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THE NATIVE ORCHID CONFERENCE JOURNAL

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Message from the President:

Early February in Edmonton, Alberta and the night time temperatures have dropped to -31°C. Orchid hunting seems a long way off. By now you will have heard of the difficult decision recently made by the Board to postpone (yet-again) the 2021 Olympic Peninsula Symposium scheduled for June. We felt that despite many signs of progress with the pandemic that there is still too much uncertainty and risk to organize a large gathering to look at orchids - as worthwhile as that sounds to some of us! Not to despair, there are signs of hope! The days are getting longer. Vaccines are rolling out. Orchids are already starting to appear in some places. We are planning a new series of 'virtual' native orchid get-togethers, along with our online Annual Meeting (scheduled for June). And with everyone staying inside for so long, it will be all that much sweeter to finally get outside. The orchids will be there, better than ever!

Our Journal Editor Chelsea Kieffer has assembled another wonderful issue for your enjoyment. Volume 18.1 contains four original articles and outstanding colour photographs covering a number of interesting topics. First, Tom Sampliner writes about *Spiranthes lacera* and its two varieties: *var. gracilis* and *var. lacera*. He illustrates and reviews the long-standing problems with their identification. Next, Paul Catling and Brenda Kostiuik present the results of their study on the *Platanthera aquilonis - dilatata* complex in Newfoundland. This is an important article for anyone who has tried to tell some of these species apart in the field. Third, Stefan Ambs describes and illustrates a weekend trip chasing three *Cypripediums* (*montanum*, *fasciculatum*, and *californicum*) in the mountains of southwest Oregon. Finally, John Horner presents a new (green) variety of *Corallorhiza odontorhiza* from Door County, Wisconsin. We thank these authors for their contributions, and hope that you enjoy their efforts.

NOC always needs articles for the Journal. Everyone benefits from them. Please consider sharing your finds with us: write an article for the Journal; submit some of your photographs to our Facebook page; or send us a link to your orchid pictures on one of the many photo-sharing websites.

Stay safe and healthy. Take care of yourselves, your family and your friends.

Ben Rostron

Edmonton, Alberta

February, 2021

A TALE OF TWO VARIETIES

Text and photos by Tom Sampliner, tomsam2651@hotmail.com

I had not seen them in a very long time. I had almost forgotten the differences between the two varieties. One, I see locally on an annual basis since it occurs in my regular orchid hunting grounds here in Northeastern Ohio. I refer to *Spiranthes lacera* var. *gracilis* (Bigelow) Luer, the so-called Southern Slender Ladies'-tresses orchid (Figure 1). The uncommon one around these parts and one I had not seen in some time was the northern taxon, *Spiranthes lacera* var. *lacera* (Raf.) Raf. (Figure 2), the Northern Slender Ladies'-tresses. Finally, last summer in July of 2019 in the company of a friend from the Greater Pittsburgh area, I decided to become reacquainted with this taxon.



Figure 1: Southern Slender Ladies'-tresses,
Spiranthes lacera var. *gracilis*



Figure 2: Northern Slender Ladies'-tresses,
Spiranthes lacera var. *lacera*

The separation of the two taxa has been known for quite some time, but has had a chaotic back and forth treatment by various authors over the years. A concise but cryptic history is set forth by Case (1987) in his classic “Orchids of the Western Great Lakes Region” at page 172, he wrote that Fernald in 1946 departed from a single species concept then known as *Spiranthes gracilis* to recognize a northern and a southern taxon at the varietal level. This approach was rejected by Correll (1950) and had also been rejected by Case in the earlier first edition of his book. Luer (1975) had accepted two varieties of one species following Fernald’s (1950) descriptions. Paul Catling affirmed Luer’s treatment and combined with Case in Michigan Botanist 22:79-92 (1982) in their joint article, “The Genus *Spiranthes* in Michigan.” Several comments made in that article are quite revealing.

They say that specimens encountered in the field are “not always clear cut,” when one attempts to assign them to one of the two varieties. I fully understand after seeing specimens in the field that don’t seem to have read any of these works to know what they are supposed to be looking like.

Michigan Botanist (1982) 22: 79-92 at page 88: A couple traits that Catling and Case point to would be (1) in variety *gracilis* the lip apex is more rounded and the green lip stripe is broader (Figure 9,11), and (2) along with a later flowering time than for variety *lacera*.

They also distinguish companion plants and habitats at page 88: “the Northern Slender Ladies-tresses usually occurs in dry acid substrates in pine woods or plantations of *Pinus strobus*, *P. resinosa*, *P. banksiana* or on open, sandy or rocky granite barrens and dunes where it occurs with blueberry, *Vaccinium angustifolium*, poverty grass *Danthonia spicata*, bracken fern, and polytrichum mosses.” Flowering time in the Great Lakes for the Northern Slender Ladies-tresses is the third week in July.

In contrast, also on page 88, Catling and Case say that “variety *gracilis* occurs in rather open dry old fields or prairies in slightly acid or neutral substrates. Common associates are Canada blue-grass, *Poa compressa*, poverty grass, and wild strawberry, *Fragaria virginiana*. Southern slender ladies’-tresses flowers from mid-August to mid-September.”

Homoya (1993) at page 202 has a great quote regarding field examination of the two taxa, “distinct in the extreme but the common occurrence of intermediates can cause frustration and the suspicion that only one highly variable entity exists.”

Homoya summarizes that one of the most field-friendly traits separating the two taxa as being a distance between the lowest flowers in variety *lacera* resulting in a loose spiral, versus a more regular distance between all florets in variety *gracilis* which would make a tighter spiral. He also adds that the leaves are generally present at flowering time in variety *lacera* but absent in *gracilis*. Images in figures 3 and 4

present the classic appearance of the two taxa. Figures 5 and 6 are examples of each variety that appear to be a departure from the classic.



Top left, Figure 3: Tight spiral showing lip floor green pattern typical for specimens of Northern Ohio of Southern Slender Ladies'-tresses, *Spiranthes lacera* var. *gracilis*

Top right, Figure 4: Northern Slender Ladies'-tresses, *Spiranthes lacera* var. *lacera* from Central Pennsylvania in mid-July 2019. Arrows showing gap between lowest two florets and rest of raceme

Bottom left, Figure 5: Southern Slender Ladies'-tresses, *Spiranthes lacera* var. *gracilis* can be single or multiple ranked and the multiple can be very regular or this messy look.

Bottom right, Figure 6: An ambiguous specimen which I considered more like var. *lacera*, Northern Slender Ladies'-tresses.

The Ohio flora books are old enough that they use the older no-longer followed taxonomy of Correll and Case in his first edition. You will find an interesting observation regarding differences between their leaf venation as well as with the green color pattern on the lip. Braun (1967) at pages 431- 432 provides excellent line drawings to show what would be difficult to communicate with words alone (Figures 7-10). It takes magnification for our eyes to see the minute differences between the venation patterns of the two *spiranthes* varieties. Variety *lacera* has a more pronounced venation compared with variety *gracilis* which has a fainter and tighter venation. I have not found any prior reference by another author as to venation differences on the leaves of these two taxa. I am now motivated to go out and look; hopefully you are too.

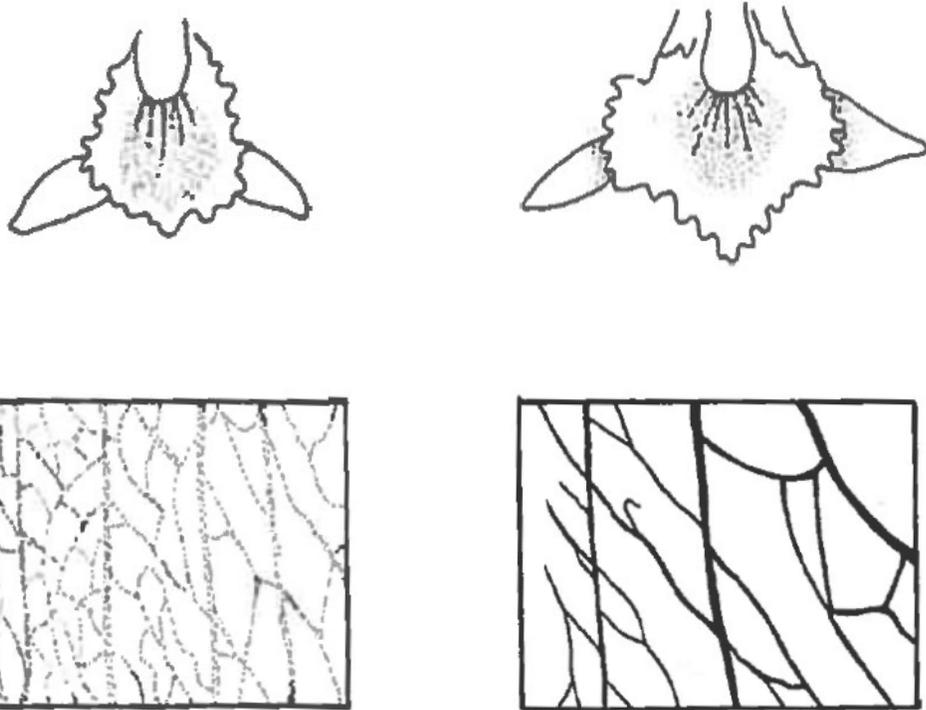


Figure 7 and 8: Green pattern on lip and leaf venation of Southern Slender Ladies'-tresses, *Spiranthes lacera* var. *gracilis*. Diagrams in Braun (1967) were not scaled.

Figure 9 and 10: Green pattern on lip and leaf venation of Northern Slender Ladies'-tresses, *Spiranthes lacera* var. *lacera*. Diagrams in Braun (1967) were not scaled.



An interesting occurrence of two inflorescence intertwining together of Southern Slender Ladies'-tresses, *Spiranthes lacera* var. *gracilis*, Cuyahoga Valley, OH

In Center County, Pennsylvania in a Jack Pine copse of trees on a slope on state forest land not too far from the site I talked about in my article on *Neottia smallii*, some specimens of *Spiranthes lacera* var. *lacera* were in bloom during my mid-July of 2019 visit. I must say that these orchids certainly have more consideration for the photographer than do the *Neottia*. Here with the *Spiranthes* we did not have to put up with stout rhododendron shrubs tripping, tangling, or otherwise interfering with our walk or setting up to take pictures. Maybe they can teach the twayblade this more welcoming approach.

In any event, the substrate being grassy, rather open and fairly vegetation free made it easy to sprawl on the ground and take pictures of the orchid specimens. As you will observe from my images, some of the orchids did their homework and read up on how they are to appear so that they followed the classic descriptions for their variety. Perhaps the non-conforming orchids can enroll in summer school and pick up on how it should look. I hope you find this article both educational and entertaining.

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OBSERVATIONS ON THE SYSTEMATICS OF THE *PLATANATHERA AQUILONIS*- *P. DILATATA* COMPLEX IN NEWFOUNDLAND

Text and photos by Paul M. Catling & Brenda Kostiuk, brenda.kostiuk@gmail.com

Abstract

The tetraploids, *P. huronensis* and *P. hyperborea*, are believed to have evolved from hybridization of the diploids, *P. aquilonis* and *P. dilatata*. In a hybrid zone in Newfoundland involving proximity of the parents, these tetraploid species are less distinct. Once outside the hybrid zone, hybrid lineages may be selected and isolated, and become more distinct. This appears to be the case with *P. huronensis* and *P. hyperborea* which are relatively well defined over large areas of their North American range.

Introduction

This brief article is about the *P. aquilonis* – *P. dilatata* group. Included are four taxa: (1) *Platanthera dilatata* (Pursh) Lindley ex L.C. Beck var. *dilatata* (Tall White Bog Orchid) with white flowers; (2) *Platanthera aquilonis* Sheviak (Tall Northern Green Orchid) with green or yellowish-green flowers; (3) *Platanthera huronensis* (Nuttall) Lindley (Lake Huron Green Orchid) with whitish-green flowers; and *P. hyperborea* (L.) Lindley (Leafy Northern Green Orchid) with pale green flowers. The first two are diploids with two sets of homologous chromosomes. The second two are triploids or tetraploids with three or four sets of homologous chromosomes.

When Sheviak (2002) provided an excellent and current taxonomic treatment of *Platanthera* for Flora of North America, the study of the *P. aquilonis* – *P. dilatata* group was ongoing and *P. hyperborea* (Leafy Northern Green Orchid) was not reported for North America. Subsequently he clarified the occurrence and distinctive features of *P. hyperborea* indicating that it was a distinctive and widespread taxon occurring in arctic and subarctic North America (Sheviak 2011) including southern Yukon, southern James Bay, Newfoundland, and Manitoba. The differences between *P. aquilonis* (Tall Northern Green Orchid) and *P. hyperborea* were further discussed in Catling (2012), where the two taxa were reported to be distinct in four areas of sympatry across Canada including northern Alberta, northern Ontario, Quebec and Nova Scotia.

A field study in Newfoundland suggested that the taxa were less distinct there, and that this may be a consequence of hybridization. Here some evidence is provided that supports this suggestion. Although the data set is small, it does represent, with data, what was seen over a large area with many hundreds of plants, and provides hypotheses that can be further tested as well as a basis for a brief discussion of implications.

The hypotheses are: (1) Proximity of plants of the four species in Newfoundland leads to various hybridizations and backcrosses that results in a complex cloud of variation where species limits of *P. huronensis* and *P. hyperborea* are less clear than in many other parts of Canada; and (2) the morphological characters of *P. huronensis* and *P. hyperborea* can be explained in terms of intermediacy between *P. dilatata* var. *dilatata* and *P. aquilonis*, suggesting a hybrid origin.



Platanthera huronensis on the right, and plants of *P. dilatata* to the left.
4 km N of Bellburns, 16 July 2012.
Photo: P.M. Catling.

Loc. No.	No. of Plants	Region	Latitude	Longitude	Flower Color
405	2	St. John's	47.58459	-52.7478	1
397	4	Cook's Harbour	51.57242	-55.9044	1
385	2	Stephenville	48.5227	-59.2127	1
390	5	Bellburns	50.39146	-57.5185	1
397	4	Cook's Harbour	51.57242	-55.9044	1.5
395	3	Cook's Harbour	51.51899	-55.9321	1.5
397	4	Cook's Harbour	51.57242	-55.9044	1.5
390	10	Bellburns	50.39146	-57.5185	1.5
383	1	Stephenville	48.49439	-59.2217	2
390	6	Bellburns	50.39146	-57.5185	2
397	5	Cook's Harbour	51.57242	-55.9044	2
386	3	Cow Head	49.91523	-57.9058	2
383	8	Stephenville	48.49439	-59.2217	2
381	2	Stephenville	48.46479	-59.2658	2
390	6	Bellburns	50.39146	-57.5185	2
379	10	Stephenville	48.53535	-58.7688	2
397	1	Cook's Harbour	51.57242	-55.9044	2.5
386	1	Cow Head	49.91523	-57.9058	2.5
395	5	Cook's Harbour	51.51899	-55.9321	2.5
388	4	Corner Brook	48.93943	-57.9345	2.5
397	2	Cook's Harbour	51.57242	-55.9044	2.5
390	2	Bellburns	50.39146	-57.5185	2.5
395	2	Cook's Harbour	51.51899	-55.9321	3
380	12	Stephenville	48.51762	-58.9766	3
385	3	Stephenville	48.5227	-59.2127	3

Table 1. Locations of samples showing (showing location number and latitude and longitude), and number of plants of different flower color at each location. For flower color: 1 = white (*P. dilatata*), 1.5 = very pale greenish-white (putative hybrid), 2 = whitish green (putative hybrid), 2.5 = green (putative hybrid), 3 = green with a yellow-green lip (*P. aquilonis*).

Methods

Field study

Between 7 and 26 July 2012, data were collected on flower color (on a scale with 1 = white and 3 = green), lip length, lip width, spur length and connective length in 107 plants of the *P. aquilonis* – *P. dilatata* group from 11 sites scattered over a large part of Newfoundland, but often with a few in the same region (Table 1). The connective length is the length of the tissue at the tip of the column between the anther sacs. A single flower was measured from each plant selected and it was always the third flower from the bottom of the inflorescence. Two to 23 plants were measured at each site and the plants for measurement were selected to represent the variation at the site in size and flower color. Consequently more flowers were measured from some sites than from others. Sites were chosen to represent various habitats including roadside ditches, coastal barrens, alpine wetlands and fens in forested areas.

Data Analysis

Both analyses described below utilized the database described in the Methods, except that the white flowered plants (*P. dilatata* var. *dilatata*) were left out of the first one which involved only the discreteness of the predominantly green-flowered group.

1. Discreteness of the predominantly green-flowered group

A three-dimensional plot of lip length, spur length and connective length was keyed to flower color categories which have been shown to correspond relatively well with morphologically-based groups. The result was compared with similar graphs representing other regions of Canada (Catling 2012, Figs. 3, 4, and 5).

2. A potential hybrid continuum

Discriminant analysis using lip length (mm), lip width (mm), spur length (mm) and connective length (mm), and using flower color categories as grouping variables, was used to evaluate the discreteness of

hybrids. Analysis of variance provided F values (ratio of between group estimate to within group estimate of variance) for the characters which suggested relative character value in differentiating flower color groups. Discriminant Analysis produces a weighted formula that optimally separates predetermined groupings. As a result of the correlation of flower color and floral morphology, potential hybrids with intermediate flower color are expected to occupy an intermediate position between *P. aquilonis* and *P. huronensis* (Nuttall) Lindley (Lake Huron Green Orchid).

Results

1. Discreteness of the predominantly green-flowered group

Comparison of the plot of Newfoundland green-flowered plants here (Figure 1) with similar graphs in Catling 2012 (Figs. 3, 4, and 5) shows much less discreteness of *P. aquilonis* and *P. hyperborea*. The patterns of variation (Figure 1) however are similar with whitish or pale green-flowered plants (*P. huronensis* and *P. hyperborea*) in the upper right, and dark-green flowered plants with yellowish-green lips (*P. aquilonis*) in the lower left.

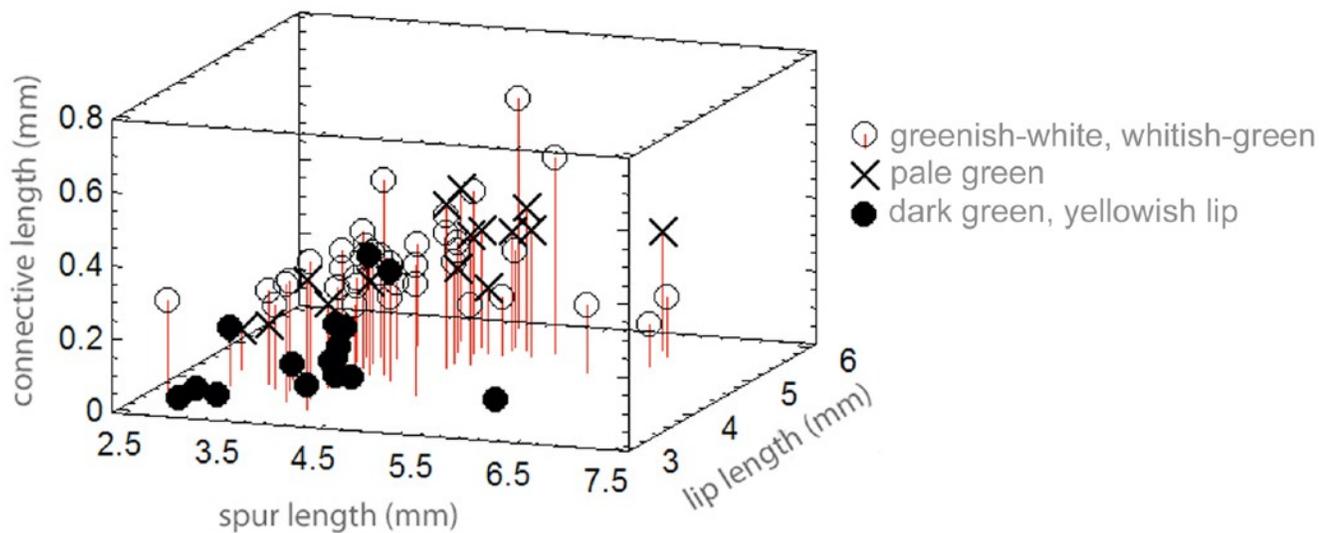


Figure 1. Three-dimensional plot of spur length, lip length and connective length for a sample of Newfoundland *Platanthera* (Table 1). The open circles represent greenish-white or whitish-green flowers (usually referred to *P. huronensis*), the Xs represent green flowers (usually referred to *P. hyperborea*) and the dots represent plants with darker green flowers with a yellowish-green lip (usually referred to *P. aquilonis*). The entirely distinct *P. dilatata* var. *dilatata* with white flowers is not shown. There is overlap in all of the three green-flowered groups with *P. aquilonis* being the most discrete, but not separate.

2. A potential hybrid continuum

All characters used in the Discriminant Analysis were significant for differences between their means for flower color groups. From highest (most useful) to lowest the F values were connective (76.18), spur length (43.76), lip length (41.30) and lip width (37.43). Most of the variation (94.4%) was accounted for on the first discriminant axis. Flower color groups in the Discriminant Analysis overlapped but *P. aquilonis* and *P. dilatata* (Pursh) Lindley ex L.C. Beck (Tall White Bog Orchid) were widely separated at each end of an

apparent hybrid continuum connecting the green flowers of the former with the white flowers of the latter (Figure 2). Plants with slightly greenish-white and pale green or whitish-green flowers (blue dots and open red triangles) occupy a space between and are presumably taxa of hybrid origin referable *P. huronensis* or *P. hyperborea* but are not clearly differentiated.

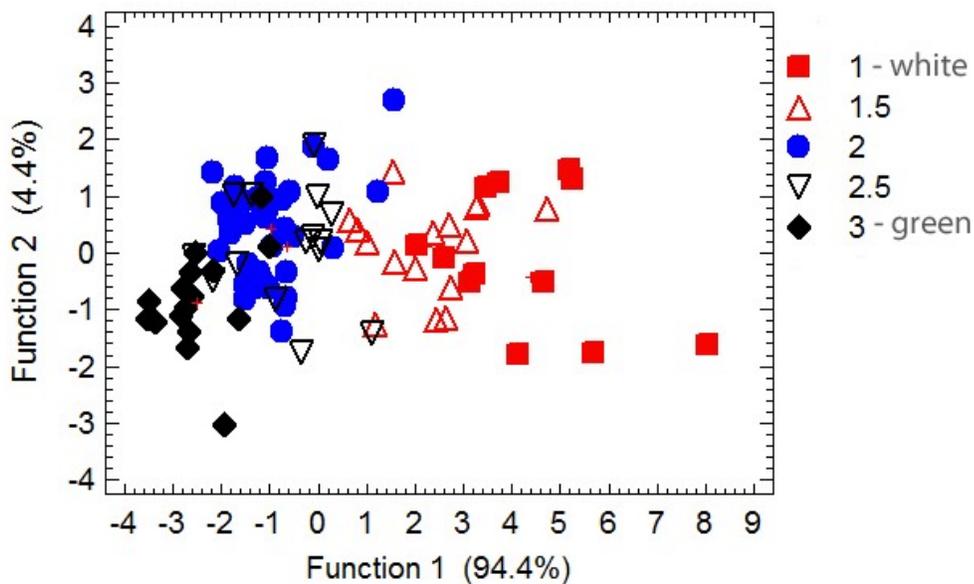


Figure 2. Discriminant analysis using lip length, lip width, spur length and connective length with flower color categories as grouping variables, based on material from five localities in Newfoundland. The flower color categories are 1 = white, 1.5 = greenish-white, 2 whitish-green, 2.5 = green, 3.0 darker green with a yellowish-green lip.

Discussion

1. Discreteness of the predominantly green-flowered group

The much less clear clusters of *P. aquilonis* and *P. hyperborea* in Newfoundland (Figure 1) than in a number of other regions of Canada may be a consequence of the cloud of non-selected hybrid variation that exists in Newfoundland. Elsewhere the two taxa have apparently been selected and isolated (odor, flower color, flowering time, ecology, etc.) and are less variable (Catling 2012).

2. A potential hybrid continuum

In Newfoundland, where both *P. aquilonis* and *P. dilatata* may occur in close proximity, a group of intermediates occurs that includes a variable group of plants referable to either *P. huronensis* or *P. hyperborea*. This is an apparently recent (or current) and variable hybrid swarm. The two hybrid taxa that appear to have evolved from such a variable swarm, *P. huronensis* or *P. hyperborea*, are difficult to differentiate here and probably cannot be reliably separated by flower color (Figure 2) which separates the

parents so well. The illustration is a reasonable portrayal of the situation seen in the field which involves a much larger number of plants (at least 2000 at least 100 localities).

3. Explanations, implications and considerations

The tetraploids, *P. huronensis* and *P. hyperborea*, are believed to have evolved through chromosome doubling, allowing fertility, and selection of two particular hybrid lineages from hybridization of the diploids, *P. aquilonis* and *P. dilatata* (Sheviak 2011). Although all four taxa may be distinct over much of their extensive North American range due to selection and isolating mechanisms (Catling 2012), there are likely restricted areas throughout North America where the formative hybridization is occurring extensively. Newfoundland appears to be one of these.

The parents are edaphically different plants. In a particular region, *P. aquilonis* often grows in drier places whereas *P. dilatata* is often in water in a more calcareous environment. This could lead to one of many advantages of a hybrid, the production of a plant that has similar proven qualities of the parent but can extend its occurrence by occupying an intermediate habitat that is slightly different from those of either parent. The parents also differ in breeding system with *P. aquilonis* elaborately designed for self-pollination and *P. dilatata* an obligate outbreeder. A hybrid with a new combination of characteristics and breeding system might be very successful under specific conditions.

Platanthera hyperborea could have arisen as a result of selection for self pollination in a plant with a different odor from that of *P. aquilonis* (pleasant instead of reminiscent of cat urine), and able to thrive in wetter conditions. Sheviak (2011, p. 14) noted that the allotetraploid genetics “would provide ample opportunity for the generation of variation that could include a distinct autogamous lineage.” It may also have arisen as a tetraploid backcross with *P. aquilonis* through an unreduced gamete of the latter which would result in a tetraploid plant with characteristics between *P. aquilonis* and *P. huronensis*, ... or it could have arisen through hybridization in some other way. This hybrid lineage has been extremely successful in the north and northeast where it occurs particularly in disturbed gravelly areas along roads, often in the thousands, only to decline in numbers as vegetation succession produces a more competitive cover.

The advantage of the other selected lineage, *P. huronensis*, may be simply a plant that could thrive in drier conditions than *P. dilatata*. In some cases it occurs in a fen with *P. dilatata*, but in drier parts. Elsewhere it is abundant by itself in periodically dry wetlands, particularly in the western mountains, far removed from *P. dilatata*. There are likely many other aspects of selection, none of which are immediately apparent, nor tested, that play a role, but these few observations may at least advance our understanding.

Sheviak (2000) noted that typical of the group, each time a question is answered new ones are raised. Some of what we know about the distinctive features and isolating mechanisms (e.g. Catling 2012) is based on

small samples and limited geographic areas. The variability within flowers on a single wild plant (Sheviak 2011, p. 27) is disturbing with regard to attempts to characterize taxa, and more study of this is desirable. A number of questions also remain with regard to the consequences of diploid-polyploid hybrid zones (Petit et al. 1999).

Conclusions

Although of limited scope, this study supports the recognition of four taxa in the *P. aquilonis-dilatata* complex. Hypothesis 1 suggesting regional difficulties in identification due to current hybridization in some areas of overlap of the putative parents, such as Newfoundland (where *P. huronensis* and *P. hyperborea* merge), is supported. Hypothesis 2 is supported by the fact that the morphological characters of *P. huronensis* and *P. hyperborea* can be explained in terms of intermediacy between *P. dilatata* var. *dilatata* and *P. aquilonis*, suggesting a hybrid origin. Hybrid lineages of these plants have a number of advantages based on ecology and breeding systems and tentative explanations for the evolution of *P. huronensis* and *P. hyperborea* are available.

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A MEETING WITH LADIES ON MEMORIAL DAY WEEKEND, 2001

...featuring *Cypripedium californicum*, *C. fasciculatum*,
and *C. montanum* in southwest Oregon

Text and photos by Stefan Ambs, ambss@mail.nih.gov

(Photos were taken on subsequent trips and most not at same locations.)

Spring is prime time for lady's-slippers in the Northeast. However, when I left our Massachusetts home on the morning of May 25, it was not for an orchid hunt in New England. My mind was set for lady's-slippers in Oregon. I arrived in Portland, where I continued my journey by rental car to the southwest corner of the state. The last stop of the day was Grants Pass, located in the heart of the Rogue River Valley, a gateway to the Siskiyou. This region is well known for the many endemics that have adapted to a mineral-rich serpentine soil. Orchids are common here and three lady's-slippers are known from the area. The California Lady's-slipper (*Cypripedium californicum*) is one of the endemics that is restricted to the serpentine seepage slopes of the region while the Clustered Lady's-slipper (*Cypripedium fasciculatum*), and the Mountain Lady's-slipper (*Cypripedium montanum*), are woodland plants found locally in many of the western states.



Mountain Lady's-slipper,
Cypripedium montanum



California Lady's-slipper,
Cypripedium californicum



Clustered Lady's-slipper,
Cypripedium fasciculatum

In preparation for my trip, I had contacted Penny Latham, a local nature conservationist. Thanks to her help, I was equipped with detailed maps that would lead me to locations of *Cypripedium fasciculatum* and *C. montanum* in the mountains that surround Grants Pass. I started my excursions the next morning with a short drive to the Whitehorse Park area. Here, a colony of *C. fasciculatum* and a few plants of *C. montanum* were growing together on a wooded slope just above a dirt road. The peak blooming season of *C. fasciculatum* is mid-May and I was rather late to see this lady's-slipper in bloom. Thus, it was not surprising that all the *C. fasciculatum* were past bloom. However, I was a little disappointed when I discovered that the same was true for *C. montanum*. The latter was probably in peak bloom a week earlier and the unusually warm spring may have shortened the blooming period. While I did not see my lady's-slipper on this May 26 morning, I was still lucky and spotted several plants of a white flowering *Piperia* (now *Platanthera*). The plants resembled both *P. candida* and *P. unalascensis*, and may have been a variant of the two closely related species, or a hybrid between the two. Leaving Whitehorse Park with a spirit for more, I proceeded through Grants Pass to interstate 5 and continued south. Near the town of Wilmer was the other mixed stand of lady's-slippers that I was going to visit that day. I followed a forest road uphill to an intersection. Here, I left my car and hiked a short distance until a red flag marked the entrance to a trail. I walked up the wooded hill and turned left to finally get to the ridge. Along the mountain slope under a



Mountain Lady's-slipper, *Cypripedium montanum*

dying manzanita, there it was: a large population of *C. fasciculatum* joined by a smaller stand of *C. montanum*. Although the location was several hundred feet higher than Whitehorse Park, all of the *C. fasciculatum* were gone by and only one of the *C. montanum* was still in full bloom. I eagerly took pictures of the only plant that had not faded prior to my arrival. Further explorations of the area showed me that at least five *C. montanum* and many more *C. fasciculatum* had flowered just one or two weeks before, and that some *Piperias* would bloom here in June.

I swiftly decided not to give up and moved on to Galice and the scenic Rogue River Valley. My destination was a *C. fasciculatum* site at Taylor Creek adjacent to the Briggs Valley road. At this location, the plants grow in shaded, moist woodlands very close to the creek. I was hoping that the cool moist environment would delay or extend the flowering period of *C. fasciculatum*, in comparison to the drier and sunnier locations at Whitehorse Park and Murphy Creek. My intuition was correct and I indeed found the lady's-slippers in full bloom at this low elevation site. Most of the brownish flowers were past peak but a few hung on and provided me with a first experience of a blooming Clustered Lady's-slipper. Nearby, a large colony of *Calypso bulbosa* var. *occidentalis* was in fruit and several plants of *Corallorhiza maculata*, the most luxurious I had ever seen, had just opened their flowers. *Corallorhiza striata* and *Goodyera oblongifolia* are two other orchids that can be found here, but they bloom either earlier or later. With my expectations met for the day, I returned to the Rogue River Valley and headed west for the Pacific Ocean. The Rogue River Valley and its tributaries offer great scenery that will captivate all audiences and not only the orchid enthusiasts. After driving for several hours along the Pacific coast, I finished my day in Humboldt County, CA, with an excellent dinner and a good glass of wine.



Clustered Lady's-slipper, *Cypripedium fasciculatum*

The second day in the West would bring me deeper into Humboldt County. I followed Route 36 to Dinsmore, as Ron Coleman had told me. Just before the township, I turned onto Buck Mountain Road and proceeded for several miles on dirt roads. The hillsides are very steep in this area and they are cut by deeply eroded streambeds. I was searching for one of those streams. A white marker told me that I had finally found the spot. Ron had seen a large colony of Clustered Lady's-slippers blooming near the streambed many years before. While I was searching for the plants, I realized that most of the population had been



Phantom Orchid,
Cephalanthera austiniiae

washed away. A large landslide on the left side of the creek had taken its toll on the colony. However, I still found eight scattered clumps with 3-10 plants each on both sides of the creek. There was only one plant in full bloom; all others were past their prime. Surprisingly, I found a good number of Western Calypso orchids that were still in peak condition. I continued to search the nearby woods and discovered *Cephalanthera austiniiae* in large numbers. The pure white stems gave the plants a ghostly appearance in the coniferous woods. Up and down the road there were hundreds, and one was already blooming. Other orchids that were common included *Piperia* and the Spotted Coralroot. The Dinsmore location was very impressive with the many species it supports and the sheer number of plants that thrive on the forest slopes. Having seen two of the three Western lady's-slippers by now and with only one day left for excursions, I made my way back to the California/Oregon border in search of the California Lady's-slipper.

I stayed overnight in Crescent City and enjoyed some local seafood for dinner. Although the city may be best known as a fishing community, I was rather struck by the number of strip malls, fast food joints and motels. The next day, I headed for the Redwood highway, Route 199, and continued on this winding road to the town of Gasquet. Here, I took a left turn through the township and passed a bridge spanning the Smith River. I continued to a trailhead that gave me access to Stony Creek. This area is part of the Smith River drainage system that has spectacular river canyons carved out

of the serpentine rock that dominates the area. Serpentine rock is also the preferred soil of the California Lady's-slipper. It only took a short hike to discover the first colony of *Cypripedium californicum*. In the red-rock canyon, luxurious clumps of lady's-slippers flourished in a seepage area surrounded by *Darlingtonia californica* and fragrant azaleas. I wasn't very lucky this morning and most of the plants were past prime. Fortunately, Stony Creek was not the only place along Route 199 that harbors the lady's-slippers. I returned to the car and drove about an hour northeast to the town of O'Brien. From there I continued to Whiskey Creek along the Wimer road that once was the main passage between this area and California. The climate is considerably cooler at this site than it is at Stony Creek and supports a later blooming period for the California lady's-slipper. This site is at a higher elevation and *C. californicum* was just perfect. The site also had hundreds of *Platanthera sparsiflora*. Last, I visited a site along the Onion Mountain road in SW Oregon. I had found this site three years earlier. It had flowering Calypso, *Neottia*

banksiana and *Corallorhiza mertensiana*. *Piperias* and *Goodyera oblongifolia* were emerging. At another place, I saw several *Spiranthes porrifolia* that needed probably two more weeks to start blooming. Overall, I had a good mixture of populations that were at the end of their blooming season and those that had just started. I can not complain. This year was certainly a very warm year with an early blooming season, but a very good orchid year overall (as it appeared to me).



California Lady's-slipper, *Cypripedium californicum*

GREEN *CORALLORHIZA ODONTORHIZA* IN WISCONSIN

Text and photos by John H. Horner, JHorner@addisoncw.com

In October 2015, while observing a population of *Corallorhiza odontorhiza* (Willdenow) Poiret, Autumn Coralroot, in Peninsula State Park in Door County, Wisconsin, my attention was drawn to two bright lime to apple green plants growing amidst a stand of purple and brown-stemmed *C. odontorhiza*. It took a few seconds to realize that the bright green plants were specimens of *C. odontorhiza*, lacking most of the pigmentation typical of this species. Many of the flowers were closed with swelling ovaries typical of cleistogamous flowers of *C. odontorhiza* var. *odontorhiza*. Several flowers were fully open (as in *C. odontorhiza* var. *pringlei* (Greenman) Freudenstein, commonly called Pringle's Coralroot), but displaying a white lip tinged only along the margin by small amounts of purple. The smaller plant had four cleistogamous flowers with swelling ovaries. The second plant had 12 flowers, 9 of which were closed with swelling ovaries. The remaining flowers were open, displaying a nearly pure white lip, marked only by minor splotches of purple (Figure 1).

Corallorhiza odontorhiza is a relatively inconspicuous leafless orchid native to the forested areas of eastern North America and to upland areas of southern and western Mexico (Freudenstein, 1997). It is one of the latest orchids to bloom, with a bloom period extending from August to November. Typical coloration of the floral stems, sepals, and petals ranges from deep purplish red through brown to dull greenish brown. "Green" and "nongreen" *Corallorhiza* species were investigated by Barrett et al. (2014) and present the following results. *Corallorhiza odontorhiza* is one of the three "green" coralroots, along with *C. trifida* and *C. wisteriana*, found within the boundaries of the United States and Canada. Along with *C. bulbosa*, *C. macanthra*, and *C. maculata* var. *mexicana*, from Mexico and Central America, they form a green clade within *Corallorhiza*. They classified *C. trifida*, *C. wisteriana* and *C. odontorhiza* as "green *Corallorhizas*", because these species still produce significant quantities of chlorophyll (31.6, 21.5 and 17.5 ng/mg, respectively). The chlorophyll level reported by Barrett, for *C. odontorhiza* is sufficiently high, that if not masked, the plants would be expected to appear green, not unlike *C. trifida*, which has been characterized in one study as a partial mycoheterotroph (vide infra). The presence of chlorophyll in *C. odontorhiza*, has generally been overlooked because it is masked by brown, reddish-brown or purple pigments. Investigations of many plant species, including many orchidaceae, have shown that pigments of these colors, are commonly due to anthocyanins, but this has not been investigated in *Corallorhiza*.

Barrett et al. (2014) also determined that the chloroplast genome of *C. trifida* is still largely intact. This is consistent with a stable isotope study by Zimmer et al. (2004), that showed that *C. trifida* is a partial mycoheterotroph (mixotroph), deriving some nutrition from associated soil fungi, but still able to carry out

some photosynthesis (Zimmer 2008). The jury is still out as to whether or not the other “green” *Corallorhiza* species still derive nutrition from photosynthesis since their chloroplast genomes are slightly more degraded than that of *C. trifida*.



Figure 1: *Corallorhiza odontorhiza* forma *viridis*. Plants found growing in Peninsula State Park, Door County, Wisconsin, October 2015. The plants are morphologically similar to normal tan and brown colored plants, with which they grew, but lacked almost all traces of brown coloration. The lip is relatively unspotted, but does display slight purple fringing.

The vast majority of *Corallorhiza odontorhiza* specimens that I have observed have been brown, reddish-brown, tan, or sometimes greenish-brown, but I have occasionally seen plants with brown stems, bearing flowers with dull greenish ovaries and a purple spotted lip.

The only previously named color forms in *Corallorhiza odontorhiza* include: (1) *Corallorhiza odontorhiza* var. *pringlei* f. *flavida* (Wherry) Horner **comb. nov.** [synonym *C. odontorhiza* f. *flavida* in J. Washington Acad. Sci. 17: 36 – 37, Figure 1 (1927)] which is similar in the relatively unspotted lip. However, the plant is dull yellow, as the name implies; (2) *Corallorhiza odontorhiza* f. *radia* Freudenstein Harvard Pap. Bot. 1(10): 26 (1997), which is reported only from Central America and has flowers with purple-spotted lips; (3) An obscure *Corallorhiza odontorhiza* var. *verna* Alph.Wood, Class-book Bot., ed. 2a: 531 (1847) believed to refer to *C. trifida*. The Latin word “*verna*” does not mean green, but rather refers to springtime or of spring, not consistent with the blooming time of *C. odontorhiza*; and finally (4) an unnamed pinkish-purple color form from western Pennsylvania (Richards 2015).

The green in plants of *Corallorhiza odontorhiza* has been described as “greenish” stems and flowers “suffused with green” (Magrath and Freudenstein 2003). As far as I am aware, the present finding in Door County, Wisconsin, is the first observation of bright green plants sporting bright green flowers and a white lip with very little brown or purple coloration (Figure 2).

A search of the Kew World Checklist of Selected Plant Families and the International Plant Names Index revealed no taxonomic entities described as a green *C. odontorhiza*. These unique plants deserve a name to document them and provide a reference point to their existence which has both ecological and evolutionary implications. With this publication, I suggest that these plants be formally referred to as:

Corallorhiza odontorhiza (Willdenow) Poiret var. *odontorhiza* forma **viridis** J. Horner **forma nova**. TYPE: United States. Wisconsin: Peninsula State Park, Door County, October 2015 (Holotype: Figure 1). Plants bright green with bright green closed flowers.

C. odontorhiza (Willdenow) Poiret var. *pringlei* (Greenman) Freudenstein forma **viridis** J. Horner **forma nova**. TYPE: United States. Wisconsin: Peninsula State Park, Door County, October 2015 (Holotype: Figure 1). Plants bright green with bright green open flowers with a mostly white lip.

Based on: *Cymbidium odontorhizon* Willdenow Sp. Pl. 4(1): 110. 1805. *Corallorhiza pringlei* Greenman Proc. Amer. Acad. Arts 33: 475. 1898. Respectively.

Brown coloration in *C. odontorhiza* appears to be quite strongly selected for, and likely serves a cryptic purpose, by making the plants less visible to herbivores. *Corallorhiza odontorhiza* can be found growing

against variously colored backgrounds from green to nearly black. Even when growing in the presence of green plants, brown leaf detritus and senescing autumnal vegetation is commonly present. Thus, to a passing herbivore, most plants of *C. odontorhiza* look like an unpalatable brown stick. Green color forms described here may be rare due to limited advantage in the dark backgrounds where the plants often occur.



Figure 2: Comparison of *C. odontorhiza* forma *viridis* with normal colored form.

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Fred was associated with Cranbrook Institute of Science, Mt. Cuba Center, University of Michigan Matthaei Botanical Gardens, Longwood Gardens, Michigan Department of Natural Resources Committee on Endangered and Threatened Plants, Michigan Botanical Club, North American Rock Garden Society, Saginaw Valley Audubon Society, Saginaw Valley Orchid Society and Nature Conservancy. His book, *Orchids of the Western Great Lakes*, was a seminal work in regional orchid floras and remains the standard work by which all others are judged.



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