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Editorial contributions and inquiries about publishing articles and requirements for manuscripts, illustrations, or photos for publication should be addressed to the **Editor**:

**Duane Erdmann**  
241 Kirkbrae Road  
Kennett Square, PA 19348  
DJErdmann46@comcast.net

## Seed Production in *Aplectrum hyemale* (Adam and Eve Orchid, Putty-Root)<sup>1</sup>

Charles L. Argue

Department of Plant Biology  
University of Minnesota  
Saint Paul, Minnesota  
argue001@umn.edu

*Aplectrum hyemale* (Muhl. ex Wild.) Nutt. is an orchid of moist, shady deciduous forests dominated by sugar maple, basswood, beech, and red oak, but can sometimes occur in coniferous and mixed-coniferous forests (Hapeman, 1996) or wooded flood plains, peat bogs and tamarack swamps (Correll 1978). It is often found scattered in dense aggregations and shows a preference for rich, fine-textured, loamy and slightly alkaline soils (e.g., Smith 2012). Capable of withstanding a wide variety of climatic conditions, it ranges from Minnesota, southern Quebec and Massachusetts to Oklahoma and Georgia (Auclair 1972; Magrath 2002; Smith 2012). The present account summarizes information on the genetic compatibility, breeding system, pollination mechanisms, and fruiting success of this orchid.

*Aplectrum* produces a loose terminal raceme of six to eighteen medium-sized flowers in May or early June (Figure 1, page 13) (Luer 1975). Sepals and lateral petals vary in color from yellow to pale green, tinged with magenta or purple-brown toward the tips (Figure 2, page 13) (Luer 1975; Smith 2012). The sepals are spreading whereas the petals parallel the column (Figure 2; 3a, page 4). The labellum is obovate and 3-lobed (Figure 3b, page 4). The central lobe, whitish with purple markings, is large and orbicular with an undulate margin and three fleshy lamellae on its lower half (Figures 3a, b). Small, ovate lateral lobes are present on either side toward the middle and ascend to flank the column (Figures 2, 3a) (Luer 1975; Magrath 2002). The column is compressed, elongate, 7 mm long, and pale green with purple spots. It bears a distinctly concave stigma and a terminal anther containing four hard, superposed, yellow pollen aggregations or pollinia (Magrath 2002). Nectar is apparently absent (Hogan 1983). The plants bloom after the spring ephemerals, and the flowers last about 4 or 5 days. Time lapse from floral bud to mature fruit ranges from 18 to 20 weeks (Auclair 1972). Blooming time in a wintergreen orchid

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<sup>1</sup>Modified from the author's book *The Pollination Biology of North American Orchids*, vol. 2. Springer, New York (2012).

such as *A. hyemale* may be set by the period available for high carbohydrate production and accumulation in spring prior to flowering. This period is restricted to the interval between snowmelt or spring warming and closure of the canopy (Stevens and Dill 1942; Adams 1970). The potential for evolutionary changes in phenology is therefore probably limited.

Leaf measurements suggest that plants must attain some minimum size before flowering, and only one or two individuals from aggregates of 100 or more may flower in a given year (Case 1987; Smith 1993). In a pioneering two-year study of *A. hyemale* in east central Illinois, Hogan (1983) found that hand pollination between flowers on the same raceme (geitonogamy) resulted in 100% fruit set, indicating full self-compatibility at the level of fruit production. About 87% of artificially cross-pollinated flowers set fruit. Moreover, when enclosed in insect-proof, one mm-mesh nylon bags, 47% of emasculated flowers and 71% of unmanipulated flowers set fruit, indicating that the flowers can self pollinate in the absence of pollinators (autogamy) and possibly, produce seed asexually (agamospermy). Seed weight and viability did not differ significantly among open-pollinated and artificially cross- or self-pollinated plants. There is, therefore, no evidence of inbreeding depression at the level of seed production. Although agamospermy is present elsewhere in other orchids (e.g., *Spiranthes*), it is unusual in this family (Pijl and Dodson 1966), and Hogan (1983) did not rule-out the possibility that fruit set in emasculated plants might reflect autogamy that occurred prior to emasculation. Nevertheless, Leavitt (1901) reported seeds containing multiple embryos (polyembryony) in *A. hyemale*, a trait associated with agamospermy. Embryological studies are needed to determine whether this polyembryony was produced by cleavage of the fertilized zygote or was adventitious and asexual in origin.

Fruit set occurred in about 82% of flowers that were left to be pollinated naturally (open pollination), but pollinators were rarely seen. Only about one out of 50 flowers was visited during a five-day flowering period. Hogan (1983) recorded  $1.2 \times 10^{-4}$  insect visits per flower per 10 min. This is about 1/4000<sup>th</sup> the frequency observed for several species of earlier blooming spring ephemerals at the same site (Schemske *et al.* 1978). The difference cannot be accounted for by the lack of nectar in *Aplectrum* because the visitation rates among nectarless spring ephemerals were 0.03 to 0.71 per flower per 10 min (Schemske *et al.* 1978). Instead, Hogan (1983) suggested the reduced visitation rate might be due to a change in pollinator availability between the fixed blooming period for *A. hyemale* and the earlier blooming ephemerals.

Freshly placed pollinia from another flower were never observed on the stigma. In fact, twenty-six hours of observation over four days revealed only about twelve individuals of the short-tongued bee, *Lasioglossum oblongum* (Lovell) (as *Dialictus oblongus* (Lovell)) (Hymenoptera: Halictidae) visiting the flowers (Hogan 1983). All were seen on a single day between noon and

1:30 pm. Most merely landed on the inflorescence, remaining for up to one-half min. Only five entered flowers. Each entered only one and remained about five seconds. None were observed bearing pollinaria either before or after the flower visit. In one case a bee dislodged the anther-cap, and although no pollinia were removed, two were observed to be in contact with the stigma following the bee's departure. Thus insect facilitated self-pollination could be a factor. Although gene flow through pollen may occur, the available data do not confirm any actual transfer of pollen between plants, and in Hogan's (1983) opinion, *A. hyemale* is routinely autogamous and perhaps, agamosperous. Very limited pollinator visitation rates in this species may have favored selection for autogamy. K. P. Kevin (in Catling 1983) and Catling (1984) also reported autogamy in Illinois and Canadian populations, respectively, although the plants in one population from Simcoe County, Ontario, were apparently self-incompatible (Catling 1982).

The usual sequence of events leading to pollination in *A. hyemale* was the same in bagged and unbagged inflorescences (Hogan 1983). The pollinia were covered by the anther-cap in newly opened flowers (Figure 3a). On the first or second day the cap dropped off, laying bare the pollinia. On the third or fourth day the pollinia were displaced, and fleshy, white lobes covered the stigma. According to Hogan (1983), the generation of these lobes was the result of contact between the stigmatic surface and the displaced pollinia. Catling (1984), indeed, described a 270-degree rotation of the pollinia onto the stigma following degeneration of the anther cap.

According to Hogan (1983) the patches of *A. hyemale* are probably clonal. If so, the genetic variability resulting from autogamy (or agamospermy) approximately equals that resulting from pollen transfer within populations, and fruit-set is increased with no additional loss in genetic diversity. At the same time, the limited genetic variability reported for *A. hyemale* by Adams (1970) and Auclair (1972) is not surprising for a species with a breeding system based on clonal growth and autogamy rather than outcrossing. Limited genetic variability would, in turn, be consistent with an absence of significant diversification in this monospecific genus (Stebbins 1957; Hogan 1983).

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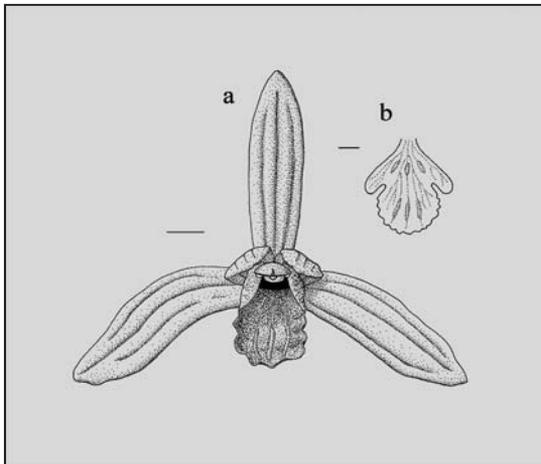


Figure 3. (a) Flower, front view; (b) Lip flattened, scale bars = 2.5 mm. Drawn by the author.

## Green Swamp, North Carolina – Fall Flora

Jim Fowler

Greenville, South Carolina

jimstamp@aol.com

Our original trip to the Green Swamp was scheduled for October 27 and 28, 2012 but Hurricane Sandy had other ideas.... So, we changed the dates to November 2 and 3. Generally, any time from the last weekend in October through the first weekend in November is a great time for the fall display of wildflowers (orchids included) in the Green Swamp, Brunswick County, North Carolina.

My main objective for this trip was to photograph three native orchid species: *Spiranthes cernua* (Nodding ladies'-tresses orchid), *Spiranthes longilabris* (Long-lipped ladies'-tresses orchid) and *Spiranthes odorata* (Fragrant ladies'-tresses orchid). In addition, there is the beautiful, electric blue *Gentiana autumnalis* (Pine Barren Gentian) as well as several other interesting savannah wildflowers including the rare *Parnassia caroliniana* (Carolina Grass-of-Parnassus).

Since I would be joining David McAdoo, Ben Rostron, and Skip Pudney early on Saturday morning, I decided to drive down (5+ hours each way for me) on Friday, spend the night in a nearby motel, and get an early start on Saturday morning. Ben had flown from Edmonton, Alberta, Canada to Charlotte, North Carolina for a conference, and decided to contact David to see if it would be possible to visit the Green Swamp since he would be so near. Skip is a local resident and is talented photographer and very generous with his time to check out several of the localities for us before hand.

Morning broke, and we decided to get an early start. Along the Atlantic Coastal Plain, the wind doesn't usually cause problems before 10:00 am, so we wanted as much wind-free photography time as we could get. Turns out, David, Ben, and I were staying at the same motel in Shallotte, North Carolina, so we caravanned to "The Pond", a parking area on Big Island that many of you will be familiar with. This is a usual meeting place for groups to meet when anticipating a trip to the Green Swamp.

After strapping on our camera backpacks, we headed north along a forest path into an area called Shoestring Island. This savannah had seen a prescribed burn in September, and I had some doubts that we would be able to find any blooming flowers of *Parnassia caroliniana* (Figure 1, page14). However, we

did manage to find a couple of dozen in full bloom. In a good year, there are many hundreds of flowers in bloom at the edge of the savannah next to the dense pocosin.

The morning dew, glistening on the seed heads of the savannah grasses, gave us an opportunity to get some good wide angle shots of the surrounding environment. These grassy savannahs are always so pretty several months after a prescribed burn, allowing the wildflowers and pitcher plant stems to rise above the grasses.

After getting our fill of the beautiful *Pamassia caroliniana*, we walked back to our cars, checked out the several species of sundews next to the pond, and then headed across Highway 211 to Big Island, where we expected to find a few blooming stems of *Spiranthes longilabris*. (See back cover.) Fortunately, I had been there the previous afternoon to check out the area and had found and marked several good plants for the next day.

Skip and a friend of his, Jason Barnes, had joined us at this point, and we got down to the serious business of finding more of these beautiful orchids. We did end up finding about a dozen of them, some just barely poking above the savannah wire grass. These little beauties are not that easy to spot, and I recounted to the group my experience in having briefly lost sight of one of the better specimens when I walked a few feet to retrieve my tripod. When I came back to the spot where I remembered the plant to be, it just was not there! Skip finally found it for me, and it turned out to be one of the better specimens of the day.

After finishing up with the plants on Big Island, Skip and I decided to travel to a location in Boiling Spring Lakes, a small community about fifteen miles away. David and Ben said that they had seen a number of *Gentiana autumnalis* on a previous trek to that site. Upon arriving at the undeveloped housing development, we saw a few specimens of this unbelievably blue flower in the ditches. Across from the Gentian flowers, we spotted a few *Spiranthes cernua*. There were not as many of this species as in previous years, but we were able to photograph a few of the better ones (Figure 2, page 14).

We photographed a few more flowers and decided to explore a bit further. Rounding the corner of one of the decaying side streets, Skip spotted a couple of the Gentian flowers in the ditch beside the road. While I was photographing those flowers, Skip walked a bit farther into the woods, and uttered a loud exclamation! He had obviously found the “mother lode”.... There were dozens of bright blue flowers scattered all over the forest floor under the towering long-leaf pines (Figure 3, page 15). This is the best area for these that I’ve ever seen, and I will surely check it out on next year’s trip.

We left Boiling Spring Lakes and headed north to an area known as Rice Creek. In season, we can usually find *Epidendrum magnoliæ* (Green-fly orchid) high up on the trunk and limbs of some of the ancient bald cypress trees.

On this trip, however, our quarry was *Spiranthes odorata*. Skip had visited this particular site the week before, and he had located a nice group of blooming plants near the creek and right next to the gravel roadway. This group provided us with a neat shot that included not only the flowers, but some reflections of the sky as well as some yellow fall leaves floating in the creek (Figure 4, page 15). We ended up spending another hour or so (some of it just sitting in front of the creek-side *S. odorata* group and enjoying the view) scouting the area and finding some remarkable orchid plants. Skip found one that was nearly three feet (one meter) tall! This has always been a good place for this species, and I hope it will remain this way.

It was getting late, and I had a five-hour trip ahead of me, so we agreed that it had been a wonderful photography weekend, and made a promise to get together in the Green Swamp for the flush of spring orchids next May. This is a place to be treasured, and on each trip down to the Green Swamp, I give thanks for my photography buddies and for the dedicated and capable management of the area by The Nature Conservancy.

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## ***Erratum***

On page 11 of Paul Catling's *Platanthera* article "Observations on the Discreetness of *Platanthera aquilonis* and *P. hyperborea* across Canada" in the last *NOC Journal* - 9(4), the references to the front cover photos state *P. hyperborea* is on the left and *P. aquilonis* is on the right. These should be reversed. Their identification on the back of the front cover is correct.

## ***Publication Preference***

After receiving comments from multiple readers, the Publication Committee has decided that it will not publish GPS coordinates with pictures or in articles. This leaves sharing such information off-line to the discretion of the author.

## Orchids Found Nowhere Else in France

Paul M. Catling and Brenda Kostiuk

170 Sanford Ave., Ottawa, Ontario  
catlingp@agr.gc.ca

The French Islands called Saint-Pierre et Miquelon (which includes Langlade and some smaller islands) off the coast of southwestern Newfoundland are proud of a rich orchid flora, which is of course, unique in France. In 2006, four 0.53€ stamps (Figure 1a, below) were issued by the islands to celebrate their orchids. The islands had already issued some very popular whale stamps. In fact the postage stamps from these islands are some of the most popular with stamp collectors worldwide. They have usually featured the work of local artists, and these islands may be one of the few French possessions still issuing their own stamps. Although the best known, the 2006 orchid stamps were not the first orchids to be featured on the island stamps. On 24 April 1962, there were two very impressive 25 and 50 F stamps (Figure 1b, page 9).



Figure 1a. Postage stamps issued by the French Islands of Saint-Pierre et Miquelon off the coast of southwestern Newfoundland in 2006.

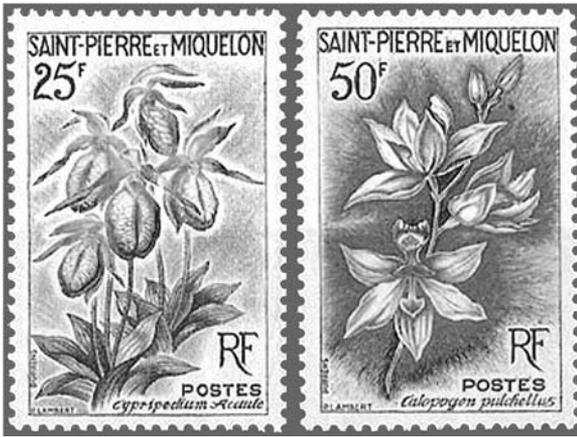
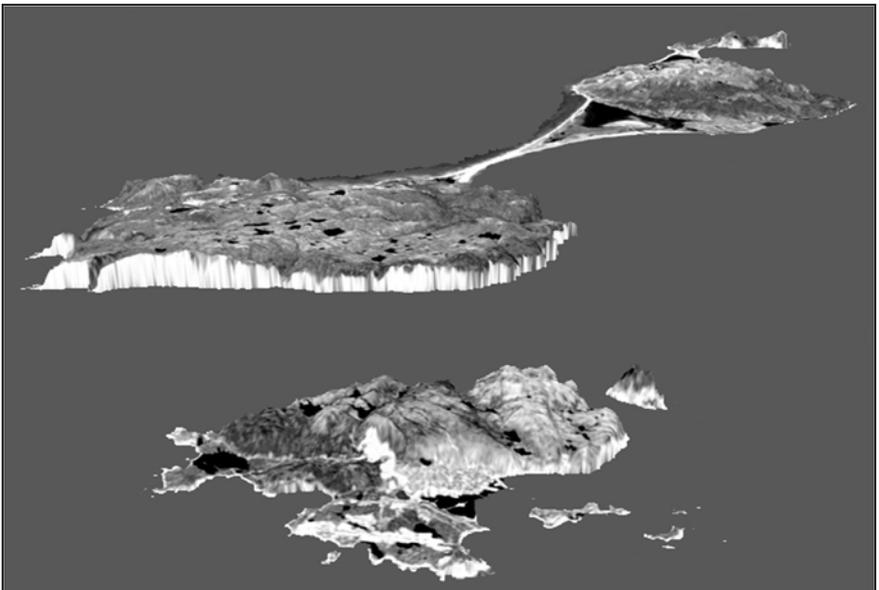


Figure 1b. Postage stamps issued by Saint-Pierre et Miquelon in 1962.

The islands (Map, page 9 below) have been well studied botanically (Rouleau and Lamoureux 1992, Pringle 1995, and see <http://www.grandcolombier.com/bibliotheque/biblio/search.php> for other information). Twenty-one orchid species are present (LeGallo 1954, Rouleau and Lamoureux 1992, Roger Etcheberry, pers. comm., Table 1, page 23). That is



Map of St. Pierre and Miquelon looking north. Credit: NASA/SCIENCE PHOTO LIBRARY

most of the species in southwestern Newfoundland and more species than occur on the Îsles-de-la-Madeleine (Quebec) in the central Gulf of St. Lawrence. In the latter island chain, the most common and widespread orchid is the Ragged Fringed Orchid (*Platanthera lacera*) which occurs in the meadows, bogs and on rocky slopes. On Saint-Pierre et Miquelon, the most common orchid is the White-Fringed Orchid (*Platanthera blephariglottis*) which occurs in the blanket bogs which are a major part of the picturesque landscape.

The lists (Table 1) suggest species to look for in the different regions. For example, the Long Spurred Round-leaved Orchid (*Platanthera macrophylla*) and Tesselated Rattlesnake-Plantain (*Goodyera tessellata*) may occur on St. Pierre et Miquelon, based on their occurrence in southeastern Newfoundland which has mostly similar habitats. It is notable that *P. hyperborea* is present on St. Pierre et Miquelon but absent from the Avalon and Burin Peninsulas (Clase 1998, Table 1).

Anticosti-Minganie has the limestone habitats that result in it having an orchid flora similar to that of the Northern Peninsula of Newfoundland including some absent from the other areas listed. Grand Manan at the mouth of the Bay of Fundy has the most species (Table 1), partly because it is far to the south, and orchid diversity (and diversity in general) increases closer to the equator. Regardless of these observations, St. Pierre et Miquelon has an impressive list of species, especially for its surface area (Table 1).

Soon after we arrived in St. Pierre on 30 July 2012, we went up the hill behind the town and found the first orchids. Little Club Spur Orchid (*Platanthera clavellata*, Figure 2, page 16) was scattered along temporary streams in the open rocky barren area which also had a few arctic plants such as Alpine Azalea (*Loisleuria procumbens*). This was an unusual companion for the orchid. The habitat offered a memorable view of the town of St. Pierre (Figure 3, page 16).

Among the interesting features of the orchid flora of Saint-Pierre et Miquelon is the presence of a dwarf form of Small Purple Fringed-Orchid (*Platanthera psycodes*, Figures 4 & 5, page 16) on the extensive heathy plains between the dunes (Plaine de la Chapelle, Figure 6, page 16) connecting Miquelon and Langlade. In a few hours we found a few hundred plants scattered over an extensive area and none were more than 10-15 cm tall, but all had dense inflorescences of 25 to 70 flowers. Most were growing in heathy vegetation dominated by *Empetrum nigrum* and *Vaccinium uliginosum*, but they occurred in a surprising variety of habitats including meadows closer to the ocean that were dominated by *Ammophila breviligulata*, *Fragaria virginiana* and *Plantago maritima*. We suspect that the plants on these plains are genetically dwarfed, an adaptation to high winds which would knock down the inflorescences and place the flowers at a disadvantageous height for pollinators. Our

suspicion of genetic dwarfing is based on the fact that they were consistently dwarf over an extensive area regardless of associates or height of adjacent vegetation or cover. In some respects they deserve to be named as a form, but there is a continuum from tall plants to short plants over a much broader area making a cut off for identification of the form somewhat arbitrary. Regardless it is an unusual variant and similar plants have been seen only from a few other localities such as Ramea Island (Day and Northcott 1992, specimens at DAO), also off the southern coast of Newfoundland and 60 miles to the northwest of Miquelon.

On the shoulders of a gravel road south of the town of Miquelon are plants of *P. psycodes* (Figures 7 & 8, page 17) of more normal height (30-40 cm). Along this road the plants grow only in the roadside gravel probably obtained from a sea beach, but occurred in almost every 100 yards of a few miles of road (Figure 9, page 17). They were absent from the surrounding wetlands where White-Fringed Orchid (*Platanthera blephariglottis*) was common. Romanzoff's Ladies-Tresses (*Spiranthes romanzoffiana*, front cover) also grew in the this roadside gravel. See also Figures 12-14, page 18.

Although we found only 20 plants of the Ragged Fringed Orchid (*Platanthera lacera*) in one small area of Plaine de la Chapelle, these were also dwarfs, as were most of the *P. blephariglottis* in the blanket bogs. The Ragged Fringed Orchid on Miquelon, both at the north end (Clase 1998) and at the south end (pers. obs., Figures 10 and 11, page 17) is apparently a more ragged and more greenish white form than that which occurs on the Avalon Peninsula. The plant that is more creamy coloured, or often has a pinkish tinge, that Fernald called var. *terrae-novae* is likely of hybrid origin and is best referred to as *P. ×andrewsii* (Catling 1997). Outside Newfoundland, plants of this taxon are clearly recent hybrids, but in Newfoundland there is a continuum of variation. Some plants appear to be recent hybrids and backcrosses that exist as part of what appears to be a hybrid swarm. Others occur without the putative parents and may be reproducing as a species of hybrid origin. Since many plants seem to be hybrids and since a species of hybrid origin does not seem to be well defined or isolated yet, as in cases like *Goodyera tessellata* and *Platanthera hyperborea*, treatment of these plants as hybrids is appropriate.

Another unusual aspect of the flora of Saint-Pierre et Miquelon is that it is the type locality of Fernald's poorly understood var. *lehorsii* of *Platanthera orbiculata*. It was collected by Le Hors among ericaceous shrubs on a denuded hill at Cap à l'Aigle on July 25 and August 2, 1945. Fernald distinguished the variety as being 7-11 cm tall with spurs 8-15 mm long, instead of 15-52 cm high with spurs 16-27 mm long as in var. *orbiculata* (Fernald 1950a, b). The characteristics of var. *lehorsii* are probably at least partially genetic and studies currently underway may indicate that it is worthy of recognition. The var. *orbiculata* also occurs on Saint-Pierre et Miquelon (Le Gallo 1954) and interme-

diates were reported by Fernald from bare mountainous areas of western Newfoundland (Fernald 1950b).

With an impressive list of orchids present, possibly still others to be found, a high orchid abundance, and some unusual local variants, the French islands are of particular interest. This rich and unusual orchid flora suggests that the flora and fauna is of interest in other ways, — and so it is with a number of rare species and some that are unknown in Newfoundland, and local abundance of other species that are usually not abundant in Newfoundland.

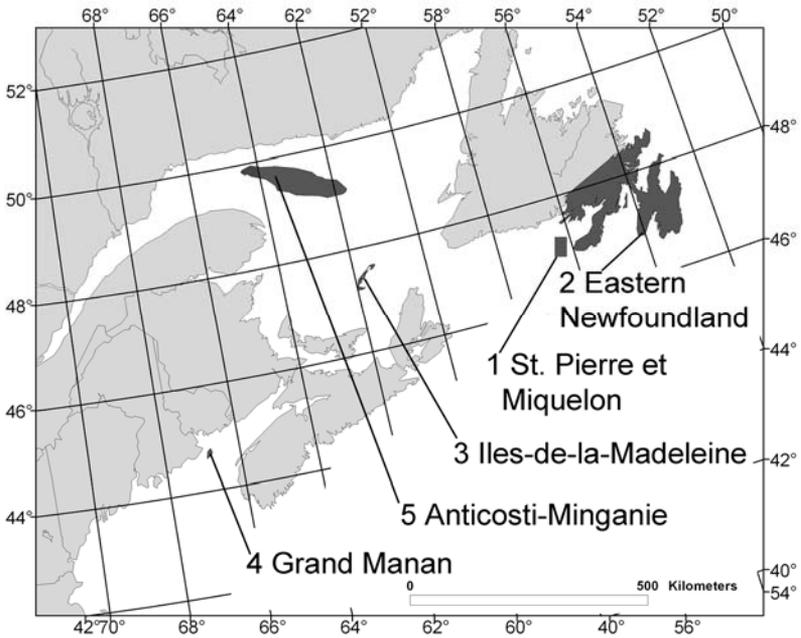


Figure 15. Locations of sites for orchids listed in Table 1, page 23.

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(Continued on page 22)

Figures to accompany “Seed Production in *Aplectrum hyemale*” by Charles L. Argue, page 1.



Figure 1. Inflorescence. Photo by David G. Smith (<http://www.delawarewildflowers.org>), used with permission.



Figure 2. Flower. Photo by Albert F. W. Vick, Lady Bird Johnson Wildflower Center, used with permission.

Figures to accompany “Green Swamp, North Carolina – Fall Flora”  
by Jim Fowler, page 5. Photos by author.



Figure 1. *Pamassia caroliniana*.



Figure 2. *Spiranthes cernua*.



Figure 3. *Gentiana autumnalis*.

Figure 4. *Spiranthes odorata*.



Figures to accompany “Orchids Found Nowhere Else in France” by Paul M. Catling and Brenda Kostiuk, page 8. Photos by authors.



Figure 2. *Platanthera clavellata*.

Figure 3. Barren hilltop habitat of *P. clavellata* overlooking St. Pierre.

Figures 4., 5. *Platanthera psycodes*.

Figure 6. Habitat of *P. psycodes* on Plaine de la Chapelle (with wild horse dump left of center).





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Figures 7, 8. *Platanthera psychodes*.

Figure 9. Habitat, gravel roadside.



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Figure 10. *Platanthera lacera*.

Figure 11. Habitat of *P. lacera*.



11



Figure 12. *Platanthera blephariglottis*.

Figure 13. *Platanthera dilatata*.



Figure 14. Blanket bog habitat of both overlooking the town of Miquelon.

Figures to accompany “Developmentally Variable Lip Color in *Cypripedium parviflorum* Salisb.: More Than a form?” by Charles J. Sheviak, page 26. Photos by author unless noted otherwise.



Figure 1. *Cypripedium aff. parviflorum* (cf. *C. ×andrewsii*) from Woodford County, Illinois, in cultivation. Three clones exhibiting population and developmentally variable lip color. Top row: Left: *Sheviak 2699/4* [NYS] : The rich yellow lip color is maintained from initial expansion of the flower until it senesces; Right: *Sheviak 2699/1* [NYS]: showing lip color after a few days, which is then maintained until the flower senesces. Bottom row, *Sheviak 2699/2* [NYS]: Left: plant showing lip color as it faded in the first days of bloom. Right: flower after 4 days.



Figure 2. *Cypripedium aff. parviflorum* (cf. *C. ×andrewsii*) from Woodford County, Illinois, in cultivation. Two flowers from the same rhizome, showing marked color change within a few days of opening. Sheviak 2699/3 [NYS]

Figure 3. *Cypripedium aff. parviflorum* (cf. *C. ×andrewsii*), Sharp County, Arkansas, showing fading of lip as in the Illinois plants, but broken pattern of dark coloring of sepals and petals. Orzell 1699 [NYS]. Photos by Steve Orzell.



Photos to accompany “11th Annual Native Orchid Conference” invite page 31. Photo by Raymond Prothero and David McAdoo.



*Cypripedium californicum*.  
Prothero/McAdoo



*Cypripedium fasciculatum*. Prothero



*Cypripedium montanum*. Prothero



*Epipactis gigantea*. Prothero/McAdoo

(Continued from page 12)

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Table 1. Orchids present in various regions of northeastern North America: (1) St. Pierre et Miquelon (LeGallo 1954, Rouleau and Lamoureaux 1992, Roger Etcheberry, pers. comm); (2) eastern Newfoundland (all east of a line from the west side of the Bona Vista Peninsula at Port Blandford and the west side of the Connaigre Peninsula at Conne River, based on Rouleau and Lamoureaux 1992); (3) Îsles de la Madeleine (Catling 2011); (4) Grand Manan (Weatherby and Adams 1945, Hinds and Flanders 1993, and Hinds 2000); (5) Anticosti-Minganie (Marie-Victorin and Rolland-Germain 1969). →

Table 1.

<i>SPECIES</i>	1. St. Pierre et Miquelon	2. eastern Nfld.	3. Îsles-de-la-Madeleine	4. Grand Manan	5. Anticosti-Minganie
<i>Cypripedium acaule</i> Aiton PINK MOCCASIN FLOWER, STEMLESS LADY'S-SLIPPER	yes	yes	-	yes	yes
<i>Cypripedium parviflorum</i> var. <i>makasin</i> (Farw.) Sheviak YELLOW LADY'S-SLIPPER	-	-	-	-	yes
<i>Cypripedium parviflorum</i> var. <i>pubescens</i> (Willd.) Knight LARGE YELLOW LADY'S-SLIPPER	yes	yes	-	-	yes
<i>Cypripedium passerinum</i> Richards. var. <i>minganense</i> Victorin MINGAN SPARROW'S-EGG LADY'S-SLIPPER	-	-	-	-	yes
<i>Pogonia ophioglossoides</i> (L.) Ker-Gawler ROSE POGONIA, SNAKE-MOUTH ORCHID	yes	yes	yes	yes	-
<i>Goodyera repens</i> (L.) R. Brown in W. Aiton and W.T. Aiton var. <i>repens</i> EASTERN DWARF RATTLESNAKE-PLANTAIN	yes	yes	-	yes	yes
<i>Goodyera tessellata</i> Loddiges TESSELLATED RATTLESNAKE-PLANTAIN, CHECKERED RATTLESNAKE-PLANTAIN	-	yes	-	yes	yes
<i>Spiranthes cernua</i> (L.) L.C. Rich. NODDING LADIES'-TRESSES	-	-	-	yes	?
<i>Spiranthes lacera</i> (Rafinesque) Rafinesque var. <i>lacera</i> NORTHERN SLENDER LADIES' TRESSES	-	-	yes	yes	-
<i>Spiranthes romanzoffiana</i> Chamisso HOODED LADIES'-TRESSES	yes	yes	yes	yes	yes
<i>Amerorchis rotundifolia</i> (Banks ex Pursh) Hultén SMALL ROUND-LEAVED ORCHIS	-	-	-	-	yes
<i>Platanthera × andrewsii</i> (M. White) Luer (includes <i>P. lacera</i> × <i>P. psycodes</i> ) ANDREW'S ROSE-PURPLE ORCHID	?	yes	?	yes	-
<i>Platanthera aquilonis</i> Sheviak NORTHERN GREEN ORCHID	-	-	-	-	yes
<i>Platanthera blephariglottis</i> (Willd.) Lindley var. <i>blephariglottis</i> WHITE FRINGED-ORCHID	yes	yes	-	-	-
<i>Platanthera clavellata</i> (Michaux) Luer LITTLE CLUB-SPUR ORCHID, GREEN WOODLAND ORCHID	yes	yes	yes	yes	yes
<i>Platanthera dilatata</i> (Pursh) Lindley ex L.C. Beck var. <i>dilatata</i> TALL WHITE BOG ORCHID, FRAGRANT WHITE ORCHID, BOG CANDLES	yes	yes	yes	yes	yes
<i>Platanthera grandiflora</i> (Bigelow) Lindley LARGE PURPLE FRINGED-ORCHID	yes	yes	-	yes	-
<i>Platanthera huronensis</i> (Nutt.) Lindley LAKE HURON GREEN ORCHID	yes	?	?	?	yes

<b><i>SPECIES (cont.)</i></b>	1. St. Pierre et Miquelon	2. eastern Nfld.	3. Îsles-de-la-Madeleine	4. Grand Manan	5. Anticosti-Minganie
<i>Platanthera hyperborea</i> var. <i>hyperborea</i> NORTHERN GREEN ORCHID	yes	yes	yes	yes	yes
<i>Platanthera lacera</i> (Michaux.) G. Don in R. Sweet RAGGED FRINGED ORCHID, GREEN FRINGED ORCHID	yes	yes	yes	yes	-
<i>Platanthera macrophylla</i> (Goldie) P.M. Brown LONG SPURRED ROUND-LEAVED ORCHID	-	yes	-	-	-
<i>Platanthera obtusata</i> (Banks ex Pursh) Lindley BLUNT-LEAF ORCHID	yes	yes	yes	yes	yes
<i>Platanthera orbiculata</i> (Pursh) Lindley var. <i>orbiculata</i> SHORT-SPURRED ROUND-LEAVED ORCHID	yes	yes	-	-	-
<i>Platanthera psycodes</i> (L.) Lindley SMALL PURPLE FRINGED- ORCHID	yes	yes	yes	yes	yes
<i>Coeloglossum viride</i> (L.) Hartman var. <i>virescens</i> (Muhl. ex Willd.) Luer LONG-BRACTED ORCHID	-	-	-	-	yes
<i>Piperia unalascentis</i> (Sprengel) Rydberg ALASKA REIN ORCHID	-	-	-	-	yes
<i>Dactylorhiza majalis</i> (Reichenbach) P.F. Hunt and Summerhayes var. <i>junialis</i> (Vermeulen) Senghas LEOPARD MARSH ORCHID, ST. JOHN'S ORCHID, TIMMINS ORCHID	-	yes	-	-	-
<i>Epipactis helleborine</i> (L.) Crantz BROAD-LEAVED HELLEBORINE	-	yes	-	-	-
<i>Listera auriculata</i> Wieg. AURICLED TWAYBLADE	-	-	-	yes	yes
<i>Listera borealis</i> Morong NORTHERN TWAYBLADE	-	-	-	-	yes
<i>Listera convallarioides</i> (Swartz) Nuttall ex Elliot BROAD-LIPPED TWAYBLADE	yes	-	yes	yes	yes
<i>Listera cordata</i> (L.) R. Brown in Aiton var. <i>cordata</i> HEART-LEAVED TWAYBLADE	yes	yes	yes	yes	yes
<i>Arethusa bulbosa</i> L. DRAGON'S MOUTH	yes	yes	-	yes	yes
<i>Calopogon tuberosus</i> (L.) BSP. var. <i>tuberosus</i> GRASS-PINK	yes	yes	yes	yes	-
<i>Liparis loeselii</i> (L.) L.C. Rich. LOESEL'S TWAYBLADE	-	-	yes	yes	-
<i>Malaxis monophyllos</i> (L.) Swartz var. <i>brachypoda</i> (Gray) F. Morris & Eames NORTH AMERICAN WHITE ADDER'S-MOUTH	-	-	yes	yes	yes
<i>Malaxis unifolia</i> Michaux GREEN ADDER'S-MOUTH ORCHID	yes	yes	yes	yes	yes

<i>SPECIES (cont.)</i>	1. St. Pierre et Miquelon	2. eastern Nfld.	3. Isles-de-la-Madeleine	4. Grand Manan	5. Anticosti-Minganie
<i>Corallorhiza trifida</i> Chatelain EARLY CORAL-ROOT	yes	yes	yes	yes	yes
<i>Corallorhiza maculata</i> (Raf.) Raf. var. <i>maculata</i> SPOTTED CORAL-ROOT	yes	yes	yes	yes	yes
<i>Total orchid species</i>	22	25	17	25	26
<i>Total area (approx. square miles)</i>	93	10,850	79	55	3,120

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## CASE GRANT — “To be or not to be” the question?

Unfortunately there are rumors traveling around the Native Orchid Conference that the Case Grant is dead, kaput and gone forever. Nothing could be further from the truth. At our annual conference in Delaware in 2011 the membership approved the establishment of the Case Scholarship Grant. Our goal is to endow this fund with at least \$20,000 to enable us to grant a \$1,000 annual scholarship. We decided that we would have to use funds from our existing treasury to compliment this endeavor until such time as we were able to fully endow it. There was some discussion at the Board meeting in May of 2012 about how long this may take what with the current economic situation but we, at no time, made a decision to do away with this project — quite the contrary. It may take us many years to fully endow the Case Grant but the Board of Directors along with the full support of our membership will see this to fruition no matter how long it takes.

I know that times are tough for many of us, especially those of us entering retirement, but I would ask for your continued support for this project and there is no amount too small to send. When you send your 2013 Membership Application (enclosed in this issue) please consider including a designated donation to the Case Grant along with you annual dues. The future of our native orchids depends on us to help support the next generation of orchid specialist.

As a reminder the deadline for applicants for the next Case Grant is fast approaching (January 31, 2013) so please get the word out to all interested parties. **HELP SPREAD THE WORD!**

Thanks for your help and support.

R. Mark Rose, President NOC

## Developmentally Variable Lip Color in *Cypripedium parviflorum* Salisb.: More Than a form?

Charles J. Sheviak

Albany, New York  
csheviak@mail.nysed.gov

In my previous publications on this species, I've attempted to present the variation of *Cypripedium parviflorum* Salisb. within a conceptual framework comprising varieties, hybrids, more ambiguous introgression products, and outright unknowns. I think these efforts have resulted in a better treatment of the species than had been available, but it is far from complete and certainly not definitive. As specimens and population information have accumulated, what originally appeared to be random variation has sometimes begun to emerge in distinct patterns. One such pattern in particular stands out and warrants serious study. I want to present it here so as to bring attention to it in the hope that other workers with modern methods may shed some light on it.

Over the course of two brief periods, 1930-32 and 1950-53, the notable Illinois botanist Virginius Chase repeatedly collected a number of significant *Cypripedium* specimens from an extensive fen in Woodford County. These were remarkable in the variability of their lip color, which ranged from yellow to white. With small lips and the sepals and petals uniformly suffused with a dark cinnamon color, they most closely approached what is today recognized as *C. parviflorum* var. *makasin* (Farwell) Sheviak. At the time of Chase's initial discovery, natural hybrids were not recognized in the genus, and *C. ×andrewsii* A.M. Fuller had not yet been described. Working in Wisconsin at about the same time, however, Fuller coincidentally published on the hybrids of *C. candidum* Muhl. ex Willd. and *C. parviflorum* var. *makasin* (Fuller 1932); subsequently he determined some of Chase's early collections as *C. ×andrewsii*. With variably pale lips and uniformly dark-suffused sepals and petals, together with their fen habitat, they would seem to fit comfortably within the current concept of *C. ×andrewsii* nothovar. *andrewsii*. With broader experience, however, I now think this determination should be reconsidered, and that these plants warrant further investigation.

### THE ILLINOIS POPULATION

Chase's imprecise locality data suggested a fen that was fully 3 miles long and quite heterogeneous, and repeated efforts were necessary to locate the pop-

ulation. Eventually I located a population of *Cypripedium reginae* Walt. growing in a perched, spring-fed site under a growth of *Toxicodendron vernix* (L.) Kuntze. This was typical habitat for *C. parviflorum* var. *makasin*, but the plants were absent. However, I directed a colleague, Marlin Bowles, to the *C. reginae* site, and he subsequently located the critical population. These grew nearby, but in a completely distinct habitat: a mossy wooded fen slope in an open grove of *Fraxinus nigra* Marsh. By the time I was able to return to the site, a drainage ditch from a gravel mine had been dug through the colony, and the expanding mine was threatening to divert the water supplying that portion of the fen; the adjacent *C. reginae* site had been buried under gravel fill. With the plants' future appearing grim, I collected divisions of four clumps. Insofar as the collection was made in August without flowers, it constituted a random sample. These plants were maintained in cultivation for many years; their compelled cultivation rather than brief field study proved to be fortuitous, because it permitted the plants to be studied throughout their periods of bloom and over a period of years.

The plants I collected bore lips of three distinct colors. In one, lips were a rich yellow. In a second plant, lips were pale yellow as the flower opened but faded to cream within a few days, then held that color for the remaining period of bloom. In the remaining two plants, lips were initially creamy or pale yellow but quickly faded to white, again maintaining the color in good condition. In all four plants the sepals and petals were suffused with a dark cinnamon color, as is typical of *Cypripedium parviflorum* var. *makasin* and as often, but not always, seen in *C. ×andrewsii*. A hybrid origin is also suggested by the vegetative habit of the white-lipped plants. Whereas the yellow and cream-lipped plants were rather typical of *C. parviflorum*, with broad leaves wide-spreading on the tall stems, the white-lipped plants were lower growing, with narrower, more ascending leaves and a particularly vigorous, clump-forming habit, all of which might have been contributed by *C. candidum*. On the other hand, whereas the staminodia of the white-lipped plants were narrow, again suggesting *C. candidum*, and those of the yellow-lipped plant much broader as in *C. parviflorum*, those of the cream-lipped plant were broader still. It would appear that, if *C. candidum* were a parent, then this particular yellow-lipped plant could not be a parent of the creamy one. Additionally, although the uniformly dark sepals and petals suggested *C. parviflorum* var. *makasin* as a parent, the flowers and especially the lips of the yellow and cream-lipped cultivated plants seemed too large for that variety.

The limited color notes on Chase's specimens expand the sample: 6 specimens are noted as yellow; 1 as pale yellow, 1 very pale yellow, 1 cream, 1 pale cream, and 5 white. Altogether, Chase's and my plants include 7 yellow, 7 white, and 5 variously intermediate. There is no way of knowing, however, how many of Chase's specimens may have faded to paler colors had they not been pressed first; they may actually represent a more limited number of discrete color forms. Figures 1 and 2, pages 19 and 20.

Considering all available data, I came to interpret the entire population, including the yellow-lipped plants, as a hybrid swarm involving *Cypripedium parviflorum* var. *pubescens* (Willd.) Knight (Sheviak, 1974). For this interpretation I invoked the verified presence of small-flowered, very darkly colored plants that occurred in the region; I now recognize these to be *C. parviflorum* var. *parviflorum*. At the time, the difference in the nature of the dark coloring of the sepals and petals, suffused versus densely marked, was a recognized problem with this interpretation, and it remains so.

This population would remain an isolated problem of limited significance were it not for more recent discoveries to the south.

## THE OZARKS

The description in 1989 of *Cypripedium parviflorum* f. *albolabium* Magrath & Norman introduced white-lipped plants in a region virtually lacking in *C. candidum*. The authors' interpretation of their plant as a white-lipped clone of *C. parviflorum* was furthermore appropriate given that it was reportedly the only such plant in a large population of approximately 140 normal yellow plants on an oak-hickory forested slope. In their paper (Magrath and Norman, 1989), they also cited another plant (*Timme 2434* [UARK]) that had been the basis for much-publicized reports of *C. candidum* from Benton County, Arkansas. Were this plant in fact *C. candidum*, it would have constituted a state record. This plant clearly was not referable to *C. candidum*, however, and, as reported by Magrath and Norman, in 1987 I had annotated it: "This specimen is not *C. candidum*, which has a very different vegetative habit. It is comparable to other material I have seen from Arkansas, Missouri, and Illinois which combines characteristics of *C. candidum* and a yellow-lipped plant. Accordingly, these specimens have usually been referred to *C. ×andrewsii* Fuller nm. *favillianum* (J.T. Curtis) Boivin, but, as noted by Atwood, they may represent white-lipped plants of a normally yellow-lipped species. The identity of the yellow-lipped plant, however, is uncertain." I now understand the yellow-lipped plant to be *C. parviflorum* var. *parviflorum*, in keeping with Magrath and Norman and the contemporary interpretation of Atwood.

Note that if the white-lipped plants were indeed hybrids, they would then not be referable to nothovar. *favillianum*, which involves *C. parviflorum* var. *pubescens*; a hybrid of var. *parviflorum* has not been recognized and a name is not available.

The "other material" alluded to in my annotation included not only the Woodford County, Illinois plants, but others that I had learned of from Steve Orzell, then of the Arkansas Natural Heritage Commission. He provided a specimen and photographs of pale-lipped plants from Sharp County, Arkansas,

and photographs of another from Crawford County, Missouri. Lips in these plants were noted as “pale yellow fading soon to white” (Orzell to Sheviak, 19 Aug 1985). Figure 3, page 20.

Truly white-flowered forms of normally colored flowers lack the necessary pigment of the corresponding normal-colored plants. Hence, the white does not develop though fading from a weak expression of normal coloration. I have no information and cannot comment on the Oklahoma plant described as f. *albolabium*, nor on the Timme specimen. But clearly those collected or reported by Orzell fade as do the Illinois plants. These cast a somewhat different light on the problem, such that the oak-hickory forest occurrence of Magrath and Norman’s plant, a typical habitat for var. *parviflorum*, was perhaps anomalous; these other pale-lipped plants appear to associate with lowland settings suggesting the fen habitat of the Illinois plants. As Orzell commented, his Sharp County plant was growing in “a partially shaded seep in the transitional area between a fen and an adjoining slope.” (Orzell *loc. cit.*). This description would quite accurately describe the Woodford County site. His site was further characterized as “base of west-facing, partially shaded wooded slope... saturated by calcareous seepage.” Associated species included a mixture of lowland trees and herbs of calcareous fens and wet-mesic prairies. Furthermore, he went on to report, “I have done lots of botanizing in fens in South-eastern Missouri and northern Arkansas, but never have I collected *C. parviflorum* from these types of areas.”

These variable plants therefore are evidently not merely white-lipped *Cypripedium parviflorum*. In his letter, Orzell reported second-hand reports of small white-flowered plants in Howell County, Missouri. He concluded, “It appears that this white-flowered *Cypripedium* is turning up on occasion in the Interior Highlands.”

The fading of lip color is an unusual feature, one that suggests that these plants constitute some sort of group. I have seen numerous plants of *Cypripedium* × *andrewsii*, including nothovars. *andrewsii* and *favillianum*, from Manitoba, Iowa, Illinois, Indiana, Michigan, and New York and have been able to follow many of them throughout their periods of bloom. In none did the lip color fade to the extent that it does in these plants. Only in a single plant of nothovar. *landonii* (Garay) Boivin from Indiana was the fading at all marked, and it was minor in comparison. Additionally, no evidence of fading was found in *C. ×columbianum* Sheviak, either in the field or cultivation. Indeed, the only report suggesting comparable color change in any evident hybrids was in a single herbarium specimen of *C. ×columbianum* from British Columbia. On the label was the note “yellow flowers, often fade white or whitish.” The change in color of the lips of these plants consequently may be significant; further investigation might elucidate a distinct group.

One opposing fact, however, is difficult to reconcile with a possible unity of all these variable-lipped plants. As noted earlier, the sepals and petals of the Woodford County plants, regardless of lip color, are generally suffused with a cinnamon color, as in *Cypripedium parviflorum* var. *makasin*. In contrast, the photographs and specimens that I have seen from the Ozarks show the dark coloration to be contributed by closely-spaced spots, like those of var. *parviflorum*. This may indicate that the Illinois plants are not in fact part of the more southern group.

The occurrence of these plants across a discrete area largely lacking a white-lipped species is intriguing. Perhaps the phenomenon is in fact merely a matter of regional population-level allele frequency. Given the documented association of pale lips with hybridization of *Cypripedium parviflorum* with both *C. candidum* and *C. montanum*, however, it seems more likely that the pattern is the result of ancient gene flow, much as Kleir et al. (1991) found in prairie populations of *C. parviflorum* var. *pubescens*. A reasonable hypothesis would involve introgression during post-Pleistocene migrational periods of sympatry. Which of the white-lipped species might have been involved, however, is not necessarily obvious. As previously pointed out (Sheviak 2011), there is a possibility of *C. montanum* occurring far to the east during this period. Such a possibility should be explored in any attempt to resolve the present problem.

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# 11<sup>th</sup> Annual Native Orchid Conference

June 10 - 13, 2013

FEATHER FALLS CASINO  
OROVILLE, CALIFORNIA

Feather Falls Casino in Oroville - meet, eat, sleep and play all in one location. Field trips will be around Quincy area of Plumas County (North Central CA). There are twenty-one species of native orchids in the county. There is a possible post conference trip to the coast on the 14<sup>th</sup> if enough people show interest and signup.

List of plants that should be in flower at the time of the Conference:

1. *Cephalanthera austiniiae*
2. *Corallorhiza maculata*
3. *Corallorhiza striata*
4. *Cypripedium californicum* (photo page 21)
5. *Cypripedium fasciculatum* (photo page 21)
6. *Cypripedium montanum* (photo page 21)
7. *Epipactis gigantea* (photo page 21)
8. *Goodyera oblongifolia* (in spike)
9. *Listera convallarioides* with flower buds; maybe in bloom
10. *Platanthera dilatata* var. *leucostachys*
11. *Platanthera sparsiflora*

Leaves of orchids we should see are:

1. *Piperia transversa*
2. *Piperia unalascensis*

Carnivorous plant bog with:

1. *Darlingtonia californica*
2. *Drosera rotundifolia*

aSpeakers expected include:

- Ron Coleman, author of “Wild Orchids of California”
- Raymond Prothero – *Orchids of Plumas County*
- Bob Lauri – *Platanthera & Piperia*
- Jyotsna Sharma – *Current Orchid Research*
- Dennis Whigham, Smithsonian Environmental Research Center
- Ken Cameron, Botany Professor University of Wisconsin
- Ron Parsons – *Coastal Orchids of California*
- Barry Rice, University of California, Davis – *Carnivorous Plants*
- James Belsher-Howe – *Butterfly Valley Botanical Area*
- Dick Hilton, Sierra College – *Geology of Feather River Region*

The plan is to open registration in early spring and limit attendance to the first 100 people who sign up. The cost will be \$150 for a single or \$275 for a couple. \$25 per person of either registration will be a tax exempt donation to the Fred Case Grant Fund. Lunch will be provided on the two days of meetings.

Information on the hotel/casino can be found on their web site located at:

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Rooms start at \$65.77 per night

Onsite contact: Susan Tiesing, Corporate Sales

Direct Line: (530) 534-4042

Meetings are in the Silver Moccasin Ballroom on Monday 6/10 and Wednesday 6/12. Field trips are on Tuesday 6/11 and Thursday 6/13.

To give you an idea of the terrain, here is a link to a YouTube video of Barry Rice hiking for carnivorous plants in the area.

[http://www.youtube.com/watch?v=a-ld\\_a6iJuc](http://www.youtube.com/watch?v=a-ld_a6iJuc)

For any questions, please contact:

- Raymond Prothero, Conference Chair: [raypro64@aol.com](mailto:raypro64@aol.com)
- Mark Rose, NOC President: [rmarkrose\\_2000@yahoo.com](mailto:rmarkrose_2000@yahoo.com)
- David McAdoo: [ncorchid@yahoo.com](mailto:ncorchid@yahoo.com)

## **The Native Orchid Conference, Inc.**

P.O. Box 13204

Greensboro, NC 27415-3204

**Web Sites:** <http://nativeorchidconference.org/>  
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