

## A VEINLESS FORM OF *SARRACENIA PURPUREA* SUBSP. *PURPUREA* DISCOVERED IN ONTARIO, CANADA

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In June 1997, we visited a *Sphagnum* lake-margin bog in Grey County, Ontario, Canada. This 5,000 square meter site contains a population of the typical (i.e. intensely red-pigmented) form of *Sarracenia purpurea* subsp. *purpurea* common throughout the Great Lakes region. During this trip, we discovered a previously undocumented population of the anthocyanin-free *Sarracenia purpurea* subsp. *purpurea* f. *heterophylla*. The two grow intermixed on the floating *Sphagnum* mat (see Figure 1).

During this and subsequent field trips to this location, we observed pitcher plants that superficially resemble *Sarracenia purpurea* subsp. *purpurea* f. *heterophylla*. The current season pitchers of these plants are yellow-green to almost pure yellow (when growing in full sun), and look very much like the anthocyanin-free form. However, the growing points exhibit coloration typical of the normal, red-colored *S. purpurea* subsp. *purpurea*. Furthermore, over-wintered pitchers are often suffused with pale pink. During the flowering season, the petals on these strange plants range in color from almost pure yellow to the deep maroon typical of *S. purpurea* subsp. *purpurea*. Some flowers exhibit pinkish to red streaking on yellow petals.

In addition, we have observed yet other plants with peculiar pigmentation patterns worthy of comment, that could be described as being intermediates. In summary, in our 1997-2001 observations (made at various times of the year), we have noted four distinct color variants of *S. purpurea* subsp. *purpurea* in the bog:

1—The typical form of *Sarracenia purpurea* subsp. *purpurea* plants with intensely red leaf venation and red flowers (see Figure 2). This is the pigmentation pattern that Sheridan & Scholl (1996) referred to as “red”.

2—The anthocyanin-free form, *Sarracenia purpurea* subsp. *purpurea* f. *heterophylla* (see Figure 3). Red pigmentation is absent from all the plant’s parts. Sheridan & Scholl refer to this form as “green.”

3—Plants exhibiting only marginal red coloration (see Back Cover). Upon casual viewing, these clones resemble “green” plants. Closer examination, however, finds slight red pigmentation in the growth point (typically buried by *Sphagnum*, and occasionally in the leaf margin, ringing damaged portions pitchers and suffusing aged pitchers from the previous growing season. Petal color is highly variable, and may be green, pink, red, yellow streaked with red, or other intermediate patterns. The red pitcher venation so typical of “red” plants is always absent. As such, we have coined the term “veinless” (that is, lacking red venation) to describe these plants, to augment the terminology used by Sheridan & Scholl (1996).

4—This category contains the range of plants that are intermediate between the “red” plants and the “veinless” plants, with varying degrees of venation. We have coined the term “semi-veinless” to denote these plants. Examples of semi-veinless plants are shown in Figures 4, 5 and 7.



Figure 1: An open *Sphagnum* bog in Grey County, Ontario, Canada. Note the intermixed color variants of *Sarracenia purpurea*. Photograph by Carl Mazur.



Figure 2: Red *Sarracenia purpurea* at Grey County, Ontario, Canada. Photograph by Carl Mazur.



Figure 3: Green *Sarracenia purpurea* at Grey County, Ontario, Canada. Photograph by Carl Mazur.



Figure 4: Semi-veinless *Sarracenia purpurea* at Grey County, Ontario, Canada. Red pigmentation and venation is prominent, but not as intense as in normal red plants. Photograph by Carl Mazur.



Figure 5: Semi-veinless *Sarracenia purpurea* at Grey County, Ontario, Canada. Red venation is nearly absent, but a slight pitcher blush of orange is still visible, especially on the margins of the pitchers. Photograph by Carl Mazur.

In July of 1997, one of us (CM) and Dino Petruzzi conducted a census of the plants in a portion of the bog at the Grey County site. Ten 2.25 m<sup>2</sup> quadrats were selected that appeared to be representative of the entire bog. A total of 184 plants were classified by color type as described above. Only plants mature enough to clearly indicate their pigmentation class were included in the count; immature plants do not express sufficient pigmentation characteristics to ensure accurate classification.

The veinless form predominated, comprising more than two-thirds of classified plants (see Figure 6). Only six percent of the examined population consisted of red plants, and only one percent of the examined population consisted of green plants. Approximately one-fourth of the plants consisted of semi-veinless plants.

We have observed an additional bog exhibiting similar color variability in Huron County, Ontario, Canada, approximately 100 kilometers from the Grey County site. Here, the red form of *S. purpurea* subsp. *purpurea* dominates. However, green, veinless, and semi-veinless color forms are also present. Color variability has also been reported in bogs in Northern Michigan (Case, 1956; Shomin, 1993).

#### The Visual Case for Hybridization

So far, forms of *Sarracenia* subsp. *purpurea* lacking red venation have only been observed in the company of *S. purpurea* subsp. *purpurea* f. *heterophylla*. It is therefore plausible that these “veinless” plants are the result of hybridization between red and green plants. This hypothesis is further supported by the spatial distribution of the color forms in the Huron County location. While red

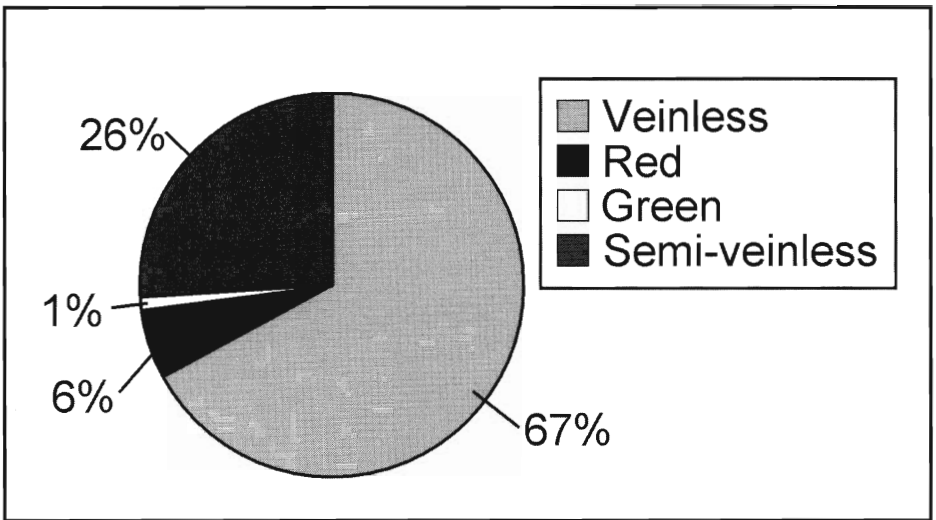


Figure 6: A pie chart showing the relative frequencies of the four pigmentation types of *Sarracenia purpurea*, as observed in a bog in Grey County, Ontario, Canada.

plants dominate at this site, there are localized areas, approximately 10-50 meters in diameter, where other color forms are more prevalent or even locally dominant. At the centers of these areas, there are typically one or more green plants. In the immediate vicinity of these green plants is a higher occurrence of veinless plants. As the distance from cluster core increases even more, semi-veinless plants become more common (and the degree of red pigmentation in these appears to increase with increasing distance from the cluster core). This is not to say that the green, veinless, semi-veinless, and red plants form clearly delineated concentric rings around the cluster core; rather, the frequency of semi-veinless and veinless plants increases closer to the green plants.

In September 2000, one of us (CM) visited a *Sarracenia purpurea* subsp. *purpurea* bog in Wellington County, Ontario, with Phil Wilson and Melissa Burgio. While this bog was dominated by red plants, one green plant was located. Other plants near the green specimen exhibited less-apparent red venation and more yellow color to the leaf than is seen in red specimens. This was a case of a green plant associated with semi-veinless plants.

Interestingly, a nearly opposite color distribution pattern can be found in the Grey County bog, where the locally-rare red plants can be found in the center of areas of semi-veinless plants. As the distance from isolated red plants increases, the frequency of intermediate plants decreases, gradually blending into the locally-abundant veinless plants. Perhaps the process of hybridization in this site has been occurring for so long that the red plants have blended with the veinless or semi-veinless plants. Even more interesting is the possibility that the red plants have been out-competed by semi-veinless, veinless and green competitors. It has been suggested, at least in the case of *S. rubra* subsp. *jonesii*, that green clones out-compete their red counterparts for prey, and enjoy a resulting increase in growth and vigor (P. Sheridan, pers. comm.). Perhaps a similar effect may be happening at the Grey County bog with *Sarracenia purpurea* subsp. *purpurea*.

#### Other Examples of Intermediate plants

Occurrences of veinless and semi-veinless plants are not restricted to Ontario *Sarracenia purpurea* subsp. *purpurea* sites. Similar pigmentation patterns have been observed in other *Sarracenia* populations. We have observed veinless and semi-veinless specimens of *Sarracenia rosea* plants among normal, red *S. rosea* plants in Bay County, Florida. One of us (JL) has observed populations of *Sarracenia psittacina* in Gulf County, Florida that contained green, veinless, semi-veinless and red plants.

Finally, we have observed *Sarracenia minor* sites, in Ware County, Georgia and Berkeley County, South Carolina, that include veinless and semi-veinless specimens among the red plants.



Figure 7: Semi-veinless *Sarracenia purpurea* at Grey County, Ontario, Canada. Red venation is nearly absent, but an orange-red blush on the pitchers is still evident. Photograph by Carl Mazur.

Sheridan & Scholl (1997) suggest that the green trait in *Sarracenia* is consistently recessive, and Sheridan & Mills (1998) demonstrated that crossing red plants with green plants resulted in red phenotypes that carry the recessive green gene in the F1 generation. Furthermore when they crossed F1 plants they obtained the expected genetic ratio of 3:1 red to green offspring with no intermediates. However Sheridan's experiments do not appear to be consistent with our field observations.

Note: Permissions to access to the sites described in this report were kindly provided by the Saugeen Valley Conservation Authority and the Hamilton-Wentworth Conservation Authority.

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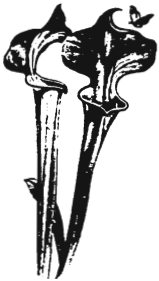
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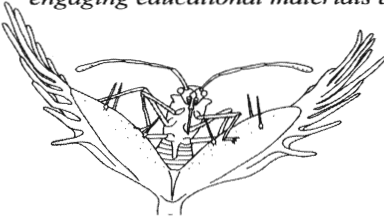
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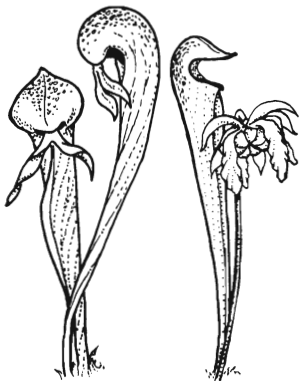
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Front Cover: *Drosera binata* and *Cephalotus follicularis* in Western Australia. See article on page 68. Photograph by Robert Gibson.

Back cover: Veinless *Sarracenia purpurea* in Grey County, Ontario, Canada. Unless carefully inspected, this plant could be mistaken for *Sarracenia purpurea* f. *heterophylla*. See article on page 79. Photograph by Carl Mazur.

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