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## A Resurvey of the Violets of Iowa

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## A Resurvey of the Violets of Iowa

By NORMAN H. RUSSELL

The following account must be considered preliminary in the sense that it is based primarily upon herbarium research. During the summer months of 1952, the writer was employed as an instructor by the State University of Iowa and, while there, engaged in a study of the violets, using material from the Herbaria of the State University of Iowa, Iowa State College, and Grinnell College. Appreciation is expressed to these institutions for the use of their specimens. In addition, many thanks are due Dr. Robert T. Thorne and Dr. Robert L. Hulbary for their cooperation and helpfulness during the period of research.

The most recent survey of Iowa violets is that of Newbro (1936). In this paper Miss Newbro recognized 19 species and one variety; in the present work only 14 species and one variety are recognized. Detailed descriptions and illustrations were considered unnecessary in this paper. For illustrations of the species and for synonymy, the reader is referred to Miss Newbro's paper. For complete descriptions of the species and variety, Fernald (1950) will serve in most cases. The present author disagrees in some instances with Newbro and Fernald regarding interpretation of morphological differences and affinities, and these disagreements are presented in the discussions of the species.

### KEY TO SPECIES

#### Key to Genus *Viola*—petaliferous condition (spring)

- 1. Petals yellow; plant caulescent ..... *V. pennsylvanica*
- 1. Petals white, blue or violet; plants caulescent or acaulescent.....2
  - 2. Petals white .....3
    - 3. Plants caulescent, large ..... *V. rugulosa*
    - 3. Plants acaulescent, small ..... 4
      - 4. Leaves reniform in shape; plants without vegetative stolons; petals not bearded ..... *V. renifolia*
      - 4. Leaves not reniform; plants bearing vegetative stolons; petals usually bearded .....5
        - 5. Leaves lanceolate ..... *V. lanceolata*
        - 5. Leaves cordate .....6
          - 6. Leaf blades perfectly glabrous, petioles often pubescent; lateral petals with sparse beard ..... *V. pallens*
          - 6. Leaf blades variously pubescent; petals with heavy beard.....  
..... *V. incognita*

- 2. Petals blue or violet, rarely white .....7
- 7. Leaves variously lobed or cut .....8
  - 8. All petals glabrous; flowers flat in appearance; rhizome fleshy, erect .....9
  - 9. Bicolorous; upper two petals dark purple, lower three light violet .....*V. pedata*
  - 9. Concolorous; all petals light to medium violet .....*V. pedata* var. *lineariloba*
- 8. At least lateral petals bearded; flowers papilionaceous in appearance; rhizome erect or more frequently horizontal .....10
  - 10. Leaves shallowly incised at base with 4-6 teeth; laminas heavily pubescent .....*V. sagittata*
  - 10. Leaves deeply lobed; laminas glabrous or sparsely pubescent .....11
    - 11. Spurred petal glabrous at base .....*V. viarum*
    - 11. Spurred petal villous at base .....*V. pedatifida*
- 7. Leaves not lobed or cut .....12
  - 12. Leaf blades completely glabrous; spurred petal beardless or nearly so .....13
    - 13. Leaf blades cordate, with somewhat attenuate apices in early spring; corollas rich violet with pale center; sepals not white-margined .....*V. papilionacea*
    - 13. Leaf blades deltoid, apex especially so; corollas light violet, darker toward center; sepals white-margined .....*V. missouriensis*
  - 12. Leaf blades variously pubescent; spurred petal villous at base .....14
    - 14. Leaf blades with a few short, stiff hairs on upper surface or glabrous; flowers overtopping leaves .....*V. nephrophylla*
    - 14. Leaf blades definitely pubescent, often densely so, with long, soft hairs on both upper and lower lamina surfaces; leaves overtopping flowers .....*V. sororia*

**Key to Genus *Viola*—cleistogamous condition (summer)**

- 1. Caulescent; having erect, leafy stem .....2
  - 2. Plants with vigorous underground stolons; leaves, especially the lower, broadly uniform .....*V. rugulosa*
  - 2. Plants with short rhizomes but no underground stolons; leaves cordate (the upper subcordate) and with somewhat attenuate apices.....*V. pensylvanica*
- 1. Acaulescent; stems subterranean, erect or horizontal .....3
  - 3. Producing neither stolons nor cleistogamous flowers; leaves palmately divided with middle lobe unclenft...*V. pedata* and *V. pedata* var. *lineariloba*
  - 3. Usually with stolons; plants (except seedlings) with cleistogamous flowers; leaves entire or divided .....4
    - 4. Rhizome cord-like and thin (1-3 mm. thick); usually producing stolons at the surface of the soil .....5
      - 5. Leaves broadly reniform, about .6 X as long as wide; either without stolons or with short fruiting stolons in autumn .....*V. renifolia*
      - 5. Leaves not reniform but lanceolate to cordate, producing long, vegetative stolons abundantly .....6
        - 6. Leaves lanceolate, 4-6 times as long as broad .....*V. lanceolata*
        - 6. Leaves cordate to slightly reniform .....7
          - 7. Leaves completely glabrous except for petioles, which may be fringed; cleistogamous capsules green, borne on ascending peduncles .....*V. pallens*

7. Leaves variously pubescent; cleistogamous capsules purple or purple-spotted, borne on prostrate peduncles .....*V. incognita*
4. Rhizome thick and fleshy (3-10 mm. thick); no stolons .....8
8. Leaves variously lobed or toothed .....9
9. Leaves with 4-6 shallow teeth at base; laminas heavily pubescent .....*V. sagittata*
9. Leaves deeply lobed; laminas glabrous or sparsely pubescent .....10
10. Leaf blades with several conspicuous basal lobes, these from 1-4 cm. long .....*V. viarum*
10. Leaf blades palmately divided nearly to base into long, narrow segments. Middle segment divided .....*V. pedatifida*
8. Leaves not lobed or cut .....11
11. Leaf blades completely glabrous .....12
12. Leaf blades cordate, somewhat broader than long; sepals not white-margined .....*V. papilionacea*
12. Leaf blades deltoid, as long as broad; sepals white-margined ..... *V. missouriensis*
11. Leaf blades pubescent .....13
13. Leaf blades sparsely pubescent with short, stiff hairs on upper surface; cleistogamous capsules green and erect....*V. nephrophylla*
13. Leaf blades densely pubescent to moderately pubescent on both surfaces; cleistogamous capsules green or purple and borne on short, prostrate peduncles .....*V. sororia*

## DISCUSSION

*Viola pedata* L. var. *pedata* (Map 1)

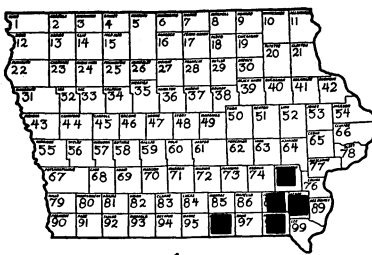
This violet is quite rare in Iowa, and there is some doubt that it is the true *V. pedata* of the southern states. It is easily recognized by the two upper petals being much darker than the three lower, but this is not a constant character and grades into the concolorous condition. Occasionally plants have been seen by the author from Iowa and from southeastern Minnesota with the upper petals flecked with dark purple, rather than being uniformly dark. *V. pedata* is found on sandy, open prairies, often in very dry situations.

*Viola pedata* L. var. *lineariloba* DC. (Map 2)

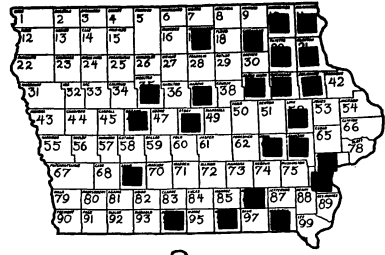
The color of the corolla of this violet varies from a very light blue to a rather dark blue-purple, but in all instances the petals are concolorous. Apparently it differs from the typical variety of *V. pedata* only in petal color. A diligent search by the author for other differences has been unsuccessful. The varietal name, *lineariloba*, and the original description by DeCandolle, imply that the lamina lobes are narrower in this variety. An examination of several hundred specimens from several large herbaria has indicated that this is not the case.

*Viola papilionacea* Pursh (Map 3)

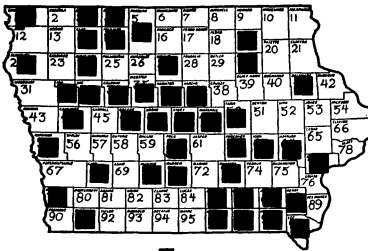
This is one of our commonest violets, growing often as a weed about dwellings and in grazed fields. It hybridizes freely with several of the other stemless blue violets, especially *V. sororia*, so that many specimens may be difficult of determination. In addition it is very similar to *V. missouriensis*, from which it differs in the following ways. The shape of the lamina is definitely cordate with an abruptly tapering apex in spring and a short, acute apex in summer leaves. The sepals have a thin, brown margin, and the seeds are dark brown. *V. missouriensis*, on the other hand, has deltoid leaves, with straight-sided apices; the sepals have a relatively broad white margin, and the seeds are buff colored.



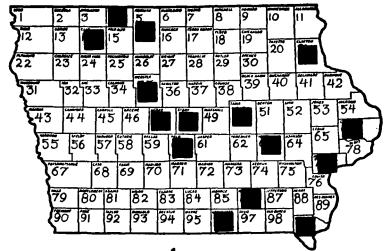
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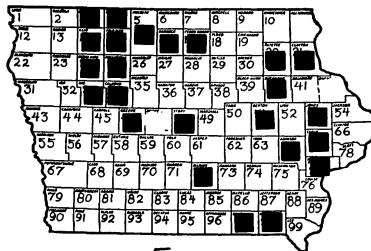
2.



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5.

*Viola missouriensis* Greene (Map 4)

A violet normally found in low, wet woodlands, *V. missouriensis* has also been collected in several Iowa cities, growing more or less as a weed. Its deltoid leaves, with straight margins, and white-margined sepals are the most reliable characters for its determination.

*Viola nephrophylla* Greene (Map 5)

This violet is found in open, wet fields. Occasionally it may be found in grazed fields where the drainage is poor, and along stream banks. In the spring the earliest leaves are purplish on the under surface, which helps in its recognition. In summer the erect, green capsules make it easily distinguishable.

*Viola sororia* Willd. (Map 6)

This is perhaps the commonest violet of the state, being found most frequently in woodlands of all kinds. The leaves are always pubescent, though the amount of hairiness varies. Sometimes the leaves are pubescent only on the major veins; at other times the whole plant is covered with long, soft hairs. Petal color is very variable. In a woodland near Kellogg, in Jasper County, petal color of *V. sororia* flowers varied from pure white to dark purple, and a cultivated form in Grinnell had reddish-purple petals.

*Viola sagittata* Ait. (Map 7)

Newbro (1936) considered this violet not to be present in the state, and identified the specimens here referred to *V. sagittata* as *Viola fimbriatula* J. E. Smith. The present writer has seen and studied typical *V. fimbriatula* in a number of localities in the eastern states, and it is certainly a different plant from our Iowa representatives. It differs from our *V. sagittata* principally in leaf shape and basal lobing. True *V. fimbriatula* has ovate leaves, almost as wide as long, and no conspicuous flaring teeth at the base of the lamina. *V. sagittata*, on the other hand, has an ovate-lanceolate to lanceolate blade with 4-6 conspicuous basal teeth, which may be up to 1 cm. in length. Two things may confuse the student. The young leaves, in early spring, may appear only crenate-serrate at the base; if the plant is observed for a few weeks it will be seen that the basal teeth develop as the leaf increases in size. Secondly, Brainerd (1921) and Fernald (1950) characterize the leaves of *V. sagittata* as glabrous. This is true only in the southeastern third of the range of *V. sagittata*. A definite cline has been found by the present author in this species, showing a marked increase in lamina pubescence from the southeastern (Virginia and the

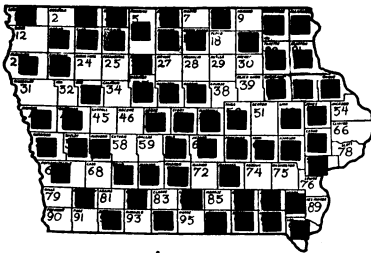
Carolinas) to the northwestern part of the range, in Iowa and Minnesota.

*Viola viarum* Pollard (Map 8)

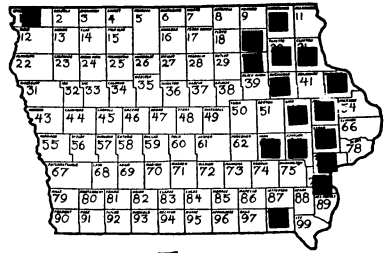
This is a prairie violet, found in the southern counties of Iowa. It may be confused with some of the hybrids of *V. pedatifida*, from which it differs by having basally incised, rather than flabelliform, leaves. In addition the leaves are glabrous, thus differing both from those of *V. pedatifida* (minutely pubescent), and *V. sagittata* (moderately to heavily pubescent.)

*Viola pedatifida* G. Don (Map 9)

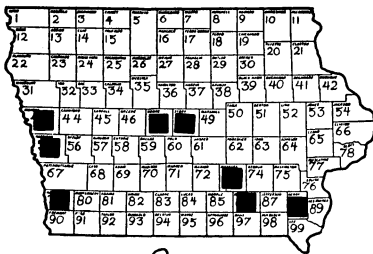
The leaves of *V. pedatifida* are truly palmate, having both the



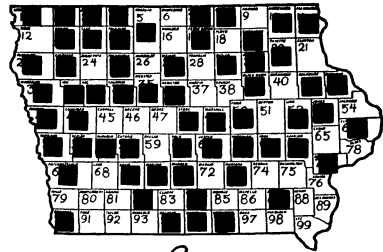
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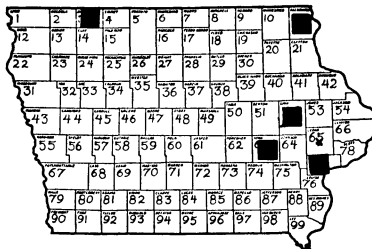
7.



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9.



10.

lateral and the middle segments divided palmately, thus differing in the latter from *V. pedata*. Considerable difficulty may be found in distinguishing between *V. pedatifida* and *V. pedata* in the summer. At this time the leaves of *V. pedatifida* are pubescent, those of *V. pedata* glabrous. *V. pedata* does not produce cleistogenes, whereas *V. pedatifida* does. *V. pedatifida* has a horizontal, somewhat elongated rootstock, while *V. pedata* has a very short, erect rootstock.

Very frequently encountered in the herbarium specimens were hybrids of *V. pedatifida*. This species apparently will hybridize with almost any of the other stemless blue violets, producing at least first generation offspring, and sometimes second generation hybrids and backcrosses (Brainerd, 1924). Newbro (1936) has pictured one of these hybrids with a plant of the species in her Plate V., Fig. 8, but did not differentiate between the two. In the material examined by the present author, there were suspected hybrid specimens between *V. pedatifida* and three other stemless blue violets, *V. sororia*, *V. sagittata*, and *V. papilionacea*.

*Viola pallens* (Banks) Brainerd (Map 10)

This small, stemless, white violet is found at the western edge of its range in Iowa. It is always found in wet places, either in open bogs or marshes or less frequently in wet woods.

*Viola incognita* Brainerd (Map 11)

*V. incognita* has been found only in Muscatine County, at a station which marks the southwestern limit of its range. It is the most common of the stemless white violets in the Great Lake states and in northeastern United States. Newbro identified the specimen from Muscatine Co. as *V. blanda*, a species not found west of central Indiana. Fernald (1950) gives the range of *V. blanda* as extending westward to Minnesota, Wisconsin, and Illinois. The author has monographed the stemless white violets (Russell, ms.), and all specimens labeled as *V. blanda* Willd. from the above states have proven to be *V. incognita*. *V. incognita* has slightly reniform leaves with deep sinuses, as opposed to the subcordate to shallowly cordate, narrower leaves of *V. blanda*. In addition the lateral petals are bearded in *V. incognita* and not in *V. blanda*. The lateral petals of *V. incognita* are short and clavate, and not elongate and twisted as in *V. blanda*.

*Viola renifolia* A. Gray (Map 12)

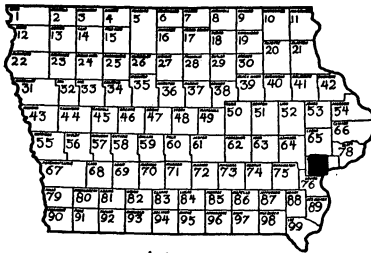
The single collection of this species in Iowa (Pine Hollow, Dubuque Co.) is of considerable interest. The nearest specimens of



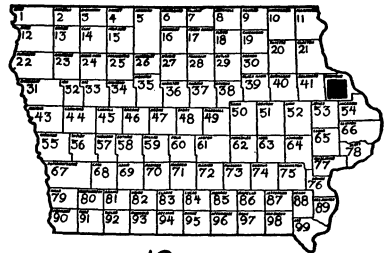
this species known to the author are found in the Cedar Creek Bog, about 40 miles north of Minneapolis, Minnesota. *V. renifolia* is usually found in cold bog forests or in pine forests, growing on the leaf litter. The reniform leaves and lack of vegetative stolons are distinctive.

*Viola lanceolata* L. (Map 13)

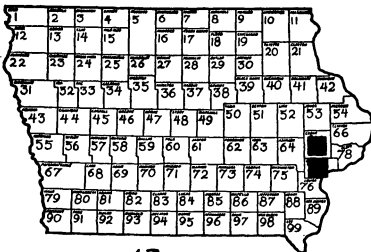
This species may be sought along the edges of lakes and ponds and in wet meadows in eastern Iowa. It is a widespread species, occurring in some form over the eastern half of the United States, and in addition a variety of *V. lanceolata* is found in some Oregon coastal marshes.



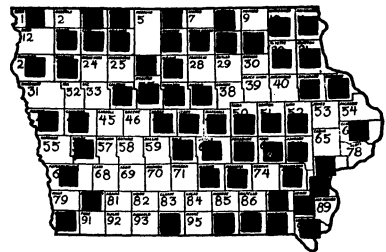
11.



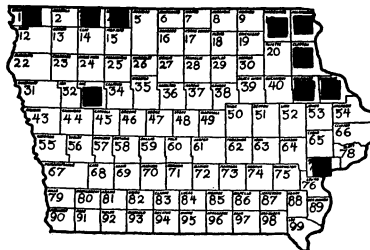
12.



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*Viola pensylvanica* Michx. (Map 14)*V. eriocarpa* Schw.

For some years, Dr's. Stanley Cain and Pierre Dansereau have been studying the stemmed yellow violets of North America. Though their work has not been published, the present author has been fortunate enough to examine the manuscript of Dr. Cain. In putting all our yellow violets under this species, he is following Dr. Cain's interpretation. Actually the majority of Iowa specimens are intermediate morphologically between *V. pensylvanica* and *V. pubescens* Ait., and it is difficult to assign them to either species, using such keys as those of Fernald (1950). Until the publication of the work of Cain and Dansereau this placement must be regarded as provisional.

*Viola rugulosa* Greene (Map 15)

In 1902 Greene separated this species from *V. canadensis* L. It differs from *V. canadensis* in a number of ways. The plant is generally more vigorous; the basal leaves are reniform rather than cordate; the flowers are slightly smaller and with a distinct bluish tinge to the back of the petals; most important, the rhizome is branched and sends out long, subterranean stolons, a character not found in *V. canadensis*. As now understood, *V. rugulosa* is the stemmed white violet found in the midwestern and prairie states, and *V. canadensis* is found in the eastern states, across southern Canada, and in the northern Rockies.

## EXCLUDED SPECIES

*Viola lucidifolia* Newbro

The specimens upon which Newbro based this species have been examined at the State University of Iowa, and the present author is unable to separate them from *V. missouriensis*.

*Viola hirsutula* Brainerd

This violet was suspect because Iowa is rather far from its known range. Fernald (1950) gives the range as "Ga. and Ala., n. to Ct., N.Y., W. Va. and s. Ind." Upon examination it was discovered that most of the specimens assigned here were actually *V. nephrophylla*. It was further found that *V. nephrophylla* usually, but not always, has the upper surfaces of the laminae sparsely hirsute. This character is not given in published descriptions and was checked further in the Herbarium of the Missouri Botanical Garden, where it was found to hold true for almost all their specimens labeled as

*V. nephrophylla*.

*Viola septentrionalis* Greene

This is a very elusive species, at least in Minnesota and Iowa, where the author has studied violets most intensively. It was decided to exclude it from the present paper, because all of the specimens seen that were so labeled equally or better fitted the description of *V. sororia* Willd. In the only clear character in which the two are supposed to differ, the pubescence of the spur petal, there were all gradations between almost glabrous (*V. sororia*) and moderately villous (approaching *V. septentrionalis*).

*Viola fimbriatula* J. E. Smith

The specimens were re-identified as *V. sagittata* Ait.

*Viola primulaefolia* L.

The author's studies of the stemless white violets have demonstrated that *V. primulifolia* is essentially a coastal plain violet, found from New England to Texas. The several reported records of *V. primulifolia* from Iowa, Wisconsin, and Minnesota are in all probability records of a hybrid between *V. lanceolata* L. and *V. pallens* (Banks) Brainerd. In almost every instance, including the Iowa record, both the putative parents have been found with the "*Viola primulifolia*". An as yet unpublished study of one such instance, in the "Ham Lake Meadow", about 40 miles north of Minneapolis, Minnesota, has given rather conclusive proof that such is the case there. Due to the great morphological similarity between the hybrid (F<sub>1</sub>) and the northeastern form of *V. primulifolia*, it is difficult to separate the two. The hybrid will have generally a more lax habit, and in addition seldom, if ever, produces good seed. Attempts to germinate a small amount of seed found by the author were unsuccessful.

*Viola blanda* Willd.

The specimens were re-identified as *V. incognita* Brainerd.

*Viola canadensis* Ait.

The specimens were re-identified as *V. rugulosa* Greene.

*Viola pubescens* Ait.

The specimens were re-identified as *V. pennsylvanica* Michx.

#### HYBRIDIZATION IN VIOLA IN IOWA

A large number of specimens were examined in the stemless blue violets in which hybridization was strongly suspected. The following list summarizes the number and distribution of the supposed hybrids.

- V. pedatifida* X *V. sororia*—specimens from 19 counties  
*V. papilionacea* X *V. pedatifida*—18 counties  
*V. pedatifida* X *V. sagittata*—1 county  
*V. sagittata* X *V. sororia*—3 counties  
*V. missouriensis* X *V. sororia*—1 county  
*V. missouriensis* X *V. sagittata* ?—1 county  
*V. papilionacea* X *V. sororia*—4 counties  
*V. nephrophylla* X *V. papilionacea*—1 county

Maps of these locations are not presented because of the rather speculative nature of the evidence. However, it has been shown (Brainerd, 1924; Bamford and Gershoy, 1928; Bold and Gershoy, 1934) that hybridization does occasionally occur in the above instances, as well as in many more. Studies have been undertaken by the author to test some apparent cases of hybridization in this group (Russell, 1952; Russell and Kunimura, unpublished), and will be continued throughout at least the present growing season in New York, near the center of range for the stemless blue violets. There seems to be every indication that the taxonomy of much of the genus *Viola* is in extreme need of revision.

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#### EXPLANATION OF PLATES

Figures 1-15. Range maps for the violets of Iowa. Each dot represents one or more collections examined from the counties indicated. Fig. 1. *Viola pedata* var. *pedata*. Fig. 2. *V. pedata* var. *lineariloba*. Fig. 3. *V. papilionacea*. Fig. 4. *V. missouriensis*. Fig. 5. *V. nephrophylla*. Fig. 6. *V. sororia*. Fig. 7. *V. sagittata*. Fig. 8. *V. viarum*. Fig. 9. *V. pedatifida*. Fig. 10. *V. pallens*. Fig. 11. *V. incognita*. Fig. 12. *V. renifolia*. Fig. 13. *V. lanceolata*. Fig. 14. *V. pensylvanica*. Fig. 15. *V. rugulosa*.

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