

***NORTH AMERICAN
NATIVE ORCHID JOURNAL***

Volume 14 (1)

2008



IN THIS ISSUE:

**A NEW *SPIRANTHES* FROM THE WESTERN UNITED STATES
A FAMILY ORCHID VACATION TO NEWFOUNDLAND
*and more.....***

The *North American Native Orchid Journal* (ISSN 1084-7332) is a publication devoted to promoting interest and knowledge of the native orchids of North America. A limited number of the print version of each issue of the *Journal* are available upon request and electronic versions are available to all interested persons or institutions free of charge. The *Journal* welcomes articles of any nature that deal with native or introduced orchids that are found growing wild in North America, primarily north of Mexico, although articles of general interest concerning Mexican species will always be welcome.

NORTH AMERICAN NATIVE ORCHID JOURNAL

Volume 14 (1)

2008

CONTENTS

NOTES FROM THE EDITOR

2

A NEW *SPIRANTHES* (ORCHIDACEAE) FROM THE WESTERN UNITED STATES

Paul Martin Brown, Lucy A. Dueck & Kenneth M. Cameron

3

A FAMILY ORCHID VACATION TO NEWFOUNDLAND

Tom Nelson

22

HABITAT NOTES ON *EPIDENDRUM MAGNOLIAE* VAR. *MAGNOLIAE*, THE GREEN FLY ORCHID

Michael Dorris

41

MY FAVORITE THINGS: ORCHIDS OF THE INDIANA DUNES

Peter Grube

43

BEING GOOD CARETAKERS

The Slow Empiricist

52

ORCHID REINTRODUCTION IN THE UNITED STATES:

A MINI-REVIEW

Scott L. Stewart

54

BOOK REVIEWS & PUBLICATION ANNOUNCEMENTS

60

Field Guide to the Wild Orchids of Texas

Orchids of Dominican Republic and Haiti

Orchid Seed Germination Media, a Compendium of Formulations

Lady's-slippers in Your Pocket

Ladies'-tresses in Your Pocket

Unless otherwise credited, all drawings in this issue are by Stan Folsom.

The opinions expressed in the *Journal* are those of the authors. Scientific articles may be subject to peer review and popular articles will be examined for both accuracy and scientific content.

Volume 14 (1): 1- 67 issued January 15, 2008.

Copyright 2008 by the *North American Native Orchid Journal*

Cover: *Platanthera ciliaris* by Stan Folsom

NOTES FROM THE EDITOR

With Volume 14 the *North American Native Orchid Journal* will return to four issues per year. This means we will have space for more articles and photographs. Major articles for the next three issues in 2008 are already planned but there is plenty of space for additional contributions. The electronic format has been very well received and we now reach more than 1000 readers. You may either read this issue directly from the e-mailed PDF file or access it, and back issues, at: <http://wiki.terrorchid.org/tow;journals>. The current update of the *North American Personal Checklist* is also available at that website. The checklist will be updated quarterly as needed.

I hope to have volumes 4 & 5 converted to PDF format by early March and volumes 1-3 by June. The first 3 volumes will take time because they are in a totally different word processing program and each page has to be individually scanned before the PDF can be made.

Paul Martin Brown

Editor

naorchid@aol.com

10896 SW 90th Terrace, Ocala, FL 34481

PO Box 759, Acton, Maine 04001 June- mid October

LOOKING FORWARD

April 2008

Grass-pink Hybrids

Contributions to the Status and Morphology of *Platanthera pallida*

Two New Color Forms from the Central Appalachians

Orchids of the Florida Panther National Wildlife Refuge

.....and more

***SPIRANTHES STELLATA* (ORCHIDACEAE),
A NEW SPECIES OF LADIES'-TRESSES
FROM THE WESTERN UNITED STATES**

Paul Martin Brown, Lucy A. Dueck, and Kenneth M. Cameron

ABSTRACT

A *Spiranthes* found in montane meadows of northern California and southern Oregon has generally been considered to be a local race of *S. romanzoffiana* Chamisso, but its status as a distinct species is supported by morphological and DNA sequence data. This new species, *S. stellata* P.M. Brown, L.A. Dueck & K.M. Cameron, is described here. It is distinguished by its star-like spreading floral parts, typically single-ranked arrangement of the flowers, folded lip, descending tuberous root, non-stoloniferous habit, and supportive molecular evidence.

Key Words: DNA, *Spiranthes stellata*, *Spiranthes romanzoffiana*, *Spiranthes porrifolia*, Orchidaceae, Sierra Nevada, California, Cascades, Oregon.

I.

NATURAL HISTORY AND TAXONOMY

Paul Martin Brown

INTRODUCTION

For some years, a distinctive *Spiranthes* in the Sierra Nevada range of eastern California has attracted the attention of botanists. These orchids are unlike either *S. romanzoffiana* Chamisso, which is widespread in the region, or *S. porrifolia* Lindley, which is local to rare in the mountains. The distinctive plants are common in the moderate elevation fen meadows found throughout Yosemite National Park (YNP) and have been observed as far north as southern Oregon and as far south as Tulare County, California.

Five currently recognized species of *Spiranthes* are found west of the Rocky Mountains in North America. Two of them, *S. infernalis* Sheviak and *S. delitescens* Sheviak, are locally endemic to southwest Nevada and southeast Arizona, respectively. A third species, *S. diluvialis* Sheviak, is known primarily from Colorado but with small populations in Utah, Idaho, Washington, Wyoming, and western Nebraska. The two remaining species are *S. porrifolia* from California, Oregon, southern Washington, western Nevada, and western Idaho, and the circumboreal and widespread *S. romanzoffiana*. Only the latter two species have been recorded from northern California and southern Oregon, but the presence of another *Spiranthes* unlike the others has been noted in this area as well by previous researchers (Coleman, 1995; Sheviak, 1990). Coleman (1995) photo-documented and made note of a *Spiranthes*, particularly in Yosemite National Park, California, that was relatively common and that appeared intermediate between *S. romanzoffiana* and *S. porrifolia*. At the time, these plants were generally considered to be a local race of *S. romanzoffiana*, although when compared with typical *S. romanzoffiana* growing within the park several notable differences were observed. Coleman mentioned that perhaps they represented a

hybrid between the more common *S. romanzoffiana* and the locally much rarer *S. porrifolia* – or even a new species. With scattered individual plants this hybrid theory may be sound, but the mystery *Spiranthes* grows in great abundance in YNP. Interestingly, only in Yosemite does one of the proposed parents (*S. romanzoffiana*) grow with or near any of the plants in question, and then only at one site. A closer inspection of the distinctive aspects of these plants revealed that both morphological and molecular data support their recognition as a new species, described below.

Spiranthes stellata* P.M. Brown, L.A. Dueck & K.M. Cameron, *sp. nov.

Florae niveus, prope conduplicate oval labrum candela ut apex per pallens viridis vel crepito in lacus; apices petala et sepala quod singulus exilis acuminatus et patens

Flowers white, the nearly conduplicate oval lip tapered to the apex with pale green or cream in the trough; the apices of the petals and sepals slender, acuminate and spreading

Plants 15–45 cm tall; roots few, descending, tuberous, short and stout to 3.0 x 1.5 cm; rachis sparingly glandular; leaves 4-6 persisting through anthesis, basal or nearly so, ascending, petiolate, lanceolate to oblanceolate, to 16 × 2 cm; 3-4 slender sheathing stem bracts, floral bracts acuminate ± equaling perianth in length; spikes single ranked, usually loosely flowered, 5 flowers per cycle of spiral with flowers occupying ca. ($\frac{1}{3}$) $\frac{1}{4}$ of the upper portion of the stem; rachis glabrous with very few sessile glands. **Flowers** ascending, white to pale ivory, tubular for $\frac{1}{2}$ - $\frac{2}{3}$ the length; sepals and petals sparsely glandular, lateral petals and dorsal sepal connivent above a gently descending lip (ca. 45°); sepals and petals linear to oblanceolate, acute and spreading at the apex; 5–12 mm; the perianth resembling a star; lip oval, but nearly conduplicate and appearing long and slender, the trough often suffused with light green or pale yellow, 4.5–10.0 × 1.7–6.0 mm, the base only slightly expanded, apex tapering to a point, nearly glabrous or with a few scattered glands; ovary green, 5 mm, pedicle pale or often white. **Seeds** monoembryonic, chromosome number $n = 22$ (preliminary).

TYPE: U.S.A. California: Mariposa County, Yosemite National Park. East end of Monroe Meadow (Badger Pass Ski Resort), just south of Glacier Point Road. UTM Zone/Easting/Northing 11N/265304/4171434. Datum NAD27. Elevation 7300 feet. In fen at the margin of a large meadow. Among dense short-stature vegetation in part shade of *Pinus contorta* and *Abies magnifica* forest. Associated species include *Carex vesicaria*, *Eleocharis decumbens*, *Mimulus primuloides*, *Pedicularis attollens*, *Oxyopolis occidentalis*. 7/30/2007. *Alison Colwell* 07-279, *Paul Martin Brown*, *Stan Folsom*, *Brad Kelley*, *Robert Lauri*. (HOLOTYPE: UC; ISOTYPE: YM) Figures I-1-7.

PARATYPES:

CALIFORNIA: Butte Co. Jones Meadow, ca. 3 mi s of Philbrook Reservoir, ca. 6 mi ne of Stirling City. 6000 ft. 8/16/1981. *M. S. Taylor*, *L. Abart* 4204 (CHSC33959); Small bog in a large meadow, about 200 yards east of Keyser Creek, on the north side of the dirt County Road, about $\frac{3}{4}$ mile (air) northeast of Oak Point, about $\frac{1}{2}$ mile (air) west of Big Kimsheew Creek, about $1\frac{3}{4}$ miles southeast of Bald Mountain, 4766 ft. 8/02/2004 *Lowell Abart* 11325 (CHSC88186); On n side of Humboldt Rd., ca. 3.2 mi e of Butte Meadows 1414 m, 9/17/1983 *S.C. Morey* 751 (CHSC64056); common in wet grassy places, Chico Meadows. Elev. 4000 ft no date or collector (OSU 2952); Jonesville, in swamp 1550 m Jul. 28, 1929 *E. B. Copeland s.n.*, (UC600632, UC392228); Near the center of a large open meadow with bogs, about 70 yards east of the poor dirt road, about 100 yards south of the cabin, about $\frac{3}{4}$ mile (air) northwest of Jonesville, about 5 miles (air) northeast of Butte Meadows 5148 ft. Aug. 15, 2006 *Lowell Abart* 13183 (JEPS110395); **Calaveras Co.** Strawberry Valley Aug. 1903 *Mrs. A. F. Lange s.n.* (UC52253); **El Dorado Co.** nr. Luther Pass Grass Lake 7000 ft. Aug. 1, 1969 *Gladys L. Smith* 2408 (JEPS73055); El Dorado National Forest 5 miles west of Uncle Tom's Cabin growing in a bog 8 July 1956 *C.H. Lamoureux* 1169-12; *H.B. Currier* and *D. Dybing* (UCD 151131); **Fresno Co.** Region of Dinkey Creek, Sierra Nevada Mountains 6600 ft. Jun. 25, 1900-Jul. 15, 1900 *H. M. Hall* and *H. P. Chandler* 569 (UC64083); Huntington Lake 7100 ft. Jul. 28, 1928 *W. L. Jepson* 13038 (JEPS64499); meadow above Mono Crossing 5500 ft. Aug. 15, 1918 *Adele Lewis Grant* 1510

(JEPS64506); Half-way towards meadow w of road Shaver Lake Ranger Station, Shaver Lake 5600 ft. Aug. 11, 1931 *W. L. Jepson 16095* (JEPS64514); Sierra Nevada. Ship's Hot Springs. Aug 12, 1948 *L.C. Wheeler 6688* (RSA599316); Sierra Nevada. Blaney Hot Springs, South Fork San Joaquin River. Elev. 7500 ft. Aug. 9. 1949 *L.C. Wheeler 6742* (RSA 600689); **Madera Co.** RAC; **Mariposa Co.** Yosemite National Park. On east side of Tioga Pass Rd., 3.2 miles east of junction with Big Oak Flat Road at Crane Flat. *Sphagnum* meadow with *Platanthera yosemitensis*, *P. dilatata* var. *leucostachys*, and *P. sparsiflora*. 31 July 2007. *A.E.L. Colwell 07-282*, with P.M. Brown, S.N. Folsom & B. Kelley (UC, YM); Yosemite National Park. Summit Meadow, south side of Glacier Pt. Rd, south of Yosemite Valley. Fen meadow with *Platanthera yosemitensis*, *P. dilatata* var. *leucostachys*, and *P. sparsiflora*. 31 July 2007. *A.E.L. Colwell 07-280*, with P.M. Brown, S.N. Folsom & B. Kelley (UC, YM); Meadow Brook headwaters, 3.4 km n of Badger Pass Ski Area, Yosemite National Park, 8/20/2003 *A.E.L. Colwell s.n.* (two specimens on sheet. 1. *S. stellata* 2. *S. romanzoffiana*) (YM 6809), Peregoy Meadow. Yosemite National Park 8/15/1935 *H. Williams 4* (YM 1159), Yosemite National Park 08/8/1928 *Enid Michael s.n.* (YM 1157), Yosemite National Park, South Tiltill Valley 7/31/1938 *George Hale s.n.* (YM 1158); **Nevada Co.:** near Emigrant Gap Bear Valley Jul. 21, 1898 *W. L. Jepson 21284* (JEPS64503); On the southeast margin of a small lake, near Round Valley, about 1 mile northwest of Graniteville Road (Forest Road 18), about ¾ mile (air) west of Jackson Meadow Reservoir Dam Elev. 6500 ft. 08 14 2001 *Lowell Abart 9164* (CHSC81075); **Placer Co.** Cascade Lake, Tahoe Region Aug. 8, 1890 *Chesnut and Drew s.n.* (UC72215); **Plumas Co.** near Quincy Butterfly Valley 4000 ft. Jul. 21, 1950 *Robert J. Weatherby 1480* (UC1075680); wet *Carex* meadow in the Butterfly Valley Botanical Area nw. of Quincy, Plumas Nat. Forest. Fls. White. 9 August 1990 *D.W. McNeal 3769* (OSU 183630); Butterfly Valley; bog and marsh Aug. 19, 1949 *Malcolm A. Nobs and S. Galen Smith 1445* (UC1192307); On sunny wet soil in marshy meadow, Butterfly Valley, near Quincy. 1219 m, Jul. 21, 1950. *Robert J. Weatherby 1480* (SD46500); 300 feet east of Ohio Ravine, about 2¼ miles south of Grizzly Mountain 5400 ft, 08/16/1979 *Lowell Abart 2013* (CHSC46545); Northern Sierra Nevada between Butte Meadows and Hwy 89 along Humbug Valley Road at the Yellow Creek crossing. 4000 ft., 8/7/2004, *R.D. Fischer, Jenny Marr 853* (CHSC95151); **Tulare Co.** 7/25/06 *S. DeGroot s.n.*, DNA sample (NY); Giant Forest Aug. 4, 1919 *L.M. Newlon 60* (JEPS64504, JEPS64505); Huckleberry Meadow Kaweah River Basin Aug. 14, 1905 *Ralph Hopping 321* (UC429191); Hockett Meadows Southern Sierra Nevada Mountains 8500 ft. Aug. 5, 1904 *H. M. Hall and H. D. Babcock 5626* (UC64460); Little Kern R. 8000-9000 ft April 1897-September, 1897 *C.A. Purpus 5266* (UC143402); **Tuolumne Co.** Hetch Hetchy Sierra Nevada, Yosemite National Park, Swamp Lake 5200 ft. Jul. 7, 1938 *Herbert L. Mason 11877* (UC1093908); Hetch Hetchy Sierra Nevada, Yosemite National Park, Swamp Lake 5200 ft. Jul. 22, 1937 *Herbert L. Mason and L. W. Reinecke 11626* (UC1076534); Poopenaut Valley Sierra Nevada, Yosemite National Park, vicinity of Hetch Hetchy Jul. 21, 1923 *Herbert L. Mason 639* (UC673572); Highway 120 ca. 1 mile E of White Wolf road McSwain Meadows; Yosemite National Park 8200 ft. Sep. 19, 1997 *Dean Wm. Taylor 16243* (JEPS96583); meadow NW of Ackerson Meadow, west of Evergreen Road 4600 ft. Aug. 3, 1998 *Dean Wm. Taylor 16960* (JEPS96584); Mather Spring Sierra Nevada Mountains, Yosemite National Park, Hog Ranch Jul. 25, 1923 *H. L. Mason 649* (UC673574); 1 mi E of Siesta Lake on Tioga Rd, Yosemite National Park, Aug 22 1964. *C.W. Sharsmith 7359* (SJSU4012). **OREGON: Douglas Co.** 8/12/06 *H. Stubbs s.n.* DNA sample (NY); **Klamath Co.:** Pole Bridge Creek, Canadian Zone, Crater Lake Park. *Spiranthes sp.* nov.? lip lingulate, not constricted as wide at tip as elsewhere; nipples none; spike apparently one-sided, and 1-spiral. 12 August 1929 *F. Lyle Wynd 1651* (ORE23894); Pole Bridge Meadow, Crater Lake Park. 15 August 1930. *H.A. Scullen s.n.* (OSC29443); About 1 mile east of Crescent Lake, wet ground. 6 August 1939. *Orlin L. Ireland 1352* (ORE38773); *Sphagnum* Bog; NW corner of Crater Lake Nat. Park, .5 mi. E of western Park boundary; lower part of east side of Bog in a wet, very boggy area carpeted by *Sphagnum*. Associated Species: *Sphagnum*, *Carex limosa*, *Eleocharis pauciflora*, *Drosera anglica* Elev.1600 m 16 August 1977 *Susan C. Seyer 86*. (OSC153058, CRLA); **Lane Co.** Happy Lakes, 9/7/06 *T. Harvey s.n.* DNA sample (NY).

Note: County vouchers cited in Coleman (1995) (RAC) of *Spiranthes porrifolia* and *S. romanzoffiana* from the California Academy of Arts and Sciences in San Francisco could not be accessed at this time due to the relocation of the herbarium. It is most likely the collection does contain specimens of *S. stellata*; if so, a list of those specimens will appear in the *NANOJ* 14(2), scheduled for April 2008.



Figure I-1
Spiranthes stellata P.M. Brown, L.A. Dueck & K.M. Cameron

ETYMOLOGY: The specific epithet, *stellata*, was chosen for the star-like appearance of the flowers.

KEY TO THE *SPIRANTHES* OF NORTHWESTERN NORTH AMERICA
(Calif., Ore., Wash., Alaska; B.C.)

- 1a lip distinctly panduriform; petals and sepals appressed and united to form a hood; lip abruptly descending; flowers white to pale cream...*S. romanzoffiana*
- 1b lip not (strongly) panduriform; petals and sepals free at the tips and partially spreading ...2
- 2a flowers tubular for most of their length with the apices of the petals and sepals spreading; cream to pale yellow...*S. porrifolia*
- 2b flowers tubular not more than half of their length; white to pale cream ...3
- 3a sepals and petals spreading and creating a star-like appearance, lip conduplicate...*S. stellata*
- 3b sepals markedly incurved, lip not conduplicate...*S. diluvialis* (central Washington)

Sheviak (1990, 2002) mentions a possible new taxon among the *Spiranthes* of northern California and southern Oregon and even provides a key to the plants (1990); *Spiranthes stellata* will also key out here.



Map 1.
Distribution of *Spiranthes stellata* in Oregon and California

Traits specific to *Spiranthes stellata*

Single-ranked, loose to moderately spaced flowers – both *S. porrifolia* and *S. romanzoffiana* (usually) are multiple ranked and densely-flowered

Folded lip - both *S. porrifolia* and *S. romanzoffiana* have a moderately channeled lip but neither are folded (conduplicate)

Descending tuberous roots - both *S. porrifolia* and *S. romanzoffiana* have multiple thickened tuberous roots that are generally horizontal in orientation

Non-stoloniferous - both *S. porrifolia* and *S. romanzoffiana* produce stolons and eventually new growth at the tips



Figure I-2,3 *Spiranthes stellata* P.M. Brown, L.A. Dueck & K.M. Cameron
Yosemite National Park July 30, 2007



Spiranthes stellata P.M. Brown, L.A. Dueck & K.M. Cameron
Yosemite National Park
Figure I-4 three different floral arrangements
Figure I-5 winter buds (November)
Figure I-6 leaves and root system

DISCUSSION

Although *Spiranthes stellata* may possess some of the characters of *S. romanzoffiana* and *S. porrifolia*, such as similar color and general flower form, it has many morphological features that are unique and which clearly separate it well from either of those taxa. Perhaps the most notable feature is seen at first observation when the spikes of white, star-shaped flowers dot the meadows. The slender, pointed, wide-spreading sepals and lip on the loosely spaced inflorescences give the flowers a star-like appearance. It is interesting to mention that unbeknownst to each other, both Brown and Dueck made this observation and immediately selected *stellata* as a species epithet should the new species eventually be published.

Plants of *Spiranthes stellata* have thick tuberous roots that descend rather than spread horizontally and the bud for the next season is immediately adjacent to the current season's growth. Alison Colwell (pers. comm.) noted that, after most plants in the meadows had senesced for the season (early October) and there was no evidence of other orchids, plants of *S. stellata* were easily seen by their sturdy brown fruiting stalks and the tiny green bud for the next year's growth (Figure I-5). It is also important to note that in most *Spiranthes* species, which are typically single-ranked and loosely-flowered, inflorescences do occur with crowded flowers that appear to be multiple-ranked. This characteristic, as well as direction of the spiral, is variable from year to year on individual plants.

Relationships of *Spiranthes stellata*

Coleman (1995) suggested that the then-unknown plants described here as *Spiranthes stellata* could be hybrids, as they had characters of both other *Spiranthes* species in the region. When *Spiranthes* hybrids are found they usually, as do most hybrids, occur with both parents nearby in a mixed population. The distribution of *S. romanzoffiana* extends well away in all directions from the Sierra Nevada-Cascade ranges, whereas *S. porrifolia* is more limited, being found primarily in California with a few sites in Oregon, southern Washington and northwestern Nevada, but their ranges do overlap. However, except in one site in Yosemite National Park, neither of the other two species is present with *S. stellata* at the sites studied. Plants of *S. stellata* appear to prefer a typical bog or fen setting, such as that of a wet *Sphagnum* meadow or fen abundant in forbs and several other orchid species, including in some sites the recently described and locally endemic *Platanthera yosemitensis* (Colwell et al., 2007). Although it would not be unreasonable for the other two species to co-occur in the same habitat, *S. porrifolia* is much more frequent in a seep/streamside environment in the interior and wet bluffs along the West Coast, while *S. romanzoffiana*, on the other hand, grows in a wide variety of damp to wet areas from open gravels to mossy turfs and roadside ditches. *Spiranthes stellata* is far more widespread and common in the meadows of the Sierra Nevada than any other orchid in that region and often forms dense, almost turf-like colonies (Figure I-8).

Several interesting facts were noted in examining herbarium specimens from seventeen herbaria. The earliest collection was in 1890 (Chestnut and Drew) in Plumas Co. Calif. near Lake Tahoe. R. Lauri photographed plants of *Spiranthes stellata* in a similar area in 2007. *Spiranthes stellata* has been vouchered for 11 counties in California and 3 counties in Oregon. The most interesting specimen annotation is from Crater Lake National Park in 1929: "*Spiranthes* sp. nov.? lip ligulate, not constricted as wide at tip as elsewhere; nipples none; spike apparently one-sided, and 1-spiral. 12 August 1929 F. Lyle Wynd 1651". Most specimens identified as *S. stellata* were originally labeled as *S. romanzoffiana* or possible hybrids, but rarely as *S. porrifolia*. This is not surprising as *S. romanzoffiana* is highly variable morphologically throughout its range across North America and distinctive local populations have often been noted, as well as plants with three different ploidy levels – $2n$

= 44, 66, 88 (Sheviak & Brown, 2002). But in all cases of these ‘races’ the plants are easily identifiable to *S. romanzoffiana* by their prominently hooded flowers and pandurate lips and none have the distinctive morphology of *S. stellata*. In at least five instances herbarium specimens originally identified by others as hybrids between *S. romanzoffiana* and *S. porrifolia* have proven to be *S. stellata*. Hybridization and gene flow among these species may still represent a real aspect of the biology of *S. stellata*, but future biosystematic studies will be necessary to reveal any possible complexities in its breeding system. Such studies are already underway. S. Servick of the University of Florida is currently working to determine the karyotype of *S. stellata*. His preliminary findings (pers. comm.) indicate that the species is a diploid with a base chromosome number of 22, not unlike its closest relatives. This does not eliminate the possibility of hybridization or allopolyploidy among the three sympatric species, with formation determined by factors such as number of plants in a colony, proximity of alleged parents, geographic location, pollinators, and phenology. A sheet consisting of three plants collected in 1882 by L.F. Henderson near Falcon Prairie, Oregon (no county given) was annotated by C.J. Sheviak as *S. romanzoffiana*, *S. porrifolia*, and the third as a possible hybrid. The ‘hybrid’ bears no resemblance to *S. stellata*.



a. *Spiranthes porrifolia*

Figure I-7
b. *S. stellata*

c. *S. romanzoffiana*

II.
MOLECULAR EVIDENCE FOR NEW SPECIES –
SPIRANTHES STELLATA

Lucy A. Dueck & Kenneth M. Cameron

INTRODUCTION

Some summer-blooming *Spiranthes* Richard found in western subalpine wetlands have confused local botanists with regards to their taxonomic status. Coleman (1995) and Sheviak and Brown (2002) suggested that such specimens may be polyploid, and/or hybrids between *S. porrifolia* Lindley and *S. romanzoffiana* Chamisso, but no attempts were made to further describe them. While undertaking a comprehensive project on the molecular phylogeny of *Spiranthes*, we (L.D. and K.C.) received similar specimens (determined by photo comparison with Coleman 1995) from the Cascade and Sierra Nevada mountains that did not match the genetic profile of either purported hybrid parent. We therefore conducted a separate analysis of western *Spiranthes* to support the establishment of these specimens as representatives of a new species, *S. stellata*.

METHODS

Six samples of the unknown taxon were made available to our project by three individual collectors, each sampling from a different site in either Oregon or California in 2006 (Figure II-1). Thirty-six other samples of four additional *Spiranthes* species found in far western U.S. states were also included, as well as an outgroup, *Sacoila lanceolata* var. *lanceolata* (Aublet) Garay (Table 1). The additional local congeners included the purported parents, *S. porrifolia* and *S. romanzoffiana*, plus state-threatened *S. infernalis* Sheviak from Nevada and federally-endangered *S. delitescens* Sheviak from Arizona. Note that one purported parent, *S. romanzoffiana*, has a trans-continental distribution, so samples from across North America and Europe were also included in our analysis.

DNA was extracted from dried samples using the DNeasy[®] kit from Qiagen, and target loci were PCR-amplified then sequenced according to standard protocols outlined in Dueck et al. (2005) and Dueck and Cameron (2007). For this analysis, we used sequences from two maternally-inherited plastid regions – the non-coding *trnS-fM* spacer (Demesure et al. 1995, Szalanski et al. 2001) and the protein-coding *matK* gene (Whitten et al. 2000; Cameron 2005). We also sequenced the biparentally-inherited internal transcribed spacer region (including ITS1, 5.8S, and ITS2) of the nuclear genome (Baldwin, 1992; Szalanski et al. 2001).

Resulting electropherograms were contiged and edited using Sequencher 4.1.4 (Gene Codes), and the matrices of individual and combined gene sequences were aligned manually. These data sets were then analyzed using the parsimony criterion in PAUP* vers. 4.0b10 (Swofford, 2002), and support values for relationships were calculated by performing jackknife analyses of 5000 replicates. Since the separate loci trees were concordant, data were also combined and analyzed together. Matrix and tree statistics are compared in Table 2.

Resulting trees are displayed conservatively as strict consensus cladograms with jackknife support values >50% provided. A neighbor-joining tree based on uncorrected (“p”) distances was also calculated for the two-gene plastid analysis in order to highlight variation in branch lengths and to emphasize that the unknown samples are unique in their plastid genotypes.



Figure II-1. Photographs of new species *Spiranthes stellata* taken by sample collectors for molecular phylogeny project: a. #31a, Hope Stubbs, Douglas Co., OR; b. #31bcde, Tanya Harvey, Lane Co., OR; and c. #31f, Sarah DeGroot, Tulare Co., CA.

Table 1. *Spiranthes* samples used in *S. stellata* analysis

<u>Species</u>	<u>Species name -</u>				
<u>ID #</u>	<u>sample ID #</u>	<u>Collector*</u>	<u>Collection Site</u>	<u>Coll. Date</u>	<u>Archive</u>
5	<i>S. delitescens</i> - a	A.H.	Santa Cruz Co., AZ	5/2005	<i>in hort.</i>
	<i>S. delitescens</i> - b	A.H.	Santa Cruz Co., AZ	5/2005	<i>in hort</i>
	<i>S. delitescens</i> - c	A.H.	Santa Cruz Co., AZ	5/2005	<i>in hort</i>
9	<i>S. infernalis</i> - a	C.S./J.F.	Nye Co., NV	6/19/04	V, P
	<i>S. infernalis</i> - b	C.S./J.F.	Nye Co., NV	6/19/04	V, P
	<i>S. infernalis</i> - c	C.S./J.F.	Nye Co., NV	6/19/04	V, P
21	<i>S. porrifolia</i> - h	L.D.	Sierra Co.-A, CA	6/15/06	V, P
	<i>S. porrifolia</i> - j	L.D.	Sierra Co.-A, CA	6/15/06	V, P
	<i>S. porrifolia</i> - L	L.D.	Sierra Co.-B, CA	6/15/06	P
	<i>S. porrifolia</i> - Lb	L.D.	Sierra Co.-B, CA	6/15/06	P
	<i>S. porrifolia</i> - m	L.D.	Sierra Co.-B, CA	6/15/06	P
	<i>S. porrifolia</i> - mb	L.D.	Sierra Co.-B, CA	6/15/06	P
	<i>S. porrifolia</i> - n	M.P.	Curry Co., OR	6/14/06	P
	<i>S. porrifolia</i> - o	M.P.	Sierra Co. A/B, CA	6/18/06	P
	<i>S. porrifolia</i> - p	B.K.	Marin Co., CA	6/11/06	P

	<i>S. porrifolia</i> - s	L.D.	Sierra Co.-A, CA	6/15/06	P
	<i>S. porrifolia</i> - u	N.C.	San Diego Co., CA	7/12/06	SD, P
	<i>S. porrifolia</i> - v	N.C.	San Diego Co., CA	7/12/06	SD, P
	<i>S. porrifolia</i> - w	N.C.	San Diego Co., CA	7/12/06	SD, P
24	<i>S. romanoffiana</i> - a1 (SR3)	R.B. (DNA)	WY	≤2001	
	<i>S. romanoffiana</i> - a2 (SR7)	R.B. (DNA)	WY	≤2001	
	<i>S. romanoffiana</i> - b	F.C.	Presque Isle Co., MI	8/16/04	
	<i>S. romanoffiana</i> - e	ID	Bunchgrass Co., WA	7/26/87	ID, P
	<i>S. romanoffiana</i> - f	ID	Deschutes Co., OR	7/6/92	ID, P
	<i>S. romanoffiana</i> - j	ID	Ravalli Co., Mont.	8/4/88	ID, P
	<i>S. romanoffiana</i> - m	C.U.	Whiteboro, NY	8/26/05	
	<i>S. romanoffiana</i> - n	B.K.	Monterey Co., CA	6/30/06	P
	<i>S. romanoffiana</i> - o	K.K.	Marinette Co., WI	7/24/06	P
	<i>S. romanoffiana</i> - pq	B.K.	Marin Co., CA	7/30/06	P
	<i>S. romanoffiana</i> - r (Sr85)	A.F. (DNA)	Scotland (southern)	unknown	
	<i>S. romanoffiana</i> - s (Sr154)	A.F. (DNA)	Scotland (northern)	unknown	
	<i>S. romanoffiana</i> - t	T.H.	Lane Co., OR	9/4/06	P
	<i>S. romanoffiana</i> - u	T.H.	Lane Co., OR	9/4/06	
	<i>S. romanoffiana</i> - v	T.H.	Lane Co., OR	9/4/06	V
	<i>S. romanoffiana</i> - w	R.L.	Unalaska Is., AK	7/24/06	
30	<i>Sacoila lanceolata</i> var. <i>lanc.</i>	S.S.	Levy Co., FL	6/1/04	
31	sp.nov. (<i>S. stellata</i>) - a	H.S.	Douglas Co., OR	8/12/06	P
	sp.nov. (<i>S. stellata</i>) - b	T.H.	Lane Co., OR	9/7/06	P
	sp.nov. (<i>S. stellata</i>) - c	T.H.	Lane Co., OR	9/7/06	P
	sp.nov. (<i>S. stellata</i>) - d	T.H.	Lane Co., OR	9/7/06	P
	sp.nov. (<i>S. stellata</i>) - e	T.H.	Lane Co., OR	9/7/06	P
	sp.nov. (<i>S. stellata</i>) - f	S.DG.	Tulare Co., CA	7/25/06	P

V = voucher on file at CLEMS, **P** = photo on file at CLEMS

SD = San Diego Natural History Museum Herbarium

ID = University of Idaho Herbarium

*see Acknowledgements

Table 2. Variability and informativeness of sequence segments

	<u>ITS</u>	<u>trnS+matK</u>	<u>combined</u>
# characters	671	2223	2894
# variable positions	81 (12%)	90 (4%)	171 (6%)
# informative positions	26 (4%)	33 (1.5%)	59 (2%)
# of resultant trees	2	15	180
tree length in # of steps	88	97	186
Consistency Index (CI)	0.9773	0.9485	0.9570
Retention Index (RI)	0.9937	0.9887	0.9895

RESULTS

Individual nuclear (Figure II-2) and plastid genome (Figures II-3 and II-4) trees, as well as the combined loci tree (Figure II-5), show strong support for the monophyly of a clade containing all six samples of the unknown taxon, which we here recognize as a distinct species, *Spiranthes stellata*. This clade itself is strongly supported as sister to an unresolved clade containing samples of both *S. romanzoffiana* and *S. delitescens*. This larger dual clade is, in turn, sister to the other large clade containing *S. porrifolia* and *S. infernalis*, which are unresolved. It is worth noting that the California individual of *S. stellata* differs slightly in its nuclear ITS profile from the Oregon samples, but all six samples of *S. stellata* share the same unique plastid genotype, which is different from *S. romanzoffiana* or any other species of *Spiranthes* sampled to date in the comprehensive phylogeny of the genus (unpubl. data). In addition, an autapomorphy (A at position 630 while all other *Spiranthes* have C) was discovered in the *matK* sequences for all six samples of *S. stellata*. This unique genetic identifier may aid future researchers who wish to develop identification tools via DNA barcoding technology.

DISCUSSION

Using both nuclear and plastid loci sequence data, we have failed to discover any genetic evidence supporting the hypothesis that *Spiranthes stellata* is a hybrid between *S. romanzoffiana* and *S. porrifolia*, or any other extant species of *Spiranthes* for that matter. If it were a hybrid, then we would expect these individuals to share the plastid genome of their maternal parent (presumably *S. romanzoffiana*). Based on our widespread sampling of *S. romanzoffiana*, including individuals regionally sympatric with *S. stellata*, they do not. Instead, we find that plants sharing a similar unique phenotype also share the same unique genotype, even when sampled from disjunct populations in California and Oregon. Moreover, the level of genetic variation detected between *S. stellata* and its closest relatives is greater than that detected between *S. romanzoffiana* and *S. delitescens*, or between *S. porrifolia* and *S. infernalis*. Genetic evidence alone should be used with caution for the purpose of recognizing new species (see Pillon & Chase, 2007 for a discussion on the irresponsibility of taxonomic exaggeration among orchids), but coupled with the additional evidence reported here, we feel that there is strong support for the recognition of this new species, *S. stellata*.

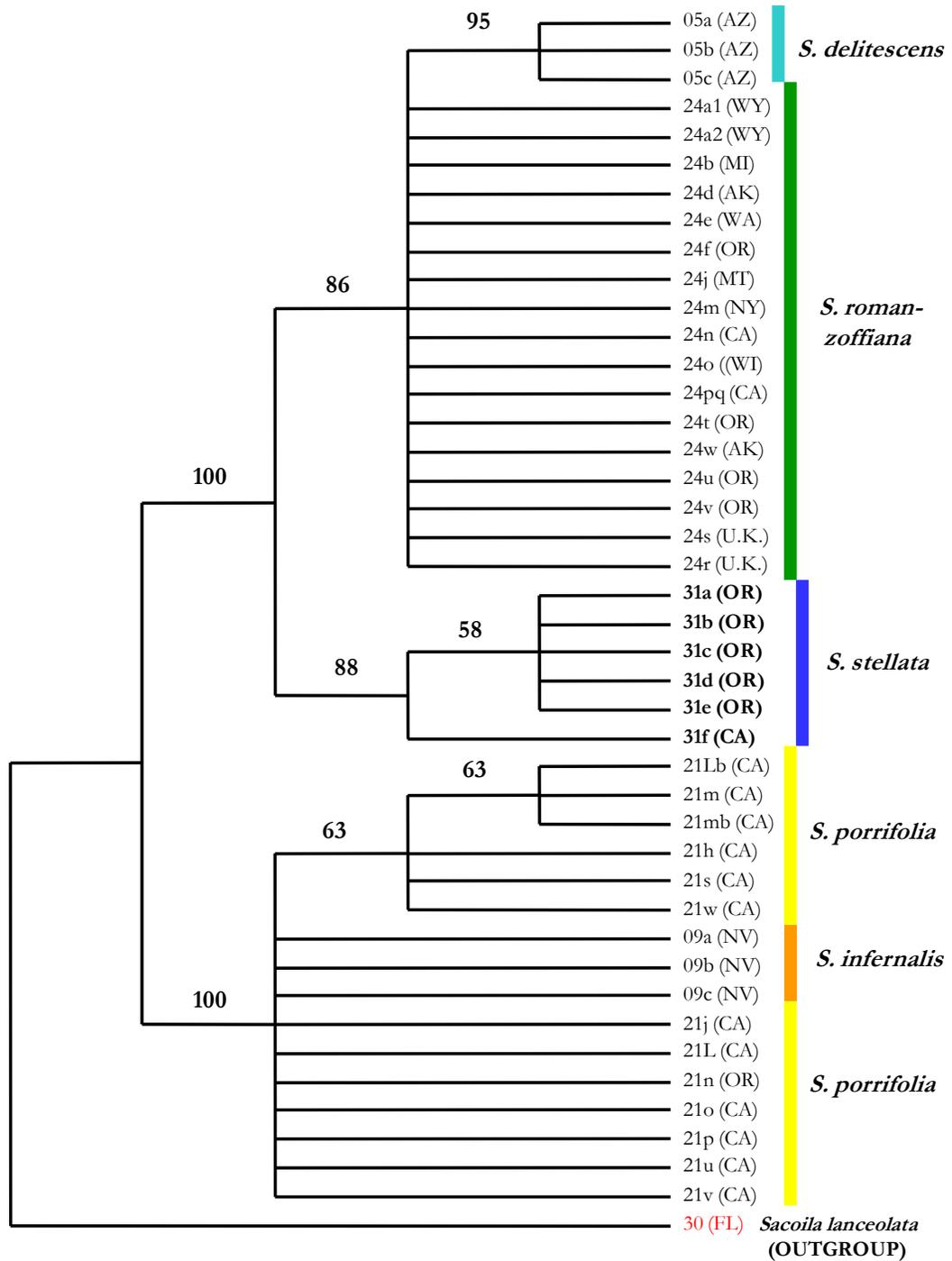


Figure II-2. Strict consensus cladogram for western U.S. *Spiranthes* species based on nuclear ITS sequences using maximum parsimony - 2 trees found; jackknife support values (%) superimposed on branches.

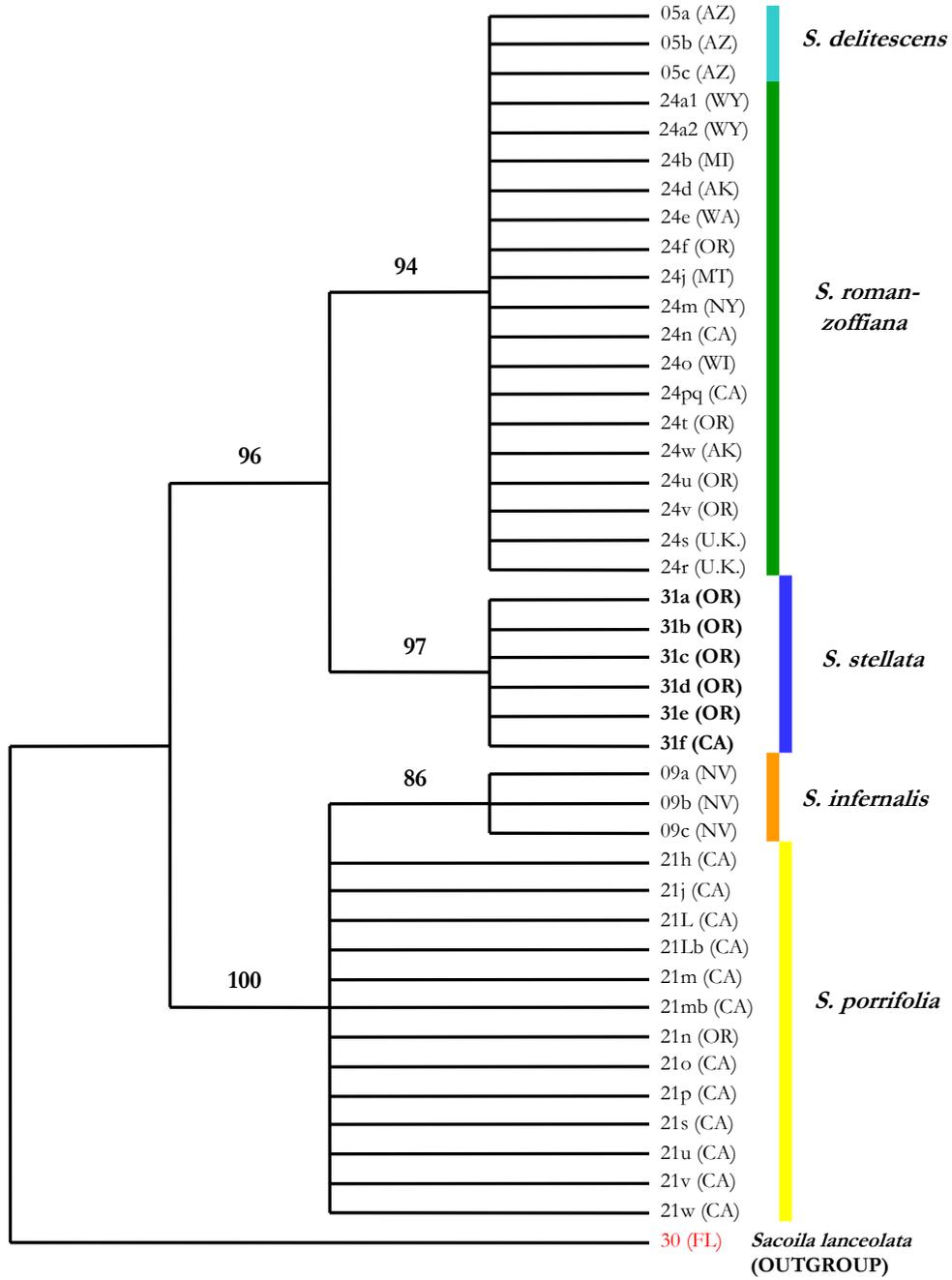


Figure II-3. Strict consensus cladogram for western U.S. *Spiranthes* species based on combined plastid gene sequences (*trnS-fM* and *matK*) using maximum parsimony - 15 trees found; jackknife support values (%) superimposed on branches.

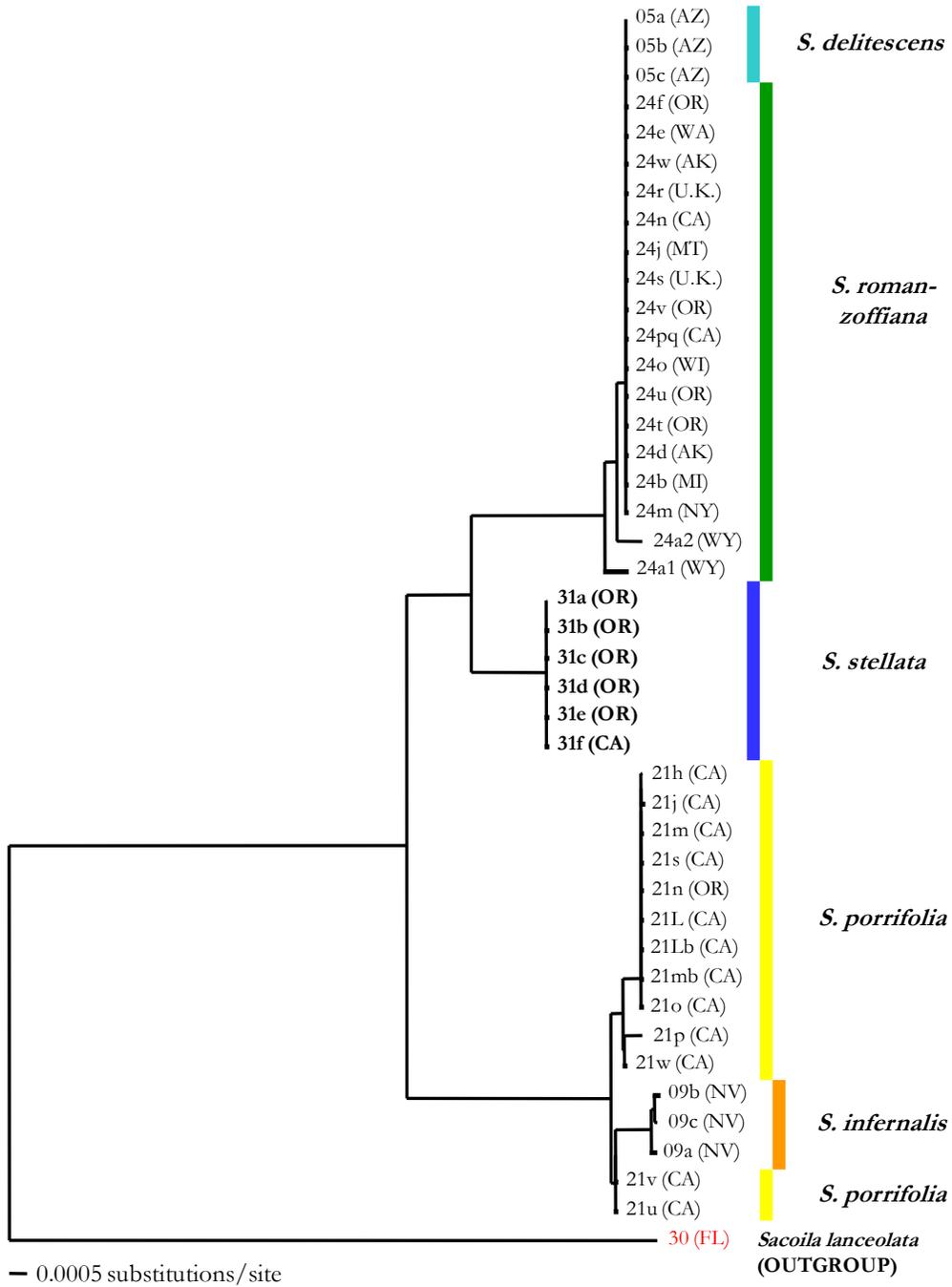


Figure II-4. Neighbor-joining phylogram for western U.S. *Spiranthes* species based on combined plastid gene sequences (*trnS-fM* and *matK*); branch lengths represent relative genetic distances.

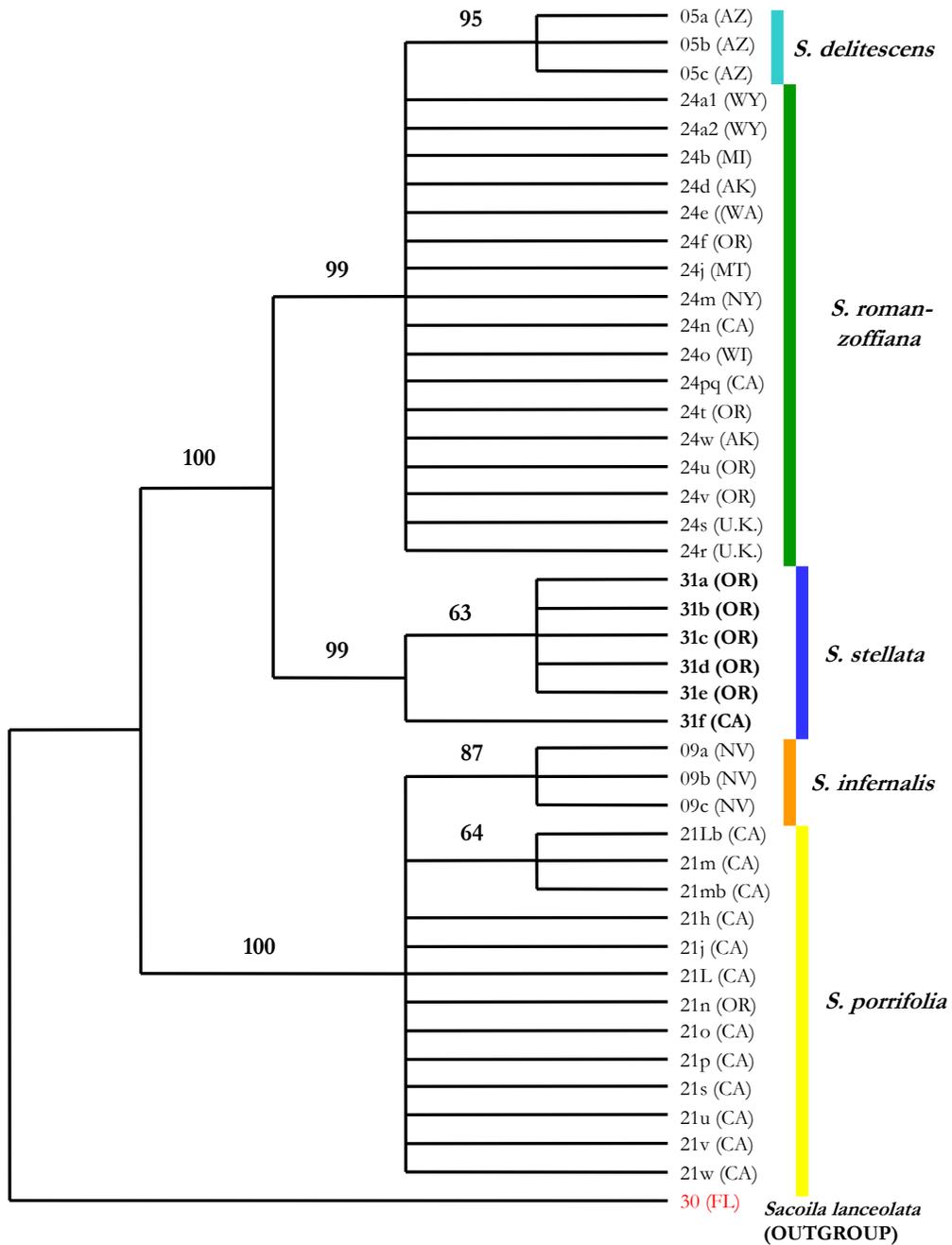


Figure II-5. Strict consensus cladogram for western U.S. *Spiranthes* species based on combined three loci sequences (nuclear ITS, plastid *trnS-fM* + plastid *matK*) using maximum parsimony - 180 equally parsimonious trees found; jackknife support values (%) super-imposed on branches.

REFERENCES

- Baldwin, B.G. 1992. Phylogenetic utility of the internal transcribed spacers of nuclear ribosomal DNA in plants: an example from the Compositae. *Molecular Phylogenetics and Evolution* 1:3–16.
- Cameron, K.M. 2005. Leave it to the leaves: a molecular phylogenetic study of Malaxideae (Epidendroideae, Orchidaceae). *American Journal of Botany* 92:1025-1032.
- Coleman, R.A. 1995. *The Wild Orchids of California*. Comstock Publishing Associates (Cornell University Press), Ithaca, N.Y. & London.
- Colwell, A., C.J. Sheviak, and P.E. Moore. 2007. A new *Platanthera* (Orchidaceae) from Yosemite National Park, California. *Madrono* 54(1): 86-93.
- Demesure, B., N. Sodzi, and R.J. Petit. 1995. A set of universal primers for amplification of polymorphic non-coding regions of mitochondrial and chloroplast DNA in plants. *Molecular Ecology* 4:129–131.
- Dueck, L.A., J.A. Fowler, C.S. Hagen, and T.C. Glenn. 2005. Genetic discrimination of *Spiranthes cernua* species complex in South Carolina. *Selbyana* 26 (1,2): 145-54.
- Dueck, L.A. and K.M. Cameron. 2007. Sequencing re-defines *Spiranthes* relationships, with implications for rare and endangered taxa. *Lankesteriana* 7(1-2): 190-95.
- Pillon, Y. and M.W. Chase. 2007. Taxonomic exaggeration and its effects on orchid conservation. *Conservation Biology* 21(1): 263-65.
- Sheviak, C.J. 1984. *Spiranthes diluvialis* (Orchidaceae) a new species from the western United States. *Brittonia* 36: 8-14.
- 1989. A new species of *Spiranthes* (Orchidaceae) from Ash Meadows, Nevada. *Rhodora* 91: 225-34.
- 1990. A new *Spiranthes* (Orchidaceae) from the Cienegas of southernmost Arizona. *Rhodora* 92: 213-31.
- Sheviak, C.J. and P.M. Brown. 2002. Orchidaceae, Vol. 26, *Spiranthes*, in *Flora of North America north of Mexico*. Published on the Internet at: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=131021.
- Swofford, D.L. 2002. *PAUP* 4.0b10: Phylogenetic Analysis Using Parsimony (* and other methods)*. Sinauer Associates Sunderland, Mass.
- Szalanski, A.L., G. Steinauer, R. Bischof, and J.Peterson. 2001. Origin and conservation genetics of the threatened Ute ladies'-tresses, *Spiranthes diluvialis* (Orchidaceae). *American Journal of Botany* 88: 177-80.
- Whitten, W.M., N.H. Williams, and M.W. Chase. 2000. Subtribal and generic relationships of Maxillarieae (Orchidaceae) with emphasis on Stanhopeinae: combined molecular evidence. *American Journal of Botany* 87: 1842-56.

Acknowledgements

Part I.

The author wishes to acknowledge Ron Coleman for bringing attention to these plants, Alison Colwell (YNP) for facilitating field work and collections, Stan Folsom for field assistance and his drawing, Chuck Sheviak, Brad Kelley, Bob Lauri, for additional assistance, Stein Servick and Doug Soltis for preliminary cytological work, Kent Perkins (FLAS) for facilitating the loans of specimens, and the curators and/or managers of the following herbaria for the loan of specimens and/or digital images: CA, CHSC, CRLA, JEPS, NY, ORE, OSU, RSA, RENO, SD, SJSU, UC, UCD, UCR, UNLV, WILLU, YM.

All photographs in Part I by P.M. Brown.

Part II

The authors wish to thank Travis Glenn for design of one primer and use of his lab, and Cris Hagen for running some of the sequences. We also thank the U.S. Fish & Wildlife Service for permit #TE100419-0 to transport cultivated samples of an endangered species. We are especially grateful to the herbaria personnel that offered specimens for analysis and to the collectors: Aaron Hicks, Carol Siegel/Jody Fraser, Mike Parsons, Brad Kelley, Nick Crawford, Richard Bischof (NGPC), Fred Case, Jason Grant, Charles Ufford, Kip Knudson, Alan Forrest, Tanya Harvey, Scott Stewart, Hope Stubbs, and Sarah DeGroot.

The authors also wish to thank Stan Folsom, Scott Stewart, Helen Jeude, Bob Ferry, and Alison Colwell for helpful comments and suggestions.

Materials for Part II of this project were funded by a research grant from the American Orchid Society for 2004-2005; time (partially) and facilities were supported by the Department of Energy under Award Number DE-FC09-07SR22506 to the University of Georgia Research Foundation. *Disclaimer:* This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process

disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Paul Martin Brown, Florida Museum of Natural History, University of Florida Herbarium, Gainesville, FL 32611; 10896 SW 90th Terrace, Ocala, FL 34481 email: naorchid@aol.com

Lucy A. Dueck, Savannah River Ecology Lab, Aiken, SC 29802, Current address: P.O. Box 1413, Athens, TX 75751 email: lucydueck@msn.com

Kenneth M. Cameron, The New York Botanical Garden, Bronx, NY 10458 email: kcameron@nybg.org. Current address: Wisconsin State Herbarium, Department of Botany, University of Wisconsin, Madison, WI 53706



Figure I-8. *Spiranthes stellata* in a typical meadow/fen habitat, Yosemite National Park, California, August 1, 2007

A FAMILY ORCHID VACATION TO NEWFOUNDLAND JULY 8-19, 2007

Tom Nelson

-Prologue-



One cold day in early January of 2007 I was spending time in one of my favorite winter haunts - the library of the New York Botanical Garden. Pursuing various details related to my interest/obsession with native orchids, I was perusing back issues of *NANOJ* (a discovery I had made just that day) and as luck would have it, one of the articles I ran across was by Paul Martin Brown entitled *39 Species in Two Weeks in Newfoundland*. I became very excited, for it was the first time I had seen directions to specific orchid sites and I had been hoping for years to see many of the species mentioned, complete with a day by day itinerary and even motel and restaurant recommendations! When my wife Jackie saw the article, we immediately decided that we, along with our daughters Johanna - age eight, and Christina - age four, would be going to Newfoundland in the summer (1)!

After a few days I realized that I needed more information regarding blooming times in Newfoundland so I e-mailed Paul, who responded generously with more details and eventually a box in the mail filled with maps, travel brochures, scientific articles, and all sorts of fun things - this was getting better and better! It was a long time until summer, but I used the six months wisely, doing infinite research on Newfoundland and making early motel and ferry reservations. I soon got a copy of Paul and Stan's new book *Wild Orchids of the Canadian Maritimes and Northern Great Lakes Region* which contains reams of valuable information and great photos, adding fuel to the fire. *Orchids On The Rock - The Wild Orchids of Newfoundland* by Andrus & Maria Voitk came out in March, and its dazzling photos of Newfoundland's orchids made it almost impossible to wait for July.

The big day finally arrived, and we left on July 3rd, driving from our apartment in northern Manhattan, where there are even orchids - robust specimens of *Epipactis helleborine* can be found in neighboring Inwood Hill Park, the last uncut forest in Manhattan to Portland Maine. Our second night was spent in Moncton, New Brunswick and then it was

on to Cape Breton Island, Nova Scotia for two nights/three days to drive the famed Cabot Trail. By this time the rain had come in and there was zero visibility, but the pictures of the area in the Visitor's Center looked great! It was still incredibly beautiful, and we found our first orchids: dragon's mouth, *Arethusa bulbosa*, tall white northern bog orchis, *Platanthera dilatata*, and a strange looking saprophytic apparition that I later determined was a late-blooming spotted coralroot, *Corallorhiza maculata* var. *maculata* in the budding stage, thanks to pictures in Carl Munden's book *Native Orchids of Nova Scotia*. On July 7th we finally reached North Sydney, Nova Scotia to board the 4 PM ferry to Newfoundland. It didn't actually leave until 6:30, but the anticipation of finally setting foot on "The Rock" was so great that it really didn't matter!

July 8th

The ferry finally arrived in Newfoundland after 1 AM and even though we were tired, we couldn't help but be amazed by the brilliance of the northern constellations that accompanied us on the short drive to the Hotel Port Aux Basques. There are very few lights in this part of Newfoundland, and we truly felt as if we had arrived in another world. I dragged myself out of bed at 7 AM, opened the curtains and was greeted by brilliant sunshine and clear blue skies. After three days of rain, the sight of the Long Range Mountains, complete with snowfields, in the distance was a welcome one indeed!

After a stop at the emergency room, as Christina had a mosquito bite on her eyelid and it was swollen shut, we drove a mile or so west of Port Aux Basques to a wonderful site for *Arethusa bulbosa*, the dragon's-mouth, located beside the old narrow-gauge railroad track bed that now serves as a bike path. Overwhelming numbers! Thousands of *Arethusa* filled the bog before us. The majority of them were the typical color form, but many were a darker, deeper magenta, some beautiful pure white specimens, some pink (pale) forms, and a few forma *subcaerulea*, which is lilac-blue. Johanna, my field botanist in training, sat down amidst the profusion of dragon's-mouths and described in her notebook the stunning floral display spread out before her; Christina and Jackie busied themselves picking delicious wild strawberries while I photographed.

We then headed up Route 1 to J.T. Cheesman Provincial Park to walk the nature trail. We soon discovered that the recent rains had created a bumper crop of mosquitoes and black flies. Our new *friends* would follow us for most of the trip. The nature trail was beautiful, winding through boreal forest bordering a bog. Jackie was walking ahead when suddenly she came back and told me to close my eyes, as there was a surprise up ahead. We rounded a corner, and when I opened my eyes there was a magnificent clump of the deepest velvet-red pink lady's-slippers (2) that I had ever seen, sheltered in amongst the balsam fir. There were nine very tall plants, with gracefully curved flowering stems at least 20" high. More were scattered out in the bog, all past bloom and very small, not more than 8" tall! I had never seen *Cypripedium acaule* in a bog before, but I would learn that the extreme climate in Newfoundland creates all sorts of habitat and size variations in the native flora. There were 20 northern white fringed orchis, *Platanthera blephariglottis*, in the bog, just coming on, and many more *Arethusa* (3). We would have explored more, but Christina started to get tired (it's hard to carry a 4 year old through a bog) so as would often be the case, we had to leave the rest for next time.

It was just as well, as we had a long drive ahead of us, so we got back on Rt.1 and headed north. The stark, undeveloped beauty of southwestern Newfoundland is quite overwhelming. There is very little traffic on the highway to Stephenville, and it is not unusual to drive for 5 or 10 minutes without seeing another car! We headed west from Stephenville

towards the Port au Port Peninsula under threatening skies. It's amazing how fast the weather can change in Newfoundland. The natives say that if you don't like the weather when you go out the front door, just go out the back! After following a long and very winding road for what seemed to be an eternity, we finally reached the tiny hamlet of Cape St. George and the Felix Bed & Breakfast at the end of the peninsula. After dinner we drove, it was raining by this time, out to Parc Boutte de Cap to see if we could spot any of the thousands of yellow lady's-slippers that grow there. Jackie's *eagle eye* soon spotted several in the twilight, along with numerous northern green bog orchis, *Platanthera aquilonis*. A good portent for the morning! We then parked right at land's end at the edge of the cliffs overlooking the Gulf of St. Lawrence. Watching the whales surfacing as the rays of the setting sun pierced the clouds and illuminated the rain-soaked landscape is an experience that will be etched in our memories forever.

July 9th

It rained hard all night. During breakfast I had an animated conversation with members of the Newfoundland Wildflower Society (some of whom just happened to be staying in our B&B!). I got some good tips on orchid sites up north, and I told them not to miss the deep red *Cypripedium acaule* at Cheesman. They left for their field trip out to Boutte de Cap, where we caught up with them later. By this time the rain had stopped and azure-blue skies greeted us. It was very windy, and we had to bundle up in every sweater we had to stay warm, even though the sun was shining brightly! Carl Munden and John Maunder (two big names in the local orchid world) were the leaders. What luck! Carl autographed his book for me, and they directed us to an area where large clumps of *C. parviflorum* var. *pubescens* carpeted the limestone bluffs like dandelions. Thirty to fifty thousand at least! The lady's-slippers (along with everything else) were very short, growing very close to the ground because of the wind. This phenomenon is called tuckamore by the Newfoundlanders. We also saw our first specimens of green bog orchis, *Platanthera huronensis*. The scenery was spectacular; one could see why the island is called simply 'The Rock' – with its stony core exposed on every side and precipitous drops of hundreds of feet to turbulent waters, the setting was truly magnificent. Johanna (4) and Christina had fun seeing the lady's-slippers, but especially enjoyed watching a very colorful snail eat a leaf! Good stuff for city kids...

We reluctantly left this paradise (we had to get to Rocky Harbour by nightfall) and headed back to Rt.1. On the way we stopped at one of the many beautiful bogs along Rt.461 (most of Newfoundland is still wonderfully undeveloped and wild) and found astonishing numbers of *Arethusa* and our first common grass-pink, *Calopogon tuberosus*.

We passed through Corner Brook and Deer Lake; the most developed areas of western Newfoundland, but still beautiful. After leaving Deer Lake, Rt.1 is called The Viking Trail, and the land turns wild again. We had directions to a site for the striped coralroot, *Corallorhiza striata* forma *eburnea* (5), near Comack, and unbelievably, I actually located the plants! Growing right next to a motel, behind the playground, there were only two blooming stems of this most unusual and rare orchid; this population, one of two in Newfoundland, seems precarious at best. The black flies were swarming, so the girls stayed in the car while I photographed with my collar up, sleeves down, and hat pulled tightly onto my head.

We finally reached Rocky Harbour after a beautiful evening drive through Gros Morne National Park. We passed a red fox sitting by the highway that seemed to be sick, since it tried to approach us when we stopped. We arrived at the luxurious Ocean View Motel (thanks, Paul!) in time for a sumptuous seafood dinner.





July 10th

We awoke to overcast conditions; a nice jog to explore Rocky Harbour set the mood for the day. We headed out to the Lomond River Trail and were overwhelmed by the sheer number of showy lady's-slippers, *Cypripedium reginae* (6), growing everywhere! There are thousands in the bog next to the boardwalk and many more along the highway by the turnoff. Huge clumps were growing at the top of one roadside embankment as if to announce that the Queen was in charge! Many were just budding out, so I think the area will be at its peak when we return on our way back. The lady's-slippers were mixed in with a wonderful array of flowering plants: buttercups, *Ranunculus acris* and bunchberry, *Cornus canadensis*, complement the orchids nicely. The black flies were very bad, but luckily we had bought mosquito hats for the kids, which really helped. Johanna and Christina have been doing very well on the trip and are being exposed to great things. As we left the parking lot and drove towards Woody Point, we kept seeing (for at least a mile) large stands of showies marching endlessly up the mountainside; countless little paradises too numerous to visit!

We proceeded on to the tiny fishing village of Trout River for a delicious lunch of fresh mussels and cod burgers. Another stunning view of the coastline delighted us while we dined. While driving near Trout River Lake (a beautiful land-locked fjord) we had our first near-moose encounter. As I was driving (luckily slowly) along a gravel road, a moose calf - Jackie thought it was a donkey! - suddenly bolted out of the willows at the side of the road. I turned the wheel hard to the left and he veered to the right and we somehow missed each other. Whew! After we had regained our composure we drove to the nearby Tablelands, an area that I was very excited to explore. We walked about one and a half miles in and witnessed the 'moonscape' environment created when plate-tectonics pushed the magma from the ancient ocean floor and deposited it on the surface. The parched yellow and tan cliffs and boulders that resulted from the violent internal upheavals are formed of peridotite, and the soil is toxic to most plant life. The area resembles the high Rocky Mountains with humidity and the few plants that grow there are very specialized. Of course there are orchids - *Platanthera dilatata* and *Cypripedium parviflorum* var. *pubescens* seem to be able to stand just about anything. Some of the other alpine beauties we saw were thrift, *Armeria maritima*; alpine campion, *Lychnis alpina*; lush stands of Aleutian maidenhair fern, *Adiantum aleuticum*, along the stream; and unusual maroon colored pitcher plants, *Sarracenia purpurea*. On the way back to Rocky Harbour we stopped at Lomond for just a few more pictures to see once more the regal Queen in all her roadside glory.

July 11th

Today it is very foggy and overcast, so we postponed our boat tour of Western Brook Pond until 4 PM. We proceeded to the Gros Morne Trailhead, although the kids are too young to do the whole day-long hike to the top and were rewarded with an amazing display of pad-leaved orchids, *Platanthera orbiculata* (7). After a short walk we reached an area where hundreds of blunt-leaved rein orchids, *P. obtusata* (8), *P. orbiculata*, and *P. macrophylla* were the only thing growing in a carpet of lush sphagnum moss under fir trees. These three species have taken over an area about a city block square and are even growing unmolested right in the trail! There are seedlings everywhere, and the colony is thriving. Newfoundland is amazing; four days and four totally different mega-displays of orchid species that are very rare in most places! Only *P. obtusata* was in flower - hopefully the others will be open when we return next week. The size and texture of the *P. macrophylla* leaves are amazing! They look like some sort of strange, freakish prehistoric anomaly. We looked in vain for twayblades, but so far have been unable to spot any.

We had a few hours until the boat trip so I left the family at the motel and went out in search of the fabled Rocky Harbour Bog. The rangers at Park Headquarters had helped me pinpoint the exact location on the map (separated from Rt.1 by about a quarter mile of dense alder and willow thickets) and I managed to find a decent path leading in that even had a crude ‘fisherman’s’ bridge over the stream, which, of course, I couldn’t find on the way out; and there it was! It is truly an amazing place. A raised bog, the result of thousands of years of decaying sphagnum having elevated it above its surroundings, it covers many acres and has all of the associated niche plants that one would expect. Where I entered there were no orchids, but after trudging through the soggy peat for about ten minutes, I came to an area towards the east end where the *Arethusa*, *Calopogon*, and rose pogonias (the first and only ones I saw) numbered in the tens of thousands. I found all three color forms of *Arethusa*, all going past their prime fast – while the pogonias were just opening up. By this time the sun had come out, which was good news for the pending boat trip, but it was very hot and the flies made it almost impossible to photograph.

I went back to the motel to have a quick sandwich and pick up the family to head for Western Brook Pond. Another land-locked fjord, it is accessed by a mile and a half long boardwalk through yet another orchid-rich bog. *Arethusa*, bog candles, northern green orchids, and pad-leaved orchids (in the budding stage in woods next to the bog) were all present. After a few days, it almost becomes commonplace to see so many orchids, until one remembers how uncommon these species are in other areas. The fjord is spectacular! It’s like a flooded Yosemite Valley. Waterfalls cascade off the dizzying heights of the cliffs and stunning vistas await the eye around every turn. I met a very urbane elderly gentleman from Montreal who told me that Newfoundland is one of the last undiscovered, unpopulated places, mostly due to the lack of a highway to the mainland, thank God! Clouds started rolling in as the boat tour ended, and we straggled out amidst a swarm of black flies - paradise definitely comes with a price - as rain began to fall.

July 12th

The day looks like it will be sunny! While the girls slept I went on a nice jog to the Salmon Point Overlook right outside Rocky Harbour (9). A gravel road winds up a steep bluff that opens up to an incredible vista. I startled a flock of twelve brilliant yellow goldfinches on the way up – the avian equivalent of yellow lady’s-slippers! When I got to the top, I could see all the way south down the coast, and east into Bonne Bay and the Tablelands.

We then headed out to Western Brook Beach (where the river that drains Western Brook Pond meets the ocean). The kids had a great time playing in the surf and hunting for shells. It must have been 70 or 80 degrees! It felt wonderful after all those cold dreary days. The trail to the beach passes through a sort of enchanted forest with lots of mossy, strangely shaped trees, and on the way back I said to Jackie, “I’ll bet there’s something incredible back in those trees”. I left the trail, went up over a little rise, and suddenly entered a sylvan glade filled with giant specimens of Braun’s holly fern, *Polystichum braunii* var. *pushii*. Massive in size, the fronds were well over thirty inches long!

We had directions to a site for the dwarf rattlesnake orchid, *Goodyera repens*, at nearby Broom Point (on the Western Brook Trail). We were supposed to walk 384 steps, which we dutifully did, and there they would be. My stride must have been too wide, because there was nothing where we ended up. We went back to the trail head (this time I remembered my



8



9



glasses) and Johanna counted the steps. We ended up in a different spot, and I got down on my hands and knees, determined to find the elusive quarry. I had never seen this species before and had no idea how tiny they are. I suddenly realized that there were literally hundreds of miniscule orchid plants, right under my nose! Many had blooming stalks developing. These specimens were forma *ophioides*, and the variegated, silver-veined leaves (about 1/2" long) were very attractive. This colony must be many years old! There was also a nice group of *Platanthera obtusata* in a cedar grove next to the trail.

We are getting ready with great anticipation for our trip to Plum Point tomorrow; the Great Northern Peninsula awaits us! So, after a wonderful dinner of Rocky Harbour lobster at the Ocean View-fine dining at its best- it was off to bed.

July 13th

Today was truly overcast and luckily it was a driving day. We visited the Marine Station Aquarium at Norris Point before leaving. A very knowledgeable marine biologist showed us the various live native species on display. The kids loved it, and especially enjoyed handling some live specimens.

We then headed up the Viking Trail in a steady drizzle with fog shrouding the mountains. Our first stop was at the Table Point Ecological Preserve near Bellburns. I was glad we had directions, as there was no sign on the highway. We found this to be the case at Watt's Point as well; the fewer visitors, the better. Our first limestone barrens, it is a fascinating and starkly beautiful place. All the plants are hunkered down low against the ground because of the high winds coming off the Strait of Belle Isle. The rain didn't really matter (Paul told me that he has taken some of his best photos in the rain) and we had a wonderful time exploring this unique habitat. One has to watch carefully not to step in the holes and crevices hidden by the thick mat of heath. The thousands of yellow lady's-slippers were almost all past bloom. Luckily we were still feeling sated from our experience at Boutte de Cap. We had directions to a site for the early coralroot, *Corallorhiza trifida*, which we couldn't find, and the dwarf Hooker's orchid, *Platanthera hookeri* forma *abbreviata* (11), which we found! There were about twenty Hooker's orchises poking up out of the heath, scattered about in a small area. The fascinating floral spike is at the most 10 cm tall. While I was photographing the *P. hookeri*, Jackie found an interesting looking plant that turned out to be a very compact, yet robust rattlesnake fern, *Botrychium virginianum*. The ubiquitous *P. aquilonis* was growing everywhere, the largest specimens not more than 5 cm tall!

After a picnic on the tailgate, as it was still foggy and wet, we headed for Port au Choix National Historic Site (a Basque word, Choix is pronounced swa) located on the Point Richie Peninsula. As we drove out onto the point, there were hundreds of yellow lady's-slippers (definitely the flat-petalled *planipetalum* ecotype with golden petals) growing along the roadside in the limestone barrens. Since we were now further north, quite a few were still blooming. An incredible sight! The main attraction at Port au Choix (for the non orchid-fancier) is Phillip's Garden, where Dartmouth College anthropologist Elmer Harp Jr. excavated a 2000 year old Dorset Paleoeskimo site in the early 1960's. Always windy (and bug-free!) for over 5000 years people have been making their living from the sea at Port au Choix, making it one of the richest archaeological sites in eastern Canada.

I was beginning to realize that the parks in Canada are a lot better staffed than in the United States, and when we inquired about orchids - at first they thought we said "orcas"! - at the Visitor's Center, they said "speak to Patti, the staff naturalist". We were soon greeted by an enthusiastic woman who knew all of the orchids by their Latin names and gave us directions to sites for heart-leaved twayblades, *Listera cordata*, *Corallorhiza trifida*, and Port au

Choix's main attraction (for us) *Pseudorchis straminea*, the Newfoundland orchid (10). It was 4:30 PM by this time and everyone was tired, but I insisted that we forge ahead, as the rain had finally stopped. We headed down the Philip's Garden Trail and were once again amazed by the diversity of the flora; all the plants grow flattened against the ground or are extremely short in this incredibly harsh environment. After ½ mile or so we were rewarded with dozens of *Pseudorchis*, all in prime bloom. It's a very exciting and quite indescribable feeling to suddenly come upon a plant in the field that one has only been seeing pictures of in books for years! I repeated that 'first time' experience over and over on this trip. We finally found *C. trifida* in the fruiting stage (it can't be missed, it's bright green). The trail eventually descended into an area protected from the wind and entered a beautiful boreal forest abounding with *Platanthera obtusata*. It took a few tries, but Patti's directions to the *Listera* were good. "Pass the downed timber, go 25 feet to a stump on your right..." When we found the orchids, Jackie, exhausted from a long day a field, took one look at the diminutive plants with their mosquito sized blossoms, and said "that's it?" and promptly headed back to the car, leaving me to photograph to my heart's content. When viewed through a macro lens, the heart-leaved twayblade is a unique and beautiful flower, so I set up my tripod and managed to get some good shots, in between wind gusts and at a very slow shutter speed, in the fading light.

As we were driving to Plum Point a large moose ran towards the car from between two houses, totally unnerving me. The locals all drive about 20 miles per hour on the highway; I now knew why! We finally reached Plum Point Motel & Cabins utterly exhausted, and immediately went to their excellent dining room for a wonderful scallop dinner. The wild orchid/fresh seafood combination that Newfoundland offers is unbeatable! The boreal twilight lasts for well over an hour after sunset on the northern peninsula; as we walked to the cabin after a late dinner, the sky suddenly cleared and we were treated to a brilliant star show! It was so cold that we gladly turned the heat on in the cabin and snuggled up under several blankets; I was tempted to call someone in New York (where it was undoubtedly sweltering) and boast.

July 14th

I got up early and while the ladies slept I went on an exploratory jog out onto Plum Point, accompanied by the omnipresent light drizzle; yes, the clouds had come back in while we slept. Growing along the roadside was a lot of blue flags, *Iris versicolor*, big clumps of pink shinleaf, *Pyrola asarifolia*, *Platanthera aquilonis*, and my first bird's-eye primrose, *Primula laurentiana*. I was very excited to get back and get going, as we had directions to a site for the Hider-of-the-North; the exquisite eastern fairy slipper, *Calypso bulbosa* var. *americana* (12).

We got in the car and drove north for about an hour through the usual fog and drizzle. As we rounded the northern tip of Newfoundland a miracle occurred: the clouds literally ended (it looked like one of the gods had drawn a line of demarcation across the sky) and we drove into totally different weather. Blue skies, nothing but blue skies! It was like being in the high mountains of Colorado. The interior of the island is quite forested, and beautiful coniferous forest and some pretty big mountains unfolded before our eyes. The Appalachians reach their northern terminus in Newfoundland. As we came up over a hill, a giant bull moose was standing right in the middle of the road, about 25 ft. away. I slammed on the brakes, and as the guide books tell you to do, let him saunter away, feeling unthreatened, before driving on.

We reached the town of Raleigh and proceeded around the harbor to Burnt Cape Ecological Preserve. Right along the beach, before going up on the cape and entering the





15

preserve, we found the Holy Grail we had been seeking. As I was searching, I could see a raised vegetated area up ahead covered with red blooms. As I got closer, I realized that I was looking at a giant colony of jewel-like calypsos, not hiding at all, but growing right out in the open, sparkling in the sunshine. Indescribable! At least a hundred plants (counting all of the seedlings) were growing within a thick mat of bog laurel, *Kalmia polifolia*, gold-drop, *Potentilla fruticosa*, and dwarf willow, *Salix reticulata*. There were normal colored flowers as well as the forma *rosea*, and many in between. Needless to say, I took a lot of pictures! It was wonderful to have absolutely perfect weather for such a momentous occasion. While I photographed, the girls busied themselves by looking in the nearby tidal pools. They found some beautiful shells and other interesting things. While on a bathroom break, Jackie discovered a clump of ten dazzling yellow lady's-slippers in prime bloom growing amidst *Potentilla* on a limestone ledge. They were deliciously fragrant, which led to the verdict of: *Cypripedium parviflorum* var. *makasin*, the northern small yellow lady's-slipper. We were excited to see the preserve, so we proceeded to the entrance, only to discover a barricade with a sign saying that due to a polar bear sighting in the area, Burnt Cape was closed. Drat. Just then some rangers drove up and said we were absolutely not allowed in the preserve. They directed us back where we had just been to see *Crorallorhiza trifida*, which we couldn't find although we did find two more *C. pubescens* var. *makasin* and a lot of *Pseudorchis*.

We then drove to L'Anse aux Meadows, site of the first Viking settlement in North America, where we went on a great guided tour of the archeological sites, complete with live "Viking" actors. Not quite Burnt Cape with its unique alpine flora, but a pretty good alternative. We saw a lot of impressive icebergs on the way. After yet another delicious seafood dinner (there were still several hours of daylight left) we took the longer interior route (Rt.432) back to Plum Point. This recently built highway travels through almost total wilderness, and the wildlife is very abundant. We saw three moose, one caribou, a red fox, and Jackie even spotted a very rare Canadian lynx crouched down in the grass along the side of the road! She was watching for orchids as we drove – an indispensable co-pilot. The bog candles were so thick along the roadside that we could almost smell them as we drove. A deep red Canadian Sunset lingered on and guided us back to Plum Point, completing a 240 mile round trip.

July 15th

The good weather has held for two days! We're on a late schedule; I got the troops moving by 10:30, but staying out in the field until after dark makes it hard to get going again the next morning. We headed for Watts Point Ecological Reserve to search for the small round-leaf orchis, *Amerorchis rotundifolia* (13). The road out along the coast is very rough, and we eventually reached a bridge -this was the original road before the highway was built in the 1960's- that was falling into the stream and was quite impassable, although it looked like some daredevils try it. But oh, the orchids! The *Amerorchis* proved elusive at first, but what a place to search. Another limestone barrens, there are multitudes of interesting alpine species that I am used to seeing above timberline in the Rockies. Jackie and I got down on our stomachs and marveled at the microcosm spread out in front of us, remarking that each plant was a small version of its usual self because of the climate. Johanna has been very busy writing in her journal during the entire trip. Whenever I photograph, she is somewhere nearby writing and was especially busy at Watts point. I would like to share part of her journal entry from that day, just as she wrote it, spelling and all; her versions of the plant names are quite interesting (she looks at the orchid books a lot). Johanna's field notes are

better than mine and her measurements are accurate and demonstrate the small size of the plants!

Dear Diary,

“Today we are trying to find amerorchis. It is small. There are a lot of plants, and moss. It is very cold! You could smell the alpine. The wind is strong. The flowers are lightly moving back and forth. The tracks are so bumpy with rocks! There is a bridge that is very steep! So we are going to walk around the bridge. We don't dare to go with the car because there's a river. We did it. It is very rocky. Mommy and Christina had a little trouble with the bridge. Dad found the northern varcted ring orchis. (*Coeloglossium Verdi*). I thought it was a *Platanthera*. The leaves and stem is green. The flower (or buds) are yellow green. He also found an orchid named club sper (*Platanthera clactela*). The Verdi is about 3 inches. The flower is 2 inches. (Note: she is referring to the inflorescence). The club sper is about 4 cen. The flower is 2 cen. We found moss campion. It is pink. It's just flowers on moss. Mommy just found early coral root! (*Corraliza tiofoda*) The whole plant is yellow green. The whole plant is about 4-5 inches. The flower is about 3 inches. There are a lot of flowers on 1 plant. There are 38 plants of early coral root. Mommy found them 30-45 feet from the road. Daddy just spotted an iceberg in the mist. Hmmmm. Lets see what mom spotted. What is it? It is the NFLD orchid! There are 30 of them. They are 6-7 inches the plant. The flower is 2-3 inches. It is fregrent like a lemon. The flowers are white. The stem and leaves are yellow green. Now we are on the search of the amerorchis. It is about 2 inches. That's the plant! It is very hard to find. We still didn't find it. Now we are going to drive. Yay! Yahoo! Hip hip hooray! Guess what we found? Amerorchis. We solved the mystery Dad and mom found it! It is so beautiful.”

As you probably gathered, we found our first long-bracted green orchid, *Coeloglossum viride* var. *viride* (14), northern club-spur orchid, *Gymnadeniopsis clavellata* var. *ophioglossoides*, and *Corallorhiza trifida*, finally in bloom! We found the *Amerorchis* by driving slowly along the road; we spotted an area near the entrance where the ground seemed to be pink from a blooming plant. Jackie had seen it on the way in, but didn't realize it was what we were looking for It was a colony of at least 2000 small round-leaf orchis growing in full sun, and what a sight! A trip to Newfoundland is akin to going to the Serengeti Plains of Africa and witnessing massive herds of animals. We've seen species after species, not just orchids, represented not by a few paltry specimens, but by huge numbers! What a place! After spending some time with the *Amerorchis*, we drove out, finding several sweetly fragrant clumps of *Cypripedium parviflorum* var. *makasin* on the way.

We then headed for Cook's Harbour and Cape Norman. Another fascinating limestone barren, we didn't really have time to search for orchids, but we saw some fast-fading *Amerorchis* at Cook's Harbour. Traveling with kids takes a lot of patience and extra time, and every stop is a time investment. Johanna and Christina have done very well on this trip, but by this point they were starting to bounce off the walls!

Much to everyone's dismay, I insisted that we go back to Burnt Cape (last chance) as I really wanted to see it. On the way, I stopped along the highway to photograph yet another Serengeti-type species massing. This time it was *Platanthera dilatata* (16), growing by the thousands in a roadside fen and at least twice as many black flies and mosquitoes. There is no more sublime an experience than sitting in the middle of a huge stand of these scented 'bog candles' or 'scent bottles' and breathing in the air that is redolent with their perfume.

The polar bear had left Burnt Cape when we arrived, so we ventured out to take a look around. There wasn't enough time to do it justice, but the scenery was magnificent, and I got a general overview. We did find six rather pathetic looking *Amerorchis* well past. We were spoiled by Watts Point, and a lot of *Coeloglossum*. Next time...

The weather seemed to be changing, and we drove back to Plum Point through heavy fog. Arriving after dark, we had driven another 223 miles!

July 16th

This morning Jackie was looking at Paul & Stan's book during breakfast and I'm afraid she's hopelessly addicted now. Christina came over, pointed at a picture and said "I'm dying to see that!"

The rain started around noon. It must have rained at least two inches. We still headed for Port aux Choix as that had been the original plan for the day; I figured we could go hang out in the Visitor's Center. The highway on the northern peninsula is over 40 years old and is very uneven because of frost heaves, which made for some exciting driving in the heavy rain.

I patted myself on the back for having insisted that we visit Port aux Choix and hike the Phillip's Garden trail on the previous Friday. Today was Patti the ranger's day off, so there would have been no directions to orchid sites if we had stuck to our itinerary. The other staff remembered us, and was very welcoming. The Newfoundlanders are some of the friendliest people anywhere; they always wave when you pass them on the highway! When we expressed a curiosity about moose meat, one of the rangers offered us moose steaks from his freezer, if we could wait until closing time! We enjoyed the bookstore and the exhibits on Paleolithic cultures in the area. There was a wonderful lecture/performance by an Inuit throat singer from northern Labrador; the strange, multiphonic tones that emitted from her throat hearkened back through the eons to the primordial beginnings of humanity. We ventured out to Point Richie (in the car, of course) where gale-force winds were pummeling the shore. The surf was incredibly beautiful; dark green turbulent waters crashing on rocky shoals – a minor-key symphony of nature!

On the way back to Plum Point the sun suddenly came out, so we decided to stop off at Reef's Harbour to search for the white adder's-mouth, *Malaxis brachypoda* (15). What a challenge! The directions made sense until we got there, at which point we were totally flummoxed. After about 45 minutes, I finally figured it out; as we drove out on the little-used dirt road to the old harbor, the directions started to make sense, and it was like finally reaching the X on a pirate's treasure map. I stopped the car (having found the bank of cow parsnips we'd been seeking) and proceeded to the prescribed grassy area on the left side of the bank, accompanied by Johanna (mom usually runs interference with Christina at times like this). I had been warned that the orchids were very tiny, and of course I couldn't see them. Johanna kept saying "daddy, what's this?" and I kept replying impatiently "it's a dandelion!" (I was mesmerized by an orchid that I had never seen before; it turned out to be a large purple fringed orchid, *Platanthera grandiflora* in the budding stage). She said "**NO, THIS!**" I turned around (we were standing precariously balanced on the bank) and she had her finger right on the quarry (which I was poised to step backwards onto at any minute!) Good eyes! She gets the award today! They were indeed tiny, only 1-2" tall, and the flowers were fascinating when magnified. Upon closer inspection the bank was swarming with several hundred gorgeous little orchids, hidden in amongst the grass and other herbaceous plants. I really wanted to stay and look around, but poor Christina was ready for a change of venue... Jackie did venture out onto the bank to see the object of our search, and was quite amazed that Johanna had found the orchids; she also almost slipped into the ditch that is directly behind the plants! Another great Newfoundland experience!

July 17th

Having reached the apex of our northern trajectory, we left Plum Point this morning and began the 7 day journey home. We don't know when we'll be back, so we're savoring

each last moment. The weather was clear and sunny, so we got to see all the incredible seascapes and mountain vistas we had missed in the fog on the way up. The abundance of orchids along much of the Viking Trail is simply amazing; a random stop can lead to the discovery of any number of exciting things. Yellow lady's-slippers and the various *Platanthera* are very common; one almost becomes numb to the constant pageant. We arrived back in Rocky Harbour and checked into the Ocean View Motel; I immediately headed for the Gros Morne trailhead to see if the pad-leaved orchids were in bloom. Still budding! Oh well... I searched in vain for *Listera*, *Goodyera*, and *Corallorhiza* as I hiked up the trail; I did get a good picture of Gros Morne in the afternoon light from a higher part of the trail.

July 18th

We left Rocky Harbour under clear cerulean skies. Newfoundland is so beautiful when it's sunny. Air pollution seems to be non-existent and the light is intensely brilliant due to the northern latitude. We stopped by the Lomond River Trail and were surprised to find most of the showies past bloom and the bugs were gone too; the result of all those dry, sunny days. We were unable to find the other species reported from Lomond and I found out later we were searching in the wrong area. Yet another reason to come back...

We were headed for Port aux Basques and as we drove south we passed one stunning vista after another. After passing Corner Brook, a very attractive city built on the shore of a beautiful fjord, and then Stephenville, the land becomes wild again. Alpine lakes, bogs, boreal forest; nameless unwalked mountains and wild seashores unfolded before our eyes, all undoubtedly crawling with orchids! The girls fell asleep, and I drove mile after blissful mile through virgin wilderness. It would be wonderful if it could stay that way.

We finally reached Doyles, where we turned out into the bucolic Cordroy Valley where the climate is milder and there are even fruit trees, to search for purple fringed orchids. We were soon rewarded with a fabulous site, literally crawling with orchids! Even though I had never seen them before, the distinctive purple floral spikes were easy to spot from the road in what appeared to be an abandoned field. I'm glad some orchids are big! The small purple fringed orchid, *Platanthera psycodes* (17), was just coming on, although many were almost fully open (both the normal color and forma *albiflora*) and *P. grandiflora* still in bud, hooded ladies'-tresses, *Spiranthes romanzoffiana* (18), and *P. aquilonis* were also present; *P. psycodes* numbering in the hundreds. In another week or so it would have been an unbelievable floral spectacle! I feel very fortunate to have an understanding partner that allows me time to photograph to my heart's content when we are in the field. The girls were happy to pick wild strawberries while I took picture after picture in this orchid heaven. The hour was late, and even though I wanted to explore the 'valley' some more. I was very happy with the one site I found, but I knew there had to be more; we got in the car and made the short drive in to Port aux Basques. Another beautiful sunset marked the end of a long but fruitful day.

July 19th

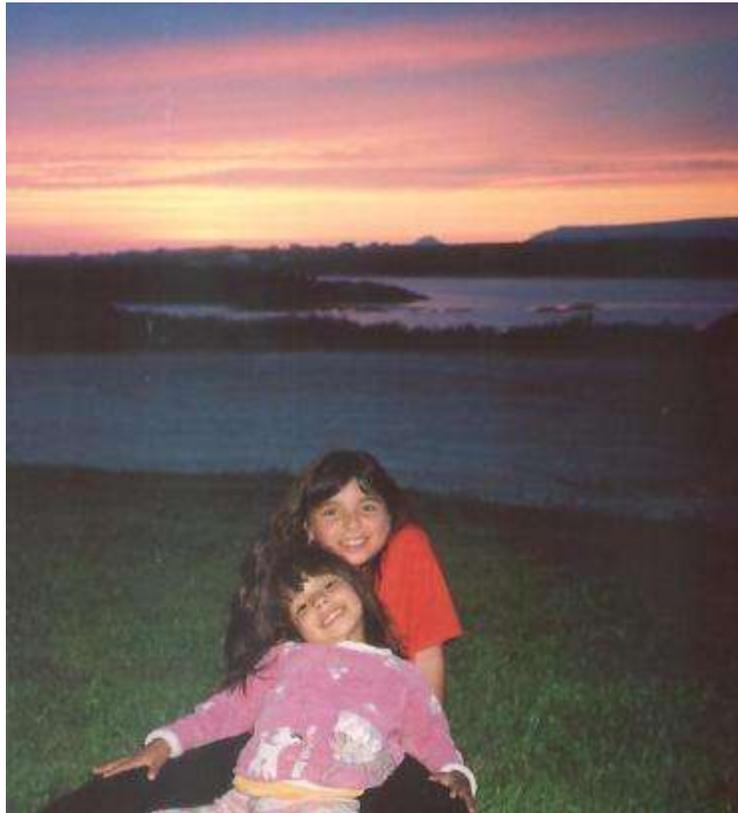
It rained hard all night and was still pouring when we woke up. It eventually let up a little, so I went out for a jog as the abandoned railroad bed/bike path that goes by the *Arethusa* site starts at the Hotel Port aux Basques. Soon after I left, a squall came in off the ocean and it started to pour again. I saw several great blue herons in the estuary next to the path that seemed very happy to be standing in the rain.

The ferry wasn't leaving until 4:30 PM, so we headed out to Cheesman Provincial Park for the requisite follow-up visit. While we were paying our entrance fee, the ranger

asked us the purpose of our visit. When he learned that we were looking for orchids, we were referred once again to the park naturalist, another very friendly woman that produced a copy of Paul & Stan's *The Wild Orchids of North America North of Mexico* to reference the species we were seeking. She directed us to where *Platanthera orbiculata* forma *lehorsii* (19) could be found (I never would have located it). We scurried over to the site, and while the girls watched *Cinderella* on DVD in the car as it was still raining, I was rewarded with six plants in prime bloom! This made up for having missed them up north. They were growing out in an open bog with *Arethusa* (several forma *albiflora*) *P. blephariglottis* and *Gymnadeniopsis clavellata* var. *ophioglossoides* (not open yet). The *lehorsii* is a truly stunning flower and the plant can reach 20 cm. tall and is visible from a quite a distance.

At this point we were out of time, but I really wanted to find the green fringed orchis, *Platanthera lacera*, and bring my species tally for the trip to an even thirty. On our first trip to Cheesman, I had noticed an intriguing boggy area near the beginning of the nature trail. So with minutes to spare, following a hunch, I literally ran up to the bog (all that jogging finally paid off) and worked my way to the back and promptly found three prime specimens of *P. lacera*! Unbelievable! There were three more *P. orbiculata* forma *lehorsii* as well. What a great way to wrap up an incredible trip!

When we arrived back at the hotel, the owner (with whom we had become friendly – she loved the little girls) took one look at me and exclaimed “what happened to you?” I guess most tourists don't lie on their stomachs photographing in a bog in the rain! It was with great sadness that we bid adieu to *The Rock* and steamed towards Nova Scotia. We'll be back!



Species found on Orchid Adventure 2007

* indicates a new species for us

- 1) *Amerorchis rotundifolia**
- 2) *Arethusa bulbosa**
forma *albiflora**
forma *subcaerulea**
- 3) *Calopogon tuberosa**
- 4) *Calypso bulbosa* var. *americana**
forma *rosea**
- 5) *Coeloglossum viride* var. *viride**
- 6) *Corallorhiza maculata* var. *maculata*
- 7) *Corallorhiza striata* var. *striata*
forma *eburnea**
- 8) *Corallorhiza trifida**
- 9) *Cypripedium acaule*
- 10) *Cypripedium parviflorum* var. *makasin**
- 11) *Cypripedium parviflorum* var. *pubescens*
ecotype *planipetalum**
- 12) *Cypripedium reginae*
- 13) *Goodyera repens* forma *ophioides**
- 14) *Gymnadeniopsis clavellata*
var. *ophioglossoides**
- 15) *Listera cordata**
- 16) *Malaxis brachypoda**
- 17) *Platanthera aquilonis**
- 18) *Platanthera blephariglottis**
- 19) *Platanthera dilatata* var. *dilatata*
- 20) *Platanthera grandiflora**
- 21) *Platanthera bookeri**
- 22) *Platanthera buronensis**
- 23) *Platanthera lacera**
- 24) *Platanthera macrophylla**
- 25) *Platanthera obtusata**
- 26) *Platanthera orbiculata**
- 27) *Platanthera psycodes**
- 28) *Pogonia ophioglossoides*
- 29) *Pseudorchis albida**
- 30) *Spiranthes romanoffiana**

Tom Nelson

tomjackie90@msn.com

HABITAT NOTES ON *EPIDENDRUM MAGNOLIAE* VAR. *MAGNOLIAE*, THE GREEN FLY ORCHID

Mike Dorris

Epidendrum magnoliae var. *magnoliae* is an inconspicuous orchid but it has the distinction of being the furthest north growing epiphytic orchid in North America and the only one found outside Florida. Misnamed for 150 years as *Epidendrum conopseum* R. Brown ex Aiton, the older and now current name was rediscovered recently (Hågsater, 2000).

This orchid is found in the southeastern United States from Louisiana to Mississippi, Alabama, Florida, Georgia, and South Carolina to southeastern North Carolina. Generally the plant is found within a hundred miles of the coast, taking advantage of the maritime influence of the Gulf of Mexico and the Atlantic to sustain it in winter. The other variety of this orchid, *Epidendrum magnoliae* Mühlenberg var. *mexicanum* (L.O. Williams) P.M. Brown is confined in central Florida and northern Mexico (Brown, 2000). This more southern variety has longer and wider leaves, pinkish petals, a scalloped lip, and more flowers per raceme. Both types are found in similar micro-climates.

When looking for *Epidendrum magnoliae*, both varieties, find trees generally more than 30 years old, within 20 feet (6.5M) of a permanent water source, that receives full to partial sun; lower the light, poorer the clump. The best clumps are often actually hanging over moving water.

A few years ago I was looking for mosses and lichens along the Chipola River in Jackson County, Fla. not far from where I lived. Jackson Co. is bordered on the north by Alabama, to the east by Georgia and an hour north of Panama City, on the Gulf of Mexico — described as the ‘real Florida’ by the locals and as Alabama by most others.

The rich broadleaf deciduous forest is a sight to behold, even in the light brown tones of a late winter day. The expected genetic diversity of this glacial refuge for the species of the eastern U.S. is a wonder; however finding a purple shiny, recently shed leaf resting on top my intended target was as expected as finding a skunk ape.

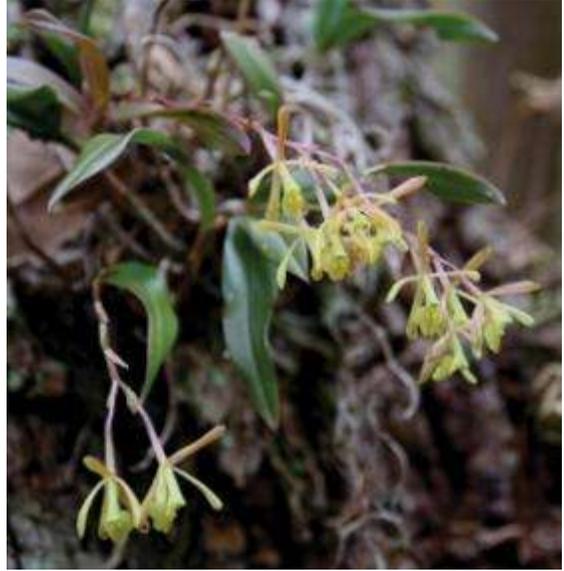
After-all, radiation frosts are common here even if daytime highs reach 50sF (10C) in winter. Trees drop their leaves, locals put on parkas, its winter even at 31 degrees latitude. How could an orchid grow on a tree where it frosted the night before?

I looked up, on the smooth bark of a very old Southern Magnolia, *Magnolia grandiflora*, and among the crustose lichens the weathered gray green finger-like roots of an epiphytic orchid spread; I looked up Orchidaceae in the *Guide to the Vascular Plants of the Florida Panhandle* by A.F. Clewell, to be amazed.

After my initial identification I searched it out everywhere, but it did not grow everywhere; only in the cool moist areas, in trees often over rivers or with in sight of one. During the dry cold season the orchid took refuge in the slightly more humid and even temperature of the river course. The ground water ranges from 68 to 72F (20 C) year-round while the air temperature fluctuates with every winter front, often dropping into the 20sF (-10C). While in warmer half of the year temperatures range from 75F (23C) to 100F (38C), daily thunder storms push the humidity to match the temperature, and the river cools the plants. This was evident when one hot summer day, while wading in Spring Creek which drains Merritt’s Mill Pond, outside Marianna, Fla. Looking for fossils, while half the town waded to fish, I smelled a rich sweet sent on the breeze, the reverse of the norm in a stream frequented by alligators at night. I looked around, nothing in bloom; I looked up, a limb

of an ancient oak reached out over the creek, a sleeve of resurrection fern fronds, *Pleopeltis polypodioides* var. *michauxianum*, and *Epidendrum magnoliae* var. *magnoliae* in full bloom framed by blue.

This corner of Florida sits atop layers of limestone, the earliest erode to add sharks teeth and shells to the local waterways, the more recent deposits sprinkle mastodon ivory, deer bones, horses teeth, and the remnants of giant tortoises to the creeks and rivers. Red maples, a short native ash, *Fraxinus caroliniana*, and numerous species of hollies wade into the creeks. Grape vines, trumpet-creeper, *Campsis radicans*, and the American wisteria, *Wisteria frutescens*, ramble in the tree tops binding the forest together while poison ivy, *Toxicodendron radicans*, crawls up tree trunks in the forest gloom. Above it all the bald-cypress, *Taxodium distichum*, stand knee deep in the water, giants and seedlings together, ancient lightning scarred trunks, always hollow, owl-nested, hung with Spanish moss, *Tillandsia usneoides*, fragments of an older ecosystem. The animal life is no less prolific. The hunters of orchids will notice quickly the enormous, trail-blocking banana spiders and the ever present mosquitoes; the fire ants and chiggers will introduce themselves soon. Deer watching at a distance, as well as the typical Florida bird myriad; not to forget the turtles and tasseled browns of the pygmy rattlers are rarer but should be looked out for as well.



Michael Dorris, 4540 Bethlehem Rd. Apt 1 B, Plant City, Fl 33566
Micdor@mindspring.com

Literature Cited:

- Brown, P.M. 2000. Recent Taxonomic and Distributional Notes from Florida 8. *North American Native Orchid Journal* 6(4): 337-38.
Clewell, A. F. 1985. *Guide to the Vascular Plants of the Florida Panhandle*. University Press of Florida, Gainesville.
Hágsater, E. 2000. New names for Florida Epidendrums. *North American Native Orchid Journal* 6(4): 300-10.



MY FAVORITE THINGS

ORCHIDS OF THE INDIANA DUNES

Peter Grube

The Indiana Dunes encompass an area in the very northwestern corner of Indiana bordering on the southern shore of Lake Michigan—wedged between Chicago on the west and Michigan City on the east. It is here that disjunctive plant communities with representatives from the boreal forests can be found growing alongside those of the desert Southwest. I recently photographed rose pogonia, *Pogonia ophioglossoides* (11), on the edge of a moist interdunal panne and only a few hundred feet away were the waxy yellow flowers of prickly pear cactus, *Opuntia humifusa*. Only remnants of this very unique natural area remain intact. And it is within these remnants that 40 species of orchids have been found; albeit, four species have been extirpated.

Here too, Henry Chandler Cowles, who is generally acknowledged as the father of ecology, did his pioneering studies of plant succession. Cowles Bog (although a fen, and not a true bog) bears his name. Efforts are being made today to establish a Cowles Bog station of pink lady's-slippers, *Cypripedium acaule* (2). They exist today in only one location at Pinhook Bog, a 14,000 year old glacial relict. Pinhook Bog, along with Lake Michigan itself, owes its existence to the advance and retreat of the glaciers, the last retreat being about 10,000 years ago.

One of the dune ecotypes with an abundance of orchids is the dune and swale area; a series of low, linear dunes running parallel to the lakefront and separated by shallow swales. Large yellow lady's-slipper, *Cypripedium parviflorum* var. *pubescens* (5), can be found blooming by the thousands in late May, followed about 10 days later by hundreds of showy lady's-slippers, *Cypripedium reginae* (3). Other species found here are tubercled rein orchid, *Platanthera flava* var. *herbiola* (8), and two *Liparis* species, *L. loeselii* and *L. liliifolia*. Three-birds orchid, *Triphora trianthophora* (6), blooms the first part of August for the lucky few to find the flowers open. Other species found here are: common grass-pink, *Calopogon tuberosus* (10), Great Plains ladies'-tresses, *Spiranthes magnicamporum* (12), nodding ladies'-tresses, *S. cernua* (13), small white lady's-slipper, *Cypripedium candidum* (1), and small yellow lady's-slippers, *Cypripedium parviflorum* var. *makasin* (4). Showy orchis, *Galearis spectabilis*, is rumored to grow here, but I have yet to observe it.

Moist sand prairies offer habitat for other orchids such as club-spur orchid, *Gymnadeniopsis* (*Platanthera*) *clavellata* (9), green fringed-orchid, *P. lacera* (7), and small purple-fringed orchid, *P. psycodes*, while in the drier sand prairies one can find both varieties of the slender ladies'-tresses, *Spiranthes lacera* var. *lacera*, and *S. lacera* var. *gracilis* (14), growing side by side.

It is hard to imagine another geographic area in the Midwest so rich in the family Orchidaceae.

Reference:

Homoya, M. A. 1993. *Orchids of Indiana*. The Indiana Academy of Science. 276 p.

Peter Grube, petegrube@comcast.net







4



5



6



7



8



9



10



11



12



13



14

BEING GOOD CARETAKERS

The Slow Empiricist

As I sit back and observe the world explode with more and more development and areas that were once rural and open become clogged with human endeavors I wonder what we, the supposedly caring for the environment, nature loving community are doing about it. I have lived in my Florida community for 10 years and have seen acres and acres of woodland bulldozed and completely cleared to make way for more shopping centers and strip malls as well as more splendid housing facilities. What is wrong with us?

I am just as guilty as the next person when I survey my own 'carbon footprints.' I love the fact that we have a shopping center practically next door that I can walk to if I were so inclined. With fuel prices so high I don't have to waste gasoline on the longer trips I used to have to take to get supplies. But I saw a lovely piney wood and all its creatures like the tortoises that lived there get obliterated to make way for this convenience.

I look at people who are constantly up-grading their homes as they tear out out-dated appliances and put in the latest things that the home decorating businesses tout as de rigueur. Granted they may be more energy efficient but what about all the stuff that ultimately gets dumped into the ever-increasing landfills?

Then I wonder at the people who have to increase the size of all their possessions - bigger homes, bigger cars and more junk. Whatever happened to being good caretakers of the things we already have? I still have family heirlooms that were my parents and grandparents and even my great grandparents things that fill my home with charm and presence. My children, however, scrap the old things and buy new things that 'fit' their modern lifestyle. I've watched sadly as they got rid of beautiful period furnishings to fill their homes with more up to date items like oversized recliners and gigantic televisions.

My neighbors here in Florida revel in green expanses of lawn and waste precious water in keeping them looking this way. They cut down large beautiful old trees because they don't want the bother of taking care of them even though they hire yard people to do it anyway.

I look at the current trend in our fashion setters like Oprah Winfrey, who have mega mansions and travel in long limousines when they go to their many destinations and marvel that they don't see the gigantic footprint they are casting on our world as they gobble up its resources. Have you ever seen the television program *What Not to Wear*? They take a supposedly fashion challenged person and give them \$5,000.00 to buy a new wardrobe in the trendy stores of New York City. They scrap all the old clothes and push cashmere and leather and designer names on the poor contestant. Or have you watched *Extreme Makeover*? They merely tear apart an existing home and super-size it into a mini-mansion for the needy family of the moment.

It seems to me we are all being suckered into being foolish when it comes to knowing what we really need and what the fashion, housing and auto industries decree is necessary for us to have. Let me ask you, do you see yourself in any of these scenarios? How big is your domicile? - your car or cars? - your wardrobe? - your traveling for recreation and orchid hunting? How many electronic gadgets do you absolutely have to have? How much do you need to keep up with the celebrities and those neighbors who live a little better than you do? Do you have a garage full of stuff or have you had to hire a storage unit to contain all your possessions?

What has this got to do with orchids and nature and what has it got to do with you? I think it has plenty to do with all those things and it starts with you examining your priorities and desires. We need to be more aware of just how our actions effect the environment and how our profligate lives are wreaking havoc with the very things we profess to love and want to nurture.

Once you have examined your needs and desires maybe you can put into perspective what has been driving you to do these things. Maybe you can cut back on your buying of the latest fashions or the latest gadgets and spend that time you spent shopping and that money you saved working to restore or manage a wildlife area in your neck of the woods. Maybe you can join your local native plant society, or orchid group, or garden club and become active in their projects and make your community more aware of nature and its benefits. Maybe you will find that these activities are more fulfilling than the pride you get driving that expensive new gas guzzling SUV past your envious neighbors. Maybe you will wake up and smell the dangers that modern living has foisted upon us as it touts the 'latest'.

I apologize to those of you who are already dedicated to preserving our wild areas and who spend many hours in that pursuit. You are to be commended for your efforts. You seem to have your heads on straight and know the difference from mere shallow existence to meaningful living. My hope is that more people will join in the program and reap the rewards of these efforts as more land is being preserved and more areas cleaned up from the pollution that abounds. We can make a difference if we truly want to do so. I hope you truly do want to make a difference and are successful in your endeavors. *The Slow Empiricist*



Gymnadeniopsis integra, yellow fringed orchid, formerly abundant at the current site of the Disney World complex south of Orlando, Florida

ORCHID REINTRODUCTION IN THE UNITED STATES: A MINI-REVIEW

Scott L. Stewart

INTRODUCTION

The primary goal of any orchid conservation program should be the *in situ* management of habitat; that is, the preservation, management, and restoration of habitats that support and are associated with orchid populations. Reintroduction and translocation of orchid plants must be seen as alternatives or augments to the preservation of orchid habitats. Recent orchid conservation efforts in North America have focused dually on habitat management and orchid reintroduction as a means of orchid conservation. This approach, when combined with research efforts into orchid ecology, pollination biology, propagation science, mycology, and population genetic diversity, is termed integrated conservation, and has been demonstrated as an effective means of orchid conservation planning and implementation (Stewart and Kane, 2007a; Swarts et al., 2007).

Reintroduction biology, as a means of plant species conservation, is relatively young, and the research on this topic has been fragmented and *ad hoc*, in many instances (Guerrant and Kaye, 2007; Seddon et al., 2007). Moreover, the science of orchid reintroduction biology worldwide is in its infancy. Several countries have taken considerable steps to include orchids as a part of overall biodiversity conservation, resulting in many successful plant reintroductions. Some of these include: *Liparis loeselii*, *Cypripedium calceolus*, *Anacamptis laxiflora*, *Dactylorhiza majalis* var. *praetermissa* in the United Kingdom (Ramsay and Dixon, 2003), *Caladenia huegelii*, *Thelymitra manginiorum*, and *Diuris fragrantissima* in Australia (Ramsay and Dixon, 2003; Swarts et al., 2007; Smith et al., 2007), *Grammatophyllum speciosum* in Singapore (Yam Wing and Thame, 2001), *Ipsea malabarica* and *Vanda coerulea* in India (Martin, 2003; Seeni and Latha, 2000). Despite these international successes in orchid plant reintroduction, the science and practice of orchid reintroduction for conservation purposes remains understudied in North America, especially in the United States. Few well documented, scientifically planned examples of North American orchid reintroductions exist despite being a priority topic among those interested in the conservation of North American native orchids.

While orchid conservation programs should approach the issue of orchid conservation using the integrated model, the focus of the current mini-review will be limited to the final step in the integrated conservation system—plant reintroduction. The goal of this current work is to provide a brief overview of previous, well documented orchid reintroductions in the United States, and provide a simple overview of the methods, successes, and shortcomings of those reintroductions.

CASE STUDIES

Case Study one: *Spiranthes brevilabris*, short-lipped ladies' tresses, in Florida

Spiranthes brevilabris is a rare terrestrial orchid native to north-central Florida and is currently known to persist in semi-disturbed edges such as roadsides and cemeteries. Historically, the species is known from Alabama, Georgia, Louisiana, Mississippi, Texas, and Florida; although it is currently known only from Florida and Texas (Brown and Folsom, 2002, 2005; E.L. Keith, personal

communication). In Florida, the species is found in its greatest abundance along roadsides throughout Goethe National Forest (Levy County), and this habitat is the greatest concern for the long-term sustainability of the species. Roadsides can experience tremendous disturbances and should not be considered *natural* habitats. While the natural habitat for *S. brevilabris*, pine flatwoods, does experience disturbance events ranging from fires to storm damage, these are regenerative disturbances for this particular habitat that cycle new nutrients through the habitat and create necessary canopy openings for the sustainability and recruitment of plant species. This is contrasted to the often abrupt disturbances found along roadsides, which can include road widening, re-ditching, fuel and oil spills, and severe mowing (S.L. Stewart, personal observation). The goal of conservation research on *S. brevilabris* was to both propagate the species and determine sound reintroduction methods that would allow for the reintroduction of plants to suitable habitats in the north-central Florida area (Stewart, 2002, 2003, 2007a).

Symbiotic seed germination studies with *Spiranthes brevilabris* were undertaken in 2001, which resulted in over 200 seedlings acclimatized to greenhouse conditions (Stewart et al., 2003). Fungi originating from both the study species and the Florida epiphytic orchid, *Epidendrum magnoliae* var. *magnoliae* were used to germinate and grow seedlings of *S. brevilabris* in the laboratory. One-hundred and seventy-two of these seedlings were used in reintroduction studies at six sites in Goethe State Forest. Prior to reintroduction, leaf-bearing seedlings of *S. brevilabris* were transferred from Petri plates to 44.0 × 12.5 mm aluminum dishes, each containing approximately 15-20 grams sterilized soil. The soil originated from a pine flatwood habitat in Alachua County, Florida. Three seedlings were placed into each dish; each seedling in the same dish was infected with the same fungus to prevent the mixing of orchid fungi during greenhouse acclimatization and growth. All seedlings were allowed to grow under greenhouse conditions for 78 days. After this time, 178 seedlings were prepared for reintroduction.

Since this study represented the first reintroduction of a symbiotically grown North American native orchid, the reintroduction method was designed to minimize disturbance to both the plant and its critical fungal associate. The goal in the reintroduction of symbiotically grown orchid seedlings is actually two-fold—the reintroduction of the plant and the introduction of an appropriate fungal associate. This double reintroduction allows for the continued existence of the reintroduced plant, as well as an appropriate fungus that will allow for future seedling recruitment in the area (Zettler, 1997; Hollick et al., 2007). Five reintroduction sites in Goethe State Forest where *Spiranthes floridana* did not currently exist were chosen, along with one site where the species did currently exist. Each site where *S. brevilabris* did not currently exist was chosen based on the presence of associated plants and a similar soil type as was found at current *S. brevilabris* sites. At each site, two plots were established representing the two different fungal associates. Plants were carefully removed from their aluminum dishes, with the surrounding soil intact, and placed in shallow pre-dug holes. Each plot was watered with tap water until the area was saturated, and no further artificial watering took place. No fertilizer was used. Seedlings were monitored for survivorship over the next several growing seasons (Stewart et al., 2003).

After one month, 100% of reintroduced seedlings survived. Seventeen of the seedlings (9.9%) initiated flowering after six months (Stewart, 2002, 2003; Stewart et al., 2003). A 2004 survey of all six reintroduction sites in Goethe State Forest found that all seedlings at three of the sites had disappeared; however, >70% of the seedlings at the remaining three sites were located and found to be flowering. In both 2005 and 2006, only two of the reintroduction sites could be located. At both these sites, 53.4% of the reintroduced plants were found to be flowering (Stewart 2007a).

The reintroduction of *Spiranthes brevilabris* represents the first example of the successful reintroduction of a symbiotically grown orchid in the United States. The fact that >50% of the reintroduced plants at two reintroduction sites remain and are reproducing demonstrates the success

of both the symbiotic propagation method and plant reintroduction methods. However, the lack of consistent long-term monitoring is problematic. The disappearance of plants at the other four reintroduction sites could be better explained if monitoring beyond one year had been less *ad hoc*. The importance of well-designed long-term monitoring programs in the conservation and management of any species has been clearly demonstrated (Martin et al., 2007). Nonetheless, the successful reintroduction of the rare terrestrial orchid *S. brevilabris* in Florida represents the bringing together of propagation science and reintroduction biology for the conservation of an individual species—the beginnings of species-level integrated conservation.

The seed germination of a number of other North American *Spiranthes* species has been studied. These include: *S. delitescens* (Hicks, 2007), *S. cernua* Deep South race (Stewart, 2007a, 2007b), *S. magnicamporum* (Anderson, 1991), *S. cernua* (Zettler and McInnis, 1993), *S. lacera* (Zelmer and Currah, 1997), and *S. odorata* (Zettler and Hofer, 1997; S.L. Stewart, unpublished data). Hicks (2007), Stewart (2007a, 2007b), Zettler and McInnis (1993), and Stewart (unpublished data) all resulted in greenhouse acclimatized plants, but not reintroduced plants.

Case study two: *Epidendrum nocturnum*, night scented orchid, in South Florida

Epidendrum nocturnum is a commercially appealing and endangered orchid found in south Florida, as well as the West Indies, Mexico, Central America, and northern South America (Brown and Folsom, 2005). In Florida, the species reaches its greatest abundance in the Big Cypress Basin area of southwestern Florida, particularly in the greater Fakahatchee swamp and slough system. While quite common in the area, *E. nocturnum* populations are under increasing extinction pressures from urbanization, changing habitat structure, and man-made hydroperiod changes. These factors, combined with an ever decreasing range in Florida and habitat fragmentation caused by urbanization, have prompted a great deal of interest in the propagation, reintroduction, and conservation of *E. nocturnum*, as well as other south Florida orchid species.

Although readily germinated using asymbiotic techniques, the use of symbiotic seed germination in the propagation of *Epidendrum nocturnum* was undertaken to produce plants for preliminary reintroduction studies (Massey and Zettler, 2007; Zettler et al., 2007). Seeds of *E. nocturnum* were collected from the Fakahatchee Strand State Preserve (FSSP) and the Florida Panther National Wildlife Refuge (FPNWR), and germinated using a fungus isolated from *Spiranthes brevilabris*. The use of an orchid endophyte originating from a north Florida terrestrial orchid to germinate seeds of a south Florida epiphyte may seem counterintuitive; however, no fungi have been isolated from *E. nocturnum* after repeated attempts and this particular fungus, *Epulorbiza repens*, is considered a ubiquitous global orchid endophyte (Stewart, 2007a; Zelmer, 2001). Seeds from both collection sites readily germinated and resulted in a total of 284 fungus-infected seedlings that were acclimatized to greenhouse conditions. After 163 days under greenhouse conditions, 203 seedlings survived. Of these surviving seedlings, 43 plants were prepared for reintroduction into sites at the FPNWR (16 months post seed sowing).

Three sites at the FPNWR were chosen to study the reintroduction of laboratory-grown *Epidendrum nocturnum* seedlings. The first site was chosen because plants of *E. nocturnum* were found in this site, and this site represents the seed collection location. The second and third sites were chosen because they were similar habitats to the first site and support other native orchid species (i.e., *Encyclia tampensis*). *Epidendrum nocturnum* sites at the FPNWR are best described as flooded and seasonally flooded swamps and sloughs dominated by pop ash (*Fraxinus caroliniana*) and pond apple (*Annona glabra*), which accurately describes both the second and third reintroduction sites (L. Richardson personal observation).

Plant reintroduction method was the same at all three sites. *Epidendrum nocturnum* seedlings were secured to *Fraxinus caroliniana* tree trunks at approximately 1.5-2 meters above the swamp floor.

A previous survey indicated that approximately 60% of all *E. nocturnum* plants at the seed collection site at the FPNWR occurred within this height range (S.L. Stewart, unpublished data). Plants were secured by placing a small amount of fresh, wet sphagnum moss around the seedling root system, placing the seedling against the tree trunk at the appropriate location, and securing the plant using 0.5 cm² pore size plastic gutter mesh stapled to the tree (Zettler et al., 2007). Preliminary studies on the reintroduction of two other south Florida epiphytic orchids—*Cyrtopodium punctatum*, cigar orchid and *Prosthechea cochleata* var. *triandra*, clamshell orchid—previously demonstrated this plastic mesh method as suitable for the reintroduction of epiphytic orchids (S.L. Stewart and L. Richardson unpublished data). Once reintroduced, seedlings of *E. nocturnum* were not provided supplemental water or fertilizer. Fifteen plants were reintroduced at the first site, while 14 plants each were introduced at the other two sites.

After one month, 100% of the reintroduced *Epidendrum nocturnum* seedlings had survived at all three sites. However, survivorship decreased sharply at all sites from this time forward. After six months *in situ*, <50% of seedlings at all sites had survived. Eight months after reintroduction, only two seedlings each at the second and third sites had survived, while 42% of seedlings at the first site had survived. After one year *in situ*, no seedlings survived at the second or third site, and 20% of seedlings survived at the first site. The high mortality of *E. nocturnum* seedlings was most likely related to the small size of reintroduced seedlings, with most measuring <7 cm in total length, and the inability of these small seedlings to cope with periods of desiccation (S.L. Stewart, personal observation). Preliminary reintroduction studies with *P. cochleata* var. *triandra* indicated that larger seedling size at the time of reintroduction was correlated with survivorship beyond one year (S.L. Stewart, unpublished data). Therefore, future propagation and reintroduction efforts dealing with epiphytic orchids, including *E. nocturnum*, should use larger, more mature seedlings at time of reintroduction. While a total of only three seedlings survived after one year in the first site, this reintroduction effort is considered a success since valuable information was gained concerning the reintroduction requirements of *E. nocturnum*. Also of note, Zettler et al. (2007) showed a clear home-site advantage for survivorship of those *E. nocturnum* seedlings reintroduced at the original seed collection location. The concept of home-site advantage is best defined, in terms of plants, as the increased fitness advantage of local plant selections relative to non-local plant selections (Hufford and Mazer, 2003). Not accounting for the home-site advantage issue, as well as other issues related to plant ecotypes and genetic differentiation, can lead to inbreeding depression, outbreeding depression, unforeseen hybridization, genetic swamping, and genetic dilution of reintroduced plant populations (Kaye 2001; Lynch 1991; Hufford and Mazer 2003). Unfortunately, the long-term effects of these genetic diversity issues are often not observed for many generations. The observation of a possible home-site advantage may indicate a degree of local genetic adaptation for *E. nocturnum* that will play a large role in the success or failure of future reintroduction efforts with this species from throughout southwestern Florida.

The establishment of a successful symbiotic propagation and reintroduction method for *Epidendrum nocturnum* represents a step in the pre-emptive conservation of an endangered, but not yet critically imperiled orchid species. Unlike recent conservation research on other critically endangered Florida orchids (i.e., *Spiranthes floridana*, *Cyrtopodium punctatum*; Stewart and Kane, 2007b; D. Dutra, personal communication) that represents conservation “fire-fighting” (Spring et al., 2007), the work of Massey and Zettler (2007) and Zettler et al. (2007) represents the groundwork that will insure the long-term sustainability of *E. nocturnum* in south Florida. Furthermore, the present *E. nocturnum* conservation research lays the foundation for future research on the species’ ecology, pollination biology, and population genetic diversity—all critical steps in the integrated conservation of orchid species.

Additional conservation research is currently ongoing at the FPNWR that will lead to additional orchid reintroductions. Species included in this research include: *Eulophia alta* (Johnson et al., 2007), *Calopogon tuberosus* var. *tuberosus* and var. *simpsonii* (P. Kauth, personal communication), *Bletia purpurea* (Dutra et al., submitted), and *Cyrtopodium punctatum* (D. Dutra, personal communication). This research will follow the model of integrated conservation demonstrated by the previous work with *Epidendrum nocturnum*.

CONCLUSION

The two case studies presented in this mini-review represent two examples of recent and well-documented orchid reintroductions in the United States. Few other good examples of orchid reintroductions in either the U.S. or North America exist, despite proven techniques and suitable protected habitats throughout the area (i.e., Wake, 2007; Ortega-Larrocea et al., 2007; Rangel-Villafranco and Ortega-Larrocea, 2007; Smith et al., 2007). The majority of documented reintroductions remain *ad hoc* and lack serious ecological planning; however, these orchid reintroduction efforts do provide valuable information about the basic ability of particular species to survive translocation from greenhouse to a natural habitat. Those interested in using plant reintroductions as a means of orchid conservation should educate themselves on the many nuances of conservation-based plant reintroductions, as well as consider developing partnerships with academic researchers and state or federal land management agencies. Future orchid conservation programs should not only adopt the integrated conservation approach, but also utilize documented reintroduction techniques as the capstone for the conservation effort.

REFERENCES

- Anderson, A.B. 1991. Symbiotic and asymbiotic germination and growth of *Spiranthes magnicamporum* (Orchidaceae). *Lindleyana* 6:183-86.
- Brown, P.M. and S.F. Folsom. 2002. Wild Orchids of Florida. University Press of Florida, Gainesville.
- Brown, P.M. and S.F. Folsom. 2005. Wild Orchids of Florida: Updated and Expanded Edition. University Press of Florida, Gainesville.
- Dutra, D., T.R. Johnson, P.J. Kauth, S.L. Stewart, M.E. Kane, and L. Richardson. Submitted. Asymbiotic seed germination, *in vitro* seedling development, and greenhouse acclimatization of the threatened terrestrial orchid *Bletia purpurea*. *Plant Cell, Tissue and Organ Culture*.
- Guerrant, E.O. and T.N. Kaye. 2007. Reintroduction of rare and endangered plants: common factors, questions and approaches. *Australian Journal of Botany* 55:362-70.
- Hicks, A. 2007. On the germination and subsequent culture of *Spiranthes delitescens* Sheviak in sterile culture. *Orchid Digest* July-Sept.:158-60.
- Hollick, P.S., J.A. McComb, and K.W. Dixon. 2007. Introduction, growth and persistence *in situ* of orchid mycorrhizal fungi. *Australian Journal of Botany* 55:665-72.
- Hufford, K.M. and S.J. Mazer. 2003. Plant ecotypes: genetic differentiation in the age of ecological restoration. *TRENDS in Ecology and Evolution* 18:147-55.
- Johnson, T.R., S.L. Stewart, D. Dutra, M.E. Kane, and L. Richardson. 2007. Asymbiotic and symbiotic seed germination of *Eulophia alta* (Orchidaceae)—preliminary evidence for the symbiotic culture advantage. *Plant Cell, Tissue and Organ Culture* 90:313-23.
- Kaye, T.N. 2001. Common ground and controversy in native plant restoration: the SOMS debate, source distance, plant selections, and a restoration oriented definition of native. In: Haase, D.L. and R. Rose (eds). *Proceedings of the Conference: Native Plant Propagation and Restoration Strategies*, pp. 5-12.
- Lynch, M. 1991. The genetic interpretation of inbreeding depression and outbreeding depression. *Evolution* 45:622-629.
- Martin, J., W.M. Kitchens, and J.E. Hines. 2007. Importance of well-designed monitoring programs for the conservation of endangered species: case study of the snail kite. *Conservation Biology* 21:472-81.
- Martin, K.P. 2003. Clonal propagation, encapsulation and reintroduction of *Ipsa malabarica* (Reichb. f.) J.D. Hook., and endangered orchid. In *Vitro Cellular and Developmental Biology—Plant* 39:322-26.
- Massey, E.E. and L.W. Zettler. 2007. An expanded role for *in vitro* symbiotic seed germination as a conservation tool: two case studies in North America (*Platanthera leucophaea* and *Epidendrum nocturnum*). *Lankesteriana* 7:303-08.

- Ortega-Larrocea, M.P. and M. Rangel-Villafranco. 2007. Fungus-assisted reintroduction and long-term survival of two Mexican terrestrial orchids in the natural habitat. *Lankesteriana* 7:317-21.
- Ramsay, M.M. and K.W. Dixon. 2003. Propagation science, recovery and translocation of terrestrial orchids. In: Dixon, K.W., S.P. Kell, R.L. Barrett, and P.J. Cribb (eds). *Orchid Conservation*, pp. 259-88.
- Rangel-Villafranco, M. and M.P. Ortega-Larrocea. 2007. Efforts to conserve endangered terrestrial orchids *in situ* and *ex situ* at two natural reserves within central Mexico. *Lankesteriana* 7:326-33.
- Seddon P.J., Armstrong D.P, and R.F. Maloney. 2007. Developing the science of reintroduction biology. *Conservation Biology* 21:303-12.
- Seeni S. and P.G. Latha. 2000. *In vitro* multiplication and ecorehabilitation of the endangered Blue Vanda. *Plant Cell, Tissue and Organ Culture* 61:1-8.
- Smith, R.H., J. Smith, and S. Liebler. 2007. Production of *Cypripedium montanum* seedlings for commercial value and reintroduction into restoration projects: Phase II. *Lankesteriana* 7:376.
- Smith, Z.F., E.A. James, and C.B. McLean. 2007. Experimental reintroduction of the threatened terrestrial orchid *Diuris fragrantissima*. *Lankesteriana* 7:377-80.
- Spring D.A., O. Cacho, R. MacNally, and R. Sabbadin. 2007. Pre-emptive conservation versus “fire-fighting”: a decision theoretic approach. *Biological Conservation* 136:531-40.
- Stewart, S.L. 2002. Saving a native orchid: a case study on the reintroduction of *Spiranthes brevilabris* into native habitats in Florida. *Orchids* Oct.:916-19.
- Stewart, S.L. 2003. Successful re-introduction of the short-lipped ladies’-tresses to Florida, USA: implications for the future of native orchid restoration. *Re-Introduction NEWS* 22:21-22.
- Stewart, S.L. 2007a. Integrated conservation of Florida Orchidaceae in the genera *Habenaria* and *Spiranthes*: model orchid conservation systems for the Americas. Ph.D. Dissertation, University of Florida, Gainesville.
- Stewart, S.L. 2007b. Symbiotic seed germination of the “Deep South” race of *Spiranthes cernua* from Florida. *North American Native Orchid Journal* 13:39-52.
- Stewart, S.L. and M.E. Kane. 2007a. Orchid conservation in the Americas—lessons learned in Florida. *Lankesteriana* 7:382-87.
- Stewart, S.L. and M.E. Kane. 2007b. Symbiotic seed germination and evidence for *in vitro* mycobiont specificity in *Spiranthes brevilabris* (Orchidaceae) and its implications for species-level conservation. *In Vitro Cellular and Development Biology—Plant* 43:178-186.
- Stewart, S.L., L.W. Zettler, J. Minso, and P.M. Brown. 2003. Symbiotic germination and reintroduction of *Spiranthes brevilabris* Lindley, an endangered orchid native to Florida. *Selbyana* 24:64-70.
- Swarts, N.D., A.L. Batty, S. Hopper, and K.W. Dixon. 2007. Does integrated conservation of terrestrial orchids work? *Lankesteriana* 7:219-222.
- Wake, C.M.F. 2007. Micro-environment conditions, mycorrhizal symbiosis, and seed germination in *Cypripedium candidum*. strategies for conservation. *Lankesteriana* 7:423-426.
- Yam Wing, T. and A. Thame. 2001. Orchid conservation at the Singapore Botanic Gardens. In: Barrett, R.L. and K.W. Dixon (eds). *First International Orchid Conservation Congress Book of Extended Abstracts*, pp. 26.
- Zelmer, C.D. 2001. Root-associated organisms of the Cypripedioideae (Orchidaceae). Ph.D. Dissertation, University of Guelph, Ontario.
- Zelmer, C.D. and R.S. Currah. 1997. Symbiotic germination of *Spiranthes lacera* (Orchidaceae) with a naturally occurring endophyte. *Lindleyana* 12:142-148.
- Zettler, L.W. 1997. Terrestrial orchid conservation by symbiotic seed germination: techniques and perspectives. *Selbyana* 18:188-194.
- Zettler, L.W. and T.M. McInnis. 1993. Symbiotic seed germination and development of *Spiranthes cernua* and *Goodyera pubescens* (Orchidaceae: Spiranthoideae). *Lindleyana* 8:155-162.
- Zettler, L.W. and C.J. Hofer. 1998. Sensitivity of *Spiranthes odorata* seeds to light during *in vitro* symbiotic seed germination. *Lindleyana* 12:26-29
- Zettler, L.W., S.B. Poulter, K.I. McDonald, and S.L. Stewart. 2007. Conservation-driven propagation of an epiphytic orchid (*Epidendrum nocturnum*) with a mycorrhizal fungus. *HortScience* 42:135-139.

Scott L. Stewart, Ph.D. Phytotechnology Laboratories, LLC, P.O. Box 12205, Shawnee Mission, KS 66282-2205 E-mail: scott@phytotechlab.com

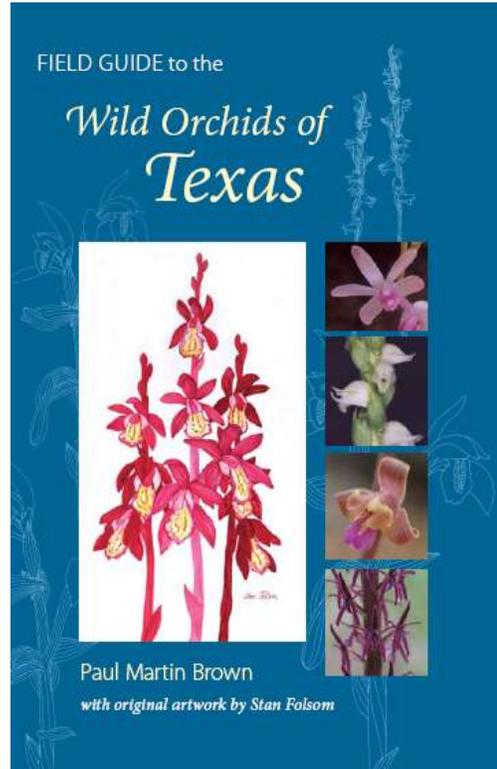
BOOK REVIEWS & PUBLICATION ANNOUNCEMENTS

Field Guide to the Wild Orchids of Texas

Paul Martin Brown

with original artwork by Stan Folsom

University Press of Florida
\$29.95 ISBN 978-0-8130-3159-0
316 pages
6 x 9"
Maps - 67
Color Photos - 286
Watercolors - 7
Line drawings - 91



Field Guide to the Wild Orchids of Texas is well put together and has very useful information on the orchid species, ranges, and habitat requirements. The county range maps are very useful. This mapping is a good, practical approach that should be used by other native flower authors on future native orchid books or regional flora books. The photos in the book are very well done and show the plants nicely in natural habitats as well as close-up views. There is also a very good discussion on the different regions of Texas and regional distribution of the native orchid species. This is a welcome addition to the author's recent works for the orchids of the US and Canada. This book is a good value and a must-have for any orchid enthusiast.

Mark Larocque
pesllc@comcast.net

* * * * *

It has been many years since I was in Texas, and even then, my exposure to the state consisted primarily of an intensive familiarity with the Dallas/Fort Worth Airport. Needless to say, the orchid flora at DFW was not particularly rich. Just as people's impressions of the state that I now call home, New Jersey, are shaped and limited by their own experience—typically gained while traversing the many highways that pass through the Garden State—so, too, my impressions of Texas were formed twenty years ago in Dallas and in El Paso. It never occurred to me that I would want to return to Texas to explore its orchid flora—never, that is, until I began to leaf through Paul Martin Brown's *Field Guide to the Wild Orchids of Texas*.

The latest in Brown and Folsom's series of field guides to North American orchids published by the University Press of Florida, this book, like the others, features Stan Folsom's original artwork and Brown's photography. The *Field Guide to the Wild Orchids of Texas* is designed to serve well as a companion in the field. Its cover is plastic-coated (hence somewhat waterproof and easy to wipe clean!) and flexible, and it has a metric ruler on the front flap and an English ruler on the back flap. The keys are easy to use (and the explanation of how a dichotomous key works seems

BOOK REVIEWS & PUBLICATION ANNOUNCEMENTS

as if it would be easy to understand for someone new to this way of identifying plants), and the photographs and drawings are suited for field use in making identification. At times, the treatment of a species might benefit from a more detailed diagnostic drawing, but this is a minor nit.

For those who know Brown and Folsom's previous works, the organization of this volume will be familiar. Part 1, *Orchids and Texas*, provides background on just what its title suggests that it would. A brief overview of the work that has been done on the Orchidaceae in Texas, and how recent work published in Volume 26 of *The Flora of North America North of Mexico* has informed our understanding of Texas orchids, is paired with a discussion of the "botanical ecoregions" of the state. This is followed by an introduction to orchid biology, an explanation of dichotomous keys, a key to the genera, and a few other housekeeping details.

Part 2, *The Wild Orchids of Texas*, is, as one might surmise from its title, the meat of the book. Herein each species is treated in a two-page spread, with range information (both overall and within Texas), a written description of the plant, its leaves and flowers, its flowering period, and its habitat, along with a brief and more personal paragraph or two about the species and its history, sometimes replete with an anecdote. The left-hand page of the spread is also the home of Stan Folsom's line drawing of each plant. On the facing page, three to six stunning photographs illustrate the plant and any recognized forms and varieties. Below the photographs is a range map for Texas illustrating the counties in which the plant has been verifiably reported. The final section of Part 2, Bordering Species, Excluded Species, and Literature Reports (which in most of the other guides in this series is at most a page) is a full eight pages. This is exciting stuff for those of us who like to engage in botanical sleuthing!

The third part of the book, *References and Resources*, has a number of treats for the confirmed native orchid fanatic and the newly initiated alike. A checklist of Texas orchid species, distribution lists by region, and several sections explicating and reconciling the comparative taxonomy found in other works on the native orchids of Texas are useful. More fun, at least in this reader's opinion, are the sections that list Texas wild orchid facts (for example, Texas is home to many species of orchids that reach the limit—northern, southern, eastern or western—of their range in the Lone Star State. Given its size and location, this probably should not have come as a surprise!).

Finally, Part 4, *Orchid Hunting*, provides a region-by-region and season-by-season guide to finding the wild orchids of Texas. It is not, of course, a listing of GPS coordinates, but rather a guide to what species may be found in the different habitats of the regions throughout the year. The guidance is general enough that one need not fear that unscrupulous individuals would be able to use it to deplete the already rare stocks of native orchids. At the same time, it is specific enough that the reasonably knowledgeable and enthusiastic botanizer will find plenty of information to lead him or her in the right direction and to ensure that she or he is keeping an eye out for plants that might actually be there.

In addition to its value as a field guide, *Field Guide to the Wild Orchids of Texas* is also a wonderful addition to one's orchid or natural history library. I, for one, will purchase a second copy for any forays into the Texas wilds; with a child who is looking at colleges and seems enamored of Texas, those forays may come sooner than I would have thought!

Nathaniel E. Conard
nconard@pingry.org

ORQUÍDEAS DE LA REPÚBLICA DOMINICANA Y HAITÍ
ORCHIDS OF THE DOMINICAN REPUBLIC AND HAITI

Eladio Fernández, Francisco Jiménez, Juan Llamacho, and James Ackerman

American Chamber of Commerce of the Dominican Republic

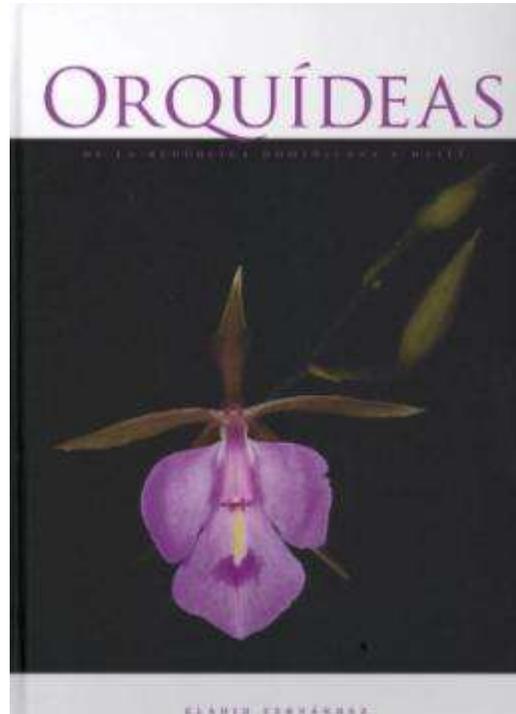
209 pages, 100 illustrations

Limited printing of 2000 copies

9.25 x 12.5"; \$95 US plus shipping at cost

Ordering information: Amcham@amcham.org.do or
<http://www.orchidsbooks.com/book.asp?id=1150>

Another visual feast of orchids from the Caribbean and Middle America! With 200 pages of color photographs by Eladio Fernández, a series of essays co-authored by Juan Llamacho (author of *Orchids of Cuba*) and James Ackerman (author of *Orchids of Puerto Rico*) it concludes with an updated list of all the orchid species reported for the island. The large format of the book enables us to see many of these tiny-flowered species many times their natural size. The text is in both Spanish and English throughout. The Introduction is excellent and covers much of the usual material in most orchid books regarding morphology and taxonomy as well as sections on the various and diverse habitats found in Hispaniola (Haiti and the Dominican Republic). Many species are illustrated for the first time in such a publication. The species treatments are divided



into two sections: epiphytic and terrestrial. The latest recognized generic concepts are used and the book is dedicated to Donald Dod, a long-time orchid researcher on the island, and species either discovered by him or named for him are often featured. For the US native orchid enthusiast twenty species are treated and illustrated that also occur in Florida and/or the southeastern United States.

There are few errors to be noted, and most of them in spelling (which may have been the result of translating from Spanish to English): *Maxilaria* for *Maxillaria*, *Polystachia* for *Polystachya*, *Epidendrum difformes* for *E. difforme*, etc. Three textual statements are curious. In the Introduction under *What are Orchids?* the first statement is: Orchids are grasses....., a curious conception; under the genus *Ponthieva* it states that the genus 'is indigenous to the American tropics' which is incorrect as it ranges to southeastern Virginia in the US; and under *Spiranthes* states that the 'genus is fragrant, and is found in warm tropical regions in the Western Hemisphere' which is also incorrect as *Spiranthes* is found in both hemispheres and ranges northward to the tundra (*S. romanzoffiana*) and few species have any fragrance.

Some of the spectacular photos may be seen at http://www.gigasize.com/get.php/-1100139986/070105_Presentacion_Orquideas2.pdf. The publication is sponsored by the American Chamber of Commerce of the Dominican Republic with a percentage of the sales devoted to AMCHAM's social responsibility projects. I highly recommend it for all orchid enthusiasts with an interest in Florida and the Caribbean. *PMB*

Orchid Seed Germination Media, a Compendium of Formulations

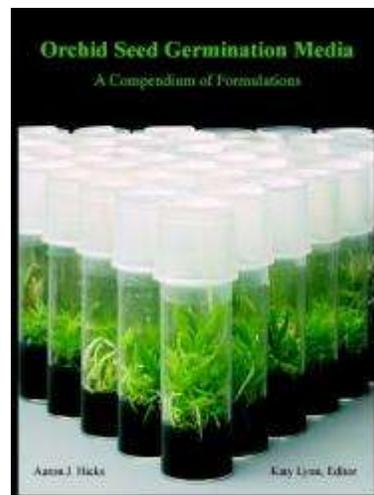
Aaron J. Hicks with Katy Lynn (editor)

The Orchid Seedbank Project

210 pages ISBN 0-9673049-2-X

\$60 postpaid Order from: The Orchid Seedbank Project at

<http://members.cox.net/ahicks51/osp> or *Phyto*Technology Laboratories at www.phytotechlab.com



For those interested in orchid seed germination, this 210 page publication has more media formulation information contained between its covers than any other currently available book on the subject. With page-after-page of tabularized media formulation, with original publication references cited, Hicks presents a nearly complete encyclopedia of new and old media formulations for the germination, replate, and maintenance of orchid cultures. The first half of the book contains thorough discussions on the history, chemistry, and basic laboratory supplies commonly used in the formulation and preparation of orchid germination media. Of the 19 concise chapters contained in the text, I found six of particular interest and importance to any publication dealing with *in vitro* orchid media—chapters on essential nutrients (macronutrients), micronutrients, other mineral elements, vitamins, sugars, and heterotrophic carbon. Several previous attempts by other authors to include adequate discussions of these important *in vitro* factors to orchid seed germination, growth, and development have resulted in 300 page plus academic textbooks that are often out of reach to many orchid enthusiasts. Hicks conquered these topics with skill and clarity, making the *in vitro* mineral nutrition of orchids accessible to a wide audience. The publication is completed by a listing of over 125 different formulations for orchid media and macro- and micro-element mixtures. Besides listing the formulations for the most commonly used orchid media, Hicks' in-depth research yielded several lesser known and lesser publicized media formulations that could be of interest to specialized growers of the less popularized orchid genera. Also, Hicks includes formulations for both asymbiotic and symbiotic orchid seed germination and replate media for tropical and temperate species; something new to compendia of media formulations. Each formulation is accompanied by the original publication citation and a brief discussion of the application of each medium. I was privileged to contribute a few of the symbiotic media formulations and application notes.

As with any publication, there are things that could have been done differently. I found Hicks' brief discussion of individual orchid genera in relation to seed germination *before* the presentation of each individual media formulation awkward. I would have preferred this section come after the media formulation section, since specific media are discussed in conjunction with each genus. However, this is of no major consequence to the quality or completeness of the publication.

For enthusiasts or professionals interested in orchid seed germination, this text is a simple *must have* in your library, and works well as an companion to Hicks' 1999 publication, which is currently back in print, *Asymbiotic Technique of Orchid Seed Germination*. Both publications are available at The Orchid Seedbank Project website, and the media formulation guide will soon be available through *Phyto*Technology Laboratories.

Scott L. Stewart, Ph.D. *Phyto*Technology Laboratories, LLC, P.O. Box 12205, Shawnee Mission, KS 66282-2205 E-mail: scott@phytotechlab.com

Native Orchid Online Shop

www.nativeorchid.org/shopping.htm

Native Orchid Conservation Inc (NOCI) is a non-profit conservation organization. We sell these products as one way to raise money for our conservation projects. Items for sale include the field-guide *Orchids of Manitoba* which we published, the *Zoom In* video which we produced, and the wonderful Handcrafted Leather Jewellery which is Made in Canada by Elizabeth Petrucci. All prices are in Canadian-Dollars.



Tenth Anniversary Calendar --NEW ITEM--

This 2008 calendar features orchids and other attractive nature photographs. Two additional pages highlight activities and accomplishments of NOCI during its first ten years.

A great gift for any occasion!

Price: \$9.95



Orchids of Manitoba: a fieldguide

by Ames, Bainard, Acheson, Heshka, Joyce, Neufeld, Reeves, Reimer, Ward; 158pp; ISBN: 0973486406;

"One of the best orchid guides in North America, a blend of excellence, accuracy and quality...the photographs are exceptional...a great book!" -- Paul M. Catling, Research Scientist and Curator at Agriculture Canada;

Price: \$17.95



Zoom In On Native Orchids

Educational and entertaining video on DVD; the first segment features Al Simmons; the second segment has information on our native orchids;

Price: \$5.00

BOOK REVIEWS & PUBLICATION ANNOUNCEMENTS



Showy lady's-slipper pin

Made in Canada; handcrafted in leather by Elizabeth Petrucci;

SMALL (approx 2x1.5 inches): Price: \$10.00

LARGE (approx 3x2 inches): Price: \$20.00



Pink lady's-slipper pin

Made in Canada; handcrafted in leather by Elizabeth Petrucci;

SMALL (approx 2x1.5 inches): Price: \$10.00

LARGE (approx 3x2 inches): Price: \$20.00



White lady's-slipper pin

Made in Canada; handcrafted in leather by Elizabeth Petrucci;

SMALL (approx 2x1.5 inches): Price: \$10.00

LARGE (approx 3x2 inches): Price: \$20.00



Yellow lady's-slipper pin

Made in Canada; handcrafted in leather by Elizabeth Petrucci;

SMALL (approx 2x1.5 inches): Price: \$10.00

LARGE (approx 3x2 inches): Price: \$20.00



White fringed-orchid pin

Made in Canada; handcrafted in leather by Elizabeth Petrucci;

SMALL (approx 2x1.5 inches): Price: \$10.00

LARGE (approx 3x2 inches): Price: \$20.00



Purple fringed-orchid pin

Made in Canada; handcrafted in leather by Elizabeth Petrucci;

SMALL (approx 2x1.5 inches): Price: \$10.00

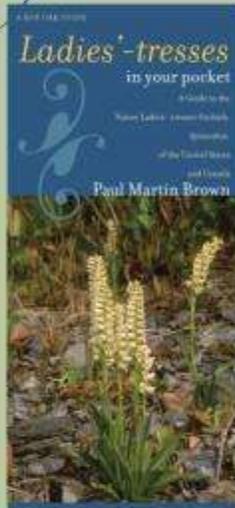
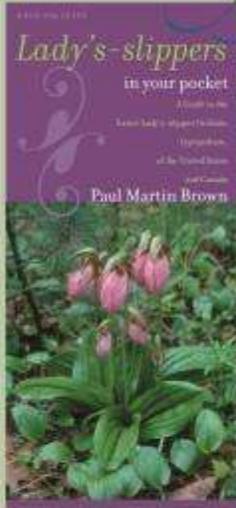
LARGE (approx 3x2 inches): Price: \$20.00

Membership in Native Orchid Conservation Inc

Being a NOCI member means you'll receive our quarterly newsletter; you'll have the opportunity to go on field-trips to see orchids and other rare plants and to photograph them. \$10.00 (for one year)

Ordering options (by mail, phone, email, website): NOCI Book Orders, 202--737 St-Joseph St., Winnipeg, MB R2H3A2 Canada 204-237-9325 hcalvez@mts.net <http://www.nativeorchid.org/shopping.htm>

Looking for orchids?



Lady's-slippers in Your Pocket
A Guide to the Native Lady's-slipper Orchids,
Cypripedium, of the United States and Canada
by PAUL MARTIN BROWN
laminated fold-out guide · 34 color photos · \$9.95

Ladies'-tresses in Your Pocket
A Guide to the Native Ladies'-tresses Orchids,
Spiranthes, of the United States and Canada
by PAUL MARTIN BROWN
laminated fold-out guide · 30 color photos · \$9.95

Paul Martin Brown provides general distributional information, time of flowering, and habitat requirements for each species as well as a complete list of hybrids and the many different growth and color forms that can make identifying orchids so intriguing. For the lady's-slippers he includes information on 12 species, 2 additional varieties, and 6 hybrids; for the ladies'-tresses information on 26 species, 3 additional varieties, and 7 hybrids.



IOWA *where great writing begins*
University of Iowa Press
www.uiowapress.org



Available from your favorite bookseller, University of Iowa Press,
or the authors at naorchid@aol.com
These are the first two in a projected series of 12 guides.

NOW AVAILABLE!

Ideal for the casual or dedicated orchid enthusiast

"Clear and concise text, easy-to-use keys, breathtaking photography, exquisite line drawings, and easily tucked into your backpack! What more could one ask of this nifty field guide?"--Helen Jeude, Botanical Research Institute of Texas

"An outstanding addition to previous similar works by the same author-artist team. However, this work and the others are much more than mere 'field guides!' They clarify and update information regarding the orchid flora of the United States, and for the orchid hobbyist-hunter, the 'where-to-look-for-orchids' portion alone may be worth more than the price of the book."--Dr. Robert J. Ferry, McAllen (Texas) International Orchid Society

Though many may not realize it, Texas is home to some of the rarest orchid species in the world. From the Big Thicket to the Big Bend, from the Panhandle to the coastal plains, *Field Guide to the Wild Orchids of Texas* is the first native orchid field guide to cover each of the Lone Star State's eco-regions.

60 species and varieties --
4 new to Texas

38 color and growth forms -- 4 recently published and new to Texas; 8 hybrids; details on 17

additional species that grow adjacent to the borders of Texas and may eventually be found there
University Press of Florida - \$29.95 - ISBN13:978-0-8130-3159-0 316 pages; 288 color photographs; 6 color watercolors; 91 line drawings; 67 full color maps

Signed and inscribed copies from the authors at naorchid@aol.com

The perfect compliment and companion to the
Liggio's *Wild Orchids of Texas* (1999).

