come to look at the shore. Here was *Ericocaulon Parkeri*, our first from this river; but we soon became absorbed in the masses of trees and shrubs on the bank and back of the beach. Everything cultivated on the old plantation had evidently run wild and multiplied on the steep bank. Many familiar cultivated shrubs and trees there abound, and the shrubby *Vinca major* L., with branches 6 feet long, made a wonderful dark-leaved thicket. It is unnecessary here to make a catalogue of old garden plants, but the most notable of the naturalizations was Kentucky Coffee Tree, *Gymnocladus dioica*, here at home and heavily (in both senses) fruiting. A few miles to the southeast, we turned in near Loretto in Essex County and came to another stretch of shore, there establishing Rappahannock stations for *Isoetes saccharata*, *Aneilema Keisak* Hassk. and some other tidal-marsh species. *Hypericum prolificum* abounded and, in the woods, *Poncirus trifoliata* (L.) Raf. was loaded with fruit. We had been amazed when, some years ago, we found this small Asiatic orange slightly naturalized near Claremont on the James. On the Rappahannock it is 60 miles farther north.

Planning to make a last trip of the season to productive stations in Greensville County, we decided that, instead of following the usual roads from below Petersburg into the city, there picking up the route to Emporia, we would go south on U. S. Route 1 and pick up a cross-road to the Emporia route. The road from McKenney, 15 or 20 miles back in the Piedmont, straight across to Stony Creek at the inner border of the Coastal Plain, was one we had never taken; that seemed the proper choice and it would get us promptly to Stony Creek, thence to Emporia. We somehow never learn that, if we want promptly to reach a distant point, it is unwise to take an unfamiliar road! Promptly when we swung from Route 1 at McKenney into the Stony Creek road, I called a halt. At the border of the woods I saw too many Coastal Plain plants. A couple of hours in flat pineland, a characteristic Coastal Plain habitat, revealed that, back here in supposed Piedmont country, there is a tongue of typical Coastal Plain deposits and vegetation, an evident arm or inlet of the Miocene sea. *Helianthus angustifolius*, *Cirsium virginianum* and *Solidago perlonga* Fernald were conspicuous and dominant, all belonging chiefly to the rockless area to the east, and soon we were collecting *Gentiana cherokeensis* (W. P. Lemmon) Fernald, the species of northwestern Georgia which had its only known additional station in the flat pineland east of Stony Creek. Then Correll brought in characteristic material of *Hypericum denticulatum* Walt., a species we had known in eastern Virginia only from a single small station in Greensville County. It was late in the season, consequently most species were now unrecognizable but sharing the thicket with *Chionanthus*, as abundant as we have ever seen it, was a shrub quite new to the Coastal Plain list, the inland *Viburnum Rafinesquianum* Schultes. Furthermore, here was the same puzzling *Muhlenbergia* which in late August of 1938 had perplexed us in Assamoosick Swamp and, again, in October of that year had seemed both strange and familiar to us in the flat pinelands, with *Gentiana cherokeensis*, east of Stony Creek. Turning up now with the same associates in the flat pineland near McKenney, it has more than piqued our curiosity; and well it might, for it proves to be the very characteristic *M. brachyphylla* Bush, heretofore known in low woods and prairies from Texas to Nebraska, Iowa, Illinois and Indiana. Obviously the flat pineland just east of McKenney needs attention through the season.

Driving slowly now, for the immediate problem was the important one, we noted many spots for future exploration and shortly before leaving Dinwiddie County we were attracted to a wet depression in the woods. It was a typical bit of Coastal Plain, mossy and wet and given over largely to the local *Rhynchospora cephalantha* Gray, *Xyris platylepis* and other characteristic and local species of the Coastal Plain; and bordering the swamp there were as handsome and profusely fruiting shrubs of the tropical *Cyrilla racemiflora* as we ever saw. We had been, and who would not be, very enthusiastic over the great beauty of fruiting *Cyrilla* at the eastern border of the Dismal Swamp but here, at a new northern and inland limit, it was quite as beautiful.

Obviously, having spent some hours in covering the 18 miles of fine road between McKenney and Stony Creek, we must postpone much of the Greensville County programme. We, consequently, went in to Emporia for one of the delicious and sumptuous dinners supplied by Mrs. Harrison and then drove north to the region of Orion. It was important to try again (after many failures) to find flowers on the puzzling *Aconitum* which leans over a woodland brook slightly below Double Bridge. At last there was a flower, a solitary one on a single plant. The two colonies here and the one at Carey Bridge are too much shaded for flowering, but the single specimen secured settles the identity. The plant will be described and illustrated (PLATE 720) in Part II. Along this brook there is a fine colony of *Lycopodium lucidulum*, and Correll, always with an eye for orchids, contributed a specimen of *Spiranthes ovalis*, already known at several stations but not in Greensville County.

Some years earlier we had picked up a few plants of the pink-rayed and very little known *Boltonia Ravenelii* Fernald & Griscom in bottomland-woods of Fontaine Creek, southwest of Haley's Bridge. The species is known only from Ravenel's original collections, made in 1846 at Santee Canal, South Carolina, and our meagre material. Starting again on this last errand, we safely passed Emporia and got nearly to Taylor's Millpond, where on a mossy savannah-like swale *Lycopodium carolinianum*, at its only known Virginia station, mingles with other paludal species. Wishing to show this *Lycopodium*-assemblage to Correll, we took time off. During our last two visits there the swale was drowned by heavy rains and we were at disadvantage in collecting. Now it was comfortably dry and we could see the plants. Some colonies of *Lycopodium inundatum* var. *adpressum* Chapman were of the forma *polyclavatum* (McDonald) Fernald; and growing with it there was a similar form, with forked fruiting branches, of the coarser var. *Bigelovii*, the latter form not previously known. These were, however, relatively "small potatoes" as compared with the next discovery. *Muhlenbergia capillaris*, with delicate purple panicles, grows in small clumps in relatively dry soils of eastern Virginia, but here, occupying perhaps an acre of wet sphagnous swale or savannah, there was a solid stand of a *Muhlenbergia*, in dense tussocks, with bronzy-brown panicles just flowering in mid-October. The obvious course was to take a good series of it. It is fortunate that we did so, for, whereas *M. capillaris* has prolonged and slender glumes and long awns, the plant from near Taylor's Millpond has the glumes broad, short and bluntish and the awns very short. It is *M. expansa* (DC.) Trin., heretofore unknown north of southeastern North Carolina.

The stretch of bottomland on Fontaine Creek, where we vaguely remembered getting *Boltonia Ravenelii*, has grown up to a dense mass of giant herbs, and search for an hour or more failed to bring it to light. Another year, slightly earlier in the season, we may have better luck; but one plant of this area greatly interested us. We had already collected it, in September, at the margin of a bottomland of the Blackwater in Southampton, then immature. Now it was in splendid condition, a *Panicum dichotomiflorum* with tiny spikelets like those of the Cape Cod and New Jersey var. *puritanorum* Svenson, but the plants gigantic, with sprawling culms more than 6 feet long, primary panicles more than a foot long and principal leaves more than an inch broad. In the relatively dwarf northern var. *puritanorum* the narrow leaves are smooth, in this Virginia plant harshly scabrous. It will be described in Part II. In crossing the now dried-out bed of Fontaine Creek we found the logs and mossy islets carpeted with *Micranthemum umbrosum* (Walt.) Blake. We had previously known it along Three Creek, of the Nottoway System, and on the Blackwater in Isle of Wight County; now we record it from the Meherrin system.

Our last day in a very hurried trip had yielded one species new to Virginia and a geographic variety and a minor form new to science. In fact, during our eight days in the field in October we had maintained a daily average of more than two plants new to the state, at least one a day new to science. Starting the seventh century with a score of 50 as a liberal margin, we had overtopped the 700 additions to the state flora by 51 extra: that in a region actively investigated at intervals through nine seasons. But we have not reached the end. Only the restrictions on use of gasoline blocked our programme in 1942, when, in an area not previously appreciated, we were getting in a single day four native plants new to Virginia, three of them apparently new to science. Repeating my statements in previous articles: There is plenty to do; there are few thoroughly prepared to do it.

Part II. Range-extensions, technical Notes and Revisions

In Part II, as in previous papers of the series, I have assembled in compact form for quick reference, the principal records of range-extensions found in the diffuse narrative. With them are some not there noted and a few based upon collections made by others. Several revisions of groups growing out of our Virginia observations are included. The plates have been prepared with utmost patience by my assistant, Dr. Bernice G. Schubert. The cost of the engraver's blocks has been partly met through an appropriation for personal research from the Department of Biology of Harvard University. For meeting a large part of the expense of their reproduction I am again indebted to the generosity of Mr. Long. In the citation of specimens (except in new descriptions or in formal revisions) the collectors, *Fernald & Long* (or their associates) are omitted. Plants thought to have been previously unrecorded from the state are indicated by an asterisk (*).

Dryopteris celsa (Wm. Palmer) Small. Many additional stations in Surry, Nansemond and Norfolk Counties; often so abundant as to invade soft-shoulders of roads in calcareous woods. See p. 354.

Osmunda Claytoniana L. Isle of Wight County: rich calcareous wooded slopes along James River, west of old Fort Boykin, no 12,912. Only a single plant noticed, our first from the Coastal Plain of the state. See p. 345.

*O. cinnamomea L., var. glandulosa Waters. King and

Queen County: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,209. Very abundant and the only form present. See p. 353.

Lycopodium lucidulum Michx. To the station already reported in Southampton County add one in Greensville County: rich woods along brook entering Nottoway River below Double Bridge, north of Orion, no. 13,506. See p. 374.

L. inundatum L., var. adpressum Chapm., forma polyclavatum (McDonald) Fern. in Rhodora, xlii. 405 (1940). To the station in Sussex County add one in Greensville County: argillaceous and sphagnous meadow northwest of Taylor's Millpond, no. 13,853. See p. 375.

*L. inundatum L., var. Bigelovii Tuckerm., forma **furcatum,** f. nov., ramibus fertilibus plus minusve furcatis strobilis 1–4. Greensville County, Virginia: argillaceous and sphagnous meadow northwest of Taylor's Millpond, October 14, 1941, *Fernald & Long*, no. 13,852 (type in Herb. Gray.; isotype in Herb. Phil. Acad.). With and closely simulating the preceding, but with the thick strobiles and loosely spreading-ascending sporophylls of var. *Bigelovii*. See p. 375.

Isoetes Engelmanni A. Br., var. caroliniana A. A. Eaton. Range extended northward to James City County: bottomland woods along Powhatan Creek, northwest of Five Forks, no. 13,210.

I. saccharata Engelm. Local range extended to tidal shores of the Chickahominy and Rappahannock Rivers. Charles City County: Chickahominy River, Graves Landing, north of Holdcroft, no. 13,507. New Kent County: Chickahominy River, Lanexa, no. 13,508. Essex County: Rappahannock River, northeast of Loretto, no. 13,855. See p. 372.

Typha truxillensis HBK. To the stations on the shores of Back Bay add another in Princess Anne County: reed-marsh along Blackwater River, southwest of Pungo Ferry, no. 13,856. See p. 370.

Potamogeton Spirillus Tuckerm. Range extended slightly southward, into Charles City County: fresh tidal margin of Chickahominy River, near Cypress Bank Landing, nos. 13,217 and 13,218. See p. 356.

Zannichellia palustris L., var. major (Boenn.) Koch. Isle of Wight County: spring-pool in cypress swamp back of sand-beach of James River, below old Fort Boykin, no. 13,513; an extraordinary habitat, the plant (usually of brackish waters) here filling a spring-pool constantly replenished with fresh water by an active hydraulic ram! See p. 361.

Sagittaria Weatherbiana Fern. Range extended north to Surry County: forming extensive colonies at margin of sluggish stream, Cypress Swamp, near Sexton, no. 12,920.

*S. Eatoni J. G. Sm. Sterile plants with fleshy phyllodia and no petioled blades or flowering scapes are characteristic in fresh tidal mud. They seem to be the poorly understood *S. Eatoni*, not recorded from south of the lower Delaware. Essex County: shore of Rappahannock River, northeast of Loretto, no. 13,858. New Kent County: Lacey Creek, west of Walker, no. 13,514. Charles City County: Chickahominy River, near Cypress Bank Landing, no. 13,221; Chickahominy River, Graves Landing, north of Holdcroft, no. 13,515; Chickahominy River, Matahunk Neck, no. 13,857. See pp. 356 and 368.

*S. Engelmanniana J. G. Smith, forma dilatata Fern. Norfolk County: sphagnous and peaty thickets near Jericho Ditch, Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,516. Although Smith, in his Revision of the North American Species of Sagittaria and Lophotocarpus, 15 (1894), cited no positive stations from south of Delaware, he noted with a doubt a Chapman plant thought to come from Florida. It is, therefore, noteworthy that in July, 1895, the late *C. S. Williamson* collected the typical narrow-leaved *S. Engelmanniana* at Wilmington, North Carolina (Herb. Phil. Acad.) and in 1939 *Godfrey & Tryon* collected several numbers of it at Colclough Pond, northwest of Manning, in Clarendon County, South Carolina. See p. 365.

[Echinodorus tenellus (Martius) Buchenau was reported in Mrs. Erlanson's *Flora of the Peninsula of Virginia*, Papers Mich. Acad. Sci. Arts and Lett. iv. 120 (1924), as occurring along the Chickahominy at Lanexa, *Grimes*, no. 4135. The specimen in the Gray Herbarium of no. 4135 is of *Sagittaria subulata* (L.) Buchenau, a common species on tidal shores of the Chickahominy. No. 4135 in Grimes's own series (at the New York Botanical Garden), labeled *Echinodorus tenellus*, is a very rare new species of *Bacopa* (of the *Scrophulariaceae*), which, it is safe to assert, was not found at Lanexa! The bases of the report of *E. tenellus* are completely confused.]

Limnobium Spongia (Bosc) Steud. To the few stations in Princess Anne County add the following in Norfolk County: springy spots and rills, sandy and peaty margin of Lake Drummond, near Jericho Ditch, Great Dismal Swamp, west of Wallaceton, no. 13,519; very abundant in lowest areas of river-swamp along Northwest River, northeast of Northwest, no. 13,861. See pp. 365 and 370.

The correct citation of the name is *Limnobium Spongia* (Bosc) Steudel, Nom. ed. 2, ii. 45 (1841); not (Bosc) L. C. Richard, as given in Britton & Brown, Ill. Fl. i. 94 (1896) and accepted by others. The original very detailed description, with beautiful plate, was under *Hydrocharis Spongia* Bosc, Ann. Mus. d'Hist. Nat. Paris, ix. 396, t. 30 (1807). In Mém. Inst. Paris, xxxii. 32.

t. 8 (1812) Richard described as new and gave a very detailed plate of *L. Bosci* (not *L. Spongia* as recently cited) and on page 66 (the page cited by Britton & Brown for *L. Spongia*) he defined the genus *Limnobium*, without using any specific name; but on page 78, in an enumeration of genera and species of the family, he cited Bosc's original name in the synonymy of *L. Bosci*. The original specific name, *Spongia*, was first transferred into *Limnobium* by Steudel.

*Bromus racemosus L. Isle of Wight County: waste ground back of sand-beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,923. Not mapped by Hitchcock from Virginia. See p. 344.

*B. arvensis L. Isle of Wight County: border of cultivated field back of James River, west of old Fort Boykin, no. 12,921. Cited by Hitchcock only from eastern Maryland. See p. 344.

B. purgans L. Isle of Wight County: specimens from seeping argillaceous and calcareous bluffs along Burwell's Bay, below Rushmere, no. 12,926, establish a record of 2 m. in height, with leaves 2 cm. broad.

Festuca rubra L. Extending up the James to northern Nansemond County: upper border of sandy beach of James River, Eclipse, no. 12,928.

Diplachne maritima Bicknell. Extending inland to Essex County: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,226. See p. 354.

Elymus virginicus L. Isle of Wight County: specimens from seeping calcareous wooded bluffs by James River, west of Fort Boykin, no. 12,932, are 1.4 m. high. See p. 345.

*E. virginicus L., var. jejunus (Ramaley) Bush. Eastern range extended south from New Jersey to Charles City County: cypress swamp by Chickahominy River, Cypress Bank Landing, no. 13,229. Isle of Wight County: base of rich calcareous wooded slopes by Burwell's Bay, James River, below Rushmere, no. 13,227. See p. 357.

E. riparius Wiegand. To the few recorded stations add one in Sussex County: alluvial woods along Nottoway River, Green Church Bridge, northwest of Owen's Store, no. 13,864.

Aira praecox L. To the few recorded stations add one in Nansemond County: sandy clearing near Western Branch, south of Reid's Ferry, no. 13,230.

Leptochloa filiformis (Lam.) Beauv. Local range extended to Prince George County: weed in cultivated field by James River, Jordan Point, no. 13,530. In Rhodora, xlii. 390 (1940) this species, as a weed in Petersburg, was recorded by clerical error as *L. fascicularis*, which we do not know in Virginia.

Agrostis stolonifera L., var. compacta Hartm. To the few recorded stations add one in Nansemond County: border of brackish marsh along Western Branch, south of Reid's Ferry, no. 13,231.

*Phleum pratense L., var. nodosum (L.) Richter. Isle of Wight County: turfy waste ground back of sand-beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,935.—Differing from typical *P. pratense* in its more slender inflorescence, with shorter and smoother spikelets, with less bristly-ciliate keels. Our first American collection. See p. 344.

*Muhlenbergia expansa (DC.) Trin. (*M. trichopodes* Chapm.). Greensville County: argillaceous and sphagnous meadow northwest of Taylor's Millpond, no. 13,866, growing in large stools over an extensive area. The first from north of Wilmington and adjacent area in southeastern North Carolina. See p. 375.

*M. brachyphylla Bush. Sussex County: border of Assamoosick Swamp, about 2 miles northeast of Homeville, no. 8956; moist argillaceous pineland about 2 miles east of Stony Creek, no. 9532. Dinwiddie County: open argillaceous low woods just east of McKenney, no. 13,865.—First from east of Indiana, Missouri and eastern Texas, Deam speaking of it as growing in Indiana "in low, flat woods", Palmer & Steyermark assigning it in southern Missouri the habitat, "Prairie banks and low moist woods". In habit the plant suggests very slender but unusually branched *M. foliosa*, with rhizomes, panicles, glumes and long-awned lemmas of *M. tenuiflora* of more upland and richer habitats, the slender lateral branches numerous and terminated by exserted panicles, the internodes glabrous throughout or barely scabrous at summit, the callus and base of lemma bearded. See p. 373.

Paspalum fluitans (Ell.) Kunth. To the few recorded stations add one in Southampton County: open muddy and sandy borders of pools, alluvial bottomlands of Three Creek, Drewryville, no. 13,538. See p. 367.

Panicum caerulescens Hack. Local range extended inland to Dinwiddie County: open argillaceous low woods just east of McKenney, no. 13,871. Norfolk County: fresh reed-marsh and swale along Northwest River near Northwest, no. 13,872.

P. mutabile Scribn. & Sm. Local range extended to northern Nansemond County: dry sandy woods along Nansemond River, east of Cahoon Pond, northwest of Suffolk, no. 13,246.

P. Ravenelii Scribn. & Merr. Range extended northward to King William County: sandy oak woods southwest of Aylett, no. 13,245.

*Panicum dichotomiflorum Michx., var. **imperiorum**, var.

nov., culmis crassis 0.8–2 m. altis deinde depressis furcatisque; vaginis glabris, laminis primariis 0.7–2.5 cm. latis paginis superioribus scaberrimis; paniculis primariis breviter exsertis 2–4 dm. longis, paniculis lateralibus deinde numerosis late ovoideis ramis horizontaliter divergentibus; spiculis oblongo-lanceolatis vel anguste ellipsoideis breviter acutiusculis 1.8–2.3 mm. longis, gluma superiore lemmateque sterili submembranaceis fructus paullo superantibus.—VIRGINIA: damp clearing in woods along Blackwater River, east of Oak Grove School, Southampton County, September 11, 1941, *Fernald & Long*, no. 13,540 (primary panicle partly expanded); wooded bottomland, Fontaine Creek, southwest of Haley's Bridge, Greensville County, October 14, 1941, *Fernald & Long*, no. 13,877 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.), primary panicle over-ripe, lateral panicles mature. See p. 375.

Panicum dichotomiflorum, var. *imperiorum* (of the Dominions) is the southern representative of var. *puritanorum* Svenson in RHODORA, xxii. 154 (1920). In its short, thick and short-tipped spikelets with submembranaceous 2nd. glume and sterile lemma it is inseparable from the northern var. *puritanorum* and might be taken for a gigantic development of that small plant (culms slender, 0.3–6 dm. high or long; leaf-blades 1–8 mm. broad; primary panicle 0.2–2.5 dm. long); but var. *puritanorum* has the leaf-surfaces quite smooth (margins sometimes scabridulous), while the surfaces of the blades of var. *imperiorum* are harsh above and often below. In typical *P. dichotomiflorum* and var. *geniculatum* (Wood) Fernald in RHODORA, xxxviii. 387, pl. 441, fig. 2 (1936) and var. *bartowense* (Scribn. & Merr.) Fernald, l. c. the more slender and acuminate spikelets are 2.6–3.6 mm. long, the 2nd. glume and sterile lemma subcoriaceous.

P. HEMITOMON Schultes. To the few recorded Virginia stations add one in NORFOLK COUNTY: extensive colonies at border of wooded swamp along Northwest River, southeast of Cornland, nos. 13,875 and 14,280. See p. 369.

SACCIOLEPIS STRIATA (L.) Nash, forma **gibba** (Ell.), comb. nov. *Panicum gibbum* Ell., Sketch Bot. S. C. and Ga. i. 116 (1816). *P. Elliottianum* Schultes, Mant. ii. 256 (1824). *S. gibba* (Ell.) Nash in Britton, Man. 89 (1901). See p. 355.

Typical *Sacciolepis striata* is glabrous throughout. The type of the species is Clayton's no. 590 in the Linnean Herbarium, described by Linnaeus as *Holcus striatus* L. Sp. Pl. ii. 1048 (1753), with an unusually full diagnosis, with "*vaginis crassiusculis* *striatis*", but no mention of pubescence. The Grovonian description of no. 590, cited by Linnaeus, similarly makes no mention of pubescence; and a photograph of this type, in the Gray Herbarium, shows perfectly glabrous sheaths. This plant, with glabrous sheaths is wide-ranging, from Texas to Florida and the West Indies, northward to Oklahoma, Tennessee and on the Coastal Plain to southern New Jersey. All our collections from the James River northward belong to it.

South of the James in Virginia the plant sometimes has the lower, middle and sometimes the upper sheaths hirsute, this hirsute-sheathed form occurring occasionally to Florida and Texas; but that it is less common south of Virginia than the glabrous-sheathed plant is evident even from the meagre representation of the species in the Gray Herbarium: from North Carolina typical *S. striata* (glabrous sheaths) 3, forma *gibba* (hirsute sheaths) 1; Florida, typical *S. striata* 17, forma *gibba* 1. Forma *gibba* is *Panicum gibbum* Ell. or *Sacciolepis gibba* (Ell.) Nash; Elliott's detailed description noting the "leaves . . . somewhat scabrous, pubescent, expanding; sheaths . . . the lower ones hispid".

The Virginia material in the Gray Herbarium is as follows: SACCIOLEPIS STRIATA (L.) Nash (typical). STAFFORD COUNTY: Brooke, *F. J. Hermann*, no. 10,408. NEW KENT COUNTY: Windsor Shades, no. 11,244. WARWICK COUNTY: east of Harpersville, no. 8579. PRINCESS ANNE COUNTY: near Creed's, no. 4775.

*Forma GIBBA (Ell.) Fern. PRINCESS ANNE COUNTY: Virginia Beach, *Heller*, no. 1263, *Fernald, Griscom & Long*, no. 4546; Rifle Range, south of Rudy Inlet, no. 4264; Cedar Island, no. 12,260. NORFOLK COUNTY: Lake Drummond, Great Dismal Swamp, no. 13,238; border of wooded swamp along Northwest River, southeast of Cornland, no. 13,879. DINWIDDIE COUNTY: Burgess, no. 7294.

ECHINOCHLOA WALTERI (Pursh) Heller, forma LAEVIGATA Wieg. Range extended inland to NORFOLK COUNTY: wet woods and thickets near the Feeder Ditch from Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,545; deep peat and mud, southeastern shore of Lake Drummond, no. 13,546.

SETARIA MAGNA Griseb. Add other stations in NORFOLK COUNTY: border of roadside ditch in wooded swamp along Northwest River, southeast of Cornland, no. 13,882; disturbed soil, wet woods and thickets near the Feeder Ditch from Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,549.

ERIANTHUS BREVIBARBIS Michx. To the single recorded station add another in SUSSEX COUNTY: alluvial woods along Nottoway River, Green Church Bridge, northwest of Owen's Store, no. 13,884. See p. 367.

*ANDROPOGON PRAEMATURUS Fernald, forma **hirtivaginatus**, f. nov., vaginis basilaribus hirtis vel pilosis. TYPE: open pineland near Mason's Siding, about 1 mile north of Henry, Sussex County, Virginia, August 3, 1941, *Fernald & Long*, no. 13,248.

Andropogon praematurus Fernald in RHODORA, xlii. 413, t. 626, figs. 1–3 (1940), like so many species of the genus, has the sheaths either quite glabrous or obviously pubescent. The TYPE, *Fernald & Long*, no. 10,092, is strictly glabrous. The originally cited material of *A. praematurus* consisted of both the glabrous and the pubescent-sheathed forms, which often, as in other species, grow side by side.

CYPERUS OVULARIS (Michx.) Torr., var. SPHAERICUS Boeckl. To the single recorded station add three others. JAMES CITY COUNTY: sandy roadside bank about 2 miles northwest of Toano, no. 13,258; clearing in woods south of Ewell, no. 13,259. GREENSVILLE COUNTY: exsiccated argillaceous fallow field near Meherrin River, northeast of Gaskins, no. 13,261.

FIMBRISTYLIS CASTANEA (Michx.) Vahl. Range extended inland to ESSEX COUNTY: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,270. See p. 354.

F. CAROLINIANA (Lam.) Fern. With the last, no. 13,271. See p. 354.

ELEOCHARIS PARVULA (R. & S.) Link. Extensive inland station in northern NANSEMOND COUNTY: carpeting a shallow pool, border of salt marsh by James River, Eclipse, no. 12,945.

E. ALBIDA Torr. Extending inland to ESSEX COUNTY: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,266. See p. 354.

E. TORTILIS (Link) Schultes. Inland to KING AND QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,268. See p. 353.

SCIRPUS POLYPHYLLUS Vahl. KING WILLIAM COUNTY: border of magnolia swamp about 2 miles northeast of St. Stephen's Church, no. 13,272. Our first collection on the Coastal Plain of the state. See p. 353.

*S. ERIOPHORUM Michx., forma **praelongus**, f. nov., spiculis deinde 8–12 mm. longis.—VIRGINIA: damp peaty depressions in sandy pineland, Cape Henry, September 7, 1935, *Fernald & Long*, no. 4821; fresh reed-marsh and swale along Northwest

River near Northwest, October 11, 1941, *Fernald & Long*, no. 13,894 (TYPE in Herb. Gray.).

The counterpart in *Scirpus Eriophorum* of similar forms with the rachillas of the spikelets much prolonged, such as are occasionally found in other species of the genus and in *Cyperus* and other genera. In both collections of forma *praelongus* the inflorescence is very small for the species, only 1–1.5 dm. high and about 1 dm. broad. Well developed typical *S. Eriophorum* (with spikelets 3–7 mm. long) has the inflorescence 2–3.5 dm. high and 1.5–2.5 dm. broad. In forma *praelongus* the vigor of the plant seems to concentrate on the spikelets!

ERIOPHORUM VIRGINICUM L. To the few recorded stations of the Coastal Plain of the state add one in NORFOLK COUNTY: sphagnous and peaty thickets near Jericho Ditch, Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,560. See p. 364.

RHYNCHOSPORA MACROSTACHYA Torr. Thus far typical *R. macrostachya* is known in the state only from shores of Lake Drummond. To old collections by others, add our nos. 13,563 and 13,564, both from NORFOLK COUNTY. See p. 364.

R. MACROSTACHYA Torr., var. COLPOPHILA Fernald & Gale. To the localities already listed add the following, all on fresh tidal shores and marshes. CAROLINE COUNTY: Rappahannock River, Port Royal, no. 13,897. ESSEX COUNTY: Rappahannock River, northeast of Loretto, no. 13,898. CHARLES CITY COUNTY: Chickahominy River, Cypress Bank Landing, no. 13,565. NORFOLK COUNTY: Northwest River near Northwest, no. 13,896. See pp. 369 and 372.

R. ALBA (L.) Vahl. PRINCESS ANNE COUNTY: savannah-like opening in wooded swamp of North Landing River, west of Pungo Ferry, no. 13,899. Our first evidence of this circumboreal species on the Coastal Plain of the state. See p. 371.

R. HARVEYI Wm. Boott. To the few recorded stations add one in SUSSEX COUNTY: very local, open pineland near Mason's Siding, about 1 mile north of Henry, no. 13,274.

R. CEPHALANTHA Gray. To the very few stations add one in DINWIDDIE COUNTY: depression in argillaceous woods west of Winfield's Mill, nos. 13,901 and 13,902. See p. 374.

R. MICROCEPHALA Britton. Local range extended to KING AND QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett's Creek, about 1 mile northeast of St. Stephen's Church, no. 13,275.

R. CHALAROCEPHALA Fernald & Gale. NORFOLK COUNTY: finely developed and abundant on shores of Lake Drummond, nos. 13,276, 13,277 and 13,540. See pp. 359 and 365.

R. CADUCA Ell. To the several localized stations add the following in NORFOLK COUNTY: wooded river-swamp and margin of Northwest River, northeast of Northwest, nos. 13,904 and 13,905. See p. 370.

*R. MILIACEA (Lam.) Gray. NORFOLK COUNTY: old specimen in Herb. Phil. Acad., coll. *Reed*.

*CLADIUM MARISCOIDES (Muhl.) Torr. PRINCESS ANNE COUNTY: border of swampy or inundated woods, north of Blackwater River, no. 3802; savannah-like opening in wooded swamp of North Landing River, west of Pungo Ferry, no. 13,907. NORFOLK COUNTY: fresh reed-marsh and swale along Northwest River, near Northwest, no. 13,906. See p. 369.

*CAREX RUTHII Mackenz. SMYTH COUNTY: at 2500 feet along Nick's Creek, near base of Pine Glade Mountain, June 4, 1892, *J. K. Small*, distrib. as *C. echinata* Murr.—*C. Ruthii*, described from Big Craggy Mountain, Buncombe County, North Carolina, and recorded by Mackenzie as otherwise known only from the mountains of eastern Tennessee and of Georgia, indicates the rich harvest of northern extensions to be made when the westernmost counties of Virginia are thoroughly scrutinized; as does, also, *Eupatorium roanense*, described by Small only from Roan Mountain at the border of Tennessee and North Carolina. See discussion under *Eupatorium*.

C. NORMALIS Mackenz. To the very few recorded Coastal Plain stations add one in SURRY COUNTY: alluvial woods along Gray's Creek, west of Old Courthouse Corners, no. 9845.

C. FESTUCACEA Schkuhr, *sensu* Mackenz. Whereas *C. straminea* Willd., *sensu* Mackenz., is very common in southeastern Virginia, *C. festucacea* is local. The following nos. are before me. ELIZABETH CITY COUNTY: borders of old fields in dry soil near Buckroe, *B. L. Robinson*, no. 338; marshy border of woods between Buckroe and Hampton, *Robinson*, no. 338[a]; both distrib. as *C. straminea*. SUSSEX COUNTY: alluvial bottomland woods along Nottoway River, west of Homeville, no. 11,754; swales and wet thickets south of Stony Creek, no. 11,755.

C. HORMATHODES Fern. To Grimes's stations in James City County add one in ISLE OF WIGHT COUNTY: swale by Burwell's Bay, James River, at Bailey's Beach, near Rushmere, no. 12,690. See p. 344.

*C. PHYSORHYNCHA Liebm. DINWIDDIE COUNTY: dry meadow, clearing along Appomattox River, just above the "fall-line", about 2 miles west of Petersburg, no. 11,770: extension north from South Carolina.

*C. NIGROMARGINATA Schweinitz, var. FLORIDANA (Schweinitz) Kükenthal (*C. floridana*). ELIZABETH CITY COUNTY: in the graveyard, Fortress Monroe, April 8, 1887, *G. G. Kennedy* in Gray Herb.

Var. *floridana* differs from *Carex nigromarginata* in its loosely stoloniferous habit, with horizontally elongate, slender stolons, less fibrillose bases of the old leaves, uniformly pale scales (*C. nigromarginata* may have the scales pale), and less sharply trigonous achenes. In the North American Flora, xviii^{4}. 192 (1935) Mackenzie gives it the range, "Georgia and Florida to Texas," adding the "Note: *Carex nigromarginata* Schw. occasionally has light-colored scales when growing in dense shade. It is probably such a specimen which is the basis of the record of *Carex floridana* from Virginia given by Kükenthal in Engler (Pflanzenreich 4^{20}: 445), from which is taken the statement in Britton & Brown (Ill. Fl. ed. 2. **1**: 393)." Dr. Kennedy's material from Fortress Monroe, although young, has the horizontal and slender stolons nearly 2 dm. long, the scarcely fibrillose sheaths and the pale spikes which in combination place it in var. *floridana*. Similarly, *Weatherby & Griscom's* no. 16,460 from Horry County, South Carolina, was correctly reported by them as var. *floridana* (when they proposed the reduction of *C. floridana* to the varietal status already given it by Kükenthal in 1909) in Rhodora xxxvi. 39 (1934).

*C. debilis Michx., var. intercursa Fernald in Rhodora, xliv. (1942). Henrico County: Richmond, May 9, 1894, *J. R. Churchill*. Greensville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, no. 12,016. See p. 348.

*C. abscondita Mackenz., var. **rostellata** var. nov., foliis firmis glaucescentibus; perigyniis 3–4.5 mm. longis rostellatis; squamis foemineis 2–3 mm. longis.—Virginia: swampy depressions in pine barrens, south of Lee's Mill, Isle of Wight County, June 8, 1940, *Fernald & Long*, no. 12,012 (type in Herb. Gray.; isotype in Herb. Phil. Acad.); woods near Hampton, May 16, 1905, *C. F. Wheeler*. Alabama: wet woods about half a mile south of Ocklocknee, Leon County, April 12, 1925, *R. M. Harper*, no. 13.

Var. *rostellata* has the large and definitely beaked perigynium and the relatively firm leaves of the extreme southern (Floridan) *Carex abscondita*, var. *glauca* (Chapm.) Fernald in Rhodora xxxvii. 406 (1935), i. e. *C. magnifolia* Mackenzie. That variety, however, has the pistillate scales very short, only 1–barely 2 mm. long and about one fourth the length of the perigynia, whereas in var. *rostellata* they are about half the length of the perigynia. In eastern Virginia, typical *C. abscondita*, a plant with subflaccid leaves, essentially beakless perigynia 2.5–3.5 mm. long and scales rarely more than one third their length, is a plant of the richest woodlands. Var. *rostellata*, on the other hand, occurs in acid and swampy pine barren.

*× C. **absconditiformis.** hybr. nov. (*C. abscondita* Mackenz. × *C. laxiculmis* Schwein.), planta inter *C. absconditam* et C. *laxiculmem* intermedia; foliis pallide viridibus subglaucescentibus ad 4.5 dm. longis 7–10 mm. latis; culmis vel 0.5–1.5 cm. altis bracteis valde prolongatis spiculisque ut in *C. abscondita* vel culmis elongatis 3–4.5 dm. altis spicis remotis longe pedunculatis, stamineis longe pedunculatis, bracteis brevibus.—VIRGINIA: bottomland woods along Nottoway River, east of Huske, Sussex County, June 13, 1941, *Fernald & Long*, no. 12,969 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); rich woods south of Hotwater, James City County, July 22, 1938, *Fernald & Long*, no. 8622. See p. 348.

× *Carex absconditiformis* greatly puzzled us in the field, where a considerable carpet of it combines in a most perplexing fashion the characters of *C. abscondita* and *C. laxiculmis*. Typical *C. abscondita* has the culms 0.5–2 dm. high, mostly somewhat hidden among the bases of the prolonged leaves (up to 3 dm. long and 4–9 mm. broad); the bracts greatly prolonged above the inflorescence, the upper subspathiform and much overtopping the crowded upper spikes, this fascicle of spikes with the short staminate one shorter than and somewhat hidden among the pistillate ones; and the pistillate scales are blunt. *C. laxiculmis* has elongate culms, up to 6 dm. high, these mostly overtopping the very glaucous leaves (up to 4.5 dm. long and to 12 mm. broad), the spikes scattered on long arching peduncles in the axils of relatively short and narrow non-spathiform bracts, the long staminate spike raised on a long peduncle; and the pistillate scales are awned or pointed.

× *Carex absconditiformis* is as exact a combination of the two as can be imagined: leaves as long and broad as in *C. laxiculmis* but not so glaucous; some short culms of *C. abscondita*, with the prolonged and spathiform bracts, crowded upper pistillate spikes and hidden staminate one, with pistillate scales either blunt or cuspidate; other culms from the same crown prolonged and with short bracts, scattered and long-peduncled pistillate spikes, with the long staminate spike peduncled and the pistillate scales often blunt, as in *C. abscondita.*

* × C. COPULATA (Bailey) Mackenzie (*C. digitalis* Willd. × *C. laxiculmis* Schwein.) SURRY COUNTY: dry woods near Blackwater River, about 1 mile southwest of Dendron, no. 12,964. SUSSEX COUNTY: bottomland woods along Nottoway River, east of Huske, no. 12,970. See p. 348.

× *Carex copulata* is, it seems to me, a semi-fertile hybrid of *C. digitalis* and *C. laxiculmis.* The trivial name was given by Bailey because the plant seemed to him to unite those two species. His original account was as follows:

> 57.—CAREX DIGITALIS, Willd., var. COPULATA.
> *C. retrocurva,* var. *copulata,* Bailey, Herb. Distr. 1886.
> Larger than the species, the culms weak and reclining, sometimes two feet long; leaves twice or thrice broader; spikes shorter and heavier; perigynium mostly larger.—Woods, central Michigan, where it is common. In aspect much like *C. laxiculmis,* but has no glaucousness; the upper spikes are shorter peduncled, and minor characters also separate them. I find it to be connected with *C. digitalis* by intermediate forms.—Bailey in Mem. Torr. Bot. Cl. i. 47 (1889).

It could have been said with more precision that it is "connected with" *C. laxiculmis.* Its broad and prolonged leaves, weak culms, "sometimes two feet long", its shorter and heavier spikes and larger perigynia are characters of the latter. Lack of bloom and the "minor characters" unstated placed it with *C. digitalis.* Additional material showing it to be as near *C. laxiculmis* Schwein. (*C. retrocurva* Dewey), I transferred it as *C. laxiculmis* var. *copulata* in RHODORA, viii. 183 (1906); but Mackenzie treats it as a species, *C. copulata* (Bailey) Mackenzie in N. Am. Fl. xviii[5]. 251 (1935). Mackenzie cites it from New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Iowa and Missouri; and he says with characteristic assurance: "It is widely distributed and is certainly not a hybrid." Having once camped for nearly a month with Mackenzie and witnessed the promptmess with which he decided, when no other member of the party could find and none of the material collected shows well-filled achenes, that × *C. mainensis* Porter is a fertile species, I learned to look into matters before accepting his verdicts so positively asserted. So with × *C. copulata.* *C. digitalis* and *C. laxiculmis* are certainly good species. × *C. copulata* so combines their characters that Bailey threw it both ways and stated that it had characters of both. In the Gray Herbarium the material gives the following score.

CONNECTICUT: Waterford, June 13, 1896, *C. B. Graves*, no good perigynia.

NEW JERSEY: Lower Valley, Hunterdon County, June 30, 1938, *Benner*, no. 8201, no developed perigynia at this late date; Pensauken, Camden County, June 15, 1918, *Long*, no. 19,091, no developed perigynia; Blackwood, Gloucester County, June 1, 1918, *Long*, no. 18,824 no developed perigynia.

PENNSYLVANIA: Lycoming County, May 27, 1939, *Wahl*, no. 291, perigynia soft, not well filled; Leolyn, Tioga County, June 5, 1937, *Clausen & Wahl*, no. 2512, some perigynia distended, most of them not.

VIRGINIA: Dendron, June 14, 1941, *Fernald & Long*, no. 12,964, no perigynia distended; east of Huske, June 13, 1941, *Fernald & Long*, no. 12,790, most perigynia soft and not distended.

MICHIGAN: Lansing, June 1, 1886, *Bailey*, N. Am. Carices, no. 161 (ISOTYPE), some perigynia distended, some not; Alma, June 15, 1895, *Charles A. Davis*, distended perigynia.

OHIO: Florence, July 24, 1897, *Moseley*, perigynia not distended.

INDIANA: Huntertown, Allen County, May 17, 1915, *Deam*, no. 15,692, perigynia not distended.

ILLINOIS: Joliet, June 15, 1904, *Wheeler & Skeels*, no. 268, perigynia mostly not distended.

Material of characteristic *Carex digitalis* and of *C. laxiculmis* shows no such proportion of unfilled perigynia.

C. COLLINSII Nutt. To the very few recorded stations add one in KING AND QUEEN COUNTY: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,285. See p. 353.

ERIOCAULON DECANGULARE L. To the very few recorded stations note one in NORFOLK COUNTY: sphagnous pocket at border of reed-marsh of Northwest River near Northwest, no. 13,908; already recorded by Kearney from Northwest. See p. 370.

E. PARKERI Robins. Local range extended to fresh tidal shores in four counties. CHARLES CITY COUNTY: Chickahominy River, near Cypress Bank Landing, no. 13,287. NEW KENT COUNTY: Lacey Creek, west of Walker, no. 13,576. CAROLINE COUNTY: Rappahannock River, northwest of Return, no. 13,909. ESSEX COUNTY: Rappahannock River, northeast of Loretto, n. 13,910. See p. 372.

XYRIS CAROLINIANA Walt., forma FLACCIDA Fern. Local range extended to NEW KENT COUNTY; fresh tidal shore of Lacey Creek, west of Walker, no. 13,577.

*X. FIMBRIATA Ell. NORFOLK COUNTY: east shore of Lake Drummond, Great Dismal Swamp, July 22, 1918, *J. Arthur Harris*, no. C18,119; edge of Lake Drummond, October 2, 1921, *Grimes*, no. 4527; wet sand and peat, near entrance to Portsmouth Ditch, Lake Drummond, very scarce, no. 13,585. Apparently rare as compared with *X. caroliniana* Walt. and *X. difformis* Chapm., which abound around Lake Drummond. See p. 364.

Aneilema Keisak Hassk. Range extended north to Essex County: sandy and muddy tidal shore of Rappahannock River, northeast of Loretto, no. 13,912. Also along south side of James River in Prince George County (Flowerdew Hundred, no. 12,982) and in Surry County (Claremont, no. 13,586). See p. 372.

Juncus subcaudatus (Engelm.) Coville & Blake. Local range extended into King and Queen County: sphagnous magnolia swamp at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,298, gigantic plants with sprangling inflorescences 2.5 dm. long. See p. 353.

J. caesariensis Coville. To the scattered stations recorded add one in James City County: sphagnous border of shallow peaty pond-hole ½ mile east of Centerville, no. 13,297.

Uvularia pudica (Walt.) Fern., var. nitida (Britton) Fern. Local range extended into Dinwiddie County: scarce in dry woods west of Winfield's Mill, no. 13,916.

Hemerocallis fulva L., var. Kwanso Regel. Surry County: very abundant on sand-beach of Cobham Bay, James River, northwest of Chippokes, no. 13,300; obviously spread from near a deserted and collapsed dwelling and rapidly propagating.

Lachnanthes tinctoria (Walt.) Ell. Norfolk County: edge of Lake Drummond, Great Dismal Swamp, October 2, 1921, *Grimes*, no. 4536; wet sandy and peaty shore near entrance to "the Feeder", Lake Drummond, no. 13,304; similar habitat near entrance to Portsmouth Ditch, Lake Drummond, no. 13,305. Nansemond County: muddy and peaty southwestern shore of Lake Drummond, no. 13,590. See pp. 354 and 365.

So far as we yet know Lake Drummond is the only locality in Virginia where *Lachnanthes* is unquestionably indigenous, its colony on a cranberry-meadow in Augusta County (Carr, Rhodora, xlii. 92) being, according to Professor Massey, a probable introduction with cranberry-plants. So far as shown in the Gray Herbarium *Lachnanthes* is not found in North Carolina north of the lower Neuse, nor between Lake Drummond and Delaware. It was not recorded by Kearney from Lake Drummond.

*Leucojum aestivum L. Isle of Wight County: about ½ acre of densely crowded plants at border of woods (old house-site) near James River, west of old Fort Boykin, no. 12,992. Hanover County: very abundant over many acres of bottomland woods along Pamunkey River, north of Old Church, no. 14,131. See p. 344.

Hypoxis leptocarpa Engelm. & Gray. Range extended into two additional counties. Surry County: bottomland woods along Blackwater River, about 1 mile southwest of Dendron, no. 12,991. Isle of Wight County: sandy, recently cleared woods along Blackwater River, below Broadwater Bridge, north of Zuni, no. 13,306.

Spiranthes ovalis Lindl. To the scattered stations add one in Greensville County: rich woods along brook entering Nottoway River below Double Bridge, north of Orion, very rare, no. 13,921. See p. 374.

S. cernua (L.) Richard, var. odorata (Nutt.) Correll. Range extended north to New Kent County: fresh tidal shore of Chickahominy River, Lanexa, no. 13,922.

Basal Sprouts of Quercus alba.—In dry woods near the Nottoway River, near Peter's Bridge in Sussex and Southampton Counties, there occur dense circles of low oaks with prolonged subterranean rooting stems. These low shrubs, often only 2.5–5 dm. high are all sterile and they do not have the foliage of any of the low and stoloniferous species of the extreme South. Returning in June, 1941, to study them further and, if possible, to secure young fruit, we were so fortunate as to find, southwest of Lambs, a very complete circle of such young leafy shoots directly under the outer tips of the branches of a large standing White Oak. Digging down at the inner side of the circle we found that the deceptive sprouts were attached to roots, often 3–6 cm. in diameter, of the large tree. Such sprouting of *Quercus alba* is not mentioned in any discussions of the species which have come to hand. It is represented by our nos. 12,314 and 12,998.

*× Quercus Fernowi Trelease (*Q. alba* × *stellata*). Nansemond County: dry sandy woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, no. 13,321, a small shrubby tree less than 2 m. high, presumably derived in part from one of the smaller extremes of *Q. stellata*.—A hybrid previously recorded from the District of Columbia, Missouri and Alabama.

*Q. lyrata Walt., forma viridis Trelease. Prince George County: river-swamp of Blackwater River, north of Disputanta, no. 5762. Dinwiddie County: alluvial woods near head of Old Town Creek, northwest of Petersburg, no. 6190. Southampton County: sandy alluvial bottomlands of Three Creek, Drewryville, no. 5761.

Ordinarily *Quercus lyrata* has the leaves permanently whitish to gray beneath with minute tomentum. The numbers cited above have the lower surfaces glabrous and green. Although Trelease's description is merely in a key, "Leaves green beneath . . . f. *viridis*" and he accompanies it by no citation of specimens, I assume that trees like the above are what he intended.

Q. PALUSTRIS DuRoi. Range extended southward into GREENSVILLE COUNTY: bottomland woods along Meherrin River, northeast of Gaskins, no. 13,000. To be expected in North Carolina, farther down-river. See p. 349.

Q. NIGRA L., var. TRIDENTIFERA Sargent. To the single Virginia station (Suffolk) cited by Sargent in Bot. Gaz. lxv. 429 (1918) add the following from NORFOLK COUNTY: dry woods west of Bethel Church, Gertie, nos. 13,929 and 13,930; dry woods east of Cedarville, no. 13,932. GREENSVILLE COUNTY: along a seepy old woodroad north of Dahlia, no. 9912, distrib. as *Q. nigra* × *Phellos*. See p. 369.

Sargent, Man. Trees N. Am. ed. 2: 261 (1922) speaks of "var. *tridentifera* Sarg. rare and local; southwest Virginia to Alabama", etc. Noting in passing that Suffolk, cited with the original description, is in southeastern (not "southwest") Virginia, we got the impression that var. *tridentifera*, which often has some simple and narrowly oblong to oblanceolate leaves below the deeply 3-cleft upper ones, is the result of crossing of *Q. nigra* and *Q. Phellos*.

*Q. PHELLOS L., forma **intonsa,** f. nov., foliis subtus semper sericeo-tomentulosis, pilis albidis vel cinereis.—DELAWARE: near Wilmington, *Canby*. VIRGINIA: large tree in dry woods by York River, above Mt. Folly, York County, July 28, 1941, *Fernald & Long*, no. 13,324 (TYPE in Herb. Gray., ISOTYPE in Herb. Phil. Acad.); swampy woods southeast of Joyner's Bridge, Isle of Wight County, July 17, 1940, *Fernald & Long*, no. 12,328.

Quercus Phellos commonly has the leaves glabrous or, if pubescent upon unfolding, promptly glabrate. Sargent, Sylva. viii. 179 (1895), cites the Canby specimen in the Gray Herbarium as the only one he had ever seen with the leaves permanently pubescent beneath. The tree below Joyner's Bridge had fallen and was thought to be perhaps not normal in its foliage. The large tree above Mt. Folly is sturdy and fertile; there is no question of its virility.

*POLYGONUM TENUE Michx., var. **protrusum,** var. nov. calycibus maturis 1.5–2 mm. longis, sepalis exterioribus rotundato-ovatis quam interioribus duplo longioribus; achaeniis nigricantibus valde exsertis.—VIRGINIA: dry sand of gravel-pit near Blackwater River, southeast of Ivor, Southampton County, October 16, 1941, *Fernald & Long*, no. 13,937 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). Notable for the very short calyx with broad and rounded sepals and the strongly exserted black achene.

*P. SAGITTATUM L., var. **gracilentum,** var. nov., foliis anguste lanceolato-sagittatis, primariis 3.5–6.5 cm. longis 5.5–10.5 mm. latis, superioribus valde reductis; internodiis superioribus perlongis superne laevibus.—Fresh to brackish tidal marshes, southeastern VIRGINIA: brackish marsh along Piscataway Creek, northwest of Dunnsville, Essex County, August 1, 1941, *Fernald & Long*, no. 13,331 (TYPE in Herb. Gray., ISOTYPE in Herb. Phil. Acad.); fresh tidal marsh by Lacey Creek, west of Walker, New Kent County, September 9, 1941, *Fernald & Long*, no. 13,602 (transitional); fresh tidal margin of Chickahominy River, near Cypress Bank Landing, Charles City County, September 9, 1941, *Fernald & Long*, no. 13,602. See p. 353.

Typical *Polygonum sagittatum* L. (var. *americanum* Meisner) has oblong- to narrowly ovate-lanceolate leaf-blades, the primary ones ranging from 1.3–10 cm. long and 0.7–2.8 cm. broad, averaging two-fifths as broad as long, the upper ones well developed; the upper internodes are retrorsely barbed essentially to summit and not conspicuously elongate. In var. *gracilentum* the upper internodes are much longer than the lower and median ones, 8–14 cm. long, smooth (except sometimes toward base); and the narrow lanceolate leaves average one sixth as broad as long, the uppermost becoming reduced to tiny bracteiform blades.

*CHENOPODIUM BERLANDIERI Moq. DINWIDDIE COUNTY: abundant and spreading from a freight-yard, Petersburg, no. 13,941. GREENSVILLE COUNTY: railroad-yard, North Emporia, no. 9320 (distrib. as *C. album* L., var. *viride*). A southwestern species, now casually naturalized from South Carolina to New England.

*C. PAGANUM Reichenb. KING WILLIAM COUNTY: border of cultivated field, Cohoke, no. 12,646. Although cited by Standley in N. Am. Fl. xxi[1]. 23 (1916) as found "throughout the United States", there is no previous material in the Gray Herbarium from the Atlantic States from south of the District of Columbia.

*C. BOTRYS L. HENRICO COUNTY: waste places and railroad ballast, South Richmond, no. 12,643. Although stated by Standley, l. c. 26, to occur "in nearly all parts of the United

States", we have found no record of it as definitely in Virginia, nor are there previous specimens in the Gray Herbarium from the Atlantic States south of Maryland and the District of Columbia.

*C. AMBROSIOIDES L., var. CHILENSE (Schrad.) Spegaz. (*C. vagans* Standl.). Often abundant as a coarse weed of cultivated ground, waste places and roadsides, from Prince George County to southern Southampton County. Our specimens are from Courtland, nos. 8252, 8707 and 9046. See p. 362.

Typical and now wide-spread *Chenopodium ambrosioides*, originating in South America but now generally dispersed in warm and temperate countries, has the stems and leaves glabrous or merely waxy-pruinose. It is relatively infrequent in eastern Virginia, where the white-villous or hirsute var. *chilense* abounds. Schrader's original description of *C. chilense* called for "caule hirto", etc., and, although he described it as annual, the plant in Virginia may become a strong perennial with coarse and deep roots. It has recently (1940) been collected in Randolph County, West Virginia (*J. C. Tosh*, no. 404); and Mr. Long informs me that it has just appeared in eastern Pennsylvania. It is also known from California. When treated as a species, merely on its pubescence, it is *C. vagans* Standl. (1916), substitute for *C. chilense* Schrad. (1832), not Pers. (1805). When it was made a variety by Spegazzini in 1902, he kept Schrader's name for the variety, as he had a right to do. I am taking the name var. *chilense* for the plant with cuneate lanceolate to oblong leaves as defined by Schrader and later by Moquin in DC. Prodr. xiii². 74 (1849). A minor form "foliis minoribus angustissimis" was called by Moquin *C. chilense*, β. *angustifolium* Moq. l. c., based upon a plant cultivated in Paris. Although this name is earlier in the varietal category than var. *chilense*, its application to our plant is too doubtful. It is called by Aellen *C. ambrosioides* subsp. *chilense* (Schrad.) Aellen, var. *eu-chilense* Aellen, forma *angustatum* Aellen in Fedde, Repert. Spec. Nov. xxvi. 36 (1929).

*PORTULACA GRANDIFLORA Hook. ESSEX COUNTY: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,332, a stray from cultivation. See p. 354.

SUBMERSED LEAVES OF NUPHAR ADVENA (PLATE 717, FIG. 1).— As it characteristically grows in the fluctuating water-levels and regularly exposed muds of our tidal estuaries, *Nuphar advena*

(Ait.) Ait. f. has the ovate to suborbicular leaf-blades erect and borne well above all but the highest tides. In this, one of its most characteristic habitats, only the firm and promptly emersed blades are developed. In their descriptions of many species with floating blades, *Nuphar microphyllum* (Pers.) Fern. (*Nymphaea microphylla* Pers.), *N. rubrodiscum* Morong (*Nymphaea rubrodisca* (Morong) Greene), *N. variegatum* Engelm. (*Nymphaea variegata* (Engelm.) G. S. Miller), *N. sagittifolium* (Walt.) Pursh (*Nymphaea sagittifolia* Walt.), etc., Miller & Standley in their detailed monograph, *The North American Species of Nymphaea*, Contrib. U. S. Nat. Herb. xvi. pt. 3 (1912), regularly described the filmy submersed leaves; but under *Nuphar advena* they did not mention them, correctly saying merely "Leaves erect, usually borne above the surface of the water, occasionally floating in deep water; blades . . . thick and firm". This is the situation in all the tidal margins of streams where Mr. Long and I have watched the plants in Virginia; when young plants are found in the tidal mud they have the submersed leaves quite like the full-grown emersed ones, only smaller.

In fresh rills, springy swales and shallow fresh ponds of James City County, Virginia, a relatively small-leaved plant with blades usually erect, the sinus as in *Nuphar advena* but the blades often nearly orbicular, though no more so than in some estuarine specimens, greatly puzzled us in the field. Study of it shows it to have the very numerous stamens (5–8 rows), the rays of the greenish disk and the other characters of *N. advena*. Its rhizomes are more slender and with more crowded scars and teeth than in the plant of tidal mud, but this may well be an environmental point. In the shallow pond-hole slightly east of Centerville this small-leaved *N. advena* abounds, the plants near shore with erect blades, those in deeper water with them floating; best of all, young plants in this relatively stable aquatic habitat develop filmy and translucent leaves (PL. 717, FIG. 1), in shape like the emersed ones but as flaccid as in the species which normally produce them. The series from fresh waters and swales is as follows, all from

JAMES CITY COUNTY: swampy thicket, Chisel Run, northwest of Williamsburg, no. 13,337 (leaves erect); swale at head of Chisel Run, clearing in woods south of Ewell, no. 13,338 (blades erect); shallow peaty pond-hole ½ mile east of Centerville, no.

13,339 (blades floating or erect; filmy submersed leaves developed); muddy swale, Long Hill Swamp, east of Centerville, no. 13,340 (blades erect). See p. 358.

NUPHAR SAGITTIFOLIUM IN VIRGINIA (PLATE 718).—Along with the small boreal *Nuphar microphyllum*, with its nearly filiform petioles, narrow sepals, promptly deciduous petals and stamens, naked-based fruit and small stigmatic disk, another species, *N. sagittifolium* (Walt.) Pursh of southeastern North Carolina and northeastern South Carolina stands apart from the less easily recognized eastern American species of the genus. After prolonged field-study and examination of living, unpressed and pressed material, the latter from all the larger American herbaria, Miller & Standley op. cit. 96, were able to cite it (as *Nymphaea sagittifolia*) only from the Coastal Plain of North Carolina, in the drainage system of the Cape Fear River from Fayetteville to the Wilmington region, and from Georgetown, South Carolina, summarizing their findings in the significant note: "It is exceedingly improbable that the species is found outside the States of North and South Carolina. We have seen no specimens from other States nor have we any information that clearly indicates the plant's occurrence elsewhere". Later collections have greatly increased the number of stations represented from North Carolina but they are all in a restricted area: from the Waccamaw and Little Pee Dee Rivers in northeastern South Carolina to the Cape Fear drainage, from Columbia County to the sea, in southeastern North Carolina. To this area should, perhaps, be added that of *Nymphaea ulvacea* Miller & Standley, described from Santa Rosa County in northwestern Florida. At least, I fail to get the sharp lines I should like between an isotype of *Nymphaea ulvacea* and specimens from the Lumber and Little Pee Dee systems in Scotland and Robeson Counties, North Carolina and in Horry County, South Carolina. In fact, these Carolina collections show that the emersed or floating blades may sometimes be of even broader outline than in the type of *N. ulvacea*.

So deeply rooted has become the view that *Nuphar sagittifolium* is confined to a restricted area, only 130 miles broad from north to south, in the Carolinas, that it has not been realized that it abounds within 100 miles of Washington and nearly 200 miles north of its supposed northern limit. In the Chickahominy River, however, from head of tide below Providence Forge for about 15 miles down-river, very characteristic *N. sagittifolium* (PL. 718, FIGS. 1–3) forms a continuous belt at mid-stream, the floating leaves 3–4 dm. long, 7–11 cm. wide. The Carolina material shows the floating leaves to range from 1.8–4 dm. long and 5–7.5 cm. broad, while emersed blades (on stranded plants) may be narrowly ovate and only 0.7–2 dm. long. In the Chickahominy, *N. sagittifolium*, so far as we yet know, is only near the head of tide, the long blades pointing up-stream as the tide comes in, down-stream as it goes out.

The broad tidal marshes of the Chickahominy are covered down to the low-tide level with typical erect-leaved *Nuphar advena*, with broad-ovate to subrotund blades and no filmy submersed leaves. In the broad belt between the marsh-area of *N. advena* and the mid-stream belt of *N. sagittifolium*, with narrow floating leaves and *Ulva*-like lanceolate translucent submersed ones, there are broad areas of a plant (PL. 719) with floating leaves (FIG. 1) narrowly ovate to oblong, shorter than but much broader than in *N. sagittifolium*, with beautiful masses of broad-oblong submersed leaves (FIG. 2), again broader and shorter than in *N. sagittifolium* and quite unlike the rarely translucent, submersed ovate blades of *N. advena*. Repeated search showed that, whereas both *N. advena* and *N. sagittifolium* mature plenty of good fruit, this common intermediate plant of the Chickahominy only rarely develops well filled capsules (FIG. 4). It is so clearly a hybrid of the two that I am so designating it below.

*NUPHAR SAGITTIFOLIUM (Walt.) Pursh. NEW KENT COUNTY: deep fresh tidal water of Chickahominy River, southeast of Windsor Shades (Boulevard Postoffice), no. 13,335. CHARLES CITY COUNTY: similar habitat, near Cypress Bank Landing, no. 13,334. See p. 357.

* × NUPHAR **interfluitans,** hybr. nov. (*N. advena* × *N. sagittifolium*). TAB. 719. Planta inter *N. advena* et *N. sagittifolium* intermedia; laminis natantibus firmis opacis anguste ovatis vel ovato-oblongis 2–4 dm. longis 0.9–1.8 dm. latis obtusis sino acuto; laminis submersis flaccidis translucentibus, laminis petiolisque subaequantibus, late oblongis vel oblongo-ovatis 2–3.5 dm. longis 0.7–1.8 dm. latis margine crispatis apice rotundato sino late rotundato; floribus ut in *N. sagittifolium;* staminibus 3–5-

seriatis; disci viridiscentibus, radiis 8–10 lineari-lanceolat attenuatis; capsulis rare distentis globoso-urceolatis.—Virginia: growing in a broad band between mid-stream and margi of Chickahominy River, intermediate in position between N. *advena* of the tidal marshes and *N. sagittifolium* of mid-curren New Kent County: deep fresh tidal water, southeast of Windsor Shades (Boulevard Postoffice), September 9, 1941, *Fernald & Long*, no. 13,607 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). Charles City County: similar habitat, near Cypress Bank Landing, July 26, 1941, no. 13,336, and September 1 1941, no. 13,700. See p. 357.

Very rarely fruiting, most of the ovaries shriveling. Differing from the erect-leaved *N. advena* in its narrower floating leaves (PL. 719, FIG. 1) with narrower sinus, in the abundant filmy and translucent submersed leaves of narrower outline (FIG. 2) than in the rare submersed leaves of *N. advena* (PL. 717, FIG. 1), in the more slender rays (PL. 719 FIG. 3) of the disk and, viewed from above, in the greater uniformity in length of the rows of anthers (PL. 719, FIG. 3). In *N. sagittifolium* the submersed leaves (PL. 718, FIG. 2) and the floating leaves (PL. 718, FIG. 1) are much narrower and with narrower sinuses; the rings of stamens, viewed from above being similar (PL. 718, FIGS. 3 and 4).

Plate 717 is of Nuphar advena: fig. 1, young plant with translucent filmy submersed leaves, × 1, from east of Centerville, Virginia, *Fernald & Long*, no. 13,339; fig. 2, flower aid partly open to show cone of young stamens × 1, from no. 13,339.

Plate 718, of N. sagittifolium: fig. 1, floating leaf, × 3/7, from Chickahominy River, Virginia, *Fernald & Long*, no. 13,334; fig. 2, submersed leaf × 3/7, from no. 13,334; fig. 3, flower partly opened to show stamens, × 1 from Chickahominy River, no. 13,334; fig. 4, flower, partly opened to show stamens, × 1, from Wilmington, North Carolina, 1858, *McRee*.

Plate 719, × N. interfluitans, all from the type: fig. 1, floating leaf × 2/5; fig. 2, submersed leaf, × 2/5; figs. 3 and 4, flower and fruit, × 1.

*Aconitum uncinatum L., var. **acutidens**, var. nov. (TAB 720, FIG. 2–4), foliorum foliolis cuneatis apice acuminatis acute subinciseque serratis.—Mountains of western Maryland to those of North Carolina and Tennessee; inner Coastal Plain of southeastern Virginia. The following are characteristic: Maryland: Oakland, Garrett County, September, 1881, *J. D. Smith*. Virginia: mts., 1843, *Asa Gray et al;* Bedford County, October 1871, *A. H. Curtiss;* rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, Southampton County, May 7, 1940, foliage, *Fernald & Long*, no. 11,652; rich woods along brook entering Nottoway River below Double Bridge north of Orion, Greensville County, June 13, 1940, foliage, *Fernald & Long*, no. 12,079, August 21, 1940, foliage, no. 12,65

September 14, 1941, young flower-buds, no. 13,613, October 13, 1941, flowers very scarce, no. 13,945 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). NORTH CAROLINA: shady banks, Biltmore, September 9, 1897, *Biltmore Herb.*, no. 72[a]; wet rocks, "Pink Beds", 4000 feet alt., Pisgah Forest, September 1, 1908, *House*, no. 4001; rich ravines, alt. 5000 feet, Great Smoky Mountains, Swain County, August 18, 1891, *Beardslee & Kofoid*. TENNESSEE: deep woods along "K. and N. G. R. R.", October 2, 1902, *Ruth*, no. 389; along brooks on western slopes of Mt. LeConte, alt. 4500 feet, August 12, 1930, *Svenson*, no. 4037. See p. 374.

Typical *Aconitum uncinatum* L. Sp. Pl. ed. 2, i. 750 (1762) is the extreme of the species which early reached European gardens. Its middle and upper leaves (FIG. 1) have broader and less cuneate and less acuminate leaflets or divisions, these with shorter and blunter teeth, the plant illustrated in Bot. Mag. xxviii. t. 1119 (1808). Its leaves were described by Linnaeus "*Folia triloba s. quinqueloba, angulato-dentata*" but, although he gave the "*Habitat in* Philadelphia" it is not now admitted as a native of that city. It seems, however, to be a plant usually of lower altitudes than var. *acutidens:* low woods, near Great Falls, Virginia; "*In vicinis* Washington, D. C."; Falls of Saluda River, Greensville Co., South Carolina; etc. In southeastern Virginia it occurs in HENRICO COUNTY: woods, campus of University of Richmond, October 10, 1931, *J. T. Johnson*.

In PLATE 720, FIG. 1 is a characteristic leaf of typical A. UNCINATUM, × 1, from Great Falls, Virginia, September 24, 1915, *Holm;* FIGS. 2–4, flowering tip and characteristic portions of leaves, × 1, of type and topotypes of var. ACUTIDENS.

*PERSEA PALUSTRIS (Raf.) Sarg., forma **laevifolia,** f. nov., foliis subtus glabris vel subglabris.—Nansemond County, VIRGINIA: wet woods near lumber camp of Camp Lumber Co., Great Dismal Swamp, southeast of Whitmarsh School, July 19, 1939, *Fernald & Long*, no. 10,652 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); woods and thickets back of sandy western shore of Lake Drummond, Great Dismal Swamp, September 15, 1941, *Fernald & Long*, no. 13,616; swampy depressions in pine barrens northeast of Sandy Landing, south of South Quay, August 27, 1939, *Fernald & Long*, no. 11,039. See p. 366.

Typical and, in southeastern Virginia, common *Persea palustris* has the leaves densely soft-pubescent to tomentulose beneath; forma *laevifolia* has the lower surface as smooth as or smoother than in *P. Borbonia* (L.) Spreng., but the outline of the leaf is

that of *P. palustris*. No fruiting trees of the glabrescent
have yet been found but it is improbable that they will
material departure from *P. palustris*. In making the com
tion *P. palustris* (Raf.) Sargent in Bot. Gaz. lxvii. 229
Sargent based it on "*Tamala palustris* Rafinesque, Fl. Te
137. 1838." When Flora Telluriana, a work published
several separately paged parts, is looked up we find no part
as many as 137 pages, and the last part, "pars iv et ult.",
the date 1836 (now known to be 1838). *Tamala* is not in
index to any of the parts. So, having become familiar with
loose bibliography of both authors concerned, we search
eventually find that *Tamala palustris*, "fol. lanceol.
pallidis pubescens," etc., was published in Sylva Telluriana
(1838). By our present easy-going practice, however, Sarg
is accepted as author of the combination.

*Capsella gracilis Grenier. Prince George Co
border of cultivated field near James River, Windmill P
Flowerdew Hundred, no. 13,014; apparently the first record
North America. See p. 346.

*Cardamine Longii Fernald. Fresh tidal shores, esp
in mud and among other taller vegetation; heretofore known
only from the original stations on tidal mud of Saga
County, Maine, whence it was introduced by the late Fay
F. Forbes to the lower Charles River in eastern Massach
Recently found by Mr. Long on tidal mud at the head of Ch
peake Bay, near the mouth of the Susquehanna. Pr
George County: James River, Windmill Point, Flowe
Hundred, no. 13,015; James River, Jordan Point, no. 13
Charles City County: Chickahominy River, Cypress
Landing, no. 13,345. New Kent County: fresh tidal sh
Chickahominy River, above Lanexa, no. 13,017. King W
County: Mattaponi River at Horse Landing, near King W
Courthouse, no. 13,018; Mattaponi River, northwest of K
William Courthouse, no. 13,019. King and Queen Co
Mattaponi River, Walkerton, no. 13,020. Caroline Co
Rappahannock River, northwest of Return, no. 13,947 Se
pp. 346, 347 and 356.

Arabis laevigata (Muhl.) Poir. Local range extended
James City County: rich wooded slopes by James River, C
Landing, southeast of Grove, no. 13,346.

*Heuchera americana L., var. **heteradenia**, var
(tab. 721, fig. 2 et 3) foliis magnis, laminis deinde 0.8–1.5
longis paginis superioribus strigoso-pilosis; petiolis scapis

rhachibusque superne densissime hirsuto-glandulosis, glandulis valde inaequalibus 0.1–2 mm. longis; scapis 3–6 dm. altis; paniculis ad 4.3 dm. longis et 1.5 dm. diametro; calycibus regularibus in anthesi 3–4.5 mm. longis; petalis lineari-oblanceolatis paullo exsertis.—Calcareous bluffs along James River, Surry and Isle of Wight Counties, VIRGINIA: wooded calcareous bluffs by Cobham Bay, northwest of Chippokes, Surry County, June 10, 1941, *Fernald & Long*, no. 13,024; rich calcareous wooded slopes west of old Fort Boykin, Isle of Wight County, June 14, 1941, *Fernald & Long*, no. 13,026; seeping calcareous wooded bluffs by James River, west of old Fort Boykin, June 14 and 16, 1941, *Fernald & Long*, no. 13,027 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). No. 13025, from west of old Fort Boykin is less hirsute, forming a transition to var. *typica* Rosendahl, Butters & Lakela. See p. 345.

*H. AMERICANA L., var. **subtruncata**, var. nov. (TAB. 721, FIG. 1), foliorum laminis membranaceis glabris (vel subtus sparsissime hirtellis) angulato-dentatis, basi subtruncatis; petiolis scapis rhachibusque glabris vel minute glanduloso-puberulis vel sparsissime hirtellis; calycibus regularibus in anthesi 3–3.5 mm. longis; petalis oblanceolatis paullo exsertis.—Henrico County, VIRGINIA: rich wooded slopes by James River, west of Varina, June 6, 1940, *Fernald & Long*, no. 12,092 (TYPE in Herb. Gray.); same station, June 19, 1941, *Fernald & Long*, no. 13,031. See p. 349.

Although, as pointed out by me in RHODORA, xliii. 495–497 (1941) and again, l. c. xliv. 39–41 (1942), the exact identity of *Heuchera americana* L. is not finally settled, nor can it be until after the present world-war, in the meantime it is better to accept the interpretation of Rosendahl, Butters & Lakela. As treated by them typical *H. americana* is a frequent plant of the Atlantic and Appalachian region with cordate leaves with glabrous to sparsely hirtellous petioles, glandular-puberulent scapes and rachises and calyx in anthesis 4–5.5 mm. long. It passes insensibly into the scarcely worth-while var. *brevipetala* Rosendahl, Butters & Lakela, separated because of its more elongate leaf-blades, smaller flowering calyx (3–3.5 mm. long) and sometimes shorter petals.

As already noted (RHODORA, xliii. 495) var. *subtruncata*, growing near typical *Heuchera americana*, has such thin leaves that the specimens of it were thoroughly dry after three days in press, whereas the neighboring specimens of var. *typica*, with heavy cordate blades, required two weeks of drying.

Var. *heteradenia*, in its extreme development, suggests var. *hirsutissima* (Wheelock) Rosendahl, Butters & Lakela, of Indiana, Illinois and Missouri and var. *interior* Rosendahl, Butters & Lakela, of somewhat broader range in the Interior (to Tennessee and Arkansas); but the pubescence of the petioles in these inland extremes is very much looser and longer (FIG. 4, var. *hirsutissima;* FIG. 5, var. *interior*) than in the James River plant, that of var. *hirsutissima* up to 5 mm. long; the leaves of var. *interior* are definitely longer than broad; and its flowering calyx usually less than 3 mm. long. Var. *hirsutissima*, although with flowering calyx as large as in var. *heteradenia*, has the limb definitely oblique, instead of quite regular.

In PLATE 721 FIG. 1 is the type of HEUCHERA AMERICANA, var. SUBTRUNCATA, × ½; FIGS. 2 and 3, portions of rachis and scape, × 4, from TYPE of var. HETERADENIA; FIG. 4, portion of scape, × 4, of TYPE of var. HIRSUTISSIMA; FIG. 5, base of petiole, × 4, of var. INTERIOR, from Pine Hills, Union County, Illinois, May 6, 1902, *Gleason.*

RUBUS JANSSONII Bailey. Although the inflorescences usually have several flowers and fruits, colonies with solitary (rarely 2) flowers or fruits occur. These seem otherwise quite like typical *R. Janssonii.* Such 1-flowered variants are the following: PRINCE GEORGE COUNTY: thickets and wood back of beach of James River, Windmill Point, Flowerdew Hundred, no. 13,046; SOUTHAMPTON COUNTY: border of sandy woods south of Applewhite's Church, no. 13,045.

*R. RECURVANS Blanchard. Although, merging *R. recurvans* with the unidentified *R. heterophyllus* Willd., Bailey, in Gent. Herb. ii. 421 (1932), gives the range "from Quebec and Nova Scotia to New York and apparently Virginia, Minnesota, Iowa, Missouri", it is well to give a positive citation for Virginia: GREENSVILLE COUNTY: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, no. 13,051; the material, with arching and intricately branching canes and jagged-serrate leaves soft-pilose beneath, closely matching specimens from Nova Scotia and New England. We should not have looked for a wide-ranging northern species at the inner margin of the Virginia Coastal Plain, only a few miles from North Carolina. See p. 348.

R. FLORIDUS Tratt. Range extended northward to SURRY COUNTY: border of dry woods near James River, west of Ingersoll, no. 13,050. Fruit large, of superior quality.

*R. (§ *Arguti*, subsect. *Frondosi*) **defectionis,** sp. nov. (TAB. 722). Arcuans; primocannis 0.6–1.5 m. altis rigidis ad basin 3.5–5 mm. diametro glabris armatis, aculeis subulatis deflexis 2–4 mm. longis basi compressis 2.5–4 mm. latis; primocannae foliis 3- vel 5-natis petiolo sparse piloso glabrato armato; foliolis ovatis abrupte breviterque acuminatis supra glabratis subtus subvelutinis margine adpresso-serratis; foliolo terminali 5–6.5 cm. longo 2.5–4 cm. lato basi rotundato; floricannis valde ramosis ramis divergentibus; foliolis anguste cuneato-obovatis vel -subrhomboideis 2–4 cm. longis; corymbis 2–4-floris; pedicellis adscendentibus, filiformibus 1–2.5 cm. longis breviter pilosis plus minusve glandulosis; calycibus maturis pilosis, lobis anguste ovatis 4 mm. longis apice mucronatis valde reflexis; fructibus subglobosis 1.2–1.5 cm. diametro.—Nansemond County, VIRGINIA: forming an extensive thicket at the base of a dry wooded bank by James River, Eclipse, June 20, 1941. *Fernald & Long*, no. 12,047 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). **See p. 348.**

Rubus defectionis (from *defectio*, an eclipse) is obviously related to *R. pauxillus* Bailey, Gent. Herb. ii. 415, fig. 180 (1932), described from Stafford, Spotsylvania and Surry Counties. It shares with that species the slender habit, small leaves and glandular pedicels. *R. pauxillus*, however, is said to be only 1 to 2 feet (3–6 dm.) high, erect and unbranched; *R. defectionis* is 0.6–1.5 m. high, strongly arching and with horizontal branching. *R. pauxillus* has the terminal leaflet of the primocane-foliage broadly rounded at base and only about 4 cm. long; in *R. defectionis* it is less broadly ovate and 5–6.5 cm. long. In *R. pauxillus* the leaflets of the floricane-foliage are, as illustrated by Bailey, ovate and short-acuminate; in *R. defectionis* cuneate-obovate or -subrhombic and less sharply pointed.

*R. (§ *Arguti*, subsect. *Anormi*) **dissitiflorus**, sp. nov. (TAB. 723). Erectus; primocannis 4.5–5 dm. altis olivaceis glabris 2–3 mm. diametro valde armatis, aculeis pallidis unguiculatis 2–3 mm. longis subulatis basi compresso 2–3 mm. latis; primocannae foliis ternatis submembranaceis supra strigoso-pilosis, subtus subvelutinis, petiolo glabro vel glabrato valde armato, foliolis anguste ovatis dentato-serratis, dentibus obtusis vel subacutis, subacuminatis; foliolo terminali 5–6 cm. longo 2.7–3.7 cm. lato, petiolulo armato glabro 1–1.3 cm. longo; foliolis lateralibus basi sublobatis; floricannis breviter ramosis, ramis suberectis; foliolis oblongo-ellipticis vel rhomboideo-ellipticis obtusis vel subacutis 3–5.5 cm. longis; pedicellis solitariis axillaribus erectis filiformibus pilosis 2–4 cm. longis aculeatis aculeis divergentibus; calycibus maturis pilosis, lobis adpresso-erectis ovatis 6–7 mm. longis; fructibus vix 1 cm. diametro.—Isle of Wight County, VIRGINIA: seeping calcareous wooded bluff by

James River, west of old Fort Boykin, June 14 and 16, 1941, *Fernald & Long*, no. 13,052 (TYPE in Herb. Gray.). See p. 345.

Rubus dissitiflorus is, apparently, the first member of subsection *Anormi* found in the eastern states north of Florida. It strongly suggests *R. lucidus* Rydb. of Florida; but that species has the taller canes with prolonged and weak horizontal branches so that the plant becomes subprostrate, the lustrous leaves glabrous above and nearly so beneath, the primocane-foliage 5-foliolate, the flowers several, and calyx-lobes promptly reflexed. *R. tallahasseanus* Bailey likewise has the primocane-leaves 5-foliolate and the fruiting calyx reflexed; it is a trailing plant. *R. oklahomus* Bailey of Oklahoma is, like *R. dissitiflorus*, erect and with 3-foliolate primocane-foliage, but it has the mature calyx reflexed, the leaflets pilose beneath only on the veins, the flowers several on each lateral spur.

We have not yet found the real home of *Rubus dissitiflorus*. The solitary individual collected was in a habitat most unusual for a blackberry, in wet calcareous marl. Search revealed no other specimen there and it is presumable that the TYPE-SPECIMEN was a stray individual derived from dry woods or clearings somewhere back of the river-bluffs. So interesting and isolated a species must be sought in the neighborhood.

*GYMNOCLADUS DIOICA (L.) Koch. CAROLINE COUNTY: many trees naturalized on steep wooded bluff by Rappahannock River, northwest of Return, no. 13,956. See p. 372.

CASSIA TORA L. GREENSVILLE COUNTY: sandy roadsides and borders of cultivated fields near Meherrin River, northeast of Gaskins, no. 13,352; our first collection in southeastern Virginia. See p. 360.

*C. FASCICULATA Michx., forma **transmutata**, f. nov. (TAB. 724, FIG. 1 et 2) inflorescentiis dense glomerulatis, floribus ad bracteos imbricatos confertosque transmutatis.—Norfolk County, VIRGINIA: in dense cane (*Arundinaria*)-scrub north of Cornland, October 17, 1941, *Fernald & Long*, no. 13,955 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); FIG. 1 is × 1; FIG. 2, × 3.

An extraordinary sterile mutation of the common *Cassia fasciculata*, with dense and forking glomerules of flowers reduced to strongly ribbed bracts and bractlets. The plant was growing in most adverse conditions, in dense cane-scrub, where the roots were forced to strike into the crowded mass of rhizomes. Whethor it is the result of this most trying habitat or, perhaps, of nematode-attack, it is so unusual an aberration in *Cassia* as to merit minor recognition and illustration.

*C. FASCICULATA Michx., forma **mutata,** f. nov. (TAB. 724, FIG. 3), foliis impari-pinnatis foliolis 3 vel 5.—Nansemond County, VIRGINIA: roadside by swampy woods north of Whitemarsh School, July 19, 1939, *Fernald & Long*, no. 10,685. TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). FIG. 3 is × 3.

In its way as eccentric a deviation from normal *Cassia fasciculata* as the preceding. *Cassia*, theoretically, has abruptly pinnate leaves and typical *C. fasciculata* should have 20 or more leaflets. The plant here called forma *mutata* has odd-pinnate leaves, with 3 or 5 leaflets, thus completely departing from the generic pattern as well as from that of the species. The terminal odd leaflet, however, is enlarged and appears to be two leaflets fused. A single individual was found in the disturbed soil of a roadside fill and, although not yet fruiting, was taken, with the supposition that it was a member of some genus new to the flora of Virginia. Two later visits to the locality have failed to reveal another plant; and examination shows the eccentric individual to have the bracts, leaflets and petiolar gland, as well as the venation of the leaflets of typical *C. fasciculata*. It is a remarkable aberration. Its occurrence in a new "soft shoulder" is a tribute to the well known potency of disturbed soil in stimulating abrupt mutations.

THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(*Continued from page 405*)

*Crotalaria sagittalis L., var. oblonga Michx. Fl. Bor.-Am. ii. 53 (1803). Northampton County: dry pine woods south of Kendall Grove, no. 5330; dry sandy pine woods, Eastville, no. 5322. Greensville County: sandy roadsides and borders of cultivated fields northeast of Gaskins, no. 13,354. See p. 360.

Typical *Crotalaria sagittalis* has the bracteal leaves (those subtending the inflorescences) narrowly oblong to lanceolate or linear. Such a plant is wide-ranging, from tropical America to the Northern States and southernmost Canada. Var. *oblonga* has all the leaves, both the true foliage and the bracteal leaves, broadly elliptic-oblong, the upper barely if at all reduced or narrowed. Just such a plant can be readily picked out from among the superabundant typical *C. sagittalis* from Mexico and Florida. From north of Florida there are no specimens in the Gray Herbarium except ours from eastern Virginia, though it is presumably in the Carolinas and Georgia. Michaux, l. c. treated *C. sagittalis* as an inclusive species with three coordinate varieties:

> Var. α. *linearis:* foliis linearibus, caule erecto.
> — β. *oblonga:* foliis ovali-oblongis; caule erecto.
> — γ. *ovalis:* foliis subelliptico-ovalibus, caule procumbente.
> *HAB.* in Virginia et Carolina.

C. sagittalis α. *linearis* is the narrowest-leaved phase of the common plant. Var. *ovalis* is, as shown by a photograph of the type, *C. angulata* Mill. (*C. rotundifolia* Poiret, *C. ovalis* (Michx.) Pursh); while the same photograph shows var. *oblonga* to the plant here so interpreted. Although Michaux gave the undifferentiated "in Virginia et Carolina" for all three varieties, the sheet preserved in his herbarium gives no locality. True *C. sagittalis* (var. *linearis*) is common in eastern Virginia and *C. angulata* (*C. sagittalis*, var. *ovalis*) frequent in the southeastern counties. Var. *oblonga* is there evidently very rare; I am assuming that it is new to the recorded flora of the state.

C. SPECTABILIS Roth. To the few recorded stations add one in HENRICO COUNTY: waste places and railroad ballast, Richmond, no. 12,374.

AESCHYNOMENE VIRGINICA (L.) BSP. Local range extended to ESSEX COUNTY: sandy and muddy tidal shore of Rappahannock River, northeast of Loretto, no. 13,957; brackish marsh along Piscataway Creek, northwest of Dunnsville, no. 13,358.

DESMODIUM OCHROLEUCUM M. A. Curtis. To the single definite Virginian station, in Sussex County, add one in SURRY COUNTY: rich calcareous wooded ravine near James River, northwest of Chippokes, no. 13,359. See p. 362, where it is shown that the record from Caroline County was based on a misidentification.

*D. CANESCENS (L.) DC., forma **albinum,** f. nov., petalis albidis.—Surry County, VIRGINIA: rich calcareous wooded ravine along James River, Claremont, September 7, 1941, *Fernald & Long*, no. 13,627 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

*Phaseolus polystachios (L.) BSP., var. **aquilonius,** var. nov., foliis submembranaceis supra laevibus, subtus subvelutinis; rhacheos pilis plus minusve incurvatis; calycibus vix venosis; seminibus valde biconvexis atrorubentibus 5–8 mm. longis 4–6 mm. latis.—Connecticut to the upland of North Carolina. The following are characteristic. Connecticut: Franklin, September 29, 1906, *R. W. Woodward* (type, 2 sheets, in Herb. Gray.); New Haven, *Dana;* base of East Rock, New Haven, August 26 and September 27, 1904, *Woodward;* rocky bank near shore of Housatonic River, Huntington, August 18, 1903, *Harger,* no. 4148; rocky woods near seashore, Norwalk, August 23 and September 16, 1901, *Bissell.* New Jersey: by Delaware River road above Milford, Hunterdon County, August 29, 1906, *Van Pelt & Long;* loamy, wooded slope along streamlet tributary to South Branch, Timber Creek, Blackwood, Gloucester County, July 31, 1917, *Long,* no. 17,034. Pennsylvania: Easton, August 29, 1868, *Porter;* steep slope along Hay Creek, ½ mile northeast of Trap Rock Station, Berks County, August 19, 1938, *Hans Wilkens,* no. 5648; wooded roadside, north of Hanover, York County, August 25, 1938, *Louise F. A. Tanger;* rocky hill-slope, quartzite ridge, 1 mile east of Black Horse, Chester County, August 5, 1933, *Fogg,* no. 5796; mountains about Cold Spring, August 7, 1889, *Small.* Delaware: Brandywine, June and July, 1887, *Edw. Tatnall;* Centreville, August 24, 1874, *Commons.* District of Columbia; near Washington, September 25, 1897 and July 30, 1899, *Steele.* Virginia: wooded hill near Dead Run, August 14, 1921, *Leonard & Killip,* no. 897; northwest of Belt's, 1 mile north of Hopewell Gap, Fauquier County, August 9, 1936, *Allard,* no. 2079; Bedford County, August and September, 1871, *A. H. Curtiss.* North Carolina: rich woods, Great Smoky Mts., Swain County, August 1, 1891, *Beardslee & Kofoid.* See p. 367.

Whenever we have collected *Phaseolus polystachios* in southeastern Virginia Mr. Long has regularly protested that it is quite unlike the plant he knows in the Delaware Valley and elsewhere farther north. During September and October of 1941 we twice collected the southern plant under conditions where it was necessary to carry the specimens for a quarter of an hour to a full hour or more before they could be cared for. In both cases the subcoriaceous leaves remained stiff and unwilted. The northern var. *aquilonius,* carried in the open for five minutes, would become a hopelessly wilted wreck. Furthermore, the leaflets of the southern plant, when fresh, adhere very tightly to the fingers or clothes by their minutely scabridulous surfaces and the lower leaf-surfaces are softly pubescent, almost velvety to the touch. Fortunately we secured ripe fruit—fortunately, for comparison of the southern and the northern plants brings out important seed-characters. These in conjunction with the other points give the following contrasts.

P. POLYSTACHIOS (L.) BSP., based on *Dolichos polystachios* L. Sp. Pl. 726 (1753) (type coll. by Clayton in eastern Virginia, photograph in Gray Herb.). *P. perennis* Walt., Fl. Carol. 182 (1788). *P. paniculatus* Michx. Fl. Bor.-Am. ii. 60 (1803). Leaves firm, not quickly wilting, minutely scabridulous above, softly subvelutinous beneath, when fresh strongly adherent, the larger leaflets 4–8 (–10) cm. long; rachis usually short-hispid, with straightish divergent hairs; calyx (dry) relatively thin, the veins and veinlets evident; seeds flattened on both sides, black or black and gray, 5–10 mm. long, 5–6.5 mm. broad.—Florida to Arkansas, north to eastern Virginia, West Virginia, Tennessee and southern Illinois.

Var. AQUILONIUS. Leaves submembranaceous, promptly wilting, smooth and glabrous or glabrescent above, less pilose beneath, only slightly adherent, the larger leaflets up to 1.3 dm. long; rachis usually with inflexed pilosity; calyx (dry) of thicker texture, its veins obscure or not visible; seeds strongly biconvex, reddish-black (the red usually obvious under a hand-lens), 5–8 mm. long, 4–6 mm. broad.—Southern Connecticut to Delaware and on the upland to North Carolina.

Without better material it is not now possible for me to state more fully the two ranges; either of the varieties may have a broader range. The identity of *Dolichos polystachios* L., basis of *Phaseolus polystachios*, is inferred from its resting wholly on a specimen of Clayton's, a photograph of which is before me. *P. perennis* of Walter can hardly be anything but the southeastern plant; and a full sheet, including ripe seed, of the type of *P. paniculatus* Michx., given, at least a century ago, to Asa Gray is wholly characteristic and with very flat and black seeds. In fact, all the material I have seen from southern Illinois is of typical *P. polystachios*. It is noteworthy, therefore, that, in describing his species from southern Illinois, Michaux explicitly said of it: "Planta more HEDYSARI [i. e. DESMODII] tenacissima . . . semina compresso-reniformia, nigerrima".

We have typical *P. polystachios* from the following stations in Virginia. EXACT LOCALITY UNKNOWN: *John Clayton*, photograph in Gray Herb. NEW KENT COUNTY: thicket bordering

Chickahominy River, Lanexa, no. 13,963. Prince George County: dry wooded slopes of gullies near Powell's Creek Garyville, no. 8325. Dinwiddie County: dry clearings and borders of woods south of Burgess Station, no. 9080. Greensville County: dry sandy pine and oak woods north of Orion no. 13,660. Southampton County: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, no. 8736.

*Strophostyles umbellata (Muhl.) Britton, var. **paludigena,** var. nov. Planta glabra vel glabrescens, leguminibus plerumque 5–7 cm. longis, seminibus quadrato-oblongis furfuraceo-tomentosis 5–10 mm. longis, 3.5–5 mm. latis.—Fresh to brackish tidal marshes, District of Columbia and Virginia. District of Columbia or Maryland: river-marsh, East Branch of Potomac (now Anacostia River), September 5, 1902, *E. S. Steele* (distrib. under unpublished name). Virginia: fresh tidal marsh by Chickahominy River, at "Shady Rest", southeast of Windsor Shades (Boulevard Postoffice) New Kent County, August 31 1940, *Fernald & Long*, no. 12,689; fresh tidal marsh by Lacey Creek, west of Walker, New Kent County, September 9, 1941 *Fernald & Long*, no. 13,663 (type in Herb. Gray.; isotype in Herb. Phil. Acad.); fresh tidal shore of Chickahominy River, Graves Landing, north of Holdcroft, Charles City County, September 10, 1941, *Fernald & Long*, no. 13,664; field about miles west of Toano, James City County, August 13, 1939, *R. W. Menzel*, no. 306; fresh to brackish tidal marsh by Burwell's Bay, James River, at Bailey's Beach (MacKimmie's Wharf), near Rushmere (Fergusson's Wharf), October 10, 1941, *Fernald & Long*, no. 13,964. See p. 368.

Ordinarily *Strophostyles umbellata* occurs in dry sandy or argillaceous soil or pinelands, but sometimes in dune-hollows or damp habitats. It is not usually in deeply drowned estuaries, habitat of var. *paludigena*. In typical *S. umbellata* the young branches and stems are retrorse-pilose, usually rather densely so, the leaves glabrous or somewhat strigose-pubescent beneath, the legumes 3.7–5.5 cm. long, the seeds quadrate-short-oblong or subcubical, 3–4.5 (rarely to 6) mm. long and 2–3 mm. thick. The estuarine var. *paludigena* is nearly or quite glabrous, its legumes 5–7 cm. long, the heavily scurfy seeds quadrate-oblong and 5–10 mm. long by 3.5–5 mm. broad or thick. Some specimens from marsh habitats are quite transitional: for instance material from edge of marsh, Chopa Wausic Creek, Virginia, *Tidestrom*, no. 7611, with less pubescence than in typical *S. umbellata* but more than in var. *paludigena*.

*Strophostyles helvola (L.) Ell., var. missouriensis (S. Wats.) Britt. Charles City County: sandy tidal margin of Chickahominy River, Ferry Point, no. 11,064. Isle of Wight County: thicket at base of seeping and calcareous bluffs along Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,688 and 13,965. See p. 372.

Typical *Strophostyles helvola* is low and erect, 1.5–4 dm. high, or soon reclining and trailing (sometimes climbing) to a length of 1 or 2 m.; the principal leaves are often 3-lobed and fiddle-shaped, or, when unlobed, ovate and tapering by straight sides to a short acumination, the terminal leaflet 2–6.5 cm. long and 0.8–4 cm. broad. Var. *missouriensis* is high-climbing, ascending 3–10 m. Its principal leaflets are unlobed, broadly rounded to rhombic-ovate and gradually rounded to blunt or merely subacute apices, the terminal one 4–8 cm. long and 3–6.5 cm. broad. Its flowers are slightly larger (1–1.5 cm. long) than in typical *S. helvola* (0.8–1.3 cm.), its legumes often longer (5–10 cm.) as against 3.5–8.5 cm.; its seeds averaging longer (8–12 mm. long, with hilum 5–7 mm. long) as opposed to 6–9.5 mm. long, with hilum 4–5 mm. long. Var. *missouriensis* is a plant of calcareous shores and river-thickets, occurring from northern Florida to Arkansas, north to Pennsylvania (bank of Schuylkill River at Tunnell Hill, Phoenixville, Chester Co., September 1, 1929, *H. E. Stone*), the Potomac, southern Illinois, Missouri and Kansas. I have seen no material from between northern Florida and the James River.

*Pueraria Thunbergiana (Sieb. & Zucc.) Benth. Nansemond County: very extensively naturalized at border of rich sandy oak and hickory woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, nos. 13,372, 13,661 and 13,966. See p. 352.

Rhynchosia in eastern Virginia.—Two species of *Rhynchosia* abound in the drier soils of southeastern Virginia: one, a trailing or twining plant with stems and branches with spreading or reflexed pilosity, the earliest leaves simple and reniform, the later with 3 rounded to ovate, rhombic or elliptic leaflets only sparsely pilose to glabrescent, the plant passing (erroneously) in our manuals as *R. tomentosa* (L.) Hook. & Arn.; and a second species, erect, with tomentose or tomentulose pubescence, that on the stem appressed-ascending, the 3 oblong to oval leaflets canescent-tomentose beneath, the plant known as *R. erecta* (Walt.) DC. Besides these, a third species, *R. simplicifolia* (Walt.) Wood, is regularly included in our manuals as extending north to Virginia.

Repeatedly rebelling at the use of the name *Rhynchosia tomentosa* for the Virginia plant which is *not* tomentose and confident that Linnaeus would not so misuse the term, I have looked up the treatments of the species from its original publication by Linnaeus in Sp. Pl. ii. 754 (1753). He there defined a plant in his own herbarium and cited as associated by him with it two which had been earlier defined. His treatment was as follows:

> *tomentosa*. 4. GLYCINE foliis ternatis tomentosis, racemis axillaribus brevissimis, leguminibus dispermis.
> Ononis caule volubili. *Gron. virg.* 81.
> Anonis phaseoloides scandens, floribus flavis sessilibus. *Dill. elth.* 30. *t.* 26. *f.* 29.
> *Habitat in* Virginia.

In Species Plantarum, ed. 2, ii. 1024 (1763) Linnaeus added a reference to Gronovius, ed. 2: 106 (1762); in his treatments in Systema Naturae, through ed. 12 (1767), the same diagnosis (abbreviated) was repeated, without the citations from Gronovius and Dillenius. In Gmelin's edition of the Systema, ed. 13, ii. 1106 (1796) the Dillenian figure was again cited; and Gmelin added to the synonymy the South American *Dolichos pubescens* L., thus adding needlessly to the confusion, since *D. pubescens* can hardly be conspecific with either of the Virginian plants. Willdenow, Sp. Pl. iii². 1061 (1803), followed Gmelin and appended to *G. tomentosa*, as var. β., *Dolichos pubescens*.

In North America, Walter, Fl. Carol. 184 (1788) had described *Trifolium simplicifolium*, basis of *Rhynchosia simplicifolia*, and *T. erectum* "caule subrigido erecto . . . tomentoso, foliis ternatis rotundatis rugosis tomentosis, spicis axillaribus", etc., basis of *R. erecta*. Michaux, Fl. Bor.-Am. ii. 63, 64 (1803), took up the whole group as a variable species with 3 coordinate varieties, *Glycine tomentosa* L.:

> Var. α. *erecta:* caule erecto; tomentosior; foliolis saepe oblongo-ovalibus.
> TRIFOLIUM *erectum*. WALT.
> — β. *volubilis:* caule volubili; foliis imis simplicibus, caeteris trifoliatis.

— γ. *monophylla:* caulibus brevissimis; foliis omnibus unifoliatis sive simplicibus, subreniformi-rotundatis.
TRIFOLIUM *simplicifolium.* WALT.
Hab. in Virginia et Carolina.

Here, apparently, was the beginning of the record of *R. simplicifolia* (*R. reniformis* (Pursh) DC.) from Virginia. It should be noted, however, that Michaux was giving the inclusive range for all three plants included, two of which are well known in Virginia.

Pursh very promptly, in his Fl. Am. Sept. ii. 486 (1814), separated the simple-leaved plant as *Glycine reniformis* (with *Trifolium simplicifolium* and *G. tomentosa*, var. *monophylla* cited as synonyms) and restricted its range to Carolina and Georgia. Torrey & Gray, likewise, noting specimens seen, cited for this plant only South Carolina, Florida and Alabama. The northernmost specimens in the Gray Herbarium come from Cumberland and Moore Counties, North Carolina. It can safely be dropped from the Virginia list.

Returning to the two species actually in Virginia, the next important step in their history seems to have been their treatment, along with the species last discussed, as a separate genus *Arcyphyllum* Elliott in Journ. Acad. Nat. Sci. Phila. i. 371 (1818). Elliott's new genus, promptly united with *Rhynchosia* Lour. (1790), contained *Arcyphyllum simplicifolium* (Walt.) Ell., *A. erectum* (Walt.) Ell. and the newly proposed species,

2. *Difforme.*
A. caule volubili, foliis subrhomboideis, rugosis, interioribus simplicibus, superioribus ternatis, racemis axillaribus summitate confertifloris.
Glycine tomentosa, var. b. *volubilis*, Mich. 2, p. 62.
Hab. in aridis et cultis.

Elliott, writing from Charleston, South Carolina, obviously secured his *Arcyphyllum difforme* in that region. He very promptly abandoned it, however, for in his Sketch, ii. 234 (1822) he modestly refrained from mentioning it, even in synonymy, returning to the Linnean *Glycine*. Elliott's diagnosis in 1822 of *Glycine tomentosa*, beginning "G. caule volubili; foliis ternatis, rhombeis, rugosis", was so like his diagnosis of *Arcyphyllum difforme* that there can be no question regarding the identity of the latter.

DeCandolle promptly took up Elliott's new specific name, although failing to cite Elliott as its original author. In DC. Prodr. ii. 284 (1825), where *Arcyphyllum* appears in the generic synonymy of *Rhynchosia*, we find the following:

> 3. R. DIFFORMIS, caule volubili velutino, stipulis oblongo-lanceolatis, foliis infer. simplicibus summis trifoliolatis, racemis longè pedunculatis confertè subspicatis, cal. laciniis lanceolatis acuminatis . . . in aridis et cultis Carolinae. Glycine tomentosa var. volubilis Michx. fl. bor. am. 2. p. 63.

Although DeCandolle failed to cite the synonym, *Arcyphyllum difforme* Ell., the diagnosis, with "foliis infer. simplicibus summis trifoliolatis" and the habitat, "in aridis et cultis Carolinae" are so clearly derived from Elliott that the combination should certainly be written *Rhynchosia difformis* (Ell.) DC.

Torrey & Gray (1838) maintained *Rhynchosia tomentosa* in the all-inclusive sense, with vars. *monophylla*, *volubilis*, *erecta* and two more, all now regularly considered distinct species; and Gray, admitting the polymorphous group to the Manual in ed. 2, so treated it through ed. 5. So long as the several plants (whether erect and tomentose, with trifoliolate leaves; erect and with simple suborbicular leaves; or twining or trailing, with early leaves simple, the later trifoliolate and not tomentose) were all treated as *R. tomentosa*, the identity of the Linnean type was relatively unimportant. Now that the three (and other) elements are treated as species the identity of the plant which Linnaeus had immediately before him in preparing Species Plantarum (1753) becomes highly important. Dr. B. Daydon Jackson, in his Index to the Linnean Herbarium (1912), states that in preparing ed. 1 Linnaeus had a plant of his *Glycine tomentosa* in his own herbarium. This was studied more than a century ago by Asa Gray who, in his manuscript notes on the Linnean Herbarium, recorded: "*Glycine tomentosa!* = *Rhynchosia tomentosa* var. *erecta*, fol. oblongis (Specimen est Clayt.). This erect plant, the actual TYPE, is really tomentose and is properly described by the trivial name used by Linnaeus. The twining or creeping plant, with broader leaflets is *not* tomentose. There is no question that the plate of Dillenius was made from the latter, and a Clayton specimen preserved at the British Museum is the latter (photograph before me). Clayton, obvously, collected both the common species of southeastern Virginia and Linnaeus included them both under *Glycine tomentosa*. The brief diagnosis of Gronovius, made from Clayton's material, was cited by Linnaeus only in its abbreviated form, as "Ononis caule volubili. *Gron. virg.* 81." When the original Gronovian account is looked up, however, it is found that Gronovius, like Linnaeus, cited the Dillenian plate of *Anonis phaseoloides scandens*, the twining species, but more important, he quoted Clayton's account of the plant: "Trifolium nunc volubile, nunc erectum", etc. In other words, the full account in Gronovius calls for stems either twining or erect. Clayton, Gronovius and Linnaeus, like Michaux, Torrey & Gray and others still later, saw only one species, although they had two.

In view of this evidence I am taking up for the erect plant with tomentose leaves and stems, which is now passing as *Rhynchosia erecta* (Walt.) DC., the appropriate name R. TOMENTOSA (L.) Hook. & Arn. The twining or trailing species with broader short-pilose to glabrescent leaflets, the plant erroneously passing as *R. tomentosa*, is R. DIFFORMIS (Ell.) DC.

*OXALIS EUROPAEA Jordan, forma **pallidiflora,** f. nov., petalis pallide colore limonis.—Isle of Wight County, VIRGINIA: seeping calcareous wooded bluffs by James River, west of old Fort Boykin, June 14 and 16, 1941, *Fernald & Long*, no. 13,060 (TYPE in Herb. Gray., ISOTYPE in Herb. Phil. Acad.).—A pale-flowered form of otherwise typical *O. europaea*. See p. 345.

*O. EUROPAEA Jordan, var. BUSHII (Small) Wiegand, forma SUBGLABRA Wiegand. NANSEMOND COUNTY: border of low woods, Adams Swamp, south of Baines Hill School, no. 13,061: gigantic plants, up to 1.125 m. high, the variety and form chiefly in the Mississippi Valley.

PTELEA TRIFOLIATA L. Local range extended to PRINCE GEORGE COUNTY: abundant in thickets and woods back of beach of James River, Windmill Point, Flowerdew Hundred, no. 13,062. See p. 346.

PONCIRUS TRIFOLIATA (L.) Raf. Range extended north to ESSEX COUNTY: border of dry woods northeast of Loretto, shrubs up to 4 m. high, fruit October 15, 1941, no. 13,967, flowers April 15, 1942, no. 14,185. See p. 372.

*RHUS COPALLINA L., forma **frondosa,** f. nov., paniculis valde foliosis.—VIRGINIA: border of fresh to brackish tidal marsh by Burwell's Bay, James River, at Bailey's Beach, near Rushmere, Isle of Wight County, October 10, 1941, *Fernald & Long*, no. 13,969 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

Cyrilla racemiflora L. Range extended northward into Dinwiddie County: border of depression in argillaceous woods west of Winfield's Mill, no. 13,970. See p. 374.

Celastrus scandens L. Local range extended to Caroline County: steep wooded bluff by Rappahannock River, northwest of Return, no. 13,973.

Acer floridanum (Chapm.) Pax. To the few recorded stations in the state add the following from James City County: rich woods and slopes by James River, Grove Landing, southeast of Grove, nos. 13,382, 13,386, 13,389, 14,186, 14,187, *Delisle*, nos. 1–6. See plate 725, figs. 1 and 2, and 727, fig. 3. See pp. 359 and 360.

*A. floridanum (Chapm.) Pax, forma **villipes** (Rehder) stat. nov. Var. *villipes* Rehder, Trees and Shrubs, ii. 255 (1913). Quite like typical *A. floridanum* except in having densely pilose petioles and, often, young shoots. Of similar range and sometimes growing with typical *A. floridanum* (with glabrous branchlets and petioles). The following Virginian specimens belong here. James City County: rich woods and slopes by James River, Grove Landing, southeast of Grove, no. 13,387; *Delisle*, no. 7; woods and thickets back of sand-beach of James River, Martin's Beach, southeast of Grove, no. 13,388. See plate 725, fig. 3 and 727, fig. 4.

*A. floridanum, var. **Longii,** var. nov. (tab. 726). Arbor ad 30 m. alta, cortice albido deinde exfoliato, ramibus griseis, ramulis juvenilibus saepe densissime velutino-villosis; foliis maturis subtus petiolisque dense velutino-villosis, petiolis crassis 1.5–2 mm. diametro, laminis subaequaliter longis et latis, basi plus minusve cordatis vel subtruncatis 3-lobatis 7–13 cm. longis 7–14 cm. latis, lobis anguste oblongo-ovatis longe attenuatis integris vel sparse lobulatis mediis 4–8 cm. longis; calycibus 3–4 mm. longis; stylo 2.5–3 mm. longo, stigmatibus 5–6 mm. longis; antheris 1.5–2 mm. longis; samaris 2.5–3.5 cm. longis loculis horizontalibus 8–10.5 mm. longis 5–7 mm. latis, alis adscendentibus 1.7–2.5 cm. longis 9–11 mm. latis.—James City County, Virginia: rich woods and slopes by James River, Grove Landing, southeast of Grove, July 29 and 30, 1941, *Fernald & Long*, no. 13,385 (branchlets nearly glabrous); April 19, 1942, *Fernald, Long & Abbe*, nos. 14,187 (type in Herb. Gray.; isotype in herb. Phil. Acad.) and 14,189, May 5, 1942, *Delisle*, nos. 8–12.

Var. Longii, forma **platylobum,** f. nov. (tab. 727, fig. 1 et 2), foliis late rotundatis cordatis 1–1.7 dm. latis, lobis late oblongis vel oblongo-obovatis lobis grosse acuteque lobulatis.—Southeastern Virginia: rich woods and slopes by James River, Grove Landing, southeast of Grove, *Fernald & Long*, nos. 13,383 and 13,384 (type in Herb. Gray.; isotype in Herb. Phil. Acad.).

May 5, 1942, *Delisle*, nos. 13–15; rich calcareous slopes by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), Isle of Wight County, August 27 and 29, 1940, no. 12,718, April 17, 1942, *Fernald, Long & Abbe*, no. 14,190. Grimes, no. 3929, from calcareous bluffs along James River near Camp Wallace, is transitional between the typical var. *Longii* and forma *platylobum*, but the wings of the samaras are small for either.

When more fully understood *Acer floridanum* and var. *Longii* may prove to be specifically separable. In their extreme forms they are far apart but essentially all characters too closely converge for me to feel certain that they are more separable as species than the northern and upland *A. saccharum* and its var. *nigrum*. These in extreme development appear abundantly distinct; when carefully scrutinized, however, there are too many intergradient forms. As I now understand the variations of *A. floridanum* I should separate them as follows.

Tree with close whitish bark becoming furrowed in age, the trunks up to 7 dm. in diameter; branchlets grayish, with purplish tinge, the young branchlets of the season 1–2 mm. thick; mature leaves minutely pilose to glabrate beneath, those of fertile shoots (not the vigorous leaders) 3–9.5 (av. 6.7) cm. long, 3.5–11 (av. 8) cm. broad, the middle lobe 2–5.5 (av. 3.3) cm. long; petioles 0.5–1 mm. thick (near middle); flowering calyx (including hypanthium) 1.5–2.5 mm. long; style 1–2.5 mm. long, stigmas 1.5–5 mm. long; anthers 1–1.5 mm. long; samaras 1.5–3 cm. long, the mature locules 5–10 (av. 6.5) mm. long and 4–6.5 (av. 5.4) mm. thick, the mature wings 1–2.2 (av. 1.6) cm. long and 4.5–9 (av. 7) mm. broad.

Petioles and young branchlets glabrous . . . . *A. floridanum* (typical).

Petioles and often the young branchlets densely short-pilose . . . . Forma *villipes*.

Tree with finally exfoliating bark, the trunks up to 1.2 m. in diameter; branchlets gray, the young branchlets of the season 2–3 mm. thick, oftenest densely villous; mature leaves densely velutinous beneath, those of fertile shoots 7.5–13 (av. 10) cm. long and 7–17 (av. 13) cm. broad, the middle lobe 3.5–8 (av. 6.3) cm. long; petioles 1.5–2 mm. thick near middle, heavily velutinous; flowering calyx 3–4 mm. long; style 2.5–3 mm. long, stigmas 5–6 mm. long; anthers 1.5–2 mm. long; samaras 2.5–3.5 cm. long, the mature locules 8–10.5 (av. 9.25) mm. long and 5–7 (av. 6.5) mm. thick, the mature wings 1.7–2.5 (av. 2.1) cm. long and 9–11 (av. 10) mm. broad.

Leaves slightly cordate to subtruncate at base, the 3 lobes narrowly oblong-ovate, long-attenuate, entire or remotely and obtusely lobulate . . . . Var. *Longii*.

Leaves definitely cordate-rotund, the broad-oblong to oblong-obovate lobes coarsely and acutely lobulate. Var. *Longii*, forma *platylobum*

The measurements (many hundreds), based on the large representation of *Acer floridanum* in the Britton Herbarium of the New York Botanical Garden and that of the Arnold Arboretum and the lesser representation in the Gray Herbarium include the Virginian material as well as the more southern and more typical specimens (PL. 725, FIG. 1, and 727, FIG. 3). As a matter of fact the original Florida specimens and most of the recent material from there, thence to Texas and Arkansas, are smaller in all parts than the Virginian series, in which leaves and fruits approach the dimensions in var. *Longii*. It is this transitional series and occasional large-leaved and large-fruited material from the Carolinas and Georgia which forces me to the conclusion that *A. floridanum* is as plastic as *A. saccharum* and *A. rubrum*.

The Grimes material and some other in herbaria has been confused with *Acer leucoderme* Small. That, however, is a large shrub or very small tree with the leaves green on both sides (not whitened as in *A. floridanum*), and the pubescence of the lower surface minutely hirtellous (of straightish hairs) rather than pilose-tomentulous or velutinous.

In PLATE 725 FIGS 1 and 2 are of ACER FLORIDANUM: FIG. 1, portion of fruiting branch, × 1, from Chattahoochie, Florida, *A. H. Curtiss*, no. 497*; FIG. 2, portion of inflorescence, × 3, from Grove Landing, Virginia, *Fernald, Long & Abbe*, no. 14,168. FIG. 3, forma VILLIPES: portion of TYPE, × 1, of var. *villipes* Rehder.

PLATE 726 is of ACER FLORIDANUM, var. LONGII, all figs. from TYPE-tree: FIG. 1, flowering branch, × 1; FIG. 2, flowers, × 3; FIG. 3, fruiting branch, × 1.

In PLATE 727 FIGS. 1 and 2 are of ACER FLORIDANUM var. LONGII, forma PLATYLOBUM, both from TYPE: FIG. 1, leaf, × 1; FIG. 2, base of leaf (lower surface) and summit of petiole, × 6. FIG. 3, A. FLORIDANUM: base of lower surface of leaf and summit of petiole, × 6, from *Curtiss*, no. 497*. FIG. 4, forma VILLIPES: base of lower surface of leaf and summit of petiole, × 6, from TYPE.

IMPATIENS BIFLORA Walt., forma PEASEI A. H. Moore. This striking color-form, with cream-colored corolla, the petals heavily spotted with old-rose, occurs in NORFOLK COUNTY: wet woods and thickets along the Feeder Ditch from Lake Drummond, Great Dismal Swamp, west of Wallaceton, no. 13,682.

VITIS BAILEYANA Munson. Local range extended into SUSSEX COUNTY: bottomland woods along Nottoway River, east of Huske, nos. 13,080 and 13,658. Leaves thinner and more often lobed than in *V. vulpina (cordifolia)*, soft-pilose like the new branchlets; fruit bluish with a bloom, sweetish, ripe and falling September 5, much earlier than the bloomless, blackish and intensely sour fruit of *V. vulpina*. See pp. 348 and 366.

V. CINEREA Engelm., var. FLORIDANA Munson. Range extended northward into KING AND QUEEN COUNTY: border of woods at head of Garnett Creek, about 1 mile northeast of St. Stephen's Church, no. 13,390.

PARTHENOCISSUS QUINQUEFOLIA (L.) Planch., forma HIRSUTA (Donn) Fern. Although it is generally stated that this form is sterile, flowering plants occur in ISLE OF WIGHT COUNTY: thicket back of sand-beach of James River, west of old Fort Boykin, no. 13,074.

SIDA INFLEXA Fernald. Range extended into GREENSVILLE COUNTY: dry sandy pine and oak woods north of Orion, nos. 13,688 and 13,689; a very fine colony, with handsomely flowering plants up to 1.5 m. or more in height, the leaves (in disturbed soil) up to 2.8 cm. broad. See p. 367.

*ANODA CRISTATA (L.) Schlecht. ISLE OF WIGHT COUNTY: abundant weed in cultivated field near James River, west of old Fort Boykin, no. 13,690.

Tentatively so identified, the plants of tropical and subtropical America (both North and South) passing as *A. cristata* being a heteromorphous series not yet critically studied. The Virginia plant, loosely villous-hirsute, has maple-like leaves, the blue-violet petals being shorter than the calyx. It is not clearly matched but, since it is obviously adventive, it would be quite unwise to give it a new name until the whole genus is adequately and critically studied. See p. 361.

*HYPERICUM PUNCTATUM Lam., forma **subpetiolatum** (Bickn.), stat. nov. *H. subpetiolatum* Bickn. in Small, Fl. Se. U. S. 790 (1903). JAMES CITY COUNTY: border of rich woods by James River, Grove Landing, southeast of Grove, no. 13,394. DINWIDDIE COUNTY: depression in argillaceous woods west of Winfield's Mill, no. 13,977. GREENSVILLE COUNTY: bottomland woods along Meherrin River northeast of Gaskins, no. 13,395. See p. 359.

When it occurs, as in the above cases, in pure colonies forma *subpetiolatum*, with oblanceolate leaves tapering to subpetiolar bases, is strikingly different from extreme *Hypericum punctatum*, with oblong or elliptic sessile round-based or subamplexicaul leaves. Much material is clearly transitional and in many cases found in the herbaria, both extremes have been collected and distributed under one label. With no evidence of a different range, forma *subpetiolatum* is best considered a well defined form.

H. PROLIFICUM L. Local range extended to ESSEX COUNTY: border of dry woods northeast of Loretto, no. 13,975. See p. 372.

H. denticulatum Walt. To the single small station in Greensville County add one in Dinwiddie County: open argillaceous woods just east of McKenney, nos. 13,976 and 14,365. See p. 373.

Cuphea petiolata (L.) Koehne. Isle of Wight County: upper margin of sand-beach of James River, west of old Fort Boykin, very scarce, no. 13,703; our first station in the Tidewater area. See p. 362.

Ammannia Koehnei Britton, var. exauriculata Fern. Range extended into Nansemond County: border of brackish marsh along Western Branch, south of Reid's Ferry, no. 13,398. See p. 352.

Ludwigia pilosa Walt. To the single known Virginia station, in Norfolk County, add an extensive one in Nansemond County: wooded bottomland, Adams Swamp, south of Baines Hill School, no. 13,705; the plants rooting at tips. See p. 368.

L. alata Ell. To the single known Virginia station add another, also in Princess Anne County: reed-marsh along Blackwater River, southwest of Pungo Ferry, nos. 13,981 and 13,982. See p. 370.

Gaura biennis L. Range extended down the James. Surry County: woods and thickets back of sand-beach, Claremont, no. 13,708. Isle of Wight County: thicket back of sand-beach, west of old Fort Boykin, no. 13,709. See p. 362.

Torilis japonica (Houtt.) DC. Local range extended to Isle of Wight County: waste ground back of sand-beach of Burwell's Bay, James River, below Rushmere, no. 13,096. See p. 344.

Zizia aurea (L.) Koch. Locally abundant in Isle of Wight County: seeping calcareous wooded bluffs by James River, west of Old Fort Boykin, no. 13,093; very large, nearly 8 dm. high. See p. 345.

*Z. aurea, forma obtusifolia (Bissell) Fern. Casual plants with the last, no. 13,094. See p. 345.

Taenidia integerrima (L.) Drude. James City County: locally abundant, rich woods and slopes by James River, Grove Landing, southeast of Grove, no. 13,411; our first station on the Coastal Plain. See p. 359.

*Lyonia ligustrina (L.) DC., var. foliosiflora (Michx.) Fern. Norfolk County: fresh reed-marsh and swale along Northwest River, near Northwest, no. 13,992; compact shrub 1–2 m. high, the first from north of North Carolina. See Rhodora, xliii. 628 (1941). See p. 370.

Vaccinium arboreum Marsh. Range extended northward into Dinwiddie County: low woods near Mt. Olivet Church, no. 13,994.

Hottonia inflata L. To the rather few stations add another in Sussex County: open muddy soil, Coppahaunk Swamp, south of Spring Hill Church, no. 13,723.

Bumelia lycioides (L.) Gaertn. f., var. virginiana Fernald. Range extended up the James to Prince George County: many trees in thicket and woods back of beach, Windmill Point, Flowerdew Hundred, no. 13,106. Also to James City County: base of rich woods and slopes by James River, Grove Landing, southeast of Grove, no. 13,419. See p. 346.

Styrax americana Lam. Local range extended to Charles City County: wooded bank by Chickahominy River, Cypress Bank Landing, no. 13,391. See p. 357.

*Buddleja Davidi Franch. Surry County: slightly naturalized in woods and thickets back of sand-beach of James River, Claremont, no. 13,728.

*Forsythia viridissima Lindl. Southampton County: waste ground, Franklin, no. 13,726.

Cynoctonum Mitreola (L.) Britton. To the very few recorded stations add an extensive one in Southampton County: wooded bottomland of Blackwater River, southeast of Ivor, no. 13,727. See p. 366.

Sabatia stellaris Pursh, forma albiflora Britton. Extending inland to Essex County: damp sand back of beach of Rappahannock River at Ware's Wharf, northeast of Dunnsville, no. 13,422. See p. 354.

*S. campanulata (L.) Torr., var. gracilis (Michx.) Fern. Greensville County: exsiccated argillaceous fallow field near Meherrin River, northeast of Gaskins, no. 13,421. Although in Rhodora, xxxvii. 438, *S. gracilis* was reported from Princess Anne County, the material is transitional to *S. campanulata*. See Rhodora, xxxix. 444 (1937). The Gaskins plant is quite satisfactory var. *gracilis*. See p. 360.

S. dodecandra (L.) BSP. To the few recorded stations add the following. Nansemond County: border of brackish marsh along Western Branch, south of Reid's Ferry, no. 13,423. Norfolk County: sphagnous pocket at border of reed-marsh of Northwest River near Northwest, no. 13,997. See pp. 352 and 370.

Gentiana cherokeensis (W. P. Lemmon) Fernald. To the extensive area in Sussex County add one twenty-two miles farther west, in Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,001. See p. 373.

Vinca major L. Often abundantly naturalized. Seen in several counties. See p. 372.

*Cuscuta indecora Choisy. Princess Anne County: on various herbs, damp woods, Virginia Beach, no. 4149 (distrib. as *C. Coryli* Engelm.).

Identification corrected by Dr. T. G. Yuncker, who notes:

"This is the first specimen of the species I have seen from the northeastern United States". The species ranges from the West Indies and Florida to Texas and Mexico, north rather generally in the Mississippi Basin and westward.

C. Coryli Engelm. Princess Anne County: on *Cassia*, border of pine barrens, near Princess Anne Courthouse, *Fernald & Griscom*, no. 2879 (distrib. as *C. polygonorum* Engelm.).

Identification corrected by Dr. Yuncker. In his *Revision of the North American and West Indian Species of Cuscuta*, Univ. Ill. Biol. Mon. vi. 146—repr. 56 (1921), Yuncker cited Virginian material only from the Peaks of Otter and from farther west.

Hydrolea quadrivalvis Walt. Range extended into Greensville County: sandy and muddy border of Slagle's Millpond, northwest of Emporia, very abundant, no. 13,733.

Heliotropium indicum L. To the few recorded stations add one in Norfolk County: swampy woods west of Bethel Church, Gertie, no. 14,003.

Scutellaria ovata Hill, var. **versicolor** (Nutt.), stat. nov. *S. versicolor* Nutt. Gen. ii. 38 (1818).—A new station along the James. Prince George County: thickets and woods back of beach, Windmill Point, Flowerdew Hundred, no. 13,126. Also in Greensville County: rich wooded slope just above the "fall-line" by Three Creek, northwest of Emporia, no. 14,004.

Although Blake in Rhodora, xvii. 133 (1915) adopted the name *S. ovata* Hill, Hort. Kew. ed. 1: 242 (1768) and ed. 2: 242, pl. 8 (1769) for *S. versicolor* Nutt. and stated that "The types of *S. versicolor* Nutt. and *S. caroliniana* Walt., both in the British Museum, are identical with the plant here taken as *S. ovata* Hill", there seems to me considerable doubt, inasmuch as Blake proceeded (l. c. 134) to make for the plant with "enlarged floral bracts" the combination *S. ovata* var. *bracteata* (Benth.) Blake, based on *S. versicolor*, ξ. *bracteata* Benth. Labiat. 433 (1832-36). Nuttall definitely described his *S. versicolor* with "bractes short and sessile" and Bentham, who must have known the type, so took it up, his *S. versicolor*, ξ. *bracteata* "non nisi foliis floralibus majoribus subcoloratis differt". *S. versicolor* was described by Nuttall as "The largest North American species", because it had "leaves broad-cordate, large, . . . nearly smooth; petioles very long . . . leaves thin and diaphanous, a little hirsute above, 2 or 3 inches broad and 3 or 4 long, . . . peduncles [petioles] 1 and a half to 2 inches long". This account is wholly in accord with the plant taken by Bentham, Gray and others as *S. versicolor*, the broadly cordate-ovate thin blades of the principal leaves in the short-bracted series before me ranging from 2½ to 5 inches long and 2–4 inches broad, with petioles 1–3 inches long. This plant, true *S. versicolor*, ranges from Virginia to Iowa, south to Louisiana. The material of Bentham's *S. versicolor*, var. *bracteata* comes from southern Illinois to Mississippi, Arkansas, Oklahoma and Texas. Its leaves are relatively narrow-ovate, firm, heavily pubescent, and ranging from 1½ to 3 (rarely in transitional specimens to 4) inches long, and from 1 to 2½ inches broad, with petioles ½–2 inches long. Hill's plate of his *S. ovata* shows a more branched inflorescence than I can match in most *S. versicolor* but easily matched in *S. versicolor*, var. *bracteata*, very large bracts, and narrowly ovate leaves on relatively short petioles. To me it is a far better match for var. *bracteata* than for typical *S. versicolor*. Hill described *S. ovata* with stem "subhirsutus" and so illustrated it. In typical *S. versicolor* the pubescence of the stem is a minute inflexed pilosity (Nuttall said "a soft and glandular pubescence"); in var. *bracteata* of divergent glandular hispidity. I am, therefore, treating *S. ovata* as based upon a garden specimen of *S. versicolor*, var. *bracteata*, in spite of the fact that Hill said the flowers were "rubescentes". The native plant has the corolla blue, with the lower lip whitish.

I, of course, do not know just what was taken as Nuttall's type at the British Museum and pronounced "identical" with *S. ovata*. If it is identical it disagrees in many points with Nuttall's detailed description. Bearing in mind that Nuttall did not think in terms of "types" and that he often marked with an asterisk on his labels wholly different things, which he had called the same, his rather vivid account of *S. versicolor*, accurately describing a familiar plant, should have precedence over a specimen which, if it matches Hill's plate and brief description, does not well agree with Nuttall's description.

*S. ovalifolia Pers., var. **hirsuta** (Short), stat. nov. *S. hirsuta* Short in Transylv. Journ. Med. viii. 582 (1836). *S. pilosa* Michx., var. *hirsuta* (Short) Gray, Syn. Fl. N. Am. ii[1]. 379 (1878). Henrico County: rich wooded slopes by James River, west of Varina, no. 13,123. See p. 349.

Although described from Kentucky and noted by Leonard in

Contrib. U. S. Nat. Herb. xxii. 741 (1927) only from that state, it is represented in the Gray Herbarium also from West Virginia, Ohio, Indiana and Michigan, south to Georgia and Mississippi. There is one other Virginian specimen: Wytheville, Wythe County, *Howard Shriver*. The Varina plant is the first from east of the Blue Ridge of Virginia and North Carolina.

*S. PUNCTATA (Chapm.) Leonard. JAMES CITY COUNTY: rich land, Matoaka Park (near Williamsburg), June 29, 1939, *R. W. Menzel* (as *S. serrulata* Andr.). The first from north of upland North Carolina.

*SATUREJA CALAMINTHA (L.) Scheele, var. NEPETOIDES (Jordan) Briquet. ISLE OF WIGHT COUNTY: by path on rich calcareous wooded slope along James River, west of old Fort Boykin, no. 13,739. Apparently not previously reported from North America. See p. 361.

PHYSALIS ANGULATA L. Range extended into SOUTHAMPTON COUNTY: roadside fill above wooded bottomland of Blackwater River at South Quay Bridge, east of Oak Grove School, no. 13,742; very large plants stimulated by loosening of soil, 1.2 m. high, with leaves up to 9 cm. broad.

*P. BARBADENSIS Jacq. ISLE OF WIGHT COUNTY: disturbed soil by James River, below old Fort Boykin, no. 13,741. See p. 361.

P. PUBESCENS L. Local range extended northward. ISLE OF WIGHT COUNTY: disturbed soil in bottomland woods along Blackwater River, above Broadwater Bridge, north of Zuni, no. 13,442. JAMES CITY COUNTY: calcareous fossiliferous bluff by James River, Grove Landing, southeast of Grove, no. 13,441.

SCROPHULARIA MARILANDICA L. Range extended into two additional Coastal Plain counties. MIDDLESEX COUNTY: rich wooded slope by Rappahannock River, Bay Point, no. 13 443. SURRY COUNTY: rich calcareous wooded ravines along James River, Claremont, no. 13,743. See p. 363.

CHELONE CUTHBERTII Small. SUSSEX COUNTY: swampy woods along Spring Creek, about 2 miles north of Henry, nos. 13,446 and 13,744.

*BACOPA **stragula,** sp. nov. (TAB. 728). Planta prostrata stragulos 0.5–3 dm. diametro formans; caulibus succulentis glabris valde ramosis repentibus ramis adscendentibus; foliis crassis opacis rotundo-ovatis sessilibus subamplexicaulibus 5–10 mm. longis 3.5–10 mm. latis apice rotundatis palmatinerviis nervis obscuris; floribus axillaribus, pedicellis 3–6 mm. longis adscendentibus vel patentibus deinde arcuato-recurvatis; sepalis exterioribus cordatis rotundo-ovatis apice rotundatis 4–6 mm. longis; corollis tubulosis albescentibus 4–5 mm. longis 5-lobatis, lobis apice subtruncato-rotundatis; staminibus 3 vel 4; capsulis ovoideis obtusis 2–4 mm. longis deinde nudis.—Fresh tidal muddy or sandy shores of rivers entering Chesapeake Bay, Maryland and Virginia. MARYLAND: Salisbury, September, 1863, *Canby*. VIRGINIA: Mattaponi River, Walkerton, September 1, 1940, *Fernald & Long*, no. 12,801; Mattaponi River at Horse Landing, near King William Courthouse, October 14 and 16, 1939, *Fernald & Long*, no. 11,613 (distributed as *B. cyclophylla* Fernald), August 31, 1940, *Fernald & Long*, no. 12,799; Mattaponi River northwest of King William Courthouse, August 31, 1940, *Fernald & Long*, no. 12,800; Chickahominy River, Walker, New Kent County, September 10, 1941, *Fernald & Long*, no. 13,746; Chickahominy River, Lanexa, New Kent County, September 13, 1941, *Fernald & Long*, no. 13,748 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); Chickahominy River, southwest of Windsor Shades, New Kent County, October 12, 1941, *Fernald & Long*, no. 14,010; Chickahominy River near Cypress Bank Landing, Charles City County, July 26, 1941, *Fernald & Long*, no. 13,447; Chickahominy River, Graves Landing, north of Holdcroft, Charles City County, September 10, 1941, *Fernald & Long*, no. 13,745; Chickahominy River, Wilcox Neck, Charles City County, September 13, 1941, *Fernald & Long*, no. 13,747; Chickahominy River, Matahunk Neck, Charles City County, October 12, 1941, *Fernald & Long*, no. 14,011. See pp. 355, 356 and 368.

Our earliest collection from Virginia was misidentified as *Bacopa cyclophylla* Fernald in RHODORA, xli. 446 (1939) = *Herpestis rotundifolia* Gaertn. f. (1807) not *Bacopa rotundifolia* (Michx.) Wettst. (1891); and Pennell, Scroph. E. Temp. N. Am. 69 (1935), cited the Maryland material of Canby as *Herpestis rotundifolia*. That species, however, is thin-leaved, the blades of the primary axes mostly 1–1.5 cm. long, the branches closely but minutely pilose, the pedicels up to 8 mm. long and pubescent, the stamens 2. So far as I can determine (and the translucent leaves of specimens are confirmatory), *Bacopa cyclophylla* (*Herpestis rotundifolia*) is aquatic or subaquatic; on the other hand, the new *B. stragula*, with thick and opaque leaves, glabrous branches, and 3 or 4, instead of 2, stamens, is a plant of tidal mud and sand. *B. cyclophylla* is apparently unknown from north of southeastern North Carolina, my statement in RHODORA, xlii. 479, 480 (1940), that our first known Virginia station connects "that at Wilmington, North Carolina, with the two in eastern Maryland" having been based on the misidentifications above referred to.

It is not clear to which of Pennell's segregates of *Bacopa* the new *B. stragula* belongs. By his treatment, l. c. 49 et seq., he then recognized three genera of the inclusive *Bacopa* with ebracteolate pedicels. These he separated by the following key:

"G. Capsule globose or ovoid, nearly equaling the sepals; outer sepal orbicular-oval to oblong.
H. Corolla 7–8 mm. long [in the key to species on p. 57 two of the three species are said to have "corolla 5–7 mm. long", the third "corolla 3–4 mm. long"], 5-lobed (because the two posterior and the 3 anterior lobes are all distinct); stamens 4; leaf-blades entire . 3. *Macuillamia*
HH. Corolla 2 mm. long, 3-lobed (because the 2 posterior lobes have united, and the anterior petal is lost, so leaving the anterior lip 2-lobed); stamens 3; leaf-blades repand . . . . 4. *Hydranthelium*
G. Capsule ellipsoid-ovoid, much shorter than the sepals; outer sepal orbicular-cordate; stamens 2 . . . . 5. *Herpestis*"

However, in the "Annotations and Corrections" at the end of the volume (p. 630) Pennell admitted "a species of *Macuillamia* . . . which showed corollas either 4- or 3- [in addition to 5-] lobed and stamens either 4 or 3 in number, thus bridging the supposed gap [supposed only as Pennell originated this departure from conventional practice] between these groups [*Macuillamia* and *Hydranthelium*]. Moreover, the species of *Hydranthelium* from Mazatlan bore entire leaf-blades, just as given in my key for *Macuillamia*. It is evident that the former species of *Hydranthelium* are to be considered merely as florally reduced members of a common genus for which the name should be *Hydranthelium*"; whereupon the species of *Macuillamia* were formally transferred to *Hydranthelium*.

With *Hydranthelium* thus absorbing *Macuillamia*, having the corolla 3-, 4- or 5-lobed and stamens either 3 or 4, we have left as reputed "generic" differences: *Hydranthelium* with the ovoid (or globose) "capsule nearly equaling the sepals; outer sepal orbicular-oval or oblong" and stamens 3 or 4; *Herpestis* with "Capsule ellipsoid-ovoid, much shorter than the sepals; the outer sepals orbicular-cordate; stamens 2." But now comes the limnophilous new *Bacopa* to muddy the supposedly clear water; for in *B. stragula* the short capsule and the cordate-rotund outer sepals are those of only 2-stamened *Herpestis* (as defined), the 5-lobed corolla is that either of *Herpestis* or of *Hydranthelium* (as revised by taking in *Macuillamia*), but the 3 or 4 stamens put *B. stragula* into readjusted *Hydranthelium*, which is now conceded to have either 3 or 4 stamens. If the number of stamens, whether 2 in *Herpestis* or 3 or 4 in *Hydranthelium*, is all that is left, there is little to separate these two reputed genera.[1] Incidentally, the newly described plant with 3 or 4 stamens but with cordate-rotund outer sepals and short capsule superficially more closely resembles *Herpestis rotundifolia* than the species placed by Pennell in *Hydranthelium*. In view of this author's recently announced preference for superficial or habital aspect as taxonomically superior to morphological differences in flower, fruit and seed, it is assumed that *Bacopa stragula*[2] might perhaps find its place in *Herpestis*. In his recent paper on *Scrophulariaceae of Trans-Pecos Texas*, Proc. Acad. Nat. Sci. Phila. xcii. 301 (1940) Pennell said, in discussing *Maurandya Wislizeni:* "Recently Dr. P. A. Munz (in Proc. Calif. Acad. Sci. IV. 15: 380, 1926) has revived Engelmann's proposed genus *Epixiphium* for this species; this was based wholly upon the fruiting characters (the accrescent sepals, the peculiar capsule, style, and seeds), but the flowering state and the habit of the plant are so similar to other species of *Maurandya* as to make such a segregation in my opinion undesirable". All sorts of possibilities suggest themselves if floral and fruiting morphology are to give way to habital aspect, a play to superficial ecology. How such sound morpholo-

[1] Those who make the artificial separation of these from *Bacopa* Aubl. (1775) should note that *Herpestis* Gaertn. f. (1807) has priority over *Hydranthelium* HBK. (1825) to which the species of *Macuillamia* Raf. (1825) have been transferred.

[2] In giving to *Bacopa stragula* this specific name I am using a common Latin adjective, found in most dictionaries of that language and meaning *forming a mat or carpet*. The first time I used this specific name was when I described an *Astragalus* (*A. stragulus*) of northern Newfoundland, which formed a dense and intricately woven carpet. Comparing it with a species of Jones (Marcus E.), I referred to his key-statement and diagnosis being perplexingly contradictory. This was enough for that militant warrior. He promptly announced that "The name straga[u]lus should not be used because it does not correspond phonetically with the genus name, and because there is no such adjective as stragalus in Latin, a fact that Fernald ought to know". Had Jones looked up the specific name *stragulus*, which was used, he could have found it. Continuing, he wrote: "He might have used stragalarius, or stragalensis, but has little authority for using a noun as an adjective, and none in a way that means nothing. Fernald recently seems afflicted with that disease known as 'caput intumescens'."—M. E. Jones, Contrib. to Western Bot. No. 15: 15 (1929). As to the latter disease, it was placed upon him by no other infector than the revered and universally loved Bailey, for the first plant with which the victim's name was publicly associated was discovered by him while still in his teens and named *Carex intumescens*, var. *Fernaldii* by Bailey. **What a pity that so great and so generous a man could not** have foreseen the life-long infection he was starting! If the species had only been any but *C. intumescens* (inflated)—*C. aenea* (brassy), *C. nervosa* (nervy), *C. torta* (twisted), *C. molesta* (troublesome), *C. Jonesii* (for Marcus Jones), *C. incomperta* (unknown), or almost any other—the calamity might have been avoided.

gists as Bentham, Engelmann, Gray or Wettstein would have cringed at such sophistry!

Plate 728 is of Bacopa stragula: fig. 1, portion of plant, × 1, from Graves Landing, north of Holdcroft, Virginia, *Fernald & Long*, no. 13,749; fig. 2, portion of type, × 1; figs. 3 and 4, flowers, × 3, from Salisbury, Maryland, *Canby;* fig. 5, corolla, laid open, × 10, from type (the anther at the right partly hidden under the lobe to the left, the next anther broken in desiccating); fig. 6, bud with 3 stamens, laid open, with ovary turned down, × 10, from type.

*B. **simulans,** sp. nov. (tab. 729). Planta decumbens basi radicans vel suberecta; caulibus succulentis glabris simplicibus vel sparse ramosis 0.5–2 dm. altis; foliis crassis subopacis rotundo-obovatis vel ellipticis apice rotundis 1–2 cm. longis 6–15 mm. latis palmatinerviis nervis obscuris; floribus axillaribus solitariis vel binis, pedicellis crassis rectis vel falcatis deinde divergentibus vel reflexis ad 5–11 mm. longis; sepalis exterioribus late ovatis apice rotundatis arctis 4–5.5 mm. longis; corollis tubulosis albescentibus 4 mm. longis 5-lobatis, lobis tubo aequantibus apice emarginatis, fauce flavo; staminibus 4 inclusis, antheris atropurpureis; capsulis ellipsoideis inclusis.—Charles City County, Virginia: sandy-muddy fresh tidal shore of Chickahominy River, Graves Landing, north of Holdcroft, September 10, 1941. *Fernald & Long*, no. 13,749 (type in Herb. Gray; isotype in Herb. Phil. Acad.); three plants collected by *E. J. Grimes* and mislabeled *Echinodorus tenellus* (no. 4135[1], cited by Pennell as 4136), the exact locality now obscure, the plants identified by Pennell as *Macuillamia obovata* Raf.

Although the hopelessly mislabeled specimens collected somewhere, presumably by Grimes (see discussions on pp. 355 and 368) have been taken by Pennell, Scroph. E. Temp. N. Am. 60 (1935) as *Macuillamia obovata* Raf., therefore *Hydranthelium obovatum* (Raf.) Pennell, l. c. 630, and *Bacopa obovata* (Raf.) Fernald in Rhodora, xxxix. 475 (1937), there is very great doubt whether Rafinesque ever saw this species. Here is Rafinesque's account:

> "333, *Macuill. obovata* Raf. glabr. vel hirsuta prostrata non flex. fol. obov. vel. ellipt. sessilib. obt. ped. fol. brevior. caps. globosa.—Virginia in the River Potomac. and in Louisiana, larger plant, leaves semiuncial" —Raf. Aut. Bot. 44 (1840).

[1] In the Gray Herbarium the material, clearly numbered 4135 and called *Echinodorus tenellus* from Lanexa, is *Sagittaria subulata;* on the label at New York the last digit is poorly typed, so that Pennell has cited it as 4136. In her *Flora of the Peninsula of Virginia*, Papers Mich. Acad. Sci, Arts and Lett. iv. 120 (1924) Eileen Whitehead Erlanson (formerly Mrs. Grimes) listed no. 4135 as *Echinodorus tenellus* and no. 4136 as *Eriocaulon Parkeri*. In the Gray Herbarium, likewise, no. 4136, the label written by Grimes, is *Eriocaulon*.

As Pennell, l. c. 60, states, no type of Rafinesque's species is known to exist, "certainly none in herbaria of the United States or in the Durand Herbarium . . . at Paris". To these can be added Geneva, for Dr. Hochreutiner writes me that there is nothing of it in the great herbaria there, which have many of Rafinesque's plants. Pennell, recognizing that Rafinesque's *M. obovata* was a probable mixture, attempted to sort out from among the few stated characters some for the plant of the Potomac, some for the plant of Louisiana. At best, however, there is little about Rafinesque's account to make it really safe, in the absence of actual specimens, thus to apportion the points between Louisiana and the Potomac and to apply the resultant name to a plant known only as a highly localized species at the head of tide on the Chickahominy, nearly 100 miles up-river from Chesapeake Bay and, following the isolated fresh tidal shores, several times that distance, around the forbidding saline shores, from the fresh estuary of the Potomac. *Bacopa simulans* is certainly not "prostrate", nor is its slenderly ellipsoid capsule "globose"; and its pedicels are not sufficiently "shorter than the leaves" as to attract notice. The generic account of *Macuillamia* by Rafinesque, Neogen. 2 (1825), called for "cor. four cleft". Since the plant of the Chickahominy, *Bacopa simulans*, has the corolla 5-cleft, it seems like a forced misinterpretation of Rafinesque's confused account to identify it with his *Macuillamia obovata*, with prostrate stems, short pedicels, 4-cleft corolla and globose capsules. I apologize for having so ignorantly made the needless combination *B. obovata*.

If one is seeking a plant presumably of the Potomac or of tidal rivers entering Chesapeake Bay north of the mouths of the Chickahominy and the James, with obovate leaves, pedicels much shorter than the leaves, corolla 4-cleft, and globose capsule, he can find it in *Gratiola virginiana* var. *aestuariorum* Pennell (see PL. 730, FIG. 3), a plant which, repeatedly overflowed by tidal water, may be quite depressed or prostrate. Var. *aestuariorum* is cited by Pennell, l. c. 630, as extending northward to the Delaware drainage.

Returning to *Bacopa simulans*, the name is given from its habital resemblance to *B. rotundifolia* (Michx.) Wettst. That usually coarser and prostrate aquatic of fresh water, chiefly of the Mississippi drainage, however, has the stems copiously hirsute, the thin and clearly nerved leaves more rounded, the larger ones 2–3.5 cm. long and 1.5–2.7 cm. broad, the slender and pubescent pedicels 0.8–2 cm. long, the rather showy campanulate corolla 6–8 mm. long, with wide-spreading limb about as broad. *B. simulans*, on the other hand, is a relatively small, merely decumbent to erect plant of tidal shore, with glabrous stems and pedicels, the more opaque leaves only 1–2 cm. long and 0.6–1.5 cm. broad, the thick pedicels at most 11 mm. long, the insignificant corolla 4 mm. long and 2 mm. broad.

PLATE 729 is of BACOPA SIMULANS, from the TYPE-material: FIG. 1, habit, × 1; FIG. 2, corolla, laid open, × 10.

*GRATIOLA VIRGINIANA L., forma **acutidens,** f. nov. (TAB. 730, FIG. 1 et 2), robusta 3.5 dm. alta; foliis primariis lanceolato-acuminatis 6–7 cm. longis divergente serrato-dentatis, dentibus lanceolatis vel lanceolato-falcatis 3–6 mm. longis; sepalis 8–9 mm. longis capsulis valde longioribus.—Henrico County, VIRGINIA: "Manchester", opposite Richmond, May 7, 1894, *J. R. Churchill* (TYPE in Herb. Gray.).—An extraordinarily robust form, differing at once from typical *G. virginiana* (FIGS. 4 and 5) in its large and long-attenuate leaves with long and slender teeth, and in the sepals strongly overtopping the capsule.

*G. VIRGINIANA, var. AESTUARIORUM Pennell. KING AND QUEEN COUNTY: fresh tidal marsh of Mattaponi River, Walkerton, no. 13,143. KING WILLIAM COUNTY: fresh tidal marsh of Pamunkey River, Sweet Hall, nos. 13,142 and 13,144. NEW KENT COUNTY: fresh tidal marsh by Chickahominy River, southeast of Windsor Shades (Boulevard Postoffice), no. 13,454. NANSEMOND COUNTY: muddy rill in swampy woods east of Milk Landing, south of South Quay, no. 11,428. See p. 356 and PLATE 730, FIG. 3.

Var. *aestuariorum*, based by Pennell upon material from Salisbury, Maryland, was described as "erect, with closely ascending branches. Leaf-blades oval, 1.5–2.5 cm. long, crenate-undulate to entire. Pedicels less than 1 mm. long, so that the flowers are nearly sessile. Capsule 3–4 mm. long." An isotype before me conforms to this description and our nos. 13,142 and 13,143 well agree with it, except that they have pedicels 3–5 mm. long. Other material (Salisbury, Maryland, October 3, 1863, *Canby*, and our nos. 11,428 (FIG. 3) and 13,454), all with sessile or nearly sessile fruits, is depressed and widely branching at base. It is far more extreme than the type. Typical or at least ordinary

G. virginiana has the upper or bracteal leaves lanceolate to oblong or narrowly elliptic and subacute to acute, only rarely quite obtuse. It is a thin-leaved plant, often with pedicels 0.8–1.3 cm. long (FIG. 4) but not rarely with the flowers subsessile (FIG. 5). As the fuller collections from tidal shores and their vicinity seem to indicate, the plant of such habitats consistently has the upper leaves blunt or rounded at tip and varying from elliptic to obovate. They are, naturally, of fleshy texture. With this extended meaning I am maintaining var. *aestuariorum*. It is not without significance, however, that *G. virginiana* L. Sp. Pl. i. 16 (1753) rests exclusively on the plant, no. 379, of Clayton, "*Gratiola foliis lanceolatis obtusis vix dentatis*". When in 1917–18 Blake (RHODORA, xx. 65) and in 1930 Pennell saw the type they presumably did not recognize the common inland plant and var. *aestuariorum*, published in 1935, as separable. The latter can hardly be described as having the leaves lanceolate; states of the former could. The Gloucester County specimens noted by Pennell, Scroph. E. Temp. N. Am. 92 (1935), *Pennell*, no. 12,700, as coming from "close to the home of John Clayton", have the leaves oval to obovate and obtuse and the fruits nearly sessile. A good photograph of the type of *G. virginiana* is in order, when the Clayton plants become available.

In PLATE 730, FIGS. 1 and 2 are from the type of GRATIOLA VIRGINIANA, forma ACUTIDENS, × 1; FIG. 3, summit of var. AESTUARIORUM, × 1, from near Milk Landing, south of South Quay, Virginia, *Fernald & Long*, no. 11,428; FIG. 4, fruiting node, × 1, of G. VIRGINIANA, from Norfolk, Virginia, May 3, 1894, *Churchill*, identified by Pennell; FIG. 5, summit of G. VIRGINIANA, × 1, from Louisiana, *Hale*, validated by Pennell.

ANOTHER INTERPRETATION OF LINDERNIA DUBIA (PLATES 731–733). In his Scrophulariaceae of Eastern Temperate North America (Acad. Nat. Sci. Phila. Mon. i), 137, Pennell, in a healthy spirit of conservatism, reduced *Ilysanthes* Raf. (1820) to *Lindernia* All. (1766). With this reduction all who are of conservative mood will agree. The first American species described in the group was *L. dubia* (L.) Pennell, l. c. 141, resting upon *Gratiola dubia* L. Sp. Pl. i. 17 (1753), "*Habitat in* Virginiae *aquosis*", *G. dubia* resting for typification upon *Clayton*, no. 164, which had been described by Gronovius, Fl. Virg. ii. 129 (1743), "*GRATIOLA floribus pedunculatis, foliis ovatis crenatis*", this diagnostic phrase taken over directly by Linnaeus.

Ilysanthes dubia consists of three clearly intergrading varieties, two of fresh to barely brackish mud and shores, one of tidal shores. The last variety, well characterized by its elliptic to obovate round-tipped leaves, and nearly always cleistogamous flowers on pedicels only 1–5 (very rarely –10) mm. long, the pedicels much shorter than the bracteal leaves. This is var. *inundata* (Pennell) Pennell, l. c. 150 (1935), resting upon his earlier (1919) *Ilysanthes dubia inundata*. In some ways the most extreme trend in the species, var. *inundata* is shown in PLATE 733.

The other two varieties have the bracteal leaves more tapering at apex, merely bluntish or acute, not strongly rounded and obovate. In the plant which Pennell considers typical *L. dubia* (PLATE 732) the bracteal leaves become, as the axes prolong strongly reduced in size. They are then lanceolate to lance-ovate or oblong and only 1–6 mm. broad, and exceeded by the upper pedicels which range from 0.5–2 cm. long. In this plant the larger foliage-leaves are narrowly elliptic or narrowly ovate and gradually narrowed to base (I find no justification for Pennell's characterization (l. c. 142) of them as "cuneate"); furthermore, all but the latest flowers have expanded corollas, though late in the season they may be cleistogamous. As Pennell says (l. c.) "integradation is complete between *L. dubia major* and *L. dubia typica*"; he therefore treats them as "subspecies", a degradation of an honorable term clearly exposed in RHODORA for May of this year. But, on the whole, *L. dubia major* (Pursh) Pennell, as subsp., l. c. 146, is a reasonably good variety (PLATE 73). Its most conspicuous character is the nearly uniform foliage-leaves and bracts. The latter are only slightly or scarcely smaller than the former, with more gradually rounded bases (therefore ovate) and less acute tips. They consistently overtop the pedicels, the latter ranging from 0.5–1.7 cm. long, the upper bracts being 5–10 mm. broad. This plant produces normal expanded corollas until late in the season. In its aggregate of characters it stands midway between Pennell's *L. dubia* subsp. *typica* and his var. *inundata*, and it frequently ventures, without more serious alteration than becoming of more fleshy texture, upon tidal shores, just as the obovate- and obtuse-leaved var. *inundata* will sometimes stray slightly from tidal flats and, getting into deep shade, become thin-leaved and etiolated.

On the whole the three varieties of *Lindernia dubia* are reasonably well marked. It seems to me, however, that, in defining the three, Pennell over-stressed the "cuneate" base of the leaf in his *L. dubia typica* and that his recollection of the Linnean type must have been obscured by time. Pennell (l. c. 41, 42) wrote: "Based primarily upon Clayton 164, which I have seen in the Clayton Herbarium of the British Museum (Natural History) in London. In this the leaf-blades are nearly all narrowed to base, yet the spreading pedicels were 15 mm. long—a combination of characters that denotes the prevalent plant of the Central Lowland . . . As the authors of both our recent northeastern manuals have been unaware of the plant now considered with its combination of cuneate leaf-blades with long pedicels, it is natural that . . . Dr. Robinson (Gray's New Man. ed. VII. 725. 1908) stressed instead the cuneate lower leaves and so applied the name to what I am now calling *L. dubia major*." It so happens that the joint editors of Gray's Manual, ed. 7, were Robinson & Fernald and, by a division of responsibility agreed upon, each of us "did" certain groups. Joint authorship, however, was assumed for all groups, and I do not find any mention in the treatment in the *Manual* of "cuneate" leaves in *L. dubia*. Instead, this is the unaltered text: "leaves ovate, rounded, or oblong, . . . the upper partly clasping, the lower more or less narrowed to base".[1] This description was checked by a tracing (PLATE 731, FIG. 4) of Clayton's no. 164, TYPE of the species, sent by Mr. Edmund G. Baker to the Gray Herbarium. Although a poor fragment, the tracing of *Clayton* no. 164 shows the lower bracts oval and rounded at base as in *L. dubia major* (Pursh) Pennell. This is quite in agreement with the "*foliis ovatis crenatis*" of Gronovius and of Linnaeus. *Cuneate*, from *cuneus*, a wedge, implies straight lines converging to the basal angle. Anyone who tried to use a wedge with the rounded sides of the lower bracts of the type of *Gratiola dubia* would have his work cut out for him. It seems to me that the type of *Gratiola*

[1] Somewhat earlier Dr. Robinson had discussed the type of *Gratiola dubia* L. He did not note "cuneate" leaves but said: "To make sure of this identity the writer applied to Mr. E. G. Baker of the British Museum of Natural History to examine the still extant specimen of Clayton. This he most kindly did and sent a tracing of it to the Gray Herbarium [PLATE 731, FIG. 4] showing conclusively its identity with the larger-leaved relatively shorter-pediceled form, which Dr. Small has called *I[lysanthes] attenuata*".—Robinson in RHODORA, x. 67 (1908).

dubia, therefore of *Lindernia dubia*, was a fragment of the plant which Pennell calls *L. dubia major*. When the actual specimen can be examined we may possibly find that Gronovius and, after him, Linnaeus were in error in describing the "foliis ovatis"; they certainly did not say "cuneatis". My faith, however, based upon long experience with their precision, is such that I am treating as typical *L. dubia* the plant treated by Pennell as *L. dubia major*. I am, therefore, taking the chance of overloading synonymy by calling the plant with much reduced upper bracteal leaves equaled or overtopped by the upper pedicels

LINDERNIA DUBIA (L.) Pennell, var. **riparia** (Raf.) comb. nov. *Ilysanthes riparia* Raf. Ann. Nat. 13 (1820). *L. dubia typica*, sensu Pennell, Acad. Nat. Sci. Phila. Mon. i. 141 (1935), not *Gratiola dubia* L. Sp. Pl. i. 17 (1753). PLATE 732.

As to the type locality of *Gratiola dubia*, Linnaeus said only Virginia and Clayton and Gronovius gave nothing more definite. In view of Clayton's well known trips far from Gloucester County it could have come from a remote area, although it is frequent enough in the eastern counties. Pennell seems to have inferred that the type came from Gloucester County. At least, as coming from "Near type locality", he has distributed tiny plants (PLATE 733, FIG. 3) from a "wet draw in forest" near James Store, Gloucester County, *Wherry & Pennell*, no. 12,698, as *Ilysanthes dubia*, although in his later treatment he called it *Lindernia dubia* subsp. *major*. The specimens are tiny, obviously etiolated from growing in the woods, with unusually long petioles, with obovate blades broadly rounded above, with pedicels very short, and the label bears the note: "Corolla falling unopened". Why is it not an etiolated woodland development of *L. dubia*, var. *inundata* (PLATE 733, FIGS. 1 and 2) which was described with "Leaf-blades oval, all broadly rounded or obtuse; fruiting pedicels 3–5 mm. long; only the earliest corollas, if any, opening . . . nearly all the corollas falling unopened and the flowers habitually self-pollinated . . . ; plant erect"? No. 12,698 meets all these requirements; it strongly contradicts the definition of *L. dubia major* (PLATE 731), under which it is cited: "Leaf-blades oblanceolate to ovate-lanceolate, usually only the lower obtuse or rounded at apex; fruiting pedicels at least 5 mm. long; earlier corollas habitually opening; plant diffuse".

Of the plant (PLATE 732), with reduced upper bracts and prolonged pedicels, *Lindernia dubia*, var. *riparia*, the *L. dubia typica* of Pennell, "the prevalent plant of the Central Lowland which from the Ohio valley crosses the Appalachians through the Potomac valley to the Chesapeake Bay of Virginia" (Pennell, l. c. 141), it is a striking fact that in his enumeration of specimens Pennell cited from all Virginia only a single collection and that from Fairfax County, in the extreme northeast; but for the plant which he did not consider to be typical *L. dubia* (his *L. dubia major*) he had a whole paragraph of Virginia citations, including specimens from many of the eastern counties where the plant abounds: Hanover, Northampton, Warwick, Mathews, James City, Norfolk, Princess Anne and others. If it is right to assume that Clayton would have collected the commonest variation of the species "*in* Virginiae *aquosis*", it is natural to believe that he would get the *commonest* variation!

As stated, in southeastern Virginia typical *Lindernia dubia* (*L. dubia*, subsp. *major* Pennell) is common. Besides the counties cited by Pennell the following are represented by our specimens: Nansemond, Southampton and Greensville.

Var. RIPARIA (Raf.) Fernald. Our only collections from the tidewater counties are as follows. JAMES CITY COUNTY: moist soil, site of old pond, ½ mile south of Ewell, *Grimes*, no. 4489 (see FIG. 2), cited by Pennell as the latter (his subsp. *major*). PRINCESS ANNE COUNTY: clay ditches bordering pine woods, Virginia Beach, no. 4179. GREENSVILLE COUNTY: wooded bottomland, Fontaine Creek, southwest of Haley's Bridge, no. 14,014, late flowers, on October 14, all cleistogamous (FIG. 3).

Var. INUNDATA Pennell. To the two Virginia stations cited by Pennell add the following. GLOUCESTER COUNTY: wet draw in forest, James Store, *Wherry & Pennell*, no. 12,698 (see FIG. 3). CAROLINE COUNTY: sandy and muddy tidal shore of Rappahannock River, northwest of Return, no. 14,016. KING WILLIAM COUNTY: fresh tidal shore of Mattaponi River, at Horse Landing, near King William Courthouse, no. 11,612. NEW KENT COUNTY: fresh tidal marsh by Chickahominy River, southeast of Windsor Shades (Boulevard Postoffice), no. 13,453, plants in shade, leaves thin and dilated and pedicels elongate. CHARLES CITY COUNTY: fresh tidal shore of Chickahominy River, Matahunk Neck, no. 14,015; sandy tidal margin of Chickahominy River, Ferry Point, no. 11,141; sandy tidal shore of James River at "Four Oaks", below Harrison Point, no. 11,427. SURRY COUNTY: fresh to brackish tidal marshes, Hog Island, no. 12,803. PRINCE

George County: muddy tidal shore of James River, Jordan Point, no. 9430. See p. 356.

Plate 731 is of Lindernia dubia (= subsp. *major* Pennell), all × 1: fig. 1, small plant from Hanover, New Hampshire, July 14, 1910, *E. F. Williams*; fig. 2, portion of plant from Louisiana, *Hale*, identified by Pennell as subsp. *major*; fig. 3, flowering tip from Marshall, Madison County, North Carolina, *Wherry & Pennell*, no. 14,254, cited by Pennell as subsp. *major*; fig. 4, tracing of type of Gratiola dubia L. (cf. fig. 2).

Plate 732 is of Lindernia dubia, var. riparia, all × 1: fig. 1, from Vienna, Illinois, *Gleason*, no. 2640; fig. 2, portion of plant from south of Ewell, Virginia, *Grimes*, no. 2289, but cited by Pennell under his subsp. *major*; fig. 3, tips (cleistogamous) of plant from Fontaine Creek, southwest of Haley's Bridge, Greensville County, Virginia, *Fernald & Long*, no. 14,014.

Plate 733 is of Lindernia dubia var. inundata, all × 1: fig. 1, portion of topotype, from Delair, New Jersey, *Pennell*, no. 6496; fig. 2, portion of loosely spreading plant from below Harrison Point, James River, Virginia, *Fernald & Long*, no. 11,427; fig. 3, three etiolated woodland plants from James Store, Gloucester County, Virginia, *Wherry & Pennell*, no. 12,698, distributed as typical *Ilysanthes dubia* (L.) Barnhart (*Gratiola dubia* L.) from "near type locality" of *G. dubia*, but later cited as *L. dubia* subsp. *major*.

Micranthemum micranthemoides (Nutt.) Wettst. Range extended south from the Potomac to fresh tidal shores of the Chickahominy. New Kent County: Walker, no. 13,752; Lanexa, no. 13,754. Charles City County: Cypress Bank Landing, nos. 13,380 and 13,750; Graves Landing, north of Holdcroft, no. 13,751; Wilcox Neck, no. 13,753. See pp. 356 and 368.

M. umbrosum (Walt.) Blake. Range extended into Greensville County: on logs and at muddy margin of Fontaine Creek, southwest of Haley's Bridge, no. 14,013. A new station in Southampton County: sandy alluvial bottomland of Three Creek, Adams Grove, no. 14,403. See pp. 367 and 375.

*Gerardia flava L., var. reticulata (Raf.) Cory. Extended north from North Carolina. Nansemond County: dry sandy woods and adjacent clearings, Kilby, no. 5033. Isle of Wight County: dry sandy oak woods, southeast of Zuni, no. 14,018. Sussex County: sandy alluvial woods, bottomland of Nottoway River, southwest of Burt, no. 6392 (as *G. laevigata*); rich woods by Nottoway River, southeast of Stony Creek, no. 13,757. Exsiccated argillaceous pineland about 2 miles east of Stony Creek, no. 9144. Prince George County: dry sandy woods and clearings about 3 miles southeast of Petersburg, at head of Poo Run, no. 6693. Caroline County: wooded alluvium of Mattaponi River, south of Milford, no. 7603 (as *G. laevigata*). The early misidentifications kindly corrected by Dr. Pennell.

G. purpurea L., forma albiflora Britton. Southampton County: damp clearing in woods along Blackwater River, east of Oak Grove School, no. 13,758.

The Authorship of Melampyrum lineare, var. lati-

FOLIUM (PLATES 734–736).—The name *Melampyrum latifolium*, with no word of description but merely with a translation of the name, "broad-leaved", just as all trivial names in the work were translated or explained ("Pennsylvanica . . . Pennsylvanian"; "ovata ovate-leaved"; "leptostachya . . . small-flowered" [the original "translation" by Muhlenberg]; "phrymoides phryma-like"; "spuria . . . spurious"; "officinalis . . . officinal"; "bracteosa . . . leafy"; "paniculata . . . panicled"; "coccinea . . . scarlet"; "pallida pale"; "crista galli . . . cock's comb"; "rotundifolia round-leaved" and "euphrasioides [like] eyebright") occurred in Muhlenberg, Cat. 57 (1813). As stated, it had no word of specific diagnosis and merely the statement of habitat, "Delaw." Although from Muhlenberg's translation of the trivial name and the Latin name itself it is possible for those who glorify vague publication to argue that his trivial name was equivalent to a description, it certainly cannot be urged that the parallel cases in the same column, "eyebright", "American" "officinal" and "spurious" were new diagnoses.

In Acad. Nat. Sci. Phila. Mon. i. 512 (1935) Pennell credits the proper publication of *Melampyrum latifolium* to Muhlenberg as validated by Eaton, Man. ed. 2: 316 (1818). It is, therefore, rather unedifying to see just what Eaton actually said: "*latifolium* (C[1]) leaves broad. I have no description of this species, nor a specimen". That is all! If, by merely repeating as "leaves broad" Muhlenberg's original translation of *latifolium*, "broad-leaved", and explicitly stating that he had no description nor specimen to stand for it, Eaton was guilty of publishing an intelligible diagnosis, why should those who are satisfied by such unnutritious matter ever go to the trouble to write a real diagnosis? In his Flora Ludoviciana Rafinesque based his half-imaginary descriptions only upon Robin's impressionistic accounts, although he did not have the plants before him. Rafinesque, who is not a good model, at least had plenty of words; Eaton in ed. 2 had no words of description, had seen none and had no specimen and honestly admitted the fact.

The first time that Eaton gave anything resembling a diagno-

[1] Meaning, according to Eaton's explanation (p. 120) "Columbia college. Plants which grow about New York"

sis of the broader-leaved plant was in his ed. 3: 350 (1822), when he recognized a single species, *Melampyrum americanum* Michx., properly defined, with "lower leaves linear entire; floral ones lanceolate, toothed behind", etc., and under it, without any mention of Muhlenberg, "Var. *latifolium*, has very broad leaves". That met the minimum requirements and is a description, because associated, as a variety, with a described species; but it was not the first valid publication under the name *latifolium*.

In his Monograph (1935) Pennell, arguing that "subspecies" and "varieties" are the same, took up for the plant in question the trinomial "*Melampyrum lineare latifolium* (Muhlenb.)", wrongly ascribing it to Beauverd in Mém. Soc. Phys. et Hist. Nat. Genève, xxxviii. 474 (1916); wrongly, because Beauverd definitely called the plant "Var. α. *latifolium*", because Muhlenberg had given no diagnosis, therefore can hardly be recognized as the author of a validly published name, because Beauverd did not consider it a subspecies and because the latter author did not disguise the rank of the plant by the obscure trinomial. Beauverd correctly understood and discussed the differences between true subspecies, varieties and forms, having a special chapter upon these categories, and dividing the Old World *M. pratense*, for example, into two subspecies and these into varieties and forms. Exact bibliography would not quote him as doing what he intentionally did not do. The first treatment of the plant in question as a subspecies was in 1927, when it was called *M. lineare*, subsp. *latifolium* Soó in Fedde, Repert. Spec. Nov. xxiv. 189 (1927).

In all these treatments the monographers seem entirely to have ignored the first legitimate publication of *Melampyrum lineare*, var. *latifolium*. Barton, in his time a well known Philadelphia botanist, recognized *M. lineare* and under it properly published β. *latifolium* Barton, Compend. Fl. Phila. ii. 49 (1818), with no word of reference to Muhlenberg, with "all the leaves lanceolate". This antedates by 98 years the similar varietal combination of Beauverd and by 112 years the same combination by Farwell; but, going back still farther, to Barton, Fl. Phila. Prodr. 64 (1815), we find a series of columns somewhat parallel with those of Muhlenberg's Catalogus, the second column giving translations or explanations of the Latin names ("ovalifolia . . . oval, or elliptic-leaved"; "Pennsylvanica . . . Pennsylvanian"; "spuria . . . spurious"; etc.) and, farther to the left, columns giving specific characters. At the bottom of p. 64 occurs *Melampyrum Americanum* Michx., var. β. *latifolium*, characterized as having a white corolla and "foliis lanceolatis". That was a definite diagnosis, not a mere translation of the Latin; it antedates Barton's *M. lineare*, var. *latifolium* by three years and was, apparently, the first diagnosis of the plant.

Although somewhat arbitrarily divided into varieties, nevertheless the typical developments of these plants are distinctive, and each has its chief area of concentration: typical *Melampyrum lineare* the most northern, not extending south of the northernmost states and at its southern limit, in northern New England, principally on peaty mountain-summits between 2000 and 4400 feet high; var. *americanum* more southern; var. *pectinatum* decidedly eastern, occurring chiefly on the Coastal Plain from eastern Massachusetts to Virginia, but locally inland; and var. *latifolium*, the broadest-leaved plant, eastern, with concentration largely on the Piedmont and Appalachian region south to Georgia. The following key to them may be of service.

a. Principal leaves of primary axis linear to narrowly lanceolate, 1–10 mm. broad; mature internodes separating the 2 lowest fruiting nodes of the primary axis 0.5–3 cm. long; lowest bracteal leaf of primary axis 1–4 (–6) cm. long and 1–10 (–20) mm. broad. . . . *b.*

b. Stem simple or loosely few-branched, 0.5–2 dm. high, the simple branches only 1–10 cm. long; foliage-leaves and bracts linear, 1–4 (–6) mm. broad, all entire or the uppermost bracts rarely toothed at base; mature capsule 3–5 mm. broad. . . . . *M. lineare*, var. *lineare*.

b. Stem usually bushy-branched (exceptionally unbranched), (1–) 2–5 dm. high, the branches in well developed plants 0.2–2.5 dm. long; foliage-leaves linear to lanceolate, 2–10 mm. wide; larger bracts linear-lanceolate to lance-ovate, 3–20 mm. broad, some or all of them sharply toothed at base; mature capsule 3.5–6 mm. broad.

Branches mostly simple or with few short or flexuous branchlets; foliage-leaves 2–10 mm. broad; bracts (excluding teeth) up to 20 mm. broad, the lower ones 2.5–6 cm. long; basal teeth of the middle and upper bracts shorter than breadth of bract. . . . . Var. *americanum*.

Branches mostly stiffly forking, the plant thus intricately branched and very leafy with linear leaves; foliage-leaves 2–6 mm. broad; bracts (excluding teeth) 1–7 mm. broad, the lowermost 1–3.5 cm. long; basal teeth of the middle and upper bracts about as long as breadth of bract. . . . . Var. *pectinatum*.

a. Principal leaves of primary axis 0.5–3 cm. broad, lanceolate to narrowly ovate; mature internode separating 2 lowest nodes of primary axis 3–4.5 cm. long; lower foliaceous bracts of primary axis broadly lanceolate to ovate, 3–7 cm. long and 1–3 cm. broad, the bracts all toothless or the middle and upper ones with relatively short basal teeth; branches of plant few, simple or only loosely few-forked . . . . Var. *latifolium.*

M. LINEARE Desr., var. LINEARE (Desr.) Beauverd in Mém. Soc. Phys. et Hist. Nat. Genève, xxxviii. 475 (1916). *M. lineare* Desr. in Lam. Encycl. Meth. iv. 22 (1797). *M. americanum* Michx. Fl. Bor.-Am. ii. 16 (1803) in part (only the plant of Hudson Bay). *M. brachiatum* Schwein. in Keating, Narr. Exped. St. Peters R. ii. 391 (1824). *M. lineare*, var. *lineare*, forma *brachiatum* (Schwein.) Beauverd, l. c. 476 (1916). *M. lineare typicum* (as subspecies) Pennell in Acad. Nat. Sci. Phila. Mon. i. 509 (1935).—Bogs, heaths and peaty or rocky barrens, Newfoundland and southern Labrador Peninsula to northern Alberta and British Columbia, south to Nova Scotia, eastern and northern Maine, alpine areas (up to 4400 feet) of Maine, New Hampshire and Vermont, northern Michigan, northern Wisconsin, northwestern Montana, northern Idaho and Vancouver Island. PLATE 734.

Although various authors quote from the original very detailed account, they seem not, until Pennell, to have looked at the signature at the end of the treatment of *Melampyrum* in Lamarck's Encyclopedia. Most, including *Index Kewensis*, cite it without question as the work of Lamarck. Nevertheless at the end of the treatment of the genus (p. 23) acknowledgment is definitely given: "Par M. DESROUSSEAUX." In fact Desrousseaux was author of all generic treatments in the first part of the volume: from *Malvastrum* on page 1 through *Meniscium* on page 94. Then come a series of unsigned generic treatments (presumably, since not signed, by Lamarck), beginning with *Menispermum* on page 94, then *Mentha*, *Mentzelia*, &c., on until on page 128 "le citoyen POIRET" discussed philosophically the subject METHODE. Other genera treated were done, not by Lamarck, but by his collaborators: *Mnium* by Vintenat, others by Poiret and so on. In fact, Poiret seems to have been assigned a batch of terms or genera beginning with the French word Moelle (p. 244), continuing the articles, whether on morphology, *Mucor*, *Monarda*, Monocotylédons, through Monotrope (*Monotropa*). It is clear, then, that by no means all the species published in Lamarck's Encyclopedia were Lamarck's, and, although *Index Kewensis* credits him with *Melampyrum lineare*, it correctly credits Desrousseaux with new species of *Melanthium*, *Melastoma* and some other genera for the treatment of which Lamarck gave the same acknowledgment, "Par M. DESROUSSEAUX".

Var. AMERICANUM (Michx.) Beauverd in Mém. Soc. Phys. et Hist. Nat. Genève, xxxviii. 475 (1916). *M. americanum* Michx. Fl. Bor.-Am. ii. 16 (1803) in part. *M. lanceolatum* Raf. Aut. Bot. 160 (1840). *M. pratense*, β. *Americanum* (Michx.) Benth. in DC. Prodr. x. 584 (1846), as to source of name.—Dry woods, Anticosti Island, Quebec, to Minnesota, south to Nova Scotia, New England, Long Island, Maryland and upland to North Carolina and Tennessee; northwestern Montana and northern Idaho. PLATE 735.

Michaux made no differentiation of the variations, calling them all *Melampyrum americanum* "a sinu *Hudsonis* ad montosam Carolinam". The material preserved at Paris was studied by me in 1903 and a photograph of it is before me. It consisted of a mixture of immature possible *M. lineare*, already published by Desrousseaux in 1797, and a plant and fragment (FIGS. 1 and 2) of what I am calling var. *americanum*. It is possible to take either of these as standing for *M. americanum*, and in 1935 Pennell chose to consider the narrowest-leaved plant, not here shown (possibly typical *M. lineare*) as primarily meant by Michaux. That may perhaps be so, but Michaux's "foliis lineari-lanceolatis; superiorum basi parce setaceo-dentata" is as good, if not better, for the common narrow-leaved plant with the middle and upper bracts sharply toothed at base as for the most northern extreme (*M. lineare*, var. *lineare* Beauverd), which was originally and correctly described "foliis linearibus, integerrimis" and again "Les feuilles sont . . . linéaires, . . . entières". At any rate, Beauverd in his monograph of the genus in 1916, had already made the choice from the three Michaux pieces; he selected, not the boreal and alpine plant with linear leaves and entire bracts, but the one which is common southward, with narrowly lanceolate leaves, the middle and upper bracts toothed, and he cited as illustrating it Britton & Brown, Ill. Fl. iii. fig. 3340 (1898). Beauverd having first made the decision as to which of Michaux's mixed material should stand as type of *M. americanum*, I follow him, especially since I am recognizing that plant as a reasonably good geographic variety.

Var. **pectinatum** (Pennell), stat. nov. *M. lineare pectinatum* (as subsp.) Pennell, l. c. 515 (1935).—Dry sandy pineland and oak scrub, eastern Massachusetts, Rhode Island and southeastern New York to Virginia: northern Indiana. PLATE 736, FIG. 1.

In eastern Virginia found in PRINCESS ANNE COUNTY: Cape Henry (various collectors).

Var. LATIFOLIUM Barton, Compend. Fl. Phila. ii. 49 (1818); combination independently published by Beauverd, l. c. 47 (1916) and by Farwell in Am. Midl. Nat. xii. 72 (1930). *M. americanum*, var. *latifolium* Barton, Fl. Phila. Prodr. 64 (1815). *M. latifolium* Britton in Britton & Brown, Ill. Fl. iii. 188, no. 3341 (1898), ascribed to Muhlenberg who gave no diagnosis. *M. lineare*, subsp. *latifolium* Soó in Fedde, Repert. Spec. Nov. xxiv. 189 (1927). *M. lineare latifolium* (as subsp.) Pennell, l. c. 512 (1935).—Dry or moist woods, southwestern Quebec and New York to southern New England, Long Island, Virginia, and on the upland to Georgia, less common than var. *americanum*. PLATE 736, FIG. 2.

In eastern Virginia known only from the Eastern Shore.

PLATE 734 is of typical MELAMPYRUM LINEARE: FIG. 1, upper half of Desrousseaux's TYPE, × 1, from photograph by *Cintract;* FIG. 2, branching plant, × 1, from summit of Rumford Whitecap Mt., Rumford, Maine, *Pease*, no. 19,420; FIG. 3, small unbranched plant, × 1, from no. 19,420; FIG. 4, bracts and fruit, × 2, from no. 19,420.

PLATE 735, var. AMERICANUM: FIG. 1, portion of the larger of the three preserved Michaux specimens, × 1, transitional between typical M. LINEARE and var. AMERICANUM (note toothed bracts near center and lanceolate leaves); FIG. 2, the fertile tip, × 1, in Herb. Michaux, apparent basis of Michaux's description of M. AMERICANUM with leaves, the "superiorum basi parce setaceo-dentata"; FIG. 3, summit of median axis in fruit, × 1, from Eel Lake, Yarmouth County, Nova Scotia, *Fernald, Bean & White*, no. 22,471. FIGS. 1 and 2 from photograph by *Cintract.*

PLATE 736, FIG. 1, var. PECTINATUM: portion of ISOTYPE, × 1, from Toms River, Ocean County, New Jersey, *Pennell*, no. 6522. FIG. 2, var. LATIFOLIUM: portion of main flowering axis, × 1, from Highlands, North Carolina, July 13, 1901, *T. G. Harbison.*

THE SEVENTH CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA

M. L. Fernald

(*Continued from page 452*)

*Diodia virginiana L., var. **attenuata,** var. nov., planta gracillima; foliis anguste lanceolatis membranaceis basi apiceque valde attenuatis; fructibus subcylindricis 2.5–3.5 mm. diametro; calycis lobis linearibus.—Virginia: open muddy and sandy borders of pools, alluvial bottomlands of Three Creek, Drewryville, Southampton County, September 14, 1941, *Fernald & Long*, no. 13,765 (type in Herb. Gray.; isotype in Herb. Phil. Acad.).

The common and typical *Diodia virginiana* is relatively coarse, with the thick lanceolate to narrowly oblong leaves sessile and only slightly tapering at tip; its fruits are ellipsoid, 3.5–5 mm. in diameter, and crowned by lanceolate calyx-lobes. Var. *attenuata* is slender, relatively weak, with thin or membranaceous narrowly lanceolate leaves attenuate to petiolar bases and to prolonged tips; the slender fruits only 2.5–3.5 mm. broad and crowned by slenderly linear calyx-lobes. It dominates large areas of open muddy and sandy depressions on the bottomlands of Three Creek, where during the summer and autumn of 1940 it was not subject to inundation; nor is it the immediate result of shading, since the open areas of these bottoms are no more shaded than are many other areas where the broader-leaved and thicker-fruited plant abounds. See p. 367.

D. virginiana, forma **hirsuta** (Pursh), stat. nov. *D. hirsuta* Pursh, Fl. i. 106 (1814). *D. virginiana*, γ. *hirsuta* (Pursh) Torr. & Gray, Fl. ii. 29 (1841).—With no definite range and likely to occur throughout the range of the smoother typical *D. virginiana*, the hirsute plants seem to be a form rather than a true geographic variety.

Viburnum Rafinesquianum Schultes. Dinwiddie County: a characteristic undershrub in open argillaceous low woods just east of McKenney, nos. 14,024 and 14,421; our first station on the Coastal Plain, the low woodlands occupying a characteristic intrusion of Coastal Plain back into the Piedmont. See p. 373.

*Campanula americana L., forma **tubuliflora**, f. nov., corollis cylindrico-tubuliformibus ad apicem angustatis clausirare stylo exserto.—Virginia: seeping calcareous wooded bluffs by James River, west of old Fort Boykin, Isle of Wight County, September 5, 1941, *Fernald & Long*, no. 13,772 (type in Herb. Gray.; isotype in Herb. Phil. Acad.).—A remarkable aberration, strikingly contradicting the supposed generic character (the rotate corolla) upon which some botanists maintain *Campanula americana* as a separate genus, *Campanulastrum* Small. See p. 362.

Lobelia elongata Small. Norfolk County: fresh reed-marsh and swale along Northwest River near Northwest (the type-area), nos. 14,028 and 14,029, frequently with inflorescences virgate-forking. See p. 369.

Dipsacus sylvestris L. Isle of Wight County: disturbed soil by James River, below old Fort Boykin, nos. 13,170 and 13,768; the only time we have noted it in Tidewater Virginia.

*Elephantopus carolinianus Willd., forma **vestitus**, f. nov., caule superne ramibusque dense cinereo-tomentuloso-hirsutisque, pilis patentibus.—Virginia: low woods, Adams Swamp, south of Baines Hill School, Nansemond County, June 20, 1941 and September 12, 1941, *Fernald & Long*, nos. 13,172 and 13,780 (type in Herb. Gray.; isotype in Herb. Phil. Acad.). See p. 367.

Typical and common *Elephantopus carolinianus* has only the lower internodes with divergent pubescence, the upper ones and the branches merely with somewhat scattered appressed strigae. Forma *vestitus* is cinereous with short and close pubescence to the summit, the lower and middle internodes heavily tomentulose, the upper ones with close tomentulose pubescence mixed with spreading hairs. Some other collections from Nansemond County are transitional.

Notes on Eupatorium hyssopifolium (Plate 737).—*Eupatorium hyssopifolium* L. Sp. Pl. ii. 836 (1753) was clearly described "foliis lanceolato-linearibus trinerviis integerrimis" and two early plates cited: one of *Eupatorium virginianum, foliis angusto, floribus albis* of Dillenius (1732); the other of *Eupatorium* *hirsuta, hyssopi foliorum aemula, virginiana* of Plukenet (1691), from which Linnaeus obviously drew the name. The figure of Plukenet and the plate of Dillenius are unequivocal. They are of a plant of eastern Virginia (FIG. 1) thence north somewhat locally to southern Rhode Island and south to Alabama, with the lower primary leaves narrowly lanceolate or oblanceolate and entire or slightly toothed, the middle and upper ones entire, the principal ones 5–10 mm. broad. It occurs in moderately dry to damp soils.

This plant passes insensibly into one (FIG. 3), usually much commoner, with all the leaves narrowly linear to linear-oblanceolate, often revolute, mostly quite entire and ranging from 0.5–5 mm. broad, occurring generally north on dry sands and in open pinelands to southeastern Massachusetts, and south to Georgia. This is *E. linearifolium* Walter, Fl. Carol. 199 (1788), clearly described "foliis linearibus integris subverticillatis, calycibus 3 ad 5-floris".

In the other direction typical *Eupatorium hyssopifolium* passes to a plant with all or nearly all the primary leaves serrate to almost laciniate (FIG. 2). The principal primary leaves are lanceolate or linear-lanceolate and 5–17 mm. broad. It occurs in dry to wet soil from Pennsylvania to Kentucky, south to Florida, Alabama and Louisiana. In its most extreme development (with prolonged teeth) it is *E. hyssopifolium*, var. *laciniatum* Gray, Syn. Fl. N. Am. i². 98 (1884). The plants with somewhat lower and shorter teeth are *E. Torreyanum* Short in Transylv. Journ. Med. n. 32, viii. 575 (1836).

These three plants, strikingly different in their extremes, so clearly merge that it is most difficult to sort them into exclusive piles. In involucre, corolla and achene they seem to be inseparable, and they all have the consistent habital character, the development of crowded and suppressed branches, forming fascicles in the axils of all but the lowest leaves. Our representation from southeastern Virginia is as follows.

E. HYSSOPIFOLIUM L. (typical). NORTHAMPTON COUNTY: Capeville, no. 5497; Eastville, no. 5496; Bell's Haven, *Fogg*, no. 9728. PRINCESS ANNE COUNTY: Cape Henry, *Killip*, no. 6680; Virginia Beach, nos. 2948, 5064 and 5070; Rosemont, no. 5065; Macon Corners, no. 2949. NORFOLK COUNTY: Great Dismal Swamp, north of Wallaceton, no. 13,795. ISLE OF WIGHT

County: Bailey's Beach (McKimmie's Wharf), near Rushmere, no. 12,845; west of old Fort Boykin, no. 13,794. Surry County: Claremont, no. 12,844. Sussex County: southwest of Lambs, no. 7644. Nansemond County: Kilby, no. 5066. Southampton County: southwest of Applewhite's Church, no. 11,450.

*Var. laciniatum Gray. Elizabeth City County: west of Hampton, no. 5071. Princess Anne County: Dam Neck, no. 4706. Norfolk County: Lake Drummond, Great Dismal Swamp, west of Wallaceton, nos. 13,476 and 13,793. Isle of Wight County: Cat Pond, south of Benns Church, no. 7642. Southampton County: moist sandy and peaty shore of Whitefield's Millpond, no. 14,429. Prince George County: south of Upper Brandon, no. 9165.—These are identified with the type of var. *laciniatum*, which I am designating as the plant of Bedford County, Virginia, September 10, 1871, *A. H. Curtiss*, which, obviously, was the chief basis of Gray's variety. See p. 366.

*Var. **linearifolium** (Walt.), stat. nov. *E. linearifolium* Walt. Fl. Carol. 199 (1788). Northampton County: Eastville, no. 5495. James City County: 1 mile west of Williamsburg, *Grimes*, no. 3190. Princess Anne County: Virginia Beach, no. 5067; Rosemont, no. 5068. Norfolk County: Northwest, *Heller*, no. 1239. Isle of Wight County: south of Lee's Mill, no. 12,840. Surry County: Cobham Bay, northwest of Chippokes, no. 12,841; Claremont, no. 12,842.

Plate 737 is of foliage of the three varieties of Eupatorium hyssopifolium, all × ½: fig. 1, typical E. hyssopifolium from north of Wallaceton, Virginia, *Fernald & Long*, no. 13,795; fig. 2 of the type of var. laciniatum; fig. 3 of var. linearifolium from Rosemont, Virginia, *Fernald & Long*, no. 5068.

As noted, *Eupatorium hyssopifolium* and its confluent varieties have fascicles of suppressed branches in the axils of all but the lowest leaves. Another plant of southeastern Virginia (plate 738, figs. 1 and 2), there found in rich, mostly calcareous, woods and thickets, might be considered a very extreme development of *Eupatorium hyssopifolium*, much larger and with broader leaves than in *E. hyssopifolium*, var. *laciniatum*. This calcicolous and broader-leaved plant, however, usually does not develop axillary fascicles, or the axillary branches are few and not fascicled. Instead, it has the habit of *E. altissimum* or of very large *E. leucolepis*, with the involucre of *E. hyssopifolium*. I can relate it closely only to *E. anomalum* Nash, described from Florida but now known from southeastern North Carolina.[1] It so far departs, however, from *E. anomalum* that I am calling it

[1] Here I place the material distributed without specific identification from pineland at Fort Fisher on the Lower Cape Fear Peninsula, New Hanover County, North Carolina, *Godfrey*, no. 6193. It is a close match for Nash's type.

*E. **saltuense,** sp. nov. (TAB. 738, FIG. 1 et 2), caule erecto subtereto 0.9–1.4 m. alto superne minutissime hirtello; foliis caulinis 12–14-jugis patentibus vel laxe adscendentibus glabris vel subtus minute hirtellis; primariis lanceolatis acuminato-attenuatis 6.5–11 cm. longis 1.3–2.5 cm. latis serratis, dentibus plerumque 12–15-jugis, basi angustatis sessilibus vel imis breviter petiolatis; corymbo 1.8–3 dm. latis; involucris 6–7 mm. altis, phyllaribus 3-seriatis puberulis obtusis, externis ovato-oblongis, internis oblongis apice scariosis; acheneis 3 mm. longis acute angulatis.—Rich woods, thickets and clearings, southeastern VIRGINIA: thicket back of sand-beach of Cobham Bay, James River, northwest of Chippokes, Surry County, August 25, 1940, *Fernald & Long*, no. 12,846 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.); rich alluvial woods and thickets back of sand-beach of James River, below Sunken Meadow Beach, Surry County, August 23, 1938, *Fernald & Long*, no. 9166; rich calcareous wooded ravine west of Claremont, Surry County, August 23, 1940, *Fernald & Long*, no. 12,847; open pine and oak woods about 3 miles southwest of Waverly, Sussex County, October 20, 1936, *Fernald & Long*, no. 6880; dry sandy woods, thickets and clearings north of Moore's Mill, Sussex County, July 19, 1936, *Fernald & Long*, no. 6413; wooded banks of Appomattox River, Petersburg, Dinwiddie County, September 24, 1939, *Fernald & Long*, no. 11,451; dry woods about 5 miles east of Burgess Station, Dinwiddie County, August 26, 1939, *Fernald & Long*, no. 11,166. See p. 366.

Differing from *Eupatorium hyssopifolium* L. (pl. 737, FIG. 1), its var. *laciniatum* Gray (FIG. 2) and var. *linearifolium* (Walt.) Fernald (FIG. 3) in its broad leaves without crowded axillary fascicles, at most producing few short branches in some of the upper axils. In involucres, flowers and fruits it is very similar to the others; but the habital difference seems to separate it quite definitely from *E. hyssopifolium.* Nearly related to *E. anomalum* Nash, but that more southern species (FIGS. 3 and 4) has relatively short and broad leaves and more tapering and narrower phyllaries, and its heads are on definitely bracted pedicels.

In PLATE 738, FIG. 1 is the TYPE of EUPATORIUM SALTUENSE, × ½; FIG. 2, an involucre, × 4. FIGS. 3 and 4 are of E. ANOMALUM from near Lloyds, Florida, *A. H. Curtiss*, no. 6902; FIG. 3, larger cauline leaves, × ½; FIG. 4, an involucre, × 4.

*E. RECURVANS Small. Extended north from Georgia and southeastern South Carolina. NORFOLK COUNTY: damp old clearings and thickets, eastern side of Great Dismal Swamp, north of Wallaceton, no. 13,796; wet sandy and peaty shore near entrance to the Feeder Ditch, Lake Drummond, Great Dismal Swamp, no. 13,797; similar habitat, near entrance to Portsmouth Ditch, Lake Drummond, nos. 13,798 and 13,799. SURRY COUNTY: open clearing, Hog Island, no. 12,843 (leaves not recurved, but with shape and size as well as with the involucre of *E. recurvans*. See p. 366.

E. TORTIFOLIUM Chapm. Range extended westward into SOUTHAMPTON COUNTY: dry sandy pine and oak woods 6 to 7 miles south of Franklin, no. 8867.

E. SESSILIFOLIUM L., var. VASEYI (Porter) Fern. & Gris. Range extended to SURRY COUNTY: woods and thickets back of sand-beach of James River, Claremont, no. 13,792.

E. RUGOSUM Houtt. (*E. urticaefolium* Reichard). To the few recorded stations in the southeastern tidewater counties add the following. SUSSEX COUNTY: rich woods, Moore's Mill, no. 7647; dry woods by Nottoway River, Green Church Bridge, northwest of Owen's Store, no. 14,032. GREENSVILLE COUNTY: rich wooded slope just above the "fall-line" by Three Creek, northwest of Emporia, no. 14,031. PLATE 740, FIG. 1.

*E. RUGOSUM Houtt., var. **roanense** (Small), stat. nov. *E. roanense* (as "*roanensis*") Small, Man. Se. Fl. 1326 (1933). CRAIG COUNTY: Potts Mts., alt. 910 m. *Steele & Steele*, no. 118.—Although Small described his *E. roanense* only from Roan Mt. in western North Carolina and eastern Tennessee, with "bracts somewhat spatulate" (see PLATE 740, FIG. 3), this characteristic extreme follows the mountains from Potts Mountain (separating Craig County, Virginia, from Monroe County, West Virginia) to northwestern Georgia (*Ravenel* in Gray Herb.).

*E. RUGOSUM Houtt., var. **chlorolepis**, var. nov. (TAB. 739), foliis primariis late ovatis acuminatis basi rotundatis vel subcordatis utrinque strigoso-setulosis 5–10 cm. longis 3–6.5 cm. latis; involucris 4–5.5 mm. longis, phyllaribus herbaceis viridescentibus oblongis vel late linearibus valde nervosis.—Surry County, VIRGINIA: woods and thickets back of sand-beach of James River, and rich calcareous wooded ravines along the James, Claremont, September 7, 1941, *Fernald & Long*, nos. 13,784 and 13,785, October 10, 1941, *Fernald & Long*, no. 14,034 (TYPE in Herb. Gray., ISOTYPE in Herb. Phil. Acad.). See pp. 365 and 371. In PLATE 739 all figures are from the TYPE, FIG. 1, summit of stem, × 1, FIGS. 2–4, heads and involucre × 4.

Characterized by its broad and herbaceous phyllaries (FIGS. 2–4), much broader than the linear-attenuate scarious ones (PL. 740, FIG. 1) of typical *Eupatorium rugosum*. Although the wide-spread *E. rugosum* may have the leaves as small as in var. *chlorolepis*, they are usually much larger (up to 1.8 dm. long and

1.1 dm. broad), generally smoother and only rarely subcordate. The broad and strongly costate phyllaries, green and herbaceous except for the short scarious tip, at once mark the variety. In a region (the very rich calcareous slopes to the James) which is famous for the great size of foliage of most species we should expect *E. rugosum* to have large leaves, for, in much less favorable spots in the southeastern counties the thin and smooth noncordate leaves of typical *E. rugosum* are 8–15 cm. long and up to 10 cm. broad. The involucre of var. *chlorolepis* suggests that (FIG. 2) of the southwestern var. *angustatum* (Gray) Blake (Arkansas, Louisiana and Texas), but the phyllaries are more corrugated and the ovate leaves rounded to subcordate at base, whereas in var. *angustatum* they are very narrowly ovate to broadly lanceolate, with strongly tapering bases. In width of phyllaries var. *chlorolepis* is comparable with var. *roanense* (noted above); but that characteristic variety of the Blue Ridge or of the Alleghenies, from the borders of Virginia and West Virginia to Georgia and Tennessee, has very full heads, with the phyllaries (FIG. 3) dilated upward and with broadly scarious margins.

The plant with villous stems and petioles described by me as *Eupatorium urticaefolium*, var. *villicaule* is only a trivial form,[1] rather than a true geographic variety. Its involucre (FIG. 4) is that of typical *E. rugosum* and its foliage is characteristic of typical *E. rugosum*. FIG. 4 is from the type.

Of close affinity to *Eupatorium rugosum* is the very local species of Whitley County, Kentucky, *E. Luciae-Brauniae*[2]; but the cordate-deltoid leaves (FIG. 5) and the tiny involucres (FIGS. 6 and 7) with caudate-tipped phyllaries mark that little known plant.

In PLATE 740 the involucres and heads are all × 4, the leaf × 1. FIG. 1 shows a fruiting head and a separated involucre of EUPATORIUM RUGOSUM from northwest of Emporia, *Fernald & Long*, no. 14,031; FIG. 2, a flowering head from the TYPE of var. ANGUSTATUM; FIG. 3, a flowering head of var. ROANENSE from Highlands, North Carolina, *Harbison*, no. 1105; FIG. 4, from TYPE of forma VILLICAULE.

FIGS. 5–7 are from the TYPE of E. LUCIAE-BRAUNIAE, a characteristic leaf, a flowering head (FIG. 6) and a younger head (FIG. 7).

[1] EUPATORIUM RUGOSUM Houtt., forma **villicaule** (Fernald), stat. nov. *E. urticaefolium*, var. *villicaule* Fernald in RHODORA, x. 87 (1908). *E. rugosum*, var. *villicaule* (Fernald) Blake in RHODORA, xliii. 558 (1941).

[2] E. **Luciae-Brauniae**, nom. nov. *E. deltoides* E. L. Braun in RHODORA, xlii. 50 (1940), not *E. deltoideum* Jacq. (1798) nor Poepp. ex Spreng. (1826).

Carphephorus bellidifolius (Michx.) T. & G. Two range extensions northward. Isle of Wight County: dry sandy woods northwest of Raynor, no. 13,471. Southampton County: dry sandy oak woods southwest of Applewhite's Church, no. 13,782.

Chrysopsis graminifolia and Allies in Virginia and the Carolinas (Plates 741–744).—The characteristic series of plants of sands of the Coastal Plain and sands or silicious rocks of adjacent provinces, which, in the aggregate, passes as *Chrysopsis graminifolia* (Michx.) Ell., is very complex. By early American authors treated as a single variable species, it seems to consist of a considerable number of localized trends, comparable with those in *Aster*, *Solidago* and *Antennaria*. By Small it was treated in his Flora of the Southeastern United States, 1181 and 1182 (1903) as 9 species. Some of the latter, *C. flexuosa* Nash, *C. latifolia* (Fernald) Small, *C. Ruthii* Small, *C. oligantha* Chapm., *C. microcephala* Small and, perhaps, *C. Tracyi* Small, are sufficiently definite as to stand as local species. There are apparently others to be differentiated in the most southern States. These I am not attempting to deal with; but the splendid series from eastern North and South Carolina assembled by Mr. Robert K. Godfrey and the recent series from eastern Virginia gives evidence that, whereas the elongate basal leaves are essentially alike in all these plants, there are very real differences in habit and involucres.

Although in 1903 and again in 1913 (his Fl. ed. 2) Small considered these plants of the *Chrysopsis graminifolia* series to be members of *Chrysopsis*, in his Manual (1933) he removed them to *Pityopsis* and divided this hardly worth-while genus into three series of species, two of which, his "II. *Graminifoliae*" and "III. *Asperae*", are well represented in Virginia and the Carolinas. *Pityopsis*, series *Graminifoliae* he characterized, "Peduncles, branches and stem woolly-tomentose", the *Asperae* having "Peduncles, branches, and sometimes the stem, glandular". Under the *Asperae* the only species in Small's treatment which concerns us is *P. aspera* (Shuttleworth) Small, with "outer bracts of the involucre . . . glandular". Desperately floundering in the complexities of the group and trying to match the plant of eastern Virginia with relatively short and glabrate or glabrous but stipitate-glandular involucre, in 1937 (Rhodora

xxxix. 455) I called it *C. graminifolia*, var. *aspera* (Shuttleworth) Gray, in contradistinction to the plants with glandless and pilose or lanate involucres which, following Small, I then called *C. graminifolia.*

Shuttleworth seems never to have published *Chrysopsis aspera*. The binomial first appeared as the synonymic basis for *C. graminifolia*, var. *aspera* Gray, Syn. Fl. N. Am. i². 121 (1884), Gray defining an all-inclusive *C. graminifolia* (Michx.) Ell. as "silvery sericeous", with "bracts [phyllaries] many-ranked, glabrate, sometimes granulose-glandular on back; peduncles when glabrate, often hirtellous-glandular", and of this "silvery-sericeous" plant he proposed

> "**Var. áspera** (*C. aspera*, Shuttlew. in distrib. coll. Rugel), a glabrate rigid and polycephalous state, near St. Marks, Florida (probably on the very coast), the stem and leaves sparsely glandular-hispidulous."

Just what Gray had as var. *aspera* I am unable to say, no plant so named by him being now in the Gray Herbarium, although a *Rugel* specimen from Florida, received since Gray's death, sufficiently matches his description. It is apparently a trivial state of the plant with copiously glandular involucre. The specific or, with Small, serial character "Peduncles . . . glandular", as opposed to "Peduncles . . . woolly-tomentose", too often breaks: for instance, a single specimen of *C. nervosa* (Willd.) Fern. (*C. argentea* (Pers.) Ell.) from Northampton County, Virginia (*Fernald, Long & Fogg*, no. 5503), has 2 large heads, with glandless involucres, but one head is on a silky-pilose almost glandless peduncle, the other with the peduncle copiously stipitate-glandular. Most commonly, however, when stipitate glands abound on the peduncles they are equally abundant on the involucres; but some plants, in general quite like ordinary small-headed *C. aspera*, have the involucres with no stipitate glands, or a few only on the lowest phyllaries.

Incidentally, if, before taking up *Chrysopsis aspera* as a species, Small had consulted the original description of *Inula graminifolia* Michx. Fl. Bor.-Am. ii. 122 (1803), the basis of *C. graminifolia* (Michx.) Ell. Sk. ii. 334 (1824), he would have found that it was clearly described "calycibus turbinatis; squamis numerosis, acutissimis, superne glandulosis . . . *Hab.* a Carolina ad Floridam, frequens". Small defines *C. aspera* with "outer bracts of the involucre lanceolate, glandular". The difference is not evident. Persoon, working with Michaux's collections in 1806, maintained *Inula graminifolia*, "argenteo-sericea, . . . fol. lanceolato-linearib. nervosis, . . . squamis acutissimis medio glandulosis . . . Cal. parvuli Conyzae, carina serrato-glandulosa", and, immediately following, described as a new species, presumably found in Michaux's material,

> "*Inula argentea,* sericea, fol. lanceolatis trinerviis erectis flexuosis, corymb. subcomposito stricto. Hab. in Pennsylvania. Color pl. argenteo-virens. Fol. lanceolato-acuminata, cauli subappressa. Antecedenti colore et foliis similis, sed flor. multo majores, squamae calycin applantae, pubescentes".—Pers. Syn. ii. 462 (1806).

Inula argentea is, evidently, the common, usually nonglandular plant (PLATE 743, FIG. 3 and PL. 744, FIG. 3) which follows the sands northward to Delaware; and when Nuttall placed *I. graminifolia* Michx. and *I. argentea* Pers. in his subgenus *Chrysopsis* in his Gen. ii. 151 (1818), he explicitly defined *I. graminifolia* with "calix . . . glandularly pubescent" while *I. argentea* had "calix . . . pubescent, not glandular". Nuttall apparently erred, however, in placing *Erigeron nervosum* Willd. under *I. graminifolia* and there is apparently no justification for his citing the plant with glandular involucre from Delaware, where *I. argentea* alone is known. Nuttall gave for *I. graminifolia* (glandular involucre) the range "Delaware to Florida", for the glandless *I. argentea* "Virginia to Florida".

As to *Erigeron nervosum* Willd. Sp. iii^3. 1953 (1803), with "*Habitat in* America *boreali*", his description was rather detailed:

> "*5. Erigeron *nervosum*. W.
> E. foliis lineari-lanceolatis integerrimis sericeis, nervosis, floribus paniculatis. W.
> Nerviges Berusungskraut. W.
> *Habitat in* America *boreali*. ♃ (v. s.).
> Caulis *erectus simplex albo-tomentosus*. Folia *alterna inferiora quadripollicaria, summa semipollicaria et breviora, stricta rigida, lineari-lanceolata acuta integerrima . . . nervosa viridia, subtus pilis sericeis adspersis albidis obsita*. Panicula *terminalibus simplex, pedunculis tomentosis*. Calyx *imbricatus, squamis oblongis*. Corolla *non vidi*. Pappus *rufescens pilosus*. W."[1]

Willdenow said nothing about glands on the involucre. His

[1] This unusually full description was characterized by E. L. Greene in Erythea, ii. 93 (1894) as "worse than a *nomen nudum*, and that specific name should therefore be allowed to remain unemployed."

Erigeron nervosum was, with scarcely a doubt, the commonest coastwise species of eastern America, *Chrysopsis argentea* (Pers.) Ell. (PL. 743, FIG. 3, and 744, FIG. 3).

As pointed out to me by Mr. Robert K. Godfrey, when he was tentatively working over his Carolina collections, *Chrysopsis microcephala* lacks the prolonged and horizontal stolons which are found in carefully collected *C. nervosa*. This character seems to be a fundamental one, just as it is in *Antennaria*. One series is cespitose or subcespitose, with the erect new leafy basal offshoots close to the flowering stem or merely on very short and promptly assurgent offshoots; the other series, although sometimes with approximate erect leafy tufts, generally produces prolonged and flagelliform stolons (see PL. 744, FIG. 1), these eventually terminated by the characteristic basal rosettes from which, the following season, new flowering stems arise. In carefully collected material this difference in the vegetative habit is striking; in merely "grabbed" (not "grubbed") specimens the inconclusive identifications have to be by matching specimens. The character, glandular or nonglandular involucre, etc., is, it would seem, less fundamental. True *C. graminifolia* (*C. aspera*) PL. 742, FIG. 3, with abundant stipitate glands on the involucre, passes into a state habitally quite like it but with the glands nearly obsolete; and, under the silky tomentum, the involucres of *C. nervosa* may sometimes show abundant but minute viscid trichomes or glands.

Returning to the division of the series on habit, the specimens in the Gray Herbarium give the following results. To the series with cespitose or subcespitose habit belong *C. graminifolia* (*aspera*), PL. 742, FIG. 3, *C. microcephala*, PL. 741, FIG. 3, *C. Correllii* (see below), PL. 741, FIGS. 1 and 2, and *C. latifolia;* to the series with flagelliform stolons *C. nervosa* (*C. graminifolia* of authors and *C. argentea*), PL. 743, FIG. 3 and 744, FIG. 3, *C. Tracyi* (too near the last), *C. oligantha* and *C. adenolepis* (see below), PL. 742, FIGS. 1 and 2. *C. Ruthii* and *C. flexuosa*, with subequal and loosely spreading cauline leaves, are not habitally like the others. Within these two series there are parallel tendencies. The species with involucres glandular but otherwise glabrous have the leaves of the peduncles few and scattered; those with the involucres pilose to silky-lanate have the equally pubescent leaves of the peduncles very numerous and imbricated, so that they and the lowest phyllaries seem confluent.

Upon these characters I am grouping the species of the *graminifolia* series in Virginia and the Carolinas as follows, it being clearly understood that, when types of Michaux, Persoon, Willdenow and some others are available again, the applications of some names may necessarily change.

a. Plants cespitose or tufted, the basal offsets erect or at most short and promptly assurgent stolons....*b*.
b. Involucre glabrous or essentially so at base, 6–10 mm. high (to tips of inner phyllaries); phyllaries and peduncles stipitate-glandular or glutinous, the phyllaries not conspicuously merging into the few scattered leaves of the peduncle..1. *C. graminifolia.*
b. Involucre silky-lanate at least at base, the outer phyllaries and the abundant and imbricated upper leaves of the peduncles intergrading.
Involucre (to tips of inner phyllaries) 5–8 mm. long, at first mostly heavily lanate at base; principal phyllaries oblong-lanceolate, the inner with broad pale chartaceous margins; new heads well formed at expanding of the earlier ones.............................2. *C. microcephala.*
Involucre 8–13 mm. long, only sparsely lanate; phyllaries linear and herbaceous except for the very narrow margins; first heads greatly overtopped by stiffly ascending branches and branchlets terminated by undeveloped heads.....................................3. *C. Correllii.*
a. Plants with prolonged flagelliform or filiform prostrate stolons and eventual slender rhizomes.
Involucre glabrous or nearly so except for the glandular phyllaries; the outer gland-bearing phyllaries not merging into the scattered upper leaves of the peduncles. 4. *C. adenolepis.*
Involucre pilose to silky-lanate, glands if present partly hidden or inconspicuous, outer phyllaries gradually merging into the often imbricated leaves of the peduncles.
Principal phyllaries broadly linear to linear-lanceolate or narrowly oblong, 1–1.4 mm. broad, chartaceous except for green midrib.
Inflorescence a loose and open corymbiform panicle, with elongate slender branches..................5. *C. nervosa.*
Inflorescence a slender cylindric thyrsiform panicle with abbreviated erect branches..........5a. *C. nervosa*, var. *virgata.*
Principal phyllaries narrowly linear, 0.6–1 mm. broad, strongly herbaceous except for very narrow scarious margins.........................5b. *C. nervosa*, var. *stenolepis.*

1. C. graminifolia (Michx.) Ell. Sk. ii. 334 (1824); DC. Prodr. v. 326 (1836); Bertol. Misc. Bot. vii. 33, t. 3 (1848). Bertoloni's plate being excellent, his description accurate: "Fibrae radicales e rhizomate brevissimo ortae . . . Folia . . . radicalia caespitosa, . . . Pedunculi monocephali, foliis exiguis, paucis instructi, glandulisque stipitellatis adspersi. Calathus imbricatus, squamis lanceolato-linearibus, acutis.

dorso hirtis glandulis stipitellatis". *Inula graminifolia* Michx. Fl. Bor.-Am. ii. 122 (1803); Nutt. Gen. ii. 151 (1818). *Erigeron glandulosus* Poiret in Lam. Encycl. Meth. viii. 487 (1808), not Walt. *Diplopappus graminifolius* (Michx.) Less. in Linnaea, v. 144 (1830) at least as to basinym. *Pityopsis graminifolia* (Michx.) Nutt. in Trans. Am. Phil. Soc. n. s. vii. 317 (1841). *C. aspera* Shuttlew. ex Gray, Syn. Fl. N. Am. i². 121 (1884) in synonymy; Small, Fl. Se. U. S. 1182 (1903). *C. graminifolia*, var. *aspera* (Shuttlew.) Gray, Syn. Fl. N. Am. 1². 121 (1884). *Pityopsis aspera* (Shuttlew.) Small, Man. Se. Fl. 1341 (1933).—Siliceous or argillaceous pine or oak woods and openings, northern Florida to Mississippi, north to Virginia. The following selected from a large representation, are characteristic. VIRGINIA: Bowling Green, Caroline County, *Fernald & Long*, no. 9174; Urbanna, Middlesex County, *Hermann*, no. 10,425; 3 miles north of Williamsburg, James City County, *Menzel*, no. 119; Campus, University of Richmond, Henrico County, *M. Ryland;* Chester, Chesterfield County, *Smith & Hodgdon* in Pl. Exsicc. Gray, no. 889; headwaters of Blackwater River, Prince George County, *Fernald & Long*, no. 6711; Gary Church, Prince George County, *Fernald & Long*, no. 6712; Disputanta, Prince George County, *Fernald & Long*, no. 6418. NORTH CAROLINA: Middlesex, Nash County, *Godfrey*, no. 5430; Oxford, Granville County, *Godfrey*, no. 5533; Raleigh, Wake County, *Biltmore Herb.*, no. 1955a; Reidsville, Rockingham County, *Godfrey*, no. 6108; Greensboro, Guilford County, *Wm. Rhoades;* Winston-Salem, Forsyth County, *Schallert;* Sanford, Lee County, *Godfrey*, no. 6894; 10 miles north of Laurinburg, Scotland County, *Godfrey*, no. 5430; between Blowing Rock and Lenoir, Wautaga County, *A. B. Seymour*, no. 65; between Gold Hill and Falls of the Yadkin, Stanley County, *Small & Heller*. SOUTH CAROLINA: west of McBee, Chesterfield County, *Godfrey*, no. 8076; 14 miles south of Columbia, Lexington County, *Godfrey & Tryon*, no. 1302; Caesar's Head, Greenville County, *J. D. Smith*. GEORGIA: Athens, Clarke County, *Wiegand & Manning*, no. 3192; Angusta, ex herb. *Thurber;* north of Quitman, Brooks County, *Harper*, no. 1619. FLORIDA: Live Oak, Suwanee County, *Curtiss*, no. 6939; ? St. Marks, Wakulla County, *Rugel*, no. 484. ALABAMA: southwest of Booth, Autaga County, *Harper*, no. 3265; east of Notasula, Macon County, *Wiegand & Manning*, no. 3191; 16 miles south of Dothan, Houston County, *Wiegand & Manning*, no. 3190; Tensaw, Baldwin County, *Tracy*, no. 8022; west of Mobile, Mobile County, *Harper*. MISSISSIPPI: Ocean Springs, Jackson County, *Seymour & Earle*, no. 91821.43; Biloxi, Harrison County, *Tracy*, no. 4337. PLATE 742, FIG. 3; MAP 1.

As contrasted with *Chrysopsis nervosa* and its varieties, the only other species of Virginia, *C. graminifolia* shows a pronounced preference for the Piedmont region. As pointed out in an earlier paper we have not found it on the outer coastal sands; nor does it occur in the most sterile pine barrens of the state.

2. C. MICROCEPHALA Small, Fl. Se. U. S. 1182 and 1339 (1903). *Pityopsis microcephala* (Small) Small, Man. Se. Fl. 1341 (1933).—Sandy pineland and sand hills, Florida to eastern Texas, north to southeastern North Carolina, northeastern South Carolina, southern Arkansas and southeastern Oklahoma. The following are characteristic. NORTH CAROLINA: near Southport, Brunswick County, *Godfrey & Shunk*, no. 4141. SOUTH CAROLINA: Hartsville, Darlington County, *Eggleston*, no. 4936; west of Salters, Williamsburg County, *Godfrey & Tryon*, no. 511 (with unusually large and subglabrate involucre, presumably from growing in a drainage-ditch); Santee Canal, Berkeley County, *Ravenel;* west of Bonneau, Berkeley County, *Godfrey & Tryon*, no. 1618; west of Jamestown, Berkeley County, *Godfrey*, no. 8175. GEORGIA: Folkston, Charlton County, *Francis Harper*, no. 668 (as *Aster*). FLORIDA: Jacksonville, Duval County, *Curtiss*, no. 5319 (ISOTYPE); Lake City, Columbia County, *Nash*, no. 2492 (very narrow-leaved); Starks, Volusia County, *Grace Gilbert;* Homestead, Dade County, *Small, DeWinkler & Mosier*, no. 11,162; Marcs, Lee County, *Hitchcock*, No. 138 (slender-leaved). ALABAMA: Gateswood, *Tracy*, no. 8566. ARKANSAS: near Malvern, Hot Springs County, *E. J. Palmer*, no. 29,579. OKLAHOMA: Page, LeFlore County, *G. W. Stevens*, no. 2623. TEXAS: Houston, *E. J. Palmer*, no. 12,727. PLATE 741, FIG. 3; MAP 2; a southern Coastal Plain species.

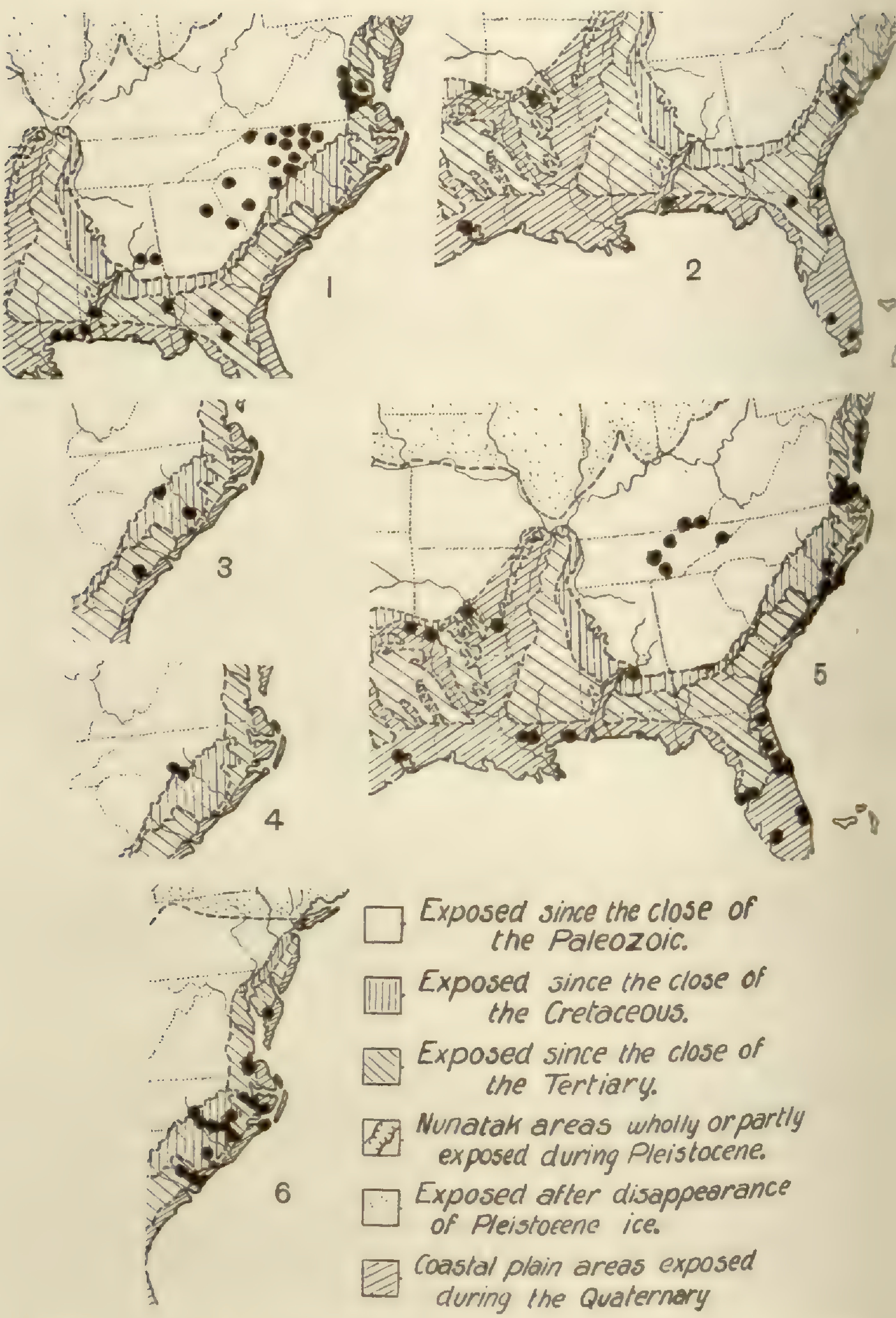
3. C. **Correllii,** sp. nov. (TAB. 741, FIG. 1 et 2). Perennis subcespitosa; foliis radicalibus confertis erectis lineari-lanceolatis elongatis argenteo-sericeis; caulibus 1–4 rigidis scopiformibus 3–7.5 dm. altis argenteo-sericeis; foliis caulinis adpressis; paniculis rigidis corymbiformibus ramis valde adscendentibus; pedunculis imbricato-foliaceis, precosioribus ramulis elongatis capitula immatura gerentibus valde superatis; involucro turbinato 8–13 mm. longo basi sparse lanato, phyllaribus valde imbricatis herbaceis viscidis anguste lineari-attenuatis, majoribus 0.5–0.8 mm. latis; ligulis luteis; pappo sordido.—Southeastern North Carolina and southeastern South Carolina. NORTH CAROLINA: sandy region at White Lake, Bladen County, July 15, 1935, *Correll*, no. 2577 (TYPE in Herb. Gray.); White Lake, August 14, 1938, *Godfrey*, no. 5985; moist rich soil along Drowning Creek, near Wagram, Scotland County, June 18, 1935, *Correll*, no. 1168. SOUTH CAROLINA: sandy bank, 8 miles south of Hendersonville, Colleton County, July 19, 1927, *Wiegand & Manning*, no. 3186. MAP 3.

Chrysopsis Correllii is a very early-flowering species, beginning to flower in mid-June. The type (PL. 741, FIG. 1), with only a few fully developed heads and many erect broom-like branchlets with incipient heads, is as far along (July 15) as Godfrey's material of August 14 from the same locality. Correll's other number, collected June 18, is essentially as mature. When the heads terminating the erect lateral branchlets come to anthesis the central heads would doubtless be over-ripe. Although the herbaceous phyllaries are not stipitate-glandular they are so viscid as to adhere closely to the pressing paper. The species seems to be a very local one. It is a great pleasure to associate with it the name of DONOVAN STEWART CORRELL, who has so extensively explored the flora of the Carolinas.

4. C. **adenolepis** sp. nov. (TAB. 742, FIG. 1 et 2). Planta valde stolonifera, stolonibus flagelliformibus bracteoliferis elongatis; foliis imis lineari-lanceolatis prolongatis argenteo-sericeis vel sublanatis, superioribus valde reductis; caule erecto sericeo 4–4.5 dm. alto corymbiformi-paniculato; pedunculis filiformibus stipitato-glandulosis remote bracteolatis; involucris turbinatis 8–10 mm. altis, phyllaribus multi-seriatis linearibus vel anguste lineari-lanceolatis glabris dorso viridibus margine scarioso-chartaceis, exterioribus dorso stipitato-glandulosis; ligulis flavis; pappo sordido-rufescenti.—Moore County, NORTH CAROLINA. old barren fields, Pinehurst, August 19, 1897, *Otto Katzenstein* (TYPE in Herb. Gray.); sandy roadside, near West End, June 30, 1927, *Wiegand & Manning*, no. 3185.

In its glandular involucre at once suggesting *C. graminifolia* of which, when understood, it may prove to be an extreme variation. The flagelliform stolons, the only minutely glandular peduncles and the very slender phyllaries seem to distinguish it. The development or failure to develop flagelliform stolons is so general a character through large and consistent series of specimens that I am giving it much weight in separating *C. adenolepis*. MAP 4.

5. C. **nervosa** (Willd.), comb. nov. *Erigeron nervosum* Willd. Sp. Pl. iii³. 1953 (1803). *Inula argentea* Pers. Syn. ii. 452 (1806); Nutt. Gen. ii. 151 (1818). *C. argentea* (Pers.) Ell. Sk. ii. 334 (1824); DC. Prodr. v. 326 (1836). *Pityopsis argentea* (Pers.) Nutt. in Trans. Am. Phil. Soc. n. s. vii. 318 (1841). *C. graminifolia* sensu most recent auth., not (Michx.) Ell.—Bearing elongate flagelliform basal stolons; stems 1–4, 0.15–1.2 m. high; panicle open, with elongate slender branches (rarely with only



Map 1, Range of Chrysopsis graminifolia; map 2, of C. microcephala; map 3, of C. Correllii; map 4, of C. adenolepis; map 5, of C. nervosa; map 6, of C. nervosa, var. stenolepis.

1-few heads); involucre 8–13 mm. high, silky-pilose to -lanate, without stipitate glands, the short outer phyllaries passing insensibly into the crowded or imbricated silky upper bracts of the peduncles; the longer scario-chartaceous phyllaries linear to linear-lanceolate or narrowly oblong, 1–1.4 mm. broad.—Dry to moist sandy pine or oak woods, thickets, ridges or openings, or siliceous rock in the interior, Coastal Plain from Florida to eastern Texas, north to southern Delaware, central Arkansas and southeastern Oklahoma; Pine Mountain, southeastern Kentucky, and Cumberland Plateau to Great Smoky Mountains, Tennessee. The following, from a large representation, are representative. DELAWARE: near Terrapin Hill, southwest of Laurel, August 5, 1874, *A. Commons* (although Persoon's *Inula argentea* was said to have come from Pennsylvania and an old specimen in the Gray Herbarium bears in the hand of Elias Durand the data "N. Jersey", I find no authentic record of the plant from north of southern Delaware). MARYLAND: Salisbury, October 3, 1863, *Canby*, with the note: "To show the runners" (more than 3 dm. long). VIRGINIA: Old Town Neck, Northampton County, *Fernald, Long & Fogg*, no. 5503; west of Kiptopeke, Northampton County, *Fernald, Long & Fogg*, no. 5504; Cape Henry, Princess Anne County, *Tidestrom*, no. 3065, *Killip*, no. 6750; Virginia Beach, Princess Anne County, *K. K. Mackenzie*, no. 1729, *Fernald & Griscom*, no. 2913; near Franklin in Isle of Wight County, *Heller*, no. 1122; south of Factory Hill, Nansemond County, *Fernald & Long*, no. 6884; Nottoway Swamp, west of Franklin, Southampton County, *Fernald & Long*, no. 9636; Point Beach, south of Franklin, *Fernald & Long*, no. 11,457. NORTH CAROLINA: 5 miles west of Clinton, Sampson County, *Godfrey*, no. 4525; Carolina Beach, New Hanover County, *Godfrey*, no. 4671; Old Dock, Columbus County, *Godfrey & Shunk*, no. 4179. GEORGIA: Blackbeard Island, *McAtee*, no. 3331. FLORIDA: near Jacksonville, *Curtiss*, no. 1359; DeLand, Volusia County, *G. D. Hurst;* Orlando, February, 1889, *Canby:* Okeechobee region, Brevard County, *Fredholm*, no. 6338; Earman. Palm Beach County, *F. R. Randolph*, no. 59; west of Jupiter, Palm Beach County, March 15, 1924, *Harper;* St. Petersburg, *Mrs. Chas. C. Deam*, no. 2909; Hillsborough County, *Fredholm*, nos. 6481 and 6492; Fort Myers, *J. P. Standley*, nos. 27 and 87. KENTUCKY: Pine Mountain, Bell County, *Kearney*, no. 405; Pine Knot, McCreary County, *H. J. Rogers*, no. 85. TENNESSEE: at 2300 ft. alt., Rugby, Morgan County, *Svenson*, no. 4096; at 2300 ft. alt., 8 miles east of Crossville, Cumberland County, *Svenson*, no. 4147; Wolf Creek, Cocke County, *W. A. Anderson*, no. 1115; Hiwassee Valley, *Ruth*, no. 27. ALABAMA: northeast of Autaugaville, Autauga County, *Harper*, no. 3270. MISSISSIPPI: Biloxi, *Tracy*, no. 6444. ARKANSAS: Rose Bud, White County, *Demaree*, no. 10,918; Pulaski Heights, Little Rock, *Demaree*, no. 8148; Blue Mountain, Pulaski County, *Demaree*, no. 8808; Counterfit Hollow, northwest of Murfreesboro, Pike County, *Demaree*, no. 9761. LOUISIANA: vicinity of Covington, *Arsène*, no. 11,431; southwest of Hammond, Tangipahoa Parish, *D. S. & H. B. Correll*, no. 9268. OKLAHOMA: Broken Bow, McCurtain County, *Hopkins & Van Valkenburgh*, no. 6146. TEXAS: presumably near Houston, *Lindheimer*, no. 89. PLATE 743, FIG. 3 and PL. 744, FIG. 3; MAP 5.

*Var. **virgata**, var. nov. (TAB. 744, FIG. 1 et 2), paniculis anguste cylindrico-thyrsiformibus ramis erectis valde abbreviatis. VIRGINIA: vicinity of Norfolk, autumn of 1906, *M. C. Jensen;* dry open sandy soil northwest of Magnolia, Nansemond County, October 17, 1941, *Fernald & Long*, no. 14,036 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.). See p. 371.

*Var. **stenolepis**, var. nov. (TAB. 743, FIG. 1 et 2), var. typicae similis, phyllaribus longioribus anguste linearibus 0.6–1 mm. latis valde herbaceis margine angusto scarioso exceptis.—Pinelands and pine barrens, eastern Maryland to South Carolina. MARYLAND: open pine woods along Tonytank Creek, 2½ miles south of Salisbury, September 8, 1938, *R. R. Tatnall*, no. 3971 (transitional). VIRGINIA: dry sandy pine barrens south of Zuni, Isle of Wight County, August 24, 1936, *Fernald & Long*, no. 6710; white sand of dry pine barrens, south of Lee's Mill, Isle of Wight County, August 23 and September 2, 1940, *Fernald & Long*, no. 12,860; sandy and peaty pine barrens, east of Cox Landing, south of South Quay, Nansemond County, September 15 and 22, 1939, *Fernald & Long*, no. 11,456. NORTH CAROLINA: pine woodland, McCullen, Wake County, July 12, 1938, *Godfrey*, no. 4950; pineland, Chocowinty, Beaufort County, July 20, 1938, *Godfrey*, no. 5410; dry sand, Snow Hill, Greene County, July 8, 1922, *L. F. & F. R. Randolph*, no. 756; sand ridge near Goldsboro, Wayne County, September 3, 1938, *Godfrey*, no. 6555; low pineland, Dunn, Hartnett County, August 25, 1938, *Godfrey*, no. 6126; pineland near Lilington, Hartnett County, August 5, 1938, *Godfrey* no. 5638; pineland at Fort Barnwell, Craven County, October 13, 1938, *Godfrey & White*, no. 6832; pineland, Grantsboro, Pamlico County, October 13, 1938, *Godfrey & White*, no. 6828; open woodland, Olympia, Pamlico County, July 12, 1922, *L. F. & F. R. Randolph*, no. 910 (TYPE in Herb. Gray.); pineland near Atlantic, Cartaret County, September 1, 1938, *Godfrey*, no. 6421; open pinelands, Jacksonville, Onslow County, July 20, 1922, *L. F. & F. R. Randolph*, no. 995; pineland near Hallsboro, Columbus County, August 29, 1938, *Godfrey*, no. 6286. SOUTH CAROLINA: excavated, coarse white sandy pockets in pine barrens, 5 miles south of Kingstree, Williamsburg County, August 23, 1939, *Godfrey & Tryon*, no.

1647 (phyllaries unusually blunt); grass-sedge bog or savannah, 12 miles north of Georgetown, June 23–24, 1939, *Godfrey & Tryon*, no. 106; burned-over savannah, 5 miles south of Andrews, Georgetown County, August 11, 1939, *Godfrey & Tryon*, nos. 1372 and 1378. MAP 6.

Var. *stenolepis*, although habitally inseparable from typical *Chrysopsis nervosa*, seems to be a fairly marked variety of pinelands chiefly of southeastern Virginia and the Carolinas. Var. *virgata*, known only from a limited area in southeastern Virginia, within the range of typical *C. nervosa*, may prove to be only a vegetative form. Typical *C. nervosa*, with one area at high altitude on the Appalachian Upland, the other following much of the Coastal Plain, illustrates the large group of species which, presumably, has retained a foothold on the old core of the continent, where, except in highly silicious soils, conditions are less favorable for them than on the younger sands of the Coastal Plain. It is strongly contrasted with *C. graminifolia*, which has its great development on the Piedmont east of the Alleghenies and on the inner Coastal Plain. It is not wholly satisfactory to keep *C. Tracyi* Small specifically apart from *C. nervosa*. Until the Floridan series is more thoroughly studied I am leaving them apart, as I am an unidentified plant of Florida with stiff branches often overtopping the inflorescences.

In PLATE 741, FIGS. 1 and 2 are of CHRYSOPSIS CORRELLII: FIG. 1, TYPE × 2/5; FIG. 2, head, × 4. FIG. 3, head, × 4, of C. MICROCEPHALA, from ISOTYPE. PLATE 742, FIGS. 1 and 2, C. ADENOLEPIS, from TYPE: FIG. 1, plant, × 2/5; FIG. 2, head, × 4. FIG. 3, head, × 4, of C. GRAMINIFOLIA from near Bowling Green, Virginia, *Fernald & Long*, no. 9174. PLATE 743, C. NERVOSA, var. STENOLEPIS: FIG. 1, portion of small plant, × 1, from east of Cox Landing, south of South Quay, Virginia, *Fernald & Long*, no. 11,456; FIG. 2, head, × 4, from the TYPE. FIG. 3, inflorescence, × 1, of 2-headed plant of C. NERVOSA, from Old Town Neck, Northampton County, Virginia, *Fernald, Long & Fogg*, no. 5503. PLATE 744, FIGS. 1 and 2, C. NERVOSA, var. VIRGATA, from the TYPE: FIG. 1, plant, × 1/3; FIG. 2, head, × 4. FIG. 3, head, × 4, of typical C. NERVOSA from near Factory Hill, Virginia, *Fernald & Long*, no. 6884.

SOLIDAGO BICOLOR L., var. OVALIS Farwell. To the recorded stations add others. ISLE OF WIGHT COUNTY: seeping calcareous wooded bluffs by James River, west of old Fort Boykin, no. 13,175. GREENSVILLE COUNTY: wooded bottomland of Nottoway River below Double Bridge, north of Orion, no. 13,802.

S. ARGUTA Ait. On the calcareous bluffs along the lower James, west of old Fort Boykin, this and other species reach phenomenal size, our no. 13,176 having basal leaves up to 3.4 dm. long and 1 dm. broad, no. 13,804 being 2 m. high, with panicle-branches nearly 5 dm. long. See p. 345.

S. perlonga Fern. Range extended 25 miles inland to southwestern Dinwiddie County: very abundant in open argillaceous low woods just east of McKenney, no. 14,042. See p. 373.

S. Elliottii T. & G. Add stations in Norfolk County: in dense cane (*Arundinaria*) scrub, north of Cornland, nos. 14,039 and 14,040.

S. fistulosa Mill. Thickets of this species along the Feeder Ditch from Lake Drummond, Norfolk County, reach a height of 2.25 m., no. 13,836.

Boltonia asteroides, var. glastifolia (Hill) Fern. Frequent on tidal marshes and shores of Chickahominy River to head of tide in New Kent and Charles City Counties, sometimes up to 1.6 m. high, the ligules white or lilac (many nos.). See p. 357.

Aster grandiflorus L. Range extended inland to southwestern Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,051.

*A. racemosus Ell. Norfolk County: dry open ground east of Cedarville, no. 14,052; the first from north of South Carolina. See p. 369.

A. pilosus Willd., var. demotus Blake. On the sand-beach of James River, Claremont, becoming shrubby, the new flowering branches of the year arising from among the old fruiting branches of the preceding year (no. 13,820). See p. 363.

*A. Elliottii T. & G. Range extended north into Princess Anne County: reed-marsh along Blackwater River, southwest of Pungo Ferry, no. 14,054—ligules rosy-pink. See p. 370.

Erigeron pulchellus Michx. Local range extended into Nansemond County: forming extensive carpets in dry sandy woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, no. 13,481.

*Pluchea purpurascens (Sw.) DC., var. succulenta Fernald in Rhodora, xliv. 227 (1942), forma **obovata,** f. nov., foliis late obovatis basi subcuneatis apice rotundatis emarginatisve.—Virginia: tidal marsh along Powhatan Creek, north of Jamestown Island, James City County, August 22, 1939. *Fernald & Long*, no. 11,191 (type in Herb. Gray.).

An extraordinary form, with broadly obovate leaves strongly rounded to emarginate at summit, typical var. *succulenta* having the rhombic- to oblong-ovate leaves tapering to tip.

Helianthus angustifolius L. Range extended inland to southwestern Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,058. See p. 373.

*Coreopsis oniscicarpa Fernald, var. **simulans,** var. nov., foliis radicalibus late oblanceolatis vel subellipticis 1.2–2 cm. latis; phyllaribus externis deltoideo-ovatis margine albidohyalinis ad 5 mm. longis et 2 mm. latis, phyllaribus internis pallide brunneis; ligulis 0.6–1.2 cm. longis.—Nansemond County, VIRGINIA: sandy ditch at border of low woods northeast of Baines Hill School, September 12, 1941, *Fernald & Long*, no. 13,827 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.), October 16, 1941, no. 14,061 (fruit from same colony). See pp. 368 and 371.

Typical *Coreopsis oniscicarpa* Fernald in RHODORA, xl. 472, pl. 533 and 534, figs. 1, 5 and 8 (1938) has the narrowly oblanceolate basal leaf-blades only 0.5–1 cm. broad; the outer phyllaries deltoid-lanceolate to lance-oblong, only 0.7–3 mm. long and less whitened at the margins; the inner phyllaries dark brown to fuscous; the ligules 0.8–1.8 cm. long. Var. *simulans* has broader basal leaves (1.2–2 cm. broad); the outer phyllaries deltoid-ovate, prominently pale-margined, and mostly 3–5 mm. long; the inner phyllaries pale brown; and the ligules constantly short (only 0.6–1.2 cm. long). Its achenes are in no way different from those of typical *C. oniscicarpa*. The varietal name is given because, in the broad basal leaves and in the shape of the outer phyllaries, var. *simulans* slightly suggests the more southern *C. linifolia* Nutt.—see Fernald in RHODORA, xlii. 496, 497, pl. 649 (1940). In that species of the extreme South, however, the outer phyllaries are round-ovate (in *C. oniscicarpa*, var. *simulans* deltoid), the inner ones (as well as the outer) with pale margins; the ligules 1.3–2.5 cm. long (in var. *simulans* 0.6–1.2 cm.); and the bodies of the achenes 2.5–3.2 mm. long and 1–1.2 mm. broad. In the more northern *C. oniscicarpa* and its var. *simulans* they are 1.8–2.2 mm. long and 0.6–0.9 mm. broad. Although simulating *C. linifolia*, the new *C. oniscicarpa* var. *simulans* clearly belongs with the latter species.

*COREOPSIS TINCTORIA Nutt., forma **atropurpurea** (Hook.), stat. nov. Var. *atropurpurea* Hook. Bot. Mag. lxiii., t. 3511 (1836). SOUTHAMPTON COUNTY: roadside bank, south of Franklin, no. 13,186.

*BIDENS CORONATA L., var. BRACHYODONTA Fernald. NEW KENT COUNTY: fresh tidal marsh of Pamunkey River, south of White House, no. 11,635. PRINCESS ANNE COUNTY: reed-marsh along Blackwater River, southwest of Pungo Ferry, no. 14,066. NORFOLK COUNTY: damp old clearings and thickets, eastern side of Great Dismal Swamp, north of Wallaceton, nos. 13,829, 13,830 and 14,064.—Extension south from Delaware. See pp. 366 and 371.

*Cosmos bipinnatus Cav. The commonly cultivated species, frequently seen on dumps and in waste ground. In dry sandy woods north of Orion, Greensville County, apparently naturalized, some large plants with the expanded heads 5–6 cm. broad, others, in poorer soil, with them only 2–3 cm. across (nos. 14,062 and 14,063).

Senecio obovatus Muhl. Range extended down the James to Isle of Wight County: seeping calcareous wooded bluffs west of old Fort Boykin, no. 13,187. See p. 345.

Cirsium virginianum (L.) Michx. Range extended inland to southwestern Dinwiddie County: open argillaceous low woods just east of McKenney, no. 14,070. See p. 373.

*Sonchus oleraceus L., forma lacerus (Willd.) G. Beck. James City County: calcareous fossiliferous bluff by James River, Grove Landing, southeast of Grove, no. 13,488; a relatively rare form in America.

*S. asper (L.) Mill., forma inermis (Bisch.) G. Beck. Isle of Wight County: with typical *S. asper* on dry calcareous bluff by Burwell's Bay, James River, at Bailey's Beach, near Rushmere, no. 13,188.

*Lactuca canadensis L., var. obovata Wieg., forma Steelei (Britton) Fernald in Rhodora, xl. 481 (1938). *L. Steelei* Britton. Range extended south to King William County: border of sandy oak woods southwest of Aylett, no. 13,489.

*Prenanthes serpentaria Pursh, forma **simplicifolia**, f. nov., foliis oblongis vel elliptico-lanceolatis.—Virginia: rich woods and bushy clearing just east of the "fall-line" along Nottoway River, Double Bridge, about 6 miles northwest of Jarratt, Sussex County, September 21, 1939, *Fernald & Long*, no. 11,485 (type in Herb. Gray.; isotype in Herb. Phil. Acad.); Bedford County, October 6, 1871, *A. H. Curtiss*.

Prenanthes serpentaria is ordinarily the most stable species of our flora in its foliage. Typically the lower and median leaves are of an ovate outline and deeply lobulate, whereas the foliage of *P. trifoliolata* (Cass.) Fernald and *P. altissima* L. is variable without seeming limit. Forma *simplicifolia* is, therefore, a noteworthy departure from typical *P. serpentaria*. It is possible that it may be *Nabalus integrifolius* Cass., basis of *N. Fraseri*, var. *integrifolius* (Cass.) Torr. & Gray. Without close study of Cassini's type it would be unsafe to guess, since Torrey & Gray and, after them, Gray did not distinguish *P. serpentaria* and *Nabalus Fraseri* from the polymorphic northern *P. trifoliolata* (Cass.) Fernald, which sometimes has unlobed leaves.

INDEX

New scientific names are printed in full-face type

Photo. B. G. Schubert.

NUPHAR ADVENA: FIG. 1, young plant with translucent submersed leaves, × 1; FIG. 2, flower, laid open, × 1.

Photo. B. G. Schubert.

NUPHAR SAGITTIFOLIUM: FIG. 1, floating leaf, × 3/7; FIG. 2, submersed leaf, × 3/7; FIGS. 3 and 4, flowers, laid open, × 1.

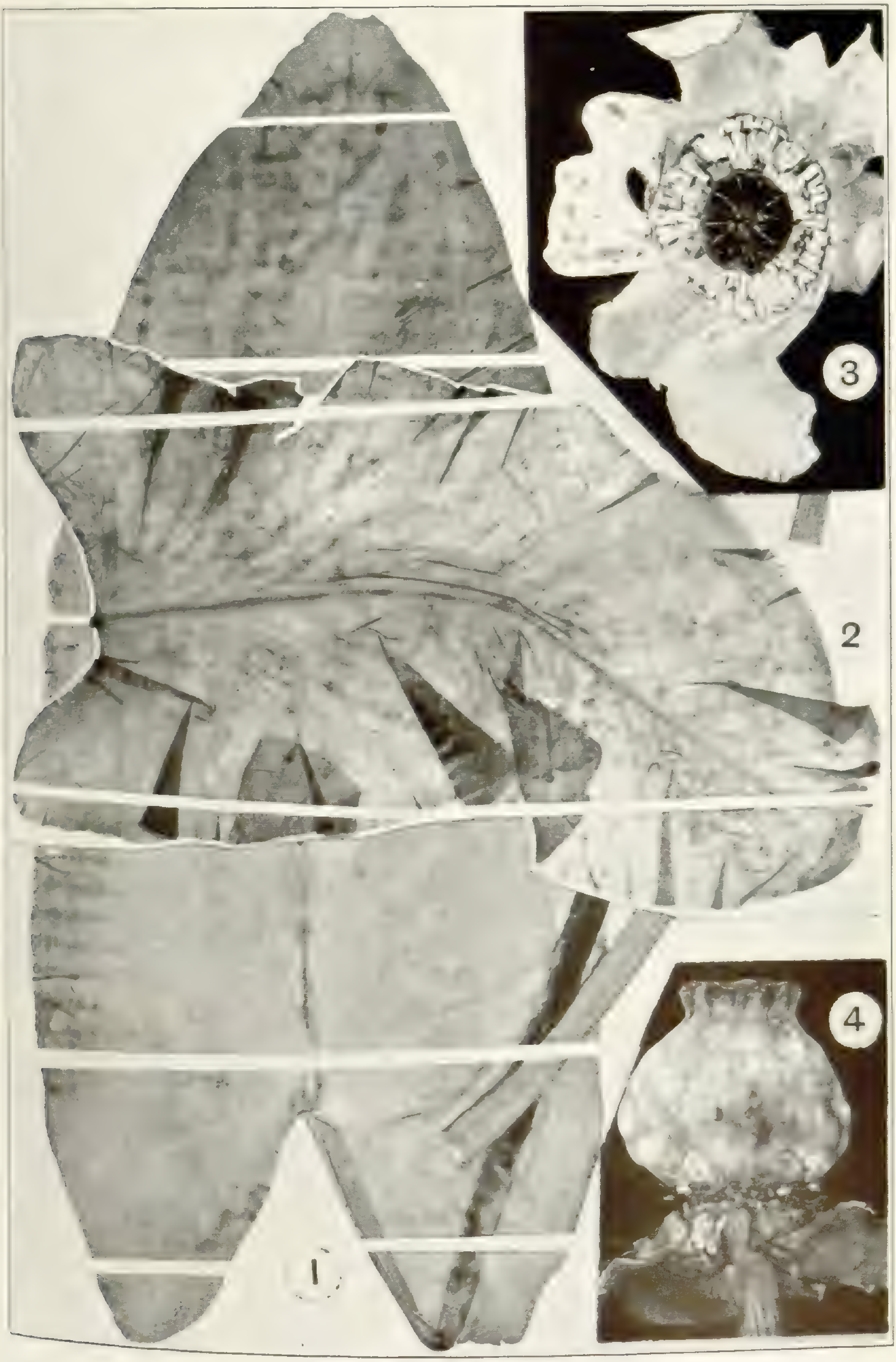


Photo. B. G. Schubert.

NUPHAR INTERFLUITANS: FIG. 1, floating leaf, × 2/5; FIG. 2, submersed leaf, × 2/5; FIG. 3, flower, laid open, × 1; FIG. 4, fruit, × 1.

Photo. B. G. Schubert.

ACONITUM UNCINATUM, FIG. 1; var. ACUTIDENS, FIGS. 2–4: all × 1

Photo. B. G. Schubert.

HEUCHERA AMERICANA, var. SUBTRUNCATA, × 1/2, FIG. 1; var. HETERADENIA, × 4, FIGS. 2 and 3; var. HIRSUTICAULIS, × 4, FIG. 4; var. INTERIOR, × 4, FIG. 5.

Photo. B. G. Schubert.

RUBUS DEFECTIONIS. × 1

Photo. B. G Schubert.

Rubus dissitiflorus. × 1.

Photo. B. G. Schubert.

CASSIA FASCICULATA, forma TRANSMUTATA, FIG. 1 × 1, FIG. 2 × 3; forma MUTATA, FIG. 3 × 3.

Photo. B. G. Schubert.

ACER FLORIDANUM: FIG. 1, foliage and fruit, × 1; FIG. 2, portion of inflorescence, × 3. Forma VILLIPES: FIG. 3, foliage and fruit, × 1.

Photo. B. G. Schubert.

Acer floridanum, var. Longii: fig. 1, flowering branch, × 1; fig. 2, flowers, × [?]; fig. 3, fruiting branch, × 1.

Photo. B. G. Schubert.

ACER FLORIDANUM: FIG. 3, lower surface of leaf and summit of petiole, × 6. Forma VILLIPES: FIG. 4, lower surface of leaf and summit of petiole, × 6. Var. LONGII, forma PLATYLOBUM: FIG. 1, leaf, × 1; FIG. 2, lower surface of leaf and summit of petiole, × 6.

Photo. B. G. Schubert.

BACOPA STRAGULA: FIGS. 1 and 2, portions of plants, × 1; FIGS. 3 and 4, flowers, × 8; FIGS. 5 and 6, corollas, laid open, × 10.

Photo. B. G. Schubert.

Bacopa simulans: fig. 1, plant, × 1; fig. 2, corolla, laid open, × 10

Photo. B. G. Schubert.

GRATIOLA VIRGINIANA: FIGS. 4 and 5, fruiting nodes, × 1. Forma ACUTIDENS: FIGS. 1 and 2, portions of plant, × 1. Var. AESTUARIORUM: FIG. 3, fruiting tip,

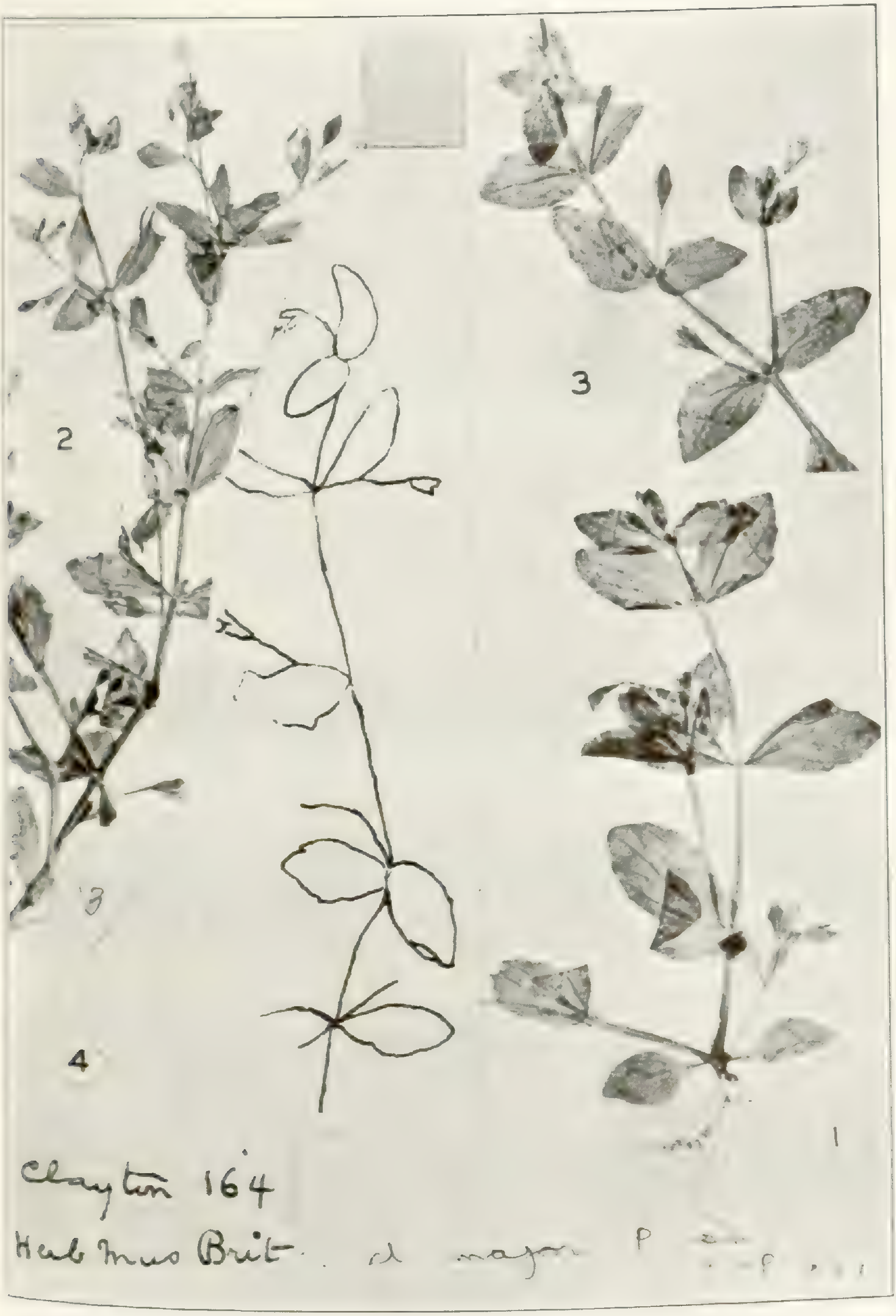


Photo. B. G. Schubert.

LINDERNIA DUBIA: portions of plants, × 1; FIG. 4, tracing of type.

Photo. B. G. Schubert.

LINDERNIA DUBIA, var. RIPARIA: portions of plants, $\times$ 1.

Photo. B. G. Schubert.

Lindernia dubia, var. inundata, all × 1.

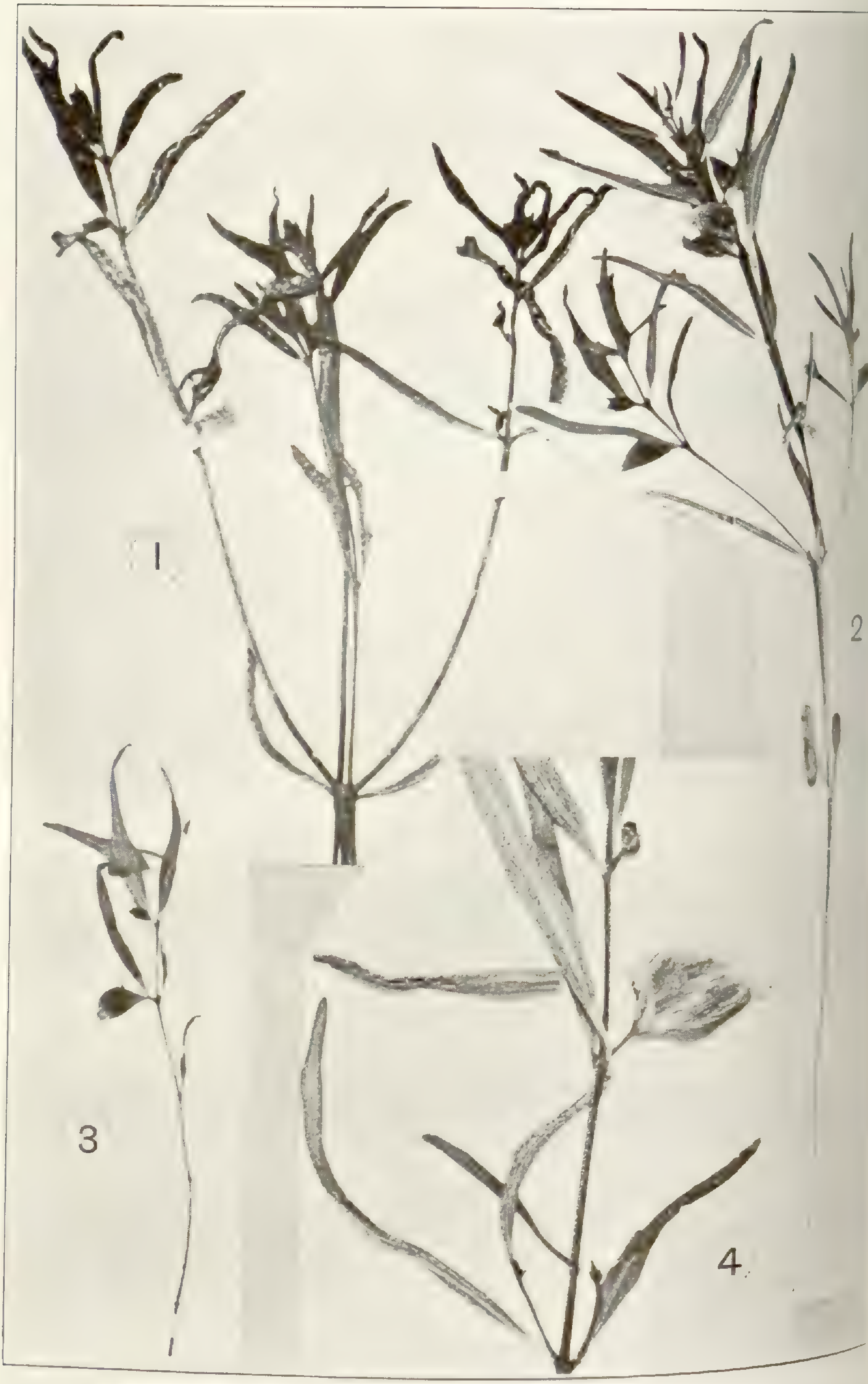


Photo. B. G. Schubert.

Melampyrum lineare: figs. 1–3, × 1, fig. 4, × 2; fig. 1, summit of Desrousseaux's type, photo after *Cintract*.

Photo. B. G. Schubert.

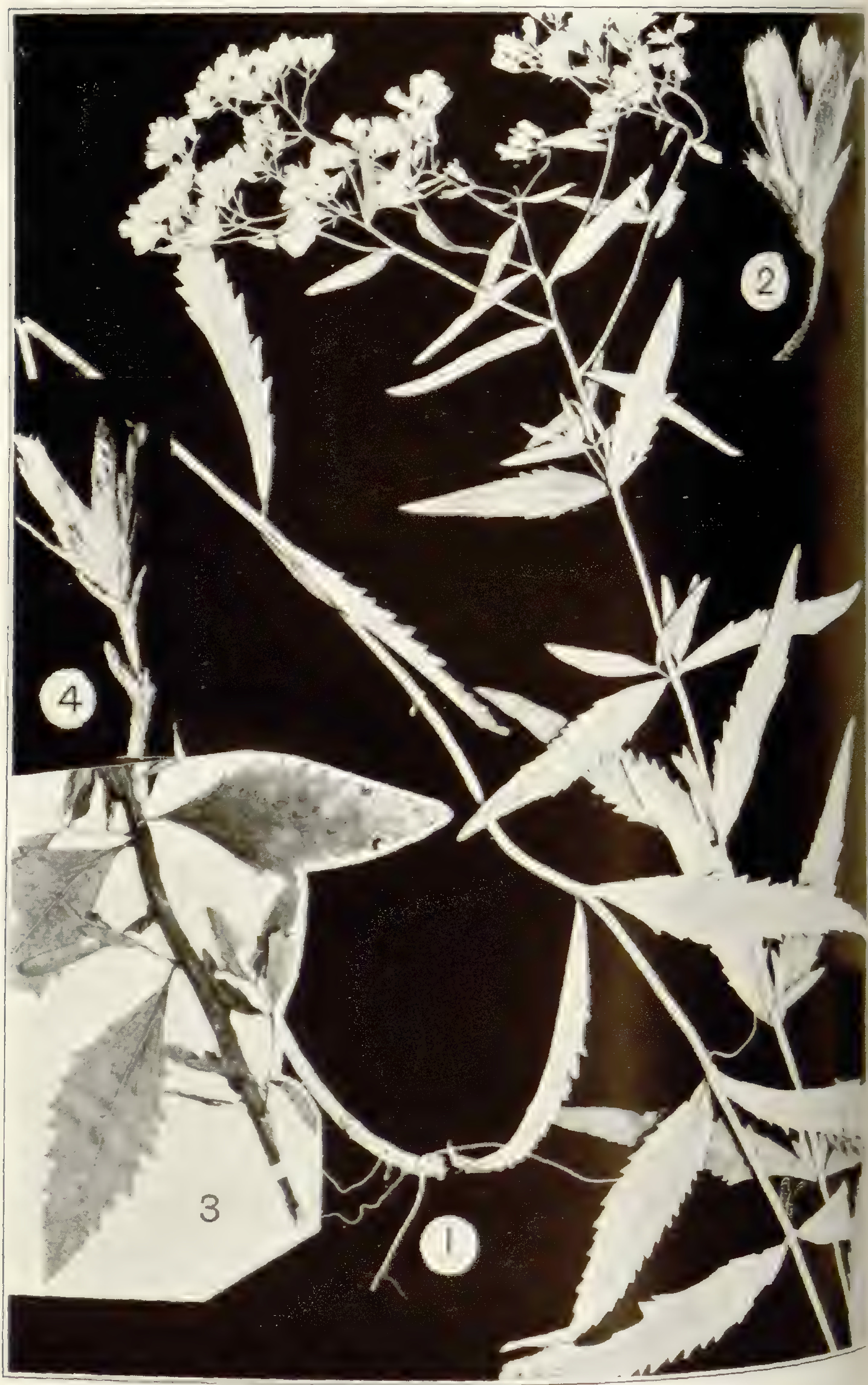
MELAMPYRUM LINEARE, var. AMERICANUM: FIGS. 1 and 3, × 1, FIG. 2, × 2; FIGS. 1 and 2, from Michaux's TYPE, after *Cintract.*

Photo. B. G. Schubert.

Melampyrum lineare, var. pectinatum: fig. 1, portion of Pennell's isotype, × 1
Var. latifolium: fig. 2, portion of flowering axis, × 1.

Photo. B. G. Schubert.

Eupatorium hyssopifolium: fig. 1, foliage, × ½. Var. laciniatum: fig. 2, foliage, × ½. Var. linearifolium: fig. 3, foliage, × ½.



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EUPATORIUM SALTUENSE: FIG. 1, TYPE, × ½; FIG. 2, involucre, × 4.
E. ANOMALUM: FIG. 3, foliage, × ½; FIG. 4, involucre, × 4.

Photo. B. G. Schubert.

EUPATORIUM RUGOSUM, var. CHLOROLEPIS: FIG. 1, foliage, × 1; FIGS. 2–4, heads and involucre, × 4; all from TYPE.

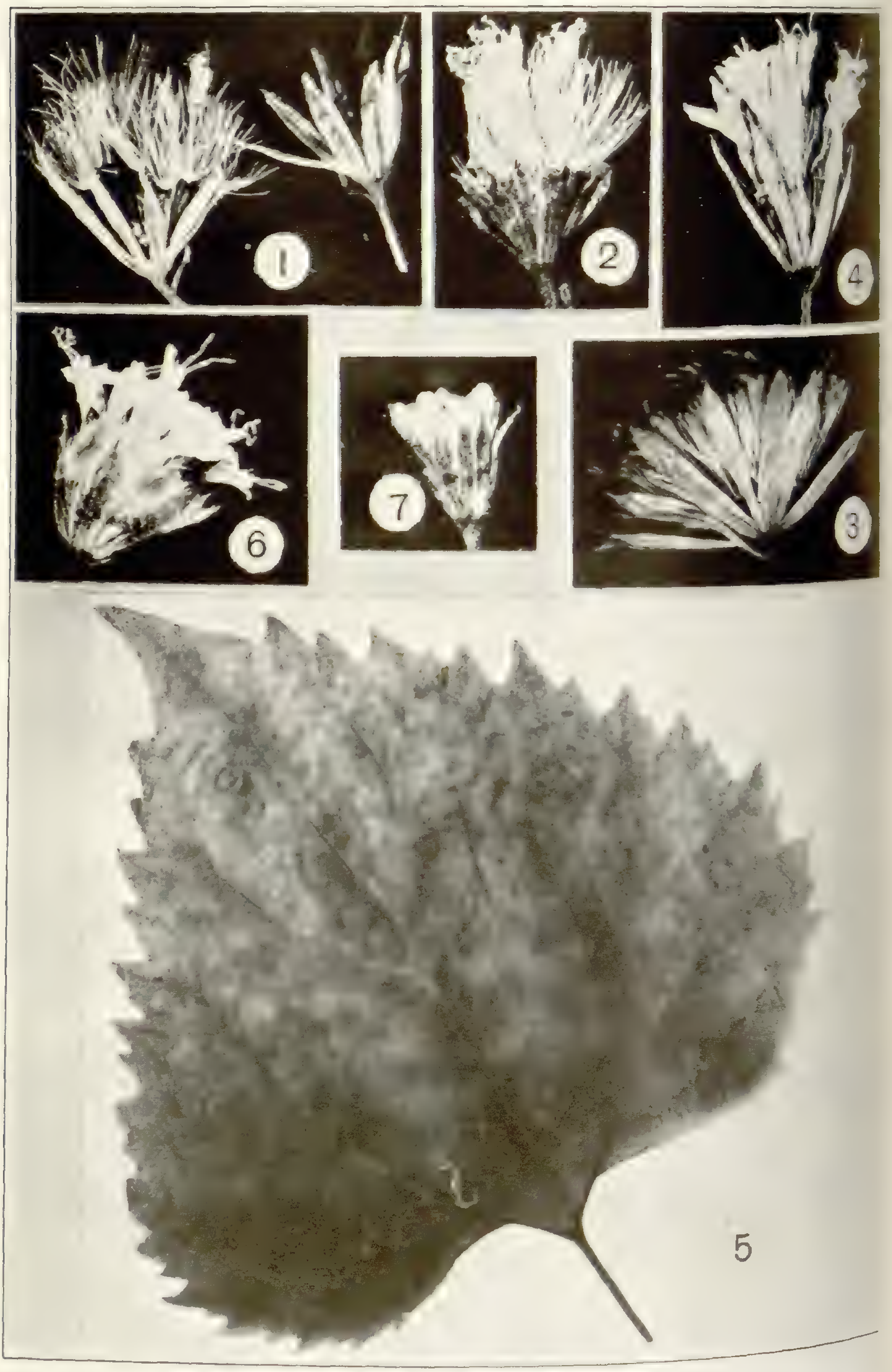

Photo. B. G. Schubert.

EUPATORIUM RUGOSUM: FIG. 1, head and involucre. Var. ANGUSTIFOLIUM: FIG. 2, head. Var. ROANENSE: FIG. 3, head. Forma VILLICAULE: FIG. 4, head. All × 4. E. LUCIAE-BRAUNIAE: FIG. 5, leaf, × 1; FIGS. 6 and 7, flowering and budded heads, × 4; all from TYPE.

Photo. B. G. Schubert.

CHRYSOPSIS CORRELLII: FIG. 1, TYPE, × 2/5; FIG. 2, head, × 4. C. MICROCEPHALA: FIG. 3, head, × 4.

Photo. B. G. Schubert.

Chrysopsis adenolepis: fig. 1, type, × 2/5; fig. 2, head, × 4.
C. graminifolia: fig. 3, head, × 4.

Photo. B. G. Schubert.

CHRYSOPSIS NERVOSA: FIG. 3, a small inflorescence, × 1. Var. STENOLEPIS: FIG. 1, portion of plant, × 1; FIG. 2, head, × 4.

Photo. B. G. Schubert.

CHRYSOPSIS NERVOSA: FIG. 3, head, × 4.
Var. VIRGATA: FIG. 1, TYPE, × ⅓; FIG. 2, head, × 4.

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CXLVI

A REVISION OF THE GENUS GERANIUM IN MEXICO AND CENTRAL AMERICA

H. Emery Moore, Jr.

FIG. 1, GERANIUM GENTRYI, n. sp.; FIG. 2, G. OAXACANUM, n. sp.; FIG. 3, G. MEXICANUM var. TYPICUM; FIG. 4, G. VULCANICOLA; FIG. 5, G. HINTONII, n. sp.; FIG. 6, G. SCHIEDEANUM.

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CXLVI

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A REVISION OF THE GENUS GERANIUM IN MEXICO AND CENTRAL AMERICA

H. Emery Moore, Jr.

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sp.

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

A REVISION OF THE GENUS GERANIUM IN MEXICO AND CENTRAL AMERICA

H. EMERY MOORE, JR.

INTRODUCTION

A GENUS of about 300 species, *Geranium* is represented in Mexico and Central America by 43 species. There its distribution is confined to the temperate highlands where the number is nearly twice that of the native species of the remainder of North America.

A limited acquaintance in the field with some of the small-flowered species aroused an interest in problems pertaining to them in particular. A later and wider survey of the taxonomic state of the genus in the area selected revealed a decided need for revision. This need is a result partly of the unsatisfactory nature of the last comprehensive treatment and partly of the accumulation of much additional material in the last thirty years.

The present revision is not complete. The floras of Mexico and Central America are still far from well-known and the limited amount of material available for study leaves much to be desired in any consideration of species-variability and geographical distribution.

Unfortunately, the collections in European herbaria, upon which much previous work was founded, have not been accessible. It has been possible, however, to draw the primary specific lines, to clear up some confusion resulting from the misapplication of names and to lay a more sound basis of classification in terms of the real characters. The series of specimens at hand in this study have usually been sufficient to differentiate the variable characters from the stable.

HISTORICAL ACCOUNT

The only comprehensive treatments of the Mexican and Central American species of *Geranium* are those in Hanks and

Small[1] and Knuth.[2] These authors treated all the species then known to grow in the area under consideration and Knuth also presented a subgeneric classification by sections. Many new species were described by these and contributing authors.

Both treatments, however, are unsatisfactory for the Mexican and Central American species. Hanks and Small apparently did not consult all the material available in American herbaria and as a consequence their specific lines are often too finely drawn. Several of the descriptions do not correspond to the type-specimens and names are often misapplied. Numerous errors in the key and contradictions between the key and the descriptions add to the difficulty of using the work.

Knuth, as was customary with the authors of *Das Pflanzenreich*, based his study on material in European herbaria, neglecting the many critical collections in the United States. This may account for his inadequate interpretation of the Mexican species. He included much of the work of Hanks and Small without change or comment and most of their errors are retained.

Reiche[3] and Knuth[4] have presented the most important outlines of the genus, listing sections and representative species. Knuth's previous treatment in *Das Pflanzenreich* is the most important subgeneric classification, having a more comprehensive basis than Reiche's treatment and forming the foundation for his later work.

Classification

1. Series

In monographing *Geranium* for the world in *Das Pflanzenreich*, Knuth grouped the species, about 250, in 30 sections on the basis of duration, habit, rhizome, foliage, size of flowers, type of inflorescence and geographical distribution. In five of these sections, *Sylvatica*, *Caespitosa*, *Incanoidea*, *Striata* and *Mexicana*, were included the species of Mexico and Guatemala known to him. The remainder of Central America was given little attention.

[1] Hanks & Small, N. Am. Fl. 25 (1907).
[2] Knuth, in Engler, Pflanzenr. 4 Fam. 129 (1912).
[3] Reiche, in Engler & Prantl, Pflzfam. 3 Abt. 4 (1897).
[4] Knuth, in Engler & Prantl, Pflzfam. Ed. 2, 19a (1931).

It has not been possible to evaluate sections other than the five mentioned. The limits of others may be more definite and more easily adapted to allow for the inclusion of new species. In studying the Mexican species, however, many have been found at variance with Knuth's disposition. It has been difficult to consider such widely different species as *G. Wislizeni*, erect with villous petals, and *G. clarum*, procumbent with reticulate-veined petals, closely related to *G. Seemanni* (*G. mexicanum* sensu Knuth), an ascending species with nearly free-veined, essentially glabrous, small petals. All three were included in section *Mexicana.* Striking differences in habit and pubescence between species of series *Nivea* and *Bella*, included together in section *Incanoidea*, will be discussed in more detail. *G. atropurpureum* and *G. crenatifolium* differ as much from each other as from those species of western North America with which they were placed in section *Caespitosa*. *G. Hernandezii* and *G. mexicanum* var. *resimum*, both placed with *G. striatum* and other Old World species in section *Striata*, are certainly not closely related to those species and, further, have quite different types of inflorescences, habit, flowers and leaves. In addition, the several novelties, five alone in series *Deltoidea*, have failed, in many instances, to fit sections already delimited, thus making the definition of some new categories necessary.

Consequently, reëvaluating the characters used in part by Knuth and placing more emphasis on the type of inflorescence, leaf-shape, more exact characters of the petals and fruit, such as petal-venation and -pubescence and length of the style-beak, I have arranged the species of the area considered in twelve series which represent convenient and apparently natural groups of species. That they are little more than the latter is apparent when morphological characters are sought which might make possible a generic subdivision of higher order and the series as set here up are not always sharp in their lines.

2. Species

Specific differences are generally cumulative, based on several characters of the habit, inflorescence, leaf, flower and fruit. The most important characters are those of inflorescence-type and habit, division of the leaves, pubescence, size, venation and pubescence of the petals and the length of the fruit and style-beak.

Except for *G. carolinianum* all of the species appear to be **perennial.** *G. cruceroënse* and *G. Seemanni* have been described as annual but I have grown these species and both are at least short-lived perennials, sending up new rosettes of leaves from the apex of the old rhizome after a short period of dormancy.

Habit is one of the characters given importance by Knuth. It is valuable in conjunction with associated inflorescence-types in the delimitation of two groups of series, the first six, A–F, being erect or spreading with determinate inflorescences (Pl. 1, figs. 2, 3; Pl. 4, fig. 3), the remaining six, G–L, of lower habit with mostly indeterminate inflorescences (Pl. 1, figs. 1, 4, 5, 6; Pl. 4, figs. 1, 8). One series, *Repentia*, is characterized by the unusual procumbent or repent habit of its members.

The **roots** are of little critical value. Usually woody or woody-fibrous, they sometimes become greatly enlarged and cormose as in *G. oaxacanum.* (Pl. 1, fig. 2.)

The **rhizome** may be stout, vertical and single as in *G. trolliifolium,* or similar but tufted as in series *Nivea;* or long, slender and branched as in series *Crenata.* A singular *Dryopteris*-like rhizome is found in *G. monanthum.* The character of the rhizome is a supplementary character that often is consistent within a series but that varies with age and habitat and is difficult to use.

The **caudex** varies greatly with the age of the plant and is not generally useful as a taxonomic character.

Diagnostically, the **leaves** are of great importance. The blades are usually 3–5-lobed; those with four incisions of equal depth are termed 5-lobed; those with two incisions of equal depth, 3-lobed (Pl. 2 and 3). In the latter, the lateral lobes are often parted again to a lesser degree. The depth of division of the blade is variously expressed as divided from one-half to nearly to the base, these proportions being based on measurements from the tip of the lobe and from the sinus to the point of attachment at the petiole. The depth of division and the shape of the lobes and ultimate segments or teeth are critical characters in both series and species. Also the contrast between the basal leaves and the cauline leaves and the deciduous or persistent nature of the basal leaves.

All the leaves are stipulate but in few species are the stipules constant or different enough to be used. Notable exceptions are found in the conspicuous basal stipules of series *Crenata* and *Trolliifolia* and to some degree in the cauline stipules of series *Nivea* and *Bella*.

The **inflorescence** is of two types. In species 1–15 it is a terminal, loosely branched or seldom corymbiform cyme, rarely of single peduncles rising from the caudex (Pl. 1, figs. 2, 3; Pl. 4, fig. 3). In species 16–42 it is usually indeterminate with the peduncles borne singly at the nodes along the stem or sometimes aggregated at the tips of the branches (Pl. 1, figs. 1, 4, 5, 6; Pl. 4, figs. 1, 8). *G. carolinianum* has the peduncles solitary or in terminal, few-flowered corymbs.

Pubescence is an excellent accessory character but it is often variable. In naming the various types, I have tried to follow the definitions of Gray and Lindley, adapting them to meet the demands of terminology within the genus. A study of plate 5 will help to visualize several types such as the villous petioles of *G. bellum*, the hirsute and glandular pubescence of *G. hystricinum* and the hispidulous pedicels of *G. atropurpureum*. The pedicels, sepals and fruiting parts of many species have short to long, gland-tipped hairs in addition to the various eglandular hairs. This condition has been referred to as glandular; the relative length of the tipped hairs as short or long. Series *Bella* is characterized by the lack of any glandular hairs and two species, *G. alpicola* and *G. hystricinum*, are noteworthy for exceptional pubescence-types.

Measurements of the **peduncle** and **pedicel** have been found to be fairly constant within limits and these have been used in the key to some extent.

Most truly critical characters are concerned with the flowers and fruit. It is advisable to have both flowering and fruiting material for easy identification.

The **calyx** is imbricate in bud and therefore only the outer sepals are entirely regular. All descriptions are based on these.

The sepals of all our species have awns that are only occasionally distinctive as in *G. aristisepalum*.

Many important characters are associated with the **petals.** The size, again, shows considerable variation in some species but it is relatively constant in others. The venation is of two types: profusely reticulate as in most species (PL. 5, FIG. 4; PL. 4, FIG. 7) or essentially free with few areoles and only slightly anastamosed at the apex as in series *Vulcanicola* and *Caroliniana* (PL. 5, FIG. 2). The veins are usually darker than the petal-tissue. The petals are all pubescent and fall in three groups: those villous or pilose at the base and along the veins to or past the middle (PL. 5, FIG. 4); those similar but with the hairs confined to the basal portion, termed shortly-pilose, and those with two lateral tufts of short hairs at the base as in series *Vulcanicola* (PL. 5, FIG. 2). In many series, *Bella*, *Deltoidea*, *Atropurpurea*, *Vulcanicola*, etc., the pubescence of the petals is a constant character throughout. Field experience leads me to believe that the color of the petals is constant in most species, but due to the difficulty of determining this in dried material, I have primarily distinguished only between white and colored petals.

Within limits, the mature **fruit** is essentially uniform in shape, size and pubescence. To distinguish the terms beak and column as used indiscriminately for the whole fruit by older writers, I designate the united styles between the ovary and the free stigmas as the **style-column.** The stigmas are stigmatic to various degrees but are always free and very constant in length. Collectively, they form the **style-beak** and all measurements have been made from the point of union at the tip of the style-column to the tips of the free branches. The importance of the style-beak as a character cannot be overestimated; the length is as constant as any character used and relatively minor differences are given considerable importance. The ovary-wall that surrounds the fruit in seed is termed the **carpel-body** and is only occasionally useful in diagnosis.

The **seeds** are mostly reticulate in our species and show little specific variation. In one species, *G. sublaevispermum*, the reticulations are very fine so that the seed appears smooth in contrast with related species (PL. 4, FIGS. 4, 5, 6).

Geographical Distribution

The genus *Geranium* is widely distributed throughout the temperate regions of the world and in the cool, high mountainous regions of the topics.

In Mexico and Central America, *Geranium* occurs in the temperate oak and pine or alpine regions of the Cordilleras. All but three of the forty-three species are endemic to the area. These three, *G. atropurpureum*, *G. Wislizeni* and *G. carolinianum*, grow in the southwestern United States and the last is of wide distribution in the east and west.

By far the greatest number are local in their distribution, being represented from single stations or single regions. Of the forty-three species, eleven are known only from the type-locality and another eleven from a single state. Of the remaining species, a few are distributed throughout Mexico or Central America and the rest rather abundantly in certain areas such as the central plateau of Mexico or the Sierra Madre of the northwestern states of Durango, Chihuahua, Sinaloa and Sonora.

The series usually form a geographical as well as a morphological unit. Thus, series *Crenata* occurs in the Sierra Madre Oriental from Nuevo Leon to San Luis Potosí; series *Lata*, *Resima* and *Deltoidea* in the Sierra Madre Occidental; series *Nivea* mostly in northwestern Mexico; series *Repentia* along the Central American Cordillera and adjacent mountains of western Mexico and series *Bella* and *Vulcanicola* primarily in the central pleateaus of Mexico and Guatemala.

It is too early, however, to draw conclusions as to the number of true local species. Exploration of each new region brings out extensions of ranges of known species and new species of apparent isolation.

Further notes on geographical ranges will be included in the discussions of the various species.

Materials

This study is based upon approximately 750 sheets of Mexican and Central American *Geranium* in the herbaria of the Field Museum of Natural History (abbreviated F in the specimen-citations); Gray Herbarium (G); Missouri Botanical Garden

(M); New York Botanical Garden (NY); Pomona College (P) and the United States National Herbarium (US).

Type-specimens or type-collections of most of the names have been available. Photographs of types in European herbaria are available in the Gray Herbarium and particularly in the herbarium of the Field Museum. In several cases it has seemed wise to designate a type where several collectors were cited. These lectotypes have been chosen from collections seen by the writer. In addition to the older collections, the recent activities of several collectors in Mexico have added considerably to our knowledge of the species, old and new.

Acknowledgements

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Key to the Series

A. Inflorescence cymose, terminal; stems erect, spreading or sometimes lacking; petals (8–) 10 mm. long or longer . . . . B.
- *B*. Petals unguiculate; sepals 4.5–5 mm. long . . . . Series *C. Ambigua.*
- *B*. Petals obovate or cuneate-obovate, not conspicuously clawed; sepals 6 mm. long or longer . . . . *C*.
  - *C*. Leaves divided to the base; lobes pinnatifid-toothed with long, linear to linear-lanceolate segments . . . . Series *B. Nivea.*
  - *C*. Leaves divided one-half to three-fourths to the base; lobes variously toothed with wider segments . . . . *D*.
    - *D*. Inflorescence compact, corymbiform; peduncles 1–∞-flowered . . . . Series *A. Trolliifolia.*
    - *D*. Inflorescence loose, taller than wide; peduncles 1–2-flowered . . . . *E*.
      - *E*. Lateral lobes of the cauline leaves progressively reduced toward the inflorescence; tall plants, up to 8 dm. high . . . . *F*.
        - *F*. Basal leaves few, not long-persistent; cauline leaves numerous; peduncles mostly less than 9 cm. long . . . . Series *D. Lata.*
        - *F*. Basal leaves numerous, persistent; cauline leaves few; peduncles 7–25 cm. long . . . . Series *E. Resima.*
      - *E*. Lateral lobes of the cauline leaves not progressively

reduced toward the inflorescence; low plants, seldom more than 3.5 dm. high............Series *F. Crenata.*

A. Inflorescence of peduncles borne singly at the nodes along the stem, or if somewhat congested then the petals less than 10 mm. long; stems repent to ascending, rarely erect....*G.*

G. Pubescence entirely eglandular; leaves divided nearly to the base; lobes long-pinnatifid- to bipinnatifid-toothed; petals 10–22 mm. long, shortly pilose at the base....Series *H. Bella.*

G. Pubescence glandular, at least of the pedicels, or if eglandular then the petals pilose or villous along the veins nearly to the middle or less than 10 mm. long; leaves variously divided and toothed....*I.*

I. Basal leaves absent; stems rising at intervals from a long, horizontal rhizome..........................Series *H. Bella.*

I. Basal leaves present; stems rising from a definite, terminal caudex....*J.*

J. Mature style-beak (2–) 2.5–8 mm. long; veins of the petals 5 or more, conspicuously reticulate....*K.*

K. Mature style-beak 5–8 mm. long; petals purple, villous to the middle with straight, terete hairs Series *G. Atropurpurea.*

K. Mature style-beak less than 5 mm. long or the petals white, variously pubescent with curly, flattish hairs....*L.*

L. Leaves divided one-half to three-fourths to the base; median lobe rhombic or wide-rhombic with teeth mostly less than 5 mm. long; stems procumbent with ascending branches, ascending or rarely erect....................Series *I. Deltoidea.*

L. Leaves divided three-fourths or nearly to the base; median lobe narrow-rhombic with teeth mostly 5 mm. long or longer; stems procumbent or repent.........................Series *J. Repentia.*

J. Mature style-beak 1–2 (–2.5) mm. long; veins of the petals 3–5, nearly free except at the apex of the petal....*M.*

M. Carpel-body ascending-villous; peduncles solitary or in loose, 4–12-flowered corymbs; annual or biennial...........................Series *L. Caroliniana.*

M. Carpel-body pilose, hirsute or glandular with straight or appressed hairs; peduncles solitary or in loose cymes; perennials........Series *K. Vulcanicola.*

Artificial Key to the Species

A. Acaulescent plants; peduncles rising from the caudex....*B.*

B. Pedicels antrorse-strigillose or -canescent; Oaxaca and Guatemala.................................3. *G. alpicola.*

B. Pedicels open- or retrorse-pubescent....*C.*

C. Stem villous below; northeastern Mexico........12. *G. crenatifolium.*

C. Stems glabrate to strigose below....*D.*

D. Petals 10 mm. long, white or yellowish; San Luis Potosí...15. *G. tenue.*

D. Petals 13–18 mm. long, rose-lavender; Guanajuato and Michoacan to Mexico........11. *G. mexicanum* var. *typicum.*

A. Caulescent plants; peduncles solitary at the nodes or in cymose or corymbose inflorescences....*E.*

E. Inflorescence cymose, terminal; stems erect or spreading; petals 10 mm. long or longer. . . .*F*.
F. Petals unguiculate with a claw ca. 9 mm. long; sepals 4.5–5 mm. long; Guerrero. . . . . .6. *G. unguiculatum.*
F. Petals obovate or cuneate-obovate, not conspicuously clawed; sepals 6 mm. long or longer. . . .*G*.
G. Leaves divided to the base; lobes pinnatifid-toothed with long, linear to linear-lanceolate segments. . . .*H*.
H. Leaves white-canescent, at least below. . . .*I*.
I. Petals spatulate, reflexed in anthesis; pedicels glandular; Chihuahua. . . . . .2. *G. niveum.*
I. Petals obovate, not reflexed in anthesis; pedicels antrorse-strigillose or -canescent; Oaxaca and Guatemala. . . . . .3. *G. alpicola.*
H. Leaves strigose or strigillose beneath. . . .*J*.
J. Pedicels glandular; fruit 25–35 mm. long; Nayarit. . . . . .4. *G. madrense.*
J. Pedicels not glandular; fruit 20–27 mm. long; Chihuahua and Sinaloa. . . . . .5. *G. charucanum.*
G. Leaves divided one-half to three-fourths to the base; lobes variously toothed with wider segments. . . .*K*.
K. Inflorescence compact, corymbiform; peduncles 1–∞-flowered; Chihuahua and Durango. . .1. *G. trolliifolium.*
K. Inflorescence loose, taller than wide; peduncles 1–2-flowered. . . .*L*.
L. Mature style-beak 5–8 mm. long; petals purple, villous to the middle with straight, terete hairs; northwestern Mexico. . . . . . . .16. *G. atropurpureum.*
L. Mature style-beak 1.5–5 mm. long; petals shortly pilose or villous along the veins toward the middle with curly, flattish hairs. . . .*M*.
M. Stems villous below with terete, translucent hairs; petals shortly pilose at the base. . . .*N*.
N. Leaf-blades densely pubescent above; lobes obtusely cleft and toothed at the apex; northeastern Mexico. . . . . .12. *G. crenatifolium.*
N. Leaf-blades sparsely pubescent above; lobes sharply cleft and incised; Hidalgo. . . . .13. *G. Pringlei.*
M. Stems glabrate to long-pilose or hirsute below with flattish, opaque hairs; petals mostly pilose or villous along the veins toward the middle. . . .*O*.
O. Petals rose to lavender. . . .*P*.
P. Basal stipules 10–20 mm. long, persistent, conspicuous; Nuevo Leon. . . . . .14. *G. potosinum.*
P. Basal stipules much shorter, soon withered. . . .*Q*.
Q. Basal leaves numerous, persistent; peduncles 7–25 cm. long; Nayarit and Zacatecas to Mexico. . . . . .11. *G. mexicanum.*
Q. Basal leaves few, not long-persistent; peduncles 3–5 cm. long; Oaxaca. .9. *G. oaxacanum.*
O. Petals white or pinkish, often with red veins. . . .*R*.
R. Basal leaves numerous, persistent; cauline leaves few, not much reduced toward the inflorescence; San Luis Potosí. . . . .15. *G. tenue.*
R. Basal leaves few, not long-persistent; cauline leaves numerous; lateral lobes pro-

gressively reduced toward the inflorescence.... *S*.

S. Mature style-beak 3–5 mm. long, usually red; leaf-lobes rhombic in outline.... *T*.

T. Leaves thin, light-green; lobes and teeth narrow; stems sparsely strigose: Chihuahua................7. *G. albidum.*

T. Leaves thick, dark-green; lobes and segments broad; stems mostly pilose; central Mexico ....8. *G. latum.*

S. Mature style-beak 2–2.5 (–3) mm. long, never red; leaf-lobes mostly cuneate-obovate in outline; northwestern Mexico........................10. *G. Wislizeni.*

E. Inflorescence of peduncles borne singly at the nodes along the stem, or if sometimes congested then the petals less than 10 mm. long; stems repent to ascending, rarely erect.... *U*.

U. Mature style-beak 2.5–8 mm. long.... *V*.

V. Petals with 3–5 nearly free veins that anastamose only slightly at the apex; Chihuahua to central Mexico 40. *G. subulato-stipulatum.*

V. Petals with 5 or more conspicuously reticulate veins.... *W*.

W. Mature style-beak 5–8 mm. long; petals purple, villous along the veins to the middle with straight, terete hairs; northwestern Mexico......16. *G. atropurpureum.*

W. Mature style-beak less than 5 mm. long or the petals white, variously pubescent with curly, flattish hairs.... *X*.

X. Pedicels antrorse-strigillose or -canescent; Guatemala....................................3. *G. alpicola.*

X. Pedicels open- or retrorse-pubescent.... *Y*.

Y. Basal leaves absent; stems rising from an elongate, horizontal rhizome; Oaxaca..21. *G. monanthum.*

Y. Basal leaves present; stems rising from a definite, terminal caudex.... *Z*.

Z. Pedicels not glandular.... *a*.

a. Sepal-awns (2–) 3–4 mm. long; central Mexico......................24. *G. aristisepalum.*

a. Sepal-awns 0.5–2.5 mm. long.... *b*.

b. Petals lavender to purple.... *c*.

c. Stems, peduncles and pedicels villous; Chiapas.....................19. *G. Goldmanii.*

c. Stems, peduncles and pedicels strigillose to hirsute.... *d*.

d. Leaf-segments linear; peduncles mostly less than 10 cm. long and 1-flowered; central Mexico 20. *G. potentillaefolium.*

d. Leaf-segments ovate- or oblong-lanceolate; peduncles mostly more than 10 cm. long and 2-flowered; San Luis Potosí to Oaxaca. 22. *G. Schiedeanum.*

b. Petals white or faintly pink.... *e*.

e. Leaves divided three-fourths to nearly to the base, pentagonal or orbicular in outline; lobes more or less pinnatifid- to bipinnatifid-toothed with segments mostly 5 mm. long or longer. . . . *f*.

f. Stems, peduncles and pedicels villous. . . . *g*.

g. Petals shortly pilose at the base; stems spreading or ascending; Hidalgo. . . . . .18. *G. bellum.*

g. Petals villous along the veins toward the middle; stems repent; Guerrero. . . . . .34. *G. Hintonii.*

f. Stems, peduncles and pedicels strigillose to long-pilose. . . . *h*.

h. Pedicels 6–10 mm. long; petals deeply notched [at the apex]; Oaxaca. .33. *G. clarum.*

h. Pedicels more than 15 mm. long; petals entire or slightly emarginate. . . . *i*.

i. Leaf-blades densely spreading-pilose or -hirsute beneath. . . . *j*.

j. Peduncles mostly 1-flowered; Guatemala. . . . . .23. *G. andicola.*

j. Peduncles mostly 2-flowered; San Luis Potosí to Oaxaca 22. *G. Schiedeanum.*

i. Leaf-blades sparsely strigillose or strigose beneath; Hidalgo and Michoacan. . . . . .17. *G. Lozani.*

e. Leaf-blades divided one-half to three-fourths to the base, pentagonal, hastate or deltoid in outline; lobes toothed with teeth mostly less than 5 mm. long. . . . *k*.

k. Mature style-beak 2.5–3 mm. long. . . . *l*.

l. Seed black, nearly smooth; leaf-lobes rhombic in outline with obtusish segments; stems procumbent to ascending; Chihuahua. . . . . .27. *G. sublaevispermum.*

l. Seed brown, coarsely reticulate; leaf-lobes cuneate-obovate or obovate in outline with mostly acute segments; stems erect or spreading; northwestern Mexico. . . . . .10. *G. Wislizeni.*

k. Mature style-beak 4–6 mm. long. . . . *m*.

m. Petals 7–11 mm. wide, (10–) 15–16 mm. long; teeth of the leaf-lobes acute, mucronulate; Sinaloa to Mexico. . . . . .25. *G. Hernandezii.*

m. Petals 4 mm. wide, 10–12 mm. long; teeth of the leaf-lobes obtusish, scarcely mucronulate; Chihuahua and Durango. .26. *G. deltoideum.*

Z. Pedicels glandular. . . . *n*.

n. Leaves divided three-fourths to nearly to the base; lobes narrow-rhombic, more or less pinnatifid-toothed with teeth mostly 5 mm. long or longer; stems repent or procumbent....*o.*

o. Peduncles 6–10 cm. long, pilose or strigose; Guerrero and Guatemala to Panamá........................32. *G. repens.*

o. Peduncles 1.5–3.5 cm. long, densely villous; Guerrero....................34. *G. Hintonii.*

n. Leaves divided one-half to three-fourths to the base; lobes rhombic or cuneate-obovate, toothed with teeth mostly less than 5 mm. long; stems ascending to erect....*p.*

p. Mature style-beak 2.5–3 mm. long....*q.*

q. Petals white, villous along the veins toward the middle....*r.*

r. Upper stem and leaf-petioles long-hirsute and densely short-glandular; style-column abruptly narrowed below the style-beak; Guerrero .... 29. *G. hystricinum.*

r. Upper stem and leaf-petioles hispid to pilose, rarely glandular; style-column tapered below the style-beak....*s.*

s. Seed black, nearly smooth; leaf-lobes rhombic in outline with obtusish segments; stems procumbent to ascending; Chihuahua ....27. *G. sublaevispermum.*

s. Seed brown, coarsely reticulate; leaf-lobes cuneate-obovate or obovate in outline with mostly acute segments; stems erect or spreading; northwestern Mexico.....................10. *G. Wislizeni.*

q. Petals rose to lilac, or if paler then shortly pilose at the base....*t.*

t. Median lobe of the leaf 1.5–3 times as long as the lateral lobes; leaf-margins eglandular; central Mexico.......................31. *G. lilacinum.*

t. Median lobe of the leaf little longer than the lateral lobes; leaf-margins often glandular; Sonora. 30. *G. Gentryi.*

p. Mature style-beak 4–6 mm. long....*u.*

u. Petals lilac, or if paler then shortly pilose at the base; central Mexico 31. *G. lilacinum.*

u. Petals white, villous along the veins toward the middle....*v.*

v. Petals 7–11 mm. wide, (10–) 15–16 mm. long; Sinaloa to central Mexico..................25. *G. Hernandezii.*

v. Petals 4–5 mm. wide, 8–12 mm. long....*w.*

w. Blades of the lower cauline leaves

7–10 cm. wide; lobe-teeth acute; Jalisco.............28. *G. latilobum.*
w. Blades of the lower cauline leaves 2–4 cm. wide; lobe-teeth obtusish; Chihuahua and Durango...............26. *G. deltoideum.*

U. Mature style-beak 1–2 mm. long....*x.*
x. Petals conspicuously reticulate-veined, villous or pilose on the veins toward the middle....*y.*
y. Stems repent, densely villous; Guerrero........34. *G. Hintonii.*
y. Stems ascending or erect; glabrate to pilose....*z.*
z. Petals rose; Sonora.........................30. *G. Gentryi.*
z. Petals white; northwestern Mexico..........10. *G. Wislizeni.*
x. Petals with 3–5 nearly free veins that anastamose only slightly at the apex, pilose at the base with lateral tufts of short hairs....*aa.*
aa. Carpel-body ascending-villous; peduncles solitary or in loose, 4–12-flowered corymbs; annual or biennial; Baja California................43. *G. carolinianum.*
aa. Carpel-body pilose, hirsute or glandular with straight or appressed hairs; peduncles solitary or in loose cymes; perennials....*bb.*
bb. Leaf-blades divided to or nearly to the base; lobes radiate with linear to oblong-lanceolate teeth; stems densely strigillose or hispid below; central Mexico.................42. *G. cruceroënse.*
bb. Leaf-blades divided one-half to nearly to the base; lobes toothed with wider segments; stems mostly longer pubescent....*cc.*
cc. Mature style-beak 1 mm. long; central Mexico 37. *G. vulcanicola.*
cc. Mature style-beak 1.5–2 mm. long....*dd.*
dd. Blades of the lower cauline leaves seldom more than 3 cm. wide, mostly longer than the petioles; lobes narrow-rhombic and deeply toothed (except young or small plants of *G. Seemanni* or *G. guatemalense* with the leaf-blades shallowly toothed ....*hh.*); stems slender to moderately stout, procumbent, usually with ascending branches, seldom more than 4 dm. long ....*ee.*
ee. Petals 5 mm. long; pedicels densely pilose or hirsute, occasionally glandular; Baja California.................38. *G. flaccidum.*
ee. Petals 6–9 mm. long; pedicels short-pilose and usually copiously glandular....*ff.*
ff. Petals deeply notched; Guatemala 39. *G. culminicola.*
ff. Petals entire or shallowly emarginate; central Mexico..................41. *G. Kerberi.*
dd. Blades of the lower cauline leaves usually more than 3 cm. wide, shorter than the petioles; lobes variously toothed; stems moderately stout to stout, procumbent, ascending or semi-erect, 1 dm. to 2 m. long....*gg.*
gg. Stems and petioles long-pilose or hirsute;

lobes of the leaf-blades shallowly toothed; petals lavender to nearly white, the apex usually shallowly notched. . . . *hh*.

hh. Leaves coarsely cleft and toothed with ovate to oblong-lanceolate segments; stems ascending, 1 dm. to 1 m. long; Mexico . . . . 35. *G. Seemanni.*

hh. Leaves finely cleft and toothed with acute, lanceolate segments; stems procumbent to ascending, 1 dm. to 2 m. long; Guatemala to Panamá 36. *G. guatemalense.*

gg. Stems and petioles sparsely short- to long-pilose and densely puberulent or glandular; lobes of the leaf-blades radiate, deeply and acutely toothed; petals magenta or lilac, the apex mostly entire; Chihuahua to central Mexico 40 *G. subulato-stipulatum.*

Geranium L. Annual, biennial or perennial herbs, often with a woody root and rhizome terminating in a simple or branched caudex: stems repent to erect, dichotomously branched or more or less determinate. Leaves opposite, petiolate, stipulate; blades palmately or radiately lobed, cleft or parted; lobes variously toothed or incised: inflorescence more or less terminal and cymose, or sometimes corymbose, or of peduncles borne singly at the nodes along the stem: flowers regular, pentamerous: sepals 5, persistent, imbricate, usually awned: petals 5, deciduous, hypogynous, imbricate, reticulate-veined or only slightly so at the apex, usually pubescent toward the base, alternating with 5 glands: stamens 10 (rarely 5), all anthiferous, of two lengths, alternating; filaments free or very shortly connate at the base, often ciliate, sometimes exserted in fruit; anthers versatile, deciduous: ovary 5-lobed, 5-locular; ovules 2 per locule; styles united in a column about a long carpophore; stigmas 5 at the apex of the style-column, free; carpel-bodies 1-seeded, permanently attached to the styles; styles revolute from the base at maturity, not twisted: seed plump; surface pitted, reticulate or rarely smooth; cotyledons induplicate-plicate or convolute; endosperm thin or lacking.—Sp. Pl. **1:** 676 (1753); L. Gen. Pl. **5:** 306 (1754); Hanks & Small, N. Am. Fl. **25** (1907); Knuth, in Engler, Pflanzenr. **4** fam. **129** (1912).—*Rhamphocarpus* Neck., Elem. **2:** 438 (1790). *Robertium* Picard, in Mém. Soc. Agric. Boulogne 2 Sér. **1:** 99 (1837). *Geranion* St.-Lag., in Ann. Soc. bot. Lyon **7:** 126 (1880). *Robertiella* Hanks, in Hanks & Small, N. Am. Fl. **25:** 3 (1907).—Type-species, *G. sylvaticum* L.

Name from the old Greek γέρανος, a crane. About 300 species in temperate regions the world over and in high mountains through the tropics.

SERIES A. TROLLIIFOLIA. With characters of the species

1. G. TROLLIIFOLIUM Small in Hanks & Small (PL. 2, FIG. 1). Perennial: rhizome very thick, vertical, single: stems 2–4.5 dm. high, erect, usually single; lower part simple, very stout, densely villous with terete hairs and sometimes short-pilose or glandular, first internode long; upper part robust, villous and short-pilose or glandular, seldom branched below the inflorescence: basal leaves few or numerous, persistent; petiole 4–20 cm. long, sometimes overtopping the inflorescence, villous; blade 2.5–10 cm. wide, pentagonal to orbicular in outline, thick, densely appressed-pubescent above with long or short hairs, spreading-pilose on the veins and often the surface below, divided past the middle into 5–7 nearly equal, cuneate-obovate lobes; lobes incised and toothed with short to long, lanceolate to oblong, mucronulate segments: cauline leaves few; petiole shorter than that of the basal leaves; blade similar to that of the basal leaf but less incised, the lobes longer and narrower, often glandular: basal stipules 15–25 mm. long, broadly lanceolate, adnate one-third their length to the petiole, deep-brown, glabrous or minutely pubescent and often ciliate: cauline stipules 6–10 mm. long, broadly ovate-lanceolate, brown, densely appressed-pilose and ciliate: peduncles 3–12 cm. long, copiously short-pilose and glandular, 1–∞-flowered, aggregated in a compact, terminal corymbiform inflorescence: pedicels 1–2 cm. long, copiously short-pilose or puberulent and glandular: outer sepals 9–11 mm. long, awned; body 8–10 mm. long, elliptic-lanceolate, 3-veined; veins and body copiously short-glandular, seldom with long hairs; awn 0.5–1.5 mm. long: petals 15–25 mm. long, 10–15 mm. wide, rose to purple, obovate; apex entire or shallow-emarginate; base very shortly pilose: stamen-filaments shorter than to longer than the sepals, ciliate, not conspicuously exserted in fruit: anthers 2.5 mm. long, linear: fruit 25–40 mm. long; style-beak 2.5–3 mm. long; style-column copiously glandular-pubescent: carpel-body 6 mm. long, brown, glandular-pilose: seed 3.4 mm. long, dark-brown, minutely reticulate.—N. Am. Fl. **25:** 14 (1907). TYPE: *Townsend & Barber* 34, NY (seen).—*G. madrense* Jones, Contr. West. Bot. **12:** 6 (1908), *Jones* s. n., P (seen), not *G. madrense* Rose ex Hanks & Small, N. Am. Fl. **25:** 17 (1907).—Sierra Madre of Chihuahua and Durango.—MEXICO: CHIHUAHUA: near Colonia Juarez, Sierra Madre, June 21–July 29, 1899, *Nelson* 6041 (G, US); Meadow Valley, Sierra Madre Mts., 7000′, Sept. 17, 1903, *Jones* s. n. (P, type & isotype of *G. mad-*

rense Jones); Chuichupa, Sierra Madre Mts., 7000′, Sept. 21, 1903, *Diehl* s. n. (P); old field, Chuichupa, Aug. 4, 1937, *Le Sueur* 1359 (F); near Colonia Garcia, Sierra Madre, 8000′, June 16, 1899, *Townsend & Barber* 34 (NY, TYPE; F, G, M, P, US, ISOTYPES); Mts. near Concheño, July 1, 1936, *Le Sueur* 734 (F, G); mound valley, south of Pachaco, July 12, 1891, *Hartman* 692 (G). DURANGO: grassy pineland, El Salto (Aserraderos), 2530–2540 m., Aug. 28, 1934, *Pennell* 18293 (US); City of Durango and vicinity, Apr.–Nov., 1896, *Palmer* 826 (US); near El Salto, 8000–8700′, July 12, 1898, *Nelson* 4542 (US); without locality, *Garcia* 329 (US).

G. trolliifolium is the Mexican representative of a group of western North American species of robust habit with large, mostly simple rootstocks and compact inflorescences, such as *G. oreganum* Howell, *G. viscosissimum* Fisch. & Meyer.

With the Mexican species, it is perhaps distantly related to series *Nivea*, from which it differs in the less deeply divided leaves and more compact, less branched inflorescence, and to series *Crenata*, from which it separates on the robust habit, inflorescence, large basal stipules, stout, single and mostly vertical rootstock. The long, terete hairs of this species are very similar to those of *G. crenatifolium* and *G. Pringlei*.

The peduncles are very stout, aggregated in a terminal corymbiform inflorescence and bearing several showy flowers. This species may be distinguished from those of western North America by the long, terete hairs investing the lower stem.

An examination of type-material of *G. madrense* Jones shows it to be identical with *G. trolliifolium*.

SERIES B. NIVEA. Erect perennials (except *G. alpicola*) with stout, branched rhizomes: stems 1–4 or up to 8 dm. high, single or tufted, terminating in a strict to lax, little- or much-branched, cymose inflorescence: basal leaves numerous, persistent; cauline leaves few; blades divided to the base into 3–7 nearly equal lobes; lobes deeply cleft and pinnatifid-toothed with long, linear to linear-lanceolate segments: sepals sericeous and often short-glandular, reddish or purplish in fruit: petals 12–20 mm. long, rose, blue or purple, spatulate or obovate; veins reticulate; base shortly pilose or villous to the middle (*G. niveum*): stylebeaks 2–6 mm. long.

Three species of northwestern Mexico, *G. niveum*, *G. madrense*, *G. charucanum*, and one species of the volcanoes of Oaxaca and

Guatemala, *G. alpicola,* comprise this series. It is demarcated by the deeply divided and cut leaves; the erect stems (except *G. alpicola*) with terminal, branched inflorescences; the short, often canescent pubescence and the sericeous or glandular sepals.

With the exception of *G. charucanum,* then unknown, Knuth included the species of this series in his section *Incanoidea,*[5] apparently on the basis of the deeply divided leaves, the large flowers and the white or silver pubescence. In respect to habit, inflorescence, leaf-position and glandular pubescence, however, species of series *Nivea* differ from the remaining species of section *Incanoidea, G. bellum,* etc., which constitute in themselves a very natural unit, series *Bella.*

The species of this series appear distantly related to *G. viscosissimum* Fisch. & Meyer and allies of western North America and to *G. trolliifolium* of Chihuahua and Durango.

2. G. NIVEUM S. Wats. (PL. 2, FIG. 3). Perennial: rhizome stout: stems 3–4 dm. high, erect, single or tufted; lower part little-branched, robust, densely retrorse-silver-canescent; upper part less robust, thinner-canescent to short-pilose and often short-purple-glandular, divaricate-branched: basal leaves numerous, persistent; petiole 6–12 cm. long, canescent; blade 2–9 cm. wide, reniform to orbicular in outline, densely appressed-white-canescent above and below, divided to the base into 5–7 nearly equal lobes; lobes cleft into 3–5 long, linear segments: cauline leaves few; petiole short to nearly absent; blade similar to that of the basal leaf: basal stipules 6–15 mm. long, lanceolate, red-brown, adnate one-third their length to the petiole, finely pubescent and ciliate: cauline stipules 10–20 mm. long, linear-lanceolate to lanceolate, entire, deep-brown, finely pubescent and ciliate: peduncles 4–6 cm. long, canescent and often short-glandular, 2–4-flowered, aggregated in a divaricate-branched, terminal, cymose inflorescence: pedicels 1.5–3 cm. long, short-pilose and glandular, divaricate and geniculate in fruit: outer sepals 10–14 mm. long, awned; body 10–12 mm. long, ovate, 3–5-veined, sericeous and short-glandular; awn 1–3 mm. long: petals 10–15 mm. long, 6–8 mm. wide, rose, lavender or purple, spatulate, reflexed in anthesis; apex entire or shallow-emarginate; base villous to the middle: stamen-filaments mostly longer than the sepals, short-ciliate, conspicuously exserted and often red in fruit; anthers 2–3 mm. long, linear: fruit 25–35 mm. long; style-beak 5–6 mm. long; style-column short-pilose and glandular,

[5] L. c. p. 167.

narrow at the apex; carpel-body 5 mm. long, light-brown, short-pilose and often glandular: seed 3 mm. long, black, finely and shallowly reticulate with nearly isodiametric reticulations.—Proc. Am. Acad. **21:** 421 (1886). Type: *Palmer* 406, G (seen).—Chihuahua.—MEXICO: Chihuahua: in moist, grassy openings, Norogachi, 150 miles north of Batopilas, 8000′, Nov. 1885, *Palmer* 406 (G, type, US, isotype); near Colonia Garcia, Sierra Madre, 7500′, July 17, 1899, *Townsend & Barber* 141 (F, G, M, NY, P, US); gravelly banks of streams, base of Sierra Madre (near Guerrero), Sept. 16, 1887, *Pringle* 1202 (F, G, NY, US); near Colonia Juarez, foothills of Sierra Madre, June 1899, *Nelson* 6084 (G, US); Culebra Mts., Aug. 18, 1936, *Le Sueur* 737 (F, G); grassy prairie, Llanura de Babicora, 2200–2250 m., Sept. 19, 1934, *Pennell* 19017 (US); arroyo and meadow banks, transition, pines, Memelichi, Rio Mayo, 7500′, Sept. 16, 1936, *Gentry* 2756 (F, G, M, US); Round Valley, Sierra Madre, 7000′, Sept. 17, 1903, *Jones* s. n. (P).

Aptly named, *G. niveum* is a striking species with white-canescent stems and leaves. The flowers, with spatulate petals strongly reflexed in anthesis, resemble those of a large *Dodecatheon*, presenting a marked contrast with all other species of Mexico. The branched inflorescence with divaricate and geniculate pedicels, the exserted stamen-filaments and reddish or purplish fruit-parts are also distinctive.

G. niveum is most closely related to *G. madrense* of the Sierra Madre of Nayarit. The leaves of that species, however, although canescent when young, soon lose much of their indument and are strigose above and below at maturity. Thus they may be distinguished from the persistent-canescent leaves of *G. niveum*. Floral characters noted above are equally distinctive. The length of the style-beak in *G. niveum* is nearly twice that of *G. madrense*. This character was confused by Hanks & Small in their key, the lengths being reversed. *G. niveum* was also noted as having glandless sepals, although they are usually copiously short-purple-glandular. The leaves of both species were described as silky-canescent by the same authors, although, as shown above, this is not true of the mature state.

Related *G. charucanum* is weakly erect, often semi-aquatic, and has fewer, less persistent basal leaves than *G. niveum*. The deep-purple, obovate petals, short style-beak and strigose pubescence also distinguish it from the latter species.

The plants of *G. niveum* grow in wide clumps on grassy prairies or along arroyo and meadow banks in pine country. Gentry (in field data) mentions that the roots are reported as used against fevers.

3. G. ALPICOLA Loes. (PL. 2, FIG. 6). Perennial with a woody tap-root: rhizome slender to stout: stems up to 20 cm. long or absent with the peduncles rising from the caudex, ascending or spreading when present, one or more at the caudex; lower part slender, densely antrorse-strigose or -strigillose; upper part slender, antrorse-strigose or -strigillose, loosely branched in a determinate inflorescence: basal leaves numerous, persistent; petiole 1–10 cm. long, antrorse-strigillose; blade 1.5–3 cm. wide, reniform in outline, moderately thick, dark-green, or sometimes red in the sun, and strigillose above, white-canescent below, divided to the base into 5–7 nearly equal lobes; lobes pinnatifid-toothed with long, linear segments: cauline leaves few; petiole short; blade similar to that of the basal leaf: basal stipules up to 10 mm. long, lanceolate, adnate nearly one-half their length to the petiole, deep red-brown, strigillose: cauline stipules 5–7 mm. long, lanceolate, deep-brown, reddish or green, strigillose to glabrate: peduncles 4–8 cm. long, antrorse-strigose or -strigillose, 1–2-flowered, rising from the caudex or in a loose, short, determinate inflorescence: pedicels 1–4.5 cm. long, densely antrorse-strigose or -strigillose, seldom divaricate or geniculate in fruit: outer sepals 8–9 mm. long, awned; body 7.5–8.5 mm. long, ovate, 3-veined, sericeous; awn 0.5 mm. long; petals 12–15 mm. long, 7–9 mm. wide, blue, reddish or purple, not reflexed in anthesis, obovate; apex scarcely emarginate; base sparsely pilose: stamen-filaments shorter than the sepals, sparsely ciliate below the middle, not conspicuously exserted in fruit: fruit 20–25 mm. long; style-beak 4 mm. long; style-column antrorse-sericeous; carpel-body pilose: seed not seen.—Bull. Herb. Boiss. 2 Sér. **3:** 92 (1903). LECTOTYPE: *C. & Ed. Seler* 2377, at Berlin (not seen); ISOLECTOTYPE, G (seen). Knuth, in Engler, Pflanzenr. **4** fam. **129:** 173 fig. 25 (1912).—*G. Nelsonii* Rose ex Hanks & Small, N. Am. Fl. **25:** 20 (1907), type *Nelson* 622, US (seen).—Mt. Zempoaltepec, Oaxaca, Mexico and volcanic peaks of Guatemala.—MEXICO: OAXACA: summit of Mt. Zempoaltepec, 11,400′, July 9, 1894, *Nelson* 622 (US, type of *G. Nelsonii* Rose; photograph G); Zempoaltepec, June 1842, *Liebmann* s. n. (F). GUATEMALA: SAN MARCOS: open, rocky slopes between San Sebastián and summit of Volcán Tajumulco, 3800–4600 m., Feb. 13, 1940, *Steyermark* 35485 (F); and 35502 (F); auf der Sierra Madre und altos bei Tejutlan, 4000 m., June, 1882,

Lehman 1515 (US). HUEHUETENANGO: in Bergwald oberhalb Todos los Santos, June 19, 1896, *C. & Ed. Seler* 2939 (G, ISOPARATYPE); alpine meadow, Sierra Cuchumatanes, 10,600′, Sept. 15, 1934, *Skutch* 1262 (F, G, US). QUETZALTENANGO: summit of Volcán Zunil, 3000–3800 m., Jan. 22, 1940, *Steyermark* 34842 (F). TOTONICAPÁN: Valle de la Desolación, near Totonicapán, 9500′, July 27, 1939, *Lewis* 926 (F); damp bank, region of Desconsuelo, 3000–3240 m., Jan. 15, 1939, *Standley* 62702 (F); Alpenweise, Totonicapán, 3000 m., Sept. 25, 1896, *C. & Ed. Seler* 2377 (G, ISOLECTOTYPE).

G. alpicola is the least typical species of this series. It bears a close resemblance to *G. niveum* in many respects but is an alpine-type and in habit and other characters is similar to the Andean species of Peru, Ecuador and Colombia, such as *G. acaule* Willd. and *G. cucullatum* HBK.

G. alpicola approaches *G. acaule* (*Hitchcock* 22025 from Chimborazo, Ecuador, G) in dwarf habit, woody root, large basal stipules and leaf-cutting. The hairs are of a similar type but are antrorse-appressed and more densely distributed. A stemless specimen of *G. alpicola* appears very close to *G. acaule*, as Loesener noted in describing the species.[6] However, the fruiting structures are noticeably different, *G. alpicola* having the style-column tapering to a rather long (4 mm.) style-beak, while *G. acaule* has a very short, stout style-column that terminates abruptly in a short (2 mm.) style-beak. *G. cucullatum* var. *elongatum* Wedd. (*Killip & Smith* 18733 from Dept. Santander, Colombia, G) has a stem similar to elongate specimens of *G. alpicola*.

The following characters, however, place *G. alpicola* with series *Nivea:* the more or less terminal (though usually spreading) flowering stem, the closely pubescent lower leaf-surface, the large, conspicuous cauline stipules, the very narrow leaf-segments, the purple petals and the tapering, long-beaked fruit with a usually reddish or purplish cast.

This species is variable in the length of the stem. It may be very short or absent or up to 20 cm. long (*Skutch* 1262). These are probably habitat phases produced by varying amounts of sun or water in the rocky alpine-meadows on which they occur.

[6] Bull. Herb. Boiss. 2 Sér. 3: 93 (1903).

G. alpicola is easily distinguished from *G. niveum* in having glandless pedicels, sepals and style-column; antrorse-appressed pubescence; shorter style-beak and erect, obovate petals. From *G. madrense*, it separates by the canescent lower leaf-surface, antrorse pubescence and lack of glandularity.

The type-material of *G. Nelsonii* Rose has been examined and found identical with Loesener's species in all particulars.

4. G. MADRENSE Rose ex Hanks & Small (PL. 2, FIG. 2). Perennial: rhizome stout: stems 1–3.5 dm. high, erect, single or tufted; lower part occasionally branched, rather slender, densely retrorse-pubescent with minute hairs; upper part slender, densely short-curly-pilose and short-glandular, simple to slightly branched: basal leaves numerous, persistent; petiole 12–14 cm. long, minutely pubescent; blade 2.5–5 cm. wide, reniform to pentagonal in outline, white-canescent when young, green above and below at maturity, thick, glabrate above, appressed-strigose below, divided to the base into 3–5 nearly equal lobes; lobes pinnatifid-toothed with 3–5 short to long, linear segments: cauline leaves few; petiole short to subsessile; blade similar to that of the basal leaf or much reduced: basal stipules 5–10 mm. long, lanceolate, not long-adnate to the petiole, red-brown, glabrous: cauline stipules about 8 mm. long, lanceolate, ciliate: peduncles 4–8 cm. long, copiously short-pilose and glandular, 1–2-flowered, aggregated in a terminal, cymose inflorescence: pedicels 2–6 cm. long, copiously short-pilose and glandular, not divaricate or geniculate in fruit: outer sepals 10–12 mm. long, awned; body 9.5–10.5 mm. long, linear- to oblong-lanceolate, 3–5-veined or veins indistinct, sericeous with scattered, often deciduous-glandular hairs; awn 0.5–1 mm. long: petals 16–19 mm. long, 10–11 mm. wide, rose-purple, not reflexed in anthesis, obovate; apex entire or shallow-emarginate; base shortly pilose: stamen-filaments mostly as long as or longer than the sepals, conspicuously exserted in fruit, yellow-green or brown, ciliate below the middle: fruit 25–35 mm. long; style-beak 2–3 mm. long; style-column finely pubescent and glandular, tapering toward the apex; carpel-body 5.5–6 mm. long, short-pilose and glandular: seed not seen.—N. Am. Fl. **25:** 17 (1907). TYPE: *J. N. Rose* 2161, US (seen).—Known only from the type-locality.—MEXICO: NAYARIT (Territorio de Tepic): near Santa Teresa, Sierra Madre, Aug. 10, 1897, *J. N. Rose* 2161 (US, TYPE; G, NY, ISOTYPES).

This species, closely related to *G. niveum*, is known from a single locality. Distinctions between *G. madrense* and *G. niveum* are considered in a discussion of the latter species. With *G. charucanum, G. madrense* has several characters in common. Both have a strigose pubescence, short style-beak and purple, obovate petals. Neither has the spatulate, reflexed petals of *G. niveum.* The pedicels of *G. madrense,* however, are copiously short-purple-glandular, while glands are absent in *G. charucanum;* the fruit is longer and stouter and the stamen-filaments are exserted in fruit.

5. G. CHARUCANUM Standl. (PL. 2, FIG. 4). Perennial: rhizome?: stems 3–8 dm. long, weakly erect, single or tufted; lower part simple to slightly branched, slender, sparsely strigose; upper part slender, densely strigose, usually widely ramose: basal leaves few to numerous; not long-persistent; petiole 8–15 cm. long, strigose; blade 6–7 cm. wide, reniform in outline, surfaces bright-green, moderately thick, densely strigillose above and at least on the veins below, divided to or nearly to the base into 3–7 mostly equal lobes; lobes coarsely cleft and toothed with long, linear to linear-lanceolate segments: cauline leaves few or numerous; petiole mostly shorter than or the blade subsessile; blade 2–8 cm. wide, similar to that of the basal leaf, but always divided to the base, or reduced to 1–3 linear, toothed lobes; the lateral lobes sometimes twice-cleft: basal stipules about 8 mm. long, lanceolate, adnate one-fourth their length to the petiole, finely pubescent: cauline stipules 6 mm. long, lanceolate, green, more or less strigillose: peduncles 4–16 cm. long, strigose or strigillose, 2-flowered, aggregated in a lax, branched, terminal, cymose inflorescence: pedicels 1.5–6 cm. long, densely strigillose, glandless, slightly, or usually not at all, divaricate and geniculate in fruit: outer sepals 7–12 mm. long, awned; body 6–9.5 mm. long, elliptic- to ovate-lanceolate, 3–5-veined, densely sericeous; veins strigose; awn 0.5–2.5 mm. long: petals 15–20 mm. long, 10–13 mm. wide, red-purple or purple, not reflexed in anthesis, wide-obovate; apex entire or shallow-emarginate; base shortly pilose: stamen-filaments shorter than the sepals, yellow-green, not conspicuously exserted in fruit, ciliate below the middle: fruit 20–27 mm. long; style-beak 2.5–3.5 mm. long; style-column densely antrorse-strigillose, tapering toward the apex; carpel-body 4.5–5 mm. long, densely pilose: seed 3 mm. long, dark-brown, very shallowly and finely reticulate, reticulations nearly isodiametric.—Field Mus. Pub. Bot. **22**, no. 1: 32 (1940). TYPE: *Gentry* 1813, F (seen).—Southwestern Chihuahua and adjacent Sinaloa.—MEXICO: CHIHUAHUA: riparian, transition, pines, Sierra Charuco, Rio Fuerte, 5500′, Sept. 13, 1935, *Gentry* 1813 (F, TYPE; G, M, ISOTYPES); in meadow grass, transition,

pine country, Loreto, Rio Mayo, Sept. 3, 1936, *Gentry* 2576 (M); scattered, marginal to water course, transition, pine-cupressus canyon, Sierra Canelo, Rio Mayo, Aug. 27, 1936, *Gentry* 2481 (F, G, M, US). SINALOA: colonial, aquatic, meadow seep, rolling open valley with argillaceous soils, Ocurahui, Sierra Suratato, 6000–7000′, Sept. 1–10, 1941, *Gentry* 6341 (G).

The weak habit of this riparian or partially aquatic species may be associated with the habitat, but the stems are much more branched and lax than in *G. madrense* or *G. niveum*. Standley, in describing it, says "in general appearance the plant, especially because of its large and showy flowers, bears much resemblance to some species of the malvaceous genus *Calirrhoe*".[7]

Though the basal parts are imperfectly known, it seems safe to place *G. charucanum* in series *Nivea* and near *G. madrense* on the basis of leaf-cutting, pubescence, inflorescence and floral characters. It also has the fruiting parts suffused with a reddish or purplish color as in the other species of the series. Although the flowers are remarkably similar in appearance, the distinctive antrorse pubescence, the longer style-beak and dwarf-alpine habit of *G. alpicola* are in direct contrast with the retrorse pubescence, short style-beak and tall, branched habit of *G. charucanum*. Contrasts with other species of the series have been previously noted.

SERIES C. AMBIGUA. With characters of the species

6. G. **unguiculatum,** sp. nov. (PL. 2, FIG. 5; PL. 4, FIGS. 2, 7), herba perennis: caulibus 8 dm. longis, erectis, robustis, inferne 7 mm. crassis, glabratis vel sparsim strigosis, superne dense strigosis vel breviter patenterque pilosis et saepe glanduloso-pilosis, ramosis, ramis inflorescentiam cymosam terminalem gerentibus: foliis caulinis numerosis; petiolo foliorum inferiorum 18–27 cm. longo, sparsim strigoso; lamina foliorum inferiorum pentagona, 10–12 cm. lata, crassa, supra saturate viridi, breviter pubescente, subtus pallidiore, venis reticulatis breviter pubescentibus, ⅔ ad basin 5-lobata, lobo medio saepe longiore quam lobis lateralibus, lobis grosse dentatis, dentibus ovatis vel deltoideis; petiolo foliorum superiorum 0.5–4 cm. longo; lamina foliorum superiorum 3–5 cm. lata, eae foliorum inferiorum simili vel 3-lobata, lobis brevibus, sparsim dentatis: stipulis 5–8 mm. longis, oblongis, atrobrunneis, strigillosis ciliatisque: pedunculo 1.5–3 cm. longo, copiose breviterque piloso et longe

[7] Field Mus. Pub. Bot. 22, no. 1: 32 (1940).

glanduloso-piloso, gracili, 1–2-floro: pedicellis 1–2 cm. longis, copiose breviterque pilosis et longe glanduloso-pilosis, fructiferis erectis: sepalis exterioribus 4.5–5 mm. longis, mucronatis mucrone 0.5–1 mm. longo, anguste ovato- vel elliptico-lanceolatis, 3-nervatis, venis marginibusque strigillosis glanduloso-pilosisque, margine tenue, saepe breviter setoso: petalis 21 mm. longis, ad apicem 7 mm. latis, unguiculatis ungui 9 mm. longo, pallide roseis, reticulato-venosis, glabratis, basi breviter pilosis, apicibus rotundatis: staminibus calycem superantibus, glabratis, demum exsertis: stigmatibus (anthesi) 2 mm. longis; columna stylorum strigillosa et glanduloso-pilosa. Fructus maturus non visus.

Perennial: rhizome and caudex not seen: stems 8 dm. high, erect; lower part sparingly branched, stout, 7 mm. thick, glabrate or sparsely strigose; upper part robust, rather densely strigose to short open-pilose and glandular, branched; branches terminating in cymose inflorescences: basal leaves not seen: cauline leaves numerous; petiole of the lower leaves 18–27 cm. long, sparsely strigose; blade 10–12 cm. wide, pentagonal in outline, darker above than below, thick, pubescent with short, flat hairs above and on the conspicuously areolate veins below, divided two-thirds to the base into 5 rhombic lobes; median lobe often somewhat longer than the lateral lobes; lobes coarsely toothed with ovate or deltoid segments; petiole of the upper leaves 0.5–4 cm. long; blade of upper leaves 3–5 cm. wide; inflorescence-leaves subsessile, reduced to three short, simple-toothed lobes: cauline stipules 5–8 mm. long, oblong, deep-brown, strigillose and ciliate: peduncles 1.5–3 cm. long, copiously short-pilose and long-glandular, slender, 1–2-flowered, aggregated in a compact, laterally or apically terminal, cymose inflorescence: pedicels 1–2 cm. long, copiously short-pilose and long-glandular: outer sepals 4.5–5 mm. long, awned; body 3.5–4.5 mm. long, narrow-ovate to elliptic-lanceolate, 3-veined; veins and margins strigillose; margins membranaceous and often studded with tiny bristles; awn 0.5–1 mm. long: petals 21 mm. long, 7 mm. wide at the apex, unguiculate with a claw 9 mm. long, pink, reticulate-veined, thin; apex rounded; base very shortly pilose: stamen-filaments longer than the sepals, yellowish, nearly glabrous, exserted in fruit: fruit not seen; style-beak at anthesis 2 mm. long; style-column strigillose and glandular.—Known only from the type-locality.—MEXICO: GUERRERO: steep, rocky slopes in oak forest, Yesceros-Cruz Pacifica, Dist. Mina, 2550 m., Nov. 26, 1939, *Hinton* 14906 (G, TYPE).

The affinity of this remarkable novelty from Guerrero is difficult to ascertain without more complete material. The base is lacking on the single specimen and no flowers are complete. It is similar to *G. latum* and its relatives in having the leaves progressively reduced along the stem and to *G. trolliifolium* in having robust stems, large, sharply toothed leaves and nearly glabrous petals.

The long-clawed petals, from which the specific epithet is derived, are unlike those of any species now known from Mexico. The sepals are also of interest in their small size as compared with the petal. Very few flowers are present on the type-sheet, but it appears that the petals wither after anthesis, leaving a recurved stump between the sepals. Whether or not this indicates a reflexed condition in anthesis is questionable, but it is not improbable since such a condition occurs in *G. niveum*.

Series D. LATA. Erect or somewhat spreading perennials with woody or cormose roots and short, slender, rhizomes; stems 1–8 dm. long, terminating in a loosely branched, cymose inflorescence or with some peduncles occasionally single from the lower nodes: basal leaves few, not long-persistent; blades pentagonal to reniform in outline, divided one-half to three-fourths to the base into 3–5 rhombic, cuneate-obovate or obovate lobes; lobes coarsely cleft and toothed: cauline leaves numerous; blades similar to those of the basal leaves or hastate and 3-lobed to 1-lobed with basal auricles or lobelets on the inflorescence-branches, in a progressive, acropetal series of reduction: sepals finely pubescent; veins and margins usually pilose or glandular: petals 10–17 mm. long, white, rose or lavender, obovate or cuneate-obovate; veins reticulate, often deep-red in the white-flowered species; base villous to the middle: style-beaks 2–5 mm. long, often deep-red.

The four species comprising this series have very natural affinities. All are characterized by an erect or spreading, tall, leafy habit, a progressive, acropetal reduction of the leaves and terminal, branched, cymose inflorescences with flowers of moderate size bearing petals with flattish villous hairs at the base and along the veins to or past the middle. The roots are woody, sometimes cormose; the caudices mostly simple with single stems; the rhizomes are short to long and mostly vertical or oblique.

Except for the habit and aggregate peduncles, these species bear a close resemblance to *G. aristisepalum* and allied species of

Mexican distribution. *G. mexicanum* and *G. unguiculatum* approach series *Lata* in having the same type of leaf-reduction. However, other characters, discussed in their treatments, indicate that they are distinct.

The species of this series are chiefly of western distribution in Mexico: *G. albidum* and *G. Wislizeni* in the southwestern Sierra Madre, *G. latum* in the central mountains and *G. oaxacanum* in the Sierra de San Felipe of Oaxaca. They are the most southern elements of the group of erect species centered in the western United States.

7. G. ALBIDUM Rydb. ex Hanks & Small (PL. 2, FIG. 7). Perennial: rhizome mostly slender: stems 4–7 dm. long, erect or spreading, mostly single; lower part sometimes branched, moderately stout, sparsely strigose or pilose to glabrate; upper part slender, sparsely strigose to glabrate, branched: basal leaves few, not long-persistent: petiole 6–20 cm. long, strigose, sometimes with longer, spreading hairs or short-pilose; blade 3–7 cm. wide, pentagonal in outline, green and densely short-pilose above, lighter and spreading short-pubescent on the veins and surface below, thin, divided three-fourths to the base into 5 nearly equal, broad-rhombic lobes; lobes incised and toothed with acute, oblong-lanceolate segments: cauline leaves numerous; petiole 1–8 cm. long, sparsely to moderately densely strigose; blade similar to that of the basal leaf but the lobes longer and narrower with acute, lanceolate segments, or hastate and 3-lobed, the median lobe narrow-rhombic and longer than the lateral lobes; lateral lobes greatly reduced with few teeth on the inflorescence branches: basal stipules 10–15 mm. long, linear-lanceolate, adnate one-third their length to the petiole, glabrate or the midnerve pubescent, ciliate: cauline stipules 8–10 mm. long, lanceolate or ovate-lanceolate, apiculate, golden-brown, glabrate, ciliate: peduncles 2.5–8 cm. long, or the lowest up to 12 cm. long, retrorse- or open-pilose and/or short-curly-pilose, 2-flowered, aggregated in a lax, branched, terminal, cymose inflorescence or sometimes single at the lower nodes: pedicels 8–30 mm. long, open-pilose and/or short-curly-pilose or rarely glandular: outer sepals 6–10 mm. long, awned; body 4.5–8 mm. long, elliptic-lanceolate, bright-green, 3-veined, densely or sparsely fine-pubescent with few long hairs or occasionally glandular hairs on the veins and margins; awn 1.5–2.5 mm. long: petals 10–14 mm. long, 4–7 mm. wide, white with dark or red, reticulate veins, obovate or somewhat cuneate; apex entire; base villous to the middle: stamen-filaments as long as or longer than

the sepals, villous-ciliate at the base, tips often red at anthesis and fruit, exserted in fruit: fruit 25–30 mm. long; style-beak 3–5 mm. long; style-column finely antrorse-pubescent, occasionally glandular; carpel-body pilose: seed dark-brown, reticulate.—N. Am. Fl. **25:** 19 (1907). Type: *Townsend & Barber* 181, NY (seen).—Chihuahua.—MEXICO: Chihuahua: near Colonia Garcia, Sierra Madre, 7500′, July 29, 1899, *Townsend & Barber* 181 (NY, type; G, M, P, US, isotypes); foothills of the Sierra Madre, near Colonia Juarez, June 21–July 29, 1899, *Nelson* 6136 (G, US); Chuhuichupa, Aug.–Sept., 1936, *Le Sueur* 735 (F) and 736 (F, G).

The available material of *G. albidum* is so limited as to offer difficulty in determining its correct status in regard to closely related *G. Richardsonii* of the Rocky Mountains from Canada to Arizona and California. It differs primarily in being less robust, of more spreading habit and in having the peduncles and pedicels mostly pilose rather than densely glandular. Floral characters are so similar as to be indistinguishable except in the length of the petals, which are shorter than is usual in *G. Richardsonii*, and in the more prominent, red veins. The base is less thick than in the latter species and the stems usually rise from slender rhizomes as in *G. latum*. In contrast, the stems of *G. Richardsonii* usually rise directly from the rather thick caudex although occasional collections show the presence of a more or less elongate rhizome and other characters, particularly of pubescence, attributed to *G. albidum* occur inconstantly. From its isolation and pubescence characters *G. albidum* seems best maintained as distinct at present.

G. albidum is closely related to *G. latum* and its differences are discussed with that species. Occurring in the same region as *G. Wislizeni*, *G. albidum* may be distinguished by the longer, red style-beak, red-tipped stamen-filaments, usually longer and darker- or red-veined petals and narrow leaf-lobes with acute, narrow segments. The plants are spreading to erect with a closely appressed, strigose pubescence, brownish stems and longer peduncles.

8. G. latum Small in Hanks & Small (Pl. 2, fig. 8; Pl. 5, fig. 4). Perennial: root thick, woody: rhizome long, slender, sometimes branched: stems 1–8 dm. long, erect or spreading, mostly single; lower part seldom branched, moderately stout,

glabrate to densely retrorse-hirsute with flattened hairs; upper part slender to moderately stout, densely pilose, sometimes glandular, branched: basal leaves few, not long-persistent; petiole 3–25 cm. long, sparsely to densely strigose and often short-curly-pilose; blade 4–9 cm. wide, pentagonal in outline, thick, dark-green and closely appressed-pilose above, lighter and spreading-pilose on the veins and surface below, divided three-fourths to the base into 3– mostly 5 nearly equal, wide-rhombic lobes; lobes cleft and toothed with obtuse, ovate segments: cauline leaves numerous; petiole shorter than that of the basal leaf to nearly absent, densely pilose; blade similar to that of the basal leaf but smaller, or 3-lobed and hastate, the median lobe long, broad, few-toothed and the lateral lobes, especially on the inflorescence branches, reduced: basal stipules about 10 mm. long, lanceolate, adnate one-fourth their length to the petiole, brown, strigillose or glabrate: cauline stipules 7–14 mm. long, lanceolate, red-brown or brown, pubescent: peduncles 4–9 cm. long, densely pilose or short-pilose and usually glandular, 1– mostly 2-flowered, aggregated in a loosely branched, terminal, cymose inflorescence or sometimes single at the lower nodes: pedicels 2–5 cm. long, densely short-pilose and usually glandular; outer sepals 8–10 mm. long, awned; body 7–8 mm. long, oblong-lanceolate to ovate, 3–5-veined, finely pubescent; veins and margins pilose and often glandular; awn 1–2 mm. long: petals 10–17 mm. long, 7–14 mm. wide, white or pinkish with dark-red, reticulate veins; apex entire or slightly emarginate; base villous past the middle: stamen-filaments shorter than or as long as the sepals, densely villous-ciliate, usually deep-red, scarcely exserted in fruit: fruit 22–35 mm. long; style-beak 3.5–4 mm. long, red; style-column densely antrorse-hispidulous and often glandular; carpel-body 4 mm. long, pubescent and often glandular: seed 3 mm. long, black, minutely reticulate.—N. Am. Fl. **25:** 18 (1907). TYPE: *Rose & Hay* 6065, US (seen).—*G. pinetorum* Knuth in Kew Bull. 1937: 503, type *Hinton* 1887, at Kew (not seen); isotype, G (seen), not *G. pinetorum* Hand. Mazz., Symb. Sin. Pt. **7:** 619 (1933).—Hidalgo to Morelos and Mexico.—MEXICO: HIDALGO: San Vicente, Aug. 16, 1937, *Mary T. Edwards* 853 (F). MÉXICO: Río Frío, Aug. 27, 1930, *Russell & Souviron* 81 (US); under thick pines in damp hollow, Monte Río Frío, 4000 m., July 31, 1929, *Mexia* 2695 (US); San Rafael Atlixco-monte, July 1929, *Lyonnet* 498 (NY, US); Popocatepetl, Aug. 7–8, 1901, *Rose & Hay* 6065 (US, TYPE; photographs, F, G); on rocks, in moist ravine, 7.5 miles up road from Amecameca to Puerto De Tlamancas, Mt. Popocatepetl, Sept. 26, 1940, *Moore*, 26 (G); pine and oak forest, Zitacuaro-El Aguila, Dist. Valle de Bravo, 2800 m., Nov. 4, 1938, *Hinton* 13417 (G); pine forest, Mesón

Viejo, Dist. Temascaltepec, 2830 m., Oct. 4, 1932, *Hinton* 1887 (F, G, M, NY, isotypes of *G. pinetorum* R. Knuth); barranca, Mesón Viejo, Dist. Temascaltepec, Oct. 11, 1935, *Hinton* 8339 (F, G, M, NY); pine forest, Cumbre Trojes, Dist. Temascaltepec, Sept. 8, 1935, *Hinton* 8271 (F, G, M, NY). DISTRITO FEDERAL: La Cima, 10,000′, Jajalpa, 6000′, Aug. 1904, *Kuntze* 23719 (NY). MORELOS: Tres Marias, Aug. 23, 1910, *Orcutt* 3759 (F, M).

G. latum, of the central Mexican upland, is very closely related to *G. albidum*. However, it is sufficiently distinct morphologically and geographically to merit complete separation.

G. latum differs from *G. albidum* in having thick leaves with mostly obtuse, ovate segments; a predominantly three-lobed upper leaf, that of the inflorescence with a single, broad, auriculate lobe, and usually denser, not appressed, pubescence on the stem. The leaves of *G. albidum* are thin with narrower, longer, more acute segments, more often five lobes and a lighter color. The rhizome is thicker and the basal stipules are much more conspicuous.

In floral characters, the two are extremely close, both having the distinctive white or pinkish petals with darker veins and villous pubescence, red-tipped stamen-filaments and red style-beak.

Also related is *G. oaxacanum* from which *G. latum* separates on points mentioned in discussing the former.

An examination of isotypes of Knuth's *G. pinetorum* shows it to be distinct only in the variable characters of petal-size and density of pubescence.

9. G. **oaxacanum,** sp. nov. (PL. 1, FIG. 2), herba perennis: radice lignoso, cormoso, 3–4 cm. crasso: rhizomate brevi et modice crasso vel nullo: caudice simplici: caulibus 3–6 dm. longis, erectis, inferne interdum ramosis, robustis, glabrescentibus, puberulentibus vel sparsim longeque pilosis, superne ramosis, modice robustis vel gracilibus, in inflorescentiam ramosam, cymosam terminantibus vel inferne paucis pedunculis solitariis ad nodos: foliis basalibus paucis, mox deciduis: foliis caulinis numerosis; petiolo foliorum inferiorum quam lamina duplo longiore, dense longeque piloso; lamina foliorum inferiorum pentagona vel hastata, 3–6 dm. lata, crassa, supra saturate viridi dense adpresso-pilosa, subtus pallidiori patenter pilosa, ⅔–¾ ad basin partita, plerumque 3-lobata; lobo medio longo.

lobis lateralibus lobulo basali ornatis, lobis ad apicem acute dentatis; petiolo foliorum superiorum quam lamina breviore dense longeque piloso, vel folio subsessili; lamina eae foliorum inferiorum simili nisi minore, lobis lateralibus interdum recurvis vel minimis: stipulis ovato-lanceolatis, pilosis ciliatisque: pedunculo 3–5 cm. longo, longe piloso et interdum sparsim decidueque glanduloso-piloso, 1–2-floro: pedicellis 1.5–4 cm. longis, pilosis, interdum glanduloso-pilosis, fructiferis saepe geniculatis: sepalis exterioribus 7.5–9.5 mm. longis, mucronatis mucrone 1.5–2.5 mm. longo, ovato- vel elliptico-lanceolatis, 3-nervatis, subtiliter pubescentibus, venis marginibusque longe pilosis vel sparsim glanduloso-pilosis: petalis 12–15 mm. longis, 8–10 mm. latis, roseis vel pallide purpureis, reticulato-venosis, obovatis, ad basin versus breviter vel longe piloso, apicibus rotundatis vel breviter incisis: staminibus calycem aequantibus, saepe rubris, demum non exsertis: fructu 26–32 mm. longo; stigmatibus 5 mm. longis, atrorubris; columna stylorum dense hispidula; carpello 4 mm. longo, pubescente: semine 3 mm. longo, brunneo, subtiliter reticulato.

Perennial: root woody, cormose, 3–4 cm. thick: rhizome short and moderately stout or absent: stems 3–6 dm. high, erect or, spreading, single; lower part sometimes branched, stout, glabrous puberulent or sparsely long-pilose; upper part moderately robust to slender, densely long-pilose, much-branched: basal leaves few and soon deciduous: cauline leaves numerous; petiole of lower leaves up to twice as long as the blade, densely long-pilose; blade of lower leaves 3–6 cm. wide, pentagonal or hastate in outline, thick, dark-green and densely appressed-pilose above, grayish and spreading-pilose below, divided two-thirds to three-fourths to the base into 3– seldom 5 lobes; median lobe usually longer than the lateral lobes; lobes sharply toothed toward the apex; petiole of the upper leaves shorter than the blade to nearly absent densely long-pilose; blade hastate, similar to that of the lower leaves but usually smaller with the lateral lobes sometimes recurved or reduced to a single auriculate lobe on the inflorescence-branches: basal stipules short, broad, dark-brown: cauline stipules about 5 mm. long, ovate-lanceolate, pilose and ciliate: peduncles 3–5 cm. long, long-pilose and sometimes sparsely deciduous-glandular, 1–2-flowered, aggregated in a loosely-branched, terminal, cymose inflorescence or sometimes single at the lower nodes: pedicels 1.5–4 cm. long, pilose and occasionally glandular, often geniculate in fruit: outer sepals 7.5–9.5 mm. long, awned; body 6–7 mm. long, ovate- to elliptic-lanceolate, 3-veined, finely pubescent; veins and margins with long hairs, occasionally sparsely deciduous-glandular: awn 1.5–2.5 mm. long: petals 12–15 mm. long, 8–10 mm. wide, rose to lavender, obovate; veins reticulate, conspicuous; apex entire or shallow-emarginate; base short- to long-pilose with short hairs on the veins toward the middle: stamen-filaments as long as the sepals, often red, sparsely ciliate at the base, not exserted in fruit: fruit 26–32 mm. long; style-beak 5 mm. long, deep-red; style-column densely hispidulous, occasionally sparsely glandular; carpel-body 4 mm. long, pilose; seed 3 mm. long, oval, dark-brown, finely reticulate.—*G. Hernandezii* sensu Knuth in part, in Engler, Pflanzenr. **4** fam. 129: 193 (1912).—Mountains of Oaxaca.—MEXICO: OAXACA: Sierra de San Felipe, 7000′, Sept. 10, 1894, *Pringle* 4866 (G, TYPE; F, G, M, NY, US, ISOTYPES); vicinity of Cerro San Felipe, 7000–8500′, Sept. 1, 1894, *Nelson* 1174 (US); Cerro de San Felipe, 2000 m., Aug. 22, 1897, *Conzatti & Gonzalez* 436 (G); Cerro San Felipe, 7000′, Sept. 23, 1895, *Conzatti* 711 (G); 18 miles southwest of the city of Oaxaca, 7000–9500′, Sept. 10–20, 1894, *Nelson* 1370 (G, US); inter San Andres and San Miguel, Oct. 1842, *Liebmann* 3753 (US); Sierra, 7000–8000′, Sept. 1840, *Galeotti* 4022 (NY, US); Oaxaca, 1750 m., July–Aug., 1900, *Conzatti & Gonzalez* 13 (US).

Material of *G. oaxacanum* was included with *G. Hernandezii* by Knuth[8] and it resembles that species in some respects, particularly in leaf-shape. The inflorescence, however, is of an entirely different nature from that of *G. Hernandezii* as interpreted here, the peduncles being aggregated terminally. The petals are rose or lavender, not white, and the cormose root is a distinctive feature.

G. oaxacanum is most closely related to *G. latum* of the central plateau of Mexico, differing in having colored flowers with less prominent veins, a cormose root with short or no rhizomes, thicker, for the most part hastate, leaves, and a sparsely glandular pubescence.

This species is restricted to the state of Oaxaca for which it is named, and it is apparently most abundant on the Sierra San Felipe near Oaxaca de Juarez.

10. G. WISLIZENI S. Wats. (PL. 2, FIG. 9; PL. 4, FIG. 6). Perennial: root woody or woody-fibrous: rhizome mostly short and stout: stems 1–6 dm. long, erect, spreading, or somewhat ascending in age; lower part branched, moderately stout, glabrate to densely open- or retrorse-hirsute; upper part moderately stout to slender, sparsely to densely pilose or hirsute, often puberulent or glandular, branched: basal leaves few to numerous,

[8] L. c. p. 193.

not long-persistent; petiole 5–35 cm. long, pilose or hirsute, often puberulent; blade 3–9 cm. wide, pentagonal to reniform in outline, thin, not much darker above than below, sparsely to densely pilose or hirsute above, spreading-pilose on the veins and occasionally the surface below, divided one-half to two-thirds to the base into 3– mostly 5 nearly equal, cuneate-obovate or obovate lobes, if 3-lobed, the lateral lobes with a basal lobelet; lobes shallow-toothed at the apex with ovate- or oblong-lanceolate segments: cauline leaves numerous; petiole 1–10 cm. long, pilose or hirsute; blade 1–4 or rarely up to 9 cm. broad, similar to that of the basal leaf or mostly 3-lobed, the median lobe broad, lateral lobes with a basal lobelet, often greatly reduced on the inflorescence-branches; segments acute, ovate-lanceolate to sharply deltoid: basal stipules 6–10 mm. long, linear-lanceolate, appressed-hispid, brown: cauline stipules 5–8 mm. long, linear-lanceolate or subulate, short-pubescent and ciliate: peduncles 1.2–4 or rarely to 6.5 cm. long, open-hirsute and puberulent or [sometimes] deciduous-glandular, 2-flowered, single and axillary at lower nodes, aggregated in a cymose inflorescence at the branch- or stem-terminus: pedicels 5–15 mm. or rarely to 45 mm. long, pilose and puberulent and/or copiously glandular, slender, divaricate and geniculate in fruit: outer sepals 5.5–7.5 or 9 mm. long, awned; body 5–6 or 8 mm. long, enlarged in fruit, elliptic-lanceolate, 3-veined, finely pilose; veins and margins with scattered stiff or glandular hairs; awn 0.5–1.5 mm. long: petals 8–13 mm. long, 4–6 mm. wide, white, narrow-obovate; veins darker, reticulate; apex rounded; base villous or pilose to the middle: stamen-filaments shorter than the sepals, ciliate, yellowish, not exserted in fruit: fruit 18–25 mm. long; style-beak 1.5–2.5 or rarely 3 mm. long, never red; style-column antrorse-hispidulous and sometimes glandular; carpel-body 3.5 mm. long, light-brown, hirsute and often glandular: seed 2.4 mm. long, plump, oblong-ovoid, black or dark-brown, rather coarsely reticulate with elongate reticulations.—Proc. Am. Acad. **21:** 421 (1886). Type: *Palmer* 428, G (seen).—*G. geoides* Small in Hanks & Small, N. Am. Fl. **25:** 19 (1907), type *Pringle* 1203, NY (seen). *G. calvescens* Briq., in Ann. Cons. et Jard. Bot. Genève **11, 12:** 186 (1908), type *Pringle* 1578, at Geneva (not seen); M, isotype (seen).—Northwestern Mexico into southwestern United States.—MEXICO: Chihuahua: 150 miles north of Batopilas, Nov. 1885, *Palmer* 428 (G type; US isotype); rocky stream-bank, above Colonia Garcia, 2000–2100 m., Sept. 23, 1934, *Pennell* 19103 (US); near Colonia Garcia in the Sierra Madre, Aug. 1–20, 1899, *Nelson* 6191 (G, US); canyons (near Guerrero), Sierra Madre, Oct. 14, 1888, *Pringle* 1578 (M, isotype of *G. calvescens* Briq.); Guayanopa Canyon, Sierra Madre Mts., 5000′, Sept. 23, 1903, *Jones* s. n. (P); Llanos Mts., *Wislizenus* 211 (G); pine slope, transition, Los Cascarones, Rio Mayo, 8000′, Sept. 19, 1936, *Gentry* 2804 (F, G, M); shaded canyon, Chuhuichupa, Aug.–Sept., 1936, *Le Sueur* 733 (F); Pilares (Strawberry Valley), Sept. 19, 1891, *Hartman* 785 (G); Majalca, Aug. 18–20, 1935, *Le Sueur* Mex- 84 (F, G); shaded rocky slope 6 miles north of Picachic, Dist. Guerrero, 7000′, July 25, 1937, *Shreve* 8017 (F, US); near Colonia Garcia, Sierra Madre, 7500′, Aug. 5, 1899, *Townsend & Barber* 222 (F, G, M, P, US); in moist places and by stream, tolerant pine slope, transition, Sierra Charuco, Rio Fuerte, Sept. 11, 1935, *Gentry* 1756 (F, G, M); Majalca (Pilares), 40 miles northwest of Chihuahua, 6800′, Aug. 11, 1939, *White* 2389 (G); ledges of rock, "Barranca Colorad", Sierra Gazachic, 35 km. southwest of Minica, 2200–2300 m., Sept. 16–17, 1934, *Pennell* 18890 (US); rocky canyon, Majalca, northwest of Chihuahua, 2020–2050 m., Sept. 29, 1934, *Pennell* 19285 (US); San Diego Canyon, Sierra Madre Mts., 6400′, Sept. 16, 1903, *Jones* s. n. (P); cool, damp ledges (near Guerrero), Sierra Madre, Sept. 17, 1887, *Pringle* 1203 (NY type of *G. geoides* Small; F, G, US, isotypes); Mojarachic, July 31, 1938, *Knobloch* 5223 (F); DURANGO: El Oro to Guanacevi, Aug. 14–16, 1898, *Nelson* 4736 (G, US); City of Durango and vicinity, Apr.–Nov., 1896, *Palmer* 780 (G, US); barranca below Sandia Station, 6500′, Oct. 19, 1905, *Pringle* 10022 (F, G, M, US); rocky, andesitic bank, Rio Chico, on railroad west of Durango, 2300–2320 m., Aug. 27, 1934, *Pennell* 18238 (US); ravine at waterfall, Metates, North of Cueva, 2600–2650 m., Aug. 29–30, 1934, *Pennell* 18441 (US); SONORA: Los Pinitos, 6100′, Oct. 11, 1890, *Hartman* 141 (G, US); canyon slope, transition, Saguaribo, Rio Mayo, Nov. 2, 1935, *Gentry* 2115 (F, G, M, US); Cerro del Capulin, northwest of Aribabi, 6100′, Sept. 4, 1939, *White* 2719 (G); El Rancho del Roble, northeast of El Tigre, region of the Rio de Bavispe, 6000′, Sept. 2–13, 1941, *White* 4198 (G); Las Tierritas de El Temblor, Sierra de El Tigre, region of the Rio de Bavispe, Aug. 18–24, 1940, *White* 3342 (G); pine land burned over June, 1939, Puerto de los Aserraderos, region of the Rio de Bavispe, Aug. 4–9, 1940, *White* 3147 (G); El Rancho de la Nacha, 25 miles west of La Angostura, region of the Rio de Bavispe, 4300′, Aug. 14–20, 1941, *White* 3978 (G).

G. Wislizeni is one of the commonest species of northwestern Mexico. The often erect stem, the acropetal reduction in leaf-size and lobe-number and a tendency for most of the peduncles to be aggregated terminally are characters that associate it with the species of this series, rather than with *G. Seemanni* ("*G.*

mexicanum") to which Hanks & Small and Knuth allied it. The pubescent petals with more or less reticulate veins are additional points indicating an affinity with series *Lata*.

G. geoides Small and *G. calvescens* Briq. are only phases of glandularity, size of petals and habit naturally included in this variable species. Small gives the length of the petals of *G. geoides* as 15–18 mm. but those of the type are shorter and within the limits given here. Types or isotypes of both species have been examined.

From its allies, *G. latum* and *G. albidum*, *G. Wislizeni* may be distinguished by the generally smaller petals with less conspicuous venation and shorter hairs; yellow, never red, stamen-filaments; short style-beak; more sharply and shallowly toothed leaf-blades with cuneate-obovate or obovate lobes and coarser, more branched habit. *G. sublaevispermum* resembles young plants of this species but differs as pointed out in the discussion pertaining to it.

Series E. RESIMA. With characters of the species.

11. G. mexicanum HBK. Perennial: root thick, woody: rhizome short, slender or nearly absent: stems 3–7 dm. high, erect or decumbent at the base; lower part seldom branched, slender, glabrate to moderately densely pubescent with short or longish, appressed, flat hairs; upper part slender, short-pilose, occasionally glandular: basal leaves numerous, persistent; petiole 4–7 cm. long, retrorse-pilose; blade 3.5–7 cm. wide, pentagonal to reniform in outline, thick, green and glabrate to appressed-pilose above, gray-green and sparsely pilose on the conspicuously reticulate veins below, divided three-fourths to the base into 3–5 nearly equal, radiating, narrow-rhombic lobes, if 3-lobed, the lateral lobes with a basal lobelet; lobes coarsely cleft and toothed at the apex with obtuse to acute, ovate-lanceolate to lanceolate segments: cauline leaves few; petiole 1–12 cm. long, mostly shorter than the blade; blade similar to that of the basal leaf or hastate and 3-lobed; lobes usually narrower and longer than those of the basal leaf and the lateral lobes often somewhat reflexed; inflorescence-leaves much reduced: basal stipules small, soon withered: cauline stipules 5–12 mm. long, ovate to ovate-lanceolate, finely pubescent: peduncles 7–25 cm. long, sparsely or copiously short-pilose and glandular, 1–3-flowered, aggregated in a loose, little-branched, terminal, cymose inflorescence or sometimes single from the base or lower nodes:

pedicels 1.7 cm. long, densely short-pilose and glandular, distinctly nodding in bud: outer sepals 6– mostly 8–12 mm. long, awned; body 5.5– mostly 7–10 mm. long, elliptic or oblong, 3–7-veined, glabrate to finely strigillose or pilose; veins usually with glandular hairs; awn 0.5– mostly 1–2 mm. long: petals 13–18 mm. long, 9–10 mm. wide, rose-lavender, cuneate-obovate, reticulate-veined; apex entire or emarginate; base and veins villous: stamen-filaments mostly shorter than the sepals, thin, ciliate, not exserted in fruit: fruit 25–35 mm. long; style-beak 2.5–5 mm. long; style-column closely short-pilose and glandular; carpel-body 3 mm. long, pubescent: seed not seen.

Var. **typicum** (Pl. 1, fig. 3). Stems 3–4 dm. high: leaf-segments mostly obtuse, ovate-lanceolate: fruit 25–28 mm. long; style-beak 2.5–3.5 mm. long.—HBK., Nov. Gen. et Spec. **5:** 230 (1822). Type: *Humboldt & Bonpland*, in Herb. Humboldt, Muséum d'Histoire Naturelle, Paris (not seen); photograph, F no. 981829 (seen).—*G. temascaltepecense* Knuth in Kew Bull. 1937: 503, type *Hinton* 1327, at Kew (not seen); isotype, G (seen).—Guanajuato to Mexico.—MEXICO: Guanajuato: between Guanajuato and Santa Rosa, Aug,–Sept., 1803, *Humboldt & Bonpland* (type-photograph, F no. 981829). Michoacan: pine forest, Sierra Torricillas, Dist. Coalcoman, 2380 m., Oct. 11, 1938, *Hinton* 12347 (G). México: Las Mesas, Dist. Temascaltepec, 2000 m., Aug. 14, 1932, *Hinton* 1327 (F, G, M, NY, isotypes of *G. temascaltepecense* Knuth); oak woods, Nanchititla, Dist. Temascaltepec, Aug. 15, 1933, *Hinton* 4533 (F, G, M, NY); oak woods, Cucha, Dist. Temascaltepec, Aug. 5, 1934, *Hinton* 6393 (G, M); oak woods, Las Mesas, Dist. Temascaltepec, Aug. 15, 1935, *Hinton* 7996 (G). Distrito Federal ?: in vallibus prope Mexico, 9000′, 1850, *Sartorius* s. n. (US).

Var. **resimum** (Small), comb. nov. (Pl. 2, fig. 14). Stems 3–7 dm. high: leaf-segments mostly acute, lanceolate: fruit 32–35 mm. long; style-beak 4–5 mm. long.—*G. resimum* Small in Hanks & Small, N. Am. Fl. **25:** 12 (1907). Type: *J. N. Rose* 2070, NY (seen).—Nayarit and Zacatecas.—MEXICO: Nayarit (Territorio de Tepic): between Santa Gertrudis and Santa Teresa, Sierra Madre, Aug. 8, 1897, *J. N. Rose* 2070 (NY, type; US, photograph F, isotype); between Dolores and Santa Gertrudis, Aug. 7, 1897, *J. N. Rose* 3374 (US). Zacatecas: Sierra Madre, Aug. 17, 1897, *J. N. Rose* 2370 (US).

A photograph at the Field Museum of the type of *Geranium mexicanum* HBK. at Paris and the excellent description of this species show definitely that it is not the small-flowered *G. Seemanni* which has been called *G. mexicanum* by most authors.

The type is an exact match for isotypes of the later *G. temascaltepecense* Knuth. Measurements of the style-beak on the type-photograph give a length of approximately 2.5 mm., almost identical with that in isotypes of Knuth's species.

Differences between var. *typicum* and var. *resimum* do not seem adequate to uphold the latter as a distinct species. Except for quantitative and variable differences of pubescence and differences in length of the fruit and style-beak and in the cutting of the leaves, the two varieties are very similar. Since the differences in the length of the fruiting parts and the width of the leaf-segments do appear constant, I am retaining *G. resimum* Small in a varietal status.

The affinity of *G. mexicanum* is doubtful. It is tenuously allied with the series *Lata* because of the progressive reduction of the leaves toward the stem-terminus and the sparsely villous petal-pubescence, but in several characters it differs from these possible relatives. While the basal leaves of *G. latum* and allied species are sometimes persistent, they are mostly soon deciduous and seldom numerous; in this species they are usually numerous and persistent with a distinctive gray-green or even reddish lower surface and conspicuously reticulate veins below. The stem is little-branched with few leaves and the pedicels are noticeably nodding in bud. In some respects of habit, leaf-venation and petal-pubescence, *G. mexicanum* resembles *G. tenue* and species of series *Crenata* but the leaf-shape, root, rhizome, basal stipules and reduced leaves are of a different type.

Var. *resimum* is known only from Nayarit and the Sierra Madre of Zacatecas, while var. *typicum* is more common in Guanajuato, Michoacan and Mexico.

Series F Crenata. Erect or decumbent perennials with slender or moderately thick, spreading, woody rhizomes: stems single or tufted, 2–3.5 dm. high, terminating in a loosely branched, cymose inflorescence and sometimes with the peduncles rising singly from the caudex or lower nodes: basal leaves mostly numerous, persistent or not; blades reniform to orbicular in outline, divided one-half to two-thirds to the base into 5 nearly equal, radiating, cuneate-obovate lobes; lobes cleft and toothed or incised toward the apex with short, acute or obtuse segments: cauline leaves mostly few; blades similar to those of the basal leaves, or with fewer lobes but the lateral lobes not progressively reduced toward the stem-terminus: sepals minutely pubescent; veins and margins with gland-tipped, long-pilose or villous hairs: petals 10–20 mm. long, white, yellowish, rose-purple or purple, broad-obovate to cuneate-obovate; veins reticulate; base shortly pilose or villous to the middle: style-beaks 2.5–3 mm. long.

Taken as a unit, the species of this series differ from those of the series *Nivea* in their usually lower stature, slender to only moderately stout, branched and somewhat tufted rhizomes, broad-lobed, less deeply divided and cut leaves and in the long hairs on the veins and margins of the sepals.

Although these species simulate *G. mexicanum* and species of series *Lata*, the cauline leaves are seldom much reduced toward the stem-terminus and the lobes, at least on the basal leaves, are cuneate-obovate rather than rhombic in outline.

G. crenatifolium, *G. potosinum*, *G. tenue* and *G. Pringlei* are closely related in many characters that are discussed under the individual species. They appear to be southern relatives of *G. Parryi* (Engelm.) Heller and *G. Fremontii* Torr. ex Gray of western and southwestern United States, species included with *G. crenatifolium* and *G. Pringlei* in Knuth's section *Caespitosa*.[8a] The western species, however, are coarser plants with caespitose stems, long style-beaks, exserted stamen-filaments and finer, often densely glandular pubescence.

Of the four species in this series, three are endemic in the mountains of Hidalgo, San Luis Potosí and Nuevo Leon respectively. *G. crenatifolium*, although of somewhat wider range, is restricted to mountains of the adjacent states of Coahuila, Nuevo Leon and Tamaulipas in northeastern Mexico.

12. G. **crenatifolium,** nom. nov. (Pl. 2, fig. 15). Perennial: rhizome long, slender to stout: stems 18–36 cm. high, erect, often tufted; lower part little-branched, slender, spreading-villous; upper part slender, spreading-villous and short-pilose, sometimes glandular: basal leaves numerous, persistent; petiole 5–15 cm. long, villous and short-pilose; blade 1.5–5 cm. wide, reniform to orbicular in outline, darker above than below, thin, villous or long-pilose above and on the veins below, divided one-half to the base into 5 nearly equal cuneate-obovate lobes; lobes shallowly

[8a] L. c. p. 99.

cleft and crenate-toothed at the apex with obtuse segments: cauline leaves few or absent; petiole 1–7 cm. long, villous and short-pilose; blade similar to that of the basal leaf or with fewer lobes: basal stipules about 12 mm. long, lanceolate, adnate one-third their length to the petiole, lustrous, deep-brown, glabrous or short-glandular and ciliate: cauline stipules 5–10 mm. long, lanceolate, yellow-brown, short-pilose and often glandular, ciliate: peduncles 4–17 cm. long, short-pilose and villous, sometimes glandular, 2-flowered, single from the caudex or aggregated in a little-branched, terminal, cymose inflorescence: pedicels 1–6 cm. long, short-pilose, villous and often glandular: outer sepals 8–10 mm. long, awned; body 7–8 mm. long, oblong- to elliptic-lanceolate, 3–5-veined, short-glandular; veins and margins villous; awn 0.5–2 mm. long: petals 12–17 or exceptionally 20 mm. long, 7–10 or rarely 15 mm. wide, rose, magenta or occasionally white; veins reticulate, not conspicuously darker; apex rounded, somewhat emarginate or crenulate; base shortly pilose: stamen-filaments shorter than the sepals, not conspicuously exserted in fruit: fruit 28–30 mm. long; style-beak 2.5–3 mm. long; style-column copiously short-glandular, glands sometimes deciduous, tapering toward the apex; carpel-body deciduous-glandular: seed not seen.—*G. crenatum* S. Wats. in Proc. Am. Acad. **17:** 334 (1882), TYPE: *Palmer* 136, G (seen); Knuth in Engler, Pflanzenr. **4** fam. 129: 101, 102 fig. 17, A & B (1912), not *G. crenatum* Andr., Geran. **2:** t. 77 (1805).—Coahuila, Nuevo Leon and Tamaulipas.—MEXICO: COAHUILA: Lerios, 45 miles east of Saltillo, July 1880, *Palmer* 136 (G, TYPE; photograph, NY). NUEVO LEON: abundant in grassy pine forest near peak, Cerro Potosi, Municipio de Galeana, 11,600′, July 20, 1938, *Schneider* 1039 (F); open pine forest on east face of peak, Cerro Potosi, Municipio de Galeana, 11,000′, July 5, 1938, *Schneider* 1029 (F); rocky summit, Mt. "El Infernillo", Pablillo, southeast of Galeana, 3000–3100 m., June 29, 1934, *Pennell* 17122 (US); common in pine savannah, ascent of Sierra Infernillo, about 15 miles southwest of Galeana, June 17, 1934, *C. H. & M. T. Mueller* 852 (G); common in pine belt above Mesa de la Camisa, north slope of Mt. Sierra Tronconal between Canyon de los Charcos and Canyon de San Miguel, about 15 miles southwest of Galeana, 6000–9000′, June 4, 1934, *C. H. & M. T. Mueller* 738 (F, G, NY, US). TAMAULIPAS: mts. near Miquihuana, 7000–9000′, June 10, 1898, *Nelson* 4491 (US, photograph NY); in forest of large pines, on mountain top 7 kilos. S. W. of Miquihuana, 3430 m., Aug. 5, 1941, *Stanford, Retherford & Northcraft* 709 (G).

The only species of this series with a range of any breadth, *G. crenatifolium* grows in pine forests in the mountainous regions of northeastern Mexico. In habit, the species is variable: usually of low plants, it sometimes reaches a height of 3.5 dm. with a branched stem (*Nelson* 4491, *Mueller* 738, F). This is apparently an environmental phase. The petals are rose to magenta but an albino individual (*Schneider* 1029) was collected on Cerro Potosi, N. L. growing with the normal colored plants.

The low phase of *G. crenatifolium* is very close to *G. tenue* and the taller phase resembles *G. potosinum* or *G. Parryi*. It may be distinguished readily from these species by the villous stem, obtuse, crenately toothed leaf-lobes and broad-obovate, rose or magenta petals. From *G. tenue*, this species differs further in the mostly glabrous basal stipules and less spreading rhizomes. The albino form of *G. crenatifolium*, similar in color, possesses much larger petals than those of *G. tenue*. The sharply incised leaves and conspicuously veined, narrower petals of *G. potosinum* serve further to distinguish it from *G. crenatifolium*.

13. G. Pringlei Rose (Pl. 2, fig. 10). Perennial: rhizome slender to mostly moderately stout: stems 2–3 dm. long, erect or decumbent at the base, tufted; lower part often branched near the base, slender, densely spreading-villous with terete hairs; upper part slender, sparsely villous and copiously short-glandular: basal leaves mostly few except in young plants, not long-persistent; petiole 8–25 cm. long, densely villous; blade 3–5 cm. wide, pentagonal, reniform or orbicular in outline, light-green, thick, sparsely short-pubescent above, with scattered, long hairs on the veins below, divided one-half to two-thirds to the base into 5–7 nearly equal, radiating, cuneate-obovate lobes; lobes deeply twice-cleft and sharply incised at the apex with acute, lanceolate or ovate-lanceolate segments: cauline leaves numerous: lower petioles 3–10 cm. long, villous, occasionally short-glandular; upper petioles 1–3 cm. long, copiously short-glandular with scattered, long hairs; blade similar to that of the basal leaf or with only three lobes; lobes mostly longer and narrower with thinner segments, sometimes with glandular hairs on the margins and veins below: basal stipules 8–10 mm. long, broad-lanceolate, adnate one-third their length to the petiole, lustrous or dull, brown, glabrous, not ciliate: cauline stipules 5–8 mm. long, ovate-lanceolate, brown, glabrous, ciliate: peduncles 4–25 cm. long, copiously short-glandular, 2-flowered, aggregated in a terminal cyme or sometimes single at nodes nearer the base: pedicels 1–3 cm. long, copiously short-glandular: outer sepals 9.5–12 mm.

long, awned; body 9–11 mm. long, elliptic- to ovate-lanceolate or ovate, 3-veined; veins and margins pubescent with short-glandular and long, terete hairs; inner sepals ciliate; awn 0.5–1 mm. long: petals 15–20 mm. long, 15 mm. wide, blue or purple, cuneate-obovate; veins reticulate; apex shallow-emarginate; base shortly pilose: stamen-filaments as long as the sepals, not conspicuously exserted in fruit: fruit 30–32 mm. long; style-beak 2.5–4 mm. long; style-column densely glandular-pubescent, with or without long hairs; carpel-body 4–5 mm. long, pilose with glandless or glandular hairs: seed 3–5 mm. long, red-brown, minutely reticulate.—Contr. U. S. Nat. Herb. **10:** 109 (1906). TYPE: *Pringle* 8978, US (seen).—Known only from the type-locality.—MEXICO: HIDALGO: meadows, Cuyamaloya Station, 8300′, Aug. 2, 1904, *Pringle* 8978 (US, TYPE; F, G, M, NY, P, US, ISOTYPES).

G. Pringlei, known only from the type-locality in the state of Hidalgo, is the southernmost representative of the series *Crenata*. Its stems are generally more branched than those of the other species and are often decumbent at the base. Some of the peduncles occur singly at the lower nodes and, in young plants, the inflorescence may appear only weakly terminal. This species may be distinguished from all members of series *Bella*, with which it might be confused, by the glandular pedicels and flower-parts and less deeply divided and cut leaf-blades.

In character of pubescence, this species is very similar to *G. crenatifolium*, both having the stems and sepal-veins villous with long, terete, silvery hairs. It may be distinguished, however, by the sparsely pubescent upper leaf-surface,, the sharply incised, twice-cleft leaf-lobes, the often orbicular leaf-blades, longer sepals and branched, leafy habit.

From *G. tenue*, its nearest geographical relative, *G. Pringlei* is distinct at once in having large, purple petals, villous pubescence and sharply incised leaves. Contrasts with *G. potosinum* are presented in the discussion of that species.

14. G. **potosinum,** sp. nov. (PL. 4, FIG. 3), herba perennis: rhizomate longo, patente, gracili vel modice crasso: caudice simplice: caulibus 3 dm. longis, solitariis vel numerosis, inferne simplicibus gracilibus, sparsim strigosis, superne gracilibus, strigosis, in inflorescentiam cymosam terminantibus: foliis basalibus paucis vel numerosis, mox deciduis; petiolo 5–15 cm. longo, sparsim strigoso; lamina orbiculari vel pentagona, 1.5–3 cm.

lata, tenue, utrinque adpresse pilosa, ½–⅔ ad basin 5-lobata: lobis aequalibus vel lobo medio longiore, ad apicem inciso-dentatis; dentibus lanceolatis: foliis caulinis paucis; petiolo ad 7 cm. longo, strigoso; vel foliis superioribus sub-sessilibus; lamina eae foliorum basalium simili vel deltoideo-hastata, 3-lobata, lobis lateralibus saepe lobulo basali ornatis, lobis angustioribus longioribusque: stipulis basalibus 10–20 mm. longis, lanceolatis, ⅓ ad petiolum adnatis, brunneis, glabrescentibus ciliatisque: pedunculo 4–12 cm. longo, strigoso, bifloro: pedicellis 1–3 cm. longis, breviter pilosis, saepe deciduo-glanduloso-pilosis, floriferis erectis: sepalis exterioribus 7–10 mm. longis, mucronatis mucrone 1.5– raro 3 mm. longo, ovatis, 3-nervatis, subtiliter pubescentibus, venis marginibusque longe pilosis: petalis 12–15 mm. longis, 6–7 mm. latis, pallide roseis vel purpureis, saturate purpureo-reticulato-venosis, obovatis, e basi ad mediam villosis, apicibus rotundatis: staminibus quam sepalis brevioribus, non exsertis: fructu 18–20 mm. longo (immaturo); stigmatibus 3 mm. longis; columna stylorum subtiliter pubescente et decidue glanduloso-pilosaa; crpellum seminaque non visa.

Perennial: rhizome long, spreading, slender to stoutish: stems 3 dm. long, erect, single or tufted; lower part unbranched, slender, sparsely strigose; upper part slender, strigose, little-branched: basal leaves few to numerous, not long-persistent; petiole 5–15 cm. long, sparsely strigose; blade 1.5–3.5 cm. wide, orbicular to pentagonal in outline, thin, densely appressed-pubescent above, coarsely pubescent on the veins below, divided past the middle into 5 nearly equal, radiating, broad-rhombic or cuneate-obovate lobes; lobes sharply and coarsely incised and toothed toward the apex with lanceolate segments, median lobe sometimes longer than the lateral lobes: cauline leaves few, with petiole 7 cm. long or upper subsessile, strigose; blade similar to that of the basal leaf or deltoid-hastate in outline, 3-lobed; lobes usually narrower and longer than in the basal leaf, lateral lobes with or without basal lobelets: basal stipules 10–20 mm. long, lanceolate, adnate one-third their length to the petiole, dull-brown, glabrous: cauline stipules 8–10 mm. long, lanceolate, dull-brown, glabrous or minutely pubescent and ciliate: peduncles 4–12 cm. long, strigose, 2-flowered, aggregated in a strict, terminal, cymose inflorescence: pedicels 1–3 cm. long, short-pilose and often deciduous-glandular: outer sepals 7–10 mm. long, awned: body 6–8 mm. long, ovate, 3-nerved, minutely pubescent; veins and margins long-pilose; awn 1.5– seldom 3 mm. long: petals 12–15 mm. long, 6–7 mm. wide, rose-lavender with darker, red-purple, prominent and reticulate veins, obovate; apex rounded; base villous to the middle: stamen-filaments shorter than the sepals, sparsely ciliate, not exserted in fruit: fruit 18–20 mm. long (immature); style-beak 3 mm. long; style-column minutely pubescent and deciduous-glandular, tapering abruptly at the apex; carpel-body and seed not seen.—Known only from the type-locality.—MEXICO: NUEVO LEON: abundant in the upper pine wood, Peak of Cerro Potosi, Municipio de Galeana, July 21, 1935, *Mueller* 2257 (G, TYPE; F, ISOTYPE).

At the present time, *G. potosinum* is known only from Cerro Potosi, N. L. It is said by Mueller (field data) to grow abundantly in the upper pine woods where it is probably found in association with *G. crenatifolium* (*Schneider* 1039). Its closest relationships are with *G. crenatifolium* and *G. tenue*. Comparisons with these two species are to be found in their respective discussions. The erect habit, leaf-shape and nature of the rhizome place *G. potosinum* in this series as do characters of the petals and sepals. The large, glabrous basal stipules are particularly interesting in their similarity to those of *G. crenatifolium* and in shape and abundance, with those of *G. tenue* and *G. Pringlei* and the sharply cut leaves approach those of *G. Pringlei* more closely than those of the other two species. *G. potosinum*, however, is a strongly erect, not decumbent species, with little-branched stems and shorter, narrow-obovate petals of pale rose or lavender color. The long, terete hairs so prevalent on the stems and sepals of the latter species are lacking in *G. potosinum*.

15. G. TENUE Hanks in Hanks & Small (PL. 2, FIG. 11). Perennial: rhizome long, slender: stems 15–25 cm. high, erect, single or tufted; lower part little-branched, slender, sparsely strigose; upper part slender, thinly strigose and densely short-curly-pilose, often deciduous-glandular: basal leaves numerous, persistent; petiole 3–12 cm. long, strigose and sometimes short-pilose; blade 1.5–3.5 cm. wide, orbicular, reniform or pentagonal in outline, moderately thick, dark-green and densely appressed-pilose above, grayish-green and appressed-pilose on the veins beneath, divided three-fourths to the base into 5 nearly equal, radiating, cuneate-obovate lobes; lobes coarsely toothed toward the apex with oblong or ovate segments: cauline leaves few; petiole short to subsessile; blade similar to that of the basal leaf or often three-lobed, the lateral lobes with or without a basal lobelet: basal stipules about 12 mm. long, lanceolate, adnate about one-third their length to the petiole, dark-brown, pubescent: cauline stipules up to 10 mm. long, lanceolate, pilose and ciliate: peduncles 4–12 cm. long, short-pilose and often glandular,

2-flowered, single from near the caudex or aggregated in a strict, little-branched, terminal, cymose inflorescence: pedicels 1–2.5 cm. long, densely short-pilose and often glandular, somewhat geniculate in fruit: outer sepals 7–8 mm. long, awned; body 6–7 mm. long, ovate, 3-veined, minutely pubescent; veins and margins, occasionally the body, long-pilose or glandular; awn 0.5–1 mm. long: petals 10 mm. long, 4–5 mm. wide, yellowish to white, narrow-obovate or somewhat spatulate; veins prominent, reticulate; apex rounded or shallow-emarginate; base villous to the middle: stamen-filaments as long as the sepals, not exserted in fruit: fruit 24–30 mm. long; style-beak 3 mm. long; style-column finely antrorse-pubescent and spreading, deciduous-glandular; carpel-body 3 mm. long, pilose, brown: seed 2.4 mm. long, deep-brown or grayish-black, reticulate with narrow reticulations.—N. Am. Fl. **25:** 10 (1907). TYPE: *Schaffner* 458, NY (seen); Knuth, in Engler, Pflanzenr. **4** fam. **129:** 102 fig. 17 C–K (1912).—Mountains in the vicinity of San Luis Potosí.—MEXICO: SAN LUIS POTOSÍ: ex convalli San Luis Potosí, 1877, *Schaffner* 458 (NY, TYPE); in montibus San Miguelito, 1876, *Schaffner* 186 (F, G); in montibus San Rafael, 1876, *Schaffner* 187 (G).

G. tenue is related to *G. potosinum* in aspect, pubescence and petal-pubescence. It may be distinguished, however, by its whitish rather than purple petals; its persistent basal leaves; its coarsely toothed leaf-lobes with ovate or oblong segments and by its pubescent, instead of glabrous, basal stipules. The upper surface of the leaf is darker green, reddening in age, and the blades are thicker than in *G. potosinum.* The stems lack the broad, glossy-brown stipules of the latter species and are shorter and less stiffly erect. Relationships of this species with others in the series are considered in the discussions of the various species.

Hanks, in the original description, described the petals as purple. The type-sheet is in bud or fruit, but *Schaffner* 187 has the petals yellowish-white, agreeing with the accompanying label reading "flores lutei albescentes."

Watson cited two collections from the vicinity of Penasco and San Luis Potosí, S. L. P., *Schaffner* 190 (G) and *Parry & Palmer* 101 (G, US), as *G. carolinianum.*[9] These are the same as *Schaffner* 459 (NY), also from San Luis Potosí, labeled *G. tenue,* ap-

[9] Proc. Am. Acad. **17:** 334 (1882).

parently by Hanks. It is doubtful that they are either species. The plants strongly resemble *G. carolinianum* but are perennial with a large, woody root (*Schaffner* 459), deeply reticulate seeds and somewhat elongate stems. In view of these characters and their geographic isolation from the northern range of the species, it is unlikely that Watson's identification is correct.

Neither are they equivalent to the type-material of *G. tenue.* The style-beaks are much shorter (1.5 mm.), the leaf-divisions narrower and the peduncles single. The sepals lack the characteristic long, soft, marginal hairs of *G. tenue* and the veins on the lower surface of the leaves are essentially free in contrast to the conspicuous, reticulate veins of Hanks' species. Schaffner, himself, differentiated between the two, labelling the type of *G. tenue* as *G. Schiedeanum* and no. 459 as *G. carolinianum.* Subsequent and more adequate collections may throw additional light on this material.

SERIES G. ATROPURPUREA. With characters of the species.

16. G. ATROPURPUREUM Heller (PL. 2, FIG. 12; PL. 5, FIG. 5). Perennial: rhizome long, slender: stems 1–9 dm. long, erect when young, sprawling in age, one or mostly several from the caudex; lower part often branched, rather stout, densely hirsute or hispid; upper part moderately robust to slender, densely and retrorsely hispid, hispidulous, strigose or sometimes short-curly-pilose, usually much-branched, indeterminate: basal leaves few, not long-persistent; petiole 5–10 cm. long, densely hispid to short-pilose; blade 2–6 cm. wide, reniform to orbicular in outline, radiate, densely hispid or hispidulous above and below, divided nearly to the base into 3–5 cuneate-obovate, nearly equal lobes; lobes coarsely toothed or cleft and toothed near the apex with oblong to ovate-lanceolate, obtuse to acutish segments; lateral lobes usually with a basal lobelet: cauline leaves numerous; petiole 1–8 cm. long, densely hispid, hispidulous or short-pilose; blade similar to that of the basal leaf or 3-lobed: lobes long and narrow-rhombic in outline; lateral lobes with or without a basal lobelet: cauline stipules 5–7 mm. long, linear-lanceolate, brown, pubescent and ciliate: peduncle 3–14 cm. long, densely hispidulous and/or short-curly-pilose, 2-flowered, single and axillary: pedicels 2.5–4 cm. long, hispidulous and/or short-curly-pilose or very rarely sparsely glandular, divaricate and geniculate in fruit: outer sepals 9–11 mm. long, awned; body 8–9.5 mm. long, oblong- to ovate-lanceolate, 3–5-veined, minutely pubescent;

veins and margins with longer, very seldom glandular, hairs; awn 1–2.5 mm. long: petals 10–15 mm. long, 5–7 mm. wide, red-purple or occasionally paler with darker red to purple, reticulate veins, narrow-obovate; apex rounded; base villous to or past the middle with long, terete, stiffish, silvery hairs: stamen-filaments much exceeding the sepals, ligulate, villous-ciliate, yellow or often red, exserted in fruit: fruit 30–40 mm. long, stout; style-beak 5–8 mm. long, often deep-red, branches often divaricate; style-column densely and minutely pubescent or very seldom sparsely glandular, tapering to the apex; carpel-body 5 mm. long, brown, hirsute: seed 2.5–3 mm. long, dark-brown, coarsely and deeply reticulate.—Bull. Torr. Bot. Club **25:** 195 (1898). Type: *Heller & Heller* 2723, probably at NY (not seen).—*G. gracile* Engelm. ex A. Gray, Pl. Fendl. 27 (1849), not *G. gracile* Ledeb. ex Nordm., in Bull. Sc. Acad. Pétersb. **2:** 314 (1837) not *G. gracile* Schrenk, in Bull. Phys.-Math. Acad. Pétersb. **3:** 308 (1845). *G. caespitosum* James var. *gracile* (Engelm.) A. Nels. & Macbr., in Bot. Gaz. **55:** 376 (1913).—*G. caespitosum* sensu A. Gray, Pl. Fendl. 25 (1849).—Northwestern Mexico.—MEXICO: Coahuila: (western), gravelly stream beds, pine forests in middle section of Sierra del Pino, 2–10 miles north of camp at La Noria, Aug. 22, 1940, *Johnston & Mueller* 515 (G); Del Carmen Mountains, Aug. 26, 1936, *Marsh* 605 (F); moist stream-side, Canyon de Sentenela on Hacienda Piedra Blanca, Sierra del Carmen, Municipio de Villa Acuña, July 8, 1936, *Wynd & Mueller* 586 (G, M, NY, US); (western), trailing on moist, rich benches and slopes in moist, shaded canyon in lower part of pine belt, Sierra de la Madera, Corte Blanco fork of Charretera Canyon, moist shady conifer-forest on steep north-slopes, 6500–8700′, Sept. 12–14, 1941, *I. M. Johnston* 8986 (G); (central), under oaks on middle slopes, western side of Potrero de la Mula, about 20 km. northwest of Ocampo, on the escarpment near the mines, Sept. 18, 1941, *I. M. Johnston* 9219 (G); (western), hill-sides and meadows, high central parts of the calcareous Sierra del Pino, about 20 km. northwest of La Noria, Aug. 29, 1941, *Stewart* 1237 (G); (northern), shaded places along arroyo, 2 miles up canyon, Cañon de San Enrique, eastern side of Sierra de la Encantada, 5 km. west of Rancho Buena Vista, Sept. 4, 1941, *Stewart* 1397 (G). Chihuahua: Majalca (Pilares), 40 miles northwest of Chihuahua, 6800′, Aug. 11, 1939, *White* 2357 (G); Majalca, Aug. 24, 1935, *Le Sueur* Mex-32 (F, G); San Diego Canyon, Sierra Madre, 6400′, Sept. 16, 1903, *Jones* s. n. (P); stony pine woods, Majalca, northwest of Chihuahua, 2050–2100 m., Sept. 29, 1934, *Pennell* 19303 (US); dry mountains near Pilares (Strawberry Valley), Sept. 18, 1891, *Hartman* 791 (G, US); between Colonia Garcia and Pratt's Ranch below Pacheco, Aug. 22–24, 1899, *Nelson* 6253 (G, US); rocky cliff, Strawberry Creek, northeast of Colonia Pacheco, 1900–2000 m., Sept. 22–24, 1934, *Pennell* 19190 (US); near Colonia Garcia in the Sierra Madres, 7500′, Aug. 5, 1899, *Townsend & Barber* 227 (F, G, M, P, US); shaded rocky ravine, Calera, east of San Isidro, 2100–2300 m., Sept. 15, 1934, *Pennell* 18789 (US). SONORA: El Rancho del Roble, northeast of El Tigre, region of the Rio de Bavispe, 6000′, Sept. 2–13, 1941, *White* 4182 (G); Cononea, Aug. 20–Sept. 1, 1914, *Murdoch* s. n. (F); San José Mts., 8000′, Aug. 3, 1893, *Mearns* 1603 (US); Aug. 5, 1893, *Mearns* 1645 (US); 8500′, Aug. 7, 1893, *Mearns* 1680 (US); mountain pass near Sta. Cruz, Sept. 1855, *Schott* s. n. (F); pine land burned over June 1939, Puerto de los Aserraderos, region of the Rio de Bavispe, Aug. 4–9, 1940, *White* 3133 (G); wet meadow, Las Tierritas de El Temblor, Sierra de El Tigre, region of the Rio de Bavispe, Aug. 18–24, 1940, *White* 3343 (G). BAJA CALIFORNIA: banks of La Sanca Creek, about 5 miles northwest of La Grulla, Sierra de San Pedro Martir, 6700′, Sept. 17, 1930, *Wiggins & Damaree* 4869 (P, US); Cantiles Mts., July 1883, *Orcutt* 924 (G); Hanson's Ranch, 6000′, July 29–30, 1883, *Orcutt* s. n. (F, US).

It was to this species that Gray assigned the name *G. caespitosum*[10] believing it to be the species described by James. Material in the Gray Herbarium shows *G. atropurpureum* extending northward into the southern and southwestern counties of Colorado but not into the northeastern region where James is supposed to have collected his "caespitose" *Geranium* as pointed out by Heller.[11] Lacking collections from the general region or an actual specimen collected by James it seems advisable to follow Heller in calling this distinctly southern species *G. atropurpureum* and to consider *G. caespitosum* James ex Torr. a *nomen dubium.*

The species varies in habit from young plants with erect stems simulating those of series *Lata* to old plants with long, sprawling stems. The petals also vary in color and in size but always have stiff, terete hairs at the base and along the veins to or past the middle. Although essentially with an eglandular pubescence, occasionally specimens occur with slight glandularity on the pedicels, sepals and style-column. These phases of pubescence are apparently responsible for the description of several species in the southwestern United States that probably are not specifically distinct.

[10] Pl. Fendl. 25 (1849).

[11] Bull. Torr. Bot. Club 25: 196 (1898).

G. atropurpureum is most closely related to *G. Parryi* (Engelm.) Heller and *G. Fremontii* Torr. ex Gray of the western United States. All have a long style-beak, exserted, ligulate stamen-filaments and villous pubescence on the petals, but *G. atropurpureum* is distinguished by its sprawling habit, usual lack of glands and in having the peduncles always single and axillary instead of in a terminal inflorescence.

Occurring from Coahuila to Baja California across northern Mexico, this species is one of the most widely distributed within the scope of this treatment.

Series H, BELLA. Procumbent, spreading, ascending or seldom decumbent perennials: stems 1–5 dm. long, branched, indeterminate: basal leaves few or absent, not long-persistent; blades similar to those of the cauline leaves but usually 5–7-lobed: cauline leaves numerous; blades reniform, pentagonal or orbicular in outline, divided nearly to the base into 3–7 nearly equal lobes; lobes pinnatifid- to bipinnatifid-toothed with long, linear to oblong-lanceolate segments: pubescence never glandular: peduncles 2–28 cm. long, mostly overtopping the leaves, always single and axillary: pedicels 8 mm. to 9 cm. long: veins and margins of the sepals usually long-haired: petals 10–22 mm. long, cuneate-obovate, obovate or obcordate, white to purple; veins reticulate; bases shortly pilose (except *G. monanthum*): style-beaks 3–7 mm. long.

Geranium potentillaefolium, *G. Schiedeanum*, *G. bellum*, *G. Lozani*, *G. andicola*, *G. Goldmanii* and *G. monanthum* are inhabitants of the uplands of central and southern Mexico and Guatemala. They comprise a very natural series characterized by the spreading, low habit, the deeply cut leaves, the totally eglandular pubescence, the showy flowers, usually narrow, long-haired sepals and mostly long peduncles which are always single and axillary.

Knuth maintained these species with those of series *Nivea* in his section *Incanoidea*.[12] The division of this section has been discussed in connection with that series.

The characters of size, form, leaf-cutting and pubescence that are usually of specific importance are variable in this series. Therefore, the species are interpreted with broad concepts. Undoubtedly many of the variations are due to environmental

[12] L. c. p. 167.

influences and this is discussed in detail under *G. potentillaefolium.* When intergradations unite several more or less distinct forms, these are considered to be phases of a single species. This is perhaps best illustrated by *G. Schiedeanum*, several phases of which have received names as distinct species.

17. G. Lozani Rose (Pl. 2, fig. 16). Perennial: rhizome long, slender: stems 2–3 dm. long, spreading and ascending, several from the caudex; lower part branched, rather slender, glabrate to densely strigillose with flattened hairs; upper part slender, mostly unbranched, indeterminate; pubescence similar to that below: basal leaves few, soon deciduous; petiole 8–18 cm. long, sparsely to densely strigillose; blade 4–5 cm. wide, orbicular in outline, radiate, somewhat coriaceous, not darker above than below, strigillose above and below with flattened hairs, densely so on the veins above, divided nearly to the base into mostly 5 nearly equal, somewhat cuneate lobes; lobes 2–3-cleft and toothed with oblong or lanceolate, divaricate segments: cauline leaves numerous, similar to the basal leaves but the petioles shorter: cauline stipules 3–8 mm. long, ovate to elliptic-lanceolate dark-brown, glabrous and ciliate, often cleft: peduncle 5– mostly 10–18 cm. long, usually overtopping the leaves, densely strigillose, 2-flowered, single and axillary: pedicels 3–6 cm. long, densely strigillose, erect in fruit: outer sepals 9–13 mm. long, awned; body 8.5–11.5 mm. long, oblong-elliptic to broadly ovate, 3–5-veined, sparsely pubescent with short to moderately long, flattened hairs; veins and margins long-haired; awn 0.5–1.5 mm. long: petals 17–22 mm. long, 10–12 or rarely 15 mm. wide, white with many, dark or reddish, reticulate veins, cuneate-obovate or obovate; apex entire or shallow-emarginate; base pilose: stamen-filaments as long as or longer than the sepals, yellow, ciliate, not conspicuously exserted in fruit: fruit 30–40 mm. long; style-beak 5–7 mm. long; style-column densely hispidulous, stout; carpel-body 5 mm. long, light-brown, long-pilose: seed 3 mm. long, brown-black, deeply and coarsely reticulate.—Contr. U. S. Nat. Herb. **10:** 108 (1906). Type: *Pringle* 8994, US (seen).—Hidalgo and Michoacan.—MEXICO: Hidalgo: meadows near Buena Vista Station, 8500′, Aug. 6, 1904, *Pringle* 8994 (US, type; F, G, P, US, isoytpes); between Somoriel and Las Lajas, Aug. 5, 1905, *Rose, Painter & Rose* 9208 (G, US). Michoacan: Cerro San Miguel, Morelia, Feb. 1909, *Arsène* s. n. (F).

This species is one of the most handsome in central Mexico with its large, dark-veined, white flowers and dark leaves. A distinctive type of pubescence serves to distinguish it from all the species in the series except *G. monanthum* which is widely different in leaf-shape, size and pubescence of the petals, peduncle-length and lack of basal leaves. The hairs of *G. Lozani* are very short, almost scale-like at times and sparsely distributed.

18. G. BELLUM Rose (PL. 3, FIG. 4; PL. 5, FIG. 1). Perennial: rhizome long, slender to stout: stems 1.5–5 dm. long, spreading to ascending, mostly several from the caudex; lower part usually branched, moderately stout, densely villous; upper part moderately stout to slender, densely villous, often branched, indeterminate: basal leaves few, not long-persistent; petiole 5–16 cm. long, densely villous; blade 2.5–7 cm. wide, reniform to pentagonal in outline, moderately thick, dark-green and densely appressed- to open-villous above, gray-green and densely spreading-hirsute on the conspicuous veins below, divided nearly to the base into 3–5 nearly equal, spatulate to broad-rhombic lobes; lobes 3–5-cleft and pinnatifid- to bipinnatifid-toothed with linear-lanceolate, mostly widely divergent segments; if three-lobed, the lateral lobes with a basal lobelet: cauline leaves numerous; petiole 2–10 cm. long, densely villous; blade 2–5 cm. wide, similar to that of the basal leaf but mostly pentagonal and three-lobed; lobes often less cut and with all the segments linear and widely divergent or at an acute angle with the mid-vein of the lobe, the lateral lobes with or without a basal lobelet: cauline stipules 3–5 mm. long, linear-lanceolate, long-pilose and ciliate: peduncle 2–11 or rarely to 18 cm. long, densely villous, 1- rarely 2-flowered, single and axillary, those near the base longest: pedicels 1.5–7 or up to 12 cm. long, villous, erect or sometimes geniculate in fruit: outer sepals 9–10 mm. long, awned; body 8–9 mm. long, ovate, 3–5-veined; veins and margins pubescent with long, slender hairs; awn 1–1.5 mm. long: petals 11–18 mm. long, 8–10 mm. wide, white with many darker, reticulate veins, obovate; apex entire or shallowly emarginate; base shortly pilose: stamen-filaments shorter than the sepals, yellowish, ciliate, not exserted in fruit: fruit 25–32 mm. long; style-beak 4 mm. long; style-column stout, rather abruptly narrowed below the beak, densely long- or short-pilose; carpel-body 4.5 mm. long, light-brown, long-pubescent: seed 3 mm. long, dark-brown, moderately coarsely reticulate.—Contr. U. S. Nat. Herb. **10:** 108 (1906). TYPE: *Rose & Hay* 5618, US no. 395386 (seen); Knuth, in Engler, Pflanzenr. **4** fam. 129: 170, fig. 24 (1912).—Hidalgo.—MEXICO: HIDALGO: Sierra de Pachuca, July 21–22, 1901, *Rose & Hay* 5618 (US, TYPE; US, in part ISOTYPE); open woods, mountains, Pachuca, July 1905, *Purpus* 1432 (F, G, M, NY, P); between Pachuca and Real del Monte, July 19, 1905, *Rose, Painter & Rose* 8738 (F, G, NY, US); El Chico (Peña del Cuervo),

July 1927, *Lyonnet* 100 (US); oak woods, Lena Station, 8300′, Aug. 26, 1905, *Pringle* 10021 (F, G, M, NY, US); between Pachuca and Real del Monte, Aug. 31, 1903, *Rose & Painter* 6672 (US); mts. near Pachuca, June 1, 1899, *Rose & Hough* 4464 (NY, US) and 4479 (US, in part); on mountains above Pachuca, July 24, 1905, *Rose, Painter & Rose* 8876 (G, NY, US); Sierra de Pachuca, 9000′, July 22, 1898, *Pringle* 6909 (G, NY, US); Xalapa, *Coulter* 764 (G).

G. bellum differs from the other species in its villous pubescence and mostly one-flowered peduncles bearing white flowers. In most instances, the segments of the leaf-lobes are widely divergent, often nearly at right angles to the mid-nerve. *G. Goldmanii* possesses a similar pubescence but it differs in having usually two purple or lavender flowers on the peduncles and is separated geographically, occurring in Chiapas, while *G. bellum* is restricted to the mountains about Pachuca in Hidalgo.

At times, *G. Schiedeanum* approaches *G. bellum* in the color of the petals (*Purpus* 3910) but the peduncles are 2-flowered and the pubescence is of a strigose or pilose type. *G. Lozani*, similar in color of the flowers, is also distinct in having two-flowered peduncles and a short pubescence.

Large plants of *G. potentillaefolium* have been confused with this species, but, so far as is known, its petals are always colored.

19. G. GOLDMANII Rose ex Hanks & Small (PL. 2, FIG. 13). Perennial: rhizome stout: stems 3–4 dm. long, ascending to decumbent or sub-erect, one or more from the caudex; lower part branched, moderately stout, villous or hirsute; upper part moderately robust to slender, densely villous, indeterminate, branched: basal leaves few, not long-persistent; petiole 7–9 cm. long, densely villous; blade 3–5 cm. wide, pentagonal in outline, moderately thick, green and sparsely to densely appressed-long-pilose above, lighter and spreading-hirsute on the veins below, divided nearly to the base into 3–5 nearly equal, spatulate to cuneate-obovate lobes; lobes cleft and pinnatifid- or bipinnatifid-toothed with oblong-lanceolate segments, if three-lobed, the lateral lobes with a basal lobelet: cauline leaves numerous; petiole 3–5 cm. long, densely villous; blade 2.5–3.5 cm. wide, similar to that of the basal leaf but mostly 3-lobed, the lobes radiate and pinnatifid-toothed; cauline stipules 3–5 mm. long, linear-lanceolate to ovate-lanceolate, lustrous deep-brown, ciliate: peduncle 3–14 mm. long, stoutish, rather erect, sparsely to moderately densely villous or long-pilose, 1–2-flowered, single

and axillary: pedicels 1.5–6 cm. long, sparsely to moderately densely long-pilose, erect or somewhat geniculate in fruit: outer sepals 7–9 mm. long, awned; body 5.5–8 mm. long, ovate-, elliptic- or oblong-lanceolate, bright-green, 3-veined, glabrous or minutely pubescent; veins sparsely long-haired; awn 1–2 mm. long: petals 12–17 mm. long, 8 mm. wide, lavender to purple with dark, reticulate veins, obovate or cuneate-obovate; apex entire or shallowly emarginate; base shortly pilose: stamen-filaments shorter than the sepals, not exserted in fruit: fruit 22- mostly 25–30 mm. long; style-beak 3–4 mm. long; style-column stoutish, sparsely to densely antrorse-pilose; carpel-body 5 mm. long, light-brown, pilose: seed 3.5 mm. long, dark-brown, finely reticulate.—N. Am. Fl. **25:** 17 (1907). TYPE: *Goldman* 946, US (seen).—Chiapas.—MEXICO: CHIAPAS: Teopisca, May 7, 1904, *Goldman* 946 (US, photographs F, G, NY, TYPE); near San Cristobal, 7000–8800′, Sept. 18, 1895, *Nelson* 3155 (NY, US, photograph NY); without locality, 1864–70, *Ghiesbreght* 657 (G); without data, *Ghiesbreght* 59 (NY); s. n. (G).

This species is distinguished from *G. Schiedeanum* chiefly by the longer, stiffer, terete hairs of the stem, peduncle and sepals. The stems are more robust, much more densely pubescent, the leaf blades more angular, the peduncles stouter, shorter and more densely pubescent than in *G. Schiedeanum* and the pedicels are usually somewhat geniculate in fruit.

G. Goldmanii is readily separated from *G. andicola*, the only Guatemalan representative of this group by its purple, not white, flowers and villous, rather than strigose, pubescence. The obcordate, light-colored petals, one-flowered peduncles, distinctive rhizome and lack of villous pubescence on the stem readily separate *G. monanthum* of Oaxaca from *G. Goldmanii*.

20. G. POTENTILLAEFOLIUM DC. (PL. 3, FIG. 2). Perennial: root woody-fibrous: rhizome short to long, mostly stout: stems 1.5–5 dm. long, spreading or ascending, one to several from the caudex; lower part branched, moderately stout, densely long-pilose or hirsute; upper part moderately stout to slender, densely long-pilose and often short-pilose, branched, indeterminate: basal leaves few, not long-persistent; petiole 8–12 cm. long, sparsely to densely long-pilose and often short-pilose; blade 2.5–5 cm. wide, pentagonal in outline, moderately thick, dark-green and sparsely to densely pubescent with short to long hairs above, gray-green and densely spreading-long-pilose on the conspicuous veins and inrolled margins below, often appearing

tomentose or canescent, divided nearly to the base into 3–5 nearly equal lobes; lobes radiate, spatulate to rhombic in outline, pinnatifid-toothed with long, linear segments directed forward at an acute angle with the mid-veins; lateral lobes usually with a smaller basal lobelet: cauline leaves numerous; petiole 2–6 cm. long, densely pilose; blade 1.5–3.5 or up to 5 cm. wide, similar to that of the basal leaf but usually smaller and 3-lobed; lateral lobes with a basal lobelet: cauline stipules 4–8 mm. long, elliptic- to ovate-lanceolate, red-brown or golden-brown, conspicuous, pubescent and long-ciliate: peduncle 4–10 or rarely to 16 cm. long, densely pilose, 1– rarely 2-flowered, single and axillary: pedicels 1.5–4 or up to 6.5 cm. long, pilose, usually geniculate in fruit: outer sepals 6– mostly 9–11 mm. long, awned; body 5– mostly 7–9 mm. long, linear-lanceolate, 3-veined, glabrous or short-pilose; veins and margins densely long-silver-pilose; awn 1– mostly 2 mm. long: petals 12–17 or rarely 19 mm. long, 7–10 mm. wide, red-purple, cuneate-obovate or obovate; apex entire or shallowly to deeply emarginate; base shortly pilose: stamen-filaments as long as or longer than the sepals, yellow, sparsely ciliate, not exserted in fruit: fruit 25–30 mm. long; style-beak 3–4 mm. long; style-column stoutish, densely short-pilose; carpel-body 4–5 mm. long, pilose: seed 3.5 mm. long, black, rather coarsely reticulate.—Prodr. **1:** 639 (1824). TYPE-PLATE: A. DC., Calq. Dess. Fl. Mex. Moç. & Sessé t. 148 (1874). *G. pedunculare* Willd. ex Spreng. Syst. **3:** 71 (1826).—Hidalgo, Valley of Mexico, Mexico and into Michoacan.—MEXICO: HIDALGO: Sierra de Pachuca, July 21–22, 1901, *Rose & Hay* 5618 (NY, US 395385 in part). MICHOACAN: among tall clumps of zacate in pine forest, Zitacuaro-Cacique Peak, Dist. Zitacuaro, 3000 m., June 6, 1938, *Hinton* 11931 (G). MÉXICO: mountain meadow, south of Mexico City, 9500′, July 12, 1941, *Leavenworth* 952 (G); Río Frío, Aug. 9, 1938, *Kenoyer* A 451 (F); Hacienda de La Encarnacion, July 7, 1905, *Rose, Painter & Rose* 8465 (US); pine forest, Las Cruces, Dist. Temascaltepec, 3350 m., May 30, 1933, *Hinton* 3988 (G); wooded slopes, Cañada de Contreras, s. w. of Mexico City, 10,000′, Aug. 22, 1937, *Munz* 15007 (P); moist hillside under pines, Monte de Río Frío, Sept. 29, 1940, *Moore* 53 (G); Nevada de Toluca, 10,000–10,600′, Oct. 15, 1903, *Rose & Painter* 7923 (NY, US); pine and fir forest, Las Cruces, Dist. Temascaltepec, 3400 m., June 13, 1934, *Hinton* 6079 (G, M); pine forest, Las Cruces, Dist. Temascaltepec, 3350 m., May 24, 1932, *Hinton* 782 (M, US); dry field and damp depressions in pine woods, road to Nevada de Toluca, Oct. 4, 1940, *Moore* 88 (G); moist slope under firs, road to Nevada de Toluca, Oct. 4, 1940, *Moore* 88a (G); woods, Río Frío, Aug. 27, 1930, *Russell &*

Souviron 75 (US); Monte de Río Frío, July 31, 1929, *Mexia* 2676 (F, G, M, NY, P, US); Popocatepetl, Aug. 7–8, 1901, *Rose & Hay* 6030 (US); open woods, Ixtaccihuatl, 10–11,000′, Mar.–July 1903, *Purpus* 308 (P, US); San Rafael Atlixco-Monte, July 1929, *Lyonnet* 492 (G, M, NY, US). DISTRITO FEDERAL: Cima, Aug. 24, 1910, *Orcutt* 6617 (US) and 3779 (F, M); Sierra de las Cruces, July 10, 1892, *Pringle* 5282 (G); fir forests, Sierra de las Cruces, 10,000′, July 19, 1896, *Pringle* 6370 (F, G, M, NY, US); woods, Peña de los Charros, Aug. 22–Sept. 19, 1930, *Russell & Souviron* 140 (US); Cima Station, 9800′, Aug. 30, 1905, *Pringle* 13510 (G, US). MORELOS: Toro, 9800′, Aug. 5, 1924, *Fisher* 297 (M, US).

Geranium potentillaefolium is a distinctive species of the mountains about the Valley of México and into Michoacan. It illustrates well the excessive variability of the series *Bella*, having at least three rather well-marked but intergrading phases. Judging from the type-plate, typical *G. potentillaefolium* is an elongate-stemmed plant with large leaves as *Orcutt* 3779, *Russell & Souviron* 75. *Pringle* 6370, for the most part, is a low, compact phase with shorter internodes, smaller leaves and thicker pubescence.

These two phases are apparently responses to different conditions of sun and moisture. In the pine woods about the base of the Nevada de Toluca, I have observed both forms growing within 100 feet of each other, the compact plants in an open, grassy area exposed to full sun, the elongate plants in the shade of pines and in moist depressions (*Moore* 88). In the fir forest at a higher elevation, the latter condition alone occurs (*Moore* 88a). This contrast is also seen in *Mexia* 2676 (NY) from the Río Frío region where I also observed the two phases. *Pringle* 6370 (US 304035) shows a transition within a single plant from the compact to the elongate phase.

Hinton 782 from Dist. Temascaltepec, Mexico, is a third variation with extremely narrow leaf-segments and apparently a nearly erect habit. However, intergradations to the normal form occur in the specimen at the Missouri Botanical Garden.

G. potentillaefolium is most readily distinguished from *G. Schiedeanum* by the nearly always one-flowered, short, stiff peduncles and usually geniculate fruiting pedicels as contrasted with the usually two-flowered, long, slender peduncles and erect fruiting pedicels of the latter species. As in so many other characters, these cannot always be relied upon. The leaf-segments of *G. potentillaefolium*, however, are always linear and densely pilose below, appearing canescent when young, and with a fringe of very long hairs on the inrolled margins. The leaf-segments of *G. Schiedeanum* are wider, the leaves are often bipinnatifid-toothed and less densely pubescent.

The pubescence of *G. potentillaefolium*, although plentiful, is not closely villous as in *G. bellum* nor are the flowers white, so far as is known. The peduncles of both species are usually one-flowered. Larger leaves on elongate stems of *G. bellum* sometimes have the segments of the lobes directed forward as in *G. potentillaefolium* but in normal leaves they are nearly at right angles with the mid-nerve.

G. Lozani, with its usually two-flowered peduncles, large white petals and thin, short pubescence, will not be confused readily with this species. Points of difference from other species in the series are considered under their various discussions.

21. G. MONANTHUM Small in Hanks & Small (PL. 3, FIG. 1). Perennial: rhizome long, slender, horizontal, with many short, vertical caudices rising from it at intervals: caudex simple: stems 1–2.5 dm. long, spreading, ascending or perhaps sub-erect; lower part unbranched, slender, glabrate to densely retrorse-strigillose or with few, long, thin, flattened hairs near the caudex, internodes short; upper part slender, densely strigillose, indeterminate, unbranched: basal leaves absent: cauline leaves numerous; petiole 1–2 cm. long, sparsely strigillose; blade 1.5–2.5 cm. wide, pentagonal in outline, dark-green and strigillose above, gray-green and spreading-long-pilose or hirsute on the veins below, divided nearly to the base into 3– sometimes 5 nearly equal, rhombic lobes; lobes cleft and toothed with lanceolate segments, if three-lobed, the lateral lobes with basal lobelets: basal stipules 5 mm. long, ovate, lustrous, red-brown, enclosing the young stems, minutely pubescent: cauline stipules 3–5 mm. long, ovate to ovate-lanceolate, deep-brown, minutely pubescent: peduncle 3–4 cm. long, strigillose, 1-flowered, single and axillary: pedicels 8–15 or rarely 25 mm. long, slender, densely strigillose: outer sepals 8–10 mm. long, awned; body 6.5–8 mm. long, oblong-lanceolate, 3-veined, usually densely and minutely pubescent; veins and margins with long, spreading hairs; awn 1.5–2 mm. long: petals 12–15 mm. long, 8 mm. wide, lavender to white with lavender to purple, reticulate veins, obcordate; apex deeply

notched; base sparsely villous to the middle: style-beak 3 mm. long at anthesis: other fruiting parts not seen.—N. Am. Fl. **25**: 21 (1907). TYPE: *Nelson* 659, US (seen).—Known only from the type-locality.—MEXICO: OAXACA: N. W. side of summit, Mt. Zempoaltepec, 10,000–11,000′, July 9, 1894, *Nelson* 659 (US, TYPE; photographs, F, G); top of Mt. Zempoaltepetl, Feb. 19–27, 1937, *Camp* 2624 (NY).

G. monanthum, included here because of its superficial resemblance to *G. potentillaefolium* in having glandless pubescence, dissected foliage and large stipules, differs from all other species of the series in its very short, slender peduncles and pedicels; in its villous petals and in the type of rhizome. This latter is of particular interest, being long, slender and horizontal with stems rising from it at intervals. Basal leaves are lacking and the growing tip, with its broad, brown stipules enclosing young stems, looks much like the rhizome of a *Dryopteris*. A somewhat similar condition is seen in some specimens of *G. Schiedeanum* (*Matuda* 1094, M) but there is a whorl of basal leaves present, at least in youth, the rhizome is more compact and the stipules are not as conspicuous. The disposition of this species should not be considered final.

The species is known only from the summit of Mt. Zempoaltepec, Oaxaca, at an altitude of 10,000–11,000′. Here it is said to be abundant. On this same mountain are found *G. alpicola*, otherwise known only from Guatemala, and *G. clarum*, another endemic of the lower slopes at about 8,000′ altitude. *G. monanthum* may be distinguished from the former by the sparser and retrorse, not antrorse, pubescence and from the latter by the larger petals, longer pubescence of the lower surface of the leaf and more compact habit.

22. G. SCHIEDEANUM Schlecht. (PL. 1, FIG. 6; PL. 3, FIG. 3). Perennial: rhizome slender to mostly stout, horizontal: caudex simple or often branched from the apex of the rhizome or sometimes the caudices rising along the rhizome: stems 1–5 dm. long, spreading or ascending, one to several from the caudex; lower part often branched, slender to moderately stout, mostly sparsely to densely strigose or hispid and sometimes short-pilose; upper part mostly slender, sparsely strigose to densely long- or short-pilose, branched or not, indeterminate: basal leaves few, not long-persistent; petiole 6–20 cm. long, densely hispid, pilose or strigose; blade 2–5 cm. wide, reniform, orbicular or pentagonal

in outline, moderately thick, green and sparsely to densely appressed- to open-pilose above, gray-green and mostly densely spreading-pilose or -hirsute on the veins below, sometimes appearing tomentose, divided nearly to the base into 3–5 or 7 nearly equal lobes; lobes slightly to greatly cleft and pinnatifid- or bipinnatifid-toothed toward the apex with long, oblong-lanceolate to lanceolate segments directed forward at an acute angle with the mid-nerve of the lobe, if three-lobed, the lateral lobes with a basal lobelet: cauline leaves numerous; petiole 1.5–7 cm. long, sparsely to densely pilose; blade similar to that of the basal leaf but usually less divided and three-lobed, pinnatifid- to bipinnatifid-toothed: cauline stipules 5–10 mm. long, linear-lanceolate, brown, pilose and ciliate: peduncle 7–28 cm. long, mostly sparsely strigose or pilose, slender and ascending, mostly overtopping the leaves, 1– mostly 2-flowered, single and axillary: pedicels 2–9 cm. long, mostly sparsely to densely strigose and/or curly-short-pilose, erect or slightly geniculate in fruit: outer sepals 8–10 mm. long, awned; body 7–9 mm. long, elliptic- to ovate-lanceolate, 3-veined, glabrous to minutely pubescent; veins usually dark and conspicuous; veins and margins with few to many long, usually curly, flattened hairs, sometimes almost tomentose; awn 1–2 mm. long: petals 12–20 mm. long, 6–10 or rarely to 15 mm. wide, purple, red-purple to pale-lavender and perhaps white, obovate or obcordate; veins numerous, reticulate, dark-colored; apex entire or deeply notched; base shortly pilose: stamen-filaments shorter than to as long as the sepals, not exserted in fruit: fruit 22–28 mm. long; style-beak 3–4 mm. long; style-column stoutish, densely antrorse-short-pilose or hispidulous; carpel-body 4 mm. long, light-brown, pilose: seed 2.5 mm. long, plump, dark-brown or black, finely reticulate.—Linnaea **10:** 253 (1836). Type: *Schiede*, La Joya, Vera Cruz, 1828 (?), probably at Berlin (not seen).—*G. Palmeri* Rose ex Hanks & Small, N. Am. Fl. **25:** 16 (1907), type *Palmer* 146, US (seen). *G. pedatifidum* Hanks in Hanks & Small, N. Am. Fl. **25:** 17 (1907), type *Rose, Painter & Rose* 8690, NY (seen). *G. Purpusii* R. Knuth, in Fedde, Rep. Spec. Nov. **12:** 40 (1913), type Herb. *Schenck* no. 944 from plants cultivated at Darmstadt, Germany from Purpus, a. 1908, from Esperanza, Puebla, Mexico (not seen). *G. Arsenianum* R. Knuth, in Fedde, Rep. Spec. Nov. **18:** 290 (1922), type *Arsène* 2126, in Herb. Berol. (not seen); isotype G (seen).—San Luis Potosí to Vera Cruz and Oaxaca.—MEXICO: San Luis Potosí: Alvarez, Sept. 28–Oct. 3, 1902, *Palmer* 146 (US, type of *G. Palmeri;* F, G, M, NY, isotypes); in montibus Escobrillos, ex convalli San Luis Potosí, 1876, *Schaffner* 189 (G); moist woods on limestone, Alvarez, Sierra de Alvarez, 2100–2300 m., July 30–31, 1934, *Pennell* 17817 (US);

region of San Luis Potosí, 6000–8000′, 1878, *Parry & Palmer* 99 (G, US). HIDALGO: between Pachuca and Real del Monte, July 19, 1905, *Rose, Painter & Rose* 8690 (NY, type of *G. pedatifidum;* F, G, M, US, isotypes); between Somoriel and Las Lajas, Aug. 5, 1905, *Rose, Painter & Rose* 9225 (NY, US); Sierra Pachuca, July 20–24, 1905, *Rose, Painter & Rose* 8875 (US); open, grassy place on hillside above small stream, Real del Monte, 2700 m., Aug. 25, 1929, *Mexia* 2768 (M, NY, US); mts. near Pachuca, June 1, 1899, *Rose & Hough* 4479 (US, in part); Zimapan, *Dr. Coulter* 764 (G, NY); between Pachuca and Real del Monte, Aug. 31, 1903, *Rose & Painter* 6656 (NY, US). MÉXICO: Río Frío, Aug. 9, 1938. *Kenoyer* A 449 (F); Amecameca, 8100′, July 26, 1924, *Fisher* 296 (F, M, US). VERA CRUZ: Mt. Orizaba, July 25–26, 1901, *Rose & Hay* 5669 (US); Mt. Orizaba, 10,000′, Aug. 5, 1891, *Seaton* 175 (F, G, US); in cultis ad vias Orizaba, July 1857, *Mohr* s. n. (US); Cumbre Acultzingo, May 1, 1937, *Matuda* 1094 (F, M); PUEBLA: Chinantla, May 1841, *Liebmann* 3759 (F); sur la voie vers Boca del Monte, 2450 m., Nov. 16–19, 1907, *Arsène* 2126 (G, M, NY, US, isotypes of *G. Arsenianum*); growing at Darmstadt, Germany, from Esperanza, Purpus a. 1908, *J. N. Rose* 17255 (US); Esperanza, près de Puebla, Nov. 19, 1908, *Arsène* s. n. (NY); Manzanilla, vicinity of Puebla, 2250 m., July 30, 1908, *Arsène* 7181 (US); Cerro del Gavilan, 9000–10,000′, Aug. 1909, *Purpus* 3910 (F, M, US); Falls of Necaxa, Dist. of Huauchuiango, 3500′, Sept. 10, 1905, *Roby* s. n. (US). OAXACA: Cerro Verde, July 1908, *Purpus* 3508 (F, G, M, NY, US); Mts., San Juan del Estado, June 3, 1894, *L. C. Smith* 19 (G); Cerro de Buena Vista, Dist. Etla, June 1888, *C. & Ed. Seler* 101 (G); Cañada de San Gabriel, Etla, 2600 m., Aug. 8, 1897, *Conzatti & Gonzalez* 315 (G); La Carbanera, 2600 m., Aug. 1, 1897, *Conzatti & Gonzalez* 267 (G, US); Clavellinas, 10,000′, June 26, 1894, *L. C. Smith* 56 (G); vicinity of Cerro San Felipe, 9500–11,000′, 1894, *Nelson* 1078 (US, in part); Sierra de San Felipe, 10,000′, Aug. 28, 1894, *L. C. Smith* 653 (M); Sierra, 7–8000′, Sept. 1840, *Galeotti* 4023 (G, NY, US).

G. Schiedeanum has been the subject of much misinterpretation in print and in herbaria. Several species have been described which correspond to the original description or which differ from it and from each other only in variable characters. These intergrade sufficiently to lead me to believe them phases of a single variable species. The differences stressed in *G. Arsenianum* R. Knuth, *G. Purpusii* R. Knuth, *G. Palmeri* Rose and *G. pedatifidum* Hanks, when reviewed with material now available from a wide area, appear quantitative rather than qualitative. I have seen type- or isotype-material of all species but *G. Purpusii*, the type-material of which is probably represented by *Rose* 17255, and in view of the habit-variation apparent in *G. potentillaefolium*, *G. bellum* and *G. andicola*, it seems not inconsistent to include the first mentioned four species within the range of variation of *G. Schiedeanum*.

Schlechtendal described *G. Schiedeanum* from an incomplete specimen sent by Schiede from La Joya, Vera Cruz, in part as follows:[13] ". . . pedunculis bifloris, caule elongato retrorsum pubescente, foliis caulinis oppositis petiolatis 3–5 partitis, partitionibus pinnatifidis laciniis late linearibus acutiusculis submucronatis integris trilobisve, utrinque subtus densius (albide) adpresse substrigoso-pubescentibus, . . . petalis calycem longe superantibus . . . corolla magna coerulea. Pr. La Joya, Jun. 29."

Schiede's specimen was collected at La Joya where he mentions seeing "die *Geranien* mit grossen blauen Blumen".[14] Presumably it is this same species which is found about Orizaba, *Seaton* 175, *Rose* 5669, and Acultzingo, *Matuda* 1094, these being nearest to the type-station of any collections studied and certainly fitting the description of *G. Schiedeanum*.

Mohr s. n. from Orizaba intergrades with the pinnatifid leaf-condition of the former collections and the bipinnatifid condition of a specimen grown at the Botanical Garden at Darmstadt, Germany (*Rose* 17255) which probably represents *G. Purpusii*. The latter is scarcely distinguishable from robust specimens labeled *G. pedatifidum* (*Rose* 9225). In pubescence of the sepals and length of the peduncles there are also gradations among these phases. *Arsène* 2126, type of *G. Arsenianum*, although least typical, appears to be a plant of open habitat judging from the compact habit, stouter stems and peduncles and denser pubescence.

Purpus 3910 (F) and *Rose, Painter & Rose* 8875 (US) serve to integrate material from San Luis Potosí, Hidalgo and Puebla. Although quantitative variation of leaves and pubescence is evident, there is also a series in the color of the petals, ranging

[13] Linnaea **10**: 253 (1836).
[14] Linnaea **4**: 222 (1829).

from purple through rose to nearly white in some of the Puebla and Oaxaca stations (*Purpus* 3910, 3508).

Material from Sierra San Felipe, Oaxaca, notably *Galeotti* 4023, *Nelson* 1078 and *Smith* 653, has sepals with enlarged, horn-shaped awns. Except for *Galeotti* 4023, the plants are also densely pubescent, approaching *G. Goldmanii*, and with short peduncles. Localized as this condition is, it does not seem sufficiently clear-cut to consider it of varietal significance because of variable pubescence, leaf-shape and an occasional tendency toward thickening of the sepal-awns in material from some Puebla stations.

The long, two-flowered peduncles of normal *G. Schiedeanum* are usually distinctive in separating this species from *G. potentillaefolium* or *G. bellum*. Further discussions may be found under these closely allied species. *G. Goldm*[illegible] closest relative and the two are distinguished in the di[illegible]

G. Schiedeanum, as at present understood, occurs over a considerable territory from San Luis Potosí and Hidalgo in the north to Vera Cruz and Oaxaca in the south.

23. G. ANDICOLA Loes. (PL. 3, FIG. 5). Perennial: rhizome long, slender: stems 2.5–3.5 dm. long, spreading, ascending or decumbent at the base and nearly erect, one or more from the caudex; lower part often branched, slender, sparsely to densely strigose; upper part slender, rather densely strigose to open-hirsute, indeterminate: basal leaves few, not long-persistent; petiole 7–24 cm. long, glabrate to short-pilose and/or strigose; blade 3–7 cm. wide, reniform to pentagonal in outline, thick, bright-green to red and appressed- to erect-hirsute above, gray-green and densely spreading-hirsute on the conspicuous veins below, divided nearly to the base into 5 nearly equal, spatulate or broad-rhombic lobes; lobes 3–5-cleft and pinnatifid- or bipinnatifid-toothed with oblong-lanceolate segments: cauline leaves numerous; petiole 1–6 cm. long, strigose, densely so below the blade; blade 1.5–5 cm. wide, similar to that of the basal leaf or mostly pentagonal in outline, 3-lobed, pinnatifid-toothed with narrower segments; lateral lobes with a basal lobelet: cauline stipules 3–5 mm. long, oblong- to elliptic-lanceolate, reddish or brown, pubescent and ciliate: peduncle 3.5–19 cm. long, strigose, 1– rarely 2-flowered, single and axillary: pedicels 1.5–7.5 cm. long, strigose and often short-pilose, densely so below the calyx, often somewhat geniculate in fruit: outer sepals 8.5–11 mm. long, awned; body 7.5–9.5 mm. long, elliptic- to ovate-lanceolate,

3–5-veined; veins pubescent with long, spreading hairs; awn 1–1.5 mm. long: petals 10– mostly 13–20 mm. long, 4– mostly 7–12 mm. wide, white with reticulate veins, obovate to obcordate; apex shallowly to deeply emarginate; base shortly pilose: stamen-filaments shorter than the sepals, yellowish, not exserted in fruit: fruit 25–28 mm. long; style-beak 3.5–5 mm. long; style-column antrorse-pilose with flattened hairs; carpel-body and seed not seen.—Bull. Herb. Boiss. **2** Sér. **3:** 93 (1903). TYPE: *C. & Ed. Seler* 2371, at Berlin (not seen); photographs, F, G (seen).—*G. andicola* var. vel forma *longipedicellatum* Loes., in Bull. Herb. Boiss. **2** Sér. **3:** 93 (1903), type *C. & Ed. Seler* 2755, at Berlin (not seen); photographs, F, G (seen). *G. andicola* var. vel forma *brevipedicellatum* Loes. in Bull. Herb. Boiss. **2** Sér. **3:** 93 (1903), type *C. & Ed. Seler* 2371, at Berlin (not seen); photographs F, G, isotype G (seen). *G. andicola* Loes. emend. Knuth in Engler, Pflanzenr. **4** fam. **129:** 171 (1912). *G. longipedicellatum* Knuth in Engler, Pflanzenr. **4** fam. **129:** 171 (1912).—Guatemala.—GUATEMALA: SAN MARCOS: pine woods between San Sebastián and summit of Volcán Tajumulco, 3800–4600 m., Feb. 13, 1940, *Steyermark* 35554 (F). HUEHUETENANGO: Todos los Santos und Chiantla, Sept. 11, 1896, *C. & Ed. Seler* 2755 (type of *G. andicola* var. *longipedicellatum*, at Berlin; photographs, F, G); alpine meadows and open woods, Sierra Cuchumatanes, 11,000′, Sept. 15, 1934, *Skutch* 1238 (G). QUETZALTENANGO: Volcán Santa Maria, 12,000′, July 27, 1934, *Skutch* 856 (F, G, US). TOTONICAPÁN: Bergwald zwischen Totonicapán und Los Encuentros, Sept. 25, 1896, *C. & Ed. Seler* 2371 (type of *G. andicola* var. *brevipedicellatum*, at Berlin; photographs, F, G; isotype G). SOLOLÁ: Los Encuentros, Sept. 25, 1937, *J. R. Johnston* 1008 (F). SACATEPÉQUEZ: Volcán de Agua, 7500′, June 1892, *Shannon* 3654 (US); crater, Volcán de Agua, July 22, 1937, *J. R. Johnston* 804 (F). JALAPA: moist, shaded, pine-covered slopes in hills between Guisiltepeque and Potrero Carrillo, 1800 m., Dec. 11, 1939, *Steyermark* 33082 (F).

Loesener described two forms or varieties of *G. andicola*:[15] var. vel forma *brevipedicellatum*, small plants with short peduncles and pedicels and small leaves; var. vel forma *longipedicellatum*, larger plants with long peduncles and pedicels and large leaves. Knuth subsequently raised var. *longipedicellatum* to specific rank, emending *G. andicola* to include only the first variety.

The accumulation of additional collections indicates that these are only phases of a variable species. Recombinations of

[15] Bull. Herb. Boiss. 2 Sér. 3: 93 (1903).

leaf-size, peduncle- and pedicel-length occur throughout the range of the species and there is considerable variation in the size of the petals. Leaf-cutting varies from pinnatifid to bipinnatifid but a uniform type of pubescence occurs in all specimens studied. I have not seen type-material of var. *longipedicellatum*, but specimens collected by Skutch (1238) in the region of this segregate agree with the type-photograph. Isotype-material of var. *brevipedicellatum* and similar specimens are not sufficiently different to warrant separation.

G. andicola is the only species of series *Bella* occurring in Guatemala. It grows on the volcanoes and central highlands from Huehuetenango to Jalapa. The combination of white flowers and mostly strigose pubescence is distinctive although the elongate-stemmed plants of northern Guatemala bear some resemblance to *G. Lozani* and *G. bellum* of the Mexican highlands. These latter, however, are readily separable in leaf-cutting and pubescence.

SERIES I. DELTOIDEA. Spreading, ascending, sub-erect or perhaps erect perennials: stems 1–9 dm. long, branched, indeterminate: basal leaves few, soon deciduous: cauline leaves numerous; blades 5-lobed and pentagonal in outline to mostly 3-lobed and pentagonal or hastate in outline; lobes coarsely toothed or incised toward the apex with shallow teeth; median lobe equal to or longer than the lateral lobes; lateral lobes with or without a basal lobelet: pubescence usually glandular on the upper parts and/or floral axes (except *G. aristisepalum*): peduncles 1–10 or up to 26 cm. long, single and axillary: petals 8–18 mm. long, narrow-cuneate to obovate, white or pinkish with dark or red veins, lilac, rose or purple; veins conspicuous, mostly reticulate; base villous to the middle or shortly pilose (*G. lilacinum*): style-beaks 2– mostly 3–6 mm. long.

The eight species included in this series are characterized chiefly by the mostly hastate or pentagonal cauline leaves, shallowly toothed leaf-lobes, villous petal-pubescence, except *G. lilacinum*, and glandular hairs, at least on the pedicels, except *G. aristisepalum*.

The basal portions of only three species are known, those of *G. aristisepalum*, *G. Hernandezii* and *G. latilobum*. In these species, the roots are thick, woody and horizontal with rather short, vertical rhizomes. A similar condition may be postulated for the remaining species, although Gentry's field data note that *G. Gentryi* is an annual. Habit is also difficult to determine. The stems of *G. aristisepalum* are often decumbent at the base or erect. *G. Hernandezii* is a procumbent to ascending species as is *G. lilacinum.* It is possible that, except for *G. sublaevispermum* which is low and spreading, the rest are sometimes erect, although they are said to grow in thickets or brakes where ascending stems often reach considerable heights. This may be true particularly of *G. hystricinum*, the stems of which attain a length of two meters.

Within the series, *G. Gentryi*, *G. latilobum* and *G. hystricinum* have particularly close affinities in leaf-shape and flower. Except for *G. sublaevispermum* which is closest to *G. deltoideum*, these species have the smallest flowers of the group and are marked, as well, by the very shallow, acute teeth of the leaf-lobes. In *G. Gentryi* and *G. hystricinum*, the leaves are often glandular, at least about the margins.

G. Hernandezii and *G. aristisepalum* are very similar in characters of the flower but differ in pubescence. Close to these species are *G. deltoideum* and *G. sublaevispermum*, smaller-flowered species of Durango and Chihuahua.

G. lilacinum is least conformable to the limits of the series, resembling somewhat species of series *Repentia.* The petals are nearly glabrous, whereas those of the other species are villous below the middle. The leaf-lobes have longer teeth and the median lobe usually much exceeds the lateral lobes.

G. aristisepalum has been associated with the species of section *Sylvatica* by Knuth; *G. Hernandezii* with section *Striata* and *G. lilacinum* with section *Mexicana*, but they find their natural affinities within the present series.

24. G. **aristisepalum,** nom. nov., perennial: root woody, thick: rhizome short, slender, usually vertical: stems 3–8 dm. long, erect to spreading or decumbent at the base, single; lower part occasionally branched, moderately robust, sparingly long-pilose; upper part moderately robust to slender, open- or retrorse-long-pilose, branched: basal leaves few, soon deciduous; cauline leaves numerous; petiole of lower leaves once to twice as long as the blade, long-pilose and often short-pilose; blade 3–9 cm. wide, pentagonal in outline, thick, green and appressed-pilose to gla-

brate above, lighter and spreading-pilose beneath, divided two-thirds to three-fourths to the base into 3–5 rhombic lobes; lobes sharply toothed toward the apex with moderately long, cuneate to ovate segments; petiole of upper leaf somewhat longer than to mostly shorter than the blade, long-pilose; blade similar to that of the lower leaves but smaller, more densely pubescent and usually 3-lobed and hastate in outline; lobes narrower, median lobe long, lateral lobes straight or sagittately recurved, often with a small basal lobelet: cauline stipules 7–10 mm. long, lanceolate to subulate, apiculate, greenish to red-brown, usually with a prominent mid-vein, pubescent and ciliate: peduncle 12–26 cm. long, long- and short-pilose, eglandular, 2-flowered, single and axillary: pedicels 2–7.5 cm. long, long- and short-pilose, erect or geniculate in fruit: outer sepals 8–14 mm. long, awned: body 7–11 mm. long, elliptic-lanceolate, 3–5-veined, copiously appressed-long-pilose; awn 2– mostly 3–4 or rarely 5 mm. long, usually long-haired: petals 13–18 mm. long, 7–13 mm. wide, white to pale pink with prominent, more or less reticulate, red or purple veins or purple with darker veins, cuneate-obovate; apex shallowly to deeply emarginate; base villous to or past the middle: stamen-filaments shorter than to as long as the sepals, yellowish to red, not exserted in fruit: fruit 35–45 mm. long; style-beak 3–6 mm. long; style-column copiously short-pilose, tapering toward the apex; carpel-body 4–5 mm. long, brown, hirsute: seed not seen.

Var. **typicum** (Pl. 3, fig. 6a & b). Lateral lobes of the cauline leaves seldom more than moderately reflexed, teeth numerous: outer sepals 10–12 mm. long; petals 13–16 mm. long, 7–10 mm. wide, white with red veins: style-beak 5–6 mm. long.—*G. aristatum* Small in Hanks & Small, N. Am. Fl. **25:** 19 (1907), Type: *Rose & Painter* 6496, NY (seen), not *G. aristatum* Freyn. & Sint., in Bull. Herb. Boiss. **5:** 587 (1897).—Hidalgo to Michoacan.—MEXICO: Hidalgo: El Chico, Sept. 1927, *Lyonnet* 122 (G, M, NY, US). Michoacan: hanging from steep bank at edge of oak forest, Zitácuaro-Zirahuato, Dist. Zitácuaro, 1940 m., Aug. 19, 1938, *Hinton* 13119 (G); Jaripeo, Morelia, 2100 m., July 13, 1911, *Arsène* 9829 (US); San Miguel, Morelia, 2100 m., Aug. 8, 1912, *Arsène* 9033 (US); Cerro San Miguel, 2100 m., vicinity of Morelia, Sept. 1, 1910, *Arsène* 9828 (US); Rincon, Morelia, 2000 m., July 7, 1909, *Arsène* 9830 (US). México: oak woods, Tule, Dist. Temascaltpeec, July 22, 1934, *Hinton* 6250 (G, M). Distrito Federal: along rocky bank of stream near Santa Fé, Valley of Mexico, Aug. 22, 1903, *Rose & Painter* 6496 (NY, type of *G. aristatum* Small; NY, US, isotypes); barranca above Santa Fé, Aug. 12, 1909, *Pringle* 10833 (G, US); Valle de Mexico, pedregal, June 26, 1865–66, *Bourgeau* 290 (F, G); barranca above

Santa Fé, 8500′, Sept. 1, 1905, *Pringle* 13499 (G, US); near Santa Fé, Valley of Mexico, 1905, *Rose & Painter* 8627 (US).

Var. **michoacanum,** var. nov. (Pl. 3, fig. 6c), lobis lateralibus foliorum caulinorum valde reflexis, dentibus paucis: sepalis exterioribus 10–14 mm. longis: petalis 15–18 mm. longis, 12–13 mm. latis, purpureis: stigmatibus 3–4 mm. longis.

Lateral lobes of the cauline leaves often greatly reflexed, teeth few: outer sepals 10–14 mm. long: petals 15–18 mm. long, 12–13 mm. wide, purple: style-beak 3–4 mm. long.—Michoacan.—MEXICO: Michoacan: road from Tancitaro to Apatzingan, Municipio Tancitaro, 5000′, July 30, 1940, *Leavenworth* 393 (F); pine forest, Sierra Torricillas, Dist. Coalcoman, 1900 m., July 24, 1939, *Hinton* 13986 (G); pine woods, road from Tancitaro to Apatzingan, Municipio Tancitaro, 5000′, Aug. 17, 1940, *Leavenworth* 609 (G, type; F, M, NY, isotypes).

G. aristatum Small is a later homonym of *G. aristatum* Freyn. & Sint. The name proposed here finds its basis in the same character of the sepal which suggested Small's name.

The material of *G. aristisepalum* has generally given the impression that the long peduncles are entirely solitary although most of the plants are not fully branched. For this reason it is placed in series *Deltoidea.* In the rather erect habit, the thick, hastate or pentagonal leaves and the thick, woody root, approaching the cormose state of *G. oaxacanum, G. aristisepalum* resembles that species as much as any in the series to which it is assigned here.

This species and *G. Hernandezii*, with which it has been confused, are discussed under the latter species. The very long peduncles, entirely eglandular pubescence and long sepal-awns distinguish it from all related species.

The typical variety is white-flowered, occurring in the Valley of Mexico and adjacent Hidalgo to Temascaltepec, Mexico, and Michoacan. Var. *michoacanum* is restricted to Michoacan.

25. G. Hernandezii Moç. & Sessé ex DC. (Pl. 3, fig. 7). Perennial: root thick, woody: rhizome short, slender, usually vertical: stems 3–5 dm. long, procumbent to ascending; lower part often branched, moderately robust, brown, glabrous to very sparsely hirsute or strigose; upper part slender, sparsely to moderately hirsute or pilose, copiously puberulent and often short-glandular, branched, indeterminate: basal leaves few, not long-persistent; petiole 4–5 cm. long, hirsute and puberulent; blade 3–5 cm. wide, pentagonal in outline, dark-green and

appressed-pilose above, lighter and spreading-pilose below, divided two-thirds to three-fourths to the base into 3–5 rhombic lobes; if three-lobed, the lateral lobes with a basal lobelet; median lobe not much longer than the lateral lobes; lobes toothed toward the apex with acute, mucronulate, ovate-lanceolate to deltoid segments: cauline leaves numerous; petiole mostly as long as or longer than the blade, retrorse- or open-hirsute and often short-glandular; blade 1.5–4 cm. wide, hastate in outline, 3-lobed, moderately thick, dark-green and appressed-hirsute or pilose and/or hispidulous above, grayish and spreading-hirsute or pilose and/or hispidulous beneath, divided two-thirds to three-fourths to the base into rhombic lobes; lobes toothed toward the apex with acute, mucronulate, ovate-lanceolate to deltoid segments; median lobe often longer than the lateral lobes; lateral lobes with or without a small basal lobelet: cauline stipules 3–5 mm. long, ovate-lanceolate, brown, pubescent and ciliate: peduncle 4–5.5 cm. long, rarely up to 9 cm. long, densely short-pilose or puberulent and short-glandular or occasionally hirsute, 2-flowered, single and axillary: pedicels 1–2 cm. long, copiously short-pilose, puberulent and glandular or occasionally hirsute, erect or somewhat geniculate in fruit: outer sepals 8–10 mm. long, awned; body 6.5–8.5 mm. long, ovate to elliptic-lanceolate, 3-veined, hispidulous; veins and margins sparsely to moderately densely hirsute and often deciduous-glandular; awn 1–2 mm. long: petals 10– mostly 15–16 mm. long, 7–11 mm. wide, white or light-pink with red, more or less reticulate veins, cuneate-obovate or obcordate; apex emarginate; base villous to the middle: stamen-filaments much longer than the sepals, yellow, ciliate, exserted in fruit; anthers 1.6 mm. long, oval, dark-brown: fruit 25–35 mm. long; style-beak 5–6 mm. long, red; style-column slender, copiously hispidulous and/or short-glandular; carpel-body 3.5 mm. long, pubescent and glandular.—Prodr. **1:** 640 (1824). Type-plate: A. DC. Calq. Dess. Fl. Mex. Moç. & Sessé, t. 147 (1874).—Sinaloa to Guerrero and Mexico.—MEXICO: without data, Sierra Madre, *Seemann* s. n. (G, photograph F, NY). Sinaloa: without locality, 1921, *Ortega* s. n. (US); Conchitas, Municipio de San Ignacio, Sindicatura de San Juan, March 1931, *Ortega* 6857 (F); moist, shady, brushy slope, oak forest, Puerto a Tamiapa, 4500′, Mar. 6–8, 1940, *Gentry* 5848 (NY). Jalisco: La Laguna, Sierra de Juanacatlan, 6000–8000′, Mar. 25, 1897, *Nelson* 4116 (G, US); densely wooded slope, Real Alto to Poso Hedionda, Sierra Madre Occidental, 2500 m., Feb. 20, 1927, *Mexia* 1720 (US). Michoacan: Quinceo, vicinity of Morelia, 2800 m., Mar. 11, 1909, *Arsène* 2786 (G, M, US); also Nov. 11, 1909, no. 57 (F), no. 3232 (G, M, US), 1910, no. 5668 (M, US), Feb. 1910, no. 60, in part, (F), and Sept. 10, 1910, without number (NY); Campanario, Morelia, 2100 m., Nov. 17, 1910, *Arsène* 6568 (US); also Dec. 1910, no. 6694 (US); Cerro Azul, vicinity of Morelia, 2800 m., Nov. 6, 1909, *Arsène* 9831 (US); also Mar. 11, 1912, no. 9001 (F, G, M, US); Carrindapaz, Morelia, Nov. 8, 1911, *Arsène* 16, in part, (F); north slopes, Mt. Patamban, 8500–10,500′, Feb. 1–4, 1903, *Nelson* 6585 (G, US); Sierra Madre (Mich. & Gro.), 2000 m., Feb. 16, 1899, *Langlassé* 873 (G, US). MEXICO: by the water, La Labor, Dist. Temascaltepec, Feb. 19, 1936, *Hinton* 8927 (F, G, M); pine woods, Hornos, Dist. Temascaltepec, Feb. 10, 1936, *Hinton* 8913 (G, M); barranca, Cajones, Dist. Temascaltepec, 2520 m., Apr. 18, 1935, *Hinton* 7470 (F, G, M); pine forest, Mesón Viejo, Dist. Temascaltepec, Jan. 28, 1935, *Hinton* 7220 (F, G, M, NY), Anonas, Dist. Temascaltepec, 880 m., Mar. 7, 1933, *Hinton* 3567 (F, US). GUERRERO: pine forest, Chiriagua, Dist. Mina, 1860 m., Nov. 19, 1936, *Hinton* 9853 (G).

The type-plate of *G. Hernandezii* is not sufficiently detailed to place the name with absolute certainty. However, all but two species, *G. aristisepalum* and *G. Hernandezii*, as I interpret it, may be excluded from consideration on combinations of habit and floral size. Of these two, the short peduncles and short sepal-awns indicate that the name may be and seems best applied in its present and generally accepted sense. Knuth applied the name in a similar but considerably broader sense.

G. Hernandezii is an attractive procumbent to ascending species with short, usually glandular peduncles and pedicels and short sepal-awns contrasting markedly with the long, glandless peduncles and pedicels and long sepal-awns of *G. aristisepalum*. The dark-brown, pendulous anthers that are borne on long filaments are conspicuous in flower, usually remaining attached in drying.

In the type of inflorescence and color of the petals, it is distinct from *G. oaxacanum*, included in Knuth's concept of the species, and in its long style-beak and white petals, from *G. lilacinum*. Contrasts with other species follow in discussions pertaining to them.

26. G. DELTOIDEUM Rydb. ex Hanks & Small (PL. 3, FIG. 9; PL. 4, FIGS. 1, 4). Perennial: rhizome short, slender, nearly vertical: stems 1–4 dm. long, procumbent with ascending branches or ascending; lower part usually branched, moderately robust, glabrous or sparsely hispid; upper part slender, branched,

puberulent and occasionally sparsely hispid, indeterminate: basal leaves few, not long-persistent; petiole about 8 cm. long, densely appressed-hispid or pilose; blade 2–5 cm. wide, pentagonal in outline, thickish, green and densely appressed-hispid above, grayish and densely puberulent or hispid to pilose beneath, divided one-half to two-thirds to the base into 3–5 shallow-toothed, rhombic lobes with obtuse, scarcely mucronulate, ovate segments; if 3-lobed, the lateral lobes with a basal lobelet; median lobe wide-rhombic, somewhat longer than the lateral lobes: cauline leaves numerous; petiole nearly always as long as or longer than the blade, densely appressed-hispid or -pilose; blade 1.5–2.5 cm. wide, similar to that of the basal leaf but deltoid in outline, 3-lobed; the median lobe wide-rhombic and longer than the lateral lobes; basal lobelets absent or poorly developed on the lateral lobes: cauline stipules 5 mm. long, lanceolate, brown, puberulent and ciliate: peduncle 6–10 cm. long, slender, retrorse-hispid or -pilose, 2-flowered, single and axillary: pedicels 1.5–3 cm. long, retrorse-hispid or -pilose and often copiously short-purple-glandular, erect or geniculate in fruit: outer sepals 7–9 mm. long, awned; body 6.5–8.5 mm. long, ovate, 3-veined or the veins indistinct, puberulent and occasionally sparsely glandular; veins and margins with scattered long hairs; awn 0.5–1 mm. long: petals 10–12 mm. long, 4 mm. wide, white, obovate; veins reticulate, not conspicuous; apex deeply or shallowly emarginate; base villous to the middle: stamen-filaments longer than the sepals, yellowish, ciliate, somewhat exserted in fruit: fruit 23–27 mm. long; style-beak 4–5 mm. long; style-column slender, tapering toward the apex, short-pubescent and glandular; carpel-body 3.5–4 mm. long, short-pilose: seed 2.5 mm. long, black or deep-brown, finely reticulate.—N. Am. Fl. **25:** 18 (1907). TYPE: *Palmer* 192, NY (seen).—Chihuahua and Durango to Zacatecas.—MEXICO: CHIHUAHUA: Mojarachic, May 10, 1938, *Knobloch* 5101 (F). DURANGO: San Ramón, Apr. 21–May 18, 1906, *Palmer* 192 (NY, TYPE; F, G, M, US, ISOTYPES). ZACATECAS: Sierra Madre, Aug. 17, 1897, *J. N. Rose* 2370 (NY).

G. deltoideum is closely related to *G. Hernandezii* and *G. sublaevispermum*. From *G. Hernandezii*, it is set apart by the shorter, narrower petals, shorter stamen-filaments and smaller leaves with obtuse, scarcely mucronulate, ovate segments as opposed to the acute, mucronulate, ovate-lanceolate to deltoid segments of the leaves of *G. Hernandezii*. *G. sublaevispermum* is very similar in habit but has much shorter peduncles and style-beak. The peduncles of the latter tend to be somewhat aggregated at the tips of the branches in old stems, a condition not apparent in *G.*

deltoideum. The petals are described by Rydberg as 17–19 mm. long but examination of the type shows them to be much shorter.

27. G. **sublaevispermum,** sp. nov. (Pl. 3, fig. 8; Pl. 4, figs. 5, 8), herba perennis: rhizomate gracili: caulibus 3 dm. longis, patentibus vel procumbentibus, ramis ascendentibus, hirsutis vel pilosis, ramosis: foliis caulinis numerosis; petiolo brevi, hispido vel breviter piloso; lamina pentagona vel deltoidea, 0.8–4 cm. lata, supra viridi, glabrata vel hispidula, subtus pallidiore, glabrata vel dense hispidula, venis hispidis vel hirsutis, ¾ ad basin partita, 3-lobata, lobis aequalibus, rhomboideis, ad apicem dentatis; dentibus oblongo-lanceolatis: stipulis lineari-lanceolatis, ciliatis: pedunculo 1.5–3 cm. longo, hispido vel interdum breviter glanduloso-pubescente, bifloro, plerumque axillari: pedicellis 0.5–2 cm. longis, hispidis vel dense breviterque glanduloso-pilosis, demum geniculatis divaricatisque: sepalis exterioribus 6–8 mm. longis, mucronatis mucrone 1–1.5 mm. longo, elliptico-lanceolatis, 3-nervatis, dense hispidulis vel puberulentibus et venis saepe breviter glanduloso-pilosis: petalis 7–9 mm. longis, 4–5 mm. latis, albis, rubrovenosis, obovatis, ad basin villosis, apicibus rotundatis: staminibus calycem aequantibus, non exsertis: fructu 16–19 mm. longo; stigmatibus 2.5 mm. longis; columna stylorum hispidula et saepe breviter glanduloso-pilosa; carpello 3 mm. longo, pubescente, interdum glanduloso: semine 2–2.5 mm. longo, nigro, subtilissime reticulato vel fere glabro.

Perennial: rhizome slender: stems 2 dm. or more long, spreading or procumbent with ascending branches; lower part branched, moderately stout, hirsute; upper part less stout, pilose and/or curly-short-pilose, much-branched: basal leaves not seen: cauline leaves numerous; petiole mostly as long as or shorter than the blade, 3.5 cm. long to nearly absent, hispid and curly-short-pilose; blade 0.8–4 cm. wide, pentagonal to deltoid in outline, thickish, bright-green and glabrate to densely hispidulous above, lighter and glabrous to densely hispidulous with hispid or hirsute veins below, divided three-fourths to the base into 3 nearly equal, rhombic lobes; lateral lobes occasionally with a small basal lobelet; lobes toothed or cleft and toothed toward the apex with oblong-lanceolate segments: cauline stipules 3–6 mm. long, lanceolate, often cleft and apiculate, dark-brown, hispid and ciliate: peduncle 1.5–3 cm. long, hispid and sometimes short-purple-glandular, 2-flowered, single and axillary or sometimes more or less aggregated at the ends of the old branches: pedicels 0.5–2 cm. long, hispid, copiously short-purple-glandular and hispid or curly-short-pilose, divaricate and geniculate in fruit: outer sepals 6–8 mm. long, awned; body 5–6.5 mm. long, elliptic, lanceolate, obscurely 3-nerved, densely hispidulous or puberulent; veins often short-purple-glandular; awn 1–1.5 mm. long: petals 7–9 mm. long, 4–5 mm. wide, white with dark or red, more or less reticulate veins, obovate; apex entire or very shallowly emarginate; base villous to the middle: stamen-filaments as long as the sepals, yellowish, not exserted in fruit: fruit 16–19 mm. long; style-beak 2.5 mm. long; style-column hispidulous and often short-glandular; carpel-body 3 mm. long, pilose and sometimes glandular: seed 2–2.5 mm. long, brown-black or black, very finely reticulate, appearing smooth.—Chihuahua.—MEXICO: CHIHUAHUA: at base of rocks, in meadow margin, transition, pines, Memelichi, Rio Mayo, 7500′, Sept. 16, 1936, *Gentry* 2740 (G, TYPE; F, M, US, ISOTYPES); scattered in rocks along stream, transition, riparian, pine woods, Cerro Quicorichi, Rio Mayo, Oct. 6, 1935, *Gentry* 1937 (US).

G. sublaevispermum is essentially similar to *G. deltoideum* with small, mostly deltoid leaves, small, white flowers and a fine pubescence.

However, the very short peduncles, which occasionally tend to aggregate at the tips of older branches, the short pedicels, fruit and style-beak separate it from that species. The seeds are black and extremely finely reticulate, appearing smooth while the seeds of *G. deltoideum* are coarser, noticeably rough and of a lighter color.

The petals of *G. sublaevispermum* are said by Gentry (field data) to have a central red pattern, which, although somewhat faded, shows at the bases of the petals in the type-collection.

This species may also be confused with young plants or ascending branches of *G. Wislizeni*. In habit and leaf-shape, however, the two are distinctly different. *G. Wislizeni* is essentially an erect or spreading species with the leaves mostly 5-lobed and reduced on the inflorescence, the lobes cuneate-obovate while *G. sublaevispermum* is a low, spreading or procumbent species with the leaves 3-lobed, the lobes rhombic. The flowers are similar but the seeds of *G. Wislizeni* are coarsely reticulate.

28. G. **latilobum,** sp. nov., (PL. 3, FIG. 15), herba perennis: radice lignosa: rhizomate brevi: caulibus 5–6 dm. longis, ascendentibus, robustis, inferne sparsim vel modice dense hirsutis, breviterque pilosis, superne hirsutis breviterque glanduloso-pilosis: foliis caulinis numerosis; petiolo plerumque quam lamina longiore; lamina foliorum inferiorum 7–10 cm. lata, ea foliorum superiorum angustiore, late hastata, tenui, supra viridi, glabrata

vel breviter pilosa, sparsim longeque pilosa, subtus pallidiore, glabrata vel dense hispidula, venis patenter longeque hirsutis, ½–⅔ ad basin partita, 3-lobata, lobis late ovatis, margine dentato vel duplicato-dentato, dentibus brevibus, lobo medio longo, lobis lateralibus lobulo basali ornatis: stipulis brevibus, deltoideis, brunneis, subtiliter pubescentibus ciliatisque: pedunculo 3–7 cm. longo, copiose breviterque piloso et longe glanduloso-piloso, bifloro, plerumque axillari: pedicellis 12–20 mm. longis, copiose breviterque glanduloso-pilosis, saepe geniculatis: sepalis exterioribus 7–8 mm. longis, mucronatis mucrone 1–1.5 mm. longo, ovato-lanceolatis, 3–5-nervatis, hispidulis, venis marginibusque sparsim longeque pilosis vel glanduloso-pilosis: petalis 8–10 mm. longis, 4–5 mm. latis, albis, cuneato-obcordatis; venis reticulatis, e basi ad mediam villosis; apicibus profunde incisis: staminibus calycem aequantibus, demum exsertis: fructu 23–27 mm. longo; stigmatibus 4–5 mm. longis; columna stylorum glanduloso-pubescente: carpello 3.5–4 mm. longo, glanduloso-hirsuto: semina non visa.

Perennial: root woody: rhizome and caudex not seen: stems 5–6 dm. long, ascending or erect (?); lower part little-branched, robust, sparsely to moderately densely hirsute with flat hairs and short-pilose or sometimes glandular; upper part moderately robust, hirsute with flat hairs and copiously short and often deciduous-glandular pubescent, indeterminate: basal leaves not seen: cauline leaves numerous; petiole mostly longer than the blade, hirsute and rather densely short- or glandular-pubescent; blade of the lower leaves 7–10 cm. wide, that of the upper leaves narrower, broadly hastate in outline, thin, green and glabrate or sparsely to rather densely short-pilose with scattered long, flat hairs above, lighter and glabrate to rather densely hispidulous with long, spreading hairs on the veins below, divided one-half to two-thirds to the base into 3 broad, nearly ovate lobes; margins of the lobes dentate or duplico-dentate with short teeth; median lobe usually longer than the lateral lobes, lateral lobes sometimes with a small basal lobelet or somewhat reduced toward the terminus of the stem: cauline stipules 3–5 mm. long, deltoid, brown, minutely pubescent and ciliate: peduncle 3–7 cm. long, copiously short-pilose and long-glandular, 2-flowered, single and axillary for the most part: pedicels 12–20 mm. long, copiously short-pilose and glandular, often geniculate in fruit: outer sepals 7–8 mm. long, awned; body 6–7 mm. long, ovate-lanceolate, 3–5-veined, hispidulous; veins and margins with few long, flat or occasionally deciduous-glandular hairs; awn 1–1.5 mm. long: petals 8–10 mm. long, 4–5 mm. wide, white, cuneate-obovate or obcordate; apex deeply notched; base villous to the middle: stamen-filaments as long as or slightly longer than the sepals, ciliate, only slightly exserted in fruit: fruit 23–27 mm. long; style-beak 4–5 mm. long; style-column glandular-pubescent; carpel-body 3.5–4 mm. long, glandular: seed not seen.—Known only from the type-locality.—MEXICO: JALISCO: streamside, Arroyo del Notoguio, San Sebastian, 1500 m., Feb. 13, 1927, *Mexia* 1671 (G, TYPE; F, M, NY, ISOTYPES).

The large, broad-lobed, hastate leaves, villous, white, notched petals and glandular stems ally this species with *G. Gentryi*, *G. hystricinum* and *G. lilacinum*.

G. latilobum differs from *G. Gentryi* and *G. hystricinum* in pubescence and leaf-shape and in lacking glandular hairs on the margins and lower surfaces of the leaves. The white, villous petals, long style-beak and stouter, more erect habit separate it from *G. lilacinum*. Though bearing a superficial resemblance to *G. Hernandezii* and *G. deltoideum*, the broad lobes and shallow teeth of the larger leaves are distinguishing characters. The petals are much smaller than the average in *G. Hernandezii*, though similar to those of *G. deltoideum* from which it differs in stouter habit. Some specimens of *G. Wislizeni* resemble *G. latilobum* but may be separated by their much shorter style-beak.

29. G. **hystricinum.** sp. nov., (PL. 3, FIG. 10; PL. 5, FIGS. 3, 7), herba perennis: caulibus 2 mm. longis, ascendentibus, robustis, ramosis, modice dense rigido-hirsutis breviterque glanduloso-pilosis: foliis caulinis numerosis; petiolo 1–7 cm. longo, breviter glanduloso-piloso et sparsim hirsuto; lamina pentagona, ea foliorum caulis primarii 5–6 cm. lata, modice crassa, supra dense hirsuta breviterque glanduloso-pilosa, margine breviter glanduloso-pilosa, subtus venis patenter hirsutis et glanduloso-pubescentibus, ½–⅔ ad basin 3–5-lobata, lobis rhomboideis, dentatis, dentibus brevibus, acutis, mucronatis, lanceolatis, lobo medio quam lobis lateralibus interdum longiore, lamina foliorum ramorum 1–4 cm. lata, eae foliorum caulis primarii simili nisi plerumque 3-lobata: stipulis brevibus, ovato-lanceolatis et apiculatis, pilosis ciliatisque: pedunculo 2.5–6.5 cm. longo, sparsim hirsuto copioseque glanduloso-piloso, bifloro, plerumque axillari: pedicellis 1–3 cm. longis, copiose glanduloso-pubescentibus, fructiferis geniculatis: sepalis exterioribus 7–8 mm. longis, mucronatis mucrone 1–1.5 mm. longo, ovatis, 3-nervatis, strigillosis vel glanduloso-pilosis, venis marginibusque dense glanduloso-pilosis: petalis 8–8.5 mm. longis, 4–5 mm. latis, albis, obovatis, venis reticulatis; e basi ad mediam dense villosis, apicibus obcordato-incisis: staminibus calycem non aequantibus; fructu

22–26 mm. longo; stigmatibus 2.5–3 mm. longis; columna stylorum copiose glanduloso-pilosa hispidulaque, ad rostrum abrupte angustata; carpello 3–4 mm. longo, brunneo-nigro, hirsuto glanduloso-pilosoque: semine 2.5–3 mm. longo, brunneo-nigro, breviter elongato-reticulato.

Perennial: basal parts and leaves not seen: stems 2 m. long, ascending; upper part robust or moderately so, rather densely open- or retrorse-hirsute with coarse, apiculate hairs and short-glandular beneath, much-branched, indeterminate: cauline leaves numerous; petiole 1–7 cm. long, short-glandular and sparsely hirsute, densely hirsute below the blade; blade of leaves of the main axis 5–6 cm. wide, pentagonal in outline to rarely hastate, moderately thick, not much darker above than below, densely erect or appressed-hirsute and short-glandular, at least on the margins, spreading-hirsute and glandular on the conspicuously areolate veins below, divided one-half to two-thirds to the base into 3–5 rhombic lobes, the median lobe sometimes longer than the others, lobes shallow-toothed with acute, mucronulate, lanceolate segments; blade of the leaves of the branches 1–4 cm. wide, similar to that of the leaves of the main axis but mostly 3-lobed, the lateral lobes with or without a basal lobelet: cauline stipules 5–7 mm. long, ovate-lanceolate and apiculate, pilose and ciliate, brown: peduncles 2.5–6.5 cm. long, rather stout, sparsely hirsute and copiously dirty-glandular, 2-flowered, single and axillary or sometimes aggregated somewhat at the tips of the branches: pedicels 1–3 cm. long, copiously glandular, somewhat divaricate and geniculate in fruit: outer sepals 7–8 mm. long, awned; body 5.5–6.5 mm. long, enlarged in fruit, ovate, 3-veined, strigillose and sometimes glandular; veins and margins densely glandular; awn 1–1.5 mm. long: petals 8–8.5 mm. long, 4–5 mm. wide, white with reticulate veins, obovate; apex notched; base closely fine-villous to the middle: stamen-filaments shorter than the sepals, villous-ciliate nearly to the apex, not exserted in fruit: fruit 22–26 mm. long; style-beak 2.5–3 mm. long; style-column copiously glandular and hispidulous, tapering abruptly at the beak: carpel-body 3–4 mm. long, brown-black, hirsute and glandular: seed 2.5–3 mm. long, brown-black, shallow-reticulate, reticulations somewhat elongate.—Known only from the type-locality.—MEXICO: GUERRERO: by stream in thicket in llano, Puerto Rico, Dist. Mina, 1800 m., Dec. 8, 1939, *Hinton* 14972 (G, TYPE).

This species is known only from incomplete material collected by Mr. Hinton in Guerrero. In general aspect, it is not dissimilar to coarse individuals of *G. Seemanni* but differs in the wide, villous petals with reticulate veins and glandular leaves.

Although the base is not known, the species appears to be perennial and of tall habit, Hinton stating its height as 2 m., and ascending or perhaps erect. The stems are robust, branched and hirsute with coarse, very stiff hairs overlying a denser indument of slender, glandular hairs. This pubescence suggests the coat of a porcupine from which the specific epithet has been derived.

The shorter, notched, bearded, white petals of *G. hystricinum* and the bluntly tapered style-column, much stiffer stem-hairs and less densely pubescent under-surface of the leaves are critical in separating it from *G. Gentryi.* This relationship is presented in greater detail with the latter species as well as points of difference from two other allied species, *G. lilacinum* and *G. latilobum.*

30. G. **Gentryi,** sp. nov., (Pl. 1, fig. 1; Pl. 5, fig. 6), herba perennis (?): caulibus 4.5–7.5 dm. longis, ascendentibus, plus minusve ramosis, modice robustis, sparsim longeque pilosis, breviter denseque pilosis vel glandululoso-pilosis: foliis caulinis numerosis; petiolo 1–8 cm. longo, plerumque quam lamina longiore, dense glanduloso-piloso; lamina pentagona vel hastata, 1.5–5 cm. lata, modice crassa, supra dense longeque adpresso-pilosa et breviter glandulosa, marginibus breviter glanduloso-pilosis, ½–⅔ ad basin 3–5-lobata, lobis rhomboideis, dentatis, dentibus breviter ovato-lanceolatis, lobo medio raro longiore quam lobis lateralibus: stipulis caulinis lanceolatis, breviter glanduloso-pilosis ciliatisque: pedunculo 3.5–4 cm. longo, dense breviterque piloso et longe glanduloso-piloso, bifloro, axillari: pedicellis 1.5–2 cm. longis, copiose breviterque pilosis et longe glanduloso-pilosis, fructiferis saepe geniculatis: sepalis exterioribus 7–8 mm. longis, mucronatis mucrone 1–1.5 mm. longo, ovatis, 3-nervatis, glanduloso-pilosis: petalis 10–11 mm. longis, 5–6 mm. latis, saturate roseis, obovatis, apicibus rotundatis vel breviter incisis; e basi ad mediam sparsim villosis: staminibus quam calyce brevioribus, pilosis, non exsertis: fructu 22–25 mm. longo; stigmatibus 2–3 mm. longis; columna stylorum gracili, breviter glanduloso-pilosa, ad rostrum gradatim attenuata; carpello 4 mm. longo, pubescente: semina non visa.

Perennial (?): basal portions and leaves not seen: stems 4.5–7.5 dm. long, ascending: upper stem somewhat branched, moderately robust, sparsely long-pilose and densely fine-pilose and/or short-glandular, indeterminate: cauline leaves numerous; petiole 1–8 cm. long, mostly longer than the blade, densely fine-pilose and glandular; blade 1.5–5 cm. wide, pentagonal to hastate in outline, thickish, light-green, densely appressed-long-pilose and short-glandular above and on the margins, densely spreading-pilose and glandular on the veins and surface below, divided one-half to two-thirds to the base into 3–5 shallow-toothed, rhombic lobes with ovate-lanceolate segments; median lobe wide-rhombic, not much longer than the lateral lobes; if three-lobed, the lateral lobes, at least on the lower leaves, nearly always with a basal lobelet: cauline stipules 7–8 mm. long, lanceolate, short-pilose, glandular and ciliate: peduncle 3.5–4 cm. long, densely short-pilose and long, yellow-white-glandular, 2-flowered, single and axillary: pedicels 1.5–2 cm. long, copiously short-pilose and long-glandular, often geniculate in fruit: outer sepals 7–8 mm. long, awned; body 6–7 mm. long, ovate, 3-veined, finely pilose and glandular; awn 1–1.5 mm. long: petals 10–11 mm. long, 5–6 mm. wide, rose, obovate; apex rounded or shallow-emarginate; base sparsely villous to the middle: stamen-filaments shorter than the sepals, ciliate, not exserted in fruit: fruit 22–25 mm. long; style-beak 2–3 mm. long; style-column slender, very shortly pilose and glandular, tapering gradually to the beak; carpel-body 4 mm. long, pubescent: seed not seen.—Known only from the type-locality.—MEXICO: SONORA: spring waters, Tepopa, Rio Mayo, Mar. 9, 1935, *Gentry* 1420 (G, TYPE; F, M, ISOTYPES).

Geranium Gentryi is very closely related to *G. hystricinum* of Guerrero. The two species are very similar in habit, pubescence and leaf-shape. The leaves are not deeply divided, those of the main axis being mostly five-lobed or three-lobed with or without basal lobelets. The pubescence, particularly in regard to the glandular hairs, is similar, these hairs being thin, rather long and with glandular tips of dirty yellowish-white or purplish color. The leaves, although only moderately thick, appear thicker because of the dense, long-hirsute or long-pilose indument above and on the veins below, being much more dense on the veins of *G. Gentryi*. Glandular hairs are usually present on the margins of the leaves as well. The upper stems are densely glandular and this is overlain with a thin or thick coat of long hairs, those of *G. Gentryi* soft and somewhat flattened, those of *G. hystricinum* stiff, pointed and often filled with a brownish pigment.

G. Gentryi may be distinguished further from its ally by the longer, broader, rose-colored petals with rounded or very shallowly notched apices and sparsely villous base, the hairs not extending more than a third toward the apex. The fruit is somewhat shorter, although the style-beaks are of the same length. The style-column is slender, tapering gently toward the style-beak in *G. Gentryi*, while the style-column of *G. hystricinum* is stout and abruptly tapered at the tip.

G. latilobum is distinct from *G. Gentryi* and *G. hystricinum* in its long style-beak and broad, three-lobed leaves and *G. lilacinum* differs in the very slight basal pubescence on the lilac petals, long median leaf-lobe and distinctly lower and more slender habit.

31. G. LILACINUM R. Knuth (PL. 3, FIG. 11). Perennial: mature rhizome and caudex not seen: stems 3–5 dm. long, ascending or nearly procumbent; lower part little-branched, slender, glabrate or sparsely pilose, internodes short; upper part slender, more strongly pilose and glandular, branched, indeterminate: basal leaves not seen: cauline leaves numerous; petiole mostly as long as or longer than the blade, pilose and occasionally glandular; blade 2.5–7 cm. wide, hastate or rarely pentagonal in outline, thin, green and appressed-pilose above, lighter and spreading-pilose on the veins beneath, divided three-fourths to the base into 3 rhombic lobes; lobes toothed with moderately long, lanceolate segments; median lobe usually 1.5–3 times as long as the lateral lobes, broad-rhombic in outline; lateral lobes with or without a smaller basal lobelet: cauline stipules 5–7 mm. long, lanceolate, apiculate, green to red, pubescent and ciliate: peduncle 4–10 cm. long, densely pilose, usually long-white-deciduous-glandular, 2-flowered, single and axillary: pedicels 0.7–2 cm. long, densely short-pilose and long-white-glandular: outer sepals 7–9 mm. long, awned; body 6–7 mm. long, ovate, 3–5-veined, glabrous, fine-pubescent or pilose; veins with long, white, glandular hairs, usually with a reddish cast in fruit; awn 1–2 mm. long, usually recurved: petals 10– mostly 12–14 mm. long, 4– mostly 5 mm. wide, pale violet or lilac or rarely paler with lilac, slightly reticulate veins, narrow cuneate-obovate or obcordate; apex emarginate; base shortly pilose: stamen-filaments as long as or longer than the sepals, tinged with lavender, ciliate at the base, not exserted in fruit: fruit 23–30 mm. long; style-beak 2.5– mostly 3.5–4 mm. long; style-column slender, short-pilose and usually glandular; carpel-body 3.5–4 mm. long, pubescent: seed 2 mm. long, red-brown, deeply reticulate.—Kew Bull. 1937: 502. TYPE: *Hinton* 8945, at Kew (not seen); ISOTYPE, G (seen).—San Luis Potosí to Guerrero.—MEXICO: SAN LUIS POTOSÍ: in montibus San Miguelito, ex convalli San Luis Potosí, 1876,

Schaffner 191 (G). México: wet barranca, Hornos, Dist. Temascaltepec, Jan. 13, 1935, *Hinton* 7199 (F, G, M, NY, ISOPARATYPES); Ixtaccihuatl, Jan. 1909, *Purpus* 3731 (F, G, M, US); pine forest, Sierrita, Dist. Temascaltepec, Feb. 23, 1936, *Hinton* 8945 (F, G, M, NY, ISOTYPES); wet barranca, Los Hornos, Dist. Temascaltepec, 2550 m., Jan. 28, 1934, *Hinton* 5428 (F, G). Guerrero: oak forest, Pie de la Cuesta, Toro Muerte, Dist. Galeana, 2600 m., July 12, 1937, *Hinton* 11078 (G); streamside in shade, Barranca del Ranchito, Sierra Madre del Sur, Petlacala, Dist. Mina, 1920 m., Jan. 8, 1938, *Mexia* 9095 (F, G, M).

Geranium lilacinum is a species of the central highlands of Mexico from San Luis Potosí to Guerrero, differing from the species allied with it here in having lilac petals which are very shortly pilose or seldom villous near the base. *G. Gentryi* is the only other species with colored petals and the differences between the two are discussed under its treatment. Occasional pale-flowered specimens appear (*Mexia* 9095) which resemble *G. Seemanni* but for the long median leaf-lobe, large petals and long style-beak.

Series J. REPENTIA. Procumbent or repent perennials: stems 3–8 dm. long, slender, procumbent with short, ascending branches and often rooting at the nodes, indeterminate: basal leaves few, not long-persistent; cauline leaves numerous; leaf-blades pentagonal, hastate or deltoid in outline, divided nearly to the base into 3–7 lobes; lobes cleft and toothed or toothed with moderately long, lanceolate segments; median lobe as long as or longer than the lateral lobes: pubescence glandular, at least on the pedicels (except *G. clarum*): peduncles 1.5–10 cm. long, single and axillary: pedicels 6–35 mm. long: petals 9.5–14 mm. long, 4–8 mm. wide, narrow-cuneate-obovate or -obcordate; veins few or numerous, more or less reticulate; base shortly pilose or sparsely villous: style-beaks 2–3 mm. long.

Two of the three species which comprise this series, *G. clarum* and *G. Hintonii*, are known only from the type-collections. The other, *G. repens*, embraces a variable complex from Oaxaca and northern Guatemala to Chiriquí Province, Panamá.

These species are united by three characters: the long, slender, procumbent stems which often root at the nodes: the deeply divided leaves with the median lobe sometimes longer than the lateral lobes, and the flowers which approach those of series

Vulcanicola in size and in having the petals nearly glabrous and less distinctly reticulate-veined than those of the preceding series.

32. G. **repens,** nom. nov. (Pl. 3, fig. 16), perennial: root woody-fibrous: rhizome short to long, slender, horizontal: stems 3–5 dm. long, procumbent with ascending branches, often rooting at the nodes; lower part slender, glabrate to densely strigillose or short-pilose, indeterminate; branches short, ascending, densely strigillose to short-pilose: basal leaves few to numerous, not long-persistent; petiole 5–25 cm. long, strigose or pilose; blade 2–5 cm. wide, thin, pentagonal in outline, darker above than below, closely strigillose to pilose above, strigose to pilose on the veins below, divided nearly to the base into 3–7 nearly equal, narrow-rhombic lobes; lobes cleft and toothed or toothed with moderately long, lanceolate segments: cauline leaves numerous; petiole 6 cm. long to nearly absent, strigose or pilose; blade 2.5–5 cm. wide, hastate or deltoid in outline, similar to that of the basal leaf but mostly 3-lobed; median lobe longer than the lateral lobes: cauline stipules 7–10 mm. long, lanceolate, apiculate, ciliate: peduncle 3– mostly 5–10 cm. long, open- or retrorse-pilose or strigose and sometimes glandular, 2-flowered, single and axillary: pedicels 10–35 mm. long, long-glandular and short-pilose, divaricate but not geniculate in fruit: outer sepals 6–6.5 mm. long, awned; body 5–5.5 mm. long, ovate, 3-veined, antrorse-strigillose; veins and margins long-glandular; awn 1 mm. long: petals 10–14 mm. long, 4–5 mm. wide, lilac to pale lavender or white with dark purple veins, narrow-obovate; veins few, nearly free to moderately reticulate; apex deeply or shallowly notched; base very shortly pilose: stamen-filaments shorter than the sepals, not exserted in fruit: fruit about 18 mm. long; style-beak 3 mm. long; style-column hispidulous or short-pilose and glandular; carpel-body pilose: seed 2–3 mm. long, dark-brown, rather coarsely reticulate.—*G. pulchrum* Morton, Phytolgia **1:** 147 (1935). Type: *Skutch* 709, US (seen), not *G. pulchrum* N. E. Br., Kew Bull. 1895: 143.—Southern Mexico to Panama.—MEXICO: Guerrero: pine forest, Piedra Ancha, Dist. Galeana, 3150 m., Oct. 30, 1939, *Hinton* 14579 (G). GUATEMALA: Quetzaltenango: Volcán Santa María, 11,800′, July 27, 1934, *Skutch* 860 (F, G); upper northeast-facing slopes to summit of Volcán Santa María, 3000–4200 m., Jan. 13, 1940, *Steyermark* 34156 (F). Totonicapán: Bergwald zw. Totonicapán und Los Encuentros, Sept. 25, 1896, *C. & Ed. Seler* 2351 (G). Chimaltenango: lumbered cypress forest (*C. Benthami*) about 9500′, Santa Elena, Nov. 25, 1933, *Skutch* 709 (US, photograph G, type; G, isotype). Sacatepéquez: Volcán Agua, 9500′, Feb. 4, 1908, *Kellerman*

7462 (F, NY). JALAPA: pine forest, between Miramundo and summit of Montaña Miramundo, between Jalapa and Mataquescuintla, 6 miles south of Miramundo, 2000–2500 m., Dec. 5, 1939, *Steyermark* 32706 (F). COSTA RICA: SAN JOSÉ: Cerro de las Vueltas, 3000 m., Jan. 1897, *Pittier* 10512 (US); Cerro de la Muerte, 3100 m., Jan. 1897, *Pittier* 10490 (US); wet thicket, Cerro de las Vueltas, 2700–3000 m., Dec. 29, 1925–Jan. 1, 1926, *Standley & Valerio* 43709 (US). CARTAGO: in potrero, southern slope of Volcán de Turrialba, near the Finca del Volcán de Turrialba, 2000–2400 m., Feb. 22, 1924, *Standley* 34952 and 35212 (US); in the oak forest on the upper slopes, El Volcán Irazú, Aug. 18, 1925, *Dodge* 3426 (G, NY, US); common over entire cinder area, vicinity of Cartago, June–July, 1923, *Stork* 356 (US); Alrededores del Crater de Volcán Irazú, Aug. 24, 1935, *Quiros* 344 (F); Irazú, 8000′, June 25, 1874, *Kuntze* 2328 (NY); Irazú, May 17, 1928, *Stork* 2834 (F); Volcán Irazú, Aug. 4–5, 1920, *Rowlee & Stork* 930 (US). PANAMÁ: moist corner of potrero, Loma Larga to summit, Volcán de Chiriquí, 2500–3380 m., July 4–6, 1938, *Woodson, Allen & Seibert* 1049 (M); around El Potrero Camp, Chiriquí Volcano, 2800–3000 m., Mar. 10–13, 1911, *Pittier* 3096 (NY, US); Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m., July 13–15, 1940, *Woodson & Schery* 378 (G); above Potrero Camp, Chiriquí Volcano, 2900 m., Feb. 27, 1918, *Killip* 3592 (US); Potrero Muleto, Volcán de Chiriquí, 10,400′, July 18, 1938, *Davidson* 1007 (F, M).

The variable, repent or procumbent *Geranium* of the highlands and volcanoes from southern Mexico to Volcán Chiriquí, Panama, I refer to the species described by Morton as *G. pulchrum*. An earlier homonym, *G. pulchrum* N. E. Br., necessitates a new epithet which has been chosen in reference to its habit. Considerable variation in pubescence, leaf-shape and, to some extent, in petal-venation occurs throughout the range but I cannot segregate elements with sufficient clarity to warrant recognition of geographic varieties.

The northern representative, *Hinton* 14579, from Guerrero, has villous pubescence and large petals but is so similar in other respects that I am placing it here at present. Some of the Costa Rican collections, *Dodge* 3426, *Kuntze* 2328, have a finely toothed, angular leaf and similar specimens, *Seler* 2351, occur in Guatemala.

The latter collection was cited by Knuth in his description of *G. guatemalense* but is distinct from that species, as emended, in the longer style-beak (3 mm.), longer peduncles, procumbent habit and more deeply toothed leaf-lobes.

This species is distinguished from species of series *Vulcanicola* by the longer peduncles, longer style-beak and larger flowers; from *G. clarum* by the presence of long, glandular hairs on the pedicels, and from *G. Hintonii* by the narrow petals and shorter, seldom villous pubescence.

33. G. CLARUM Small in Hanks & Small (PL. 3, FIG. 22). Perennial: root and rhizome not seen: stems about 3 dm. long, prostrate; lower part slender, brown, strigillose; upper part slender, strigose and strigillose, branched, indeterminate: cauline leaves numerous; petiole 1.5–3 cm. long, densely strigillose with scattered longer hairs near the blade; blade 1.5–4 cm. wide, pentagonal in outline, thin, densely strigillose and sparsely strigose above, lighter and spreading-hirsute on the veins below, divided three-fourths to the base into 3–5 nearly equal, narrow-rhombic lobes; lobes toothed with moderately long, ovate-lanceolate segments; if 3-lobed, the lateral lobes with a basal lobelet: cauline stipules 7 mm. long, linear-lanceolate, entire or cleft, dark-brown, strigillose and ciliate: peduncle 4.5–6 cm. long, closely strigillose, eglandular, 2-flowered, single and axillary: pedicels 6–10 mm. long, closely white-strigose to -strigillose: outer sepals 5–6 mm. long, awned; body 4.5–5.5 mm. long, ovate, reddish, 3-veined, body glabrous, veins and margin strigose and ciliate; awn 0.5 mm. long: petals 9.5–11 mm. long, 4.5 mm. wide, white, narrow-obcordate; veins prominent, only slightly reticulate; apex deeply notched: style-beak 2.5–3 mm. long at anthesis: fruiting parts not seen.—N. Am. Fl. **25:** 19 (1907). TYPE: *Nelson* 552, US (seen).—Known only from the type-locality.—MEXICO: OAXACA: west slope of Mt. Zempoaltepec, 7700–8000′, July 5–13, 1894, *Nelson* 552 (US, photographs F, G, TYPE).

Geranium clarum is known only from the type-sheet but it is distinctive in being the only species of this series which is entirely devoid of glandular hairs. The peduncles and pedicels are shorter than those of *G. repens* and are appressed-pubescent, unlike those of related *G. Hintonii.*

34. G. **Hintonii,** sp. nov. (PL. 1, FIG. 5), herba perennis: rhizomate modice crasso: caulibus 3–8 dm. longis, repentibus, ramis ascendentibus, gracilibus, glabratis, pilosis vel superne villosis: foliis basalibus paucis, mox deciduis; petiolo 3.5 cm. longo, dense longeque piloso vel villoso; lamina orbiculari, 2 cm. lata, tenui, supra saturate viridi, dense pilosa, subtus pallidiori,

venis subtus patenter pilosis, ¾ ad basin 5-lobata, lobis aequalibus, cuneato-obovatis, ad apicem dentatis, dentibus oblongo- vel ovato-lanceolatis: foliis caulinis numerosis; petiolo 1–3 cm. longo, piloso vel villoso; lamina 1.5–3 cm. lata, pentagona, eae foliorum basalium simili nisi 3-lobata, lobis longioribus, dentibus pluribus, lobis lateralibus lobulo basali ornatis: stipulis ovatis, brunneis, pubescentibus ciliatisque: pedunculo 1.5–3.5 cm. longo, dense patenterque villoso, interdum sparsim glanduloso-villoso, bifloro, solitario: pedicellis 8–15 mm. longis, patenter villosis, saepe glanduloso-villosis: sepalis exterioribus 4.5–6 mm. longis, mucronatis mucrone 0.5–1 mm. longo, ovatis, 3-nervatis, subtiliter pubescentibus, saepe rubidis, venis marginibusque longe glanduloso-villosis: petalis 10–13 mm. longis, 5–8 mm. latis, pallide roseis, reticulato-venosis, late cuneato-obovatis vel oblongis, ad basin versus sparsim villosis, apicibus manifeste obcordato-incisis: staminibus calycem aequantibus, demum exsertis: fructu (immaturo) 14 mm. longo; stigmatibus 2–3 mm. longis; columna stylorum gracili, dense longeque pilosa et saepe glanduloso-pilosa: carpella seminaque non visa.

Perennial: rhizome moderately stout: stems 3–8 dm. long, procumbent with ascending branches and rooting at the nodes, branches mostly short, somewhat erect, slender, densely long-pilose to villous with very soft hairs, indeterminate: basal leaves few, not long-persistent; petiole 3–5 cm. long, densely long-pilose to villous; blade 2 cm. wide, orbicular, thin, dark-green and densely pilose above, lighter and spreading-pilose on the veins below, divided three-fourths to the base into 5 nearly equal, cuneate-obovate lobes, lobes few-toothed at the apex with moderately long, oblong or ovate-lanceolate segments: cauline leaves numerous; petiole 1–3 cm. long, densely villous and short-pilose; blade 1.5–3 cm. wide, pentagonal in outline, similar to that of the basal leaf but often 3-lobed, the lateral lobes with a basal lobelet and the lobes longer with more numerous, oblong-lanceolate teeth: cauline stipules 3–5 mm. long, ovate, brown, pubescent and ciliate: peduncle 1.5–3.5 cm. long, densely villous, sparsely glandular or eglandular, 2-flowered, single and axillary: pedicels 8–15 mm. long, open-villous and often deciduous-glandular, somewhat geniculate in fruit: outer sepals 5–6 mm. long, awned; body 4.5–5.5 mm. long, ovate, 3-veined, finely pubescent and often reddish; veins and margins long-glandular-villous; awn 0.5–1 mm. long: petals 10–13 mm. long, 5–8 mm. wide, pink with delicate, mostly reticulate veins, broad-cuneate-obovate or -oblong; apex shallowly to deeply notched; base sparsely villous to the middle: stamen-filaments as long as or longer than the sepals, yellow, ciliate, somewhat exserted in fruit: fruit (immature) 14 mm. long; style-beak 2–3 mm. long; style-column slender, copiously long- and often glandular-pilose; carpel-body and seed not seen.—Known only from the type-locality.—MEXICO: GUERRERO: open pine and fir forest, Teotepec, Dist. Mina, 3200 m., Nov. 5, 1939, *Hinton* 14787 (G, TYPE).

The villous pubescence of this interesting species of repent habit is not encountered in any of the other species of this series. In addition, the petals are very broad with somewhat reticulate veins and with a sparse pubescence of moderately long hairs.

In aspect, *G. Hintonii* is close to *G. clarum*, particularly in regard to leaf-shape and short peduncles. The stems of the latter, however, are prostrate but apparently do not root at the nodes as they do in this species, and the stem-hairs are very short.

This novelty was collected in the District of Mina, Guerrero, by Mr. Hinton whose collections have been of great value in this study. I take pleasure in naming it in his honor.

SERIES K. VULCANICOLA. Prostrate to ascending, probably short-lived, perennials, often erect when young: stems 1 dm. to 2 m. long, indeterminate: basal leaves not long-persistent: cauline leaves numerous; leaf-blades reniform, pentagonal or reniform-orbicular in outline, mostly 5-lobed or 3-lobed; the lateral lobes with basal lobelets, lobes variously divided: pubescence variable but often pilose and nearly always glandular, at least on the pedicels: peduncles mostly less than 5 cm. long, 2-flowered, single and axillary or, in some species, tending to aggregate in loose cymes at the tips of old branches: pedicels 3–15 mm. long: sepals less than 6 mm. long at anthesis, often enlarged in fruit: petals 4–8 or rarely 10 mm. long, 2–4 or rarely 5 mm. wide, narrow-obovate, -cuneate or -obcordate with 3–5 veins anastamosing only slightly at the apex; base glabrous or very shortly pilose: style-beaks 1–2.5 mm. long.

Of the many species native to Mexico and Central America, none are as perplexing as the small-flowered species with essentially glabrous and free-veined petals. Nearly every character varies inconstantly with little decisive geographic significance. A paucity of good field data concerning habit and floral character and a high percentage of poorly prepared or incomplete specimens makes the task of delimiting these species most difficult.

G. Seemanni and *G. guatemalense* are admittedly complexes that may be resolved eventually into definable geographic units with careful field study and correlation of more extensive series of specimens. With *G. vulcanicola*, these two species form a unit characterized chiefly by a pilose or hirsute pubescence, broad-lobed, shallow-toothed leaves and elongate stems.

G. cruceroënse, with its much-dissected leaves, is amply distinct from all species. *G. Kerberi*, *G. subulato-stipulatum*, *G. culminicola* and *G. flaccidum* have the leaves more deeply toothed and, except for the last, are less pubescent than *G. Seemanni*.

Limited field contact and observation of plants grown from seed lead me to believe that petal-color and shape may be more constant than they appear from a study of prepared material but, at best, these characters show poorly on most herbarium specimens, the petals fading and shrinking in drying.

Three of the species, *G. Seemanni*, *G. guatemalense* and *G. subulato-stipulatum*, have extensive ranges as may be expected of weedy, variable species; the remainder are inhabitants of the central plateaus of Mexico and Guatemala except for *G. flaccidum*, endemic to Baja California.

35. G. SEEMANNI Peyr. (PL. 3, FIG. 12; PL. 5, FIG. 2). Perennial: root fibrous, woody-fibrous or sometimes woody: stems 1–10 dm. long, erect when young, ascending or rarely procumbent with ascending branches in age; lower part branched, usually rather stout, glabrate to mostly densely long-pilose or hirsute with flattened hairs, often deeply colored; upper part moderately stout to slender, puberulent and sparsely to densely long-pilose or hirsute with flattened hairs, in older stems sometimes sparsely glandular, branched, indeterminate: basal leaves few to numerous, not long-persistent; petiole up to 20 cm. long, pilose or hirsute and puberulent; blade 4–7 cm. wide, reniform in outline, somewhat darker above than below, erect- or appressed-hirsute or -long-pilose above, spreading-hirsute or -long-pilose, especially on the veins, below, divided one-half to two-thirds to the base into 5 nearly equal, cuneate-obovate lobes; lobes twice-cleft and toothed or shallow-toothed above the middle with short, oblong obtuse segments: cauline leaves numerous; petiole 2–7 cm. long, mostly longer than the blade, usually puberulent and long-pilose; blade 2–6 cm. wide, 3-lobed; lobes toothed or cleft and toothed above the middle with obtuse to acute, ovate-lanceolate to lanceolate segments; lateral lobes with a basal lobelet; median lobe broad-rhombic, as long as or longer than the lateral lobes: cauline stipules 5–8 mm. long, subulate or linear-lanceolate, minutely pubescent and ciliate: peduncles 1.5–3 or rarely 4 cm.

long, densely long-pilose and puberulent or less pubescent and glandular, 2-flowered, rather stiff, single and axillary or tending to be aggregated in loose cymes at the tips of older branches: pedicels 3–10 mm. long, rarely .longer, long-pilose or copiously glandular, erect in fruit: outer sepals 4–5 mm. long, awned; body 3.5–4.5 mm. long, enlarged in fruit, ovate, 3-veined; veins and margins glandular or pilose; awn 0.5–1 mm. long: petals 6–8 or rarely to 10 mm. long, 2–3 mm. wide, pale-pink, rose, lavender or nearly white with lilac veins, narrow-obovate; apex entire or usually emarginate; base very shortly pilose or glabrate; veins nearly free, but slightly reticulate at the petal-apex: stamen-filaments shorter than to as long as the sepals, not exserted in fruit: fruit 17–22 mm. long; style-beak 1.5–2 mm. long; style-column stoutish, hispidulous and usually glandular; carpel-body 3 mm. long, hirsute: seed 2–2.5 mm. long, black or dark-brown, shallow-reticulate; reticulations usually elongate or occasionally deeply reticulate with nearly isodiametric reticulations.—Linnaea **30:** 66 (1859). LECTOTYPE: *Galeotti* 4024, at Geneva (not seen); ISOLECTOTYPE, US (seen).—*G. Seemanni* var. *minoriflorum* Briq., in Ann. Cons. et Jard. Bot. Genève **11, 12:** 190 (1908). *G. Seemanni* var. *macranthum* Briq., in Ann. Cons. et Jard. Bot. Genève **11, 12:** 190 (1908). *G. mexicanum* HBK. var. *minoriflorum* (Briq.) Knuth, in Engler, Pflanzenr. **4** fam. **129:** 197 (1912). *G. mexicanum* HBK. var. *macranthum* (Briq.) Knuth, in Engler, Pflanzenr. **4** fam. **129:** 197 (1912). *G. regale* Rydb. ex Hanks & Small, N. Am. Fl. **25:** 11 (1907), type: *Rose, Painter & Rose* 8675, NY (seen).—Nuevo Leon and Coahuila to Chiapas.—MEXICO: TAMAULIPAS: Mesa de Tierra, vicinity of San José, 3500′, July 19, 1930, *Bartlett* 10451 (F, US); La Vegonia, vicinity of San José, 2900′, July 2, 1930, *Bartlett* 10029 (F, G, US); Santa Rita Ranch, 1500 m., Apr. 8, 1926, *Runyon* 865 (US). NUEVO LEON: abundant on forest floor, Las Canoas on Cerro Potosi, Municipio de Galeana, July 17, 1935, *Mueller* 2199 (F, G); Sierra Madre, Monterrey, May 27, 1908, *Pringle* 15598 (G, US); above La Mina, Sierra Madre Mts., near Monterrey, 6000′, July 6, 1933, *C. H. & M. T. Mueller* 479 (F, G); Hacienda Pablillo, Galeana, Aug. 1, 1936, *Taylor* 35-A (F, M); "Cieneguillas," Pablillo, southeast of Galeana, 2400–2500 m., June 28–30, 1934, Pennell 17143 (US); Sierra Madre Mts. Monterrey 2500–4500′, July 18, 1933, *C. H. & M. T. Mueller* 480 (F, G); San Agustín, Monterrey, 800 m., Aug. 1911, *Abbon* 6419 (US). COAHUILA: Lerios, 45 miles east of Saltillo, 10,000′, July 10–13, 1880, *Palmer* 137 (G, US); (central) sprawling on oak-clad slope, western side of Potrero de la Mula, about 20 km. N. W. of Ocampo, on the escarpment near the mines, Sept. 18, 1941, *I. M. Johnston* 9241 (G); 9 kilo. south of Parras on Sierras Negras, 2400 m., July 3, 1941, *Stanford, Retherford & Northcraft* 138 (G); Del Carmen Mts., Aug. 9, 1936, *Marsh* 562 (F); road to Diamante, Sa. Zapalinamé, 6600′, Aug. 31, 1938, *Shreve* 8536 (US); in arroyo on south slope of mountain, 24 kilo. northwest of Fraile, 2900 m., July 15, 1941, *Stanford, Retherford & Northcraft* 379 (G); moist stream-side, Canyon de Sentenela on Hacienda Piedra Blanca, Sierra del Carmen, July 8, 1936, *Wynd & Mueller* 587 (G, M, NY); Saltillo, 5300′, Aug. 24, 1926, *Fisher* 213 (US); Saltillo and vicinity, June 1898, *Palmer* 329 (F, G, M, US); Saltillo, 1600 m., 1911, *Arsène* 6347 (US). SINALOA: in partial shade of trees and shrubs, Ocurahui, Sierra Surotato, Sept. 1–10, 1941, *Gentry* 6291 (G). SAN LUIS POTOSÍ: oak woods, Sierra Alvarez, Alvarez, 2200–2400 m., July 30–31, 1934, *Pennell* 17881 (US). ZACATECAS: near Plateado, Sept. 2, 1897, *J. N. Rose* 3635 (US). HIDALGO: Jacala, Nov. 13, 1937, *Kenoyer* s. n. (M); oak woods near Real del Monte, July 19, 1905, *Rose, Painter & Rose* 8675 (NY, photograph, G, type of *G. regale* Rydb.; G, US, isotypes); Tulancingo, Aug. 26, 1893, *Nelson* s. n. (US). JALISCO: moist places beside stream, barranca southeast of Ciudad Guzman, Oct. 22, 1940, *Moore* 153 (G). MICHOACAN: Cerro Tancitaro, Dist. Tancitaro, 11,000′, Aug. 19, 1940, *Leavenworth* 693 (F, G); Patzcuaro, Oct. 29, 1895, *C. & Ed. Seler* 1192 (G, US); hills of Patzcuaro, Nov. 21, 1890, *Pringle* 3350 (F, G, P, US); pine forest, Sierra Torricillas, Dist. Coalcoman, Oct. 4, 1937, *Hinton* 15265 (G); in grass in open pine forest, Sierra Torricillas, Dist. Coalcoman, 2280 m., Oct. 11, 1938, *Hinton* 12344 (G); open pine forest, Zitácuaro-Cacique, Dist. Zitácuaro, 3325 m., Aug. 29, 1938, *Hinton* 13174 (G); Carrindapaz, vicinity of Morelia, 2200 m., Nov. 8, 1911, *Arsène* 6079 (G, M, US) and 16 in part (F); vicinity of Morelia, 1900 m., Oct. 15, 1909, *Arsène* 3116 (M, NY, US); Jardín del Colegio del Sagrado Corazón, 1850 m., Oct. 27, 1909, *Arsène* 3353 (G, M, US); Quinceo, vicinity of Morelia, Feb. 1910, *Arsène* 60 in part (F); Rincon, Morelia, Sept. 24, 1910, *Arsène* s. n. (F); talus, Morelia, Aug. 7, 1910, *Arsène* s. n. (F); intereur prison, Morelia, 1870 m., Oct. 10, 1909, *Arsène* 7285 (US). MÉXICO: Chalco region, Oct. 4, 1921, *Kempton & Collins* s. n. (US); by the water, Ocotepec, Dist. Temascaltepec, 1500 m., Dec. 7, 1932, *Hinton* 2891 (G, M); shaded banks of ditches, km. 68 on road from D. F. to Toluca, Oct. 2, 1940, *Moore* 77 (G); bankings above ditches, near Rio Lerma, road from D. F. to Toluca, Oct. 4, 1940, *Moore* 84 (G); Cumbre, Dist. Temascaltepec, Nov. 4, 1934, *Hinton* 6811 (G); Cumbre de Tejupilco, Dist. Temascaltepec, Nov. 22, 1934, *Hinton* 7019 (F, G, M, NY); Amecameca, 8600′, Aug. 1904, *Kuntze* 23688, in part, (NY). DISTRITO FEDERAL: frequent along borders, El Rosario, Aug. 20, 1936, *MacDaniels* 692 (F); Pyramid of Cuicuilco, Tlalpam, 7400′, Aug. 15, 1935, *MacDaniels* 73 (F); Pedregal de San Angel, Sept.–Oct., 1930, *Lyonnet* 681 (NY, US). GUERRERO: Pilas, Dist. Mina, 1600 m., Sept. 20, 1937, *Hinton* 10690 (G). VERA CRUZ: in graminosis prope Jalapam et in monte Serro Colorado, Aug., 1828 (?) *Schiede* 463 (US); Pic d'Orizaba, 11,500′, 1840, *Galeotti* 4019 (US). TLAXCALA: Sta. Ana Chiautempan, Nov. 10, 1908, *Arsène* 1713 (G, US) and Oct. 9, 1909, *Nicolas* s. n. (G, NY). PUEBLA: Salto Chico in convalli regio Huauchinango, 1100 m., Feb. 17, 1932, *Fröderström & Hultén* 858 (F); Rancho Posadas, 2194 m., Sept. 20, 1909, *Arsène & Nicolas* 338 (G, M, NY, US); jardin abandonné, 2111 m., Aug. 30, 1906, *Arsène* 440 (US); près l'Hacienda Sta. Barbara, barranque de L'Alseseca, Aug. 16, 1907, *Arsène* 1387 (US); route de Cholula, 2170 m., Aug. 27, 1907, *Arsène* 2317 (M, US); San Balthazar près de Puebla, Sept. 20, 1909, *Nicolas* s. n. (G, NY); Rancho Rosadas près de Puebla, Sept. 10, 1909, *Nicolas* s. n. (NY); Bord de l'Atoyác, Sept. 20, 1909, *Nicolas* 62 (F). OAXACA: vicinity of La Parada, 7500–8500′, Aug. 19, 1894, *Nelson* 1039 (G, US); Sierra de San Felipe, 10,000′, Aug. 28, 1894, *Smith* 654 (M, US); Sierra de San Felipe, 10,000′, Aug. 28, 1894, *Pringle* 5732 (G, US); vicinity of Cerro San Felipe, 9500–11,000′, 1894, *Nelson* 1078 in part (US); Oaxaca, 7500′, Sept. 1840, *Galeotti* 4029 (US); Juquila, 7–8000′, Sept., 1840, *Galeotti* 4024 (LECTOTYPE at Geneva, photograph F; ISOLECTOTYPE, US). CHIAPAS: meadows near Fenia, Apr. 1905 (?), *Purpus* 340 (US); without locality, 1864–70, *Ghiesbreght* 731 (G); near San Cristobal, 7000–8000′, Sept. 18, 1895, *Nelson* 3154 (NY, US).

The name *G. mexicanum* has been applied in a broad sense by most authors to the variable small-flowered species of Mexico. An examination of the type-description and a photograph of the type at Paris shows the misapplication of this name. Salient parts of the description: "Herba suboctopollicaris. Caulis erectus . . . Flores . . . magnitudine floris Geranii phaei . . . Petala . . . obovata, reticulato-nervoso . . . calyce duplo longiore" define a species of erect habit with large, reticulate-veined petals of an entirely different nature from the ascending species with long stems and small, very slightly reticulate petals. As has been noted previously, the type-photograph is an exact match for the later *G. temascaltepecense* Knuth, showing the erect stems, large, reticulate-veined petals and deeply divided, reniform leaves with broad sinuses.

Geranium Seemanni is the first name that can be applied definitely to the species that has passed as *G. mexicanum*. *Heller* 325, 258, 273 from Toluca, *Berlandier* 829, *Galeotti* 4024 and 4019 (Pic d'Orizaba on the sheet in the U. S. National Herbarium) from Oaxaca were cited by Peyritsch in his description, the Galeotti and Berlandier collections representing a large-flowered form.[16] Briquet later described two varieties, var. *minoriflorum* and var. *macranthum*,[17] the former based on *Galeotti* 4019 and 4029, the latter on *Galeotti* 4024. Briquet's varieties are based on the size of the petals, a character that varies within a single collection, and they do not seem well founded in the light of the general variability of this species as I understand it.

The Heller collections were not seen by Briquet nor have they been available for this study. However, for purposes of affixing the name, I have selected *Galeotti* 4024. The older descriptions lacked much of the detail that is necessary to distinguish among the several small-flowered species of Mexico, but the Galeotti specimen fits the description well and it seems well to fix the name for future clarity.

As previously noted, there is considerable variation throughout the range of this species but, without a better knowledge of distribution and the stability of phases, the description of minor variations would only add to the confusion. The typical phase represented by *Galeotti* 4024 is a rather coarse, hirsute, large-leaved form most common in the central region. Northward, this phase grades imperceptibly into a more slender one with a less glandular pubescence, longer, more slender peduncles, smaller leaves and a more coarsely reticulate seed (*Palmer* 329). *G. regale* Rydb. seems to be an expression of this tendency. This species was described as having the pedicels without glandular hairs but the type-sheet shows some with glands upon close inspection. The leaves are small and the peduncles slender. A third phase is seen in *Mueller* 2199 with petals up to 10 mm. long, the peduncles distinctly longer than average and the leaves small and usually three-lobed.

[16] Linnaea **30**: 66, 67 (1859).
[17] Ann. Cons. et Jard. Bot. Genève **11**, **12**: 190 (1908).

The pale, lavender-pink or darker petals with usually three dark veins and slightly notched apices, the broad, shallowly toothed leaf-lobes and rather dense pubescence set *G. Seemanni* apart from *G. subulato-stipulatum* and *G. Kerberi*. *G. vulcanicola* and *G. guatemalense* are very closely related. The former has very small, nearly white flowers and a style-beak not exceeding 1 mm. in length, while the latter is generally more slender with the stems procumbent or ascending, attaining a length of two meters and having the cauline leaves more finely toothed or incised with acute segments. *G. Seemanni* is more or less common throughout elevated regions of Mexico and *G. guatemalense* from Guatemala to Panamá.

36. G. GUATEMALENSE Knuth. emend. (PL. 3, FIG. 13). Perennial: root fibrous, woody-fibrous or woody: stems 1 dm.–2 m., long, erect when young, ascending or procumbent with ascending branches in age; lower part branched, moderately stout to mostly slender, often dark in color, sparsely to moderately densely pilose or hirsute; upper part slender, sparsely to densely long-pilose, branched, indeterminate: basal leaves few to numerous, not long-persistent; petiole sparsely pilose or hirsute to densely so beneath the blade; blade 3–6 cm. wide, pentagonal in outline, darker above than below, erect- or appressed-hirsute above, spreading-hirsute or long-pilose on the veins and veinlets below, divided one-half to two-thirds to the base into 5 nearly equal, broad-rhombic lobes; lobes twice-cleft and closely toothed above the middle with short, acute, lanceolate segments; lateral lobes often with a basal lobelet: cauline leaves numerous; blade 1.5–6 cm. wide, pentagonal to often nearly deltoid in outline, similar to that of the basal leaf in color and pubescence, divided often three-quarters to the base into mostly 3 lobes; lobes rhombic, nearly equal, sharply cleft and toothed or toothed toward the apex; median lobe broad; lateral lobes with a basal lobelet: cauline stipules 5–8 mm. long, subulate, sometimes cleft, minutely pubescent and ciliate: peduncles 1–3.5 or rarely 5 cm. long, long-pilose to copiously glandular, 2-flowered, single and axillary or tending to aggregate in loose cymes at the tips of older branches: pedicels 5–15 mm. long, copiously glandular or pilose, erect in fruit: outer sepals 5–6 mm. long, awned; body 4.5–5 mm. long, enlarged in fruit, ovate-lanceolate, 3-veined; veins and margins glandular; awn 0.5–1 mm. long: petals 6–7 mm. long, 2–3 mm. wide, pale-lavender with lilac, very slightly reticulate veins, narrow-obovate; apex entire or usually shallowly notched: stamen-filaments shorter than the sepals, not exserted

in fruit: fruit 18–20 mm. long; style-beak 1.5–2 mm. long; style-column hispidulous and glandular; carpel-body 3 mm. long, hirsute or glandular: seed 2–2.5 mm. long, black or deep-brown, shallow-reticulate to deep-reticulate, reticulations elongate or nearly isodiametric.—Engler, Pflanzenr. **4** fam. **129:** 200 (1912). LECTOTYPE: *Heyde & Lux* 2914, at Berlin (not seen).—GUATEMALA: without locality, 1892, *Heyde* 160 (US). SAN MARCOS: shaded ravine slopes: upper south-facing forested slopes of Volcán Tajumulco between Las Canojas and top of ridge, 7 mi. from San Sebastian, 3300–3900 m., Feb. 16, 1940, *Steyermark* 35875 (F); in shade by water trickling down slope, along road between San Sebastian at km. 21 and km. 8, 8–18 miles northwest of San Marcos, 2700–3800 m., Feb. 15, 1940, *Steyermark* 35638 (F); and in open thickets, 35674 (F); moist cliff banks, barrancas 6 miles south and west of town of Tajumulco, northwest slopes of Volcán Tajumulco, 2300–2800 m., Feb. 26, 1940, *Steyermark* 36611 (F); above Río Tacaná, near San Antonio, about 2700 m., Feb. 22, 1939, *Standley* 66119 (F). HUEHUETENANGO: Jacaltenango, 3500–5400′, Dec. 18–19, 1895, *Nelson* 3583 (US); Todos los Santos, Sept. 11, 1896, *C. & Ed. Seler* 3189 (G); Huehuetenango, 1890 m., Jan. 14, 1939, *Standley* 62597 (F). QUETZALTENANGO: damp, dense forest, mts. southeast of Palestina, 2700 m., Feb. 22, 1939, *Standley* 66330 (F); Volcan Santa Tomas, 2500–3700 m., Jan. 22, 1940, *Steyermark* 34732 (F); ravine below Fuentes Georginas, just above Zunil, 2500 m., Jan. 20, 1940, *Steyermark* 34485 (F); Volcan Zunil, 2500–3800 m., Jan. 22, 1940, *Steyermark* 34749 (F). TOTONICAPÁN: "Aguju del diablo," Sept. 1940, *Margaret Lewis* 930 (F). EL QUICHÉ: San Miguel Uspantán, 6000′, Apr., 1892, *Heyde & Lux* 2914 (G, M, US, ISOLECTOTYPES). CHIMALTENANGO: Alameda, Sept. 22, 1936, *J. R. Johnston* 4 (F); near Finca La Alameda near Chimaltenango, 1830 m., Dec. 7, 1938, *Standley* 59133 (F); Barranca de la Sierra, southeast of Patzun, 2100 m., Dec. 31, 1938, *Standley* 61503 (F); Tecpán, 1800 m., Nov. 1929, *Morales* 1284 (F); Tecpán, 1930, *Palm* 115 (F); oak-pine forest, Chichavac, 2400–2700 m., Nov.–Dec., 1930, *Skutch* 15 (US). SACATEPÉQUEZ: Volcán Agua, 9000′, Feb. 15, 1905, *Kellerman* 4743 (US); hills of Finca Carmona, southeast of Antigua, 1590–1800 m., Jan. 27, 1939, *Standley* 63795 (F); Cuesta de las Cañas, above Antigua, 1950 m., Dec. 6, 1938, *Standley* 58945 (F); slopes of Volcán de Agua, south of Santa María de Jesús, Dec. 10, 1938, *Standley* 59456 (F); Volcán Acatenango, 8000′, Aug. 1892, *Shannon* 3653 (G, US); moist ditches in shade, by finca northwest of Antigua, Nov. 18, 1940, *Moore* 301 (G). GUATEMALA: damp forest, Volcan de Pacaya, above Las Calderas, 1800–2400 m., Nov. 30, 1938, *Standley* 58422 (F); in field of

Tripsacum fasciculatum, Barbarena—El Salvador road from Guatemala City, Nov. 17, 1940, *Moore* 285 (G);. Alta Verapaz: Cobán, 1350 m., Nov. 1907, *Tuerckheim* II 645 (F, US); near Cobán, 1260–1440 m., Mar. 26–Apr. 15, 1939, *Standley* 71491 (F); Cobán, 4300′, Mar. 1886, *Tuerckheim* 884 (G, US); Cobán, 1400 m., Oct. 1902, *Tuerckheim* 8187 (G, US). Jutiapa: Volcán Suchitán, northwest of Asunción Mita, 600–2050 m., Nov. 18, 1939, *Steyermark* 31946 (F). Jalapa: between Miramundo and summit of Montaña Miramundo, between Jalapa and Mataquescuintla, 6 miles south of Miramundo, 2000–2500 m., Dec. 5, 1939, *Steyermark* 32720 (F). Chiquimula: middle slopes of Montaña Norte to El Jutal, on Cerro Brujo, southeast of Concepcion de las Minas, 1700–2000 m., Nov. 2, 1939, *Steyermark* 30985 (F). EL SALVADOR: moist thicket, rim of crater, Volcán de San Salvador, 1000–1800 m., Apr. 7, 1922, *Standley* 22941 (US). COSTA RICA: Toblazo, 1800 m., Jan. 23, 1935, *Valerio* 1018 (F); Palmira, region of Zarcero, 5600′, Oct. 18, 1937, *A. Smith* A 533 (F); pâturages à Palmira del Naranjo, 1825 m., Apr. 1921, *Brenes* 3525 (F). Alajuela: clairières de l'achiote (Poas), 2200 m., Oct., 1896, *Tonduz* 10293 (US); pâturages de Rancho Flores, Feb. 22, 1890, *Tonduz* 2124 (F, US); Viento Fresco, 1600–1900 m., Feb. 13, 1926, *Standley & Torres* 47891 (US); La Palma de San Ramon, 1150–1200 m., Oct. 26, 1927, *Brenes* 5772 (F). San José: murs de Santa Rosa du Copey, 1800 m., Apr., 1898, *Tonduz* 12248 (US); moist oak forest near Quebradillas, about 7 km. north of Santa María de Dota, 1800 m., Dec. 24, 1925, *Standley* 43034 (US); in dense oak and bamboo forest near Laguna de la Escuadra, northeast of El Copey, 2000–2200 m., Dec. 16, 1925, *Standley* 41985 (US); vicinity of Santa María de Dota, 1500–1800 m., Dec. 14–26, 1925, *Standley* 41785 (US); brushy slope, Cerro de Piedra Blanca above Escasú, Jan. 31, 1924, *Standley* 32584 and 32478 (US); potreros of Rancho Redondo, 2220–2600 m., Nov. 19, 1929, *Dodge & Thomas* 4925 (F, M). Cartago: caillis sur les collines d'Ochomogo, 1600 m., Nov., 1898, *Pittier* 13019 (US); summit ridge of La Carpintera, 2000 m., Dec. 1, 1937–Jan. 1, 1938, *Allen* 645 (F, M); environs de Cartago toward the Atlantic, 1417 m., Oct., 1894, *Biolley* 8993 (US); in potrero, Cerro de La Carpintera, 1500–1850 m., Feb. 1, 1924, *Standley* 34218 (US); northwest slope, Cerro Carpintera, above La Union de Tres Ríos, 1460–1700 m., Nov. 1, 1929, *Dodge & Thomas* 4793 (G); slope of Cerro Carpintera, above La Union de Tres Ríos, 1350–1500 m., July 1, 1936, *Dodge & Goerger* s. n. (M). PANAMÁ: vicinity of "New Switzerland," central valley of Rio Chiriquí Viejo, 1800–2000 m., Jan. 6–14, 1939, *Allen* 1380 (F, G, M); common in clearings, vicinity of Casita Alta, Volcán de Chiriquí, 1520–2000 m., June 28–July 2, 1938, *Woodson, Allen & Seibert* 893 (M); near El Volcán, Rio Chiriquí Viejo valley, July 20, 1938, *White* 183 (G, M); rain forest, near Bajo Chorro, Boquete Dist., Prov. Chiriquí, Feb. 17, 1938, *Davidson* 303 (F, M).

In describing *G. guatemalense,* Knuth cited the following collections: *Heyde & Lux* 2914, *C. & Ed. Seler* 2940 and 2351. Material of the first and last is available in the Gray Herbarium and a comparison shows them to be quite distinct, although Knuth's description is broad enough to include both.

Choosing *Heyde & Lux* 2914 as the type, it becomes necessary to redefine the species and to associate many of the collections cited by Knuth as *G. mexicanum* var. *minoriflorum* with the name *G. guatemalense.* As I define it, the species resembles *G. Seemanni* of Mexico and *C. & Ed. Seler* 2351 must be referred to *G. repens,* having narrow, more deeply toothed leaf-lobes, longer peduncles and a style-beak 3 mm. in length. Material of the other number cited has not been available.

G. guatemalense and *G. Seemanni* are very close in general floral characters, differing chiefly in habit and leaf-characters. The stems of *G. guatemalense* are generally less robust than those of *G. Seemanni* and of procumbent habit in open areas or ascending in thickets and often reaching a length of over two meters. A thickish, woody root is developed in age. A marked difference in leaf-cutting is the most obvious point of distinction. The lobes of *G. guatemalense* are finely cleft and toothed with short, acute segments which contrast with the broader, obtuse segments of *G. Seemanni.* Both have short peduncles, petals seldom exceeding 8 mm. in length, style-beak not more than 2 mm. long and broad-rhombic leaf-lobes, at least on the basal and lower cauline leaves.

This species, variable as are other species of the series, has a geographic separation from the majority of those included in series *Vulcanicola.* Specimens referable to *G. guatemalense* occur throughout Guatemala and down the Cordillera to Volcán Chiriquí in Panama. The only other species of this series occurring in Guatemala, *G. culminicola,* is distinct in characters of the leaf, flower and habit, and is restricted to the northern part of the country.

37. G. VULCANICOLA Small in Hanks & Small (PL. 1, FIG. 4). Perennial: root fibrous, or woody-fibrous: stems 1–9 dm. long, erect when young, spreading to procumbent with ascending branches in age; lower part branched, slender to seldom stout, sparsely to densely short-pilose, hispid or sometimes strigose; upper part very slender to seldom moderately stout, densely long-pilose or hirsute and short-pilose or seldom only short-pilose, sometimes glandular, branched, indeterminate: basal leaves few, not long-persistent; petiole 3–6 cm. long, rather densely pilose, especially below the blade; blade 1.5–2 to seldom 6 cm. wide, reniform in outline, thin, slightly darker above than below, short- to long-pilose above, spreading-pilose on the veins and veinlets below, divided one-half to two-thirds to the base into 5 nearly equal, cuneate-obovate lobes; lobes toothed at the apex with short, ovate-lanceolate or oblong-lanceolate segments: cauline leaves numerous; petiole 1–5 or rarely to 12 cm. long, rather densely long- and short-pilose; blade 1–3 or rarely to 5 or 7 cm. wide, deltoid or pentagonal in outline, pilose above and on the veins below, divided two-thirds to six-sevenths to the base into 3 lobes; lobes toothed from the middle to the apex with short, ovate-lanceolate to oblong-lanceolate, often mucronulate segments; median lobe wide-rhombic, often longer and wider than the lateral lobes; lateral lobes often with a small basal lobelet: cauline stipules 3–7 mm. long, linear-lanceolate, minutely pubescent and ciliate, often reddish: peduncles 1–2.5 cm. long, densely short-pilose or sometimes long-pilose and often glandular, very slender, 2-flowered, single and axillary or tending to be aggregated in loose cymes at the tips of older branches: pedicels 2–12 mm. long, copiously puberulent and glandular, often nearly capillary, erect in fruit: outer sepals 4–5 mm. long, awned; body 3.5–4.5 mm. long, enlarged in fruit, 3-veined, glabrous or stipitate-glandular with short, spreading, often red-tipped, glandular hairs on the veins and margins; awn 0.25–1 mm. long: petals 3.5–6 mm. long, 2–3 mm. wide, white to delicate pink with 3–5 darker, only slightly reticulate veins or the veins inconspicuous, narrow-obovate; apex often notched; base sparsely short-pilose: stamen-filaments shorter than the sepals, white, ciliate only at the very base: fruit 14–18 mm. long; style-beak 1 mm. long or less, the branches usually appressed; style-column stout, puberulent or glandular, terminating rather abruptly in the short beak; carpel-body 2.5–3 mm. long, dull-green, pilose: seed 2 mm. long, black or brown-black, finely reticulate with elongate reticulations.—N. Am. Fl. **25:** 12 (1907). TYPE: *Purpus* 1691, NY (seen).—Vera Cruz to Michoacan.—MEXICO: MICHOACAN: Quinceo, vicinity of Morelia, 2800 m., Nov. 11, 1909, *Arsène* 3231 (M, NY, US). MÉXICO: Telapón, July 1930,

Lyonnet 681 (G, M); under pines on moist slope, Monte Río Frío, km. 56–57 on road to Puebla, Sept. 29, 1940, *Moore* 44 (G); on llano, Crucero Agua Blanca, Dist. Temascaltepec, 3170 m., Aug. 1933, *Hinton* 4621 (US); meadows above timberline, Ixtaccihuatl, Oct. 1905, *Purpus* 1691 (NY, TYPE; M, US, in part, ISOTYPES). DISTRITO FEDERAL: field, km. 35 on road to Toluca, Oct. 4, 1940, *Moore* 78a (G); grassy slopes about stream in fir forest, km. 27.5 on road to Toluca, Oct. 2, 1940, *Moore* 66 (G); Cima Station, 9800′, Aug. 30, 1905, *Pringle* 10020 (F, G, M, NY, US); Desert of the Lions, July 8, ?, *Plunkett* 29 (F); moist soil under trees, El Desierto de las Leones, 9000′, Aug. 18, 1935, *MacDaniels* 89 (F). VERA CRUZ: Orizaba, *Botteri* 389 (F, US); Orizaba, 1853, *Müller* s. n. (NY); Mt. Orizaba, 8500–9000′, July 25–26, 1901, *Rose & Hay* 5696 (NY, US); Mt. Orizaba, 10–11,000′, Aug. 5, 1891, *Seaton* 176 (F, G, US).

G. vulcanicola is one of the critical species related to *G. Seemanni*, very distinct in the field but often separated with difficulty in the herbarium due to the shrinkage and fading color of the petals of the latter species. The flowers are the smallest of the group, the petals seldom reaching a length of 6 mm. and of delicate pink or white color with pale veins. The pedicels are usually very slender, almost capillary, and copiously glandular and puberulent. The peduncles are short and often densely pilose, resembling those of *G. Seemanni* in this character.

Characters of the leaf are also similar to those of *G. Seemanni*. The median lobe is long, broadly rhombic, and shallowly toothed at the apex; the lateral lobes are shorter and narrower. The basal leaves are five-lobed but those of the stem are always three-lobed.

The easiest way to separate this species in the herbarium is by the very short style-beak. In this respect, *G. vulcanicola* differs from closely related species.

G. flaccidum of Baja California is similar in petal-size but the petals are magenta and the style-beak is longer.

The range of this species indicates a name aptly applied. It is found on the peaks of Orizaba, Ixtaccihuatl and the higher summits between the Valley of Mexico and the Valley of Toluca. In the latter locality, it grows in rather open glades in damp fir forests. Associated with it was *G. Kerberi* which prefers similar conditions.

38. G. FLACCIDUM Small in Hanks & Small (PL. 3, FIG. 14). Perennial: root woody or woody-fibrous: rhizome moderately stout, long, vertical in old plants, absent in young plants: stems 2–3 dm. long, procumbent to spreading, sometimes many together from tufted rhizomes; lower part branched or simple, slender to moderately stout, rather densely strigose or hirsute, sometimes red or deep-brown; upper part slender, densely and often retrorsely long-pilose or hirsute, simple or branched, indeterminate: basal leaves few, not long-persistent; petiole 3–4 cm. long, hirsute and hispid; blade similar to that of the lower cauline leaves: cauline leaves numerous; petiole 1–5 cm. long, slender, hirsute and hispid; blade of the lower cauline leaves 2.5–3 cm. wide, pentagonal in outline, moderately thick, darker above than below, densely hirsute above and below, divided nearly to the base into 3–5 nearly equal, divergent, rhombic or cuneate-obovate lobes; lobes cleft and toothed or toothed above the middle with moderately long, lanceolate segments; if 3-lobed, lateral lobes with a basal lobelet; blade of the upper cauline leaves 1–3 cm. wide, nearly deltoid in outline, less densely hirsute, 3-lobed; median lobe long, narrow-rhombic, toothed with long, lanceolate segments; lateral lobes often with a basal lobelet, their bases straight and nearly at right angles to the petiole: cauline stipules 3–5 mm. long, linear-lanceolate and apiculate, pubescent and ciliate: peduncle 1.5–5 cm. long, very slender, rather densely hirsute or pilose and hispid, occasionally glandular, 2-flowered, single and axillary: pedicels 5–12 mm. long, pilose and hispid or densely glandular, erect or slightly divaricate in fruit, not geniculate: outer sepals 4.5–5 mm. long, awned; body 3.5–4.5 mm. long, ovate-lanceolate or elliptic-lanceolate, 3-veined or the veins indistinct, hispid; veins and margins hirsute and/or glandular; awn 0.5–1 mm. long: petals 5 mm. long, 2 mm. wide, carmine or magenta, obovate; apex mostly emarginate: stamen-filaments shorter than the sepals, not exserted in fruit: fruit 16–20 mm. long; style-beak 1.5–2 mm. long; style-column slender, hispid or glandular and minutely pubescent; carpel-body 3 mm. long, hirsute: seed 2 mm. long, brown, plump, shallowly reticulate, reticulations elongate.—N. Am. Fl. **25:** 11 (1907). TYPE: *Brandegee* s. n., NY (seen).—Baja California.—MEXICO: BAJA CALIFORNIA: La Chuparosa, Oct. 16, 1893, *Brandegee* s. n. (NY, TYPE; US ISOTYPE); The Laguna, La Laguna Mts., Sept. 22, 1930, *Jones* 27041 (NY, P).

Geranium flaccidum is a weak-stemmed perennial with the slender stems procumbent or spreading and often closely aggregated from tufted rhizomes and a thick, woody root. On the upper parts, the typical pilose pubescence of *G. Seemanni* occurs.

The leaves resemble those of *G. Kerberi* but are smaller with narrower lobes. The petals are mostly emarginate, deep carmine or magenta and of small size, comparable to those of *G. vulcanicola.* This species is endemic to Baja California.

39. G. **culminicola,** sp. nov. (PL. 3, FIG. 20; PL. 5, FIG. 8), herba perennis: radice ligneo-fibroso: rhizomate crasso: caudice ramoso: caulibus pluribus, 3 dm. longis, procumbentibus, ramosis, inferne subtiliter pubescentibus, superne pilosis, interdum glanduloso-pilosis: foliis basalibus paucis, mox deciduis; petiolo brevi; lamina eae foliorum caulinorum simili: foliis caulinis numerosis; petiolo 1–5 cm. longo, dense breviterque piloso; lamina pentagona, 1.5–3 cm. lata, crassa, supra saturate viridi, sparsim vel dense pilosa, subtus pallidiore, longe pilosa vel hirsuta, ½–⅘ ad basin 5-lobata; lobis subaequalibus, rhomboideis, dentatis; dentibus longe oblongo-lanceolatis; vel 3-lobata, lobis lateralibus lobulo basali ornatis: stipulis ovato-lanceolatis, fuscis, puberulentibus: pedunculo 2.5–4.5 cm. longo, breviter piloso, interdum glanduloso-pilosoque, bifloro, axillari: pedicellis 5–12 mm. longis, copiose breviterque glanduloso-pilosis: sepalis exterioribus 5–6 mm. longis, mucronatis mucrone 0.5 mm. longo, ovatis, 3-nervatis, saepe rubidis, subtiliter pubescentibus; venis glanduloso-pilosis: petalis 8–9 mm. longis, 4–5 mm. latis, albis vel pallide roseis, venis purpureis manifeste percursis non conspicue reticulatis, anguste obovato-obcordatis, glabris; apicibus profunde incisis; basi sparsim pilosis: staminibus calycem non aequantibus: fructu 17–22 mm. longo; stigmatibus 1.5 mm. longis; columna stylorum gracili, dense breviterque glanduloso-pilosa; carpello 3 mm. longo, hirsuto glanduloso-pilosoque: semine 2 mm. longo, crasse reticulato.

Perennial: root woody-fibrous: rhizome stout: caudex branched: stems about 3 dm. long, prostrate, several from the caudex; lower part branched, robust, often reddish, finely puberulent to pilose; upper part moderately robust, densely puberulent to pilose and occasionally sparsely glandular, branched, indeterminate: basal leaves few, not long-persistent; blade similar to that of the cauline leaves: cauline leaves numerous: petiole 1–5 cm. long, mostly densely short-pilose; blade 1.5–3 cm. wide, pentagonal in outline, moderately thick, sparsely to mostly densely pilose and dark-green above, somewhat lighter and longer pilose to hirsute below with the veins and margins often reddish, divided one-half to four-fifths to the base into 3–5 nearly equal, rhombic lobes; lobes deeply pinnatifid-toothed with moderately long, lanceolate to oblong, obtuse segments; if 3-lobed, the lateral lobes usually with a prominent basal lobelet: basal stipules 6–8 mm. long, ovate-lanceolate, free, dark-brown, pubescent: cauline stipules 4–8 mm. long, ovate-lanceolate, brown, puberulent: peduncle 2.5–4.5 cm. long, short-pilose and sometimes short-glandular, 2-flowered, single and axillary: pedicels 5–12 mm. long, copiously short-pilose and glandular, erect in fruit: outer sepals 5–6 mm. long, awned; body 4.5–5.5 mm. long, ovate, 3-veined, usually reddish, minutely pubescent; veins prominent, often deep red with glandular hairs; awn 0.5 mm. long: petals 8–9 mm. long, 4–5 mm. wide, white to pink with purple veins, narrow-obcordate, glabrous; veins not reticulate; apex deeply notched; base very shortly pilose: stamen-filaments shorter than the sepals, yellowish, not exserted in fruit; anther 1.2 mm. long, oval, light-brown: fruit 17–22 mm. long; style-beak 1.5 mm. long; style-column slender, densely short-pubescent and glandular; carpel-body 3 mm. long, greenish-black, hirsute and glandular: seed 2 mm. long, black, plump, coarsely reticulate.—Guatemala.—GUATEMALA: QUETZALTENANGO: open summit, Volcán Santa María, 12,400′, July 26, 1934, *Skutch* 841 (G, TYPE; F, ISOTYPE); old cornfield, San Mateo, 2520 m., Feb. 22, 1939, *Standley* 66051 (F). CHIMALTENANGO: open forest above Las Calderas, 1800–2100 m., Dec. 15, 1938, *Standley* 60013 (F); open pine forest with tussock grass, slopes of Volcán de Acatenango, above Las Calderas, 2700–2900 m., Jan. 3, 1939, *Standley* 61871 (F).

The short, prostrate stems of *G. culminicola* form spreading mats and are generally stoutish with short internodes. Because of its habitat, open places on volcanic peaks, I have named it the "summit dweller."

This species is close to *G. guatemalense* but differs strongly in habit, the stems of the latter being slender and long. The petals are more deeply notched at the apex and longer than is usual in *G. guatemalense*. Pubescence is variable but is usually a dense indument of short hairs. The leaf-blades are small, deeply divided and with much longer, obtuse teeth.

In most characters, *G. culminicola* is nearer *G. Kerberi* of central Mexico but the pale, deeply notched petals are distinctive and the species appears to be rather local in distribution.

40. G. SUBULATO-STIPULATUM Knuth (PL. 3, FIG. 19). Perennial: root fibrous or woody-fibrous: stems 1.5–8 dm. long, erect when young, ascending in age; lower part branched, mostly stout, glabrate to mostly sparsely strigose or pilose, often red-purple or red-brown in color; upper part moderately robust to slender, rather densely short-pilose and usually glandular to seldom long-pilose or strigose, branched, indeterminate: basal

leaves few, not long-persistent; petiole up to 16 cm. long, sparsely pilose; blade 4–7 cm. wide, reniform in outline, radiate, thickish, slightly darker above than below, glabrous to pilose above, spreading-pilose or strigose on the veins below, divided two-thirds to the base into 5- rarely 7 nearly equal, cuneate-obovate lobes; lobes cleft and toothed at the apex with long, oblong-lanceolate segments; median lobe with the sides concave: cauline leaves numerous; petiole 1–7 or rarely up to 10 cm. long, stout, strigose, pilose or usually densely short-pilose and glandular; blade of the lower cauline leaves 4–6 cm. wide, pentagonal or rarely nearly orbicular in outline, radiate, thickish, somewhat lighter below than above, glabrous to pilose above, strigose or spreading-pilose on the veins below, divided three-fourths to the base into 5 nearly equal, cuneate-obovate or rhombic lobes; apex of the lobes bluntly cleft and toothed above the middle with long, ovate-lanceolate or oblong-lanceolate segments; median lobe with the basal sides concave; lower sides of the lateral lobes often nearly straight and at right angles to the petiole: blade of the upper cauline leaves similar but often 3-lobed; lobes mostly narrower and less cut with acute segments and often with glandular hairs beneath: cauline stipules 8–12 mm. long, subulate or sometimes lanceolate, thin, green or reddish, long-ciliate or sometimes the stipules much shorter and wider: peduncles 1.5–4 or rarely 6 cm. long, strigose, pilose or mostly densely short-pilose and glandular, slender, 2-flowered, single and axillary or sometimes tending to aggregate in loose cymes at the tips of older branches: pedicels 4–15 mm. long, copiously short-pilose and glandular, erect in fruit: outer sepals 4.5–5 mm. long, awned; body 4–4.5 mm. long, ovate or ovate-lanceolate, 3-veined; veins glandular or pilose; awn 0.5–1 mm. long: petals 6.5–8 mm. long, 2.5–3 mm. wide, magenta, dark-lilac or sometimes lighter with 3–5 darker, only slightly reticulate veins, obovate; apex rounded; base very shortly pilose: stamen-filaments shorter than the sepals: fruit 18–22 or rarely 22 mm. long; style-beak 1.5–2 or rarely 2.5 mm. long; style-column short-pilose and/or glandular, stoutish; carpel-body 3 mm. long, hirsute: seed 2.5–3 mm. long, black, finely and shallowly reticulate; reticulations elongate.—Engler, Pflanzenr. 4 fam. **129:** 199 (1912). LECTOTYPE: *Pringle* 7917, at Berlin (not seen).—Vera Cruz to Chihuahua.—MEXICO: CHIHUAHUA: base of Mt. Mohinora, 8 miles from Guadalupe y Calvo, 7000–7500′, Aug. 23–31, 1898, *Nelson* 4849 (G, US); rocky meadow margins, transition, pines, Memelichi, Rio Mayo, 7500′, Sept. 16, 1936, *Gentry* 2745 (F, G, M, US); cañons, Sierra Madre, Oct. 16, 1887, *Pringle* 1512 (G); Yerba Buena above Batopilas, 7000′, Nov. 1885, *Palmer* 305 (G, US). DURANGO: vicinity of the city of Durango, Apr.–Nov. 1896, *Palmer* 561 (F, G, M, US); edge of marsh, El Salto (Aserraderos), 2530–2540 m., Aug. 28, 1934, *Pennell* 18361 (US). SAN LUIS POTOSÍ: region of San Luis Potosí, 6000–8000′, 1878, *Parry & Palmer* 100 (G, US). HIDALGO: fields near Buena Vista Station, 8500′, Aug. 30, 1904, *Pringle* 11941 (F, G, US); between Somoriel and Las Lajas, Aug. 5, 1905, *Rose, Painter & Rose* 9207 (US). GUANAJUATO: Guanajuato, 1886, *Dugés* 208 (G). MÉXICO: San Miguel, Dist. Temascaltepec, 2240 m., Sept. 22, 1932, *Hinton* 1723 (G); Amecameca, 8600′, Aug. 1904, *Kuntze* 23688 (NY in part); Amecameca, 8100′, July 25, 1924, *Fisher* 295 (F, M, US); Amecameca, July 1905, *Rose, Painter & Rose* 8615 (F, G, NY, US); on banks above ditches, near Rio Lerma on road from D. F. to Toluca, Oct. 4, 1940, *Moore* 84a and 87 (G); shaded banks of ditches, km. 68 on road to Toluca, Oct. 2, 1940, *Moore* 76 (G); DISTRITO FEDERAL: Ajusco, Valley of Mexico, Aug. 9, 1905, *Rose & Painter* 9261 (NY, US); Tlalpam, Aug. 16, 1910, *Orcutt* 3637 (F, G, M); Contreras, Aug. 9, 1910, *Orcutt* 3486 (F, M); bois du canal près Mexico, July 17, 1865 (?), *Bourgeau* 273 (G, ISOPARATYPE); Valley of Mexico, 7300′, Aug. 14, 1899, *Pringle* 7917 (F, G, M, US, ISOLECTOTYPES); near Tlalnepantla, July 6, 1905, *Rose, Painter & Rose* 8390 (US). MORELOS: Cuernavaca, July 16, 1938, *Kenoyer* A 450 (F). VERA CRUZ: Orizaba, *Botteri* 389 (G); Souchil, Pico de Orizaba, 8000′, July 23, 1857, *Mohr* 55 (US); Mt. Orizaba, 10,000′, Aug. 5, 1891, *Seaton* 178 (F, G, US). PUEBLA: entre Haciendas Sta. Barbara et Cristo, sur l'Alseseca, vicinity of Puebla, 2150 m., Aug. 1, 1907, *Arsène* 9832 (M, US).

Although the subulate stipules are not always diagnostic of this species, the leaf-division and cutting is of a very distinctive nature. The median lobe is narrow, rather deeply toothed with the lower sides concave. The blades of the lower leaves are often radiate, but on the upper part of the stem, the bases of the lateral lobes are nearly straight and at right angles to the petiole.

In addition to the characteristic leaf-shape, the stems and petioles are much less pilose than in *G. Seemanni* and are usually glandular. The petals usually have rounded apices and are of a deep carmine or magenta color.

G. subulato-stipulatum may be distinguished from closely related *G. Kerberi* by the larger leaves, longer petioles and ascending habit. The plants are not compact as in the latter species but form broad masses in the open or tangles of stems in the weedy thickets in which they usually occur.

This species is distributed from the central plateau of Mexico northward to the Sierra Madre of Chihuahua. A moist soil seems favorable for its growth: most of the stations I have seen have been close to streams and ditches.

41. G. KERBERI Knuth (PL. 3, FIG. 17). Perennial: root fibrous or woody-fibrous: stems 1–15 dm. long, erect when young, procumbent with short, ascending branches in age; lower part branched, moderately stout, strigose to pilose, often dark-colored; upper part mostly slender, puberulent and thinly to densely pilose and sometimes sparsely glandular, branched, indeterminate: basal leaves few, not long-persistent; petiole 6–15 cm. long, puberulent and pilose; blade 3–6 cm. wide, reniform in outline, slightly darker above than below, appressed-pilose above, spreading-pilose on the veins below, divided two-thirds to five-sixths to the base into 5–7 nearly equal, cuneate-obovate or rhombic lobes; lobes mostly twice-cleft and toothed or pinnatifid-toothed above the middle with moderately long, oblong-lanceolate segments; median lobe with the sides concave: cauline leaves numerous; petiole 1–5 cm. long, slender, seldom longer than the blade, puberulent, sparsely to densely pilose and sometimes glandular; blade 1.5–3.5 cm. wide, similar to that of the basal leaf but smaller or 3-lobed; median lobe cuneate with concave sides; lateral lobes usually with a small basal lobelet, the lower sides straight and nearly at right angles to the petiole; lobes less coarsely cleft with moderately long, ovate-lanceolate segments, sometimes nearly glabrous above and long-pilose below: cauline stipules 1–2.5 mm. long, linear-lanceolate, acute, dark-brown, shortly pilose and ciliate: peduncle 1–2.5 or rarely 4 cm. long, puberulent, pilose and often glandular, 2-flowered, single and axillary: pedicels 4–12 mm. long, puberulent, short-pilose and usually copiously glandular, erect in fruit: outer sepals 4–5 mm. long, awned; body 3.5–4.5 mm. long, enlarged in fruit, ovate-lanceolate, 3-veined; veins and margins short-glandular; awn 0.5–1 mm. long: petals 6–7 mm. long, 2.5–3 mm. wide, magenta, lilac or sometimes paler with darker, only slightly reticulate veins; apex rounded or slightly emarginate; base very shortly pilose: stamen-filaments shorter than the sepals, not exserted in fruit: fruit 18–20 mm. long; style-beak 1.5–2 mm. long; style-column slender to somewhat stout, hispidulous and glandular; carpel-body 3 mm. long, hirsute: seed 2 mm. long, plump, black, shallowly reticulate.—Engler, Pflanzenr. **4** fam. **129:** 200 (1912). LECTOTYPE: *C. & Ed. Seler* 145, at Berlin (not seen).—Hidalgo to Mexico and Morelos.—MEXICO: SAN LUIS POTOSÍ: Alvarez, Sept. 28–Oct. 3, 1902, *Palmer* 188 (US); in montibus San Rafael, 1876, *Schaffner* 188 (G). HIDALGO: San Vicente, Aug.

16, 1937, *Mary T. Edwards* 830 (F, M); prope Zacualtipan, Mar. 1888, *C. & Ed. Seler* 145 (G, ISOLECTOTYPE); Real del Monte, *Coulter* 763 (G). MÉXICO: San Miguel, Dist. Temascaltepec, 2770 m., Oct. 20, 1933, *Hinton* 4915 (G); roadside near fields, km. 37, road from D. F. to Toluca, Oct. 2, 1940, *Moore* 70 (G). DISTRITO FEDERAL: grassy slopes above stream in fir forest, km. 27.5 on road to Toluca, Oct. 2, 1940, *Moore* 66a (G); field, km. 35 on road to Toluca, Oct. 4, 1940, *Moore* 78 (G); champs incultes près Mexico, 1866 (?), *Bourgeau* 694 (G); Ajusco, Aug. 19, 1910, *Orcutt* 3703 (F, M, US); Cima, Aug. 30, 1905, *Pringle* 13498 (US). MORELOS: Tres Marias, Aug. 17, 1906, *Rose & Rose* 11104 (NY, US); roadside near pines, km. 56–57 on road from D. F. to Cuernavaca, Oct. 13, 1940, *Moore* 111 (G). PUEBLA: pine forests, Honey Station, June 20, 1908, *Pringle* 10801 (G, US).

G. Kerberi is one of the highland species so often confused with *G. Seemanni.* Like the latter, this species is erect when young but the stems are prostrate in age. An old plant forms a compact, low clump of prostrate or spreading stems with short, erect or ascending branches. The stems, although often having long hairs, are not as densely pilose as those of *G. Seemanni* and are usually slender.

In leaf-shape, this species is distinctive, although the character is difficult to use in the herbarium with poorly prepared or fragmentary material. The cauline leaves are small, seldom more than 4 cm. wide, and mostly smaller, with usually three narrow-rhombic lobes, the median lobe with few, rather long, lanceolate teeth and concave lower sides, the lateral lobes similar but usually with a more or less well-developed basal lobelet. The base of the blade is nearly straight and at right angles to the petiole. The leaves are bright-green, as are those of *G. subulato-stipulatum*, with a fine pubescence and a somewhat glossy appearance in contrast with the pubescent, dull leaves of *G. Seemanni* and allied species.

42. G. CRUCEROËNSE Knuth (PL. 3, FIG. 18). Perennial: root woody-fibrous: stems 1–4 dm. long, erect when young, spreading to procumbent in age; lower part usually branched, slender, densely strigillose or hispid; upper part slender, densely strigillose to hispid or short-glandular, often branched, indeterminate: basal leaves numerous, not long-persistent; petiole 4–5 mm. long, strigillose; blade 1.5–3.5 cm. wide, pentagonal to orbicular in outline, radiate, darker above than below, densely strigillose

above and below, divided nearly to or to the base into 5 nearly equal, cuneate lobes; lobes 3–5-toothed with long, linear or oblong-lanceolate segments: cauline leaves numerous; petiole 1–8 cm. long, mostly longer than the blade, strigillose; blade similar to that of the basal leaf but pentagonal with longer teeth and often 3-lobed: cauline stipules 5–6 mm. long, subulate, often cleft, ciliate: peduncle 2–3.5 cm. long, densely short-pilose and glandular, 2-flowered, single and axillary: pedicels 4–10 mm. long, copiously short-pilose and glandular, erect in fruit: outer sepals 3.5–5 mm. long, awned; body 3–4.5 mm. long, enlarged in fruit, ovate, 1–3-veined or the veins indistinct, densely short-pilose; veins and margins with glandular hairs; awn 0.2–0.5 mm. long: petals 5–6 mm. long, 3.5–4 mm. wide, white with prominent, only slightly reticulate veins, obcordate; apex often deeply notched: stamen-filaments shorter than the sepals; anthers 0.8 mm. long, nearly globose: fruit 16–18 mm. long; style-beak 1–1.5 mm. long; style-column stoutish, densely hispidulous and glandular, rather abruptly tapered toward the beak; carpel-body 2.5–3 mm. long, hispid, often glandular: seed 2 mm. long, black, shallow-reticulate with elongate reticulations.—Kew Bull. 1937: 502. TYPE: *Hinton* 4617, in Herb. Kew (not seen); ISOTYPE, G (seen).—*G. radiatum* Small in Hanks & Small, N. Am. Fl. **25:** 11 (1907), type *Rose & Hay* 5620, NY (seen), not *G. radiatum* Andr., Bot. Rep. t. 222 (1802).—Hidalgo to Mexico.—MEXICO: HIDALGO: Sierra de Pachuca, July 21–22, 1901, *Rose & Hay* 5620 (NY, type of *G. radiatum* Small; US, photograph F, NY, isotypes). MÉXICO: Popocatepetl, Aug. 7–8, 1901, *Rose & Hay* 6007 (US); meadows above timber-line, Ixtaccihuatl, Oct. 1905, *Purpus* 1691 (US in part); dry field in pines, road to Nevada de Toluca, Oct. 4, 1940, *Moore* 89 (G); pine-fir forest, Crucero, Dist. Temascaltepec, July 28, 1935, *Hinton* 7971 (G); llano, Crucero Agua Blanca, Dist. Temascaltepec, 3250 m., Aug. 20, 1933, *Hinton* 4617 (F, G, M, NY, ISOTYPES). DISTRITO FEDERAL: Sierra de Ajusco, 10,000′, Aug. 23, 1896, *Pringle* 7308 (G, US); Cima, Aug. 30, 1905, *Pringle* 13497 (US); Cima, Aug. 24, 1910, *Orcutt* 4234 (F, M, US); La Cima, 10,000′, Jajalpa, 6000′, Aug., 1904, *Kuntze* 23777 (NY).

Knuth's later name must be applied to this species first recognized by Small. An earlier homonym, *G. radiatum* Andr., although now referred to *Pelargonium*, was validly published as *Geranium*. Knuth's name, however, is appropriate for this inhabitant of the mountain ridges and llanos about the central plateau and into the northwestern part of the State of Mexico.

The white flowers and deeply dissected leaves are characteristic of this species. In habit, the mature plants are low, usually with spreading or procumbent stems. Although Knuth described *G. cruceroënse* as an annual, there is evidence to the contrary. I have had a plant of this species growing for well over a year, new crowns and stems arising from the root after a short period of dormancy. It is very likely that the species should be described as a short-lived perennial.

SERIES L. CAROLINIANA.[18] With characters of the species

43. G. CAROLINIANUM L. (PL. 3, FIG. 21). Annual or biennial herb with a slender tap root: stems 1–4 dm. long, erect at the base with spreading or ascending branches, thin or moderately robust, densely retrorse-hispid or hirsute, sometimes glandular on the upper parts: basal leaves not long-persistent: cauline leaves numerous; petiole mostly longer than the blade; blade 2–6 cm. wide, reniform or reniform-orbicular in outline, thin, appressed-hispid above and below, divided three-fourths to nearly to the base into 5–7 nearly equal, cuneate lobes; lobes deeply divided and toothed at the apex with linear-oblong, obtuse segments: stipules 5–7 mm. long, linear-lanceolate, short-pubescent: peduncles 1–3 cm. long, slender, 2-flowered, single and axillary or loosely aggregated in terminal, 4–12-flowered corymbs, densely retrorse-hispid, occasionally glandular: pedicels 5–10 mm. long, hispid to short-pilose, occasionally glandular: outer sepals 5–6 mm. long, awned; body 4–5 mm. long, 3–4.5 mm. wide, ovate, 3-nerved, puberulent; veins and margins usually hirsute; awn 1 mm. long: petals 6–8 mm. long, 2–3 mm. wide, light-pink or whitish, few-veined: fruit 13–17 mm. long; style-beak 1–1.5 mm. long; style-column densely puberulent and hispid or glandular; carpel-body 3–3.5 mm. long, villous with ascending hairs: seed 1.5–2 mm. long, dark-brown, shallowly reticulate with elongate and irregular areolae.—Sp. Pl. **1:** 682 (1753). TYPE-PLATE: Dill. Elth. 162 t. 135, f. 162.—*G. atrum* Moench, Meth. 285 (1794). *G. lanuginosum* Jacq., Hort. Schoenb. **2:** 8 (1797). *G. Langloisii* Greene, Pittonia **3:** 171 (1897).—Baja California and the United States.—MEXICO: BAJA CALIFORNIA: Todas Santas, Sanzul, Mar. 26, 1883, *Fanny E. Fish* s. n. (F, US).

Geranium carolinianum, widespread in the United States and

[18] *Geranium texanum* (Trel.) Heller, allied here, is said by Fernald, Rhodora **37:** 299 (1935), to occur in northern Mexico. There is a single sheet of this species in the Gray Herbarium collected by Wright in 1852, presumably from Chihuahua. It is probable that the species does occur more extensively in Mexico but the evidence does not warrant full treatment here. *G. texanum* is very similar to *G. carolinianum* but may be separated at once by its pitted, not reticulate, seeds.

occurring in southern California, is represented from a single Mexican station in northern Baja California. In contrast to species of series *Vulcanicola*, this species is of annual or biennial persistence. Characters of the inflorescence and carpel-body are usually sufficient to distinguish the species from those of the latter series although the seed has the same reticulate pattern.

Collections of Schaffner (190) and Parry & Palmer (101), both from San Luis Potosí, were identified as *G. carolinianum* by Watson[19] but this record is doubtful as I have pointed out in a discussion under *G. tenue*.

Doubtful Species

"G. carmineum Knuth.—Rhizoma squarroso-ramosum, 4–6 mm. crassum, brunneum, apice stipulis squamiformibus, pallido-fuscis, linearibus, longe acuminatis, acutissimis obtectum. Caules ascendentes, humiles, usque 10–25 cm. longi, foliati, patule pilosi. Folia basalia pauca, breviter petiolata, petiolis 2–2.5 cm. longis, patule pilosis; lamina pilis setosis longis adpressis obsita, ambitu cordato-reniformis, usque ad $\frac{4}{5}$ palmato-3-5-partita, lobis rhomboideis, pinnatifido-palmato-dentatis, dentibus rotundatis vel obtusis, breviter mucronulatis; folia caulina basalibus plane conformia, summa autem fere subsessilia. Stipulae bracteaeque stipulis basalibus similes, sed angustiores; bracteae lineari-subulatae, 2.5 mm. longae. Pedunculi vix 2 cm. longi, aeque ac pedicelli (7–10 mm. longi) pilis patulis obsiti. Flores media magnitudine, folia superantes. Sepala ovata, trinervata, ad nervos praecipue longe pilosa, 5 mm. longa, mucronata mucrone 1 mm. longo. Corolla 10 mm. diam.; petala (teste Seler) carminea, quam calyx 1.5-plo longiora, obcordata. Stamina calyci aequilonga. Fructus rostratus 15 mm. longus; valvulae longe pilosae; rostrum dense patule puberulum."—Engler, Pflanzenr. **4** fam. **129:** 119 (1912).—MEXICO: Oaxaca: "im Distrikt Nochistlan bei Cuauhtlilla (*C. & Ed. Seler*, Pl. Mexic. a. 1895 n. 1517 sub nom. *G. Hernandezii* DC vel aff? in Bull. Herb. Boiss. **2** Sér. **3:** 94 (1903)); bei San Miguel Quilitongo (*C. & Ed. Seler*, Pl. Mexic. a. 1895 n. 1448 sub nom. *G. mexicanum* HBK, p. p. in Bull. Herb. Boiss. **2** Sér. **3:** 94 (1903)). Ohne Standortsangabe (*Uhde* n. 1190).—Bluhend und fruchtend November.—*Nota.* Species verisimiliter subalpina, distincta est caulibus tenuibus, rhizomate pro caulibus robusto, floribus paucis intense coloratis."

[19] Proc. Am. Acad. 17: 334 (1882).

Having seen no material of this species, I am unable to place it correctly. Knuth includes it with species of his section *Sylvatica.*

Species Excluded from the Flora of Mexico

G. dissectum L. var. *typicum* Knuth in Engler, Pflanzenr. **4** fam. **129:** 51 (1912) = *G. subulato-stipulatum* Knuth. Report from Mexico based on *Pringle* 11941.

G. collinum Bieb?, Loes. in Bull. Herb. Boiss. **2:** 542 (1894) = *G. Schiedeanum* Schlecht. Report from Mexico based on *C. & Ed. Seler* 101.

G. hirtum Willd. ex Spreng., Syst. **3:** 72 (1826).

Willdenow described *G. hirtum* from a Humboldt collection, giving the locality as Mexico and stating that it was the same as *G. mexicanum* HBK. and *G. Hernandezii* Moç. & Sessé, two good species previously described. A photograph in the Gray Herbarium of a Humboldt specimen in the Berlin Herbarium, annotated by Knuth as the type of *G. hirtum* Willd., shows it to be unlike any species of Mexico. Knuth treats it as a native of Colombia and this is borne out by a specimen in the Gray Herbarium (*Killip & Smith* 18139, Dept. Santander, Colombia) which is a good match for the photograph.

G. caespitosum James ex Torr., *nomen dubium.*

The descriptions of James and Torrey are not sufficient to apply this name definitely and there is no specimen for comparison as noted by Torrey.[20] The name has been applied by Gray and others to *G. atropurpureum* although the flaws in such a procedure have been pointed out in a discussion of the latter species.

[20] Ann. Lyc. N. Y. **2:** 173 (1828).

Explanation of Plates

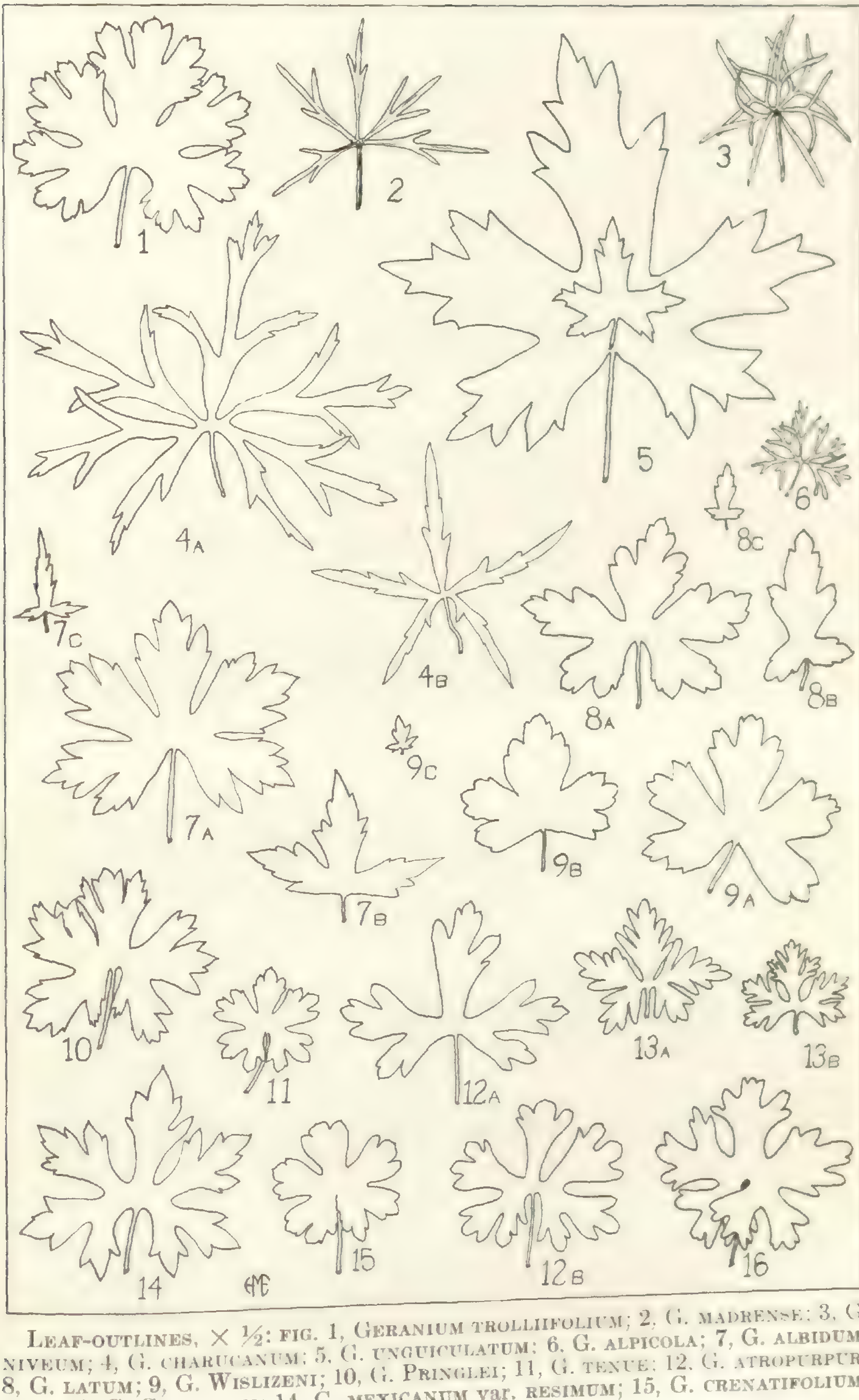
Plate 1. Geranium Gentryi, n. sp.: fig. 1 (type), portion of flowering stem × ¼. G. oaxacanum, n. sp.: fig. 2 (type), plant × ¼. G. mexicanum HBK var. typicum: fig. 3 (*Hinton* 1327, M; 4533, M; 12347, G), plant × ¼. G. vulcanicola Small: fig. 4 (type), portion of plant × ¼. G. Hintonii, n. sp.: fig. 5 (type), A, base × ¼; B, portion of repent stem × ¼. G. Schiedeanum Schlecht.: fig. 6 (*Rose, Painter & Rose* 8690, G), plant × ¼.

Plate 2. All figures × ½. Geranium trolliifolium Small: fig. 1 (*Jones* s. n., P), basal leaf. G. madrense Rose: fig. 2 (*Rose* 2161, G), basal leaf. G. niveum S. Wats.: fig. 3 (*Jones* s. n., P), basal leaf. G. charucanum Standl.: fig. 4, A (*Gentry* 2576, M), lower cauline leaf; B (*Gentry* 2481, M), upper cauline leaf. G. unguiculatum, n. sp.: fig. 5 (*Hinton* 14906), lower cauline leaf; inset, upper cauline leaf. G. alpicola Loes.: fig. 6 (*Skutch* 1262, US), basal leaf. G. albidum Rydb.: fig. 7, A (*Nelson* 6136, US), basal leaf; B (*Townsend & Barber* 181, M), middle cauline leaf; C (*Townsend & Barber* 181, G), upper cauline leaf. G. latum Small: fig. 8, A (*Mexia* 2695, US), basal leaf; B (*Hinton* 1887, G), middle cauline leaf; C (*Russell & Souviron* 81, US), upper cauline leaf. G. Wislizeni S. Wats.: fig. 9, A (*Pringle* 1203, G), basal leaf; B (*Palmer* 428, G), middle cauline leaf; C (*Pringle* 1203, G), upper cauline leaf. G. Pringlei Rose: fig. 10 (*Pringle* 8978, G), basal leaf. G. tenue Hanks: fig. 11 (*Schaffner* 458, NY), basal leaf. G. atropurpureum Heller: fig. 12 (*White* 2357, G), A, cauline leaf; B, basal leaf. G. Goldmanii Rose: fig. 13, A (*Ghiesbreght* s. n., G), cauline leaf; B (*Nelson* 3155, NY), cauline leaf. G. mexicanum HBK. var. resimum (Small) n. comb.: fig. 14 (*Rose* 2070, NY), lower cauline leaf. G. crenatifolium, n. nom.: fig. 15 (*Schneider* 1029, F), basal leaf. G. Lozani Rose: fig. 16 (*Pringle* 8994, G), cauline leaf.

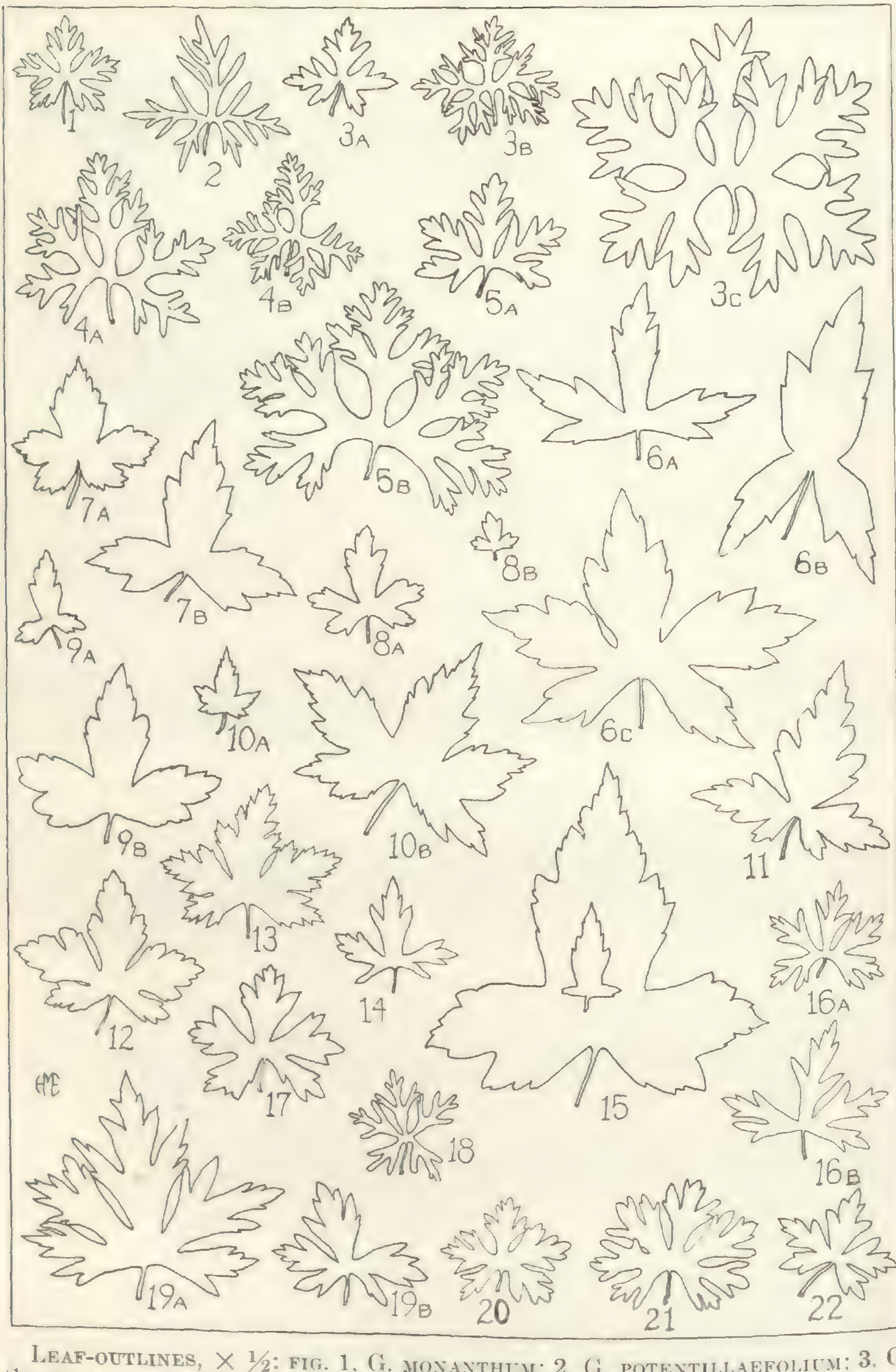
Plate 3. All figures × ½. Geranium monanthum Small: fig. 1 (*Camp* 2624, NY), cauline leaf. G. potentillaefolium DC: fig. 2 (*Orcutt* 3779, M), cauline leaf. G. Schiedeanum Schlecht.: fig. 3, A (*Palmer* 146, G), cauline leaf; B (*Mexia* 2768, M), cauline leaf; C (*Mohr* s. n., US), cauline leaf. G. bellum Rose: fig. 4, A (*Pringle* 10021, NY), lower cauline leaf; B (*Pringle* 6909, US), upper cauline leaf. G. andicola Loes.: fig. 5, A (*Skutch* 856, G), upper cauline leaf; B (*Skutch* 1238, G), basal leaf. G. aristisepalum, n. nom.: fig. 6, var. typicum, A (*Rose, Painter & Rose* 6496, NY), cauline leaf; C (*Pringle* 13499, G), basal leaf; var. michoacanum, n. var., B (*Leavenworth* 609, NY), cauline leaf. G. Hernandezii Moç. & Sessé: fig. 7, A (*Hinton* 7220, F), basal leaf; B (*Nelson* 4116, US), cauline leaf. G. sublaevispermum, n. sp.: fig. 8 (*Gentry* 2740, G), A, lower cauline leaf; B, upper cauline leaf. G. deltoideum Rydb.: fig. 9 (*Palmer* 192), A (G), cauline leaf; B (F), basal leaf. G. hystricinum, n. sp.: fig. 10 (*Hinton* 14972, G), A, upper cauline leaf; B, lower cauline leaf. G. lilacinum Knuth: fig. 11 (*Hinton* 8945, G), cauline leaf. G. Seemanni Peyr.: fig. 12 (*Nelson* 1039, G), cauline leaf. G. guatemalense Knuth: fig. 13 (*Tuerckheim* 8187, G), cauline leaf. G. flaccidum Small: fig. 14 (*Brandegee* s. n., NY), cauline leaf. G. latilobum, n. sp.: fig. 15 (*Mexia* 1671, F), lower cauline leaf; inset, upper cauline leaf. G. repens, n. nom.: fig. 16 (*Skutch* 709) A (US), basal leaf; B (G), cauline leaf. G. Kerberi Knuth: fig. 17 (*Rose, Painter & Rose* 11104, NY), cauline leaf. G. cruceroënse Knuth: fig. 18 (*Hinton* 7971, G), cauline leaf. G. subulato-stipulatum Knuth: fig. 19 (*Pringle* 7917, G), A, lower cauline leaf; B, upper cauline leaf. G. culminicola, n. sp.: fig. 20 (*Skutch* 841, F), cauline leaf. G. carolinianum L.: fig. 21 (*Fish* s. n., US), cauline leaf. G. clarum Small: fig. 22 (*Nelson* 552, US), cauline leaf.

Plate 4. Geranium deltoideum Rydb.: fig. 1 (type), ascending branch × ⅜; fig. 4 (isotype, G), seed × 10. G. unguiculatum, n. sp.: fig. 2 (type), inflorescence-branch × ⅜; fig. 7 (type), petal × 2. G. potosinum, n. sp.: fig. 3 (type), plant × ⅜. G. sublaevispermum, n. sp.: fig. 5 (type), seed × 10; fig. 8 (type), portion of ascending branch × ⅜. G. Wislizeni S. Wats.: fig. 6 (type), seed × 10.

Plate 5. Geranium bellum Rose: fig. 1 (*Rose, Painter & Rose* 8738, F), portion of villous petiole × 10. G. Seemanni Peyr.: fig. 2 (*Moore* 77, G), petal × 6. G. hystricinum, n. sp.: fig. 3 (type), portion of leaf-margin and petiole showing pubescence × 10; fig. 7 (type), fruit × 2. G. latum Small: fig. 4 (*Hinton* 1887, G), petal with soft hairs × 4. G. atropurpureum Heller: fig. 5 (*Stewart* 1397, G), flower × 2. G. Gentryi, n. sp.: fig. 6 (type), fruit × 2. G. culminicola, n. sp.: fig 8 (type), flower × 6.

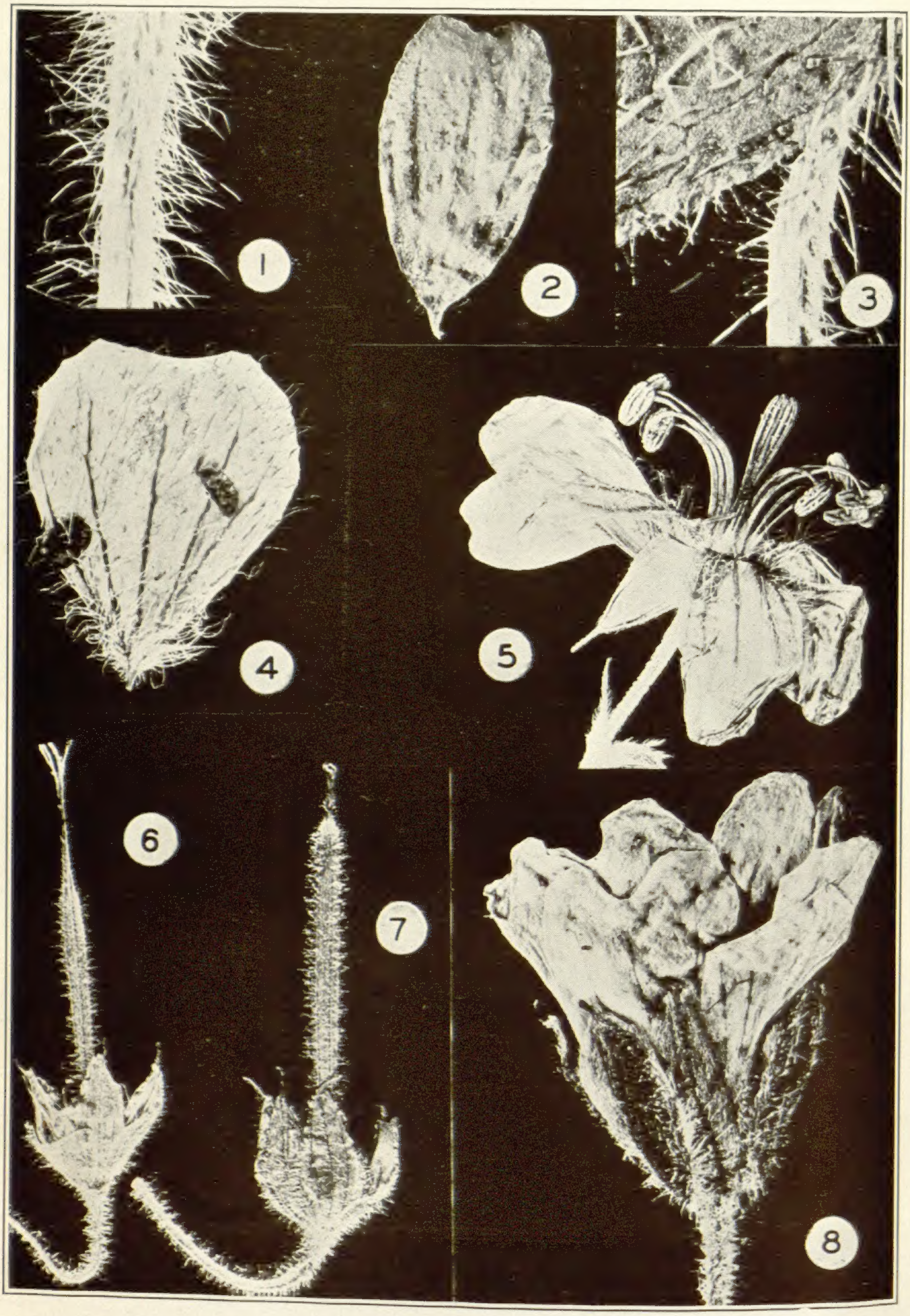


LEAF-OUTLINES, × ½: FIG. 1, GERANIUM TROLLIIFOLIUM; 2, G. MADRENSE; 3, G. NIVEUM; 4, G. CHARUCANUM; 5, G. UNGUICULATUM; 6, G. ALPICOLA; 7, G. ALBIDUM; 8, G. LATUM; 9, G. WISLIZENI; 10, G. PRINGLEI; 11, G. TENUE; 12, G. ATROPURPUREUM; 13, G. GOLDMANII; 14, G. MEXICANUM var. RESIMUM; 15, G. CRENATIFOLIUM; 16, G. LOZANI.



LEAF-OUTLINES, × ½: FIG. 1, G. MONANTHUM; 2, G. POTENTILLAEFOLIUM; 3, G. SCHIEDEANUM; 4, G. BELLUM; 5, G. ANDICOLA; 6A, G. ARISTISEPALUM var. TYPICUM; 6B, G. ARISTISEPALUM var. MICHOACANUM; 7, G. HERNANDEZII; 8, G. SUBLAEVISPERMUM; 9, G. DELTOIDEUM; 10, G. HYSTRICINUM; 11, G. LILACINUM; 12, G. SEEMANNI; 13, G. GUATEMALENSE; 14, G. FLACCIDUM; 15, G. LATILOBUM; 16, G. REPENS; 17, G. KERBERI; 18, G. CRUCEROËNSE; 19, G. SUBULATO-STIPULATUM; 20, G. CULMINICOLA; 21, G. CAROLINIANUM; 22, G. CLARUM.

FIGS. 1 and 4, GERANIUM DELTOIDEUM; FIGS. 2 and 7, G. UNGUICULATUM, n. sp.; FIG. 3, G. POTOSINUM, n. sp.; FIGS. 5 and 8, G. SUBLAEVISPERMUM, n. sp.; FIG. 6, G. WISLIZENI.



DETAILS OF GERANIUM

FIG. 1, G. BELLUM; FIG. 2, G. SEEMANNI; FIGS. 3 and 7, G. HYSTRICINUM n. sp.; FIG. 4, G. LATUM; FIG. 5. G. ATROPURPUREUM; FIG. 6, G. GENTRYI, n. sp.; FIG. 8, G. CULMINICOLA, n. sp.

INDEX

New scientific names are printed in full-face type