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THE PURPLE-FLOWERED, STEMLESS VIOLETS OF THE ATLANTIC COAST.*

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The acaulescent species of the genus *Viola* constitute a most perplexing natural group, and are very baffling to one who attempts, as I have attempted during the last five years, to discover satisfactory and constant characters on which to base a specific arrangement. While herbarium specimens of these plants are quite adequate for morphological study, it has been found that habit and habitat are of the utmost importance in respect to specific relationship, as is also the degree of variation under changed conditions of environment. I have therefore supplemented a close and searching series of field observations during the past few seasons by a study of many different forms under cultivation, noting the behavior, for example, of two plants from the same patch, one grown in sandy soil, with full exposure to the sun, and the other in damp, rich soil in a shaded situation. A residence of several successive seasons in one neighborhood afforded an opportunity of observing whether a given specimen set out in one summer presented marked leaf variation in the next.

The result of these investigations proves, I think, conclusively, that while several of these violets are extremely polymorphous, the species themselves do not intergrade to the extent generally believed. The difficulty has arisen in some cases by a confusion of the earlier types by writers at the beginning of this century;

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in other instances it is due to an over-conservative view of what constitutes a species. It is a well-known fact in botany, and I presume also in other branches of biology, that the species of one genus differ *inter se* to a much less extent than those of another genus. In *Lechea*, for example, we are forced to depend almost solely on the appearance and structure of the radical shoots springing up after the close of the flowering season, while in the nearly allied genus *Polygala*, we have usually not only well-marked floral characters, but habit and leaf arrangment to guide us in making determinations. I believe that wholesale reduction to a single species of a number of so-called polymorphous types is a most unphilosophical and evasive method of treatment and productive of immense difficulty to the critical monographer. As an illustration of the simple solution presented when one of these aggregate types is reduced to its component forms, I may refer to the two Eastern species of *Sanicula*, which for many years were sources of despair to most botanists, since they presented remarkable variability in habit and phyllotaxy. Mr. E. P. Bicknell, after an extended series of field observations, discovered that there were altogether four very distinct species confused under the two originals, affording not only constant characters with respect to habit of growth and geographical range, but also in the fruit, which is of paramount importance in the study of all Umbelliferæ.* The same author has recently shed light on the Eastern forms of *Sisyrinchium*, no satisfactory disposal of which has heretofore been accomplished.† A similar condition exists among the violets of the Atlantic coast, and, while I by no means wish to imply that we can obtain an absolutely correct systematic treatment of this or any other genus, I do contend that it is possible to so arrange the species that any given plant may be determined with comparative ease. The conspectus of the group, which will be found at the close of this paper, is merely tentative, and is offered simply as the outgrowth of the field and herbarium study already referred to.

In taking up the discussion of individual species I wish to embrace the opportunity of extending thanks to Dr. N. L. Britton, of New York, for the loan of numerous specimens from the Columbia University herbarium, and also to Messrs. H. W. Olds and D. Leroy Topping, of Washington, for abundant field-notes and living plants.

* Bull. Torr. Club, 22, 351–361, 1895. † Ibid., 23, 130–137, 1896.

Passing over for the present the consideration of the Linnæan species, *Viola pedata*, which differs in root-structure from the other members of the group, we shall find that *V. palmata*, also described by Linnæus, may be fairly regarded as the type of its class, since it is the aggregate from which most of the remaining species have been separated. With *sagittata* and possibly *dentata*, *V. palmata* constitutes what we may call the heterophyllous type of stemless violets, or those in which the earliest leaves differ in shape from the later appearing ones. In *palmata* only the first two or three leaves, which are cordate in outline and rather small, are entire, the remainder being usually lobed to a greater or less extent. In the majority of forms there are three main divisions, of which the central one is the largest, the lateral lobes being occasionally cut-toothed or still more deeply divided. The general contour of the leaf is ovate or oblong, the length somewhat exceeding the breadth, the base never cucullate or inrolled as in *obliqua*, our common round-leaved violet. With a view to ascertaining how closely these two species might approach each other in leaf-forms, I set out several specimens in close proximity one fall. The following summer the leaves of *palmata* were scarcely at all lobed, but they preserved their characteristic outline, and were quite clearly distinguishable from the allied species. Similar observations have been made by others who have had the plants under cultivation. But this is not the only distinguishing character of *V. palmata*; it grows almost invariably in rich, shaded woodlands, and, as Schweinitz has observed,* never occurs in swamps or bogs, where *obliqua* is most common. Dr. Gray once reduced *palmata* to varietal rank in the fifth edition of the Manual,† but he afterward restored it to its former place,‡ a conclusion in which every other botanist of the century has concurred. The species of Muhlenberg and Schweinitz here referred to *palmata* are merely forms exhibiting slightly unusual degrees of lobation. Le Conte's *V. septemloba*, however, belongs to a different category. It is apparently confined to brackish meadows along the coast from Staten Island to the Gulf States, and I had always considered it a good illustration of varietal differences induced by local influences, but on a recent excursion with Dr. Britton to the home of the plant I became thoroughly convinced as to its specific validity. The leaves are quite gla-

*Am. Journ. Sci., 5, 54, 1822. †Gray, Man. Ed., 5, 78, 1867.
‡Coult., Bot. Gaz., 11, 254, 1886.

brous and succulent, chiefly remarkable for the constancy exhibited in the shape of their lobes, which in every one of the numerous plants examined consisted of a large central lobe and three lateral pairs, having a pinnate instead of a palmate arrangement, the large lobe serving as a rachis. Minor characters are presented also in the shape of the rootstock.

Our commonest violet has passed under a very varied assortment of names. In Hill's Hortus Kewensis *Viola obliqua* is first described and so well figured as to leave not the slightest doubt concerning the plant to which it refers.* Twenty years later Aiton in a similar work describes *V. obliqua* and *V. cucullata*, assigning the former name to a plant with pale flowers ("petala straminea"), which may have been an albino of the same species, or else something quite distinct.† At all events, Aiton's *cucullata* is Hill's *obliqua*, and the former name, though promulgated twenty years later, has been accepted by all our botanists up to the present time, *obliqua*, if retained at all, being based on Aiton's and not on Hill's plant. Dr. Gray admits the applicability of the name *obliqua* to our common violet in his revision of the genus published in the Botanical Gazette for 1886,‡ where he says "The name *cucullata* would have to give way to the much earlier-published *V. obliqua* Hill, well figured and unmistakable in his Hortus Kewensis." The calamity that would attend the taking up of an older name Dr. Gray averted by retaining the plant in question as a variety of *palmata*. The characters have been chiefly pointed out in connection with the latter; it only remains to say that *obliqua* has the earlier leaves reniform, the later ones cordate and cucullate, usually glabrate or subpubescent, and grows in wet or damp situations.

The history of Walter's *V. villosa* affords a further illustration of the differences in opinion between early and late botanists. Before 1850 it was recognized as a good species in nearly every published work, including the monographs of Schweinitz and Le Conte, Nuttall's Genera, and Torrey and Gray's Flora. It is not mentioned in the first edition of Gray's Manual, but is treated as a species in the second and third editions of the same work, and depressed to varietal rank in the fifth, under the name of *cordata*. In the first fascicle of the Synoptical Flora of North America, part I, Dr. Robinson transfers this variety to *palmata*,

* Hill, Hort. Kew., 316, t. 12, 1769. † Aiton, Hort. Kew., 3, 288, 1789.
‡ Coult. Bot. Gaz., l. c.

applying to it the original specific name *villosa*, to which he appends the abbreviation "n. var." It is certainly one of the marvels of systematic botany that a plant described by Walter in 1788 as *Viola villosa* should be able to reappear, first as *V. cucullata* var. *cordata* in 1867, and then as *V. palmata* var. *villosa*, "n. var." in 1895!

The species has an early blooming period, and may be found on dry hillsides, usually in rich soil, always distinguishable on account of its leaves, which are round-cordate, almost orbicular in outline, and lie closely impressed on the ground; they are variegated with purple veins beneath, and exhibit a delicate, silvery pubescence. The flowers are rather small, reddish-purple in hue, and the plant sends up but few leaves and flowers from a simple rootstock.

Viola sagittata, another of Aiton's species, has received universal acceptance, but it has also been made to include some forms for which we can find no warrant in the original description. The leaves are there referred to as "unequally and remotely serrate, incised-sinuate below the middle, subpubescent, cordate-sagittate, oblong."* This seems sufficiently clear for all practical purposes, and yet in one of our botanical text-books *V. sagittata* is described as follows: "Smoothish or hairy; leaves on short and margined, or the later often on long and naked petioles, varying from oblong-heart-shaped to halberd-shaped, arrow-shaped, oblong-lanceolate or ovate, denticulate, sometimes cut-toothed near the base."

Such a description is not merely faulty but false. The author of the species states distinctly that the leaves are "incised-sinuate below the middle;" yet when a student learns that they are "sometimes cut-toothed near the base," as stated above, he is apt to mistake type for variation, gaining, accordingly, an incorrect conception of the species; and this is precisely what has happened in the case of *V. sagittata*. The plant which Aiton had in mind is far less common than is generally supposed. It has rather obtuse sagittate or hastate glabrous leaves, which although at first borne on petioles scarcely exceeding the scapes, soon become greatly elongated, the petiole attaining a length of twice or thrice that of the blade, the base of which is always sharply dentate or deeply incised. Even at the early vernal stage the smooth leaf with its peculiar base serves to differentiate

*A literal translation. See Aiton, l. c.

the plant from *V. ovata* Nutt., with which it is always confounded. Both species have the first three or four leaves oval and entire or merely crenate, but before flowering, *V. ovata* puts forth its characteristic strongly pubescent or even villous foliage, the regularly shaped, almost entire, ovate-elliptical leaves never becoming so elongated as to exceed either flowering or fruiting scape.

Viola ovata Nuttall is *V. ciliata* of Muhlenberg's Catalogue,* well described and differentiated afterward by Darlington and other writers and retained by Torrey and Gray as a variety of *sagittata*. The plant which I last year described as another variety of *sagittata*, under the name of *Hicksii*,† is much closer to *ovata* than to the true *sagittata* as now understood, and I take this opportunity of indicating its transfer, retaining it under the varietal name. Dr. Robinson, in the Synoptical Flora above quoted,‡ remarks in connection with this form that the recurved fruiting peduncles and distinctly mottled seeds "are not infrequently associated with quite different foliage." However this may be, specimens have been sent to Prof. C. F. Wheeler, of Michigan, and to Dr. T. J. W. Burgess, of Canada, both of whom have admitted it to be distinct from what they are accustomed to regard as typical *sagittata*. We have it in the National Herbarium from Pennsylvania and from Sussex county, New Jersey, in addition to the original locality near Pierce's Mill, in the District of Columbia.

Pursh's *Viola dentata*, here reinstated, is a plant to which my attention was called by Dr. Britton some time ago as a species of marked validity. The leaves in this plant are glabrous and somewhat flaccid, deltoid-cordate, or even panduriform in outline, irregularly crenate, and in general so unlike those of the ordinary violets with which it is associated that it has been considered a hybrid. Le Conte pointed out these characters, under his name of *emarginata*, sixteen years after Pursh's original publication. The plant is mainly of southern range. A typical specimen of it, collected by Dr. John K. Small in northern Georgia in 1895, is to be found in the herbarium of Columbia University. In the National Herbarium the species is represented by a plant found in the District of Columbia by Dr. Vasey.

It will be observed that eight species of the eastern acaulescent

* Muhl. Cat., 26, 1813, without synonymy or description.

† Coult. Bot. Gaz., 20:326, 1895.

‡ 1, 1:197, foot-note.

purple-flowered violets are here maintained as distinct. Pursh and Schweinitz, two of the earliest authorities in this century, recognized each ten species, Nuttall accepted six, Le Conte thirteen, and Torrey and Gray six. In the first edition of the Manual, Gray admits but four species, in the second five, and in the fifth and sixth editions three only. In the most recently published work, the Synoptical Flora, above referred to, there are included three species and four varieties. It seems obvious that the most logical course of procedure for a conservative botanist is the reduction of all possible forms to the Linnæan species *palmata*, for the differences between *palmata* and *sagittata*, the validity of both of which is everywhere admitted, are scarcely more than those between any others of this group selected for comparison.

Synopsis of Species.*

Leaves all pedately divided; rootstock short and abruptly perpendicular ..... *V. pedata.*

Leaves broadly lobed or undivided; rootstock ascending or horizontal.

Plants glabrous or with very slight pubescence:

Leaves somewhat pinnately 7-lobed ..... *V. septemloba.*
Leaves deltoid-cordate or panduriform ..... *V. dentata.*
Leaves hastate or sagittate, basally incised ... *V. sagittata.*
Leaves cordate-cucullate ..... *V. obliqua.*

Plants pubescent or villous:

Leaves palmately lobed ..... *V. palmata.*
Leaves ovate or oval ..... *V. orata.*
Leaves cordate-orbicular ..... *V. villosa.*

Viola pedata L., Sp. Pl. 933, 1753.† Not of subsequent authors.

V. pedata bicolor Pursh, tide Raf. in D. C., Prodr. 1 : 291, 1824.

Viola pedata inornata Greene, Pitt. 3 : 35, 1896.

V. pedata of authors, not of L.

* In this connection it should be stated that *V. pedatifida* Don, which is closely related to *V. pedata*, is omitted as not belonging strictly to our coast.

† Prof. E. L. Greene has proved that the type of the Linnæan *pedata* must have been a plant of the bicolor variety rather than the monocolored form which we are accustomed to regard as *pedata*. This is conclusively shown by an examination of the plate of Plukenet to which Linnæus refers.

Viola palmata L., Sp. Pl. 933, 1753.

Viola heterophylla Muhl., Cat. 25, 1813.
Viola palmata var. *d. heterophylla* Ell., Bot. S. C. and Ga., 1:300, 1817.
Viola triloba Schwein., Am. Journ. Sci., 5:57, 1822, in part.
Viola cucullata var. *palmata* A. Gray, Man. Ed., 5:78, 1867.

Viola septemloba Le Conte, Ann. N. Y. Lyc., 2:141, 1828.

Viola obliqua Hill, Hort. Kew., 316, t. 12, 1769. Not Pursh, 1812.

Viola cucullata Ait., Hort. Kew., 3:288, 1789, in part.
Viola asarifolia Pursh, Fl. Am., Sept. Suppl., 732, 1812, in part.
Viola papilionacea Pursh, Fl. Am., Sept., 1:173, 1812, in part.
Viola affinis Le Conte, Ann. N. Y. Lyc., 2:138, 1828, in part.
Viola congener Le Conte, Ann. N. Y. Lyc., 2:140, 1828, in part.
Viola palmata var. *cucullata* A. Gray, Coult. Bot. Gaz., 11:254, 1886.
Viola palmata var. *obliqua* A. S. Hitchc., Trans. St. Louis Acad., 5:487, 1891.

Viola villosa Walt., Fl. Car., 219, 1788.

Viola sororia Willd., Hort. Berol., 1:72, 1809.
Viola villosa var. *b. cordifolia* Nutt., Gen. 148, 1818, in part.
Viola cucullata var. *cordata* A. Gray, Man. Ed., 5:78, 1867.
Viola palmata villosa Robinson, Syn. Fl. N. Am., I, 1:196, 1895.

Viola dentata Pursh, Fl. Am., Sept., 1:172, 1812.

Viola sagittata var. *b. emarginata* Nutt., Gen. 148, 1818.
Viola emarginata Le Conte, Ann. N. Y. Lyc., 2:142, 1828.

Viola sagittata Ait., Hort. Kew., 3:287, 1789.

Viola ovata Nutt., Gen. 148, 1818.

Viola primulifolia Pursh, Fl. Am., Sept., 1:173, 1812, not *V. primulæfolia* L., 1753.
Viola ciliata Muhl., Cat. 26, 1813, without description or synonymy.
Viola sagittata var. *b. ovata* T. and G., Fl. N. Am., 1:138, 1838.

Viola ovata Hicksii Pollard.

Viola sagittata Hicksii Pollard, Coult. Bot. Gaz., 20:326, 1895.