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# *Platanthera praeclara* × *psycodes*, A New Fringed Orchid Hybrid from Manitoba

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Four observations have been made of a fringed-orchid with pale purple flowers in the Tall Grass Prairie Preserve near Vita and Gardenton in southern Manitoba. Some observers thought that these plants may be of hybrid origin. The preserve is located at 49.0813, -96.4249. The observations are:

(1) 7 July 2003 on SW25-2-6E; flowers slightly smaller than the typical western prairie fringed-orchid and tinged with light purple; observed by Christie Borkowsky and Laura Reeves.

(2) 9 July 2003 in the north block, three pale purple-flowered plants observed by Christie Borkowsky and Lorne Heshka all with smaller flowers than typical *P. praeclara* (*Platanthera praeclara* Sheviak and Bowles). Photographed by Lorne Heshka (Figures 1 (cover) and 2).

(3) July 2003 (no exact date) on NW7-2-7E; flowers slightly smaller than the typical western prairie fringed-orchid and tinged with light purple; observed by Christie Borkowsky and Laura Reeves.

(4) 7 July 2005 on SW25-2-6E; flowers a bit smaller than the typical western prairie fringed-orchid and with a slight pinkish look to them; observed by Christie Borkowsky, Erin Lubianski and Chris Friesen.

All that is available to document these observations are the notes above and some photographs showing pale purple flowers. Most of these are taken at a distance and are of limited use in analysis of floral features, but one close-up photo taken by Lorne Heshka (Figure 1, cover) is very informative. This plant, photographed in 2003 by Heshka was recorded to have smaller flowers than typical Great Plains White Fringed-Orchid, as were all of the other pale purple-flowered plants.

Despite visits of thousands of people to the preserve, and the surveys that were conducted in the general area and monitoring of the population of the Great Plains White Fringed-Orchid populations, no additional observations of plants with pale purplish flowers have been made. For almost 10 years we have been anticipating another observation that would have allowed more information to be gathered to assist identification. Here we have decided to proceed with the existing information and have found the qualitative characters sufficient to discuss and recognize a new hybrid. The justification for that decision follows.

There are three possible identities for the pale-purple-flowered fringed orchids in Manitoba. The analysis refers to only one of them which is illustrated in Figure 1: The plant is: (1) a very unusual *P. praeclara* with purple in the flowers; (2) a pale-flowered Small Purple Fringed-Orchid (*P. psycodes* (Linnaeus) Lindley); or (3) a *P. praeclara* × *psycodes* hybrid. We have dismissed the possibility of it being referable to the Prairie White Fringed-Orchid (*P. leucophaea* (Nuttall) Lindley), and its hybrid with *P. psycodes* called Reznicek's Hybrid Fringed-Orchid *(Platanthera ×reznicekii* Catling, Brownell, & Allen, 1999) because these occur far to the east (Sheviak and Bowles 1986). See also under "identification" below.

## Some basic considerations

(1) Dorsal sepal and lateral petals are not erect and/or spreading as they are in *P. psycodes* but they do form a galea but less so than in *P. praeclara*.

(2) The lateral sepals are not reflexed downward as in *P. psycodes* but are somewhere between that and the forward orientation of *P. praeclara*.

(3) The opening to the spur is not dumbbell-shaped as it is in *P. psycodes*, but resembles more that of *P. praeclara* (Figure 1, cover).

(4) In *P. praeclara* the anther sacs are elongated and their axes incline with the rostellum lobes, but in the pale purple-flowered plant the anther sacs are parallel to one another, and the caudicles then diverge abruptly at an angle; the pollinarium is geniculate (Figure 2). This is not seen in either *P. praeclara* or

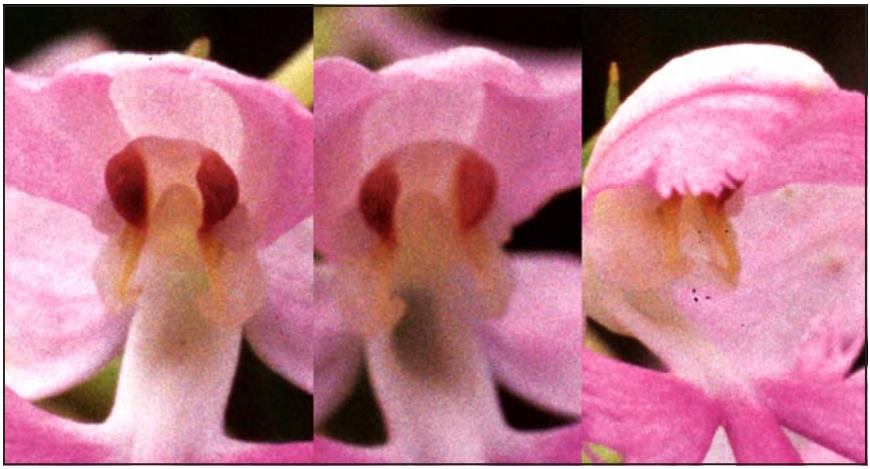

Figure 2. Close view of the flowers shown in Figure 1 (front cover). The forward leaning and essentially parallel anther sacs and diverging caudicles are notable. Photograph taken by Lorne Heshka at the Tall Grass Prairie Preserve North Block, Manitoba, 9 July 2003.

*P. psycodes*. In connection with this orientation, the plant in question has a small opening beneath the anther and between the rostellum lobes, whereas in *P. praeclara*, the diverging anther sacs lead to a large chamber formed in part by a broad, concave connective. This difference itself rules out a color form of *P. praeclara*. Although this might be interpreted as an intermediate condition between divergence and parallelism of male parts at the tip of the rostellum, it is in other respects unique.

(5) The anther sacs lean forward as in *P. praeclara*, unlike the vertical sacs in *P. psycodes*.

(6) The three divisions of the lip are not as deeply fringed as in *P. praeclara* but are more deeply fringed than is usual for *P. psycodes.*

(7) The pale pinkish-purple and whitish flower colour differs from that of *P. praeclara* which is always white or creamy, and is a little different from that of *P. psycodes* which is often a darker purple but pale and even white-flowered forms of *P. psycodes* (*P. psycodes* f. *albiflora* (R. Hoffm.) Whiting and Catling) are widespread.

(8) The flowers are said to be smaller than those of *P. praeclara* by observers. Since flower size is often a variable character it cannot be used to entirely exclude *P. praeclara*.

Table 1. Scores for three possible identifications based on eight considerations.

| **Consideration** | *P. praeclara* | *P. psycodes* | *P. praeclara* × *psycodes* |
|---|---|---|---|
| 1 | 1.5 | 1.5 | 3 |
| 2 | 1.5 | 1.5 | 3 |
| 3 | 3 | 0 | 1.5 |
| 4 | 0 | 0 | 3 |
| 5 | 3 | 0 | 3 |
| 6 | 1.5 | 1.5 | 3 |
| 7 | 0 | 2.5 | 3 |
| 8 | 0.5 | 3 | 3 |
| Total | 11 | 10 | 22.5 |

Scores between 0 and 3, where 3 is the most likely for a particular assignment, are given to the three possibilities, and the putative hybrid is given "3" for intermediacy but only "1.5" for characters of either parent. Unique hybrid characters are scored as "0" for putative parents. The result of this analysis with 11 for *P. praeclara*, 10 for *P. psycodes* and 22.5 for *P. praeclara* × *psycodes* (Table 1) is a strong suggestion that the unknown plants with pale purplish flowers are of the postulated hybrid origin, i.e. *P. praeclara* × *psycodes*. The unique column character in consideration 4 (above) is convincing apart from the overall score.

## History and distribution of putative parents

Having established a very high level of likelihood that the pale purple-flowered plants are a *P. praeclara* × *psycodes* hybrid on the basis of morphological characteristics, it is appropriate to consider circumstantial evidence. Hybrids are most likely to occur where the putative parents are close together. *Platanthera praeclara* Sheviak and Bowles was first discovered in Manitoba by Catling and Brownell near Vita in 1984 (Catling & Brownell 1987). They also reported the first observations of *P. psycodes* at Buffalo Point, Lake of the Woods in the same year (Catling and Brownell 1987). Neither of these species has been found in Manitoba substantially beyond the general areas where they were first discovered (Ames et al. 2005) although more local populations of *P. praeclara* were found in the Vita area where the Prairie Preserve was estab-

lished in 1989. The distance between the Manitoba locations of these two fringed orchids is approximately 60 miles. However, there has been an occurrence of *P. psycodes* in Minnesota near the Manitoba border across from the Tall Grass Prairie Preserve (Smith 1993, Welby Smith, pers. comm.). This would make the putative parents approximately 10 miles apart. Closer occurrence is a possibility. Even if that was not the case, *P. praeclara* is pollinated by hawkmoths (sphinx moths, Westwood and Borkowsky 2004). This group of moths includes the fastest flying insects that are known to disperse and migrate (Stevenson et al. 1995). Although little is known of their pollen dispersal capability (Levin and Kerster 1974), it is conceivable that individuals of some species may transport pollen over distances of several miles. Long distance dispersal of orchid seed from an unknown area of sympatry does not have to be evoked as an explanation under the circumstances of potential local occurrence of *P. psycodes* in the area, and potential long distance dispersal of pollen of *P. psycodes*. Thus the occurrence of the hybrid *P. praeclara* × *P. psycodes* in the Tall Grass Prairie Preserve is not unlikely.

## A NEW HYBRID

A hybrid involving *P. praeclara* and *P. psycodes* has not previously been reported (Sheviak 2002) although it has been expected since a hybrid with *P. psycodes* is known in the related Eastern Prairie Fringed-Orchid, *P. leucophaea* (Catling et al. 1999).

*Platanthera praeclara* × psycodes. *Platanthera praeclara* Sheviak and Bowles (Rhodora 88: 267, figs. 1a-d, 2-4. 1986) × *Platanthera psycodes* (Linnaeus) Lindley (Gen. Sp. Orchid., 294. 1835). Figure 1.

Hybrid from *P. praeclara* and *P. psycodes,* intermediate in orientation of the perianth parts and the anthers, with the roundish spur opening of *P. praeclara*, lip more deeply divided than *P. psycodes* and flowers pale pinkish-purple and white.

**ETYMOLOGY:** This hybrid cannot be given an official Latin name because doing so would be in contravention of the Melbourne Code article 40.4 which requires that the type be a specimen rather than an illustration (McNeill et al. 2012). However, we recommend that it be accorded the English name Borkowsky's Hybrid Fringed-Orchid, after Christie Borkowsky, Biologist at the Manitoba Tall Grass Prairie Preserve near Gardenton, Manitoba. Christie observed all plants and kept a record of their locations and has played an important role in the management and conservation of one of the largest remaining tall grass prairies in Canada.

**IDENTIFICATION:** In other cases it has been possible to use floral dimensions to characterize *Platanthera* hybrids (Catling 1999, Catling and Brownell 1999), but in this case it is not since only a photograph is available. This hybrid differs from other pale-purplish-flowered fringed-orchid hybrids (*P. ×hollandiae* Catling & Brownell, *P. ×reznicekii* Catling, Brownell, & Allen, *P. ×andrewsii* (Niles) Luer) by having the stipes (sometimes called caudicles) of the pollinia divergent toward the viscidia, a feature derived from *P. praeclara* (Sheviak and Bowles 1986). It would likely differ from *P. ×keenanii* P.M. Brown in having broader lateral petals and a less deeply incised lip. However, neither this latter hybrid, nor its putative parents (*P. grandiflora* (Bigelow) Lindley and *P. lacera* (Michx.) G. Don) are likely to occur in alkaline calcareous prairie since they favour acid substrates (pers. obs.).

**DISTRIBUTION:** This hybrid is currently known only from the Tall Grass Prairie Preserve. It may occur wherever the parental species overlap in geographic distribution and flowering time. Since *P. praeclara* has a more western distribution than *P. psycodes*, the only area of overlap may be the vicinity of the Tall Grass Prairie Preserve.

**CONSERVATION:** The only known site for Borkowsky's Hybrid Fringed-Orchid on the Tall Grass Prairie Preserve is protected. It may be expected to vary in appearance from year to year based on variation in annual weather as appears to be the case with *P. praeclara.*

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# Love in the Swamp Among the Orchids

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Whoever thought I would be invited to attend a wedding in a swamp where the bride wore a long white wedding dress with combat boots and water up to her knees.

So here I was on the first of June in the Fakahatchee Strand State Preserve (FSSP) in Southwest Florida to witness the marriage of Mike Owen, the chief biologist of the preserve for the past eighteen years, and Donna Glann-Smyth. The story goes that they met eight years ago when Mike was leading a guided swamp walk through the Fakahatchee Strand looking for some of the 46 species of orchids that are found here.

One of the most precious, *Dendrophylax linden*, the elusive "Ghost Orchid", was found in full bloom as they were passing through the tropical canopy of Cypress Trees. Mike pointed out this orchid to Donna as it clung to the pop ash tree with the tentacles going around the trunk like an octopus. This is one of the three leafless orchids that occur here in this strand. Within a few minutes en route Donna had spotted another one on her own, which apparently is unheard of as most first time visitors are more aware of alligators, venomous cottonmouth snakes which are very territorial, poison ivy and poisonwood trees. Jumping spiders also lurk around every corner. Mike was quite impressed that a visitor had found an orchid that was not known to him and

Photo by Saul Friess. Used by permission

probably knew then that Donna was something special so at the end of the guided tour he took her telephone number.

After eight years they decided to wed at the same place that they saw this same Ghost Orchid and especially in June as it would be very likely that one orchid would be in flower for the ceremony, but alas, although one was due to bloom, it was stolen a few weeks previously. However there were two Ghost Orchids entangled around the tree where Rene Rau, an ordained minister, who is also the Superintendent of the FSSP, conducted an outstanding wedding ceremony.

We all met up at the visitors centre at the FSSP at 10:00 a.m. We all car-pooled and then drove seven miles to gate #12 before entering the swamp with our walking poles. Some had come dressed for the occasion with Saul Friess in a tuxedo and Blanca Clusman in a Hawaiian skirt. After a brisk walk through the swamp we came to a halt and all prepared for the occasion with Mike calling like Tarzan a call that is often needed in unfamiliar surroundings, as it is so easy to get disorientated, it sounded like "Hootee Hooo-o-o-o". The bride seemed to appear from nowhere holding a bouquet of flowers that strangely looked like a bunch of "Ghost Orchids" as she headed towards the ceremonial tree. There were about 40 attendees for the swamp wedding and about a hundred at the reception held at the Everglades City Seafood Depot Restaurant.

After the wedding my wife and I tramped through the undergrowth back to the path but on route we did see a "Ghost Orchid" in bloom just above our heads; an *Epidendrum amphistomum,* the "dingy orchid", which Mike prefers calling "rollercoaster orchid" as he says nothing is dingy in the FSSP; *Encyclia tampensis,* the "butterfly orchid"; and *Vanilla phaeantha,* the oblong-leaved vanilla orchid.

The FSSP encompasses much of Florida's most spectacular swamp consisting of a 90,000-acre wilderness. It is the western part of the Big Cypress with its waters running from Lake Okeechobee through the strand, and into the Gulf of Mexico. It is well known for its Bald Cypress Trees. Many of them were cut down during the Second World War leaving a long road called "Janes Scenic Drive" which goes for 11 miles but does not lead anywhere. The lumberjacks left tram trails that lead into the swamp by canals that helped them with the logging. These areas have created great canopies for orchids. The FSSP, known as the orchid and bromeliad capital of the United States, has the distinction of having more orchid and bromeliad species than anywhere else in the USA and Canada. Many epiphytic species are found in the FSSP.

I think I prefer this real true love story to the non-fiction book '"The Orchid Thief" written from true facts by Susan Orlean, and to the subsequent the very fictitious film "Adaptation" starring Nicholas Cage and Meryl Streep. The book was a true story. Mike Owen was there for the arrest, and he met with Susan Orlean for the story and the facts.

Other orchids seen in the area included *Encyclia tampensis*, Butterfly Orchid, and *Platanthera nivea*, Snowy Orchid. Photos by Eli Schaperow

*A 2013 NOC Meeting Presentation*

# *Cypripedium* of Sichuan, China

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The following report chronicles our botanical outing of June 2012 to Sichuan (formerly Szechuan), China. Our group was small, six participants, all experienced explorers. The trip was arranged and guided by Holger Perner, a German botanist. He came to China years ago for his orchid work, needed a local driver (enter Wenquin) and today they are married with two lovely preteen daughters. An excellent pair, Holger provides botanical expertise and Wenquin covers logistics such as lodging, driving, translating, and ordering meals. Perner operates a lab and greenhouses, Hengduan Mountain Biotechnology, in which he propagates Chinese *Cypripediums* and *Paphiopedilums* for sale.

This article is not intended as a comprehensive overview of Sichuanese *Cypripediums*. There are even more species to be found in the province, but such is the nature of China that to get to them often requires a two day drive and then a full day hike. China is viewed as ground zero for the global distribution of *Cypripediums*, with incredibly about 25 of the 45 taxa Cribb recognizes as comprising the genus occurring there.

The Sichuan province is located in southern China, due north of Viet Nam and the approximate latitude of San Diego/northern Mexico. The central fea-

*Cypripedium tibeticum* and *C. bardolphianum*.

ture is the Hengduan Mountain Region, a.k.a. the mountains of southwest China. Many peaks exceed 4,000 meters elevation, the highest being 5,588 meters. Twelve thousand higher plant species are known from the region, 3,500 of which are endemics. 363 orchid species are listed in 32 genera. The number of showy plant species of horticultural value we personally encountered was incredible. Included were Lillium, Primula, Iris, Gentian, Meconopsis (poppy), Clematis, Peony, and Rhododendron. The crown of this area is Huanglong National Park, recognized as one of the 34 Global Biodiversity Hotspots, lists 69 orchid species. The jewel in the crown is the Huanglong Valley (3,100 meters) in which one spot has an amazing 34 temperate terrestrial orchid species found in an area of about one square kilometer.

The central feature of Huanglong Valley is its travertine pools, one of the largest structures of its type on the planet. Geothermal water laden with calcium carbonate wells up from a deep underground fault, and from thence down the mountain. Surface exposure causes carbon dioxide gas to be released, which in turn causes calcium carbonate to precipitate out as travertine, forming the most compelling of landscape features. The limestone forms on the perimeters of the stream, eventually forming a series of descending rounded terraced pools, filled with lovely blue sapphire water. Chinese visit the site as aggressively as we visit North America's Yellowstone or Yosemite. Indeed, records reveal 5000 years ago the valley was esteemed as a place of pilgrimage and contemplation.

*Cypripedium flavum* and *C. guttatum*.

As this travertine or tufa deposit underlays most of the greater valley area, tree growth is inhibited creating an open, park like landscape, which also is an ideal situation for terrestrial orchids, particularly *Cypripediums*, to thrive in. The *Cypripedium* species we encountered in bloom were *C. tibeticum, flavum, bardolphianum*, and *guttatum,* as well as *Calypso bulbosa* var. *speciosa*. Perner's studies of flower morphology point to *C. bardolphianum* as the most highly evolved species in the *Cypripedium* genera. It occurs in both a golden yellow and deep maroon form. *C. guttatum* is also easily viewable in Alaska, and also holds the distinction of being the most globally widespread slipper orchid. The most spectacular location is definitely the area below the sapphire pools. The water flow broadly spreads out into shallow braided streamlets and islets of small trees/scrub vegetation, interspersed with marshy areas. Here the deep pink to maroon *Cypripedium tibeticum* and the soft yellow *Cypripedium flavum* grow in abundance. The number of blooms were literally in the thousands.

From Huanglong we proceeded down the Fu River through the Danyun gorge, a steady drop from 2,500 to 1,700 meters. Midway we exited the road to pick our way up a lushly wooded slope with an equally lush understory of ferns and other interesting plants. As we worked upward we encountered scattered groups (circa two or three individuals) of *C. sichuanense*, with its pleated, nearly round, spotted, softball size pair of leaves[1] nearly hugging the ground. Described by Perner in 2002, it is endemic to Sichuan province, and a close relative of *C. fargesii* (see below). Growing with the *C. sichuanense* but agonizingly not in bloom was the diminutive *C. micranthum*, possibly with insufficient light to bloom. A sad note—before leaving the area Holger had to

1) Technically the second leaf is a bract.

*Cypripedium sichuanense* and *C. fargesii*.

*Cypripedium flavum* colony.

walk up and down the road to be sure no plants were visible from the roadway. If discovered, the entire colony could be wiped out by a well-known local plant dealer. This dynamic is a particularly threatening problem for the number of singularly spectacular orchid species native to China.

Another popular park with limestone pools is Jiuzhaigou (2,200 meters), though the terrain is flatter and the features tend to be larger pools and lakes. Here we found *C. fargesii* growing in open lightly shaded situations. *C. fargesii* is one of the five unique Chinese Cyp species with large, round, pleated leaves covered with large grey spots. I find them fascinating as no other Cyp species have even remotely similar foliage. One theory is these spots mimic moldy lesions that would attract a pollinating fly. Also seen in the park were the beautifully shaped green and white *C. farreri,* and the deep, deep maroon *C. calcicolus*. Proceeding higher to a lovely alpine setting (2,900 meters) we viewed a nice colony of *C. palangshanense* growing in the mixed forest understory. Similar to the North American *C. fasciculatum*, but even smaller and single-flowered, it blends in so well one can stand and look at the whole colony and not distinguish a plant until it is pointed out.

An informative stop was Perner's *Cypripedium* growing shade houses in the Huanglong area. Seed is sown in his lab in the provincial capital of Chengdu, and when large enough, the plants are grown out in his specially prepared beds. Here we were able to see a living collection of virtually all the species to be found in this part of China, most in bloom. Along with all of the aforemen-

tioned species, in bloom were *C. fasciolatum* (largest of all Chinese Cyps), *C. macranthos* var. *hotei* (a Japanese species), *C. calceolus*, and *C. plectrochilum*, with its obvious affinity with our *C. arietinum* (Ram's Head Ladyslipper).

In addition to the *Cypripediums* I have focused on, many other terrestrial orchids were encountered in a wide variety of habitats. Those seen in bloom included *Amitostigma monanthum*, *A. physoceras*, *Bletilla ochraceae*, *Calanthe brevicornum*, *C. tricarinata*, *Dactylorrhiza salina*, *Galearis roboroskii*, *Hemipilia* ssp., *Herminium ophioglossoides, Listera grandiflora*, *Oreorchis fargesii*, *O. nana*, *Phaius delavayii, Platanthera* ssp., *Pleione bulbocodiodes*, *Ponerorchis chusa*, and *P. c*renulata.

In summary, I will say a trip to this area is on a par with a visit to one of the more legendary orchid destinations of the world, such as South America. We had frequent encounters with a number of singular orchid species, augmented by the spectacular, showy, and entertaining nature of the wide variety of *Cypripediums* to be found in this region. Add to that mix other spectacular native flowers, engaging native ethnic groups, and unique landscapes, for a worthwhile experience of a novel, exotic corner of the world.

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*This was also presented at the 11th Native Orchid Conference, June 2013*

View of limestone pools and temple in Huanglong Valley.

# Herbivorous Threats to *Hexalectris colemanii* (Catling) Kennedy and Watson

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*Hexalectris colemanii* (Figures 1 and 2) is a rare orchid from southeastern Arizona and extreme southwestern New Mexico. The U. S. Fish and Wildlife Service is conducting a status review of *H. colemanii* as part of the process to determine if it warrants protection under the Endangered Species Act of 1973.

Figures 1. and 2. Flower, front and side view, of *H. colemanii* photographed at study site in 2013. All photographs by author.

I first became aware of what is now *H. colemanii* while doing research for *The Wild Orchids of Arizona and New Mexico* (Coleman 2002). Credit for the first discovery of the plant goes to Larry Toolin and Frank Reichenbacher who discovered it in south central Pima County in 1981. They identified the plant as *H. spicata*, which is reasonable given the keys in then available floras. A second discovery by Steve McLaughlin was made in 1986 in the southern part of Pima County. Like Toolin and Reichenbacher, McLaughlin identified the plants as *H. spicata*. Both of these discoveries are documented with collections housed at the herbarium of the University of Arizona in Tucson.

I initially thought the plants were *H. revoluta* and reported them as such (Coleman 1999 and Coleman 2000). Relying on that work, this taxon was also reported as *H. revoluta* by Goldman, Catling, and Coleman (2002). Later Catling (2004) determined that the plants in Arizona differed from *H. revoluta* and named the Arizona plants *H. revoluta* var. *colemanii*. Kennedy and Watson (2010) published a paper demonstrating that the Arizona plants are distinct from *H. revoluta* and the Arizona taxon is now known as *H. colemanii*.

Figure 3. Plant of *H. colemanii* photographed and flagged at study site in 2013.

I started a long term study tracking the number of plants at two major sites in 1996. I visit each site every year, usually multiple times, and record the status of the plants. The data show that the blooming pattern for *H. colemanii* is erratic, from as many as 40 plants at one site in 2001 to as few as zero plants in 2002 and 2009. I presented interim results from my studies at two scientific conferences (Coleman 2001, and Coleman 2005).

Our knowledge of *H. colemanii* is expanding. My field studies found two sites in addition to those discovered by Toolin and Reichenbacher, and McLaughlin. Starting in 2010 research conducted by Westland Resources (Westland, 2010 and Westland 2012) under funding by the Rosemont Copper Company, and by the U.S. Fish and Wildlife Service (Baker 2012) resulted in the discovery of populations in two additional mountain ranges, including one in New Mexico. However, *H. colemanii* remains rare with only a few hundred plants appearing each year.

Repeatedly since 1996 I had observed evidence of herbivory, even reporting in Coleman (2002) that some plants are eaten each year. Sometimes there would be only a remnant of a stalk where a plant had stood. Other plants would have the inflorescence eaten off past the lowest flower. In some cases there would be no trace of a plant that had been flagged a week earlier. Data began to indicate that herbivory might be more prevalent than first thought. Starting in 2012 an attempt was made to try to quantify the threat to *H. colemanii* by herbivores. Eight plants were marked and numbered. The plan was to document the blooming history of these plants and capture evidence of herbivory. Results came sooner than expected. A later visit that year showed that four of the marked plants had been destroyed by digging, such as one would expect from a small rodent. There was no trace of any of the plants.

Herbivory was even more pronounced in 2013. Two trips were made to study the plants at one location: first on 11 May, and again on 24 May. None of the plants marked with permanent stakes in 2012 had returned. The first visit was early in the season. Two plants had their lowest flowers just starting to open. Others were still in early bud. Temporary flagging was used to mark each plant. Several of the flagged plants were photographed (Figure 3).

Figure 4. Hole apparently made by small herbivore digging up *H. colemanii*. Flagging is also shown.

The return visit on 24 May provided ample evidence of herbivory, but with no direct indication of the herbivore. Several plants had been dug up and completely removed or consumed. The plant of Figure 3 was one of those, and the hole and flagging are shown in Figure 4. The holes are small and fairly shallow, suggesting the rodent dug only deep enough to access the fleshy rhizome from the current growth. On other plants the lower portion of the flower stalk remained standing, but had been eaten down below the lowest flower (Figure 5). This suggests a larger animal such as a rabbit or even a deer was the herbivore.

Figure 5. Still standing spike of *H. colemanii* but all the flowers had been eaten away.

In some places large sections of the chewed flower stems were still on the ground (Figure 6). All the flowers were missing and both ends of the fragments had been chewed. A close up of one fragment (Figure 7) indicates apparent tiny teeth marks, such as may have been made by a chipmunk, mouse, or squirrel.

At first I believed that like other myco-heterotrophic orchids *H. colemanii* after blooming could live underground in association with its fungus for a year or more without reappearing above ground (Coleman 2002). Subsequently my

Figure 6 and 7.

Partially eaten flowering stem of *H. colemanii.*

Close up of chewed end of stem of *H. colemanii*

data refute that belief. The typical pattern is for a plant to bloom once. I have been watching some spots for 15 years and the plants there have not re-appeared after their initial blooming. That suggests the populations of *H. colemanii* are dependent upon seedling recruitment. My experience suggests capsule formation is fairly low. Therefore the heavy predation of *H. colemanii* as documented in 2013 precluding large numbers of plants from developing and maturing capsules may be one reason *H. colemanii* remains relatively rare. Additional work is needed to identify the herbivores and to determine if heavy herbivory is the rule rather than the exception.

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# Recap

The **11th Annual Native Orchid Conference** meeting was held June 10-13, 2013 in Oroville, California. Raymond Prothero served as conference chair. Among those providing support were Ron Coleman, David McAdoo, Mark Rose, and Ben Rostron. Thanks to these organizers and all who helped.

*Corallorhiza striata* — a golden yellow form

The two days of talks got rave reviews. Abstracts from several of them are found on the following pages. Ron Coleman's update on the area's orchid flora raised considerable interest and excitement about the two field days that were to follow in perfect hunting/photographing weather. Although each group's spottings varied slightly, most saw 11 blooming species of California native orchids. Raymond also led two days of local field trips after the event for those who still needed to see and photograph more.

***And next year*** — mark your calendars for July 14-17 at Itasca State Park in Lake Itasca (Park Rapids), MN. Go to http://www.dnr.state.mn.us/state_parks/itasca/index.html for further information on the area.

*A 2013 NOC Meeting Presentation*

# Update of The Orchid Flora of California

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Ron Coleman opened the 2013 NOC with an overview of the wild orchid flora of California. The presentation emphasized changes in nomenclature and new taxa since publication of *The Wild Orchids Of California* (Coleman 1995).

California has 11 orchid genera with 35 species. Ron recognizes 39 taxa as shown in Table 1. There are many color forms of some species, such as *Corallorhiza maculata*, that are not included in the table.

Six taxa are worth noting because their nomenclature either was incorrectly captured in *The Wild Orchids Of California* or their nomenclature has changed since that volume was published.

*Listera banksiana* is the species whose specific epithet was incorrect in *The Wild Orchids Of California.* Coleman (1995) showed it as *Listera caurina*. Brown (2004) points out that the correct name is *Listera banksiana* Lindley. Brown observes that the error traces back to Wiegand (1899) who listed *L. banksiana* as a synonym for *L. convallarioides*. Wiegand was followed by many authors, including Coleman. Fernald and Schubert (1948) had earlier pointed out the nomenclature confusion, but not all authors noticed their work.

Sheviak and Jennings (2007) described a new species of *Platanthera. Platanthera tescamnis* Sheviak and Jennings, occurs in the Great Basin, the Colorado Plateau, and adjacent areas, including the White Mountains and eastern Sierra Nevada in California. Coleman (1995) treated those plants as *P. hyperborea*, but we now understand that species does not occur in California.

Only a year later Colwell, Sheviak, and Moore (2007) described still another new *Platanthera*, this one based on material from Yosemite National Park. *Platanthera yosemitensis* is endemic to California and is narrowly distributed in the eastern Sierra Nevada range. Coleman (1995) showed photos of the plants, but treated this species as *P. hyperborea* var. *purpurascens* which is now known as a synonym for *P. purpurascens*. *Platanthera purpurascens* does not grow in California.

Coleman treated a *Spiranthes* he photographed in the central Sierra Nevada range as "undescribed" and was not sure whether it might be a new species or a

hybrid. That issue was resolved by Brown, Dueck, and Cameron (2008). Their paper provided data supporting the position that the heretofore undescribed plant was in fact a new species, *Spiranthes stellata*. The type specimen of *S. stellata* is from Yosemite National Park.

The most recent addition to the orchid flora of California was made by Sheviak (2012). He described *S. stellata* subsp. *perexilis* based on material from Butterfly Valley in Plumas County, CA, an area visited during field trips of the Native Orchid Conference (NOC) of 2013. This is a rare plant and was not known to Coleman (1995).

Another change to the orchid flora of California was presented by Coleman (1995), was made by Brown (1995). Brown described *Epipactis gigantea* forma *rubrifolila*, a plant with wine-red leaves and darker than usual flowers, first found by Roger Rachie. Many authors, including this one, do not separately account for color forms of species. However this form is so striking it deserves mention. Raymond Prothero took some attendees to see this plant after the NOC 2013 ended.

Table 1 shows the revised orchid flora of California. It still recognizes the genus *Piperia*. Two presenters at the NOC, Dr. Robert Lauri and Dr. Kenneth Cameron, included information on advances in phylogenetic analysis that suggest Bateman's (Bateman et al. 2003) inclusion of *Piperia* as a section within *Platanthera* instead of as an independent genus may eventually prevail. If and when that happens the nomenclature of the orchid flora of California will change again. But that is a story for another day.

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## TABLE 1

## The Orchid Flora of California

| | |
|---|---|
| *Calypso bulbosa* var. *occidentalis* | *Piperia colemanii* |
| *Cephalanthera austiniae* | *Piperia cooperi* |
| *Corallorhiza maculata* var. *maculata* | *Piperia elegans* var. *elegans* |
| *Corallorhiza maculata* var. *occidentalis* | *Piperia elegans* var. *decurtata* |
| *Corallorhiza mertensiana* | *Piperia elongata* |
| *Corallorhiza striata* | *Piperia leptopetala* |
| *Corallorhiza trifida* | *Piperia michaelii* |
| *Cypripedium californicum* | *Piperia travsversa* |
| *Cypripedium fasciculatum* | *Piperia unalascensis* |
| *Cypripedium parviflorum* | *Piperia yadonii* |
| *Cypripedium montanum* | *Platanthera dilatata* var. *leucostachys* |
| *Epipactis gigantea* | *Platanthera sparsiflora* |
| *Epipactis gigantea* forma *rubrifolila* | *Platanthera stricta* |
| *Epipactis helleborine* | *Platanthera tescamnis* |
| *Goodyera oblongifolia* | *Platanthera yosemitensis* |
| *Listera banksiana* | *Spiranthes porrifolia* |
| *Listera convallarioides* | *Spiranthes romanzoffiana* |
| *Listera cordata* | *Spiranthes stellata* ssp. *stellata* |
| *Malaxis monophyllos* | *Spiranthes stellata* ssp. *perexilis* |
| *Piperia candida* | |

*Cephalanthera austiniae* being closely admired.

*A 2013 NOC Meeting Presentation*

# Chloroplast Evolution in *Platanthera* Rich. (Orchidaceae)

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This presentation outlined the need for additional genetic markers to elucidate the phylogenetic relationships within *Platanthera s.l.* and among the different sections. The focus of the study was on chloroplast variation. It was determined that three regions were phylogenetically informative. These regions include *petA-psbJ*, *rpl14-rpl36*, and *trnS*$^{GCU}$*-trnG2S*. Seventy-three samples of *Platanthera s.l.* were included in the study along with nine additional samples of outgroup taxa. After amplification of the three above mentioned regions, a total of 2,265 base pairs of data were sequenced for each sample. These data were analyzed in PAUP© for maximum parsimony and Mr. Bayes for Bayesian Inferences of phylogenetic relationships .

These phylogenetic data appear to have several inversions in the sequences and also several insertions/deletions that exhibit homoplastic characteristics. There also appears to be some loss of phylogenetic signal due to "noise" within the data matrix when analyzed. This noise has resulted in difficulties in determining the phylogenetic relationships between the different sections of *Platanthera s.l.* However, several of the sections of *Platanthera s.l.* are strongly supported as phylogenetically distinct (monophyletic) groups including *Blephariglottis*, *Limnorchis*, *Platanthera*, and *Piperia*. Thus, these data support the placement of *Piperia* as a section of *Platanthera* Rich. by Bateman et al. 2003 and 2009.

Including additional sequences from slower evolving chloroplast regions (e.g. *matK*, *rbcL*, or *ndhF*) may assist in stabilizing the topology along the spine of the phylogenetic tree. Adding these regions to a future study of the *Platanthera s.l.* should elucidate the relationships among the sections within our concept of *Platanthera* Rich.

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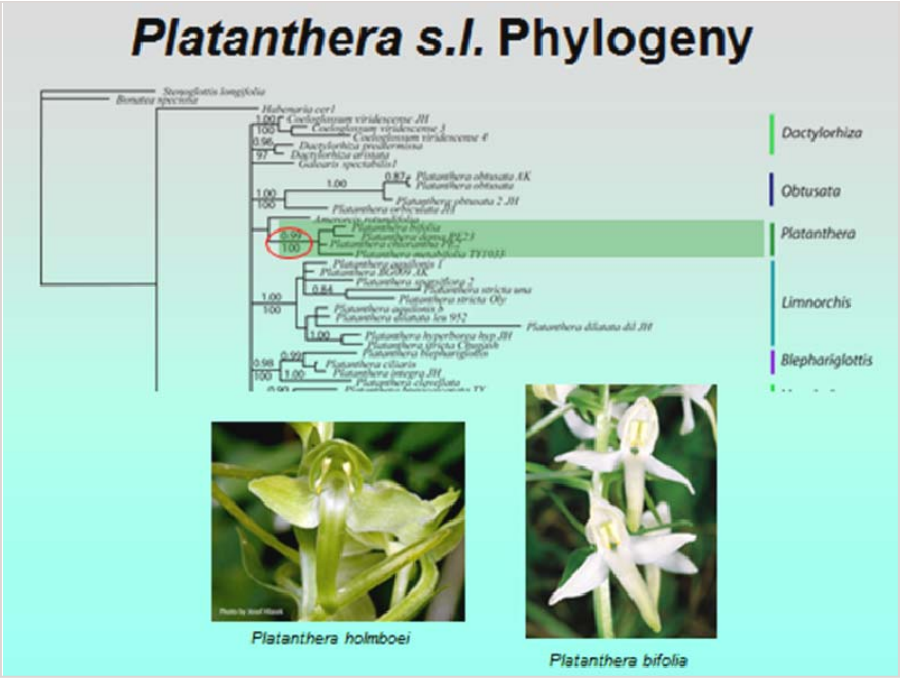

*A 2013 NOC Meeting Presentation*

# Comparative Morphology of *Platanthera* Rich. (Orchidaceae)

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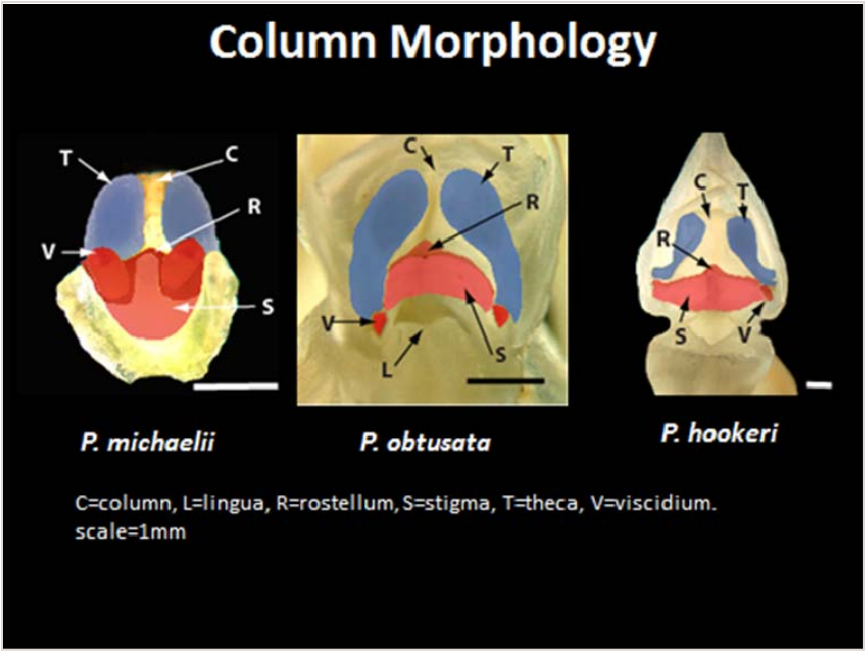
A number of studies have attempted to elucidate the morphology within *Platanthera s.l.*, however little attention has been given to the sections within this group. It seems pertinent to investigate the morphology of these groups, given that recent molecular studies have hypothesized close relationships of these clades (e.g., sections *Blephariglottis*, *Fimbriella* (*Lacera*), *Limnorchis*, *Lysiella*, *Piperia*, and *Platanthera*). A fair amount of morphological knowledge has been elucidated within sections *Platanthera* and *Limnorchis*. However, many morphological characters within these groups vary quite considerably (e.g., tuber shape, leaf number, flower color, and labellum shape). These characters are thought to be highly homoplastic by many authors; therefore, it has been decided that other characters should be investigated to determine if they would be more suitable for comparative morphological and phylogenetic studies.

Morphological characters such as overall column, anther, stigma, rostellum, and viscidium shape have been documented as good taxonomic characters used to identify species. In addition, seed morphology has been documented to be highly variable (especially seed testa patterns). However, no study has focused on the variation of these characters in a phylogenetic context. This study focused on the comparative analysis of these characters to better define each section, and provide synapomorphies (shared character traits) for individuals within these groups. Two samples were included from each of the nine groups identified in this study and other recent studies (Hapeman and Inoue, 1997), as good phylogenetic groups. The total number of samples used for this study was twenty six.

Preliminary results show that synapomorphies are found for several of the groups and individuals including *Piperia*, *Platanthera obtusata*, and *Platanthera hookeri*. Section *Piperia* exhibits a unique hatchet shaped stigma that is consistent for all members of that group. In addition, *P. obtusata* exhibits a membranous lingua at the opening of the nectary spur, and *P. hookeri* exhibits an extended nose shaped roetellum that no other *Platanthera* have. These synapomorphies do not elucidate phylogenetic relationships among the sections of




*Platanthera s.l.*, however they do provide us with unique characters with which we can delineate the sections within the group. Further research on this study is planned, and will likely provide additional morphological characters that will elucidate the phylogenetic relationships within *Platanthera s.l.*

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*A 2013 NOC Meeting Presentation*

# The Geology of the Feather River Area

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## Abstract

The geology of the Feather River area of northern California spans nearly a half billion years, from ancient seas and accreted terrains to the building of an Andean-style mountain range and its erosion into what now is the Central Valley. New rocks accumulated on that erosion surface only to be partially eroded away as the Sierra faulted on the east, and tilted to the west and north. As it rose, rivers cut V-shaped canyons while the ice age began and glaciers sculpted the higher reaches of the tilted block. Throughout this long and tortured history, occasional deposition of sedimentary rocks entrapped a limited record of life through fossils.

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1) Dick Hilton's research emphasis is on the geology and paleontology of California and Nevada. He has published numerous scientific articles in the field of vertebrate paleontology and a book titled "Dinosaurs and Other Mesozoic Reptiles of California" published by the University of California Press.

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